Abstracts and Programme

EUROANAESTHESIA 2007

Annual Meeting of the European Society of Anaesthesiology

Munich, Germany,
June 9–12, 2007
EUROANAESTHESIA 2007
Annual Meeting of the European Society of Anaesthesiology
Munich, Germany, June 9–12, 2007

ABSTRACT PRESENTATION PROGRAMME

For the first time at Euroanaesthesia meetings, abstract presenters will NOT be required to make a formal presentation of their abstract in a separate room, using audiovisual aids (except for the Best Abstract Prize Competition). Instead, two chairpersons will conduct, in front of each poster, a short discussion of each abstract with the presenter and the audience, for every abstract in that session. Poster presenters will be required to stand by their poster for 45 minutes before and 30 minutes after their session, to address further questions.

Note that all posters of regular abstract sessions will be displayed in Hall B0. The Best Abstract Prize Competition, however, takes place in Room 03.

As of this year, the accepted abstract number has a new format, consisting of the session reference, followed by a number denoting the order of the abstract within this session (e.g. 6AP1, which would be the first (1) Abstract Presentation (AP) session for subcommittee 6). The first abstract to be presented in session 6AP1 will thus be called 6AP1-1, the second one 6AP1-2 and so on.

The locate abstract 6AP1-1 or other abstracts for session 6AP1 in this supplement, look for the session reference (6AP1) in the schedule below, then browse to the appropriate page number, which always refers to the page number of the first abstract within the specified session.

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BAPC1-1
Reduced propofol sensitivity in S267 mutant glycine receptors
J. Ahrens, M. Leuwer, J. Lambert, G. Haeseler
Anaesthesiology, Hannover Medical School, Hannover, Germany

Background and Goal of study: The aromatic alcohol propofol (2,6 disopropylphenol) positively modulates GABA-A and glycine receptors (1). While molecular determinants for binding of propofol to GABA-A receptors have been extensively studied (2), little is known about the binding site of propofol on glycine receptors.

Material and Methods: We investigated the effects of propofol on chloride inward currents via two specific mutations within the α1 subunit of the rat glycine receptor (α1, S267I and α1, S267M) with standard whole-cell experiments. Glycine receptor α1 subunits (wild type or mutants) were heterologously expressed in human embryonic kidney cells.

Results: Both mutants (a) decreased sensitivity to the natural agonist glycine (glycine EC50 12.8 ± 2.3 μM in wild type, WT), 81.5 ± 21.2 μM in α1, S267I and 122.8 ± 18.5 μM in α1, S267M); (b) decreased sensitivity to propofol with respect to co-activation of an EC50 glycine response (propofol EC50 4.8 ± 1.2 μM in WT, 36.3 ± 17.5 μM at the α1, S267I and 9.5 ± 3.2 μM at the α1, S267M receptor); and (c) abolished direct receptor activation by propofol.

Conclusions: These results suggest that the serine residue at the position 267 in the transmembrane domain 2 of the α1 glycine receptor is crucial for receptor activation by the natural agonist glycine and by the anesthetic propofol in the absence of glycine. The fact that the exchange of serine for the bulkier isoleucine had a stronger impact on the co-activating actions of propofol than the exchange for the polar methionine suggests that larger hydrophobic side chains inhibit access to the co-activating binding site.


BAPC1-2
Maintaining normoglycemia and not glycemia-independent actions of insulin preserves myocardial performance by protecting mitochondrial function
B. Elger, I. Vanhorebeek, Y. Debaveye, R. De Voss, G. Van den Bergh
Department of Intensive Care Medicine, Catholic University of Leuven, Leuven, Belgium

Background and Goal of Study: Intensive insulin therapy (IIT) reduces mortality and morbidity of critically ill patients. Several investigations suggest that insulin might ameliorate myocardial contractility independently of its actions on blood glucose.

Materials and Methods: In a rabbit model of prolonged critical illness using a 4-arm design (n = 8 per group), blood glucose (normal NG-high HG) and plasma insulin levels (normal NI-high HI) were independently manipulated over 7 days, to elucidate relative impact of maintaining normoglycemia and glycemia-independent actions of insulin on left ventricular contractility in an open chest preparation. Cellular ultra-structure by electron microscopy, the activities of the respiratory chain complexes in biopsies from the left ventricle, and plasma levels of serum heart-fatty-acid-binding-protein.

Results and Discussions: Contractility increased in HI/NG animals and deteriorated in HI/HG compared to other groups and healthy controls. Cardiac output and surrogates parameters of preload and afterload did not differ among groups. Electron microscopy revealed severely damaged mitochondria in cardiac myocytes in particular in HI/HG rabbits. Concomitantly, the activities of complexes I, III and V were compromised in the left ventricle biopsies of both hyperglycemic groups, in particular in the HI/GG group. Both normoglycemic groups revealed no changes in ultra-structure and complex activity compared to healthy controls. Compromised mitochondrial enzyme activities correlated with cardiac damage assessed by plasma levels of heart-fatty-acid-binding-protein, suggesting that mitochondrial protection mediated part of the prevention of organ failure.

Conclusions: In our animal model of prolonged critical illness, insulin ameliorated myocardial contractility but only when normoglycemia was maintained concomitantly. Maintaining normoglycemia and not glycemia-independent actions of insulin appear crucial for preserving mitochondrial function in the myocardium.

BAPC1-3
The protective role of carbon monoxide in ventilator induced lung injury
A. Hoetzl, Y. Zhang, A.M.K. Choi
Pulmonary, Allergy, and Critical Care Medicine, University of Pittsburgh Medical Center, Pittsburgh, USA

Background and Goal of Study: Ventilator induced lung injury (VILI) still remains a major cause of death in intensive care medicine. Carbon monoxide (CO) has been shown to exert anti-inflammatory, anti-oxidative, and anti-proliferative effects. Here, we hypothesized that CO might reduce lung injury during mechanical ventilation.

Materials and Methods: C57/BL6 mice (n = 5/group) were ventilated with 12 ml/kg tidal volume for 1, 4 and 8 h, with room air or air + 250 ppm CO. Control mice were sham operated. Blood samples were taken to measure blood gases. Bronchoalveolar lavage (BAL) and lung tissue were analyzed to determine total cell and neutrophil count, cytokine release, and heat shock protein response, respectively.

Results and Discussions: Mechanical ventilation without CO led to an increase in neutrophil and total cell count in BAL after 4 and 8 h (p < 0.05) of ventilation as compared to sham. Furthermore, heat shock protein 70 and heme oxygenase-1 were up regulated in lung tissue. In contrast, additional CO-application attenuated the augmentation of neutrophil and total cell count (p < 0.05) in BAL as well as the up regulation of heat shock proteins during ventilation. These findings show that CO reduces lung injury that results from mechanical ventilation. Most interestingly, while the ventilation-induced IL-6 release was decreased in the presence of CO in the BAL, tissue levels of IL-6 were further increased by CO treatment as compared to ventilation alone. This data indicates that CO might disturb neutrophil migration and cytokine release into the alveolar space.

Conclusion(s): 1) VILI occurs even with tidal volumes as low as 12 ml/kg that are used in clinical routine. 2) CO in low dose decreases lung injury that is observed with ventilation alone. 3) We suggest that the protective mechanism involves the inhibition of neutrophil migration and cytokine release by CO.

BAPC1-4
Indirect markers of pulmonary endothelial dysfunction correlate with high-altitude induced pulmonary hypertension
M.M. Berger, P. Bärttsch, H. Mairbäurl, E.R. Swenson, C. Dehnert
Department of Anesthesiology, University of Heidelberg, Heidelberg, Germany

Background and Goal of Study: Hypoxia-induced pulmonary hypertension plays a major role in the pathophysiology of hypoxic pulmonary edema formation (e.g. high-altitude pulmonary edema; HAPE). We hypothesized that the rise in pulmonary artery pressure (PAP) during hypoxic exposure is related to impaired pulmonary endothelial function with reduced nitric oxide (NO) and enhanced endothelin-1 (ET-1) bioavailability.

Materials and Methods: 34 participants were investigated at low altitude (110 m) and after rapid ascent to high altitude (≤ 24 hours to 4559 m), 3–4 hours after arrival at high-altitude blood samples were drawn via a central venous and a radial artery catheter, respectively, for determination of plasma nitrite (measured by flow injection analysis technique), plasma ET-1 (measured by radioimmunoassay), and plasma catecholamines (noradrenaline, adrenaline measured by HPLC). Systolic PAP (PAS) was estimated by transthoracic doppler-echocardiography, and chest radiography was used to diagnose pulmonary edema. In subjects developing HAPE the presented data were collected before the onset of edema formation. Data are expressed as Mean ± SEM, a p-value < 0.05 indicates statistical significance.

Results and Discussion: After ascent to high altitude arterial pO2 decreased to 38 ± 0.5 mmHg (p < 0.001) and PASP increased from 23 ± 0.7 mmHg to 37 ± 2 mmHg (p < 0.001). HAPE developed in 4 participants. Central venous ET-1 plasma levels increased about 3-fold (p < 0.001) while plasma nitrite remained stable (p = 0.331). At low altitude arterial-central venous (ACV) plasma gradients were negative for ET-1 and positive for nitrite (p < 0.001). They reversed after ascent to high-altitude (p < 0.05) and significantly correlated with PASP (ET-1: R = 0.49, p < 0.001; nitrite: R = −0.21, p < 0.05). ACV plasma gradients of ET-1 and plasma nitrite showed an inverse correlation (R = −0.48; p < 0.001), indicating a reciprocal regulation. Central venous plasma levels of noradrenaline and adrenaline increased about 2-fold (p < 0.001) and 1.6-fold (p < 0.05), respectively, but showed no correlation with PASP (p = 0.118 and p = 0.594).
Conclusion: These results indicate that an impairment of pulmonary endothelial function with a shift in the balance between plasma ET-1 and nitric oxide is of major significance for hypoxia-induced pulmonary hypertension.

BAPC1-5

Protective effects of sevoflurane preconditioning on Oxygen-Glucose Deprivation injury. Role of reactive oxygen species and adenosine triphosphate-regulated potassium channels

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Background and Goal of Study: The purpose of the present study was first to compare the extent of sevoflurane-induced neuroprotection on primary cortical cells cultures subjected to transient oxygen-glucose deprivation (OGD) either when applied during or before (preconditioning) the insult. Secondly, the possible involvement of intracellular reactive oxygen species (ROS) levels and KATP channels in the mechanism of the preconditioning effect of sevoflurane (SEVO) was explored.

Materials and Methods: Mature primary cortical neuronal-glial cultures were exposed to 90 min OGD followed by reoxygenation. Culture were randomly exposed to SEVO either during OGD without preconditioning or during a 90 min preconditioning period followed by a 60 min wash-out period before OGD. 2-mercaptoethanol glycine (2MGP) a free radical scavenger or glibenclamide (GLB) a blocker of KATP channels were added during the preconditioning. Twenty-four hours after the injury, neuronal death was quantified by lactate dehydrogenase (LDH) release into the media. Free radical generation in cells was assessed after preconditioning period using 2,7–dichlorofluorescin diacetate (DCFH-DA). Data are presented as mean ± SD. Statistical analysis used ANOVA.

Results and Discussions: Twenty-four hours after our cell cultures were subjected to 90-min OGD, 78.5 ± 4.4% of the neurons died. SEVO added at the start of the injury, elicited a potent and dose-dependent neuroprotective effect. SEVO preconditioning elicited a threshold neuroprotective effect at concentrations higher than 0.03 mM. In the presence of 2MGP (100 μM) or GLB (0.3 μM) sevoflurane lost its preconditioning effect as assessed by LDH test. In normoxic cultures preconditioned by SEVO (3.4 mM), DCFH-DA fluorescence intensity increased in a significant manner compared to sham wash cultures. The SEVO preconditioning-induced increase in ROS levels was inhibited by 2MGP and GLB.

Conclusions: Sevoflurane preconditioning neuronal-glial cell cultures against OGD by mechanisms that apparently involve release of ROS and KATP channels.

BAPC1-6

Caffeic acid phenethyl ester reduces mortality and sepsis induced injury in rats

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Background and Goal of Study: Sepsis and ensuing multi organ failure continue to be the major causes of morbidity and mortality in the intensive care units. Nuclear factor-Kappa beta (NFkB) activation is supposed to be one of the targets in the treatment of sepsis and ensuing mortality. We studied the effectiveness of caffeic phenethyl ester (CAPE), a known NFkB inhibitor, in cecal ligation and puncture (CLP) induced sepsis and lung injury.

Materials and Methods: 80 rats are randomized to 5 groups that included 8 rats for the mortality study and the rest 8 rats for histopathological and biochemical study. All rats were operated to induce sepsis with cecal ligation and puncture (CLP) except control and CAPE groups that were operated just with laparotomy. CAPE (50 μg/kg) was administered to rats intramuscularly at the time of operation in CAPE and CAPE + Sepsis(0) groups. CAPE was administered to rats in CAPE + Sepsis(12) group 12 hours after CLP. Rats were observed for mortality. 8 rats from each group were sacrificed 24 hours after CLP; blood was taken for interleukin 1, IL-6, IL-10 and TNF-α study and right lung was taken out for histopathological analysis, and left lung was taken out for oxidative stress parameters. Apoptosis was examined with Tunel staining. Induced nitric oxide synthase (NOS) and heat shock protein (HSP70) were examined with immunohistochemistry. Malondialdehyde (MDA), catalase (CAT), superoxide dismutase (SOD) and glutathione peroxidase (GSH-Px) were studied for oxidative stress evaluation.

Results and Discussion: Mortality was significantly decreased in CAPE + sepsis(0) (3deaths/8rats) and CAPE + sepsis(12) (3deaths/8rats) groups compared to the sepsis group (8deaths/8rats). IL-1, IL-6, and IL-10 increased except TNF-α levels in sepsis groups compared to control group. All cytokine levels were similar to control levels only in CAPE + sepsis(12) group. Apoptosis, NOS and HSP70 evaluation were significantly changed between all groups in following order: control < CAPE + CAPE + sepsis(12) < CAPE + sepsis(0) < sepsis. SOD and GSH-Px levels were not different among groups. MDA, CAT were increased sepsis.

Conclusion: CAPE reduced mortality in sepsis and histopathological changes best when it was administered after sepsis formation.

Evidence based practice and quality assurance

1AP1-1

Can we predict those patients who require anaesthetic assessment for major colorectal surgery?

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Background and Goal of Audit: Major colorectal surgery can have significant morbidity and mortality in the peri-operative period. We feel that it is important to identify high-risk patients before a date for surgery is confirmed to allow time for informed consent, investigations and optimization. The aim of the audit was to look at current practice and identify from this patients who should be assessed by a Consultant Anaesthetist prior to listing for surgery, compared to the number who were seen.

Materials and Methods: We audited 102 consecutive patients undergoing colo-rectal surgery. A questionnaire was completed by the Consultant Anaesthetist prior to listing for surgery compared to the number who were seen.

Results and Discussions: Results were analyzed by dividing the patients into 2 groups. Group 1 (n = 45): all patients who had been seen by an anaesthetist or those we would have liked to have seen prior to listing for surgery (44% of total patients seen), Group 2 (n = 57): all other patients. Data was analyzed using the Mann Whitney U test which compares Group 1 versus Group 2 for ASA grade, age, number of chronic diseases, number of drugs taken and chronic health score. P < 0.001 for all categories. Further analysis suggested that by looking at 2 categories and assessing all those with an ASA category of 3 or higher, or all above 79 years of age, we would ensure that we captured 98% of the patients we wished to see.

Conclusion(s): We would suggest that in our hospital best practice could be achieved by requesting to see all patients (for major colorectal surgery) who were ASA 3 or above or over 79 years of age. Within our institution this would average out at 2 patients per week involving 1 to 1.5 hours Consultant time. This may be useful for other centers who wish to assess the cost and time implications of offering anaesthetic pre-assessment to colorectal patients.

1AP1-2

Anaesthesiologist view by future nurses and pharmacists

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Background and Goal of Study: Knowledge of the activities and responsibilities along with communication between health care professionals represent one of the key factors for the improvement of health care quality.

How are anaesthesiologists and anaesthesia understood by future non medical health care professionals?

Materials and Methods: Last year students of pharmacy and nursing filled in 256 valid questionnaires. The answers were analyzed according to professional group and age.

Results and Discussions: It is clear the influence of the academic background of future professionals with future pharmacists focusing mainly on the interface between the anaesthetists and the drugs and to a lesser degree with the patient (e.g. pain management < 5%). Future nurses are more focused
1AP1-3

Efficient operating room management: an empirical analysis of german hospitals
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Background and Goal of Study: The goal of this study is to evaluate the cost efficiency of different OR management forms empirically.

Materials and Methods: We use cross-sectional data from a survey of all Anesthesiology departments in German hospitals for the year 2002. We develop hypotheses about the effect of structural, organizational and workflow components of the OR management process on OR efficiency. These components are taken out of existing management literature as well as suggestions from practitioners. To test our hypotheses, we develop a new proxy for operating room efficiency and regress variables which describe the different OR management forms on this proxy.

Results and Discussions: While the size of the hospital is the most important factor for increasing OR efficiency, the enforcement capacity of the OR manager is the single influential factor which is independent of external constraints. A hospital cannot change its size easily, but can equip its OR manager with the power necessary for this position.

Conclusion(s): The analysis shows that while structural characteristics have an important influence on OR efficiency, the implementation of the elementary management functions planning and controlling are critical to efficient OR performance.

1AP1-4

The ratio between anaesthesia and surgical procedure time as a controlling tool in the operating room
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Department of Anesthesiology, Kantonsspital Lucerne, Lucerne, Switzerland

Background and Goal of Study: Anaesthesia time (AT) and incision-to-suture time (IST) are important variables representing the production process in the Operating room (OR). The Ratio (R = AT/IST) between these two times is dependent on different variables and may also reflect the productivity in an OR. Therefore these times were analysed and assessed for simple influencing factors such as emergency versus elective situations and the surgical disciplines.

Materials and Methods: 40024 consecutive anaesthesia records of a general hospital were included in this study representing a 2 year period. 435 records had to be excluded because of inconsistent data. AT is defined as the time from the first contact with the patient till its transfer to the PACU or ICU. The Ratio (R) of AT divided by IST was calculated.

Results and Discussions: The mean surgical duration of a procedure (IST) was 68 minutes (min) = 69 standard deviation (S.D.) min for all 39589 cases (median: 45 min). The mean R was 2.62, the median 2.27 and the mode 2.0 = 6.25 S.D. 30698 (77,54%) procedures were elective and 8891 emergency cases. Mean ART, IST and R were statistically different between elective and surgical cases (p < 0.01, R elective mean 2.9 ± 3.2 S.D. and R emergency mean 3.2 ± 4.0 S.D.). The following surgical disciplines were included (mean R; General Surgery: 20.83% (R 2.97), plastic surgery 6.87% (R 3.5), obstetrics and gynaecology 11.72% (R 3.2), vascular, 3.08% (R 2.8), orthopaedics 5.5% (R 2.73), urology 4% (R 2.97), ophthalmology 16.18% (R 2.64), paediatrics 14.23% (R 3.4), ENT 8.92% (R 2.9), mandible-facial surgery 2.28% (R 2.51), adult heart surgery 2.51% (R 2.12) and neurosurgery 1.29% (R 2.4). In a regression model the surgical discipline (p 0.03) and case urgency (p 0.02) influenced R statistically significant.

Conclusion(s) and discussion: R is dependent of the surgical discipline and the urgency of the case. It is a variable tool together with other data to analyze productivity in the OR, but R is clearly dependant on the definition of AT, which may also influenced by local settings.

1AP1-6

Measurements of psychomotor performance of anesthesiologists during the 24-hours in-hospital call
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Department of Anesthesiology and Intensive Care, University of Split School of Medicine, Split, Croatia

Background and Goal of Study: Anesthesiologists’ work along with extended duty shifts is combined with intensified stress. Moreover, anesthesia practice requires sustained vigilance, parallel decision-making, and fine motor skills. The aim of this study was to find out the impact of sleep deprivation, fatigue and stress on anesthesiologists’ psychomotor performances, measured by the CRD (Complex Reactiontime Device), a computer based psychometric system, able to detect even discrete psychological and mental changes (2).

Materials and Methods: After the Medical Ethics Committee approval and informed consent, 27 staff anesthesiologists (35–55 yrs) were tested. A battery of 4 computer-generated cognitive psychological tests was used to record 2 parameters of cognitive performance: total test solving time (TTST – describing speed of reactions), and variability of reaction time (VRT-attention, alertness). Two tests were made during on call (8 am and 4 pm i.e. D8, D16), and two during the ordinary working day (8 am, 4 pm, i.e. W8, W16), ANOVA for repeated measures and LSD post-hoc test were used.

Results and Discussions: (see Table 1)

1AP1-7

Fast track rehabilitation of patients undergoing major abdominal surgery
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Background and Goal of Study: It has been proposed that a fast track (FT) programme omitting preoperative fasting, bowel preparation, routine abdominal drainage and NG tube insertion, together with epidural anaesthesia, infusion volume restriction, early enteral nutrition and mobilization, can reduce perioperative stress and enhance recovery without compromising patient safety(1). Our aim was to implement such a protocol and verify its safety.

Materials and Methods: During a 6 month period 30 patients undergoing major abdominal surgery were treated according to FT principles. Median age 63 yrs (40–88), 18/30 female, 77% (23) ASA I&II, 23% (7) ASA III. Continuous epidural infusion of levobupivacaine 0.125% & tramadol 5 mg/ml commenced preoperatively, supplemented by NSAIDs postoperatively. All admitted for 24 hr ICU observation, where enteral nutrition and mobilization started 5 hrs postoperatively. VAS pain score assessed 4 hourly during 24 hrs. A matched control group (group C) of 30 patients operated during the same period received “traditional” care. Independent samples t-test and ANOVA were used for result analysis and group comparison.

Results and Discussions: (see Table 2)

Table 1: Mean VAS scores, complication rates and CRI

Table 2: Mean VAS scores, complication rates and CRI
Infection, central venous catheter related bacteriemia), none of which directly related to any FP procedure.

**Conclusion(s):** Implementation of a fast track protocol resulted in improved patient recovery and a shorter hospital stay without increasing the complication rate compared to a traditional approach to perioperative care for patients undergoing major abdominal surgery ranging from oesophagegjunal to low colorectal anastomoses.

**Reference:**

### 1AP1-8

**Factors influencing the length of time for induction of anesthesia**


Anesthesiology; Hospital del Mar, Barcelona, Spain

**Background and Goal of Study:** The time needed for induction of anesthesia (TIA) is influenced by many factors. The aim of the study was to analyze variables described as significant in a recent observed-based study (1) and include a new set.

**Materials and Methods:** A retrospective observational study was performed with 14,342 charts from patients scheduled in the last 3 years. Data were directly collected from the automated Anesthesia record and Hospital databases. Variables analyzed were those previously described as significant (1): surgical service, ASA physical status (ps), resident teaching, anesthesiologists, techniques used (anesthetic, monitoring), and we also included the use of airway devices. ANOVA was performed to evaluate these factors.

**Results and Discussions:** The time of anesthesia induction was significantly increased by ASAs, anesthetic techniques, monitoring, airway devices, anesthesiologists, surgical service and resident teaching.

**Table 1.** TIA as a function of ASAs and primary anesthetic technique

<table>
<thead>
<tr>
<th>ASA I</th>
<th>ASA II</th>
<th>ASA III</th>
<th>ASA IV</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>n</td>
<td>26 ± 0.4</td>
<td>32 ± 0.4</td>
<td>37 ± 0.6</td>
</tr>
<tr>
<td></td>
<td>P value</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Spinal</td>
<td>n</td>
<td>20 ± 0.5</td>
<td>29 ± 0.4</td>
<td>33 ± 0.6</td>
</tr>
<tr>
<td></td>
<td>P value</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

**Table 2.** TIA in cases with invasive monitoring

<table>
<thead>
<tr>
<th></th>
<th>AC</th>
<th>CVP</th>
<th>PAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>37 ± 1.0</td>
<td>40 ± 1.2</td>
<td>44 ± 0.7</td>
</tr>
<tr>
<td>Yes</td>
<td>50 ± 0.9</td>
<td>47 ± 0.8</td>
<td>70 ± 5.0</td>
</tr>
<tr>
<td>P value</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

**Table 3.** TIA in cases with different airway devices

<table>
<thead>
<tr>
<th></th>
<th>LM</th>
<th>OTI</th>
<th>DLT</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>23 ± 0.7</td>
<td>33 ± 0.3</td>
<td>57 ± 3.0</td>
</tr>
<tr>
<td>Yes</td>
<td>505</td>
<td>645</td>
<td>138</td>
</tr>
</tbody>
</table>

**Conclusion(s):** Our study demonstrates that there are several variables than extend time of anesthesia induction. Added to a recent study (1) the use of airway devices were predictors of prolonged TIA. These factors should be taken in the account to optimize operating room schedule.

**Reference:**

### 1AP1-9

**Effects of an OR Manager on Workflow Effectiveness and Organizational Hierarchy in the OR Suite**

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**Background and Goal of Study:** The goal of this study is to identify how the existence of and the perceived effectiveness of an OR manager changes workflow and hierarchical relationships in the OR suite.

**Materials and Methods:** We use data from a survey of all Anesthesiology departments in German hospitals for the year 2005. This survey includes not only questions to the status quo of the OR management process but also on how anesthesiologists would rate this process at their institution, and how they would improve it. We then analyze for each component of the OR management process separately whether hospitals with a satisfying OR management are different from the others, and whether anesthesiologists which are unsatisfied with the OR management recommend improvements already in place in satisfying hospitals. We are particularly interested in how the OR manager is integrated into the existing personnel structure.

**Results and Discussions:** We found a number of OR-management significant correlations. For example, the presence of an effective OR manager correlates significantly (p = 0.001, Spearman’s rho) with a more effective management of OR schedule changes. On the hierarchy side, the presence of a stronger OR manager correlates significantly (p = 0.001, Spearman’s rho) with a decreased influence in the OR of the Chief of Surgery.

**Conclusion(s):** We find that the appointment of an OR manager is associated with a number of workflow effects and changes personnel hierarchy. These effects are overwhelming positive; however, some do not reach significance.

### 1AP2-1

**Auditing our audits. Are we completing the cycle?**

E. Duff

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**Background and Goal of study:** There is great emphasis on a comprehensive programme of clinical audit with it lying at the heart of clinical governance[1]. The audit cycle consists of choosing a topic, observing practice, setting standards, comparing practice with standards, implementing change and observing new practice (six stages). An assessment of the standard of clinical audit was completed in three directorates (medicine, surgery groups, women and children).

**Materials and Methods:** A quantitative retrospective assessment of clinical audit in three directorates between April 2003 and April 2005 was performed. Levels of audit completed were defined as full audit (FA, 5 out of 6 stages), partial audit (PA, 3 stages), potential audit (PO, 2 stages), planning audit (PL, topic chosen, intentions outlined), no audit (NA, not considered to be audit[2]). The target standard set was that 100% of audits should fulfill criteria for being full audits.

**Results and Discussions:** Findings are presented in the table as number performed (percent). The results for anaesthesia are included within the surgery group.

<table>
<thead>
<tr>
<th></th>
<th>FA</th>
<th>PA</th>
<th>PO</th>
<th>PL</th>
<th>NA</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Med</td>
<td>78 (31)</td>
<td>50 (9)</td>
<td>84 (34)</td>
<td>34 (14)</td>
<td>248</td>
<td></td>
</tr>
<tr>
<td>Surg</td>
<td>92 (33)</td>
<td>54 (19)</td>
<td>28 (11)</td>
<td>68 (25)</td>
<td>30 (12)</td>
<td>272</td>
</tr>
<tr>
<td>Anaes</td>
<td>7 (12)</td>
<td>18 (32)</td>
<td>16 (29)</td>
<td>6 (11)</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td>W&amp;C</td>
<td>106 (44)</td>
<td>62 (25)</td>
<td>12 (5)</td>
<td>46 (19)</td>
<td>15 (6)</td>
<td>236</td>
</tr>
</tbody>
</table>

Implementing change: 11% of the audits in anaesthesia led to change in practice. Re-audit: 1.7% of all audits in anaesthesia were re-audited.

**Conclusions:** Re-education on the basic principles of clinical audit and regularly “auditing the audits” will help derive maximum benefit from good quality audits. Re-auditing after implementing recommendations is essential to ensure clinical practice has changed and to establish improvements are sustained.

**References:**
1. NICE. 2002.

### 1AP2-2

**Does preoperative ECG testing offer any advantage over clinical risk scoring in the prediction of postoperative cardiovascular morbidity and mortality?**


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**Background & Goals:** Patients undergoing vascular surgery have a high incidence of postoperative (postop) complications[1]; in order to predict and potentially prevent these, investigations as well as scoring systems based on clinical information may be used. We have compared the utility of the Revised Cardiac Risk Index (RCRI) with 3 simple, non-invasive tests using
Electrocardiography (ECG) for detecting pre-existing cardiac disease to ask whether these tests offer greater predictive ability.

**Materials & Methods:** 222 vascular pts were recruited after informed consent and ethics committee approval. Full clinical assessment was made, together with routine clinical biochemistry, allowing determination of the RCRI. A pre-operative (preop) resting 12-lead ECG was performed and the presence of abnormalities noted (rhythm other than sinus, LVH, left axis deviation, ST seg. <, or > 5 VEs). QTc dispersion was calculated from the resting ECG (abnormal > 60 msec). Preop ambulatory ECG (AECG) monitoring was performed for silent myocardial ischaemia (SMI). The follow-up period was 12 mths after surgery and the timing of all adverse cardiovascular events was noted (cardiac death, MI, unstable angina, CCF, CVA or significant arrhythmia). The association between an abnormal clinical test and adverse outcome were made by Chi2 analysis; calculation of relative odds ratio, and the positive and negative predictive values of the 3 different investigations.

**Results & Discussion:** 63 pts were excluded from the final analysis (equipment failure, non-analyzable ECG), leaving 159. The preop ECG showed abnormalities in 70 pts; while SMI occurred in 30. Abnormal QTc dispersion was seen in 129 subjects. There were 24 events in the 1st 30 days, with a further 12 in the next 11 mths. There were no associations between any of the 3 preop investigations and postop outcomes. However, there was an association between the RCRI and outcome at 12 mths ($R^2 = 0.068; p = 0.0482$).

**Conclusions:** Preop 12-lead ECG and AECG monitoring give a poor indication of the likelihood of complications in vascular surgery pts. The RCRI has a role in identifying pts who may benefit from preop cardiac referral.

**References:**

**1AP2-3**

**Cause of failure of cannulation the internal jugular vein**

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**Cardioanaesthesiology, G.Papanikolaou, Thessaloniki, Greece**

**Background and Goal of Study:** Internal jugular vein (IJV) catheterization is a common procedure in anaesthesiology and critical care everyday practice, however anatomical variations of the IJV might prevent cannulation while repeated efforts might lead to complications such as arterial puncture, hematoma formation, pneumothorax, injury to the trachea, vein thrombosis. Cannulation is not always successful and uneventful mainly due to anatomical variations of the size and/or location of the IJV.

**Materials and Methods:** Autopsy findings in 93 human cadavers revealed the presence of a hypoplastic left IJV in 3 cases (3/93, 3.2%).

**Results and Discussions:** In first case the diameter of the left IJV was 3 mm, while in the other two cases the diameter was about 5–6 mm. In both cases the external jugular veins were larger than average. In the first case there was a local hematoma formation due to unsuccessful cannulation. Alderson et al. studied a group of children under the age of 6 and found 4% to have very small diameters of right IJV. Small size (<5 mm) located in the normal position were found in 8.7% of both the right and the left IJV. Denys and Uretsky also reported in their adult series that usually small veins (<=5 mm) were seen in six (3%) patients.

**Conclusion(s):** These findings suggest that anatomical variation may partly account for the inability to cannulate the internal jugular vein in certain patients. Taking into consideration the frequency of anatomical variations of IJV, one should consider to attempt an ultrasound-guided puncture for safe and effective cannulation of these veins.

**References:**

**1AP2-4**

**Quality indicators for anesthesia, the need for nationwide comparison of health care**

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**Anesthesiology, University Medical Center Utrecht, Utrecht, The Netherlands**

**Objective:** To develop a nationwide quality control program for anesthesia based on indicators for anesthesia, as required by national health authorities for all medical specialties.

**Materials and methods:** The National Society of Anaesthesiology has selected 18 indicators out of an original set of 65 to be put on trial for this year. First focus is on reliable registration of structure and process indicators, the next step will be registration and implementation of outcome indicators.

**Results:** The selected indicators are listed below.

Preoperative care:
Preoperative clinic, % patients seen by anesthesiologist.
Fasting: % that had clear fluids 2 hours before anesthesia.
β blockers: % high-risk patients that had β-blockers preop.

Intraoperative care:
Thermoregulation: % < 35° core-temperature postop
Epidural for vascular and colorectal surgery: % used
Epidural for lateral thoracotomy: % used
Immediate availability of anesthesiologist.

Postoperative care:
Urinary retention: % bladder volume measured
Recovery facilities: is 24 hour recovery available?
Recovery discharge criteria: % with PAR-score determined
Pain treatment:
Severe postoperative pain: % VAS > 7 (of 10), < 24 hours
Acute pain service: availability and % treated for postop pain
Epidural for delivery: availability 24 hours, 7 days
Life support:
Code for full/no resuscitation: % recorded in medical records
Resuscitation committee: % evaluated resuscitations
Advanced Life Support: available ALS team 24 hours: % < 5
Basic Life Support: % BLS trained hospital personnel

**Conclusion:** The feasibility of the set is piloted in 2007 in 14 hospitals. Useful indicators will be implemented nationwide and, in the future, can be used by health authorities and health insurance companies for evaluation of quality.

**1AP2-5**

**Beta error free riskfactor identification based on SPELA, a neuro-evolution method**

T. Kaufmann, K. Wassermann, G. Schuepfer

**Medical staff office, Kantonsspital Luzern, Luzern, Switzerland**

**Background and Goal of Study:** Preoperative risk identification is important for resource allocation in perioperative medicine. A beta error free identification of risk factors assessed by anaesthetists would help to steer the perioperative process more efficiently.

**Materials and Methods:** Data for predictive modeling: 18788 patients for elective surgery has been selected in order to exclude a bias due to different baseline risk. 68 patients (0.37%) died within 30 days. Using ASA risk classification, age, gender and 48 binary variables a risk stratification for postoperative mortality was made. The generated records were linked with the administrative database of the hospital. Therefore, mortality within 24 hours and 30 days after surgery was linkable with the two different classifications.

**Results and Discussions:** Using SPELA, a neuro-evolution method able to create models without type-II-errors and to identify interactions between variables, was used to simultaneously identify sub-sets of risk factors and typical risk profiles.

**References:**

**1AP2-6**

**Beyond Medline: how much do other trial search strategies contribute to a systematic review in anaesthesia?**


**Anaesthesia, Royal Lancaster Infirmary, Lancaster, United Kingdom**

**Background and Goal of Study:** Exhaustive multi-method searching is recommended [1] to locate all relevant randomised controlled trials (RCTs) for systematic reviews, but there are few empirical data to support the additional
effort involved [2]. We used our data from a Cochrane review of ultrasound guidance of regional blockade to explore this question.

**Method:** We used expert, database-specific search strategies for Medline (1966 on), EMBASE (1974 on) and CENTRAL (the Cochrane Collaboration register of controlled trials). We handsearched 6 major anaesthetic journals and the annual meeting supplements of the European, American and Canadian anaesthetic societies, all from 2004 on. We also contacted researchers in the field.

**Results and Discussion:** The Medline search missed none of the RCTs that were finally included. EMBASE and CENTRAL both found possibly relevant material missed by the Medline search. The eventual yields of the 3 databases are shown in the Table.

<table>
<thead>
<tr>
<th>Method</th>
<th>Medline</th>
<th>EMBASE</th>
<th>CENTRAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>'Hits'</td>
<td>803</td>
<td>892</td>
<td>106</td>
</tr>
<tr>
<td>Possibly relevant</td>
<td>10</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>In final review</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Yield (%)</td>
<td>0.005</td>
<td>0.003</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Handsearching journals yielded no extra RCTs. Searching the meeting abstracts found 7 abstracts of otherwise unpublished RCTs. Personal contact yielded a further trial not yet indexed in the above databases, and a further RCT just submitted for publication.

**Conclusions:** Addition of a second database to Medline helped find more RCTs in CENTRAL (which contains only RCTs), but handsearching meeting supplements and contact with researchers is clearly of benefit when new technologies are still undergoing evaluation.

**References:**
1. www.cochrane.org/resources/handbook.

**1AP2-7**

Systematic review of effectiveness and safety of ultrasound guidance in regional neural blockade: preliminary findings


Anaesthesia, Royal Lancaster Infirmary, Lancaster, United Kingdom

**Background and Goal of Study:** Ultrasound (US) has been introduced into anaesthetic practice for the insertion of regional blocks. There have been many publications on the subject but few rigorous evaluations. We aimed to identify and collate all randomized controlled trials (RCTs) on the effectiveness and safety of this technique.

**Method:** We searched for RCTs studying the use of US, in comparison with another method of nerve location, in adults undergoing regional blockade as sole anaesthetic technique for surgery. We searched Medline (1996 on), EMBASE (1974 on) and CENTRAL, as it contains only RCTs. Handsearching meeting supplements and contact with researchers is clearly of benefit when new technologies are still undergoing evaluation.

**Results and Discussion:** We identified 5 full reports of RCTs, including 338 patients. All studied the technique in brachial plexus blockade (axillary alone 2 trials, supraclavicular alone 1, infraclavicular alone 1, axillary/intercostal 1). Two compared US with electrical nerve stimulation, one with surface landmarks, one with a transarterial technique and one with US plus nerve stimulation. Outcomes assessed included time taken for insertion, onset time, quality/extent of block, need for supplementary injections, conversion to general anaesthesia (GA) and ‘adverse events’ (inadvertent arterial puncture, painful paraesthesiae). No single trial reported on all outcomes. In view of the diversity of techniques, outcomes and comparisons, we have not applied statistical meta-analysis. The effect of US on the quality of sensory block is inconsistent, the effect size apparently being dependent on the control technique. However, US appears to reduce insertion time by between 2 and 5 minutes, reduce the need for GA and reduce the incidence of adverse events. The 8 trials we found published as abstracts showed similar findings. Their results will be incorporated when the full trial data are available.

**Conclusion:** Ultrasound guidance of brachial plexus blocks appears to offer some advantages, especially in terms of insertion time and complications. We will quantify this benefit when further full data appear.

**Background and Goal of Study:** The aim of our study was to assess the effect of NutriPDA, a personal digital assistant (PDA)-based clinical decision-support system (CDSS) for the management of artificial nutrition. A CDSS was developed and implemented on a handheld computer for use in the ICU after cardiovascular and thoracic surgery. System impact was assessed in a prospective “before/after” cohort trial.

**Materials and Methods:** After informed consent we studied 61 patients in the postcardiovascular and thoracic surgery ICU (length of stay > 8 days). Patients were divided into two groups (before and after the use of NutriPDA: Group A: 32 patients (4-month period in 2005); group B: 29 patients (4-month period in 2006). Analysis of variance (p < 0.05) was performed to test difference between groups.

**Results and Discussion:** There were no significant differences in anthropometric and clinical parameters between the 2 groups. Energy intakes were < 80% of basal energetic expenditures in 21% and 1% of patient, respectively (p < 0.001). Caloric and nitrogen intakes were beyond international recommendation in the Group A: 20 ± 7 kcal/kg/d (mean ± SD), 104 ± 33 mg/kg/d, but not in the Group B: 26 ± 4 kcal/kg/d, 196 ± 61 mg/kg/d (p < 0.001).

**Conclusion(s):** NutriPDA was found to be able to optimize artificial nutrition by improving caloric intake in ICU. This new software has potential clinical applications.


**1AP2-8**

Use of Personal Digital Assistant for managing artificial nutrition in intensive care unit after cardiovascular and thoracic surgery

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Service danaesthesie reanimation, Hopital cardiovasculaire et pneumologique L.Pradel, Lyon, France

**Background and Goal of Study:** Living donation in the field of renal transplantation has increased over time as well as the use of laparoscopic nephrectomy. Pneumoperitoneum, as used in laparoscopic surgery, may result in complications. We aimed to identify and assess the long-term follow-up of kidney donors.

**Method:** We conducted a retrospective study of donor nephrectomy performed at our institution from 2002 to 2006. We reviewed the medical charts of all donors who underwent laparoscopic nephrectomy.

**Results:** During the study 100 LDN were performed (37% males, 63% females and mean age 50.67 ys). The average duration of surgery was 227.5 minutes. Six laparoscopic procedure required conversion to laparotomy. All de donors presented an alteration of the renal statistically significant function that was kept for one month.

**Conclusion:** The use of laparoscopic nephrectomy in living donation is safe and feasible. The postoperative complications are unpredictable and can be avoided by careful selection of donors and surgical technique.
Conclusion: Our results confirmed that LDN is a safe procedure with a low morbidity. Despite that we adopted an strategy for "renal protection", there was an alteration of the renal function without clinical repercussions.

1AP2-10

Department of Anesthesiology, University Hospital Bern, Bern, Switzerland

Background and Goal of Study: Besides morbidity and mortality quality of recovery has been recommended as an important outcome after anaesthesia [1]. The SF-36 – a validated quality of life score – was used to show advantages of epidural anesthesia [2]. The quality of recovery score (QoR) was validated in English and German [3]. Quality of recovery after hepatic resection is unknown. We assessed the feasibility of the SF-36 and QoR (German versions) to determine the time course of postoperative quality of life and recovery.

Methods: In 13 patients scheduled for hepatic resection a thoracic epidural was used for pain management and general anaesthesia was standardized. The SF-36 (7-day recall) was recorded preoperatively and at postoperative day 7 (pod7). The QoR was performed preoperatively and at pod1, pod3, pods and pod7. In addition the duration of interviews was recorded.

Results and Discussions: Physical and mental health decreased at pod7. QoR-duration of interview was shorter than SF-36 preop (by 8min) and at pod 7 (by 5.6 min) (p < 0.001).

Conclusions: Major abdominal surgery has a significant impact on physical health > 7 days. SF-36 and the QoR are feasible and valuable tools to evaluate this. The QoR Score may be superior in terms of short term quality of recovery because of shorter recall time of the items and time needed for assessment.

References:

1AP3-1
Practical Implementation of a peri-operative smoking cessation package. Experiences in a scottish DGH C. Hawe, C. Cairns, A. Longmate

Anaesthesia and Intensive Care, Stirling Royal Infirmary, Stirling, United Kingdom

Background and Goals: Smoking is the biggest cause of preventable morbidity and mortality in the UK. Millions of smokers requiring surgery are at increased risk of respiratory, cardiovascular and wound related complications (1). According to Scottish national guidelines this risk should be presented to the patient, alongside the offer of cessation support (2). However, this may not be achieved because of lack of time, staff training, and perceived effectiveness. Planned elective surgery represents a window of opportunity for successful smoking cessation interventions as demonstrated by a recent Cochrane Collaboration Review (3). This study aimed to assess our existing pre-operative smoking cessation advice and success rates, to develop an intervention package to support cessation and then to assess its impact.

Materials and Methods: Initially data was collected from 57 smokers attending for elective surgery, prior to introduction of the cessation package. The package included "brief advice training" for nurses involved in pre-operative care, improved written information for patients, and a publicity campaign, which included written advice and support from the GP and surgeon involved. After the package was implemented a further 30 smokers were assessed.

Results and Discussion: Post-intervention those who remembered receiving peri-operative smoking cessation advice increased from 37% (21/57) to 90% (27/30). This resulted in an increased cutting down rate from 21% (12/57) to 87% (26/30). Recall of risks and available support also improved.

Conclusions: This study demonstrates that brief advice training increases the likelihood of smokers receiving cessation advice and consequently, a reduction in peri operative smoking rate.

References:
Patients are referred by the radiologists and HbA1c plasma concentrations were similar in ASA I-III nondiabetic (normal – 6.1%) patients. After IRB approval, 30 ASA I-III nondiabetic (normal – 6.1%) patients were recruited to participate in this study. This study assessed the increased risk of perioperative morbidity and mortality. We hypothesized that increased risk of perioperative morbidity and mortality would be associated with increased perioperative hyperglycemia. We tested the hypothesis that perioperative hyperglycemia is greater in morbidly obese patients than in nonobese patients.

**Materials and Methods:** After IRB approval, 30 ASA I-III nondiabetic (normal HbA1c and fasting glycemia) morbidly obese patients (BMI: 30.3 ± 3.5 kg/m²) scheduled for laparoscopic sigmoidectomy. Anesthetic technique (sevoflurane in O₂-air) was standardized in all patients. After surgery, all patients were administered Glucose 10%. 80 ml/h. Blood glucose was measured before premedication, at induction of anesthesia, after tracheal intubation, every 30 min intraop, and then every 6 h postop for 24 h. Data (mean ± SD) were analyzed using Students’ t test or ANOVA for repeated measures when appropriate. P < 0.05 — statistically significant.

**Results and Discussions:** HbA1c plasma concentrations were similar in nonobese (5.7 ± 0.5%) and obese (5.6 ± 0.6%) patients. Intra- and postop glycemia were not significantly different in obese markedly obese patients (BMI: 43.1 ± 11.3 kg/m²) scheduled for laparoscopic cholecystectomy. Anesthetic technique (sevoflurane in O₂-air) was standardized in all patients. After surgery, all patients were administered Glucose 10%. 80 ml/h. Blood glucose was measured before premedication, at induction of anesthesia, after tracheal intubation, every 30 min intraop, and then every 6 h postop for 24 h. Data (mean ± SD) were analyzed using Students’ t test or ANOVA for repeated measures when appropriate. P < 0.05 — statistically significant.

**Conclusions:** Oral preoperative carbohydrate improves postoperative patient recovery but does not reduce the risk of PONV after thyroidectomy. No effect on anxiety was detected.

**References:**

**1AP3-4**

Perioperative hyperglycaemia is similar in nondiabetic morbidly obese and nonobese patients undergoing prolonged laparoscopy

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**Background and Goal of Study:** Surgical stress results in perioperative hyperglycaemia. Insulin resistance frequently develops in morbidly obese patients. We tested the hypothesis that perioperative hyperglycaemia is greater in nonobese diabetic patients than in nonobese patients.

**Materials and Methods:** After IRB approval, 30 ASA I-III nondiabetic (normal HbA1c and fasting glycemia) morbidly obese patients (BMI: 30.3 ± 3.5 kg/m²) scheduled for laparoscopic sigmoidectomy. Anesthetic technique (sevoflurane in O₂-air) was standardized in all patients. After surgery, all patients were administered Glucose 10%. 80 ml/h. Blood glucose was measured before premedication, at induction of anesthesia, after tracheal intubation, every 30 min intraop, and then every 6 h postop for 24 h. Data (mean ± SD) were analyzed using Students’ t test or ANOVA for repeated measures when appropriate. P < 0.05 — statistically significant.

**Results and Discussions:** HbA1c plasma concentrations were similar in nonobese (5.7 ± 0.5%) and obese (5.6 ± 0.6%) patients. Intra- and postop glycemia were not significantly different in morbidly obese and nonobese patients (F1).

**Conclusion(s):** Despite well-documented insulin resistance in obese patients, surgical stress during prolonged laparoscopy results in similar hyperglycaemia in nondiabetic obese and nonobese patients.

**References:**

**1AP3-5**

The use of remifentanil sedation in interventional radiology

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The Royal London Hospital Anaesthetics Department, Barts and the London NHS Trust, London, United Kingdom

**Background and Goal of Study:** Advances in interventional radiology have expanded the type of procedures performed in the radiology suite. While this allows patients to avoid open surgery, the procedures can be prolonged and painful, rendering "conventional" sedation used by radiologists inadequate to ensure patient comfort. Yet the increase in demand for anaesthesia has not been matched by an increase in access to general anaesthesia and theatre time.

We developed a protocol for the use of remifentanil as an alternative analgesic/sedative administered as an infusion by a solo consultant anaesthetist (no additional theatre staff are required). All procedures are performed in the radiology department.

**Materials and Methods:** Patients are referred by the radiologists and assessed by the anaesthetist for suitability. Monitoring, including capnography, is established. The dose of remifentanil required depended on patient physiology and procedure, was given as a continuous infusion and ranged from 0.01 to 1 mcg/kg/min.

**Results and Discussions:** From August 2004 to December 2006, we performed a total of 47 procedures under remifentanil sedation (26 male, 21 female, age range 24 to 86 years, ASA grades 2–5). Procedures performed included: radiofrequency ablation of liver, renal or lung tumours (25), percutaneous transhepatic cholangiography, dilation & stent insertion (18), occlusion of vascular supply (5), superior vena cava stenting (3), insertion of percutaneous entrogastrostomy(1) Patient satisfaction was high and no patient required conversion to general anaesthesia.

**Conclusion(s):** Whilst Remifentanil may not replace general anaesthesia for painful interventional radiology procedures, it is safe and effective and allows reduction in the demand on theatre resources.

**Reference:**

**1AP3-6**

Complications and mortality in older surgical patients in Catalonia, Spain

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**Background and Goal of Study:** Ageing has been shown to bear a relation to increased risk of perioperative morbidity and mortality. We aimed to describe the characteristics of older surgical patients in Catalonia and to assess the rates of perioperative complications and mortality in this population.

**Materials and Methods:** We analysed data for the population >60 yr old extracted from a cross-sectional multicentre study that gathered pre-, intra- and postop. information on a random sample of patients >18 years old undergoing surgery (excluding obstetric) under general or regional anaesthesia. The software SPSS.14 was used to compile descriptive statistics and compare qualitative variables with a χ² test and quantitative variables with a Student t test.

**Results and Discussions:** Of a total population of 1966 patients, data were extracted for 912 patients >60 yr. Complications arose during surgery in 28.5% of these older patients. The rates of intraop. and postop. complications were significantly lower in the overall population, at 14.7% and 6.6%, respectively (p < 0.001). The complication rates were significantly higher in the subpopulation of surgical patients: >80yr (intraop. 39.9%; postop. 31.9%) (p < 0.01 vs. the patients 60–80yr old). The hospital mortality rate was 1.5% and the 3-month mortality rate was 2.4% in the overall surgical population, whereas in patients >60 yr the rates were 2.9% (p = 0.08) and 4.8% (p = 0.01), respectively. In patients aged over 80 yr, hospital mortality was 6.5% (p = 0.06 vs patients 60–80yr old) and 3-month mortality was 10.1% (p = 0.02 vs the patients 60–80 yr old).

**Conclusion(s):** This study assessed the increased risk of perioperative complications and mortality for surgical patients aged over 60 yr in Catalonia. We observed that the incidence of complications and mortality in patients over 80yr rises sharply. Our elderly surgical patients require diligent monitoring and preventive measures.

**References:**

**1AP3-7**

Potential to optimize preoperative medication

J. Brugger, J. Broschelt, S. Hoefer, T. Winkilmaier, N. Roewer
Anesthesiology, University Clinic, Wuerzburg, Germany
Background and Goal of Study: Anxiety is an important determinant of perioperative stress that can be reduced by an appropriate procedure. Thus a questionnaire was sent to 21 German university hospitals to elucidate the current procedure.

Materials and Methods: The questionnaire was structured into 3 parts: Part 1 included the kind of preoperative medication of ambulatory and stationery patients. The latter group was differentiated into adult patients and children for cardiac surgery and non-cardiac surgery. Part 2 contained details of the procedure. Part 3 dealt with subjective satisfaction of different aspects of the premedication by the operator using a pseudodichotome four-point-scale.

Results and Discussions: In the 21 interviewed German university hospitals benzodiazepines were preferred. Mostly Midazolam was administered orally for stationery and ambulatory patients. Patients for cardiac surgery received prolonged effective benzodiazepines. Midazolam (0.5 mg/kg) is mostly used for children and the oral way is preferred against the rectal. Most patients received premedication by nurse on the peripheral station. The subjective estimation of the success of premedication was 73% (SD = 10.25%).

Conclusion(s): Benzodiazepines are the standard medicament for premedication. Other medication as the intramuscular premedication has no more rank in Germany and was left in favour of the oral application. Patients of all age groups get Benzodiazepines with short half-life. Benzodiazepines with long half-life are preferred for patients undergoing a cardiac surgery. In spite of a contentment of over 70% there is a great necessity of optimising anxiolysis and time management. The physician making premedication and narcosis in personal union is desirable.

Reference:

1AP3-8
Attitudes of anaesthetists and surgeons to informed consent
A. Jamjoom, J.G. Hardman, I.K. Moppett
Anaesthesia, University of Nottingham, Nottingham, United Kingdom

Background and Goal of Study: The attitudes of patients’ to informed consent have changed over the years1, but there has been little systematic study of the attitudes (and possible differences) of anaesthetists and surgeons in this process. We aimed to describe the attitudes of medical professionals in our local hospital to issues surrounding informed consent.

Materials and Methods: A custom designed questionnaire was administered to a randomly selected cohort of 75 anaesthetists and surgeons. All answers were selected from a 5-point scale: 1 – strongly disagree to 5 – strongly agree.

Results and Discussions: Surgeons and anaesthetists generally agreed in their attitudes towards informed consent. Although the clear majority were happy with the provision of informed consent in their practice, less than 25% had had formal training. Respondents were more inclined towards consent as an ethical and legal obligation than being of benefit to the doctor-patient relationship; anaesthetists were more likely to feel that informed consent may reduce anxiety. Around 50% of both groups felt that informed consent was inappropriate since most patients do not usually remember all the information given to them. Although, in the UK consent can be taken by any appropriately trained person, both groups were strongly opposed to non-physician consent, anaesthetists more so. The majority of both groups felt that major risks more common that 1:1000 should be disclosed; a minority felt this for risks > 1:10,000. For minor risks, the majority favoured disclosure > 1:100, the minority for risk > 1:1000. UK case law does not set a particular frequency of risk for disclosure. The level of the patient’s education, inquisitiveness and seriousness of co-morbidity were more likely to influence anaesthetists than surgeons. Neither group was particularly influenced by patient’s sex or publicly versus privately funded healthcare settings. Both groups favoured the provision of written information.

Conclusion: Surgeons and anaesthetists in the UK have similar attitudes to informed consent, though anaesthetists may be more influenced by individual circumstances than surgeons. Both groups tend towards informed consent as an obligation rather than being of benefit to the patient.

Reference:

1AP3-9
National Institute for clinical excellence preoperative tests:
Is the consensus hard to get?
Anaesthesiology Department and Biomathematic Laboratory, Hospital de Santa Maria and University of Lisbon Medical School, Lisboa, Portugal

Background and Goal of Study: It is routine in our preoperative consultation the evaluation of chest X-ray, lab tests and ECG, ordered previously by the patient surgeon. In June 2003, the National Institute for Clinical Excellence (NICE) published Guidelines defining the preoperative tests needed. However the consensus was not obtained in some tests. The goal of our study was to quantify the number of tests with alterations for each NICE indication, in order to verify if there were significant differences between the group “don’t do” and the group “without consensus”.

Materials and Methods: 268 records, two months of the Urology and Gynaecology Anaesthesiology consultation were included. To guarantee homogeneity in the classifying criteria of the tests, any examination (41 pts) values out of the reference intervals, or any examination with anomalies in the report was defined as altered. To test the equality proportions the Z-test and Fisher exact tests were applied.

Results: Of the 268 records (ASA I-II, 110 were M and 158 were F, with 57.07 years as the average age. The tests with alterations by type of NICE indication are presented in the following table:

<table>
<thead>
<tr>
<th>NICE indication</th>
<th>Chest X-ray</th>
<th>ECG</th>
<th>Full blood count</th>
<th>Haemostasis</th>
<th>Renal function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do the test</td>
<td>18 (13.1%)</td>
<td>19 (19.4%)</td>
<td>16 (16.4%)</td>
<td>12 (12.2%)</td>
<td>10 (10.3%)</td>
</tr>
<tr>
<td><em>p-value</em></td>
<td>0.2295</td>
<td>0.0001</td>
<td>0.0001</td>
<td>0.0001</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

Conclusion: The guidelines “don’t do” and “without consensus” seems to have the same risk of not detecting alterations in all tests, except the ECG. In those tests we may state that the two indications can be merged in to “don’t do the test” indication. To complete this study it is important to evaluate the alterations found in the tests, determining its importance in per operative period.

Reference:

Ambulatory anaesthesia

2AP1-1
VIMA with sevoflurane versus balanced anaesthesia in pediatrics outpatient’s surgery. Is premedication really worth?
I.G. Cucureanu Bădică, A.A. Brădăţ, I.M. Grinăscu
Department of Anaesthesia and Intensive Care, Emergency Clinical Hospital, Bucharest, Romania

Background and Goal of Study: “The simplest the best” seems to work in the operating theater where children that receive only sevoflurane spend less time in hospital than those premedicated or those that received balanced anaesthesia. The aim of the study is to evaluate the perioperative evolution, incidence of side effects and time spent in hospital for those children.

Materials and Methods: After Hospital Ethics Committee approval 128 children 2–10 years of age scheduled for tonsillectomy, adenoidectomy and circumcision were randomly assigned in 3 groups: the first group (B-41 pts) received premedication with 0.5 mg/kg Midazolam given per os in 5 mL Ibuprofen suspension and received propofol, opioids and muscle relaxants (balanced anaesthesia technique with intravenous induction), the second group (P-42 pts) received just premedication and Sevoflurane and the third group (S-45 pts) just Sevoflurane. All the children had an intravenous line and received 5 mg/kg/h hemisuccinate hydrocortisone preoperative and 15 mg/kg/h iv. Paracetamol. We assess the time to spontaneous breathing, extubation, Aldrete score = 9, the incidence of PONV and agitation and the hospitalization time. Statistics used ANOVA, Mann-Whitney U-test and χ² test (p < 0.05).
Results and Discussions: The incidence of PONV was significantly statis-
tic lower in Groups II and III (VIMA groups), recovery was faster in III group
compared with group I. Agitation was practically present in all patients.

<table>
<thead>
<tr>
<th>Time (min)</th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sport breathing</td>
<td>4.2 ± 2.3</td>
<td>3.1 ± 1.7</td>
<td>2.8 ± 1.8</td>
</tr>
<tr>
<td>Exhalation</td>
<td>8.9 ± 4.1</td>
<td>5.7 ± 2.9</td>
<td>5.8 ± 2.7</td>
</tr>
<tr>
<td>Pulse &gt; 9</td>
<td>25 ± 11</td>
<td>20 ± 9</td>
<td>18 ± 5</td>
</tr>
<tr>
<td>PONV</td>
<td>11 (27%)</td>
<td>4 (9.5%)</td>
<td>4 (9%)</td>
</tr>
<tr>
<td>Agitation (%)</td>
<td>&gt;100%</td>
<td>&gt;100%</td>
<td>&gt;100%</td>
</tr>
<tr>
<td>Hospitalization</td>
<td>8.3 hours</td>
<td>5.6 hours</td>
<td>5.2 hours</td>
</tr>
</tbody>
</table>

Conclusion(s): The incidence of PONV was lower and recovery was faster for
VIMA with Sevoflurane than for balanced anesthesia. Premedication had no
advantages but it was time consuming. Children have a strong fear of needles
and they prefer an anesthetic technique without needles. As long as we can
satisfy this preference and this have only advantages we see no reason not
to do it.

2AP1-2
Reaction time monitored patient maintained propofol
sedation: a volunteer safety study
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Department of Anaesthesia, Glasgow Royal Infirmary, Glasgow,
United Kingdom

Background and Goal of Study: Effect-site controlled patient maintained
propofol sedation (ePMS) was found to be safe and effective in patients having
dental surgery1, but when healthy volunteers deliberately attempted to over
sedate themselves, potentially unsafe levels of sedation were seen in a few
volunteers2. As a patient’s effect-site propofol concentration (Ce) increases,
their reaction time increases. We have now incorporated a reaction time mon-
tor into our current ePMS system’s handset. The aim of this study was to
assess whether this modification would reduce the risk of over sedation.

Materials and Methods: 20 healthy volunteers (ASA 1–2) were recruited
and an average baseline reaction time (RT) was recorded (handset button
pressed in response to its vibration). Propofol sedation was commenced at
Ce of 1 mcg/ml and the handset vibrated at one minute intervals during
sedation to monitor RT. The volunteer could increase target Ce in increments
of 0.2 mcg/ml by double pressing the demand button, provided calculated Cp
(plasma concentration) and Ce had equilibrated within 10%. In addition, the
patient’s RT compared to baseline was used in an algorithm that would pre-
vent further increases or actually reduce target Ce if their RT was becoming
too slow. Volunteers were encouraged to use the button to make themselves
as sedated as possible. The study would end if verbal contact was lost, if SaO2
fell below 90%, if aerialway intervention was required, after 3 consecutive reduc-
tions in target Ce due to RT slowing or after 30 minutes if none of the above.

Results and Discussions: All 20 volunteers maintained verbal contact
throughout, and did not reach any unsafe end point. The average maximum
propofol Ce (range) was 1.7 (1.2–2.4) mcg/ml. The mean lowest SaO2 (range)
was 97% (93–99%). No aerialway intervention was required in any volunteer.

Conclusions: This study indicates that the addition of reaction time monitor-
ing has improved the safety of propofol ePMS. It may be possible to use this
system in the absence of an anesthetist.

References:

2AP1-3
Anesthetic management in a case of melkerson-rosenthal
syndrome
A.M. Castro E Melo, T. Pereira, N. Lages, J. Tavares
Anesthesiology, Hospital de São João, Porto, Portugal

Background and Goals: The Melkerson Rosenthal Syndrome (MRS) is a
disorder of unknown etiology, with an incidence of 0.08% (1), clinically charac-
terized by the triad of chronic or recurrent orofacial edema, with edema of one
or both lips, recurrent unilateral or bilateral facial palsy and lingua picata. We
are not aware of any reports on the anesthetic management of a case of MRS.

Material and Methods: A 64-year-old woman, 60 Kg, with MRS confirmed
by lip biopsy was submitted to shoulder arthroscopic procedure. She
presented mild facial edema and volumous tongue (Mallampati 3). After intra-
venous midazolam (2 mg), an interscalene brachial plexus block was performed
with 30 mL of 0.5% ropivacaine. A 22 G/35 mm needle with a neurostimulator
NH 12 Braun® was used to elic a biceps contraction at a 0.4 mA current.
The block was complemented with a superficial cervical plexus block with
10 mL of 1% lidocaine (23 G/25 mm needle).

Results: Regional anesthesis (RA) avoided the manipulation of the airway,
providing a proper sensitive block throughout the surgery with no unexpected
events. The association of MRS with edema of the airway poses problems
with airway management. The orofacial features of MRS include edema of
the face, lips, gingivae and buccal mucosa, anesthesia around the mouth
and facial palsy. Intraoral involvement may appear as palatal mucosa, sub-
lingual area, larynx and pharynx swelling (2). The facial and lip edema may
evolve rapidly (1). As to what relates to anesthesiology, there is one emergency
case report of a 21-year-old woman with MRS presenting with sudden upper
airway obstruction and cardiopulmonary arrest. Anesthesiologists must be
aware of the MRS as a possible, although rare, cause of edema of the larynx (1).

Conclusions: To the best of our knowledge this is the first report of the anes-
thetic management of a patient with MRS. Anesthesiologists must be aware
of MRS as a cause of problematic airway management and RA should be
preferred to minimize the risk of larynx edema.

References:
519–523.

2AP1-4
Unilateral spinal anesthesia versus conventional spinal
anesthesia in ambulatory lower abdominal surgery
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Constanta, Romania

Background and Goal of Study: Unilateral spinal anesthesia offers anal-
geisia and operating conditions as good as standard spinal technique in out-
patient scheduled for lower abdominal surgery (1).

The objective of the prospective randomized current study is to evaluate
the two spinal anesthesia techniques with respect to recovery times, level of
patient postoperative comfort and anesthetic-related costs.

Materials and Methods: One hundred ASA I–II, premedicated subjects
scheduled for hernioplasty were randomly allocated into two groups to receive
conventional (n = 50) and unilateral (n = 50) spinal anesthesia with 10 mg
hyperbaric bupivacaine. In unilateral spinal anesthesia group a lateral decubi-
tus position with the operative side down was maintained for 20 min, after
spinal injection. For both groups recovery times, postoperative effects profile
during a 5 days follow-up period, as well as costs were registered. 5 days after
the procedure, the patients were interviewed by telephone about analgesia
medication requirements after discharge, as well as occurrence of headache
or backache.

Results and Discussions: Compared to bilateral spinal anesthesia, the
subjects receiving unilateral spinal technique had shorter recovery times
(120 ± 56 min vs 240 ± 70 min, p < 0.001) and lower pain scores at dis-
charge (14 ± 13 mm vs 32 ± 30 mm, p < 0.001). These patients had less
requirements for analgesic medication at home (22/50 vs 40/50, p < 0.001).
Frequency of headache (2/50 vs 9/50, p < 0.05) and backache (1/50 vs 6/50,
p < 0.05) registered lower values in unilateral spinal anesthesia group, too.
The anesthetic-related costs were also less for unilateral spinal technique
(102.14 ± 30.82 vs 134.93 ± 31.03$).

Conclusion(s): The unilateral spinal anesthesia technique is more cost-
effective than traditional spinal anesthesia for lower abdominal surgical proce-
dures in ambulatory setting, as it is associated with an earlier recovery, high
postoperative patient satisfaction and decreased costs.

References:

2AP1-5
Comparison of propofol-remifentanyl anesthesia versus
desflurane-remifentanyl anesthesia in obese patients whom
laparoscopic cholecystectomy planned
Anesthesiology, Reanimation, İzmir Ataturk Training and Research
Hospital, İzmir, Turkey

Background and Goal: In obese patients, due to increased fat tissue,
changes are seen in metabolism of anesthetic drugs. In outpatient surgery this
situation forms a severe problem. In our study, we aimed to compare propofol-
remifentanyl and desflurane-remifentanyl anesthesia methods in terms of
preoperative hemodynamic and recovery properties in obese patients whom laparoscopic cholecystectomy planned.  

**Material and Methods:** After permission was obtained from ethical council of our hospital, 60 patients who were between 18–65 years of age, matching ASA I-II classification, having BMI greater than 30 and undergoing laparoscopic cholecystectomy were included in this study. Patients were randomly subvided into two groups and maintenance of anesthesia was achieved with remifentanyl and propofol infusion in Group P (n = 30), remifentanyl infusion and desflurane (1 MAC) in Group D (n = 30). During operation, dose of propofol infusion and MAC value of desflurane were kept constant. According to requirements opioid dose was increased or decreased. At the end of the operation, quality of recovery was evaluated by Aldrete Recovery Scale. In PACU, patients were followed for 2 hours in terms of hemodynamics, recovery and pain.  

**Results and Discussion:** It is understood that group D is more effective to prevent tachycardia during intra-operative and post-exitation period than group P. In each group when remifentanyl values during intra-operative period is compared, it’s found that desflurane decreases intra-operative remifentanyl requirement (p = 0.014). In each group, when SP02 values in 1st (P = 0.000) and 5th (P = 0.020) minutes after extubation are compared; a statistically significant difference is found in group D than in group P. In each group, when postoperative MAP values are compared, it is understood that desflurane is more effective to decrease MAP values according to basal values than propofol (p = 0.001). In group D, VAS values and post-op analgesic requirement is found to be less (p < 0.05). In our study, when Aldrete Recovery Scale is compared in each group, no statistically significant difference was found (p = 0.110).  

**Conclusion:** In our study, we determined that inhalation agent desflurane protects hemodynamic stability better, provides more rapid and qualified recovery, blocks were solicited. Data analysis included valid responses expressed as a percentage of the total. The relationship between hospital type (University and District General Hospital (DGH)) and the frequency of use of nerve blocks were compared using Fisher’s exact test.  

**Results and Discussions:** The response rate was 62%. The median (IQR) experience of the consultants was 9 years (5–15), 59% of responding consultants were from DGH, 28% from a University Hospital, 11% and 2% from affiliated and specialist hospitals respectively. 15% of respondents had >50% of ambulatory practice and 67% had <25% practice. There is no difference in the practice of RA in ambulatory care between hospital types (p = 0.75).
Any complaints or complaints were noticed during anaesthesia or recovery.

The nurse anaesthetists’ subjective comments are given in the table.

**Conclusion:** There are no major clinical differences between different laryngeal mask airways. The AMBU mask seems reassuringly easy to use.

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**Materials and Methods:** Eighty ASA patients with physical status 1 or 2 patients who underwent a PELD were enrolled in this study. They were allocated randomly to receive one of two treatments: a fentanyl bolus of 0.7 μg/kg 7 min before the procedure and of 0.7 μg/kg during the procedure (n = 40, group F), or remifentanil, titration of the target effect-site concentration (0.3–2.5 ng/ml) available throughout the procedure according to the visual analogue scale of pain (VAS), the time and frequency of requiring analgesics, and administration of local anesthetic.

**Results and Discussions:** No significant differences were found in the demographic characteristics. There were no significant differences in terms of the recovery characteristics, incidence of complications. The study didn’t find significant differences between the two groups in the cumulative morphine requirement during the 2 hours and the 24 hours (p > 0.05). There were no significant differences in terms of the postoperative VAS score between remifentanil group (2.45 ± 1.53, 2.46 ± 1.43) and fentanyl group (2.33 ± 1.48, 2.5 ± 1.39) during the 2 hours and the 24 hours (p > 0.05).

**Conclusion:** We conclude that analgesia using remifentanil for the ambulatory surgery such as PELD does not significant effect on the postoperative pain.

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Elastomeric pumps are a safe way of delivering a preset infusion of local anaesthetic. They are associated with minimal complications, as well as being simple to use, portable, economical, and disposable.

With the aim of decreasing re-admission rates due to poor pain control, elastomeric pumps were introduced into our day surgery service.

Over a 72 hour period we assessed pain control, nausea and vomiting, time to mobility, and patient satisfaction using a telephone questionnaire.

**Results and Discussions:** Patient satisfaction was excellent overall, with the main complaint being lack of sensation. The average time to pump removal was 49.3 hours, and 92.5% of patients were happy to use this technique again.

**Conclusion(s):** In Orthopaedic shoulder keyhole surgery, elastomeric pumps provide a safe alternative for analgesia in day surgery patients, and are associated with a high level of patient satisfaction.

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**References:**


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**2AP2-3**

**Postoperative pain management for shoulder arthroscopy in ambulatory surgery:** comparison between single injection or continuous perineural infusion of local anesthetic

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**References:**


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**2AP2-4**

**Patient satisfaction: are we singing from the same songsheet?**

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Department of Anaesthetics, Royal Hampshire County Hospital, Winchester, United Kingdom

**Background and Goal of Study:** Patient satisfaction constitutes one of the four domains of effective healthcare governance as defined by the WHO (1). The aim of the survey was to assess patient satisfaction with respect to the anaesthetist-patient relationship.
Materials and Methods: Patient satisfaction was assessed in a cohort of 80 adult day-case patients using the CARE questionnaire (2). The questionnaire contains 10 items exploring the non-technical aspects of the anaesthetist-patient relationship which may be broadly divided into 3 areas: 1) emotional support 2) respect for patient values 3) information-giving and education. Patients were asked to rate the 10 items on a scale ranging from poor to excellent. In addition, patients were asked to indicate how important the 10 items were to them and free comments were invited. Reponses were obtained by post within 2 weeks of discharge.

Results and Discussion: The overall response rate was 70%. 91% of the responders rated the items in the emotional support category as either very good or excellent. Regarding the respect for patient values and information-giving and education items, they were rated as very good or excellent in 72% and 74% of the responses respectively. 89% considered the items on the questionnaire to be either moderately (30%) or very (59%) important.

Conclusions: An important indicator of quality of care is patient satisfaction and we have demonstrated a high level through our survey. This study has enabled us to implement changes to address the shortfalls that have been identified. The free comments have been invaluable in this process of tailoring our service to the patients’ specific needs.

References:

2AP2-5
The patient experiences with the preoperative assessment clinic (PEPAC): validation of a questionnaire
G.M. Edward, L.C.J.M. Lemaire, F. Gort, B. Preckel, H. de Haes
Anaesthesiology, Academic Medical Centre, Amsterdam, The Netherlands

Background and Goal of Study: No comprehensive and validated questionnaire to measure patient experiences with the preoperative assessment clinic (CAP) is available so far. We developed and validated the Patient Experiences with the Preoperative Assessment Clinic (PEPAC) questionnaire, which can be used for quantitative measurements of patient experiences to establish the quality level of care within one PAC or nationwide.

Materials and Methods: The NHs outpatient questionnaire was adapted for the PAC, incorporating questions specific for anaesthesiology. Both patients and health professionals judged its content validity. To make the PEPAC appropriate for quantitative measurements, dimensions were constructed fit for statistical analysis along with single items. Each dimension consists of multiple items that measure the same care aspect. Reliability was established by computing Cronbach’s alpha coefficients. Construct validity was assessed by correlating the dimensions with the patient’s overall care appraisal (Pearson r). Also, these dimensions should explain a substantial part of the variance of the patients’ overall appraisal.

Results and Discussions: After a pilot phase, the questionnaire was sent to 700 consecutive patients (response 74%). Five scales measuring five dimensions of patient experiences were constructed: reception (3 items), waiting (6 items), the nurse (5 items), the anesthetist (20 items), and other questions (15 items). Cronbach’s alpha ranged from 0.56 to 0.84, supporting reliability of the PEPAC. Correlations between the dimensions and the patients’ overall appraisal ranged from 0.22 to 0.56. Collectively, the five scales explained 51% of patients’ overall appraisal.

Conclusion(s): The PEPAC is a comprehensive, reliable and valid instrument to measure patient experiences with the PAC. It can determine the areas of the PAC that require improvement in a single institute or be used to compare the quality of care across institutions.

Monitoring: Equipment and Computers

3AP1-1
Is it possible to measure the abdominal pressure volume relation before surgery? J.P. Muller, B. Dillemans, T. Declercq, T. Sablon
Anaesthesiology, AZ St Jan AV Brugge, Brugge, Belgium

Background and Goal of Study: The abdominal pressure volume relation (APVR) is measured during a pneumoperitoneum.(1) If the APVR is known earlier therapeutic actions can differ. Goal of this study was to measure the APVR direct after induction and to compare it with the APVR during the pneumoperitoneum.

Materials and Methods: Approval from the ethical committee was given. 10 Patients scheduled for a gastric banding who need a gastric tube with a balloon are investigated. After anesthesia induction the gastric tube is introverted in the stomach and used to measure the gastric pressure during end inspiration and expiration. The airway pressure is measured at the same

2AP2-6
Is postdischarge nausea and vomiting very frequent after day surgery? M. Sá Monteiro, D. Moreira, F. Barros, A. Castro, P. Lemos
Anaesthesiology, Hospital Geral Santo António, Porto, Portugal

Background and Goal of Study: Postdischarge nausea and vomiting (PDNV) may have an important impact on patient recovery after ambulatory surgery. PDNV should be quantified to evaluate quality of health care after ambulatory surgery. Our goal is to evaluate the patient complaints at home, quantify the incidence of NV, identify the risks and the possibility of reducing that incidence.

Materials and Methods: We planned a prospective study with 592 ambulatory surgery patients, collecting data from hospital stay and telephone interviews 24 h after surgery. All patients made intraoperative prophylaxis (dexamethasone 5 mg ev + droperidol 0,625 mg ev) for PDNV. Several variables were analysed in order to find possible relations with NV incidence. We used Pearson correlation, t-test, Kruskal-Wallis test and Chi-square test in this analysis.

Results and Discussions: Our sample included 320 females (54%), ASA I-IV, 48 ± 17 years, surgery time 40 ± 27 min. The incidence of PDNV was 6,6%. Independent variables associated with incidence of NV were: female gender, pain, disturbed sleep, insufficient therapy and limiting activity at 24 h (P < 0,01). We did not find any relation between age, anaesthesia time and technique, surgery type, PONV at day surgery unit (DSU) or PONV therapy at DSU (ondansetron) and PDNV.

Conclusion(s): The lower incidence of PDNV found suggests the need to collected more data in order to identify more reliable conclusions. Nevertheless, these results allows us to provide a better PDNV strategy, such as a more aggressive control of pain. The authors would also recommended a female patient a rescue treatment for PDNV at home.
time. Patient is volume ventilated with a tidal volume of 10 and 6 ml/kg. The abdominal movement is free during a first measurement and is blocked by an abdominal corset during a second measurement. After both measurements ventilation is proceeded as clinical required.

The total compliance is calculated during abdominal fixation with two tidal volumes. Without abdominal fixation part of the tidal volume pushes the diaphragm down giving a rise in gastric pressure. The airway pressure without abdominal fixation is lower and allows to calculate the comparable tidal volume that should be used with abdominal fixation. The difference is the volume blown in the abdomen. The concomitant intra-gastric pressure rise is used to calculate the abdominal elastance. The intra gastric pressure at end expiration without abdominal fixation is used as PV0 calculated. At the start of the pneumoperitoneum the abdominal pressure volume relation with E and PV0 are measured as previously described. TOF is used to assures no change in muscle relaxation. Both values of E and PV0 are compared with a paired t test.

<table>
<thead>
<tr>
<th>E calc</th>
<th>E meas</th>
<th>PV0 calc</th>
<th>PV0 meas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>4.76</td>
<td>3.23</td>
<td>7.2</td>
</tr>
<tr>
<td>st. dev.</td>
<td>1.52</td>
<td>1.34</td>
<td>1.3</td>
</tr>
<tr>
<td>Paired t test</td>
<td>0.362</td>
<td>0.044</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: PV0 is correctly estimated while E is significant different. This technique is not suitable to measure the E before the pneumoperitoneum.


3AP1-2
Evaluation of a mechanical build model of the abdominal pressure volume relation
J.P. Muller, B. Dillemans, L. Heremans, A. Vanlander
Anaesthesiology, az St Jan AV Brugge, Brugge, Belgium

Background and Goal of Study: We calculated the pressure volume relation (PVR) of several theoretical mechanical models. We found that a half rigid sphere with one elastic membrane behaves initial linear and probably comparable to the abdominal PVR. We have build such a mechanical model and wanted to test its PVR.

Materials and Methods: No approval from the ethical committee was needed as no patients or animals were investigated in this study. A half rigid sphere of 25 mm radius is covered with an elastic membrane. Water is injected with an increment of 2 ml till an elevation of 40 mm is reached. The pressure is measured with a pressure transducer in mmHg and the elevation above the sphere is measured in mm. A linear fit is made using the least square with R² as fit quality. The maximum elevation up to the radius with a fit quality of 0.99 is calculated.

Results and Discussions: Graph 1 shows the measured pressure volume relation and the measured elevation volume relation. The fitted line using the data points up to an elevation of the radius gives an R² of 0.999 and is given on the same graph.

Conclusion: A half rigid sphere covered with an elastic membrane behaves linear with an elevation up to the radius. This model is a possible explanation for the linear abdominal elastance behavior (1).


3AP1-3
Is CO₂ leakage or absorption important during measurement of the abdominal pressure volume relation in a pneumoperitoneum?
J.P. Muller, B. Dillemans, A. Luijten, R. Nieuwenhuizen
Anaesthesiology, az St Jan AV Brugge, Brugge, Belgium

Background and Goal of Study: We measure the abdominal pressure inflated volume relation at the beginning of a pneumoperitoneum. We assume that CO₂ absorption and leakage during the initial measurements is minimal. We wanted to test if absorption or leakage during a period of 5 minutes disturbs the measurements.

Materials and Methods: Approval from the ethical committee was given. 10 patients scheduled for a laparoscopic operation are included in this study. One trocar is placed and inflation is stopped when abdominal pressure reaches 15 mmHg. We measured the abdominal pressure at 1 and at 5 minutes after the insufflation stop and analysed with the paired t test. No medication was given in bolus, no inhalation concentration was changed, no surgeon was allowed to touch the patient and table position or ventilation remained unchanged.

Results and Discussions: The insufflator stops when 15 mmHg is reached during inflation. The insufflator is closed and the abdominal pressure stabilises in the first minute around 14 mmHg and stays constant. Table 1 gives the mean and standard deviation together with the paired t test.

<table>
<thead>
<tr>
<th></th>
<th>After 1 minute</th>
<th>After 5 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean</td>
<td>14,01</td>
<td>13,94</td>
</tr>
<tr>
<td>st dev</td>
<td>0.5858517</td>
<td>0.6040603</td>
</tr>
<tr>
<td>t test</td>
<td>0.132303</td>
<td></td>
</tr>
</tbody>
</table>

No statistical difference with the paired t test was found between both measurements suggesting that absorption and leakage do not play an important role during the measurement of the abdominal pressure volume relation.

Conclusion: Leakage is minimal and absorption is small in the first 5 minutes during a pneumoperitoneum.


3AP1-4
Effect of desflurane on the abdominal pressure volume relation without muscle relaxants
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Anaesthesiology, Az St Jan AV Brugge, Brugge, Belgium

Background and Goal of Study: Relaxes desflurane the abdominal muscles without muscle relaxants? The use of the abdominal pressure volume relation (1) allows the evaluation of the effects of desflurane on the abdominal muscles. We found in previous studies that only the pressure at zero volume (PV0) changes with muscle relaxation. Goal of this study was to test if elastance (E) or PV0 changes with 1.5 Mac versus 0.5 MAC desflurane in air/oxygen.

Materials and Methods: 20 patients, ASA class I, II or III between 21 and 75 years old and scheduled for a laparoscopic surgery were included in this study with approval from the hospital ethical committee. Anaesthesia was induced with Propofol 200 mg, Sufentanil 20 ug, and succinylcholine 100mg. Anaesthesia was maintained with a remifentyl infusion of 0.5 ug/kg/minute, and patients were ventilated with 50% O₂/N₂O. Desflurane was given randomly at 0.5 or at 1.5 Mac and followed by 1.5 or 0.5 Mac in a 50% O₂/air concentration. When end tidal concentration was stable the abdomen was inflated with calculation of E and PV0. Patients were asked to empty the bladder before surgery. The stomach was emptied by suction through a gastric tube. All the CO₂ was allowed to escape between two measurements. A paired t test was used to analyse the difference between 0.5 and 1.5 mac for E and PV0.

Results and Discussions:

<table>
<thead>
<tr>
<th></th>
<th>E 0.5 mac</th>
<th>E 1.5 mac</th>
<th>PV0 0.5 mac</th>
<th>PV0 1.5 mac</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean</td>
<td>2.76</td>
<td>2.81</td>
<td>6.2</td>
<td>5.4</td>
</tr>
<tr>
<td>st dev</td>
<td>0.87</td>
<td>0.94</td>
<td>0.4</td>
<td>0.7</td>
</tr>
<tr>
<td>paired t test</td>
<td>0.262</td>
<td>0.045</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1 gives the mean and standard deviation for E and PV0 at 0.5 and 1.5 mac with the paired t test. PV0 did fall significantly with increasing concentration of desflurane while E remained unchanged.

Conclusion: Desflurane has some independent muscle relaxant effect lowering PV0 without affecting E.


3AP1-5
Online monitoring of propofol in expiratory air in patients undergoing total intravenous anaesthesia
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Department of Anaesthesiology, University of Munich, Munich, Germany
Background and Goal of Study: Propofol is an aromatic compound with low water solubility and low vapour pressure (0.142 mmHg at 20°C). These properties could allow diffusion of propofol through the alveolo-capillary membrane and detection of volatile propofol in exhaled breath of patients undergoing total intravenous propofol anaesthesia with this substance. The aim of this study was to detect propofol in exhaled breath and to examine the relationship between propofol in exhaled breath and propofol whole blood levels in patients undergoing total intravenous anaesthesia.

Methods: Eleven patients received target controlled infusion of propofol during neurosurgical procedures. For detection of volatile propofol a gas analysing system based on ion molecule reactions coupled with quadrupole mass spectrometry was used. The system was directly connected to the endotracheal tube by a T-piece and 50 ml/min of breathing gas were continuously analysed for propofol concentrations. Propofol whole blood levels were determined by liquid chromatography tandem mass spectrometry.

Results and Discussion: Propofol could be detected in exhaled breath of patients undergoing propofol anaesthesia. A close interindividual correlation between propofol levels in exhaled breath and propofol whole blood levels was found \( r^2 = 0.722 \) of 49 measurements in eleven patients. Correlation between expiratory breath and blood propofol levels within individual patients ranged from \( r^2 = 0.615 \) to \( r^2 = 0.90 \). Expiratory propofol levels followed changes in propofol whole blood levels within less than 60s.

Conclusions: Analysis of propofol in exhaled breath by ion molecule reaction mass spectrometry allows monitoring of relative changes in propofol whole blood concentrations. This could permit non-invasive routine estimation of propofol blood levels in patients undergoing total intravenous anaesthesia similar to monitoring of MAC with volatile anaesthetics.

3AP1-6
Performance of a tactile adductor pollicis close-loop control for managing stable paralysis levels in abdominal surgery.
A. Dholander, E. Schiffer, I. Madzar, C.-E. Klopfenstein
Anesthesiology, CHU-Geneva, geneva, Switzerland

Background and Goal of Study: Performance of many automatic muscle relaxants close-loop [C-L] control systems are generally excellent. As measuring the performance of a clinician closing the loop with a simple tactile monitoring remains poorly documented (1), the goal of the present trial was to measure the performance of clinicians managing a full manual C-L control with tactile adductor pollicis TOF counting (TOFc).

Methods: After IEC approval, twenty ASA I-II written consenting adult patients scheduled for elective lower abdominal laparotomies were anesthetized (sufentanil/propofol/mivacurium or cis-atracurium), intubated and mechanically ventilated. The muscle relaxant perfusion was adjusted to target two TOFc levels: either 1 or 2. TOFc and muscle relaxant perfusion were concomitantly assessed every 5 min during the first 60 min and, thereafter, at 15 min intervals until the end of the surgery. Thirteen and or-pharyngeal temperatures were controlled and maintained, by different warming devices, above 32.5 and 35.9°C, respectively. For each patient, the manual C-L control performance was defined by the ratio: total number of TOFc 1 or 2 episodes/total number of control periods.

Results: The data collected, expressed as [median]-p10/p90 were: age [years]68 49/80, weight [kg]73 48/82, height [cm]171 160/177; muscle relaxant infusion durations [min]207-111/365. Descriptive statistics the TOFc based C-L control observed are detailed below:

<table>
<thead>
<tr>
<th>Total number of TOFc 1 or 2 episodes</th>
<th>[19]-10/30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of control periods</td>
<td>[21]-15/03</td>
</tr>
<tr>
<td>Performance of manual C-L control</td>
<td>[0.89]-0.727</td>
</tr>
</tbody>
</table>

Conclusion: The performance level obtained with the present manual C-L control should appear quite attractive for all the clinicians concerned for producing stable paralysis levels by such a simple, robust but reliable methodology.


3AP1-7
The effect of volatile anaesthetic agents on filtration efficiency
C. Cann, A.R. Wilkes, J.E. Hall, D. Chethan, M.A. Hampson
Anaesthetics and Intensive Care Medicine, Cardiff University, Cardiff, United Kingdom

Background and Goal of Study: The European standard for breathing systems filters (BSF) tests filtration performance by challenging filters with an aerosol of sodium chloride particles (1). Volatile anaesthetic vapours are organic molecules and may affect the filtration performance of certain BSF during anaesthesia (2). Therefore, the filtration performance of the Flitta-Therm BSF (Intersurgical Limited, Wokingham, UK) was measured following exposure to sevoflurane and isoflurane.

Materials and Methods: The pressure drop across all samples was measured at a flow of 30 L min\(^{-1}\). Five samples were then exposed to sevoflurane at the following: 1.8% for 1 h, 3.6% for 1 h and 3.6% for 4 h. This was repeated for isoflurane at 1.2% for 1 h, 2.4% for 1 h, 2.4% for 4 h. Five samples were exposed to air only for 1 h and five were not exposed. The filtration performance was then measured using a Moore’s test rig (SPS Services, Christchurch, UK) at a flow of 30 L min\(^{-1}\). One-way analysis of variance (SPSS 14, SPSS Inc. Chicago, Il) was used to analyse the penetration results with anaesthetic sevoflurane (3 groups), isoflurane (3 groups), air or no exposure added as a factor.

Results and Discussion: Sevoflurane and isoflurane penetrated the BSF more readily than air in BSF exposed to anaesthetic. Correlation between expiratory breath and blood propofol levels within individual patients ranged from \( r^2 = 0.615 \) to \( r^2 = 0.90 \). Expiratory propofol levels followed changes in propofol whole blood levels within less than 60s.

Conclusions: Analysis of propofol in exhaled breath by ion molecule reaction mass spectrometry allows monitoring of relative changes in propofol whole blood concentrations. This could permit non-invasive routine estimation of propofol blood levels in patients undergoing total intravenous anaesthesia similar to monitoring of MAC with volatile anaesthetics.

Conclusion: Neither volatile anaesthetic has a clinically significant affect on filtration efficiency on this BSF (p > 0.05).


3AP1-8
The validity of esophageal temperature during open chest surgery
S.K. Liu, R.S.C. Wu, B.C. Lin
China Medical University Hospital, Departments of Anesthesia, Pain Service and Critical Care Medicine, Taichung, Taiwan

Background and Goal of Study: Accurate monitoring of core body temperature is vitally important in patients during major surgery under general anesthesia. In the operation room, core temperature can be measured at various sites, such as the lower esophagus, nasopharynx, pulmonary artery and tympanic membrane.

Liver transplantation\(^2\) procedure for esophageal temperature monitoring closed to the measurement sites of esophageal temperature recording may cause faulty readings. We hypothesize that esophageal temperature would be affected by ambient environment and surgical manipulations during the procedure. This study investigated the validity of esophageal temperature in open chest surgery with full lateral position.

Materials and Methods: We studied 32 adult patients undergoing thoracic surgery placing in the full lateral position. Patients with hypothermia (<36°C) or already being hyperthermic (>38°C) before entering the operating room were excluded. The operating room was kept at a temperature of 22 ± 1°C. General anesthesia was maintained with sevoflurane, and the fresh gas flow was 2 L/min constantly throughout the surgery. Tympanic and esophageal temperatures were measured by temperature probes. All core temperatures were recorded at 15-minute intervals following induction of anesthesia and throughout the surgery.

Results and Discussions: Esophageal temperature (Te) correlated well with tympanic temperature (Tt) before chest opening but significant difference was observed after chest opening (p < 0.05, paired t-test). The difference of Te at different time after chest opening was also significant difference with Tt by using mixed model analysis. Te is influenced by both dependent lung, warmer part, and nondependent lung, cooler part. The mixed effects of perfusing blood temperature of the esophagus and cooler surroundings adjacent to the esophagus lower Te.
Conclusion(s): Te is affected during open chest surgery and the validity is not reliable. Tt is still a proper site for monitoring during open chest surgery.

References:

3AP1-9

The liver-vein catheter: a feasible tool to assess hepatic oxygenation and metabolism in partial hepatectomy

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Department of Anesthesiology, University Hospital Bern, Bern, Switzerland

Background: Hepatic resection is associated with high morbidity [1]. Reported complications include: hemorrhage, biliary leakage and transient liver failure [2]. To reduce intraoperative blood loss liver central venous pressure [3] and non-selective intermittent hepatic pedicle clamping has been suggested [2]. The effects of these manoeuvres on liver oxygenation are unknown. We assessed the feasibility of perioperative liver-vein catheterization for the measurement of hepatic oxygenation.

Methods: 9 patients scheduled for partial hepatectomy were included. A COC/SVO2 pulmonary artery catheter was inserted in a hepatic vein using fluoroscopy and the correct position confirmed with a small amount of contrast medium. Time from start insertion to the correct positionning, length of catheter insertion and complications were recorded. Pressure and hepatic-vein saturation were continuously recorded.

Results: Mean placement time was 16 minutes and correct position was achieved at 35–40 cm. No complications occured. In the table data are presented as mean (SD).

<table>
<thead>
<tr>
<th></th>
<th>Invasive art. pressure [mmHg]</th>
<th>CVP [mmHg]</th>
<th>Liver pressure [mmHg]</th>
<th>Liver-vein saturation [%]</th>
<th>Inspired oxygen fraction [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before resection</td>
<td>70(6)</td>
<td>6(3)</td>
<td>12(6)</td>
<td>75(10)</td>
<td>38(4)</td>
</tr>
<tr>
<td>During resection</td>
<td>70(10)</td>
<td>5(2)</td>
<td>6(4)</td>
<td>67(18)</td>
<td>36(2)</td>
</tr>
<tr>
<td>After resection</td>
<td>70(6)</td>
<td>6(2)</td>
<td>8(8)</td>
<td>67(22)</td>
<td>36(2)</td>
</tr>
</tbody>
</table>

ANOVA RM
p = 0.967   p = 0.009   p = 0.476   p = 0.784   p = 0.165

Conclusion: Insertion of a liver-vein catheter for monitoring during partial hepatectomy is feasible and valuable to assess liver oxygenation and metabolism.

Reference:

3AP2-1

Monitoring with Narcotrend (NT) or standard anaesthesiologists technique (SAT) during anesthesia with desflurane-remifentanil in major gynaecological surgery.

Our experience

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Background and Goal of Study: To compare the influence of the monitoring with NT or SAT (based on the classic clinical parameters), during anaesthesia with desflurane (D) and remifentanil (R).

Materials and Methods: 20 patients (ASA I–II) candidate to elective major gynaecological surgery have been randomly assigned in 2 groups that received D-R under the guide of NT monitoring (group A) or SAT (group B). Premedication in both groups: atropine 0.01 mg/kg, lidocaine 50 mg i.v. At the induction of anaesthesia all the patients received propofol 2 mg/kg and remifentanil 0.25 mcg/kg/min. After muscle paralysis (succrachiriam 0.2 mg/kg) and endotracheal intubation, D has been administered at (MAC 1) with FGF 4 L/min in O2 50% mixture for 3 min that it came then reduced to 0.5 L/min. The D came therefore titrated (up and down technique) in order to obtain a NT index of "D0-E1" during maintenance (group A). In the group B the D titration has been guided by the observation of clinical parameters which cardiac frequency, arterial pressure, spontaneous movements. The times of recovery were recorded. The vaporiser of the D has been weighed at the beginning and the end of every participation and the gas consumption for every patient has been calculated.

Results and Discussions: The 2 groups were similar for demographic data, medium dosage of R and duration of anaesthesia. The group A has received a smaller amount of D (391.7 mg/min) regarding the group B (444.6 mg/min) (P = 0.003). The times of recovery not deferred meaningfully between the 2 groups: time eyes opening group A: 4.1 ± 1.8 min, group B: 4.5 ± 2.1 min. The mean end tidal D to obtain a NT index of D0-E1 was 4.8.

Conclusion(s): Our data suggest that during anesthesia with D-R in closed circuit 0.5 L/min in O2 50% mixture, in major gynaecological surgery, NT monitoring has concurred a reduction in the consumption of D, while minimal differences in the reduction of the times of recovery regarding the monitoring with SAT have been observed.


3AP2-2

Changes of electroencephalographic bioecohoreduction induced by hypothermia

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Anesthesiology, Osaka University Graduate School of Medicine, Suita City, Japan

Background and Goal of Study: We previously investigated the changes of EEG bioecohoreduction during hypothermia, the degree of phase coupling among the frequency components of a signal, during anesthesia. We found two dominant peaks were emerged in bi-frequency space during anesthesia. We defined those peak heights as pBIC_low and pBIC_high, and their frequencies as fBIC_low, fBIC_high. Here we investigated the effect of hypothermia on those peaks.

Materials and Methods: After IRB approval and obtained informed consent from the participants, we enrolled 10 patients (either gender; 51–79 yr) who underwent elective cardiac surgery using cardio-pulmonary bypass (CPB). Anesthesia was induced with propofol using target controlled infusion (TCI) system followed by fentanyl and vecuronium. Besides the monitors for cardiac surgery, Bis-Plus probe was attached and raw EEG wave data as well as Bis and other EEG derived parameters were continuously recorded on a computer and processed using our original software BSA for Bis. Anesthesia was maintained with propofol (TCI was set at 1.5–2.0 µg/ml) and fentanyl. Just before starting CPB, target of propofol was set at 1.0 µg/ml and was kept until body temperature (BT) was returned to 35.0°C. We measured those parameters at 3 points: (1) when BT was decreased to 35.0°C, (2) during CPB at 28.0°C and (3) when BT was returned to 35.0°C.

Results and Discussions:

<table>
<thead>
<tr>
<th></th>
<th>Pre (35.0°C)</th>
<th>CPB (28.0°C)</th>
<th>Post (35.0°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pBIC_low</td>
<td>35.9 ± 9.0%</td>
<td>24.6 ± 7.0%</td>
<td>39.1 ± 8.6%</td>
</tr>
<tr>
<td>pBIC_high</td>
<td>35.1 ± 8.9%</td>
<td>28.2 ± 5.5%</td>
<td>34.3 ± 5.6%</td>
</tr>
<tr>
<td>fBIC_low</td>
<td>4.1 ± 0.4Hz</td>
<td>2.3 ± 0.3Hz*</td>
<td>4.5 ± 0.3Hz</td>
</tr>
<tr>
<td>fBIC_high</td>
<td>9.1 ± 0.8Hz*</td>
<td>5.3 ± 0.7Hz*</td>
<td>9.5 ± 0.9Hz*</td>
</tr>
</tbody>
</table>

*p < 0.05

We previously showed that fBIC_high was decreased while fBIC_low remained around 4.0 Hz when the concentration of anesthetic was increased. Thus changes of EEG bioecohoreduction during hypothermia was quite different from those when the concentration of anesthetic was increased.

Conclusions: Hypothermia altered the phase coupling of EEG in different way of the anesthesitcs.

Reference:

3AP3

Does AEP monitoring reveal changes in anesthetic depth during one lung ventilation in sevoflurane anesthesia?

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Intensive Care Department, Pulmonary Diseases and Thoracic Surgery Center, Poznan, Poland

Background and Goal of Study: One lung ventilation (OLV) during thoracic surgery is associated with rapid and significant changes in alveolar ventilation and blood perfusion in the dependent lung. The inhalation anesthesia with sevoflurane, an agent with the low blood solubility is regarded as a save method that protects patients from the intraoperative awareness and ensures quick recovery. In our prospective study we evaluated changes in the depth of anesthesia measured by the AEP Monitor/2 (Dammeter) during two lungs ventilation (TLV) and OLV in patients under combined anesthesia with sevoflurane.

Materials and Methods: 24 patients, aged 52.8 ± 17.4 yrs undergoing lung resection due to primary lung cancer or metastasectomy were enrolled. Thoracic epidural analgesia (cather T5–6, bupivacaine 0.25%, fentanyl
Conclusion: reported undesirable event recalls. 83.3%. Benefits of midazolam include anterograde amnesia and reduction in anterograde amnesia after 10 mg midazolam nasal administration.

Results and Discussion: analysed. Results are expressed as number (percent) or mean (TN) without recall or false negative (FN) with recall. Sensitivity (S), specificity was 0.97 with an 18G standard canula. After surgery, the patients were asked for under 90 (BIS rhinitis and nasal obstruction were excluded. BIS levels (Aspect A2000, soft-

After ethics committee approval, written informed consent was obtained from 42 ASA I-III consecutive patients scheduled for surgery. Monitoring the central nervous system changes and cost analysis of a propofol/remifentanil (TIVA), desflurane, sevoflurane anaesthesia in major abdominal surgery. Material and Methods: With IRB approval and written informed consent 60 ASA I-III patients undergoing elective major abdominal surgery were allocated randomly to groups to receive propofol/remifentanil (Group P n = 20), des-

Background and Goal of Study: Monitoring the central nervous system effects of anaesthesia in an objective, reliable fashion has been an ultimate goal (1). Objective criteria for the depth of anaesthesia are the most challenging and missing part for cost and recovery studies (2). The purpose of this study was to compare quantitative EEG (QEEG), haemodynamic changes and cost analysis of propofol/remifentanil (TIVA), desflurane, sevoflurane anaesthesia in major abdominal surgery.

Background and Goal of Study: Monitoring the central nervous system effects of anaesthesia in an objective, reliable fashion has been an ultimate goal (1). Objective criteria for the depth of anaesthesia are the most challenging and missing part for cost and recovery studies (2). The purpose of this study was to compare quantitative EEG (QEEG), haemodynamic changes and cost analysis of propofol/remifentanil (TIVA), desflurane, sevoflurane anaesthesia in major abdominal surgery.

The significant difference existed among ETsevo values (F = 21.6, p < 0.001), as well as between B and C groups regarding repeated measures of ETsevo (F = 3.3, p = 0.012).

Conclusion: There was a significant difference in anaesthesia for OPCABG surgery regarding ETsevo values guided by BIS vs. BIS unfollowed. Fentanyl appeared to be used more in group B than in group C.

Reference:
1 Anaesth Analg 2003; 96: 336–43.

3AP2-4

BIS as predictor of anterograde amnesia in nasal midazolam administration
M.J. Estruch-Pérez, J. Sánchez, M.T. Richart, J. Soliveres, C. Solaz Anesthesiology and Critical Care, Dr. Ptiton University Hospital, Valencia, Spain

Background and Goal of Study: Surgery room memories or venopuncture may be unpleasant. Nasal midazolam has a good pharmacokinetic profile and can be used for premedication1. The objective is to assess the sensitiv-

Results and Discussion: Results are shown in the table.

Amnesia No amnesia Total
BIS < 90 33 (TP) 3 (FP) S = 97.1%
BIS > 90 1 (FN) 5 (TN) E = 62.5%
Total 34 (81%) 8 (19%)

Time to reach BIS < 90 was 5.57 ± 2.17 min. PPV was 91.7% and NPV was 83.3%. Benefits of midazolam include anterograde amnesia and reduction in reported undesirable event recalls.

Conclusion: These results suggest that BIS < 90 is a good test to predict anterograde amnesia after 10 mg midazolam nasal administration.

Reference:

3AP2-5

The difference between BIS guided vs. BIS unguided anesthesia in off pump coronary artery bypass grafting surgery
N. Karanovic, I. Husedzinovic, N. Nikic, M. Carev, Z. Dogas Anesthesiology and Intensive Care, University of Split School of Medicine, Split, Croatia

Background and Goal of Study: Clinical evaluation of BIS is still contro-

The significant difference existed among ETsevo values (F = 21.6, p < 0.001), as well as between B and C groups regarding repeated measures of ETsevo (F = 3.3, p = 0.012).

Conclusion: There was a significant difference in anaesthesia for OPCABG surgery regarding ETsevo values guided by BIS vs. BIS unfollowed. Fentanyl appeared to be used more in group B than in group C.

Reference:
1 Anaesth Analg 2003; 96: 336–43.

3AP2-7

Quantitative EEG monitored anaesthesia; cost comparison of three anaesthetic techniques management
B. Berkel, Z. Alangoiu, Y. Ates, O. SelviCan, F. Tuzuner Anaesthesiology and ICM, Medical School of Ankara University, Ankara, Turkey

Background and Goal of Study: Monitoring the central nervous system effects of anaesthesia in an objective, reliable fashion has been an ultimate goal (1). Objective criteria for the depth of anaesthesia are the most challenging and missing part for cost and recovery studies (2). The purpose of this study was to compare quantitative EEG (QEEG), haemodynamic changes and cost analysis of propofol/remifentanil (TIVA), desflurane, sevoflurane anaesthesia in major abdominal surgery.

Material and Methods: With IRB approval and written informed consent 60 ASA I-III patients undergoing elective major abdominal surgery were allocated randomly to groups to receive propofol/remifentanil (Group P n = 20), des-

<table>
<thead>
<tr>
<th>Agent</th>
<th>B group (n = 23)</th>
<th>C group (n = 25)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fentanyl (mg)</td>
<td>1.66 ± 0.34</td>
<td>1.49 ± 0.26</td>
<td>0.060</td>
</tr>
<tr>
<td>Midazolam (mg)</td>
<td>38.04 ± 7.15</td>
<td>35.60 ± 9.50</td>
<td>0.320</td>
</tr>
<tr>
<td>ETsevo 1 (S1)</td>
<td>1.23 ± 0.34</td>
<td>1.06 ± 0.36</td>
<td>0.090</td>
</tr>
<tr>
<td>ETsevo 2 (S2)</td>
<td>1.31 ± 0.22</td>
<td>1.08 ± 0.25</td>
<td>0.001</td>
</tr>
<tr>
<td>ETsevo 3 (S3)</td>
<td>1.17 ± 0.19</td>
<td>1.25 ± 0.41</td>
<td>0.380</td>
</tr>
<tr>
<td>ETsevo 4 (S4)</td>
<td>1.10 ± 0.26</td>
<td>0.94 ± 0.24</td>
<td>0.030</td>
</tr>
<tr>
<td>ETsevo 5 (S5)</td>
<td>0.90 ± 0.18</td>
<td>0.80 ± 0.21</td>
<td>0.070</td>
</tr>
</tbody>
</table>

Agent | B group (n = 23) | C group (n = 25) | p       |
Fentanyl (mg) | 1.66 ± 0.34 | 1.49 ± 0.26 | 0.060   |
Midazolam (mg) | 38.04 ± 7.15 | 35.60 ± 9.50 | 0.320   |
ETsevo 1 (S1) | 1.23 ± 0.34 | 1.06 ± 0.36 | 0.090   |
ETsevo 2 (S2) | 1.31 ± 0.22 | 1.08 ± 0.25 | 0.001   |
ETsevo 3 (S3) | 1.17 ± 0.19 | 1.25 ± 0.41 | 0.380   |
ETsevo 4 (S4) | 1.10 ± 0.26 | 0.94 ± 0.24 | 0.030   |
ETsevo 5 (S5) | 0.90 ± 0.18 | 0.80 ± 0.21 | 0.070   |

The significant difference existed among ETsevo values (F = 21.6, p < 0.001), as well as between B and C groups regarding repeated measures of ETsevo (F = 3.3, p = 0.012).

Conclusion: There was a significant difference in anaesthesia for OPCABG surgery regarding ETsevo values guided by BIS vs. BIS unfollowed. Fentanyl appeared to be used more in group B than in group C.

Reference:
1 Anaesth Analg 2003; 96: 336–43.
3AP2-8
Spectral entropy reduces propofol consumption during long lasting TCI anaesthesia
N. Van Rompaey, E. Engelman, O. Caelen, A. Verleijen, B. Ickx
Anesthesiology, CUB Hopital Erasme, Bruxelles, Belgium

Background and Goal of Study: Spectral entropy monitoring has already been shown to decrease anaesthetic drug consumption during short to medium term anaesthesia (1). Target controlled infusion (TCI) anaesthesia using propofol/remifentanil is associated with the highest intraoperative cost but the fewest postoperative side effects (2). In our study, the entropy sparing effects on propofol/remifentanil TCI anaesthesia was evaluated.

Materials and Methods: Eighty patients scheduled for abdominal surgery lasting more than 2 hours were prospectively randomized to receive propofol/remifentanil effect-site TCI anaesthesia guided by Entropy or not (entropy values hidden but recorded). 0.3 mg intrathecal morphine was injected before the start of the anaesthesia. Effect concentration (Ce) of propofol was adjusted to maintain entropy values between 40 and 60 in the Open Group (OG), or according to the usual practice in the Blind Group (BG). Remifentanil Ce was adjusted to keep haemodynamic variables stable in both groups.

Results: Groups were similar for demographic data. Perioperative data are presented in the table as mean ± SD and compared by a Mann-Whitney test:

<table>
<thead>
<tr>
<th></th>
<th>OG (n = 37)</th>
<th>BG (n = 43)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anesthesia, min</td>
<td>378 ± 237</td>
<td>311 ± 154</td>
<td>0.478</td>
</tr>
<tr>
<td>Propofol, mg</td>
<td>1704 ± 948</td>
<td>2050 ± 808</td>
<td>0.009</td>
</tr>
<tr>
<td>Remifentanil, mg</td>
<td>3.48 ± 1.61</td>
<td>3.58 ± 1.42</td>
<td>0.569</td>
</tr>
<tr>
<td>Open eyes, min</td>
<td>5.65 ± 4.91</td>
<td>8.07 ± 4.68</td>
<td>0.009</td>
</tr>
<tr>
<td>Extubation, min</td>
<td>7.73 ± 5.02</td>
<td>9.64 ± 5.12</td>
<td>0.085</td>
</tr>
</tbody>
</table>

When normalized to time, propofol consumption was reduced by 22% in OG (5.52 mg/min versus 7.06 mg/min in BG; p = 0.010). 2-way analysis of variance showed no differences between groups, nor any interaction (p = 0.89) for the distribution of entropy values in the 3 ranges [0–39], [40–60] and [60–95]. Postoperative hospital stay was the same in both groups (12 ± 10 days in OG versus 11 ± 10 days in BG p = 0.911).

Conclusion: Spectral entropy monitoring reduces propofol consumption during propofol/remifentanil effect-site TCI anaesthesia.


3AP2-9
Propofol versus sevoflurane general anaesthesia: influence on the state entropy variability
A. Castro, E. Amadeu, F. Martins, P. Sa Couto, P. Amorim
Matematica Aplicada, Faculdade de Ciencias da Universidade do Porto, Porto, Portugal

Background and Goal of Study: The goal of this study was to determine if there are differences in SE variability for different anaesthetic techniques: with sevoflurane (Sevo Group) and with propofol (Prop Group).

Materials and Methods: Data collected during 32 urology procedures every 5s from Datex S/5 monitors and infusion pumps with Rugloop® TCI software. Schneider [1] model was used for propofol TCI. Induction with propofol 1% infusion at 200 ml/h until loss of consciousness, and effect-site concentration (Ce) target maintained until intubation. In Prop Group propofol Ce was adjusted regarding patient stability and BIS target [40–60]. In the Sevo Group, propofol was stopped after intubation and sevoflurane started at 1.5% (in O2 and air), also adjusted to maintain BIS in the target interval [40–60]. Remifentanil was used in all cases. SE variability during maintenance phase was analyzed using the variability sequences: difference between original and smoothed filtered signal (Butterworth). (Data: mean ± SD)

Results and Discussions: 16 patients in Sevo Group: 57 ± 14 years, 72 ± 12 kg 164 ± 7 cm, 7 female, procedure time 223 ± 127 min and average SE 44 ± 9; 16 patients in Prop Group: 55 ± 14 years, 70 ± 15 kg, 184 ± 9 cm, 7 female, procedure time 192 ± 66 min and average SE 45 ± 6, with no statistically difference between groups (t-test). Variability sequences had logistic distribution characterized by the shape parameter b, which gives information about signal variability (greater b, greater variability). The b parameter was correlated to mean SE values in both groups (although not statistically significant). There was no statistical difference between groups for the b parameter (t-test).


3AP2-10
BIS and CSM fail to asses the clinical evolution of children during induction with sevoflurane
M. Garcia, J.C. Álvarez, I. González, E. Soler, B. Rodríguez
Anesthesia, IMAS, Barcelona, Spain

Background and Goal of Study: The EEG waveform in children and the evolution in time under anaesthesia with sevoflurane represent a challenge for the monitoring of hypnosis. The aim of the study was to correlate the evolution of BIS™ and the new hypnosis monitor CSM™ with depth of anaesthesia.

Materials and Methods: A prospective observational study was performed in 20 pediatric patients (ages: 2 to 9 yr), BIS and CSM monitors were attached in all the patients before anaesthesia. Penile or caudal block was completed after sevoflurane induction and laryngeal mask insertion. Anaesthesia was uniquely maintained with sevoflurane. BIS and CSM values, University of Michigan Sedation Scale (UMSS) score, and non steady state end-tidal sevoflurane were register in different moments of anesthesia. The anesthesist guided the administration of sevoflurane by clinical signs and was blinded to the hypnosis monitors. Pearson correlation analysis was used.

Results and Discussions: A great interindividuality variability of BIS and CSM for the same clinical event was found. The hypothesis scores correlate with UMSS except for the induction period until the insertion of laryngeal mask (LM). Correlation coefficient between BIS and CSM for all the anesthesia period is weak (0.506). The correlation improves regarding to the period from LM insertion until the recovery of consience (0.726).

Conclusion(s): Our study demonstrated that the BIS™ and CSM™ may not reflect the clinically assessed depth of anesthesia during sevoflurane induction in children. The epileptogenic potential of sevoflurane could be the cause of this effect.

Reference: 1 Anesthesiology, 1998; 88: 1170–82.

References:
3AP3-2
Effects of remifentanil and rocuronium on RE, SE, BIS values with and without stimuli
J. Liu, Y. Yue
Department of Anaesthesiology, Beijing Chaoyang Hospital, Capital Medical University, Beijing, China

Background and Goal of Study: We evaluated effects of remifentanil and rocuronium on RE (response entropy), SE (state entropy), BIS (bispectral index) with and without noxious stimuli.

Materials and Methods: 50 patients were randomly divided into two groups (group A: n = 25 each). Both groups were received an effect-site controlled infusion starting at 2.0 μg ml⁻¹ and increased in steps of 0.3 μg ml⁻¹ till loss of consciousness (loss of response to verbal commands and eyelash reflex).

The effect-site concentration of loss of consciousness of propofol (Ce(Prop,loc)) was maintained, then effect-site controlled infusion of remifentanil (A: 0 ng ml⁻¹, B: 2 ng ml⁻¹) was maintained, 2 minutes late an electric stimulus (50 Hz, 80 mA, 4 seconds) was given. After that, Ce(remif) (effect-site concentration of remifentanil) was increased (A 2 ng ml⁻¹, B 4 ng ml⁻¹), and rocuronium 0.6 mg kg⁻¹ was given to facilitate tracheal intubation 2 minutes late. Finally the same electric stimulus was given 6 – 8 minutes after intubation. The base values before noxious stimuli and values at 10s, 20s, 30s after stimuli of RE, SE, BIS and MAP (mean arterial pressure), HR were recorded. Independent sample T test was used to describe inter-group difference.

Results and Discussions: There is no significant difference in gender, age and weight between two groups. The base values and values at 10s, 20s, 30s of RE, SE, BIS before and after these three stimuli (intubation included) between group A and B also have no significant difference (p > 0.05). However, the MAP of group A were significantly higher than group B in all the same time-points (p < 0.05). The RE, SE, BIS values before and after the second electric stimulus of group A (Ce(remif,loc) = 2 ng ml⁻¹, rocuronium 06 mg kg⁻¹) is significantly lower than those values before and after the first electric stimulus of group B (Ce(remif,loc) = 2 ng ml⁻¹, no rocuronium).

Conclusion(s): Increase of Ce(remif,loc) (2 ng ml⁻¹) has no effect on RE, SE, BIS values regardless of stimulus, even though it can significantly decrease MAP. However, the use of rocuronium can decrease RE, SE, BIS values.

3AP3-3
Spectral Entropy and bispectral index as guidance for propofol-remifentanil anaesthesia in combination with regional anaesthesia compared with a standard clinical practice group
Department of Anaesthesiology and Intensive Care Medicine, University of Bonn, Bonn, Germany

Background and Goal of Study: This study was designed to investigate the impact of Spectral Entropy and bispectral index (BIS) monitoring on drug consumption and recovery times when compared with standard anesthetic practice in patients undergoing orthopaedic surgery in a combination of regional and general anaesthesia. Anaesthesia was performed by an experienced anaesthesiologist.

Materials and Methods: After obtaining approval from the institutional review board and written informed consent, 80 adult patients undergoing surgery to the upper or lower extremity received regional anaesthesia for post-and intra-operative pain control and were randomized to receive general anaesthesia by propofol/remifentanil infusion controlled either solely by clinical parameters or by targeting Entropy or BIS values of 50. Recovery times and drug consumption were recorded.

Results and Discussions: Compared with standard practice, patients with Entropy or BIS monitoring needed similar propofol concentrations (standard practice 101 ± 22 μg/kg/min, Entropy 106 ± 24 μg/kg/min, BIS 104 ± 20 μg/kg/min), and had similar recovery times and profiles (extubation: 7.3 ± 2.9 min, 9.2 ± 3.9 min, and 6.8 ± 2.9 min; Aldrete score (10/10) at extubation: 8.8 ± 0.4, 8.4 ± 0.6, and 8.6 ± 0.5).

Conclusion(s): Compared with standard anesthetic practice Entropy and BIS targeting a value of 50 did not result in a reduction of propofol consumption or recovery times during general anaesthesia combined with regional anaesthesia performed by an experienced anaesthesiologist in orthopaedic patients.

3AP3-4
The role of neuromuscular block monitoring during anaesthesia in the optimization and cost reduction of cisatracurium usage
E. Musiol, B. Seifert, K. Grzybowska, I. Duda
Anaesthesiology and Intensive Care, Central Clinic Hospital, Katowice, Poland

Background and Goal of Study: Cisatracurium is a neuromuscular (n-m) blocking agent commonly used in general anaesthesia. Due to the higher price of this drug – as compared to its analogue – the authors attempted to determine the results of the n-m block monitoring on the optimization of its usage.

Materials and Methods: We have analyzed of anaesthesia protocols in 688 women who underwent gynecological operations comparing the use of cisatracurium and neostygmine. Patients who were monitored during the n-m block (TOF group, n = 378) and patients who had the mentioned drug administered without monitoring (K group, n = 310). The authors documented: age, weight and BMI of the patients, duration of anaesthesia, total, induction and conduction doses of cisatracurium, time elapsed from the last dose of the drug to the termination of operation (39 vs 48 min), and a more frequent administration of neostygmine (53% vs 65%). The comparison in paired subgroups defined according to the duration of procedure showed parallel differences, with the exception of the lack of change in the frequency of administration of neostygmine in the TOF₁ and K₁ subgroups.

Conclusion(s): The neuro-muscular transmission monitoring provides an optimal muscle relaxation with regard to the duration of the procedure, furthermore ensuring an objective control over the n-m blocker action and its cessation after the termination of the procedure (especially in short duration procedures with a high risk of residual block) leading to reduction of the total dose and subsequent costs.

3AP3-5
Number of skin conductance fluctuations increased differently from BIS during tetanic stimuli. Increasing doses of remifentanil attenuated the skin conductance response
H. Storm, I. Raeggen, R. Stoen, P. Klepstad, J. Raeder
University Administration, The Skills training Center, UIO, Oslo, Norway

Background and goal: Number of skin conductance fluctuations per sec (NSCF) in the palmar surface correlates well with sympathetic nerve activity. NSCF has been proposed to measure pain responses. The BIS index measures disorders in the EEG signal and is associated with awakening. The purpose of the study was to examine if NSCF and BIS could detect the pain response from tetanic stimuli, and to further examine if the tetanic stimuli response was stronger in a situation without anesthetic intervention compared to a situation with ongoing anesthetic target control infusion (TCI).

Materials and methods: 28 patients in ASA 1 or 2 were studied after induction of general anaesthesia with propofol (BIS between 40–50), but before intubation and start of laparoscopic surgery. The patients were given 3 series of tetanic stimuli of 50 mA that lasted for 30 sec: Tetanic 1 (T1) without ongoing remifentanil analgesic infusion, Tetanic 2 (T2) after 4 min with TCI 4 ng/ml remifentanil and Tetanic 3 (T3) after 4 min with TCI 10 ng/ml remifentanil. The NSCF and BIS responses were registered continuously, starting 30 sec before stimuli and ending 30 sec after the stimuli started. The maximum values for NSCF and BIS during the tetanic pre stimuli periods were compared with the maximum values of the tetanic post stimuli periods. Moreover, NSCF and BIS responses during T1 were compared with the responses during T2 and T3. The Wilcoxon non-parametric test was used.

Result and discussion: NSCF:

<table>
<thead>
<tr>
<th></th>
<th>T1 NSCF</th>
<th>T2 NSCF</th>
<th>T3 NSCF</th>
<th>T1 BIS</th>
<th>T2 BIS</th>
<th>T3 BIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean(SD)</td>
<td>0.000(0.01)</td>
<td>0.000(0.00)</td>
<td>0.000(0.00)</td>
<td>43.90</td>
<td>42.90</td>
<td>42.90</td>
</tr>
<tr>
<td>P value</td>
<td>0.000</td>
<td>0.027</td>
<td>0.180</td>
<td>0.272</td>
<td>0.393</td>
<td>0.227</td>
</tr>
</tbody>
</table>

BIS:

<table>
<thead>
<tr>
<th></th>
<th>T1-2: NSCF</th>
<th>T1-3: NSCF</th>
<th>T1-2: BIS</th>
<th>T1-3: BIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean(SD)</td>
<td>0.07(0.07)</td>
<td>0.07(0.07)</td>
<td>0.01(0.06)</td>
<td>0.01(0.06)</td>
</tr>
<tr>
<td>P value</td>
<td>0.873</td>
<td>0.882</td>
<td></td>
<td></td>
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</tbody>
</table>

The NSCF post stimulus level was higher than the pre stimulus level during T1 and T2, contrasting BIS, which did not change significantly. After 4 min with TCI 10 ng/ml remifentanil, no differences between post stimulus levels of NSCF and BIS were observed. The NSCF response during tetanic stimuli was reduced when the remifentanil doses was increased different from BIS.
Conclusion: In contrast to BIS, this study showed that NSCF is sensitive to tetanic noxious stimuli during sleep, and the measured response is attenuated when an ongoing analgesic infusion is given.

3AP3-6
In-vitro comparison of three different tracheal wall pressure measurement techniques
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Background and Goal of the Study: Measurement of pharyngeal and tracheal wall pressure exerted by artificial airways is of great interest, because of pressure-induced reduction of mucosal perfusion and related morbidity. The aim of this study was to compare three different wall pressure measuring techniques using an in vitro model.

Materials and Methods: Using a high volume low pressure (HVLP) Portex Soft Seal cuffed tracheal tube with internal diameter (ID) 7.5 mm and a tracheal model the pressure difference technique (1), the wall membrane transducer technique (2) and the microchip Codman probe technique with and without lubrication (3) was studied. Wall pressures were noted every 0.5 ml aliquots of air inflated in to the cuff from 0 to 50 mmHg cuff pressure. All experiments were performed (T 20° C, ambient pressure) twice with the same cuffed tracheal tubes. Measured mean pressure values were plotted against volume of air inflated. The coefficient of variance (CV) was calculated.

Results: Median CV was largest for pressure probe technique without lubrication (214%) and with lubrication (29%) and was lowest for the wall membrane transducer (22%) and the pressure difference technique (19%).

Conclusions: Membrane transducer technique and pressure difference technique provided comparable results. The microchip Codman probe technique underestimates wall pressure due to reseamed pressure sensor at the probe. This can partially overcome by lubrication of the sensor probe.

References:

3AP3-7
Electroencephalogram-based anaesthesia monitors: correlation between the BIS and the Narcotrend index?
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Background and Goal of Study: The bispectral index (BIS) and the Narcotrend index (NCT) are indices of the hypnotic component of anaesthesia. Both produce a number between 0 and 100 with deeper values indicating a deeper hypnotic level, but they are based on different algorithms. Reflecting the same clinical endpoint, one may expect a high correlation between the indices. [1]

Materials and Methods: EEG was recorded from 40 adults patients, receiving different anaesthetic regimes. Group 1: sevoflurane, remifentanil < 0.1 µg kg⁻¹ min⁻¹ (“remi low”); Group 2: sevoflurane, remifentanil > 0.2 µg kg⁻¹ min⁻¹ (“remi high”). Group 3: propofol, “remi low”; Group 4: propofol, “remi high”. EEG was recorded with a sample rate of 256 Hz and played back to the monitors simultaneously via an EEG player. The index values were stored every 5s and Pearson’s Correlation was calculated.

Results and Discussion: The overall correlation coefficient is 0.5678. The figure shows BIS versus NCT index values. The level for general anaesthesia is represented by index values 40–60 (BIS) or 13–64 (NCT) (see figure, lines). White background indicates that both monitors display the same level of anaesthesia. In grey areas, BIS and NCT indicate different levels of anaesthesia, i.e. BIS and NCT are inconsistent with one another.

Reference:

3AP3-8
Performance of surgical stress index during sevoflurane-fentanyl and isoflurane-fentanyl anaesthesia
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Background and Goal of Study: Surgical Stress Index (SSI, GE Healthcare, Helsinki, Finland), based on heart rate and photoplethysmography, has been recently introduced for the assessment of surgical stress [1]. We recorded SSI values during sevoflurane-fentanyl and isoflurane-fentanyl anaesthesia.

Materials and Methods: Thirty patients, ASA I–III, aged 27–80 yr, gender (F/M) 19/11, scheduled for surgical procedure, were studied. Patients received fentanyl 2 microg/kg and thiopentone for induction of anaesthesia and were paralyzed with rocuronium. Tracheal intubation was performed 5 min after fentanyl. Patients were randomly assigned to receive fentanyl 1.5 microg/kg five minutes before (FB) or after (FA) skin incision. 20 patients were anaesthetized with sevoflurane and 10 with isoflurane. State entropy was maintained at 40–60. Reactivity of SSI to surgery and fentanyl boluses was recorded. Two-tailed M-U-test was used for statistics.

Results and Discussion: SSI increased significantly after tracheal intubation and skin incision in both groups (P < 0.05). The increase of SSI after skin incision was lower in FB than in FA group but it was statistically insignificant (fig. 1). A reason for this can be that the surgical procedures were very diverse and stimuli could be very different or fentanyl boluses were not high enough.

Conclusions: Fentanyl given five minutes before tracheal intubation or skin incision did not block totally the increase of SSI. The increase of SSI in FB group compared to FA group after skin incision was statistically insignificant.

Fig. 1. SSI values after intubation and skin incision.

Reference:
3AP3-9
Correlation dimension, an EEG complexity measure, reflects increasing and decreasing anaesthesia using data of a multicenter study
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Background and Goal of Study: Correlation Dimension (CD) was introduced to quantify the order/disorder of signals generated by low dimensional chaotic systems [1]. The present investigation was performed to evaluate the capability of the EEG parameter CD in separating consciousness from unconsciousness and the monotonic behaviour of CD in phases of increasing and decreasing anaesthesia.

Materials and Methods: EEG data from a study performed in 6 European centres involving 263 adult patients undergoing surgery under general anaesthesia was used. Patients were randomly assigned to one of 11 anaesthetic combinations. The capability of CD in separating consciousness from unconsciousness was evaluated using prediction probability (Pp) [2]. For this purpose, parameter values were calculated immediately before and after loss and return of consciousness. The parameter values in phases of anaesthetic increase (until EEG burst suppression) and anaesthetic decrease were analysed computing Spearman correlation coefficients as a measure of monotonic behaviour. A perfect correlation of the parameter and the monotonic decreasing (anaesthetic increase) respectively increasing (anaesthetic decrease) function will result in a correlation coefficient of 1.

Results and Discussions: Analysis of Pp revealed a value of 0.65 (transition between consciousness and unconsciousness). Spearman correlation coefficients were 0.30 (“deepening” of anaesthesia) and 0.18 (“lightening” of anaesthesia), where positive values indicate a monotone relationship of CD to “depth of anaesthesia”. It may be explained by more “order” and less “randomness” in EEG-signal with increasing anaesthesia. The results of Pp indicate that CD is less adapted to separate consciousness and unconsciousness, because the parameter may be affected by high dimensional EEG signals.

Conclusion(s): Based on the challenging data selection involving numerous anaesthetic regimes, CD shows a monotone behaviour in phases of anaesthetic increase and decrease but is less useful for separating consciousness from unconsciousness.

References:
* European Multicenter EEG/AEP Anaesthesia Monitoring Study Group

3AP3-10
Factors associated with the occurrence of BIS values below 45
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Background and Goal of Study: It is accepted that BIS should be maintained between 45 and 60. We did a retrospective study to analyze the incidence of BIS below 45 and identify possible causative factors.

Materials and Methods: Data records from neurosurgeries were collected every 5s from Aspect XP, Datex S/5 and IV pumps with Rugloop® TCI. Anaesthesia was with TCI of Propofol and Remifentanil. The only defined goal that the anaesthesiasts had, was avoiding BIS above 60. BIS was analyzed from BIS < 70 at induction, until BIS > 70 at recovery – anaesthesia time (AT). For poor neuro grade cases, AT was from induction until end of surgery. An algorithm (in Matlab®) extracted the time periods with BIS in different levels (<30, 30–35, 35–40 and 40–45). Several variables were analyzed in relation to the occurrence of BIS below 45 and 30. (Data: mean ± SD)

Results and Discussions: 211 patients, ASA 1–4, 51 ± 17 years, 69 ± 13 kg, 163 ± 9 cm, 92 male, 166 head surgeries and 45 spinal, Glasgow score 3–8 in 8 patients and 9–12 in 11. Factors associated with increased time at BIS < 45 were: cranial surgery (P < 0.05, t-test), higher ASA grade (P < 0.05, Kruskal-Wallis and t-test), supine position (P < 0.01, t-test) and the anaesthetist (P < 0.01, Kruskal-Wallis test). Factors associated with more time at BIS < 45 were: cranial surgery (P < 0.05, supine position (P < 0.05, t-test) and anaesthetist (P < 0.01, K-Wallis). The amount of drugs had no relation.

3AP4-1
Computer generated pathophysiological diagnoses during anaesthesia
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Department of Anaesthesiology, University of Auckland, Auckland, New Zealand

Background and Goal of Study: Display of trend data during anaesthesia is commonplace; however, data integration to automate diagnoses is not. The purpose of this “proof of concept” study was to examine a system that could, potentially, recognise absolute hypovolaemia. We report the efficacy of the software when applied, retrospectively, to data collected during major surgery where blood loss and hypovolaemia was likely.

Materials and Methods: The software uses probabilistic statistics, fuzzy logic (1) and respiratory related systolic-pressure-variation (2). Data collected from the analogue port of the GE/Ohmeda Datex monitor was filtered extensively to reduce artefacts, processed using MATLAB and LabVIEW. The data were analysed in 15-minute epochs, the agreement between clinician and computer assessed using Kappa.

Results and Discussions: There were 54 15-minute epochs. The positive agreement was 0.84, negative agreement 0.72, Kappa = 0.56 (95% CI 0.33–0.79) which indicates moderate agreement. Neither the clinician nor the software was considered a gold-standard and therefore in this preliminary study only agreement could be assessed. It is hoped that a redundancy of diagnostic information may reduce false alarms. On-line testing is imminent.

Conclusion: Hypovolaemia can be diagnosed using variables routinely monitored during anaesthesia, with a moderate degree of agreement with a clinical assessment.

References:

3AP4-2
Interim results of a study to evaluate the effectiveness of a new Electrocardiography (ECG) monitor in helping doctors improve their diagnostic proficiency and certainty in detecting acute ischaemia
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Anaesthetics, Broomfield Hospital, Chelmsford, United Kingdom

Background and Goal of Study: It is crucial to have accurate and prompt interpretation of signs of acute ischaemia during Electrocardiograph (ECG) monitoring. Yet, competency in reading ECGs among 120 residents in Medicine was shown to be low[1]. Cardiac monitors with automated ST segment analysis are available for ischaemia detection. However, the use of such monitors has been limited for several reasons[2]. A new ECG monitor with automated ST analysis capability has been developed to assist professionals identify changes of acute ischaemia with the site and severity of the changes. The monitor projects the changes as a 3D image of the heart showing progression of acute changes in real time. We conducted a study to evaluate the performance of the new ECG monitor in aiding doctors improve their diagnostic proficiency and certainty.
Material and methods: 50 resident doctors took part in a 2-phase evaluation. In Phase-1 we asked participants to make the diagnosis of acute ischemia using a set of 8 ECG printouts on the basis of ST elevation or depression. They also had to indicate their diagnostic certainty on a scale of 0–4 (0 = lowest, 4 = highest). This methodology was similar to that used by previous investigators1. In Phase-2 they reviewed a second set of 8 ECGs, but they also had access to the new imaging monitor to help them reach a diagnosis. The new monitor could recall any of the 8 ECG’s which were stored as electronic records. Two specialists marked the diagnosis made by participants in a scale of 0–2, and the aggregated score for all ECGs was labelled Diagnostic Profi- ciency score. The time to complete the test was also noted in both phases.

Results: Diagnostic Proficiency scores and Certainty scores (Median value with 25th–75th percentile) were calculated for both Phases. We compared the new data from the two phases to establish effectiveness of the new ECG monitor as an aid to doctors. Using the new imaging ECG monitor, doctors increased their median Diagnostic Prociency from 50% to 100% (P < 0.001); while their Certainty increased from 65% to 80% (P < 0.001). The average time taken to reach diagnosis dropped from 15 minutes to 9 minutes (P < 0.001).

References: 

3AP4-3
Validation of the IoC-view device for monitoring the level of consciousness during propofol anaesthesia
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Background and Goal of Study: The purpose of this study was to validate a new device for monitoring the level of consciousness, the IoC-view (Morpheus Medical Inc, Spain)(1) during propofol anaesthesia. The Index of Consciousness (IoC) was compared with the Bispectral Index (BIS-XF; Aspect Medical Systems, USA) and the Observers Assessment of Alertness and Sedation Scale (OAAS)(2) during the induction of anaesthesia. The IoC is based on a chaos mathematical analysis, termed Symbolic Dynamics (SD), of the frontal EEG(3). The basic principle of SD is to transform a time-series (here the EEG) into a symbol sequence.

Materials and Methods: After Ethical Committee approval, data was collected from 20 patients scheduled for cardiac surgery. In all patients the standard departmental procedure for propofol induction was applied: TCI reaching an effect site concentration of 5 µg/ml in 5 min or until loss of consciousness was reached, defined as loss of response to mild shaking and prodding (OAAS 1). Five minutes after the patient reached OAAS 1, atracurium 0.6 mg.kg\(^{-1}\) and continuous remifentanil infusion 0.3 µg.kg\(^{-1}\).min\(^{-1}\) (after a bolus of 1 µg.kg\(^{-1}\).min\(^{-1}\) in 1 min) were administered and the trachea was intubated. Data was collected until the surgery was ended. The IoC and the BIS were recorded simultaneously. The prediction probability (Pk) of the two indices ability to predict the OAAS was assessed along with the Spearman’s rank correlation.

Results and Discussions: The Pk(SE) values for IoC and BIS were 0.93(0.03) and 0.91(0.04), respectively. The Spearman’s rank correlation of the IoC vs. BIS was 0.88. Both monitors presented a similar evolution during the whole procedure.

Conclusion(s): The IoC seems to be a promising alternative for monitoring the level of consciousness during propofol anaesthesia.

References: 

3AP4-4
Improving of Preoperative Evaluation by electronic form
J. Mata, B. Tolskord, V.M. Estrada, I. Valdeperas, J.L. Aguilar
Anesthesiology, Son Llàtzer Hospital, Palma de Mallorca, Spain

Background and Objectives: Each patient, even more those with elevated risk factors who require an anesthetic for surgical treatment have to be evaluated by an anesthesiologist prior to surgery to prevent complications and to treat accompanying diseases. Each detail has to be documented as important information for the anesthesiologist involved in the patient’s care. For several reasons (human errors, technical difficulties...) data may get lost. Computer programs might minimize the risk of data loss.

Methods: By 2002 an electronic form for preoperative documentation according to the Spanish Society of Anesthesiology was introduced into daily practice. Since 2005 it was decided to insert spaces that need to be filled in. No reprint of the document can be obtained if those spaces are not completed with the aim to prevent loss of data. Specifically: ASA, CMA, blood transfusions, results of cardiac and pulmonary auscultation, difficult intubation, and allergy require documentation. Retrospectively, we compared the amount of data losses before the introduction of detailed data documentation between 2002 – 02/2005 and after between 03/2005 – 12/2006.

Results: 

<table>
<thead>
<tr>
<th>Year</th>
<th>Complete (n)</th>
<th>Not completed (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002 – 02/2005</td>
<td>82444</td>
<td>0</td>
</tr>
<tr>
<td>2003 – 12/2006</td>
<td>8774</td>
<td>0</td>
</tr>
</tbody>
</table>

Blood transf 81 (0,8%)
CMA 3212 (60%)
ASA 219 (2,3%)
Auscultation Cardiac 836 (8,8%)
Pulmonary 648 (6,9%)
Difficult int 3212 (60%)
Allergy 184 (2,1%)

The loss of data before meticulous documentation resulted in additional time to recover those data. Calculating 10 for the recovery of each loss of data resulted in a loss of time up to seven hours/week.

Conclusions: The electronic form of preoperative documentation improves the preoperative evaluation. Additionally, filling out a prepared form prevented the loss of data and shortened the time to recover them.

3AP4-5
SSI is sensitive to both sevoflurane and alfentanil during general anaesthesia
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Background and Goal of Study: During general anaesthesia (GA), neuromuscular blockade and hypnosis are routinely monitored, whereas measurement of nociception still remains a challenge. Surgical stress index (SSI) is a new numerical indicator of patient’s state, designed to indicate the nociceptive – anti-nociceptive balance. We hypothesized that a change in alfentanil (A) concentration would cause the SSI value to change.

Materials and Methods: 39 adult ASA I-III females scheduled for abdominal surgery under GA were randomized in two groups. After anaesthetic induction with propofol, A and rocuronium, 20 patients received A at 50 ng/ml target site concentration (Ce), while sevoflurane (S) MAC was changed between 0.7 and 1.5 every 15 minutes. In other 19 patients S-MAC was kept constant at 0.8 whereas A-Ce was changed between 25 and 75 ng/ml every 25 minutes. SSI was calculated on-line by utilizing ECG and plethysmographic pulse wave data (1). SSI changes during 51 S-MAC increases and 25 A-Ce increases were analyzed. Wilcoxon signed rank test was used. P value < 0.05 was considered significant.

Results: Results are mean ± SD (Figure).

Conclusions: With both S and A, the increase in drug concentration is associated with a decrease in SSI. Both drugs possess anti-nociceptive properties and SSI behaves as a reliable indicator of nociceptive – anti-nociceptive balance.

Reference: 

3AP4-6
Implementation of an emergency department information system resulted in significantly reduced waiting times
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Introduction: Patient satisfaction at emergency departments (EDs) can be improved by reducing wait times. In the present paper, we evaluated the impact of an ED information system, available for all ED (medical and nursing) staff and displaying a visual tracking system of all pts admitted to the ED.

Patients and Methods: We retrospectively analysed all different waiting times for all patients admitted to the ED in a 3-months period before and after the installation of the visual tracking system. Different waiting times were: first, pts have a wait for registration (wR), then a wait for the initial triage (wT), a separate wait for the consulting room (wC), a wait for – if necessary – technical investigations (wI), and finally a further wait for treatment (wT) and discharge (wD).

Results: A total of 4,720 pts were included in the first 3-months period, compared to 4,910 pts for the second period. We observed a significant decrease in all, except (wR), waiting times after the installation of the visual tracking system. Analysis of different waiting times revealed that largest reductions were obtained in the wait for initial triage and consult (wT: m28min reduced to m19min and wC: m43min reduced to m27min). We also observed a significant reduction in outliers, i.e. extremely long waiting times, mostly occurring for technical investigations.

Conclusion: The implementation of an ED information system, with the use of a visual tracking screen including all ED pts, resulted in significantly reduced waiting times.

3AP4-7
Ability of anaesthesiologists to assess the incidence of deep anaesthesia (BIS below 45) in their own cases
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Background and Goal of Study: Individual anaesthesiologists may deal differently with the information obtained from BIS monitoring. We studied the occurrence of low BIS in neurosurgeries and the ability of the anaesthesiologists who conducted the cases to self-assess its incidence.

Materials and Methods: Data records of neurosurgeries were collected from Aspect XP with RugoStop II TCI software. Anaesthesia was with propofol and remifentanil. The only defined goal of the anaesthesiologist was to avoid BIS > 60. BIS was analyzed from after induction up to recovery (AT) with BIS/H11021. Analysis of different waiting times revealed that largest reductions were obtained in the wait for initial triage and consult (wT: m28min reduced to m19min and wC: m43min reduced to m27min). We also observed a significant reduction in outliers, i.e. extremely long waiting times, mostly occurring for technical investigations.

Conclusion: The implementation of an ED information system, with the use of a visual tracking screen including all ED pts, resulted in significantly reduced waiting times.
**3AP5-1**

Effect of epidural opioids on postoperative transcutaneous carbon dioxide tensions and peripheral oxygen saturations in spontaneously breathing patients with the TOSCA monitor

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Background and Goal of Study: Hypoventilation is associated with opioid analgesics, independent of route of administration. In previous research we found significant hypercapnia, but no hypoxyaemia, in postoperative patients on oxygen 4 L - min⁻¹ with PCA-morphine. This observational, prospective study evaluates the effect of commonly administered epidural opioids on transcutaneous carbon dioxide partial pressures (PtCO₂) and peripheral oxygen saturations (SpO₂) with a non-invasive earlobe monitor, (TOSCA). The processed readings correlate well with arterial blood gas results.

Materials and Methods: 14 patients (ASA I-II; m = 10, f = 4) scheduled for laparotomy participated. Post-operatively, patients received oxygen (4 L - min⁻¹). Pain management was with continuous epidural bupivacaine (0.1%) and diamorphine (40 mcg - ml⁻¹; n = 2), or fentanyl (2 mcg - ml⁻¹; n = 8). Data was collected for 8 hours on both pre- and post-operative nights and analysed with TOSCA.

Results and Discussion: Descriptive data are shown (ΔM = post-pre-operative median change; t = time spent)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Med</th>
<th>IQ</th>
<th>UQ</th>
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<th>Max</th>
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</thead>
<tbody>
<tr>
<td>ΔM PtCO₂</td>
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<td>-0.1</td>
<td>0.8</td>
<td>-1.2</td>
<td>1.8</td>
</tr>
<tr>
<td>ΔM SpO₂</td>
<td>3.6</td>
<td>2.7</td>
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<td>1.0</td>
<td>6.6</td>
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<tr>
<td>ΔM &gt; 6 ≥PaCO₂</td>
<td>0.1</td>
<td>-0.6</td>
<td>2.3</td>
<td>-5.8</td>
<td>3.9</td>
</tr>
<tr>
<td>ΔM % Hb</td>
<td>-1.4</td>
<td>-3.8</td>
<td>-0.8</td>
<td>-6.1</td>
<td>-0.1</td>
</tr>
</tbody>
</table>

**Hypercapnia-time:** mean change = -0.15 ± 0.12 (19 to 1.7); (P = 0.02).

**Desaturation-time:** mean change = -2.2 ± 0.23 (4.5 to -1.1); (P = 0.0009).

Conclusions: We found no evidence of significant post-operative hypercapnia or hypoxaemia in patients receiving epidural bupivacaine containing opioids at commonly used doses. There was also significant evidence to show a decrease in desaturation time with epidural analgesia.

References:

**3AP5-2**

Infrared tissue oximetry and metabolic oxygen consumption.

New anaesthetic applications

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Background and Goal of Study: The use of infrared spectra is applied every time with more success in monitoring of cerebral tissue oximetry. It is still unknown if these systems can show additional information about metabolic state and flow in other organs like liver, kidney or asplenic system. Our intention is to analyze during paediatric anaesthesia, modifications in oximetry at hepatic and asplenic flow level, correspond with modifications in the measured values of metabolic oxygen consumption by indirect calorimetry (VO₂).

Materials and Methods: We studied 21 patients, 1–6 years, ASA I-II, under balanced general anaesthesia, during one hour of surgery time. 8% Sevoflurane for anesthesia induction and 2% sevoflurane in 50% O₂/Air, in spontaneous ventilation, for maintenance, were used. Hemodynamic and respiratory pattern; temperature; hypnosis level by Entropy of EEG; inspiration and expiration gases pattern; and VO₂ were studied. Data were gathered by Datex-Ohmeda® monitoring system S/STM and CAIOVX module, and information was processed by “S/5 Collect™” Software. Oximetry values were registered in a separate system, measured by “Somatetics” sensor of INVOX™ oximetry.

Results and Discussions: After induction regular differences -p < 0.05- between the average values from oximetry in liver (χ = 84 ± 9) and asplenic territory (χ = 92 ± 6), was found. These values stayed stables in both and show a reduction that correlated (R) statistically 0.93 with VO₂ increase. Reductions of Median Arterial Tension, and/or increase of cardiac frequency, superior to 15% of basal value; greater increase of respiratory frequency (20% of basal value); pain or intraoperative awakening episodes; produced a significant elevation of VO₂ (p < 0.01). Each degree of Temperature loss correspond to VO₂ elevation > 10% (p < 0.01). These situations that alter VO₂, correlates with significant reduction values of asplenic and hepatic oximetry (p < 0.05) -R statistically ≥ ±0.9; z > 4.500-, staying differences of oximetry average values between both territories.

Conclusions: Cerebral oximetry by infrared monitoring systems can be used to the asplenic and hepatic territory. They could be systems of visceral sanguineous indirect measurement flow and/or tissue metabolic stress during anesthesia.

**3AP5-3**

Comparison of blood glucose estimated by continuous blood glucose monitor (STG-22™) and ABL™800FLEX

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Background and Goal of Study: Intensive insulin therapy has been reported to reduce the mortality in critically ill patients (1). However, it has been remained a concern that target blood glucose exceeded in 45% of ICU patients (2), although the conventional insulin infusion nomogram requires frequent blood glucose testing. Therefore, a continuous blood glucose monitoring might be necessary. In the present study, we compared blood glucose measured by STG-22™ (Nikkiso Inc, Tokyo, Japan), a continuous blood glucose monitor, with that measured by ABL™800FLEX which is widely used in the world (Radiometer Medical Aps, Boroeshoj, Denmark) to know the reliability and the accuracy during surgery.

Materials and Methods: Twenty-nine patients who underwent scheduled operation (hepatectomy, pancreatoduodenectomy, vascular surgery, off-pump coronary artery bypass grafting and others) were enrolled in this study. After anesthesia induction, 20 G intravenous catheter was inserted in the peripheral vein and connected to STG-22™. And then a radial arterial catheter was inserted. Blood glucose samples were obtained from an arterial line by an anesthesiologist following an established protocol of discarding three milliliters prior to the actual blood sample. Blood glucose was measured by ABL™800FLEX which is widely used in the world (Radiometer Medical Aps, Boroeshoj, Denmark) to know the reliability and the accuracy during surgery.

Results: Correlation coefficient between STG-22™ and ABL™800FLEX was 0.95. Bias and upper/lower limit of agreement were -2.6 and 23.2–28 respectively.

Conclusion(s): The precision of blood glucose measurements between STG-22™ and ABL™800FLEX was very similar. STG-22™ is a reliable device for measuring blood glucose continuously. Therefore, we could use the device routinely for intensive insulin therapy.

References:

**3AP5-4**

Clinical observation of perfusion index for noxious stimuli detection

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Background and Goal of Study: It is quite important to find a useful indicator for noxious stimuli during operation. Previous researches showed that perfusion index(PI), obtained from the area of plethysmography, could detect the reaction of nociception, so we hypothesized that the PI would be a potential indicator for noxious stimuli during general anesthesia.

References:
Materials and Methods: Thirty-six patients undergoing gynecological celiotomy were randomly assigned to three groups (n = 12): Group 1 (G1), fentanyl 1 μg/kg; Group 2 (G2), fentanyl 3 μg/kg; Group 3 (G3), fentanyl 5 μg/kg. 8 ml/kg of Lactated Ringer’s solution was given before induction, and continued at 10 ml/kg/h. Anesthesia was induced by TCI of propofol, different doses of fentanyl and 0.1 mg/kg of vecuronium. Tracheal intubation was performed when Ce reached at 3 μg/ml (the beginning of tracheal intubation) while skin incision at 3.9 μg/ml (the beginning of incision). HR, MAP, Bis and Perfusion Index were recorded at time points of baseline, 1 μg/ml, 2 μg/ml and 3 μg/ml Ce of propofol, process of induction (10 s, 30 s, 60 s), TCI induction (3.9 μg/ml) and process of skin incision (10 s, 30 s, 60 s, 120 s).

Results and Discussions: When the noxious stimuli appeared, the values of PI had remarkable and immediate decreases, which were less than 30% of corresponding beginning values. The time points of its lowest value were 42.6 ± 6.4 s during tracheal intubation and 16.6 ± 6.6 s during skin incision. PI also had the highest sensitivity than HR and MAP. During tracheal intubation, the sensitivity was 89% of PI, 56% of HR, and 28% of MAP (< 0.001), during skin incision, the sensitivity was 100% of PI, 11% of HR, and 36% of MAP (< 0.001). At all time points during the process of noxious stimuli, there was a slight but not significant difference of PI among three groups (lowest values, intubation: G1 – 24.9 ± 10.6, G2 – 26.1 ± 6.3, G3 – 33.3 ± 11.6, P = 0.107; Skin Incision: G1 = 23.4 ± 13.0, G2 = 24.3 ± 9.5, G3 = 24.8 ± 7.1, P = 0.945, respectively) while the values of HR, MAP and Bis changed very little.

Conclusion: During the induction and the beginning of anesthesia by TCI, PI indicates the noxious stimuli effectively and immediately, but it shows no correlation with the different doses of fentanyl.

3AP5-5
The interference of electrical appliances with SCS and the effectiveness of shielding clothing for the patient with SCS
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Anesthesiology and Intensive Care, Hamamatsu University School of Medicine, Hamamatsu, Japan

Background and Goal of Study: Spinal cord stimulation system (SCS) is widely used for the patients with chronic pain. Recently electrical appliances which make strong magnetic field, such as an induction heating (IH) cooking plate, have been widely used. In spite of many reports of electrical interference in pace-maker (PM), no report has been described about the SCS. We investigated electromagnetic interference of IH to SCS.

Materials and Methods: At first, we assessed electromagnetic interference of IH to SCS with a human body model and the shielding effectiveness of IH to SCS. We observed that the slight alteration of rSO2 decrease with INVOS 5100B (1). Further study must evaluate whether IH gives electromagnetic interference with SCS not in the general anesthesia surgery.

Conclusion(s): Characteristics of oxygenation, gas exchange, respiratory function and hemodynamics were within the range of physiologic norm during anesthesia with reduced flow. Use of sevoflurane to support anesthesia reduces pharmacologic homeostasis loading in a patient, and synergism reduces stress-induced response to surgical intervention. Reliable improvement in C3 utilization and compliance is an additional advantage of reduced flow anesthesia as compared to high flow anesthesia.

3AP5-7
Detection of cerebral ischemia during carotid endarterectomy in patients under general or regional anesthesia: evaluation of the new monitor InVos 5100B
Y. Letournier, H. Lagadec, Y. Goueffic, B. Roze, Y. Blanleoil
Anesthesia and surgical intensive care, University hospital chu Nantes, Nantes Saint Herblain, France

Background and Goals: Detection of cerebral ischemia during carotid endarterectomy (CEA) may be improved by cerebral oxymetry (rSO2) as evidenced in patients assessed under regional anesthesia (LRA) (1). We conducted a prospective evaluation of a new version of INVOS (5100B) comparing this monitoring in patients with general anesthesia (GA) and LRA.

Patients and Methods: 25 patients undergoing CEA with GA and 28 with LRA were monitored with INVOS 5100B allowing bilateral rSO2 along with radial arterial pressure and standard monitoring with a continuous computerized recording (Fusion Pegase™). Variations in rSO2 from preclamp values, and values at 3.5, 10 min after internal carotid clamping were compared between patients with and without neurologic symptoms. Median [min-max]; Mann-Whitney; p < 0.05.

Results: Stroke occurred in 1 patient with GA and 2 with LRA. During LRA neurologic symptoms appeared after 3 and 8 min of clamping. There was a significant ipsilateral rSO2 decrease in patients with (−24, −30, −49%) in comparison to patients without neurologic symptoms (−7.5% (−10, −27%)) (p < 0.004) between preclamp values and values at 5 min after clamping. One patient during LRA had a 27% decrease in rSO2 without neurologic symptoms. The cutoff value for prediction of neurologic deterioration was −24% at 5 min. No significant contralateral rSO2 variations were observed in all patients.

Conclusions: This study confirms the cutoff value of 20–25% of ipsilateral rSO2 decrease with INVOS 5100B (1). Further study must evaluate whether a systematic shunt use when this decrease occurred at 5 min after clamping will decrease the incidence of neurologic accidents.


3AP5-8
A prospective study to validate continuous non-invasive measurement of hemoglobin via pulse CO-oximetry
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Anesthesiology, Loma Linda University, Loma Linda, USA

Background and Goal of Study: New advances in pulse oximetry technology have led to the development of multi-wavelength pulse CO-oximeters designed to measure multiple physiologic parameters. This study utilizes a prototype pulse CO-oximeter that allows for measurement of continuous hemoglobin concentration (pHb).

Materials and Methods: After Review Board approval and informed consent 19 patients scheduled to undergo surgery were enrolled in this ongoing study. Each subject was monitored with ASA standard monitors and radial artery

Data and results of continuous measurement of hemoglobin concentration (pHb):

<table>
<thead>
<tr>
<th>Data of reduced flow anesthesia</th>
<th>Initial data</th>
<th>Immediately after surgery</th>
<th>In 24 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.43 ± 0.06</td>
<td>7.39 ± 0.008*</td>
<td>7.4 ± 0.042</td>
</tr>
<tr>
<td>pCO2 (mmHg)</td>
<td>3.22 ± 0.8</td>
<td>3.68 ± 0.81</td>
<td>3.42 ± 0.4</td>
</tr>
<tr>
<td>SO2 (mmHg)</td>
<td>97.01 ± 6.21</td>
<td>141.62 ± 9.97*</td>
<td>95.67 ± 6.4</td>
</tr>
<tr>
<td>pCO2 (mmHg)</td>
<td>25.07 ± 0.23</td>
<td>24.09 ± 0.21</td>
<td>24.7 ± 0.4</td>
</tr>
<tr>
<td>Bilirubin (mcM/L)</td>
<td>14.18 ± 0.88</td>
<td>12.81 ± 0.91</td>
<td>11.83 ± 1.15</td>
</tr>
<tr>
<td>Concentrations (mcM/L)</td>
<td>7.53 ± 0.44</td>
<td>7.74 ± 0.48</td>
<td>6.17 ± 0.35*</td>
</tr>
<tr>
<td>Bilirubin (mcM/L)</td>
<td>0.11 ± 0.04</td>
<td>0.095 ± 0.04</td>
<td>0.1 ± 0.004</td>
</tr>
<tr>
<td>Creatinine (mcM/L)</td>
<td>0.72 ± 0.07</td>
<td>0.6 ± 0.04*</td>
<td>0.64 ± 0.05</td>
</tr>
<tr>
<td>ALT (mcM/L)</td>
<td>42.4 ± 0.04</td>
<td>39 ± 0.03</td>
<td>0.44 ± 0.03</td>
</tr>
<tr>
<td>Urea (mcM/L)</td>
<td>6.01 ± 0.37</td>
<td>5.54 ± 0.34</td>
<td>5.58 ± 0.39*</td>
</tr>
<tr>
<td>Compliance</td>
<td>37.7 ± 0.45</td>
<td>54.6 ± 0.5</td>
<td>36.6 ± 0.65</td>
</tr>
<tr>
<td>Utilization O2 (%)</td>
<td>3.7 ± 0.2</td>
<td>9.21 ± 0.38*</td>
<td>3 ± 0.25</td>
</tr>
<tr>
<td>pHb (g/dl)</td>
<td>6.4 ± 0.3</td>
<td>10.6 ± 0.3</td>
<td>10.6 ± 0.3</td>
</tr>
</tbody>
</table>

*p < 0.01
canul. Three prototype SpHb sensors, optically isolated from each other, were attached to a data collection system (Masimo Inc., Irvine, CA). In addition to SpHb, the Spo2, pulse rate and perfusion index (PI) values were recorded. Routine surgical care of these patients was not altered. Data was collected throughout the course of each case. SpHb/Hb data pairs were collected at baseline, throughout the course of surgery and at completion of the case. Arterial blood samples were analyzed by laboratory CO-oximeter (Radiometer ABL735), and the resulting Hb measurements were compared with the data collected from the corresponding SpHb readings. Regression analysis, bias, precision and ARMS were calculated.

**Results and Discussions:** Nineteen patients (5 males, 14 females) ranged in age from 10 to 67 years. Mean (SD) SpO2 was 99.1% (2.4%), 303 SpHb/Hb data pairs were collected and analyzed. Hb concentration ranged from 5.8 to 14.1 g/dL (mean = 9.5 g/dL, SD = 1.8 g/dL). Regression analysis between Hb and SpHb yielded a correlation coefficient of 0.822 and the S.E.E/Bias, precision and ARMS were 0.186, 1.06 and 1.07 respectively.

**Conclusion(s):** This device is the first device developed that can noninvasively continuously measure hemoglobin concentration in addition to the other common hemoglobin species, and therefore provides a significant expansion of existing physiologic monitoring technology. Rapid measurement of hemoglobin would be an extremely useful tool in many clinical scenarios.

### 3AP5-9

#### Tromboelastography during liver transplantation

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**Background and goal of study:** To date a major problem in liver transplantation (OLT) is to maintain an adequate haemocoagulative homeostasis. Conventional tests provide only quantitative and punctual informations on haemostatic process whereas tromboelastography allows a dynamic analysis of coagulation and a functional interpretation of blood components involved.

**Aim of the study was to compare tromboelastographic data and standard laboratory tests (PT, aPTT, INR, fibrinogen, ATIII, d-dimer, PLT, Hb, Hct).**

**Materials and methods:** Twenty consecutive patients undergone OLT for end stage liver disease (ESLD) were included in the study. In all patients conventional and tromboelastographic tests were simultaneously collected at standard times: post anesthesia induction, during pre-anhepatic phase, during anhepatic phase, after venous and arterial graft reperfusion and at the end of surgery.

**Statistics were performed by ANOVA and regression analysis using SPSS 6.0.**

**Results:** According to literature a statistically significant correlation (p < 0.05) between the analysed data was found as follow: the reaction time (R) relates well to aPTT and, as the last, is prolonged at baseline and at anhepatic phase; the clot kinetic time (K) directly relates to INR and aPTT and inversely relates to fibrinogen; it is prolonged in case of platelet dysfunction; α-angle inversely relates to aPTT; maximum amplitude negatively relates to INR and aPTT. Particularly significant is the lack of correlation between tromboelastographic parameter Lys 30 - direct index of fibrinolysis- and d-dimer, in postreperfusion phase too.

**Conclusions:** According to clinical evidence of poor bleeding, tromboelastography suggests that postreperfusion d-dimer increase reflects a graft release and not a host hyperfibrinolitic state.

Tromboelastography reliably detects actual hyperfibrinolysis allowing to avoid a potentially dangerous antifibrinolitic Reference:


### 3AP6-1

#### Induction dose of atracurium does not interfere intra-operative neuromonitoring of the recurrent laryngeal nerve during thyroidectomy

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**Background and Goals:** Though muscle relaxants are suggested to avoid in intraoperative neuromonitoring (IONM), the laryngeal muscles were reported to exhibit a quicker recovery than the abductor pollicis (1). The purpose of this study is to investigate whether induction dose of atracurium interfere IONM during total thyroidectomy.

**Material and Methods:** In a prospective study involving 27 patients undergoing elective total thyroidectomy, the influence of induction dose of atracurium on neuromonitoring of the recurrent laryngeal and vagus nerve was investigated. The patients received general anesthesia with oxygen-sevoflurane and atracurium was used to facilitate tracheal intubation. The degree of relaxation was monitored continuously by accelerometry (twitch%). Evoked potentials obtained from an insitu Nemed endotracheal tube connected to EMG monitor expressed in μV.

**Results:** First response signals were recorded for 45 vagus and recurrent laryngeal nerves. For vagus nerve, the time of first response signal occurred at 56.8 ± 15.6 minutes and evoked potential was 122 ± 106.9 μV. First response twitch was 0.8 ± 1.5%. For recurrent laryngeal nerve, the time of first response signal occurred at 102.8 ± 28.3 minutes and evoked potential was 389.9 ± 377.6 μV. First response twitch was 31.8 ± 27% (data were expressed as mean ± SD)

**Conclusions:** 1. Relaxant-free anaesthesia may not be mandatory for intraoperative neuromonitoring (IONM) of the vagus and recurrent laryngeal nerve. 2. Giving only induction dose of atracurium does not interfere with intraoperative neuromonitoring and can facilitate intubation.

**Reference:**

Results and Discussions: There were 48 study periods each of four minutes duration. Characteristic EEG changes associated with sedation were present in 29 (Table 1).

Table 1:

<table>
<thead>
<tr>
<th>MOAA/S Score</th>
<th>Sedated (EEG) n = 29</th>
<th>Not Sedated (EEG) n = 19</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>12</td>
<td>19</td>
</tr>
<tr>
<td>&lt; 5</td>
<td>17</td>
<td>0</td>
</tr>
</tbody>
</table>

MOAA/S score was 100% specific and 59% sensitive in identifying patients with EEG evidence of sedation. MOAA/S failed to identify sedation in 41% of patients (negative prediction value 61%).

Conclusion: MOAA/S failed to identify sedation (as defined by EEG) in 41% of ASA I patients receiving low dose propofol sedation.

References:

3AP6-4
Effects of epidural administration of lidocaine andropipavacaine on myogenic motor evoked potentials
T. Horuchi, M. Kawaguchi, H. Hayashi, S. Inoue, H. Furuya
Department of Anesthesiology, Nara Medical University, Kashihara, Japan

Background and Goal of Study: Motor evoked potentials (MEP) to transcranial electrical stimulation are used for the patients undergoing thoracoabdominal aortic surgery to prevent postoperative neurological deficits (1). During such surgery, epidural anesthesia may be applied, however, the effects of epidural anesthesia on myogenic MEPs remained undetermined. We investigated the effects of epidural administration of lidocaine and ropivacaine on myogenic MEPs.

Materials and Methods: This study is a prospective randomized control trial. After institutional approval and written informed consent, twenty-four patients who underwent elective abdominal aortic aneurysm surgery were studied. After the recording of control MEPs in response to transcranial multi-pulse stimulation under propofol and fentanyl anesthesia, 5 ml of 2% lidocaine (n = 8) or 0.75% ropivacaine (n = 8) or saline (n = 8) was epidurally administered and then MEPs were recorded every 5 to 15 minutes. Percent changes of MEP amplitudes were analyzed by repeated measures analysis of variance.

Results and Discussions: Control MEP amplitudes were similar among three groups. In all groups MEP amplitudes remained unchanged during the study period until 45 minutes after epidural administration.

Conclusion(s): The results indicated that relatively small dose of lidocaine and ropivacaine had little influences on myogenic MEPs in patients under propofol and fentanyl anesthesia.

Reference:

3AP6-5
Photoplethysmogram amplitude provides information on the adequacy of analgesia of post surgical patients
Clinical Systems, GE Healthcare, Helsinki, Finland

Background and Goal of Study: Analgesia is an important part of the care of post surgical patients. The aim of this study was to compare the information obtained from the photoplethysmographic waveform with the post surgical patients’ self-report of their pain intensity.

Materials and Methods: Physiological parameters were recorded from 15 female ASA II patients recovering from a major laparotomy. The analgesia was provided with patient controlled oxycodone. The patients’ pain intensity was asked at 15-minute interval with the numeric rating scale (0–10); total of 93 pain reports were obtained. Photoplethysmographic wave amplitude (PPGA) time series was extracted off line and the power ratio of high frequency power (0.15–0.4 Hz) and sub high frequency power (0.003–0.15 Hz) was calculated. Prediction probability (P) values were calculated in respect to the patients’ pain reports. Additionally, the Pk values of heart rate (HR) and non-invasive mean blood pressure (MBP) were calculated as references. The standard errors of the Pk values were estimated with the jackknife method. Statistical significance was tested with two-tailed t-test.

Results and Discussions: MBP, PPGA, and PPGA ratio predicted pain intensity in the sense of Pk (see figure). PPGA ratio had the highest Pk value (0.72 ± 0.03) and it was significantly higher than the Pk values of HR and BP.

3AP6-6
Effect of neuromuscular block reversal on bispectral index in anesthetized patients
Surgery, Sao Paulo Federal University, Sao Paulo, Brazil

Background and Goal of Study: Intraoperative memory leads to psychological disorders in anesthetized patients. Anesthesia depth can be assessed by Bispectral Index (BIS). BIS values above 60 present risk of conscious1. Glicopirrolate and neostigmine can alter anesthesia depth in patients that received propofol anesthesia. There are no research on neuromuscular block reversal and anesthesia depth during inhalatory anesthesia. The goal of this study was evaluate BIS changes after atrofino and neostigmine administration in propofol or sevoflurane anesthetized patients.

Materials and Methods: Eleven patients ASA 1 or 2 were randomized to propofol (n = 6) or sevoflurane (n = 5) groups. Anesthesia induction: remifentanil, propofol, and rocuronium. Maintenance: continuous remifentanil and propofol (propofol group – P) or sevoflurane (sevoflurane group – S). Titrated doses of propofol and sevoflurane were used to maintain BIS values ± 40. Atrofino and neostigmine were administrated when TOF – 3. BIS variation between initial and maximum values was calculated. T test was used to compare BIS change between the groups (significant p < 0.05).

Results and Discussions: BIS change (mean ± SD) was 22.8 ± 9.2 (group P) and 8.2 ± 1.8 (group S) and p = 0.009. BIS values can be affected by central nervous system (SNC) muscular tonus perception. SNC inhibition by sevoflurane is due to GABA and glicine spinal receptors that modulate muscular tonus, while propofol inhibits only GABA receptors2. Diverse spinal mechanism of action could lead to lowest BIS change in sevoflurane anesthetized patients.

Conclusion(s): Atrofino and neostigmine administration increases BIS values of propofol anesthetized patients deeper than sevoflurane anesthetized patients.

References:

3AP6-7
Indocyanine green used for PDE imaging system increases mixed venous oxygen saturation (SvO2) reading
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Department of Anesthesia, Cardiovascular Center Hokkaido Ohno Hospital, Sapporo, Japan

Background and Goal of Study: Laser light causes indocyanine green (ICG) to fluoresce and near infrared sensitive videocamera can capture this fluorescence image. PDE Imaging System (Hamamatsu Photonics, Hamamatsu, Japan) is such device and can use intraoperatively. This is a study to clarify whether ICG used for PDE imaging System affects mixed venous oxygen saturation (SvO2) readings, which also measured by using infrared light.

Materials and Methods: After obtaining IRB approval and written informed consent, we studied 64 consecutive patients scheduled for OPCAB. After completion of anastomoses, 56 patients received assessment of grafts and anastomoses using PDE Imaging System with 0.3125 mg, 0.625 mg, 1.25 mg or 2.5 mg of ICG (1 ml) injection with 5 ml of normal saline. Eight patients were injected 5 ml of normal saline. SvO2 was measured with Swan-Ganz Continuous Cardiac Output/End Diastolic Volume Thermodilution Catheter with CEDV/Vigilance system (Edwards Lifesciences, Irvine, USA).
and recorded every 2 seconds before ICG injection till 90 seconds after ICG injection. Paired t-test was performed and P < 0.05 was considered significant.

**Results and Discussions:** Immediately after ICG injection, SvO₂ showed spiky increase and baseline increase except ICG 0.3125 mg and normal saline group. In both groups, only slight peak was observed. Since hemodynamic is extremely stable during image capturing with PDE Imaging, increase of SvO₂ reading does not result from hemodynamic change. Flushing with normal saline may concerns the spiky increase to some extent but it does not explain baseline increase. It is known that ICG decreases pulse oximetry readings dose-dependently. Because pulse oximetry is two-wavelength system and SvO₂ monitoring is three-wavelength system, this difference may cause the significant increase in SvO₂ after ICG injection unlike pulse oximetry.

**Conclusion:** ICG based PDE Imaging System is a prominent intraoperative graft and anastomosis assessment device. Although very low dose of ICG is injected, ICG increases SvO₂ reading significantly.

**3AP6-8**

Usefulness of BIS monitoring to manage adequate depth of anaesthesia without muscle relaxants for cerebellopontine angle surgery with evoked potential monitoring and electromyography

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Anesthesiology, Hospital, Riga, Latvia

**Background and Goal of Study:** To asses the usefulness of BIS monitoring to manage adequate depth of anaesthesia without muscle relaxants at Cerebellopontine Angle surgery with evoked potential monitoring (EP) and electromyography (EM) to preserve the functional integrity of nerve tissue placed at risk.

**Materials and Methods:** The ethical committee of the hospital approved the study. 45 patients ASA II–IV aged 15–78 from 2000–2006 undergoing elective neurosurgery with tumours of Cerebellopontine Angle – neurinomas of the Vestibulocochlear nerve, Facial nerve, Trigeminal nerve, Glossopharyngeal nerve and meningeomas of the Cerebellopontine Angle. Patients were divided in two groups: I group 2000–2002 without BIS monitoring (n = 20); II group 2003–2006 BIS monitoring was used. All patients were asked after surgery about consciousness and comfort during operation. Intra-operative EP and EM were used for avoiding acute intra-operative nerve injury. Induction technique was standardised with Midazolam 5 mg, Propofol (Pr) 2 mg/kg, Fentanyl (F) 3 μg/kg, and Nimbex 0.15 mg/kg during opening and closure of the skull. Anaesthesia was maintained with Sevoflurane (Sevo) and mixture 50% O₂ in air. Sevo MAC 0.5–0.7 was titrated to maintain BIS among 30–45 during the surgery. Cerebral perfusion pressure was maintained above 70–80 mmHg. F and Pr were added in requirement perfusion.

**Results:** In the I group, use of F was 4 μg/kg/h, Pr 3–4 mg/kg/h and patients extubation time was 1 h 30–6h. 50% of patients were extubated at the operating room. In the II group use of F was 3 μg/kg/h, Pr 3–4 mg/kg and patients extubation time was 3h 4h. 85% of patients were extubated at the operating room. Operation time was 2h 20–11h 45 : Nerve tumour microsurgical removal time was 1h 30–10h 25. In nerve tumour microsurgical removal time, haemodynamic parameters were supported stable. Surgical procedures didn’t create a significant impairment of neurological status. We haven’t seen any episodes of awakening and moving during surgery. BIS during EPM was 35–45.

**Conclusion:** BIS monitoring is a very useful method to manage adequate depth of anaesthesia without muscle relaxants at Cerebellopontine angle surgery with EP and EM and patients safety.

**3AP6-9**

A survey of current practice of peri-operative neuromuscular transmission monitoring in the United Kingdom

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Anaesthetics, Cardiff University, Cardiff, United Kingdom

**Background and Goal of Study:** Neuromuscular function monitoring (NFM) in patients having neuromuscular blocking drugs is a minimal monitoring standard recommended by the Association of Anaesthetists of Great Britain and Ireland (AAGBI) [1]. Objective NFM assesses neuromuscular transmission avoiding residual paralysis [2]. Surveys of NFM practice of anaesthetists are published [3], with practices differing internationally. We surveyed NFM practice in the United Kingdom (UK).

**Materials and Methods:** A questionnaire was conducted of 702 (20%) randomly selected consultant anaesthetists on the 2005/2006 UK medical directory database. We asked if NFM was routinely used with muscle relaxants (Q4), how routinely reversal agents were used (Q11) and whether they thought NFM should be a minimal monitoring requirement (Q12). Data are number and percentage and compared by χ² using SPSS 12.

**Results and Discussions:** 571 questionnaires (81%) were returned. 29 (5%), 131(23%) and 401(70%) had experience of <5, 5–10 and >10 y respectively. Years of experience did not affect routine NFM use (Q4) (p = 0.091 and 0.29) or whether reversal is routinely used (Q11) (p = 0.48 and 0.09). Whether NFM should be part of minimal monitoring varied significantly with experience (p = 0.046).

<table>
<thead>
<tr>
<th>Table 1 Responses to questions: Q4, Q12 and Q11.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q4</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Blank</td>
</tr>
<tr>
<td>Always</td>
</tr>
</tbody>
</table>

**Conclusion:** The majority of consultant anaesthetists in the UK do not follow the AAGBI recommendations on NFM use. Despite evidence that clinical evaluation alone will not prevent residual blockade, 64% do not think that NFM should be part of minimal monitoring. However 6% gave an unsolicited response stating that it should be available instead of being made mandatory.

**References:**

**3AP6-10**

Development of new ankle compression type foot pump with bio-impedance evaluations

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**Background and Goal of Study:** We had recommended the bio-impedance measurement for anti-DVT (deep vein thrombosis) foot pump’s evaluations, instead of an ultrasonic Doppler flow meter, at ESA 2005 Vienna. 1) Impedance changes are good blood volume shift parameter. It is possible to carry out multiple measurements in a short period. Using this method we have produced new ankle compression type foot pump.

**Materials and Methods:** We evaluated four different designed trial products of foot pumps (including with/without ankle compression) in each 4 male healthy volunteers aged 29 to 59. Each product had 4 chamber bladders. Three different compression pressures (80, 100, 130 mmHg) were regulated with a pressure generator. After electrodes fixation on dorsal foot and frontal thigh, we measured bio-impedance with a bio-impedance amplifier (Nihon-kohden, Japan) under 50 kHz 20 mA transmit current Output signals were stored in a computer and analyzed.

**Results and Discussions:** Totally 48 times measurements were carried out. Control leg impedance value was 265.6 ± 45.2 Ω (mean ± SD). The most prominent impedance changes were derived only by ankle compression (figure 1) and it showed same pattern with ultrasonic Doppler flow meter. This means that not only plantar compression but also ankle compression is very important in foot pump function. An ankle may be more vascular/blood rich than we thought. This new foot pump with ankle compression was commercialized lately in Japan.

**Conclusion(s):** Bio-impedance measurement is also good evaluation method for producing anti-DVT foot and/or leg compression devices.


**3AP7-1**

Respiratory variations in pulse oximetry plethysmographic waveform amplitude to predict fluid responsiveness in the operating room

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Background and Goal of Study: Respiratory variations in pulse oximetry plethysmographic waveform amplitude (ΔPOP) are related to respiratory variations in pulse pressure (ΔPP) and are sensitive to changes in preload. However, nothing is known about its ability to predict fluid responsiveness. We hypothesized that ΔPOP can predict fluid responsiveness in mechanically ventilated patients under general anesthesia.

Materials and Methods: Twenty-five patients referred for cardiac surgery were studied after induction of general anesthesia. Hemodynamic data (cardiac index (CI), central venous pressure (CVP), pulmonary capillary wedge pressure (PCWP), ΔPP, and ΔPOP) were recorded before and after volume expansion (VE) (500 ml of hetastarch 6%). Fluid responsiveness was defined as an increase in cardiac index (CI) > 15%. Results and Discussions: VE induced changes in CI (2.0 ± 0.4 to 2.3 ± 0.5 mmHg; p < 0.05), ΔPP (11 ± 7 to 6 ± 5%; p < 0.05), and ΔPOP (12 ± 9 to 7 ± 5%; p < 0.05). ΔPOP and ΔPP were higher in responders than in non-responders (17 ± 6 vs. 6 ± 4% and 14 ± 7 vs. 6.4 ± 4% respectively; p < 0.05). ΔPOP > 13% before VE allowed discrimination between responders and non-responders with 80% sensitivity and 90% specificity. There was a significant relationship between ΔPOP before VE and percent change in CI after VE (r = 0.62; p < 0.05).

Conclusion(s): ΔPOP can predict fluid responsiveness non-invasively in mechanically ventilated patients under general anesthesia. This index has potential clinical applications.

3AP7-2
Haemodynamic variations and indices of cardiac performance assessed with PICCO system during bariatric laparoscopic surgery
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Background and Goal of Study: The haemodynamic parameters and the index of cardiac contractility often change in obese patients undergoing surgical laparoscopic procedures. We have employed the PICCO System Pulsiion in order to evaluate the variations of these parameters (1).

Materials and Methods: In 27 consecutive obese patients (BMI 50.2 ± 5) undergoing bariatric procedures (gastric by-pass and sleeve resection) have been studied the following parameters: cardiac output (CO), central venous pressure (CVP), global end-diastolic volume (GEDV), systemic vascular resistance (SVR), stroke volume variation (SVV), cardiac function index (CFI), mean arterial pressure (MAP), left ventricular contractility (dP/dt), intrathoracic blood volume (ITBV) and extra-vascular lung water (EVLW) in 5 different surgical steps: after induction of general anesthesia in supine position, 5 mins after reverse Trendelemburg position (TP), at 90 mins and 120 mins after the beginning of pneumoperitoneum (PP) and finally 5 mins after abdominal decompression. A standardized TIVA anesthesia was used and based on the ideal body weight. The Wilcoxon test was applied for statistical analysis and p < 0.05 as significant.

Results and Discussions: All the parameters evaluated were greatly influenced by PP: dP/dt and CFI significantly decreased (p < 0.01), while MAP and SVR increased at 90 mins (p < 0.05); GEDV and CO showed a significant decrease with PP (p < 0.01); PVC, ITBV, EVLW and SVV variations were not significant. All these indices dramatically return to the basic values after the end of PP.

Conclusions: The decrease of the main haemodynamic parameters is a clear consequence of PP(2). The reverse TP does not influence the results. dP/dt, CFI, PVC a GEDV are mainly correlated to the PP and have to be considered to optimize the anesthetic and surgical procedures.

References:

3AP7-3
Accuracy of stroke volume variation (SVV) and pulse pressure variation (PPV) measured automatically with pulse contour analysis (PICCO) for evaluation of preload dependency during aortic surgery
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Background and Goal of Study: Stroke volume and pulse pressure respiratory variation are generally considered as accurate indices of preload dependency. Those indices have been mostly validated in septic patients or during post-operative period. The goal of this study was to evaluate the accuracy of automatic measurement of SVV and PPV during aortic surgery characterized by dramatic changes of volemia and aorto-ventricular coupling factors.

Materials and Methods: SVV and PPV are measured with PICCO system (Pulsion, Munich) with long radial artery and central venous catheters. Fluid challenges (BMI . 10 ml) of hydroxyethylstarch were performed with the infusion rate of 100 ml/min and at different times of the surgical procedure during period of hemodynamic stability. An increase of stroke index measured by Transpulmonary thermodilution superior to 10% was considered as a positive sign of preload dependency.

Results and Discussions: One hundred and thirty fluid challenges (5 ± 2 per patient) have been performed in 26 patients. A positive response to fluid loading (increase of SI > 10%) was present in 46% of patients. A correlation between initial SVV or PPV was observed with SI changes after volume loading (p < 0.0001; R = 0.605 and p < 0.0001; R = 0.521 respectively) (Fig 1). The area under the curve (AUC) of the receiving operating curve for SVV (>9%) and PPV(>7%) was respectively 0.884 (95% CI: 0.82–0.93) Vs 0.832 (95% CI: 0.73–0.91) (Fig 2). There were no significant difference between SVV and PPV for sensibility (respectively 87% Vs 85%) and specificity (respectively 84% Vs 71%) for diagnosis of fluid responsiveness.

Conclusion: Automatic measurement of SVV and PPV with PICCO system can be used intraoperatively to guide fluid therapy and for optimization of cardiac output.
### 3AP7-4

**Usefulness of intraoperative three-dimensional transesophageal echocardiography in the identification of individual segment/scallop of the mitral valve during mitral valve repair**

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**Background and Goal of study:** Intraoperative three-dimensional transesophageal echocardiography (3D-TEE) offers great promise for improving the understanding of the mitral valve anatomy, function, and pathology. It may have important implications for medical or surgical management of different mitral valve disease. The study aim was to evaluate the feasibility, accuracy and potential usefulness of intraoperative 3D-TEE, coupled with two-dimensional TEE (2D-TEE) in evaluating mitral valve structure, before and after mitral valve repair.  

**Material and Methods:** Between August 2004 and December 2006, preoperative 2D and 3D-TEE were assessed in 65 patients (mean age 65 ± 10 years) in whom surgical intervention was undertaken for severe mitral insufficiency due to different mitral valve disease. The location and severity extent of mitral valve prolapse, flail, and regurgitation were demonstrated preoperatively by three-dimensional dynamic sequences of the reconstructed mitral valve to the surgeon and later compared with the intraoperative finding. Leaflet scallops and commissures were displayed in short axis end-face and long-axis views. Echocardiographic results were surgically validated.

**Results and Discussion:** There was an excellent correspondence and closely agreed between the echocardiographic localization of the mitral valve pathology and surgical inspection. The quality of the 3D TEE was graded good in 35 patients (54%), fair in 19 patients (29%), and poor in 11 patients (17%) where atrial fibrillation did not allow ECG gating. Intraoperative 3D-TEE correctly identified the location and scallops/segment prolapse in 54 of 65 patients (83%). Compare with 2D-TEE, 3D-TEE was higher sensitivity in commissural and multiple leaflet defects (40.9% vs. 92.5%, p < 0.05). 11 patients areas of prolapse seen by surgeon were missed by 3D-TEE because some of those scallops/segments could not be well imaged due to poor “drop out” and artifacts. Thus, perfect correlation between 3D-TE and surgery was noted in 54 of 65 (83%) patients.

**Conclusions:** 3D-TEE is useful in identifying the location of mitral valve prolapse, allowed a precise localization and an accurate recognition of prolapsing portion of the leaflets. It may also potentially useful in assessing the extent of individual scallop/segment prolapse and beneficial for the evaluation and classification of the specific pathology before mitral valve repair. The more complex the lesion, the more valuable 3D-TEE is compared with 2D-TEE.

### 3AP7-5

**Changes in renal function in laparoscopic versus retroperitoneal prostatectomy**

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**Background and Goal of Study:** Pneumoperitoneum of laparoscopic surgery is a complex physiologic event associated with neuroendocrine, respiratory, cardiovascular, and renal disturbances, as well as compromised organ blood flow. The changes in renal function of laparoscopic surgery of prostate in comparison to open surgery are unknown. This historical cohort study was performed to compare the outcome of laparoscopic versus open surgery in terms of glomerular filtration rate (GFR).

**Patients and Methods:** The study group comprised all patients undergoing radical laparoscopic prostatectomy from July 2003 to July 2006 at our institution. These patients were compared with patients undergoing retropubic prostatectomy. We evaluated renal function by estimated GFR through Modification of Diet in Renal Disease formula (MDRD-4 standardized IDMS) before and two days after surgery. Associated variables were studied: age, BMI, ASA status, duration of procedure and blood loss. T test and χ² test were used to compare means or percentages.

**Results:** 432 patients were scheduled for radical prostatectomy. Patients’ characteristics are shown below:

<table>
<thead>
<tr>
<th></th>
<th>Laparoscopic</th>
<th>Retroper</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>N*</td>
<td>274 (81.9%)</td>
<td>298 (84.1%)</td>
<td>0.487</td>
</tr>
<tr>
<td>AGE*</td>
<td>63 (55–69)</td>
<td>65 (55–69)</td>
<td>0.118</td>
</tr>
<tr>
<td>BMI**</td>
<td>26.6 (24.3–27.0)</td>
<td>26.8 (26.4–27.2)</td>
<td>0.508</td>
</tr>
<tr>
<td>ASA physical status (I/II/III)</td>
<td>13.3%/75.2%/11.5%</td>
<td>4.7%/71%/24.3%</td>
<td>0.007</td>
</tr>
<tr>
<td>GFR before surgery</td>
<td>77.5 (75.2–78.6)</td>
<td>80.1 (73.9–82.6)</td>
<td>0.093</td>
</tr>
<tr>
<td>GFR post surgery</td>
<td>77.4 (74.6–80.2)</td>
<td>77.1 (74.1–80.1)</td>
<td>0.769</td>
</tr>
<tr>
<td>Haemoglobin pre*</td>
<td>153.8 (151.2–155.6)</td>
<td>153.6 (151.5–155.7)</td>
<td>0.561</td>
</tr>
<tr>
<td>Haemoglobin post*</td>
<td>124.2 (121.5–126.8)</td>
<td>108.5 (106.8–112.2)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Duration of procedure*</td>
<td>300 (230–390)</td>
<td>220 (174–296)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

* Median (10–90th percentile); ** Mean (95% CI)

**Conclusion:** The glomerular filtration rate didn’t change significantly in laparoscopic prostatectomy compared to open surgery, despite an important pneumoperitoneum in Trendelenburg position was performed. Haemoglobin decreased more in open than laparoscopic surgery, and the duration of procedure was longer in laparoscopic surgery.

**References:**

### 3AP7-6

**Portal ligation monitored by ICG clearance**

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**Background and Goal of study:** To predict and estimate the optimal time of resection following portal vein ligation (PVL) with the aid of 3D CT volumetry and indocyanine green (ICG) clearance in healthy liver. Following right portal vein ligation, hypertrophy of the left liver lobe was induced prior to an extended right hepatectomy.

**Materials and Methods:** Fourteen patients with huge right lobe colorectal liver metastases underwent right PVL. Cut off points of ICG clearance test were: R15 < 14% or PDR > 15% min. The criteria for resection also required a remnant liver volume of 25% of the whole liver volume. The latter was assessed by CT scan prior to the procedures. Liver function was measured with routine biochemical tests and ICG clearance. Postoperatively, repeated ICG clearance and 3D CT volumetry tests were used to estimate the liver’s regeneration. Liver resections were performed as a second stage.

**Results and Discussion:** After portal ligation, ICG clearance increased significantly in some patients, while in the rest, the ICG clearance remained unchanged with borderline low or normal clearance values. Between the two operations, the patients with high clearance had less complications and a better regeneration rate of the left lobe with a shorter waiting period in contrast to the ‘low ICG group’.

**Conclusion:** ICG clearance has a significant prognostic value. Patients with an apparently inoperable right lobe tumor can be successfully treated using a two-stage hepatectomy. The 3D CT volumetry and ICG clearance test were essential monitoring tools in these liver resections.

### 3AP7-7

**Very early hemodynamic optimization on ScvO2 in high risk patients undergoing major abdominal surgery**

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**Background and Goal:** Many strategies have been proposed to improve the outcome of patients undergoing major abdominal surgery (1). The aim of the study was to evaluate the effect of perioperative EGDT on ScvO2 (2) on the number of complications and length of stay (LOS) in high risk patients undergoing major abdominal surgery.

**Material and methods:** This was a randomised, prospective, double blind trial. 22 adult high risk patients (ASA III–IV) undergoing major surgery were enrolled and divided into two groups: continuous ScvO2 (PreSep, Edwards, Irvine CA,USA) (10 patients) and CTRL (12 patients). In the study group patients followed an ScvO2 (>70%, according to the Rivers protocol) (2) guided fluid, vasoactive drugs, blood and inotropes protocol. CTRL group patients were managed using routine cardiovascular monitoring aimed for CVP between 8–12 mmHg, MAP between 65–95 mmHg and Hct more than 30% according to the Rivers protocol. ScvO2, CVP, MAP, Hct data were managed and recorded since the beginning of the anesthesia (OR) and for 48 hours after admission in ICU. Changes in these parameters occurring during the study period were corrected to reach the hemodynamic goals. Complications and deaths occurring during the hospital stay were included in the data analysis until the end hospital stay. Student T test and χ² were used to analyze parametric and non parametric data.

**Results:** are shown in the following table (*p* < 0.05).

<table>
<thead>
<tr>
<th></th>
<th>ScvO2#10</th>
<th>CTRL#12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complications (pts)</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Episodes for pts</td>
<td>1.2 ± 0.92</td>
<td>1.83 ± 1.4</td>
</tr>
<tr>
<td>Complications tot</td>
<td>12</td>
<td>22*</td>
</tr>
<tr>
<td>LOHIS</td>
<td>13.8 ± 9.2</td>
<td>14 ± 7.7</td>
</tr>
<tr>
<td>Deaths</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

**Conclusion:** Very early perioperative optimization of ScvO2 according to Rivers (2) since the OR in high-risk patients reduced the number of postoperative complications and shows a tendency to reduce the postoperative LOS.
3AP7-8
Minimal invasive cardiac output monitoring, and fluid guidance: intraoperative comparison of the new Vigilego with the trial tested CardioQ device
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Background and Goal of Study: Stroke volume guided fluid therapy using esophageal doppler (CardioQ, Deltex Medical Systems) can reduce the length of hospital stay after colorectal surgery [1]. In another trial, fluid challenges were performed with a corrected flow time (FtC) <0.35 sec and a stroke volume increase >10% [2]. Recently, pulse pressure contour analysis without need for calibration has been brought on the market (Vigileo, Edwards Lifesciences) [3]. The aim of this study was to compare the two methods for the assessment of the response to fluid administration.
Methods: In 9 patients scheduled for partial hepatectomy we compared the change in cardiac output and stroke volume variation of the Vigileo with the simultaneously CardioQ-recorded cardiac output and Ftc after a volume bolus. At the end of surgery (abdominal fascia closed) and after a ten minute baseline measurement Hetastarch 130/0.4 (Voluven) 7 ml.kg−1 was rapidly infused to replace intraoperative deficits and measurements were continued for ten minutes. All data were recorded online.
Results: In contrast with CardioQ, Vigileo readings were very stable and artifact free.

![Fig. 1](https://example.com/fig1.png)

**Fig. 1** Vigileo CI = 0.40L.min−1.m−2, CardioQ CI = 1.32L.min−1.m−2

**Conclusion**: Vigileo and CardioQ provided satisfactory intraoperative information about changes in cardiac index and response to volume load in major abdominal surgery.

References:

3AP7-9
Cardiovascular monitoring by pulse dye densitometry or arterial ICG dilution
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Background and Goal of Study: Indocyanine Green (ICG) dilution measured by Pulse Dye Densitometry (PDD) allows noninvasive cardiac output (CO) measurement. So far, PDD has been validated poorly [1]. We compared hemodynamic parameters derived from PDD (DDG-2001, Nihon Kohden, Japan) to those derived from simultaneously taken arterial blood ICG concentrations.

Materials and Methods: In 20 patients (6M/14F), ASA I or II, 36 experiments were performed (n = 26 with the PDD-finger probe and n = 10 with the PDD-nose probe). After iv administration of 10 mg ICG, 32 arterial blood samples were taken in each session, of which 20 in the first 2 min. Comparison of CO, central blood volume (CBV) and total blood volume (TBV) between methods was done by Bland-Altman analysis, reporting mean difference (bias) and limits of agreement (LOA = ± 2 SD).

Results and Discussions: PDD overestimated CO by 8–30% for the finger or nose probe, and CBV by 46–48%. The LOA for CO varied from −67% to +127% for the nose probe. The LOA for CBV were from −98% to +193% as compared to invrascavular measurements. TBV agreed better: −10% to −15% with LOA of −47% to 27%.

Conclusion(s): The significant bias and large limits of agreement of PDD compared to invasive measurement suggest that PDD is unsuitable for evaluation of cardiovascular parameters in the individual patient. In contrast to other studies, the nose probe did not perform better than the finger probe for CO measurement [2].

References:

3AP8-1
Temperature and humidity alterations in the course of low flow anaesthesia
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Introduction: The study was conducted to examine the temperature and humidity alterations in the course of Low Flow Anesthesia (LFA) and to compare it to parameters of high gas flow.

Patients and methods: 60 patients: age 21–80; male – 22; female – 38; ASA I-II; body weight – 56–84 kg (average 72.4 ± 3.1), who undergoing abdomino-nal and gynecological surgery, were divided into two groups – by 30 patients each. Intraoperative mean inspiratory–inspiratory duration was equal in the both groups – 156 min (from 120 to 215 min, average 156 ± 4.3). General anesthesia with fentanyl 2.0–2.2 μg/kg/hour, halothane 0.8–1.0 vol.-% (1–1.25 MAC) and pancuronium 0.04–0.05 mg/kg/hour or atracurium 0.5–0.6 mg/kg/hour was performed in both groups. Fresh gas flow (FGF) at the 1-st group was 6 L/min, at the 2-nd – 2 L/min. Two thermoelectric sensors were incorporated directly to the patients circuit, in case of the temperature measurement – at the inspiration and expiration lines, in case of humidity measuring – at the inspiration line successively. The 1-st sensor was dry, and the 2-nd – wet. Ambient air temperature at the operating theatre was 18–20°C. Absolute humidity was calculated by the following formula: K = f – α(tdry – twet), where K – absolute humidity; f – maximal water vapors pressure under the temperature of wet sensor; α – psychrometric coefficient = 0.0011; B – barometric pressure.

Results and discussion: Gas mixture temperature at 1-st group (FGF = 6 L/min) came to 20.2 ± 0.5°C in the inspiration line, and to 21.08 ± 0.4°C in the expiration line. Temperature alterations were insignifi-
cant during anesthesia maintenance, temperature increase in the expiration line was not more than 4.5% (p > 0.05). Absolute humidity in the expiration line was unchanged – 15 mm.Hg. Initial inspiration mixture temperature at 2-nd group (FGF = 2 L/min) was 20.6 ± 0.5°C, in a 30 min became 23°C, in a 90 min – 27.0 ± 0.6°C. Expiration temperature came in a 90 min to 28.1 ± 0.5°C, while increase was 0.05–1.0°C per min, or 29.5%. Absolute humidity in the expiration line became 21.8 mm.Hg, or humidity increased up to 25%.

Conclusion: Low Flow Anesthesia is the optimal method for the physiologic-
tical temperature and humidity value maintenance at the prolonged anesthesia.

3AP8-2
Clinical usefulness of a novel algorithm for automatic estimation of the respiratory variations in arterial pulse pressure
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Background and Goal of Study: Respiratory variations in arterial pulse pressure (ΔPPman) are accurate predictors of fluid responsiveness in mechan-
ically ventilated patients. However, they have to be calculated manually and cannot be monitored. The aim of our study was to assess the clinical utility of a novel algorithm for automatic estimation of ΔPPman.

Materials and Methods: We studied 23 patients referred for coronary artery bypass grafting. ΔPPman was continuously recorded using a method based on automatic detection algorithms, knee smoothing, and rank-order filters(1). All patients were under general anesthesia, mechanical ventilation, and were equipped with a pulmonary artery catheter. ΔPPman and ΔPPauto were recorded simultaneously at eight steps during surgery including before and after a vol-
ume expansion (VE) (500 ml haestarch). Responders to VE were defined as patients presenting >15% increase in cardiac output following VE. Agreement between ΔPPman and ΔPPauto was determined using Bland-Altman analysis.

Results and Discussions: There was a strong and significant relationship between ΔPPman and ΔPPauto over the 184 pairs of collected data (r = 0.90; p < 0.05). We observed a good agreement between ΔPPman and ΔPPauto (bias = −1.3 ± 3.3). Fifteen (65%) patients were responders to VE. A threshold ΔPPman value of 12% allowed discrimination of responders to VE with a sensitivity of 80% and a specificity of 100%. A threshold ΔPPauto value of 9% allowed discrimination of responders to VE with a sensitivity of 80% and a specificity of 88%. There was no statistically significant difference between area under the ROC curve for ΔPPman and ΔPPauto (0.908 ± 0.068 vs. 0.898 ± 0.065 respectively; p < 0.05).

Conclusion(s): ΔPPman is strongly correlated to ΔPPauto, is an accurate pre-
dictor of fluid responsiveness, and allows continuous monitoring of ΔPPman. This novel algorithm has potential clinical applications.

Reference:

3AP8-3
Reclaiming waste anesthetic gas: initial clinical trials
J. Berry, J. Barwise, L. Lancaster
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Background and Goal of Study: There are potentially both economic and environmental benefits in reclaiming and recycling waste volatile anesthetics. Of the technologies available, only condensation of waste anesthetic gas (WAG) provides both economy and ease of implementation. We evaluated a new technology which combines efficient anesthetic gas scavenging with cold-trap condensation of WAG.

Materials and Methods: A suite of 4 operating rooms was equipped with new waste gas scavenging interface valves using demand valves rather than the traditional open “active” scavenging systems. These were connected to a proprietary vacuum unit, water trap, and cold-trap condenser operating at –90 degrees C and 200 kPa. Efficiency, anesthetic yields, and cost of opera-
tion were evaluated.

Results and Discussions: The units were easily installed in operating suites with existing, dedicated piping for WAG disposal. Efficiencies of extraction approached 99% under most conditions. The cost per operating room was US$5500; this would be lower in the case of a larger operating suite. The widespread implementation of this technology could reduce WAG emissions in the US by as much as 1500 tonnes/year (equivalent to 3.5 Tg of CO2).

Conclusion(s): The use of condensation as a tool for capture of WAG is both economical and practical in the hospital setting. The recycled product may be able to reduce the cost and increase the availability of modern volatile anesthetics worldwide.

Reference:
Berry JM: Volatile anesthetic recycling: it’s about time [and temperature] Society for Technology in Anesthesia, San Diego USA, January 2005 (abstract)

3AP8-4
Airway pressures monitoring in anesthesia: intra and extratracheal differences
A. Abad-Gurumeta, J.M. Calvo-Vecino, M. Ortega-Urbanjea, T. Lopez-Quesada
Anesthesia, Gregorio Maranon General University Hospital, Madrid, Spain

Background and Goal of Study: We designed an endotracheal sensor for monitoring intra and extratracheal pressures. Our hypothesis try to demon-
strate airways pressures obtained inside and outside trachea, are different.

Materials and Methods: We studied average, peak and plateau pressures of the respiratory ways, during general anesthesia in 71 children. The study was managed by Datex-Ohmeda® Cardiopac 5 spimeter. Values were obtained by means of a sensor placed inside the anesthetic circuit before the endotracheal tube (connected to the paediatric O2-lite system), and by means of another sensor – specifically designed – placed in the trachea, immediately before the carina and after the end of the endotracheal tube. This sensor has two elements: first is a capnography measuring cannula which has been sectioned to be introduced through the second element. This one consists of a paediatric urinary fixer that was introduced in an opening of respiratory circuit. The cannula was introduced through out, which lets the compartment stay watertight. Before orotracheal intubation, we measured and marked the sensor length with regard to the endotracheal tube for its correct location. The veracity of the obtained intratracheal pressure values was checked by means of a pressure manometer and using the correction factor (1.36) of Hg mm to H2O cm. Every variable was analysed in the following times: starting, 5, 10, 15, 20, 30, 40, 50 and 60 minutes. Chi2 was used.

Results and Discussions: Globally the pressures (obtained in the airways – intra and extratracheal) was present a differential of 3.5 ± 0.35 points (p < 0.01). There was not peak pressure in the endotracheal measurement and it was practically the same than the Plateau pressure.

Conclusion(s): Pressure measurements differences are due to the different places where the measurement is carried out. In the trachea, the peak pressure disappears and is the same as the Plateau pressure due to the fact that the trachea is not a rigid conduct, as the tubing. By this reason, we obtain a more physiological airway pressure result (1).

Reference:

3AP8-5
Intraoperative transesophageal echocardiography in refractory hypotension
C. Cabrera Schulmeyer, R. Vega, S. Schmied, R. Hernández, J. De la Maza
Anesthesiology, Hospital Clinico FAC, University of Valparaiso, Santiago, Chile

Background and goal of the study: According to the practice guidelines for perioperative transesophageal echocardiography (TEE), the evaluation
of acute and persistent hypotension is a category 1 indication. This is an
unfrequent perioperative situation but determining the etiology is essential
for a successful therapy. The utility of TEE during hypotension is not well
explored during non cardiac surgery and the aim of this study was to evalu-
ate if TEE was useful for the hemodynamic management of these patients.

Material and Methods: Adults were prospectively enrolled. Refractory
hypotension was arbitrarily defined as systolic blood pressure lower than
85 mmHg, have not responded to adequate volume administration and to
three bolus doses of ephedrine. Then a multiplanar TEE probe was inserted
and a preestablish protocol of 2-D images and color, continuous and pulsed
doppler was done.

Results and Discussion: 38 adults (71 ± 12 years) were studied, 82
percent during elective non cardiac surgery. The most frequently surgeries done
were abdominal (open and laparoscopic), thoracic and orthopedic. In all patients
TEE was useful for determining the etiology of persistent hypotension.
Hypovolemia was diagnosed in 14 patients (41%). Low ejection fraction
(EF < 30%) was detected in 5 cases and was treated with inotropic drugs
successfully. Systolic anterior motion (SAM) of the mitral valve was the diagnosis
in 5 patients and in another 6 patients severe embolism was detected
during hip and knee surgery. Myocardial ischemia causing persistent
hypotension was detected in only 5 patients and in 3 patients cardiac tam-
ponade was the etiology of refractory hypotension. Two patients died and
both had severe myocardial ischemia.

Conclusion: Perioperative TEE is useful can be quickly inserted with few com-
parisons index and heart and great vessels can be directly seen and function-
ally evaluated. Hypovolemia may be frequently underdiagnose because wrong
estimations of volume. TEE not only permits to assess volemia it also allows
to manage volume reposition. TEE is a minimally invasive image tool and it is
the only monitor that permits to diagnose ischemia, cardiac tamponade,
embolic phenomena and SAM in the operating room.

3AP8-6
Filtering performance of breathing system filters after
24 hours pre-conditioning
D. Chethan, A. Wilkes, C. Cann, J. Hall
Anaesthetics and Intensive Care Medicine, Cardiff University, Cardiff,
United Kingdom

Background and Goal of Study: The European standard for breathing sys-
tem filters specifies pre-conditioning each filter for the manufacturer’s maxi-
mum recommended time of use for the filter (usually 24 hours) before testing
the filtration performance (1). However, in a previous study, the filtration per-
formance of filters was determined after only three hours of pre-conditioning
(2). This study measured the filtration performances of different types of
filters after 24 hours of pre-conditioning.

Materials and Methods: Three samples of six different filters (three pleated
and three electrostatic) intended for adult use were pre-conditioned for 24 hours
before testing by connecting each filter to a patient model breathing with a tidal
volume of 0.5 L, a frequency of 12 breaths per minute and an I:E ratio of 1:2 and
expiring fully saturated air at 34°C. The filtration performance of each sample
was measured by determining the penetration of sodium chloride particles
using a sodium flame photometer Type No. 1100 (SFP Services, Christchurch,
UK) at a flow of 30 L min⁻¹. Five samples of each filter were also tested without
any pre-conditioning. Analysis was by general linear modeling to allow for the
effect of pressure drop.

Results and Discussions:

<table>
<thead>
<tr>
<th>Model</th>
<th>Mean (range) penetration %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unused Pre-conditioned</td>
</tr>
<tr>
<td>Electrostatic</td>
<td></td>
</tr>
<tr>
<td>Barrierbac S</td>
<td>4.40 (2.8–9.95)</td>
</tr>
<tr>
<td>Filta-Therm</td>
<td>0.28 (0.26–0.34)</td>
</tr>
<tr>
<td>Inter-Guard</td>
<td>3.40 (2.61–4.11)</td>
</tr>
<tr>
<td>Pleated</td>
<td></td>
</tr>
<tr>
<td>BB25</td>
<td>0.04 (0.03–0.09)</td>
</tr>
<tr>
<td>Hydro-Guard</td>
<td>0.02 (0.01–0.07)</td>
</tr>
<tr>
<td>Sterivent Mini</td>
<td>0.51 (0.49–0.54)</td>
</tr>
</tbody>
</table>

Conclusion(s): Pre-conditioning, and hence exposure to humidification,
did not have a significant effect (p > 0.05) on the filtration performance
of any of the filters.

References:

3AP8-7
Changes in regional cerebral oxygenation during off-pump
coronary artery bypass graft surgery
C. Verboigh, S. Hasan, R. Lauwers, N. Rooselaer, F. Camu
Anesthesia, UZ Brussel, Brussel, Belgium

Background and Goal of Study: Neurocognitive performance following off-
pump coronary artery bypass (OPCAB) surgery remains impaired after surgery
as compared to before (1). Haemodynamic disturbance resulting from optimal
surgical exposure (2) might be a causal factor. We studied changes in regional
cerebral oxygen saturation measurement (SO₂) by near infrared optical spec-
troscopy (3) as a non-invasive monitoring endpoint during the different pos-
tions of the heart needed to perform anastomoses on specific coronary arteries.

Materials and Methods: Thirty-five patients scheduled for off-pump CABG
agreed to take part in this open observational study. SO₂ (Invos®, Somanetics
Corporation) was recorded via sensors placed left and right on the frontopari-
tal area. Cardiac output (CO) and mixed venous oxygen saturation (SvO₂)
and other haemodynamic variables were obtained with the heart in neutral
position (PRE), and after stabilisation and exteriorisation for anastomosis on
the left anterior descending artery (LAD), the first diagonal branch (D1),
the obtuse marginal artery (OM) and the right circumflex artery (RCX). Wilcoxon
test was performed with Stataic(6), data expressed as means (S.E.M.)

Results and Discussions: The patients were 71 (2) years old, with an ejection
fraction of 57 (3)% (ventriculography). Ten patients had previous myocardial
infarction. Results are shown below:

<table>
<thead>
<tr>
<th>CI (L·min⁻¹)</th>
<th>LAD</th>
<th>OM</th>
<th>RCX</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.43 (0.1)</td>
<td>2.01 (0.09)</td>
<td>1.69 (0.24)</td>
<td>1.64 (0.17)</td>
</tr>
<tr>
<td>3.72 (0.09)</td>
<td>2.23 (0.09)</td>
<td>2.42 (0.17)</td>
<td>2.55 (0.17)</td>
</tr>
<tr>
<td>6.02 (0.17)</td>
<td>5.55 (0.09)</td>
<td>5.70 (0.09)</td>
<td>5.10 (0.09)</td>
</tr>
<tr>
<td>6.22 (0.09)</td>
<td>5.20 (0.09)</td>
<td>5.84 (0.09)</td>
<td>5.20 (0.09)</td>
</tr>
<tr>
<td>7.21 (0.09)</td>
<td>7.40 (0.09)</td>
<td>7.60 (0.09)</td>
<td>7.50 (0.09)</td>
</tr>
</tbody>
</table>

*: significantly different from PRE with p < 0.05.

Conclusion(s): The Invos® regional cerebral oximetry seems to accurately
reflect the consequences of haemodynamic disturbance during OPCAB sur-
gery, in a noninvasive way.

References:

3AP8-8
Flow through intravenous cannulae: neither easily predictable
nor laminar
D. McPherson, O. Adekanye, A.R. Wilkes, J.E. Hall
Department of Anaesthesia and Intensive Care Medicine, University
Hospital of Wales, Cardiff, United Kingdom

Background and Goal of Study: Predicting flow through an intravenous can-
nula (IVC) is useful to clinicians if changes in flow are required and to guide
selection of IVC. We set out to find the usefulness of manufacturers’ quoted
flows according to standard tests (1) in predicting actual flow and to charac-
terise that flow.

Materials and Methods: We built a model of a vein and inserted IVCs of
varying gauges into it. The height of the fluid bag above the vein was varied
to set the filling pressure and the flow through the IVC was measured.

Results and Discussions: The graph shows measured (*) and theoretical
(•) flow at a pressure of 10 cmH₂O and the quoted (○) flow. The flow through
an IVC is not a consistent ratio of the quoted maximum flow: at 100 cmH₂O
it is 0.83±0.06 [mean±sd] for 0.75 mm IVCs compared with 0.72±0.04 for
1.55 mm. Flow at the manufacturer’s quoted rate is turbulent (best curve
flow = 113.3±11.4) [D2.2±0.0] [mean ± standard error], as is the flow at rates
above 12 ml.min⁻¹ (flow = 2.87±0.13) [pressure = 0±0.0] in 20 G IVCs. This is
despite Reynolds’ number being as low as 328.
Conclusion(s): Flow through IVCs is turbulent at the upper range of clini-
cally used flows, therefore Poiseuille’s law is not useful in predicting flow and the
effect of changing radius is less than commonly believed. Neither are the
quoted maximum flows easily useful. There are many determinants of lami-
nar flow apart from Reynolds’ number. Further work would determine useful
correlates of flow and find if laminar flow ever occurs in clinical situations.

Reference:

3AP8-9
Monitoring of propofol concentration in breathing gas: effect of the
lung on the course
M. Grossher, A. Hengstenberg, L. Dibbelt, B.W. Igli, H. Gehr
Anaesthesiology, University Clinic of Schleswig-Holstein Campus Luebeck,
Luebeck, Germany.

Background and Goal of Study: The part of the lung in propofol monitor-
ing has to be defined more precisely as measurements of breathing gas may be
used for the non-invasive monitoring of propofol concentration in plasma.
The following study should investigate how the course of propofol
concentration in breathing gas is related to the course of propofol in plasma
concentration.

Materials and Methods: After approval of the local ethic board we deter-
nied the propofol concentrations in plasma and breathing gas before and
during anesthesia. Propofol was constantly infused (6 mg/kg body-
weight $\times$ h). Samples of propofol and breathing gas were drawn at four
points of time (T1–T4) after 10, 20, 30 and 40 minutes in 6 cardiac surgery
patients. To describe the course of propofol concentration in plasma and
in breathing gas as a function of time alone the values of each point of time
(T1–T4) were compared to point of time 4 (T4) for each individual and
were calculated as a ratio. Non-parametric tests were used to analyze the data.

Results: Propofol concentration ranged between 2.2 to 3.3 $\mu$g/ml in plasma
and 2.4 to 17.7 ppb in breathing gas. Data of the calculated ratios are shown
in the table as mean and standard deviation ($\pm$).

<table>
<thead>
<tr>
<th></th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
</tr>
</thead>
<tbody>
<tr>
<td>RaCprPL</td>
<td>69.2(24)</td>
<td>99.9(17)</td>
<td>93.9(10)</td>
<td>100(0)</td>
</tr>
<tr>
<td>RaCprBr</td>
<td>38.1(10)</td>
<td>65.9(12)</td>
<td>96.9(9)</td>
<td>100(0)</td>
</tr>
</tbody>
</table>
| RaCprPL rsvp. RaCprBr rsvp. of ratio of propofol concentration in plasma rsvp. breathing gas at
the points of time 1 to 4 point of time 4.
| $P < 0.05$ vs T1; * $P < 0.05$ vs T2.

Conclusion: Using a constant infusion propofol concentration in breathing
gas reached a steady state after 30 minutes, which was reached earlier
in plasma. The lung may delay the appearance of propofol in breathing
gas. This has to be acknowledged for using propofol monitoring in breath-
ing gas.

3AP8-10
Accuracy of a novel bioacoustic sensor for monitoring
respiratory rate
M. Macknet, P. Kimball-Jones, R. Applegate II, R. Martin, M. Allard
Anaesthesiology, Loma Linda University, Loma Linda, USA.

Background and Goal of Study: Monitoring respiration of spontaneously
breathing patients is a concern in the operating room, post anaesthesia care
unit (PACU), and on general care wards. Currently available devices require
either a cannula system positioned in line with airflow to detect respiration or
utilize impedance pneumography. These devices have multiple limitations
which have precluded widespread implementation in a general care setting.

A novel bioacoustic sensor for continuously monitoring respiration has been
developed. We evaluated the accuracy of the prototype sensor in the post
anaesthesia care unit.

Materials and Methods: Following institutional IRB approval and informed
consent, 10 patients, upon arrival to the PACU, were monitored in the standard
fashion. In addition, a nasal cannula was placed, secured with tape, and con-
ected to a capnometer. An adhesive bioacoustic sensor connected to a
breathing frequency monitor prototype (Masimo Corp, Irvine CA) was applied
to the patient’s neck just lateral to the cricoid cartilage. Both the capnometer
and the bioacoustic monitor were connected to a computer for continuous
data recording and subsequent data analysis. The accuracy of the new
acoustic sensor and the capnometer were compared to a reference respiratory
rate from a manual scoring system. Bias, precision and $ARMS_{bias}$ were calculated
as either bioacoustic sensor – reference or capnometer–reference.

Results and Discussion: All data is expressed as mean ($\pm$ SD). 10 patients
(age = 26 to 88 years, weight = 55 to 135 kg) were enrolled. Duration of moni-
toring time in PACU was 55.2 $\pm$ 38.9 min. Respiratory rate varied 3 to 28 bpm
during this time. The resultant bias, precision and $ARMS_{bias}$ for the capnometer
was $-0.53$, 2.11, and 2.23 respectively. The bias, precision and $ARMS_{bias}$ for
the bioacoustic sensor was $-0.15$, 2.23, and 2.36 respectively.

Conclusion(s): The new prototype bioacoustic respiratory sensor demon-
strates accuracy for respiratory rate monitoring as good as capnometry, in
this population of postanaesthesia patients in the PACU. This device offers
multiple benefits over existing devices and has a potential to improve moni-
toring in a general care setting.

3AP9-11
Cerebral state index (CSI) monitoring in dogs during
induction of anaesthesia with propofol
L. Ribeiro, D. Ferreira, N. Bressan, P. Amorim, L. Antunes
Anestesia, Hospital Veterinario Porto, Porto, Portugal

Background and Goal of Study: The aim of the study is to evaluate the
correlation between CSI and the predicted propofol plasma concentrations
(PropCP) in dogs during induction of anaesthesia.

Materials and Methods: Fifteen healthy dogs undergoing scheduled routine
surgical procedures were enrolled in this study. All dogs were premedicated
with 0.5 mg kg$^{-1}$ morphine sulphate and with 0.03 mg kg$^{-1}$ acepromazine IM,
30 minutes prior to the beginning of the induction of anaesthesia. Three
electrodes placed in the middle of forehead, in the left side of forehead and
in the mastoid left side were used to collect the EEG signal converted by the
Cerebral State Monitor into the CSI. Anaesthesia was induced using a propofol
1% bolus dose of 6 mg kg$^{-1}$ using a syringe pump programmed to allow a
maximum infusion rate of 600 ml h$^{-1}$. A DateS S/5 monitor was used to collect
the haemodynamic data (heart rate (HR) and mean arterial pressure (MAP)).
Rugloop software based in the pharmacokinetic model for propofol for dogs$^*$
was used to control the syringe pump, to predict propofol concentrations and
to store PropCP, haemodynamic scalar of CSI in the computer. The results were
used to calculate the accuracy of propofol concentration in breathing gas in
five seconds, Spearman rank correlation analysis was used to compare PropCP
and CSI data. Data are mean $\pm$ sd.

Results and Discussions: Before induction of anaesthesia, HR was 103.6 $\pm$
20.3 bpm and MAP was 83.1 $\pm$ 14.9 mmHg, CSI was 90.7 $\pm$ 4
with an EMG of 100% and a SCI of 48.6%. During the induction of anaesthesia,
the maximum PropCP was 7.18 $\pm$ 0.39 $\mu$g/ml$^{-1}$, with a CSI of 67 $\pm$ 12,
SCI was 79 $\pm$ 12.4% and to an EMG of 32.9 $\pm$ 30.8%; HR was 122 $\pm$ 33.3 bpm
and MAP was 78.4 $\pm$ 19.4 mmHg. The minimum CSI values were 52.3 $\pm$ 9.6
with a PropCP of 5.2 $\pm$ 0.96 $\mu$g/ml$^{-1}$, 1.8 $\pm$ 1.5 minutes after the maximum
PropCP observed; SCI was 83 $\pm$ 12.1%, EMG was 30.7 $\pm$ 26.5%, HR was
117.4 $\pm$ 31.9 bpm and MAP was 73.3 $\pm$ 16.2 mmHg. There was a negative
correlation between PropCP and CSI (P < 0.0001).

Conclusion(s): The cerebral electric changes induced by increasing propofol
concentrations appear to be reflected by CSI values during induction. CSI
monitoring may be a useful tool to access depth of anaesthesia and to titrate
propofol predicted plasma concentrations during induction of anaesthesia
with propofol in dogs.

Reference:
**3AP9-2**

**Comparison between spectral edge frequency, fractal dimension and Hurst coefficient as measures of the electroencephalographic effects of sevoflurane**

M. Soehle, R. Eiermann, C. Boehm, A. Hoeft, J. Bruhn  
*Klinik für Anästhesiologie und operative Intensivmedizin, Universitätsklinikum Bonn, Bonn, Germany*

**Background and Goal of Study:** Various attempts have been made to quantify depth of anaesthesia based on the electroencephalogram (EEG). We compared spectral edge frequency (SEF95) – a traditional, frequency-domain based parameter – with fractal dimension (FD, Higuchi’s method [1]) and Hurst coefficient (H) [2] – two parameters derived from advanced non-linear EEG analysis – to investigate their dose response relationship during sevoflurane anaesthesia.

**Materials and Methods:** Twenty one patients were studied without surgical stimulus. Sevoflurane anaesthesia was induced via face mask and maintained via laryngeal mask. Sevoflurane concentration was increased until burst suppression occurred and subsequently decreased until a state of light anaesthesia was achieved. This procedure was repeated twice until patients were intubated for subsequent surgery. A single-channel EEG was recorded from the right frontal scalp (Fp2-F3), sampled at 250Hz and stored – along with entidal sevoflurane concentration – for later offline analysis. SEF95, FD and H were calculated using MATLAB R13 and compared with the estimated effect side concentration as derived from simultaneous pharmacokinetic and – dynamic modelling.

**Results and Discussions:** Sevoflurane pharmacodynamic was in close agreement with a sigmoid dose response relationship for SEF95 (correlation coefficient \( r^2 = 0.62 \pm 0.17 \)), FD (\( r^2 = 0.73 \pm 0.11 \)) and H (\( r^2 = 0.78 \pm 0.12 \)). The probability of H to predict sevoflurane effect side concentration (\( P_h = 0.86 \pm 0.05 \)) was significantly higher (\( p < 0.05 \)) as compared with FD (\( P_f = 0.81 \pm 0.06 \)) and SEF95 (\( P_s = 0.76 \pm 0.08 \)).

**Conclusion(s):** The Hurst coefficient is superior to fractal dimension and spectral edge frequency in predicting depth of sevoflurane anaesthesia. Non-linear EEG analysis seems to be a promising tool to improve monitoring of anaesthetic depth.

**References:**

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**3AP9-3**

**Efficacy of an interaction model to predict State Entropy during propofol/remifentanil anaesthesia**

C.S. Nunes, A. Castro, H. Alonso, T. Mendonca, P. Amorim  
*Dep Matematica Aplicada, Faculdade de Ciencias da Universidade do Porto, Porto, Portugal*

**Background and Goal of Study:** The aim of this study was to inspect if a published interaction model [1], could be used under induction/surgery to predict state entropy.

**Materials and Methods:** Data was collected during 7 urological surgeries with propofol/remifentanil (Prop/Remi) anaesthesia, using RugLoop® from Datex Entropy module every 5 s. TCI was used with Marshall2® for Prop and Minto3® for Remi. Anaesthesia started with a Remi infusion to reach an effect concentration of 2.5 ng/ml, followed by a constant Prop 200 ml/h infusion until loss of consciousness, thereafter Prop and Remi were changed according to patient stability. The SE signal was prefiltered with a Butterworth filter. The interaction model [1] was fitted to the data of each patient in the induction phase (first 15 min), parameters optimized using nonlinear least squares and a hybrid identification method. The individual patient models were then used to predict SE considering the drugs concentrations (data: mean ± SD).

**Results and Discussions:** 7 patients, ASA 1/2, 42 ± 15 years, 67 ± 15 kg, 166 ± 5 cm, 4 female. The individual models had good performance in the induction phase (optimization) with statistical zero errors (\( P < 0.05 \)) in 5 patients. The average of absolute errors (AAE) was 5.07 ± 1.14, capturing SE trend in all patients. When the individual models were used for prediction (15 min until the end) the AAE was 7.26 ± 2.52. In 5 patients the model was able to predict recovery.

**Conclusion(s):** The model can capture the individual patient response during induction (non-steady state conditions) identifying unique characteristics. This result leads to the idea that the PK/PD of the drugs maybe different during induction/recovery and maintenance.

**References:**
1. Anesthesiology, 2000, 92: 1603-16.

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**3AP9-4**

**Bispectral Index and State Entropy variability under propofol anaesthesia**

A. Castro, E. Amadeu, F. Martins, P. Sa Couto, C.S. Nunes  
*Matematica Aplicada, Faculdade de Ciencias da Universidade do Porto, Porto, Portugal*

**Background and Goal of Study:** BIS and State Entropy (SE) indices are used to guide anaesthesia. The variability of these signals may affect the easiness of achieving a desired target. The aim of this study was to compare BIS and SE variability under general anaesthesia.

**Materials and Methods:** Data was collected during urology surgeries. Data recorded every 5 s from Aspect XP, Datex S/5 monitors and infusion pumps with Rugloop® TCI software. Schneider [1] and Minto [2] PK models were used for propofol and remifentanil TCI, respectively. Drugs Ce were adjusted regarding patient stability and BIS target [40–60]. BIS and SE variability during maintenance were analyzed using their variability sequences: the difference between the original and the smoothed filtered signal (Butterworth). (Data: mean ± SD)

**Results and Discussions:** 20 patients, 55 ± 16 years, 69 ± 14 kg, 164 ± 9 cm, ASA 1/2/3, 9 female. Procedure time was 202 ± 77 min, mean propofol and remifentanil Ce were 2.7 ± 0.6 µg/ml and 3.9 ± 1.8 ng/ml. Mean BIS and SE (38 ± 3 and 45 ± 6) were statistically different (\( P < 0.01 \), paired sample t-test). The variability sequence follows a logistic distribution characterized by the shape parameter – the higher the shape parameter the higher the signal variability. BIS and SE shape parameters were different (\( P < 0.01 \), paired t-test).
3AP9-5

Differences between BIS and State Entropy during general anaesthesia: blind study
A. Castro, E. Amadeu, F. Martins, P. Sa Couto, C.S. Nunes
Matematica Aplicada, Faculdade de Ciencias da Universidade do Porto, Porto, Portugal

Background and Goal of Study: Based on clinical observations we hypothesized that average BIS and State Entropy (SE) during maintenance may be different. In the present work we performed a blind study (clinician blind to SE) to compare BIS and SE levels.

Materials and Methods: Data was collected during urology surgeries under general anaesthesia. Data recorded every 5 s from Aspect XP, Datex S/5 monitors and infusion pumps with Rugloop® TCI software. Schneider [1] and Minto [2] PK models were used for propofol and remifentanil TCI. Anaesthesia was induced with 1% propofol at 200 ml/h and a remifentanil effect-site concentration (Ce) target of 2.5 ng/ml. After loss of consciousness (LOC) propofol and remifentanil Ce were started, the target being Ce at LOC. Following intubation, drugs Ce were adjusted regarding patient requirements and BIS target [40-60]. During the procedure the anaesthetist was blinded to SE values. Data [Mean ± SD].

Results and Discussions: 13 patients, ASA 1/2/3, 64 ± 10 years, 70 ± 13 kg, 164 ± 11 cm, 4 female. Procedure time was 180 ± 55 min, mean propofol and remifentanil Ce were 2.5 ± 0.6 µg/ml and 3.7 ± 1.2 ng/ml. BIS and SE mean values were 39 ± 2 and 46 ± 6, respectively, during the maintenance phase. The BIS and SE presented different mean values (P < 0.01, paired t-test). The average difference between BIS and SE was -7 ± 6, and only four patients had average BIS > 40.

Fig. 1 BIS and SE mean values – maintenance phase

Conclusions(s): For the same amount of anaesthesia BIS was significantly lower than SE. Also BIS was below target. This should not invalidate the existence of a difference between BIS and SE.

References:
1 Anesthesiology, 1998, 88: 1170-82.

3AP9-6

Intraoperative low doses of ketamine increase BIS-guided sevoflurane requirements during combined general and thoracic epidural anesthesia for major abdominal surgery
K. Messada, P. Janin, A. Kaba, S. Lauwick, J. Joris
Anesthesia and Intensive Care Medicine, CHU Liège, Liège, Belgium

Background and Goal of Study: BIS monitoring can be used to titrate sevoflurane (SEVO) administration during combined general-epidural anesthesia. Intraoperative ketamine (KET) improves postop analgesia provided by thoracic epidural analgesia (TEA), but can increase BIS scores. We therefore tested the hypothesis that intraop KET increases BIS-guided SEVO requirements during major surgery under combined general-TEA anesthesia.

Materials and Methods: After IRB approval and informed consent, 40 patients scheduled for abdominal surgery under combined general-TEA were included in this randomized double-blind study. TEA was standardized in all patients. After induction of anesthesia patients were allocated to two groups: iv KET (0.5 mg/kg then infusion 0.25 mg/kg/h) or saline (SAL). Anaesthesia was maintained with SEVO in O2/air. SEVO was adjusted to keep BIS scores around 50. Arterial pressure, heart rate, BIS scores, and end-tidal SEVO were recorded every 15 min. Data [mean ± SD] were analysed using ANOVA or Student’s t-test; P < 0.05 – statistical significance.

Results and Discussions: Patient data were similar in the two groups. End-tidal SEVO were 20% greater (P < 0.001, Fig) in the KET group although BIS scores were greater in the KET group (55 ± 16 vs 50 ± 16, P = 0.005). MAP was also lower in the KET group (70 ± 15 vs 78 ± 17, P < 0.0001).

Conclusion: Low intraoperative doses of KET increase BIS guided SEVO requirements during combined general-TEA. These results raise the question of monitoring the depth of general anaesthesia when combined with TEA and KET.

References:

3AP9-8

Remifentanil bolus and entropy values in awake and anaesthetized patients. Are there any gender differences?
M. Vassiliadis, D. Geros, M. Karta, V. Siakavara, I. Paschalidis
Anesthesiology, General Hospital of Giannitsa, Giannitsa, Greece

Background and Goal of Study: Remifentanil bolus decreases bispectral index during anaesthesia. Aim of this study is to estimate its effect in spectral and response entropy values, both at awake and anaesthetized patients. Also, we seek for gender differences for this effect.

Materials and Methods: In forty surgical patients (21 female, 19 male), spectral (SE) and response (RE) entropy were monitored (Datex-Ohmeda S/5 Entropy Module). While awake, remifentanil bolus 1 µg/kg was administered and SE-RE were recorded before and after 2 minutes. Propofol 2 mg/kg was then infused and for infusion cis-atracurium 0.15 mg/kg. Maintenance was provided with continuous propofol and remifentanil infusions. During operation and in a pause of surgical stimuli, another remifentanil bolus was given. SE and RE, pre- and post bolus, were also recorded. For statistical comparison, two-sample t-test was applied. P < 0.05 was considered statistically significant.

Results and Discussions: In female and male awake patients, SE and RE were similar before and after bolus (Table 1). While anaesthetized, the difference in SE and RE (pre minus post value) was very significant, compared to awake state (P < 0.0001, power 99%), in both sexes. The reduction in both SE and RE, was more significant in females (For SE: P = 0.009, power 78%, for RE: P = 0.0002, power 91%).

Table 1. Mean values ± SD

<table>
<thead>
<tr>
<th></th>
<th>AWAKE</th>
<th>ANAESTHESIA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
</tr>
<tr>
<td>Pre bolus SE</td>
<td>89 ± 2</td>
<td>89 ± 1</td>
</tr>
<tr>
<td>Post bolus SE</td>
<td>88 ± 3</td>
<td>88 ± 3</td>
</tr>
<tr>
<td>Pre bolus RE</td>
<td>98 ± 1</td>
<td>98 ± 1</td>
</tr>
<tr>
<td>Post bolus RE</td>
<td>97 ± 2</td>
<td>95 ± 5</td>
</tr>
</tbody>
</table>
Conclusion(s): Remifentanil, given as a bolus, significantly reduces spectral and response entropy value in anaesthetised, but not in awake patients, male or female. The effect is more pronounced in female patients.


3AP9-9
The application of response entropy to monitoring propofol sedation depth
P Mahon, R. Kowalski, E. Khan, B. McMamara, G. Shorten
Anaesthesia and Intensive Care, Cork University Hospital, Cork, Ireland
Background and Goal: The aim of this prospective observational study was to investigate the associations between: (1) Response / State Entropy (RE/SE), (2) defined EEG parameters and (3) clinical assessment [Modified Observer’s Assessment of Alertness/Sedation scale (MOAA/S)] in patients receiving low-dose propofol infusion.

Materials and Methods: A target-controlled infusion of propofol was administered (using Schneider’s pharmacokinetic model) to 12 ASA I patients. The concentration of the target-effect site infusion was increased in 0.5 μg mL⁻¹ increments at four minute intervals to a maximum of 2.0 μg mL⁻¹. SE/RE indices (Entropy™ Monitor, GE Healthcare) and clinical sedation score (MOAA/S) were recorded. RE is calculated over the frequency range 0.8–47 Hz and includes muscle activity. SE is confined to the EEG frequency range.

Each patient had concurrent multi-channel (19) EEG recording. EEG recordings were later assessed by a neurophysiologist blinded to the propofol concentration. A grade was assigned according to predefined EEG criteria of sedation, for each four-minute time period or “patient/time unit” analyzed. Each unit corresponded to a fixed concentration of propofol (n = 48). Robust analysis (linear mixed model) did not demonstrate an intra-patient effect (p = 0.016).

Results and Discussion: RE but not SE was less in patient/time units with EEG evidence of sedation (Table 1).

Table 1. State/Response entropy (SE/RE) and EEG evidence of sedation [data are median (range)]

<table>
<thead>
<tr>
<th>Measure</th>
<th>EEG evidence of sedation (n = 48)</th>
<th>No EEG evidence of sedation (n = 29)</th>
<th>P value</th>
<th>Pα value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE</td>
<td>89 (60–91)</td>
<td>89 (80–91)</td>
<td>0.324</td>
<td>0.58</td>
</tr>
<tr>
<td>RE</td>
<td>96 (62–99)</td>
<td>98 (90–100)</td>
<td>0.003</td>
<td>0.75</td>
</tr>
</tbody>
</table>

RE but not SE values were less in patient/time units in which clinical evidence of sedation was present (MOAA/S < 5) (p = 0.007)

Conclusion: At low levels of propofol induced sedation, RE offers potential as a monitor of sedation depth.

Clinical and Experimental Circulation

4AP1-2
Relevance of elevated Serum Troponin I after elective major abdominal surgery
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Background and Goal of Study: The aim of this study was to investigate preoperative risk factors, intraoperative events and postoperative events that can be linked to myocardial injury as evidenced by increase in serum troponin levels during major surgery.

Materials and Methods: After obtaining local ethics approval and written consent, fifty six consecutive patients undergoing elective major surgery were recruited. Preoperative risk factors, intraoperative events such as hypotension and tachycardia and postoperative outcomes such as adverse cardiac events, pain scores and outcomes at 30 days were recorded. ECGs and serum troponin assays were done at baseline and on postoperative days 1, 2 and 3.

Results and Discussions:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>No increase in troponin</th>
<th>Troponin 0.04–0.4 ng/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>16</td>
<td>35</td>
</tr>
<tr>
<td>Age (median)</td>
<td>66 (35–86)</td>
<td>69 (37–83)</td>
</tr>
<tr>
<td>Preop risk factors</td>
<td>7 (43%)</td>
<td>14 (40%) (Chi square 1.8; p 0.215)</td>
</tr>
<tr>
<td>Postop Tachycardia</td>
<td>1 (6%)</td>
<td>9 (25%) (Chi square 3.4; p 0.06)</td>
</tr>
<tr>
<td>Postop pain</td>
<td>0</td>
<td>7 (20%) (Chi square 2.2; p 0.13)</td>
</tr>
<tr>
<td>ECG Changes</td>
<td>4 (25%)</td>
<td>12 (34%)</td>
</tr>
<tr>
<td>30 day Mortality</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Conclusion(s): Sixty eight percent of patients undergoing elective abdominal surgery have positive cardiac Troponin I levels postoperatively, consistent with myocardial damage. We conclude that it would be prudent to repeat this study with larger numbers statistically powered to detect significant difference before drawing any definite conclusions.


4AP1-3
Acute renal failure in patients undergoing mitral valve surgery
E. Dedola, O. Fochi, C. Marchetti, G. Bruno, G. Crescenzi
Department of Cardiothoracic Anaesthesia and Intensive Care, San Raffaele Scientific Institute, Milano, Italy

Background and Goal of Study: The aim of this study was to define the incidence, predictors and mortality related to ARF after different types of mitral valve (MV) surgery.

Materials and Methods: We studied 1276 consecutive adult patients undergoing isolated MV surgery with cardiopulmonary bypass. Mitral valve repair was mostly performed with the edge to edge technique with the positioning of a rigid ring while patient who had mitral replacement mostly had a mechanical valve implanted.

Results and Discussions: 32 patients (2.5%) developed postoperative ARF. The incidence of ARF for MV replacement and MV repair was 8% (25/312) and 0.7% (7/964) respectively (p < 0.001). At a multivariate analysis, MV replacement was an independent risk factor for the development of
postoperative ARF (OR 4.0, 95% confidence interval 1.49–10.59, p < 0.01) together with low-output syndrome (OR 13.7, 5.4–34.9, p < 0.01), emergency surgery (OR 8.53, 9.1–42, p = 0.02, creatinine >124 µmol L−1 (OR 7.9, 2.8–22, p < 0.01), reopening for bleeding (OR 4.5, 1.4–14.3, p < 0.01), diabetes (OR 4.4, 1.08–18.2, p < 0.04) and age (OR 1.048 per year, 1.002–1.096, p = 0.04). Hospital death occurred in 23 patients: those who developed ARF had a 46.9% incidence of death versus 0.6% in the patients without ARF. ARF requiring renal replacement therapy occurred in 20 patients: 0.3% in the MV repair group and 5.4% in the MV replacement group (p < 0.001). Patients who developed ARF requiring renal replacement therapy had 65% incidence of death. Death occurred in 61% MV replacement and in 0.4% MV repair patients (p < 0.0001). Our main result is that MV valve replacement is an independent risk factor for the development of ARF after MV valve surgery (OR 4.0; 95% CI 1.5–10.6). The other risk factors for in our study population were perioperative low-output syndrome, emergency operation, preoperative renal impairment, re-operation for bleeding, diabetes and age.

**Conclusions:** In conclusion, our study identifies risk factors for the development of ARF in MV surgery and, for the first time, shows that MV replacement is an independent risk factor for this complication.

**4AP1-4**

Postoperative risk of patients with previous coronary stenting undergoing non cardiac surgery

F. Le Saché, S. Perbet, Y. Le Manach, G. Godet

Anesthesiology and Intensive Care, La Pitie-Salpêtrière Hospital, Paris, France

**Background and Goal of Study:** Percutaneous cardiac interventions with bare metal stent (BMS) or drug eluting stent (DES) implantation is a routine treatment for coronary artery disease. Anaesthesiologists have to cope with management of antplatelet therapy. We tried to evaluate the incidence of perioperative cardiac and hemorrhagic complications in non cardiac surgery.

**Materials and Methods:** From January 1st, 2006, we conduct a prospective observational study in our institution. To be eligible, patients had to have coronary artery disease treated by previous surgery stenting and need to undergo a non cardiac surgical procedure. All urgent or elective procedures, be it minor, intermediate or major surgery, were included. Data were collected from the patients’ coronarography reports. Troponin Ic (cTni) level measures and electrocardiograms were conducted daily to detect possible in-stent thrombosis, myocardial damage or myocardial infarction during 3 days postoperatively.

**Results and Discussions:** During 11 months, 6816 patients were admitted to the ICU. We included 115 patients (1.7%) (Median Revised Cardiac Risk Index: 21–3). Among these patients, 31 were carrying DES (26%). The cardiovascular post-operative complications are marked by 14 myocardial damages (acute MI < 1.5 ng/ml), 6 myocardial infarction (CtTnI > 1.5 ng/ml) including 4 in-stent thrombosis. In 4-stent thrombosis occurred in BMS, in 2 cases with discontinuation of antplatelet therapy more than 5 days. The hemorrhagic complications are found among 6 patients of which 2 had a preoperative disruption of the antplatelet more than 5 days. A 22.6% cardiac and hemorrhagic complication rate is reported, 3 patients died before leaving the hospital because of myocardial infarction (2.6%).

**Conclusion(s):** During perioperative period, in patients with previous coronary stenting, myocardial damage is the most frequent complication (12%) without any mortality associated. It seems that in-stent thrombosis is an infrequent event (3.4%) even if it is a high lethal complication (50%).

**4AP1-5**

Predictors and outcome of renal replacement therapy in patients undergoing cardiac surgery

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Department of Cardiothoracic Anesthesia and Intensive Care, San Raffaele Institute, Milano, Italy

**Background and Goal of Study:** Acute renal failure is a serious complication of cardiac surgery. We studied the long-term survival and quality of life of patients requiring renal replacement therapy after cardiac surgery, since they represent a heavy burden on hospital resources and their outcome has never been adequately evaluated.

**Materials and Methods:** Out of 7846 consecutive cardiac surgical patients, 126 (1.6%) required postoperative renal replacement therapy: their preoperative and hospital course was compared with patients who had no need of postoperative renal replacement therapy. Patients who were on preoperative dialysis were excluded from this study. A multivariate forward stepwise analysis was used to identify predictors of renal replacement therapy.

Long-term (34 ±18 months) follow-up information was collected and quality of life and presence of hearing impairment assessed.

**Results and Discussions:** Hospital mortality in the study group was 84/126 (66.6%) versus 118/7720 (1.5%) in the control population (p < 0.001). Predictors of renal replacement therapy were: emergency surgery, preoperative renal impairment, intra-aortic balloon pump positioning, reoperation for bleeding, previous cardiac surgery, female gender, low ejection fraction, bleeding > 1000 ml, chronic obstructive pulmonary disease and age. Patients who underwent renal replacement therapy and were discharged from the hospital had an excellent long-term outcome: survival at 34 ±18 months was 70%, with 8.3% of survivors on dialysis and 29.1% complaining of hearing impairment; no other limitations in daily living were reported.

**Conclusions:** In conclusion, this study confirms that the in-hospital hospital mortality of patients requiring renal replacement therapy is high and shows an excellent long-term survival and good quality of life in patients discharged from hospital alive.

**4AP1-6**

Postoperative statin withdrawal is associated with increased cardiac morbidity

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Anesthésie Réanimation, Pitié Salpêtrière, Paris, France

**Background and Goal of Study:** Statins reduce cardiac morbidity in non-surgical populations and they may provide benefit for surgical patients (1). We assess cardiac outcome in patients who continued compared with those who discontinue statin therapy after major vascular surgery.

**Materials and Methods:** Between January 2001 and December 2003, there were no guidelines for perioperative continuation of statins (Discont., n = 491). From January 2004, guidelines were instituted whereby statin therapy was continued starting as soon as possible after surgery (Cont., n = 178). The occurrence of cardiac myonecrosis (defined as cardiac troponin I > 0.2 ng/mL) was analyzed. Intra-cohort (propensity score) and extra-cohort (Lee score) (2) adjustments of the risk were performed. Pooled analysis was then conducted to detect the predictors of cardiac myonecrosis in the all population. All analyses were done with SPSS 13.0.

**Results and Discussions:** The median delay between surgery and resumption of statin therapy was 4 days and 1 day in Discont. and Cont. Groups (p < 0.001), respectively. Using propensity score matching for likelihood of preoperative treatment, the odds ratio associated with chronic statin treatment to predict myonecrosis for patients with vs without early postoperative statin resumption (Cont. vs Discont. Groups) was 0.38 and 2.1 (relative risk reduction of 5.4; 95% CI: 1.2–25.3), respectively. The odds ratio after adjustment for the Lee score was 0.38 in the Cont.Group and 2.1 in the Discont. Group (relative reduction of 5.5; 95% CI: 1.2–26.0). A postoperative withdrawal (~4 days) was an independent predictor of postoperative myonecrosis (OR 2.9; 95% CI: 1.6–5.3).

**Conclusion(s):** Discontinuation of statin therapy after major vascular surgery is associated with an increased postoperative cardiac risk, suggesting that statin therapy should be resumed early after major vascular surgery.

**References:**


**4AP1-7**

Short-term neurocognitive outcome following off-pump coronary revascularization

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AHEPA University Hospital, Anaesthesiology and ICU, Thessaloniki, Greece

**Background and Goal of Study:** Cardiopulmonary bypass has long been considered to be a major factor in the development of post coronary artery bypass grafting (CABG) cerebral morbidity. Cerebral dysfunction can manifest as a spectrum, from stroke to cognitive decline, resulting in excess of medical resource utilization. Goal of the study was to validate the impact of off-pump CABG (OPCAB) procedures on short-term cognitive outcome.

**Materials and Methods:** Prospective study enrolling 103 candidates (92 M/11 F, aged 63.7 ± 8.9) scheduled for their first elective OPCAB surgery. Exclusion criteria included prior stroke history, carotid artery occlusion, poor left ventricular function or hemodynamic performance, renal failure and low educational status. Neurocognitive status was assessed by Mini Mental State Examination (MMSE) at baseline (2 days before CABG) and at ICU and hospital discharge (2 and 6 days post CABG, respectively). Demographic and clinical parameters were also validated as prognostic indices of cognitive outcome. Data were analyzed by ANOVA and stepwise logistic regression.
Results: No frank neurologic event was recorded. Changes of total MMSE values and their sub-divisions are presented in the table. Advanced age, diabetes and longstanding hypertension predicted 42% of the variance (p < 0.001) of the early cognitive derangement.

<table>
<thead>
<tr>
<th>Subdivision</th>
<th>Baseline</th>
<th>ICU discharge</th>
<th>Hospital discharge</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td>9.3 ± 1.4</td>
<td>8.2 ± 1.8</td>
<td>9.1 ± 1.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Registration</td>
<td>3.02 ± 0.3</td>
<td>2.8 ± 0.5</td>
<td>2.9 ± 0.3</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Attention</td>
<td>3.2 ± 0.8</td>
<td>2.3 ± 1.1</td>
<td>3.1 ± 1.1</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Recall</td>
<td>2.8 ± 0.4</td>
<td>1.6 ± 0.9</td>
<td>2.7 ± 0.6</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Language</td>
<td>7.8 ± 1.1</td>
<td>7.3 ± 1.3</td>
<td>7.6 ± 0.7</td>
<td>ns</td>
</tr>
</tbody>
</table>

Conclusion: OPCAB procedures might affect short-term neurocognitive outcome in a positive manner, although a detectable intellectual impairment (involving mainly the functions of orientation and recall, presents in the early postoperative period. Advanced age, history of diabetes and hypertension seem to be predisposing factors to this cognitive decline, which can possibly be attributed to derogation of functioning, depressive state and lack of motivation as consequences of major surgical procedures.

4AP1-8
Incidence, risk factors and outcome of renal dysfunction after coronary surgery in patients with preoperative normal renal function
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Anaesthesia, Hospital Universitari Germans Trias i Pujol, Badalona, Spain

Background and Goal of Study: To evaluate the incidence and risk factors of a decrease in creatinine clearance (CrCl) early after coronary surgery and its impact on the postoperative outcome in patients with preoperative normal renal function.

Materials and Methods: We prospectively followed up all patients undergoing coronary surgery under CPB in a 2 years period. Patients with a preoperative renal dysfunction were excluded. Renal function was assessed by CrCl, and renal impairment was defined as CrCl < 50 ml/min. In order to identify independent predictors of renal impairment, demographic, preoperative, intraoperative, CPB and postoperative variables were recorded.

Results and Discussion: A total of 312 patients were studied (age 62.8 ± 8.7, male gender 81.1%, preoperative CrCl 84.6 ± 23.7). Postoperative CrCl < 50 ml/min occurred in 16% patients.

Multivariate analysis showed 4 independent risk factors for postoperative renal impairment:

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>OR</th>
<th>IC 95%</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative CrCl</td>
<td>0.922</td>
<td>0.89–0.95</td>
<td>0.000</td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>2.84</td>
<td>1.29–6.25</td>
<td>0.006</td>
</tr>
<tr>
<td>Age (per year)</td>
<td>1.07</td>
<td>1.00–1.14</td>
<td>0.012</td>
</tr>
<tr>
<td>Inotropic drugs</td>
<td>2.66</td>
<td>1.22–5.81</td>
<td>0.014</td>
</tr>
</tbody>
</table>

Postoperative outcome was as follow:

<table>
<thead>
<tr>
<th>Outcome</th>
<th>PostopCrCl &lt; 50</th>
<th>PostopCrCl ≥ 50</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemofiltration</td>
<td>0%</td>
<td>4%</td>
<td>0.025</td>
</tr>
<tr>
<td>days in ICU</td>
<td>2.62</td>
<td>3.47</td>
<td>0.047</td>
</tr>
<tr>
<td>Mortality</td>
<td>0%</td>
<td>2%</td>
<td>0.162</td>
</tr>
</tbody>
</table>

Conclusions: In our study renal impairment in patients with previous normal renal function presented in 16% after CABG surgery. Preoperative low CrCl, advanced age, blood transfusion and use of inotropic drugs in ICU were found to be predictive for renal dysfunction.

Postoperative renal dysfunction was associated with a longer stay in ICU and increased need of hemofiltration, but not in a higher mortality rate.

Reference:

4AP2-1
Transesophageal echocardiographic automated border detection to predict fluid responsiveness in mechanically ventilated patients
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Department of Anesthesiology, Hospices Civils de Lyon, Hopital Louis Pradel, Bron, France

Background and Goal of Study: Left ventricular (LV) stroke area by transesophageal echocardiographic automated border detection (ABD) is related to LV stroke volume. Respiratory variations in LV stroke volume or its surrogates are good predictors of fluid responsiveness in mechanically ventilated patients. We hypothesized that respiratory variations in LV stroke area (ΔSA) can predict fluid responsiveness.

Materials and Methods: Eighteen mechanically ventilated patients undergoing coronary artery bypass grafting were studied. Stroke area was measured on a beat-to-beat basis using transesophageal ABD. Haemodynamic and echocardiographic data were measured at baseline and after volume expansion induced by a passive leg raising manoeuvre (PLR). Responders to PLR were defined as patients presenting more than 15% increase in cardiac output. Data are presented as mean ± SD.

Results and Discussions: Cardiac output increased significantly in response to PLR (from 2.16 ± 0.79 to 2.78 ± 1.08 L/min; p < 0.01). ΔSA decreased significantly in response to PLR, from 17 ± 7 to 8 ± 6%, p < 0.01. ΔSA was higher in responders than in non-responders (20 ± 5 vs. 10 ± 5%; p < 0.01). A cut-off ΔSA value of 16% allowed fluid responsiveness prediction with a sensitivity of 92% and a specificity of 93%. ΔSA at baseline was related to the percent increase in cardiac output in response to volume expansion (r = 0.53, p < 0.01).
Conclusion: In our study, trends in corrected flow time (FTc) obtained using Trans-Esophageal Doppler accurately reflected parallel changes in CVP. FTc may therefore be used as a guide to ensure adequate volume resuscitation following completion of the resection phase of surgery.

Reference:

4AP2-3
A new diagnostic method for visualizing the ascending aorta in patients undergoing cardiac surgery

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Division of Perioperative Care and Emergency Medicine, University Medical Center Utrecht, Utrecht, The Netherlands

Background: Atherosclerosis of the ascending aorta (AA) and emboli-related complications after cardiac surgery are related. Knowledge on presence of AA-atherosclerosis before sternotomy allows changes in surgical strategy that avoid manipulation of the AA. The “Gold”-standard for assessment of AA-atherosclerosis is epiaortic ultrasound scanning (EUS), but this can only be performed after sternotomy. Transesophageal echocardiography (TEE) is unable to detect atherosclerosis in distal AA due to the “blind” spot. A new method (A-View® method, an extension of TEE) enables assessment, preoperatively, of AA-atherosclerosis using a intra-tracheal fluid-filled balloon catheter. The aim of this diagnostic study was to evaluate if the A-View® method enables visualization of distal AA and safety of the diagnostic.

Methods: In a cross-sectional diagnostic trial, patients undergoing cardiac surgery by sternotomy underwent TEE, the A-View® method, EUS, and routine operative monitoring. Bronchoscopy was performed before and after the A-View® method in order to detect possible damage to the bronchial or tracheal wall.

Results: Study population consisted of 41 consecutive patients, 28 (68.3%) males and 13 females (31.7%), mean age 67 years (±11 years). With TEE the distal AA was visible in 4 (9.8%) patients whereas with A-View® method the distal AA was visible in all (100%) patients. There were no clinical significant side-effects associated with the use of the A-View® catheter. In 7 (18%) patients bronchoscopy revealed insignificant mucosal bleeding, this required no additional interventions nor delayed planned surgery. Severity of atherosclerosis visualized with A-View® method compared to EUS results showed a Kappa of 0.69 (0.50–0.88).

Conclusion(s): The A-View® method offers an easy, safe, and minimally invasive approach of visualizing the distal AA. Compared to EUS, the A-View® method yielded adequate results in the detection of AA atherosclerosis. The A-View® method can be used prior to sternotomy. Therefore, surgical strategy can still be adjusted to reduce manipulation of the AA in case of aortic atherosclerosis.

4AP2-4
A diagnostic systematic review using a bivariate meta-regression model of transesophageal echocardiography for the assessment of atherosclerosis in the ascending aorta in cardiac surgery patients

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Division of Perioperative Care and Emergency Medicine, University Medical Center Utrecht, Utrecht, The Netherlands

Background: Post-operative stroke in cardiac surgery is caused by emboli merging from the atherosclerotic ascending aorta (AA) after manipulation. It has been shown that the use of epiaortic scanning (EUS) combined with changes in surgical technique when atherosclerosis is present reduces the incidence of stroke. EUS has not gained widespread use, mainly because it is performed after sternotomy when changes in strategy are hardly feasible. Transesophageal echocardiography (TEE) can be performed before sternotomy to timely allow changes in surgical strategy. Hence, if accurate enough, TEE could replace EUS for the assessment of AA atherosclerosis and guide medical decisions in cardiac surgery patients. Aim of the study was to systematically review the diagnostic accuracy of TEE for the assessment of atherosclerosis in the AA in patients undergoing cardiac surgery, with EUS as reference.

Methods: We searched Medline, Embase, Cochrane library, Medion, Dare for studies comparing TEE versus EUS for detection of clinical relevant atherosclerosis. Studies were selected, data abstracted and validity assessed, according to QUADAS criteria, by independent reviewers. A random-effects bivariate meta-regression model was used to obtain summary estimates of sensitivity, specificity, and diagnostic odds ratio (DOR). Pairs of logit transformed sensitivity and specificity from each study were analysed to account for possible correlations due to different thresholds.

Results: We extracted 6 studies with a total of 346 patients of whom 419 aortic segments were analysed, including 100 segments with atherosclerosis (median prevalence 25% (range 17–62%)). Summary estimates of sensitivity, specificity and of the DOR were 21% (95% CI 13–32%), 99% (96–99%), and 18.1 (5.8–56.3) respectively.

Conclusion: Because of the low sensitivity of TEE for the detection of AA atherosclerosis a negative test result requires verification by additional testing using epiaortic scanning. In case of a positive test result, AA atherosclerosis can be considered as present, and less manipulative strategies might be indicated.

4AP2-5
Haemodynamic monitoring during orthotopic xenogentic heart transplantation

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Background and Goal of Study: Xenotransplantation offers a potential solution to the world-wide shortage of organ donors. The orthotopic xenogentic transplantation of pig hearts into baboons (oXHTx) is the only accepted preclinical animal model for cardiac xenotransplantation. Femoral artery thermomodulation (FATD) is an invasive method to monitor haemodynamic and volumetric parameters; however, FATD reference values for baboon do not exist so far. Thus we investigated haemodynamic parameters before and after oXHTx.

Materials and Methods: oXHTx from six hCD46 transgenic piglets to baboons (body weight. 10 to 26 kg) were performed. We used FATD (PiCCO, Pulsion, Munich, Germany) for the invasive assessment of cardiac index (CI), stroke volume index (SVI), global end-diastolic volume index (GEDI), intra-atrial blood volume index (ITBI), cardiac function index (GFI) and global ejection fraction (GEF) in baboons. Results and Discussions: Haemodynamic data of the baboons before and after oXHTx are given as mean ± SD (table).

<table>
<thead>
<tr>
<th>Baseline</th>
<th>after oXHTx</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR (beats min⁻¹)</td>
<td>66 ± 15</td>
</tr>
<tr>
<td>MAP (mm Hg)</td>
<td>75.7 ± 16.6</td>
</tr>
<tr>
<td>CI (l min⁻¹ m⁻²)</td>
<td>2.26 ± 0.56</td>
</tr>
<tr>
<td>SVI (l m⁻³)</td>
<td>28.4 ± 4.7</td>
</tr>
<tr>
<td>GEDI (l m⁻³)</td>
<td>506 ± 125</td>
</tr>
<tr>
<td>ITBI (l)</td>
<td>584 ± 100</td>
</tr>
<tr>
<td>GFI (mm⁻¹)</td>
<td>4.77 ± 0.91</td>
</tr>
<tr>
<td>GEF (%)</td>
<td>27.0 ± 9.6</td>
</tr>
<tr>
<td>SVRI (Dyne sec cm⁻⁵ m²)</td>
<td>2.459 ± 306</td>
</tr>
</tbody>
</table>

HR: heart rate; MAP: mean arterial pressure; SVRI: systemic vascular resistance index; *P < 0.05 paired t-test.

Volumetric FATD parameters differ from the normal range of adult and infant humans. Porcine xenograft maintained CI with elevated HR and reduced SVI.

Conclusion(s): We present FATD reference values for baboons using FATD and could show that porcine xenografts are capable to maintain cardiac function in the perioperative period after oXHTx.

4AP2-6
Global enddiastolic volume as a variable of fluid responsiveness in a paediatric animal model

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Anaesthesiology and Intensive Care Medicine, University Hospital Schleswig-Holstein, Campus Kiel, Kiel, Germany

Background and Goal of Study: Pulse pressure variation (PPV) and stroke volume variation (SVV) have been shown to predict fluid responsiveness in adults, albeit they depend on mechanical ventilation and therefore are only applicable in selected patients (1). Global enddiastolic volume (GEDV) determined by transpulmonary thermodilution accurately reflects changes in preload in adults (2). The present study was designed to evaluate whether GEDV is a suitable parameter of preload and fluid responsiveness during changing loading conditions in a paediatric animal model.

Materials and Methods: The study protocol was approved by the institutional animal research committee. 19 anaesthetized piglets 6.5 kg (±0.9 kg), ventilated with a tidal volume of 10 ml/kg were studied during normovolemic and after infusion of 20 ml/kg of 6% HES. GEDV was obtained by transpulmonary thermodilution. PPV and SVV were monitored continuously (PiCCO Plus®, Version 6.0), and central venous pressure (CVP), pulmonary capillary wedge pressure (PCWP), bolus CO and stroke volume index (SVI) were measured using a paediatric thermodilution pulmonary artery catheter.
**Results and Discussions:** All hemodynamic variables changed significantly comparing the different experimental stages. PPV and SVV, as well as CVP and PCWP showed a close correlation during changing loading conditions, whereas there was no correlation with the percentage change of SVI (ΔSVI) after volume loading. GEDV significantly correlated with SVI, ΔGEDV and with ΔSVI (r = 0.66, r = 0.80, r = -0.45).

**Conclusion(s):** In this experimental paediatric model, GEDV was the only variable to accurately reflect cardiac preload, suggesting that GEDV might be superior in guiding fluid therapy in children.

**References:**

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**4AP2-7**

**Continuous central venous and pulmonary artery oxygen saturation monitoring in cardiac surgery after cardiopulmonary bypass**

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**Background and Goal of Study:** Continuous measurement of central venous oxygen saturation (Svco2) is now available and could be an alternative to continuous monitoring of mixed venous oxygen saturation (Svo2). The accuracy of both fiberoptic measurements was assessed by comparison to reference co-oximeter results in cardiac surgery after cardiopulmonary bypass (CPB).

**Materials and Methods:** In 20 patients, after informed consent, we performed the placement of a Continuous Cardiac Output (CCO) catheter with Svo2 7.5F (Edwards Lifesciences®, Irvine, CA, USA) in the pulmonary artery and of a 2F CeVOX fiberoptic probe (Pulsion® Medical Systems, Munich, Germany) placed through a 7F triple lumen, Arrow®, in the superior vena cava. Blood samples were analysed for oxygen saturation by Instrumentation Laboratory 682 co-oximeter. Data were compared using a Pearson correlation and by the Bland and Altman method.

**Results and Discussions:** Both fiberoptic oximetry catheters correlated significantly after CPB with standard blood gas oximetry (Svco2: r = 0.95, p < 0.001; Svo2: r = 0.98, p < 0.001). For Svo2, measurements by CeVOX were on average 0.65% (±2.44 SD) lower than blood gas oximetry measurements (limits of agreement: -4.13 to 5.43) and the error range was 0.9%. For Svco2, measurements by CCO were on average 1.00% (±1.57 SD) higher than blood gas oximetry measurements (limits of agreement: -4.1 to 2.1) and the error range was 1.39%.

**Conclusion:** In cardiac surgery, after CPB, in spite of haemodilution, the results of both fiberoptic oximetry (Svco2 and Svo2) are nearly identical with standard blood gas oximetry.

**Reference:**

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**4AP2-8**

**Comparison of FloTrac™ cardiac output monitoring system in patients undergoing coronary artery bypass grafting with pulmonary artery cardiac output measurements**

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**Background and Goal of Study:** Recently, arterial pulse waveform analysis has been proposed for cardiac output (CO) determination and monitoring without out calibration or thermistor (FloTrac™/Vigileo™, Edwards Lifescience, Irvine, CA, USA). However, the accuracy and clinical applicability of this new technology has not been fully evaluated. We designed this prospective study to compare the accuracy of the FloTrac™ system (COTr) versus pulmonary artery catheter standard bolus thermodilution (COTh) in patients undergoing coronary artery bypass grafting (CABG).

**Materials and Methods:** After informed consent, we studied 11 patients referred for CABG. COTr and COTh were determined at 6 time points in the operating room including before and 5 minutes after volume expansion (VE) (500 ml 6% hetastarch). Following measurements were performed at the arrival in the intensive care unit and every four hours. Bland-Altman analysis was used to assess the agreement between COTr and COTh.

**Residual and Discussion:** COTr ranged from 2.0 to 7.6 l/min and COTh ranged from 1.9 to 8.2 l/min. There was a significant relationship between COTh and COTr (r = 0.662; p < 0.001) over the 166 pairs of data. Agreement between COTh and COTr was -0.26 ± 0.87 l/min. VE induced a significant increase in both COTh and COTr (from 3.4 ± 0.8 l/min to 4.4 ± 1.0 l/min; p < 0.001 and from 3.9 ± 1.2 to 5.1 ± 1.1 l/min; p < 0.001, respectively) and there was a significant relationship between percent change in COTh and COTr following VE (r = -0.722; p = 0.01).

**Conclusion(s):** We found clinically acceptable agreement between COTr and COTh in this setting. This new device has potential clinical applications.

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**4AP2-9**

**Heart rate variability predicts cardiovascular events during general anaesthesia**

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**Background:** Heart rate variability (HRV) has been shown to predict hypotension after spinal anaesthesia.1 Preoperative differences of HRV may be present in patients with underlying cardiovascular (CV) diseases scheduled for general anaesthesia.2

**Goal:** The predictive value of HRV for cardiovascular events (CVE) was analysed in 50 patients with cardiovascular risk factors scheduled for general anaesthesia.

**Materials and Methods:** After IRB approval and written informed consent total intravenous anaesthesia was performed in standardized fashion. CV risk was evaluated based on Lee’s Revised Cardiac Risk Index.3 Patients were included if they had a Lee score >2. CVE were defined as ST-segment depression (>0.1 mm) or elevation (>0.1 mm) during 24 hours Holter-EKG recording. HRV of patients without events (“NO-CVE”) were compared to patients with CVE. Total Power (TP), low frequency (LF), high frequency (HF), LF/HF ratio, and standard deviation of mean R-R interval (SD-R-R) were studied. LF and HF are given as percentage part of TP. Statistics: Baseline HRV was compared with Mann Whitney U test, p < 0.05.

**Results:** ST segment depression or elevation was found in 18 patients (median duration: 52 min; 5 / max: 274 minutes), 32 patients did not demonstrate Holter-EKG abnormalities. Demographic data did not differ between groups. LF/HF, reflecting autonomic balance (NO-CVE:0.9 ± 1.4 vs. CVE:2.8 ± 2.3, p < 0.05), LF, reflecting sympathetic activity (NO-CVE:25 ± 16% vs. CVE:32 ± 24%, p < 0.05), SD-R-R (NO-CVE:83 ± 18 ms vs. CVE:44 ± 29 ms, p < 0.05), and TP (NO-CVE: 1310 ± 770 ms² vs. CVE: 310 ± 620 ms², p < 0.05) demonstrated significant differences. HF, reflecting parasympathetic activity did not differ.

**Discussion:** Baseline HRV of patients with and without CVE differed significantly. Increased sympathetic activity and depressed TP predicted CVE.

**Conclusion:** These data suggest that HRV analysis of patients at high cardiovascular risk prior to general anaesthesia may detect those individuals at high risk for perioperative CVE.

**References:**

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**4AP3-1**

**Electrophysiologic mechanism of sevoflurane on action potential prolongation in rat ventricular myocytes**

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**Background and Goal of Study:** Despite prolongation of the QT interval in humans during sevoflurane anesthesia, little is known about the mechanisms that underlie these actions. In rat ventricular myocytes, the effect of sevoflurane on action potential (AP) duration and underlying electrophysiological mechanisms were investigated.

**Materials and Methods:** The AP was measured using a current clamp technique. The transient outward K+ current was recorded during depolarizing steps from ~80 mV, followed by short pulses to ~40 mV and then depolarization up to +60 mV. The voltage-dependence of steady-state inactivation
was determined using a standard double-pulse protocol. The sustained outward current was obtained by addition of 5 mM 4-aminopyridine. The inward rectifier K⁺ current was recorded from a holding potential of −40 mV before their membrane potential was changed from −130 to 0 mV. Sevoflurane actions on L-type Ca²⁺ current were obtained.

**Results and Discussions:** Sevoflurane prolonged AP duration, while the amplitude of membrane potential remained unchanged. The peak transient outward K⁺ current was significantly reduced by 18 ± 2% and 24 ± 2% by 0.35 mM and 0.7 mM sevoflurane, respectively, at around 60 mV. There was no effect on the sustained outward current by sevoflurane. Whereas 0.7 mM sevoflurane did not shift the steady-state inactivation curve, it significantly accelerated the decay of current inactivation (P < 0.05). The inward rectifier K⁺ current at −130 mV was little altered by 0.7 mM sevoflurane. The L-type Ca²⁺ current was reduced by 28 ± 5% (P < 0.05) and 33 ± 1% (P < 0.05) by 0.35 mM and 0.7 mM sevoflurane, respectively.

**Conclusion(s):** Prolongation of AP duration by clinically relevant concentrations of sevoflurane appears due to the suppression of transient outward K⁺ current in rat ventricular myocytes.

**References:**

### 4AP3-2

**Cardiac surgery anesthesia with new volatile agents (desflurane or sevoflurane): a meta-analysis**

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**Background and Goal of Study:** We performed a meta-analysis to investigate whether the cardioprotective effects of volatile anesthetics translate into decreased morbidity and mortality in patients undergoing cardiac surgery. It is commonly believed that the choice of the primary anesthetic agent does not result in different outcomes after cardiac surgery. Recent evidence however has indicated that volatile anesthetics improve post-ischemic recovery at cellular level, in isolated hearts, in animals, and in humans.

**Materials and Methods:** Four investigators independently searched BioMedCentral and PubMed. Inclusion criteria were random allocation to treatment, comparison of a total intravenous anesthesia regimen vs an anesthesia plan including new volatile anesthetics (desflurane or sevoflurane), performed on cardiosurgical patients. Exclusion criteria were duplicate publications, non-human experimental studies, no outcome data. The primary endpoint was the incidence of perioperative myocardial infarction, while the co-primary endpoint was the rate of hospital mortality.

**Results and Discussions:** The search yielded 22 studies, involving 1922 patients. Volatile anesthetics were associated with significant reductions of myocardial infarctions (24/979 [2.4%] in the volatile anesthetics group vs 45/874 [5.1%] in the control arm, odds ratio [OR] = 0.51 [0.32–0.84], p for effect = 0.006, p for heterogeneity = 0.77), and mortality (4/977 [0.4%] vs 14/872 [1.6%], OR = 0.31 [0.12–0.80], p for effect = 0.02, p for heterogeneity = 0.88).

**Conclusions:** The new anesthetics desflurane and sevoflurane have cardioprotective effects which result in decreased morbidity and mortality. Our data show for the first time that the choice of an anesthetic regimen based on administration of halogenated anesthetics is associated with a better outcome after cardiac surgery.

### 4AP3-3

**Desflurane – but not Sevoflurane – preserves microvascular oxygenation of the gastric mucosa in dogs**

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**Background and Goal of Study:** Maintenance of adequate microcirculatory haemoglobin oxygenation (μHbO₂) is crucial for the integrity of the gastric mucosa [1]. Although the depressing effects of volatile anesthetics on systemic haemodynamics are well known their effects on microcirculatory oxygenation of splanchnic mucosa remain unclear.

**Materials and Methods:** Chronically instrumented dogs (Foxhounds, 30 ± 1 kg, n = 5) were repeatedly anaesthetized either with sevoflurane (SEV) or with desflurane (DES). Dogs were mechanically ventilated (FiO₂ 0.3, ETCO₂ 35 mmHg). The concentration of the respective anesthetic agent was increased stepwise from 1.0, to 1.5 and finally to 2.0 MAC, each step maintained for 30 minutes. The μHbO₂ was measured by reflectance spectrophotometry [2]. Systemic haemodynamics (cardiac output [CO], mean arterial pressure [MAP]) were continuously recorded. Oxygen delivery [DO₂] was calculated from intermittently obtained arterial blood samples (e.g., for O₂-content determination) and CO.

**Statistics:** Means ± SEM, ANOVA, p < 0.05.

**Results and Discussions:** During anaesthesia with DES, μHbO₂ was significantly higher than with SEV already at 1 MAC (87 ± 3 vs 57 ± 19%) while DO₂ (19.5 ± 3.2 vs 14.4 ± 1.3 ml kg⁻¹ min⁻¹) did not differ significantly. DO₂ decreased significantly with both agents (2.0 MAC: DES 15.5 ± 1.4; SEV 8.2 ± 1.0 ml kg⁻¹ min⁻¹; μHbO₂ however remained virtually unchanged with DES (63 ± 2%) while SEV led to a significant depression of μHbO₂ (41 ± 5%).

**Conclusion(s):** DES preserves μHbO₂ despite a significant depression of systemic oxygen delivery and circulation whereas SEV exerts its depressive effects on both systemic oxygen delivery and regional microvascular oxygenation. Thus the use of DES could be favourable in patients at risk for splanchic hypoxoxygenation.

**References:**

### 4AP3-4

**A comparison of the influence of propofol based TIVA and sevoflurane based anesthesia on hemodynamic function during laparoscopy in morbidly obese**

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**Background and Goal of Study:** Pneumoperitoneum has important impact on haemodynamic function during general anaesthesia. The aim of the study was to estimate the influence of type of anaesthesia during laparoscopic procedures on cardiac function in morbidly obese during gastric banding surgery.

**Materials and Methods:** Haemodynamic function was measured by transoesophageal Doppler probe using HemoSonic 100 device (Arrow, USA).

**Results:** Demographic data: Age: 38.15 ± 11.31 vs 36.13 ± 9.75 yrs; Weight: 138.77 ± 26.67 vs 122.69 ± 14.43 kg; Height: 173.54 ± 8.29 vs 169.47 ± 9.26 cm; BMI: 45.98 ± 7.7 vs 43.23 ± 4.14 kg/m² in groups Sevo vs Prop respectively. Values are Mean ± SD. No difference were recorded.

**Conclusion:** There was no important difference between studied types of anaesthesia regarding influence on hemodynamic function during laparoscopy in MO pts.

### 4AP3-5

**The efficacy of sevoflurane-induced cardioprotection is not affected by bupivacaine in rat hearts**

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**Background and Goal of Study:** Plasma levels of bupivacaine may induce cardiotoxic effects, which could alter signaling pathways and thereby influence sevoflurane-induced cardioprotection against ischaemia-reperfusion injury. Therefore, we assessed the effect of bupivacaine on the efficacy of sevoflurane-induced cardioprotection.
Materials and Methods: Isolated Langendorff-perfused rat hearts received 35 minutes of global ischaemia followed by 60 minutes of reperfusion (I/R). The hearts were randomly divided into 4 groups: (1) control (CON, n = 8); (2) sevoflurane preconditioning (SEVO, n = 8) receiving three times 5-minute episodes of sevoflurane (2.5 vol%) before I/R; (3) sevoflurane preconditioning (BUPI-SEVO, n = 8); and (4) bupivacaine preconditioning (BUPI, n = 8). After I/R, cardiac function was determined as recovery of left ventricular pressures (LVP, expressed as percentage to values before I/R) and cellular injury was determined by infarct size with triphenyltetrazolium chloride (TTC) staining.

Results: After I/R, the SEVO group showed increased recovery of LVP (%3 ± 3% SEVO vs. 16 ± 3% CON, n = 8, p < 0.05), as well as a reduced infarct size (25 ± 8% SEVO vs. 59 ± 6% CON, n = 6, p < 0.01). Interestingly, in the BUPI-SEVO and BUPI group infarct size was reduced to a similar extent as the SEVO group (24 ± 7% BUPI-SEVO n = 8 and 34 ± 3% BUPI n = 4 vs. CON, p < 0.05), whereas LVP were unaltered compared to controls.

Conclusion: The efficacy of the volatile anaesthetic sevoflurane-induced cardioprotection against ischaemia-reperfusion injury was not affected by the local anaesthetic bupivacaine. Therefore, we suggest that both anaesthetics might induce similar cardioprotective signalling pathways.

4AP3-6
Sevoflurane-induced cardioprotection is mediated by protein kinase C-α/δ via production of reactive oxygen species
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Background and Goal of the Study: Recently we demonstrated that sevoflurane-induced cardioprotection is mediated via the Ca<sup>2+</sup>-insensitive protein kinase C (PKC-α/δ) isoform, reactive oxygen species (ROS) and ATP-sensitive mitochondrial K<sup>+</sup> (mitoK<sub>ATP</sub>) channels (1). Since sevoflurane modulates cardiac calcium handling, this study focuses specifically on the role of the Ca<sup>2+</sup>-sensitive PKC-α isoform in sevoflurane-induced cardioprotection and the relation with PKC-α, ROS and mitoK<sub>ATP</sub> channels.

Materials and Methods: Isolated rat trabeculae were preconditioned with 3.8% sevoflurane (15 minutes) and subsequently subjected to an ischemic protocol by superfusion of trabeculae with hypoxic, glucose-free buffer (40 minutes) followed by reperfusion (60 minutes). The functional role of PKC-α, PKC-δ, ROS and mitoK<sub>ATP</sub> channels was investigated by using the inhibitors Go6976, rottlerin, n-(2-mercapto-propionyl)-glycine and 5-hydroxydecanoic acid sodium. PKC-α activation in trabeculae exposed to sevoflurane was studied with immunofluorescent co-localization analysis.

Results: Ischaemia and reperfusion (IR) reduced the contractile recovery (F<sub>max</sub> expressed as percentage of the initial contractile force) from (Mean ± SE) 79 ± 7% [Time control] to 47 ± 3% [IR] (n = 9, P < 0.05). Sevoflurane preconditioning improved F<sub>max</sub> to 65 ± 3% [IR + Sevo] (n = 8; P < 0.05 vs. [IR]). Inhibition of PKC-α by Go6976 during preconditioning reduced F<sub>max</sub> to 42 ± 4% [IR + Sevo + Go6] (n = 10; P < 0.05 vs. [IR + Sevo]). Finally, sevoflurane preconditioning resulted in translocation of PKC-α to the mitochondria. The translocation of PKC-α was reduced by ROS scavenging, but not by inhibition of PKC-δ or mitoK<sub>ATP</sub> channels.

Conclusion: We showed that sevoflurane-induced activation of Ca<sup>2+</sup>-sensitive PKC-α, via production of ROS, is essential for cardioprotective signalning. In addition, Ca<sup>2+</sup>-insensitive PKC-δ activation and mitoK<sub>ATP</sub> channel opening are not involved in sevoflurane-induced PKC-α activation.


4AP3-7
Antioxidant effect of sevoflurane and desflurane anesthesia during coronary artery bypass graft surgery
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Background and Goal of the Study: Cardiac surgery induces oxidative stress which may lead to impairment of cardiac function. In this study we evaluated the circulating lipid peroxidation product (MDA) and markers of blood antioxidant status superoxide dismutase (SOD) and glutathione peroxidase (GPx) during balanced anesthesia established by sevoflurane and desflurane.

Materials and Methods: After getting hospital ethics committee approval and patient consent 40 patients undergoing elective coronary artery bypass graft surgery were randomly assigned to receive Desflurane in Group I (n = 20) and Sevoflurane in Group II (n = 20). Blood samples were drawn 11 before anesthesia induction; t 2-before surgical incision; t 3- before perfusion, t 4-after perfusion; t 5- at the end of the operation. Statistical analysis was performed by Mann-Whitney U and Friedman test.

Results and Discussion: Serum levels of MDA were significantly decreased after the operation (%40) when compared with preoperative measurements in sevoflurane group where it was only decreased (%23) in desflurane group. SOD and GPx measurements were increased %7 in sevoflurane group where it was only %6 in desflurane group with respect to measurements before anesthesia. GPx measurements were decreased %7 after the operation in sevoflurane group where it was decreased %63% in desflurane group. It is resulted that sevoflurane anesthesia significantly decreased lipid peroxidation product (MDA) together with an increase in antioxidant marker SOD which was accompanied by an antioxidant enzyme GPx consumption when compared to desflurane anesthesia.

Conclusion: We concluded that sevoflurane anesthesia demonstrated a better oxidative status and defended the antioxidant pool better than desflurane anesthesia.

4AP3-8
The evaluation of QTc Interval, Qtc dispersion, dysrhythmia and heart rate variability undergoing sevoflurane and desflurane anesthesia
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Background and Goal of Study: The aim of the present study was to assess the effects of sevoflurane and desflurane as inhalational anaesthetics on heart rate variability, dysrhythmias, QT interval and QT dispersion in patients who will undergo laparoscopic cholecystectomy under general anesthesia.

Material and Methods: 34 patients underwent elective laparoscopic cholecystectomy under general anesthesia.

Results: The patients who will undergo laparoscopic cholecystectomy under general anesthesia were randomized into two groups as Group 1 Sevoflurane and Group 2 Desflurane. End tidal CO₂, O₂, N₂O were monitored and ventilation were maintained to keep EtCO₂ between 30-40mmHg. Minimum, maximum, mean heart rates and heart rate variability parameters included low frequency (LF), high frequency (HF) values. LF/HF ratio, Global Sympathetic Index (GSI), R-R intervals were measured in preoperative, intraoperative and 2nd, 10th and 30th minutes after extubation. QT interval was corrected using Bazett’s formula (QTc = QT / RR). QT dispersion was calculated by finding shortest and longest QT interval. Mann Whitney-U test and Spearman Correlation analysis were used for statistical analysis. If p value was less than 0.05, it was accepted statistically significant.

Results: Assessing datas from Holter Monitor maximum heart rates values were significantly higher in Desflurane group (p < 0.049). LF/HF ratio, GSI values were lower in Desflurane group in perioperative period except in induction-extubation events. Maximum R-R intervals in Sevoflurane group in perioperative period were significantly higher. In desflurane group, QT intervals were significantly longer and QT dispersion was significantly more frequent. Positive correlation between sympathetic tonus increase and VES was recognized in both groups.

Conclusion: In this study, sympathetic activation was frequently seen in desflurane group. However severe dysrhythmias did not occur in both groups. Although both desflurane and sevoflurane increased the rate of QT, the increased of QTc and QTd in desflurane anesthesia were significantly higher than sevoflurane anesthesia.


4AP4-1
Does morphine induce preconditioning in the isolated rat heart?
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Background and Goal of Study: Morphine induces cardioprotection against ischemia-reperfusion (IR) injury in vivo and in rabbit hearts in vitro.2 While aiming to investigate the underlying signal transduction cascade of morphine preconditioning in isolated rat hearts we failed to detect a cardioprotective effect. Thus, we investigated the protective effects of different preconditioning protocols in this experimental model.

Materials and Methods: Langendorff perfused rat hearts were assigned to one of seven groups. All hearts underwent 35 min global ischemia and 60 min reperfusion. Morphine PC was initiated by administration of 3.5 min 1 μM
of lipids, and depletion of free radical scavengers (1). The invading neutrophils cause myocardial ischemia/reperfusion injury, which can be significantly attenuated by the infusion of leukocyte-depleted blood (LDB) during reperfusion. Left ventricular pressure was measured and infarct size (IS) was determined by triphenyltetrazolium staining. Statistic: One way ANOVA followed by Dunnett’s post hoc test. Data are mean ± SD.

Results and Discussions: IPC increased left ventricular developed pressure (LVDP) at the end of reperfusion (78 ± 11 mmHg vs. 51 ± 17 mmHg, P < 0.05). All other treatments had no effect on LVDP compared to control group. IPC and MORcon reduced IS by 80% (5.2 ± 5.3% vs. 25.5 ± 7.7%, P < 0.05) and 44% (14.3 ± 7.5% vs. 25.5 ± 5.7%, P < 0.05), respectively. None of the morphine PC pretreatments had an effect on IS.

Conclusion(s): In this Langendorff rat heart model, morphine administration followed by a washout period did not protect against I/R injury. The underlying reason for the difference to in vivo studies and in vitro results from rabbits need further study.

References:

4AP4-2
Hyperhomocysteinemia, oxidative stress and arrhythmia-risk factors for cardiac events
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Background and Goal: Hyperhomocysteinemia (HHcy) is associated with atrial fibrillation and stroke in humans (1). Homocysteine (Hcy) is an amino acid byproduct in the metabolism of methionine. Methionine intake is increased in western diets with a typically high amount of meat, milk and egg products. HHcy occurs in renal insufficiency and with specific enzyme defects in hereditary diseases. The role of Hcy in the cardiac conduction system in an in vivo rodent model has not yet been investigated. The goal of the study was to show that Hcy has a major influence in changes of the left ventricular geometry and conduction system with rhythm disturbances. We hypothesized that the remodeling of the extra cellular matrix (ECM) is due to Hcy induced oxidative stress (2). We wanted to show that HHcy is a risk factor for cardiac events and should be considered in the preoperative evaluation of high risk patients.

Material and Methods: Hcy was supplemented to drinking water of male C57BL6J mice to achieve moderate to high Hcy levels. ECG was monitored in freely moving mice with a subcutaneously implanted telemetric ECG probe. 2D transthoracic echocardiography was performed to assess regional wall motion abnormalities (RWMA) and left ventricular diameter. Immunoblotting was used to evaluate oxidative stress and ECM changes.

Results: RWMA with left ventricular diameter changes was seen in more than 60%. The changes in the conduction system are documented as arrhythmia. Hcy induced the expression of matrix metalloproteinases (MMP) and marker of oxidative stress. With a downregulation of thioredoxin and upregulation of free oxygen radicals. This leads to the assumption that Hcy plays a major role in oxidative stress induced remodeling of ECM in the myocardium and endothelium.

Conclusion: HHcy should be considered as a risk factor in the preoperative evaluation to screen patients with a high risk for periparative arrhythmia or thrombembolic events. HHCy should be included in the criteria for the cardiovascular syndrome.

References:

4AP4-4
Effects of leukocyte-depleted blood on the anti- lipid peroxidation ability during canine myocardial ischemia/reperfusion
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Background and Goal of Study: Myocardial ischemia reperfusion during cardiopulmonary bypass (CPB) causes release of neutrophils, peroxidation of lipids, and depletion of free radical scavengers (1). The invading neutrophils may attenuate the myocardium endogenous antioxidant defenses by generating oxygen free radicals during CPB(2).

Materials and Methods: Eighteen adult Mongolian dogs undergoing CPB, were randomized into 3 groups: the control group, whole blood group and experimental group with it use of the leukocyte depletion filter (LDF) on the bypass circuit. In experimental group, the hearts, which were declamping after 60 minutes aortic cross-clamping, were continuously reperfused for 20 minutes with leukocyte-depleted artery blood 2 ml/kg by LFD connected with bypass circuit. Control group and whole blood group were treated as experimental group but employing respectively physiological saline and artery blood as a substitute for leukocyte-depleted blood. The level of superoxide dismutase (SOD), glutathione peroxidase (GSH-Px), malondialdehyde (MDA) and mitochondrial swelling degree were determined before CPB, 60 minutes after cross-clamping, 30 minutes and 60 minutes after declamping.

Results and Discussions: The white blood cell accounted decreased significantly after the filtration. Reperfused with leukocyte-depleted blood by LDF connected with bypass circuit, the hearts of experimental group at 60 minutes after cross-clamping, 30 minutes and 60 minutes after declamping were much better in the recovery of SOD and GSH-Px than those in control group and whole blood group (P < 0.01). MPO,MDA levels and mitochondrial swelling degree at 60 minutes after cross-clamping, 30 minutes and 60 minutes after declamping were distinctly lower in experimental group than those in control group and whole blood group (P < 0.01).

Conclusion(s): Myocardial lipid peroxidation was restrained and ability of antioxidant in myocardium was improved by infusion of leukocyte-depleted blood to the heart before declamping, which could distinctly attenuate myocardial ischemia/reperfusion injury.

References:

4AP4-5
Changes of pro-inflammatory mediators in dog heart reperfused with leukocyte-depleted blood during cardiopulmonary bypass
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Background and Goal of Study: The reperfusion injury to the myocardium will develop during the process of aortic cross-clamping and declamping (1). All of these harmful substances might come from leukocytes and/or cytokines (2).

Materials and Methods: Eighteen adult Mongolian dogs undergoing CPB, were randomized into 3 groups: the control group (n = 6), whole blood group (n = 6) and the experimental group (n = 6) with it use of the leukocyte depletion filter (LDF) on the bypass circuit. In experimental group, the hearts, which were declamping after 60 minutes aortic cross-clamping, were continuously reperfused for 20 minutes with leukocyte-depleted artery blood 2 ml/kg by LDF connected with bypass circuit. Control group and whole blood group were treated as experimental group but employing respectively physiological saline and artery blood as a substitute for leukocyte-depleted blood. The levels of serum TNF-α, IL-1β and IL-8 were determined before CPB, 5 minutes after CPB, 60 minutes after cross-clamping, and 30 minutes, 60 minutes after declamping, respectively. The samples from the heart tissues were taken for determination of the activity of malondialdehyde (MDA) and the levels of malondialdehyde (MDA) before CPB, 60 minutes after cross-clamping, and 60 minutes after declamping.

Results and Discussions: The white blood cell count decreased significantly after the filtration (P < 0.01). The concentrations of pro-inflammatory cytokines (TNF-α, IL-1β) and IL-8) increased significantly after declamping in control group and whole blood group but were significantly lower in experimental group than in control group (P < 0.01) and whole blood group (P < 0.01). The MPO activity and the MDA levels 60 minutes after cross-clamping and 60 minutes after declamping were significantly lower in experimental group than in control group (P < 0.01) and whole blood group (P < 0.01).

Conclusion(s): Pro-inflammatory cytokin (TNF-α, IL-1β and IL-8) and leukocytes may participate in the inflamation-mediated myocardial ischemia/reperfusion injury, which can be significantly attenuated by the infusion of the leukocyte-depleted blood to the heart before declamping.

References:

4AP4-6
Opioid receptor expression in the rat heart during late ischemic preconditioning
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**Background and Goal of Study:** Opioid receptors (OR) are trigger and mediator of ischemic late preconditioning (LPC) (1). Leu-Enkephalin plasma levels are increased after a short term myocardial ischemia in rats (2). Whether OR Expression in the myocardium after LPC is altered is unknown. We investigated by Western Blot the expression of the three OR subtypes (δ-, κ-, μ-OR) in the rat heart up to 24 h after 5 min of coronary artery occlusion (CAO) in the conscious rat.

**Materials and Methods:** After approval by the local animal care committee, 28 male Wistar rats were in a first operation chronically instrumented with a coronary artery occluder. After a recovery period of 7 days, the animals were ischemic preconditioned by a 5 min coronary occlusion in the awake animal. The SHAM animals were not preconditioned. Immediately (0h), or 2, 4, 8, 12 or 24 h later the hearts were excised. Myocardium of the area at risk was proceeded for Western Blot detection of the three OR subtypes. All data are mean ± SD. Statistics: Student’s t-test and Bonferroni’s correction for multiple comparisons. *P < 0.05* was regarded as significant.

**Results and Discussions:** We could detect all three OR subtypes in the rat heart. δ-OR were increased 8–24 h after LPC (*P < 0.05*).

**Conclusion:** Starting 8 h after LPC δ-OR protein levels are increased after 5 min of CAO. LPC increases the δ-OR expression in the rat heart. Therefore δ-OR could be involved in ischemic LPC in rat hearts in vivo.

**References:**

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**4AP4-7**

Carbon monoxide inhalation attenuates inflammatory cytokine response after aortic ischemia and reperfusion

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**Background and Goal of Study:** Carbon monoxide inhalation has been shown to exert anti-inflammatory effects and to confer protection against ischemia-reperfusion injury in various organs [1]. Ischemia and subsequent reperfusion of the aorta is known to induce a systemic inflammatory response due to aortic clamping can be attenuated by carbon monoxide inhalation.

**Materials and Methods:** With approval of the local Animal Investigation Committee, anaesthetized, intubated and mechanically ventilated (FiO₂ 1.0, normocapnia) male Wistar rats (n = 26) underwent midline laparotomy and dissection of the retroperitoneum to expose the aorta. The rats were randomly assigned to three groups: the infrarenal aorta of animals assigned to the control-group (n = 10) was clamped for 2 hours, followed by a 3 hour reperfusion period. In the intervention-group (n = 10), the same protocol was applied but 250 parts per million carbon monoxide was added to the inspiratory gas, beginning from 1 hour prior to clamping until the end of reperfusion. Sham animals (n = 6) underwent no clamping but were mechanically ventilated for the same period of time as in the other groups. At the end of the reperfusion period, blood plasma was collected and the levels of interleukins 4, 8, 10, and 12 were determined by microsphere array technique (Luminex 100 system, Luminex, Austin, TX, USA). Statistics: mean ± SD, ANOVA + Bonferroni.

**Results and Discussions:** Interleukin plasma levels were significantly (p < 0.05) lower in CO treated animals than in controls (IL-4: 0.05 ± 0.04 vs 0.12 ± 0.10 pg/ml; IL-6: 1842 ± 1396 vs 3959 ± 1962 pg/ml; IL-10: 221.2 ± 126.9 vs 393.6 ± 169.4 pg/ml; IL-12: 194.4 ± 136.5 vs 332.3 ± 120.0 pg/ml).

**Conclusion:** Carbon monoxide inhalation attenuated the cytokine response, suggesting an anti-inflammatory effect in this model of aortic ischemia and reperfusion.

**References:**

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**4AP5-1**

Cardiac surgery with cardiopulmonary bypass: does aprotinin affect outcome

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**Background:** Aprotinin therapy is mostly confined to a population at increased risk for perioperative blood transfusion. This population is also at risk for post-operative adverse events. This study evaluated the effects of aprotinin on outcome (mortality, cardiac events, renal failure, and cerebrovascular events) in patients undergoing cardiac surgery with cardiopulmonary bypass.

**Materials and Methods:** Data were obtained in patients who received a strict blood conservation protocol: no antifibrinolytic therapy when at low risk (n = 854), and aprotinin (n = 1210) when at high risk for blood transfusion. Relative risk of different pre- and intra-operative variables was calculated for the different outcome variables. Backward stepwise regression analysis was used to identify the independent risk factors associated with the different outcome variables.

**Results:** Postoperative mortality and morbidity were higher in the aprotinin group but this was related to an increased incidence of peri-operative risk factors. Mortality was similar to what was predicted by the Euroscore. Complex surgery was the only independent variable associated with postoperative cardiac events. Preoperative heart failure and renal dysfunction, urgency and redo surgery were the independent variables associated with postoperative
haemodialysis. Age >70 years was identified as the only independent variable associated with neurologic dysfunction.

Conclusions: In the present study population the increased postoperative morbidity in patients receiving aprotinin as part of a blood conservation strategy was related to their higher risk profile. For none of the outcome variables studied was aprotinin administration identified as an independent risk factor.

4AP5-2
Effect of preoperative medication on postoperative outcome in coronary surgery
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Introduction: Several studies have assessed the potential beneficial effects of chronic pre-operative medication on postoperative outcome. Results of these studies however are conflicting. The present study investigated the effects of pre-operative medication on outcome variables after coronary surgery.(1)

Material and methods: In a retrospective study on 1670 coronary surgery (CABG) patients, preoperative risk-factors and medication were related to the following postoperative outcome variables: 30-day mortality, myocardial infarction, low cardiac output, and hemodilysis. Relative risks were calculated for the individual pre-operative data. All significant variables were entered in a backward stepwise regression analysis to identify the independent risk factors. Statistical significance was accepted at p < 0.01.

Results: Age > 70 years, diuretic therapy and low molecular weight heparin therapy were identified as the significant independent predictors of mortality. Unstable angina and clopidogrel therapy were identified as the significant independent predictor for postoperative myocardial infarction. Age > 70 years, diuretic therapy, sex, unstable angina and pre-operative myocardial infarction were identified as the significant independent predictors for postoperative low cardiac output. Diuretic and clopidogrel therapy were identified as the significant independent predictors for the need for postoperative hemodialysis.

Conclusions: Only pre-operative diuretic, low molecular weight heparin, and clopidogrel therapy were identified as independent risk factors for outcome after coronary surgery. Other chronic pre-operative medication such as β-blocking therapy, calcium channel blockers, angiotensin converting enzyme inhibitors, angiotensin II antagonists, acetylsalicylic acid and nitrates did not affect outcome in this particular patient population.

Reference:

4AP5-3
Effect of preoperative medication on postoperative outcome in cardiac valve surgery
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Introduction: Several studies have assessed the potential beneficial effects of chronic pre-operative medication on postoperative outcome. The present study investigated the effects of pre-operative medication on outcome variables after cardiac valve surgery. (1)

Material and methods: In a retrospective study on 477 cardiac valve surgery patients, preoperative risk-factors and medication were related to the following postoperative outcome variables: 30-day mortality, myocardial infarction, low cardiac output, and hemodilysis. Relative risks were calculated for the individual pre-operative data. All significant variables were entered in a backward stepwise regression analysis to identify the independent risk factors. Statistical significance was accepted at p < 0.01.

Results: Nitrates and low molecular weight heparin therapy were identified as the significant independent predictors for postoperative low cardiac output. The only significant independent predictor identified for postoperative creatinine >2 was age >70 years. Postoperative mortality, need for haemodilisation and postoperative occurrence of AMI were not significantly influenced by any preoperative medication (β-blockers, calcium channel blockers, nitrates, angiotensin converting enzyme inhibitors, diuretics, LMWH, acetylsalicylic acid or clopidogrel) or other, general preoperative factors (urgency, sex, age >70 years, unstable angina, myocardial infarction, diabetes, hypercholesterolemia or congenital arterial disease) in this particular population.

Conclusions: Only preoperative nitrates and low molecular weight heparin therapy were identified as independent risk factors for outcome after cardiac valve surgery. Other chronic pre-operative medication did not affect outcome in this particular patient population.

Reference:
Background and Goal of Study: Blood glucose (BG) and its indices (e.g., variability) are important variables in critically ill patients, myocardial infarction and neuro-logical complications (1, 2, 3). However, most studies were conducted in intensive care units. Goal of this study was to evaluate the signif-
cance of intraoperative BG indices for perioperative outcome.

Materials and Methods: 212 consecutive anaesthesia records and hospital charts were analysed from patients undergoing surgery for acute type A aortic dissection with deep hypothermic circulatory arrest. Intraoperative BG values, demographics and outcome data were extracted. SD and coefficient of variabil-
ity (SD*100/mean BG) were calculated. Statistics: Correlations between BG indices and outcome (mortality, persistent neurological deficit, myocardial infarction, and length of stay in the intensive care unit) were assessed. Statistical Significance was considered at a p value < 0.05.

Results and Discussion: There were 434 BG measure-ments, yielding up to n = 212 independent BG index values (mean, SD, coefficient of variability, and BG on admission). Demographic data, duration of deep hypothermic circulatory arrest, and BG indices were not significantly different between the following out-
come categories: survivors/non-survivors; persistent neurological deficit yes/no, myocardial infarction yes/no. Coefficient of BG variability was significantly but very weakly correlated to mortality and LOS ICU (Spearman correlation coef-
ficient 0.10 and –0.21; p = 0.04 and 0.03, respectively). No other significant association between BG indices and outcome parameters was found.

Conclusion: In patients undergoing surgery for acute type A aortic dissec-
tion, there is no clinically relevant correlation between intraoperative BG indices and mortality, persistent neurological deficit, myocardial infarction, and length of stay in the intensive care unit.

References:
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2 Fox K. Heart 2003; 89(5); 512–516.

4AP6-5
Predictors of intra-operative regional cerebral oxygen saturation decrease in patients with risk factors for cerebral hypoxia undergoing cardiac surgery
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Background and Goal of Study: Monitoring regional cerebral oxygen saturation (rSO2) identifies cerebral hypoxia during cardiac surgery, probably improving outcome and reducing ICU and hospital stay. Cost restrictions may limit its use to high-risk patients. Our goal was to test the adequacy of a set of criteria based on age, carotid stenosis and previous stroke.

Materials and Methods: We continuously monitored rSO2 (INVOS 4100) in 26 elective cardiac surgery patients. Inclusion criteria were: age above 70 years, carotid stenosis superior to 50% or previous stroke. Medical history and peri-operative information were obtained. All patients received general anesthesia with propofol, remifentanil, and vecuronium under bispectral anesthesia with propofol, remifentanil, and vecuronium under bispectral index monitoring. Statistical analysis used Mann-Whitney, chi-square and Fisher’s exact test. Results are mean ± SEM for quantitative variables.

Results and Discussions: Of the 26 patients (73.5 ± 0.9 yrs old, 46% female, all ASA III/IV, EuroSCORE = 7.8 ± 0.5 points) 73% were older than 70 yrs, 42% presented carotid stenosis, and 33% had previous stroke; 38% under-
went valve replacement, 42% aortocoronary bypass, and 15% both, with syn-
chronous carotid endarterectomy in 12%; one patient underwent left atrial myxoma excision. During surgery, 14 patients (54%) presented rSO2 decrease superior to 20% from baseline or absolute decrease below 50% that lasted 17.8 ± 27.2 mins. These patients showed a longer time to extubation (18.8 ± 7.0 vs 6.7 ± 1.5 h, P = 0.035), but no difference in ICU or hospital stay. They were not different regarding age (74.3 ± 1.2 vs 72.6 ± 1.6 yrs), stroke history (50/50%), EuroSCORE (8.4 ± 6.0 vs 7.1 ± 0.7 points), type of surgery (79 vs 58% open-heart), duration of surgery, associated medical conditions or usual medication, but had higher ASA status (86 vs 25% ASA IV, P = 0.0064) and greater frequency of carotid stenosis above 60% (29 vs 8%, P = 0.038). Only the latter two predicted intra-operative rSO2 decrease in multivariate stepwise regression.

Conclusion(s): Our preliminary results in aged high-risk patients undergoing cardiac surgery suggest that ASA status and carotid stenosis above 60%, but not age, previous stroke or EuroSCORE, may predict intra-operative rSO2 decrease.

4AP6-8
Postoperative hyperglycaemia – a marker of increased risk of complication or death in non-diabetic patients following coronary artery surgery
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Background and Goal of Study: Control of hyperglycaemia in patients after coronary artery surgery is known to be vital [1]. The aim of this study was to find out whether difficult glycaemia control in the early postoperative period is linked to postoperative complications.

Materials and Methods: 585 consecutive non-diabetic patients who under-
went first-time coronary artery surgery (412 CABG, 173 OPCAB) in a period of one year had their blood glucose levels (BGL) assessed postoperatively every hour during in the first postoperative day. Group A had all BGL < 12 mmol/l (334 CABG, 160 OPCAB), while group B had at least one BGL = 12 mmol/l (78 CABG, 13 OPCAB). Complications were recorded in our database and compared between groups. Descriptive statistics and t-test were used. p < 0.05 was considered significant.

Results and Discussion: Patients in group B were older, with higher EuroSCORE and more often operated in CABG mode. In group B we have observed significantly more deaths (0.41% vs. 4.4%, p < 0.01), low CO syn-
dromes (14.1% vs. 36.3%, p < 0.001), perioperative MI (1.02% vs. 9.9%, p < 0.001), neurological (4.3% vs. 12.1%, p < 0.01) and renal (2.1% vs.
6.6%, p < 0.05) complications.

Conclusion(s): Elevated blood glucose levels in the postoperative period are linked to the increased risk of complications and death in non-diabetic patients after coronary artery surgery.

Reference:
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4AP6-1
Effect of acute normovolemic hemodilution on left ventricular function in coronary surgery patients
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Background: Acute normovolemic hemodilution (ANH) may induce profound hemodynamic alterations which may have deleterious effects on left ventricular function. Previous echocardiographic studies have indicated that ANH could be safely performed in coronary surgery patients [2]. The present study analyzed the effects of ANH using LV pressure measurements in coronary surgery patients.

Materials and methods: 82 elective coronary surgery patients were included in this study. A pressure micromanometer was inserted in the left ventricle. The measurements consisted of recordings of electrocardiographic and LV pressure tracings during an increase in systolic and diastolic pressure, obtained by leg elevation. Measurements were obtained before and after ANH. Data were compared using paired t-test. All data were expressed as mean ± SD. Data were considered significant if p < 0.05.

Results: ANH resulted in a decrease in hematocrit from 39.8 ± 3.1 to 30.1 ± 1.7%.

In all patients cardiac output (CO) increased significantly from 5.6 ± 1.3 to 6.8 ± 1.71/min after ANH. This was associated with a significant decrease in systemic vascular resistance (SVR) from 977 ± 214 to 782 ± 153 dynes/sec.cm^-5. However, in 12 of the patients ANH was associated with a significant decrease in dP/dt max (from 873 ± 152 to 782 ± 153 mmHg/s after ANH) and a significant increase in time constant of isovolumic relaxation + (65 ± 7 before ANH to 77 ± 12 ms after ANH), while in the remaining 70 patients, this depression did not appear. (dP/dt max) - 986 ± 160 before ANH and 854 ± 152 mmHg/s after ANH, + 64 ± 9 before ANH and 67 ± 9 ms after ANH.

Conclusion: Although ANH appeared mostly well tolerated in patients with coronary artery disease, it may be associated with a depression of myocardial function not reflected in the global variables of the hemodynamics.

Reference:

4AP6-2
The effects of microcirculatory responses to hypovolemic shock following resuscitation with Ringer’s acetate and Ringer’s lactate solutions
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Background and Goals: There is no clear indication which volume replace-
ment therapy may have the best prognosis on hemorrhetic resuscitation. Aim of the study was comparison of volume replacement with Ringer’s acetate (RA) versus Ringer’s lactate (RL) solutions following induction of hypovolemic shock (HS).

Material and Methods: Rat cremaster model was used to evaluate in vivo microcirculatory changes after induction of HS by withdrawal of 15% of total
blood volume corresponding to decreasing MAP from basal 82.9 (±6.76) mmHg to 47.8 (±3.6) mmHg after HS. Rats were randomized into 4 groups of 10 each: 1) control (CTRL) and had microcirculatory hemodynamic parameters taken for four consecutive hours; 2) hemorrhagic shock (HSG) had blood withdrawn; 3) Ringer’s acetate (RAG), had blood taken and replaced with RA; 4) Ringer’s lactate (RLG), had blood withdrawn and replaced with RL. During 4 hrs microcirculatory measurements of RBC velocity, vessel diameter, functional capillary perfusion (FCP) and leukocyte-endothelial interactions where recorded. Endothelial micropoermeability (EMP) was evaluated after 4 hrs by FITC-albumin extravasation and immunofluorescence image analysis. The vital parameters (MAP, CVP, HR), as well as tissue oxygenation measurements were performed continuously.

RESULTS: At 4 hrs after volume resuscitation with RAG and RLG 66% return of FCP was recorded compared to 33% in HSG. There were no significant differences between RAG and RLG (after four hr: 8.48 ± 0.36 vs. 8.64 ± 0.22). RA resuscitation significantly reduced (P < 0.001) level of sticking and transmigrated leukocytes (PMN) compared to HSG. There were no significant differences between the HSG and RLG. The animals treated with volume replacement presented higher tissue oxygenation than HSG (RAG = 9.5 ± 0.25 and RLG 9.2 ± 0.22 vs. HSG 8.1 ± 0.15 mmHg).

CONCLUSIONS: After HS induction Ringers resuscitation significantly improved microcirculatory hemodynamics, however (RAG and RLG) hemodynamics never returned to pre-shock values. Ringer’s acetate administration decreased level of sticking and transmigrating PMN’s. Histological assessment showed degree of systemic inflammatory responses caused by HS in case of each group.

4AP6-3
Differences between a conventional intraoperative fluid management and a restrictive fluid regime in abdominal surgery
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Background: The correct perioperative fluid management is still an unresolved discussion. Underneath we report a study that evaluate the impact of two different types of fluid regimes on postoperative outcome.

Material and Methods: Sixty patients who were undergoing elective intra-abdominal surgery were assigned to two cohorts. Surgical procedures included colon resection, gastric resection and rectum resection. One cohort, n = 30, recived a conventional fluid intraoperative regime of 10 ml/kg/h of lactated Ringer’s solution [RFC]. The other cohort, n = 30, recived a restrictive fluid management of 5 ml/kg/h of lactated Ringer’s solution [RFC]. We excluded from the study pregnant patients, patients aged younger than 18 years, and those with coagulopathy, hepatic or renal dysfunction, ASA V-VI, and congestive heart failure. Primary endpoint was the number of patients who died or experienced complications. The secondary endpoints included: Time to initial passage of flatus. Hemoglobin, hematocrit, creatinine, Na and K serum concentration in the postoperative. Central Venous Pressure (CVP) during the surgery.

Results and Discussion: None of the patients died during the perioperative and postoperative period. The number of patients with complications was smaller in the [RFC] compared with [RFC] (p < 0.05). The pneumonia was the most common complication and it was higher in the [RFC] than in the [RFC] (p < 0.05). Patients in the RFC passed flatus significantly earlier than CFC (p < 0.05). There were no significant differences between the cohorts in hematoct, haemoglobin, creatinine, Na and K serum concentrations in the immediate postoperative period (p = 0.75). CVP was significantly higher in CFC compared with RFC; however, at discharge there were no significant differences between the cohorts (p = 0.98).

The current study included patients ASA III, and were performed in relatively homogeneous group of type of surgical procedures. Other major difference between other studies includes the intraoperative use of epidural catheter and the CVP intraoperative measurement.

Conclusions: The intraoperative fluid restriction in patients who are undergoing major intra-abdominal surgery reduces the number of complications and shortens the time to recovery of gastrointestinal function.

4AP6-4
Hemodynamic changes at the end of prolonged gynecological laparoscopy (GL)
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Background and Goal of Study: More prolonged GL are being performed in last years. The recent experimental study suggests that a significant decrease in cardiac index could occur after prolonged pneumoperitoneum (PP) [1]. The goal of this study was to compare aortic blood flow (ABF), total systemic vascular resistance referred to ABF (TSVRA) measured by transesophageal Doppler device (TED) with classical hemodynamic data of mean arterial pressure (MAP) and heart rate (HR) obtained at the end of different lasting GL.

Materials and Methods: 57 patients ASA I/II undergoing GL were enrolled after an informed consent was obtained. Propofol-fentanyl anaesthesia and noninvasive monitoring were performed according to institutional standard. The Doppler probe (Hemosonic-Arrow) (TED) was inserted after tracheal intubation. The mean values (± SD) of ABF, TSVRA, MAP and HR at the end of GL 5 min before, 5 min after CO2-desufflation (PP-DES) were analyzed and compared as a percentage change of initial values 5 min before PP in Trendelenburg position in 3 groups of patients according the type of PP: <30 min, 30-60 min, >60 min. Results were analyzed using Student’s t-test with statistical significance p < 0.05.

Results and Discussion: Significant increase and decrease of MAP & TSVRA respectively were observed, before and after PP-DES in all groups. TSVRA but not MAP, was significantly increased at the end of prolonged GL (before PP-DES), PP > 60 min vs. PP < 60 min. HR did not change significantly after PP-DES in all groups. Significant decrease of ABF was observed before PP-DES in GL lasting 30-60 min and >60 min vs. PP < 30 min. PP-DES produced significant increase of ABF in all groups.

Conclusion: Continuous hemodynamic monitoring with noninvasive TED but not classical hemodynamic data (MAP, HR) allows to recognize the increase of TSVRA and decrease of ABF in prolonged GL.

Reference:

4AP6-5
High thoracic epidural anesthesia attenuates left ventricular dysfunction causing aortic clamp during abdominal aortic aneurysm repair
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Background and Goal of Study: Several studies have demonstrated myoccardial dysfunction partially due to afterload increase and diastolic dysfunction by infrarenal aortic cross-clamping during infrarenal abdominal aortic aneurysm (AAA) repair under general anesthesia. At the same time high thoracic epidural anesthesia (HTEA) is reported to improve cardiac function due to afterload and diastolic characteristics. Our objective was to investigate whether HTEA attenuated hemodynamic response with aortic cross clamp.

Material and Methods: We studied 25 patients who underwent elective repair of AAA. Twelve patients received high thoracic anesthesia (THE) and thirteen patients did not (non-THE). Transesophageal echocardiography and hemodynamic measures were recorded before and after aortic cross clamp.

Result: Significant difference (p less than 0.05) was observed between THEA group and non-THEA group at aortic cross clamping in the left ventricular ejection fraction (from 0.56 to 0.45 versus from 0.58 to 0.53), end-diastolic volume (from 171 to 219 ml versus from 168 to 200), end-systolic volume (from 85 to 124 ml versus from 83 to 93), mean blood pressure (from 83 to 95 mmHg versus from 78 to 83), and end-systolic wall stress (from 53 to 70 (10^3) dyn/cm² versus from 50 to 55).

Conclusion: HTEA attenuates hemodynamic dysfunction due to aortic cross clamp during AAA repair.
4AP6-6
Evidence of differential renal dysfunction secondary to ischaemia reperfusion injury following liver transplantation and major vascular surgery
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Background and Goal of Study: Renal damage secondary to ischaemia reperfusion injury (IRI) is a recognised feature complicating vascular and transplant surgery. Urinary markers of tubular dysfunction may allow detection of renal injury. N-acetyl-β-D glucosaminidase (β-NAG) is a marker of proximal convoluted tubule (PCT) dysfunction, occurring as a consequence of an increased tubular protein load [1]. Albuminuria reflects an increase in glomerular permeability. Alpha-1 microglobulinuria (α-1 M) represents damage to the PCT. We present data on the magnitude and nature of renal IRI in orthotopic liver transplantation (OLT) and elective abdominal aortic aneurysm (AAA) surgery.

Materials and Methods: Randomised controlled trials were performed to study the effects of IRI on renal tubule dysfunction following OLT (n = 34) and AAA repair (n = 20). Urine samples were taken to detect changes in β-NAG, albumin and α-1 M.

Results and Discussions: Following reperfusion there was a significant increase in albuminuria in both groups. Both groups exhibited changes in α-1 M and β-NAG consistent with altered function within the PCT. However the magnitude of the β-NAG changes was five-fold greater in the OLT group.

Conclusions: Reperfusion results in subclinical renal dysfunction. The reduced elimination of β-NAG in the AAA group suggests less PCT lysosomal turnover as compared to the OLT group. This may be due to a reduced renal tubular protein load due to collateralisation in the AAA patients.

Reference:

4AP6-7
The effects of pneumoperitoneum and head-up positioning on the activity of the autonomic nervous system and QT dispersion during laparoscopic surgery
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Background and Goals: The effects of pneumoperitoneum (PP) and head-up positioning (HUP) on the activity of the autonomic nervous system (ANS) and QT dispersion (QTD) can lead to adverse cardiocirculatory events during laparoscopic surgery (1,2). The aim of this study was to compare the effect of PP and HUP on ANS and QTD during two different anaesthetic techniques.

Material and Methods: Thirty patients without cardiorespiratory disease, undergoing elective laparoscopic cholecystectomy were randomly assigned to receive either total intravenous anaesthesia with propofol (TIVA, n = 15) or inhalational anaesthesia with sevoflurane (IA, n = 15). For analgesia remifentanil was given as continuous infusion in both groups. ANS, by heart rate variability (HRV) analysis, and QT interval were monitored using computerized measurement with a 12-lead ECG system (Novar Medical, Israel). The low and high frequency bands ratio of HRV (LF/HF), QTmax, and rate-corrected QTD (QTDc) were recorded in baseline (T1), during CO2 CP (12 mmHg) (T2) and PP + HUP (60 degrees) (T3), and at the end of procedure (T4).

Results: Data (mean) are shown in the table.

<table>
<thead>
<tr>
<th>Groups</th>
<th>QTmax (ms)</th>
<th>QTDc (ms)</th>
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<tr>
<td>T2</td>
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4AP6-8
Haemodynamic variables during acute subclinical hypovolaemia in anaesthetized patients
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Background and Goal of Study: Arterial waveform variables (systolic pressure variation, SPV, and pulse pressure variation, PPV) are predictive of fluid loading responsiveness. Less is known about their response to hypovolaemia. The aim of this study was to evaluate standard hemodynamic and arterial waveform variables during acute gradual subclinical hypovolaemia.

Materials and Methods: After IRB approval and informed consent 62 patients were included in this prospective study. Under general anaesthesia and positive pressure ventilation they underwent gradual autodonation by steps of 2% of circulating blood volume (CBV) each, up to 20% or until a blood pressure drop by 20%. SPV and PPV were measured after each step. Patients who tolerated all 10 steps of autodonation are included in this report. Data are presented as mean ± SD and were analyzed using ANOVA with Bonferroni correction (p < 0.005).

Results and Discussions: Twenty patients tolerated acute hypovolaemia of 20% of CBV. Males/females 12/8, age 56 ± 13. Heart rate (HR) and systolic blood pressure (Syst.BP) changed significantly from base line only after 16% reduction of CBV, while arterial waveform variables changed significantly after 4% (figure).

Conclusions: In patients who tolerated an acute 20% reduction of CBV under general anaesthesia there was no change in systolic blood pressure or heart rate until 16% reduction in CBV. Arterial waveform variables, however, changed gradually and significantly after 4% reduction.

4AP6-9
Prolonged hypervolemic hemodilution impairs functional capillary density of ileal mucosa in pigs
Z. Turek, V. Cerny, M. Oberreiter, R. Parizkova, P. Dostal
Department of Anaesthesiology and Intensive Care Medicine, University Hospital Hradec Kralove, Hradec Kralove, Czech Republic

Background and Goal of Study: Hypervolemic hemodilution (HHD) is a commonly used anaesthetic technique with evident effects on macrohemodynamics, but the effects on the microcirculation are not well described. Sidestream dark-field (SDF) imaging is a new method to assess microcirculation (1). SDF imaging was used to show the changes in functional capillary density (FCD) of small intestine during HHD with Hartmann's solution.

Conclusions: Statistically significant increases of QTDc and sympathetic activity, which are associated with an increased risk of arrhythmias, occur during PP + HUP, regardless of the anaesthetic techniques used.

References:
Materials and Methods: Microcirculation of terminal ileum was assessed by SDF imaging via an ileostomy in 5 anesthetized pigs. Four sequences of microcirculatory status were recorded on-line at baseline conditions and after first, second and third hour of HHD with Hartmann’s solution (20 mL/kg/h) iv and analyzed off-line. Systolic (SBP), diastolic (DBP) and mean arterial pressures were monitored continuously. One-way ANOVA on ranks was applied to compare changes in FCD during HHD.

Results: Data are presented in the table:

![Functional capillary density of ileal mucosa in pigs when using SDF imaging](image)

<table>
<thead>
<tr>
<th>Time (h)</th>
<th>Baseline</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBP (mmHg)</td>
<td>134 ± 3</td>
<td>132 ± 4</td>
<td>131 ± 4</td>
<td>131 ± 4</td>
</tr>
<tr>
<td>DBP (mmHg)</td>
<td>86 ± 3</td>
<td>85 ± 3</td>
<td>84 ± 3</td>
<td>84 ± 3</td>
</tr>
<tr>
<td>MABP (mmHg)</td>
<td>98 ± 4</td>
<td>97 ± 4</td>
<td>97 ± 4</td>
<td>97 ± 4</td>
</tr>
</tbody>
</table>

Conclusions: Prolonged HHD impairs functional capillary density of ileal mucosa in pigs when using SDF imaging, interpretation of macrohemodynamics during fluid therapy deserves caution.


4AP7-1

Randomized study comparing INO and inhaled iloprost in cardiac surgery

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Anesthesiology, Hannover Medical School, Hannover, Germany

Background and Goal of Study: The objective of this study was to compare the efficacy of inhaled iloprost (ILO) and nitric oxide (INO) in reducing pulmonary hypertension (PHT) during cardiac surgery immediately following weaning from cardiopulmonary bypass (CPB).

Materials and Methods: Forty-six patients with PHT (mean pulmonary artery pressure (mPAP) > 26 mmHg) preoperatively at rest, after induction of anesthesia and at the end of CPB) scheduled to undergo cardiac surgery were enrolled in this prospective randomized study. Patients were randomly allocated to receive iloprost (group A, n = 23) or INO (group B, n = 23) during weaning from cardiopulmonary bypass.

Results and Discussions: Both substances caused a significant reduction in mPAP and pulmonary vascular resistance (PVR) 30 minutes post administration (p < 0.001).

However, in a direct comparison of the two substances, iloprost caused a significantly greater reduction in PVR (PVR before ILO 455 ± 373, after ILO 161 ± 131 dyn.s.cm⁻¹, p = 0.036) and mPAP (mPAP before ILO 31 ± 5, after ILO 22 ± 4 mmHg, p = 0.048) than INO (PVR before INO 450 ± 254, after INO 239 ± 118 dyn.s.cm⁻¹); (mPAP before INO 29 ± 4, after INO 25 ± 5 mmHg). At the same time, patients in the iloprost group exhibited a significant increase in cardiac output (CO before ILO 3.9 ± 1.5, after ILO 6.5 ± 1.8 l/min, p = 0.005) (CO before INO 3.2 ± 1.2, after INO 4.9 ± 1.7 l/min).

Conclusion(s): PHT following weaning from CPB was significantly reduced by the selective pulmonary vasodilators INO and iloprost. However, in a direct comparison of the two substances, iloprost proved to be significantly more effective.

4AP7-2

Effects of levosimendan in cardiac surgery patients with poor left ventricular function

H. Vandenh Eede, S. Lorsomadee, S. Cromheecke, P.J. Van der Linden, S. De Hart
Anesthesiology, University hospital of Antwerp, Edegem, Belgium

Background and Goal of Study: Patients with poor left ventricular function frequently require inotropic drug support immediately after cardiopulmonary bypass. Levosimendan improves cardiac function by a novel mechanism of action compared to currently available agents. We hypothesized that in patients with severely compromised ventricular function the use of levosimendan would be associated with better postoperative cardiac function than with inotropic drugs that increase myocardial oxygen consumption.

Materials and Methods: Thirty patients with a pre-operative ejection fraction < 30% scheduled for elective cardiac surgery with cardiopulmonary bypass were randomized to two different inotropic protocols: milrinone 0.5 µg kg⁻¹ min⁻¹ or levosimendan 0.1 µg kg⁻¹ min⁻¹, started immediately after the release of the aortic cross-clamp. The treatment was masked to the observers. All patients received dobutamine 5 µg kg⁻¹ min⁻¹.

Results and Discussion: Stroke volume was similar between groups initially after surgery, but it declined 12 hours after surgery in the milrinone group but not in the levosimendan group (p < 0.05 between groups), despite similar filling pressures. Total dose, duration of inotropic drug administration and norepinephrine dose were lower in the levosimendan group than in the milrinone group (p < 0.05). The duration of tracheal intubation was shorter in the former group compared with the milrinone group (p = 0.008). Three patients in the milrinone group but none in the levosimendan group died within 30 days of surgery.

Conclusion: In cardiac surgery patients with a low preoperative ejection fraction, stroke volume was better maintained with the combination of dobutamine with levosimendan than with the combination of dobutamine with milrinone.

References:

4AP7-4

Target-controlled infusion of remifentanil during propofol induction: a comparison between hypertensive and normotensive patients

S.H. Lee, J.I. Han
Department of Anaesthesiology and Pain Medicine, Ewha Womans University Hospital, Seoul, Republic of Korea

Background and Goal of Study: Hypertensive patients are more prone to exhibit extensive cardiovascular changes during induction (1) and may differ in dosing requirement from normotensive patients. We compared between normotensive and hypertensive patients the effect of target-controlled infusion of remifentanil (4, 5, or 6 ng ml⁻¹) during propofol induction. We also hypothesized that increasing remifentanil doses may reduce propofol consumption at loss of consciousness (2).

Materials and Methods: Forty five ASA 1 or 2 patients without hypertension and forty five ASA 2 patients with hypertension were randomly allocated according to the remifentanil target effect-site concentration (C₄, C₅, C₆, H4, H5, H6 groups respectively), 5 ml kg⁻¹ of crystalloid solution and 0.2 mg of glycopyrrolate were given at start of induction. Target-controlled Infusion (TCI) of propofol (4 ng ml⁻¹) was started when target effect-site concentration of remifentanil (TeC remi) was reached, and effect-site concentration of propofol was recorded at loss of consciousness (LOC). When target effect-site concentration of propofol (TeC ppf) was reached, 0.6 mg kg⁻¹ of rocuronium was administered and endotracheal intubation was carried out after 2 minutes. Noninvasive blood pressure, heart rate (HR), bispectral index (BIS) and infused dose of remifentanil and propofol were recorded before induction, on reaching Tc remi, at LOC, at Tc ppf, before intubation, and 1, 2 and 5 minutes after intubation.

Results and Discussions: In hypertensive patients, remifentanil effect-site concentration as low as 4 ng ml⁻¹ may attenuate cardiovascular responses to endotracheal intubation. Increasing remifentanil concentration in moderate range (from 4 to 6 ng ml⁻¹) is devoid of sparing propofol requirements for hypnosis.

Conclusion(s): In hypertensive patients, lower effect-site concentration of remifentanil may be adequate during propofol induction.

References:

4AP7-5

Does nitroglycerin really act as a selective venous vasodilator?

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Background and Goals: It is generally accepted, that nitroglycerin (NG) acts in dose-dependent manner, and arteriolar dilation requires higher i.e. infusion rates than venous dilation (1). Our aim was to determine the exact NG infusion rate to achieve selective venous dilation.
Materials and Methods: On institutional approval and informed consent, 10 healthy volunteers (group A), 23 ICU patients, receiving NG for common indications (group B), and 7 ICU patients recovering after elective CABG (group C) were included in prospective study. All the patients had stable circulation and received neither inotropic nor vasoactive medication. Groups A and B received i.v. NG infusion in ascending rates (0.01 to 0.1 mkg kg⁻¹ min⁻¹). Hemodynamic variables were measured using impedance cardiography (Diamant, Russia). In group C patients NG i.v. infusion (0.05 and 0.1 mkg kg⁻¹ min⁻¹) was readministered for the short time just before Swan-Ganz pulmonary artery catheter removal (S/5 monitor, GE) and ICU discharge.

Results: In A and B groups the earliest hemodynamic change was significant systemic vascular resistance decline leading to stroke volume rise without shift of heart rate. This result prompted us to compare preload and afterload dynamics during NG infusion using invasive monitoring in group C. The latter data are shown in the table (Mean ± SD, p < 0.01 vs base variable level):

<table>
<thead>
<tr>
<th>Base level</th>
<th>NG mkg kg⁻¹ min⁻¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base 1</td>
<td>31.8 ± 2.2</td>
</tr>
<tr>
<td>Base 2</td>
<td>34.6 ± 3.3</td>
</tr>
<tr>
<td>Base 3</td>
<td>9.8 ± 5.7</td>
</tr>
<tr>
<td>HR, min⁻¹</td>
<td>82 ± 14</td>
</tr>
<tr>
<td>SVR, dyn · cm⁻⁵ m⁻²</td>
<td>2799 ± 457</td>
</tr>
<tr>
<td>PVR, dyn · cm⁻⁵ m⁻²</td>
<td>269 ± 83</td>
</tr>
<tr>
<td>CVP, mmHg</td>
<td>7.8 ± 2.1</td>
</tr>
<tr>
<td>PAOP, mmHg</td>
<td>13.8 ± 1.2</td>
</tr>
</tbody>
</table>

Conclusion: In all the groups, afterload decrease followed by stroke volume rise surprisingly left behind preload decline. Since even low-rate NG i.v. infusion causes circulatory changes typical for arterial dilation, despite undoubted venodilator properties, the selectivity of NG as a venous dilator in clinical settings may be revised.

Reference:
1 Abrams J. Am J Cardiol 1992; 70: 30–42.

### 4AP7-6

Cardiovascular effects of normobaric hyperoxia in patients with heart rate fixed by permanent pacemaker

K. Anderson, J. Harten, C. Berry, A. McConnachie, J. Kinsella

University Department of Anaesthesia, Glasgow Royal Infirmary, Glasgow, United Kingdom

Background and Goal of Study: Hyperoxia has significant effects on hemodynamics in humans [1]. It is unclear whether the reduction in heart rate and cardiac output are the primary effect or occur secondary to the increase in systemic vascular resistance. In this study, we studied the cardiovascular effects of oxygen on patients with a fixed heart rate on their permanent pacemaker.

Materials and Methods: Following ethical approval, nine patients with permanent pacemakers and no other co-morbidity, gave informed consent. Patients were paced at a fixed rate and then exposed to medical air (FₐO₂ = 0.21) and oxygen (FₐO₂ = 0.8) in a randomised and double-blinded fashion. We used a thoracic bio-impedance machine (BioZ System 1.52, CardioDynamics San Diego, USA) to determine heart rate, stroke volume, cardiac index, non-invasive blood pressure and systemic vascular resistance index.

Results and Discussions: When increasing the FₐO₂ from 0.21 to the higher level the delivered FₐO₂ was (median 0.85 (range 0.70–0.93)). On increasing FₐO₂, there were significant differences compared to low FₐO₂ for SpO₂ (an increase of 0.85% (95% CI: 0.01, 1.68), p = 0.045), ETCO₂ (a decrease of 0.18 kPa (0.06, 0.30), p < 0.01) and systemic vascular resistance index (an increase of 172 (19, 325) dyne·s·cm⁻⁵·m⁻², p < 0.03). There was no evidence of difference in heart rate (p = 0.51), stroke index (p = 0.44), cardiac index (p = 0.18) or mean arterial pressure (p = 0.52).

Conclusion(s): This suggests that the increase in systemic vascular resistance seen in previous studies is the primary effect, and that the reduction in heart rate and cardiac index are secondary to changes in vascular tone.

Reference:
1 Harten J. Anaesthesia 2003;58: 885–888.

### 4AP7-7

Reliability of buccal mucosal visible light spectrometry and laser Doppler flowmetry

V. Gath, Y. Saky, S. Klünzung, T. Simon, G. Marx

Department of Anaesthesiology and Intensive Care, Friedrich Schiller University Hospital, Jena, Germany

Background and Goal of Study: There are insatiable demands for new technologies to advance basic biological investigation at the microcirculatory level. Oxygen to see (O2C®) is a newly developed system that combines laser Doppler flow (LDF) and visible light spectroscopy (VLS) technology. The aim of our study was to assess the reliability of O2C® measurements applied to the buccal mucosa in healthy volunteers.

Materials and Methods: Microcirculatory hemoglobin oxygen saturation (μHbO₂, %) and blood flow (flow, AU) were measured using O2C® (Lea Medizintechnik GmbH, Giessen, Germany) probe applied to the buccal mucosa. Measurements were obtained simultaneously at two depths; superficial (2 mm) and deep (6 mm) every 2 seconds for 5 minutes and recorded for later analysis. The procedure was repeated in another occasion at least one week apart.

Results: We studied 20 healthy subjects; 10 males and 10 females (mean age = 38 ± 18, range 21–74 years). Both μHbO₂ and flow measurements were consistently higher when measured from the deep tissue layers (6 mm) than those measured from the superficial layers. Buccal mucosal μHbO₂ ranged from 78 to 96 % and varied only minimally (CV: 4–7.5%), whereas, there was a marked variability in flow measurements (CV: 29–63.9%). The reproducibility of buccal mucosal μHbO₂ and flow measurements were moderate to good (i.e., intra-individual reliability, ICC: range 0.7–0.87, p < 0.05). However, only measurements from the superficial mucosal layers showed a trend to good degree of inter-individual agreement (i.e., intra-individual reliability, ICC: range 0.68–85, p < 0.001).

Conclusion: O2C® provides a reliable measurements of buccal μHbO₂ and microvascular flow.

### 4AP7-8

The association of erythrocyte aggregation index and acute phase proteins after cardiac surgery with CPB


Department of Anaesthesiology, University Medical Center Groningen, Groningen, The Netherlands

Background and Goal of Study: Erythrocyte aggregation affects blood viscosity and microvascular flow dynamics. Aggregation is influenced by the concentration of acute phase proteins, which changes during and after cardiac surgery with cardiopulmonary bypass (CPB). We studied the acute phase response by measuring acute phase proteins and erythrocyte aggregation during a six day perioperative period.

Materials and Methods: After IRB approval and informed consent 41 patients scheduled for cardiac surgery with CPB were prospectively studied. Blood samples were collected before surgery (T1), at the end of surgery (T2), on the first (T3), third (T4) and fifth (T5) postoperative day. Erythrocyte aggregation index was measured using a laser assisted optical rotational cell analyser (LORCA, Mechatronics Instruments, Hoorn, Netherlands). Fibrinogen, C-reactive protein, albumin, ceruloplasmin, haptoglobin and malondialdehyde were determined. For statistical analyses Student t test, Mann-Withney U test and ANOVA were performed when appropriate, and significance accepted at P < 0.05.

Results and Discussions: Erythrocyte aggregation index decreased at the end of surgery and significantly increased above baseline (Fig) in the study period. Haptoglobinulin (Fig), and the other acute phase proteins showed a similar pattern. The changes in aggregation index and acute phase proteins were associated.

Conclusions: Changes of acute phase protein concentrations affect aggregation index after cardiac surgery with CPB. The acute phase response is still ongoing on the fifth postoperative day after cardiac surgery.

Reference:

### 4AP7-9

Comparison of serum lipids and glucose levels during propofol or midazolam infusions in coronary artery bypass surgery

A. Aygun, I. Oztekin, D. Oztekin, G. Topcu, S. Canik

Anesthesiology, Siyami Ersek Thoracic and Cardiovascular Surgery Hospital, Istanbul, Turkey
Background and Goal of Study: Plasma triglyceride (TRG) levels are preserved with propofol (P) 1% infusion whereas it is decreased compared to start level with midazolam (M) infusion during cardiac surgery (1,2,3). The aim was to document changes in serum lipids and glucose (GLU) levels during P 2% or M infusions for cardiac surgery in normolipidemic patients.

Materials and Methods: 30 normolipidemic patients undergoing elective coronary artery bypass graft surgery were randomly assigned into two groups. The P group of 15 patients received a continuous P 2% infusion and the M group of 15 patients received an M infusion for induction and maintenance of anesthesia. Serum total cholesterol (CHO), TRG, high-density lipoprotein (HDL), low-density lipoprotein (LDL), very low-density lipoprotein (VLDL) and GLU levels were measured at five periods until postoperative 24th hour. Variance analysis in repeated measures* and "t" test for coupled series" were used. *p < 0.05 was accepted as statistically significant.

Results and Discussion:

<table>
<thead>
<tr>
<th>Grp</th>
<th>Pre-induction</th>
<th>Post-induction</th>
<th>End CPB</th>
<th>Postop. 24h*</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRG P</td>
<td>112 ± 29.5</td>
<td>106 ± 36.1</td>
<td>69 ± 21.3</td>
<td>101 ± 26.4</td>
</tr>
<tr>
<td>M</td>
<td>115 ± 29</td>
<td>101 ± 23.6</td>
<td>54 ± 16*</td>
<td>104 ± 23.1</td>
</tr>
<tr>
<td>CHO P</td>
<td>147 ± 16.7</td>
<td>133 ± 20.1</td>
<td>84 ± 14.6</td>
<td>119 ± 36.9*</td>
</tr>
<tr>
<td>M</td>
<td>160 ± 26.9</td>
<td>148 ± 20.3</td>
<td>89 ± 12.8</td>
<td>127 ± 17.2*</td>
</tr>
<tr>
<td>HDL P</td>
<td>39 ± 11.1</td>
<td>35 ± 9.3</td>
<td>23 ± 7*</td>
<td>33 ± 14.7*</td>
</tr>
<tr>
<td>M</td>
<td>41 ± 7.6</td>
<td>37 ± 7.8</td>
<td>24 ± 6.1*</td>
<td>34 ± 4.9*</td>
</tr>
<tr>
<td>LDL P</td>
<td>86 ± 10.3</td>
<td>78 ± 17.2</td>
<td>49 ± 10.3</td>
<td>70 ± 20.8*</td>
</tr>
<tr>
<td>M</td>
<td>96 ± 23.9</td>
<td>91 ± 18.8</td>
<td>54 ± 8.3*</td>
<td>72 ± 15.1*</td>
</tr>
<tr>
<td>VLDL P</td>
<td>23 ± 6.9</td>
<td>21 ± 6.2</td>
<td>13 ± 3.9*</td>
<td>20 ± 5.2*</td>
</tr>
<tr>
<td>M</td>
<td>23 ± 6.9</td>
<td>20 ± 4.7</td>
<td>11 ± 2.4*</td>
<td>26 ± 20.8</td>
</tr>
<tr>
<td>GLU P</td>
<td>98 ± 6.9</td>
<td>124 ± 23.6*</td>
<td>149 ± 23.7*</td>
<td>148 ± 20.5*</td>
</tr>
<tr>
<td>M</td>
<td>95 ± 10.5</td>
<td>119 ± 12.2*</td>
<td>144 ± 33.3*</td>
<td>148 ± 18.6*</td>
</tr>
</tbody>
</table>

*p < 0.05 (in the same group); #p < 0.05 (between the groups); CPB, cardiopulmonary bypass

Conclusion: Use of P 2% infusion does not increase significantly the risk of hyperlipidemia when used in cardiac surgery.

References:


4AP8-1

Glyceryl trinitrate markedly influences haemodynamic multiscale sample entropy

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Department of Anaesthesiology, University Hospital of Duesseldorf, Duesseldorf, Germany

Background and Goal of Study: Cardiovascular dynamics in health and disease appear to reflect complex regulatory mechanisms [1], which can be assessed by analysing haemodynamic sample entropy. Therefore, we studied the effects of Glyceryl trinitrate (GTN) on haemodynamic sample entropy.

Materials and Methods: With approval of the District Governmental Animal Research Committee, six mechanically ventilated foxhounds received GTN intravenously (135 min (2)). Five mg ICG were added to 125 ml perfusate at the start of liver perfusion. The liver was transplanted, the liver removed and perfused in a closed ex vivo perfused rat liver model.

Results:

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>R60min</th>
<th>R120min</th>
<th>R180min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentane</td>
<td>I 10.6 ± 1.6</td>
<td>10.0 ± 0.9</td>
<td>9.4 ± 1.4</td>
<td>10.0 ± 2.4</td>
</tr>
<tr>
<td>ALT (IU/l)</td>
<td>I 9 ± 2.5</td>
<td>7.7 ± 1.5*</td>
<td>11.2 ± 2.0*</td>
<td>9.0 ± 1.7</td>
</tr>
<tr>
<td>AST (IU/l)</td>
<td>I 55 ± 32</td>
<td>55 ± 27</td>
<td>54 ± 28</td>
<td>48 ± 25</td>
</tr>
<tr>
<td>ALT (IU/l)</td>
<td>II 47 ± 15</td>
<td>45 ± 18</td>
<td>85 ± 20</td>
<td>111 ± 27*</td>
</tr>
<tr>
<td>AST (IU/l)</td>
<td>II 38 ± 8</td>
<td>31 ± 8</td>
<td>30 ± 9</td>
<td>32 ± 12</td>
</tr>
<tr>
<td>ALT (IU/l)</td>
<td>II 40 ± 18</td>
<td>46 ± 18</td>
<td>241 ± 36*</td>
<td>268 ± 56*</td>
</tr>
</tbody>
</table>

B: baseline; i: ischemia; r: reperfusion

Conclusion(s): 1) Pentane can indicate the level of the liver injury during ischemia-reperfusion; 2) Pentane was prior to serum enzyme elevation.

References:


4AP8-3

Effect of nutritional status on hepatocyte integrity and function in an ex vivo perfused rat liver model

L. Van Der Goot, V. Nuyens, M. Stadler, J. Boogaerts
Anaesthesiology, CHU Charleroi, Charleroi, Belgium

Background: The pre-existing nutritional status of the liver might contribute to the extent of tissue injury occurring during surgical procedures, ischaemic state and multiple organ failure (1,2). The aim of this study was to determine the role of starvation on hepatic integrity and function measured by the kinetics of indocyanine Green (ICG) in an ex vivo perfused rat liver model.

Materials and Methods: Wistar rats were divided into 2 groups (n=5): one had free access to food, the other was fasted for 16h. The portal vein was canulated, the liver removed and perfused in a closed ex vivo system during 135 min (2). Five mg ICG were added to 125 ml perfusate at the start of experiment. Glucose and lactate (mg/dl), enzymes ALT, AST, LDH (IU/l), pentane (mg/kg/l), free radicals, i.e. dienes and trienes (% Oxidative Index: O.I.), cytochrome c (Cyt c; ng/ml) and ICG (spectrophotometry) were measured in perfuse samples at different times. The proportion (%) of glycogen in hepatocytes was determined in biopsies. ICG kinetic was summarized as k0 parameters, ICG parameter for flux of ICG and liver damage caused by ischemia-reperfusion.

Materials and Methods: Thirty rabbits were randomly divided into two groups: (I) sham group; (II) liver ischemia-reperfusion group, clamped for 23 minutes. Exhaled breath samples (10 ml) and blood samples (4 ml) were taken from the animals at baseline; reperfusion 0 min; 60 min; 120 min; 180 min. Pentane was determined by SPME(2) in GC-MS. At the end of the experiment liver tissue samples were obtained. AST and ALT plasma levels were measured in the blood samples.

Results: Data (Mean ± SD) are shown in the table.

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>R60min</th>
<th>R120min</th>
<th>R180min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentane</td>
<td>I 10.6 ± 1.6</td>
<td>10.0 ± 0.9</td>
<td>9.4 ± 1.4</td>
<td>10.0 ± 2.4</td>
</tr>
<tr>
<td>ALT (IU/l)</td>
<td>I 9 ± 2.5</td>
<td>7.7 ± 1.5*</td>
<td>11.2 ± 2.0*</td>
<td>9.0 ± 1.7</td>
</tr>
<tr>
<td>AST (IU/l)</td>
<td>I 55 ± 32</td>
<td>55 ± 27</td>
<td>54 ± 28</td>
<td>48 ± 25</td>
</tr>
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<td>II 47 ± 15</td>
<td>45 ± 18</td>
<td>85 ± 20</td>
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</tr>
<tr>
<td>AST (IU/l)</td>
<td>II 38 ± 8</td>
<td>31 ± 8</td>
<td>30 ± 9</td>
<td>32 ± 12</td>
</tr>
<tr>
<td>ALT (IU/l)</td>
<td>II 40 ± 18</td>
<td>46 ± 18</td>
<td>241 ± 36*</td>
<td>268 ± 56*</td>
</tr>
</tbody>
</table>

B: baseline; i: ischemia; r: reperfusion

Comparison with B P < 0.05; *P < 0.01

Conclusion(s): 1) Pentane can indicate the level of the liver injury during ischemia-reperfusion; 2) Pentane was prior to serum enzyme elevation.

References:

Conclusion: In the present experimental conditions, fasting impaired hepatocytes integrity but did not seem to alter liver function.

Reference:

4AP8-4
Effect of increase in blood pressure on plasma volume loss under normal microvascular permeability
M. Dubniks, P.O. Grande
Anaesthesiology and Intensive Care, Lund University Hospital, Lund, Sweden
Background and Goal of Study: Adequate intravascular volume is one of the most important prerequisites for hemodynamic stability in the perioperative and intensive care settings. In a previous study (1) we showed that at a state of increased microvascular permeability, the transcapillary loss of plasma fluid is increased when blood pressure is increased. The present study evaluated the effect of an increase in blood pressure on plasma fluid loss, but now at normal permeability.

Materials and Methods: In 3 groups of adult male rats (N = 11 each group), plasma volume (PV) was determined by a 125I-albumin tracer technique at baseline condition and at the end of experiment after 2.5 h period of noradrenalin (NA) infusion. Before NA was started, 5% albumin in the dose of 15 ml/kg was infused for 15 min in group 1. In group 2, 15 ml/kg of 5% albumin was given after the animals were bled by 15 ml/kg. In group 3, the animals received NA infusion only. The rate of NA infusion was adjusted to keep mean arterial pressure slightly above the baseline value. PV loss was calculated as the difference between PV before and after NA infusion.

Results and Discussions: PV loss was 12.4 ± 3.5 ml/kg in group 1 (P < 0.001), 1.6 ± 3.6 ml/kg in group 2, and 2.0 ± 3.6 ml/kg in group 3, compared with PV losses from the previous study (1) of 3.4 ml/kg and 13.4 ml/kg without and with increased blood pressure, respectively, at increased permeability and normovolaemia.

Conclusion(s): 1. In normovolaemia, transcapillary plasma fluid loss associated with NA-induced increase in blood pressure is larger at increased than at normal permeability. 2. Excess of circulating plasma volume escapes circulation even at normal permeability.

Reference:

4AP8-5
Non heart beating donors porcine livers: effect of three different pump flow rate during cardiopulmonary bypass
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Background and Goal of Study: Normothermic Recirculation (NR) before Total Body Cooling [TBC] is an effective method to improve graft viability in porcine livers obtained from non heart beating donors [NHBD][1]. Optimization of the hepatic flow perfusion during NR using a non pulsatile roller pump was evaluated at three different pump flow rate [PFR].

Materials and Methods: pigs were transplanted with an hepatic allograft obtained from NHBD after 60 min of cardiac arrest, NR was performed during 30 min at maximum pump flow rate and finally total body cooling until liver temperature of 15°C. Animals were randomly treated with Dpt 5µg/Kg/min (Dpt G; n = 8) or glucose 5% (Control G; n = 10). Hepatic flows were recorded at baseline, 5, 15, 30 min and at the end of TBC. Blood samples for transaminases (AST, ALT) and hyaluronic acid (HA) were collected from suprahepatic artery and hepatic artery at baseline (T1), the end of NR(T2), 60 min post-reperfusion (T3), at second (T4) and fifth day (T5) post transplantation. HA extraction (AHE) = arterial AH-suprahepatic vein AH.

Results and Discussions: Data (Mean ± SD) are shown:

<table>
<thead>
<tr>
<th>Control</th>
<th>Dpt Group</th>
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<tbody>
<tr>
<td>AFB</td>
<td>AF5A</td>
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<tr>
<td></td>
<td>AFB</td>
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<td></td>
<td>AFB</td>
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<td>AST/ALT1</td>
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<td>AHE1</td>
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<tr>
<td></td>
<td>AHE2</td>
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<td></td>
<td>AHE3</td>
</tr>
</tbody>
</table>

*p < 0.05 vs Control Group.

Conclusion(s): Dobutamine addition during NR and TBC increases portal blood flow, significantly decreases AST (2nd day) and ALT (2nd–5th day). AHE showed a positive value 60 min after reperfusion.

References:

4AP8-7
Plasma BNP and diastolic dysfunction in patients with preserved systolic function
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Background and Goals of the Study: Plasma BNP levels have utility for diagnosing and managing heart failure. (1,2) The aim of our study was to evaluate if BNP levels can detect diastolic dysfunction, and if the new echo indexes of diastolic dysfunction add new information when compared with standard tools.

Materials and Methods: Sixty patients with preserved left ventricular ejection fraction [LVEF] > 0.45, were enrolled in this study. Thirty-five were scheduled for CABG, twenty-five for aortic valve replacement (AVR). Basal plasma BNP levels were measured preoperatively on day of surgery. After induction of anaesthesia we performed comprehensive TEE with assessment of left ventricular diastolic function with transmural flow velocity and pulmonary vein flow interrogation, and by measuring flow propagation velocity and mitral annular velocities with color M-mode (CMM) and tissue Doppler imaging (TDI).

Conclusion(s): Low pump flow rate decreases significantly arterial and portal blood flow during NR and TBC. OER was higher in constant flow rate groups (LG > HG > CG). The best survival was achieved in group control

Reference:
Results and Discussion: In CABG group we found 71% of pts with grade I of diastolic dysfunction, while in AVR group we found 75% of grade I of diastolic dysfunction. Median plasma BNP levels were elevated in both groups compared with pts without diastolic dysfunction. Using mitral annular velocities with CMM and TDI, we could observe that pts with grade I of diastolic dysfunction in CABG group were 88% and in AVR group 92%. In 17% of CABG group and in 17% of AVR group (grey zone), diastolic dysfunction was detected only by mitral annular velocities with CMM and TDI. Basal BNP in these subgroups were respectively 134 ± 74 and 145 ± 80.

Conclusion: Plasma BNP levels and newer diastolic indexes measured from TDI and CMM both detect diastolic dysfunction. The present study shows that plasma BNP levels reflect diastolic dysfunction, not only in patients with systolic dysfunction as demonstrated in other studies, but also in patients with preserved left ventricular function. It also demonstrates that standard echo evaluation can miss diastolic dysfunction in 17% of cases.

References:

4AP9-8 Effects of activated protein C on leukocyte adherence and mesenteric plasma extravasation during experimental endotoxia
Department of Anesthesiology and Intensive Care Medicine, Ernst-Moritz-Arndt-University, Greifswald, Germany

Background and Goal of Study: To evaluate the effects of activated protein C (APC) on mesenteric microcirculation (leukocyte-endothelial interactions, plasma extravasation) during experimental endotoxia in rats.

Materials and Methods: Prospective, randomized, controlled animal study in 40 male Lewis rats. Group 1 (CON) served as healthy control group. Group 2 (LPS) and group 4 (LPS + APC) received an endotoxin bolus i.v. (15 mg/kg lipopolysaccharide, LPS). In group 3 (APC) and group 4 (LPS + APC) APC was administered before endotoxin or placebo. Leukocyte-endothelial interactions and mesenteric plasma extravasation were determined at 0, 1 and 2 hours during the experiment by intravital microscopy (IVM).

Results and Discussion: During endotoxia, a significant increase of leukocyte rolling behaviour, leukocyte adherence and plasma extravasation in the LPS group (p < 0.05 versus control group) was observed. APC treatment (group 4) reduced leukocyte adherence and plasma extravasation significantly compared to untreated LPS animals (group 2). Also in group 3 (APC) a significant decrease of the mesenteric plasma extravasation was to be seen (p < 0.05 vs. control group).

Conclusion(s): APC treatment prevented the detrimental impact of endotoxia on parameters of the mesenteric microcirculation in rats.

References:
1. Iba T, Kidokoro A, Fukunaga M, Nagakura K, Shirahama A, Ida Y. Activated protein C improves the visceral microcirculation by attenuating the leukocyte-endothelial interaction in a rat lipopolysaccharide model.

4AP9-9 Inhibition of neuronal nitric oxide synthase with 7-nitroindazole attenuates oxidative stress after combined burn and smoke injury in sheep
Investigational Intensive Care Unit, University of Texas Medical Branch, Galveston, USA

Background and Goal of Study: Excessive production of nitric oxide (NO) by the neuronal NO synthase (nNOS) is believed to play a pivotal role in the pathogenesis of the inflammatory response to smoke inhalation and burn injury. We tested the effects of 7-nitroindazole (7-Ni), a selective nNOS inhibitor, on crucial molecular mechanisms in an established model of acute lung injury in sheep.

Results and Discussion: The combination injury of burn and smoke resulted in an inflammatory response associated with oxidative stress, as indicated by significant increases in plasma nitrate/nitrite (NOx) levels, myeloperoxidase (MPO) and poly (ADP-ribose) polymerase (PARP) in the placebo group. In sheep treated with 7-Ni, NOx plasma levels (8.4 ± 1 vs. 26 ± 10 µmol/L), MPO (3.9 ± 0.2 vs. 5.9 ± 0.7 µg/tissue) and PARP were significantly reduced (p < 0.05 each).

Conclusion(s): Selective nNOS inhibition with 7-Ni reduced important markers of systemic inflammation and oxidative burst in sheep. Therefore, administration of 7-Ni may represent a beneficial approach to treat patients with smoke inhalation associated lung injury.

4AP9-1 Influence of the anesthetic on the left ventricular function in rats assessed by 99mTc MIBI pinhole gated SPECT
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Background and Goal of Study: Pinhole gated SPECT is used for serial follow up of myocardial perfusion and function of cardiac disease in rat models. The anesthetic used is critical for the correct assessment of cardiac function. The aim of our study was to compare the effect of different intraperitoneal (IP) and inhalation anesthetics on cardiac function.

Materials and Methods: Wistar rats (n = 48) were scanned 2 times with one week interval. Once under Pentobarbital (60 mg/kg IP) anesthesia for the control study and a second time using a different anesthetic: (a) Isoflurane induction (5%) followed by Pentobarbital (60 mg/kg IP), (b) Ketamine-Xylazine (100–2 mg/kg/IP); (c) propofol (200 mg/kg/IP); (d) midazolam (70 mg/kg/ip); (e) Isoflurane (2.5%). (f) Halothane (4%), (g) sevoflurane (2%) or (h) desflurane(7%). Pinhole gated SPECT was performed 1 hour after intravenous injection of 330MBq 99mTc-MIBI Reconstruction was performed iteratively. Parameters of cardiac function (EDV: end-diastolic volume, ESV: end-systolic volume) were derived using Quantitative gated SPECT. Left ventricular ejection fraction (EF), stroke volume (SV) and cardiac output (CO) were calculated.

Results and Discussion: The % change in comparison with the control are shown in the Table below. (p < 0.05 , *p < 0.01).

Table:
<table>
<thead>
<tr>
<th>Group</th>
<th>EDV</th>
<th>ESV</th>
<th>HR</th>
<th>EF</th>
<th>SV</th>
<th>CO</th>
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<tr>
<td>a</td>
<td>2.2</td>
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<td>11.7</td>
<td>11.4</td>
<td>3.8</td>
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<tr>
<td>b</td>
<td>33.6</td>
<td>25.6</td>
<td>29.7</td>
<td>3.6</td>
<td>3.85</td>
<td>2.6</td>
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<tr>
<td>c</td>
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<td>19.6</td>
<td>2</td>
<td>8.3</td>
<td>4.4</td>
<td>2.3</td>
</tr>
<tr>
<td>d</td>
<td>-20.8</td>
<td>-56.8</td>
<td>8.4</td>
<td>21.3</td>
<td>-5.1</td>
<td>0.9</td>
</tr>
<tr>
<td>e</td>
<td>23.3</td>
<td>0.8</td>
<td>3.9</td>
<td>7.0</td>
<td>29.7</td>
<td>38</td>
</tr>
<tr>
<td>f</td>
<td>43.2</td>
<td>120</td>
<td>11.8</td>
<td>-34.4</td>
<td>-4.8</td>
<td>5.9</td>
</tr>
<tr>
<td>g</td>
<td>20</td>
<td>-5.8</td>
<td>-3.4</td>
<td>9.3</td>
<td>26.9</td>
<td>33</td>
</tr>
<tr>
<td>h</td>
<td>19.6</td>
<td>4.3</td>
<td>0.2</td>
<td>5.3</td>
<td>25.5</td>
<td>23</td>
</tr>
</tbody>
</table>

Conclusion: Depending on the anesthetic used, cardiac function alters dramatically. Our results suggest that Sevoflurane is the inhalation anesthetic of choice because of the better EF and CO. Midazolam is the intraperitoneal drug to use, because of the best EF, in rat heart studies.

4AP9-2 Systolic arterial pressure variability reflects circulating blood volume alterations in endotoxin induced hypotension in rabbits
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Background and Goal of Study: The high frequency component of power spectrum analysis of systolic arterial pressure variability (PSSAPV) has been shown to be comparable with systolic pressure variation (SPV) as an index of graded hemorrhaging (1), however, it was compared only in hemorrhagic shock induced animals. We attempted to determine the best means reflecting circulating blood volume (CBV) by using PSSAPV, SPV, pulse pressure variation (PPV), central venous pressure, and mean arterial pressure during endotoxin induced hypotension and fluid resuscitation.

Materials and Methods: Under sofware guided anesthesia and mechanical ventilation, the rabbits were randomized to six groups (n = 6) had LPS (lipopolysaccharide) induced hypotension only and those in group B (n = 6) had LPS induced hypotension followed by fluid resuscitation. After collecting baseline data, 1.5 mg/kg of LPS
was injected intravenously in both groups and then data collection was performed. In group R, hydroxyethyl-starch was continuously infused at a rate of 1 ml/kg/min for 25 min. Data were obtained at 5 and 60 min after fluid resuscitation in group R and at same timing in group N. Correlations between CBV and the parameters were analyzed using linear regression analysis. P < 0.05 was considered statistically significant.

**Results and Discussion:** The correlation between CBV and total power (R² = 0.241, p = 0.0004) of PSSAPV, and central venous pressure (R² = 0.113, p = 0.020), while no correlations were noted between CBV and SPV (R² = 0.065, p = 0.080), PPV (R² = 0.025, p = 0.283), and mean arterial pressure (R² = 0.003, p = 0.692).

**Conclusion(s):** Total power of PSSAPV best reflected the changes of CBV even in endotoxin induced hypotension as compared to conventional circulatory parameters.

**Reference:**

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**4AP9-3**

**Anesthetic techniques affect vascular responsiveness in experimental hemorrhagic shock**

Departments of Anesthesiology and Clinical Pharmacology, University Medical Center Groningen, Groningen, The Netherlands

**Background and Goal of Study:** Altered vascular reactivity after severe hemorrhagic shock may be influenced by the choice of anesthetic technique and interfere with the therapeutic effectiveness of vasoactive agents. The aim of the present study was to explore the changes in vascular reactivity following hemorrhagic shock using two types of general anesthetics.

**Materials and Methods:** After institutional approval, mice (n = 24) were randomly assigned to undergo hemorrhagic shock (90 min, 30 mmHg) by withdrawal of blood, or a sham-procedure. Half of the animals were anesthetized with isoflurane (ISO, 1.4%), the other half received additional nitrous oxide (N₂O, 66%). Vasomotor responses were studied in 2-mm rings of aorta mounted in a wired myograph.

**Results and Discussion:** Contraction to phenylephrine (PE) was increased in shock-mice anesthetized with ISO compared to SHAM (P < 0.05; fig). In contrast, addition of N₂O to ISO resulted in similar PE-evoked contractions in mice with and without shock (fig). In SHAM, acetylcholine (ACH) caused a biphasic curve consisting of an initial relaxation followed by a contractile response sensitive to the COX-inhibitor indomethacin (1 μM). In contrast, ISO animals undergoing shock, ACH evoked only relaxing responses.

**Conclusion(s):** Short-term hemorrhagic shock affects both contractile and relaxing vasomotor responses in aortic rings of mice anesthetized with ISO. Addition of nitrous oxide attenuates shock-dependent changes.

**References:**

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**4AP9-4**

**Diabetes inhibits coronary collateral development in a canine model of repetitive coronary occlusion**

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**Background and Goal:** Diabetic individuals with acute coronary syndrome have an increased risk of adverse cardiovascular events (1). Recent studies demonstrated that a well-developed collateral circulation is associated with higher survival rate, smaller infarct size as compared to poor collaterals (2). We tested the hypothesis that diabetes inhibits the coronary collateral development in a canine model of repetitive coronary occlusion.

**Materials and Methods:** Dogs were subjected to brief (2 min), repetitive coronary artery occlusions (1/h, 8/day, 21 day duration) in the absence (control) or presence of diabetes (diabetes). A sham group was instrumented identically but received no occlusion. Myocardial blood flow was determined in the myocardium perfused by the LAD and the LCCA. Peak reactive hyperemia response (PRH) was recorded. Collateral blood flow was expressed as the percentage of normal zone blood flow.

**Results and Discussion:** Coronary collateral blood flow was shown in the figure. PRH in the control group was significantly lower than that on day 1. PRH remained unchanged in the diabetes and the sham group.

**Conclusion(s):** Diabetes inhibits the development of coronary collateral blood flow.

**Fig.** P < 0.05 vs day 1; P < 0.05 vs the respective value in the control group.

**References:**

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**4AP9-5**

**Alterations of mitochondrial apoptotic pathways in load-induced right ventricular failure**

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Service d’Anesthésiologie Réanimation, Hospital ERASME, Bruxelles, Belgium

**Background and Goals:** We previously reported an experimental model of persistent right ventricular (RV) failure consecutive to a transient, 90-min increase in afterload induced by pulmonary arterial banding (1). We hypothesized that this particular type of ventricular stunning might be related to an early activation of apoptotic pathways.

**Material and Methods:** Pulmonary arterial elastance (Ea) and RV end-systolic elastance (Ees) were determined by a single beat method (2) in 7 anesthetized dogs before and 30 min after the release of a transient PA banding. The animals were killed by an anaesthetic overdose and RV and left ventricular (LV) myocardial tissue sampled for the measurements of mitochondrial mRNA of Bax (proapoptotic) and Bcl-2 (antiapoptotic) by real time polymerase chain reaction (RTQPCR). The Bax/Bcl-2 ratio was taken as an index of apoptotic activity.

**Results and Discussion:** Values are reported as mean ± SEM. The transient increase in PA pressure persistently increased right atrial pressure from 8.0 ± 0.4 to 10.0 ± 0.8 mmHg (P < 0.05), Ea from 0.99 ± 0.05 to 2.86 ± 0.15 mmHg/ml (P < 0.05), and decreased Ees from 1.12 ± 0.05 to 0.55 ± 0.03 mmHg/ml (P < 0.05), Ees/Ea from 1.14 ± 0.06 to 0.20 ± 0.02 (P < 0.05), and cardiac output from 4.5 ± 0.1 to 2.3 ± 0.1 L/min (P < 0.05), indicating RV failure with altered RV-arterial coupling. As compared to normal control dogs, RV Bax/Bcl-2 mRNA was increased (1.86 ± 0.35 vs. 1.00 ± 0.30; P < 0.05), while LV Bax/Bcl-2 mRNA was not different (1.61 ± 0.41 vs. 1.00 ± 0.30; P > 0.05).

**Conclusion:** An early induction of apoptotic pathways may be involved in persistent RV failure induced by a transient increase in pulmonary artery pressure.

**References:**
4AP9-6
Influence of temperature on the positive inotropic effect of Levosimendan and Dobutamine
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Background and Goal of the study: Levosimendan is a new calcium sensitizing agent with rising clinical use in heart surgery. Due to accumulation of adverse factors patients during open heart surgery are at high risk to develop dysregulation of body temperature. We performed this study to investigate the effect of temperature on the contractile response of myocardial trabeculae to levosimendan in comparison to dobutamine.
Materials and Methods: Guinea pig ventricular trabeculae were placed in an oxygenated HEPES-Buffer and stimulated at a frequency of 1.5 Hz. Trabeculae were randomized to a temperature of 40°C, 37°C, 34°C and 31°C, and levosimendan and dobutamine were stepwise increased from 10⁻⁴ M to 10⁻² M. Maximum developed force was continuously recorded. At the end of each experiment all trabeculae were tested for functional integrity.
Results and Discussion: Results after 26 experiments for levosimendan and 16 for dobutamine revealed a dose dependent positive inotropic effect for both agents. But, the positive inotropic effect of levosimendan proved to be independent of temperature; in contrast, the positive inotropic effect of dobutamine is suppressed by hypothermia. Hypothermia per se induced a positive inotropic effect. Possibly, hypothermia which per se interacts with intracellular calcium homeostasis inhibits the cAMP dependent dobutamine effect, but not the calcium sensitizer levosimendan.

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Levosimendan</th>
<th>Dobutamine</th>
</tr>
</thead>
<tbody>
<tr>
<td>37</td>
<td>120.7 ± 8.5</td>
<td>134.3 ± 7.3</td>
</tr>
<tr>
<td>31</td>
<td>124 ± 17.6</td>
<td>112.4 ± 4.0</td>
</tr>
</tbody>
</table>

Increase of developed force of contraction by levosimendan and dobutamine 10–6 M in percent of baseline ± SD.

Conclusion: Our results suggest no modulation of the positive inotropic effect of levosimendan by the experimental temperature. Acting as a calcium sensitizer instead of cAMP coupled dobutamine, levosimendan might prove to be a favourable positive inotropic substance after cardiopulmonary bypass, if patients show a low-output syndrome during hypothermia.

4AP9-7
Involvement of NOS1 in the Beta3-adrenoreceptor signaling pathway in diabetic cardiomyopathy
A. Birenbaum, J. Amour, P. Michelet, P. Coriat, B. Riou
Hôpital Pitié-Salpêtrière, Paris, France
Background: In the diabetic heart, the positive inotropic response to beta-adrenergic stimulation is markedly altered owing to the negative inotropic effect of beta3-adrenoreceptor(1). The nitric oxide (NO) involved in the beta3-adrenoreceptor signalling pathway is depending on the NO synthase (NOS). The specific NOS isoform of this pathway (NOS1, NOS2 or NOS3), which could be a new therapeutic target, is still unknown in diabetic cardiomyopathy.
Material and Methods: Left ventricular papillary muscles were provided from healthy and streptozotocin-induced diabetic rats. The effect of beta3-adrenoreceptor signaling pathway inhibition on the inotropic response following beta-adrenergic stimulation was investigated using S-cyanopindolol (direct antagonist of beta3-adrenoreceptor), L-NNAME (a non-specific NOS antagonist) or L-NVIO (a specific antagonist of NOS1) at 29°C with 12 pulses/min. Immunoblot experiments were performed within cardiomyocytes. The data are mean percentages of baseline ± SD.

Results and Discussion: In healthy rats, the positive inotropic effect (179 ± 15%) was unchanged by S-cyanopindolol (174 ± 20%) or L-NNAME (183 ± 19%) or LVNIO (179 ± 22%). In contrast, in diabetic rats, the impaired positive inotropic effect (112 ± 5%) was partially restored by S-cyanopindolol (137 ± 8%, P < 0.05), L-NNAME (133 ± 11%, P < 0.05) or LVNIO (129 ± 12%, P < 0.05). NOS isoform expression was exclusively NOS1 in diabetic cardiomyocyte. NOS2 and NOS3 proteins were not expressed in diabetic cardiomyocyte.

Conclusion: The beta3-adrenoreceptor effect which plays an important role in the diabetic beta-adrenergic dysfunction is exclusively mediated by NOS1-derived NO in the diabetic cardiomyocyte. These findings could lead to new therapeutic targets.


4AP9-8
Does clonidine improves post-hypoxic vascular reactivity?
Evaluation on rats isolated aorta
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Anesthesiology, University Hospital UCL -Mont-Godinne, Yvoir, Belgium
Background and Goal of Study: Clonidine (CL), an alpha2-adrenoreceptor agonist, reduces perioperative myocardial ischemia in-patients undergoing surgery.1 In isolated heart model, this class of drugs protects against ischemia. Our experimental study intends to demonstrate that improvement of post-hypoxic vasomotricity is the mechanism underlying this beneficial effect.
Materials and Methods: After animal ethic committee approval, 60 rings aorta (3x20) from 15 different rats were studied according to a validated methodology.2 CL (10⁻⁴ M) was added in two baths (CL Group). Two were used as the control group (CTL Group). After fifteen minutes, all baths were washed and 25 minutes of hypoxia (Po2 < 10 mmHg) was applied. After 40 minutes re-oxygenation (Po2 > 400 mmHg), post-hypoxic vaso-constriction was evaluated by cumulative Phenylephrine (PE) concentrations (10⁻¹²–10⁻⁸ M). Post-hypoxic endothelium-dependent and independent vasodilatations were investigated respectively by cumulative acetylcholine and nitroprusside concentrations (10⁻¹²–10⁻⁴ M) on pre-contracted aorta. The statistical analysis used GEE regression, p < 0.05 significant.

Results and Discussions: In CL group, post-hypoxic endothelium-dependent vasodilatation and vaso-constriction were significantly different from the CTL group (p < 0.002 and p < 0.018, respectively fig 1 and 2). When considering post-hypoxic endothelium-independent no significant difference was found.

Fig. 1: Dose response relationship of post-hypoxic endothelium dependent vasodilatation
Fig. 2: Dose response relationship of post-hypoxic vasoconstriction


Respiration

5AP1-1
Development and test of a new mode of assisted spontaneous ventilation: Chaotic variable pressure support ventilation (noisy PSV)
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Clinic of Anesthesiology and ICU, University Clinic Carl Gustav Carus, Dresden, Germany
Background and Goal of Study: Pressure support ventilation (PSV) combined with intermittent sighs (PSV + Sighs) is widely used when resuming spontaneous breathing, but the resulting respiratory pattern shows low variability if the inspiratory effort is constant. We aimed at implementing and testing a new mechanical ventilation mode that is able to enhance the variability of the respiratory pattern independently of the inspiratory effort.
Materials and Methods: A mechanical ventilator EVITA XL 4 Lab (Dräger Medical AG, Lübeck, Germany) was controlled by an external laptop to vary
pressure support chaotically (noisy PSV). During noisy PSV, pressure support values followed a normal distribution, with mean comparable to traditional PSV and standard deviation set at 1/3 of mean. During PSV + Sighs, sighs were applied with a frequency of 1/min. Tests were performed in 8 pigs with acute lung injury induced by surfactant lavage. Gas exchange, work of breathing, breathing comfort (visual analogue scale), and lung aeration (helical computer tomography - CT - scans at end-expiration, CHRISTIAN Software) were assessed during controlled ventilation (baseline + injury) and after resuming of spontaneous breathing, with both modes (1 hour duration each, random sequence).

Results and Discussions: Surfactant washout resulted in significant deterioration of the pulmonary function. After resuming of spontaneous breathing, pulmonary function improved with both modes, but noisy PSV led to higher PaO2/FIO2, lower AaDO2 and higher breathing comfort than PSV + Sighs (median values: 296.8 mmHg (Q1 174.0–395.2) vs. 216.8 mmHg (Q1–3 152.2–321.2); 309.9 mmHg (Q1–3 272.6–371.2) vs. 350.9 mmHg (Q1–3 301.9–389.9); 35.3 (Q1–3 49–55) vs. 50 (Q1–3 47–51), respectively, p < 0.05). Both modes were associated with comparable distributions of hyper-, normal, hypo- and non-aerated compartments in CT scan analysis, as well as inspiratory pressure-time product and P0.1 values.

Conclusion(s): Noisy PSV restored the variability of the respiratory pattern during assisted spontaneous breathing and was superior to PSV + Sighs with regard to oxygenation and comfort of breathing in this model of acute lung injury. This new mode may prove valuable.

5AP1-2
Volume-controlled versus pressure-controlled ventilation in morbid obesity
A. Parera, R. Hoffmann, J.J. Casas, M.V. Moral
Anaesthology, Hospital de la Santa Creu i Sant Pau, Barcelona, Spain

Background and Goal of Study: Comparison of two different mechanical ventilation modes: volume controlled (VCV) vs. pressure controlled ventilation (PCV) and influence on oxygenation in morbidly obese patients during open laparoscopic surgery.

Materials and Methods: Prospective, randomized cross-over clinical trial in 50 with BMI > 40 kg/m² admitted to open laparoscopic surgery. After randomization of the initial ventilatory mode, VCV(25): VCV and PCV(25): PCV, we performed induction of general anaesthesia. Ventilatory parameters: 12 bpm, FIO2 0.5, and group-related tidal volume or pressure level were set to achieve normoventilation. We analyzed arterial blood gas every 20 min and then changed the ventilatory mode completing 2 VCV and 2 PCV phases. Main variable PO2 and secondary variables: PCO2, ETCO2, parameters of ventilation and hemodynamics were assessed. The results of both techniques in each patient and between groups were compared through an ANOVA. Alpha error of 5% and statistical power of 80%.

Results and Discussions: We observed an increase of PO2 during surgery, an increase of the compliance and a decrease of the airway endurance in both cases. This change could be due to a FRC recovery doing the laparotomy. An increase of the compliance and a decrease of the airway endurance in both lung injury. This new mode may prove valuable.

Conclusions: We found no evidence that any of the two ventilation modes (PCV or VCV) provide a better oxygenation and ventilation to the patients. Nevertheless, we cannot conclude if any of these ventilatory modes may have a more protective effect on the lung than the other in case of extended mechanical ventilation.


5AP1-3
Randomised controlled trial comparing application of PEEP and ZEEP during laparoscopic surgery by electrical impedance tomography (EIT)
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Background and Goal of Study: Pneumoperitoneum (PP) influences respiratory mechanics. This leads to formation of atelectasis and impairment of oxygenation. Application of positive end-expiratory pressure (PEEP) can maintain pulmonary gas exchange. We investigated the effect of anaesthesia, mechanical ventilation and PP on arterial oxygenation and regional ventilation monitored by EIT with and without PEEP.

Materials and Methods: We prospectively randomised 32 consecutive patients (ASA I/II) scheduled to undergo elective laparoscopic cholecystectomy. The patients were randomly assigned to PEEP (10 cmH2O) or ZEEP group (0 cmH2O). The patients were ventilated with constant tidal volume. EIT (Dräger Medical) was performed before the induction of anaesthesia (T0), after induction of anaesthesia and tracheal intubation (T1), after application of the PP (15 mmHg) (T2) and after exsufflation of the PP (T3) during a one minute time interval. We calculated the impedance ratio (IR) (1) to investigate the differences in distribution and homogeneity of ventilation. PaO2 and regional ventilation were compared between both groups. p < 0.05 was considered as statistically significant.

Results and Discussions: Both groups did not differ regarding age, sex, BMI, ASA score, length of surgery and anaesthesia. No significant difference in IR was found between the two groups at T0, whereas the PEEP group showed a more homogenous ventilation. At T1 there was a significant improvement in PaO2 (p = 0.003) and a more homogeneous ventilation (p = 0.001) in the PEEP group. At T2 no significant difference in PaO2 (p = 0.08) was found between both groups, whereas there was a trend towards a better oxygenation in the PEEP group. At T3 we found a more homogeneous distribution of ventilation (p = 0.001) in the PEEP group. There were no significant differences in PaO2 between both groups.

Conclusions: EIT is capable providing a continuous monitoring of the distribution of regional lung volumes under clinical circumstances. The effect of intraoperative PEEP application can be evaluated by dynamic EIT monitoring. PEEP compared to ZEEP preserves arterial oxygenation only after induction of anaesthesia and beginning of mechanical ventilation.


5AP1-4
Effect of continuous positive airway pressure on haemodynamic variables in human volunteers
L. Doraiari, J. Bingham, F. Shivi, R.P. Mahajan
University Department of Anaesthesia and Intensive Care, Queen’s Medical Centre, Nottingham, United Kingdom

Background and Goal of Study: The reported effects of continuous positive airway pressure (CPAP) on systemic haemodynamics are confounded by disease and/or drug therapy. Using the recently introduced Finometer1, we investigated the effects of two levels of CPAP on haemodynamic variables, including heart rate (HR), mean arterial pressure (MAP), cardiac output (CO), stroke volume (SV), total peripheral resistance (TPR) and central arterial compliance (CAC) in healthy awake volunteers.

Materials and Methods: Haemodynamic variables were recorded on beat-to-beat basis using Finometer and beatscope software in 15 healthy male volunteers, aged 19–21 years. In a predetermined order, CPAP of 5 and 10 cm was applied.

Results and Discussion: Evaluation of fixed performance oxygen masks in simulated chronic obstructive airways disease
A. Shah, Q. Siddiqui, J.G. Hardman, I.K. Moppett
Anaesthesia, University of Nottingham, Nottingham, United Kingdom

Conclusions: 1) This is the first study using non-invasive Finometer measurements to evaluate changes in haemodynamic variables with CPAP. 2) The consistency of change in CO and TPR with CPAP can potentially be developed into a test for integrity of autonomic responses.


5AP1-5
Evaluation of fixed performance oxygen masks in simulated chronic obstructive airways disease
A. Shah, Q. Siddiqui, J.G. Hardman, I.K. Moppett
Anaesthesia, University of Nottingham, Nottingham, United Kingdom

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Conclusions: EIT is capable providing a continuous monitoring of the distribution of regional lung volumes under clinical circumstances. The effect of intraoperative PEEP application can be evaluated by dynamic EIT monitoring. PEEP compared to ZEEP preserves arterial oxygenation only after induction of anaesthesia and beginning of mechanical ventilation.

Background and Goal of Study: Previous studies have evaluated the performance of Venturi masks in volunteers and face models with simulated normal respiration but not with abnormal respiration as may occur in chronic obstructive pulmonary disease (COPD). We assessed the effects of simulated COPD breathing patterns on Venturi mask performance.

Materials and Methods: The breathing patterns of normal adult subjects and patients with acute exacerbations of COPD were simulated in our Human Patient Simulator (METI Inc.). Spirometric and end-tidal CO2 values were matched to clinical data, all measured using a calibrated Datex-Ohmeda Capnomac. Three different fixed-performance masks (Flexicare Venturi (F1), Flexicare Ventimask (F2) and Intersurgical Venturi (I)) were applied to the face and oxygen was supplied with the manufacturers’ recommended flow rates. FiO2 was measured at the lips and in the larynx for each of the masks. All measurements were made 3 times after 3 minutes of steady conditions.

Results and Discussions:

Table 1:

<table>
<thead>
<tr>
<th>Set FiO2</th>
<th>Normal FiO2 (lips/larynx)</th>
<th>COPD FiO2 (lips/larynx)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F1</td>
<td>F2</td>
</tr>
<tr>
<td>24%</td>
<td>24/25</td>
<td>24/24</td>
</tr>
<tr>
<td>28%</td>
<td>28/28</td>
<td>28/27</td>
</tr>
<tr>
<td>35%</td>
<td>34/36</td>
<td>34/32</td>
</tr>
<tr>
<td>50%</td>
<td>48/52</td>
<td>48/58</td>
</tr>
</tbody>
</table>

Variation of FiO2 was trivial between experiments (<1%). Measured FiO2 was close to desired values up to 40% for each mask, but only one (F2) was close at 60%. Simulated COPD respiration caused a clinically significant reduction in FiO2 in two of the masks, whereas F2 was relatively unaffected.

Conclusions: Even if Venturi masks perform acceptably under normal conditions, abnormal ventilation may cause clinically significant changes in performance.

References:
2 Cox D, Gilbe C. Anaesthesia 1981; 36: 958-64.

5AP1-7

Differences in the gas distribution in volume controlled ventilation compared to pressure controlled ventilation in a multialveolar lung model

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Background and Goal of Study: Exits quite a controversy as to whether ventilate a patient with pressure controlled ventilation (PCV) over volume controlled ventilation (VCV). The goal was to determine if PCV offers advantages in terms of pressure and alveolar distribution in a multialveolar compartment lung model compared to a VCV.

Materials and Methods: The lung model was a passive simulator with 3 compliances of 25 or 12.5 ml/cmH2O and 4 resistances of 5 and 20% 10 cmH2O/sec. A total of 64 situations were simulated. We used as respirator the TEMEL Supra –GA. The inspiratory setting was: open circuit, of 500cc, V E 1.2, RR of 10 breaths/min and ZEEP. The flow in the VCV was 80 l/min. The pressure in the VCP was the lower to reach the tidal volume fixed. We used an endotracheal tube of 7.5 ID.

Results and Discussions:

Table 1:

<table>
<thead>
<tr>
<th></th>
<th>VCP</th>
<th>VCV</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOUHT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paw peak</td>
<td>18</td>
<td>4</td>
</tr>
<tr>
<td>Paw plateau</td>
<td>10.2</td>
<td>1.5</td>
</tr>
<tr>
<td>Paw mean</td>
<td>5.6</td>
<td>0.6</td>
</tr>
<tr>
<td>tFlow = 0</td>
<td>0.7</td>
<td>0.6</td>
</tr>
<tr>
<td>IFP</td>
<td>1.3</td>
<td>0.1</td>
</tr>
<tr>
<td>ALVEOL 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P5 initial</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td>IFP initial</td>
<td>0.3</td>
<td>0.1</td>
</tr>
<tr>
<td>tFlow = 0 real</td>
<td>0.3</td>
<td>0.1</td>
</tr>
<tr>
<td>ALVEOL 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P5 initial</td>
<td>8.3</td>
<td>2.7</td>
</tr>
<tr>
<td>IFP final</td>
<td>0.3</td>
<td>0.1</td>
</tr>
<tr>
<td>tFlow = 0 real</td>
<td>0.3</td>
<td>0.1</td>
</tr>
<tr>
<td>ALVEOL 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P5 initial</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>IFP final</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>tFlow = 0 real</td>
<td>0.3</td>
<td>0.2</td>
</tr>
</tbody>
</table>

*p < 0.05 *** p < 0.01

We also calculated the flowback and the gas distribution parameters based on the studies made by Hedenstierna calculating the initial and final distribution. The PCV group obtained worse results compared to the VCV group.

Conclusion(s): PCV does not offer advantages over the VCV in terms of alveolar pressure, which is harmful to the lung; obtaining worse results in the redistribution parameters. The VCV guarantees a tidal volume fixed, whereas the PCV maintains a constant pressure, but the tidal volume turns on the compliance and resistance and may create a situation of hypoventilation.

5AP1-8

Analysis of the dynamic airway pressure concavity and distribution of lung aeration in piglets

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Background and Goal of Study: The institution of a protective ventilatory strategy in anesthetic conditions seems to be difficult, since the compromise between the best oxygenation with less hemodynamical and ventilatory effects, is not commonly satisfied. This work aims to evaluate the usefulness of the shape of the dynamic airway pressure (Pawdyn) concavity as a guide to set positive end-expiratory pressure (PEEP) in order to institute a ventilatory strategy to minimize the lung mechanical stress.

Materials and Methods: Twelve healthy piglets (17–23 Kg), laying supine position were anesthetized and mechanically ventilated with a square flow waveform. A PEEP titration from 16 to 0 cmH2O, in steps of 4 cmH2O, was performed and the airway pressure (Paw) and flow (F) signals were recorded. In six animals, helical CT-scans were obtained during end-expiratory (EEP) and end-inspiratory pauses (EIP) at each PEEP. Two mechanical models were fitted to the data: Paw = E2V2 + E1V + R.F + P0 (V is volume, P0, E1, E2 and R are constants) and Paw = a.t2 + c (t is the inspiratory time, a, b and c are constants). The %E2 (%E2 = 100.[E2V2/ (E2 + E1)], where V is the tidal volume) and b were employed to assess the concavity of the Pawdyn and compared to the radiological evidences of tidal recruitment and overdilatation. A Wilcoxon signed rank test for paired samples was applied to compare changes in %E2 and %b and lung aeration between end-expiration and end-inspiration at each PEEP value. A P < 0.05 was considered significant.

Results and Discussions: Hyperinflated areas decreased as PEEP was reduced from 16 cmH2O to 0 cmH2O (24–62% to 1–7% at EEP and 44–73% to 4–17% at EIP) whereas normally aerated areas increased (30–66% to 72–83% at EEP and 19–48% to 73–77% at EIP). From 16 to 8 cmH2O, %E2 and b were positive (upward Pawdyn concavity) suggesting tidal overdilatation and decreased concurrently with tidal hyperventilation. A straight Pawdyn was obtained at PEEP of 8 cmH2O. At PEEP < 4 cmH2O, %E2 became negative and %b < 0.9 (downward Pawdyn concavity), suggesting tidal recruitment with an increase of tidal re-aeration.

Conclusion(s): The PEEP that resulted in a linear Pawdyn curve in mechanically ventilated healthy piglet maximized normally aerated areas and minimized tidal hyperventilation and re-aeration. This Pawdyn value is likely associated with minimal mechanical stress.

5AP2-1

Inhaled carbon monoxide (iCO) prevents LPS-induced impairment of hypoxic pulmonary vasoconstriction (HPV) in mice

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Background and Goal of Study: Pulmonary vasoconstriction in response to hypoxia (HPV) is frequently impaired in patients with sepsis or the acute respiratory distress syndrome (ARDS) or in animal models of endotoxemia. Recently, inhaled carbon monoxide (iCO) has been shown to elicit anti-inflammatory effects and to be beneficial in animal models of lung injury. Therefore, we hypothesized that iCO may prevent the development of impaired HPV during sepsis.

Materials and Methods: The pulmonary vasoconstrictor response to hypoxia (ΔPAP) was quantified in an isolated, perfused and ventilated mouse lung model (1). Groups of LPS-pretreated and untreated control mice were exposed to 21 hours of 0, 50, 125, 250, and 500 ppm iCO in air (n = 5-8 each), respectively. Moreover, CO-Hb blood levels were measured before lung perfusion experiments. To further study the effects of increased CO-Hb levels on HPV responsiveness following CO exposure, additional groups of mice were exposed to 500 ppm iCO in 50% O2. Groups were compared by ANOVA followed by a LSD post hoc analysis.
Results and Discussions: LPS pretreatment caused a significant reduction in ΔPAP ([mean ± SD]: LPS: 7 ± 5% vs. control: 55 ± 5%; p < 0.05). There was no effect of ICO exposure on ΔPAP in untreated control animals. Exposure of LPS-pretreated mice to 50 ppm ICO completely prevented the development of impaired HPV (ΔPAP 49 ± 21%; p < 0.05 vs. LPS). However, this effect vanished with increasing ICO doses and was absent at 500 ppm ICO (ΔPAP 12 ± 8%). This was associated with increasing CO-Hb blood levels, but could be overcome by reducing these by exposure with 500 ppm ICO in 50% O2 (ΔPAP 60 ± 18%).

Conclusions: Here we showed that low dose ICO inhalation may prevent LPS-induced impairment of HPV in mice. Of interest, this effect vanished with increasing doses of ICO. Our data further suggest, that high CO-Hb levels associated with CO exposure may counteract the beneficial effects of ICO during sepsis.

Reference:

5AP2-2
Inhibition of Kv channels by 4-aminopyridine restores impaired hypoxic pulmonary vasoconstriction (HPV) in endotoxemic mice
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Department of Anaesthesiology, University of Heidelberg, Heidelberg, Germany

Background and Goal of Study: Voltage-gated potassium (Kv) channels play a central role in mediating hypoxic pulmonary vasoconstriction (HPV)(1). HPV is impaired during inflammatory lung processes such as pneumonia or the acute respiratory distress syndrome. The aim of this study was to determine if inhibition Kv channels by 4-aminopyridine (4-AP) may restore this impairment of HPV during sepsis.

Materials and Methods: The effects of 0.01, 0.1, and 1.0 mM of the Kv channel inhibitor 4-AP on HPV responsiveness were assessed in isolated lungs of untreated mice and of mice 18 hours after LPS injection (20 mg/kg E. coli 0111:B4 LPS i.p.). HPV was quantified as the increase in perfusion pressure in response to hypoxic ventilation in percent of baseline perfusion pressure (ΔPAP) (2). Moreover, intrinsic pulmonary vascular resistance (R0) and pulmonary vascular distensibility (δ) were determined by non-linear regression analysis of pulmonary vascular pressure-flow (P/Q) curves generated during normoxic and hypoxic ventilation, respectively.

Results and Discussions: HPV was impaired in lungs isolated from LPS-challenged mice. Addition of 4-AP to the perfusate had no effect on baseline PAP and the HPV response in untreated mice, but dose-dependently restored HPV in LPS-treated animals. Analysis of pulmonary vascular P/Q curves revealed that 4-AP (1μM) counteracted the observed LPS-induced changes in vascular distensibility (δ) and intrinsic vascular resistance (R0) under normoxic conditions, and (ii) augmented the hypoxia-induced increase in intrinsic vascular resistance (R0).

Conclusions: These results suggest that Kv channels play a critical role in LPS-induced pulmonary hypoxic vasoresponsiveness to hypoxia, and that this impaired HPV can be restored by the Kv channel inhibitor 4-AP in murine endotoxemia.

References:

5AP2-3
The protective role of carbon monoxide in ventilator induced lung injury
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Background and Goal of Study: Ventilator induced lung injury (VILI) still remains a major cause of death in intensive care medicine. Carbon monoxide (CO) has been shown to exert anti-inflammatory, anti-oxidative, and anti-proliferative effects. Here, we hypothesized that CO might reduce lung injury during mechanical ventilation.

Materials and Methods: C57/BL6 mice (n = 5/group) were ventilated with 12 ml/kg tidal volume for 1, 4, and 8 h, with room air or air + 250 ppm CO. Control mice were sham operated. Blood samples were taken to measure blood gases, bronchoalveolar lavage (BAL) and lung tissue were analyzed to determine total cell and neutrophil count, cytokine release, and heat shock response, respectively.

Results and Discussions: Mechanical ventilation without CO led to an increase in neutrophil and total cell count in BAL after 4 and 8 h (p < 0.05) of ventilation as compared to sham. Furthermore, heat shock protein 70 and heme oxygenase-1 were up regulated in lung tissue. In contrast, additional CO-application attenuated the augmentation of neutrophil and total cell count (p < 0.05) in BAL as well as the up regulation of heat shock proteins during ventilation. These findings show that CO reduces lung injury that results from mechanical ventilation. Most interestingly, while the ventilation-induced IL-6 release was decreased in the presence of CO in the BAL, tissue levels of IL-6 were further increased by CO treatment as compared to ventilation alone. This data indicates that CO might disturb neutrophil migration and cytokine release into the alveolar space.

Conclusion(s): 1) VILI occurs even with tidal volumes as low as 12 ml/kg that are used in clinical routine. 2) CO in low dose decreases lung injury that is observed with ventilation alone. 3) We suggest that the protective mechanism involves the inhibition of neutrophil migration and cytokine release by CO.

5AP2-4
Indirect markers of pulmonary endothelial dysfunction correlate with high-altitude induced pulmonary hypertension
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Department of Anesthesiology, University of Heidelberg, Heidelberg, Germany

Background and Goal of Study: Hypoxia-induced pulmonary hypertension plays a major role in the pathophysiology of hypoxic pulmonary edema formation (e.g. high-altitude pulmonary edema; HAPE). We hypothesized that the rise in pulmonary artery pressure (PAP) during hypoxic exposure is related to impaired pulmonary endothelial function with reduced nitric oxide and enhanced endothelin-1 (ET-1) bioavailability.

Materials and Methods: 34 participants were investigated at low altitude (110 m) and after rapid ascent to high altitude (~24 hours to 4559 m). 3-4 hours after arrival at high-altitude blood samples were drawn via a central venous and a radial artery catheter, respectively, for determination of plasma nitrite (measured by flow injection analysis technique), plasma ET-1 (measured by radiomunoassay), and plasma catecholamines (noradrenaline, adrenaline measured by HPLC). Systolic PAP (PASP) was estimated by transthoracic doppler-echocardiography, and chest radiography was used to diagnose pulmonary edema. In subjects developing HAPE the presented data were collected before the onset of edema formation. Data are expressed as Mean ± SEM, a p-value < 0.05 indicates statistical significance.

Results and Discussion: After ascent to high altitude arterial PaO2 decreased to 38 ± 0.5 mmHg (p < 0.001) and PASP increased from 23 ± 0.7 mmHg to 37 ± 2 mmHg (p < 0.001). HAPE developed in 4 participants. Central venous ET-1 plasma levels increased about 3-fold (p < 0.001) while plasma nitrite remained stable (p = 0.331). At low altitude arterial-central venous (ACV) plasma gradients were negative for ET-1 and positive for nitrite (p < 0.001) 
They reversed after ascent to high-altitude (p < 0.05) and significantly correlated with PASP (ET-1: R = 0.49, p < 0.001; nitrite: R = −0.21, p < 0.05). ACV plasma gradients of ET-1 and plasma nitrite showed an inverse correlation (R = −0.48; p < 0.001), indicating a reciprocal regulation. Central venous plasma levels of noradrenaline and adrenaline increased about 2-fold (p = 0.001 and 1.6-fold (p < 0.05), respectively, but showed no correlation with PASP (p = 0.118 and p = 0.594).

Conclusion: These results indicate that an impairment of pulmonary endothelial function with a shift in the balance between plasma ET-1 and nitric oxide is of major significance for hypoxia-induced pulmonary hypertension.

5AP2-5
A development of a warm lung ischemia-reperfusion experimental study model in pigs
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2nd Department of Anaesthesia, Attikon Hospital, University of Athens, Athens, Greece

Background and Goal of Study: Lung ischemia-reperfusion injury (IRI) is a severe pathophysiological consequence of lung transplantation, cardiopulmonary bypass and pulmonary sleeve resection, leading to increased morbidity and mortality(1). The exact pathways leading to IRI are not fully elucidated while efforts are made for new therapies(2). The scope of this study is the description of an experimental model of warm lung ischemia-reperfusion injury in pigs for further investigation of the pathophysiology and potential therapeutic strategies in this model.

Materials and Methods: Seven domestic pigs were undergone general anaesthesia with conventional mechanical ventilation (tidal volume: 8-10 ml/kg, zero positive end-expiratory pressure), followed by thoracotomy, occlusion of the
left pulmonary artery for 90 min and subsequent reperfusion for 3 hours. During observation period haemodynamic parameters, respiratory mechanics and blood gases were monitored. Statistical analysis was made by Student's t-test or Mann-Whitney test. Data are expressed as mean ± standard deviation.

**Results and Discussions:** Mean arterial, central venous, and pulmonary capillary wedge pressures decreased both after ischemia and after reperfusion. No differences were found in PaCO₂, mean pulmonary artery pressure and cardiac output after ischemia or after reperfusion compared to baseline. The ratio PaO₂/FiO₂ decreased at the end of reperfusion (297 ± 89 mm Hg after reperfusion, vs. 609 ± 197 mm Hg baseline, P < .05). Significant increase in pulmonary vascular resistance (dyne·sec·cm⁻²) both after ischemia (254 ± 157 baseline vs. 330 ± 155 after ischemia, P < .05) and after reperfusion (344 ± 156, P < .05 compared to baseline) was observed. Dynamic pulmonary compliance (mL/cmH₂O) reduced after ischemia (22 ± 4 baseline vs. 18 ± 2 after ischemia, P < .05) and after reperfusion (17 ± 2, P < .05 compared to baseline).

**Conclusion(s):** This experimental model provides a fairly reproducible experimental model of lung warm ischemia-reperfusion injury in pigs for further investigation in the era of LIRI.

Reference:


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**5AP2-6**

**Effects of metabolic or hypercapnic acidosis on contractile and energetic properties of diaphragm muscle**

P. Michelet, S. Jaber, G. Orliaguet, B. Riou, O. Langeron

**Département d’Anesthésie Réanimation, Hôpital de la Pitié Salpêtrière, Paris, France**

**Background and Goal of Study:** Acidosis, a common feature in several clinical diseases, adversely affects respiratory muscle function. Nevertheless, metabolic or respiratory (i.e. hypercapnic) acidosis could induce different effects on diaphragmatic contractility. The aim of this study was to compare the effects of a metabolic and a hypercapnic acidosis on cross-bridge (CB) and energetic properties of rat diaphragm.

**Materials and Methods:** In vitro contractile and energetic properties were measured from ventral diaphragm strips obtained from 4 mo old male Wistar rats submitted to acute metabolic (reduced bicarbonate bath, n = 12, pH = 7.00 ± 0.02) or hypercapnic acidosis (n = 12, pH = 7.00 ± 0.03) for a 20 min period. After stabilization of contractility properties, the diaphragm strips were submitted to fatigue conditions (up to 60% of the maximum active force in tetanus), then a recovery period of 20 mins was observed. Calculations of muscle energetic and characteristics of cross-bridge properties were determined from standard Huxley equations. Data were expressed as mean ± SD and comparison between groups was performed by t-test.

**Results:** Compared to baseline values, hypercapnic acidosis rats were characterized by a decrease in active force (110 ± 25 vs 172 ± 13 mN · mm⁻², p < 0.05) associated with a decrease in the total number of CBs per sectional area (13 ± 3 vs 20 ± 2.10³ ± 2. mm⁻², p = 0.05). In contrast, no significant changes were observed in the metabolic group. This impairment was associated with a decrease in maximal unloaded shortening velocity in the hypercapnic group (3.9 ± 0.8 vs 5.6 ± 0.9 Lm/sec · s⁻¹, p < 0.05). After fatigue, hypercapnic group showed a lower recovery in active force compared with metabolic group (81 ± 11 vs 97 ± 5 % of pre-fatigue values, p < 0.05).

**Conclusion(s):** At the same external pH value, compared with a metabolic acidosis, a hypercapnic acidosis is associated with a greater impairment in contractility properties and a reduced recovery capacity.

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**5AP2-7**

**Effect of ageing on the contractilities properties and recovery of fatigue in the rat diaphragm**

P. Michelet, N. Salvy, G. Orliaguet, B. Riou, O. Langeron

**Département d’Anesthésie Réanimation, Hôpital de la Pitié Salpêtrière, Paris, France**

**Background and Goal of Study:** Ageing is associated with an alteration of contractile force in the senescent rat. The β₂-adrenoceptor agonists are widely used in the treatment of chronic respiratory disease. The aim of this study was to investigate whether β₂-adrenoceptor stimulation improves contractile properties of senescent rat diaphragm during tetanic stimulation and on fatigue recovery.

**Materials and Methods:** Effect of β₂-adrenoceptor stimulation by Terbutaline (10⁻⁴ M) on contractile function of ventral diaphragm strips obtained from 24 mo old male Wistar rats were studied, in vitro (Krebs-Henseleit solution, 29°C, pH 7.40, Ca⁺² 2.5 mmol). After stabilization of contractility properties (T₀), the diaphragm strips were submitted or not (n = 10 per group) to β₂-stimulation (T₁), to fatigue conditions (to 60% of the tetanic tension, F) after a recovery period of 15 mins was observed (R₁, R₂ and R₃, respectively after 5, 10 and 15 mins of recovery). Data were expressed as mean ± SD and comparison between groups was performed using ANOVA.

**Results:** β₂-adrenoceptor stimulation resulted in an improvement of active force (AF) during tetanic stimulation and a greater recovery after fatigue (Figure).

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**5AP2-8**

**Effect of beta2-adrenoceptor stimulation on contractile properties and fatigue recovery in senescent rats**

P. Michelet, J. Amour, G. Orliaguet, B. Riou, O. Langeron

**Département d’Anesthésie Réanimation, Hôpital de la Pitié Salpêtrière, Paris, France**

**Background and Goal of Study:** Ageing is associated with an alteration of contractile force in the senescent rat. The β₂-adrenoceptor agonists are widely used in the treatment of chronic respiratory disease. The aim of this study was to investigate whether β₂-adrenoceptor stimulation improves contractile properties of senescent rat diaphragm during tetanic stimulation and on fatigue recovery.

**Materials and Methods:** Effect of β₂-adrenoceptor stimulation by Terbutaline (10⁻⁴ M) on contractile function of ventral diaphragm strips obtained from 24 mo old male Wistar rats were studied, in vitro (Krebs-Henseleit solution, 29°C, pH 7.40, Ca⁺² 2.5 mmol). After stabilization of contractility properties (T₀), the diaphragm strips were submitted or not (n = 10 per group) to β₂-stimulation (T₁), to fatigue conditions (to 60% of the tetanic tension, F) after a recovery period of 15 mins was observed (R₁, R₂ and R₃, respectively after 5, 10 and 15 mins of recovery). Data were expressed as mean ± SD and comparison between groups was performed using ANOVA.

**Results:** β₂-adrenoceptor stimulation resulted in an improvement of active force (AF) during tetanic stimulation and a greater recovery after fatigue (Figure).

**Conclusion(s):** These results demonstrate that ageing is associated with an impairment of diaphragmatic contractile function associated with impairment in fatigue recovery.
Conclusion(s): The β₂-adrenoceptor stimulation partially reverse the impairment of contractile force associated with ageing and improve the fatigue recovery in senescent rat diaphragm.

5AP3-1
Evaluation of respiratory resistance, central drive and muscle capacity in early postoperative period after spinal and general anaesthesia
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Background and Goal of Study: Considering influence of anesthesia on respiratory system there is a lack of data regarding simultaneous evaluation of ventilation determinants – respiratory resistance, central nerve output and capacity of muscle pump. Aim of the study was to analyze differences of mechanisms by which lung ventilation may be compromised in early postoperative period after spinal and general anesthesia. In group of general anesthesia there was a substantial reduction of muscle strength: spinal anesthesia was accomplished. In group of general anesthesia there was a lack of data regarding simultaneous evaluation of ventilation determinants whereas measurement of both maximal muscle efforts (PmaxEx, PmaxIn) and central output (P0,1) were obtained by occlusion technique (Mastersplint, Jaeger). Examination of respiratory impedance was performed in patients undergoing general (n = 14) and spinal (n = 11) anesthesia for open abdominal surgery once prior operation and again within the first hour following one. In all calculations we used parameters expressed as percent of predicted value. 95% confidence interval for means of differences was estimated. Agreement among methods (p ≥ 0.05).

Results and Discussions: By the end of general anesthesia respiratory impedance increased by 47.4% (16.8; 77.9) versus 19.8% (9.0; 34.4) when spinal anesthesia was accomplished. In group of general anesthesia there was a substantial reduction of muscle strength: PmaxIn decreased by 21.4% (−32.4; −10.3), PmaxEx decreased by 49.7% (−70.2; −29.1). Spinal anesthesia didn’t affect inspiratory efforts (PmaxIn = −4.7% [−21.4; 12.0]) and central output but expiratory muscle dysfunction was observed: PmaxEx decreased by 21.7% (−37.7; −5.8). There was a weak tendency of increasing of P0,1 in group of general anesthesia: P0,1 increased by 7.1% (−9.4; 23.7).

Conclusion(s): Abdominal surgery combined with general anesthesia produces profound effect on respiratory system in particular disturbing respiratory mechanics and muscle efforts while combination of spinal anesthesia with similar surgical settings has lesser impact limited by expiratory muscle dysfunction.

5AP3-2
Hyperoxic ventilation reduces oxygen consumption of healthy volunteers and anesthetized patients
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Background and Goal of Study: Ventilation with pure oxygen (hyperoxic ventilation; HV; FiO2 1.0) has been described to decrease whole body oxygen consumption (VO2) in unanesthetized patients 1,2. This decrease of VO2 has been determined by the reverse Fick method based on data obtained by measurements of diaphragmatic strength using different methods and other options are needed (2,3). The goal of study was to determine VO2 during normoxic and hyperoxic ventilation with a modified metabolic monitor designed for this purpose (Oxycon Pro, Viasys, Würzburg).

Results and Discussions: After government approval 14 healthy volunteers and 14 anesthetized patients (ASA I) sequentially breathed room air (FiO2 0.21), pure oxygen (FiO2 1.0), and room air (FiO2 0.21) again. Oxygen consumption (VO2), the respiratory quotient (RQ), and energy expenditure (EE) were determined for each time point by indirect calorimetry using a modified metabolic monitor designed for this purpose (Oxycon Pro, Viasys, Würzburg).

Conclusions: Pre-oxygenation in the 45° sitting up position does not improve levels of tissue oxygenation in young healthy non-obese volunteers.

Reference:

5AP3-3
Pre-oxygenation in healthy volunteers: a randomised cross-over study comparing supine and 45° seated position
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Background and Goal of the study: Pre-oxygenation in the sitting up position has been associated with better oxygenation [1]. The aim of this study was to compare oxygenation in the supine position with the 45° seated position in young, healthy volunteers.

Materials and Methods: Research ethics approval and informed consent was obtained for this controlled cross-over study; inclusion criteria were age 18–30 years, BMI <30 and an ASA score <2. Oxygen was administered through a circle system and a tight fitting face mask. Volunteers were randomised to order of positions. Transcutaneous PO2 (tcPO2) levels were recorded by a TCM400 (Radiometer, Copenhagen) at 10 s intervals from 2 measurement points. tcPO2 measurements were recorded after 5 min of oxygenation in supine and seated position. Values are mean (SD), Paired T tests were performed. Sample size was based on difference of 40 mmHg (SD 83), alpha error 0.05 and beta error 0.83.

Results and Discussion: There was balance of gender (20/20), age 21.5 yrs (1.3), BMI 23.4 kg/m2 (2.4), peak expiratory flow rate 584.5 l/min (101.8) and SpO2 98.1 (0.5).

Conclusions: Pre-oxygenation in the 45° sitting up position does not improve levels of tissue oxygenation in healthy young non-obese volunteers.

Reference:

5AP3-4
Measurements of diaphragmatic strength using different abdominal and thoracic pressures
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Background and Goal of Study: Maximal Transdiaphragmatic pressure (Pdmax) is used to measure diaphragmatic strength. It is determined with oesophageal and gastric balloons, often with a sniff manoeuvre (1), but these are not handy methods and other options are needed (2,3). The goal of study was to determine the validity of alternative pressures to measure Paniff.

Materials and Methods: Preoperatively, 8 patients scheduled for major abdominal surgery were asked to perform a maximal sniff manoeuvre (Paniff) from FRC in supine position. The manoeuvre was performed 3 times, always with the same command. Central venous (Pcv), oesophageal (Poes), gastric (Pga), vesical (Pves) and rectal (Prect) pressures were recorded. Paniff was determined as (absolute values): 1/Pes + Pga; 2/Pcv + Prect; 3/Pcv + Pves. Intraclass Correlation Coefficient (ICC) was used to compare Pdmax measurement.

Results and Discussion: Paniff values were (mean ± SD, cmH2O): Pes + Pga, 64 ± 20; Pcv + Prect 58 ± 25; Pcv + Pves, 58 ± 25. ICC showed agreement among methods (p < 0.01).
5AP3-5

The effect of step-changes in inspired partial pressure and ventilation-perfusion mismatch on end-tidal, arterial and brain partial pressures of sevoflurane

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Background and Goal of Study: The end-expiratory partial pressure of inhaled anaesthetic agent is used as a surrogate for effect-site partial pressure to monitor depth of anaesthesia. Previous clinical work has shown that an end-expired to arterial partial pressure difference exists [1, 2]; this risks under- or overdosage. The end-expiratory to effect-site gradient has not been studied and quantified for different patterns of ventilation-perfusion (VQ) mismatch and with changes in inspired partial pressure.

Materials and Methods: Three virtual patients with distinct VQ distributions but otherwise identical were configured within the Nottingham Physiology Simulator. The measured physiological deadspace and venous admixture of the 3 patients were mild (11.6% & 1.6%, respectively), moderate (19.5% & 7.8%) and severe (32.9% & 36%). Each patient underwent the following clinically-based protocol: 8% inspired sevoflurane (Pi) for 1 min, 3% for 4 min, 2% for 15 min, 1% for 2 min, 3% for 2 min and 0% for 10 min. During this 45 min period, inspired, end-expired, arterial and brain partial pressures of sevoflurane were recorded every 5 seconds.

Results: Substantial differences (up to 1.4 kPa) between arterial and end-tidal sevoflurane partial pressure were observed, and these were largest soon after step changes in Pi. Significant differences (up to 3.3 kPa) were observed between brain and end-tidal partial pressures; again, these were largest soon after step changes in Pi. The severe VQ defect caused larger differences between arterial and end-tidal partial pressures than the mild defect (up to 7.6 times larger). The severe VQ defect also magnified the brain to end-tidal gradient, but this effect was less marked (up to 1.8 times larger). Following a step change in Pi, the difference between brain and end-tidal partial pressure was slower to return to zero in the presence of the severe defect.

Conclusions: End-tidal sevoflurane partial pressure variability represents brain partial pressure. Step changes in inspired sevoflurane and VQ mismatch increase this gradient, risking overdosage of inhaled anaesthetic and awareness.

References:

5AP3-6

Monitoring FRC by the oxygen washout technique during alveolar De- and Re-recruitment

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Background and Goal of Study: Assessing alveolar recruitment may help to guide respiratory therapy in intensive care medicine. The method of functional residual capacity (FRC) evaluation by oxygen washout is applicable routinely at bedside. We studied the course of FRC after alveolar De-recruitment and Re-recruitment.

Materials and Methods: The LUFU system (Dräger Medical, Luebeck, Germany) estimates FRC by oxygen washout, a variant of multiple breath nitrogen washout. A sidestream O2-analysers calculates FRC from the end-inspired- and end-expired O2 concentrations during fast changes of FiO2.

After approval of the local ethics committee and written informed consent we measured FRC nine times (measuring interval 4-6 min) in postoperative cardiac surgery patients during 6 hours after surgery; 3 times before (the mean is defined as basal value [pre]), 3 times after (t4, t5, t6) a standard suctioning procedure with disconnection of the ventilator (20 sec, 14F catheter, 200 mmHg negative pressure), and 3 times (t7, 18, 19) after a standard recruitment maneuver (RM) (PEEP 15 mbar, PIP 35–40 mbar for 30 sec). Patients were ventilated with biphasic airway pressure (PEEP = 10 mbar). Arterial blood gases were analysed before (pre) and after suctioning (t6), and after RM (t9).

Results and Discussion: 17 patients were studied. FRC decreased after suctioning (pre: 3.4 ± 1.1 L); t4: 3.0 ± 1.1 L (p < 0.010); t5: 3.1 ± 1.2 L (p = 0.047). No differences compared to baseline values could be detected after RM (t7: 3.4 ± 1.2 L (p = 0.957); t8: 3.3 ± 1.1 L (p = 0.332). Ratio of PaO2 and FiO2 increased after RM (pre: 373 ± 102; t6: 359 ± 98; t9: 408 ± 109; p < 0.0001) and arterial pCO2 decreased after RM (pre: 38.3 ± 5.6 mmHg; t9: 38.3 ± 5.0 mmHg; p = 0.013).

Conclusion(s): Alveolar De-recruitment and Re-recruitment could be detected in postoperative patients by monitoring FRC. Routine measurements of FRC might be of considerable interest in ventilated patients.

References:

5AP3-7

Is surgery a chance to really quit smoking?

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Background and Goal of Study: Scheduling elective surgery favours smoking cessation. Within a prospective cohort study of risk factors for postoperative complications related to smoking in Catalonia (ARISCAT) we investigated the characteristics of patients who had quit smoking spontaneously three months after surgery.

Materials and Methods: We conducted a cross-sectional multicentre study collecting pre-, intra- and postoperative information on patients aged over 18 years undergoing surgery (excluding obstetrics) under general or regional anaesthesia. Information on smoking habits was recorded before surgery. Three months after surgery, information on changes in smoking habits was obtained by phone. Statistical analyses were performed with a χ2 test for qualitative variables and a t test for quantitative ones. Data are presented as mean ± standard deviation and percentage.

Results and Discussions: From 1966 patients analysed we selected persons who were smokers at the time of surgery (422; 21.4% of all participants). There were 263 men (62.3%) and 159 women (37.7%) with a mean ± standard deviation age of 44.3 ± 15.02 years; 89.8% were ASA 1–2 and 9.9% had been diagnosed with chronic lung disease before surgery. The majority underwent elective surgery (86.5%) with hospital admission (77.5%). Three months after surgery 13.6% of the patients had quit smoking and 29.9% had reduced daily consumption. Variables that were significantly related to smoking cessation were: mean age (non-smokers, 49.6 years; smokers, 43.6 years; p = 0.007); ASA ≥ 3 (21.6% vs. 8%, p = 0.003); mean pack-years (29.7 ± 16.8 vs. 24.7 ± 14.57; p = 0.025); chronic lung disease (19.6% vs. 8.4%; p = 0.012); hospitalization (88.2% vs. 75.5%; p = 0.048); duration of surgery (2.1 ± 1.48 vs. 1.6 ± 1.38 hours; p = 0.020); intra- and postoperative complications (29.4 [20%] vs. 12.4 [9.9%]; p = 0.001); and duration of hospital stay (6.4 ± 7.47 vs. 3.0 ± 6.06 days; p = 0.003).

Conclusion(s): The perioperative period is a good moment to encourage a patient to quit smoking. Certain variables are related to success: older age and higher ASA score, heavier smoking, previous lung disease, intra- and postoperative complications, and longer postoperative hospital stay.

5AP3-8

Is it applicable to use the FEV1/FEV6 ratio for the preoperative assessment severity of COPD in elderly patients

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Figure shows an example of Psnif pattern recorded.
Background and Goal of Study: Spirometry can be used to determine agreement between FEV1/FEV6 ratio and FEV1/FVC ratio by using ROC-curve analysis and Kappa-statistics during the preoperative assessment in COPD elderly patients.

Materials and Methods: 387 participants in Al Ain Hospital, UAE aged 60 years or more with acceptable spirometry. Mean differences between FEV1/FEV6 ratio (%) and the FEV1/FVC ratio (%) were calculated according to age, sex, smoking habit, and the degree of airflow limitation. The mean difference between FEV1/FEV6% and FEV1/FVC% was 2.7% in both men and women.

Results and Discussions: The value for the FEV1/FEV6 ratio which best predicted an FEV1/FVC ratio of 70%, was 73%, and two cut-off values (kappa = 0.86). As Vandevorde & coauthors, we found FEV1/FEV6 cut-off of 73% to be the substitution for the used FEV1/FVC threshold of 70%.

| Table 1. Prevalence, sensitivities, and specificities of thresholds of the FEV1/FEV6 ratio in predicting FEV1/FVC < 70% |
|-----------------------------------|-----------------|-----------------|
| FEV1/FEV6 ratio                | Sensitivity | Specificity |
| <72%                           | 0.82         | 0.99          |
| <73%                           | 0.89         | 0.97          |
| <74%                           | 0.93         | 0.92          |
| <75%                           | 0.96         | 0.86          |

Prevalence of FEV1/ FVC<70% (kappa=0.86). As Vandevorde & coauthors, we found FEV1/FEV6 cut-off of 73% to be the substitution for the FEV1/FVC threshold of 70%.

Conclusion: The FEV1/FEV6 ratio appears to be a good substitute for the FEV1/FVC ratio in COPD patients.


5AP4-1
Changes in extravascular lung water determined with single transpulmonary thermomodulation after pneumonectomy and lung resection
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Background and Goal of Study: Lung reduction surgery, particularly, pneumonectomy (PE) can result in postoperative acute lung injury. Postpneumonectomy pulmonary edema remains a poorly understood clinical entity, which results in mortality rate of up to 50–100% [1]. We have shown that after PE, single transpulmonary thermomodulation (STD) is acceptably accurate for quantification of extravascular lung water (EVLW). Moreover, volutrauma might play a crucial role in the pathophysiology of this complication [2, 3].

The goal of the present study was to investigate the changes in EVLW that occurs after pneumonectomy in human.

Materials and Methods: We studied 27 patients who underwent elective PE (n = 16) or lung resection (LR, n = 11). After induction of total intravenous anesthesia (ketamine, midazolam, and fentanyl), a 5F thermomodulation catheter was inserted into the femoral artery and a 7F flotation catheter into the pulmonary artery. Cardiac index (CI), pulmonary artery pressure (PAP), pulmonary artery occlusion pressure (PAOP), central venous pressure (CVP), intrathoracic blood volume (ITBV), and EVLW index (EVLWI) were assessed by STD (PICCOplus, Pulson). The measurements were performed after induction of anesthesia, after thoracotomy, lung reduction and at the end of surgery as well as at 6, 12, 18, 24, 36, and 48 hrs postoperatively.

Results and Discussion: Pneumonectomy resulted in an immediate decline in EVLWI from 7.7 ± 2.4 ml/kg to 5.4 ± 1.5 ml/kg (p < 0.05). Postoperatively, EVLWI increased significantly by 24% compared with immediately after pneumonectomy, plateauing at 36 hrs following transfer to the ICU. This was not accompanied by changes in PAP, PAOP, and PaO2/FiO2. The LR group did not demonstrate any significant changes in EVLWI.

Conclusion: In major thoracic surgery, STD appears to be a valuable tool for assessment of extravascular lung water. The postoperative increase in EVLWI may be explained by a redistribution and accumulation of pulmonary interstitial fluid due to augmented perfusion of the residual lung.

References:

5AP4-2
Early prophylactic cpap after lung resection surgery: a prospective, randomized, controlled study
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Background: The aim of this prospective, randomized, controlled study was to assess the efficacy of prophylactic treatment with continuous positive airway pressure (CPAP) on gas exchange after lung resection surgery.

Methods: With IRB approval and written consent 40 consecutive patients receiving lung resection surgery with general anesthesia and thoracic epidural analgesia were randomly allocated to receive two cycles of two hours of CPAP (PEEP: 8 cm H2O; FiO2: 0.4) during the first 12 h after surgery (group CPAP, n = 21) or conventional oxygen therapy with ventilmask (FiO2: 0.4) (group Control, n = 19). Blood gas analyses were performed after 6, 12, 24, 48 hours. Occurrence of pulmonary complications during hospital stay (pulmonary retention, atelectasis, pneumonia, bronchopleural fistula, need for broncoscopy and minitrach placement) as well as duration of hospital stay were also recorded.

Results: No differences in anthropometric parameters were observed between the two groups. The Table shows effects of therapy on patients’ oxygenation (median [range]).

<table>
<thead>
<tr>
<th>PO2/FiO2 24 h</th>
<th>PO2/FiO2 12 h</th>
<th>PO2/FiO2 6 h</th>
<th>PO2/FiO2 0 h</th>
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<tr>
<td>37</td>
<td>42</td>
<td>37</td>
<td>37</td>
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</table>

No differences were recorded in hospital stay (CPAP = 7 [6–10], Control = 8 [7–16], p = 0.06) and in incidence of pulmonary complications (CPAP = 14% vs Control = 16%, p = 0.99).

Conclusions: Early prophylactic CPAP produced minor improvements in oxygenation during first 24 h but did not reduce the incidence of pulmonary complications.

5AP4-4
Remote lung injury after experimental thoracic aortic occlusion and reperfusion: a comparison of sevoflurane vs. propofol anaesthesia
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Background and Goals: Respiratory failure after major vascular surgery is quite common. Systemic inflammatory response following reperfusion, mechanical ventilation, and direct and indirect effects of anaesthetic techniques contribute to observed pulmonary dysfunction. We compared propofol and sevoflurane with respect to their influence on remote lung injury after thoracic aortic occlusion and reperfusion.

Materials and Methods: Experiments had been approved by local committees. After surgical preparation in midazolam-anaesthesia, pigs were randomised to receive either propofol or sevoflurane (n = 9, each) in an investigator blinded fashion. The thoracic aorta was occluded for 90min. Study was randomised in blocks of 5 (n = 20) vs Control (n = 18).

Results and Discussion: Oxygenation index decreased, and intrapulmonary shunt fraction increased significantly in both study groups following reperfusion. No differences in functional or morphological lung injury, or alveolar macrophage oxidative burst activity could be detected between both anaesthetics. Neither oxygenation nor other parameters were changed in non-occlusion animals.
Conclusion: Pulmonary function was only moderately impaired during the observation period in our model of severe porcine abdominal-ischaemia reperfusion injury. Remote lung injury was not different between a propofol or sevoflurane based anaesthetic regimen.

5AP4-5
Comparison of the effect of the double lumen endotracheal tube and Arndt bronchial blocker on respiratory mechanical properties
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Goal of Study: To compare airway pressures, compliance and resistance during one- and two-lung ventilation between techniques based on a double-lumen endotracheal tube (DLT) and an Arndt® bronchial blocker (ABB).

Values Device Ventilation TLV- 2 lungs 1 lung postresection
Ppeak ABB 21 ± 3 29.8 ± 5 22.5 ± 3
(cmH2O) DLT 20.2 ± 4 29.3 ± 3 22.2 ± 3
Plateau ABB 18 ± 3 28.9 ± 5 19.6 ± 3
(cmH2O) DLT 17.5 ± 5 26.1 ± 3 19 ± 4
Compliance ABB 40.4 ± 9 25 ± 6 38.5 ± 7
(1/m/cmH2O) DLT 40 ± 12 25.6 ± 9 39 ± 20
Resistance* ABB 16.3 ± 4 23.5 ± 8 18.6 ± 5
(cmH2O/L/s) DLT 14 ± 4 26.3 ± 8 16.9 ± 6

*Interaction between inter- and intragroup factors p = 0.067

Conclusions. Our results show a significant trend toward a higher decrease in airway resistance during one-lung ventilation with the ABB compared to DLT although there were no differences in mechanical properties between the devices used.

5AP4-6
Effects of Trendelenburg position on intraloulmonary shunt and oxygenation during one-lung ventilation
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Background and Goal of Study: Surgical posture considerably influences the deterioration speed and the nadir value of PaO2 during one lung ventilation (OLV) (1). In thoracic surgery with OLV in the lateral position, Trendelenburg position is often required. However, Trendelenburg position causes more compression of the dependent ventilated lung and may significantly affect the ratio of ventilation/perfusion and oxygenation. Therefore, we evaluated the effect of Trendelenburg position on intrapulmonary shunt (Qs/Qt) and oxygenation during OLV in a prospective, randomized, controlled trial.

Materials and Methods: With IRB approval, 34 patients requiring OLV for thoracic surgery were randomly allocated to either control (n = 17, CG) or Trendelenburg group (n = 17, TG). After anesthesia induction, all patients were turned to the lateral horizontal position and OLV was initiated for 15 min (T1, baseline). Then, patients were 10° head-down tilted for 10 min and returned to horizontal position in the TG, while the patients remained horizontal throughout the study period in the CG. Hemodynamic and respiratory variables were measured at T1, 5 and 10 min after head-down tilt (T2 and T3 respectively), 10 min after the patients were returned to horizontal position (T4).

Results: There were no significant differences in baseline hemodynamic and respiratory variables between the groups. Central venous pressure (CVP) at T2 and pulmonary vascular resistance index and peak airway pressure at T2 and T3 were significantly greater in the TG than in the CG. In the TG, CVP at T2 and T3, and pulmonary capillary wedge pressure and Qs/Qt at T3 were significantly increased compared to baseline values and returned to baseline values at T4.

Conclusion(s): Trendelenburg position during OLV in the lateral position caused significant increase in Qs/Qt without affecting oxygenation. These results were accompanied by distinct increase in cardiac filling pressures without any increase in cardiac output.

References:
1 Hakim TS, Dean GW, Lisbona R. J Appl Physiol 1988; 64: 1160-70.

5AP4-7
Comparative effects of sevoflurane, desflurane and propofol on bronchoalveolar lavage fluid
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Background and Goal of Study: Volatile anaesthetics may amplify the injurious effects of mechanical ventilation on the lung[1], while propofol reduces lipid peroxidation and enhances antioxidant defenses. We hypothesized that anaesthetics could induce inflammatory alterations in the healthy lung. To this point, we measured biochemical indices in bronchoalveolar lavage fluid (BALF) during anaesthesia with volatile anaesthetics, propofol or ketamine and midazolam.

Materials and Methods: In our study, 36 domestic pigs were randomly assigned to 5 groups and were subjected to intubation only (control group, n = 4), 4h sedation with ketamine and midazolam with maintenance of spontaneous breathing (sham group, n = 4) or 4h general anaesthesia with propofol (1 mg/kg/h, n = 8), sevoflurane (1.0 MAC, n = 11) or desflurane (1.0 MAC, n = 9) using mechanical ventilation with tidal volume of 10 mL/kg and zero positive end-expiratory pressure. At the end of the experiment BALF was obtained for measurement of protein, phospholipase A2 (PLA2) and platelet activating factor acetylhydrolase (PAF-AH). For statistical analysis one-way Anova or Kruskal-Wallis tests were used. Data are expressed as mean ± SD.

Results and Discussions: In sevoflurane, propofol, desflurane and sham groups PAF-AH (nmol C6-NBD-FA/mL/h) was reduced compared to controls (12.6 ± 1.3 vs. 3.86 ± 0.8 in sham group, P < .001); however, levels of PAF-AH were higher in propofol compared to sevoflurane group (6.98 ± 4.1 vs. 3.18 ± 0.5, respectively, P < .05). PAH-AH in desflurane group (5.21 ± 1.9) did not differ from other anaesthetics groups. Levels of protein (µg/mL BALF) did not differ between groups (control, 160 ± 402; sham, 221 ± 28; propofol, 159 ± 80; sevoflurane, 210 ± 124; desflurane, 190 ± 114). No differences were detected in PLA2 activity (nmol C12-NBD-FA/mL/h) (control, 3.43 ± 1.2; sham, 3.72 ± 1.2; propofol, 3.15 ± 1.9; sevoflurane, 4.37 ± 2.2; desflurane, 4.28 ± 2.6) or wet-to-dry ratio.

Conclusion: Anaesthesia with propofol, sevoflurane or desflurane under mechanical ventilation or with ketamine and midazolam with maintenance of spontaneous breathing induces a mild inflammatory response in the lung; propofol may exert partial protective effects on lung inflammation compared to sevoflurane.

References:

Transfusion and Haemostasis

6AP1-1
Intravenous iron to treat anaemia in orthopaedic surgery
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Background and Goal of Study: Preoperative anaemia is frequent in patients undergoing orthopaedic surgery. (1) The purpose of this study was to determine the increase of haemoglobin (Hb) preoperatively in patients with iron deficiency anaemia (IDA) when treated with iv iron.
**Materials and Methods:** After obtaining written informed consent, 20 patients with IDA received 900 mg iv iron sucrose (Venofer) over 2 weeks starting 4 weeks prior to surgery. Changes of Hb were measured over 4 weeks and at discharge. In the last 11 patients endogenous erythropoietin (EPO) was measured. Data were analysed using ANOVA for repeated measures.

**Results and Discussions:** Changes in Hb were significant (p < 0.05) at week 2, 3 and 4 of treatment. Overall, the mean maximum increase was 1.0 ± 0.6 g/dL (range: 0.2-2.2 g/dL). Ferritin levels also increased significantly (p < 0.01), where as transferrin saturation, serum iron, soluble transferrin receptor (sTrf) did not change significantly due to iv iron treatment. Endogenous EPO decreased due to iv iron treatment in week 3 (p = 0.049). No adverse events related to iv iron were observed.

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Week 3</th>
<th>Week 4</th>
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<tbody>
<tr>
<td>Hb (g/dL)</td>
<td>11.9 ± 0.8</td>
<td>12.8 ± 0.8*</td>
<td>12.4 ± 0.7*</td>
</tr>
<tr>
<td>Ferritin [mg/L]</td>
<td>78 ± 70</td>
<td>428 ± 191*</td>
<td>3.7 ± 2.3</td>
</tr>
<tr>
<td>Epo [mg/L]</td>
<td>261 ± 130</td>
<td>190 ± 49*</td>
<td>189 ± 75</td>
</tr>
<tr>
<td>Serum Fe [µmol/L]</td>
<td>13.3 ± 4.6</td>
<td>13.1 ± 4.5</td>
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</tbody>
</table>

p < 0.05 vs. Baseline

The highest increase of Hb was at week 3, indicating that administration of iv iron 2 to 3 weeks prior to surgery may be optimal.

**Conclusion(s):** Treatment with iv iron allows to correct IDA prior to elective surgery and may reduce perioperative transfusion needs.

**References:**

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**6AP-1-2**

**Liposome encapsulated hemoglobin (TRM-645) increases survival time of critical normovolemic anemia**

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**Background and Goal of Study:** Hemoglobin-based O2 carriers (HBOC) increase arterial O2-content (CaO2) and systemic O2-delivery (DO2). TRM-645 (Terumo Inc., Kanagawa, Japan) is a liposome encapsulated Hb formulation (LEH) with low O2-affinity and facilitated O2-offloading to the tissues. Due to its specific O2-transport properties, this LEH should represent an attractive alternative to the transfusion of allogenic red blood cells. The goal of the present study was to investigate the efficacy of TRM-645 in critical normovolemic anemia.

**Materials and Methods:** 14 anesthetized and mechanically ventilated beagle dogs were spleenectomized and hemodiluted to their individual critical hemoglobin concentration (HbcriI). HbcriI was defined as the Hb-concentration corresponding with the biological limit of anemia tolerance. The tolerance of acute normovolemic anemia depends on the choice of the plasma substitute.

**Results:** Animals of the LEH-group survived 98 ± 92 min (vs. 49 ± 31 min, N.S.-group, p < 0.05). 30 minutes after treatment, tissue O2 tension (Ptpo2) on the surface of a skeletal muscle was significantly higher in the LEH-group (24 ± 7 mmHg vs. 9 ± 2 mmHg). Regarding central hemodynamics, no significant differences were observed between the groups.

**Conclusion(s):** TRM-645 provides sufficient tissue oxygenation in critical normovolemic anemia and may be used for bridging a period of acute blood loss until allogeneic red blood cells are available.

**Disclosure:** The study was sponsored by a research grant from Terumo Inc., Kanagawa, Japan.

**References:**

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**6AP-1-5**

**Colloids as intraoperative fluid management provide better blood oxygenation than crystalloids**

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**Background and Goal of Study:** Colloids stay intra-vascularly longer than crystalloids, which are rapidly diffused into interstitial space. The aim of the study was to investigate possible alteration in blood oxygenation, as it is affected by the blood-gas barrier thickness.

**Materials and Methods:** Forty ASA I-II patients aged 58 ± 14 years, who underwent abdominal operations under general anesthesia, were randomly allocated in two groups (Group COL and Group CRS). Intraoperative fluid management consisted of colloids in group COL and crystalloids in group CRS. Primary endpoint was the dimension of HbcriI. Secondary endpoints were central hemodynamics, O2-transport and tissue oxygenation.

**Results:** During acellular volume replacement, the choice of the plasma substitute is a factor which significantly influences anemia tolerance. Low molecular HES preparations (MW 130 KDa) seem to be most advantageous for the treatment of acute blood losses. The underlying mechanism has to be elucidated so far.

**Disclosure:** The project was sponsored by a research grant from the Else Kröner-Fresenius – Stiftung, Bad Homburg, Germany.

**References:**
6AP1-6

The effect of hydroxyethyl starch (670/0.75) on hemostasis during acute normovolemic hemodilution

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Background and Goal of Study: Hextend® is a plasma volume expander containing 6% hydroxyethyl starch (HES) in a physiologically balanced medium of electrolytes, lactate and glucose (Molecular weight 670 kDa, molar substitution 0.75). HES has been associated with platelet dysfunction and inhibition of coagulation. The aim of this study is to evaluate the effect of Hextend® on hemostasis during acute normovolemic hemodilution (ANH).

Materials and Methods: Eighteen healthy adult male patients scheduled for spine surgery were enrolled in this study. Before general anesthesia, patients underwent ANH with 20 ml/kg of Hextend®. Hemoglobin, platelet count, plasma fibrinogen concentration, factor VIII activity, factor VII activity, PT, PTT and thromboelastography (TEG) were measured before and after ANH. Paired t-test was used.

Results: Age, weight and height of patients were 32.6 ± 7.5 years, 70.5 ± 8.1 kg and 172.9 ± 8.0 cm, respectively (mean ± SD). Data are shown in the following table.

<table>
<thead>
<tr>
<th></th>
<th>Pre-ANH</th>
<th>Post-ANH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobin (g/dL)</td>
<td>14.9 ± 0.9</td>
<td>11.1 ± 0.9</td>
</tr>
<tr>
<td>Platelet (10^9/L)</td>
<td>245.8 ± 47.1</td>
<td>205.8 ± 43.3</td>
</tr>
<tr>
<td>Fibrinogen (mg/dL)</td>
<td>273.9 ± 182.0</td>
<td>182.0 ± 50.1</td>
</tr>
<tr>
<td>factor VIII activity%</td>
<td>71.1 ± 43.4</td>
<td>25.1 ± 15.0</td>
</tr>
<tr>
<td>PT (INR)</td>
<td>1.00 ± 0.01</td>
<td>1.08 ± 0.06</td>
</tr>
<tr>
<td>PTT (sec)</td>
<td>26.7 ± 2.3</td>
<td>35.5 ± 4.6</td>
</tr>
<tr>
<td>u (22–38%)</td>
<td>26.8 ± 6.8</td>
<td>27.6 ± 6.7</td>
</tr>
<tr>
<td>K (330–630 sec)</td>
<td>518.5 ± 129.6</td>
<td>498.4 ± 193.1</td>
</tr>
<tr>
<td>R (930–1380 sec)</td>
<td>909.8 ± 334.4</td>
<td>993.1 ± 497.0</td>
</tr>
<tr>
<td>MA (47–58 mm)</td>
<td>41.8 ± 10.5</td>
<td>40.7 ± 8.5</td>
</tr>
<tr>
<td>Ci (3–3 + 3)</td>
<td>2.2 ± 1.9</td>
<td>2.5 ± 1.9</td>
</tr>
</tbody>
</table>

*: P < 0.05 compared to the values of pre-ANH.
Post-ANH: 120 minutes after completion of ANH.
Data are mean ± SD.

Conclusions: In spite of the decrease in the platelet count, fibrinogen concentration and factor VIII activity, ANH with 20 ml/kg of Hextend® didn’t cause impairment of TEG parameters.

6AP1-7

Quantitative and qualitative changes of von Willebrand factor during cardiac surgery

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Background and Goal of Study: Von Willebrand factor (vWF) consists of large multimeric molecules which interact with the GP1b receptor on the surface of the platelets leading to aggregation and activation of platelets at the lesion site. A decrease of the highest molecular weight multimers – as described in aortic valve defects – is reported to be associated with increased peri-operative bleeding (acquired von Willebrand syndrome – avWS). The main question was whether cardiac-pulmonary bypass changes the multimeric structure of vWF.

Materials and Methods: 25 patients with a negative standardized bleeding anamnesis which underwent heart surgery were analyzed. Operation types: coronary artery bypass grafting (10), double valve surgery (4), thoracic aorta surgery (10), pulmonary artery surgery (1), 14 patients had aortic valve disease. We investigated the changes of avWF levels, collagen binding activity (CBA) and the multimeric structure at two points: directly before the operation and at the end of the operation after the weaning from cardio-pulmonary bypass. We monitored the intra- and post-operative consumption of blood products and the drainage volume.

Results and Discussions: From the 14 patients with aortic valve disease 8 patients (57%) had preoperatively a loss of the high molecular weight multimers but all had normal avWF levels and CBA. From the 11 other patients 3 (27%) had avWS and one additionally a pathologic CBA. There was no correlation between the pre-operative state of avWF and the consumption of blood products or the drainage volume. Only 3 patients had still pathologic CBA after the weaning from cardio-pulmonary bypass, none had pathologic avWF levels or CBA. The normalisation of the vWF after the extra-corporeal circulation can be attributed to a high release of vWF from the endothelial storage pools.

Conclusions: (1) The cardiac surgery patients – even those with no aortic valve disease – had a high percentage of pre-operative avWs, which was not detected by a bleeding anamnesis. (2) A pre-operative avWS was intra-operatively corrected by the release of intact vWF from endogenous stores. (3) The consumption of blood products and the drainage volume was not correlated with the pre-operative state of the vWF.

6AP1-8

Perioperative management of a patient with Bernard – Soulier – Syndrome undergoing major abdominal surgery

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Background and Goal of Study: Perioperative management of coagulation-disorders remains a challenge in anaesthesia and can lead to high treatment costs. In 1948 Bernard and Soulier described a severe hemorrhagic thrombocytopathy showing a prolonged bleeding time, a low platelet count as well as enlarged platelets. These features are the hallmark of the Bernard – Soulier – Syndrome, characterized by a missing or dysfunctional expression of the glycoprotein Ib – V – IX complex, a receptor for the von – Willebrand factor in the platelets membrane. Therefore von Willebrand factor mediated adhesion to the subendothelial wall and aggregation at high shear forces are reduced or even impossible. We report the perioperative management of a 39-year-old male with Bernard–Soulier Syndrome, who was admitted for elective duodenotomy for chronic intestinal bleeding.

Materials and Methods: The Patient was presented for surgery with a preoperative platelet count of 12 G/Pt/l despite repeated preoperative substitution. Administration of recombinant factor VII and factor XIII perioperatively as well as further substitution of platelets 96 hours perioperatively was suggested by haematologists.

Results and Discussions: On day of surgery the patient presented with anaemia (haemoglobin 3.8 mmol/l) and was therefore substituted with two units of packed red cells. He was perioperatively monitored with thromboelastography using the ROTEM®-analyzer. Soon after incision the patient received two units of platelets and 4 g of fibrinogen according to ROTEM analysis. Estimated intraoperative blood loss was 200 ml and surgery was performed uneventfully. With clinical demand responding administration of fibrinogen no relevant bleeding occurred though perioperative platelet-count was as low as 7 G/Pt/l. Postoperatively the patient recovered from the procedure without complication.

Conclusion(s): Even in severe coagulation disorders major surgery can be performed without bleeding complications. The patient described was effectively monitored with the ROTEM®-analyzer perioperatively and sufficiently substituted with fibrinogen according to clinical demand. The widely established and recommended cost consuming recombinant factor VII and XIII substitution could be avoided.

6AP1-9

Absence of hypercoagulable state, defined by endogenous thrombin potential measurement, after radical mastectomy for cancer

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Background: Cancer and surgery are known to produce hypercoagulability. The aim of this study was to investigate the modification of the coagulability after radical mastectomy for cancer.

Methods: after local ethics committee approval and written consent, 50 patients undergoing radical mastectomy and control group of 20 persons were included in this prospective, observational study. Specific markers for coagulation (D-dimer (DD), thrombin-antithrombin III complex (TAT), endogenous thrombin potential measurement by calibrated automated thrombography (CAT)) were examined at T0 (before operation), T1 (end of surgery) and T2 (24 h after surgery).
Résultats et discussion:

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Cancer group T1</th>
<th>Cancer group T2</th>
<th>Cancer group T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD (µg/ml)</td>
<td>0.20</td>
<td>0.32</td>
<td>0.33</td>
<td>0.37</td>
</tr>
<tr>
<td>p vs T1</td>
<td>0.12-0.25</td>
<td>0.25-0.54</td>
<td>0.21-0.55</td>
<td>0.23-0.66</td>
</tr>
<tr>
<td>TAT (ng/ml)</td>
<td>2,25</td>
<td>3,46</td>
<td>4,52</td>
<td>3,95</td>
</tr>
<tr>
<td>p vs T1</td>
<td>1,75-2,52</td>
<td>2,23-7</td>
<td>3,15-15,49</td>
<td>2,89-5,99</td>
</tr>
<tr>
<td>CAT (ng/ml)</td>
<td>0,019</td>
<td>NS</td>
<td>0,003</td>
<td>NS</td>
</tr>
<tr>
<td>p vs T1</td>
<td>NS</td>
<td>NS</td>
<td>0,022</td>
<td>NS</td>
</tr>
<tr>
<td>p vs T1</td>
<td>1703</td>
<td>1667</td>
<td>1737</td>
<td>1708</td>
</tr>
<tr>
<td>p vs T1</td>
<td>NS</td>
<td>NS</td>
<td>1442-1961</td>
<td>1522-1922</td>
</tr>
<tr>
<td>p vs T1</td>
<td>NS</td>
<td>NS</td>
<td>1498-1941</td>
<td>1589-1984</td>
</tr>
</tbody>
</table>

Results are median and 25–75 percentiles.

Conclusion: Only a significant higher plasmatic concentration of DD in cancer group before surgery was recorded. There is a minimal activation of coagulation in breast cancer patients without hypercoagulability. Radical mastectomy for cancer was associated with significant transient increase in plasma concentrations of DD and TAT without significant modification of CAT. There is an activation of thrombin generation without hypercoagulability. Nor breast cancer neither surgery is responsible of a hypercoaguable state. These results are different of previous study.

Reference:

6AP1-10

Detection of aspirin and clopidogrel using multiple electrode aggregometry
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Background and Goal of Study: During invasive procedures aspirin and clopidogrel can induce bleeding. The detection of these drugs may therefore be necessary. We evaluated multiple electrode aggregometry, a new platelet analysis technique based on whole blood.

Methods: Venous blood was drawn from 212 patients treated with either aspirin (88) or clopidogrel (13) or both (57) or none of the two drugs (54) and anticoagulated using heparin (sarcod blood collection tubes) or hirudin (collection tubes provided by Dynabyte, Munich). Blood was analyzed on the Multiplate analyzer (Dynabyte) using the following tests: ASPItest (arachidonic acid induced aggregation), ADPtest (ADP induced aggregation) or ADPtest HS (high sensitivity + addition of prostaglandin E1). Aggregation was quantified by the area under the curve (1 U = 10 AU min; AU = aggregation units).

Results:

<table>
<thead>
<tr>
<th>Patients on Aspirin (145)</th>
<th>Patients without aspirin (87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASPItest (heparin blood)</td>
<td>35 ± 31</td>
</tr>
<tr>
<td>ASPItest (hirudin blood)</td>
<td>23 ± 27</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Patients on Clopidogrel (70)</th>
<th>Patients without Clopidogrel (142)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADPtest (heparin blood)</td>
<td>65 ± 30</td>
</tr>
<tr>
<td>ADPtest (hirudin blood)</td>
<td>39 ± 26</td>
</tr>
<tr>
<td>ADPtest HS (heparin blood)</td>
<td>34 ± 24</td>
</tr>
<tr>
<td>ADPtest HS (hirudin blood)</td>
<td>22 ± 16</td>
</tr>
</tbody>
</table>

Conclusion: Multiple electrode aggregometry allows for a sensitive detection of Aspirin and Clopidogrel. For the detection of clopidogrel in heparin blood ADPtest HS is preferable to the use of ADPtest.

6AP2-3

Recombinant FVIIa in critical patients with massive bleeding
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Background and Goal of Study: Uncontrolled bleeding after traumatic injury is a result of surgical and coagulopathic bleeding and it is the leading cause of early in-hospital mortality in trauma victims. Massive transfusion is also very high-risk. Recombinant activated factor VII (rFVIIa) can be effective.

Materials and Methods: We describe seven patients who between 2004–2005 received rFVIIa in cases of shock for massive bleeding: 2 women subjected to major orthopaedic surgery (78–81 years) and 5 men with severe traumatic injuries (18–78 years, mean 36). We reviewed the processes of resuscitation, the emergency surgical indications, the levels of haemoglobin and coagulation, the administered doses of rFVIIa, the amount of packed red blood cells used as well as the survival.

Results and Discussion: A surgical damage control was performed in all patients. The average of total packed red blood cells was 21 (12–31). Before rFVIIa administration the mean was 17 units (10–25), Haemoglobin levels were 7.58 (4.3–11.5) and INR 1.87 (1.05–2.81). After rFVIIa administration the mean was 5 units (4–9), Haemoglobin levels 10.5 (8.3–12) and INR 1.34 (0.85–2.17). The mean doses of rFVIIa administered were 113 µg/kg (70–180 µg/kg) in 1–3 times. All polytrauma patients survived and only one patient who had major orthopaedic surgery died.

Conclusions: Our experience demonstrates that rFVIIa can reduce or stop coagulopathic bleeding in polytrauma patients when vascular or surgical control fails. It is necessary to establish a protocol treatment to optimize the resources while we are waiting for the different studies results about clinical indications.

References:

6AP2-4

Aprotinin causes fewer complications after cardiac surgery than tranexamic acid
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Background and Goal of Study: Recently, the routine application of aprotinin, a serine protease inhibitor, during open-heart surgery has been debated (1). Our aim was to investigate the antifibrinolytic effect and the side-effects of aprotinin comparing with tranexamic acid, another antifibrinolytic drug.

Materials and Methods: We retrospectively analysed the data of patients undergoing open heart surgery in our Institute from September 2005 to June 2006. According to the institutional protocol, every patient operated on using cardiopulmonary bypass was treated with full-dose aprotinin according to the Hammersmith protocol until January 2006. In February 2006, this regimen was changed due to ethical considerations (1), and thereafter every elective spinal posterior fusion were randomly assigned to receive either 100 mg/kg tranexamic acid before incision followed by an infusion of 10 mg/kg/h during surgery (tranexamic acid group) or 0.9% saline (placebo group). General anesthesia was administered according to a standard protocol. Blood loss, transfusion requirements, coagulation parameters, and complications were assessed. Continuous parameters were tested by Mann-Whitney test and non-parametric data were tested with Fisher exact test.

Results and Discussion: Demographic data and surgical characteristics (etiologies, number of fused vertebrae) were similar in both groups. In the tranexamic acid group, blood loss was reduced by 35% compared with placebo (1529 ± 683 ml vs. 2346 ± 1255 ml; P = 0.016). The total amount of blood transfused in the perioperative period was significantly reduced in the tranexamic group (1.75 ± 1.55 units vs. 3.60 ± 2.06 units; P = 0.03). No thrombotic complications were detected. Adverse drug effects occurred in the tranexamic acid group (vomiting in 55% of patients).

Conclusion(s): Intraoperative administration of high-dose tranexamic acid reduces significantly blood loss and blood transfusion requirements during elective posterior fusion in adolescents with scoliosis.

Reference:
patient received tranexamic acid (4–6 g) as antifibrinolytic therapy. In all other aspects, the anaesthesia protocol has remained unchanged. 

Results and Discussions: 596 patients were treated with aprotinin (group A) and 592 with tranexamic acid (group T). The descriptive parameters and the comorbidities were well comparable in the two groups. The blood loss was significantly lower in group A comparing with group T at 6, 12 and 24 hours after operation (24 h: 555 ± 419 vs. 686 ± 589 mL, p < 0.001). Similarly, the frequency (58.9% vs. 66.6%, p = 0.006) and the amount of blood transfusion (2.8 ± 5.0 vs. 3.1 ± 4.5 units, p = 0.001) were also significantly lower in group A. There was no difference in the incidence of postoperative renal dysfunction, renal failure and other organ dysfunctions between the two groups, except that there were significantly less postoperative neurological complications, in particularly seizures, in group A (2.7% vs. 5.4%, p = 0.017) and other organ dysfunctions, we found significantly more neurological complications after administration of tranexamic acid. Comparing possible side effects, including renal and other organ dysfunctions, we found significantly more neurological complications after administration of tranexamic acid.


6AP2-5
Are antifibrinolytics useful in a global blood sparing strategy after Revision Total Hip Arthroplasty?
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SAR 2, CHU Trousseau, Chambly les Tours, France

Background and Goal of Study: Patients undergoing revision total hip arthroplasty (RTHA) are at high risk of allogenic blood transfusion. Studies dealing with antifibrinolytics (AF) in RTHA are scarce and tested AF alone, without consideration of a global blood sparing strategy (preoperative autologous donations, EPO, intra and post-operative autologous blood reinfusion). This is the aim of our present study.

Materials and Methods: Between 2001 and 2006, we prospectively collected data on 101 consecutive patients scheduled for aseptic non tumoral RTHA, during their first postoperative week. A global perioperative blood sparing strategy included preoperative autologous blood donations and recombinant human erythropoetin (2), and intra and postoperative autotransfusion replacement systems (CATS®, Fresenius and Constavac®, Gamida). When hemoglobin concentration was below 8 g/dL, patients received either autologous transfusion if available, or an allogeneic one in other cases. Indication and choice of AF (tranexamic acid 15 mg/kg before incision followed by 10 mg/kg/h intraoperatively, or aprotinin 2 MKIU followed by 0.5 MKIU/h intraoperatively) was left to each physician’s preferences. Chi2 or Student t tests were used to compare the 2 groups of patients (with and without AF).

Results and Discussions: Patients’ characteristics, hemoglobin concentration before surgery and 7 days latter, and duration of surgery were similar in both groups. None of the 22 patients who received antifibrinolytics (17 aprotinin, 5 tranexamic acid) had allogenic transfusion, versus 18 of the 79 patients who did not (23%, p = 0.03). Patients with AF had less intra operative autologous blood volume reinfused than the ones without AF (206 ± 93 mL versus 343 ± 264 mL, p = 0.0687), and less preoperative autologous blood transfused (21% of units versus 56%, p = 0.0004).

Conclusion(s): Adding antifibrinolytics in patients undergoing aseptic non tumoral RTHA significantly decreased allogenic and autologous blood transfusion, even in the presence of a global blood sparing strategy.


6AP2-6
Clinical experience with recombinant activated factor VIIa (2003–2006)
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Background and Goal of Study: Although treatment with recombinant activated factor VII (rFVIIa) is only accepted in haemophilia A or B with inhibitors (and Glanzmann's thrombasthenia), several case reports and small series suggest that rFVIIa could be also useful in patients with massive bleeding. The aim of the study was to review the off-label use of rFVIIa in our hospital.

Materials and Methods: Four years retrospective review of massive bleeding patients treated with rFVIIa in both, surgical and non surgical environments. The variables analysed included: demographics, indications for the treatment, dose of rFVIIa, blood products used, laboratory data, mortality, blood products used and factors that could alter rFVIIa function (pH and temperature).

Results: 24 patients received rFVIIa for compassionate treatment, mean age of 65 (26–88) years being 9 women and 15 men. Indications were: traumatic patients (2), obstetric bleeding (2), drug-related coagulation disorders (4), surgical bleeding (9) and medical indications, including respiratory disorders (3), digestive bleeding (2) and CID-sepsis (2). Mean dose of rFVIIa was 6.8 mg.

Pre-rFVIIa administration laboratory data were: mean haemoglobin of 7.5 g/dL, platelet count 98.000/µL, arterial pH at 7.25 (6.98–7.42). Mean axillary temperature was 35.2°C (32.8–37.6). Severity of bleeding was estimated by blood products administered [mean [range]: packed red blood cells 19–92, fresh frozen plasma 8 [3–15], platelet units 3 [0–26]. Fibrinogen was administered on 4/24 patients (16.6%), tranexamic acid in 3/24 (12%) and desmopresin in 4/24 (16.6%).

59% patients achieved complete or partial cessation of bleeding, 42% patients died (10/24), being only 16% of them bleeding related. No thromboembolic events were reported. Prevalence rFVIIa prescription: 1:5200 hospitalised patients, 1:3000 surgical patients.

Conclusion: In our experience, rFVIIa was safely used in a very selected truly massive bleeding patients. Probably, our results could be improved with temperature and pH pre-treatment optimisation. Although more data are needed we do believe that treatment with rFVIIa should be take into account on the hospital protocols of massive bleeding patients.


6AP2-7
Antifibrinolytic agents in lumbar arthrodesis surgery
Randomized controlled trial preliminary results
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Background and Goal of Study: To establish if the antifibrinolytic agents (aprotinin and tranexamic acid) are a safe and effective blood saving method during the intraoperative and postoperative period of the lumbar arthrodesis surgery. To compare the tranexamic acid vs. Aprotinin in this setting.

Materials and Methods: Prospective, randomized, double blind study of 62 patients undergoing lumbar arthrodesis surgery. Patients where assigned to one of the three groups (aprotinin, tranexamic acid and placebo) and perioperative bleeding, transfusion and secondary effects were recorded. Patients were restrictively transfused according to the institutional policy. Data were analyzed with the Kruskal-Wallis test.

Results and Discussions: We did not find significant differences in perioperative bleeding during the placebo and aprotinin group: In contrast we found less blood loss in the tranexamic acid group in the six-hour postoperative period (p < 0.05). We could not find significant differences of the transfusion requirements among the three groups. One patient of the aprotinin group suffered an allergic reaction. No other secondary effects due to the antifibrinolytic therapy were recorded.

Conclusion: Tranexamic acid may be an effective, efficient and safe antifibrinolytic agent to decrease the postoperative bleeding of lumbar arthrodesis surgery.

6AP2-8
Risk associated with aprotinin in acute type A aortic dissection surgery
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Department of Anaesthesiology, Hospices Civils de Lyon, Hospital Louis Pradel, bron, France, Hospices, Hospices Civils de Lyon, Bron, France

Background and Goal of Study: Aprotinin is commonly used during cardiac surgery to limit blood loss. Recent studies (1) have suggested that aprotinin may increase post-operative morbidity following coronary artery bypass grafting. However, its clinical utility is still debated. The aim of our study was to
investigate the effects of aprotinin on the postoperative course of patients with acute type A aortic dissection.

**Materials and Methods:** We reviewed all acute type A aortic dissections that were surgically managed in our institution from 1/1/1991 to 12/31/2001. Patients were divided into three groups: A: aprotinin (n = 153), TA: tranexamic acid (n = 89), and NA: no antifibrinolytic agent (n = 68). Analysis of variance (ANOVA) was used to test differences between groups. In all cases, two-tailed p-values < 0.05 were considered statistically significant.

**Results and Discussion:** A total of 317 acute type A aortic dissections were analyzed. Mean age was 60 ± 12 years. Overall mortality was 22.5%. We observed no statistically significant differences between the three groups regarding postoperative morbidity and mortality. Especially, postoperative renal failure was not significantly increased in patients receiving aprotinin (see Table).

**Conclusion(s):** In our experience, the use of aprotinin was not associated with increased postoperative morbidity and mortality in the management of patients with acute type A aortic dissection.

<table>
<thead>
<tr>
<th>A</th>
<th>TA</th>
<th>NA</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>19%</td>
<td>29%</td>
<td>23%</td>
</tr>
<tr>
<td>Renal failure</td>
<td>9%</td>
<td>4%</td>
<td>6%</td>
</tr>
<tr>
<td>Cardiovascular events</td>
<td>12%</td>
<td>18%</td>
<td>13%</td>
</tr>
<tr>
<td>Hemiplegia</td>
<td>9%</td>
<td>10%</td>
<td>7%</td>
</tr>
<tr>
<td>ICU stay (days)</td>
<td>13 ± 24</td>
<td>21 ± 65</td>
<td>12 ± 14</td>
</tr>
</tbody>
</table>

**Reference:**

### 6AP2-9

**Effectiveness and safety of tranexamic acid administration during total knee arthroplasty**

M. Easora, M. Lozano, L. Pediro, I. Merino, F. Macule

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**Background and Goal of Study:** The administration of tranexamic acid (TA), an antifibrinolytic drug, has been associated with a reduction in perioperative blood loss and a decrease in the number of red blood cells (RBC) units transfused in several surgical settings (1). However, the fear of thrombotic complications has hindered its generalization. We have evaluated the effect of introducing TA treatment in total knee arthroplasty (TKA) in red blood transfusion and investigated its impact in deep venous thrombosis (DVT).

**Materials and Methods:** We studied 416 patients who underwent TKA in our institution, 217 before TA administration and 199 after its introduction. Anaesthetic and surgical techniques were the same in both groups. Transfusion received and haemoglobin concentrations at day 5 were also recorded. In 37 patients a lower extremities phlebography between the 6th and 10th postoperative day was performed.

**Results and Discussion:** 53% of patients who did not receive TA were transfused with RBC while in those receiving TA only 18% were transfused (p < 0.0005). Furthermore the number of units given were significantly lower in TA treated patients (2.8 vs. 1.9. p < 0.0005). In 43% of patients receiving TA and 40% of the control an asymptomatic distal DVT was detected.

**Conclusions:** The administration of TA during TKA procedures reduced significantly the need of RBC transfusion and the number of units used. TA treatment was not associated to an increase in DVT incidence.

**Reference:**

### 6AP2-10

**Aprotinin in liver transplantation is not associated with adverse outcome**

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**Anesthesiology and Critical Care, Strasbourg University Hospital, Strasbourg, France**

**Background and Goal:** Hyperfibrinolysis contributes to bleeding and increases red blood cells (RBCs) requirements during orthotopic liver transplantation (OLT). Aprotinin is a well-known antifibrinolytic drug decreasing RBCs transfusion during major surgery such as OLT or cardiac surgery. However, a recent study has shown aprotinin negative impact in cardiac surgery [1]. The goal of our study was to evaluate aprotinin on OLT postoperative outcome.

**Materials and Methods:** We retrospectively screened all OLT performed in our institution from 2002 to 2006. We compared OLT in which aprotinin was used (Apro group) to those in which aprotinin was not used (NoApro group). We recorded basic peroperative data (operation duration, RBCs units requirements), hepatic function at day3 (SGOT and factor V) and postoperative outcome (mortality, graft rejection, ICU and hospital length of stay).

**Results and Discussion:** 349 OLT were performed during the 5 years period. 283 (81%) presented exploitable data. Apro group included 155 OLT and NoApro group 128. The Apro group was characterized by higher RBCs units requirements (4 ± 2 vs 2 ± 2.5, p = 0.003) and longer operation duration (339 ± 86 vs 305 ± 64 min, p = 0.002). At day3, hepatic tests were not different across groups (SGOT = 243 ± 326 vs 180 ± 157, p = 0.09 and factor V = 90 ± 33 vs 93 ± 31, p = 0.49). ICU and hospital length of stay were not different (ICU = 6.3 ± 8.2 vs 5.5 ± 6.8 days, p = 0.44, hospital = 22.8 ± 13.2 vs 24.2 ± 15.2 days, p = 0.48). Graft rejections (21/155 vs 13/128, p > 0.4) and mortality (5/155 vs 4/128, p < 0.75) were similar within the two groups.

**Conclusions:** Although aprotinin was associated with OLT’s requiring more blood transfusion, it was not associated with early hepatic dysfunction or adverse outcome. Aprotinin seems to be safe during OLT.

**Reference:**

### 6AP3-1

**Blood transfusion in radical retropubic prostatectomy**

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**Background and Goal of Study:** Blood transfusion is associated with the risk of immunosuppression and infections[1]. We conducted a study to know the incidence of hypotension and blood transfusion (BT) in patients who underwent radical retropubic prostatectomy. We aimed to identify those patients at greater risk and determine which factors can predict outcome.

**Materials and Methods:** For a period of 1 year (Nov. 2005 to Nov. 2006) all patients at Hospital San Cecilio scheduled for radical retropubic prostatectomy entered the study. Their management was not altered by being in the study and we prospectively recorded several variables of preoperative, intraoperative and postoperative period that would explain outcome. Specially, hypotension appearing, hemoglobin level (Hb), blood loss and others variables related to BT were evaluated. Every variable was binary and we tried to determine both variables associated with hypotension or BT (chi square) and those that could predict BT (multiple logistic regression model, stepwise method of variable selection). We used SPSS for windows 12.0 (p < 0.05 significant).

**Results:** 47 patients entered the study. Patient’s characteristics were (mean ± sd): age 72.38 ± 2.3 years, weight 76 ± 4.8 kg, height 1.73 ± 0.26 m. Hb level before surgery 13.5 ± 2.5 gr/dL, length of operation 129.3 ± 33.5 min and prostate size 73.35 ± 12.54 gr. Hypotension (SBP < 90 mmHg) appeared in 25 patients (53.19 %), 18 needed 2 or more blood units (Hb = 8.0 gr/dL, 72% of hypotensive patients) and we required 2.1 ± 0.54 blood units (1 patient needed 5 blood units). Variables associated with hypotension were: blood loss >1000 mL, surgery time > 2 hours and previous HTA (p < 0.05). Variables associated with BT were: hypotension, blood loss >1500 mL and surgery time > 2.5 hours. Variables that could predict BT were length of operation > 3 hours, surgeon experience (less than 15 prostatectomies) and blood loss >1500 mL (p < 0.05).

**Conclusions:** In our study surgical team experience, length of operation and blood loss greater than 1500 mL, can predict the need of 2 or more blood units in patients undergoing radical retropubic prostatectomy.

**Reference:**

### 6AP3-2

**Prospective, randomized comparison between spinal and general anesthesia on haematological factors affecting outcome during Radical Retropubic Prostatectomy (RRP)**

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**Department of Anesthesia, San Raffaele Scientific Institute, Milano, Italy**

**Background and Goal of Study:** Radical prostatectomy can be performed using two very different anesthetic techniques. The objective of the current study was to identify factors associated with haematological changes as a function of anesthetic approach.

**Materials and Methods:** 112 patients undergoing RRP for prostate cancer were randomly assigned to receive either spinal anesthesia (SA, n = 56) or general anesthesia (GA, n = 56). Patients of both groups were further
divided into two groups as a function of the analgesic drug used for postoperative pain (ketorolac group, K group, n = 23 and paracetamol group, P group, n = 23). The intraoperative and postoperative anaesthetic and surgical variables were evaluated as well as postoperative risk factors, including d-dimer increase and haemostatic dysfunction. Statistical analysis was performed using the program Statistica 5.0 (StatSoft Italia, Vigonza, Padova, Italy). Analysis of variance for repeated measures was used to analyze changes over time, while the Student’s “t”-test for unpaired data was used for inter-group comparison. Ordinal data were analyzed using the contingency table analysis with the Pearson Chi Square.

Results and Discussions: No differences in age and height were observed between the four groups. Weight and body mass index (BMI) resulted significantly higher in GA-P group compared to SA-P group. All groups were similar with respect to haematological and haemostatic arrangement as well as to intra-postoperative blood losses and intra-postoperative blood transfusion requirements.

Conclusions: These results suggest that spinal and general anaesthesia offer a similar anaesthetic and surgical success on outcome in patients undergoing radical retroperitoneal prostatectomy.

6AP3-3
Determining the true cost of RBC transfusion from a health care providers perspective – a preliminary report
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Background and Goal of Study: RBC-transfusions necessitate an integrated system of diagnostic, therapeutic, technical, lab, logistic, administrative, information, education, quality and legal processes. This study is an activity-based cost analysis, flow-charting these processes, capturing their frequencies and total resource consumptions, uncovering hidden cost factors and aiming to calculate the true cost of transfusion therapies in hospitals.

Materials and Methods: In 2003, a panel of experts convened a multidisciplinary cost-of-blood consensus conference and agreed upon activity-based costing as the appropriate method to account for the total cost of transfusion. Accordingly, software modules were developed to capture labour time, materials, 3rd party services, use of equipment and the frequency of each process step in RBC transfusion. With these data and locally applicable cost rates total resource consumptions, uncovering hidden cost factors and aiming to calculate the true cost of transfusion therapies in hospitals.

Results and Discussions: Preliminary results show 14 main processes beginning with pre-transfusion medical and clerical routines and ending with managing cases of transfusion transmitted disease. Blood bank clerks, couriers, medical technicians, nurses, nursing assistants, anesthesiologists, surgeons, hematologists, risk managers, administrators and other personnel are involved. More than 250 serial and parallel resource consuming processes steps in this intra hospital transfusion chain have been identified. Numerous process steps occur with a multiple frequency compared to the frequency of actual transfusions, because many more transfusions are prepared than given.

Conclusion(s): Former cost analyses are incomplete because significant amounts of resources being used have not been calculated. Therefore existing cost-effectiveness analyses comparing transfusion to other treatments may be deficient and should be re-evaluated. Current cost of transfusion may be grossly underestimated.

Reference:

6AP3-4
Blood loss and transfusion requirements during hepatic resection surgery under low CVP conditions – is routine cross-matching essential?
N. Quinn, L. Langford, A. Patel, W.C. Fawcett
Anaesthetics and Critical Care Medicine, Royal Surrey County Hospital, Guildford, United Kingdom

Background and Goal of Study: Patients undergoing hepatic resection surgery routinely undergo cross-matched pre-operatively. However, with advances in both anaesthesia and surgery, blood loss and consequent transfusion requirements have reduced substantially. With rapid on site cross-matching available, we question whether routine cross matching of blood is necessary, particularly for those undergoing smaller (<3 segments) resections. Group and save of blood pre-operatively appears to be adequate.

Reference:

6AP3-5
Transfusion practice in lower limb joint arthroplasty
S. Quasim, M. Kyi
Anaesthetics, Good Hope Hospital, Sutton Coldfield, United Kingdom

Background and Goal of Study: The use of blood conservation techniques reduces complications from infection and transfusion reaction that may result from using allogenic blood components. This is a study looking at transfusion practice for elective orthopaedic lower limb joint arthroplasty operations. Our aim was to assess whether changes could be made in order to reduce the costs of crossmatch and transfusion of homologous blood components.

Materials and Methods: This is a retrospective analysis of data on 124 patients undergoing elective lower limb joint arthroplasty at one centre. Results are presented relating to age, sex, operation, pre-operative and post-operative haemoglobin concentrations. We have also looked at whether the patients have been transfused.

Results and Discussions: The overall male to female ratio was 1.2:1. The mean age of those transfused was 70.7 ± 9.5 years and the mean age of those not transfused was 70.2 ± 8.3 years (not significant, p = 0.76). Of those transfused, the median number of units given was 2. Transfusion led to a significantly increased length of stay (9.16 ± 4.8 days in those not transfused; 12.91 ± 5.2 days in those transfused; unpaired t-test, p = 0.0001). The table shows transfusion rates for different procedures.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Number of patients</th>
<th>Transfused</th>
<th>Not transfused</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total hip replacement (THR)</td>
<td>39</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Conversion to THR</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>THR Revision</td>
<td>10</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>THR Resurfacing</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total knee replacement (TKR)</td>
<td>2</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>TKR Revision</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Unwashed autologous blood collected in wound drains after TKR has reduced the need for allogenic transfusion. 85% of total hip replacements received blood transfusion.

Conclusion(s): Allogenic transfusion of blood components may cause complications and increase length of stay. Further consideration towards cell salvage techniques should be given, particularly in total hip replacement.

6AP3-6
Impact of leukocyte-depleted red blood cells transfusion on postoperative infections in chronic alcoholics with major abdominal surgery
I. Cindra, A. Balcan, G. Nicolae, V. Gherghina
Anesthesiology, Intensive Care, Emergency Clinical Hospital of Constanta, Constanta, Romania
Background and Goal of Study: Major abdominal surgery involves important intra- and postoperative blood losses (1). On the other hand, chronic alcoholic candidates for such procedures recognize an increased risk for bleeding complications. The simultaneity of these two independent factors requires adequate hemoglobin correction by transfusions that are well known for their risk of postoperative infections due to immunosuppressive effect of leukocytes (2).

The goal of this retrospective observational study is to evaluate the impact of leukocyte-depleted red blood cells transfusions on incidence of postoperative infections in chronic alcoholics with elective major abdominal procedures.

Materials and Methods: We have analyzed 323 patients with documented chronic alcohol misuse that underwent major abdominal procedures during a period of one year.

These subjects were allocated into two groups: group A (n = 65) with leukocyte-depleted red blood cells transfusion therapy, respectively group B (n = 69) that has received non-leukocyte-depleted red blood cells products.

We have retrospectively investigated the incidence of postoperative infections and length of hospital stay in both groups in order to comparatively analyse these finding.

Student t test was used for statistical analysis.

Results and Discussions: Demographic and surgical variables were not different between groups. The level of perioperative coagulation parameters and transfusion requirements were similar, too.

No significant difference was recorded neither in postoperative infections incidence (12 meaning 18.5% vs 13 meaning 18.8%, p = 0.9), nor in hospital stay length (173 ± 0.9 versus 191 ± 0.6 days, p = 0.9) between groups.

Conclusion(s): These data did not conclusively demonstrate any possible advantage of leukocyte-depleted red blood cells products concerning the rate of postoperative infectious complications, as well as the hospitalization duration for alcoholics undergoing elective abdominal major surgery.

References:

6AP3-7
Preoperative transfusion strategies in a sub-group of population undergoing cardiac surgery
F. Mangia, S. Casalino, E. Stelian, E. Novelli, G. Lanziolo
Cardiac Anaesthesia and Intensive Care, Clinica San Gaudenzio, Gruppo Policlinico di Monza, Novara, Italy

Background and Goal of Study: In the past the tendency is to avoid blood transfusions due to several factors: the decrease of blood donation, the immuno-modulating effects that may increase the risk of nosocomial infection and cancer recurrence (1). The blood prestorage and the use of recombinant erythropoietin (EPO) are accepted therapies, but with high costs and not without risks. The aim of the study was to identify a sub-group of population who underwent elective cardiac surgery that could have the best benefit from the above mentioned technique and avoiding thus blood transfusion.

Materials and Methods: We analyzed retrospectively 350 patients who underwent elective cardiac surgery with cardiopulmonary bypass (CPB) in 2006. Red blood cells (RBC) concentrates were transfused to maintain a haematocrit (Ht) above 24% during CPB and above 27% during the first 48 h after CPB. For each patient we recorded the number of RBC units required. Then we tested a logistic regression model which identified as risk factors for transfusion age, preoperative Ht and body surface area (BSA).

Results and Discussions: Among the patients with a preoperative Ht < 36% received transfusion 89% of them, those with a Ht between 36 and 42% received transfusion 31.5% and those with a Ht > 42% received transfusion 6%. The average number of transfused RBC units among the patients with preoperative Ht between 36% and 42% was 2.67 ± 0.85. In order to identify a sub-group of low risk for receiving transfusion we used median reference values of age and BSA as cut-off values. Among the patients (n = 49) with an age < 70 years and a BSA > 1.8 m² received transfusion 7 (14.28%), with an average of 1.85 units of RBC per patient.

Conclusion: Due to the fact that the above described sub-group (age < 70, BSA > 1.8 m²) had a low risk of receiving transfusion and the usual requirements are under two units of RBC for a patient, we believe that can be fair to put in balance the risks of prestorage, the costs and the risks of EPO with all the risks of transfusion. In this sub-group transfusion probably could be avoided with the above mentioned technique.

Reference:

6AP3-9
Influence of bowel preparation and fluid management on blood loss and transfusion requirement in patients undergoing radical cystectomy
D. Wiessner, S. Dingler, O.W. Hakenberg, T. Koch, R.J. Litz
Urology, University of Technology, Dresden, Germany

Background and Goal of Study: Preoperative dehydration in patients undergoing major surgery is primarily attributed to preoperative fasting and bowel preparation. Therefore large amounts of fluids are administered intraoperatively to maintain circulation and kidney function, often exceeding measured fluid and blood loss. After changing our practice of fasting and bowel preparation in two steps, we examined our cohort of radical cystectomy (RCE) patients regarding intraoperative fluid requirement, blood loss and transfusion requirements.

Materials and Methods: Up to 12/2004 patients received bowel preparation with 41 of polyethylene glycol (PEG) and were NPO from the start of bowel preparation (group 1; n = 71). As of 1/2005 patients received clear oral fluids until two hours prior to surgery (group 2; n = 54). Since 1/2006 patients additionally received only 2–3 PEG orally (group 3; n = 49), Intraoperative fluids were administrated to maintain a central venous pressure between 7 and 10 mmHg. Estimated blood loss was replaced by colloids. Transfusion of packed red cells (PRC) was triggered by a haemoglobin (Hb) value of 8 g/dl.

Conclusion(s): Performing moderate bowel preparation in addition to liberal preoperative oral intake of clear fluids until 2 h before surgery led to a reduction of intraoperative fluid administration, thus resulting in reduced blood loss and decreased transfusion requirement in patients undergoing RCE.
Neurosciences

7AP1-1
Critical events during interventional neuroradiology procedures performed under general anaesthesia
H. Krovvidi, C. Moody, N. Huggins
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Background and Goal of Study: Most interventional neuroradiology procedures can be undertaken with intravenous sedation but general anaesthesia is used frequently for more complex and prolonged procedures. We studied the critical events occurring during interventional neuroradiology under general anaesthesia over a period of 1 year.

Materials and Methods: We collected the data prospectively over a period of 12 months. Emergency and elective procedures in adults were audited using a standardized form.

Results and Discussion: A total of 184 interventional neuroradiology procedures were performed in 12 months. Among them 70.6% (n = 138) cases were intracranial aneurysm coiling. 47 (25.4%) patients had one or more complications during these interventional procedures. A total of 80 critical events occurred during this period of 12 months. Cardiac events were most commonly occurring events and hypertension and tachycardia were most frequently occurring complications among all the critical events. Our audit had few procedure related complications such as introporeal vasopasm 1.08% (n = 2) and intracerebral bleed 0.54% (n = 1).

The severity of complications was classified according to Salisburry grading of critical events and among the patients having critical events, 95.74% (n = 45) belonged to mild grade (grade 1 & 2) of severity. Emergence from anaesthesia was the most critical period during which maximum number of events occurred (n = 52).

Conclusion(s): Major incidents in our series were only 0.54% (n = 1), majority of events that occurred were minor, of transient nature with minimal prolonged effects and included cardiac events (hypertension and tachycardia). Better preoperative blood pressure control, more adequate analgesia and graded and careful extubation with an intravenous beta-blocker cover were recommended to improve the complications in our institute after presenting this data.

Reference:

7AP1-2
The inflammatory response in acute ischemic stroke
M. Lonardo, S. Cotena, G. Scarpati, O. Piazza, E. De Robertis
Anesthesia and Intensive Care, Universita Degli Studi di Napoli Federico II, Napoli, Italy

Background and Goal of the Study: IL-18, a pro-inflammatory cytokine of IL-1 family, has got a crucial role in neuroinflammation and neurodegeneration (1). Serum protein S100B has been suggested as a marker of brain injury and it is involved in cytokine cascade (2).

The aim of our study was to evaluate IL-18 and S100B serum levels in acute ischemic stroke patients.

Materials and Methods: We enrolled 10 acute ischemic stroke patients. Patients with signs of inflammation were excluded.

S100B and IL-18 serum levels were measured within 24 hours of the ischemic insult; IL-18 measurement was repeated at day 5. S100B and IL-18 serum levels were quantified by ELISA.

The volume of early CT signs of brain infarction was evaluated at admission.

Results: IL-18 serum levels in the control group (10 healthy voluntaries) were 168.9 ± 40 pg/mL.

<table>
<thead>
<tr>
<th>Time point</th>
<th>IL-18 (pg/mL)</th>
<th>S100B (µg/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>day 1</td>
<td>309.4 ± 58.4</td>
<td>1500.0 ± 1234</td>
</tr>
<tr>
<td>day 1</td>
<td>246.7 ± 73.6</td>
<td>1500.0 ± 1234</td>
</tr>
<tr>
<td>day 5</td>
<td>6.37 ± 2.32</td>
<td>1500.0 ± 1234</td>
</tr>
<tr>
<td>Ischemic volume (cm³)</td>
<td>42 ± 45</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: IL-18 serum levels were significantly higher in stroke patients (normal values < 0.2 pg/mL). Compared to controls ischemic stroke patients had statistically significant higher serum levels of IL-18 at day 1 (p < 0.001) and at day 5 (p < 0.016).

IL-18 is an important but aspecific marker in monitoring severe inflammatory conditions. High serum levels of IL-18 are not associated with adverse neurological outcome and with the volume of CT hypodense areas.

High serum levels of IL-18 and S100B in ischemic stroke patients suggest a massive activation of the inflammatory cascade in acute ischemic stroke.

References:

7AP1-3
Capnometry changes due to posturing patient in sitting position
A. Hoxha, K. Pilika, M. Demneri, M. Saraci, M. Kerci
Department of Anesthesiology & Critical Care, University Hospital Center "Mother Theresa" Tirana, Albania, Tithane, Albania

Background and Goal of Study: Sitting position is frequently used for neurosurgery. Posturing patient in this position frequently causes changes in capnometry. The aim of this study is to analyze capnometric changes during this kind of positioning.

Materials and Methods: There were enrolled 257 patients, without significant heart and respiratory problems, operated in sitting position (F:M = 108:149, age 48.24 ± 16.14). After standard induction, mechanical ventilation was started (VT = 6 ml/kg, RR = 12/min) and after 10 ml/kg of saline given in 15 min, the patients were postured in sitting position. Standard ECG, IBP ETOO2, SpO2, VT, and RR were monitored, as well as CVP in 138 patients. Data are presented as mean ± SD, T-test and correlation (r) are used for statistical evaluation and p < 0.05 is considered as statistically significant.

Results: Decrease of ETOO2 was observed instantly after positioning the patients in sitting position. Drop of ETOO2 was 4.36 ± 2.56 mmHg (p < 0.01) and it paralleled the decrease of MAP (12.25 ± 8.13 mmHg (p < 0.05), increase of HR 11.69 ± 8.48 bpm (p < 0.01) and CVP drop of 5.12 ± 1.04 mmHg (p < 0.001). Such changes were present for 5–8 minutes and usually were corrected with administration of 5–10 ml/kg saline. 49 patients (19.6%) developed pronounced haemodynamic instability (MAP < 20% of baseline) and showed significantly larger decrease of ETOO2 (7.54 ± 3.42 mmHg, p < 0.05) compared with others. Haemodynamic in this group of patients was corrected with ephedrine in perfusion. Correlation between ETOO2 changes and haemodynamic instability shows strong relationship (r = 0.87).

Conclusion: Changes of capnography are significant in sitting position, ETOO2 changes parallels the haemodynamic and are an early warning of its change due to positioning of patient.

Reference:
7AP1-4
Inflammatory cytokines and clinical manifestations during the first week after subarachnoid bleeding
A. Hoxha, A. Bulo-Kasnevi, K. Pilika, M. Demneri, M. Saraci
Department of Anesthesia & Critical Care, University Hospital Centre “Mother Theresa”, Tirana, Albania

Background and Goal of the Study: Release of inflammatory factors after subarachnoid bleeding (SAB) is actually considered as a major factor in induction of brain vasospasm, the main factor of brain damage. Such pathologic vascular changes are supposed to be induced by immunological mechanisms mediated by inflammatory factors. The aim of the study is to describe the release of IL-6, IL-8, TNF-α and hs-CRP parallel to clinical signs in patients during the first week after SAH outbreak.

Materials and Methods: Blood concentrations of inflammatory cytokines (interleukin IL-6, IL-8 and tumor necrosis factor –TNF-α) and C-reactive protein (CRP) were measured in 45 patients (aged 51.3± 8.73, F:M = 19:26), suffering from subarachnoid bleeding. Aneurismal bleeding was confirmed in 42 patients. Measurements were performed 1–3 days and 5–7 days after bleeding. Clinical criteria considered were Hunt&Hess scale, Fisher scale and GOS 14 days (Glasgow outcome scale).

Results and Discussion: Blood concentration of inflammatory factors and CRP in our patients were higher than in norm. No significant difference was observed (p > 0.05) between patients with aneurismal bleeding and others. Relation of Hunt&Hess grade of the patients to blood level of the inflammatory factors showed a significant relation (during days 1–3 after bleeding for TNF-α p = 0.03, IL-6 p = 0.01, CRP p = 0.003 and during days 5–7 after bleeding CRP p = 0.001). But we did not observe such a close relation toward Fisher scale only CRP levels during days 5–7 showed p < 0.05, GOS as well as Fisher scale showed significant relation only to IL-8 during days 5–7 p = 0.012. IL-6 as well as hs-CRP showed a strong correlation to GOS in days 5–7 (p < 0.001).

Conclusion: In our patients we have observed the raise of blood concentration for all inflammatory factors. We did not observe any significant difference in their values between patients with aneurismal bleeding and others. Most close relation was observed between Hunt&Hess scale and raise of inflammatory factors especially 1–3 days after the bleeding. Relation of inflammatory factors blood level to GOS was less expressed, and inverse correlation was evident at the end of the week after SAH attack.

Reference:

7AP1-5
Role of BIS monitoring in propofol dose adjustment for intracranial tumor surgery
L.D. Mishra, N. Rajkumar, A. Tiwari, R. Gairiola
Anaesthesiology, Institute of Medical Sciences, Varanasi, India

Background and Goal of Study: Use of propofol anaesthesia in neurosurgical patients may exceed 20 liters of blood. Our general transfusion strategy based on decision support systems resulted in a significant decrease of autologous blood component use and/or instructions were handwritten by the physician without any decision support.

Results: In 18 of 20 handwritten instructions, essential medical information and/or instructions were considered as missing, while in only 2 of 20 instructions (build on decision support) essential information was missing (one concerning specific instructions for intracranial pressure monitoring, another concerning the unusual prescription of anti-epileptic drugs). Missing handwritten information concerned in 12 cases the prescription of medication (antibiotics, anti-epileptic drugs, corticosteroids…or missing dosages of medication), while in 6 cases specific instructions concerning management of blood pressure and intracranial pressure were missing. In 3 of 20 handwritten instructions, errors were observed in dosages of medication.

Conclusion: The introduction of clinical decision support for the postoperative IC instructions for neurological patients resulted in a significant decrease of missing essential information.

7AP1-6
Role of clinical decision support systems in quality of postoperative neuro-intensive care
L. Schouteten, C. De Deyne, J. Wuyts, D. Peuskens, R. Heylen
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Introduction: The introduction of clinical decision support systems in electronic medical records (EMRs) could prevent diagnostic and medication errors and could result in a better quality of patient care. In this paper, we want to illustrate the introduction of decision support in the EMR considering the postoperative instructions for neurological patients.

Materials and Methods: Since jan 2006, we implemented a clinical decision support system in our EMR for all postoperative neurological pts. Supported by the type of neurosurgical intervention and by patient history, all postoperative instructions were prefetched and made electronically available for the physician. At end of surgery, both anesthesiologist and neurosurgeon confirmed and/or (if necessary) changed the postoperative instructions, concerning all aspects of IC management: technical investigations, monitoring, medication etc. For the purpose of this paper, we compared at random all postoperative instructions for 20 pts after the introduction of the clinical decision support system to 20 control pts. For these control pts, all postoperative instructions were handwritten by the physician without any decision support.

Results: In 18 of 20 handwritten instructions, essential medical information and/or instructions were considered as missing, while in only 2 of 20 instructions (build on decision support) essential information was missing (one concerning specific instructions for intracranial pressure monitoring, another concerning the unusual prescription of anti-epileptic drugs). Missing handwritten information concerned in 12 cases the prescription of medication (antibiotics, anti-epileptic drugs, corticosteroids…or missing dosages of medication), while in 6 cases specific instructions concerning management of blood pressure and intracranial pressure were missing. In 3 of 20 handwritten instructions, errors were observed in dosages of medication.

Conclusion: The introduction of clinical decision support for the postoperative IC instructions for neurological patients resulted in a significant decrease of missing essential information.

7AP1-7
Problems of intraoperative blood loss and application of modern blood-saving techniques in neuroanaesthesiology
V. Gromova, A. Imaev, A. Lubnin, A. Belov, V. Cherekaev
Anesthesiology, Burdenko Neurosurgery Institute, Moscow, Russian Federation

Background and Goal of Study: The human brain receives about 20% of stroke volume. However the volume of the operative hemorrhage in neurosurgical patients may exceed 20 liters of blood. Our general transfusion strategy based on decision support systems resulted in a significant decrease of autologous blood component use and/or instructions were handwritten by the physician without any decision support.

Results: In 18 of 20 handwritten instructions, essential medical information and/or instructions were considered as missing, while in only 2 of 20 instructions (build on decision support) essential information was missing (one concerning specific instructions for intracranial pressure monitoring, another concerning the unusual prescription of anti-epileptic drugs). Missing handwritten information concerned in 12 cases the prescription of medication (antibiotics, anti-epileptic drugs, corticosteroids…or missing dosages of medication), while in 6 cases specific instructions concerning management of blood pressure and intracranial pressure were missing. In 3 of 20 handwritten instructions, errors were observed in dosages of medication.

Conclusion: The introduction of clinical decision support for the postoperative IC instructions for neurological patients resulted in a significant decrease of missing essential information.
The components of homologous blood were used minimally. Postoperative hemoglobin, hematocrit levels and parameters of hemostasis were within normal range.

Conclusions: In a combination with IVGDS PAP allows to refuse transfusion of donor blood at blood loss up to 3000 ml. For patients with massive blood loss (up to 8000 ml and more) the combination of PAP, IVGDS and ICS is optimum.


7AP1-8
Changes in brainstem autonomic function following induction of anaesthesia
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Background and Goal of Study: The interaction between anaesthesia and autonomic function is not fully understood. The aim of the study was to determine the effect of anaesthesia on the autonomic nervous system as measured by the heart rate, cardiac vagal tone, blood pressure and cardiac sensitivity to baroreflex.

Materials and Methods: Seventeen patients (median age 65 years, range 31–81) undergoing major surgery were included in this prospective study. An arterial line was inserted prior to induction of anaesthesia for which Propofol and Morphone or Fentanyl was used. The effect of anaesthesia on the brain and depth of anaesthesia was measured using the Bispectral Index (BIS). The autonomic nervous system activity in the brainstem was assessed with the Neuroscope™ system, which processes the ECG and BP signals to produce continuous real-time indices of parasympathetic activity, the cardiac vagal tone (CVT) and cardiac sensitivity to baroreflex (CSB). CVT is measured in an arbitrary scale, the Linear Vagal Scale (LVS) (Julu, 1992). Continuous recording of all parameters was started in theatre prior to induction of anaesthesia and continued during the whole operation. Statistical significance was assessed by paired t-test.

Results and Discussions: Mean values of recordings just before and after induction of anaesthesia were calculated. The following results are presented as the mean value before induction and the 95% confidence interval for the mean difference. There were significant changes in BIS: 94.7 (58.0–66.9%), CVT: 2.9 (0.1–2.7), LVS, CSB: 1.7 (0.3–1.8) ms · mmHg⁻¹ and SBP: 154 (27–56) mmHg. There was no change in HR (76.3 [6.2–6.2] beats · min⁻¹). These results suggest that both sympathetic and parasympathetic activity in the brainstem is reduced by anaesthesia. The decreased parasympathetic drive, as shown by reduced CVT and CSB, would alone increase the heart rate. However this is counteracted by the concurrent decreased sympathetic activity, which also causes the decrease in BP.

Conclusion: Measuring heart rate and BP alone during anaesthesia does not provide enough information about brainstem function. We therefore advocate that a direct measure of parasympathetic activity (CVT) would be valuable in monitoring the patient’s cardiovascular status.

7AP1-9
Traumatic intracranial aneurysms after gunshot injuries. Anaesthetic and endovascular management may be a prompt safe-to-use technique and a valuable option: about two cases reports
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Background and Goal of Study: There are few published large series on civilian cranioencephal gunshot injuries in children. Traumatic intracranial aneurysms (TICAs) are rare and highly unstable lesions. They represent less than 1% of all aneurysms and can either rupture within minutes after formation or remain quiescent for several weeks or years, manifesting with delayed hemorrhage and neurological deterioration.

Materials and Methods: We report two cases of TICAs after gunshot injuries in civilian practice. We discuss the pathogenesis and the management of TICA after civilian cranioencephal gunshot injuries.

Results and Discussions: Case 1: A 10-year-old girl who was referred for coma after high-velocity cranioencephal gunshot wound and neurological deterioration 7 days after the initial injury. A massive right posterior occipital hematoma caused by the rupture of an unsuspected right posterior cerebral artery TICA was discovered, and was treated by coil embolization, with a good neurological recovery at 6-month follow-up.

Case 2: A 34-year-old woman was referred for a lead shot gun injury after suicide and deteriorated neurologically secondary after the initial injury with an initial massive right sylvian valley haematoma. An unsuspected right sylvian artery TICA was discovered, and was treated by coil embolization at day two with a good neurological recovery at 8-month follow-up.

Conclusion(s): TICAs should be suspected in patients with civilian cranioencephal gunshot injuries, presenting with secondary neurological deterioration, to carry out emergent CT scan and angiographic exploration before contemplating definitive endovascular treatment. Endovascular management may be a prompt safe-to-use technique and a valuable option, especially when surgery is highly risky.

7AP2-1
Complications after lumbar posterior spinal fusion instrumentation: influence of patient characteristics, surgical procedure and learning curve
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Background and Goal of Study: To evaluate the association between major complications in lumbar posterior spinal fusion instrumentation (PSFI) and patient baseline characteristics, the surgical procedure and learning curve.

Materials and Methods: Between 1997 and 2002 the same surgical team performed PSFI in 118 patients, 70 women and 48 men with a mean age of 49.25 years (range 13-83). The patient’s baseline characteristics (age, gender, body-mass-index, ASA and associated co-morbidities), surgical data (fused levels, blood loss, duration and date of surgery) and early complications (EMC) were recorded. Major complications were defined as potentially life-threatening or cause of considerable suffering. Logistic regression analysis, non-parametric tests for comparison and Chi-Square were used for statistics.

Results and Discussion: 23 patients (19.4%) developed 32 EMC. 8 had radicular symptoms, 3 an infection, 8 pulmonary, 7 cardiovascular and 6 other complications (hematoma requiring reoperation, disorientation and confusion, impotence, pancreatitis). Bivariate Analysis: Age, body mass index, ASA, cardiac, pulmonary and vascular co-morbidity increased the rate of EMC. Duration and date of surgery modified significantly the rate of major complications. Blood loss and number of fused levels did not modify the rate of EMC.

Logistic Regression: vascular (OR 5.05, p = .16) and pulmonary disease (OR 2.34, p = .26) were the co-morbid conditions most closely associated with complications. Procedures lasting 4 to 6 hours had more complications (OR 3.61, p = .15) than those lasting less than 4 hours (OR 7.90, p = .02). The experience of the surgical team was the parameter most strongly associated with complications.

Conclusions: When performing PSFI, the experience of the surgical team and the length of the surgical procedure seem to have more influence on the complication rate than the patient’s baseline characteristics.

References:

7AP2-3
Impact of surgery-related factors and anaesthesia-related variables on cerebral infarction after aneurysmal subarachnoid hemorrhage (Pre-embolization Era)
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Background and Goal of Study: To investigate surgery-related or anaesthesia-related predictors of cerebral infarction after early aneurysm surgery(1).

Materials and Methods: A retrospective study was conducted on consecutive 382 patients who underwent early microsurgery for the anterior circulation aneurysms. We collected quantitative information about surgery-related factors (intraoperative rupture, temporary clipping, clipping- and retraction time) and anaesthesia-related variables (blood pressure, oxygen saturation, hematocrit) (2). Postoperative occurrence of vasospasm or cerebral infarction was chosen as a reference event. Patients were dichotomized according to H-H grade.

Results and Discussion: In total patients, close relation existed between intraoperative rupture, prolonged clipping and retraction time, intraoperative hypotension, low hematoct and occurrence of cerebral infarction. However, statistical significance in 2 separate groups of corresponding clinical grade was not found. On multiple logistic regression analyses, intraoperative rupture, hypotension and low hematocrit showed Odds ratio of 2.123, 3.016 and 1.628, respectively.
Conclusion(s): Early surgery for poor grade SAH patients carries significant risk of ongoing ischemic complication, and thus endovascular embolization should be considered as a strong alternative. Additionally, cardiovascular and pulmonary dysfunction hampers successful postoperative recovery in some cases.

References:

7AP2-4
What is the actions mechanism of lumbar epidural blood patch in the treatment of the headache by spontaneous carval CSF leak?
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Background and Goal of Study: To evaluate the efficacy and to identify the action's mechanism of lumbar epidural blood patch (LEBP) in the treatment of headache by spontaneous cervical CSF leak (SCCSFL).

Materials and Methods: We observed 46 patients with spontaneous intracranial hypertension (SIH) between 1992 and 2006. 16 pts received LEBP of these 5 pts (2 women and 3 men; age range 34–51 years) showed SCCSFL. LEBP was performed using 15 to 34 ml of autologous blood mixed with 1 ml of gadolinium. All patients maintained a 30 degree Trendelenburg position during the procedure and for 24 hours after. All pts performed spinal RMI about 1 h post-LEBP. Follow-up ranged from 6 to 18 months.

Results and Discussions: All patients had orthostatic headaches (OH). Other manifestations were nausea, vomiting, tinnitus, diplopia and bilateral upper limb numbness. All pts failed an initial conservative treatment (bed rest and rehydration) over a period of 1 to 18 months. Brain RMI showed diffuse pachymeningeal oedema. Hemodynamic instability, neurological deficits and intracranial hypotension (IHH) and spinal MRI showed cervical CSF leak in all pts. Spinal MRI post-LEBP showed blood mixed with gadolinium in the epidural space from lumbar to cervical level in 2 pts and only at lumbar level in 3 pts. OH recoveries within 24 h in all pts, when they were upright position. Until now none has had a relapse.

Conclusion(s): Our data confirm the efficacy of LEBP in SCCSFL and identify the two action mechanism of LEBP in these cases. The first is the plug effect that is showed when the blood arrives at the CSF cervical leak. The blood clotting closes the leak and stops lquoral cervical leakage, this is showed in only two pts. The second is the mass effect: the high quantity of blood injected in the epidural space shifts the dura madre to the spinal marrow and cauda equina to cause one reduction on the volume in the subaracnoide space, and determine the increase of liquor pressure. The liquor that is pushed up determines the increase of cranial pressure. This mechanism is showed in all our patients and is the only action mechanism in three of them.

7AP2-5
Dexmedetomidine-ketamine-midazolam combination for sedation in endovascular embolizations of cerebral arteriovenous malformations and carotid stenting
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Background and Goal of Study: Sedation is indicated in endovascular embolizations of cerebral arteriovenous malformations and carotid stenting to secure immobility, anaesthesia, analgesia, and amnesia of the patient during these procedures. Hemodynamic stability, absence of respiratory depression, preserved patient responsiveness and cooperation are required. We used theoretically promising combination of dexmedetomidine with low doses of ketamine and midazolam for sedation, and compared it with routine sufentanil-midazolam sedation.

Materials and Methods: After local ethic committee approval, 34 ASA 2–3 adults scheduled for endovascular interventions, were randomly allocated into 2 groups for sedation. Group A: bolus application of dexmedetomidine 0.5 µg kg⁻¹, ketamine 0.25 mg kg⁻¹, midazolam 0.02 mg kg⁻¹ i.v. over 5 min- utes, followed by infusion of dexmedetomidine 0.25 µg kg⁻¹ h⁻¹ and ketamine 0.25 mg kg⁻¹ h⁻¹. Infusion rate was altered to keep the patient sedated, but responsive and cooperative. Group B: bolus of sufentanil 10 µg and midazolam 0.02 mg kg⁻¹, followed by further bolus increments as needed. Blood pressure (BP), ECG, sat O₂, Pco₂, Ramsey sedation score, complications, rescue med-i-cation, amnesia, and recovery times were recorded. Patient cooperation was assessed by the radiologist (blinded to the sedation used) as excellent-sufficient-poor at the end of each procedure. Statistical analysis: t-test, χ² test, ANOVA for repeated measures.

Results and Discussions: Decrease of BP was significantly deeper in A group, than in B group (systolic BP: p < 0.05, diastolic BP: p < 0.01), as well as the decrease in heart rate (p < 0.001). Cooperation was excellent in 94% in A group, vs. 30% in B group (p < 0.001). No other statistically significant differences were found. No clinically significant complications were recorded.

Conclusion: Dexmedetomidin-ketamine-midazolam combination seems to be safe and advantageous method of sedation in endovascular interventions. Improved patient cooperation and lower blood pressure can potentially contribute to decreased risk of severe complications, as intracranial haemorrhage and hyperperfusion syndrom (1).

Reference:

7AP2-6
The effect of low dose propofol on cortical memory networks – a functional MRI study
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Background and Goals: Blood oxygenation level dependent (BOLD) based fMRI is an effective tool to investigate central drug actions (1). Recent studies showed that even low doses of propofol have significant amnesic effects (2). Whether these amnesic actions are caused by a selective or a global reduction of memory network activity is yet not clear. Thus, fMRI has been used to investigate the effects of propofol on the BOLD signal changes while subjects performed different memory tasks.

Materials and Methods: 26 male volunteers (ASA 1) were double blind randomised on three study branches: placebo (normal saline), propofol 0.6 µg/ml and 1.2 µg/ml (TCI infusion). After 10 minutes of propofol equilibration subjects performed several tasks (episodic, semantic, and working memory tasks, hyper- and hypoventilation tasks) within the scanner. 45 minutes after cessation of propofol subjects had to perform an unexpected recognition task of items (faces) presented during the working memory task.

Results and Discussions: Propofol did not affect the BOLD signal during the equilibration period. Moreover, ventilation-induced BOLD signal changes (cerebral vasoreactivity) did not differ between propofol and placebo. Reaction time and error rates of the different tasks increased dose-dependently (p < 0.05). Subjects of the placebo group recalled 69 ± 7% (mean ± SD) of the correctly processed, 0.6 µg/ml propofol decreased the recognition rate by 17% (p < 0.05), 1.2 µg/ml by 39% (p < 0.01) respectively. Significant BOLD signal reductions (p ≤ 3.1, p < 0.001) caused by increasing propofol concentrations during the different memory tasks were found in circumscribed memory network areas. There was no global reduction of cerebral network activity under propofol during the different memory tasks.

Conclusion(s): Low dose propofol does neither influence the baseline BOLD signal nor the cerebral vasoreactivity. Therefore, the observed signal changes under propofol reflect real changes of neuronal activity. As a result attention and memory deficits induced by amnesic propofol concentration can be interpreted as a highly selective impairment of cerebral networks.

References:

7AP2-7
Does the presence of a subarachnoid haemorrhage (SAH) influence analgesic requirements after treatment with surgery or endovascular coiling in patients with intracranial aneurysms?
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Background and Goal of Study: Analgesia requirements after aneurysm repair remain controversial(1-2). The purpose of this study is to assess if the presence of a sub arachnoid haemorrhage (SAH) influences the post procedure opiate use in patients treated with open craniootomy compared to endovascular coiling.

Materials and Methods: Data was collected prospectively on 134 patients undergoing treatment of intracranial aneurysm. Patients were divided into 4 groups: unruptured (no SAH) endovascular repair (EU), ruptured (SAH) endovascular (ER), unruptured craniootomy (CU), and ruptured craniootomy (CR). Total opioid pain medications given in the 48 hours post procedure were recorded (fentanyl, codeine, morphine). These doses given were converted to morphine equivalents for comparison.
Patients in the EU group required statistically less postoperative opioids than the other 3 groups.

Conclusion(s): We conclude if a patient has had a SAH from the aneurysm. They will experience similar levels of pain and require similar levels of opioids regardless of the method of repair within the first 48 hours post procedure. Thus it is important to administer adequate analgesia to all patients with SAH, and not reduce the dose if the repair has been performed by an endovascular technique.

References:

7AP2-8
Magnesium sulphate used for prevention of cerebral vasospasm
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Background: Last years clinical researchers show an increasing interest in use of magnesium sulphate (MgSO4) in prevention of delayed ischemic neuronal damage (DIND) caused by vasospasm after SAH (1,2). The aim of the study is to reveal the protective effect of MgSO4 on neurological damage after SAH in our patients.

Materials and Methods: 35 randomly enrolled patients (42.23 ± 12.56 years old) after aneurismal SAH, which had received MgSO4 60 mmol/L/day from day 4 to 10 after SAH, were compared for their neurological follow up (for 14 days) with other 96 analogous patients treated in our clinic in the previous 1.5 year period. All patients had surgery for clipping of aneurism. The difference in treatment consists only in administration of MgSO4. Neurological status at 14-th day was expressed through GOS. There were assessed SIRS and MODS too. For statistics T-test was used and p < 0.05 was considered as significant.

Results and Discussion: Patients who received MgSO4 showed a much lower (very near to significant) incidence of clinically assessed DIND (31.42%–10 from 35 to 42.67%–41 from 96, p = 0.08). GOS at 14-th day did not result in significant difference (3.86 ± 1.19 pts to 3.34 ± 0.96 pts), Mortality rate was 22.86% in magnesium group and 26.05% in others (p > 0.05). Frequency of SIRS on the first day after operation was slightly lower in magnesium group (91.42% to 94.78%). In 14 days period MODS was presented in 34.28% of patients in MgSO4 group and 39.58% in others (p > 0.05).

Conclusion: Although statistic significance was not achieved at any of indexes we observe a lower incidence of DIND, MODS and SIRS in patients treated with MgSO4. Mortality rate and GOS showed lower values in magnesium group. Lack to achieve statistic significances may be to the little number of patients in our study.

Reference:

7AP2-9
Survive and mortality in patients with severe brain trauma
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Background and Goal of the Study: Brain injury is an important part of overall injuries. The goal of the study was to assess the dynamic of head injury of ≤ 8 GCS during 2005 in our department.

Materials and Methods: 112 patients were attended to our Critical Care Department for brain injury during the year 2005. F/M ratio was 30/82, age 33.12 ± 8.42. Related to their GCS assessment they were presented as GCS 3–4 pts 36 patients, as GCS 5–6 pts 28 patients and as 7–8 pts 48 patients.

Results and Discussion: Most of them were road casualties (90 patients), 38 of them had other important damages. 17 of the patients were operated for traumatic brain haematomas. Immediately after the attendance the patients were intubated, sedated and mechanically ventilated with Tidal volume 6–8 ml/body weight. CT-scans performed at the attendance showed 69% haemorrhagic contusion, 26% were massive haematoma and 5% only pronounced hypoxemic brain swelling, 26% of the patients were presented to the hospital in shock. In 32 patients Diclofenac was used as antiflogistic agent. Overall mortality was 54% (61 from 112). Mortality rate in-patients with GCS 3–4 pts was 94%, in-patients with 5–6 GCS was 53% and in the group with 7–8 GCS 25%.

Conclusion: The most frequent cause of brain injury in our patients was road casualties. The overall mortality was over 50%. Use of Diclofenac showed better recovery to other patients.

Reference:

7AP2-10
The effects of 7,2 hypertonic saline in 6% hydroxyethyl starch 200/0,5 on intracranial pressure and cerebral regional oxygen saturation at acute normovolemic haemodilution in patients undergoing supratentorial tumor surgery
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Background and Goal of Study: Hypertonic colloidal fluid resuscitation has not been studied in cases of brain tumor. The goal of this study was to evaluate the effects of 7.2% hypertonic saline in 6% hydroxyethyl starch 200/0,5 (HyperHAES, Fresenius Kabi, Germany) on intracranial pressure (ICP) and cerebral rSO2 at acute normovolemic haemodilution (ANH) in patients undergoing supratentorial brain tumor surgery.

Materials and Methods: 250ml HyperHAES (3.8 ml/kg) has been infused during 13,7 ± 3,1 min after 1200 ml blood withdrawal at ANH in 21 patients undergoing supratentorial brain tumor resection under invasive haemodynamic and laboratory control. ICP and cerebral rSO2 continuously were measured during and 15 min after HyperHaes infusion. We used paired Student t-test or Mann Whitney test.

Results and Discussion: Changes in ICP and cerebral rSO2 are shown below on Figures. Standard deviations have been shown at beginning of study, on peak of transitory changes and in the end of infusion and study.
Results and Discussions:

In vitro and in vivo data were obtained by monitoring electroencephalogram (EEG) activity and cerebral microdialysis (MD) in awake and anesthetized rats. The used parameter, the correlation dimension is a measure of dimensionality within the contextual network, resulting from a severe anaesthetic-induced depression of neuronal activity. The correlation dimension (CD) of the EEG data, CD might be a parameter to separate consciousness from unconsciousness during anaesthesia. The anaesthetic challenge is to provide sedation, analgesia, hemodynamic stability, a safe airway as well as optimal neurological conditions. In the present paper, we monitored local cerebral metabolic changes with cerebral microdialysis (MD) during wake-up procedures.

Materials and Methods:

In this paper, we report on 9 adult pts scheduled for brain tumor surgery in eloquent areas of the brain. Induction was accomplished with propofol TCI (3 µg/ml), remifentanil TCI (8 ng/ml) and rocuronium (0.6 mg · kg⁻¹). After insertion of a laryngeal mask airway (LMA), anaesthesia was maintained with propofol TCI (titrated to Bis between 40 and 60) and remifentanil TCI (titrated to hemodynamic responses). Surgical field was infiltrated with up to 30 ml bupivacaine 0.5%. For wake-up, TCI propofol-remifentanil was gradually reduced until pt became responsive and LMA could be removed. After opening of the dura, a MD catheter was inserted by the surgeon in the at-risk cortex. This monitoring was sustained throughout the operation during which intra-operative events, as lobe retraction and especially awakening, were documented. The MD catheter was perfused at 5 µl/min enabling analysis for glucose, lactate, pyruvate and glycerol of the dialysates every 5 min.

Results:

In all 9 pts, wake-up was successfully managed. In a mean of 23 min (range 12–39 min) after start of the wake-up procedure, pts became responsive and LMA could be removed. After opening of the dura, a MD catheter was inserted by the surgeon in the at-risk cortex. This monitoring was sustained throughout the operation, during which intra-operative events, as lobe retraction and especially awakening, were documented. The MD catheter was perfused at 5 µl/min enabling analysis for glucose, lactate, pyruvate and glycerol of the dialysates every 5 min.

Conclusion:

Wake-up procedures, assuring stable hemodynamic and respiratory conditions, seem not to induce an increased risk for local cerebral metabolic (ischemic) changes, as monitored by cerebral microdialysis.

7AP3-5

Local cerebral metabolic changes, induced during minimally invasive supracraniotomy for cerebral aneurysm surgery, monitored by cerebral microdialysis

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Introduction: An alternative approach for surgical treatment of anterior/middle cranial fossa lesions is frontolateral craniotomy through supraciliary skin incision. Brain retractor applied during brain surgery may induce local changes in cerebral perfusion. Cerebral microdialysis (MD) is a tool for monitoring local cerebral metabolism. In this study, we evaluated whether MD revealed any changes in local cerebral metabolism in the brain area under the retractor and in the vascular territory of aneurysm surgery during supraciliary craniotomy.

Patients and Methods: With IRB approval, 14 pts scheduled for anterior/middle cerebral artery aneurysms, received peroperative MD. A MD catheter was inserted under direct vision into at-risk cortex at start of surgery. This monitoring was sustained throughout operation, during which intra-operative events, as cerebral anaesthetic manipulation and/or clipping or lobe retraction, were precisely documented. The MD catheter was perfused at 5 µl/min enabling analysis (for glucose, lactate, pyruvate and glycerol) of the dialysates every 5 min.

Results: In all pts, MD catheter was successfully inserted into cerebral cortex and dialysates could be obtained throughout whole operation. Insertion of brain retractors resulted in overall decrease in local glucose, most probably reflecting a decrease in local perfusion. In all patients, we observed a short-lasting increase in local glucose after retractor removal or repositioning. In 12 of 14 pts, local lactate increased, mostly related to retraction. In 4 pts, we

Conclusion(s): CD can be used to detect and evaluate sevoflurane-induced changes in the field potential activity of cortical tissue slices in vitro. Anaesthetic actions mediated by cortical and subcortical brain areas may underlie the inverse course of CD in vitro and in the EEG. Because of the “threshold” in EEG data, CD might be a parameter to separate conscious from unconsciousness during anaesthesia. This has to be evaluated in a shorter than i. artefact containing signals from ii. dynamic phases of anaesthesia.

References:

observed an increase in lactate/pyruvate ratio. Only 2 of these episodes went along with a local increase in glycerol, a sign of ongoing cerebral cell death. We observed no local metabolic changes induced by cerebral aneurysm manipulation. Postoperative outcome was uneventful for all pts.

Conclusion(s): This minimally invasive technique, a 2.5 × 3.0 cm craniotomy, through supraciliary incision, is a simple approach to the anterior/middle cranial fossa. These first results failed to reveal an increased risk of local metabolic changes induced by brain retraction.

7AP3-6
Incidence of low BIS values during general anesthesia in neurosurgical patients
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Background and Goal of Study: BIS below 45 has been associated with worse outcome following anesthesia and surgery [1]. We decided to investigate the incidence of low BIS in our neuroanaesthesia practice.

Materials and Methods: Data records from neurosurgical surgeries were collected every 5s from Aspect XP with Rugloopil®. Anaesthesia was with TCI of propofol and remifentanil. The only defined goal that the anaesthetists had, was avoiding BIS above 60. BIS was analyzed from the moment when BIS dropped below 70 (induction) until the first moment at recovery when BIS increased above 70 – anaesthesia time (AT). For poor neurological grade patients, AT was from the beginning of induction until end of surgery. An algorithm that we developed in Matlab® extracted the time periods with BIS in different levels (<30, 30–35, 35–40 and 40–45). (Data: mean ± SD)

Results and Discussions: 211 patients, ASA 1–4, 51 ± 17 years, 69 ± 13 kg, 163 ± 8 cm, 92 male, 166 head surgeries and 45 spinal, Glasgow score 3–8 in 8 patients and 9–12 in 11. BIS was below 45 for any period of time in all records: for 25–50% of AT in 31 patients, for 50–75% in 77 patients and for 75–100% of the time in 90 patients. BIS below 30 occurred for 75–100% of AT in 3 patients, for 50–75% in 11, for 25–50% in 28 and for 10–25% in 45.

Conclusion(s): We found, in our neuroanaesthesia practice, an incidence of low BIS that we think was too high: 79% of the patients had BIS below 45 more than 50% of the time. These results suggest that maybe, worrying mostly about awareness may result in too deep anaesthesia. It may be desirable to implement measures to achieve less deep anaesthesia.

Reference:

7AP3-7
Acute changes in cerebral autoregulation following carotid endarterectomy under general anaesthesia
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Background and Goal of Study: Carotid endarterectomy (CEA) may be associated with postoperative haemodynamic instability requiring treatment with vasoactive drugs[1]. If autoregulation is disordered, treatment to raise or lower the blood pressure may lead to dramatic changes in cerebral blood flow. Furthermore, some patients may exhibit postoperative blood pressures outside their normal limits of autoregulation. This study examines the change in the cerebral autoregulation index following CEA and the association between perioperative blood pressure change and autoregulation.

Materials and Methods: Fifteen patients who underwent CEA under general anaesthesia were studied. Pre and postoperative arterial pressure (MAP) were recorded. Patients underwent tilt-testing on the day before surgery and on the first postoperative day (POD1). The static autoregulation index (AI) was derived as the gradient of the relationship between CPP and MCAv (cm sec⁻¹ mmHg⁻¹). Data are reported as medians and ranges.

Results and Discussions: Ten of the patients were male. The median(range) age of patients was 67(53–83) years. The median preoperative MAP was 97(82–131)mmHg. Median postoperative MAP was 89(73–140)mmHg. The median preoperative AI was 0.21(–0.16–0.68) and the median postoperative AI 0.14(–0.61–0.54). The median change in AI was 0.072(–0.46–0.39) and was not statistically significant (p = 0.61). There was no significant correlation between the change in blood pressure and the postoperative AI (r = –0.3)

Conclusion(s): Our data do not support a significant change in cerebral autoregulation following CEA. There was no association between large changes in MAP and poor cerebral autoregulation. These data suggest that patients who have undergone CEA under general anaesthesia and do not have clinically evident hyperperfusion can be given vasoactive drugs for hypo or hypertension without undue concern.

Reference:

7AP3-8
Assessment of cerebral autoregulation with the Transient Hyperemic Response test. Comparison with CO₂ Reactivity in head-injury patients
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Background and Goal of Study: Impaired cerebral autoregulation is associated with an unfavorable outcome after head-injury. Recently, a noninvasive method using transcranial Doppler (TCD), only validated in volunteers, has been described: the Transient Hyperemic Response (THR) test. The aim of this study was to assess the reproducibility of the method in head-injury patients and to compare derived autoregulation indices with those of a standard test of autoregulation, CO₂ Reactivity (RCO₂).

Materials and Methods: Seventeen artificially ventilated patients with intracranial pressure monitoring were examined. Middle cerebral artery (MCA) was insonated with a 2-MHz TCD probe (Lokki; Atys Medical). The probe was fixed in position by using a headband to maintain a constant angle of insonation during the study. At least 2 THR tests were performed by using a 10-s compression of the ipsilateral common carotid artery (CC). For analysis, two wave forms were chosen: F1, the wave form immediately preceding the compression; F2, the second wave form after the release of compression. THR ratio = F2/F1. Normal value of THR ratio was defined as >1.10. RCO₂ was evaluated by a hyper ventilation trial to lower ETCO₂ by 5 mmHg. Normal range for RCO₂ was defined as 3.5 ± 1%×MCAv/mmHg. Data were analyzed using linear regression and Bland-Altman analysis.

Results and Discussions: Thirty-four THR test was obtained from 17 patients. Bland-Altman analysis for THR test showed a bias –6.10⁻² and a precision ±0.03. THR test <1.10 was found for 5 patients. Loss of RCO₂ was found for 10 patients. Linear regression analysis did not found any correlation between THR test and RCO₂ (figure).

Conclusions: THR test is reproducible in clinical arena. But it does not allow prediction of cerebral circulation CO₂ reactivity. Its clinical usefulness has thus to be determined.
7AP4-1
Bilaterial measurement of Bispectral Index (BIS) and Middle Latency Acoustic Evoked Potentials (MLAEP) in sedated patients with unilateral supratentorial intracranial haemorrhage

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Background and Goal of Study: The impact of intracranial lesions on the results of Bispectral Index (BIS) and Middle Latency Acoustic Evoked Potentials (MLAEP) remains unclear. If an EEG-based measurement is influenced by intracranial lesions, bilateral application in patients with unilateral brain lesions should result in different values obtained from both sides. We studied if a significant side difference exists in MLAEP (Pa, Nb) and BIS obtained bilaterally from patients with unilateral brain lesions.

Materials and Methods: BIS and MLAEP were measured bilaterally in eight sedated patients with unilateral supratentorial intracranial haemorrhage using the BIS- and AEP-module of the (S/5) monitor (GE, Helsinki, Finland). The mean difference (bias) of the measurements of both sides was calculated (Bland-Altman-Statistic). Significance of differences was calculated by paired t-Test (p < 0.05 was regarded as significant).

Results and Discussions: Nb-Latency was not measurable in two patients. A significant difference of mean values of BIS existed between the side of the lesion (32 ± 5) and the contralateral side (40 ± 7, p = 0.011). Also, Nb-latency showed lower values on the side of the lesion (55 ± 18 vs. 58 ± 17, p = 0.045). There was no significant difference between values of Pa (37 ± 18, p = 0.32). Mean bias of values was 1.5% (SD 3.6) for Pa-latency, -7% (SD 5.2) for Nb-latency and -18% (SD 17.0) for BIS, suggesting that Pb and Nb are less affected by intracranial lesions than BIS.

Conclusions: If BIS is used for measurement of depth of sedation in patients with unilateral intracranial lesions, the unaffected side should be preferred. BIS values regarded as guidelines for estimation of depth of sedation in patients without brain pathology cannot be used for patients with intracranial lesions.

Reference:

7AP4-2
Stress measured by biopyrrin, an oxidative substance of bilirubin, in two groups who underwent different neurosurgical procedures

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Background and Goal of Study: Urine biopyrrin (BYP) reveals the degrees of oxidant stress and various kinds of stress. The purpose in the present study was to evaluate the stress between two groups of patients who underwent different neurosurgical procedures by measuring BYP values.

Patients and Methods: After obtaining institutional approval and informed consent, 15 patients were enrolled in the present study. Patients were divided into two groups: patients who underwent cranial surgical procedures (G-A) and those who underwent interventionall radiology (IV) to treat their cranial diseases (G-B). BYP values were measured three times in each patient: 1) on the morning before surgery (T-1); 2) the first postoperative day (T-2); and 3) the third or fourth postoperative day (T-3). The urine samples were frozen and measured later, using the Biopyrrin EIA Kit produced by KVLO Laboratory. Urine creatinine values were measured at the same time. The BYP data (microg/gCr) were calculated as the BYP values divided by the urine creatinine values. All values were expressed as means. Statistical analysis was performed using repeated measurements analysis (ANOVA) with Scheff's test.

Results and Discussion: In G-A, nine patients (6 males) were enrolled with a mean age of 63.9 yr (range 39–74 yr). Six patients formed the G-B group (5 males), with a mean age of 72.9 yr (range 55–78 yr). BYP values at times T1, T2 and T3 were as follows for groups A and B, respectively: 3.1, 6.2, 5.4 (P = 0.02); and 3.1, 4.2, 3.8 (P = 0.195). There was no significant difference between the two groups (P = 0.06). Biopyrrin is formed from the oxidation of bilirubin. It reveals the cascade condition of the bilirubin metabolism. Some studies reported that it also revealed the degree of stressed condition and various kinds of stress. The purpose in the present study was to ascertain if a significant side difference exists in MLAEP (Pa, Nb) and BIS obtained bilaterally from patients with unilateral brain lesions.

Conclusions: BYP levels might reveal different levels of surgical stress and be useful in evaluating various kinds of surgical stress. Further studies are warranted.

7AP4-3
Metabolic acidosis induced by topiramate in neurosurgery
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Background and Goal of Study: Topiramate, a new generation antiepileptic drug, can produce asymptomatic metabolic acidosis through carbonic anhydrase isoenzymes inhibition. Intraoperative decompensation could be missed without blood gas control.

Materials and Methods: Intraoperative blood gas analysis after anesthesia induction was performed on every patient operated on brain surgery between 2004 and 2006. Patients with renal disease were excluded. Finally, 320 patients were included. Surgery was performed under propofol/remifentanyl (TCI) and rocuronium, with standard monitoring plus invasive arterial pressure.

Results and Discussions: Five patients had severe intraoperative metabolic acidosis not previously known.

7AP4-4
Influence of the sevoflurane on spontaneous bioelectric brain activity in neurosurgical patients

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Background and Goal of Study: The electrophysiologic effects of sevoflurane (S) are not well characterized in patients with intracranial pathology. There is no unequivocal opinion on safety of the use of S in neurological patients with epileptic seizures: S can exert both anticonvulsant and proconvulsant properties. The expiratory concentration of the S is important determinant of this influence. The aim of the research was the investigation of influence of S on bioelectric brain activity in neurological patients with focal cerebral lesions.

Materials and Methods: We examined 41 patients: 36 with supratentorial hemispheric tumors (26 with seizure activity on preoperative EEG and 10 without) and 5 with brain arteriovenous malformations (AVM) with epileptic activity on EEG.

Results and Discussions: S causes a dose dependent depression pattern on EEG. EEG spike frequency increased in all patients during S anesthesia compared with awake recordings. Compared with 1 MAC S, spike frequency was higher in all patients during 1.5 MAC S.

Conclusions: S causes a dose dependent depression pattern on EEG. S can be used in the patients with epilepsy caused by organic brain lesions.
without risk of development of seizures during and after surgery. Careful attention should be paid to the concentration of S in patients with AVM-induced epileptic seizures.

**7AP4-5**

Quantitative evaluation of cerebrovascular reactivity by brain arterial and internal-jugular vein differences: a comparison with Doppler sonography

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Background and Goal of Study: To verify whether CO₂ reactivity in the middle cerebral artery (MCA), as assessed with Transcranial Doppler ultrasound, adequately reflects cerebral blood flow (CBF) reactivity in healthy humans.

Materials and Methods: Twelve healthy individuals [aged 27 ± 4 (mean ± SD)] volunteered for this study; all were non-smokers without history of disease. Changes in velocity in the MCA (MCAv) were compared with changes in CBF as assessed by measurements of the difference in the reciprocal of the arterial (radial) and venous (internal jugular vein) content in oxygen (1/AVDO₂) during acute changes in PaCO₂. Incremental hypercapnic steps (4-min) were made during inhalations of 4% and 8% CO₂. Participants were then instructed to hyperventilate, to generate two levels (4-min each level) of incremental hypocapnia to match, in an equal and opposite direction, the rise in end-tidal CO₂ incurred during the hypercapnia steps. Cerebrovascular reactivity to CO₂ was expressed as the percentage (%) change in MCAv or CBF (i.e., 1/AVDO₂) per mmHg change in PaCO₂.

Results: Over the range of PaCO₂, the change in MCAv and 1/AVDO₂ were highlighted related (r = 0.80; p < 0.05). CO₂ reactivity was not different when calculated using the change in MCAv or change in 1/AVDO₂ (0.8 ± 1.2%/mmHg vs. 3.2 ± 1.8%/mmHg, respectively, p > 0.05).

Conclusion(s): MCAv variations adequately reflect CBF and CO₂ reactivity changes as compared with AVDO₂ measurements, indicating that marked variations in PaCO₂ and CBF do not act noticeably on the diameter of the MCA. These results may serve as the point of reference for ‘normal’ responses for comparison against patients with neurological disorders.

**7AP4-6**

Bispectral index monitoring in traumatic brain injury patients

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Background and Goal of Study: Maintaining an optimal level of comfort and safety for critically ill patients is an universal goal for critical practitioners. The assessment of sedation level remains a challenge for the intensivist in order to avoid over- or under-sedation phenomena. The introduction of the bispectral index (an EEG parameter) could bring potential advantages in monitoring sedation. According to the reports, the Richmond Agitation-Sedation Scale (RASS) has been shown to be highly reliable among multiple types of health care professionals. The RASS has an expanded set of scores at pivotal levels of sedation that are determinated by patients’ response to verbal or physical stimulation, which will help the clinician in titrating medication.

Materials and Methods: This is a prospective, nonrandomized, observational study in a surgical and trauma tertiary intensive care of an university hospital. Twenty-six consecutive traumatic brain injury patients (age range 17–68 yrs, mean age 42 yrs) were included. They were sedated (with propofol or remifentanil) and sensory entropy of 40–60 in group E. Standard monitoring of vital signs was performed. Et-Sevo, state entropy (SE) and response entropy (RE) data were recorded after induction (1), craniotomy (2), tumor removal (3) and at the end of operation (4) (Table 1).

Results: There were no differences between the groups with respect to demographic characteristics. Mean anesthesia time in group E was 241.6 ± 74.2 min (mean ± SD) and 263 ± 63.1 min in group O. Data (Mean ± SD) are shown in the table 1:

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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</thead>
<tbody>
<tr>
<td>Et-Sevo O</td>
<td>0.81 ± 0.16</td>
<td>1.43 ± 0.17</td>
<td>1.41 ± 0.15</td>
</tr>
<tr>
<td>Et-Sevo E</td>
<td>0.48 ± 0.21</td>
<td>0.75 ± 0.25</td>
<td>0.79 ± 0.28</td>
</tr>
<tr>
<td>RE</td>
<td>43.48 ± 8.15</td>
<td>42.45 ± 7.26</td>
<td>42.53 ± 7.47</td>
</tr>
<tr>
<td>SE</td>
<td>41.15 ± 8.87</td>
<td>40.48 ± 6.87</td>
<td>40.20 ± 6.54</td>
</tr>
</tbody>
</table>

**7AP4-7**

Monitoring of anaesthesia depth with entropy modals allows reduction of sevoflurane consumption in patient undergoing craniotomy for intracranial tumor surgery

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Background and Goal of Study: Balanced anaesthesia with sevoflurane has been the most frequently used for intracranial surgery. The study was to determine the role of anaesthesia depth monitoring to require-ment of sevoflurane for maintaining of anaesthesia in patient undergoing craniootomy for intracranial tumors.

Materials and Methods: 80 patients with ASA I-III undergoing scheduled surgery for intracranial tumors, were enrolled into the study and randomly divided into equal groups: group E with entropy monitoring and group O without it. Anaesthesia was maintained using sevoflurane with Et-Sevo of 1.5–2.0%, maintaining MAP within 20% of preinduction baseline in group O and sensory entropy of 40–60 in group E. Standard monitoring of vital signs was performed. Et-Sevo, state entropy (SE) and response entropy (RE) data were recorded after induction (1), craniotomy (2), tumor removal (3) and at the end of operation (4) (Table 1).

Results: There were no differences between the groups with respect to demographic characteristics. Mean anesthesia time in group E was 241.6 ± 74.2 min (Mean ± SD) and 263 ± 63.1 min in group O. Data (Mean ± SD) are shown in the table 1:

<table>
<thead>
<tr>
<th>Table 1</th>
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<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>Et-Sevo E</td>
</tr>
<tr>
<td>Et-Sevo O</td>
</tr>
<tr>
<td>RE</td>
</tr>
<tr>
<td>SE</td>
</tr>
</tbody>
</table>

**7AP4-8**

Monitoring of regional cerebral oxygen saturation: a supplementary tool for management of ventilation in patients with chronic obstructive pulmonary diseases

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Background and Goal of Study: In specific patients with chronic obstructive pulmonary disease (COPD) the cerebrovascular response to partial carbon dioxide pressure (PaCO₂) may be altered in unknown extent. Therefore the mechanical ventilation for these patients is not easy to adapt adequately and shows a wide interindividual variation. Regional cerebral oxygenation (rSO₂) monitoring was used for detection of cerebral oxygen desaturation events.

Materials and Methods: We present 3 patients with COPD (GOLD-criteria(1)) receiving total intravenous anesthesia for neurointerventional procedures. rSO₂ – monitoring was performed with an INVOS 5100 cerebral oximeter (Somanetics). A decrease of rSO₂ (>19%) compared with the baseline values before induction of anesthesia was defined as significant. After adjusting all conventional vital parameters as recommended in our NIRS matrix(2) the mechanical ventilation was reduced and PaCO₂ increased in the initial normocapnic patients (Table) until rSO₂ values returned near to the baseline.

Results and Discussions: Table: Parameters at the time of minimal rSO₂ values (T₀) and at return of rSO₂ close to baseline values (T₁)

<table>
<thead>
<tr>
<th>P 1</th>
<th>P 2</th>
<th>P 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₀</td>
<td>ΔrSO₂</td>
<td>etCO₂</td>
</tr>
<tr>
<td>MAP</td>
<td>90</td>
<td>73</td>
</tr>
<tr>
<td>SaO₂</td>
<td>100</td>
<td>89</td>
</tr>
<tr>
<td>FiO₂</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>T₁</td>
<td>ΔrSO₂</td>
<td>etCO₂</td>
</tr>
<tr>
<td>MAP</td>
<td>80</td>
<td>84</td>
</tr>
<tr>
<td>SaO₂</td>
<td>98</td>
<td>91</td>
</tr>
<tr>
<td>FiO₂</td>
<td>55</td>
<td>90</td>
</tr>
</tbody>
</table>

Abbreviations: P: patient; ΔrSO₂: difference of rSO₂ to baseline (%); etCO₂: end expiratory carbon dioxide; MAP: mean arterial pressure; SaO₂: peripheral oxygen saturation; FiO₂: inspiratory oxygen fraction.
**Conclusion(s):** In specific COPD-patients the NIRS monitoring appears to be a very helpful tool for correction of the mechanical ventilation in order to avoid cerebral oxygen desaturation events.

**References:**
1. GOLD Update 2006 (www.goldcopd.org)

**7AP5-1**

Changes of somatosensory evoked potentials during graded spinal cord ischemia/reperfusion injury in rabbits

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**Background and Goal of Study:** Ischemia and reperfusion of the spinal cord induce one of the most common complications after surgery for paraplegia(1). Investigation on the etiology and the intraoperative monitoring and prevention of the spinal cord injuries will be important(2).

**Materials and Methods:** Thirty rabbits were randomized into spinal cord ischemia-reperfusion groups by inflating the balloon of a 4F Swan-Ganz catheter positioned in the infrarenal abdominal aortic for 30 minutes, 45 minutes and 60 minutes, respectively. SEP amplitude was monitored before ischemia, 5 minutes, 10 minutes after ischemia, 15 minutes, 30 minutes, 1 hour, 2 hours after reperfusion. Neurologic function score(NFS)was evaluated at 6 hours, 12 hours, 24 hours and 48 hours after reperfusion. The pathological changes of spinal cord were observed after reperfusion 48 hours.

**Results and Discussions:** The pathological characters with mild, moderate and severe spinal cord ischemia-reperfusion injury could be simulated by defating after 30 minutes, 45 minutes and 60 minutes infrarenal abdominal aortic blockadings. SEP amplitude returned to normal after reperfusion 15 minutes (P > 0.05) and SEP latency returned to normal after reperfusion 30 minutes (P > 0.05) in ischemia 30 minutes group. SEP amplitude returned to normal after reperfusion 30 minutes (P > 0.05) and SEP latency returned to normal after reperfusion 60 minutes (P > 0.05) in ischemia 45 minutes group. SEP latency increased and SEP amplitude decreased in ischemia 60 minutes group, compared with other groups, there were significant differences in SEP latency and SEP amplitude (P < 0.01). With graded spinal cord ischemia/ reperfusion injury, compared with ischemia 30min group, spinal cord ischemia-reperfusion groups had significant differences in NFS (P < 0.01).

**Conclusion(s):** 1) SEP was much quicker in the recovery of interpeak amplitude than onset latency during spinal cord ischemia/reperfusion. 2) SEP is a sensitive and accurate index for spinal cord function during ischemia/reperfusion injury. 3) SEP monitoring spinal cord ischemia/reperfusion injury during operation provides experimental basis for clinical application.

**References:**

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**7AP5-4**

Effect of propofol on excitatory amino acid accumulation for ischemia-reperfusion injury to spinal cord in rabbits

Q. Wang, Y. I. Zhang, H. Fang, Y. X. Zuo, J. Liu

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**Background and Goal of Study:** The spinal cord ischemia-reperfusion injury is the principal reason of secondary spinal cord injury which could lead to neuron damage and extreme dysfunction(1). Propofol has neuroprotective effects against ischemia and that this neuroprotective effects has great relationship with excitatory amino acids in rat brain(2).

**Materials and Methods:** Seventy healthy adult New Zealand white rabbits were randomly divided into 7 groups (Groups N, A to F). Under general anesthesia, the infrarenal circumaortic clamping model was used. Normal saline, 10% intralipid, propofol 30 mg/kg, propofol 40 mg/kg, propofol 50 mg/kg, and propofol 60 mg/kg were given in Group A to Group F, respectively. Ischemia lasted for 30 min. Normal saline, 10% intralipid and propofol were continuously infused through a catheter into the aorta distal to the clamping site at a speed of 12 ml/kg during the ischemia period. Concentrations of excitatory amino acids (aspartate and glutamate) of the lumbar spinal cord were measured after 48 h of reperfusion with the high performance liquid chromatography.

**Results and Discussions:** Data (Mean ± SD, n = 10) are shown in the table below:

<table>
<thead>
<tr>
<th>Group</th>
<th>Glutamate (10⁻⁴ mmol/ml)</th>
<th>Aspartate (10⁻⁴ mmol/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>1962.5695 ± 122.2719</td>
<td>791.4751 ± 75.7955</td>
</tr>
<tr>
<td>A</td>
<td>6489.2905 ± 362.6101</td>
<td>3358.7095 ± 263.1474</td>
</tr>
<tr>
<td>B</td>
<td>6294.6118 ± 249.5627</td>
<td>3190.9319 ± 257.0592</td>
</tr>
<tr>
<td>C</td>
<td>4810.8660 ± 711.6919</td>
<td>2493.7772 ± 237.9228</td>
</tr>
<tr>
<td>D</td>
<td>3845.2207 ± 417.7513</td>
<td>1922.1510 ± 239.1342</td>
</tr>
<tr>
<td>E</td>
<td>3026.2863 ± 246.5196</td>
<td>1365.5331 ± 120.6498</td>
</tr>
<tr>
<td>F</td>
<td>3930.1586 ± 332.3011</td>
<td>1908.1714 ± 140.4763</td>
</tr>
</tbody>
</table>

P < 0.05 vs group N; # P < 0.05 vs group A; * P < 0.05 vs group B.

**Conclusion(s):** Propofol can provide a protective effect against an ischemia-reperfusion injury to the spinal cord in rabbits. 1) This neurological protection may be due to the acceleration of excitatory amino acid elimination in the reperfusion; 2) The protective effect is parallel with the dose of propofol.

**References:**

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**7AP5-5**

Cross-approximate-entropy as a measure of isoflurane-induced changes in recordings of neuronal population signals in vivo

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**Background and Goal of Study:** Cross-Approximate-Entropy (XApEn) is a parameter designed to analyse multivariate data sets. It was used to evaluate changes in field potential activity, recorded from multi-channel electrode arrays placed in the barrel cortex of rats, at increasing levels of isoflurane.

**Materials and Methods:** Electrode arrays were implanted through a cranieotorny over the right hemisphere into the somatosensory (barrel) neocortex of 3 Sprague Dawley rats. Field potential activity was recorded at 3, 8 or 14 channels at increasing levels of isoflurane (0, 0.3, 0.53, 0.75, 1.45 MAC). For every combination of channels, a XApEn value was calculated.
The Cross-Approximate-Entropy is a modification of the Approximate Entropy and can be used to quantify asynchrony between different channels [1] i.e. signals from different sites within the neural network. A decrease in the XApEn value represents a lower degree of “chaos in the signal”.

**Results and Discussions:** The XApEn decreased with increasing concentrations of the volatile anaesthetic, indicating that the signals were more synchronised across all recording sites. The pattern of XApEn was inhomogeneous, featuring a number of channel combinations with low values. This pattern of inhomogeneities, pointing to particularly synchronous activities of the neural populations at the corresponding recording sites, did not change significantly with isoflurane.

**Conclusion:** Our results indicate that isoflurane fosters synchronous activity between neuronal populations in somatosensory cortex without causing major disturbances of inter-site relationships.

**Reference:**

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**7AP5-6**

**Protective effects of sevoflurane preconditioning on Oxygen-Glucose Deprivation injury. Role of reactive oxygen species and adenosine triphosphate-regulated potassium channels**

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**Background and Goal of Study:** The purpose of the present study was first to compare the extent of sevoflurane-induced neuroprotection on primary cortical cells cultures subjected to transient oxygen-glucose deprivation (OGD) either when applied during or before (preconditioning) the insult. Secondly, the possible involvement of intracellular reactive oxygen species (ROS) levels and K<sub>ATP</sub> channels in the mechanism of the preconditioning effect of sevoflurane (SEVO) was explored.

**Materials and Methods:** Mature primary cortical neuronal-glial cultures were exposed to 90 min OGD followed by reoxygenation. Culture were randomly exposed to SEVO either during OGD without preconditioning or during a 90 min preconditioning period followed by a 60 min wash-out period before OGD. 2-mercaptobenzepropiopryl chloride (2MPPG) is a free radical scavenger or glibenclamide (GLB) a blocker of K<sub>ATP</sub> channels were added during the preconditioning. Twenty-four hours after the injury, neuronal death was quantified by lactate dehydrogenase (LDH) release into the media. Free radical generation in cells was assessed after preconditioning period using 2’,7’-dichlorofluorescin diacetate (DCFH-DA). Data are presented as mean ± SD. Statistical analysis used ANOVA.

**Results and Discussions:** Twenty-four hours after our cell cultures were subjected to 90-min OGD, 78.5 ± 4.4% of the neurons died. SEVO added at the start of the injury, elicited a potent and dose-dependent neuroprotective effect. SEVO preconditioning elicited a threshold neuroprotective effect at concentrations higher than 0.03 mM. In the presence of 2MPPG (100 µM) or GLB (0.3 µM) sevoflurane lost its preconditioning effect as assessed by LDH test. In normoxic cultures preconditioned by SEVO (3.4 mM), DCFH-DA fluorescence intensity increased in a significant manner compared to sham wash cultures. The SEVO preconditioning-induced increase in ROS levels was inhibited by 2MPPG and GLB.

**Conclusions:** Sevoflurane precondition neuronal-glial cell cultures against OGD by mechanisms that apparently involve release of ROS and K<sub>ATP</sub> channels.

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**7AP5-8**

**Pentobarbital inhibits the release of nitric oxide and the effect is antagonized by the application of neostigmine and magnesium-free perfusion in the rat striatum: an in vivo microdialysis study**

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Intensive Care Unit of University Hospital, Hamamatsu University School of Medicine, Hamamatsu, Japan

**Background and Goal of Study:** Previously, we demonstrated that pentobarbital (PB) inhibits i-DOPA-induced dopamine (DA) increases in the rat striatum [1]. However, direct neuroprotective effects have been shown to be transient. The purpose of the present study was first to demonstrate sevoflurane-induced preconditioning effect in vivo focal cerebral ischemia in rats and whether any preconditioning effect is evident after long term survival.

**Materials and Methods:** Male Sprague-Dawley rats, weighing 280-320 g, were used. Microdialysis probe was inserted into the right striatum and perfused with modified Ringer solution after recovering from the surgery. Samples were collected every 15 min and directly injected into an online analytical HPLC system. NOX and NOS (NOX) were mixed with a Griess reagent to form a purple azo dye and the absorbance was measured by a flow-through spectrophotometer. The rats were freely moving and PB was administered intraperitoneally. Neostigmine was applied with perfusate.

**Results and Discussions:** Pentobarbital decreased NOX and NOX in a dose dependent manner. Perfusion with neostigmine both 1 and 10 microM showed no effect on NOX release, however, diminished PB-induced NOX decrease in low concentration and abolished it in high concentration. Magnesium-free perfusate showed no effect on NOX release, whereas, the perfusate antagonized pentobarbital-induced NOX reduction.

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**7AP5-7**

**Protective effect of sevoflurane-induced preconditioning on focal cerebral ischemia in rats**

L. Velly, JL. Codaccioni, B. Guillet, P. Pisano, N. Bruder  
Bouches du Rhone, DAR Adultes, CHU Timone, Marseille, France

**Background and Goal of Study:** A number of investigations have shown that volatile anesthetics possess direct neuroprotective effects during ischemic cerebral injury and can mimic ischemic preconditioning in myocardium. However, direct neuroprotective effects have been shown to be transient. The aim of this study was to demonstrate sevoflurane-induced preconditioning effect in vivo focal cerebral ischemia in rats and whether any preconditioning effect is evident after long term survival.

**Materials and Methods:** 69 male Sprague-Dawley rats (250 g) were randomly allocated in 2 groups: Control group (C; n = 38) non-preconditioned and a preconditioning group (P; n = 30) exposed to 2.7 vol% sevoflurane (45 min) 60 min before surgery. Animals in both groups were anesthetized with 3.0 vol% sevoflurane and subjected to transient middle cerebral artery occlusion (MCAO) by use of the intraluminal filament model. Sevoflurane administration was discontinued as soon as the MCAO was initiated and the animals were allowed to awaken. After 60 min of focal ischemia the filament was removed. Neurologic function (Longa’s score) and infarct volumes (Nissl-staining) were determined at 3 days (C, n = 22; P, n = 18), 7 days (C, n = 9; P, n = 10), and 14 days (C, n = 8; P, n = 10) after ischemia. Data are presented as mean ± SD. Statistical analysis used ANOVA.

**Results and Discussions:** The XApEn decreased with increasing concentrations of the volatile anaesthetic, indicating that the signals were more synchronised across all recording sites. The pattern of XApEn was inhomogeneous, featuring a number of channel combinations with low values. This pattern of inhomogeneities, pointing to particularly synchronous activities of the neural populations at the corresponding recording sites, did not change significantly with isoflurane.

**Conclusion:** Our results indicate that isoflurane fosters synchronous activity between neuronal populations in somatosensory cortex without causing major disturbances of inter-site relationships.

**Reference:**
7AP5-9

Hypertonic-hyperoncotic solutions and healthy brain cells
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Background and Goal of Study: Hypertonic-hyperoncotic saline-hydroxyethylstarch solutions (HHS) may help to control intracranial hyper- tension; however, no clinical study has so far shown an improved outcome after HHS (1). Because increased intrastitial osmotic/oncotic pressures may jeopardize brain cells, long-term effects of HHS on healthy neurons and astroglia were studied.

Materials and Methods: Adult rat hippocampal neurons or astroglia were exposed to hypertonic, hyperoncotic or hypertonic / hyperoncotic medium (concentrations: 317, 336, or 377 mOsm, and 0.05%, 0.1%, or 0.25% HES) for 15 min and studied over 1 week. The Mann-Whitney U-test with Bonferroni’s correction compared control versus HHS-exposed cultures at a significance level of p < .05.

Results and Discussions: Viability of astroglia remained unchanged, but neuronal viability was reduced by 20% at 1 week after exposure to media with 377 mOsm. Water space of astroglia was decreased by approx. 80% at 1 h and 24 h after exposure to media with 377 mOsm. Water space of neurons was reduced by approx. 50% directly after exposure, increased by 150% by 1 h, decreased by 25% at 24 h, and re-increased by 140% at 7 days post-exposure to media with the highest concentrations of HHS. Glucose uptake of astroglia decreased by approx. 60% at 1 h after exposure to media with 377 mOsm, whereas neuronal glucose uptake decreased by 60% at 1 h, increased by 120% at 24 h, and remained elevated by 80% at 7 days after exposure.

Conclusions: Hypertonic-hyperoncotic solutions (osmolarity > 350 mOsm) may reduce the viability of healthy neurons. Exposure to HHS induces volume regulatory processes in neurons and astroglia; volume perturbations in hippocampal neurons are more pronounced than in glia, and a long-lasting increase in glucose uptake predispose neurons to metabolic disturbances. Our data indicate that HHS may have a harmful potential for healthy neurons.

References:

7AP5-10

Hypertonic-hyperoncotic solutions and injured brain cells
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Background and Goal of Study: Hypertonic-hyperoncotic saline-hydroxyethylstarch solutions (HHS) have been used for rapid small-volume resuscitation in hypovolemia and hemorrhagic shock associated with brain trauma (BT) (1); however, prospective trials have failed to show better outcome after HHS. Because the induction of intracellular dehydration by HHS may especially endanger injured brain cells, the long-term response of traumatized neurons and astroglia to HHS were examined over 1 week.

Materials and Methods: To simulate traumatic forces of brain injury, adult rat hippocampal neurons or astroglia were first subjected to damage by ultrasonic (i.e. ketorolac). Then, operated rats underwent aortic denervation (AoDN) group or sham operation (SHAM group) under continuous blood pressure monitoring. Two hours after completion of the procedure, the rats were sacrificed and the brains were sectioned in specific levels corresponding to motor cortex, somatosensory cortex, dentate gyrus and Purkinje cells. Rats were exposed to temporary hypothermic brain cell injury (HHS) or hyperthermic brain cell injury (HHS) for 1 h and 24 h, respectively.

Results and Discussions: Differences between groups were evaluated using ANOVA, unpaired t-test and Mann Whitney U test. Level of significance was set at p < 0.05.

Conclusions: Aortic denervation leads to neuronal damage in specific brain regions, possibly ascribed to excitotoxic phenomena induced by altered glutamate and GABA release.

References:

7AP6-1

Selective brain lesions in aortic denervated vs. sham operated rats
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Background and Goal of Study: Deep hypothermic circulatory arrest (DHCA) is used for the correction of heart abnormalities, although it is often associated with neurologic morbidity. Apart from the ischemia, brain is also exposed to temporary inhibition of baroreceptor input during DHCA. It is possible that complications are partly related to baroreceptor input inhibition and excitotoxic excitotoxicity. Aim of the present study was the evaluation of potential brain damage after aortic denervation in rats.

Materials and Methods: 30 wistar rats were assigned into two groups to undergo either aortic denervation (AoDN group) or sham operation (SHAM group) under continuous blood pressure monitoring. Two hours after completion of the procedure, the rats were sacrificed and the brains were sectioned in specific levels corresponding to motor cortex, somatosensory cortex, dentate gyrus and cerebellar Purkinje cells. Rats were exposed to temporary hypothermic brain cell injury (HHS) or hyperthermic brain cell injury (HHS) for 1 h and 24 h, respectively.

Results and Discussions: Groups were comparable regarding blood pressure, blood pressure variability and numerical density of dead neurons. Differences between groups were evaluated using ANOVA, unpaired t-test and Mann Whitney U test. Level of significance was set at p < 0.05.

Conclusions: Aortic denervation leads to neuronal damage in specific brain regions, possibly ascribed to excitotoxic phenomena induced by altered glutamate and GABA release.

References:

7AP6-2

Effect of ketorolac in Spinal Cord Ischemic injury in rats: the role of Glutamate Transporters and inducible Nitric Oxide Synthase
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Background and Goal of Study: Our previous study found that intrathecal (i.t.) ketorolac pretreatment protected rats against ischemic spinal cord injury in lower limbs motor function and histopathological changes and excitatory amino acids (EAAs) and nitric oxide NO might play a role. This study was examined the possible role of glutamate transporters (GTS) and inducible NO synthase (iNOS) in the spinal ischemic injury (SCI).

References:
Materials and Methods: SCI was induced in male Wistar rats by balloon inflation of 2F Forgathy catheter in thoracic aorta and controlled proximal inflation of 2F Forgathy catheter in thoracic aorta and controlled proximal

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8AP6-4 Evidence for implicit memory of automatic learning such as Fear Conditioning under deep anesthesia in rats
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Background and Goal of Study: Formation of some form of memory under anesthesia and shocks on the log latency to enter the context in rats tested (day 16b). Post-hoc analyses showed a significant fear to the context only in rats tested (day 16b) for implicit memory for FC to the context. Then half of the rats of each group were tested (day 16a) to assess the extent of cholinergic dysfunction. Post-mortem histochemical staining of acetylcholinesterase was used as a marker for assessing the extent of cholinergic dysfunction.

Results and Discussions: After the repetitive injection of 50 mg/kg (“anaesthesia state”), the anaesthetic score increased as the cumulative dose of propofol was increased. This effect was more marked in lesioned animals compared to the control ones. Analysis of variance for repeated measures showed a significant effect of the Group factor (F(1,7) = 18.20, p < 0.05) and of the Cumulative Dose of propofol (F(4,68) = 1.19, p < 0.05), but there was no significant interaction between both factors (F(4,68) = 1.19). Thus, a previous cholinergic depletion of the septo hipocampal system increased the anesthetic potency of propofol.

Conclusion(s): These results extent to the cholinergic neurotransmission, the participation of the Septo Hipocampal system in mediating the effects of general anesthetics.

Reference:

7AP6-5 Anaesthesia and brain ageing: the Cholinergic Septo Hipocampal system participates to general (Propofol) anaesthesia
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Background and Goal of Study: Recent study pointed out the participation of the Septo Hipocampal (SH) GABAergic system in mediating the effects of general anesthetics (1). As brain ageing is associated with a dysfunction of cholinergic Septo Hipocampal pathway, we examined how such a dysfunction may interact with the potency of general anesthesia, using propofol in rats.

Materials and Methods: The rats were randomly allocated to one of the two following groups: rats with SH cholinergic depletion induced by the selective immunotoxin 192 IgG-saporin (SAPQ; n = 14) and sham-operated controls (SHAM; n = 6). During mini-cranietomy under anaesthesia, the rats received stereotaxically guided injections of a total of 0.8 µg 192 IgG-saporin into the medial septum and the vertical limb of diagonal band of Broca. One month later, animals in each group received propofol by steps of 50 mg/kg intraperitoneally to set up an “anaesthesia state” (at least loss of righting reflex, i.e. “anaesthetic score” >0.6). The comparison of the anaesthetic scores in rats with saporin lesions with those of sham-operated controls allowed to assess the effect of the cholinergic lesion on the propofol-induced anaesthesia. Post-mortem histochemical staining of acetylcholinesterase was used as a marker for ischemic neuroprotection in clinical.

Materials and Methods: SCI was induced in male Wistar rats by balloon inflation of 2F Forgathy catheter in thoracic aorta and controlled proximal arterial blood pressure at 40 mmHg for 10 minutes. Lumbar cord removal was at various time points to examine the expression of GTs (GLAST, GLT-1 and EAAC1), COX-2 and NOS isofoms (endothelial, neuronal and inducible NOS) by real time polymerase chain reaction and immunohistochemistry. Ketorolac pretreatment (60 µg, i.t.) was used to determine its neuroprotective effect.

Results and Discussions: Real time PCR showed increasing of gene expression of GLAST, GLT-1 and EAAC1, peaked at 3 hours after SCI. The maximal change on COX-2 was also observed at 3 hours after SCI, and the maximal increase of iNOS was reached later. I.t. ketorolac suppressed these increases of gene expression. In the immunohistochemistry experiment, motor neurons and perivascular regions at both ventral and dorsal horn showed positive COX-2 staining. I.t. ketorolac also suppressed this change.

Conclusions: The expression of GTs, COX-2 and iNOS play a role in SCI. Ketorolac (i.t.) pretreatment, via inhibiting the GTs, COX-2 and iNOS expression, could ameliorate the neurological injury, it is suggested that ketorolac i.t. administration can be used for ischemic neuroprotection in clinical.

Materials and Methods: SCl was induced in male Wistar rats by balloon inflation of 2F Forgathy catheter in thoracic aorta and controlled proximal arterial blood pressure at 40 mmHg for 10 minutes. Lumbar cord removal was at various time points to examine the expression of GTs (GLAST, GLT-1 and EAAC1), COX-2 and NOS isofoms (endothelial, neuronal and inducible NOS) by real time polymerase chain reaction and immunohistochemistry. Ketorolac pretreatment (60 µg, i.t.) was used to determine its neuroprotective effect.

Results and Discussions: Real time PCR showed increasing of gene expression of GLAST, GLT-1 and EAAC1, peaked at 3 hours after SCI. The maximal change on COX-2 was also observed at 3 hours after SCI, and the maximal increase of iNOS was reached later. I.t. ketorolac suppressed these increases of gene expression. In the immunohistochemistry experiment, motor neurons and perivascular regions at both ventral and dorsal horn showed positive COX-2 staining. I.t. ketorolac also suppressed this change.

Conclusions: The expression of GTs, COX-2 and iNOS play a role in SCI. Ketorolac (i.t.) pretreatment, via inhibiting the GTs, COX-2 and iNOS expression, could ameliorate the neurological injury, it is suggested that ketorolac i.t. administration can be used for ischemic neuroprotection in clinical.

Materials and Methods: SCI was induced in male Wistar rats by balloon inflation of 2F Forgathy catheter in thoracic aorta and controlled proximal arterial blood pressure at 40 mmHg for 10 minutes. Lumbar cord removal was at various time points to examine the expression of GTs (GLAST, GLT-1 and EAAC1), COX-2 and NOS isofoms (endothelial, neuronal and inducible NOS) by real time polymerase chain reaction and immunohistochemistry. Ketorolac pretreatment (60 µg, i.t.) was used to determine its neuroprotective effect.

Results and Discussions: Real time PCR showed increasing of gene expression of GLAST, GLT-1 and EAAC1, peaked at 3 hours after SCI. The maximal change on COX-2 was also observed at 3 hours after SCI, and the maximal increase of iNOS was reached later. I.t. ketorolac suppressed these increases of gene expression. In the immunohistochemistry experiment, motor neurons and perivascular regions at both ventral and dorsal horn showed positive COX-2 staining. I.t. ketorolac also suppressed this change.

Conclusions: The expression of GTs, COX-2 and iNOS play a role in SCI. Ketorolac (i.t.) pretreatment, via inhibiting the GTs, COX-2 and iNOS expression, could ameliorate the neurological injury, it is suggested that ketorolac i.t. administration can be used for ischemic neuroprotection in clinical.
Conclusions: Edaravone could protect neurons against glutamate or hypoxic insults via inhibition of the ROS production. However, intracellular pathway may be different between these two insults.


7AP6-7
Effects of remifentanil on the NMDA receptor activation in injury of rats cortical neurons
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Background and Goal of Study: Remifentanil, an ultra-short-acting opioids, is wildly used in clinical practice, recent study shows that clinically relevant concentrations of remifentanil can stimulate human NMDA receptor expressed in Xenopus laevis oocytes[1], so it may enhance brain injury related to NMDA receptor activation, but there is no report about this hypothesis, so we designed this experiment to evaluate the effects of remifentanil on the NMDA receptor activation in injury of rats’ cerebral cortical neurons.

Materials and Methods: Primary cultured rat cortical neurons were established from the 18-day-old embryos of SD rats and cultured for 7 days, then 500 microM of glutamate was added into the culture medium for 30 minutes to produce the NMDA receptor activation injury, different concentrations of remifentanil as 0.1, 1, 10 micro M were added into the culture medium with glutamate to evaluate its effects, and 50 micro M of ketamine was applied 30 min before glutamate and remifentanil co-application to find the mechanism of remifentanil’s effects. After 24 h of drug application, neuron viability was assessed by the methods of MTT assay and LDH release measurement.

Results and Discussions: After 7 days’ culture, the proportion of neurons was about 70%. 500 microM of glutamate produced a significant injury of cultured neurons indicated by the decreasing of MTT values and the increasing of LDH values, remifentanil enhanced the glutamate injury in a concentration-dependent manner, while, 50 microM of ketamine inhibited the decreasing of MTT and increasing of LDH values induced by glutamate and remifentanil co-application.

Conclusion: Remifentanil enhances the glutamate induced injury in rat cultured cortical neurons, and its mechanism may relate to its NMDA receptor activation property.


7AP6-8
Regional and local brain oxygenation in haemorrhagic shock: effects of different therapy strategies
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Background and Goals: Patients with uncontrollable bleeding may benefit if resuscitation with large amounts of fluids is replaced by a small volume (HHS) or vasopressor until surgery (1, 2). Noradrenaline (NA) is commonly used as a vasopressor to control hypotension. Despite cerebral autoregulation, haemorrhagic hypotension and shock may result in cerebral ischaemia (3). The purpose of this study was to compare the effects of HHS alone, or combined with NA on local brain tissue oxygen (PbO2) and regional brain oxygen saturation (rSO2) in a model of uncontrolled haemorrhage.

Materials and Methods: After approval of the Animal Investigational Committee, 22 anaesthetised pigs underwent a penetrating liver trauma. At

Local and Regional anaesthesiology

8AP1-1
The construction of learning curve and recommended case load for training of epidural anaesthesia in Taiwanese patient
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Background and Goal of Study: Epidural anaesthesia was reported to be the most difficult manual anaesthetic procedures (1,2). We designed this study to construct learning curve for epidural anaesthesia in a university hospital epidural where anaesthesia was predominante than spinal anaesthesia.

Materials and Methods: Our study was designed to evaluate 400 lumbar epidurals performed by 4 first-year residents. The study enrolled 400 cases classified as grade 1 and 2 by grades of spinal process landmarks (3). We documented the first 100 performed epidural anaesthesia for each resident. For each procedure, following data were recorded and analyzed to construct learning curve and evaluate case load for training, including first-level succeess rate for cather indwelling, trying attempts and consumption time.

Results and Discussions: First level success rate maintained around than 80% after thirty procedures of epidural anaesthesia. Average success rate before and after 30 procedures of epidural anaesthesia were 72.57% and
91.1% respectively (P < 0.001). The mean trying attempts were 1.26 (95% confidence interval: 1.18–1.34) and 1.14 (95% confidence interval: 1.09–1.17) for epidural anaesthesia before and after 30 procedures respectively (P < 0.05). The mean (standard deviation) consumption time were 8.98 (0.89) and 6.12 (1.21) minutes for epidural anaesthesia before and after 30 procedures respectively (P < 0.001).

Conclusions: We concluded that after practice more than 30 cases of epidural anaesthesia residents can achieve maturity of the most difficult manual anaesthetic skill in our institution. Our recommended case load for training of epidural anaesthesia was at least thirty.

References:

8AP1-2
Complication analysis of epidural space identification – a meta-analysis of air vs. saline technique for loss of resistance
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Background and Goals: Controversy exists as to the best method for identifying the epidural space. The choice among anesthesiologists of whether to use saline or air during the loss of resistance (LOR) technique to identify the epidural space has largely been a matter of personal preference. In this meta-analysis we compared the incidence of side effects and complications depending on the medium used to identify the epidural space during the LOR technique.

Materials and Methods: We searched Medline (Ovid, 1966-present), Cochrane Central Register of Controlled Trials (Ovid), and Embase (Dialog, 1974-present). Two authors independently abstracted data from 6 prospective, randomised trials (n = 4,422 patients). A meta-analysis was performed to compare outcomes reported using LOR with air vs. saline/iodocaine. Outcomes measured were difficult catheter insertion, paraesthesia, intravascular catheter insertion, accidental dural puncture (ADP), postdural puncture headache (PDPH), and partial block.

Results: LOR using saline vs. air was associated with a 65% reduction in the risk of difficult catheter insertion (4.3% vs. 11.0%; P = 0.002), a 53% reduction in the risk of intravascular catheter insertion (5.6% vs. 11.7%; P = 0.010), a 81% reduction in the risk of PDPH (0.3% vs. 1.6%; P < 0.0001), and a 57% reduction in the risk of partial block (7.6% vs. 15.5%; P = 0.001). There were no statistically significant differences in the risk of ADP and paraesthesia between the air and saline groups.

Conclusion: Using the LOR technique with saline may reduce the incidence of certain complications in patients undergoing epidural analgesia. However, large, good quality randomised controlled trials are needed to study the differences between these LOR techniques regarding anergic onset, analgesic distribution, and quality of pain relief.

References:

8AP1-3
Comparison of the four different epidural catheter types during placement in the lower thoracic region
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Background and Goal of Study: We compared the incidence of transient paresthesia and other complications for four different epidural catheter types (closed-end), two types of polyyethylene catheters (PLA A and PLA B), polyethylene catheter (PLE) and polyamide soft tip catheter (PLA Soft Tip), during epidural catheterization in the lower thoracic region.

Materials and Methods: After obtaining IRB approval and informed consent, adult patients were randomly divided into four groups according to the type of epidural catheter; i.e. Group A: PLA A (n = 302) and Group B: PLA B (n = 306), Group C: PLE (n = 300) and Group D: PLA Soft Tip (n = 303). The patient was positioned in a moderate chest-knee position. Epidural puncture was performed at T11-12 interspace via paramedian approach. The epidural space was identified by the loss-of-resistance technique to saline. The catheter was inserted to leave 5 cm in the epidural space. Transient paresthesia and other complications during epidural catheterization were recorded. Data were analyzed by ANOVA test followed by Scheffe's post-test or Chi-square analysis as appropriate. P < 0.05 was considered significant.

Results and Discussions: Patient characteristics, number of attempts and blood aspiration were comparable among the groups. There were no major complications noted in all groups. The incidence of transient paresthesia was different among the groups, 24 (7.9%) in Group A, 19 (6.2%) in Group B, 36 (11.7%) in Group C and 3 (1.0%) in Group D (P < 0.01). Occurrence ratio of resistance to introduction of the catheter was also different among the groups, 33 (10.9%), 18 (5.9%), 6 (2.0%) and 1 (0.3%) respectively (P < 0.01). It has been reported that the relatively high incidence of complications associated with epidural catheterization was observed in the lower thoracic region. In this study, transient paresthesia was observed in all groups during epidural catheterization. However, in Group D, PLA Soft Tip group, paresthesia was rarely recognized.

Conclusion: The path and the ultimate position of PLA Soft Tip catheter might not be affected by the epidural structure during catheterization at the lower thoracic level.

References:

8AP1-4
Advantages of preoperative epidural infusion of 0.2% ropivacaine in laparoscopic colectomy
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Background and Goal of Study: It is a fact that sympathetic preganglionic fibres from T5 through L1 inhibit gut action and that epidural blockade to the mid thoracic levels remove this inhibition, yielding a contracted small intestine. Goal of our study was to assess the effect of preoperative epidural infusion of ropivacaine in laparoscopic colectomy.

Materials and Methods: 30 patients (16 women, 14 men ASA I–III), scheduled for laparoscopic resection of colon cancer (colectomy), were randomized into two groups of 15 patients each. An epidural catheter was inserted at the Th–L1 space in both groups.

• Group A: the epidural catheter was inserted the day before surgery and a continuous infusion of 0.2% ropivacaine started at a rate of 4ml/h for 12 6 2 hours before surgery.
• Group B: the epidural catheter was placed just before surgery and no preoperative infusion was used.
• The epidural catheters were also used for postoperative analgesia.

General anaesthesia was induced with propofol, remifentanil, cis-atracurium and was maintained with a mixture of oxygen/air (FiO2: 0.4), sevoflurane, remifentanil, cis-atracurium as needed.

Intraabdominal pressure in both groups were 12 mmHg.

The quality of surgical conditions and the duration of pneumoperitoneum were recorded.

Unpaired t-test was used with p < 0.05 considered statistically significant.

Results and Discussions: Patients had similar demographic data. Preoperative epidural ropivacaine yielded a small and contracted intestine in group A versus a non-contracted and large in volume intestine in group B. This fact created optimal surgical conditions in group A that led to better control of laparoscopic instruments with statistically significant reduction of surgical time and reduction of the duration of pneumoperitoneum (p < 0.05).

Conclusion: Preoperative epidural infusion of ropivacaine, proved to be beneficial in laparoscopic colectomy, as it improved the quality of surgical conditions, reduced the duration of pneumoperitoneum and eliminated its adverse pathophysiological effects during anesthesia.

8AP1-5
Documentary evidence of appropriate consent for combined spinal epidural, epidural and spinal in anaesthetic practice
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Background and Goal of Study: Lack of informed consent is an issue in approximately 30% of claims against anaesthetists (1). The AAGBI, the RCA and the GMC have produced guidance on consent. Current guidance advises that adequate documentation of the discussion of risks and benefits is mandatory and that anaesthetists should warn patients of common, serious risks but should avoid providing a bewildering quantity of information. This audit aims to assess documentary evidence of consent for epidural, spinal and combined spinal epidural (CSE) anaesthesia.
Materials and Methods: A review of the notes provided by the anaesthetist was undertaken in the post-operative period for forty-four patients who had received CSE, epidural or spinal anaesthetic techniques.

Results: In thirty cases (68.2%) some documented evidence of a discussion of the elements of the regional technique and its associated risks and benefits was seen. The following discussions of risks were documented: headache 17 (35%), paraesthesia 0, nerve damage 15 (34%), failure 12 (27%), shivering 1 (2%), infection 2 (5%), haematoma 1 (2%), hypotension 4 (9%), urinary retention 5 (11%), nausea 4 (9%) and reason for lack of discussion 0.

Conclusion(s): In nearly a third of cases anaesthetists failed to document the discussion of risks. The particular risks discussed varied considerably. The anaesthetist will always be required to exercise clinical judgement in discussion of risks but the authors feel that reasons for not discussing risks (which can be perfectly valid) should also be documented. Documentation should be improved to avoid legal complications. This might be achieved by improving training of anaesthetists on issues of consent. Evidence of understanding consent might constitute part of the forthcoming re-validation process.

Reference:
1. Royal College of Anaesthetists Raising the Standard 2000 Dr E James Consent to anaesthesia 1.2.

8AP1-6

Confirmation of epidural puncture by change in epidural pressure using Queckenstedt-test procedure in patients with cervical spinal canal stenosis

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Background and Goal of Study: The loss-of-resistance-test is the most popular method for identifying the epidural space, but it cannot confirm epidural puncture. Therefore, we developed a new method to confirm epidural puncture by assessing indirect changes in epidural pressure (EP) using the Queckenstedt-test procedure (E-QST)2, which increases subarachnoid pressure by compressing the internal jugular veins. This method depends on the dynamics of cerebrospinal fluid (CSF). Hence blockade of CSF flow, occurring with severe spinal stenosis, is predicted to reduce changes in EP using E-QST. Thus, we examined the effect of spinal stenosis on the E-QST.

Material and Methods: After institutional approval and informed consent, patients undergoing cervical spine surgery were enrolled for this study. Epidural puncture using the loss-of-resistance test was utilized to insert an electrode after anesthetic induction. EP was monitored with E-QST through a Tuohy needle to confirm epidural puncture. The insertion of the electrode into the epidural space was confirmed by observation of muscle twitch evoked after electric stimulation using the electrode.

Results and Discussion: In 60 patients, epidural puncture was performed with the loss-of-resistance test; a second trial was required for 13 patients due to less catheter advance. Increased EP during E-QST was observed in 56 of 60 cases. When increased EP was observed epidural puncture was always successful. The sensitivity and specificity of this E-QST method was 91.9% (57/63) and 100% (11/11). The positive and negative predictive values were 100% (57/57) and 68.8% (11/16) respectively.

Conclusion: EP monitoring combined with E-QST offers a reliable method for confirming epidural puncture in combination with the loss-of-resistance test, even if patients have spinal canal stenosis.

References:

8AP1-7

The effect of ketamine on combination of bupivacaine and fentanyl for quality of epidural block

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Background and Goal of Study: Opioid and local anesthetic combination has been used to enhance the quality of epidural anesthesia. It has reported that epidural ketamine tends to antagonize the antinociceptive activity of fentanyl in rat(1). The aim of this study was to evaluate the effect of ketamine on combination of bupivacaine and fentanyl for quality of epidural block.

Materials and Methods: After ethical committee approval and informed consent, forty patients undergoing hip arthroplasty were studied. Epidural catheter was inserted L3-4 or L4-5 interspaces by loss of resistance with air in sitting position. Patients randomly divided to two groups. Group BF received 75 mg bupivacaine and 100μg fentanyl. Group BFK received 30 mg additional ketamine to this combination of same dose bupivacaine and fentanyl. Onset time of sensory and motor blockage, maximum level of sensory block, degree of motor block, regression of two segments, duration of sensory and motor blockade were evaluated. Statistical analyses were performed by Kruskall Wallis and Chi Square tests.

Results and Discussions:

8AP1-8

Epidural analgesia decreases intraabdominal pressure in postoperative patients with intraabdominal hypertension

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Background and Goal of Study: Intraabdominal hypertension (IAH) causes significant morbidity and mortality in critically ill surgical patients. Pain relief may hypothetically decrease the secondary muscle spasm and increase the anterolateral abdominal wall compliance, therefore decreasing intraabdominal pressure (IAP). To rule out this hypothesis the effect of epidural analgesia on IAP in postoperative patients with IAH was investigated.

Materials and Methods: In a prospective double-blinded study 58 postoperative critically ill surgical patients with IAH receiving postoperative epidural analgesia were investigated. IAH defined as a sustained IAP > 12 mmHg or an abdominal perfusion pressure (APP) < 60 mmHg recorded by a minimum of 3 standardised measurements conducted 6 hours apart. Epidural catheterization was performed at Th8–Th10 level. After test dose and correct placement of the catheter patients received 10 ml of 0.2% ropivacaine, followed by its continuous infusion at a rate of 5 ml/h for maximum 96 hours. IAP was measured transesvically after instillation of 50 ml saline in supine position immediately before and 1 hour after initiation of epidural analgesia and every 6 hours consequently. Mean arterial pressure (MAP) was measured invasively in all patients. APP was calculated for each IAP measurement as APP = MAP−IAP. A repeated measure ANOVA was used to analyze repeated measurements of IAP, MAP and APP.

Results and Discussions: ANOVA for repeated measures showed significant within subject decrease in IAP (p < 0.0001), but failed to show any significant differences for repeated measurements of MAP (p = 0.147). Mean and standard deviation values of IAP, APP and MAP in all observations immediately before and 1 hour after initiation of epidural analgesia were 13.909 ± 3.006 mmHg vs. 7.727 ± 3.439 mmHg (p < 0.0001); 63.732 ± 16.244 mmHg vs. 75.658 ± 18.986 mmHg (p = 0.005) and 77.841 ± 17.398 mmHg vs. 83.385 ± 17.781 mmHg (p = 0.071) respectively. Measurements show a significant decrease of IAP with no significant change in MAP, which maintained APP stable or even elevated during epidural analgesia: APP 1 hour < 1 day (p < 0.001), 1 day < 2 day (p = 0.006).

Conclusion: Continuous thoracic epidural analgesia significantly decreases IAP and improves APP with no hemodynamic compromise in critically ill postoperative patients with IAH.

8AP1-9

Selective segmental epidural anaesthesia for ambulatory pilonidal sinus surgery

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Il. Anaesthesiology and Reanimation, Ankara Numune Education and Research Hospital, Ankara, Turkey

Background and Goal of Study: Epidural anaesthesia (EA) can provide sensory block with no motor blockade and the degree of block can be easily controlled (1). Our aim was to compare low dose segmental EA with conventional EA for ambulatory pilonidal sinus (PS) surgery.

Table

<table>
<thead>
<tr>
<th></th>
<th>BF</th>
<th>BFK</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset of sensory block (minute)</td>
<td>2.9 ± 1</td>
<td>2.3 ± 0.5</td>
<td>0.068</td>
</tr>
<tr>
<td>Two segment regression time (minute)</td>
<td>197.7 ± 28</td>
<td>121 ± 4</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Duration of sensoral block (minute)</td>
<td>252.5 ± 25</td>
<td>213.5 ± 23</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Maximum level of sensory block</td>
<td>T6(4–6)</td>
<td>T2(2–4)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Conclusions: Preoperative use of epidural ketamine antagonizes the beneficial effects of epidural fentanyl.

Reference:
Materials and Methods: ASA I-II forty patients undergoing PS surgery were included. In the sitting position Tuohy needle was inserted L4-5 or L5-S1 intervertebral spaces and the bevel of needle oriented caudally. Patients were randomly divided in to two groups. In Group I 15 mL bupivacaine (%0.5) and in Group II 6 mL bupivacaine (%0.5) were given over 180 seconds for EA. Then epidural catheter was advanced 3–4 cm in the same direction. Patients were repositioned in the prone position. Epidural block characteristics, hemodynamic parameters, first analgesic requirement time, time to PACU discharge, time to first voiding and time to home readiness were recorded. Mann Whitney-U, students T and chi-square tests were used for statistical analysis and p < 0.05 was considered as significant.

Results and Discussions: Demographic data, hemodynamic changes were similar. Maximum levels of sensorial and motor block degree were lower in group II. Epidural block was limited in sacral region in group II but cephalic spread was manifest in group I. Other significant parameters were showed table (p < 0.001).

<table>
<thead>
<tr>
<th>Group I</th>
<th>Group II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset of sensory block (sec)</td>
<td>13.5</td>
</tr>
<tr>
<td>Duration of sensory block (min)</td>
<td>195</td>
</tr>
<tr>
<td>First analgesic time (hr)</td>
<td>540</td>
</tr>
<tr>
<td>PACU discharge (hr)</td>
<td>127</td>
</tr>
<tr>
<td>First voiding (hr)</td>
<td>397</td>
</tr>
<tr>
<td>Home readiness (hr)</td>
<td>429</td>
</tr>
</tbody>
</table>

Conclusion: We think that the low dose selective segmental epidural anaesthesia may be preferred as an alternative technique for ambulatory PS surgery.


8AP1-10 Poor accuracy of anaesthesiologists in identifying the lumbar vertebral interspace in relation to Tuffer’s line irrespective of patients position

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Anaesthesiology, University Hospital of Heraklion, Heraklion, Greece

Background and Goal: In only 29% of patients anaesthesiologists were correct in identifying lumbar vertebral interspaces (LVIs) in patients with the lumbar spine flexed as much as possible (1). The purpose of the present study was to assess the accuracy of residents and consultants anaesthesiologists in identifying the LVI in patients positioned with their lumbar spine straightened or in the physiological lordosis.

Materials and Methods: The study was approved by the hospital research and ethics committee. Patients scheduled for spine surgery were examined after induction of general anaesthesia and placement in the prone position. Both a resident (group R) and a consultant (group C) did select blindly one of the five LVIs. After the identification of the requested interspace by palpation, each anaesthesiologist placed on the skin a needle at the assumed level. The needle’s position was confirmed with a lumbar radiograph. The requested and the actually found vertebral interspace by both the resident and the consultant were recorded. Additional recorded data included: Patients’ age, weight, height, gender, Tuffer’s line (line joining the iliac crests) level (TLL) was determined with x-rays.

Results: 77 consecutive patients were included in the study, 29 male and 48 female, resulting in a total of 154 examinations (by groups R and C). Patients’ data [age: 58 (±17) years, BMI: 26.5 (±4.6)] were normally distrib-utted and expressed as mean ± SD. Group R identified the vertebral interspace correctly in 25 patients compared to 32 accurate localizations by group C. The actually found vertebral interspace ranged from 3 levels below to 2 levels above the requested interspace for the group R and from 1 level below to 2 levels above for the group C. The differences between groups R and C did not reach statistical significance. The TLL ranged from L3 to L5. The higher the TLL was found, the higher was the actually identified vertebral interspaces for both groups.

Conclusions: In the present study, the anaesthesiologists presented a poor rate in identifying correctly a LVI. The study also confirmed the poor value of Tuffer’s line in the correct identification of the intervertebral space.

Anaesthesiologists performing spinal anaesthesia have to be aware of the inaccuracy in identifying a given LVI.


8AP2-1 Ultrasoundographic assessment of the influence of head rotation on the interscalene brachial plexus block

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Anaesthesiology, Kaohsiung Medical University Hospital, Kaohsiung, Taiwan

Background and Goal of Study: Head rotation can affect neck vessels orien-tation and may affect brachial plexus possibly (1). The goal of this study was to evaluate whether landmark-based precision of interscalene brachial plexus block and depth of brachial plexus could be altered based solely on different head rotation.

Materials and Methods: We simulated a needle insertion via interscalene approach to brachial plexus using an ultrasonographic probe in 53 volunteers (2). Ultrasonographic measurements were recorded to evaluate the influence of head rotation. First, we documented the measured deviation (d) between the simulated needle path and actual center of the brachial plexus by using a perpendicular line between them. Second, distance from skin to center of brachial plexus(s-p) was recorded. Finally, precise and venous hit were recorded.

Results and Discussions: Increased head rotation from 0°, 15°, 30°, 45° and 60° to the right of midline associated with more medial deviation of a simulated needle path to the center of brachial plexus and lower precise rate (p < 0.01). The risk of simulated needle path intersecting internal jugular was lower than 5% for head rotation within 30° and significantly higher for head rotations over 45° (p < 0.01).

Conclusions: Whenever we perform the interscalene brachial plexus block, the head rotation angle should within 30°. The measured medial deviation should be considered when the surface anatomic landmarks are used to approach interscalene brachial plexus.


8AP2-2 Ultrasound guidance for axillary block: a prospective, randomized, observer-blinded comparison with nerve stimulation

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Anaesthesiology and Pain Therapy, University of Parma, Parma, Italy

Background and Goal of Study: The aim of this prospective, random-ized, observer-blinded study was to test the hypothesis that ultrasound guidance can shorten the onset time of axillary brachial plexus block as compared to nerve stimulation guidance when using a multiple injection technique.

Materials and Methods: 60 ASA physical status I–III patients, receiving axil-lary brachial plexus with 20 mL of 0.75% ropivacaine using a multiple injec-tion technique were randomly allocated to receive either nerve stimulation guided or ultrasound guided axillary blocks. Patient acceptance was similarly evaluated.

Results and Discussions: The median (range) number of skin punctures was 2 (1–2) in group US and 2 (2–3) in group NS (P = 0.94); however, group US required less needle passes [4 (3–6)] than group NS [8 (5–13)] (P = 0.002). The onset of sensory block was shorter in group US (14 ± 6 min) than in group NS (19 ± 6 min) (P = 0.01); while no differences were observed in onset of motor block (24 ± 8 min in group US and 25 ± 8 min in group NS; P = 0.33). No failed block was reported in either group. Insufficient block was observed in 1 patients of group US (3%) and 2 patients of group NS (6%) (P = 0.61). Procedure-related pain was reported in 6 patients (20%) in group US and 14 patients (48%) in group NS (P = 0.028); patient acceptance was similarly good in the two groups.

Conclusions: Multiple injection axillary block with ultrasound guidance provided a slightly faster sensory block, fewer needle redirections, and less anesthesia-related pain as compared to nerve stimulation guidance.
8AP2-3
Complications of interscalene brachial plexus block following shoulder surgery in the awake sitting position
U. Panchagnula, S. Sagadai, M. Colomb
Department of Anaesthesia, University Hospital of South Manchester, Manchester, United Kingdom

Background: Interscalene brachial plexus block (ISB) is commonly used for shoulder surgery in the awake, sitting position (1). Aim of the study was to determine the complications following ISB, especially the incidence of syncopal episodes and neurological sequelae.

Methods: After ethical review, perioperative data from consecutive patients presenting for shoulder surgery under ISB was collected over 5 years. A chart review was done to identify postoperative complications. Patients received a standardised ISB with superficial cervical plexus block using levobupivacaine and lidocaine (20 mg each) diluted to 60 mL with 1:400,000 epinephrine. Syncopal episodes requiring treatment were classified as asymptomatic or haemodynamic. Neural sequelae were classified as major or minor, defined as possibly or not attributable to ISB. Data are presented as mean (SD), median [interquartiles] and frequency. Student’s t-, Mann-Whitney U- Fisher exact and chi-square tests were used and results are presented with 95% confidence intervals (CI) with P < 0.05 (two-sided) considered as significant.

Results: 321 patients were studied (Table). Postoperative follow-up was for 20 [10–32] weeks. The success rate for ISB was 0.96 (95% CI: 0.93–0.98). Syncopal incidence was 0.43 (95% CI: 0.38–0.49), (asymptomatic 0.14; haemodynamic 0.29) and was significantly associated with Horner’s syndrome (relative risk 1.32 95% CI: 1.02–1.71) and reduced use of midazolam. One patient had accidental intravascular injection of a test dose (transfontanicular) with successful ISB. Four patients developed neurological sequelae: one major – surgical damage to radial nerve and three minors – two due to coincidental pathology and one possibly attributable to ISB.

Conclusion: Syncopal episodes are common and are significantly associated with Horner’s Syndrome and absence of sedation. Neurological sequelae attributable to ISB are minor and rare (95% CI: 0.008–1.7).

Reference:

8AP2-4
Evaluation of the analgesic effects of 2 doses of verapamil with bupivacaine compared with bupivacaine alone in supraclavicular brachial plexus block
F. Mosafai, A.R. Salimi, F. Lahiji, M. Kazemi, A.R. Mirkheshti
Anesthesiology, Akhtar Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Background and Goal of study: Different adjuvant drugs have been used with local anesthetics in order to decrease the time of onset and elongate the duration and quality of regional blocks (1). In this study we used Verapamil (2) locally combined with Bupivacaine (2,3), in supraclavicular block (SB).

Material and Methods: In this randomised double blinded clinical trial, 60 18–40 years old patients divided randomly into 2 groups (GI: B 30 ml 0.5%, GII: B 30 ml 0.5% + V 2.5 mg). Onset time (OT) of sensory/motor, complete blocks (SB) (MB), CB, blood pressure (BP), heart rate (HR) changes were taken into consideration. We used SSIS 11.5 software.

Results: Data (Mean ± SD) are shown in the table. (P < 0.05)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Asymptomatic (N = 183)</th>
<th>Syncopal (N = 138)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (year)</td>
<td>50.4 (17.1)</td>
<td>49.4 (17.6)</td>
<td>0.62</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>78.6 (15.1)</td>
<td>82.4 (14.9)</td>
<td>0.17</td>
</tr>
<tr>
<td>Horner’s syndrome</td>
<td>87/96</td>
<td>82/56</td>
<td>0.042</td>
</tr>
<tr>
<td>Midazolam (mg)</td>
<td>1 (0, 2)</td>
<td>0 (0, 1)</td>
<td>0.045</td>
</tr>
</tbody>
</table>

There are no significant changes in BP and HR. (P = 0.236)

Conclusion: Applying V combined with B in SB can decrease the OT of SB, MB and CB which confirm the role of calcium channel blockers in analgesia(3).

References:

8AP2-5
Effects of the addition of fentanyl to levobupivacaine during auxiliary brachial plexus anesthesia
S. González, M.I. Rochera, A. Lacasta, L. Mora, J. Roigé
Anaesthesiology, Hospital Vall d’Hebron, Barcelona, Spain

Background and aim: Peripheral co-administration of local anesthetic and narcotic drugs has been reported to improve the nerve block characteristics (1,2). The aim of this prospective, randomized, double-blind study was to evaluate the effects of adding 100 μg fentanyl to levobupivacaine 0.33% for axillary brachial plexus anesthesia.

Material and Methods: The Protocol was approved by the Human Ethics Committee of the Institution, and all patients gave informed consent. Sixty four ASA I–II patients, scheduled for orthopaedic hand and forearm procedures were randomly allocated to receive an axillary brachial plexus block with 30 mL of levobupivacaine 0.33% (L) or levobupivacaine 0.33% + 100 μg fentanyl (L+ – F), using a selective multiple nerve stimulation technique. Sensory and motor block were tested for the main terminal nerves of the arm at 2.5-10-15-20-25 and 30 minutes after completion of the local anesthetic injection. Onset time, the time for the patients to be ready for surgery, the need for intraoperative analgesics, the duration of the block and adverse effects were recorded.

Results: No differences in anthropometric parameters and hemodynamic variables were observed throughout the study, and no signs of central nervous system and cardiovascular toxicity.

<table>
<thead>
<tr>
<th>Block characteristics</th>
<th>L</th>
<th>mean ± SD</th>
<th>L+F</th>
<th>mean ± SD</th>
<th>t-Student</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset sensory (min)</td>
<td>11.78 ± 5.20</td>
<td>12.73 ± 5.90</td>
<td>p = 0.463</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Onset motor (min)</td>
<td>12.02 ± 5.31</td>
<td>13.58 ± 7.48</td>
<td>p = 0.223</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ready to surgery (min)</td>
<td>23.98 ± 5.88</td>
<td>24.68 ± 6.19</td>
<td>p = 0.535</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration: Sensory (h)</td>
<td>14.10 ± 3.74</td>
<td>13.64 ± 5.00</td>
<td>p = 0.492</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration: Motor (h)</td>
<td>11.24 ± 3.12</td>
<td>11.36 ± 4.09</td>
<td>p = 0.613</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration Motor (h)</td>
<td>10.35 ± 2.85</td>
<td>10.97 ± 5.57</td>
<td>p = 0.228</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conclusions: Levobupivacaine 0.33% 30 mL produces axillary brachial plexus block of similar characteristics than the addition of 100 μg fentanyl to levobupivacaine.

References:

8AP2-6
Contributing factors for vasovagal event during shoulder arthroscopy in the sitting position after interscalene block
W. Roh, J. Chung, C. Park, B. Kim, S. Cho
Department of Anesthesiology and Pain Medicine, Daegu Catholic University Medical Center, Daegu, Republic of Korea

Background and Goal of Study: Vasovagal event has been reported in 15–25% of patients undergoing shoulder arthroscopy in the sitting position after interscalene block (ISB). This study was conducted to assess underlying contributing factors for the vasovagal events in these patients.

Materials and Methods: A retrospective analysis of 63 patients who underwent shoulder arthroscopy in the sitting position with ISB revealed 13 patients who experienced potentially dangerous vasovagal event characterized by sudden severe hypotension and bradycardia (Group 1). Fifty patients (Group 2) did not experience a vasovagal event.

Results and Discussions: There were no significant demographic or baseline hemodynamic differences between groups.

Group 1 (n = 13) | Group 2 (n = 50) | P value |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ASA PS (I/II/III)</td>
<td>8/4/1</td>
<td>39/10/1</td>
</tr>
<tr>
<td>Block size (R/LL)</td>
<td>12/1</td>
<td>32/18</td>
</tr>
<tr>
<td>Epinephrine in LA (yes/no)</td>
<td>9/9</td>
<td>26/24</td>
</tr>
<tr>
<td>Maximal Decrease of MAP from Baseline (%)</td>
<td>30.1 ± 3.4</td>
<td>9.2 ± 0.7</td>
</tr>
<tr>
<td>Time of Maximal Decrease of MAP from Baseline (min)</td>
<td>28.5 ± 3.5</td>
<td>33.8 ± 2.0</td>
</tr>
<tr>
<td>Sensory Blockade (none; 0; moderate; 1; complete; 2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C3 dermatome</td>
<td>1.7 ± 0.2</td>
<td>1.4 ± 0.1</td>
</tr>
<tr>
<td>C4 dermatome</td>
<td>2.0 ± 0.3</td>
<td>1.9 ± 0.5</td>
</tr>
<tr>
<td>C5 dermatome</td>
<td>1.9 ± 0.8</td>
<td>2.0 ± 0.0</td>
</tr>
<tr>
<td>C6 dermatome</td>
<td>1.7 ± 0.2</td>
<td>1.6 ± 0.8</td>
</tr>
<tr>
<td>C7 dermatome</td>
<td>1.3 ± 0.2</td>
<td>1.3 ± 0.1</td>
</tr>
<tr>
<td>C8 dermatome</td>
<td>0.6 ± 0.2</td>
<td>1.1 ± 0.1</td>
</tr>
<tr>
<td>T1 dermatome</td>
<td>0.5 ± 0.2</td>
<td>0.8 ± 0.1</td>
</tr>
<tr>
<td>T2 dermatome</td>
<td>0.5 ± 0.2</td>
<td>0.3 ± 0.1</td>
</tr>
</tbody>
</table>

Use of Fentanyl before Events | 7/6 | 24/48 | 0.000 |

Values are mean ± SEM.


8AP2-7
The effects of adding tramadol to ropivacaine on axillary brachial plexus block in uremic patients
B. Dikmen, G. Gamli, E. Horasanli, D. Ornek, M. Pekel
II. Anesthesiology and Reanimation, Ankara Numune Training and Research Hospital, Ankara, Turkey

Background and Goal of Study: Clinical studies to determine the effects of tramadol added to local anaesthetics for regional anesthesia have yielded contradictory results (1,2). The aim of this study was to evaluate the effect of tramadol added to ropivacaine for axillary brachial plexus block.

Materials and Methods: Thirty uremic patients scheduled for arteriovenous fistula operation were included in the study. Patients were randomly allocated to two groups. We performed axillary block with peripheral nerve stimulator by multiple injection technique. In Group A, they received ropivacaine (3.75 mg/mL) 38 mL and 2 mL of normal saline and patients in Group B received ropivacaine (3.75 mg/mL) 38 mL and 2 mL of tramadol (50 mg/mL). The onset and the duration of sensory blockade were assessed by pinprick. Motor block was tested by the movements of the fingers and the wrist. Mann Whitney-U test was used for statistical analysis and p < 0.05 was considered as significant.

Results and Discussion: Demographic data, onset of sensory and motor block, duration of sensory and motor block, quality of anesthesia and first analgesic requirement times were similar between two groups.

Conclusion: The results of our study showed that adding tramadol to ropivacaine may have no beneficial effects for the motor and sensory blockade quality on axillary brachial plexus blockade.

References:

8AP2-8
Infracavicular brachial plexus block with lateral approach: Single injection versus double injection
L. Bouattour, M. Smoumi, M. Daibabi, M. Salhi, A. Karoui
Anesthesiology, University Habib Bourguiba Hospital, Sfax, Tunisia

Background and Goal of Study: Single-injection coracoid infracavicular brachial plexus block produces inconsistent anesthesia of the upper limb (1,2). Can Single-injection lateral infracavicular brachial plexus block with stimulation of the Posterior Cord, provide both sensory and motor block enough for upper limb surgery?

Material and Methods: After institutional ethics approval and informed consent, 80 patients undergoing upper limb surgery, using infracavicular block were included in a double-blinded, prospective and comparative study. Patients with conditions precluding brachial plexus block were excluded. Patients were randomly assigned to receive a lateral infracavicular block guided by nerve stimulator: Group 1: single injection, radial response; 30 mL of local anesthetic (LA), Group 2: dual-injection, radial response; 15 mL of LA median response; 15 mL of LA. (LA: mixture of 2% lidocaine and 0.5% bupivacaine). The patient was supine with the head turned to the contralateral side with the operated arm in addiction, the elbow was fixed to the body and the palm of the hand was on the belly. The puncture site was located in the middle of infracavicular fossa; the needle was perpendicular to the skin. Sensory and motor block were assessed 10 and 20 min after the end of the injection of LA. Statistical analysis used Chi-square test and student’s t-test. p < 0.01 was significant.

Results and Discussion: Data are shown in the table:

<table>
<thead>
<tr>
<th></th>
<th>G1(n=40)</th>
<th>G2(n=40)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success rate (%)</td>
<td>92,5</td>
<td>95</td>
<td>0,64</td>
</tr>
<tr>
<td>Sensory block score at 20/min (mean ± sd)</td>
<td>12 ± 1,5</td>
<td>12,6 ± 1,2</td>
<td>0,054</td>
</tr>
<tr>
<td>Motor block score at 20 mm (mean ± sd)</td>
<td>7,2 ± 1,6</td>
<td>8 ± 1,6</td>
<td>0,003</td>
</tr>
<tr>
<td>Duration to perform the block (mm)</td>
<td>4 ± 2,4</td>
<td>6,2 ± 2,7</td>
<td>&lt;0,001*</td>
</tr>
<tr>
<td>EVA when block was performed</td>
<td>36 ± 13,5</td>
<td>44 ± 15,1</td>
<td>0,008*</td>
</tr>
<tr>
<td>Vascular puncture (%)</td>
<td>2,5</td>
<td>10</td>
<td>0,17</td>
</tr>
</tbody>
</table>

Conclusion: Single injection with radial response appears not only as efficient as dual injection in vertical paracardiac approach, but also less painful and quickly to perform.

References:

8AP3-1
Spread of single and multiple injections in the paravertebral space
R. Malchow, S. Aikele
Department of Anesthesia and Operative Svc, Brooke Army Medical Center, Ft Sam Houston, USA

Background and Goal of Study: Significant controversy exists regarding whether multiple injections are required for adequate spread within the paravertebral space. We compared single versus multiple paravertebral injections to evaluate adequacy and extent of spread.

Materials and Methods: As an observational study, ten volunteers were randomly assigned to receive either a single 30-mL injection (T4) or two separate 15-mL injections (T2, T5). Under fluoroscopy, a 22-gu needle was advanced 2.5 cm lateral from midline to the transverse process, then advanced caudally an additional 1.25 cm. With the bevel caudad, injections of diluted xicavine 200 M were performed at a rate of 0.5-1 mL/sec. Within 30 minutes, thoracic MRI scans were performed in the coronal, sagittal, and axial planes. A blinded neuroradiologist documented the extent of spread within the paravertebral, epidural, contralateral, subpleural, paraspinal, and the intercostal spaces.

Results and Discussions: Results are summarized in table.

<table>
<thead>
<tr>
<th></th>
<th>Volunteers</th>
<th>Levels</th>
<th>Lateral</th>
<th>Epidural</th>
<th>Paraspinal</th>
<th>Subpleural</th>
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<tbody>
<tr>
<td>Single Injection</td>
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<td></td>
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<tr>
<td>2</td>
<td>6</td>
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<td>None</td>
<td>Yes</td>
<td>No</td>
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</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Yes</td>
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<td>Min</td>
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</tr>
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</tr>
<tr>
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<tr>
<td>Ave</td>
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<td>Varies</td>
<td>Varies</td>
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<td>Multiple Injections</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td>9</td>
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<td></td>
</tr>
<tr>
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<td>10</td>
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<td></td>
</tr>
<tr>
<td>5</td>
<td>10</td>
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<tr>
<td>6</td>
<td>8</td>
<td>Yes</td>
<td>Min</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>10</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Ave</td>
<td>9.4</td>
<td>80%</td>
<td>Varies</td>
<td>100%</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion(s): A multiple injection technique may more reliably block up to 9 contiguous levels. Both techniques result in significant spread into intercostal, epidural, paraspinal, subpleural, and contralateral spaces.

8AP3-2
5-year-course of infections in 5,500 continuous peripheral nerve blocks
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Anesthesiology and Intensive care medicine, Traumacenter Murnau, Murnau, Germany

Background and Goal of Study: During the years 2002-2004 data of 3941 cPNB was analyzed. The results showed that the most common complications in continuous peripheral nerve blocks (cPNB) were infections, with a rate of medium and severe infections of 3,2% (1,2). Which factor could play a leading role in improving the existing standard operating procedures to reduce that enormous rate?

Materials and Methods: Over a 5 year period we investigated in a prospective study design all cPNB in a level one trauma centre (until 10/2006: n = 5536). The type of catheter, type of operation, the basic demographic data of the patient, duration of catheters and emerging complication were recorded in a computer based datasheet. It was available 24 h in each operation theatre and on each surgical ward. At that time we took part in the development of the German recommendations for the hygienic handling of PNB (2), which were carried out in our institution since 2002. In the beginning of 2005 we additionally reinforced our disinfection regime before nerve puncture. The “classical” five-swab-disinfection was prolonged to a combined disinfection using spraying and swamp cleaning lasting a minimum period of ten minutes.

Results and Discussions: In the time from 01/2005 to 10/2006 we carried out the intensified regime on further 2045 cPNB. In 2005 we found an infection
rate of 1.4% for medium and serve infections (p = 0.05, compared to 2002–2004), and even lower in 2006 (until 10/06) with 0.9% (p < 0.05). The type of cPNB (data not shown), representing the location as a risk factor, as well as the medium duration of the catheter (2002–2004: 4.03 d[0–36]; 2005: 4.69d[0–34]) did not differ significantly during 2002–2006.

Conclusion: By simply spending extra time on disinfection by combining spraying- and swab-disinfection, one can even improve an established, strict hygienic regime. With this small alteration in procedure, it seems to be possible to reach a reduction of more than 50% of the medium and severe infections in cPNB.

References:

8AP3-3
A survey of resident training in peripheral nerve blocks
A. Belbachir, L. Eyrolle, N. Rosencher, F. Bonnet, Y. Ozier
Anesthesie-Reanimation Chirurgicale, Hopital Cochin, Paris, France

Background and Goal of Study: Peripheral nerve blocks (PNBs) are increasingly used. Data on PNBs teaching methods, training and learning process of anesthesiology residents are scarce. As a preliminary approach, we have performed a survey of residents’ experience in this field in teaching hospitals.

Materials and Methods: A questionnaire was sent by regular mail to the residents in anesthesiology of Paris teaching hospitals in March 2004, followed 2 months later by a second mail to non-respondents. The questions focused on several items including duration of training, which PNB techniques were performed and total number of attempts for each one, level of self-confidence for each one, theoretical and practical courses, additional sources of training.

Results and Discussions: 174 questionnaires were sent, with a reply rate of 60.4%. 71% of the residents underwent 1 or 2 periods of PNB practical training periods occurring mainly between the 3rd and the 6th semester of education. Duration of training was: <1mo: 33%; 1–3mo: 39%; >3mo: 28%. The commonly performed PNBs were: femoral, axillary, humeral, scatic (70% cases) and interscalene brachial plexus block (43%); PNBs performed >20 times were: femoral (35% of the respondents’); humeral canal (23%). The rate of residents feeling self-confident with a technique was: 48% after >15 cases; 35% after 10–14 cases; 12% after <10 cases. Only 56% of residents followed up the patients in postoperative period. 52.5% of residents rated their PNB training as insufficient.

Available published data on the minimal number of PNB cases to be performed suggest that 40 cases are necessary to achieve proficiency in each procedure (1). For some PNBs, such as the interscalene brachial plexus block, over 20 cases are deemed necessary to obtain at least a 70% success rate (2).

Conclusion(s): Despite a preset program, residents training in PNBs appears insufficient. Anesthetic education may include more complete training in PNBs to guarantee the expertise of practitioners.

References:

8AP3-4
The use of ultrasound in thoracic paravertebral blockade
K. Haru, S. Sakura, T. Nomura, K. Doi, J. Ota
Anesthesiology, Shimane University School of Medicine, Izumo City, Japan

Background and Goal: Thoracic paravertebral block is the technique of injecting local anesthetic to the paravertebral space, which results in unilateral somatic and sympathetic nerve blockade. Previous studies have reported its effectiveness for thoracic surgery including breast surgery and pain of unilateral origin from the chest and abdomen. Its clinical advantages include the inhibition of stress and pressor response to surgical stimuli, maintenance of hemodynamic stability, low incidence of complication, and long duration of analgesia. Recent ultrasound technological advances would further increase the effectiveness and the safety of thoracic paravertebral block, although the identification of the nerve and needle is not still possible. The purpose of this study was to examine if thoracic paravertebral block is reliably performed with ultrasound.

Materials and Methods: With IRB approval and informed consent, 20 patients undergoing unilateral breast surgery received thoracic paravertebral block using 0.5% ropivacaine combined with general anesthesia. Patients were placed in the lateral decubitus position with the side to be blocked upper. A 3–11 MHz linear array transducer was applied to the paravertebral area 2.5 cm from the midline at T1 and T4 in a longitudinal fashion. The transverse process (TP) was located and its distance from the skin and that of the parietal pleura (PP) from the skin were measured. Paravertebral blocks at T1 and T4 were then performed using an 18G Touhy needle with the loss-of-resistance technique. The distances of the needle from the skin to TP and to the loss of resistance (LOR) were measured. A single injection of 5 and 15 ml of the anesthetic solution was performed at T1 and T4, respectively.

Results and Discussion: Ultrasound imaging of TP and PP was always successful. The distance measured with ultrasound was always less than the needle distance. The spread of local anesthetic solution was visualized at T4.

Conclusion: Thoracic paravertebral block is reliably performed with ultrasound. Ultrasound imaging of TP and PP provides a prior knowledge of the depth to the paravertebral space and may increase the safety of paravertebral blocks. The visualization of the anesthetic spread may increase the success rate.

8AP3-5
Paravertebral thoracic adrenaline and hemodynamic effects during open thoracic surgery
I. Garutti, P. Quesada, E. de la Fuente, B. Gutierrez, P. Piñeiro
Anesthesiology, Hospital Gregorio Maranon, Madrid, Spain

Background and Goal of Study: Adrenaline (Ad) added to the anesthetic local solutions may produce cardiovascular effects. Systemic absorption of small amounts of Ad in regional blocks is related with hemodynamic effects attributed to beta adrenergic stimulation. We want to compare hemodynamic effects of paravertebral block (PVB) using a bolus doses of plain Lidocaine (L) or L with Ad (L + Ad).

Materials and Methods: Prospectively, forty patients undergoing thoracic surgery were randomly in two groups Group L, L 2% (5 mg • kg–1) or Group L + Ad, L 2% (5 mg • kg–1) with Ad (5 µg • ml–1). Cardiac index (CI), derivate pressure (dp max), cardiac function index (CFI) heart rate (HR) and mean arterial pressure (MAP) were measured with an aortic transpulmonary thermodilution technique (PICCO system monitor) during one-lung ventilation. Concentrations of L were measured in arterial samples obtained after 15 and 30 minutes of paravertebral injection. Hemodynamic data were analyzed using Student’s t test. Plasma concentration data were analyzed with one-way ANOVA for repeated measures.

Results and Discussions:

<table>
<thead>
<tr>
<th>Group</th>
<th>Before PVB</th>
<th>After 15 min</th>
<th>After 30 min</th>
</tr>
</thead>
<tbody>
<tr>
<td>dp max</td>
<td>mmHg • s–1</td>
<td>L</td>
<td>L + Ad</td>
</tr>
<tr>
<td>CI</td>
<td>L</td>
<td>3.12 (3)</td>
<td>2.7 (2)</td>
</tr>
<tr>
<td>L/m/m–2</td>
<td>L + Ad</td>
<td>2.8 (2)</td>
<td>2.28 (2)</td>
</tr>
<tr>
<td>MAP</td>
<td>L</td>
<td>81.7 (12)</td>
<td>74.6 (13)</td>
</tr>
<tr>
<td>mmHg</td>
<td>L + Ad</td>
<td>86.8</td>
<td>75.4</td>
</tr>
<tr>
<td>CFI</td>
<td>L</td>
<td>4.45 (1.4)</td>
<td>4.41 (1.2)</td>
</tr>
<tr>
<td>HR</td>
<td>L + Ad</td>
<td>4.7 (1.4)</td>
<td>4.22 (0.8)</td>
</tr>
<tr>
<td>L</td>
<td>71.3 (13)</td>
<td>70.4 (13)</td>
<td>70.0 (13)</td>
</tr>
<tr>
<td>L + Ad</td>
<td>70.8 (16)</td>
<td>67.6 (13)</td>
<td>69.5 (13)</td>
</tr>
</tbody>
</table>

Mean (Standard deviation). (*) p < 0.05 between groups Lidocaine plain was 53% and 34% lower in the L + Ad group at 15 and 30 minutes respectively.

Conclusion(s): Addition of Ad to L solutions reduces both the plasma concentrations of L and myocardial contractility depression observed after injection in the thoracic paravertebral space.

8AP3-6
Thoracic paravertebral block for breast surgery: A randomised, double blind study
Anesthesiology, Aarhus University Hospital, Aarhus C, Denmark

Background and Goal: Breast surgery is often associated with postoperative pain, nausea and vomiting.

We examined the effect of multiple level paravertebral block in a randomised, double blind study on postoperative pain, opioid requirement and POVN.

Material and Methods: 194 patients were eligible, 36 met exclusion criteria, 70 declined and 10 were excluded during and after the study. Paracetamol 1 gr. was given preop. Immediately before the induction of anaesthesia paravertebral block was performed (1) from C7 to Th4–5 with either Ropivacaine 48% after (23%). The rate of residents feeling self-confident with a technique was: 48% after >15 cases; 35% after 10–14 cases; 12% after <10 cases. Only 56% of residents followed up the patients in postoperative period. 52.5% of residents rated their PNB training as insufficient.
Results and Discussions:

Methods used to locate peripheral nerves and the magnitude of current between August and October 2006. Information was sought on the methods of localization of a nerve plexus. The aim of this survey is to define the methods used to locate peripheral nerves by anaesthetists and occasionally by 11%. 5% never sought the lowest current. In the recovery room 23 of 38 patients in the R group did NOT receive opioids; in the Saline group only 10 of 40 did not use opioid.

<table>
<thead>
<tr>
<th>Method</th>
<th>Use</th>
<th>Do not use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ropivacaine</td>
<td>13</td>
<td>31</td>
</tr>
<tr>
<td>Saline</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>10 p.m. at rest</td>
<td>12</td>
<td>17</td>
</tr>
<tr>
<td>10 p.m. movement</td>
<td>12</td>
<td>17</td>
</tr>
<tr>
<td>8 a.m. day 1, at rest</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>8 a.m. day 1, movement</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>Nausea day 0 to 2</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Vomiting day 0 to 2</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Conclusion: Paravertebral block provided good pain relief until the evening and fewer patients needed opioid in the PACU. A surprisingly low incidence of POVN was seen in this study.

Reference:

8AP3-7

Techniques of peripheral nerve location during loco-regional anaesthesia

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Anaesthetics, Cardiff University and University Hospital of Wales, Cardiff, United Kingdom

Background: There is an increasing interest in loco-regional anaesthesia [1] and a number of new approaches to the traditional block methods have been published recently. However, the success of peripheral nerve blocks is still influenced by the method of localization of a nerve plexus. The aim of this survey is to define the methods used to locate peripheral nerves by anaesthetists in Wales, UK.

Methods: Questionnaires were sent to 266 consultant anaesthetists in Wales between August and October 2006. Information was sought on the methods used to locate peripheral nerves and the magnitude of current used when a peripheral nerve stimulator (PNS) was utilized. The number of nerve blocks performed per month was also solicited.

Results and Discussions: Data expressed as percentage; n = 164

<table>
<thead>
<tr>
<th>Method</th>
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<th>Do not use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landmark</td>
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<td>37</td>
</tr>
<tr>
<td>Paraaesthesia</td>
<td>8</td>
<td>92</td>
</tr>
<tr>
<td>PNS</td>
<td>67</td>
<td>33</td>
</tr>
<tr>
<td>2D USG</td>
<td>13</td>
<td>8</td>
</tr>
</tbody>
</table>

2D USG: 2 dimensional ultrasound guidance

67% of consultants performed <10 blocks/month, 25% between 11 and 50 and 8% more than 50 blocks. A majority of anaesthetists (55%) used a minimum current range of 0.3–0.5 mA and 67% used that as the injecting current. 11% were injecting at 0.6–0.9 mA and another 11% at <0.2 mA. 8% injected at 1 mA. Lowest current was almost always sought by 84% of anaesthetists and occasionally by 11%. 5% never sought the lowest current.

Conclusion(s): Landmarks and PNS were the most commonly used techniques of nerve location in Wales, paraaesthesia is rarely used. The use of 2D USG is probably not yet a routine practice globally. The magnitude of current chosen in our survey is comparable to the American practice [2].

Reference:

8AP3-8

The feasibility of teaching ultrasound for peripheral nerve identification within a residency program – learning curves in brachial plexus block

M. Frank, C. Hoffmann, D. Wiessner, T. Koch, R.J. Litz
Anaesthesiology, University of Technology, Dresden, Germany

Background and Goal of Study: High resolution ultrasound (US) in experienced hands allows real-time visualization of peripheral nerves, needle insertion, and the spread of the local anesthetic solution. However, due to the suspected simplicity of the procedure most residents were educated in identification of peripheral nerves by means of peripheral neurostimulation at first rather than by using ultrasound. We evaluated the feasibility of teaching US for nerve identification at first by analyzing the learning curves of residents without experience in performing peripheral nerve blocks or in applying US in axillary brachial plexus block (BPB) according to the residency teaching program.

Materials and Methods: Six residents underwent a standardized training program for US-guided BPB performance. In a first step sonoanatomy of the upper arm and the axilla was examined in each other under supervision of an experienced staff anesthetist. Theretafter residents watched 5 BPB performed by the staff with special regards to nerve identification, anatomical variations, needle visualization and local anesthetic spread. Then, each resident performed 30 BPBs under supervision. Technique was corrected if appropriate. A maximum of 40 m of local anesthetic solution was allowed. According to a standardized protocol sensory and motor block of 5 nerves were recorded in 5 min intervals. Likewise duration of the BPB performance was recorded.

Results and Discussions: Within 30 BPB residents reached a mean success rate of 89.4% [85–98] which was not significantly different between residents (P = 0.3). However, duration of procedure significantly differed between residents (10.9 ± 5.2 min vs. 16.9 ± 5.2 min; P < 0.001) and decreased over time in all residents. During performance of the first 10 blocks the identification of the radial and the musculocutaneous nerve was the most commonly seen problem for all residents. In all patients no complication related to block performance occurred.

Conclusion(s): Teaching US-guided performance of BPB to unexperienced residents was appropriate in all 6 candidates and resulted in a rapid increase in the individual learning curve, thus providing a high success rate after a short period of training.

8AP4-1

Prevention of spinal-induced hypotension by bolus injection of Lactate Ringer solution and Hydroxyethyl Starch

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Anesthesiology, Hospital Mar-Esperança IMAS, Barcelona, Spain

Background and Goal of Study: Several studies have questioned the advantage of preloading with crystalloid in the prevention of spinal-induced hypotension. The aim of this study was to determine the efficacy of crystalloids administered 30 min before spinal anaesthesia compared with a bolus administration of crystalloids or colloids at the time of spinal block, in preventing spinal-induced hypotension (SIH).

Materials and Methods: We studied 72 patients ASA I-II scheduled for surgical interventions without tourniquet or, important blood loss and with the patient placed in supine position. Monitoring included non-invasive arterial pressure (NIAP), electrocardiogram and pulse oximetry. NIAP, heart rate and peripheral oxygen saturation measurements were recorded every 5 min the first 30 min after the induction of anaesthesia and every 15 min. The sensory level was assessed 20 min after the intrathecal injection. Patients were randomized into three groups: Group 1 (n = 24) received 350 mL of lactate Ringer’s (LR) over 30 min prior to spinal anaesthesia, Group 2 (n = 24) received a bolus injection of 170 mL of hydroxyethyl starch (HS) over 3 min after spinal anaesthesia and, Group 3 (n = 24) received a bolus injection of 350 mL of LR over 3 min after spinal anaesthesia.

Results and Discussions: The LR preload and postload group, and the HS postload group were comparable in sex, height, weight, level sensory block, ASA, type of surgery and operation time. The incidence SIH was significantly higher (P = 0.003) in the LR preload group (57.5%) than in the HS postload (3.8%) and in LR postload group (8%). However, no differences in the incidence of hypotension were found between the LR postload and HS postload group.

Conclusion: It is recommendable to use a fast and small postload of volume immediately after spinal anaesthesia in order to prevent SIH.

Reference:
8AP4-2
The prognostic value of baroreflex sensitivity for severe bradycardia during spinal anaesthesia
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Anaesthesiology, University Hospital of Heraklion, Heraklion, Greece

Background and goal of study: During spinal anaesthesia the incidence of severe bradycardia is reported to be 13% while the incidence of cardiac arrest is reported as 0.4 – 1.2/10,000 patients. The purpose of the present study was to investigate the prognostic value of baroreflex sensitivity in predicting which patients will develop severe bradycardia during spinal anaesthesia. To test autonomic function the reflex heart rate responses to blood pressure changes induced by vasoactive drugs were used.

Materials and Methods: Thirteen ASA I-II patients, 20 – 50 years of age, subjected to elective lower abdomen or limb surgery under spinal anaesthesia were studied. Patients with a history of cardiovascular disease and disorders of the autonomic nervous system were excluded. All patients received 10 – 15 mg of 0.5% plain bupivacaine through a 25 gauge spinal needle at L3-L4 level. The level of spinal block was at T5 – T12 dermatome level. The baroreflex sensitivity was assessed before the induction of the spinal block using a rapid bolus injection of phenylephrine (200 µg). The values of blood pressure were plotted versus RR intervals and a regression analysis was performed. The relation was linear between the two variables over a limited pressure range and the slope of the regression line allows a qualification of the sensitivity of the reflex. Statistical analysis was performed with student t-test after the homogeneity of variances.

Results and Discussion: The analysis of baroreflex slopes in the six patients with severe bradycardia (<45 bpm) showed steep slope of the regression line, indicating strong vagal reflexes. In contrast, the pattern of response in patients who did not develop bradycardia was flat, indicating weak vagal reflexes. Using Levene and Brown-Forsythe tests for homogeneity of variances, the confidence interval was 98.7%.

Conclusions: The assessment of baroreflex sensitivity before spinal anaesthesia can predict patients prone to develop severe bradycardia. However, to assess more accurately its prognostic value probably are needed more patients.

References:

8AP4-3
Intrathecal fentanyl added to 0.5 bupivacaine in spinal anaesthesia for urologic surgery may impair haemodynamic stability
S. Fontes, D. Chalo, M.E. Amadeu, B. Pinto, G. Cardoso
Serviço de Anestesiologia, Hospital Geral de Santo Antonio, Porto, Portugal

Background and goal of Study: Adding an intrathecal opioid to a local anaesthetic results in synergism, but the hemodynamic effects have not been studied. Our study evaluated the haemodynamic stability of the association of bupivacaine and fentanyl in spinal anaesthesia.

Materials and Methods: Prospective, randomized, double-blind study, Patients (ASA I-III), had prostate surgery (TURP); groups A/B; or vesical surgery (TUR-V); groups C/D. Spinal anaesthesia was with hyperbaric bupiva-
caine (Bupi 0.5% with fentanyl(Fenta15 µg) or saline). There were 4 groups: A(n = 10); Bupi 10 mg + Fenta; B(n = 12); Bupi 10 mg + saline; C(n = 18); Bupi 7 mg + Fenta; D(n = 10); Bupi 7 mg + saline. Mean arterial pressure (MAP) was recorded at T0 (baseline) and at 5’, 10’, 15’, 30’, 60’ after spinal, before legs down and last measure in OR. The difference between each recorded MAP and MAP at T0 was calculated. Average MAP differences were compared between Groups A/B and between Groups C/D using Mann-Whitney test (p < 0.05). Results are mean ± SD.

Results and Discussions: Fifty patients were studied (46 men), 76% ASA II, age 67.7 ± 8.7 years. Demographics did not differ. The table shows MAP differences at each time point for each group. A statistically significant difference was found for (T5-T0) between A and B (p = 0.029).

<table>
<thead>
<tr>
<th>Group</th>
<th>T5-T0</th>
<th>T10-T0</th>
<th>T15-T0</th>
<th>T60-T0</th>
<th>Tfinal-T0</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-14.5</td>
<td>-11.9</td>
<td>-13.4</td>
<td>-15.14</td>
<td>-17.2</td>
</tr>
<tr>
<td>B</td>
<td>+11.2</td>
<td>+17.5</td>
<td>+10.6</td>
<td>+13.6</td>
<td>+11.4</td>
</tr>
<tr>
<td>C</td>
<td>-17.8</td>
<td>-17.9</td>
<td>-18.1</td>
<td>-16.4</td>
<td>-16.2</td>
</tr>
<tr>
<td>D</td>
<td>-1.9</td>
<td>-2.2</td>
<td>-3.8</td>
<td>-1.43</td>
<td>-4.8</td>
</tr>
<tr>
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<td>-7.5</td>
<td>-11.4</td>
<td>-9.9</td>
</tr>
<tr>
<td></td>
<td>-16.0</td>
<td>-31.6</td>
<td>-16.5</td>
<td>-21.5</td>
<td>-21.7</td>
</tr>
</tbody>
</table>

Conclusions: Adding fentanyl to spinal bupivacaine resulted in significant MAP reduction at 5 min. This was not observed when a lower dose of bupi-
vacaine was used. Further studies will be required.

References:

8AP4-4
The role of carbohydrate – rich drink on perioperative discomfort, hemodynamic changes, and insulin responses in spinal anaesthesia patients
H. Yagmur, S. Gulan, H. Yildiz, H. Gulec, C. Topkaya
Clinic of Anaesthesiology and Reanimation, The Ministry of Health Ankara Research and Training Hospital, Ankara, Turkey

Background and Goal of Study: The fasting period before elective surgery is often long enough to deplete carbohydrate reserves and also uncomfortable for the patient(1). The aim of this study was to investigate the role of carbohydrate-rich drink on perioperative discomfort, haemodynamic changes, and insulin response in elective lower abdominal surgery patients with spinal anaesthesia.

Materials and Methods: Forty-four consecutive ASA I-II adult patients were randomly assigned to one of two groups: preparation with carbohy-
rate-rich drink (CHO – 22 patients) or fasting from midnight (Fasted – 22 patients). During the evening before surgery, patients in the CHO group ingested 800 mL of carbohydrate-rich drink. Also another 400 mL of morning drink at least 90 min before spinal anaesthesia was allowed in the CHO group. The patients in the Fasted group underwent spinal anaesthesia after the routine fast from midnight. Visual analogue scales were used to score 10 dif-
ferent discomfort variables. Also blood glucose and insulin concentrations and haemodynamic changes were recorded during perioperative period.

Results and Discussion: The visual analogue scale scores in a control sit-
tuation and before intake of morning drink not different between groups. The CHO group was less hungry, less thirsty and experienced less malaise and unfitness during the period before and after the spinal anaesthesia (p < 0.05). Also the CHO group was less anxious than the Fasted group before spinal anaesthesia (p < 0.05). Trend analysis showed decreasing hunger, thirst, malaise, and unfitness during perioperative period and decreasing anxiety during the waiting period before surgery (p < 0.05). In the Fasted group, hunger and thirst increased during perioperative period (p < 0.05). Plasma glucose and insulin concentrations were increased in the CHO group before spinal anaesthesia (p < 0.05). Plasma glucose increased and insulin decreased in the Fasted group at 60 min after the spinal anaesthesia (p < 0.05). In the Fasted group, mean arterial pressure was lower at before and 10 and 20 min after the spinal anaesthesia compared to the CHO group (p < 0.05).

Conclusion: Preparation with oral carbohydrate before spinal anaesthesia had advantages over overnight fasting by reducing perioperative discom-
fort, improving insulin response and stabilizing mean arterial pressure in lower abdominal surgery patients(2).

References:

8AP4-5
Unilateral spinal anaesthesia for total knee replacement surgery: comparison of low dose hyperbaric and hypobaric ropivacaine
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Background and Goal of Study: The baricity of local anesthetic solutions can effect quality of subarachnoid block (1). We aimed to determine the effi-
ciency of hyperbaric and hypobaric ropivacaine solutions with unilateral spinal anaesthesia applied for total knee replacement (TKR) surgery.

Materials and Methods: 60 patients with ASA risk status I II scheduled for TKR was included in the study. To maintain spinal anaesthesia, in Group I (hyperbaric group) the operated extremity of the patient was lowermost with 15° fowler position, in Group II (hypobaric group) the operated extremity was uppermost with 15° trendelenburg-position. The study solution containing 11.25 mg ropivacaine in 3 ml was introduced to cerebrospinal fluid through L3-L4 interspace with combined spinal epidural anaesthesia (CSEA) in 180 sec-
onds. Hemodynamic parameters, sensory and motor block data were
recorded. Statistical analysis was performed using Mann Whitney-U, Wilcoxon and chi-square tests and p < 0.05 was considered as significant.

**Results and Discussions:** Demographical data were similar. The time to reach T10 level of the sensory block was significantly shorter in Group I (p = 0.003). The regression time of the sensory block was shorter in Group II (0.046). The incidence of unilateral spinal anesthesia was higher in Group II (%73.3 vs %66.6). The hemodynamic parameters were well preserved in both groups.

**Conclusion:** We think that the hypobaric technique may provide higher incidence of unilateral block and shorter recovery time of sensory block.

**Reference:**

**8AP4-6**

**Determination of factors affecting the success rate of spinal anaesthesia**

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**Background and Goal of Study:** Spinal anaesthesia is widely used for many surgical procedures and multiple factors can influence the chance of a successful block(1). This study aimed to identify the factors affecting the success rate of our spinal anaesthesia management.

**Material and Methods:** After approval by Institutional Ethics Committee and informed consent, all spinal anaesthesia procedures were recorded over a period of 4 months. Before attempting, the attending anaesthesiologist recorded the patient's characteristics, anatomical landmarks and previous history of spinal anaesthesia. We recorded the training level of the provider as 1–2 years (Group A), 2–4 years (Group B) anaesthesia resident or staff (Group C) having more than 3 yrs' experience. Needle gauge and spinal level used, was also recorded. All spinal blocks were performed in the sitting position through a midline approach. Direction of the needle and each new skin puncture was considered as a new attempt. Logistic regression was used to test the association between recorded data and success.

**Results:** We studied 295 patients (Table-1). Totally 445 attempts were recorded. Successful anaesthesia following one or more attempts at the first or second interspace was attained in 94.77% of patients, while the overall success rate at the first attempt was 62.71%. First- level success was not affected by age, sex, body mass index (BMI),anatomic landmarks, previous history of spinal anaesthesia, spinal needle gauge and level (p > 0.05). First attempt success rates of Group A,B and C were 44.23, 60.67 and 68.24 %, respectively. Anaesthesiologist having more than 3yrs' experience had a success rate significantly higher than the other groups (p = 0.013). The incidence of postdural puncture headache was 1.02%. The most frequently encountered adverse events were hypotension (3.39%), nausea (3.05%) and bradycardia (2.03%). No neurologic complications were observed.

**Table-1. Patients' demographics (n = 295).**

<table>
<thead>
<tr>
<th>Age(yr)</th>
<th>58.37 ± 15.69</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI(kg/m²)</td>
<td>25.76 ± 3.38</td>
</tr>
<tr>
<td>Gender (M/F)</td>
<td>276/19</td>
</tr>
<tr>
<td>ASAIII-IV</td>
<td>78/161/56</td>
</tr>
</tbody>
</table>

**Conclusion:** Our results suggest that more experienced anaesthesiologists would have greater chances of reaching the subarachnoid space.

**Reference:**

**8AP4-7**

**Comparison between hypobaric unilateral spinal anaesthesia and conventional spinal anaesthesia in elderly patients for hip trauma**

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**Background:** Hip fracture is common in the geriatric population. All anaesthetic techniques aim to avoid deleterious fall in arterial blood pressure. Hypobaric unilateral spinal anaesthesia can be associated with hypotension but has less hemodynamics effects compared to conventional spinal anaesthesia (1). This study aims to do that in a prospective manner.

**Material and Methods:** After ethical committee approval and written informed consent, 40 elderly patients (>65 yr) were randomized in two groups: conventional group and a unilateral group. Following a preload with (hemacell®) (7 ml/kg) and after an illofascial block, patients were placed in the lateral decubitus position, operative side upper most Both groups received spinal anesthesia as a combination of hypobaric bupivacaine 7.5 mg and fentanyl 10 ug.

Patients were kept in position for 15 minutes in the unilateral group and immediately turned on the dorsal side in the conventional group. Systolic, mean and diastolic arterial blood pressures, heart rate, SaO2%, epidural consumption, duration of sensory and motor block were recorded.

**Results:** Unilateral group had higher mean values of systolic pressure from the 20th minute to the 80 th minute after spinal ponction than conventional group (P < 0.05). Hypotension occurred in 60% of patients in the conventional group and 15% in the unilateral group (P = 0.003). The hypotension was deeper in conventional group (30,71%) than in unilateral group (18,57%) (P < 0.0001). Ephedrine was required to control hypotension in six unilateral patients (50%) and twelve conventional patients (60%) (P = 0.05). The ephedrine consumption was 1.35 ± 3.7 mg for unilateral group and 11.25 ± 15.10 mg for conventional group (p = 0.007). Mean duration of sensory and motor block on the operative side were comparable in the both groups.

**Conclusion:** In elderly patients undergoing hip surgery, hypobaric unilateral spinal anaesthesia induces less haemodynamic change than the conventional spinal anaesthesia and more satisfactory condition.

**Reference:**

**8AP4-8**

**Laparoscopic cholecystectomy under spinal anaesthesia: intraoperative findings from a pilot study**

K. Prattas, D. Bagka, S. Georgopoulou, F. Fafoulakis, G. Tzovaras

Anaesthesiology, University Hospital of Larissa, Larissa, Greece

**Background and Goal of Study:** Regional anaesthesia alone or combined with general anaesthesia has been used for laparoscopic cholecystectomy for high risk patients (1). We conducted a pilot study to assess the feasibility and safety of the use of spinal anaesthesia for laparoscopic cholecystectomy in fit patients, with a view to later compare the two methods of anaesthesia in a prospective randomized study.

**Materials and Methods:** We studied 15 patients, ASA I or II (12 women, age 40–67). All patients received 500 ml of Ringer's Lactate solution prophylactically and a nasogastric tube was inserted before the introduction of anaesthesia. With the patient at the right decubitus position a 25 G pencil point spinal needle was introduced into the subarachnoid space at the L2–L3 intervertebral space and 3 ml hyperbaric plain bupivacaine 0.5%, 0.25 mg morphine and 20 µg fentanyl were injected intrathecally.

**Results and Discussions:** All operations were completed laparoscopically and conversion from spinal to general anaesthesia was not required in any of the cases. No patient reported intra-abdominal complaints. Serial arterial blood gas assessment revealed that CO2 loading from the pneumoperitoneum was compensated (pH > 7.34 and PCO2 < 47). Intraoperative incidents are present on table.

<table>
<thead>
<tr>
<th>Intraoperative incidents</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild right shoulder pain (no medication given)</td>
<td>2 (13.3)</td>
</tr>
<tr>
<td>Severe shoulder pain (midazolam-fentanyl)</td>
<td>2 (13.3)</td>
</tr>
<tr>
<td>Nausea</td>
<td>1 (6.6)</td>
</tr>
<tr>
<td>Vomiting</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Bradycardia (&lt;40/p/min)</td>
<td>2 (13.3)</td>
</tr>
<tr>
<td>Hypotension (&lt;20% pre-anaesthetic value)</td>
<td>10 (66)</td>
</tr>
</tbody>
</table>

**Conclusions:** Laparoscopic cholecystectomy can be successfully and safely performed under spinal anaesthesia. Intraoperative incidents related to either the pneumoperitoneum (shoulder pain) or the high level of sympathetic blockade (hypotension, bradycardia) are easily manageable and do not preclude completion of the procedure.

**Reference:**

**8AP4-9**

**Postoperative course after laparoscopic cholecystectomy under spinal anaesthesia: a pilot study**

S. Georgopoulou, D. Bagka, K. Prattas, G. Stamatiou, G. Tzovaras

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**Background and Goal of Study:** Regional anaesthesia alone or combined with general anaesthesia has been used for laparoscopic cholecystectomy for high risk patients (1). We conducted a pilot study to assess the postoperative pain, recovery and side effects of spinal anaesthesia for ASA I-II patients, with a view to later compare the two methods of anaesthesia.
Materials and Methods: Fifteen ASA I–II patients (12 women, age 27–67) underwent laparoscopic cholecystectomy after informed consent was obtained. With the patient at the lateral decubitus position a 25 gauge pencil point spinal needle was introduced into the subarachnoid space at the L2–L3 intervertebral space and 3 ml hyperbaric plain bupivacaine 0.5%, 0.25 mg morphine and 20 μg fentanyl were injected intrathecally. Postoperative analgesia was standardized (fentanyl 25 μg every 12 hrs and paracetamol 500 mg every 6 hrs orally). Postoperative pain was assessed using the Visual Analogue Scale (VAS). Patients were followed up as outpatients at 10–15 days postoperatively and were asked to complete a standardized questionnaire regarding the quality of their recovery.

Results and Discussions: All operations were completed laparoscopically and conversion from spinal to general anesthesia was not required. Cardiovascular, respiratory or neurologic complications were not detected in any case during the immediate postoperative course. Nausea or vomiting occurred in 4 patients, while 1 patient developed urinary retention requiring catheterization. Median VAS score at mobilization was 0 at the recovery room and at 4 hrs postoperatively it was 1.5 (range 0–5), at 8 hrs was 1 (range 0–6) and at 24 hrs was 0 (range 0–6). All patients were mobilized the evening after the operation and discharged at 24 hrs postoperatively. No patient required readmission. At 2 weeks follow up 12 patients reported highly satisfied, 2 fairly satisfied and 1 dissatisfied from the procedure.

Conclusion: Laparoscopic cholecystectomy under spinal anesthesia appears to offer adequate postoperative pain control without limiting recovery.

Reference:

8AP5-1
Application of cold to the skin: does it effectively attenuate the pain associated with the infiltration of local anaesthetic?
C. Burchman, K. Judy
Department of Anesthesiology, Dartmouth-Hitchcock Medical Center, Lebanon, USA

Background and Goal of Study: Ice has been employed for thousands of years as an adjunct to analgesia. Many studies have demonstrated that ice is effective in attenuating perioperative pain (1). This study evaluated the efficacy of ice in reducing the amount of pain associated with the infiltration of local anesthetic.

Materials and Methods: Forty-eight patients underwent interventional pain management at procedures of the lumbar spine which required preliminary skin and soft tissue injections of local anesthetic (1% lidocaine). Approximately half of the injections were preceded by a 20-second application of sterile ice, directly to the skin. Patients were immediately asked to rate the pain associated with the infiltration on a verbal scale from 0–10.

Results and Discussions: Pain intensity measurements were made for procedures pretreated with and without ice. Results were compared for each subject. A Wilcoxon-Signed Ranks Test demonstrated that 77% of the subjects noted reduced use of the ice conferred significant analgesia during the local anesthetic infiltration (p < .0001). Cooling reaches superficial nerves via conduction through the skin and subcutaneous tissue. Decreased temperature results in a decrease in the conduction velocity of neuronal conduction (2). The Gate Control Theory of Pain, introduced by Melzack and Wall in 1965 results in a decrease in the conduction velocity of neuronal conduction (2).

Conclusion: Application of cold to the skin: does it effectively attenuate the pain associated with the infiltration of local anaesthetic?

References:

8AP5-2
Phrenic nerve infiltration with 0.2% ropivacaine reduces the incidence of shoulder pain after thoracotomy surgery
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Background and Goal of Study: The aim of this prospective, randomised, double blind, placebo controlled study was to test the efficacy of phrenic nerve infiltration with ropivacaine 0.2%/vol on the incidence and severity of ipsilateral shoulder pain after thoracotomy in patients receiving continuous thoracic epidural analgesia.

Materials and Methods: 50 ASA physical status II–III patients, receiving thoracic epidural analgesia for post-thoracotomy pain, were randomly allocated to receive the infiltration of the ipsilateral phrenic nerve with 10 mL of either 0.2% ropivacaine (n = 25), or normal saline (group Control, n = 25) just before lung expansion and chest closure. A blind observer recorded the incidence and severity of ipsilateral shoulder pain 6, 12, 24, 36, and 48 h after surgery. Postoperative respiratory function was also evaluated with blood gas analysis.

Results and Discussions: The cumulative incidence of ipsilateral shoulder pain during the first 24 h after surgery was 12/25 in group Ropivacaine and 16/25 in group Control (P = 0.047), with a median (CI 95%) onset time of shoulder pain of 36 (2–48) h in group Ropivacaine and 16 (0.5–48) h in group Control (P = 0.01). No differences were reported on the second postoperative day. The area under the curve of the degree of pain over time was 0 (0–2760) mm² in group Ropivacaine and 350 (0–1900) mm² in group Control (P = 0.06).

Postoperatively, the indices of respiratory function worsened in both groups, without differences between the two.

Conclusion: Phrenic nerve infiltration with 10 mL of 0.2%/vol ropivacaine reduced the incidence and delayed the onset of ipsilateral shoulder pain during first 24 h after open lung resection, with no clinically relevant effects on respiratory function.

8AP5-3
Tramadol added to 1.5% lidocaine enhances postoperative analgesia dose dependently
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Background and Goal of Study: Adjuncts to local anesthetics for peripheral plexus blockade have been proposed to enhance the quality and duration of analgesia and postoperative analgesia. Tramadol, has a unique mechanism of action that suggests efficacy as such an adjunct (1, 2). We designed a prospective, randomized, controlled and double-blind clinical trial to assess the effect of tramadol added to brachial plexus analgesia.

Materials and Methods: After institutional ethical committee approval and consent from patient, 102 patients scheduled for either hand or forearm surgeries were randomized into three groups. All patients received 1.5% lidocaine 34 mL (±120000 epinephrine) plus 4 mL of either: saline solution (placebo group), 100 mg Tramadol (TL group), or 200 mg tramadol (TH group).

We evaluated the time of onset of analgesia, duration of sensory (SB) and motor blockade (MB), duration and quality of postoperative analgesia and occurrence of adverse effects.

Results and Discussions: Demographic data were similar in all groups. The main results are in the table below.

<table>
<thead>
<tr>
<th>Group</th>
<th>Placebo n = 33</th>
<th>TL group n = 34</th>
<th>TH group n = 35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset time(min)</td>
<td>8.9 ± 3.6</td>
<td>11.1 ± 4.6</td>
<td>16.1 ± 6.9</td>
</tr>
<tr>
<td>Duration of SB(min)</td>
<td>126.4 ± 48</td>
<td>189.9 ± 97</td>
<td>265.5 ± 119</td>
</tr>
<tr>
<td>Duration of MB(min)</td>
<td>142.7 ± 53</td>
<td>180 ± 76</td>
<td>231.2 ± 82</td>
</tr>
<tr>
<td>Rescue analgesia(min)</td>
<td>371.6 ± 316</td>
<td>572.9 ± 516</td>
<td>733.8 ± 434</td>
</tr>
<tr>
<td>Rescue analgesia(%)</td>
<td>94%</td>
<td>76%*</td>
<td>77%*</td>
</tr>
</tbody>
</table>

(P): significance between placebo and TL group; (‡): significance between TL group and TH group. (q): significance between TH group and placebo and TL groups.

Conclusion(s): In our study, tramadol enhanced analgesia and postoperative analgesia in dose dependant way when used as a perineural adjunct of lidocaine 1.5% for axillary nerve block.

References:

8AP5-4
Elastomeric pumps: clinical evaluation differs from in vitro reliability
F. Remerand, J. Fusciardi
F. Remerand, J. Fusciardi
SAR2, CHU Trousseau, Chambry les Tours, France

Background and Goal of Study: In postoperative regional analgesia, perineural infusion of local anaesthetic with an continuous elastomeric pump (CEP) increases portability and patient satisfaction (1). In vitro, CEP infusion remains within ± 15% of their set rates during 76 to 90 % of their duration, but infusion rate is higher than expected during the first hours of duration (2). No in vivo data are available. The aim of our work was to assess in vivo CEP infusion rate consistency and accuracy in regional analgesia after orthopedic surgery.
Materials and Methods: We prospectively studied 117 consecutive CEP connected to 78 perineural catheters (49 femoral, 25 popliteal and 3 infraclavicular ones) in 73 patients for postoperative analgesia (knee, foot or elbow surgery). Two CEP were indifferently used in the unit: Infusor® LV5 (Baxter, France) or Easypump® (Braun, Germany), both with a 5 mL/h set rate. As a routine procedure, CEP were weighed by nurses at bedside using a portable electronic scale, several times a day, until catheter was removed. A constant mass of CEP during time traduced an obstructed catheter. Masses and hours of measures allowed accurate deflation profile assessment and flow rate calculation: (first measure - last measure) / duration. We used Fisher exact tests for statistical analysis.

Results and Discussions: After being connected to the catheter, 28 CEP did not deflate (27 Braun and 1 Baxter, p = 0.04); 9 catheters were removed 13 to 40 H latter, 9 were injected 5 to 39 H latter with 5 mL lidocain 1% and then deflated correctly, and 10 spontaneously deflated 10 to 35 H latter. Deflation defect was less frequent when a CEP was connected for the first time to a catheter (12 out of 78) than when CEP renewed a previous one (16 out of 39, p = 0.005).

Flow rates differed from 5 mL/h ± 15% in 45 cases out of 69 (30 in excess and 15 by default).

Conclusion(s): Physicians should be aware of frequent deflation defect of elastomeric pump (a possible cause of early postoperative analgesia failure). Moreover, in vivo measures of their infusion rate yielded greater variability than in vitro ones.

References
1 Capdevila X. Anesth Analg 2003; 96: 414-417

8AP5-5
Postoperative analgesia with intraarticular bupivacaine and a2 – agonist clonidine after arthroscopic knee surgery: a prospective, randomized, double – blind clinical comparison
R. Tamosiunus, A. Karbonskiene, A. G党组tium, G. Keraitiene, A. Gelmanas
Department of Anaesthesiology, Kaunas Medical University Hospital, Kaunas, Lithuania

Background and Goal of Study: The aim of the study was to compare analgesic effectiveness of intraarticular 0.5% 20 ml bupivacaine and clonidine, used separately and in combination for postoperative analgesia after arthroscopic knee surgery. We hypothesized that 0.5% 20 ml of bupivacaine with 1 μg/kg of clonidine provides best control of postoperative pain.

Materials and Methods: 48 patients, ASA 1 to 2, scheduled for elective knee arthroscopy under spinal anaesthesia were prospectively randomized to receive intraarticularly, in a double – blind manner, either 0.5% 20 ml of bupivacaine (group I); 0.5% 20 ml of bupivacaine with 1 μg/kg of clonidine (group II); or normal saline (group III – placebo group). Rescue treatment consisted of ketorolac 30 mg i.v. VAS pain scores at rest and with motion every 2 h, postoperative ketorolac consumption and patient satisfaction (VAS) with postoperative analgesia were assessed.

Statistical analysis was performed using tests of Mann–Whitney, t-test, Student t-test, Fisher exact test were performed, p < 0.05 was considered significant.

Results and Discussions: Pain scores at rest and with motion were similar in group I and II during the whole study period, except 6 (2.5 ± 0.4 vs 0.9 ± 0.2) and 8 h (2 ± 0.3 vs 0.7 ± 0.2) (p < 0.05) after intraarticular administration of study drugs. Pain relief was significantly better controlled in these groups at rest and with motion when compared with the group III and number of demanded doses of rescue analgetic was also less (median (min-max) was as follows: group I – 0 (0–1), group II – 0 (0–1), group III – 2 (2–3). Patient satisfaction with postoperative analgesia did not differ in groups I and II and there was a significant difference between groups I and III, II and III (median (min-max) of satisfaction VAS score in groups: I 8(7-9), II 10 (8-10), III 13 to 40 H latter, 9 were injected 5 to 39 H latter with 5 mL lidocain 1% and did not deflate (27 Braun and 1 Baxter, p 0.005). Masses and hours of measures allowed accurate deflation profile assessment and flow rate calculation: (first measure - last measure) / duration. We used Fisher exact tests for statistical analysis.

Conclusion(s): Physicians should be aware of frequent deflation defect of elastomeric pump (a possible cause of early postoperative analgesia failure). Moreover, in vivo measures of their infusion rate yielded greater variability than in vitro ones.

References
1 Capdevila X. Anesth Analg 2003; 96: 414-417

8AP5-7
Endovascular aortic aneurysm repair under local anaesthesia and conscious sedation
H. Bojahr, C. Kyriakides
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Background and Goal: Endovascular aortic aneurysm repair (EVAR) is gaining widespread acceptance and can be offered to patients not amenable to traditional open repair. We wish to report our experience of performing EVARs under local anaesthesia with conscious sedation.

Materials and Methods: We performed 15 consecutive EVARs under local anaesthesia; cases were abdominal and thoracic, elective or leaking. ASA grades were all 3 and over, 1 patient being classified as SE. The range of comorbidities included aortic stenosis (gradient > 100 mmHg), severe ischaemic heart disease, chronic obstructive pulmonary disease and severe rheumatoid arthritis with atlantoaxial subluxation. 2 patients were non-English speakers and verbal communication was not possible during the procedure. All patients were prepared as for open repair except for a CVP line, and blood pressure was manipulated as necessary. Remifentanil sedation was commenced through a dedicated intravenous line and maintained at a rate of 0.01-0.05 mcg/kg/min. Local anaesthesia was provided by the surgeon using Lidocaine 1% with Epinephrine. Mean operating times were 90 minutes. Patients were discharged either to the vascular ward or the surgical high dependency unit.

Results and Discussions: Operating conditions were judged good to excellent in all cases. No patient required conversion to general anaesthesia or an open repair. 1 patient developed a tachycardia with >140 beats per minute; this settled with correcting the potassium level and intravascular filling. 1 patient experienced discomfort during the procedure, however, this was an obese patient (BMI 35) and the procedure lasted over 4 hours. The only patient who died was in extremis with an aorto-duodenal fistula and had refused surgery earlier. In all other patients satisfaction was high.

Conclusion(s): Judicious local anaesthesia with Remifentanil sedation is a safe and effective way of providing anaesthesia for EVAR, producing consistently good operating conditions. This technique also reduces pressure on critical care facilities by allowing the patients to be fast-tracked to the ward. The ease of this procedure must not be underestimated as there is still potential for major disaster.

8AP5-8
Quantitative evaluation of the efficacy of different components of topical anaesthetic creams. Prospective, randomized, double-blinded, placebo controlled study
N. Rahe-Meyer, C. Hoppe, C. Weilbach, S. Piepenbrock, M. Winterhalter
Anaesthesiology, Hannover Medical School, Hannover, Germany
Background and Goal of Study: Our goal was to test the effect of different ingredients of topical local anaesthetics that might influence their efficacy and thus to find the composition with the fastest onset, the best intensity and the lowest toxic potential.

Materials and Methods: 8 different compositions were tested on 29 healthy volunteers. Approval was given by the regional Ethics Committee. They were randomly applied on the forearm in 1,77 cm² skin areas for 20, 40 and 60 minutes. After removal of the anaesthetics we gave definite, reproducible pain stimuli with a special test-stamp. This contained a 0.55 mm disposable hypodermic needle (Sterican) which was put with 0.2, 0.4 and 0.6 Newton pressure on the skin. The pain experience of the test subjects were quantitatively, subjectively measured on a visual analog scale (VAS) and quantitatively, objectively by skin impedance (ESG 1001, Dr. Janititski, Altenbeken Germany). All together we got 12528 values from all tests.

Results and Discussions: It showed that the alkaline creams make a deeper skin analgesia than the neutral ones. Propylene glycol – as a skin infiltration accelerator – had no significant effect. There was no difference in the efficacy of lidocaine 5%, 10% or 20%. The eutectic mixture of lidocaine and prilocaine (EMLA®) was insignificantly better than lidocaine as a mono substance. After 20 minutes all creams were still ineffective. After 40 minutes we observed a good dermal analgesia in all cases which got even better after 60 minutes. VAS and ESG both showed the effects but the ESG had smaller standard deviations.

Conclusion(s): This study shows that the application time is the most important parameter in topical analgesia. Even a so called skin infiltration accelerator cannot reduce this time. At least 40 minutes are necessary for a good anaesthetic effect. Topical anaesthetics work better as alkaline than as neutral cremes. Lidocaine even in the low concentration (5%) is highly effective. EMLA® is moderately more effective (not significant) but it could potentially produce methaemoglobinemia by prilocaine which might be relevant in sensitive patients like neonates.

8AP6-1
1% Chloroprocaine. A very promising short acting local anaesthetic drug in spinal anaesthesia. Clinical experience with 2000 patients since 2001
T. Palas
Anesthesia, Klinik Linde, Biel, Switzerland

Background and Goal of Study: Chloroprocaine (cp) is a very short acting local anaesthetic drug with the lowest potential toxicity. It would be an ideal replacement for lidocaine in spinal anaesthesia for short surgical procedures. We have evaluated patients in clinical settings since year 2001 with special interest in possible postoperative TNS.

Materials and Methods: 2000 patients have been evaluated. Both inpatients and ambulatory cases. 40 mg of an additive free, plain 1% chloroprocaine was injected intrathecally mostly at the L3/4 level in a sitting position. Type of surgery were: general surgery, orthopedic surgery, gyn/ob and urologic surgery. Time of surgery was planned not to take longer than 50 minutes.

Results and Discussions: Good surgical anaesthesia was achieved in every case. There was never a burning sensation during or after the cp injection. No postoperative urinary retention, no allergic reactions and no signs of TNS. The mean time for mobilization after the spinal local anaesthetic application was 90 minutes. Patient satisfaction was excellent in every case.

Conclusion: 1% chloroprocaine seems to be a very good substitute for lidocaine as a very short acting spinal local anaesthetic without having TNS as a side effect.

8AP6-2
Is Unilateral spinal anaesthesia worth all the troubles
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Anesthesia, Lautech Teaching Hospital, Osogbo, Nigeria

Background and Goals: Unilateral spinal anaesthesia has been suggested as a valuable technique in reducing the incidence of hypotension, fastening the resolution of surgical block and enhancing the quality of surgical block. 1, 2. We compared clinical profile of unilateral spinal and conventional spinal anaesthesia.

Material and Methods: We studied 74 ASA 1 and 2 patients, randomized into two groups. In the lateral position with operative side down, patients received 10 mg (2mls) of 0.5% hyperbaric bupivacaine slowly through a 25-gauge Whitacre needle without barbotage. The unilateral group (USA) was maintained in the lateral position for 15 minutes following spinal injection while those in the conventional group (CSA) were turned supine immediately after injection.

Results and Discussion: Hypotension occurred in 3 and 5 patients in the USA and CSA groups respectively (P = 0.71), with 1 patient in the USA group requiring vasopressor compared to 4 in the CSA group (P = 0.17). Block was lower than T12/no sensory block observed in the non-operated limb at 5, 10 and 20 minutes in 24, 22 and 12 patients in the unilateral group compared to 10, 9 and 0 in the conventional group (P < 0.05) respectively. Maximum sensory level on the operated side was T8 (T12-T2) in the unilateral group and T6 (T11-T2) in the conventional group (P = 0.07), attained at 20 minutes in both groups. Maximum level on the non-operated side was T9 (no sensory block-T2) at 30 minutes in unilateral group and T6 (T12-T7) at 20 minutes in the conventional group (P = 0.04). At 1 hour, motor blockade (bromage scale) of the operated limb in patients in the USA group was 0/1/2/3/0/0/0/37 and 0/1/2/3/0/2/25 (P < 0.05) in the CSA group. In the non-operated limb, it was 0/1/2/3/5/0/5/17 in the USA group, and 0/1/2/3/0/0/4/33 in the CSA group (P = 0.06).

Conclusion: Unilateral spinal anaesthesia was associated with less cardiovascular perturbations and also provided a denser block in the dependent limb when using hyperbaric bupivacaine solution.

References:

8AP6-3
Levobupivacaine-fentanyl spinal anaesthesia for transurethral urologic surgery
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Background and Goal of Study: Spinal anaesthesia is commonly associated with high incidence of hypotension. Intrathecal coadministrations of opioids intensify sensory block without increasing motor or sympathetic block (1). In this study we compared the effect of intrathecal levobupivacaine with or without fentanyl in patients undergoing transurethral urologic surgery.

Materials and Methods: A total of 40 patients were allocated to 2 groups in this prospective, randomized, double-blind study: Group L (n = 20) intrathecally received levobupivacaine 10 mg and Group LF (n = 20) levobupivacaine 7.5 mg + fentanyl 25 μg. Sensory (pin-prick test) and motor block (modified Bromage scale), hemodynamic data and side-effects were recorded. Statistical analyses were done using t-test, Mann-Whitney and Fisher’s exact test.

Results and Discussions: Demographic data, duration of operation and baseline values of systolic arterial pressure (SAP) and heart rate (HR) were comparable between the groups. Anaesthesia was adequate in all patients and pick sensory level was T9 (T10-T6) in Group L and T10 (T10-T8) in Group LF. P = 0.11. Complete motor block (Bromage score 3) had 18 (90%) Group L and 6 (30%) Group LF patients, P < 0.001. The mean duration of motor block was 137 ± 43 min in Group L and 95 ± 37 min in Group LF, P = 0.01. Decrease of SAP for more than 25% from baseline had 12 (60%) Group L and 2 (10%) Group LF patients, P = 0.01. Maximum decrease of SAP from start value was 24 ± 12% in Group L and 11 ± 7% in Group LF, P = 0.02, and of HR 24 ± 9% and 18 ± 9%, P = 0.29, respectively. Bradycardia (HR < 50/min) had 3 (15%) Group L patients. Postoperative rescue analgesic administration needed 15 (75%) Group L and 6 (30%) Group LF patients, P = 0.01. Pruritus had 5 (25%) Group LF patients. No postural punctuate headache, vomiting, respiratory depression or neurological complications were recorded.

Conclusion(s): Levobupivacaine 7.5 mg plus fentanyl 25 μg provide adequate spinal anaesthesia, faster motor recovery, better postoperative analgesia and less cardiovascular effects than levobupivacaine 10 mg in patients undergoing transurethral urologic surgery.


8AP6-4
Which drugs are used for spinal anaesthesia in the Netherlands?
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Background and Goal of Study: A Cochrane metaanalysis pointed out that one out of seven patients who received lidocaine intrathecally developed transient neurological symptoms (TNS). To avoid TNS alternatives are used in clinical practice and also published, often without extensive scientific background.

Materials and Methods: To investigate common practice in the Netherlands all members of the Dutch association of anaesthesiology were questioned on

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paper about their preferences to regional anesthetic technique (spinal vs. peripheral) and drug choice when confronted with a patient admitted for ambulatory knee arthroscopy. Neither recommendations about TNS nor other specific comments were made in the cover letter or in the presented case.

Results and Discussion: The response rate to the questionnaire was 42, 4 percent. Spinal anesthesia appeared to be the preferred technique for 96% of the respondents. For spinal anesthesia lidocaine was most popular (50%), followed by articaine (28%), bupivacaine (13%), prilocaine (5%), meptivacaine (3%) and lidocaine mixed with bupivacaine (1%). Seven percent would use additives like fentanyl, sufentanil and clonidine. Furthermore, the dosage range was wide. A favourable course time of action, the potential occurrence of TNS and drug registration issues were reported as most important criteria for drug selection.

Conclusions: According to our study, despite the high incidence of TNS, lidocaine is still the most often used drug for spinal anesthesia. To reduce TNS incidence more research has to be performed on alternative drugs or drug combinations.

References:

8AP6-5
Comparison of plain ropivacaine and hyperbaric bupivacaine in spinal anesthesia for endovascular surgery
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Background and Goal of Study: The aim of this perspective and randomized study was to compare clinical efficacy and safety of 15 mg plain ropivacaine (group 1) and 15 mg of hyperbaric bupivacaine (group 2) given intrathecally in patients scheduled for endovascular repair of abdominal aortic aneurysms.

Materials and Methods: 64 ASA II-III patients (mean age 69.1 ± 7.0 years) were scheduled after obtaining written informed consent. All patients had a history of arterial hypertension and other cardiovascular disorders pharmacologically treated.

Profile of spinal block (onset and recovery times) and quality of intraoperative anesthesia were recorded.

Pulse rate (HR), mean arterial pressure (MAP), cardiac output (CO), left ventricular contractility (dp/dt), systemic vascular resistance (SVR) and global end-diastolic volume (GEDV) were monitored by the PICCO System Pulse in order to evaluate their variations.

Results and Discussions: The median times to onset of sensory block at T10 were similar for both anesthetics. Median times to complete regression of both sensory (144 vs 174 min; p < 0.05) and motor block (189 vs 126 min; p < 0.05) were longer in the group 2. Patients therefore were mobilized sooner in the group 1 (195 vs 255 min; p < 0.05). CO and SVR were slightly decreased in the group 2, MAP decreased in the group 2 (p < 0.05). The other parameters were not influenced by the technique or by anesthetics. None of the studied patients required supplementary analgesia or general anesthesia to complete surgery.

Conclusions: Spinal anesthesia produced with 15 mg plain ropivacaine is still the most often used drug for spinal anesthesia. To reduce TNS incidence more research has to be performed on alternative drugs or drug combinations.

References:

8AP6-7
Effect of diamorphine and dilutents on baricity when added to hyperbaric bupivacaine
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Background: Changes in baricity of injected intrathecal solutions is one determinant of final block height. Density differences as small as 0.0006 g mL⁻¹ may influence the distribution of local anaesthetic (1). We assessed the change in baricity of hyperbaric bupivacaine 0.5%/w/v by the addition of various proportions of diamorphine in different diluents.

Materials and Methods: Densities of undiluted bupivacaine 0.5%/w/v (+glucose 80 mg · mL⁻¹), diamorphine (1 mg · mL⁻¹) in saline 0.9%/w/v or water for injection and their different combinations were measured using a density meter (DMA 5000 – Anton Paar, UK) with accuracy to the 6th decimal at 37 ± 0.001°C. Data were analyzed using GLM ANOVA and linear regression analysis. P < 0.05 was defined as significant.

Results and Discussion: The repeatability SD was < 0.00012 g · mL⁻¹. Tests for both main effects (diluent, combination) were highly significant (P < 0.0001). The baricity relationships were linear (r² > 0.989, P < 0.0001) over the range of combinations tested.

Conclusion: Addition of diamorphine (dissolved in either saline or water) to hyperbaric bupivacaine predictably reduces the baricity of the resultant mixture, with water having a significantly more pronounced effect. These data may facilitate further explanation of the mechanisms underlying the behaviour of intrathecal local anaesthetic-opioid mixtures.

Reference:
8AP6-8
Experiences of spinal anesthesia for previous lumbar spine surgery
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Background and Goal of Study: Spinal anesthesia is no more contraindicated in patients having undergone previous lumbar spinal surgery (1); although there are still problems that make spinal anesthesia technically more difficult, with the possibility of worsening the patient’s back pain (2). Herein, spinal anesthesia in patients with/without previous lumbar surgery was investigated and compared with regard to the success rates and possible complications.

Materials and Methods: Thirty patients with previous lumbar surgery (Group I), and thirty patients without surgery were studied (Group II) prospectively. Spinal anesthesia was performed, using a 27 G spinal needle with 0.5% isobaric tetracaine 10 mg, at the left lateral decubitus position. The attempt times of spinal anesthesia and its onset were marked, and the maximal sensory block level (MSBL), regression time of anesthesia, and its success rate and complications observed.

Results and Discussions: The success rates of spinal anesthesia were 92.9% and 100% in group I and II, respectively. The MSBLs were T4 (T3-T12) and T5 (T3-T10) in group I and II, respectively, in the median range. The regression times from MSBL to 2-segment below were 125.04 ± 43.04 min (minutes) and 110.28 ± 33.23 min in group I and II, respectively.

Conclusion(s):
1. Success rate in patients with previous lumbar spine surgery experience was 92.9%. The patients experienced no significant neurological complications.
2. There was no statistically significant difference in MSBLs between two groups.

References:

8AP7-1
Efficacy of 15 mm needle length for peribulbar anaesthesia in cataract surgery
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Background and Goal of Study: Needle length is an important for the safe conduct of peribulbar blocks. Shorter needles may reduce damage to vital structures behind the globe. At present, administration of extraconal injection is regarded as contraindicated in patients having undergone previous lumbar surgery (1); although there are still problems that make spinal anesthesia technically more difficult, with the possibility of worsening the patient’s back pain (2). Herein, spinal anesthesia in patients with/without previous lumbar surgery was investigated and compared with regard to the success rates and possible complications.

Materials and Methods: Thirty patients with previous lumbar surgery (Group I), and thirty patients without surgery were studied (Group II) prospectively. Spinal anesthesia was performed, using a 27 G spinal needle with 0.5% isobaric tetracaine 10 mg, at the left lateral decubitus position. The attempt times of spinal anesthesia and its onset were marked, and the maximal sensory block level (MSBL), regression time of anesthesia, and its success rate and complications observed.

Results and Discussions: The success rates of spinal anesthesia were 92.9% and 100% in group I and II, respectively. The MSBLs were T4 (T3-T12) and T5 (T3-T10) in group I and II, respectively, in the median range. The regression times from MSBL to 2-segment below were 125.04 ± 43.04 min (minutes) and 110.28 ± 33.23 min in group I and II, respectively.

Conclusion(s):
1. Success rate in patients with previous lumbar spine surgery experience was 92.9%. The patients experienced no significant neurological complications.
2. There was no statistically significant difference in MSBLs between two groups.

References:
8AP7-7

Local anaesthesia distribution in retrobulbar space following a Sub-tenons injection
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Background and Goal of Study: Sub-Tenon’s Block is nowadays commonly used in ophthalmic surgery because of its safety and efficacy. The aim of this study is to investigate the distribution of the anaesthetic in the retrobulbar space following an injection into the Sub-tenon space.

Materials and Methods: After approval of the local ethics committee, 19 pig cadaver heads were used (38 eyeballs). An incision was made at the infero-nasal quadrant of the eyeball, 5 mm from the corneal limb. 4.5 ml of a mixture of 2% Lignocaine, 0.5% Bupivacaine, 75 mg/ml Hyaluronidase and 0.5 ml of India Ink was administered. The orbit content was enucleated and then kept in formalin for a period of 24 hours, after which, a cross-section was made 2,6 mm posterior to the hind surface of the globe. From here, samples were taken and stained with a haematoxylin-eosin stain. After being analysed using the standard histopathological procedure, they were also analysed by computer using the Adobe Photoshop program. The retrobulbar space is divided into 4 quadrants by 2 perpendicular lines, which cross in the centre of the optic nerve. The presence of ink in connective and muscle tissues and in the neural sheath of the optic nerve was observed in each of the 4 quadrants: inferonasal (IN), inferolateral (IL), supranasal (SN) and supralateral (SL).

Results:

<table>
<thead>
<tr>
<th></th>
<th>IN</th>
<th>IL</th>
<th>SN</th>
<th>SL</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connective tissue</td>
<td>37</td>
<td>16</td>
<td>37</td>
<td>26</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Muscle tissue</td>
<td>33</td>
<td>5</td>
<td>31</td>
<td>10</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Optic nerve sheath</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>NS</td>
</tr>
</tbody>
</table>

Conclusions: Following a Sub-tenon block, local anaesthetic was present in the retrobulbar space in a high percentage of cases (97.3% or 37/38). The highest concentration was found in the IN segment (place of original injection) but significant amounts were also found in the muscle and connective tissue of the SN and SL regions. Statistically significantly smaller amounts were then in the IL segment, which would be expected to lead to increased preservation of lateral rectus muscle function. The presence of the anaesthetic in the optic nerve sheath was insignificant but it is important to mention that higher concentrations could be potentially dangerous, due to the possibility of diffusion of the anaesthetic into the subarachnoid space.

8AP7-8

Intraorbital nerve block for cleft lip surgery
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Background and Goal of Study: Cleft lip repair is a common operation in infants and requires that the child is pain-free during the postoperative period. The efficacy of intraorbital nerve block in reducing opioids consumption and postoperative pain was evaluated in children undergoing primary cleft lip repair under general anaesthesia (1, 2).

Materials and Methods: After ethical committee approval and informed parental consent, we conducted a prospective randomized double blind study including fourteen ASA I-II infants, aged from 6 to 12 months, and scheduled for elective primary cleft lip repair under general anaesthesia. Patients were randomly allocated to either the block group (n = 7) or the control group (n = 7). General anaesthesia was standardized using halothane, alfentanil and rocuronium. The patients received intraorbital nerve block with 0.5 ml of either 0.5% bupivacaine (block group) or normal saline solution (control group) administered into the soft tissue in front of the infraorbital foramen. Alfentanil was injected if systolic blood pressure or heart rate increases more than 20% of the base values. Consumption of alfentanil and morphine was evaluated in both groups. Pain intensity was also evaluated with the Objective Pain Scale (OPS) every 15 min after the end of anesthesia. Statistical analysis has used Fisher and Student test. p < 0.05 was significant.

Results and Discussions: The consumption of alfentanil was 201.4 ± 63.6 μg in the block group and 357.8 ± 166.7 μg in the control group during surgery (p < 0.05). Postoperative pain intensity was lower in the block group than in the control group, this difference was significant at 15, 30, 60 and 105 minutes. The consumption of morphine was 42.6 ± 113.3 μg in the block group and 55.7 ± 269.9 μg in the control group (p < 0.01).

Conclusions: General anaesthesia combined with infraorbital nerve block is effective in reducing the consumption of opioids and postoperative pain intensity in children undergoing primary cleft lip repair.

8AP7-9

Influences of remifentanil on hyperglycemic and endocrine response to surgery. A comparison with epidural block
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Background and Goal of Study: Neuraxial block with epidural local anaesthetic is capable of obtunding the metabolic and endocrine response induced by surgery. The purpose of this study was to investigate the effect of sevoflurane anaesthesia combined with remifentanil or epidural blockade on plasma concentration of glucose and cortisol during colorectal surgery.

Materials and Methods: Thirty eight patients undergoing elective colorectal resection for non metastatic adenocarcinoma were admitted to the study. Patients were randomly assigned to receive sevoflurane anaesthesia combined with epidural blockade (group A) or with intravenous remifentanil (group B). Anaesthesia in both groups was maintained with sevoflurane at end tidal concentration between 1.2 and 1.5%. The epidural block was main- tained with ropivacaine 0.75% to achieve a bilateral sensory block from thoracic dermatome level six (T6) to sacral level five (S5). Patients in the group B received remifentanil with infusion rate of 0.15 to 0.2 mcg/kg/min. Blood pressure and heart rate were maintained within 20% of the preoperative measurements. During surgery normothermia and normocapnia were maintained. Plasma concentration of glucose, triglycerides, lactate and cortisol were determined preoperatively, at the end of surgery and 60 min postoperatively. Furthermore, blood glucose and lactate were measured every 30 min during surgery. Differences between the groups were analysed using ANOVA, and x².

Results and Discussions: Plasma glucose concentration increased during and after surgery in both groups, without showing any differences between the two groups [group A: 136 (sd)19 mmol/dL vs. group B: 142 (sd)21 mmol/dL, p > 0.05]. Plasma concentration of lactate and triglycerides remained unaltered. Plasma concentration of cortisol increased in all patients after surgery: group A: 29 (sd)7 mcg/dL vs. group B: 34 (sd)14 mcg/dL, p < 0.05.

Conclusion: Combined anaesthesia with epidural blockade significantly reduces blood cortisol compared to remifentanil in combination with sevoflu rane but there was no difference on postoperative blood glucose concentration.


8AP8-1

Influence of heart adrenergic blockade obtained by thoracic epidural anaesthesia on QT, QTc intervals and their dispersions
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Background and Goal of Study: QT interval prolongation is connected with the risk of development of grave cardiac arrhythmias – torsade de points ventricular tachycardia and ventricular fibrillation. Dispersion of QT and corrected QT (QTC) interval may promote re-entry phenomenon occurrence. It is known, that sympathetic tone may influence on QT and QTC duration as well as on their dispersion, but it has never been studied, how reversible adrenergic blockade provided by thoracic epidural anaesthesia influences on ventricular repolarization. We wanted to verify hypothesis, that thoracic epidural anaesthesia (TEA) comprising adrenergic fibres which innervate heart (T1–T4) produces decrease in duration of parameters of ventricular repolarization.

Materials and Methods: Twenty male, non-premedicated patients (54.7 ± 4.7 years) scheduled for lung surgery were introduced into the study. 12-lead continuously ECG registration (H12+, Mortara Instrument Inc, Milwaukee, USA; sampling frequency of 10000 samples per second per channel) started before anaesthesia. Epidural catheter (EC) was inserted into epidural space at level T6–T7, T7–T8 or T8–T9. After negative test with 3 ml of lidocaine, iso- baric bupivacaine was administered via EC. Level of anaesthesia was monitored with rocuronium and after obtaining T1 level of blockade were taken to the analysis. QT interval was corrected using Bazett's and Fridericia's formula. Results are presented as mean ± SD. Comparisons were performed using Student's t-test for dependent data.

Results and Discussions: Obtained results are presented in table below. All values are presented in milliseconds.

Conclusion(s): HTEA with GA in unselected patients has shown to be safe during surgery and postoperative period, allowing fast extubation with minimal pain, no complications, with early mobilization and short ICU and hospital stay.

Materials and Methods: In this study we analysed 12 patients ASA I–II with epidural catheter for pain control in post-operative period of major abdominal and urological surgery.

The pharmacological protocol was as follows: First bolus 45 minutes before ending of surgery with 10 mg of Ropivacaine 0.2%, 10 mcg of Sufentanyl; second bolus after 15–20 minutes with 10 mcg of Ropivacaine 0.2%.

At the end of surgery we start an infusion 5 ml/h with Ropivacaine 0.2% 500 mg/250 ml and Sufentanyl 200 mcg with an electronic device. During post-operative period we obtained arterial samples done before first local anaesthetic administration and at time +3, +6, +12, +24, +48, +54, +60, and we studied the systemic absorption of local anaesthetic with HPLC-UV technique.

All patients were monitored after surgery for eventual side effects.

Result and Discussion:

<table>
<thead>
<tr>
<th>Time of sample</th>
<th>Median arterial plasma level of Ropivacaine (μg/ml)</th>
<th>% of toxic level (4.3 μg/ml)</th>
<th>Side effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL = 3</td>
<td>0.29000</td>
<td>6.74%</td>
<td>0</td>
</tr>
<tr>
<td>AL = 6</td>
<td>0.44500</td>
<td>10.35%</td>
<td>0</td>
</tr>
<tr>
<td>AL = 12</td>
<td>0.73400</td>
<td>17.07%</td>
<td>0</td>
</tr>
<tr>
<td>AL = 24</td>
<td>0.93000</td>
<td>21.63%</td>
<td>0</td>
</tr>
<tr>
<td>AL = 48</td>
<td>1.70500</td>
<td>39.65%</td>
<td>0</td>
</tr>
<tr>
<td>AL = 54</td>
<td>1.17000</td>
<td>27.21%</td>
<td>0</td>
</tr>
<tr>
<td>AL = 60</td>
<td>0.53000</td>
<td>12.32%</td>
<td>0</td>
</tr>
</tbody>
</table>

From preliminary results we can notice that arterial plasma levels obtained in our patients at different time of evaluation are really inferior to the neurocardiotoxic one. Even at plasma peak (+48) the levels observed are of only 39.65% of toxic one.

Conclusions: The preliminary data obtained show that plasma concentration of Ropivacaine in continuous epidural infusion are really inferior to toxic level for literature and it result in total absence of side effect in our study. Therefore, we can consider that the continuous epidural infusion of Ropivacaine at concentration used is clinically and pharmacologically sure and safety.


8AP8-6

Effects of levsimendan on oxygen transport indices in patients with low output heart failure under lumbar epidural anaesthesia

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Background and Goal of Study: The goal of our study was to assess the effects of preoperative infusion of LS (levosimendan) on perioperative oxygen transport in patients with LVEF < 22% undergoing elective minor abdominal surgery under lumbar epidural anaesthesia.

Materials and Methods: Five male patients, ASA III (mean age 76, range 64–85 years) with low output heart failure (mean LVEF 20, range 17–22%) were studied. Preoperatively: Before LS administration all patients had arterial and pulmonary artery catheters. LS was given as a bolus (6–24 mcg/kg) followed by continuous infusion (0.1 mcg/kg/min) lasted 24 hours.

Day of surgery: All patients received lumbar epidural anaesthesia with lidocaine 2% (loading dose 14 ± 3 ml) for minor low abdominal surgery

lasted 60 ± 10 min. Intraoperatively patients were spontaneously ventilated with FIO2: 50% (in air) via Venturi mask. Fluids were given PRN to maintain sufficient MAP and PCWP.

Baseline data were collected before LS administration. The second data were obtained in 24 hours, the third after lumbar epidural anaesthesia and the fourth at the end of surgery.

Results and Discussions: After LS infusion CO2 significantly increased ("one way ANOVA on ranks BL vs LS). After epidural anaesthesia DO2 and VO2 increased, the first more significantly ("one way ANOVA on ranks LS vs EA). Results are given as mean ± standard deviation, 95% confidence interval. (BL-baseline, LS-after levosimendan administration, EA-after epidural anaesthesia, ES-end of surgery.)

Materials and Methods: After Ethics Committee approval and written consent, 79 ASA II–IV patients were randomly assigned to conventional analgesic regimen (tramadol, CON group) or continuous epidural infusion of ropivacaine/fentanyl (EPI group). These regimens were started preoperatively and continued three days postoperatively, after spinal anaesthesia. ECG was continuously recorded. TSegment depression of >0.1 mV or elevation of >0.2 mV, lasting >1 min were considered as ischaemic episodes. Nocturnal arterial oxygen saturation (SatO2) was recorded perioperatively and subjective pain was assessed using visual analogue scale (VAS).

Results and Discussions: 13 patients(43%) in the CON and 12 patients in the EPI group had ischaemic episodes. However, significantly more patients in the CON group had ischaemia during surgery (p < 0.05). The median (quartal deviation) total ischaemic burden(i.e. integral of ST-change vs time) in patients with ischaemic episodes was ten times larger in the CON group (15400 mm/min) (p = 0.002). There were no significant differences between the groups in the average heart rates (HR) at the start of ischaemic episodes of IR during the attacks. Average nocturnal SatO2 was similar in the two groups and there were no differences in subjective pain but postoperative and average perioperative VAS scores were almost 40% lower in the EPI group (p = 0.006). Perioperative myocardial infarctions were not detected.

Conclusions: Continuous epidural ropivacaine/fentanyl analgesic regimen, started preoperatively, reduces the amount of myocardial ischaemia in elderly patients with hip fracture.

8AP8-9
Thoracic epidural anaesthesia improves intestinal mucosal capillary perfusion in acute oedematous pancreatitis in the rat
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Background and Goal of Study: Thoracic epidural anaesthesia (TEA) improved mucosal perfusion and survival in severe AP (1). Mild acute pancreatitis (AP) is also associated with impaired intestinal perfusion and motility. Therefore, the effects of TEA on mucosal circulation in mild AP were investigated.

Materials and Methods: 21 male rats were equipped with central venous and arterial lines and a thoracic epidural catheter. Rats were randomly assigned to Sham (2 ml/h NaCl0.9%, i.v., 15 μl/h NaCl0.9% epidural) or untreated AP (10 μg/kg/h Caerulein i.v., 15 μl/h NaCl0.9% epidural) and AP+TEA (10 μg/kg/h Caerulein i.v., 15 μl/h Bupivacain 0.5% epidural). After 4 h, 20mg FITC-albumin was injected and ileal mucosal perfusion was evaluated by intravital microscopy. The intercapillary area (ICA), which is inversely proportional to capillary diameter, of all perfused capillaries (ICA(total)) and of continuously perfused capillaries only (ICA(mono) and mucosal terminal arteriolar blood flow (ABF) was evaluated. Pancreatic water content, trypsin- and MPO-content were recorded.

Results and Discussions: While ICA(total) was not increased in untreated AP, a marked reduction in continuous capillary perfusion reflected by an increase in ICA(mono) from 842 ± 67 μm² to 1212 ± 152 μm² (p < 0.05 vs. Sham) was recorded. In AP+TEA, ICA total dropped to 824 ± 81 μm² (p < 0.05 vs. AP). Mucosal ABF increased from 2.6 ± 0.3 nls to 3.6 ± 0.3 nls in untreated AP (p < 0.05 vs. Sham). This increase was reduced to 2.4 ± 0.3 nls in untreated AP (p < 0.05 vs. untreated AP). Increased ABF associated with decreased capillary perfusion indicates increased mucosal shunt. Untreated AP increased pancreatic water content from 69 ± 3% to 91 ± 2% (p < 0.05 vs. Sham), which was not affected in AP + TEA. Neither AP-induced increase in MPO nor the trypsin-content was altered in AP+TEA.

Conclusion(s): TEA reduces AP-induced alterations of mucosal microcirculation in mild AP. The extrapancreatic therapeutic effects are not related to reduced pancreatic injury and might be due to regional sympathetic block (2).

References:

8AP9-1
A national survey: peri-operative anaesthetic management of patients with femoral neck fractures in the UK
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Anaesthetics, Cardiff University, Cardiff, United Kingdom

Background and Goal of Study: Surgical correction of a fractured neck of femur is an extremely common orthopaedic procedure. The incidence of hip fractures worldwide is predicted 4.5 million by 2050 with some estimates...
putting the figure as high as 21.3 million (1). The standardised mortality ratio is much higher in these patients than in the general population of comparable age (2). There are various options for the anaesthetic management of these but no one anaesthetic technique has been shown to be clearly superior to any other (3). Our survey gives a national snapshot of current anaesthetic practice in the UK which will enable us to focus and direct further research into this important area.

Materials and Methods: We randomly selected 20% of acute hospitals in the UK and sent postal tick-box questionnaires to the trauma anaesthetists working there with stamp addressed envelopes for replies. The questions pertained to peri-operative aspects of anaesthetic care.

Results and Discussions: We received 155 replies from 218 questionnaires sent (71.1% response rate). Regional anaesthesia (RA) was preferred by 75.8% of respondents, 14.4% combined general anaesthesia (GA) with a regional technique and 9.8% used GA alone. A spinal was the preferred RA in 95.5% of cases. This was generally performed bad side down (45.7%) using ketamine (37.3%) and/or midazolam (41.2%) to aid positioning. When GA was employed, either alone or in combination, respondents used a laryngeal mask airway (71.3%) with the patient breathing spontaneously (56.2%) on volatile agents (84.3%). If GA and RA were used together, a 3-in-1 block was the most popular adjunct (47.1%). Paracetamol and morphine were the most common post-operative analgesic regimes with continuous epidural or nerve block infusions used rarely.

Conclusion(s): Spinal Anaesthesia is the most commonly employed anaesthetic technique for hip fracture in the UK despite clear evidence of its benefits.

References:

8AP9-2
Ultrasound guidance reduces the minimum effective volume of local anaesthetic required to block the femoral as compared with nerve stimulation
A. Casati, G. Danelli, M. Bacaiarello, S. Leone, M. Rossi
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Background and Goal of Study: This prospective, randomized, up-and-down study tested the hypothesis that using ultrasound guidance may reduce the minimum effective anaesthetic volume (MEAV$_{U}$) required to block the femoral nerve as compared with nerve stimulation guidance.

Materials and Methods: After standard pre-injection and sciatic nerve block were given, 60 patients undergoing knee arthroscopy were randomly allocated to receive a femoral nerve block with 0.5% ropivacaine using either nerve stimulation (group NS, n = 30) or ultrasound (group US, n = 30) guidance. The volume of the injected solution was varied for consecutive patients based on a standard up-and-down staircase method according to the response of the previous patient. The initial volume was 12 mL. A blinded observer evaluated the occurrence of complete loss of pinprick sensation in the femoral nerve distribution, with concomitant block of the quadriceps muscle: positive or negative responses within 20 min after the injection determined a 3 mL decrease or increase for the next patient, respectively.

Results and Discussions: The MEAV$_{U}$ for femoral nerve block was 15 ± 4 mL (CI$_{95}$: 7–23mL) in group US and 26 ± 4 mL (CI$_{95}$: 19–33 mL) in group NS (P = 0.002). The ED$_{50}$ calculated with probit transformation and logistic regression analysis was 22 mL (CI$_{95}$: 13–36 mL) in group US, and 41 mL (CI$_{95}$: 24–66 mL) in group NS.

Conclusion: Ultrasound guidance provided a 42% reduction of the minimum effective anaesthetic volume required to block the femoral nerve as compared with the nerve stimulation guidance.

8AP9-3
Combined lower extremity regional anaesthesia: a 10 year review of 6000 nerve blocks
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Background and Goal of Study: Recently, more and more studies are dealing with lower extremity regional blocks as alternatives to general and spinal anaesthesia (1). In our retrospective study – that covers 10 years of practice – we summarize the experience gained from the above mentioned regional blocks.

Materials and Methods: We performed 6000 combined lower extremity regional anaesthesia from September 1995 to December 2006. In the first 4 years we used mainly the “3 in 1” Winnie’s method, and in the last 6 years we gradually switched to the Pevos compartment block. Sciatic nerve block was performed using the Labat approach. Performing blocks we used the nerve stimulators Stimulplex S, HNS (B.Braun), and Pajunk Multistim LA, and Stimulplex A 100, A 150 needles. The administered local anaesthetic doses were calculated for weight groups and recorded on a chart for everyday use. We didn’t exceed the dose of 4 mg/kg bodyweight for lidocain 1%, and 3 mg/kg bodyweight for ropivacaine 0.5% or ropivacaine 0.75%–1%.

Results and Discussion: 16 of 21 full-time anaesthesiologists routinely perform the above mentioned combined nerve-block in our hospital. There was no significant difference regarding the total anaesthetic procedures performed in 1996 and 2005 (11246 vs. 11638). The proportion of regional anaesthesia was constant in 1996 and 2005 (28.11% vs. 28.6% respectively). The share of lower limb regional blocks to total anaesthetic procedures increased from 2.06% to 5.67%, and within the field of regional anaesthesia increased from 7.34% to 19.67%. On the basis of the data of the last 5 years, the rate of complications has been between 0.6–2.5% (2).

Conclusions: Lower extremity regional anaesthesia developed rapidly during the last 10 years in our hospital. Combined Pevos compartment and sciatic nerve block is easy to learn, and perform with appropriate training. Patient’s trust, comfort and especially postoperative analgesia is very good.

References:

8AP9-4
New indication for obturator nerve blockade
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Background and Goal of study: N. obturator is a branch of lumbar plexus and he is in close contact with lateral wall and bladder neck and external side of prostatic urethra. Unwonted high frequency electro stimulation of n. obturator provokes very often a leg movement and can be dangerous during transurethral surgery. The goal of study was: can we provide better and safer condition for surgeon work without additional complications and can we establish new indication for n. obturator blockade?

Materials and Methods: 60 patients (38 men and 15 women) with bladder tumor of lateral wall were divided in two groups: First group (20 men and 10 women) have received only spinal anesthesia (3 ml of Bupivacain 0.5%, needle G 25, L$_2$–L$_3$ space) and Second group (19 men and 11 women) have received spinal anesthesia and n. obturator blockade (20 ml of Bupivacain 0.25% – Labat’s technique).

Results and Discussion: Between groups there were no significant difference according average years, ASA status, sex, blood arterial pressure, heart and respiratory rates changes. We have noticed 8 times more n. obturator stimulation and consequent leg movements in first group (26.67%) than in group two (3.33%) and this difference is statistically significant (p < 0.05). Average electro stimulation for nerve identification was 2.35 Ma. We did not notice any complication.

Conclusion: This is very cheap, short and simply, technique which provide better and safer condition for surgeon work during transurethral resection and we like to emphasize and add this indications as a new and beneficial.

References:
Aury Y et al: Serious complications related to regional anaesthesia: Results of a prospective survey in France. Anesthesiology 1997; 87: 479–86.

8AP9-5
A prospective, randomized double-blinded comparison between ropivacaine and lidocaine for outpatient knee arthroscopy
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Background and Goal of study: Intrathecal lidocaine is a commonly used drug for outpatient orthopaedic procedures, but its use is associated with a high incidence of transient neurologic symptoms (TNS). The aim of this prospective, randomized, double blind study was to compare the evolution of spinal block obtained with either lidocaine or ropivacaine for outpatient knee arthroscopy.

Materials and Methods: With IRB approval and patients written consent, 80 ASA physical status I–III outpatient undergoing outpatient knee arthroscopy were randomly allocated to receive spinal anaesthesia with either 50 mg lidocaine 1% (n = 15) or 10 mg ropivacaine 0.5% (n = 15). A blinded observer recorded the evolution of the spinal block until achievement
of home discharge criteria. Sensory block was assessed using loss of pin-prick sensation. Motor block was assessed using a modified Bromage score. Times from spinal injection to recovery of sensory and motor functions, unassisted ambulation and micturition were recorded. A phone-call follow up was also performed 24 hours and 7 days after surgery, in order to evaluate the incidence of TNS.

Results and Discussion: Median (1st-3rd quartile) onset time was 15 (10–21) min with lidocaine and 24 (11–37) min with ropivacaine (P < 0.11). Recovery of motor function required 113 (95–131) min with lidocaine and 135 (87–183) min with ropivacaine (P < 0.21). Lidocaine resulted in faster resolution of sensory block [148 (130–167) min vs 188 (146–231) P < 0.023], unassisted ambulation [176 (144–208) min vs 240 (179–302) min (P = 0.014)], and voiding [208 (162–254) min vs 293 (242–343) min (P < 0.001)]. Six lidocaine patients reported TNS (60%) versus no ropivacaine patients (P = 0.005).

Conclusion(s): 10 mg ropivacaine 0.5% represents an efficient alternative to 50 mg lidocaine 1% for outpatient spinal anaesthesia and is associated with less TNS.

8AP9-6
A new approach to blockade of the posterior tibial nerve
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Background and Goal: An ankle block is a form of regional analgesic technique. The blockade of the tibial posterior nerve has been described in many text books. Most of the approaches to the nerve are in the ankle joint, but it depends on the posterior tibial artery as a landmark, which in some patients it is not palpable.

The aim was to describe a new approach to the tibial posterior nerve distal to the internal malleolus using a nerve stimulator as a unique technique.

Materials and Methods: Ten patients (ASA I-II) scheduled for elective foot surgery were included. With the patient in dorsal position the foot was externally rotated. We traced two lines, one from the medium point of the internal malleolus to the inferior angle of calcaneum, and other from the tuberosity of the scaphoid to the distal insertion of the tendo Achillis.

The puncture was done in the intersection of both lines with a needle of 25 mm connected to a nerve stimulator. The needle was inserted in direction to the external malleolus until the plantar flexion response was obtained (0.5 mA, 1 Hz). We injected 5 mL of bupivacaine 0.5% and 5 mL lignocaine 2% without adrenaline after a negative aspiration test.

Results: The new approach was completely successful in our patients. They did not require local anaesthetic supplementation or intravenous analgesics. The maneuver was completed in 2 minutes with acceptable tolerance for the patient.

Conclusion: We described a approach to the distal posterior tibial nerve with nerve stimulator. The anatomic parameters were easily recognised independently of the posterior tibial artery landmark. This approach is useful as a unique technique or as supplement when proximal techniques failed.

References:

8AP9-7
Placement of catheters in the popliteal fossa through the medial approach: a preliminary study
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Background and Goal of Study: Medial approach of the sciatic nerve in the popliteal fossa has been described for single injection (1) and continuous block in patients unable to be placed prone (2). We studied catheter placement through the medial approach and compared this technique to the posterior approach (3).

Materials and Methods: 12 patients scheduled for hallux valgus surgery were randomly allocated in 2 groups. In the medial approach group, a 100 mm Tuohy needle was inserted through the Jobert fossa of 8 patients in supine position (1). When a planar flexion was obtained with a stimulation of 0.5 mA, 2 Hz, 0.1 ms, the catheter was inserted and a bolus of 30 mL of L-bupivacaine 0.5% was administered. Surgery was performed under general anaesthesia (propofol, remifentanil), a continuous infusion of 5 mL per hour of L-bupivacaine 0.125% with optional 5 mL bolii every 40 minutes was initiated at the end of surgery. In the posterior approach group, the same protocol was performed using Singelyn’s landmarks (3). Time to perform the catheter placement, post-operative pain, additional analgesic requirements, volume of infused L-bupivacaine and patient acceptance were recorded. Statistical comparisons (mean ± s.e.m.) were performed using unpaired Student t-test (P > 0.05 not significant).

Results and Discussion: Groups are similar in terms of age, weight, height and sex (P > 0.05). There are no statistical differences concerning the time to perform catheter placement (10 min ± 0.74 vs 12 min ± 0.89), post-operative pain in the first 12 hours (VAS = 0), additional analgesic requirements (no additional analgesics) and the volume of infused L-bupivacaine (162 ± 23 vs 167 ± 25) between the 2 groups (P > 0.05). No vascular puncture occurred in both groups. In the posterior approach, 2 patients reported discomfort related to the presence of the catheter at the posterior part of the thigh.

Conclusion: Our results suggest that continuous sciatic nerve block through the medial approach is an efficient technique that offers the patient the comfort to remain supine during the procedure and allows an easy monitoring of the catheter.

References:

8AP9-8
Intravenous regional anesthesia for knee arthroscopy
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Background and Goal of Study: Intravenous regional anesthesia (IVRA) has been used successfully for foot and ankle surgery (1), there was only one case report in the literature with IVRA for knee arthroscopy (2). We aimed to find out whether IVRA would be effective for knee arthroscopy and the effects of adding ketamine to local anesthetics on block properties and tourniquet pain

Materials and Methods: Forty patients undergoing knee arthroscopy were included. IVRA was performed with the modified inter-cuff technique described by Al-Metwalli. Patients were randomized to receive 80 mL solutions containing either 0.5% prilocaine (Group I) or 0.15 mg/kg ketamine plus 0.5% prilocaine (Group II). 15 minutes after drug injection distal cuff of the thigh tourniquet was inflated, proximal cuff and calf tourniquet were released then surgery was started. IVRA block characteristics, tourniquet and surgical pain, perioperative fentanyl consumption, first analgesic request time, hemodynamic parameters were assessed. Statistical analyses were performed with Mann-Whitney U and Fisher’s Chi-squared tests. P < 0.05 was considered significant.

Results and Discussions: Demographic data, operation times, fentanyl consumptions were similar. 5 patients in group I and 6 patients in group II received general anesthesia because of inadequate block. Body mass indexes (BMI) of these 11 patients were higher than the others (29.3 – 25.1, P < 0.035). Sensory block onset time was shorter and first analgesic request time was longer in group II.

Conclusion: We think that, IVRA may be considered as an alternative regional anesthesia technique for knee arthroscopy provided that volume and dosage of the drug is adjusted according to BMI. In addition, adding ketamine to local anesthetic solution may have partial beneficial effects on block quality by decreasing sensory block onset time and increasing first analgesic request time.

References:

8AP9-9
Effectiveness of ropivacaine and L-bupivacaine for continuous postoperative analgesia with “3 in 1 nerve block” after total knee arthroplasty
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Background and Goals: Severe postoperative pain is associated with total knee arthroplasty (TKA). Adequate pain management is necessary to achieve early mobilization and physical therapy. The use of peripheral nerve blocks is widely recommended after orthopaedic surgery. Our purpose was to compare the effectiveness of ropivacaine and L-bupivacaine, used for continuous “3 in 1 nerve block” as a form of postoperative analgesia.

Materials and Methods: For this retrospective study we considered 80 patients (pts), ASA II-IV, mean age 53.6 ± 10.8 yrs, undergoing elective unilaterial TKA under subarachnoid block from January 2003 to June 2006. Postoperative analgesia was performed with L-bupivacaine 0.125% in 40 pts (group L) or ropivacaine 0.2% in the other 40 pts (group R) by a perineural catheter placed to obtain a continuous 3-in-1 femoral nerve block for 72 hours after surgery, using a portable infusion pump settled at 6 ml/h.
Results and Discussions: At the infusion dose of 6 ml/h the risk for systemic central nervous toxicity is very low and we observed a good quality of analgesia and functional outcome in both groups, without any significant differences about sensorimotor block.

Conclusions: According to the current literature, with this study we demonstrate that peripheral nerve block techniques are the optimal analgesic method after TKA and that the same volume of ropivacaine and L-bupivacaine, used at different concentration leads to similar postoperative pain relief, producing a good patient satisfaction and early physical therapy.

References:

8AP10-1
A study of complications of continuous femoral block in total knee replacement
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Background and Goal of Study: To study the incidence and the severity of side-effects of continuous femoral block as part of a polymodal analgesia in total knee replacement.

Materials and Methods: We studied 150 women, aged 65–89 yrs, ASA I–III, scheduled for TKR. All patients had spinal anesthesia for the operation. In the PACU after sensory and motor blockade had worn off a femoral block was performed with a nerve stimulator using an aseptic technique. A bolus dose of 20 ml of levobupivacaine 5 mg/ml was given in increments of 5 mlls following a negative aspiration and a continuous infusion of 4–5 ml/h levobupivacaine 0.125% was set. The infusion lasted 48 hours. Vital signs were recorded every 4 hours and the patients were examined for signs of local pain, motor and sensory blockade, local haematoma infection, inadvertent arterial puncture, cardiovascular or neurologic toxicity.

Results and Discussions: Despite the fact that continuous femoral block seems to be a very satisfactory technique we observed the following complications.

Failure to perform the block in 1 patient. There was accidental removal of the catheter during its fixation in 3 patients and in other 3 patients in the ward.

The procedure was stopped in 1 patient after the appearance of blood during aspiration of he last 5 ml of the bolus injection with no other complications.

In one patient there was a severe complication. After removing of the catheter there was neuropaxia of the femoral nerve which lasted six weeks.

No other complications were observed.

Conclusion(s): The most severe complication seems to be neuroapraxia. There was no pain during the injection, the block succeeded after 3 attempts although in retrospect there was excessive resistance during the injection. The incidence happened during the learning curve of the procedure.

Accidental removal of the catheter was the commonest problem and we changed the mode of fixation. Overall continuous femoral block seems to be a safe and effective technique in providing analgesia in TKR.

8AP10-2
Intraoperative low dose of ketamine improves the transition from epidural to systemic analgesia after major abdominal surgery
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Background and Goal of Study: The interruption of epidural analgesia after surgery coincides frequently with the appearance of moderate to severe pain. We investigated whether intraoperative ketamine (KET) smoothed the transition from epidural to systemic analgesia after major abdominal surgery.

Materials and Methods: With IRB approval and informed consent, 40 patients scheduled for major abdominal surgery were included in this randomized double blind placebo-controlled study. General anesthesia (sevoflurane in O2:air) combined with thoracic (T9–T10) epidural anesthesia was used in all patients. After the induction of anesthesia patients were randomly allocated in two groups (n = 20 in each group): 0.5 mg/kg then 0.25 mg/kg/h KET or the same volume of saline (SAL). Postoperative analgesia was provided with a standardized patient-controlled epidural analgesia (PCEA) with ropivacaine 0.2% for three days postoperatively. Then PCEA was stopped and replaced by piritramide (a synthetic opioid) PCA. The follow-up parameters were measured during the four first days postoperatively: pain scores (100 mm VAS) at rest, during mobilisation, and when coughing, consumption of ropivacaine solution and of piritramide. Data (mean ± SD) were analyzed by ANOVA (P < 0.05 = statistically significant).

Results and Discussions: Pain data and pain scores at rest were similar in the two groups. Pain scores when coughing (P < 0.01) and ropivacaine consumption (398 ± 66 vs 466 ± 115 mL; P < 0.001) were significantly reduced in the KET group during PCEA. After PCEA interruption pain scores during activity (P = 0.001) and piritramide consumption during the first 24 h were significantly lower in the KET group (P = 0.03; table).

8AP10-3
Calcium chloride prolongs the effects of lidocaine in rat sciatic nerve
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Background and Goal of Study: The effect of the divalent calcium ion coadministered with local anesthetics is unknown. We hypothesized that calcium chloride (CaCl2) could be used as an adjuvant to prolong and intensify the block by lidocaine. We therefore investigated its effect on block and assessed potential histopathological damage in rat sciatic nerves, and the mechanism of the lidocaine-calcium interaction in cultured GH3 cells.
Materials and Methods: Rats weighed 250–300 grams were anesthetized, and the sciatic nerves were exposed by lateral incision. 0.2 mL of the test dose was injected with 1% lidocaine which was used alone or coadministered with 0% (no CaCl₂ added), 0.625%, 1.25%, 2.5%, or 5% CaCl₂, respectively (n = 8–10 per group). The behavioral test of proprioception, motor function, and nocifensive response were used to assess the complete blockade time and complete recovery time. The data were analyzed by ANOVA using the F-test. For pathological evaluation, the nerves were taken out 7 days after receiving the test dose (n = 6/group). To elucidate the lidocaine–calcium interaction, voltage-dependent inactivation curves were determined in cultured rat GH3 cells expressing neuronal sodium channels.

Results and Discussions: The addition of CaCl₂ prolonged the duration of blockade by lidocaine that was significantly longer for 5% than 0% CaCl₂. Histologically, rat sciatic nerves treated with 1% lidocaine coadministered with 5% CaCl₂ showed activated Schwann cells, some endoneurial edema and the epineurium thickened. However, the voltage-dependence of the steady-state Na⁺ channel inactivation in the presence of 300 µM lidocaine was shifted rightward by 10 mM CaCl₂, indicating that the CaCl₂ reduces the potency of lidocaine toward the inactivated Na⁺ channel.

Conclusion(s): CaCl₂ coadministered with lidocaine prolongs the duration of sciatic nerve blockade in rats with major histopathological changes. It appears not to be useful as an adjuvant for peripheral nerve blockade because of neurotoxicity. The mechanism is independent of the action of CaCl₂ on the Na⁺ channel.

8AP10-4

Involvement of glutamate in bupivacaine-induced myotoxicity in rats

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Background and Goal: Local anesthetics may cause reversible skeletal muscle injury and bupivacaine produce the most degree of injury (1). Glutamate is widely existed in the skeletal muscle and has its metabolic function (2). Using microdialysis, this study was to examine whether bupivacaine-induced myotoxic effect involves intramuscular glutamate release.

Materials and Methods: Twenty four male Wistar rats were divided into 4 groups (control, 0.25%, 0.5%, and 1% bupivacaine), 6 rats in each. A microdialysis tube was implanted into the right tibialis anterior (RTA) muscle of each rat. After two hours of equilibrium of the microdialysis system, 0.2 mL of normal saline or 0.25%, 0.5%, and 1% bupivacaine was injected into the RTA muscle where the microdialysis tube implanted, then the samples were collected every 30 min for 4 hours. Glutamate was measured by HPLC. Three days later, the RTA muscles were dissected at the injection sites and were examined for the severity of muscle damage. (score 0 to 3: no damage to severe myonecrosis).

Results: Bupivacaine produced a significant increase of glutamate release in the muscle and the increase was in a dose-dependent manner. The histological findings also showed a dose-dependently injury of muscular fibers caused by bupivacaine. (score, N/S, 0, 0.25% bupivacaine:1.2 ± 0.6, 0.5% bupivacaine:1.8 ± 0.7, 1% bupivacaine:2.4 ± 0.8, P < 0.05).

Conclusion: The bupivacaine-induced myotoxicity could be mediated with glutamate release in the muscle.

References:

8AP10-5

Effect of melatonin administered by intrathecal injection – an experimental study in the rat

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Background and Goal of Study: Recently, a species-dependent distribution of melatonin-binding sites was found in the dorsal and ventral horn of the spinal cord (1,2). We sought to examine the hypothesis that intrathecally injected melatonin might produce reversible spinal anesthesia comparable to that of epidural anesthesia. We evaluated the influence of isoflurane on plasma pharmacokinetics of epidural ropivacaine with (R + E) and without (R) epinephrine in a sheep model.

Materials and Methods: The epidural catheter was inserted and secured (2 weeks) before experiment. Animals received epidural R (50 mg/15 ml) + E (0.7 µg/ml) and R under GA (intubation, ventilation with isoflurane: 1–2% in oxygen/air 50%/50%) and epidural R + E and R without GA. Then an intravenous administration of ropivacaine was performed to study the systemic absorption of ropivacaine by deconvolution method. For each animal, the five administrations were performed with one week intervals. A non-compartmental analysis was performed for individual concentration data sets (n = 3).

ANOVA test was used to compare different administrations.

Results: Data (Mean ± SD) are presented in the table.

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<td>30505 ± 21744</td>
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<td>(min. ng/ml)</td>
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<tr>
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<td>T1/2 (min)</td>
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Mean systemic absorption time plots of ropivacaine are presented in the figure.

Conclusion: Despite of the presence of different concentration data sets (n = 3), no significant influence of GA on plasma pharmacokinetics of epidural ropivacaine either with or without epinephrine was evidenced. The systemic absorption of epidural ropivacaine was not modified neither by epinephrine nor by GA.

8AP10-6

The influence of General Anaesthesia on plasma pharmacokinetics of ropivacaine

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Background and Goals: The effect of general anaesthesia (GA) on the pharmacokinetics of local anesthetics administered epidurally remains unclear. We evaluated the influence of isoflurane on plasma pharmacokinetics of epidural ropivacaine with (R + E) and without (R) epinephrine in a sheep model.

Materials and Methods: The epidural catheter was inserted and secured (2 weeks) before experiment. Animals received epidural R (50 mg/15 ml) + E (0.7 µg/ml) and R under GA (intubation, ventilation with isoflurane: 1–2% in oxygen/air 50%/50%) and epidural R + E and R without GA. Then an intravenous administration of ropivacaine was performed to study the systemic absorption of ropivacaine by deconvolution method. For each animal, the five administrations were performed with one week intervals. A non-compartmental analysis was performed for individual concentration data sets (n = 3).

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<td>Tmax (min)</td>
<td>18 ± 11</td>
<td>12 ± 4</td>
<td>25 ± 14</td>
<td>18 ± 11</td>
<td></td>
</tr>
<tr>
<td>CVF (l/min)</td>
<td>0.9 ± 0.4</td>
<td>1.0 ± 0.1</td>
<td>0.9 ± 0.7</td>
<td>0.8 ± 0.2</td>
<td></td>
</tr>
</tbody>
</table>

Mean systemic absorption time plots of ropivacaine are presented in the figure.

Conclusion: Despite of the presence of different concentration data sets (n = 3), no significant influence of GA on plasma pharmacokinetics of epidural ropivacaine either with or without epinephrine was evidenced. The systemic absorption of epidural ropivacaine was not modified neither by epinephrine nor by GA.

8AP10-7

Neurotoxic change neurons after intrathecal introduction local anesthetics in rats

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Background and Goal of Study: Neurological picture after using lidocaine intrathecally made a concern about the toxicity of local anaesthetics. Recent researches demonstrate that lidocaine is more connected with neurotoxicity than other local anaesthetics.

Method: In our research we tried to compare the neurotoxic effect of different local anaesthetics in rats. As a criteria of neurotoxicity the structural changes of spinal cord motoneurons in light and electron microscopic have been chosen. After the permission of our ethical committee 21 male rats were included in this research. They were divided in three groups of 7. 15 mg 2%, 5%, 10% of lidocaine, 0.5 ml of normal solution, 3 mg 0.5% and 0.75% of bupivacaine, 4.5 mg 0.5% ropivacaine were injected intrathecally. The lumbar spinal cord with both anterior and posterior roots and dorsal ganglion were excised for light and electron microscopic examination on the following day.

Results: The histological abnormalities were observed histologically in the posterior roots and column of spinal cord in rats that received 10% lidocaine. These lesions were characterized by destruction motoneurons. In group with 5% lidocaine hyperchromatism singular neurons with destruction mitochondria and endoplasmatic net were found. Other groups did not illustrate any histological impairment neurons. Insignificant changes of myelonic neurofibers were founded excluding normal solution group.

Conclusion: The parts of spinal cord after intrathecal 10% and 5% lidocaine were presented as intracellular destructive changes of motoneurons. Our results suggest that 5% lidocaine administered intrathecally may cause damage to neurons in rats. Other intrathecal anaesthetics including 2% lidocaine did not show any neurotoxic effects in rats.

8AP10-8
Mitigation of lidocaine-induced neurotoxicity – a comparison of compartmented and dissociated sensory neuron cultures
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Background and Goal of Study: All currently used local anaesthetics are, to some extent, neurotoxic. So far, toxicity studies were mainly carried out in dissociated neuron cultures, immersing both axon and soma in local anesthetic. This approach, however, is not fully satisfying, since local anesthetic is applied to the axon alone for peripheral nerve block in the in vivo situation. Therefore, we investigated lidocaine neurotoxicity both in compartmental and dissociated sensory neuron cultures, focussing on possible ways of neuroprotection.

Materials and Methods: Lidocaine (40 mM–1%) was added to the central and/or the peripheral compartment of three-chambered dishes as well as to dissociated cultures. Additionally, we co-applied several inhibitors, such as inhibitor of caspase or Rho, to determine their effect both locally at the axon, and the neuron’s soma. Neuronal survival, axonal length and morphology were used as outcome measures.

Results and Discussion: In dissociated cultures, caspase-inhibition had a significant neuroprotective effect. Contrary, in compartmented cultures controls showed an increase of maximal axonal distance from 100% at day 7 to 133 ± 5% at day 8. Co-incubation of compartmented cultures with 40 mM lidocaine in the peripheral compartment and the selective caspase-inhibitor z-vad-fmk at 10 μM in the peripheral compartment (n = 3) showed that peripheral inhibition of caspase activation had no significant effect on the axonotaxic induction by lidocaine. The maximal axonal distance of these cultures was 77 ± 8% at day 8, and the cultures treated with 40 mM lidocaine alone in the peripheral chamber had a maximal axonal distance 60 ± 9%. Moreover, simultaneous incubation of cultures with 40 mM lidocaine in the peripheral and 10 μM z-vad-fmk in the central compartment showed a slight, but not significant protective effect on axon outgrowth (maximal axonal distance 72 ± 9%).

Conclusion: We conclude that processes localized to the axon, such as selective axonal degeneration, which do not involve the neuronal soma or caspase activation, may mediate lidocaine-induced axonal neurotoxicity. Cell death after local anesthetic application is caused by different processes depending upon whether the entire cell, or only the axon, is incubated. The compartmental culture model is potentially useful to determine in detail mechanisms involved in local anesthetic-induced neurotoxicity in vitro.

8AP10-9
Local Anesthetic effects on human neutrophil morphology and activation
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Background and Goal of the Study: Local Anesthetics (LA) inhibit neutrophil chemotaxis and accumulation in inflamed tissues, but the underlying mechanisms are not well understood. Neurons have been shown to change morphology after LA exposure, and we hypothesized that changes in cell morphology might also occur in neutrophils. If so, these might affect their motility and be relevant to the observed decrease in chemotaxis and accumulation of leukocytes in inflamed tissues. We therefore investigated the effects of LA on changes in leukocyte morphology and activation in a whole blood model.

Materials and Methods: After IRB approval and informed consent was obtained, whole blood samples were obtained from healthy volunteers and incubated for 1 or 3 hours with different concentrations (10–7 to 10–4 M) of either lidocaine, ropivacaine, QX314, or saline as control. Blood was prised with platelet activating factor (10–5 M) and activated with FMLP (10–5 M) for 15 min each. Thereafter, cells were staining with a monoclonal antibody against CD11b. After lysis of erythrocytes, samples were analyzed by flow cytometry. Changes in cell morphology were quantified as changes in Side Scatter values.

Results and Discussion: QX314, an uncharged LA that is not able to penetrate the cell wall, did not alter cell morphology and CD11b-expression. Ropivacaine, also did not affect CD11b-expression, however a significant change in cell morphology was observed at the highest concentration (p < 0.05). Lidocaine induced the most pronounced effects on cell morphology. In addition, lidocaine (10–4 M, p < 0.05) significantly inhibited priming and activation of CD11b-expression after 1 and 3 h. Changes in cell morphology were observed even at the lower concentration of lidocaine (10–4 and 10–5 M, p < 0.05).

Conclusions: Our results suggest that CD11b-expression can be primed and that priming of CD11b-expression can be significantly attenuated by LA. Second, leukocyte morphology is more sensitive to LA than neutrophil activation. The inhibition of CD11b-expression and changes in cell morphology might contribute to the decreased accumulation in inflamed tissues under LA exposure.


8AP10-10
Muscle regeneration following local anesthetic myotoxic insult. Morphometric evaluation
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Background and Goal of Study: Local anesthetic myotoxicity is a frequent complication following muscle infiltration. Although considered reversible, cases of permanent damage have been reported. Aim of the present study was the microscopic evaluation of muscle regeneration after bupivacaine muscle infiltration in rats.

Materials and Methods: Wistar rats underwent muscle injection with 100 μl of bupivacaine 0.5% (B05 group). The left tibialis anterior muscle of each rat was injected while the controlateral muscle was used as control (Control group). One month later, rats were sacrificed and the muscles were dissected, frozen and cut into 10 μm thick sections. Afterwards, they were stained using acid ATPase and examined using light microscope with a computer imaging system for morphometric analysis. Samples were evaluated regarding type of muscle fibers, cross-section fiber area and fiber perimeter. Statistical analysis was conducted using t-test. Level of significance was set at p < 0.05.

Results and Discussions: Groups were comparable regarding muscle fiber types percentages (p > 0.05). However, regenerated muscle fibers, except for type I fibers, had smaller cross-sectional fiber area and perimeter (p < 0.05).

<table>
<thead>
<tr>
<th>Fiber area: Mean ± S.D. (μm²)</th>
<th>Type I</th>
<th>Type IIA</th>
<th>Type IIB</th>
</tr>
</thead>
<tbody>
<tr>
<td>B05 675.25 ± 163.14</td>
<td>860.95 ± 192.49</td>
<td>983.98 ± 307.27</td>
<td></td>
</tr>
<tr>
<td>Control 575.58 ± 158.89</td>
<td>814.67 ± 210.42</td>
<td>1317.66 ± 451.10</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fiber perimeter: Mean ± S.D. (μm)</th>
<th>Type I</th>
<th>Type IIA</th>
<th>Type IIB</th>
</tr>
</thead>
<tbody>
<tr>
<td>B05 103.48 ± 12.60</td>
<td>118.19 ± 14.04</td>
<td>127.11 ± 20.96</td>
<td></td>
</tr>
<tr>
<td>Control 96.56 ± 13.87</td>
<td>116.00 ± 15.95</td>
<td>149.95 ± 27.90</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion(s): Although seemed to fully recover after a myotoxic insult, regenerated fibers of types Ila and Iib are characterized by smaller cross-sectional area and diameter, corresponding to smaller size. The latter could possibly lead to impaired function.

8AP10-11
Reversal of central nervous system and cardiac toxicity following local anesthetic intoxication by lipid emulsion application
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Background and Goal of Study: Lipid emulsion infusion has been proposed as the last treatment option for local anesthetic (LA)-induced systemic toxicity after failure of established resuscitation measures. The successful use of lipid emulsion following bupivacaine-induced cardiac arrest has been demonstrated in animal models. Recently, two case reports were published reporting on successful resuscitation of patients after ropivacaine- and bupivacaine-related cardiac arrest, respectively. We report of a case of successful treatment of systemic local anesthetic intoxication following brachial plexus block.

Materials and Methods: A 91 year old male (57 kg, 156 cm, ASA III) received vertical infraclavicular brachial plexus block for olecranon surgery. Fifteen min after application of 30 ml of mepivacaine 1% the block was supplemented by administration of 10 ml of prilocaine 1%. Within the next five min the patient complained of nausea and dizziness and became unresponsive to verbal commands. Heart rate increased from 76 to 92 bpm and supraventricular extra-systoles with intermitting bigeminus appeared. Blood pressure increased from 160/70 to 190/90 mmHg.

Results and Discussions: Local anesthetic toxicity was suspected and a bolus injection of 1 ml/kg Intralipid 20% was intravenously applied and repeated after three min (total of 100 ml). A continuous Intralipid® infusion was started at a rate of 14 ml/min (0.25 ml/kg/min). The patient regained consciousness within 5 min following the first lipid bolus injection. Because extra-systoles were still apparent lipid infusion was carried on up to a total dose of 200 ml until extra-systoles disappeared. Plasma concentrations of mepivacaine/prilocaine at the start of lipid infusion and 20 and 40 min later were 4.08/0.92, 2.30/0.35 and 1.73/0.24 µg/ml.

Conclusion(s): This case report demonstrates the successful use of lipid emulsion infusion with the isochronal decrease of plasma concentrations of mepivacaine and prilocaine in a patient at the onset of CNS and cardiac toxicity. Our findings may support the theory of a “lipid sink” effect as a causative mechanism of action in the treatment of LA toxicity.

Pharmacology

9AP1-1
Investigation of the antibacterial effect of ketamine
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Background: Anaesthetic agents have activity on not only excitable cells affecting cellular membranes but all cells as well. Antibacterial activity of local anaesthetics especially lidocaine have been shown previously (1). In this study, the antibacterial effect of ketamine a general anaesthetic agent was investigated.

Material and Methods: The antibacterial effect of ketamine was studied using six different strains of bacteria (S. aureus, E. coli, S. pyogenes, P. aeruginosa and E. coli) with disc diffusion method. Discs containing 500, 250, 125 and 62.5 µg of ketamine were prepared. Ketamine discs were placed in the plates into which bacteria were inoculated. Ciprofloxacin discs (CIP, oxoid) were used as controls for checking of the methodology. Results of different drug concentrations were compared within the ketamine group and with the results obtained from the CIP discs.

Results: CIP affected all bacteria as expected. Ketamine with the doses of 250 µg and 500 µg which was more prominent inhibited all bacteria resembling CIP. Ketamine with the doses of 125 µg had also activity on all bacteria except with the exception of E. coli. No inhibition was evident in discs containing 62.5 µg of ketamine.

Conclusions: Ketamine exhibited antibacterial activity with higher doses which were very close to the doses used to induce anaesthesia in experimental animal studies. When the dosages used in this study are considered, rather than studies concerning humans, the results will be meaningful in animal studies in which ketamine is used for anaesthesia (2). Therefore antibacterial activity of ketamine should be kept in mind in experimental animal studies.

References:

9AP1-2
High performance liquid chromatography (HPLC) determination of a ketamine and remifentanil mixture
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Background and Goals: The administration of small doses of ketamine during a remifentanil based anaesthesia in different surgical procedures, seems to diminish the need for postoperative opiate. Our target is to check the non-interaction between the two compounds, if they are simultaneously and continuously supplied with an only infusion pump.

Materials and Methods: An HPLC system Waters 2695 fitted with a Photodiode Array Detector (PDA) and an Empower Software, was used. The chromatography of both compounds (remifentanil hydrochloride and ketamine hydrochloride) was carried out in reversed phase with a NovaPak C18 column. The mobile phase was prepared with acetonitrile (180 ml), methanol (120 ml), phosphate buffer 50 mM (48 ml), and water (352 ml, pH 3). To prepare the problem solutions, remifentanil hydrochloride (1.5 mg) and ketamine hydrochloride (1.0 mg) were respectively dissolved into mobile phase (10 ml). Samples of 10 µL of each solution were introduced into the HPLC system, and the flow rate of the mobile phase was kept, in both cases, at 1 mL/min. Under these conditions the chromatograms 1 (remifentanil hydrochloride) and 2 (ketamine hydrochloride) were obtained. The two problem solutions were mixed at room temperature and the chromatographies were repeated under the same conditions after 3 (chromatogram 3) and 24 (chromatogram 4) hours.

Results: Chromatogram number 1; remifentanil hydrochloride retention time 2.5 min. Chromatogram number 2; ketamine hydrochloride retention time 1.7 min. The chromatograms 3 and 4 show no changes in the retention times of either compound and no formation of any new product.

Conclusions: No reaction has been observed between the two studied compounds, under the described conditions. Consequently remifentanil hydrochloride and ketamine hydrochloride can be simultaneously administered, in a safe way, using a single infusion pump. This fact facilitates the intra-operative management.

9AP1-3
Determination of the blood-gas partition coefficients for isoflurane, sevoflurane and desflurane
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Background and Goal of Study: The blood-gas partition coefficient is a crucial parameter of pharmacokinetics of volatile anaesthetics. The parameter is given in textbooks (e.g. 1) as a singular value and has been confirmed under the same conditions after 3 (chromatogram 3) and 24 (chromatogram 4) hours.

Results: Results of the blood-gas partition coefficient are shown in table in comparison with the values given in a popular German Anaesthesia textbook.

<table>
<thead>
<tr>
<th>Substance</th>
<th>n</th>
<th>median</th>
<th>Min–Max</th>
<th>25th / 75th percentile</th>
<th>textbook value(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>isoflurane</td>
<td>37</td>
<td>1.44</td>
<td>1.14-1.69</td>
<td>1.39-1.52</td>
<td>1.46</td>
</tr>
<tr>
<td>sevoflurane</td>
<td>34</td>
<td>0.76</td>
<td>0.61-0.89</td>
<td>0.72-0.79</td>
<td>0.69</td>
</tr>
<tr>
<td>desflurane</td>
<td>28</td>
<td>0.57</td>
<td>0.48-0.68</td>
<td>0.55-0.59</td>
<td>0.42</td>
</tr>
</tbody>
</table>

Conclusion: For sevoflurane and for desflurane we determined higher blood-gas partition coefficients than reported (1,3). The observed variation of the coefficient may contribute in part to individual recovering from anaesthesia.

References:
2 Eger II E1, Saidman LJ. Anesth Analg 2005, 100, 1022.
9AP1-4

Reduced propofol sensitivity in S267 mutant glycine receptors
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Background and Goal of Study: The aromatic alcohol propofol (2,6 disopropylphenol) positively modulates GABAA and glycine receptors (1). While molecular determinants for binding of propofol to GABAA receptors have been extensively studied (2), little is known about the binding site of propofol on glycine receptors.

Material and Methods: We investigated the effects of propofol on chloride inward currents via two specific mutations within the α1 subunit of the rat glycine receptor (rGlyR α1 S267M and α1 S267F) with standard whole-cell experiments. Glycine receptor α1 subunits (wild type or mutants) were heterologously expressed in an embryonic kidney cell line.

Results: Both mutants (a) decreased sensitivity to the natural agonist glycine (EC50 12.8 ± 2.3 μM vs. propofol EC50 of 12.6 ± 2.6 μM in WT, 81.5 ± 21.2 μM in α1 S267M and 122.8 ± 18.5 μM in α1 S267F); (b) decreased sensitivity to propofol with respect to co-activation of an EC20 glycine response (propofol EC50 4.8 ± 1.2 μM vs. WT, 36.3 ± 15.5 μM at the α1 S267M and 9.5 ± 3.2 μM at the α1 S267F receptor); (c) abolished direct receptor activation by propofol.

Conclusions: These results suggest that the serine residue at the position 267 in the transmembrane domain 2 of the α1 glycine receptor is crucial for receptor activation by the natural agonist glycine and by the anesthetic propofol in the absence of glycine. The fact that the exchange of serine for the bulkier isoleucine had a stronger impact on the co-activating actions of propofol than the exchange for the polar methionine suggests that larger hydrophobic side chains inhibit access to the co-activating binding site.

References:

9AP1-5

Interaction of the Ubiquitin Carboxyl-terminal Hydrodase-L1 with the alpha2-adrenergic receptor
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Background and Goal of Study: In contrast to most currently used anaesthetics, α2-adrenergic receptor (AR) agonists exert their potent clinical effects via a single type of receptors. In addition, neuroprotective effects of α2-AR agonists are mediated via the α2C-AR subtype (1), but the molecular mechanisms underlying these actions are still not elucidated. In this study, we investigated functional effects of the α2C-AR interaction with the Ubiquitin Carboxy-terminal Hydrodase-L1 gene (UCHL1), a protein that is involved in Parkinson disease.

Materials and Methods: The third intracellular loop of the α2C-AR was used in a two-hybrid system to screen a human brain cDNA for protein-protein interactions. DNA sequences were obtained from positive clones and protein-protein interactions were confirmed by GST pull down assays and co-immunoprecipitation.

Results and Discussions: Two identical clones that were 100% homologous to the gene encoding UCHL1 were identified. GST pull down assays demonstrated that UCHL1 binds preferentially to the α2C-AR subtype and only with much less affinity to α2B-AR and α2D-AR. Co-immunoprecipitation and immunofluorescence results confirmed the specificity of this interaction in vivo.

Conclusion(s): UCHL1 is a key enzyme in the protein degradation pathway. Therefore, the interaction between UCHL1 and α2C-AR may play an important role in trafficking of the receptor and its response to agonist stimulation. Furthermore, mutations in the UCHL1 gene have been associated with Parkinson and other conformational diseases (2). UCHL1 binds preferentially to α2C-AR, the subtype mediating the neuroprotective actions of α2C-AR agonists. For this reason, one may speculate that this interaction presents a potential molecular mechanism for the neuroprotective effects of α2C-AR agonists.

References:

9AP1-6

An investigation of possible neurotoxic effects of intrathecal melatonin combined with fentanyl in a rat model
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Background and Goal of Study: We have demonstrated in a rat model that intrathecal injection of melatonin plus fentanyl intrathecally can achieve anestheis sufficient for a laparotomy. We sought to establish whether this would produce neurologic damage or neurotoxic injury.

Materials and Methods: Thirty Wistar strain rats with nylon catheter chronically implanted in the lumbar subarachnoid space were divided into 5 groups (1, 2). Group 1 received 0.02 mL intrathecal 0.1% lidocaine; Group 2 received 0.01 mL melatonin 0.1% plus 0.01 mL fentanyl 0.005% intrathecally; Group 3 received 0.02 mL fentanyl 0.006% intrathecally; Group 4 received 0.02 mL lidocaine 2% intrathecally; Group 5 received 0.02 mL fentanyl in water 5% intrathecally. The neurotoxic effect of melatonin alone or combined with fentanyl injected intrathecally repeatedly on 15 occasions over a period of 1 month was studied. Histopathological examination of the excised spinal cord and paraspinal tissues was carried out.

Results and Discussion: There were no significant differences in histological changes in the neural tissues of the first 4 groups. Group 5 demonstrated the typical neurolytic lesions of phenol when injected intentionally into the subarachnoid space.

Conclusions: No clinical effect or histopathological changes were noted in this rat model when melatonin and fentanyl were injected intrathecally.

References:

9AP1-8

Neurotoxic effects of intrathecally MgSO4
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Background and Goal of Study: MgSO4 is a non competitive antagonist of N-methyl-D-aspartate receptors, has been investigated for intrathecal anaesthetic, analgesic and neuroprotective effects in animal and human studies (1, 2). There is inadequate data concerning the intrathecal neurotoxicity of the drug. In this study we aimed to investigate the neurotoxic effects of intrathecally MgSO4.

Materials and Methods: After ethics committee approval 24 male Sprague-Dawley, rats weighing 250–300 g were randomly divided into 3 groups. Following intraperitoneal anaesthesia with ketamine HCl and Xylasine HCl rats in group II received 0.02 ml 15% MgSO4 on day 7 as a sole injection; in group I received 0.02 ml 0.9% saline and group III received 0.02 ml 15% MgSO4 once a day for 7 days intrathecally at the lumbar region. Rats observed for clinical neurotoxicity throughout the study period were sacrificed at day 8 and medulla spinalis sections were assessed by electron microscopy. Data were analyzed by Kruskal-Wallis test.

Results: While no ultrastructural changes were observed in group I (control); there was mitochondrial degeneration in group II (single dose) and significant neurodegeneration in group III (repetitive dose). While histopathological assessment score was significantly higher in groups II and III compared with group I (p = 0.002 and p = 0.002, respectively). It was significantly higher in group III compared with group II (p = 0.008).

Conclusion: In our study we observed by electron microscopy that MgSO4, especially after repetitive administrations, causes significant neurodegeneration. Therefore we came to the conclusion that intrathecal MgSO4 can cause neurotoxicity and undesirable effects on clinical practice in humans.

References:

9AP1-9

Chelation of intra neuronal free calcium opposes anaesthetic actions in aged animals
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Background and Goal of Study: Our previous reports indicated that ageing potentiation of anaesthetic actions can be opposed by decreasing intra neuronal free calcium concentration ([Ca2+]i) using manoeuvres to block voltage-dependent Ca2+ influx. In keeping with this concept, we hypothesize that decreasing [Ca2+]i, using intra neuronal Ca2+ chelators can reverse age-induced enhancement of anaesthetic actions.

Materials and Methods: First, we determined the effects of intraneuronal Ca2+ chelator, BAPTA-AM (50 μM) on anaesthetic actions in hippocampal slices taken from young and aged Fischer 344 rats. Anaesthetic actions were measured by analyzing the changes in field excitatory postsynaptic potentials (fEPSPs) evoked in hippocampus slices. Slices were incubated either in BAPTA-AM or its vehicle DMSO (0.12%). Second, we determined the effects of
intraperitoneal administration of BAPTA-AM and its vehicle DMSO on MAC values for isoflurane as well as isoflurane-induced electroencephalographic (EEG) burst suppression. We also determined latency to righting reflex and eye opening after isoflurane anesthesia. Mann-Whitney test was used for statistical significance.

Results and Discussions: Aged slices incubated and perfused with BAPTA-AM showed that isoflurane actions were partially reversed compared to those perfused with DMSO. On the contrary, isoflurane actions were enhanced in young slices perfused with BAPTA-AM. Intraperitoneal injections of BAPTA-AM enhanced MAC for isoflurane by 28.78 ± 4.6 (mean ± SD) % and increased the number of bursts during isoflurane-induced EEG burst suppression in old animals. Such effects of BAPTA-AM were not observed in young animals. However, the latency to eye opening and righting reflex after administration of isoflurane 2 MAC for 1 hour was not affected by BAPTA-AM injections in old and young animals.

Conclusion(s): The intraneuronal Ca\(^{2+}\) chelator, BAPTA-AM improves synaptic efficiency and plasticity in aged neurons. Such effect might have attenuated the age-induced decrement in the MAC values for isoflurane.

References:

9AP1-10
Local anesthetic effects on intracellular release of reactive oxygen species in human neutrophils
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Background and Goal of the Study: Anti-inflammatory effects of Local Anesthetics (LA) are well documented. LA inhibit generation of reactive oxygen species in isolated neutrophils; the underlying mechanism appears to be an inhibition of leukocyte priming. Since the intracellular generation of oxygen species is a central part of the host defense, its inhibition by LA could potentially be detrimental. We therefore investigated the effects of LA on intracellular oxygen release in human neutrophils. To avoid the cellular activation associated with neutrophil isolation, we used a whole blood model.

Materials and Methods: After IRB approval and informed consent was obtained, whole blood samples were collected from healthy volunteers and incubated for 1 or 3 hours with different concentrations (10\(^{-1}\) to 10\(^{-4}\) M) of either lidocaine, ropivacaine, QX314 (an uncharged LA unable to penetrate the cell wall), or saline as control. Dihydroothidium was added to quantify oxidative burst. Samples were primed with platelet activating factor (10 \(^{-5}\) M) and with FMLP (10\(^{-9}\) M) for 15 min each. After lysis of erythrocytes, samples were analyzed by flow cytometry.

Results and Discussion: Ropivacaine and QX314 did not affect leukocyte oxidative burst. Lidocaine did not affect oxidative burst at 1 hour incubation, but after 3 hours incubation, 10\(^{-4}\) M lidocaine significantly inhibited the generation of intracellular reactive oxygen species. No effects of LA on leukocyte priming could be observed.

Conclusions: Intracellular generation of reactive oxygen species remains largely unaffected by LA in clinical concentrations. This supports the hypothesis that the anti-inflammatory effects of LA do not interfere with the host defense.

References:

9AP2-1
Reversal of pancuronium-induced block by the selective relaxant binding agent sugammadex
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Background and Goal of Study: Sugammadex is the first selective relaxant binding agent that has been designed to antagonize rocuronium. This exploratory study evaluated the effects of sugammadex on reversal of shallow neuromuscular block by pancuronium, in surgical patients.

Materials and Methods: After EC approval and written IC, 20 patients (ASA I–2;20–81 yrs) received 0.1 mg/kg pancuronium. Neuromuscular block was monitored by electromyography (TOF-Watch\(^{\text{TM}}\)). Seventeen of these patients (per-protocol population) randomly received a dose of sugammadex (1.0,2.0,4.0,6.0,8.0 mg/kg) at reappearance of T2. The primary end-point was the time of administration of sugammadex until recovery of the T4/T1 ratio to 0.9. Safety of sugammadex was evaluated by analyzing adverse events and vital signs.

Results and Discussions: The table shows the time intervals of the T4/T1 ratio to 0.9 after pancuronium-induced shallow neuromuscular block following different doses of sugammadex. For two subjects, serious adverse events were reported. They were not considered to be related to sugammadex.

<table>
<thead>
<tr>
<th>Sugammadex Dose (mg/kg)</th>
<th>Time Interval [mean (SD)] of T4/T1 ratio to 0.9 (min:sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (n = 2)</td>
<td>44:02 (53:32)</td>
</tr>
<tr>
<td>2.0 (n = 3)</td>
<td>5:17 (0:48)</td>
</tr>
<tr>
<td>4.0 (n = 4)</td>
<td>2:46 (1:32)</td>
</tr>
<tr>
<td>6.0 (n = 4)</td>
<td>1:24 (0:20)</td>
</tr>
<tr>
<td>8.0 (n = 4)</td>
<td>1:22 (0:17)</td>
</tr>
</tbody>
</table>

Sugammadex has provided reliable and predictable reversal of neuromuscular block induced by rocuronium or vecuronium. This study indicates that sugammadex decreases recovery time when administered at shallow pancuronium block, but no significant dose-response relation could be shown. Sugammadex was well tolerated.

Conclusion: Sugammadex decreases mean recovery times at shallow pancuronium-induced block. No significant dose-response relation could be shown. Sugammadex was well tolerated and had a good safety profile.

References:

9AP2-2
Neuromuscular pharmacodynamics of mivacurium in adult patients with major burns
A. Han, JAJ. Martyn
Department of Anesthesia, University of Iowa Hospitals and Clinics, Iowa City, USA

Background and Goal of Study: Burned patients are resistant to nondepolarizing muscle relaxants (NDMRs). Mivacurium, however, has not been shown to be resistant in burned children. Neuromuscular (NM) response to mivacurium in burned adults is unknown. This study examined the pharmacodynamics of mivacurium bolus in relation to size of burn, time after burn, plasma pseudocholinesterase (PChE) activity and dibucaine number, in adult major burns.

Materials and Methods: Adults (M/F = 22/8), aged 44.0 ± 10 years, with total burn area (TBA) 35.0 ± 13%, were studied at 40 ± 29 postburn days. Age and sex matched 30 nonburns served as controls. Anesthesia consisted of propofol and fentanyl infusion with N2O and O2. Mivacurium 0.2 mg/kg and righting reflex after administration of isoflurane 2 MAC for 1 hour was performed in both groups. Mivacurium onset time was not observed. Plasma peak concentration suppression intubation at 1 minute was attempted to simulate rapid sequence induction with recording of either failure or success. Spontaneous recovery profiles from paralysis were measured. Pearson correlations assessed relationship of recovery profiles to PChE activity, dibucaine number, TBA and elapsed time after the injury.

Results and Discussions: Demographics of patients were similar in both groups. Onset time and all recovery profiles were prolonged in the burned patients. Intubation was successful with difficulty in approximately 70% of both groups. PChE activity was significantly decreased in burns. Dibucaine number was similar in both groups. Recovery profiles showed high negative correlation to PChE activity and positive correlation to TBA and time after the burn injury.

Conclusion(s): Unlike children and adolescents who have onset of NM paralysis similar to unburned, mivacurium onset time was prolonged in adult burns. Prolonged onset time suggests resistance to the NM effects. Conversely, prolonged recovery profiles suggest increased sensitivity. These contradictory findings can be explained by ANH proliferation and decreased level of plasma PChE activity, which seem to depend on time after injury. In view of the prolonged onset time of almost two minutes for maximal paralysis, mivacurium does not appear to be a good drug for rapid onset of paralysis in burned adults.

9AP2-3
Incidence of residual block in recovery room (RR) after neuromuscular blockade: a prospective study
P.C. Bergonzi, F. Ruggieri, A.F. Garozzo, C. Martani, R. Valeri
Department of Anesthesia, San Raffaele Scientific Institute, Milano, Italy
Background and Goal of study: The aim of this observational, prospective study is to assess, by accelerometry, the incidence of residual block in recovery room (RR) after the use of intermediate-action neuromuscular blocking agents (NMBA).

Materials and Methods: 252 adults, undergoing general anesthesia and neuromuscular blockade with atracurium or cisatracurium, were enrolled. At the patient’s admission in RR (RR time). The train of four ratio (TOF) was determined by stimulating the ulnar nerve at the wrist with surface electrodes. Each patient was asked to perform the head lift test (HLT) and was classified by a modified Aldrete score (1). TOF ratio was then calculated as the arithmetic mean of the results of four tests. The observation was terminated if TOF ratio was 0.9. Otherwise the same procedure was repeated after 5 min RR time and eventually after 10 min (RR + 10). Primary endpoint was to define the incidence of TOF ratio <0.9, <0.8, <0.7 at RR time, RR + 5 and RR + 10. Secondary aim was to find any relationship between TOF ratio and factors as atracurium versus cisatracurium, use of anti-cholinesterase or time delay from last NMBA dose to admission in recovery room.

Results and Discussions: TOF ratio <0.9, 0.8, 0.7 at RR time was found respectively in 133 (57%), 84 (36%), 53 (23%) patients. More than 20% of patients admitted in RR had a TOF ratio suitable for a safe extubation of the trachea (2). Furthermore, at RR + 10, 20% of patients had a TOF ratio < 0.9, which indicates an incomplete recovery (3). In our cases a successfully performed HLT is significantly related to an Aldrete score >0.8 but not to a TOF ratio >0.7.

Conclusions: The rates of residual block after atracurium and cisatracurium are not statistically different. Multivariate analysis shows that the short time delay from last NMBA injection to RR admission and abdominal surgery are the only factors related to TOF ratios in RR.

References:

9AP2-4
Continuous neuromuscular blockade with rocuronium bromide increases the tolerance of acute normovolemic anaemia in anesthetised domestic pigs
M. Lossen, A. Pape, H. Kertscho, B. Zwissler, O. Habler
Clinic of Anaesthetics, Intens. Care Med. and Pain Management, J.W. Goethe-University Hospital, Frankfurt/Main, Germany

Background and Goal of study: The utilisation of the patient’s individual anaemia tolerance represents a cornerstone in every allogeneic blood conservation strategy. Whether muscular relaxation has an effect on anaemia tolerance by lowering skeletal muscular O2-consumption and total body anemia tolerance represents a cornerstone in every allogeneic blood conservation strategy. The train of four ratio (TOF) was determined by stimulating the ulnar nerve at the wrist with surface electrodes. Each patient was asked to perform the head lift test (HLT) and was classified by a modified Aldrete score (1). TOF ratio was then calculated as the arithmetic mean of the results of four tests. The observation was terminated if TOF ratio was 0.9. Otherwise the same procedure was repeated after 5 min RR time and eventually after 10 min (RR + 10). Primary endpoint was to define the incidence of TOF ratio <0.9, <0.8, <0.7 at RR time, RR + 5 and RR + 10. Secondary aim was to find any relationship between TOF ratio and factors as atracurium versus cisatracurium, use of anti-cholinesterase or time delay from last NMBA dose to admission in recovery room.

Results and Discussions: TOF ratio <0.9, 0.8, 0.7 at RR time was found respectively in 133 (57%), 84 (36%), 53 (23%) patients. More than 20% of patients admitted in RR had a TOF ratio suitable for a safe extubation of the trachea (2). Furthermore, at RR + 10, 20% of patients had a TOF ratio < 0.9, which indicates an incomplete recovery (3). In our cases a successfully performed HLT is significantly related to an Aldrete score >0.8 but not to a TOF ratio >0.7.

Conclusions: The rates of residual block after atracurium and cisatracurium are not statistically different. Multivariate analysis shows that the short time delay from last NMBA injection to RR admission and abdominal surgery are the only factors related to TOF ratios in RR.

References:

9AP2-5
Sugammadex achieves fast recovery from shallow neuromuscular blockade induced by rocuronium or vecuronium: dose-response studies
F. Pühlinger, M. Blaszyk, G. Cammu, H. Sparr, M. Heeringa
Anaesthesia and Intensive Care Medicine, Klinikum am Steinenberg, Reutlingen, Germany

Background and Goal of study: Sugammadex is the first selective relaxant binding agent (SRBA) designed to reverse the effects of rocuronium-induced neuromuscular blockade. This study assessed the effects of sugammadex on reversal of rocuronium- and vecuronium-induced shallow neuromuscular blockade.

Materials and Methods: One-hundred surgical patients (age 20–< 65 years, ASA class 1–3) were randomized to rocuronium (0.9 mg/kg, n = 50) or vecuronium (0.1 mg/kg, n = 50). Anaesthesia was induced using propofol and fentanyl and maintained with sevoflurane. Neuromuscular activity was monitored by accelerometry (TOF-Watch® SX). Patients were randomised to sugammadex (0.5, 1.0, 2.0 or 4.0 mg/kg) or placebo at reappearance of TOF. The primary end-point was the time from administration of sugammadex to recovery of the T4/T1 ratio to 0.9. An exponential model (and weighted non-linear regression) was used to explore the dose-response relation. Possible recuarization or residual curarization was assessed. Safety was evaluated by adverse events, vital signs and laboratory parameters.

Results and Discussion: Significant dose-response relations were found between sugammadex dose and time to T4/T1 ratio to 0.9 (Table).

<table>
<thead>
<tr>
<th>Sugammadex</th>
<th>Mean time (SD) to T4/T1 ratio of 0.9 (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placebo</td>
<td>96.3 (33.1)</td>
</tr>
<tr>
<td>0.5 mg/kg</td>
<td>16.3 (20.6)</td>
</tr>
<tr>
<td>1.0 mg/kg</td>
<td>4.8 (6.0)</td>
</tr>
<tr>
<td>2.0 mg/kg</td>
<td>1.4 (0.5)</td>
</tr>
<tr>
<td>4.0 mg/kg</td>
<td>1.5 (0.4)</td>
</tr>
</tbody>
</table>

A decrease from a T4/T1 ratio of >0.9 to <0.8 (indication for recurarisation) was reported for 7 subjects, predominantly in the 0.5 mg/kg group. SAEs were reported for three subjects, but none was considered related to sugammadex.

Conclusions: Sugammadex decreased recovery time from rocuronium- or vecuronium-induced neuromuscular blockade in a dose dependent manner. Sugammadex was safe and well tolerated.

9AP2-6
Propranolol and isoprenaline do not modify the sugammadex-induced fast recovery from rocuronium-induced neuromuscular blockade
A. Bom, F. Hope
Department of Pharmacology, Organon Laboratories Ltd, Newhouse, United Kingdom

Background and Goal of study: Sugammadex is the first selective relaxant binding agent (SRBA) for the reversal of neuromuscular blockade induced by steroidal neuromuscular blocking agents. Beta-adrenoceptor agonists can accelerate the onset time of rocuronium, whereas beta-adrenoceptor antagonists can slow it down1,2. The aim of this study was to determine whether pretreatment with isoprenaline or propranolol alters the recovery time from rocuronium-induced neuromuscular blockade after administration of sugammadex in rats.

Materials and Methods: Male Sprague-Dawley rats were anaesthetized with pentobarbitone sodium and artificially ventilated. Single twitch contractions of M. gastrocnemius were induced by stimulation of the sciatic nerve. Animals were pretreated with saline (n = 6), propranolol (1 mg/kg); i.v. bolus; n = 6) or isoprenaline (0.15 µg/kg/min; i.v. infusion; n = 6). Complete blockade was induced by i.v. bolus administration of a 3xED90 dose of rocuronium (3.9 µmol/kg). One minute after obtaining complete blockade, sugammadex was administered as a single i.v. bolus dose (1 µmol/kg). All data are expressed as Mean ± SEM. A one-way ANOVA (p 0.05 level) was used to determine differences between groups.

Results and Discussion: No statistically significant differences in recovery index and time to 25, 50, 75 and 90% recovery were observed between the three treatment groups.

References:
Watch

sary. Neuromuscular activity was monitored by acceleromyography (TOF)
of the neuromuscular blocking agent (NMBA) were administered if neces-
for vecuronium (0.1 mg/kg) during induction of anaesthesia. Additional doses
and maintained using sevoflurane. Patients received rocuronium (0.9mg/kg)
cluded 100 surgical patients (age

Both ephedrine (E) in small dose and the
Anesthesia and Intensive Care, S.Maria degli Angeli Hospital, Pordenone, Italy
Y . Leykin, M. Dalsasso, T. Setti, T. Pellis

Background and Goal of Study: Sugammadex is a modified ß-cyclodex-
trin and the vecuronium group.

Materials and Methods: This randomised, multicentre, parallel-group trial
included 100 surgical patients (age >20 years and <65 years, ASA class 1–3)
who had given written informed consent. Anaesthesia was induced with propo-
and maintained using sevoflurane. Patients received rocuronium (0.3 mg/kg)
or vecuronium (0.1 mg/kg) during induction of anaesthesia. Additional doses of

Results and Discussions: The relationship between PTC and time to first reaction to TOF was similar with

Conclusion: Changes in haemodynamics induced by propranolol or iso-
pranoline do not modify the sugammadex-induced rapid recovery from
rocuronium-induced neuromuscular blockade.

References:
1 Szmuk et al., Anaesth Analg 2000; 90(s): 1217.

9AP2-7
Pharmacokinetics of the selective relaxant binding agent
sugammadex, administered for reversal of shallow
neuromuscular blockade induced by rocuronium or
vecuronium
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University of Medical Sciences, Poznañ, Poland

Background and Goal of Study: Sugammadex is a modified ß-cyclodex-
trin and the first selective relaxant binding agent (SRBA), designed to
reverse the effects of rocuronium-induced neuromuscular blockade. An
objective of this study was to explore the pharmacokinetics of rocuronium, vecuronium and sugammadex in ASA class 1–3 patients who received sug-
ammadex for reversal of shallow neuromuscular blockade induced by
rocuronium or vecuronium.

Results: Median rocuronium plasma concentrations, and
the vecuronium group. Plasma concentrations of sugammadex increased with increasing dose
of sugammadex over the dose range 0.5–4.0 mg/kg, both in the rocuronium and
the vecuronium group.

Conclusion(s): Plasma concentrations of sugammadex showed an increase
after administration of sugammadex. Plasma concentrations of sugammadex were approximately dose-proportional over the dose range of 0.5 to 4.0 mg/kg, independent of the NMBA used.

9AP2-8
The effects of ephedrine on intubating conditions following low dose priming with cisatracurium
Y. Leykin, M. Dalsasso, T. Setti, T. Pellis
Anesthesia and Intensive Care, S.Maria degli Angeli Hospital, Pordenone, Italy

Background and Goals: Both ephedrine (E) in small dose and the “priming principle” increase the onset time of cisatracurium (1, 2). E improves clinical
intubating conditions following priming (P) with rocuronium when compared with P or E alone (3). We investigated the effects of E plus P with cisatracurium on clinical intubating conditions.

Material and Methods: 124 ASA I-II, aged 18 to 65 years, undergoing elective surgery were randomly allocated to 4 groups (n = 31). All patients were
induced with propofol 2 mg/kg and sulfentanil 0.15 µg/kg. In group A a P dose of
0.005 mg/kg (10% ED95) was followed 3 minutes later by an intubating dose of
0.145 mg/kg of cisatracurium. E, 70 µg/kg, was injected together with the
induction agents over 30 s just before the intubating dose. After 60 seconds
intubation was attempted. In group B the same sequence was repeated except
for sham E administration. Group C received sham P and an intubation dose
of 0.15 mg/kg., while group D sham P and sham E. Intubating conditions were
graded as excellent, good, poor, and bad. Neuromuscular transmission
was monitored by acceleromyography of the adductor pollicis muscle.

Results: There were no demographic and baseline differences among groups. All patient in group A were intubated 60 s after the intubating dose, compared to
74% of group B, 77% of C, and 64% of D. In group A the proportion of
good to excellent intubating conditions was significantly higher compared to
the other group (group A 100%, B 52%, C 52%, and D 48%; p < 0.01). No
significant difference between groups was observed with regard to twitch sup-
pression at 60 seconds and onset time, as well as haemodynamic parameters (heart rate and mean blood pressure).

Conclusions: Low dose ephedrine combined with low dose priming signif-
icantly improved clinical intubating conditions 60 s after intubating dose of
cisatracurium.

References:

9AP2-9
Modification of posttetanic count (PTC) for monitoring deep neuromuscular block
C. Kjaer, LT. Skovgaard, Y. Gurkan, J. Viby-Mogensen
Department of Anaesthesia, HOC 4231, Copenhagen University Hospital,
Rigshospitalet, Copenhagen, Denmark

Background and Goal of Study: Posttetanic count (PTC) is the gold stan-
dard for quantifying deep neuromuscular block. The purpose of this study
was to evaluate whether the duration of 1 Hz stimulation as used in the original
PTC method could be decreased without influencing recovery of block and
the relation between PTC and time to first reaction to Train-of-four (TOF) (1).

Materials and Methods: Fifteen adult patients were studied. Anaesthesia was
induced and maintained with propofol and remifentanil. Acceleromyography
was used for evaluation of neuromuscular block, following rocuronium
0.6 mg/kg intravenously. At one hand a TOF Watch SX nerve stimulator
recorded the PTC response using the original PTC method. At the contra-lat-
eral hand a modified PTC sequence was applied. The 1 Hz single stimulation
was decreased from 60 ± 60 stimulations to 10 ± 30 stimulations, before and
after the tetanic stimulation, respectively.

Results and Discussions: For the primary endpoint, time to first response in
TOF, the mean bias between the two stimulation sequences was 0.72 min
(c.i. –0.43–1.87 min), p = 0.20.

The relationship between PTC and time to first reaction to TOF was similar with
the two methods, p = 0.68.

Conclusion(s): The duration of 1 Hz stimulation and thus the total duration of
PTC stimulation could be decreased significantly (from 127 to only 47 sec-
onds), without influencing recovery and the relationship between PTC and time to
first TOF response. The modified PTC method thus allows the clinician to
obtain a result from a PTC stimulation in less than half the time of the original
method.

Reference:

9AP2-10
Optimal dosage of cisatracurium in obese patients
Y. Deshko, V. Stavom, V. Muzikov
Department of Anaesthesiology, Russian Research Center of Surgery,
Moscow, Russian Federation

Background and Goal of the Study: Whether the ideal body weight (IBW) or
the real body weight (RBW) to be used as a basis to calculate the reduced
dosage of relaxants for obese patients – this was always under discussion. The
aim of this study is to estimate the optimal dosage of cisatracurium (CisA)
based on corrected body weight (CBW).

Patients and Methods: 57 patients (age 27–70, ASA I–III) to undergo elective
abdominal surgery under balanced anesthesia or TIVA were divided into four
random groups after RRCS’s Commission on ethics approval. All patients
received 0.15 mg/kg CisA on the basis of the RBW (group I, n = 14), CBW (group
II, n = 12), IBW (group III, n = 12) or RBW (control group, n = 19). BMI in
groups I–III was 30.1–51.1 and 25 in the controlled group. CBW was cal-
culated as IBW + 0.4 × (RBW-IBW). Monitoring of NM, TOF-Watch®
SX. The onset time, the durations 25%, spontaneous or induced recovery (RI
and RT), and occurrence of antagonists injections were registered.
**Results:** Induction dose of CisA based on CBW calculated allowed perform of tracheal intubation as long as it was based on RBW figures and shorter period of action was achieved at the same time (see Table). Induction dose of CisA based on IBW extended onset time and obviously reduced its duration 25%. Body weight value had no any significant impact on the recovery rate.

<table>
<thead>
<tr>
<th>group</th>
<th>group II</th>
<th>group III</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>The onset time</td>
<td>211 ± 28</td>
<td>242 ± 48</td>
<td>305 ± 20*</td>
</tr>
<tr>
<td>Duration 25%</td>
<td>57.4 ± 5.4*</td>
<td>48.3 ± 8.2</td>
<td>37.4 ± 7.8*</td>
</tr>
<tr>
<td>RT</td>
<td>16.7 ± 6.9</td>
<td>13.1 ± 9.0</td>
<td>17.9 ± 4.5</td>
</tr>
<tr>
<td>RT</td>
<td>23.7 ± 8.4</td>
<td>25.2 ± 9.6</td>
<td>23.9 ± 6.6</td>
</tr>
<tr>
<td>Reversal agent</td>
<td>216*</td>
<td>8%</td>
<td>8%</td>
</tr>
</tbody>
</table>

Statistics: ANOVA with *p < 0.05, data are mean ± SD

**Conclusions:** When CBW was used as the CisA dosage calculation basis for obese patients more controlled and secure relaxation was achieved. We suggest that feminine or masculine constitutional patterns, muscular mass of the obese patients may have been of great importance.

**Reference:**

**9AP3-1**

Propofol and remifentanil vs. isoflurane and nitrous oxide: which can provide better surgical field in FESS?
X. Li, X. Song, T. Li, B. Zhou, B. Zhang
Anesthesiology, Beijing Tongren Hospital, Beijing, China

**Background and Goal of Study:** Both total intravenous anesthesia (TIVA) and inhaled anesthesia are widely used in functional endoscopic sinus surgery (FESS). However, they can provide different surgical field quality even under the same depth of anesthesia. This study is to compare the nasal mucus blood flow under different anesthesia methods.

**Materials and Methods:** The study is randomized, controlled, double-blinded and prospective. 40 patients (ASA II–III) aged from 18–65, male:female 1:1 underwent elect FESS were allocated into TIVA (propofol and remifentanil) group and inhaled (isoflurane and nitrous oxide) group, n = 20 each. Anesthesia depth was monitored with bispectral analysis and controlled between the BIS value between 40 and 50 in both groups during the operation. Nasal mucusal blood flow was measured with laser Doppler flowmetry. Surgical field was assessed by the same pointed surgeon according to the Fromme score.\(^1\)

**Results and Discussions:** Perfusion Unit (PU) and flow velocity (V) value of TIVA group were significantly lower than those of inhaled group (343.33 VS 448.60, 0.00021 respectively). Visual field score in TIVA group (0.07 ± 0.59) was significantly lower than those of inhaled group (2.8 ± 0.56), p = 0.00015 and p = 0.00021 respectively. Under the same depth of anesthesia, propofol and remifentanil can provide better surgical field than isoflurane by decreasing the local blood flow of the nasal mucosa.

**Reference:**

**9AP3-2**

Effect of nitrous oxide on the desflurane requirement for blunting sympathetic responses after surgical incision combined with two target-controlled concentrations of remifentanil (1 and 3 ng/ml)
E. Dedola, G. Bruno, A. Albertin, S. Turi, A. Gandolfi
Department of Anesthesia, San Raffaele Scientific Institute, Milano, Italy

**Background and Goal of Study:** The aim of this prospective, randomized, double blind study was to determine the effects of adding nitrous oxide on the desflurane requirement for blunting sympathetic responses after surgical incision (MAC\(_{\text{desflex}}\)) combined with two different target-controlled concentrations of remifentanil (1 and 3 ng/ml).

**Materials and Methods:** 100 patients, aged 20–50 years, ASA physical status I, undergoing general anesthesia for elective abdominal surgery were enrolled and randomly allocated to receive desflurane anesthesia alone (Group A, n = 52), or with the addition of 60% nitrous oxide (Group N, n = 48). Patients of both groups were further assigned to receive a target controlled effect-site concentration of 1 ng/ml (Group A1, n = 26; Group N1, n = 26) or 3 ng/ml remifentanil (Group A3, n = 26; Group N3, n = 22). Sympathetic responses to surgical incision were determined after a 20 min period of stable end-tidal desflurane and target-controlled remifentanil concentrations. Pre-determined end-tidal desflurane concentrations and the MAC\(_{\text{desflex}}\) for each group were determined using an up-and-down sequential allocation technique.

**Results and Discussions:** The MAC\(_{\text{desflex}}\) of desflurane was 5.2% (85% confidence interval, CI\(_{\text{deflex}}\): 4.9–5.5%) in Group A1 and 2.7% (CI\(_{\text{deflex}}\): 2.6–2.8%) in Group N1 (p < 0.001), while in Groups A3 and N3 the MAC\(_{\text{desflex}}\) of desflurane was 2.2% (CI\(_{\text{deflex}}\): 2.4–2.4%) and 2% (CI\(_{\text{deflex}}\): 1.9–2.2%), respectively (p < 0.01).

When considering a minimum anesthetic concentration (MAC) value in this age population and the contribution of 60% nitrous oxide (0.55 MAC), the combined MAC\(_{\text{desflex}}\) values, expressed as multiples of the MAC, were 1.9 MAC in A1 and N1 groups and 0.8 MAC and 0.74 MAC in A3 and N3 groups.

**Conclusions:** Adding 60% nitrous oxide reduces the MAC\(_{\text{desflex}}\) of desflurane by 52% when using a remifentanil concentration of 1 ng/ml and 10% when using a remifentanil concentration of 3 ng/ml.

**9AP3-3**

Evidence for a daily rest-activity rhythm disruption the days following general (propofol) anaesthesia in patients.
L. Pain, G. Dispensyn, O. Coste, J. Lellu, E. Challet
Faculty of Medicine, INSERM U666/CHRU Strasbourg, Strasbourg, France

**Background and Goal of Study:** Because of evidenced chronobiological properties of propofol (effect on biological clock) in animal, (1), we examined the daily rest-activity rhythm before and after anaesthesia, in patients.

**Materials and Methods:** Patients (age 40–60 years, ASA 1–2), with no prior sleep disorders, shift-work, cancer, benzodiazepines or beta blockers treatment, scheduled for systematic ambulatory digestive endoscopy (under intravenous propofol 1.7–2.0 mg/kg) were included. After informed consent, participants were asked to wear an actigraph (Cambridge Neurotechnology Ltd, UK) the week before and the week of the procedure. We assessed the rest-activity rhythms on 1/ the interdaily stability (IS), a measure of the strength of coupling the rest-activity rhythm to Zeitgebers (environmental time cues); high values representing a stable rhythm, 2/ the intradaily variability (IV) serves as a measure of fragmentation of the rhythm, a normal activity showing a low IV (2). Based on the fact that group differences for these variables have been previously reported using only 3 days of actigraphy, we choose to compare the same four consecutive days (6 P.M.–6P.M.) before and after anaesthesia.

**Results and Discussions:** Data obtained from the first set of 10 patients evidenced a main effect of anaesthesia (F(1,9) = 9.038; p = 0.015) on the rest-activity rhythm variables: 1/ a significant decrease of IS (F(1,9) = 5.68; p = 0.04) indicative of a lower coupling of the rest-activity rhythm to Zeitgebers and 2/ a significant increase of IV(F(1,9) = 5.78, p = 0.04), indicative of more fragmentation of the daily rhythm the days following anaesthesia.

**Conclusion(s):** Propofol anesthesia was associated with a disruption of the daily rest-activity rhythm in ambulatory patients; such a disruption might participate to postoperative fatigue and sleep disorders.

**References:**

**9AP3-4**

Remifentanil can prevent the withdrawal movements due to the intravenous injection of rocuronium.
B. Choi, K. Lee, S. Shin
Department of Anesthesiology and Pain Medicine, Yonsei University Medical College, Seoul, Republic of Korea

**Background and Goal of Study:** We investigated the effect of remifentanil pretreatment on the withdrawal movements during the intravenous (IV) injection of rocuronium during anesthesia induction (1,2,3).

**Materials and Methods:** Ninety adult females undergoing thyroidectomy were randomly allocated to three groups. Each patient received one of three solutions of 4 ml: saline (Group I, n = 30, control), remifentanil 0.5 μg/kg in saline (Group II, n = 30) or remifentanil 1 μg/kg in saline (Group III, n = 30), through a 20G IV cannula inserted into the forearm cephalic vein over 30 seconds. Thirty seconds after remifentanil injection, anesthesia was induced with IV thiopental 5 mg/kg. Twenty seconds after thiopental injection, IV rocuronium 0.6 mg/kg was administered at the injection rate of 0.5 ml/sec and patients’ withdrawal movements were assessed. Mean arterial pressures and heart rates before and during the anesthetic induction were measured to clarify the effect of remifentanil on the cardiovascular response following laryngoscopy and endotracheal intubation.

**Results and Discussions:** The incidence of withdrawal movements was significantly reduced in both of the remifentanil groups (3 and 0% in Group II and III, respectively) than in the control group (70%). Remifentanil in both
of the remifentanil groups attenuated the increase in heart rate and MAP immediately after and 1 minute after endotracheal intubation.

**Conclusion(s):** The pretreatment with remifentanil in both 0.5 and 1.0 μg/kg of bolus doses dramatically prevented the withdrawal movements caused by the rocuronium injection, and effectively blunted the cardiovascular activation following by laryngoscopy and endotracheal intubation.

**References:**

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**9AP3-5**

**The effects of two different doses of dexmedetomidine on extubation**

C. Turan, G. Turan, A. Ozgultekin, E. Dýncr, G. Yuskel
Il. Anesthesiology and Intensive Care Unit, Istanbul Haydarpapa Numune Teaching and Research Hospital, Istanbul, Turkey

**Background and Goal of study:** We studied the effects of dexmedetomidine with two different doses in extubation period, regarding hemodynamics and recovery characteristics in patients operated for intracranial lesions.

**Material and Methods:** Following the approval of hospital ethics committee, 45 patients aged 18–75, ASA I–III, who were undergoing intracranial surgery, were randomly selected and divided into three groups. 50 % O2-N2O and 1% isoflurane used for the maintenance. In Group I; isoflurane reduced to 0.5% and dexmedetomidine used 0.5 μg/kg 0.05 mcg*Kg^-1*min before induction of anaesthesia, which was performed with propofol and rocuronium. Muscle relaxation was achieved with rocuronium and tracheal intubation. Anaesthesia was maintained with infusions of propofol and remifentanil (0.5 mcg/Kg bolus followed by 0.1 mcg/Kg/min infusion). Mean arterial pressure (MAP), heart rate (HR) recorded at 1 min before and 1, 3, 5, 10, 15, 20, 30th min. after extubation. Isoflurane was stopped at the last stitch. Time to extubation and verbal responses were recorded. One-way ANOVA, Tukey HSD, paired t test and x² square test in the SPSS were used for statistical analysis.

**Results and Discussions:** MAP and HR were found significantly higher in gr III and II compared gr I. There were no significant differences in extubation times between groups. Verbal response time was significantly longer in gr II than gr II and III. (p < 0.01).

**Conclusion:** When Dexmedetomidine used 0.5 μg/kg 0.05 (in 1 min) before the extubation it is a suitable agent for optimal hemodynamic state and good recovery condition for intracranial operations.

**References:**

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**9AP3-6**

**Clonidine modifies the BIS response to tracheal intubation**

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**Background and Goal of Study:** Clonidine has been used as an adjunct to anaesthetics, because of its beneficial effects during and after anaesthesia, including sparing effect on propofol infusion guided with Bispectral Index (BIS) values. The aim of the study was to evaluate the effect of clonidine pre-treatment on BIS during induction of anaesthesia and tracheal intubation.

**Materials and Methods:** Forty patients, ASA I–II, aged 49 ± 17 years, scheduled for elective surgery under general anaesthesia, were randomly allocated in group CLO and PLA. Pre-treatment regime (clonidine 2 mcg*Kg^-1* in 5 ml or same volume of normal saline respectively) was administered 3 minutes before induction of anaesthesia, which was performed with propofol (2mg*Kg^-1*), rocuronium (0.9mg*Kg^-1*) and remifentanil (0.5mcg*Kg^-1* bolus, 0.05mcg*Kg^-1*min^-1* infusion). BIS values, along with heart rate, systolic and diastolic blood pressure, were recorded in 6 phases: before and after administration of clonidine or saline, after propofol, muscle relaxant and opioid administration and 1 and 3 minutes after tracheal intubation. All data were analyzed with 2-way ANOVA, and p < 0.05 was considered as level of significance.

**Results and Discussions:** Demographic data were similar between groups. Group CLO demonstrated lower cortisol levels (p < 0.01) with difference to be obvious after propofol administration but provides a lower level of BIS values after intubation.

**References:**

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**9AP3-7**

**Endocrine stress response modification by clonidine during laparoscopic cholecystectomy**

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**Background and Goal of Study:** One of anaesthesia aims is to suppress the stress response to surgery. This study tries to reveal and evaluate possible suppressive effect of clonidine on stress response because of pneumoperitoneum during laparoscopic procedures.

**Materials and Methods:** Twenty patients ASA I–II, aged 58 ± 15 years, scheduled for laparoscopic cholecystectomy were randomly allocated to receive intravenously either clonidine 2 μg/Kg in 5 ml volume (Group CLO, n = 10), or equal volume of normal saline as placebo (Group PLA, n = 10), 2 min prior to anaesthesia induction. In both groups general anaesthesia was induced with propofol (1.5 mcg/Kg bolus followed by 0.1 mcg/Kg/min infusion) and remifentanil (0.5 mcg/Kg bolus followed by 0.1 mcg/Kg/min infusion). Muscle relaxation was achieved with rocuronium and tracheal intubation was performed. Anaesthesia was maintained with infusions of propofol and remifentanil, as well as repeated bolus doses of rocuronium. Cortisol and blood glucose levels were estimated at 4 time points; prior to induction, 5 min after intubation, 5 min after pneumoperitoneum establishment and 5 min after the end of pneumoperitoneum. Blood pressure and Heart Rate were also recorded at the same time points. Two-way ANOVA followed by Bonferroni posthoc test were used to evaluate differences between groups.

**Results and Discussions:** Demographic data were similar between groups. Group CLO demonstrated lower cortisol levels (p < 0.01) with difference to be obvious after pneumo-peritoneum (p < 0.05), as well as after the end of pneumo-peritoneum (p < 0.05). There was no difference between groups at all time points in blood glucose concentration.

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The effects of different doses of remifentanil pretreatment on etomidate injection pain and myoclonus

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Background and Goal of Study: Etomidate is a hypnotic agent causing minimal histamine release and very stable hemodynamic profile. However, pain on injection and myoclonus are the most common side effects of this drug. The aim of this study is to compare the effect of different doses of remifentanil on preventing the injection pain and myoclonus after anesthesia induction with etomidate.

Materials and Methods: 120 adult patients, ASA I-II, scheduled for minor surgery procedures under general anesthesia, were randomly allocated into four groups. Patients received 1 μg kg⁻¹ remifentanil (group REM₁), 0.75 μg kg⁻¹ remifentanil (group REM₂), 0.5 μg kg⁻¹ remifentanil (group REM₃) and isotonic saline (group S) prior to administration of etomidate 0.3 mg kg⁻¹.

A study-blinded anesthesiologist asked patients to evaluate their pain during etomidate injection according to a 4 point scale (0 = no, 1 = mild, 2 = moderate, 3 = severe) and myoclonus was recorded with a 2 point scale (0 = no, 1 = present). Data were analysed using Chi-square test, with \( p < 0.05 \) considered statistically significant.

Results and Discussions: Data are shown in the table

<table>
<thead>
<tr>
<th>Myoclonus (n)</th>
<th>REM₁</th>
<th>REM₂</th>
<th>REM₃</th>
<th>S</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injection pain (n)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>40</td>
<td>36</td>
<td>27</td>
<td>21</td>
<td>0.00*</td>
</tr>
<tr>
<td>Mild</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

\( * p < 0.05 \)

When compared with the REM₃ and S groups, REM₁ and REM₂ showed less frequency and severity of pain (\( p < 0.05 \)). Injection pain was not observed in group REM; and there was no statistically different between groups REM₁ and REM₂ with regard to injection pain.

Conclusion(s): Lower isoflurane concentrations may have a good alternative to prevent myoclonus and pain injection due to etomidate.

Reference:

9AP4-1

Ultra-low dose of naloxone preserves morphine antinociceptive effect in PTX-treated rats: the role of glutamate transporter and glutamate metabolic enzyme

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Background and Goal Study: Morphine is less effective for treating neuropathic pains. Opioid antagonist naloxone, at ultra-low nanogram doses, enhances the analgesic effect of opioid agonists. Pertussis toxin (PTX) not only decreases the antinociceptive effect of opioid agonists, but also produces a thermal hyperalgesia. Studies have shown that glutamate transporters (GTs) play a critical role in the prevention of glutamate neurotoxicity under both physiological and pathological conditions. However, there is no study examined GTs expression by the PTX-treatment. Ultra-low dose of naloxone enhances morphine’s antinociceptive effect and reduces morphine’s side effects as well, the detail mechanisms, such as the involvement of GTs expression are examined.

Materials and Methods: Rats implanted two intrathecal (i.t.) catheter, with or without a microdialysis probe were used. PTX (1 μg) or saline was injected via the i.t. catheter to induce hyperalgesia. The antinociceptive effect of i.t. injection of saline, naloxone (15 μg, or 15 ng), and morphine (10 μg) were tested on day 4 after PTX or saline injection.

Results and Discussion: After PTX i.t. injection, a significant thermal hyperalgesia was observed with an increase in excitatory amino acids (EAAs) concentration in the spinal CSF dialysates. Naloxone, at 15 μg, had no effect on morphine’s antinociceptive effect but, at ultra-low dose, it enhanced the analgesic effect of morphine. Moreover, ultra-low dose of naloxone treatment suppressed the morphine-induced EAAs release and prevented the down-regulation of GTs in PTX-treated rats.

Conclusion: We suggest that the mechanism, at least in part, of ultra-low dose of naloxone on presenting morphine’s antinociceptive effect is via affecting the EAAs uptake and metabolism.

References:

9AP4-2

Potentiation of 5-HT₃AB receptors by small n-alcohols is caused by shifting the open-close equilibrium to the open state

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Background and Goal Study: 5-hydroxytryptamine type 3 (5-HT₃) receptors belong to the alcohol- and anaesthetic-sensitive family of Cys-loop ligand-gated ion channels. Potentiation of currents evoked by low concentrations of agonist and leftward shift of the agonist concentration response curve by small n-alcohols in 5-HT₃ receptors is subunit dependent. Receptor activation can be described using a linear model that consists of two steps: 1) the agonist binding step, and 2) the channel opening step. Partial agonists can be used as a tool to distinguish whether a modulator increases a receptor’s sensitivity to agonist by enhancing either agonist binding affinity or channel gating efficacy. The mechanisms of how n-alcohols potentiate 5-HT₃ receptors are unknown.

Materials and Methods: Currents from Xenopus oocytes expressing recombinant human 5-HT₃ receptor were recorded using the two-electrode voltage-clamp technique. The effects of several small n-alcohols (C₂–C₅) at 0.5, 1, 2, and 4 times their anesthetic concentration range on peak currents elicited by receptor-saturating concentrations (3 mM) of the partial agonist dopamine (DA) were studied. A Student's t-test was used to compare DA-evoked peak currents in the absence and presence of alcohols. \( p < 0.05 \) was considered statistically significant.

Results and Discussions: All alcohols potentiated (\( p < 0.01 \)) DA-evoked peak currents at the four concentrations studied (n = 5–10 cells per concentration in every alcohol), Enhancement of peak currents was alcohol concentration dependent in every alcohol. Potentiation of DA-evoked peak currents by equianesthetic concentrations of n-alcohols differed among the studied n-alcohols with enhancement being strongest in the following order: propenol > butanol > pentanol > ethanol.

Conclusion(s): Enhancement of the 5-HT₃ receptor function by small n-alcohols is caused by facilitating receptor gating without altering agonist action.
binding affinity. Moreover, the magnitude of potentiation of agonist evoked currents depends on the size of the n-alkanol.

References:

9AP4-3
Antinoceptive activity of vagabatin in chronic neuropathic pain in the rat
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Background and Goal of Study: The aim of study was to assess anti-alldynic and anti-hyperalgesic activity of vagabatin (VGB), and its effect on the duration of mechanical alldynia and thermal hyperalgesia in Seltzer model of chronic neuropathic pain in the rat. Materials and Methods: Experiments were performed on male Wistar rats, initially weighing 250–300 g. The experimental groups consisted of 14 animals at the beginning of experiment. VGB were administered intraperitoneally once a day at doses of 50, 100, and 200 mg/kg, starting from the second day after the operation, one hour prior to behavioral tests. Mechanical alldynia and thermal-hyperalgesia, were assessed every second day after surgery, with the use of von Frey filaments and hot plate test, respectively. Results and Discussion: Nerve injury resulted in exhibited foot withdrawal responses to von Frey hair and decreased latency to noxious thermal stimuli 2–16 days after surgery. The anti-alldynic activity of VGB was significant at 200 mg/kg, however, no effect on the duration of mechanical alldynia was observed. VGB at doses of 100 and 200 mg/kg significantly elevated the nociceptive thresholds in hot plate test. In no case, there was a complete reversal of thermal hyperalgesia in the VGB-treated group. Conclusion: VGB proved to be more efficient in relieving thermal hyperalgesia than mechanical alldynia in the Seltzer model of chronic neuropathic pain.

9AP4-4
Protective effect of nefopam on seizure activity in mice
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Background and Goal of Study: Nefopam is a centrally acting non-opioid analgesic with not completely understood mechanism of action. Adverse effects associated with therapeutic use and overdose of nefopam are mainly associated with central nervous system and include hallucinations, cerebral oedema and convulsions. To the best of our knowledge, no research was conducted on influence of nefopam on seizure activity nor possible interactions between nefopam and antiepileptic drugs. Therefore, the aim of this study was to assess the effect of nefopam administration on electrical threshold and its influence on protective activity of antiepileptic drugs in the maximal electroshock test in mice. Materials and Methods: Experiments were performed on male Swiss mice, weighing 20–25 g. The following antiepileptics were used: valproate, carbamazepine, phenobarbital, and phenytoine. The convulsive threshold was evaluated as CS50, which is the current strength (in mA), necessary to produce tonic hindlimb extension in 50% of the animals tested. In order to estimate the anticonvulsant ED50 values (50% effective anticonvulsant dose) of studied antiepileptics (given alone or in combination with nefopam) mice were pre-treated with different doses of the drugs and then challenged with maximal electroshock (25 mA).

Results and Discussion: Nefopam significantly elevated the electric seizure threshold at the dose of 5 mg/kg, whilst the dose of 1 mg/kg had no effect on seizure activity. The protective activity of studied antiepileptics were significantly enhanced by co-administration of nefopam at the dose of 5 mg/kg. Nefopam at the dose of 1 mg/kg had no effect on the protective activity of studied drugs.

Conclusion: Nefopam exerts anticonvulsive effect when given alone and potently enhances the protective activity of valproate, carbamazepine, phenobarbital, and phenytoine in the experimental seizure models in mice.

9AP4-6
Do parecoxib sodium and ketoprofen modulate the immune response and therapeutic outcome after abdominal hysterectomy
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Background and Goal: Surgery is associated with immune alterations, which are the combined result of tissue damage, anesthesia, postoperative pain and psychological stress (1). There are insufficient empirical data on the effects of postoperative pain management on immune function. Previous studies concluded that some NSAID (ketorolac, diclofenac) have immunomodulatory effect, affecting the therapeutic outcome (2); there is a lack of experience about the influence of COX-2 selective inhibitors on postoperative immune response. The aim of our study was to determine how the use of selective COX-2 inhibitor parecoxib sodium for postoperative analgesia after abdominal hysterectomy affected the immune response and to compare such modulation with the effect of ketoprofen.

Materials and Methods: Forty patients who underwent abdominal hysterectomy were randomly divided into two groups: one in which the postoperative pain was managed with opioid and IV parecoxib sodium, and in the other group – with opioid and IV ketoprofen. Blood samples were collected at three points: before surgery, 24 and 72 h postoperatively. Plasma was separated and frozen; the concentrations of cytokines were evaluated via enzyme-linked immunosorbent assays. Temperatures, some populations of T-lymphocytes (CD4, CD8, total CD3 and activated CD3) were measured. Postoperative pain was assessed by VAS; sedation – by Ramsay sedation score.

Results and Discussions: IL-6 concentrations increased, reaching peak levels at 24 h postoperatively and decreased to the initial levels at 72 h in both groups. At 24 h and 72 h, the IL-10 concentration was not significantly higher than before surgery in both groups. The pain intensity, sedation and side effects were similar in two groups of women.

Conclusion: Selective COX-2 inhibitor parecoxib sodium and traditional NSAID ketoprofen as components of postoperative analgesic strategy have demonstrated similar modulation of cytokine response. Parecoxib sodium may have beneficial effect on therapeutic outcome after abdominal hysterectomy.

References:

9AP4-7
Rekombinant NBA receptor signaling is influenced by intracellular injection of DAMGO
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Background and Goal of Study: DAMGO is a synthetic opioid peptide widely used as a selective μ opioid receptor agonist in pain research. Previous research on DAMGO effects on NBA receptor signaling yielded heterogenous results, describing inhibiting as well as potentiating effects (1). The goal of this study was to investigate these opposite effects and to generate dose-response curves as a first step towards clarification of the involved mechanisms.

Materials and Methods: After approval of the Animal and Use Committee human NR1A/NR2B (1:5 weight ratio) NMRAR subunits were recombinantly expressed in Xenopus laevis oocytes in the absence of opioid receptors. Cells were incubated in DAMGO (10–6 M) or injected with DAMGO 10–4 M (nc concentration - 10–8 M). After 10 minutes inward currents induced by glutamate (10–10–1 M) in the presence of the co-agonist glycine (10–3 M) were measured by 2-electrode voltage clamp and compared to control measurements of the same cells.

Results and Discussions: Our results show a non-competitive potentiation of glu/gly induced NMDAR currents after injection of DAMGO while extracellular incubation for 10 minutes lead to an inhibition resembling a competitive curve. (curve not shown).

Conclusion(s): The dose-response relationship suggests a non-competitive mechanism of intracellular potentiation. We hypothesize that PKC might be involved in this step (2). The apparent opioid receptor independence of this effect should be considered on DAMGO and NMDAR interaction in future.

References:
Background and Goal of Study: It has been recently shown that opioids cause endothelial cell (EC) proliferation and migration (EC-PM); two key components in tumor- associated angiogenesis. Further, methylaltrexone (MNTX), a peripheral mu opioid antagonist being developed for opioid-induced constipation in advanced illness and in phase 3 trials for postoperative ileus, has been shown to inhibit opioid-induced EC-PM by VEGF receptor transactivation. In that study, MNTX had effects beyond the receptor level, suggesting a possible potentiation of chemotherapeutic agents. Because many cancer patients receive combinations of drug treatments which include 5-fluorouracil (5-FU) and bevacizumab (B), we examined whether MNTX had a synergistic effect with these chemotherapeutic agents on angiogenic events.

Materials and Methods: Human pulmonary microvascular EC proliferation assay was performed as previously described. HPMEC (~1 x 10^4 cells/well) were plated in serum-free media containing various concentrations of 5-FU, MNTX or both (~1 nM to 100 nM). Adding 1 nM MNTX shifted the IC50 of 5-FU from ~5 to ~7 nM while adding 10 nM MNTX shifted the IC50 of 5-FU from ~5 nM to ~40 nM. Further, adding 50 nM MNTX shifted the IC50 of B on inhibition of EC migration from ~25 ng/ml to ~6 ng/ml while adding 100 nM MNTX shifted the IC50 of B from ~25 ng/ml to ~9 ng/ml. Unlike MNTX, naloxone did not exhibit synergy of 5-FU or B.

Conclusion(s): Taken together, these results indicate that in addition to blocking opioid-induced angiogenesis, MNTX is synergistic with 5-FU and B on EC-PM. Agents that reduce the therapeutic concentration of these drugs can have clinical utility by reducing cost and toxicity.

Reference(s):

9AP4-9

Cannabinoid 1 receptor antagonist reduces THC/propofol interaction

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Background and Goal of Study: Δ9-Tetrahydrocannabinol (THC) is an exogenous cannabinoid that acts as an agonist at both primary cannabinoid receptors (CB 1 and CB 2). It has been reported that THC reduces propofol induced sedation. The mechanism of this interaction however, remains unclear. Thus, we studied the interaction of propofol and THC in presence of a specific cannabinoid 1 receptor antagonist, AM 251 in a mouse model.

Materials and Methods: Twenty SV 129 male mice received an intraperitoneal injection of 75 mg/kg propofol, 50 mg/kg THC and 20 mg/kg AM 251 with permission and according to the state laws of animal safety. Propofol injection was defined as time point 0. THC was injected at ~15 min and AM 251 at ~25 min. Sedation was monitored with a rotating rod with 16 rpm. Mouse resting on rotating rod for 60 s was defined as no sedation.

Results and Discussion: Neither 50 mg/kg THC nor 20 mg/kg AM 251 alone exerted an effect on sedation. 75 mg/kg propofol induced sedation 1 min after injection and reached a maximum after 2.5 min with 17.1 s on the rotating rod. Thereafter depth of sedation decreased constantly and was no longer present after 25 min. The sedative effect of propofol was completely abolished in the presence of THC. Mice remained on the rotating rod for 60 s throughout the experiment. After injection of 20 mg/kg of the THC antagonist AM 251 in presence of THC, propofol sedation was reestablished from 1 min until 12.5 min post injection of propofol. Maximum sedation was reached after 2.5 until 7.5 min post injection with rotating rod times of 46.6 s and 45.4 s, respectively. Thereafter sedation decreased and was abolished after 15 min.

Conclusion: THC reduces propofol sedation as reported before. Administration of a CB 1 antagonist reestablished propofol sedation in presence of THC. The results of this study indicate that the interaction of THC and propofol is at least in part due to effects on the CB 1 receptor.

9AP5-1

Maturational pharmacokinetics of single intravenous bolus administration of propofol during childhood

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Background and Goal of Study: to describe maturational propofol pharmacokinetics following single intravenous bolus administration during childhood.

Materials and Methods: recently reported observations following intravenous bolus administration of propofol in neonates (n ~ 9) were combined with pharmacokinetic estimates in toddlers (n ~ 12) and young children (n ~ 10) (ref 1,2,3). Data were reported by median and range. Mann-Whitney U test or linear correlation was used to analyse pharmacokinetic findings.

Results and Discussions: Concentration-time profiles obtained were interpreted by two-stage analysis of the three compartment open model in 31 patients with a median weight of 11.2 kg (range 0.91–24 kg) and median postmenstrual age (PMA) of 108 (range 27–405) weeks. Median clearance (Cl) was 36.8 (range 3.7–78.1) ml/kg/min or 67.4 (range 2.04–135.8) ml/kg/10 min. Median apparent volume of distribution at steady state (Vss) was 7.6 (1.33–15.6) L/kg and median final serum elimination half life (t ½ EL) was 377 (range 27–1134) min. The median clearance was significantly lower in neonates compared to toddlers and older children (p < 0.01) and these differences remained significant after allometric scaling (ml/kg/10 min). A significant correlation between Vss and PMA (r = 0.61, 95 % CI 0.32–0.8, p < 0.004) was observed.

Conclusion(s): Propofol disposition is significantly different in neonates compared to toddlers and young children, reflecting both ontogeny and differences in body composition. Based on the reduced clearance of propofol, accumulation and longer recovery time are more likely to occur in neonates.

Reference(s):
can make errors to estimate central volume of distribution and clearance of propofol. The concentrations of plasma propofol would be affected by the differences between LBMe and actual lean body mass (LBMa).

Materials and Methods: 65 Korean women (age 42 ± 8 yrs) scheduled for low abdominal surgery received a combined TCI of propofol and remifentanil. Target concentration of plasma propofol was 3 µg/ml. Propofol plasma concentration, hemodynamic variables and bispectral index score (BIS) were determined at 60 minutes after induction. We calculated LBMe in according to Schnider model formula, checked LBMe with body composition analyzer (body 3.0. Biospace, Korea) and subtracted LBMa from LBMe (delta lean body mass; LBMd). Correlation analyses were taken between LBMd and each variable.

Results: LBMd showed positive correlation with plasma concentrations of propofol (Figure). There were no significant correlations between LBMd and blood pressure, heart rate, BIS, respectively. Mean plasma concentration of propofol (4.1 ± 1.08 µg/ml) was higher than target concentration (3 µg/ml).

Conclusions: Individual variances of body composition in patients with same sex, height and weight can affect the concentrations of plasma propofol using TCI. In addition, Schnider parameter set underestimates plasma concentration of propofol in Korean women.

9AP5-3
Pharmacokinetics of Rocuronium in patients with Duchenne muscular dystrophy
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Background and Goal of Study: In patients with Duchenne muscular dystrophy (DMD) time course of rocuronium (ROC)-induced neuromuscular block (NMB) has been found to be different from healthy subjects. The aim of this study was to clarify whether pharmacokinetics or pharmacodynamics are responsible for this different time course.

Materials and Methods: After approval of the local Ethics Committee and signed consent 6 boys with DMD (age: 15 ± 2 yrs, weight: 59 ± 10 kg) were studied. Following ROC 0.3 mg/kg NMB was measured according to a standard protocol at the adductor pollicis muscle using acceleromyography. Blood samples were drawn from an arterial line 2, 4, 7, 10, 15, 20, 30, 60, 90, 120 and 240 min after administration of ROC and analyzed by HPLC.

Results and Discussions: The measured concentrations of ROC could be described by a two-compartment model (table: mean ± SD and range, respectively).

<table>
<thead>
<tr>
<th></th>
<th>DMD</th>
<th>Healthy subjects Literature(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vc (ml/kg)</td>
<td>69 ± 20</td>
<td>39-77</td>
</tr>
<tr>
<td>Vss (ml/kg)</td>
<td>281 ± 82</td>
<td>207-292</td>
</tr>
<tr>
<td>CI (ml/min/kg)</td>
<td>3.7 ± 2.3</td>
<td>2.9-5.4</td>
</tr>
<tr>
<td>T1/2a (min)</td>
<td>3.6 ± 1.6</td>
<td>1.2-2.2</td>
</tr>
<tr>
<td>T1/2c (min)</td>
<td>84 ± 53</td>
<td>11.1-17.2</td>
</tr>
<tr>
<td>T1/2y (min)</td>
<td>61-94</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: The pharmacokinetics of ROC in DMD patients were in agreement with those described for healthy subjects. Therefore, in DMD patients the altered time course of NMB is most likely caused by different pharmacodynamics.

References:

9AP5-4
EEG Entropy Monitoring: pharmacokinetic and dynamic modelling
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Background and Goal of Study: The entropy module is an EEG based monitor for humans, that uses the Shannon entropy (Ent) [1] as an indicator of depth of anaesthesia (DOA). In this study Ent was applied to EEG collected in rats anesthetized to evaluate how it responds to variations in the propofol level, and model the drug effect on DOA.

Materials and Methods: Four male Wistar rats weighing 477 ± 11 g (mean ± SD) were used. The lateral tail vein was cannulated and anaesthesia was maintained with a propofol infusion (62.5 mg.kg\(^{-1}\) . h\(^{-1}\) ) for electrode implantation and endotracheal intubation. Raw EEG was recorded during different propofol infusions for each rat. The Ent algorithm was applied to the EEG records to obtain the entropy index [0-100]. Two and three-compartmental models merged with a Hill equation were used to translate the relation between the propofol infusions and Ent signal. Least squares was used to identify the model parameters and the relative mean square error was used to compare the performance of the models. [2].

Results and Discussions: Models adjusted well to Ent, but the 3-compartmental (Fig.1) model performed better in all rats. The 3-compartmental model for each rat was applied to other rat data, testing its prediction abilities. For each rat the best performance was obtained with its own adjusted model. The 3-compartmental model of rat 2 adjusted well to all other rats.

Conclusions: Ent is a good indicator of depth of anaesthesia in rats, responding adequately to changes in the hypnotic infusion rates. Models identified for one set of data can be used in data from other animals with reasonable performance.

Reference:

9AP5-5
Population pharmacokinetics and pharmacodynamics of short term etomidate infusion in healthy volunteers
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Background and Goal of Study: Etomidate is used as a fast-acting hypnotic to induce anesthesia in patients with a poor cardiovascular reserve. Bispectral index (BIS) has been suggested to be a measure of the depth of anesthesia and correlates well with the level of consciousness. This study examined the population pharmacokinetics (PK) and pharmacodynamics (PD) of etomidate during and after a brief infusion, aiming at predetermined clinical endpoints.

Materials and Methods: Eighteen middle aged adults, with ASA physical status I or II, scheduled for elective surgery, were included. Etomidate 2 mg/ml was administered at 25 ml/min until loss of consciousness (LOC). The patients...
were allowed to recover spontaneously until they regained consciousness, as determined by response to verbal command. BIS was recorded every minute and arterial blood samples were collected simultaneously. The plasma concentrations were measured with high performance liquid chromatography (HPLC). Nonlinear mixed effect modeling (NONMEM) was used for population PK and sigmoid Emmx for PK analysis.

Results and Discussions: The induction dose for LOC was 0.38 mg/kg. The time from beginning of drug infusion to LOC took approximately 3.5 minutes. The whole study took approximately 8.5 minutes from the start of drug infusion to the recovery of consciousness. BIS and etomidate plasma concentrations were 50 ± 15 and 1719.4 ± 458.8 mg/ml at LOC, and 75 ± 16 and 239.6 ± 104.5 mg/ml at recovery, respectively. PK parameters were t1/2 = 1.1 min, Vd = 1.9 min, τ = 106.5 min, τ0.5 = 0.36L/min, k0 = 0.009 L/min, V1 = 6.4L, Vp = 426 L, CI = 2.77 L/min. PDs were k0 = 0.40 L/min, EC50 = 1.0 μg/ml, E0 = 94, Emax = 94, and γ = 1.2. The performance error for etomidate concentration was 0.14 (0.2). A wide range of k e0 values has been reported for the Marsh PK model (100 to 3000 pump for effect-site TCI using the Marsh model. For each group, the pump was programmed with a different k e0 value (1.2, 0.8, 0.7, 0.6, 0.5 or 0.2 /min). The initial target concentration (C(t)) was 0.6 mcg/ml. This was increased in 0.2 mcg/ml increments each time the calculated concentration (C(t)CALC) had reached the target until a sedation score (OAA/S) of 3 was reached. The C(t) was then held constant for 15 min. If the k e0 was appropriate, the level of sedation should then have remained stable. An incorrect k e0 would lead to deepening or lightening sedation. Degree of sedation was assessed by measuring visual reaction time (VRT). The VRT after 15 min was used to classify the level of sedation as stable, deepening (> 23% increase in VRT), or lightening (> 25% decrease). These criteria were based on the changes in VRT which occurred when C(t)CALC was changed by 0.2 mcg/ml in a pilot study. The proportion of patients with deepening levels of sedation was noted for each group with ‘steady’ contributing 0.5 to a group score. Probit analysis was used to calculate the optimum k e0.

Materials and Methods: Six groups of ASA I and II patients were studied in sequence. Patients were sedated with propofol using a customised Graseby 3500 pump for effect-site TCI using the Marsh model. For each group, the induction dose for LOC was 0.38 mg/kg. The time from beginning of drug infusion to LOC took approximately 3.5 minutes. Each study group was assigned to a particular k e0. After induction, the pump was programmed with a different k e0 value (1.2, 0.8, 0.7, 0.6, 0.5 or 0.2 /min). The initial target concentration (C(t)) was 0.6 mcg/ml. This was increased in 0.2 mcg/ml increments each time the calculated concentration (C(t)CALC) had reached the target until a sedation score (OAA/S) of 3 was reached. The C(t) was then held constant for 15 min. If the k e0 was appropriate, the level of sedation should then have remained stable. An incorrect k e0 would lead to deepening or lightening sedation. Degree of sedation was assessed by measuring visual reaction time (VRT). The VRT after 15 min was used to classify the level of sedation as stable, deepening (> 23% increase in VRT), or lightening (> 25% decrease). These criteria were based on the changes in VRT which occurred when C(t)CALC was changed by 0.2 mcg/ml in a pilot study. The proportion of patients with deepening levels of sedation was noted for each group with ‘steady’ contributing 0.5 to a group score. Probit analysis was used to calculate the optimum k e0.

Results and Discussion: 64 patients (50, 34F) aged 41 ± 11 (21–65) (mean; SD; range) were studied. Inter-individual variation in k e0 was marked. In general, sedation deepened in more patients in the higher k e0 groups than in the lower k e0 groups. We calculated a median k e0 of 0.59/min (95% CI 0.36–0.78), p = 0.039.

Conclusion: Propofol infusion pumps incorporating the Marsh model should use a k e0 of approximately 0.8 min to allow most accurate effect-site TCI.

References:

9AP5-8
Ketamine Pharmacokinetics in Healthy Volunteers: Model Evaluation
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Background and Goal of Study: During 3 neuroimaging and behavioural studies the Domino model1 performed poorly when controlling a low-dose target controlled infusion (TCI) of ketamine2. We used the data acquired during these 3 studies to develop a new pharmacokinetic model for ketamine3. The purpose of the current study was to retrospectively evaluate the performance of this model in healthy volunteers who were administered ketamine (by TCI controlled by the Domino model) during a 4th study.

Materials and Methods: The 4th study comprised 49 observations from 11 individuals. Simulation was used to generate model predicted ketamine plasma concentrations for each individual using both our new model and the Domino model1. The median performance error (MDAPE) and the median absolute performance error (MDAPE) were calculated. Finally, a revised population PK model was developed using the data from all 4 studies (327 observations, 47 individuals).

Results and Discussion: Using our original model1, the MDEP for the 4th study was 20.5% and the MDAPE was 23.1%. Predictions based on the Domino model had a MDEP of –9.4% and a MDAPE of 31.6%. The PK analysis of the data from all 4 studies resulted in typical parameter values (Table) that were similar to our previous models2,3. However, unlike our previous model, weight was not a significant model covariate.

Conclusion(s): An MDPE (bias) of 20.5% indicates that the concentration predicted by our original model tended to be less than the measured concentration. Prospective clinical studies are required to further refine this model.

References:
2 http://sivaca.org/PreviousMeetings/Birmingham/Rigby-Jones.htm
9AP5-9
Loss of consciousness with intravenous induction of general anesthesia with remifentanil and propofol and its relationship with C-reactive protein
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Background and Goal of Study: Some published data suggested that inflammation and C-Reactive Protein (CRP) plasma concentration might be related with cognitive impairment after cardiac surgery. We hypothesized that anesthetic needs for loss of consciousness (LOC) are influenced by a pre-operative inflammatory state.

Materials and Methods: We studied 78 patients, 36 female, age between 21 and 81 years old, ASA I- IV, Glasgow Coma Score 14–15, submitted to brain and non-brain surgery. Anesthetic management for induction of general anesthesia was the same: using Rugloloop® software, anesthesia started with TCI of remifentanil with an effect-site target concentration of 2.5 ng/ml and a constant infusion of 1% propofol at 200 ml/h until LOC; for each patient, predicted effect-site concentration of propofol at LOC was registered. Pre-operative plasma concentrations of CRP was determined, but until LOC anesthesiologists in charge was blind for that value.

Quadratic regression was done to correlate pre-operative plasma concentrations of CRP and predicted effect-site concentration of propofol at LOC; p < 0.05 was considered significant.

Results: Pre-operative plasma concentration of CRP and predicted effect-site concentration of propofol at LOC showed an inverse correlation (r = 0.79, p < 0.01) (Figure 1). Similar correlations were found when patients were divided into brain surgery group (r = 0.64, p < 0.01) and non-brain surgery group (r = 0.86, p < 0.01).

Conclusion(s): Assuming that brain is an important target of inflammation, general anesthesia mechanisms that cause loss of consciousness might be changed if an inflammatory state co-exists. To our knowledge, our data are the first to show that inflammation decreases propofol needs for LOC.

References:
1. Anesth Analg 2006; 103: 177-86.

9AP5-10
The use of remifentanil changes the propofol requirements for loss of consciousness and correlation with patient baseline heart rate
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Background and Goal of Study: We observed that baseline heart rate (HR) had a high correlation with the propofol (Prop) effect-site concentration (Ce) required for loss of consciousness (LOC) [1], when using Prop alone. In this study, we investigate if this correlation holds when remifentanil (Remi) is also used in induction.

Materials and Methods: Data from 66 neurosurgical cases collected until LOC (Rugloop® every 5s from Datex AS5, Aspect XP); TCI: Schindler[2] for Prop; Minto[3] for Remi. 2 groups of 33 patients (ASA 1–3); Group 1: induction with Prop at 200 ml/h until LOC. Group 2: induction with Remi TCI target Ce = 2.5 ng/ml; when Remi target was reached, Prop started at 200 ml/h until LOC. Patients with interfering pathologies were excluded. Statistics used correlation analysis and t-test (data mean ± SD).

Results and Discussion: G1: 50 ± 14 years, 49 ± 10 kg (BMI), 20 female. G2: 52 ± 18 years, 51 ± 8 kg (BMI), 15 female. No statistical difference for age and BMI.

Table 1

<table>
<thead>
<tr>
<th>Group</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Awake</td>
<td>At LOC</td>
</tr>
<tr>
<td>Prop Ce μg/ml</td>
<td>0</td>
<td>5 ± 0.9</td>
</tr>
<tr>
<td>Rem Ce ng/ml</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SAP mmHg</td>
<td>140 ± 17</td>
<td>125 ± 20</td>
</tr>
<tr>
<td>HR bpm</td>
<td>72 ± 12</td>
<td>70 ± 12</td>
</tr>
<tr>
<td>BIS</td>
<td>97.4 ± 59</td>
<td>53.5 ± 16</td>
</tr>
</tbody>
</table>

Conclusion(s): Start of Prop until LOC: 3.4 ± 0.8 min (G1); 2.5 ± 0.8 min (G2). In G1 Prop Ce at LOC correlated to awake HR (R = 0.61, P = 0.0002). In G2 Prop Ce at LOC correlated with awake SAP (R = 0.51, P = 0.002). SAP before Prop (R = 0.37, P = 0.03), and BIS before Prop (R = 0.46, P = 0.007) increased before induction of anesthesia. By using calcium imaging with the calcium sensitive probe Fura 2, calcium homeostasis in response to propofol was measured. The propofol concentrations tested were 1, 3, 10, 30, 100, 300, 1000, 3000, and 5000 μM.

Results and Discussion: The intracellular calcium concentration did not increase when propofol concentrations were within 1 to 30 μM, while it increased when propofol exceeded over 100 μM. The half-maximal activation concentrations (EC50) were 181.1 μM and 420.5 μM in R2508C and L4838V mutations, respectively. Because serum-protein combination rate are between 97 and 98%, free concentrations are assumed to be approximately 1 μM.

Conclusion(s): The rise in calcium concentration in response to propofol dosage was limited with doses up to 100-fold greater than those used in clinical settings. We concluded that propofol is safe in MHS patients for clinical use.

References:

9AP6-1
Propofol-induced changes of myoplasmic calcium concentration in cultured human skeletal muscles from RYR1 mutation carriers
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Background and Goal of Study: Malignant hyperthermia (MH) is a pharmacokinetor disorder during general anesthesia. We investigated whether propofol triggers MH by changing calcium homeostasis using human cultured myotubes isolated from the patients harboring the native RYR1, R2508C and L4838V mutations linked to MH(1).

Materials and Methods: Muscle specimens were obtained from the patients for diagnosing MH disposition. By using calcium imaging with the calcium sensitive probe Fura 2, calcium homeostasis in response to propofol was measured. The propofol concentrations tested were 1, 3, 10, 30, 100, 300, 1000, 3000, and 5000 μM.

Results and Discussion: The intracellular calcium concentration did not increase when propofol concentrations were within 1 to 30 μM, while it increased when propofol exceeded over 100 μM. The half-maximal activation concentrations (EC50) were 181.1 μM and 420.5 μM in R2508C and L4838V mutations, respectively. Because serum-protein combination rate are between 97 and 98%, free concentrations are assumed to be approximately 1 μM.

Conclusion(s): The rise in calcium concentration in response to propofol dosage was limited with doses up to 100-fold greater than those used in clinical settings. We concluded that propofol is safe in MHS patients for clinical use.

References:

9AP6-2
Comparative study of granisetron alone and in combination with droperidol and dexamethasone for prevention of postoperative nausea and vomiting in laparoscopic bariatric surgery
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Background and Goal of Study: Laparoscopic bariatric surgeries are associated with an appreciably high incidence of postoperative nausea and vomiting (PONV). The study was designed to compare the effectiveness of granisetron alone and in combination with droperidol or dexamethasone for the prevention of post operative nausea and vomiting in patients undergoing laparoscopic bariatric surgeries.

Materials and Methods: After obtaining approval from the Hospital Ethics Committee and patients’ informed consent, a randomized, double-blind, placebo-controlled trial was designed. 120 patients, aged between 18–44 years, ASA class II and III were randomly assigned into 4 equal groups to receive either granisetron 1 mg, granisetron 1 mg plus droperidol 1.25 mg, granisetron 1 mg plus dexamethasone 8 mg or Placebo (saline), intravenously immediately before induction of anesthesia. Perioperative anesthetic care was standardized in all patients. Patients were then observed for 24 hours after administration of the study drugs.
9AP6-3
A comparative study of haloperidol or dexamethasone plus ondansetron as prophylactic antiemetic therapy in patients at high risk of postoperative nausea and vomiting
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Background and Goal of Study: The combination of antidepressive drugs could be a solution to prevent severe postoperative nausea and vomiting (PONV). Haloperidol has been used in the treatment of chemotherapy-, radiotherapy-, and opioid-related nausea and vomiting. We compared the prophylactic antiemetic efficacy of combining ondansetron with haloperidol or dexamethasone for patients at high risk of PONV.

Materials and Methods: A total of 88 non-smoking female patients with a history of PONV or motion sickness were included in this prospective, randomized, double-blinded study. Group H + O received haloperidol 2 mg and Group D + O received dexamethasone 8 mg during induction of anaesthesia. All patients received ondansetron 4 mg before the end of anaesthesia. The table shows the incidences of PONV (0–24 h) were compared to the predicted incidences in these patient groups if no prophylactic antiemetic was given. The efficacy results are shown in the table.

Results and Discussions: Population characteristics were similar between groups. Efficacy results are shown in the table.

<table>
<thead>
<tr>
<th>Group</th>
<th>Incidence of PONV</th>
<th>H + O</th>
<th>D + O</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual incidence</td>
<td>9 (20%)</td>
<td>14 (33%)</td>
<td>0.180</td>
<td></td>
</tr>
<tr>
<td>Predicted incidence</td>
<td>34 (76%)</td>
<td>32 (74%)</td>
<td>0.262</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion(s): Haloperidol 2 mg combined with ondansetron 4 mg is effective in preventing PONV and its efficacy is comparable to dexamethasone 8 mg plus ondansetron 4 mg.

References:

9AP6-4
A prospective randomised trial to determine if inhalational anaesthetics have any effects on hearing function
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Anaesthesiology and Reanimation, Kırıkale University School of Medicine, Kırıkale, Turkey
Background and Goals: Although uncommon, general anaesthesia is known to impair the hearing status in humans (1, 2). The purpose of this study was to investigate and compare the effects of inhalational anaesthetics (sevoflurane and isoflurane) on hearing function by using objective audiometric tests.

Patients and Methods: A prospective series of 53 adult patients (ASA I-II) scheduled for sinusonal surgery under intratracheal general anaesthesia were enrolled in the study. An exclusion criterion was history of hearing problems. Patients were premedicated intramuscularly with diazepam. Propofol (2 mg/kg) was given intravenously (iv) for induction. After endotracheal intubation with vecuronium iv (1 mg/kg), sevoflurane 2% in group 1 (n = 27) and isoflurane 1.2% in group 2 (n = 26) were used to maintain general anaesthesia. All patients received nitrous oxide during maintenance. Hearing function of the patients was measured before anaesthesia and 24 hours after surgery by means of pure tone audiometry, high frequency pure tone audiometry and transient evoked otoacoustic emissions (TEOAE) by the same clinician. The data of hearing levels obtained from the left and right ears for each frequency were used for statistical analysis.

Results: There was no statistically significant difference in demographic data, haemodynamic and respiratory parameters between the groups. Although we observed a decrease at low frequencies (250, 500 Hz) in patients receiving isoflurane, when they were assessed before and after surgery, this decrease was not found to be statistically significant (p > 0.05). In addition, no statistically significant differences in hearing levels were detected between the groups (Mann Whitney – U test, p > 0.05).

Conclusions: It was audiometrically demonstrated that general anaesthesia did not affect the hearing function in any of the patients undergoing sinonasal surgery. These findings encourage the use of sevoflurane and isoflurane as a safe agent without any ototoxic effects in general anaesthesia related to otolaryngologic surgery.

References:

9AP6-5
A low-level occupational exposure to sevoflurane is associated with genotoxicity in the sister chromatid exchange but not in the micronucleus assay
G. Wiesner, F. Schiewe-Langgartner, R. Lindner, M. Gruber
Department of Anaesthesiology, German Heart Centre, Munich, Germany
Background and Goal: The genotoxicity of the occupational exposure to inhaled, especially volatile anaesthetics, is still debated. This is the first study assessing genotoxic effects measured by sister chromatid exchanges (SCE) and micronuclei (MN) in anaesthetists exposed to low levels of sevoflurane without nitrous oxide.

Materials and Methods: Fourteen anaesthetists were a diffusion sampler to measure concentrations of sevoflurane for one working week. At the end of the working week blood samples were obtained from the anaesthetists and 14 internists (non-exposed controls) to determine SCE and MN in lymphocyte cultures. Confounding factors such as age, sex and smoking habits were assessed by questionnaires. Normally distributed data (age and SCE) were compared by t-tests, MN (not normally distributed) by Mann-Whitney U-test and ordinal data (sex, smoking habits) by Chi square analysis.

Results: Table. Data is presented as median [range] and mean ± SD. * P < 0.05 vs Internists

<table>
<thead>
<tr>
<th>Anaesthetists</th>
<th>Internists</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sevoflurane (ppm)</td>
<td>0.2 (0.1–2.2)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>32 ± 5</td>
</tr>
<tr>
<td>Sex (male/female)</td>
<td>8/6</td>
</tr>
<tr>
<td>Smoker (yes/no)</td>
<td>4/10</td>
</tr>
<tr>
<td>SCE/cell</td>
<td>6.6 ± 0.9*</td>
</tr>
</tbody>
</table>

Conclusions: A low-level exposure to sevoflurane (NIOSH threshold value: 2 ppm) was associated with an increased formation of SCE but not of MN. These results are comparable to former studies with a low-level exposure to isoflurane and nitrous oxide (1,2). However, discussing the impact of genotoxic effects has to be taken into account that SCE are of the limited value for health risk assessment (3).

References:
3 Tucker JD, Preston RJ. Mutat Res 1996; 365: 147–158.

9AP6-6
Effects of ondansetron and acupuncture on postoperative nausea and vomiting
A. Cardone, P. Aceto, E. Congedo, E. Chinè, G. De Cosmo
Anaesthesiology and Intensive Care, Catholic University of Sacred Heart, Rome, Italy
Background and Goal of Study: The authors investigated the efficacy of ondansetron and acupuncture in preventing postoperative nausea and vomiting (PONV) in this randomized and observer blind study.

Materials and Methods: After obtaining informed consent, 80 female patients, aged 18–70 years, ASA I-II, undergoing laparoscopic colecistectomy, were enrolled. General anaesthesia was standardized. Patients were randomly assigned to four groups: placebo (A group); 4 mg of i.v. ondansetron (B group); 4 mg of i.v. ondansetron plus acupuncture at the point P6 (C group); acupuncture at the point P6 (D group). All PONV prevention treatments were administered before surgical incision. Evaluation of PONV was performed with the VRS (verbal rating scale) ranging from 0 – no nausea and 3 – the worst imaginable nausea. Every hour for the first 4 hours and every four hours up to 24 hour. Logistic regression analysis was used to evaluate individual variables influence in determining PONV incidence. The independent variables considered were: treatment for PONV preventing (group) for univariate analysis; smoking, PONV history, anaesthesia duration for multivariate analysis.
Results: Univariate analysis; probability to suffer from nausea was 7.5–12 times greater for patients of group A than those of group B and 16.4–20 times larger than those of group C (respectively at first-second hour) (p < 0.01). Multivariate analysis; probability to find nausea was 17.8–25.6 times larger in A group than C group (at first-second hour) and 18.5 times greater than B group at the second hour (p < 0.01). Vomiting did not show significantly results. 

Conclusions: Acupuncture plus ondansetron was the best treatment to prevent nausea. Ondantracen alone prevented nausea while acupuncture alone was not efficacy as antiemetic procedure.

Reference:

9AP6-7

Propofol anesthesia modifies corticosterone secretion differently according to the circadian time

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Background and Goal of Study: Because of potential chronobiological properties of propofol (effect on biological clock) (1), we examined the effects in rats of a short duration propofol anaesthesia on corticosterone, the major glucocorticoid.

Materials and Methods: Forty male Wistar rats were synchronized under a LD 12:12 cycle (12 h light, 12 h dark) during 4 weeks. One group was injected in the middle of the rest phase (CT6), another one was injected 2 hours before the beginning of the activity phase (CT10) and the third group was injected in the middle of the activity phase (CT16). On day 29, rats received either propofol injection (120 mg/kg) or intralipids and they were sacrificed by decapitation one hour after drug administration. Trunk blood was collected and centrifugated; serum was then separated and kept at −30°C until corticosterone assayed by using 125I RIA kits (MP Biomedicals, NY, USA).

Results and Discussions: Propofol induced a significant increase in corticosterone secretion and disturbed its circadian rhythm. Propofol resulted in an increase of 108% (Student test, p < 0.05), 61% (p < 0.03) and 157% (p < 0.008) of corticosterone in CT6, CT10 and CT16 groups respectively (see figure).

Conclusion(s): Propofol anesthesia seems induce a desynchronization of corticosterone circadian rhythm by abolishing its morning peak and also increasing the total amount of corticosterone secretion, in rats.

Reference:

9AP6-8

Multimodal analgesia after laparoscopic cholecystectomy

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Background and Goal of Study: Multimodal analgesia is an important prerequisite for accelerated recovery after elective surgery. Our study goal was to investigate the effects of locally injected 0.25% ropivacaine (R) on post-operative pain after elective laparoscopic cholecystectomy.

Materials and Methods: After Hospital Ethics Committee approval, 60 adult patients scheduled for laparoscopic cholecystectomy performed by the same surgeon were enrolled in a prospective, randomized, double-blind, placebo-controlled study over a period of 6 months (Jan–June 2006).

All patients received the same general anesthesia protocol and 1 g iv paracetamol was infused after induction of anesthesia for postoperative analgesia, repeated each 6 hs postoperatively, up to 4 g/24 hs. Tramadol 50 mg iv bolus was used as rescue analgesic. After anesthesia induction, patients were randomized in 4 groups (n = 15 pts, each): group A (20 ml preincisional saline infiltration at the abdominal wall and 20 ml R 0.25% intraperitoneal instillation), group B (20 ml R 0.25% preincisional infiltration and 20 ml saline intraperitoneal instillation), group C (A + B) and group P (placebo, both sites saline infiltration). Primary endpoints were VAS at movement at 0, 2, 6, 12 and 24 postoperative hrs (0–10 cm), rescue analgesic requirements, PONV and length of hospital stay. Statistics: chi-square, one-way ANOVA (SPSS 13.0).

Results and Discussions: We found no differences in demographics, length of surgery and of hospital stay (total: 3.38 ± 0.22 days). VAS was significantly lower at all intervals in group C versus P and at 0, 6 and 12 hrs in group C versus both groups A and B (p < 0.05). Tramadol boluses required were significantly fewer in group C versus P (0.73 ± 1.10 vs 1.93 ± 1.03, p = 0.017) and also the incidence of PONV (1 pt in group C vs 7 pts in group P p = 0.01).

Conclusion(s): Ropivacaine 0.25% shows significant favorable effects on postoperative pain after laparoscopic cholecystectomy only when using combined preincisional local infiltration and intraperitoneal instillation.

Reference:

9AP6-9

Safety of metoclopramide in PONV prophylaxis using doses higher than 10 mg intraoperatively

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Background and Goal of Study: Doses of 25 and 50 mg metoclopramide (MCP) in combination with 8 mg dexamethasone (DEX) are effective in prophylaxis of postoperative nausea and/or vomiting (PONV; [1]). Safety and a fair trade-off of avoidance of PONV against adverse effects needs to be highlighted [2].

Materials and Methods: We reanalyzed the data of 3140 patients participating in a multi-centre study on PONV [1] and receiving randomized 0, 10, 25 or 50 mg MCP with special consideration of MCP-related immediate and delayed adverse events (AE). The case report forms contained fields of 18 expected AE and one free text item each for intraoperative and postoperative suspected AE. We performed a trend test using Kendall’s Tau (for event rate increasing with dose) and Fisher’s exact test (for increased event rate of any dose). Stepwise multiple regression analysis was used to identify predictors of AE.

Results and Discussions: Only hypotension and tachycardia following study drug administration were clearly related to MCP and increasing dose. The incidence (95%-Confidence Interval) of either of these events were 8.8% (6.8–10.8), 11.2% (9.0–13.4), 12.9% (10.5–15.3), and 17.3% (15.2–20.6) for 0, 10, 25, and 50 mg MCP. These AE were more frequent in patients older than 50 years, but obesity seemed to be protective. MCP was also associated with movement disorders (MCP-MD): number needed to harm (NNH) = 147 for any dose (78–∞) and 112 (60–1111) for 25 or 50 mg, impaired taste and smell: NNH = 167 (93–5000), and hot flushes: NNH = 182 (106–345). Duration of MCP-MD was predominantly < 1 hour with subjective impairment of 4.7 (range 2–7). MCP-MD was associated with age < 30 years. Gender, opioids, type of volatile anesthetic, and diabetes have no influence of MCP-MD. 3 definite and 3 suspected movement disorders occurred in the control group receiving only 8 mg DEX.

Conclusion(s): Because of short-lasting and mostly self-limiting immediate AE and only occasionally occurring MCP-MD a single dose of 25 or 50 mg MCP given intraoperatively can be recommended even under aspects of safety. These results cannot be transferred to pediatric anesthesia or awake patients.

References:

9AP7-1

The efficacy of sugammadex in subjects with impaired renal function

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Background and Goal of Study: Sugammadex is a modified gamma-cyclodextrin that has been designed to encapsulate the neuromuscular
blocking agent rocuronium bromide, thereby reversing neuromuscular blockade.\(^1\) As the complex of sugammadex and rocuronium is cleared by the kidneys\(^2\), we studied the efficacy and safety of sugammadex in reversing the effect of rocuronium in patients with renal failure.

**Materials and Methods:** Following Ethics Committee approval, 16 female and 14 male patients (29–81 years) consented to participate in a multicentre, parallel-group, comparative trial. Fifteen ASA II–III patients had impaired renal function (creatinine clearance \(\text{CrCl} \leq 30 \text{ ml/min}\)) and 15 ASA II–II patients had normal renal function (\(\text{CrCl} > 80 \text{ ml/min}\)). Patients were anaesthetized with propofol and opiates. Rocuronium 0.6 mg kg\(^{-1}\) was given prior to intubation. Neuromuscular monitoring was performed using train-of-four (TOF) nerve stimulation and acceleromyography (TOF-Watch\(^\text{®}\) SX). A single dose of sugammadex 2.0 mg kg\(^{-1}\) was given at reappearance of \(T_2\). The primary efficacy variable was time from administration of sugammadex to recovery of \(T_4/T_1\), to 0.9. Clinical signs of re-embarrasses were monitored for 48 hours postoperatively. Safety was assessed 2–4 weeks postoperatively.

**Results and Discussions:** Mean (SD) \(\text{CrCl}\) was 12 (5) ml min\(^{-1}\) in renally-impaired patients and 103 (24) ml min\(^{-1}\) in controls. The mean (SD) time from start of administration of sugammadex 2.0 mg kg\(^{-1}\) to recovery of \(T_4/T_1\) to 0.9 was 2.0 (0.7) min in renally-impaired patients and 1.7 (0.6) min in controls. No signs of re-embarrassment were observed in patients with renal impairment. No sugammadex-related serious adverse events were reported.

**Conclusion(s):** Sugammadex 2.0 mg kg\(^{-1}\) is well tolerated, and causes rapid and complete recovery from rocuronium-induced blockade in patients with normal or impaired renal function. Further studies of sugammadex in renal failure patients are indicated.

**References:**


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**9AP7-2**

**Sugammadex after rocuronium provides faster recovery from neuromuscular blockade than neostigmine after cisatracurium**

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**Background and Goal of Study:** The use of anticholinesterase inhibitors such as neostigmine for reversal of neuromuscular blockade accelerates recovery but can be relatively slow and be associated with muscarinic side-effects. Sugammadex, a modified \(\gamma\)-cyclodextrin, rapidly reverses the effects of the aminosteroidal neuromuscular blocking agent rocuronium by encapsulation (1). The aim of this study was to assess reversal with sugammadex after rocuronium compared with neostigmine-glycopyrrolate after cisatracurium.

**Materials and Methods:** Eighty-four ASA I–III adult patients were anaesthetized with propofol and opioids and randomised to receive rocuronium 0.6 mg kg\(^{-1}\) or cisatracurium 0.15 mg kg\(^{-1}\) with a maximum of two maintenance doses if required. Neuromuscular blockade was monitored using a TOF-Watch\(^\text{®}\) SX. Sugammadex 2.0 mg kg\(^{-1}\) or neostigmine 50 \(\mu\)g kg\(^{-1}\) (with glycopyrrolate 10 \(\mu\)g kg\(^{-1}\)) was administered to the rocuronium and cisatracurium groups respectively at reappearance of \(T_2\) after the last dose of NMBA. Times to onset of blockade after the NMBA and for recovery of \(T_4/T_1\) to 0.9 after reversal were recorded. All subjects were monitored for adverse events and any clinical evidence of recurarization.

**Results and Discussions:** Mean time (sec [SD]) to onset of neuromuscular blockade was significantly faster with rocuronium (91 [33] vs 171 [46]; p < 0.0001). The time to \(T_4/T_1\), ratio of 0.9 in the intent-to-treat population was significantly shorter in the rocuronium/sugammadex patients (Table). There were no serious adverse events or any evidence of recurarization in either group.

**Conclusion(s):** Rocuronium is a faster acting NMBA than cisatracurium. Its reversal with sugammadex is 4 times faster than cisatracurium with neostigmine.

**Reference:**


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**9AP7-3**

**Sugammadex achieves fast recovery from profound neuromuscular blockade induced by rocuronium or vecuronium: a dose-response study**

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**Background and Goal of Study:** Sugammadex is the first selective relaxant binding agent to prevent steroidal neuromuscular blocking agents from acting on their receptors. This study assessed the effect of different doses of sugammadex given after profound neuromuscular blockade (NMB) induced by rocuronium or vecuronium.

**Materials and Methods:** After written informed consent, 102 patients (age 21–64 yr, ASA class 1–3) undergoing general anesthesia with sevoflurane for maintenance were randomised to receive either rocuronium (0.9 mg/kg bolus and repeated doses of 0.1–0.2 mg/kg) or vecuronium (0.1 mg/kg bolus and repeated doses of 0.02–0.03 mg/kg). NMB was monitored by accelerometry (TOF-Watch\(^\text{®}\) SX). Sugammadex (0.5 to 8.0 mg/kg) was administered after the last dose of muscle relaxant, at 1–2 PTCs. The time from sugammadex administration to recovery of the T4/T1 ratio to 0.9 was recorded. Dose response was analysed using weighted nonlinear regression. All patients were monitored for residual curarization, recurarization, and adverse events.

**Results and Discussion:** A statistically significant dose-response relationship was found between the dose of sugammadex and recovery time (table, per protocol population).

<table>
<thead>
<tr>
<th>Sugammadex Dose (mg/kg)</th>
<th>Mean (SD) time to T4/T1 ratio to 0.9 (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>rocuronium</td>
</tr>
<tr>
<td>0.5</td>
<td>(n = 8) 7.98 (3.0)</td>
</tr>
<tr>
<td>1.0</td>
<td>(n = 8) 28.0 (4.3)</td>
</tr>
<tr>
<td>2.0</td>
<td>(n = 10) 3.2 (1.5)</td>
</tr>
<tr>
<td>4.0</td>
<td>(n = 10) 1.6 (0.7)</td>
</tr>
<tr>
<td>8.0</td>
<td>(n = 10) 1.1 (0.3)</td>
</tr>
</tbody>
</table>

A subsequent decrease of T4/T1 from > 0.9 to < 0.8 (indication for recurarization) was observed in four patients after the low dosages of sugammadex 0.5 and 1 mg/kg. Serious adverse events were reported for four patients, but none was considered related to sugammadex.

**Conclusion(s):** Sugammadex safely decreased recovery time from profound NMB by rocuronium or vecuronium in a dose-dependent manner.

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**9AP7-4**

The effect of preoperative consumption of potatoes on succinylcholine-induced paralysis and recovery from anesthesia

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**Background and Goal of Study:** Potatoes contain solanaceous glycoalkaloids (SGAs), which inhibit both butyrylcholinesterase (BuChE) and acetylcholinesterase (ACHE). Potatoes also contain a series of benzodiazepines. The aim of our study was to investigate the effect of preoperative consumption of potatoes on succinylcholine-induced paralysis and recovery from anesthesia.

**Materials and Methods:** After the approval of ethic committee of Faculty, forty-four ASA I–II, adult patients, scheduled for elective surgery, were included in a randomized, and controlled study. Patients were randomly divided into two groups. Patients in Group P (n = 21) were eaten a standard portion of potatoes in the last meal prior to fasting while patients in Group C were eaten with food not containing SGAs. Patients were premedicated with midazolam (0.05 mg/kg, iv), anesthesia was induced with thiopental (5 mg kg\(^{-1}\)) and fentanyl (2 \(\mu\)g kg\(^{-1}\), and maintained with 2.5% sevoflurane in 50% \(\text{O}_2/\text{air}\) and fentanyl as needed. Succinylcholine 1 mg kg\(^{-1}\) was administered to facilitate endotracheal intubation. Duration of succinylcholine blockade and recovery time from anesthesia were measured. Serum BuChE levels were also measured at before and four time points within 24 h post-consumption start.

**Results and Discussions:** Duration of succinylcholine-induced paralysis and recovery time from anesthesia was significantly longer in Group P than in Group C (p < 0.05). In Group P, Serum BuChE levels decreased at 6 h from consumption start. In addition, in both groups, BuChE levels markedly decreased immediately after succinylcholine blockade, thereafter increased, but did not return to baseline within 24 h from consumption start. None of these differences observed in BuChE levels was statistically significant.
Conclusion(s): This study suggests that potatoes eaten before surgery can slow down the metabolism of succinylcholine and delay recovery from anaesthesia.

**9AP7-5**

Reversal of rocuronium-induced neuromuscular blockade with sugammadex in paediatric and adult patients

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Background and Goal of Study: Sugammadex is a modified γ-cyclodextrin that reverses rocuronium-induced neuromuscular blockade (NMBA) in adults in a dose-dependent manner (1). This study explored the effects of sugammadex on reversal of rocuronium-induced NMBA in paediatric and adult patients.

Materials and Methods: Eight infants (INF, 28 days–23 months), 24 children (CHI, 2–11 years), 31 adolescents (ADO, 12–17 years) and 28 adults (ADU, 18–65 years) were enrolled in the study. Patients older than 65 years were classified as elderly (n=5) and patients 18–65 years (n=23) were classified as young adults. ASA class II (n=10) and ASA class I (n=10) were anaesthetised with propofol and opioids or caudal analgesia (INF) and received rocuronium 0.6 mg/kg. NMBA was monitored using TOF-WatchSX. Patients were randomised to sugammadex 0.5, 1.0, 2.0 or 4.0 mg/kg or placebo at reappearance of T₁₂. Time from sugammadex/placebo to recovery of T₁₂/T₀ ratio to 0.9 was recorded. Safety was assessed by recording vital signs, ECGs, laboratory data and adverse events.

Results and Discussions: The recovery time decreased in a dose-related manner in all age groups (per-protocol population) (not formally shown for infants due to the low numbers), see Table. Sugammadex was well tolerated with no recurrence of NMBA. Serious adverse events in 1 infant and 1 child were not considered related to sugammadex.

| Mediun (range) time to T₁₂/T₀ ratio of 0.9 (min) |
|-----------------|-----------------|
| Placebo        | Sugammadex (mg/kg) |
|                | 0.5             | 1.0           | 2.0           | 4.0           |
| INF            | 21.0            | 3.7            | 2.4            | 0.6            | 0.7            |
| (13.0–29.0)    | (3.3–4.2)       | (1.9–2.9)      |                |                |
| (n = 2)        | (n = 2)         | (n = 1)        | (n = 1)        |                |
| CHI            | 19.0            | 3.7            | 2.7            | 1.2            | 0.6            |
| (8.4–31.8)     | (2.4–10.9)      | (1.9–9.6)      | (0.9–1.6)      | 0.6–4.4        |
| (n = 4)        | (n = 5)         | (n = 4)        | (n = 4)        |                |
| ADI            | 23.4            | 4.6            | 1.7            | 1.1            | 1.1            |
| (6.8–41.7)     | (1.9–43.5)      | (1.5–2.5)      | (0.7–5.2)      | (0.7–1.4)      |
| (n = 5)        | (n = 6)         | (n = 6)        | (n = 6)        |                |
| ADU            | 28.5            | 4.2            | 1.7            | 1.4            | 1.2            |
| (15.6–44.0)    | (2.3–4.8)       | (1.2–2.0)      | (1.0–2.0)      | (0.3–1.6)      |
| (n = 2)        | (n = 5)         | (n = 5)        | (n = 5)        |                |

Conclusion(s): Sugammadex was effective and safe for reversal of a shallow rocuronium-induced NMBA in paediatric and adult patients.

Reference:

**9AP7-6**

Histamine-induced hemodynamic changes after vecuronium, rocuronium, and cisatracurium during cardiac surgery

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Background and Goal of Study: Choice of muscle relaxants for anaesthesia is determined by their clinical profile and side effects. The aim of our study was to evaluate the effects of different neuromuscular blocking agents (NMBA) on histamine plasma concentration, mean arterial blood pressure (MAPB) and heart rate (HR) in cardiac surgical patients.

Materials and Methods: After obtaining written informed consent and approval from the Ethics Committee, we studied 35 adult patients ASA III–IV underwent elective coronary artery bypass grafting or valvular surgery. Anaesthesia was induced by midazolam and fentanyl in standard doses. Patients received vecuronium (n = 13) 0.15 mg/kg, or rocuronium (n = 10) 0.6 mg/kg, or cisatracurium (n = 12) 0.15 mg/kg. ECG, HR, and invasive MAPB were monitored continuously with UCW monitoring system (Space Labs). Venous blood samples were obtained in 1 min after induction of anaesthesia (baseline) and in 1 and 3 min after relaxant administration. The plasma samples were analyzed by radioenzymatic assay (Histamine ELISA). Data were analyzed using Student’s t-test. Statistical significance was assumed for p < 0.05.

Results: Vecuronium, rocuronium, and cisatracurium administration did not induce any changes in either plasma histamine (table) haemodynamic parameters (mean ± SEM).

<p>| | | | |</p>
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>1 min</td>
<td>3 min</td>
<td>p</td>
</tr>
<tr>
<td>Histamine ng/ml</td>
<td>0.4 ± 0.06</td>
<td>0.4 ± 0.07</td>
<td>0.4 ± 0.07</td>
</tr>
<tr>
<td>Vecuronium</td>
<td>0.4 ± 0.08</td>
<td>0.4 ± 0.09</td>
<td>0.3 ± 0.09</td>
</tr>
<tr>
<td>Cisatracurium</td>
<td>0.3 ± 0.05</td>
<td>0.3 ± 0.05</td>
<td>0.4 ± 0.05</td>
</tr>
<tr>
<td>HR (beat min⁻¹)</td>
<td>75 ± 3.5</td>
<td>71 ± 3.8</td>
<td>74 ± 4.6</td>
</tr>
<tr>
<td>Vecuronium</td>
<td>73 ± 3.3</td>
<td>74 ± 3.1</td>
<td>74 ± 3</td>
</tr>
<tr>
<td>Cisatracurium</td>
<td>76 ± 3.4</td>
<td>71 ± 3.1</td>
<td>73 ± 2.9</td>
</tr>
<tr>
<td>MABP (mmHg)</td>
<td>74 ± 4.1</td>
<td>72 ± 4.1</td>
<td>73 ± 3.4</td>
</tr>
<tr>
<td>Vecuronium</td>
<td>79 ± 3</td>
<td>74 ± 2.4</td>
<td>76 ± 2.6</td>
</tr>
<tr>
<td>Cisatracurium</td>
<td>74 ± 3.2</td>
<td>74 ± 4.3</td>
<td>76 ± 4.7</td>
</tr>
</tbody>
</table>

Conclusions: Vecuronium, rocuronium and cisatracurium proved to be safe for use during induction of anaesthesia in cardiothoracic patients ASA III–IV.

**9AP7-7**

The neuromuscular effects of vecuronium in elderly and young adults with or without renal failure

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Background and Goal of Study: This study aims to investigate the neuromuscular effects of 0.6 mg·kg⁻¹ vecuronium under propofol anaesthesia in elderly and young adults either with renal failure or normal renal function.

Materials and Methods: After obtaining ethics committee approval and informed consent, 40 patients with renal failure undergoing arteriovenous shunt surgery and 40 patients with normal renal function undergoing peripheral venous surgery were included in the study. Patients were grouped as follows: Younger adult (18–50 yr) with renal failure (n = 20), elderly (≥65 yr) with renal failure (n = 20), younger adult with normal renal function (n = 20) and elderly with normal renal function (n = 20). Anaesthesia was induced with propofol 1–2 mg·kg⁻¹ and fentanyl 2 μg·kg⁻¹ and maintained with propofol 6–12 mg·kg⁻¹·h⁻¹ and fentanyl 2 μg·kg⁻¹·h⁻¹ and N₂O in oxygen and supplemental fentanyl. The ulnar nerve was stimulated supramaximally at the wrist via cutaneous electrodes using train-of-four nerve stimulation. Rocuronium 0.6 mg·kg⁻¹ was administered and intubation was performed at the onset of maximal neuromuscular block. The onset time, the time to recovery of the first twitch (T₁) to 25%, 50%, 75% and 90% and recovery index were recorded. T-test and Fisher’s Exact test were used for statistical analysis. P < 0.05 was significant.

Results and Discussions: The time to recovery of T₁ to 25%, 50%, 75% and 90% and recovery index were found to be prolonged in both the young and elderly patients with renal failure when compared to those with normal renal function (T₁ 25%: 58.4 ± 9.0 min, respectively) (p < 0.05). The recovery parameters were found to be prolonged in the elderly when compared with young adults in both the renal failure and the non-renal failure groups (p < 0.05).

Conclusion(s): The neuromuscular effects of 0.6 mg·kg⁻¹ vecuronium under propofol anaesthesia were markedly prolonged in elderly patients when compared with young adults and in the presence of renal failure.

Reference:

**9AP7-8**

Reversal of vecuronium-induced shallow neuromuscular blockade is significantly faster with sugammadex compared with neostigmine

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Background and Goal of Study: Sugammadex, a modified γ-cyclodextrin, is the first selective relaxant binding agent (SRBA) and was originally designed to reverse the effects of the steroidal neuromuscular blocking agent rocuronium (1). In this phase 3a study, the efficacy of sugammadex was compared with that of neostigmine for the reversal of shallow neuromuscular blockade (i.e., at reappearance of T₁₂) induced by single or multiple bolus doses of vecuronium during sevoflurane maintenance anaesthesia for scheduled surgery.
Materials and Methods: A total of 100 subjects (age ≥ 18 years, ASA class 1 to 3) who had given written informed consent were included in this randomised, multicentre, parallel-group trial. Neuromuscular blockade was monitored continuously using acceleromyography (TOF-Watch® SX, Organon Ltd, Dublin, Ireland). At reappearance of T2 after the last dose of vecuronium, either sugammadex 2.0 mg kg⁻¹ or neostigmine 50 μg kg⁻¹ plus glycopyrolole 10 μg kg⁻¹ were administered intravenously in randomised order. The primary efficacy variable was time from start of administration of sugammadex or neostigmine to recovery of the T4/T1 ratio to 0.9. Clinical signs of residual or re-curarisation were also assessed. Statistical analysis was performed using an ANOVA model on logarithmic transformed recovery times. Safety was evaluated by (serious) adverse events, laboratory variables, and vital signs.

Results and Discussion: Median (range) time to recovery in the intent-to-treat population was statistically significantly shorter with sugammadex (n = 48) versus neostigmine (n = 45): 2.1 (1.2–64.2) min versus 18.9 (2.9–76.2) min (p < 0.0001). There were no clinical events due to residual or re-curarisation. No serious adverse events were reported.

Conclusion(s): After neuromuscular blockade with vecuronium, sugammadex achieved significantly faster recovery of the T4/T1 ratio to 0.9 compared with neostigmine when administered at reappearance of T2.


9AP7-9
Neostigmine use: audit of the clinical decision compared to acceleromyography
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Background and Goal of Study: Residual neuromuscular blockade (NMB) defined as train-of-four(TOF) < 0.9 has an incidence higher than 80% right before tracheal extubation.¹ The objective of this study was to evaluate the anesthesiologists' clinical decision of using neostigmine, as a diagnostic test, compared to acceleromyography, in a university hospital of a developing country.

Materials and Methods: Adult patients under general anesthesia and endotracheal intubation with nondepolarizing NMB were studied. At the end of the surgery, the anesthesiologist was asked if neostigmine would be administered. The ulnar nerve was stimulated while a thumb transducer (TOF–Watch®) quantified NMB. If TOF < 0.9 the anesthesiologist was informed. Kappa and McNemar tests were used and P < 0.05 was considered significant.

Results and Discussion: A total of 150 patients were studied, but 78 were excluded due to peripheral hypothermia (T < 32°C), 6 due to transducer instability and 2 because neostigmine had already been used. The 64 remaining patients had a mean ± sd age of 49 ± 18 years, 68 ± 15 kg, 166 ± 9 cm, and were grouped as:

<table>
<thead>
<tr>
<th>Will neostigmine be used?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOF &lt; 0.9 %</td>
<td>7</td>
<td>32</td>
</tr>
<tr>
<td>TOF ≥ 0.9 %</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

The control event rate (CER) was 77% (49/64) and the experimental event rate (EER) was 50% (32/64), with absolute risk reduction (ARR) of 27% and relative risk reduction (RRR) of 35%. The positive predictive value (PPV) of the clinical evaluation was 85%, while the negative predictive value was 27%.

Conclusion(s): The qualitative clinical decision is inappropriate to diagnose residual NMB. In our setting, hypothermia was a limiting factor for the routine use of acceleromyography.²


9AP7-10
Sugammadex (2.0 mg/kg) significantly faster reverses shallow rocuronium-induced neuromuscular blockade compared with neostigmine (50 μg/kg)
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Klinik für Anaesthesiologie, Technische Universität München, Munich, Germany

Background and Goal of Study: Sugammadex, a modified γ-cyclodextrin, is the first selective relaxant binding agent (SRBA) and was designed to reverse the effects of the steroidal neuromuscular blocking agent rocuronium (1). This phase 3a study compared the efficacy of sugammadex versus neostigmine for the reversal of shallow neuromuscular blockade (i.e., at reappearance of T2) induced by single or multiple bolus doses of rocuronium during sevoflurane maintenance anaesthesia for elective surgery.

Materials and Methods: This randomised, multicentre, parallel-group trial included 98 subjects (age ≥ 18 years, ASA class 1 to 3). Neuromuscular activity was monitored continuously using acceleromyography (TOF-Watch® SX, Organon Ltd, Dublin, Ireland). At reappearance of T2 after the last dose of rocuronium, either sugammadex 2.0 mg kg⁻¹ or neostigmine 50 μg kg⁻¹ plus glycopyrrolate 10 μg kg⁻¹ were administered intravenously in randomised order. The primary efficacy variable was the time from start of administration of sugammadex or neostigmine to recovery of the T4/T1 ratio to 0.9. Clinical signs of residual or re-curarisation were also assessed. Statistical analysis was performed using an ANOVA model on logarithmic transformed recovery times. Safety was evaluated by assessing (serious) adverse events, laboratory variables, and vital signs.

Results and Discussion: In the intent-to-treat population (n = 48 in each group), there was a markedly shorter recovery pattern after sugammadex compared to neostigmine, the time to TOF (median and range) being 1.4 (0.9–5.4) versus 17.6 (3.7–106.9) min (p < 0.0001). No clinical events due to residual or re-curarisation occurred. Serious adverse effects were reported for 2 subjects in the sugammadex group and 3 in the neostigmine group but none were considered related to the study drug.

Conclusion(s): Sugammadex achieved significantly faster recovery of T4/T1 ratio to 0.9 compared with neostigmine after neuromuscular block with rocuronium. In addition outliers and variability of recovery times were significantly lower following reversal with sugammadex.


9AP8-1
The anti-oxidative effect of isosteviol on angiotensin-II-induced reactive oxygen species generation in hypertensive injury of aortic smooth muscle cells
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Background and Goal of Study: Isosteviol is an active derivative of steviol, a constituent of Stevia rebaudiana, and also possessing an anti-hypertensive effect. This study is to search the anti-proliferative mechanisms of isosteviol related to the Involvement of reactive oxygen species (ROS) in signal-regulation on endothelin-1 in modulating hypertensive vascular injury.

Materials and Methods: Cultured rat aortic smooth muscle cells (SMCs) were stimulated with Ang II, [3H]thymidine incorporation and the ET-1 gene expression was examined. Isosteviol and antioxidants pretreatment on Ang-II induced extracellular signal-regulated kinase (ERK) phosphorylation were performed to elucidate the redox-sensitive pathway in proliferation and ET-1 gene expression.

Results and Discussion: Cultured rat aortic SMCs were preincubated with isosteviol then stimulated with angiotensin II, after which [3H]thymidine incorporation and endothelin-1 secretion were examined. Isosteviol (100 μM) inhibits angiotensin II - induced DNA synthesis and endothelin-1 secretion. Measurements of 2′′-dichlorofluorescein diacetate, a redox sensitive fluorescent dye, showed an isosteviol- mediated inhibition of intracellular ROS generated by the effects of angiotensin II. The inductive properties of angiotensin II on ERK phosphorylation were found reversed with isosteviol and antioxidants such as N-acetyl-cysteine.

Conclusion(s): Our data suggest that isosteviol inhibit the ROS which are involved in Ang II-induced proliferation and the redox-sensitive ERK pathway plays a role in ET-1 gene expression in rat aortic SMCs that contribute to the hyperproliferation of vascular smooth muscle cells and vascular plaque formation. Thus, this study provides important insight that may contribute to the effects of isosteviol on the cardiovascular system.


9AP8-2
Effects of 5-hydroxytryptamine on rocuronium-induced neuromuscular blockade in the rat phrenic nerve-hemidiaphragm preparation
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Background and Goal of Study: The 5-Hydroxy- tryptamine 3 receptor is a member of a superfamily of the ligand-gated ion channels. It has structural
Institutional approval was obtained. Fifty male Sprague Dawley rats (150–200 g) were divided into 5 groups (control, 0.1, 1, 10, 20/µl of 5-HT). The animals were injected with phenobarbital 40 mg/kg in peritoneal cavity. The hemidiaphragm with the phrenic nerve was dissected and mounted in the organ chamber with a Grass® 588 stimulator through an SIU5 isolation unit. A twitch was recorded. In a calcium-free extra cellular solution (1) (p<0.05), the twitch height was measured by a precalibrated Grass FT88 force displacement transducer and recorded with a Grass 79 polygraph. In the cumulative dose–response study, 100 µg of rocuronium and each doses of 5-HT were administered simultaneously, and incremental 50 µg doses of rocuronium were added to obtain more than 95% twitch inhibition. ED0.1, ED0.5, ED0.9 of rocuronium in each group were calculated using a logistic model.

Results and Discussions: ED50 of rocuronium was significantly reduced in the 20/µl 5-HT group (p<0.05).

Conclusion(s): 5-HT 20/µl enhanced neuro-muscular blockade of rocuronium.

References:

9AP8-3

Verapamil-fentanyl interaction on rat neuromuscular junction

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Background and Goal of Study: Verapamil is a calcium channel blocker. Previous studies have shown that verapamil may inhibit neuromuscular transmission. On the other hand, opioids have also been found to exert complex action on neuromuscular junction. Aim of the study was the in vitro evaluation of possible synergism between verapamil and fentanyl on diaphragm contraction. Furthermore, the action of neostigmine, naloxone, CaCl2 and isoproterenol was studied regarding their potential interaction with verapamil-fentanyl.

Materials and Methods: 24 Wistar rats were sacrificed; their phrenic nerves and the diaphragm were dissected and suspended in Krebs’ solution. The nerves were stimulated with 4 Volts, 4 Hz, square wave pulses and the isometric outputs were recorded. Verapamil and fentanyl were added in the bath at concentrations of 5.09 × 10^{-5}M and 1.4 × 10^{-4}M respectively and the muscles isometric outputs were recorded again. Afterwards, preparations were assigned into four groups to be subjected to naloxone 0.5 × 10^{-4}M, CaCl2 3.40 × 10^{-4}M, neostigmine 1.1 × 10^{-4}M and isoproterenol 1.0 × 10^{-4}M respectively. Isometric muscular outputs were also recorded. Student t-test was conducted for the statistical analysis. Level of significance was set at p<0.05.

Results and Discussions: The mean reduction of twitch height observed after verapamil addition was 38.59 ± 15.83% (p<0.005). Fentanyl addition lead to a 44.80 ± 2.30% reduction (p<0.005). Neither naloxone, nor neostigmine and CaCl2 produced any change in the twitch height, whereas isoproterenol produced an increase on the twitch height of 51.00 ± 3.12 % (p<0.005).

9AP8-4

Amitriptyline attenuates smooth muscle contraction of rat trachea through the Rho-kinase pathway

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9AP8-5

Direct increase of the intracellular calcium concentration in porcine vascular smooth muscle cells by protamine

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Background and Goal of Study: Protamine is a polycationic protein used in clinical practice for antagonizing the anticoagulatory effect of heparin. Acute pulmonary arterial hypertension by vasoconstriction is one side effect of protamine (1,2). Allergic reactions, liberation of thromboxane or serotonin were assumed to contribute to this side effect, but the exact mechanism could not revealed (1,2). We investigated if protamine is able to increase the calcium concentration in vascular smooth muscle cells as a mechanisms of vasoconstriction.

Materials and Methods: Vascular smooth muscle cells were obtained from immediately slaughtered pigs from two different German breeds. The smooth muscle cells were cultured in smooth muscle medium (PromoCell, Germany). Intracellular calcium concentration in single myocytes was measured with FURA 2 (Invitrogen) at an imaging workstation (Till Photonics, Germany).

Results and Discussions: Protamine increased the intracellular calcium concentration in myocytes in a dose-dependent manner. The half-maximal effect concentration EC50 was 46.8 µM. In a calcium-free extra cellular solution the calcium transient was not detected. The intracellular stores did not contribute significantly to the protamine induced calcium transient.

9AP8-6

Amantadine attenuates smooth muscle contraction of rat trachea through the Rho-kinase pathway

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Materials and Methods: Institutional approval was obtained. Fifty male Sprague Dawley rats (150–200 g) were divided into 5 groups (control, 0.1, 1, 10, 20/µl of 5-HT). The animals were injected with phenobarbital 40 mg/kg in peritoneal cavity. The hemidiaphragm with the phrenic nerve was dissected and mounted in the organ chamber with a Grass® 588 stimulator through an SIU5 isolation unit. A twitch was recorded. In a calcium-free extra cellular solution (p<0.05), the twitch height was measured by a precalibrated Grass FT88 force displacement transducer and recorded with a Grass 79 polygraph. In the cumulative dose–response study, 100 µg of rocuronium and each doses of 5-HT were administered simultaneously, and incremental 50 µg doses of rocuronium were added to obtain more than 95% twitch inhibition. ED0.1, ED0.5, ED0.9 of rocuronium in each group were calculated using a logistic model.

Results and Discussions: ED50 of rocuronium was significantly reduced in the 20/µl 5-HT group (p<0.05).

Conclusion(s): 5-HT 20/µl enhanced neuro-muscular blockade of rocuronium.

References:

Fig 1. V+F: Verapamil fentanyl action. I: Isoproterenol action.

Conclusion(s): Verapamil and fentanyl act synergistically on the neuromuscular junction, action that is partially reversed by isoproterenol.

Reference:

Fig 1. Dose-effect curve of protamine (median, 25th/75th percentile, ∆[Ca^{2+}] increase of intracellular calcium).

Conclusion: The protamine evoked intracellular calcium transient in porcine vascular myocytes may induce a vasoconstriction in a direct manner. This
mechanism can contribute to the known side effect acute pulmonary arterial hypertension of protranine.

References:

9AP8-6
The relationship between Ca-induced Ca release function in skinned fibers and calcium homeostasis in human myotubes
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Anesthesiology, Hiroshima Prefectural Rehabilitation Center, Higashi-hiroshima, Japan

Background and Goal of Study: Malignant hyperthermia is an inherited disorder of calcium homeostasis in the skeletal muscle caused by an enhanced rate of Ca-induced Ca release (CICR) via ryanodine receptor 1 (RYR1). We assessed the relationship between CICR rate and sensitivity of human myotubes to caffeine, halothane and 4-chloro-m-cresol (4-Cmc).

Materials and Methods: We measured CICR rate in chemically skinned fibers using Endo’s method and divided 18 individuals into ‘Enhanced’ and ‘Normal’ groups according to their CICR rate. The intracellular calcium concentration of myotubes was determined with fluorescence calcium imaging system using fura-2. To stimulate myotubes, caffeine, halothane and 4-Cmc were used as RYR1 agonists. Half-maximal activation concentrations (EC50) were determined in myotubes.

Results and Discussion: ‘Enhanced’ and ‘Normal’ group contained 9 individuals each. EC50 for caffeine, halothane and 4-Cmc were significantly increased (p < 0.001) lowered showing keen sensitivity to RYR1 (Table 1). The highest correlation coefficient (r = 0.757) was observed between CICR rate (pC50.5) and EC50 for 4-Cmc.

Table 1. A comparative data in the two groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>Enhanced</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resting Ca Conc. (mM)</td>
<td>7.9 ± 1.78</td>
<td>5.18 ± 9.6</td>
</tr>
<tr>
<td>EC50 for Caffeine (mM)</td>
<td>2.72 ± 0.88</td>
<td>5.78 ± 0.75</td>
</tr>
<tr>
<td>EC50 for Halothane (mM)</td>
<td>1.89 ± 0.28</td>
<td>3.72 ± 0.76</td>
</tr>
<tr>
<td>EC50 for 4-Cmc (mM)</td>
<td>141.2 ± 46.5</td>
<td>349.2 ± 76.1</td>
</tr>
</tbody>
</table>

Conclusion(s): There was significant relationship between CICR rate in skinned fibers and sensitivity to RYR1 agonists in myotubes.

References:

9AP8-7
Livosimendan in septic myocardial depression: hemodynamics and neurohormonal effects
F. Guarracino, C. Cariello, L. Giannechini, R. Baldassarri, A. Danella
Cardiothoracic Department, Cardiothoracic Anesthesia and ICU, Pisa, Italy

Background and Goal of Study: Septic shock is characterized by profound cardiovascular alterations including myocardial depression. Levosimendan has recently showed to improve cardiac function in septic shock.

The aim of this retrospective study is to evaluate hemodynamic and neurohormonal effects of levosimendan in cardiac patients with sepsis-induced cardiac dysfunction. Levosimendan has recently showed to improve cardiac function in septic shock by increasing E7 velocity at TDI at 48h. All data were analysed by Fisher F test.

Results and Discussion: Data were obtained by evaluating the average of percentual variation between T0 (starting infusion) and T1 (24h after infusion) T2 (48h), T3 (72h), T4 (96h), T5 (120h) and T6 (144h). Levosimendan significantly increased SvO2 and EF, and decreased Tropr I and BNP.

Table: Levosimendan effects on hemodynamics and neurohormonal function in patients with septic cardiac dysfunction.

<table>
<thead>
<tr>
<th>Time (h)</th>
<th>T0</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
<th>T5</th>
<th>T6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trop I</td>
<td>0%</td>
<td>–65%</td>
<td>–86%</td>
<td>–82%</td>
<td>–78%</td>
<td>–62%</td>
<td>–61%</td>
</tr>
<tr>
<td>BNP</td>
<td>0%</td>
<td>&gt;55%</td>
<td>&gt;41%</td>
<td>&gt;56%</td>
<td>&gt;50%</td>
<td>&gt;42%</td>
<td>&gt;44%</td>
</tr>
<tr>
<td>EF (%)</td>
<td>&gt;8</td>
<td>&gt;8</td>
<td>&gt;8</td>
<td>&gt;8</td>
<td>&gt;8</td>
<td>&gt;8</td>
<td>&gt;8</td>
</tr>
</tbody>
</table>

Conclusion: Levosimendan seems to improve systemic hemodynamics and neurohormonal cardiac function in patients with septic cardiac dysfunction.

References:

9AP8-8
The neurofilament cytoskeleton is essential to the hypnotic sensitivity
D. Pietrin, F. Letournel, J.C. Granry, J. Eyer, A. Barthelaix
1-Department of Anaesthesia and Critical Care 2-Neurobiology and Transgenesis Laboratory UPR 314, Hospital University Angers, Angers, France

Background and Goal of Study: The neurofilament cytoskeleton is essential to the hypnotic sensitivity. For example, cyclosporine, open field test and elevated-plus maze test were performed.

Materials and Methods: Protocols were approved by regional ethic committee for animal experimentation. Behavioral test and LORR were performed before and during anesthesia on adult (10-weeks-old) transgenic and normal mice using video monitoring. Anesthesia was induced by intra-peritoneal injection of ketamine (200 mg/kg; n = 16), thiopental (100 mg/kg; n = 10) or midazolam (20 mg/kg; n = 10) in a blind fashion concerning the genotype of mice. Each movie was analyzed by a second experimenter blind concerning the anesthetics used and the genotype. Endpoint of study was duration of LORR. Statistical analysis was performed by unpaired t test with SAS software (SAS®, USA). A P value less than 0.05 was considered as significant.

Results and Discussion: Data were expressed as mean ± SEM. Behavioral test showed no difference between transgenic and control mice before anesthesia (p = 0.9). While duration of LORR was equal between transgenic and normal mice using midazolam (6 ± 3 min vs 5 ± 2 min; p = 0.8), the duration of LORR was shorter for transgenic mice with ketamine (14 ± 3 min vs 26 ± 3 min; p = 0.02), but longer with thiopental (98 ± 12 min vs 39 ± 13 min; p = 0.01).

Conclusion: This study clearly shows that the absence of axonal neurofilaments affects differently the anesthesia due to ketamine and thiopental injections. This indicates a fundamental role of neurofilaments, and/or associated molecules, to the hypnotic drugs susceptibility. The possible perturbation of distribution, accessibility, and function of NMDA or GABA-A receptors is presently investigated in these animals.

References:

9AP8-9
Impact of cyclosporine upon emotional behavior in mice
Y. Sato, T. Onaka, E. Kobayashi, N. Sato
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Background and Goal of Study: The calcineurin inhibitor, cyclosporine, is widely used for preventing allograft rejection in organ transplantation. Several studies report that cyclosporine induce neuropsychological side effects (1) and prolong sleep times after administration of barbiturate (2). However, its mechanisms of action remain to be elucidated.

Materials and Methods: Systemically administered cyclosporine is prevented from entering into the brain by the action of P-glycoprotein. In the present study, we developed behavioral models in wild-type and mdrl (multidrug resistant 1) knockout mice that lack P-glycoprotein (3) to examine central effects of cyclosporine upon anxiety. After intraperitoneal administration of cyclosporine, open field test and elevated-plus maze test were performed.

Table: Cyclosporine effects on locomotor activity and anxiety-like behavior in mice.

<table>
<thead>
<tr>
<th>Group</th>
<th>T0</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
<th>T5</th>
<th>T6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trop I</td>
<td>0%</td>
<td>–4%</td>
<td>10%</td>
<td>17%</td>
<td>22%</td>
<td>19%</td>
<td>22%</td>
</tr>
<tr>
<td>BNP</td>
<td>0%</td>
<td>&gt;55%</td>
<td>&gt;41%</td>
<td>&gt;56%</td>
<td>&gt;50%</td>
<td>&gt;42%</td>
<td>&gt;44%</td>
</tr>
<tr>
<td>EF (%)</td>
<td>&gt;8</td>
<td>&gt;8</td>
<td>&gt;8</td>
<td>&gt;8</td>
<td>&gt;8</td>
<td>&gt;8</td>
<td>&gt;8</td>
</tr>
</tbody>
</table>

Conclusions: Cyclosporine seems to improve systemic hemodynamics and neurohormonal cardiac function in patients with septic cardiac dysfunction.
9AP8-10

Chronic therapy by statin before vascular surgery: are patients really treated?
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Background and Goal of Study: Statins are a common chronic therapy of dyslipemic patients (primary prevention) and of cardiovascular risk patients (secondary prevention). The goals of this prospective study on patients undergoing noncardiac vascular surgery were 1) to evaluate the real incidence of chronic therapy by statin (CTS) 2) to see if objective in low-density lipoprotein (LDL) cholesterol lowering were reached.

Materials and Methods: All cardiovascular risk factors (RF) [coronaropathy, diabetes mellitus, tabagism, age, gender, peripheral atherosclerosis, cerebrovascular disease] and the rates of HDL- and LDL-cholesterol (g/L) of 213 patients undergoing vascular surgery were recorded. Inflammatory, congenital and traumatic pathologies were excluded. The existence of CTS and its efficacy on LDL rate were evaluated in different risk groups of patients.

Results and Discussions: All patients of our study had at least the indication of secondary prevention by CTS.

<table>
<thead>
<tr>
<th>Groups</th>
<th>LDL objective (g/L)</th>
<th>Patients with CTS N (%)</th>
<th>Patients without CTS N (%)</th>
<th>LDL reached if CTS N (%)</th>
<th>LDL reached if no CTS N (%)</th>
<th>Total N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 or 1 RF ≤2.2</td>
<td>0 (0)</td>
<td>2 (100)</td>
<td>0 (0)</td>
<td>2 (100)</td>
<td>2 (0.9)</td>
<td></td>
</tr>
<tr>
<td>2 RF ≤1.6</td>
<td>2 (10)</td>
<td>11 (85)</td>
<td>2 (100)</td>
<td>11 (100)</td>
<td>13 (6.1)</td>
<td></td>
</tr>
<tr>
<td>&gt;2 RF ≤1.3</td>
<td>3 (30)</td>
<td>7 (70)</td>
<td>3 (100)</td>
<td>5 (71)</td>
<td>10 (4.7)</td>
<td></td>
</tr>
<tr>
<td>High risk &lt;1</td>
<td>113 (60)</td>
<td>75 (40)</td>
<td>68 (60)</td>
<td>49 (65)</td>
<td>188 (88)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>118 (55)</td>
<td>95 (45)</td>
<td>73 (62)</td>
<td>67 (71)</td>
<td>213</td>
<td></td>
</tr>
</tbody>
</table>
**Background and Goal of Study:** The spectral entropy of the EEG (state entropy; SE) and frontal electromyogram (response entropy; RE) have been promoted as monitors of anaesthetic depth, but their characteristics in children remain poorly defined. This prospective randomized double-blind study assessed the effects of 50% N2O on SE and RE values during halothane and sevoflurane anaesthesia in children.

**Materials and Methods:** Following institutional Ethics Committee approval and parental written informed consent, 40 ASA I and II children aged 6 months–5 years undergoing general anaesthesia for lower abdominal surgery were studied. Children were randomized to undergo halothane (group H: N = 20) or sevoflurane (group S: N = 20). All received caudal analgesia (bupivacaine 2 mg/kg) after anaesthetic induction. Entropy values were recorded by a blinded anaesthesiologist at 1 MAC steady state end tidal concentrations, in 50% O2/air and 50% O2/N2O conditions. Data were compared with a paired Student t test. A p < 0.05 was considered significant. Data are presented as mean ± SD.

**Results and Discussions:** Demographic and surgical characteristics were not different among groups.

<table>
<thead>
<tr>
<th></th>
<th>Group H</th>
<th>Group S</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(N = 20)</td>
<td>(N = 20)</td>
</tr>
<tr>
<td>O2/air</td>
<td>SE: 55 ± 11</td>
<td>35 ± 19</td>
</tr>
<tr>
<td></td>
<td>RE: 62 ± 13</td>
<td>44 ± 21</td>
</tr>
<tr>
<td>O2/N2O</td>
<td>SE: 52 ± 11</td>
<td>29 ± 13</td>
</tr>
<tr>
<td></td>
<td>RE: 57 ± 12</td>
<td>38 ± 15</td>
</tr>
</tbody>
</table>

**Conclusion(s):** Administration of N2O did not influence SE and RE values during halothane or sevoflurane anaesthesia in children.

**10AP1-4**

A comparative study between cerebral state index (CSI) and bispectral index (BIS), in children anesthetised with sevoflurane

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**Background and Goal of Study:** The MS Monitor (CSM) has been recently introduced for monitoring depth of anaesthesia. Data on CSM are lacking in children. This study compares the CSM with the BIS in children anesthetised with sevoflurane.

**Materials and Methods:** After CPP approval, 17 patients, 7.5 ± 3.0 years (mean ± sd) of age, were enrolled in the study. Anaesthesia was induced with 6% sevoflurane in O2/N2O (50–50), tracheal intubation was performed at central pupils, no opioid or muscle relaxant was used. After induction, for 10 min–periods with a stable expired concentration of sevoflurane (Etsevo: 1, 2, 3, 4 and 5%) were obtained in each children. The study started after completion of the study. In addition to the standard monitoring, the BIS (Aspect Medical Systems, Newton, MA) and CSM (Danmeter, Odense, Denmark) were continuously recorded in all children. Mean values of BIS and CSM were calculated on the last minute of each stable 10 min period, and compared for each Etsevo using paired t test. In addition the relationship between both monitor indices and Etsevo was investigated using the most appropriate model of regression (Statview, Abacus).

**Results and Discussions:** Mean values of BIS and CSM decreased when Etsevo increased up to 3%, and then going up again, especially for the BIS (figure). A second order regression described the relationship between BIS and CSM, and Etsevo, r² = 0.85 and r² = 0.87, respectively.

**Conclusion(s):** The CSM might be an interesting alternative to the BIS during the sevoflurane anaesthesia in children. Further studies are required to understand BIS and CSM changes at high concentrations of sevoflurane.

**10AP1-5**

Reliability of the VO2 measurement using the deltaretic Il module for cardiac output calculation in intubated children undergoing cardiac catheterisation

Department of Anaesthesia, University Childrens Hospital Zurich, Zurich, Switzerland

**Background and Goal of Study:** To compare cardiac output values calculated with measured VO2 with cardiac output values calculated with formula-based VO2 in intubated children in a cardiac catheter laboratory setting.

**Materials and Methods:** With ethical review board approval and written parental consent, VO2 was measured using the Datex-Ohmeda Compact Airway Module AS3™ (Datex-Ohmeda, Helsinki) in children undergoing interventional cardiac catheterisation under general anaesthesia. Cuffed tubes were used for tracheal intubation. Measurements were performed in patients without cardiac shunts. Arterial and mixed venous blood was sampled for oxygen saturation measurement in a bedside oximeter. Formula-based VO2 values were chosen according to LaFarge (1). Cardiac output was calculated using the Fick’s principle. Data are compared using linear regression and Bland–Altman analysis.

**Results:** 31 patients aged from 1.0 to 16.7 years (median 4.9 years) were studied. Comparison of cardiac output values calculated with measured VO2 and formula-based VO2 revealed significant correlation (r = 0.93; p < 0.0001). Bias and precision were −0.08 and 1.59 L/min (95% limits of agreement: −1.67 to 1.51 L/min).

**Conclusion:** Cardiac output values calculated with measured VO2 using the Deltaretic Il VO2 module reliably correspond to formula-based VO2 cardiac output calculations.

**Reference:**
10AP1-6
Electrical velocimetry compared with ficks principle for cardiac output measurement in children undergoing cardiac catheterisation
A. Schmitz, O. Kretschmar, W. Knirsch, U. Bauersfeld, M. Weiss
Department of Anaesthesia, University Childrens Hospital Zurich, Zurich, Switzerland

Background and Goal of Study: To compare cardiac output values measured by electrical velocimetry (EV-CO) (Aesculon, Ospyka Medical GmbH, Berlin, Germany) (1, 2) with cardiac output values calculated from measured VO2 using the Fick’s Principle (VO2-CO) in children.

Materials and Methods: With ethical review board approval and written parental consent, EV-CO using the Aesculon Monitor and VO2-CO using the Fick’s Principle were simultaneously recorded in children without intra-cardiac shunts undergoing cardiac catheterisation. Measurements were performed under general anaesthesia. Cuffed tubes were used for tracheal intubation. Arterial and mixed venous blood was sampled for oxygen saturation assessment in a bedside oximeter. Linear regression analysis and Bland-Altman analysis were used to compare EV-CO values with VO2-CO values.

Results: 31 patients aged from 1.0–16.7 years (median 4.9 years) were studied. Only a moderate correlation between EV-CO and VO2-CO (r = 0.64; p < 0.0001) was found. Bias and precision were 2.05 and 3.67L/min (95% limits of agreement: -1.62 to 5.72 L/min).

Conclusion: Based on our preliminary experience, cardiac output values measured by electrical velocimetry using the Aesculon Monitor did not reliably correlate to cardiac output values calculated with Fick’s Principle in children. Because of its user-friendly application and the simple underlying principle the Aesculon device may be used as a trend monitor for cardiac output. To support this, further investigations, using continuous measurement of EV-CO in patients with changing hemodynamics will be needed.

References:

10AP1-7
Evaluation of the simultaneous performance of two monitors of depth of anaesthesia in children
H. Muñoz, P. León, L. Cortínez
Anestesiología, Pontificia Universidad Católica de Chile, Santiago, Chile

Background and Goal of Study: The Kimm of propofol in children has been determined with the use of the tweak method measured with the Alaris AEP monitor (v1.4). This parameter, however, might be different when the effect of propofol is measured with different monitors. We simultaneously measured the performance of two monitors of depth of anaesthesia after a bolus dose of propofol in children.

Materials and Methods: Children aged 3 to 11 yr, ASA I scheduled to undergo surgery under general anaesthesia were prospectively studied. In addition to routine monitoring, all patients were monitored with the A2000 BIS® monitor and the Alaris AEP monitor (v1.6). A bolus dose of propofol 3 mg/kg was injected in 3 seconds (s), the study finished when patients had partially recovered from propofol defined as the presence of movements of extremities. Tpeak was considered the time from the start of propofol injection until the minimum value of BIS and AAI. BIS and AAI values at baseline, tpeak and at the end of the study were compared. Values are mean ± SD.

Results and Discussions: Twenty children of 7.3 ± 2.4 yr and 28 ± 8 kg were studied. In all patients, the BIS values were obtained during all the study. Because of poor signal quality, the AAI was obtained in only 12 children and the tweak could not be determined in 2. All patients lost consciousness very fast after propofol and had signs of recovery before the end of study. Basal values were 94 ± 4 for BIS and 69 ± 22 for AAI. The mini- mum values were BIS = 15 ± 7 and AAI = 21 ± 13. The tweak with BIS was 65.7 ± 4.5 s and with AAI 202 ± 74 s. At the end of study BIS was 65 ± 7 and AAI was 22 ± 5. The differences in the measurements obtained with both monitors were statistically significant with the exception of the minimum values.

Conclusion(s): Under the dynamic conditions of this study in children, the performance of these two monitors is clearly different. While the BIS seems to display values more consistent with the clinical condition of the patient, more studies are needed to determine which monitor better reflects the state of consciousness in this population.

Reference:

10AP2-1
Recommended inflation volumes result in lower cuff pressures in paediatric patients with Ambu AuraOnce when compared to LMA-Classic
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Clinic of Anaesthesiology and Intensive Care Medicine, University Hospital Mannheim, Mannheim, Germany

Background and Goal of Study: Two laryngeal masks, LMA-Classic (LMA, LMA Company) and the single-use Ambu AuraOnce (Ambu, Ambu) are compared for ventilation in paediatric patients. Besides ease of insertion, the cuff pressure resulting when the recommended inflation volumes are applied is assessed.

Materials and Methods: After approval of the local ethics committee and written consent of the guardians, 100 ASA I/II patients, 2 to 8 years, scheduled for elective ambulatory interventions were randomized to be ventilated with LMA or Aura. Following standardized induction of general anaesthesia, the completely deflated airway devices were placed according to manufacturer’s instructions. Cuffs were inflated with 10 ml for size 2, 14 ml for size 2.5 and 20 ml for size 3. Number of attempts (maximum 2), time until first tidal volume, initial cuff pressure and intraoperative tidal volumes (goal: petCO2 of 35 mmHg) were recorded. Cuff pressures were adjusted to 60 cmH2O for measurement of airway leak pressure. Devices were inspected for traces of blood after removal. Patients were questioned for postoperative complaints.

Results and Discussions: 50 patients were ventilated with either device. Average age was 5.1 (2.2–8.0) for LMA and 5.1 (2.5–7.9) years for Aura. 44 patients in the LMA group and 48 patients in the Aura group were male. Weight, height, baseline heart rate, blood pressure and oxygen saturation were comparable for both groups. Size 2 was used in LMA/Aura in 7/4, size 2.5 in 41/45 and size 3 in 2/1 patients. Insertion was successful in all patients (first attempt LMA/Aura 4/7). Time until first tidal volume for LMA and Aura was 8.7 ± 2.3 and 8.0 ± 2.3 seconds. Initial cuff pressures were 104.2 ± 19.0 cmH2O for LMA and 74.4 ± 24.3 cmH2O for Aura (p = 0.001). Tidal volumes were 8.7 and 9.1 ml kg⁻¹ for LMA and Aura, airway leak pressures were 32.7 ± 9.4 and 34.1 ± 8.4 cmH2O. Intraoperative dislocation occurred in 1 LMA patient. No traces of blood were found after removal of the devices. No postoperative complaints were stated.

Conclusion(s): In paediatric patients, LMA-Classic and Ambu AuraOnce are found to be comparable in all respects except cuff pressures resulting from recommended inflation volumes. Excess of maximum recommended cuff pressure is considerably higher with LMA-Classic.

10AP2-2
Effectiveness of a new paediatric sedation device
S.C. Brown, S. Schneewess, D. Chastain, G. Hart, P.A. McGrath
Department of Anaesthesia, Hospital for Sick Children, Toronto, Canada

Background and Goal of Study: Despite significant progress in pain management for children requiring emergency treatment, procedural pain control remains problematic for young children, especially for anxiety-causing procedures for which children should not be deeply sedated. A new pediatric Sedation Device (SD) was designed to address this problem by delivering 50% nitrous oxide in oxygen through a simple nose piece, combined with an interactive video component so that children can use distraction with drug delivery. We conducted a Randomized Clinical Trial (RCT) to evaluate the effectiveness of this device in comparison to Standard Care (SC).

Materials and Methods: Children ages 3–9 years old who required invasive procedures typically associated with high levels of anxiety and lower levels of pain such as sutures, IV’s, and lumbar punctures were eligible for randomization. 36 children were randomized to receive either SC – physician decision re: comforting, topical or local anesthetic, nitrous oxide or the SD. Primary outcomes include children’s overt distress (Observational Scale of Behavioral Distress), and sedation level (Bromage scale). Secondary outcomes were pain, level of child’s co-operation and satisfaction with the sedation approach.

Results and Discussions: Children randomized to the device had significantly less distress (M = 1.8, SD = 3.2) than children receiving SC (M = 9.3, SD = 5.8, ANOVA p < 0.001). Children who used the device reported significantly less pain (M = 1.8, SD = 0.8) than those receiving SC (M = 2.4, SD = 0.9, t(19) = 2.07, p = 0.05). Physicians (t(15) = 4.04, p < 0.001), nurse (t(29) = 5.03, p < 0.0001), and parents (t(34) = 6.69, p < 0.0001) rated children in the device group as significantly more cooperative during invasive procedures than children receiving SC. Children who used the device had no adverse effects from the sedation.

Conclusion(s): This study shows that emergency care regimens including administration of continuous flow nitrous oxide using a novel sedation device significantly reduce distress and pain in young children, while increasing their cooperation during emergency procedures.
10AP2-3
Cerebral perfusion in newborn infants treated with non-invasive ventilation (NIV)
D. Dmytreni, I. Kuchyn
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Background: The effects of non-invasive ventilation (NIV) on hemodynamic parameters have been shown in clinical studies. In a further study we could demonstrate, that after change of a conventional positive pressure ventilation (CPAP) to non-invasive ventilation (NIV) flow velocities in cerebral arteries decreased. In the following we added to the dopplerflow method the continuous examination of cerebral oxygenation with near infrared spectroscopy (NIRS).

Methods: 19 measurements were prospectively conducted in 12 neonates. The infants were mechanically ventilated with (NIV) and were in a stable condition. Before transfer from NIV to CPAP doppler signals of the anterior cerebral artery were measured. We repeated this at the end of the study in each patient. NIRS-optodes were placed on the front and the os parietale of each infant. After stabilization of the system we changed from NIV to CMV without disconnection of the patient from the machine. Pco2 was registered continuously via a transcutaneous probe, as well as oxygen saturation via pulse oximetry. Statistical analysis was performed with Wilcoxon test.

Results: There were no significant changes of doppler – signals during the study (median vs. 20 cm/s ± 20 cm/s during CMV). The parameter of NIRS, oxygenated hemoglobin HbO[–1.3 U ± 20.1]) at 15 minutes after change, reduced hemoglobin Hbr[–1.1 U ± 4.2]) and total hemoglobin HbT[–2.6 U ± 19.7]) remained stable during the change from NIV to CMV, too. In two infants there was a decrease and in one an increase of HbO 15 minutes after change, which correlated with decrease or increase of PCO2.

Conclusion: In a combined measurement of dopplerflow and NIRS we found no special effect of NIV on cerebral hemodynamics comparing with CMV. Changes of cerebral oxygenation in NIRS correlated with PCO2.

Reference:

10AP2-4
Correlation between radiological an clinical parameters with AMBU larypeal mask in paediatric patients
E. Monclus, A. Garcés, D. Artés, S. Serrano, M. Mabrock
Anaesthesia, Hospital Sant Joan de Deu, Esplugues del Llobregat, Spain

Background and Goal of Study: The object of the study is to carry out a radiological confirmation of the correct placement of the larypeal masks in paediatric patients, correlating clinical parameters as the seal pressure and introduction easiness, with radiological studies (NMR).

Materials and Methods: They were included in the study 114 patients ASA I and II of ages from 4 months to 10 years programmed for cranial NMR. Under general anaesthesia with sevoflurane, an AMBU larypeal mask was placed for ventilatory control. The size chosen was according to the patient weight. No muscle relaxant was used. Seal pressure and introduction attempts were registered. Radiological images obtained in NMR were valued, calculating distances from proximal and distal cuff to trachea. Angles of the larypeal mask, four first cervical vertebrae, and hypophysis were also calculated.

Results and Discussions: The data were classified based on the used mask.

<table>
<thead>
<tr>
<th>Number of patients</th>
<th>Age (years)</th>
<th>ASA 1</th>
<th>ASA 2</th>
<th>ASA 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>54</td>
<td>5.7</td>
<td>1.8</td>
<td>0.1</td>
</tr>
<tr>
<td>Males</td>
<td>37</td>
<td>6.0</td>
<td>1.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Females</td>
<td>17</td>
<td>4.0</td>
<td>0.2</td>
<td>0.0</td>
</tr>
</tbody>
</table>

A smaller sized rLMA was placed in 28 children.

In three occasions, the technique was judged unsatisfactory and the trachea was intubated. In one occasion the surgeon cut the pilot tube of the rLMA. There were no episodes of laryngospasm neither haemorrhage or aspiration.

Conclusions: Our study suggests that there are advantages using rLMA during tonsillectomy. It was good surgical acces without increasing the risk of aspiration. Neuromuscular blocking agents were not required. It also provides an improved recovery profile and perhaps most important a reduction in the incidence of laryngospasm.

Reference:

10AP2-5
Reinforced larypeal mask airway and tonsillectomy. A retrospective study
D. Molies, A. Artigas, S. López, J. Torrallardona, J. Marco
Anaesthesiology, Hospital Parc Tauli, Sabadell, Spain

Background and Goal of study: Endotracheal intubation with an uncuffed tracheal lumen is routinely used to maintain the airway during tonsillectomy in children and is associated with complications. These problems can be avoided by using the reinforced larypeal mask (rLMA).

Material and Methods: A retrospective, descriptive study was performed on 91 children undergoing tonsillectomy in whom the use of the rLMA was indicated, in our hospital between January 2005 and December 2006. Children were premedicated with intranasal midazolam 0.2 mg kg–1 and EMLA cream was applied to the dorsum of both hands. Anaesthesia was induced in all patients with propofol 3–6 mg kg–1 preceded by fentanyl 1.5–2 µg kg–1 and midazolam. The rLMA was inserted without muscle relaxant. Anaesthesia was maintained by spontaneous breathing with 50% oxygen in air and 1.5–2% sevoflurane. LMA were removed with de cuff inflated.

Results: Data are shown in the table:

<table>
<thead>
<tr>
<th>Number of patients</th>
<th>Size of LMA used idem to recommended</th>
<th>Size of LMA used inferior to recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>10–20 kg</td>
<td>21–30 kg</td>
</tr>
<tr>
<td>Males</td>
<td>10–20 kg</td>
<td>21–30 kg</td>
</tr>
<tr>
<td>Females</td>
<td>10–20 kg</td>
<td>21–30 kg</td>
</tr>
</tbody>
</table>

The radio logical displacement index (table1: red dis) was calculated over the distances and angles studied and increases when diminishing the size of the used mask. First attempt introduction was higher than 90% and seal pressures achieved with AMBU larypeal mask were similar to those obtained with other devices and no statistical differences were found between displaced larypeal masks and normal fitted ones.

Conclusion(s): The anomalous placement of the mask, in paediatric patients, seen in NMR, have none correlation with clinical parameters, as modification of the seal pressure, or difficult introduction.

Reference:

10AP2-6
The larypeal mask airway proseal for pressure controlled ventilation in children
B. Mamaya, J. Stepanov
Anaesthesiology and Reanimatology, Riga Stradins University, Riga, Latvia

Background and Goal of Study: The ProSeal (PLMA) is new larypeal mask device with modified cuff to improve the seal and drain tube to provide access to the gastrointestinal tract. We assessed the use of PLMA for children.

Materials and Methods: Following acceptance by the Institutional Ethics Committee written consent from parents was obtained. 55 children (weight 25–50 kg) were managed with the size 3 and 15 children (weight 10–25 kg) with the size 2, ASA I or II and were undergoing elective plastic and reconstructive surgery in the supine position. Induction was with iv Propofol and Fentanyl untill an adequate level of anaesthesia was achieved for PLMA placement. Intra cuff pressure was set at 80 mmHg using Mallnckrodt manometer. Maintenance was of Sevoflurane and Fentanyl 3 µg/kg and pressure contro lled ventilation at 15 cm H2O without muscle relaxants, with any oropharyngeal leaks or gastric insufflation. Routine monitoring applied including NIBP, HR, ECG, SpO2, ETCO2, PiP, Pp, PEEP, Pwaw and CS.

Results and Discussions: First attempt success rates of achieving an effective airway were 90% but after 3 attempts 100%. The time to achieve effective airway was 32 ± 10 sec. A failed attempt wasn’t observed. Displacement of PLMA intraoperatively – 4 and alternative airway device was used. Drain tube air leaks – 4 cases. Tidal volume and gas exchange was adequate in all patients. During PCV by PiP = 15 cm H2O; VR = 7.2 ml/kg; Rrav = 14 ± 2 cm H2O/sec; CSi within 19 ± 5 ml/cm H2O. Such intraoperative complications as: aspiration/regurgitation, hypoxia (SpO2 < 92%), brain oedema were not observed. Airway obstruction – 1, gastric insufflation – 1, coughing during removal – 2, blood staining after removal – 3. Success rate for gastric tube insertion was 80%, more difficult at the first attempt. Incidence
of postoperative complications was: sore throat mild and moderate – 3, dysphonia – 1, jaw and neck sore – 0. Anaesthesia time was 20–245 min.

**Conclusion:** The laryngeal mask airway ProSeal is an effective airway device for pressure controlled ventilation in nonparalyzed anaeasthetised children providing adequate gas exchange.

### 10AP2-7 Cost effectiveness of cuffed versus uncuffed tracheal tubes in children

S. Eschertzhuber, B. Salgo, W. Roth, A. Gerber, M. Weiss

**Anaesthesia and Intensive Care, Medical University Innsbruck, Innsbruck, Austria**

**Background and Goal:** The increased costs of cuffed tracheal paediatric tubes are often cited reasons to avoid them in clinical practice (1). The aim of this study was to compare cost effectiveness of cuffed versus uncuffed tracheal tubes (TT) in paediatric surgical patients.

**Materials and Methods:** After institutional ethics committee approval and written parental consent the tracheas of patients from birth to 5 years undergoing elective surgery were intubated with either uncuffed (Sheridan) or cuffed TT (Microcuff PET) in randomised order. Number of TT used per patient, required for intubation until a TT with appropriate fit and seal was placed, lowest possible fresh gas flow (minimal allowed FGF: 0.5 L/min) and Sevorane® concentration used were noted. Consumption and costs for Sevorane® were calculated (2). Data were compared using unpaired, two-sided T-test (P < 0.05) and are presented as mean ± SD.

**Results:** 58 children aged 1.94 ± 1.52 years were enrolled. No significant differences in age (p = 0.28), weight (p = 0.53) or Sevorane® concentrations used (p = 0.84) were found between the two groups.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Uncuffed TT</th>
<th>Cuffed TT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td>27</td>
<td>31</td>
</tr>
<tr>
<td>Intubation time sec</td>
<td>114.0 ± 103.7</td>
<td>39.5 ± 35.1*</td>
</tr>
<tr>
<td>Number TT used n/patient</td>
<td>1.6 ± 1.0</td>
<td>1.0 ± 0.0</td>
</tr>
<tr>
<td>Costs for TT €/patient</td>
<td>2.9 ± 1.4</td>
<td>9.5 ± 0.0</td>
</tr>
<tr>
<td>Fresh gas flow L/min</td>
<td>2.41 ± 0.85</td>
<td>0.88 ± 0.34*</td>
</tr>
<tr>
<td>Assessment period Min</td>
<td>59.7 ± 23.4</td>
<td>67.5 ± 36.8**</td>
</tr>
<tr>
<td>Sevo®liquid/min</td>
<td>0.32 ± 0.14</td>
<td>0.11 ± 0.04</td>
</tr>
<tr>
<td>Sevo®volume/min</td>
<td>0.23 ± 0.10</td>
<td>0.28 ± 0.03*</td>
</tr>
<tr>
<td>Total Sevo® costs €/patient</td>
<td>14.6 ± 11.7</td>
<td>5.1 ± 2.9*</td>
</tr>
</tbody>
</table>

P: cuffed vs uncuffed TT: *P < 0.01, **P < 0.001, ***P > 0.05

**Conclusions:** In this study the increased cost of the cuffed tracheal tube was fully compensated by a lower cost of Sevorane® consumption. In addition, there are further savings due to reduced consumption of oxygen, air and nitrous oxide as well as reduced indirect costs due to primary success of intubation, reliably sealed airway and less environmental pollution by the use of cuffed tracheal tubes.

**References:**

### 10AP3-1 The effect of varying continuous propofol infusion on plasma cGMP concentrations in anesthetized children

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**Department of Anesthesia, Hospital for Sick Children, Toronto, Canada**

**Background and Goal of Study:** The glutamate-nitric oxide-cyclic GMP pathway is potentially an effective target for general anesthesia agents. Plasma cyclic GMP (cGMP) concentrations are reduced following an increase in predicted plasma propofol concentrations during sedation in healthy adult volunteers. This study hypothesized that an increase in measured plasma propofol concentration leads to a reduction in plasma cGMP in anesthetized children.

**Materials and Methods:** With Research Ethics Board approval and written parental consent, a total of eighteen healthy children aged 46.8 (±19.8) months, requiring general anesthesia for lower body surgical procedures were enrolled. Following inhalational induction, tracheal intubation and initiation of intermittent positive pressure ventilation, caudal epidural analgesia was performed. Anesthesia was maintained using a continuous propofol infusion adapted from a previously published regimen to achieve predicted propofol plasma concentration of 6, 3 and 1.5 μg/ml after 30, 50 and 70 min, respectively. Samples for propofol and cGMP plasma concentrations were collected and analyzed using high-performance liquid chromatography and an enzyme immunoassay system.

**Results and Discussions:** The plasma cGMP concentrations varied significantly (median [range]) 19.2 [11.8–23.5], 21.3 [14.6–30.8] and 24.9 [15.7–37.8] nmol/L between each predicted plasma propofol concentrations, P < 0.0001. The correlation coefficient (r) was –0.62.

**Conclusion:** This study demonstrates that an increase in plasma propofol concentration leads to a decrease in plasma cGMP in healthy children and may potentially serve as a biochemical marker for depth of propofol anesthesia in children.

### 10AP3-3 Evaluation of continuous NIRS cerebral oxygenation reading for global oxygenation monitoring during major paediatric surgery

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**Anaesthesia, University Childrens Hospital Zurich, Zurich, Switzerland**

**Background and Goal:** To evaluate continuous near-infrared spectroscopy (NIRS) cerebral oxygenation reading using the INVOS 5100 oximeter for non-invasive estimation of central venous oxygen saturation (SvO2) in children undergoing major orthopaedic surgery (1–3).

**Materials and Methods:** With approval of the Local Ethical Committee and written parental and/or patient consent, patients aged from birth to 16 years undergoing major orthopaedic surgery were enclosed into the study.

The SvO2 measurements were performed at the right forehead using the INVOS self-adsive NIRS probes. Central venous blood samples were drawn every 30 minutes and analysed for SvO2 by a blood gas analyser (ABI 700, Radiometer, Copenhagen, Denmark). Simultaneously, the SvO2 values were recorded. Values of rSO2 and SvO2 were compared inter- and intra-individual using linear regression analysis. Sensitivity and specificity of rSO2 between two measurements to indicate a fall in SvO2 were calculated.

**Results:** 18 patients aged from 0.1 to 15.5 yr (median 10.1 yr) and weighing 4.8 to 57.4 kg (median 22.0 kg) were studied. Values for rSO2 ranged from 59.0 to 92.0% (median 74.0%) for Hb from 5.1 to 14.6 g/dl (median 9.5 g/dl) and for SvO2 from 69.3 to 89.0% (median 80.0%). Among all subjects only weak correlation was found between rSO2 and SvO2 (R2 = 0.073). Intra-individual measured rSO2 values demonstrated various correlations to SvO2 values (R2: < 0.001 to 0.987; median 0.424). Sensitivity and specificity to indicate a fall of SvO2 by rSO2 was 44.3% and 57.1%, respectively.

**Conclusion:** Based on our preliminary findings continuous near-infrared spectroscopy (NIRS) cerebral oxygenation reading using the INVOS 5100 oximeter does not allow to monitor the course of global oxygenation in children during major surgery.

**References:**

### 10AP3-4 Efficacy and safety of sevoflurane and propofol anesthesia for MRI in pediatric patients

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Department of Anaesthesiology and *Radiology, Cumphuriyet University School of Medicine, Sivas, Turkey

**Background and Goal of Study:** Magnetic resonance imaging (MRI) for children often require deep sedation or anesthesia because the patients must remain completely immobile for a relatively long period to obtain high quality images. The laryngeal mask (LMA) has proved to be a safe and effective technique for airway management in both neonatal and pediatric patients. The aim of this randomized controlled study was to compare effects of propofol anesthesia or sevoflurane anesthesia with the LMA for children undergoing MRI.

**Materials and Methods:** After the approval of ethical committee and the patient, seventy-nine patients of ASA physical status I and II, with age ranging 6 months-10 years, who were scheduled for cranial MRI, were enrolled in this study consecutively. Group propofol (group P; n = 20) were given 4 mg·kg⁻¹ propofol i.v. in 30s after insertion i.v. catheter and followed by 150 μg·kg⁻¹·min⁻¹ infusion. Group sevoflurane (group S) was induced with 8% sevoflurane by facemask and maintained with an air/oxygen mixture and followed by 1-2 sevoflurane. Then i.v. catheter was inserted. The LMA was inserted with the traditional technique described by Brain (17). After insertion the lungs were manually expanded and the endtidal CO2 curve was evaluated. Heart rate, blood pressure, respiratory rate, endtidal CO2 and oxygen saturation were recorded at the start and finish of anesthesia. Imaging quality were assessed (1: very poor, 5: excellent). In addition, LMA insertion, removal, and recovery times were noted.
Results and Discussions: There were no difference between groups about demographic data, duration of scan and hemodynamic parameters. There was no significant difference in imaging quality between study groups. No significant differences were found in the incidence of PONV. Induction times and recovery times were significantly shorter in the sevoflurane group than in the propofol group (p < 0.05).

Conclusion: Propofol or sevoflurane with larengale mask provides satisfactory anaesthesia during MRI in children. Sevoflurane provides more rapid induction and recovery than propofol.

10AP3-5
A pharmacokinetic study of i.v. tramadol continuous infusion in children
A. Rochette, J. Ouaki, O. Raux, Ch. Dadure, X. Capdevila
Hôpital Lapeyronie, Department of Anesthesia & critical care, CHU de Montpellier, Montpellier, France

Background and Goal: Clinical studies encourage the use of i.v. tramadol (T) in children for post operative pain relief (1), but pharmacokinetic data remain rare. Stereoselective plasma concentration and elimination profile of T and its main metabolite, O-desmethyl-T (ODT), (i.e. (+) & (-) enantiomers, were determined after 24-h T infusion.

Methods: 24 children, 3.76–15.0 years, 15.8 ± 1.95 kg, 0.66 ± 0.60 h, underwent gastro-oesophageal reflux laparoscopic surgery under standard anesthetic conditions. They received T, 2 mg/kg in 10 min, followed by 8 mg/kg once every 6 h. Plasma samples of T and ODT were determined after 24-h T infusion.

Results: 18 patients received bolus T, 17 within 1.5 h of initial dose, 6 had 2–3 boluses. Infusion was stable for T (+) & T (-) and ODT (+) plasma concentrations. Pharmacokinetic data are reported in the table.

<table>
<thead>
<tr>
<th>Plasma conc mg/ml (H4)</th>
<th>VDss (L)</th>
<th>Clearance (L/min)</th>
<th>t1/2 (h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(+) tramadol mean(SD)</td>
<td>166.9 (77.7)</td>
<td>51 (32.8)</td>
<td>13.3 (5.9)</td>
</tr>
<tr>
<td>range</td>
<td>73.4–390</td>
<td>7.7–159</td>
<td>5.24–27.1</td>
</tr>
<tr>
<td>(-) tramadol mean(SD)</td>
<td>169.9 (68.3)</td>
<td>53 (20.1)</td>
<td>14.5 (6.6)</td>
</tr>
<tr>
<td>range</td>
<td>62.7–375</td>
<td>7.9–126</td>
<td>5.68–28.2</td>
</tr>
<tr>
<td>(+) ODT range</td>
<td>26.3 (17.3)</td>
<td>852 (820)</td>
<td>121 (103)</td>
</tr>
<tr>
<td>(-) ODT mean(SD)</td>
<td>32.8 (17.2)</td>
<td>539 (417)</td>
<td>86.7 (52)</td>
</tr>
<tr>
<td>range</td>
<td>8.11–68.9</td>
<td>180–1984</td>
<td>23.4–278</td>
</tr>
</tbody>
</table>

Conclusions: 1 – no accumulation of T or ODT occurred; 2 – no kinetic difference appeared between enantiomers of both T and ODT. 3 – data were comparable to adults. 4 – t1/2 (ODT) is about twice t1/2 (T). 5 – clinically relevant kinetic-dynamical correlations were not found.

References:

10AP3-6
The role of octreotide in the treatment of pancreatic pseudocyst in pediatric patients
I. Budic, A. Slavkovic, D. Simic, V. Djordjevic, D. Novakovic
Anesthesiology Department, Clinic for Pediatric Surgery and Orthopedics, Clinical Centre Nis, Serbia, Nis, Serbia

Background and Goal of Study: Pancreatic pseudocysts in children are rare and known as complications of acute pancreatitis and pancreatic trauma. Lately, the use of somatostatin and its long-acting analogue octreotide have proved useful in the treatment of pancreatic pseudocysts in children.

Materials and Methods: In a recent multicenter randomized controlled study we investigated the effects of short and long-term treatment of pancreatic pseudocysts with octreotide. Complete records were available for 9 patients. Data pertaining to their admission, plus long-term radiologic and clinical outcome were analyzed. All patients were treated with octreotide acetate (2–3 µg/kg SQ QD).

Results and Discussions: Five children were treated conservatively with bowel rest and hyperalimentation. Two patients required percutaneous drainage, one patient needed surgical intervention. One patient had abdominal pain and surgical re-intervention not related to the pancreatic injury. The median length of hospitalization was 22 days. In three children significant decrease of the pseudocyst size was noticeable 7 days after the conservative treatment with octreotide acetate, with almost complete resolution of the pseudocysts occurred within 6 weeks.

Conclusion(s): Octreotide is a safe and potentially effective adjunct in the treatment of pediatric pancreatic pseudocyst, by which means surgical re-intervention could be avoided.

References:

10AP3-7
Paediatric propofol pharmacokinetics: a multicentre study
A. Rigby-Jones, M.J. Priston, A.R. Wolf, J.R. Sneyd
Anaesthesia Research Group, Peninsula Medical School, Plymouth, United Kingdom

Background and Goal of Study: Schmutzer and Ihmsen’s propofol pharmacokinetic (PK) model1 based on pooled adult and paediatric data lacked information for the smallest patients. We conducted a pooled population analysis of available neonatal and paediatric propofol PK data. The variable clinical circumstances of the individual studies allowed us to explore health status as a covariate.

Materials and Methods: We combined propofol blood plasma concentration vs. time, data, dosing information and demographic data from 8 paediatric studies conducted by 6 research groups, with our data2,3. The pooled data set comprised 197 individual observations, aged 0.02 to 12.25 years (2.75 to 60.5 kg, median 15 kg). In this preliminary PK analysis using NONMEM, the basic model structure was established before all model parameters were allometrically scaled to body weight. The influence of health status on paediatric propofol PK was explored.

Results and Discussions: In this 3-compartment preliminary model, post-cardiac surgery patients have significantly reduced metabolic clearance rates (31% to 45% less when compared to healthy children or non-cardiac PICU patients). The volume of the deep peripheral compartment in critically ill and post-cardiac surgery children is 31% and 205% larger, respectively, than in healthy children, see Table 1.

Table 1. PK values for a child weighing 15 kg

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Typical Value</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL (L/min)</td>
<td>Healthy</td>
<td>0.614</td>
</tr>
<tr>
<td>PICU</td>
<td>0.767</td>
<td>0.628–0.906</td>
</tr>
<tr>
<td>PICU cardiac</td>
<td>0.421</td>
<td>0.396–0.476</td>
</tr>
<tr>
<td>Q2 (L/min)</td>
<td>Healthy</td>
<td>0.839</td>
</tr>
<tr>
<td>PICU</td>
<td>0.252</td>
<td>0.221–0.283</td>
</tr>
<tr>
<td>Q3 (L/min)</td>
<td>Healthy</td>
<td>7.76</td>
</tr>
<tr>
<td>V1 (L)</td>
<td>14.4</td>
<td>12.8–16.0</td>
</tr>
<tr>
<td>V3 (L)</td>
<td>Healthy</td>
<td>83.9</td>
</tr>
<tr>
<td>Q2</td>
<td>268</td>
<td>183–353</td>
</tr>
<tr>
<td>Q3</td>
<td>172</td>
<td>117–227</td>
</tr>
</tbody>
</table>

Conclusion(s): Health status may materially influence paediatric propofol PK.

References:

10AP4-1
Behavioral reinforcement and play in paediatric outpatients: effects on anxiety, parental separation and induction
A. Dutta, S.K. Mahotra, J. Sood, D. Kumar
Anaesthesiology, Pain and Perioperative Medicine, Sir Ganga Ram Hospital, New Delhi, India

Background and Goal of study: Coping skills, modeling and play are effective behavioral modalities in decreasing preoperative anxiety amongst pediatric inpatients. In outpatient setting, these may be inadequate and difficult to apply. This investigation determines the effectiveness of behavioral reinforcement with play versus play alone, in respect to anxiety, parental separation and induction in pediatric outpatients.

Material and Methods: Thirty two children aged 3–7 years, of either sex were randomly divided into two groups: play with behavioral reinforcement (n = 16, group I) and play alone (n = 16, group II). Standardised measures for anxiety assessment were applied in the outpatient clinic and pre-anesthesia
room. The time for parental separation and induction were observed. A bold 2cm line, colored green, drawn on the dorsum of hand during outpatient clinic visit, acted as reinforcer in group I.

**Results:** Both the groups were comparable for age, sex, body weight, parental literacy, socio-economic status, proposed procedure, surgical history and preoperative anxiety. Anxiety levels in pre-anesthesia room decreased in both the groups, though significant only in group I (p < 0.001), when compared to the baseline. The time, in seconds, for parental separation and induction were significantly higher in group II (111.75 ± 60.22 and 187.5 ± 25.92) as compared to group I (63.81 ± 35.49 and 140.31 ± 40.64) (p < 0.01). Children in group I were also more cooperative during induction.

**Conclusion:** Behavioral reinforcement when added to play results in lesser anxiety, faster parental separation and induction time as compared to play alone in pediatric outpatients.

**References:**

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**10AP4-2**

**Perioperative glyceremia in paediatric ambulatory surgery**

F. Munar, S. Manrique, N. Montferrer, M. De Miguel, E. Andreu

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**Background and Goal of Study:** Intravenous glyceremia administration during paediatric surgery remains controversial (1). We studied changes in capillary blood glucose concentrations by administering different intravenous solutions in pediatric ambulatory surgery under general anaesthesia and peripheral nerve block.

**Materials and Methods:** After institutional approval and parental informed consent, a prospective study was carried out on 48 patients aged 2–16 years, ASA I, II or stable III, undergoing circumcision or herniorrhaphy under general anaesthesia and peripheral nerve block. The patients were randomly placed in group A (n=25): 1/5 glucosamine (4.7% glucose) or group B (n=21): glucosamine (3.3% glucose). We started immediately after induction of 4 ml / kg / h1 for the first ten kg, 2 ml / kg / h1 for the second ten kg and 1 ml / kg / h1 for upwards of twenty kg until thirty minutes post-extubation. Capillary blood glucose was determined before induction (T0) and three minutes after induction (T15) and three minutes after (T30). Urinary ketones were recorded. Data were analyzed by Mann–Whitney rank sum test, Friedman’s statistic and Chi square, and were expressed as median, interquartile range and range. P < 0.05 was considered significant.

**Results and Discussions:** There were no characteristic differences, or any significant variations in glycemia between the groups. There was a significant change in the time course of glycemia in group B (p = 0.004) at T15 (p = 0.007) and at T30 (p = 0.049) but not in group A (p = 0.068). The urinary ketones (n = 6) and dizziness, nausea or vomiting (n = 10) did not depend on the fluid administered.

**Conclusion:** In paediatric patients undergoing circumcision or herniorrhaphy under general anaesthesia and peripheral nerve block, significant changes in capillary glyceremia do not exist between groups that received either 1/5 glucosamine or glucosamine. The occurrence of dizziness, nausea or vomiting and the presence of urinary ketones do not depend on the solution administered.

**Reference:**

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**10AP4-3**

**Intravenous lidocaine prior to extubation reduces postextubation cough and agitation in children undergoing tonsillectomy and adenoidectomy**

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**Background and Goals:** Sevoflurane is widely used to ambulatory pediatric anesthesia. But, sevoflurane is associated with a high incidence of emergence agitation in children (1). In this study, we examined the effect of single intravenous lidocaine prior to extubation on postoperative cough and agitation in children undergoing tonsillectomy and adenoidectomy.

**Materials and Methods:** All patients received a standardized anesthetic regimen with 2–3% sevoflurane in 50% O2/N2O after anesthetic induction with intravenous glycopyrrolate 0.004 mg/kg, thiopental 5 mg/kg and vecuronium 0.1 mg/kg. In a double-blinded trial, 120 children (age 3–9 years) were randomly assigned to receive normal saline 0.1 ml/kg (control, n = 40), 1% lidocaine 1 mg/kg (L1, n = 40) or 2% lidocaine 2 mg/kg (L2, n = 40) at 1 minute after beginning of spontaneous respiration. After extubation, the sedation score and the incidence of cough and agitation were recorded.

**Results and Discussions:** The incidence of severe cough and agitation in the L1 and L2 groups were significantly less compared with the control group (P < 0.05). The sedation score in the L2 group was higher than the L1 and control groups at 5 min after extubation. At 10 min after extubation, the sedation score in the L1 and L2 groups was higher than the control group.

**Conclusions:** We conclude that intravenous lidocaine prior to extubation reduces cough and agitation after sevoflurane anesthesia in children undergoing tonsillectomy and adenoidectomy.

**Reference:**

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**10AP4-4**

**The effect of subtenons lidocaine injection on emergence agitation after general anesthesia in pediatric strabismus surgery**

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**Background and Goal of Study:** Inhalation anesthesia with sevoflurane is widely used for pediatric patients. However, emergence agitation after sevoflurane anesthesia has been reported. This study examined whether or not a lidocaine injection into subtenons space affects emergence agitation after pediatric strabismus surgery with sevoflurane or balanced anesthesia.

**Materials and Methods:** We studied 160 children receiving muscle surgery for strabismus randomized to one of four groups (Group SS: sevoflurane and saline injection, Group SL: sevoflurane and lidocaine injection, Group BS: remifentanil & propofol and saline injection, Group BL: remifentanil & propofol and lidocaine injection). Anesthesia was induced with 4–6 mg/kg thiopental sodium and 0.8 mg/kg rocuronium. Before the end of surgery, a surgeon injected the subtenons space with 2% lidocaine or normal saline 1 ml. The degree of emergence agitation was assessed at the postanesthetic care unit using a five point scoring scale. (score 1: asleep, score 2: awake & calm, score 3: irritable or consolable crying, score 4: inconsolable crying, score 5: severe restlessness) We defined a score of 4 or 5 as emergence agitation.

**Results and Discussions:** There were no differences in age, weight, and duration of anesthesia. The incidence of emergence agitation was significantly decreased in patients who received subtenons lidocaine injection compared with saline injection. (P<0.05)

**Conclusion:** A lidocaine injection into the subtenons space reduces emergence agitation after general anesthesia in pediatric strabismus surgery.

**References:**

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**10AP4-5**

**Severe infections in postoperative period after pediatric cardiac operations – value of biochemical monitoring**

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**Background and Goal of Study:** Children are more prone to develop severe infection during postoperative period after cardiac operations. Systemic inflammatory response caused by cardiopulmonary bypass can impede early recognition of severe infection. The aim of the study was to establish importance of biochemical parameters monitoring during children’s cardio-surgical postoperative period as a help to reveal infectious process.

**Materials and Methods:** 63 consecutive children after cardiac operation with ICU stay no less than 3 days. Children were divided into two groups: A – control group without any complications during postoperative period (25 pt) and B – children who developed sepsis or severe infection in postoperative period

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**References:**
(38 pt). Each child had monitored several biochemical parameters daily (CPK, LDH, AspAT, urea, creatinine, bilirubine). Definition of severe infection (sepsis, severe sepsis, septic shock) was according to [1]. Changes in time of biochemical values from children without infection and with severe infection were observed during postoperative period. For statistical analysis we have used Friedman ANOVA test.

Results and Discussion: Significant difference was found between groups in children's age (64 ms vs. 12 ms p < 0.001) but there were no statistical differences between times of cardiopulmonary bypass (102 min vs. 92 min p > 0.05). In control group biochemical values did not rise significantly during first four days after operation. Children in studied group developed severe infection on 2nd day after operation on average (1st to 6th day). In this group we have observed significant rise of some biochemical markers (AspAT, ALT, LDH, urea, creatinine), beginning just after operation. This rise preceded diagnostic evaluation of the infection.

Conclusion(s): Elevation of biochemical markers during postoperative period after cardiac operations in children could be used as sign of impending infection.


10AP4-6

The effect of anesthetic agents on emergence delirium in pediatric strabismus surgery
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Background and Goal of Study: This study was designed to compare the effects of anesthetic agents used recently on emergence delirium (ED) in pediatric strabismus surgery.

Materials and Methods: Two-hundred thirty two children, aged 2–10 years, undergoing strabismus surgery, were randomly assigned to one of eight groups: ketamine-desflurane, ketamine-sevoflurane, midazolam-propofol, midazolam-sevoflurane, midazolam-remifentanil anesthesia was induced with ketamine 1.0 mg/kg or midazolam 0.15 mg/kg. Laryngeal mask airway was placed with rocuronium 0.5 mg/kg. Anesthesia was maintained with desflurane 5–6 vol%, sevoflurane 2–3 vol%, propofol 6–9 mg/kg/h, or remifentanil 0.5 μg/kg/min under N₂O 66% in O₂. The status of ED was evaluated by a blinded observer until discharge from postanesthetic care unit. Data were analyzed using t-test, ANOVA, and χ²-test.

Results and Discussions: There was no difference in age, sex, weight, height, anesthetic time, and recovery time among the eight groups. ED occurred in 54 children (23.3%). Compared with the ketamine group, the midazolam group showed less incidence of ED. The propofol and the remifentanil groups showed less incidence of ED compared with the desflurane and the sevoflurane groups. ED group was younger and more temperamental compared with nonED group.

Conclusions: Propofol or remifentanil provided less incidence of ED compared with desflurane or sevoflurane anesthesia in pediatric strabismus surgery.

Table 1. Factors Related Emergence Delirium (ED)

<table>
<thead>
<tr>
<th></th>
<th>NonED (n = 178)</th>
<th>ED (n = 54)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>5.5 ± 1.9</td>
<td>4.0 ± 1.9</td>
<td>0.00</td>
</tr>
<tr>
<td>Sex (M/F, n)</td>
<td>100/78</td>
<td>27/27</td>
<td>0.42</td>
</tr>
<tr>
<td>Emotional status (1/2/3, n)</td>
<td>128/32/18</td>
<td>19/27/8</td>
<td>0.00</td>
</tr>
<tr>
<td>Anesthetic time (min)</td>
<td>26.6 ± 4.1</td>
<td>27.3 ± 4.6</td>
<td>0.30</td>
</tr>
<tr>
<td>Recovery time (min)</td>
<td>9.6 ± 3.9</td>
<td>9.8 ± 3.1</td>
<td>0.83</td>
</tr>
<tr>
<td>Ketamine/midazolam (n)</td>
<td>83/95</td>
<td>34/20</td>
<td>0.035</td>
</tr>
<tr>
<td>Des/Sevo/Propofol/Remifentanil (n)</td>
<td>35/41/50/52</td>
<td>23/19/7/5</td>
<td>0.00</td>
</tr>
<tr>
<td>Inhalational/intravenous (n)</td>
<td>76/102</td>
<td>42/12</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Data are mean ± SD or number.

10AP4-7

Evaluation and validation of the FLACC preverbal patient pain scale in comparison with the VAS pain scale for pediatric patients in the PACU – A preliminary study
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Background and goal: FLACC Pain Assessment Tool is an observational scale for quantifying pain behaviors. Facial expressions, Leg movement, Activity, Cry and Consolability are each scored 0–2, for a total FLACC score of 0–10.

The goal of this study is to evaluate the correlation of the FLACC pain assessment scale with the Visual Analogue Scale VAS 0–10, in assessing pain for pediatric patients in the Post Anesthesia Care Unit (PACU)

Materials and Methods: 16 male pediatric patients aged from 1–7 years, who underwent minor surgical operations of less than 60 minutes, were studied.

They were all given the same anesthetic scheme and intraoperative analgesia with i.v fentanyl (4 μg/kg), per rectum paracetamol (30 mg/kg) and i.v clonidine (2 μg/kg).

All children were evaluated for pain using the two scales, by two different observers – in order to achieve interrater reliability – at 5, 10, 20, 30, 40 and 50 minutes from their arrival to the P.A.C.U. Additional analgesia 0,10 mg/kg iv morphine was given if the score in either scale exceeded 5 (moderate to severe pain). Data was analysed by SPSS 12.0 program using analysis of bivariate correlation (PEARSON correlation).

Results and Discussion: Data results are shown in the tables:

<table>
<thead>
<tr>
<th>FLACC 10</th>
<th>FLACC 10</th>
<th>FLACC 40</th>
<th>FLACC 40</th>
<th>FLACC 50</th>
<th>FLACC 50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Correlation</td>
<td>1</td>
<td>.889</td>
<td>1</td>
<td>.855</td>
<td>1</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.003</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.005</td>
</tr>
</tbody>
</table>

Positive correlation between the FLACC and VAS scales was found at all time intervals and was stronger and correlated significantly (p < 0.01) at 10, 40 and 50 minutes (Pearson r₁0 = 0.689, r₄₀ = 0.858, r₅₀ = 0.752).

Conclusion: FLACC pain assessment scale can be an appropriate and valid alternative tool for assessing pain especially in preverbal children in the PACU, where other pain scales are not effective.


10AP5-1

Perioperative assessment of coagulation in paediatric neurosurgical patients using thromboelastography
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-Egypt, Cairo, Egypt

Background and Goal of study: Primary brain tumors may be associated with coagulation disorders which can pose intraoperative and postoperative management difficulties. Thromboelastography (TEG) is a useful technique for evaluating coagulability.

Materials and Methods: In this study we evaluated the perioperative coagulation profile using both standard laboratory work and TEG in pediatric patients undergoing craniotomy for primary brain tumors. 40 Pediatric patients were enrolled in the study. All patients received standard anesthesia. Blood was analyzed for both standard laboratory work and TEG at three points for each patient: preoperatively, intraoperatively, and postoperatively. Post operatively patients were divided into two groups according to occurrence or not of postoperative haematomas.

GNH (non haematoma group) and GH (haematoma group). The standard blood work and TEG values for both groups were compared.

Results and Discussion: Perioperative standard blood work was within normal limits for all patients with no significant difference between both groups. In GHN TEG values were indicative of a hypercoagulable state which started intraoperative and continued into the 1st postoperative day. In GH TEG values were indicative of a hypocoagulable state which was evident in the preoperative TEG values and continued into the intraoperative as well as post operative period.

Conclusion: TEG may be useful in the perioperative assessment and monitoring of coagulation in pediatric neurosurgical patients and helps in identifying patients at increased risk of bleeding or thromboembolic events.
10AP5-2
Perioperative fluid prescribing in paediatrics
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Background and Goal of Study: The use of hypotonic intravenous fluids has been associated with more than 50 international case reports of death or neurological injury in children. In 2003 the Royal College of Anaesthetists warned of the risk of iatrogenic hyponatraemia and water overload developed after the use of sodium chloride 0.18% with glucose 4% in children. A follow-up survey found less than half of consultant anaesthetists had been aware of this warning. Our audit looked at whether anaesthetists’ fluid prescriptions intraoperatively and postoperatively reflected these concerns in our department.

Materials and Methods: The audit examined the fluid administration in paediatric operations over a 4 month period. Data collected included the age and weight of the child, the volume, rate and type of fluid prescribed intraoperatively and postoperatively, whether there was any estimate of blood or fluid loss, and whether capillary blood sugar was recorded. We also recorded the current locations of sodium chloride 0.18% with glucose 4%.

Results and Discussions: Over the 4 month period, 35 patients received intraoperative fluids: none had a capillary blood sugar recorded and only 1 had an estimate of blood or fluid loss. 31 were given isotonic solutions, at volumes between 3–34 ml/kg. 4 were given hypotonic solutions (2 at 10–20 ml/kg, 2 at greater volumes). Only 17 patients were prescribed postoperative fluids: 13 were given isotonic solutions, of which only 4 were prescribed according to the Holliday and Segar formula. The majority were prescribed at greater rates. 4 were given hypotonic fluids, 1 at the predicted rate, 2 at a greater rate and 1 at almost half the calculated rate. Sodium chloride 0.18% with glucose 4% solution was freely available in all clinical areas.

Conclusion(s): There is no restriction in the availability of sodium chloride 0.18% with glucose 4% solution. The majority of paediatric patients are given isotonic fluid intraoperatively. However, despite the concerns about hyponatraemia, post-operatively the majority are being prescribed either hypotonic or excessive rates of fluid.

References:

10AP5-3
Anesthesia-related cardiac arrest in children: the thai anesthesia incidents study (THAI Study)
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Background and Goal of Study: A higher incidence of perioperative cardiac arrest and mortality has been recognized in children than in adults (1–2). This survey evaluated the incidence, causes, outcome and corrective strategies associated with anesthesia-related cardiac arrest in children from The Thai Anesthesia Incidents Study (THAI Study), the first national study of anesthesia outcomes in Thailand.

Materials and Methods: A multi-centered prospective study was conducted among 20 hospitals across Thailand over a year from 2003 to 2004. Data of cardiac arrests in children aged 15 years and younger were collected during anesthesia, in the recovery room and 24 hours postoperative period, and reviewed independently by at least 2 reviewers.

Results and Discussions: From the database of 25,098 cases, cardiac arrest related to anesthesia had an incidence of 5.1 (95% CI: 2.7–8.8) per 10,000 anesthetics and a mortality rate of 46%. Medication-related (31%) and respiratory-related (31%) causes of cardiac arrest were most common. Most of anesthesia-related arrests occurred in operating room (61%) during induction or maintenance of anesthesia (84%). Infants younger than 1 year of age accounted for 61% of all anesthesia-related arrests. Incidences of anesthesia – related arrest were significant higher in infants than older children and in children with ASA physical status 3–5 than those with ASA physical status 1–2 (p < 0.05). Improving supervision, additional training in airway management, practice guideline, efficient blood blank, equipment maintenance and quality assurance activity are suggested corrective strategies to improve quality of care in pediatric anesthesia.

Conclusions: Anesthesia-related cardiac arrest occurred most often in children younger than 1 year of age and in patients with severe underlying disease. The identification of airway management and medication-related problems as the most frequent cause of anesthesia-related cardiac arrest has important implications for preventive strategies.

References:

10AP5-4
Replacement of preoperative NPO deficit with ringers lactate maintains the blood glucose concentration within physiologic range in children undergoing strabismus surgery
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Background and Goal of Study: We investigated the effect that the replacement of preoperative NPO deficit with Ringer’s Lactate (RL) would have on blood glucose concentration in children undergoing a brief surgery.

Materials and Methods: Sixty children scheduled for strabismus surgery, from 3 to 9 years of age, were enrolled and randomly assigned to three groups of 20 patients according to the types of fluid therapy employed.

<table>
<thead>
<tr>
<th>Group</th>
<th>Replacement</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>RL</td>
<td>RL</td>
</tr>
<tr>
<td>Group 2</td>
<td>RL D1/4NS</td>
<td>½ D1/4NS</td>
</tr>
<tr>
<td>Group 3</td>
<td>RL</td>
<td>D1/4NS + ½ RL</td>
</tr>
</tbody>
</table>

D1/4NS: 5% dextrose in 1/4 strength normal saline

Results and Discussions: No significant differences in blood glucose levels at anesthetic induction among the three groups, and the mean blood glucose concentrations remained unchanged throughout the study period in all groups. No patients were found to be hypoglycemic or hyperglycemic throughout the study period.

Conclusion: We conclude that the replacement of NPO deficits with RL maintained the blood glucose concentration within physiological range throughout the operation, regardless of the types of maintenance fluid. So, We suggest that RL was suitable for replacement of NPO deficits in children undergoing a brief surgery.

Reference:

10AP5-7
Risk and predictors of blood transfusion in patients undergoing paediatric open heart surgery
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Background and Goal of Study: Transfusion was found to increase morbidity and mortality after adult cardiac surgery. Only few data are available about the risk of transfusion in pediatric population undergone operation with cardiopulmonary bypass (CPB).

Materials and Methods: The prospectively and consecutively collected database of our pediatric intensive care department (September 2001 – December 2003) was analyzed in regard of possible relationship between blood transfusion (ml/kg) and adverse outcome. The main predictors of blood transfusion were also investigated. Spearman correlation, linear and logistic regression were applied, as appropriate for statistical analysis.

Results and Discussions: The median need for blood transfusion during the operation and the first postoperative 24 hours in the patients (n = 657) was 33.2 ml/kg (interquartile range 10–75 ml/kg). Every given 10 ml/kg of blood increased the risk for perioperative dialysis (risk ratio (RR), 1.55; 95% confidence interval (CI), 1.34–1.78) the risk for nonvascular pulmonary failure (RR, 1.31; 95% CI, 1.21–1.42) and the risk for serious infection (RR, 1.18; 95% CI, 1.13–1.24). Amount of blood transfusion was correlated with the postoperative arterial oxygen tension (r = 0.29; p < 0.0001) and with the 24th hour creatinine clearance (r = 0.75; p < 0.0001). Linear regression showed that age
(p < 0.001), weight (p = 0.001), operative complexity (p = 0.008) and duration of CPB (p < 0.001) were independent factors of the amount of transfusion (model R square = 0.57).

Conclusion(s): Our findings indicate that blood transfusion increased the incidence of adverse postoperative outcomes, as renal, pulmonary events and infections after pediatric cardiac surgery. The most vulnerable group was infants having undergone complex procedures and long-lasting CPB.

10AP6-1
A comparison of clonidine 1 mcg/kg vs clonidine 2 mcg/kg for caudal block with levobupivacaine 0.25% in paediatric patients
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Background and Goal of Study: A caudal block is commonly performed for pediatric postoperative analgesia. Adjuvants are safe and effective in pain control but are associated with troublesome side effects. We hypothesized that patients receiving caudal levobupivacaine 0.25% plus clonidine 1 mcg/kg versus levobupivacaine 0.25% plus clonidine 2 mcg/kg would experience fewer side effects and the same analgesic and rehabilitation profile.

Materials and Methods: After IRB approval and informed consent, 24 patients 6 months to 4 years of age undergoing genitourinary surgery were studied in a prospective, randomized, double-masked manner. The levobupivacaine/clonidine 1 group (LC1 = 12 patients) received 1 mcg/kg of clonidine and 2 mcg/kg of levobupivacaine 0.25% while the levobupivacaine/clonidine 2 group (LC2 = 12 patients) received 2 mcg/kg of clonidine and 2 mcg/kg of levobupivacaine 0.25%. All caudal blocks were performed with “no turn technique” prior to surgical incision. All subjects received a sevoflurane/oxygen/air anesthetic by mask or laryngeal mask airway (LMA). No other hypnotics, analgesics or antiemetics were administered intraoperatively. CHEOPS (1–7 years) and NIPS (<1 years) scales for were used for postoperative pain measurement at the end of the surgical procedures and then every 4 hours for the first 24 hours.

Results and Discussions: There were no differences in demographic or surgical characteristics. Subjects in the LC1 group experienced less postoperative nausea and vomiting (PONV) and no excessive sedation than LC2 group. Subjects in the LC2 group experienced more sustained initial postoperative analgesia and sedation than the LC1 group. However, no difference was observed in pain scores or rescue analgesic use during the initial 24 hours, or in the time to first oral solid intake or discharge home. No postoperative respiratory depression, hypotension or bradycardia was identified.

Conclusion(s): While 2 mcg/kg clonidine may produce more sustained initial analgesia and sedation, 1 mcg/kg clonidine appears to provide comparable analgesia with fewer side effects.

10AP6-2
Preoperative piroxicam for postoperative analgesia in children undergoing orthopaedic surgery
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Background and Goal of Study: The use of non-steroidal anti-inflammatory drugs for pre-emptive analgesia in children is controversial. Piroxicam is a non-steroidal anti-inflammatory drug with a long plasma half-life of about 22–40 hours in children [1]. A pharmacokinetic study concluded that 1 mg/kg of piroxicam achieved adequate plasma levels and was safe for short-term administration in children [2]. We hypothesized that preoperative administration of 1 mg/kg fast-dissolving piroxicam would reduce postoperative pain scores and analgesic requirements in children undergoing orthopaedic surgery.

Materials and Methods: Following ethical committee approval and informed parental consent, we conducted a prospective randomized double blind study including 53 children 2 to 12 years old randomly allocated to two groups: Group T (25 patients): received 5 ml of water 1 hour before surgery and 2 mg/kg of IV tramadol 10 min before the end of surgery. Group P (28 patients): received 1 mg/kg of piroxicam (dissolved in 5 ml of water) 1 hour prior to the surgery and 5 ml IV saline 10 min before the end of surgery. Children with CHEOPS modified score > 4 were treated postoperatively with IV paracetamol (15 mg/kg). The time to the first analgesic supplementation, the analgesic use and the frequency of side effects were recorded. Anova and Fisher exact tests were used. P < 0.05 were significant.

Results and Discussions: Demographic data and mean surgery time were similar in both groups. Significantly lower rate of rescue analgesia was found in group P; 6 children in group T (24%) and 18 children in group P (64%) did not required rescue analgesic during the 48 hours postoperative observation period (p = 0.01). Time for the first analgesic requirement was longer in the group P (489.0 ± 477.5 min versus 356.3 ± 276.6 min), but difference was not significant (p = 0.34). Eight patients in group T (32%) and 2 patients in group P (7%) suffered from nausea and vomiting (p = 0.02).

Conclusion(s): Our findings suggest that preoperative administration of 1 mg/kg fast-dissolving piroxicam improves postoperative analgesia after orthopedic surgery in children compared with 2 mg/kg of tramadol.


10AP6-3
Ultrasound-guided paediatric epidural anaesthesia in the Nuss procedure for pectus excavatum
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Department of Anaesthesiology, Sapporo Medical University School of Medicine, Sapporo, Japan

Background and Goals: Epidural anaesthesia is often used for postoperative pain relief after the Nuss procedure in pediatric patients. However, epidural puncture after induction of general anesthesia may cause various complications, such as nerve injury, and this is a concern for anesthesiologists. It has recently been reported that ultrasound guidance has some advantages for neuraxial blockade compared with the classical blind technique (Grau et al. 2002). The aim of the present study was to determine the usefulness of ultrasound-guided epidural puncture for the Nuss procedure.

Materials and Methods: 15 children were scheduled to undergo surgery using the Nuss procedure were randomly assigned to an ultrasound group (n = 7) or a control group (n = 8). In the ultrasound group, after general anaesthesia had been induced, ultrasound examination was performed to identify the epidural space for puncture (at Th4–9 level). Neuraxial structures, including the ligamenta flava and facet joints, were visualized in proper transversal view. Depth from the skin to the dura matter was measured. Epidural puncture was performed by the loss of resistance technique with reference to the ultrasound-guided puncture point, angle, and depth. In the control group, the puncture point was decided by palpation, and epidural puncture was performed. Number of epidural punctures required and time to reach the epidural space were recorded. The difficulty in epidural puncture was scored as a five-point scale follows: 1 = very easy, 2 = easy, 3 = equal to blind puncture, 4 = difficult, 5 = very difficult.

Results: Data (mean ± SD) are shown in the table:

<table>
<thead>
<tr>
<th>Ultrasound (n = 7)</th>
<th>Control (n = 8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Punctures</td>
<td>1.4 ± 0.9</td>
</tr>
<tr>
<td>Time (sec)</td>
<td>60.1 ± 58.0</td>
</tr>
<tr>
<td>Puncture Scale</td>
<td>1.4 ± 0.3*</td>
</tr>
</tbody>
</table>

* P < 0.05 vs. Control.

Conclusions: The results of the present study showed that ultrasound imaging for pediatric epidural analgesia in the Nuss procedure has the advantages of direct visualization of neuraxial structures and reduced performance time. Ultrasound guidance may overcome the difficulty in pediatric epidural anesthesia and reduce the anxiety of anesthesiologists.

10AP6-4
Pain control after iliac crest bone graft surgery in children: intravenous ketorolac vs. continuous bupivacaine infusion
V. Espinal, J. Hayes, B. Bissonnette
Anesthesia, The Hospital for Sick Children, Toronto, Canada

Background and Goal of Study: Iliac Crest Bone Graft Surgery (ICBG) is painful. Postoperative pain management includes the infusion of local anesthetics into the wound via an indwelling catheter (1.2) and/or non steroidal anti-inflammatory drugs (NSAIDs). The purpose of this study is to compare the efficacy of intravenous ketorolac to local bupivacaine infusion for pain control after ICBG.

Materials and Methods: To date, four patients older than 10 years requiring ICBG for alveolar cleft repair or Lefort I osteotomy have been studied. Patients were randomly assigned in a blinded fashion to receive either: IV
ketorolac 0.5 mg/kg q 8h (Group K); IV ketorolac and local infusion of plain bupivacaine 0.25% at 0.1 ml/kg/hour for 48 hours (Group K + B); or bupiva-
caine infusion alone (Group B). All patients received PCA morphine and oral acetaminophen.

Results and Discussions:

Conclusion: The patient who received bupivacaine infusion alone had the highest average pain score and cumulative morphine consumption over 48 hours when compared to the patients who received ketorolac + / − bupiva-
caine infusion.

References:

10AP6-5
The effect of pre-incisional infiltration of tonsils with dexamethasone on post-tonsillectomy pain in children
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Background and Goals: Previous studies on dexamethasone's antiemetic and analgesic potential in children undergoing tonsillectomy have produced conflicting results(1). The aim of this study was to evaluate the effects of peritonsillar infiltration of dexamethasone on the incidence and severity of postoperative vomiting and pain in children undergoing electrocautery tonsil-
lectomy under standardized general anesthesia(2).

Material and Methods: In a double-blinded study, 62 patients were randomly allocated to infiltrate dexamethasone (0.5 mg/kg, maximum dose, 12 mg) or an equivalent volume of saline at the peritonsillar region. All infiltrations were performed following the induction of general anesthesia and 5 minutes prior to the onset of surgery. Anesthetic agents, end-tidal carbon dioxide levels, and the administration of intravenous fluids were carefully regulated. Surgery was performed by one attending otolaryngologists using the same dissection and suture technique. Hernostasis was managed by suction-electrocautery and packs. The incidence of vomiting, need for rescue antiemetics, and analgesic consumption were compared in both groups. Pain scores used included Children's Hospital Eastern Ontario Pain Scale, “faces”, and a 0–10 visual analogue pain scale.

Results: Demographics of dexamethasone and placebo groups were similar. No statistically significant difference was found between the dexamethasone and placebo groups in pain score, nausea, vomiting, or analgesic requirement postoperatively.

Conclusions: This study has shown that preincisional infiltration of the tonsils with dexamethasone play a limited role in the recovery phase from tonsillec-
tomy, but further prospective, randomized studies are needed to support it. Assessment of pain, nausea and vomiting in a prospective study with larger groups of patients may reflect different results.

References:

10AP6-6
Single-shot Paravertebral blockade for postoperative analgesia after urologic surgery in children
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Background and Goal of Study: Paravertebral blockade (PVB) has been employed for analgesia in children since 1992 (1). However, efficacy of the “single-shot” technique has not yet been established.

Materials and Methods: Duration of analgesia following “single-shot” PVB was prospectively studied in 28 children aged 11.8 ± 7.06 (mean ± SD) months scheduled for major urologic surgery. Bolus 0.5 ml/kg (1) of levobupiva-
caine 2.5 mg/ml (1) and epinephrine 5 mg/ml (1) was administered after paravertebral space had been identified by loss of resistance to saline with 20G Tuohy needle at the end of surgery. Postoperative analgesia defined as interval between PVB and first administration of an opioid was evaluated by FLACC NAS score (2) and Nurse score (0 – no pain, 1 – mild pain, 2 – moderate pain, 3 – severe pain) in observer-blinded manner for 12 hours. In case that an opioid had to be administered within first 120 min., the blockade was consid-
ered as failed. Incidence of complications, PONV and motor block were recorded. Both analgesia and postoperative care were standardized.

Results and Discussions: 10 children (35.7%) required no additional anal-
gesia during the study period. In 16 children (57.1%) the duration of analge-
sia was 361.3 ± 132.1 min. In one child (3.6%) the blockade failed. Vascular puncture was observed in 3 children (10.7%), one of them received no PVB. PONV occurred in 6 children (21.4%), mostly after administration of an opio-
id. Motor block appeared in 3 children (10.7%) which can be explained by epidural spread of local anaesthetic. All complications were considered minor and did not influence patients’ recovery.

Conclusion(s): “Single-shot” PVB provided long-lasting analgesia with a
favorable safety profile in children undergoing urologic surgery.

References:

10AP6-7
General and causal analgesia in children during appendectomies
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Background and Goal of study: Single-shot causal epidural blockade is one of the most widespread techniques to provide intra and postoperative analgesia in paediatric patients (1, 2). The aim of this study is to evaluate the duration of postoperative analgesia after causal blocks in children with dif-
ferent concentrations of bupivacaine during emergent appendectomies.

Materials and Methods: After local ethical committee approval and written parental consent, 84 children (ASA I–III, 1–9 years old), undergoing append-
dectomies were enrolled in study. Induction of general anaesthesia is per-
formed using oxygen, N2O, and halothane, without using opioids in both
groups. The airway was secured by tracheal intubations. After identifying the
sacral hiatus, the causal space is entered using a short (1-inch), 20-gauge short-bevel needle that has been attached to a labelled syringe containing
the solution of 0.125% bupivacaine in volume 1 ml/kg (group I, n = 47) and
0.20% bupivacaine, 1 ml/kg (group II, n = 37). The needle was placed in the
midline and inserted at a 45–60 degree angle to the coronal plane, perpen-
dicular to all other planes and maintaining a rostral direction and prepared
solution was injected. Continual monitoring of vital signs, observational paedi-
atrian pain score (OPS), modified Bromage scale and postoperative sedation
were assessed.

Results and Discussions: Patients characteristics were similar, as well as
surgical time. Analgesics were needed after 662 ± 395 min in the first group (lower concentration) and 887 ± 607 min (higher concentration) in the second group (p < 0.05). Motor block was less in the first group (p < 0.05). Emergency
agitation was present only in two cases, in both groups. Urine incontinence
was present in 17 (45.9%) children in second group and only in 3 cases (6.4%) in first group.

Conclusion: In children undergoing appendectomies caudal blockade with
0.125% bupivacaine in volume 1 ml/kg produced shorter analgesic effect,
but without motor block, muscle weakness and the other side effects.

References:

10AP6-8
Tramadol vs nalbuphine: analgesic efficacy and side effects. A prospective, randomized, double-blinded study in children.
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Department of Anesthesia and Critical Care, Chu Montpellier, Hospital Lapeyronie, Montpellier, France
Background and Goal of Study: Tramadol (T), a central analgesic with low affinity for opioid μ receptors, has been recently suggested for moderate-to-severe post operative pain relief in children (1). However, nalbuphine (N) remains a gold standard. We compared in a prospective, randomized, double-blind trial analgesic efficacy and side effects of intravenous continuous infusion of equipotent doses of T and N in children, 1 to 10 years old, ASA 1 to 3, undergoing gastro-oesophageal reflux laparoscopic surgery under standard anesthetic procedure.

Methods: 47 children were randomly allocated to receive T (2 mg/kg) in 10 min, followed by infusion of 8 mg/kg/24 h and bolus 1 mg/kg if pain score > 3) or N (0.2 mg/kg, infusion 0.8 mg/kg/24 h, bolus 0.1 mg/kg). All were given paracetamol 60 mg/kg and niflumic acid 40 mg/kg per day. Pain score (CHIPPS), sedation, bolus requirements, Respiratory- and heart rate (RR & HR), SpO2, MAP nausea and vomiting were recorded upon arrival in recovery room and at H2, H4, H6, H8, H12, H16, H20, H24.

Results: Groups were not statistically different: 3.6 (1.7–5.2) years old, 14.0 (11–17) kg, ASA 2 (1–2) [median (25–75) interquartile]. CHIPPS, hemodynamic & respiratory data, PONV, number of analgesic bolus were comparable in both groups during the whole study. SpO2 was lower in recovery room and RR was lower at H2 in group N while not significantly (p = 0.06 and 0.09, respectively). T caused less sedation at H2 (p = 0.01). A second bolus was required earlier in group T (p = 0.02). Hemodynamic data were similar to preoperative records in both groups.

Conclusion: T appears at least as efficient as N to treat moderate to severe postoperative pain in children. T causes less early sedation, and does not increase PONV.


10AP6-9
Penile block for postoperative analgesia of hypospadias repair in children
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Osbetric Anaesthesia

11AP1-1
Botox and obstetric anesthesia: is there cause for concern?
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Introduction: Botulinum toxin is a neurotoxin produced by the bacterium Clostridium botulinum. It produces flaccid muscle paralysis by blocking the release of acetylcholine at the neuromuscular junction. Botulinum toxin type A (BTA) (Botox; Allergan Inc., Irvine, CA) is commonly used for the treatment of functional hyperfunctional facial lines resulting from repeated contractions of certain muscles (e.g., orbicularis oculi) (1). In anesthesia peripheral ulnar nerve stimulation of the adductor pollicis muscle and facial nerve stimulation of the orbicularis oculi muscle are most commonly monitored to assess the degree of neuromuscular blockade. It is therefore reasonable to speculate that cosmetic BTA injection-induced flaccid muscle paralysis may interfere with neuromuscular blockade monitoring under anesthesia.

Report of Case: Indeed, I encountered a 46-year-old parturient who required Cesarean section under general anesthesia for HELLP syndrome. Following routine rapid sequence induction of general anesthesia with standard dosages of etomidate and succinylcholine (140 mg) anesthesia was maintained with fentanyl and sevoflurane in oxygen. Ten minutes later an attempt to determine the recovery from the neuromuscular blockade [facial nerve stimulation (train-of-four pattern) to detect contraction of the orbicularis oculi muscle] was made by the anesthesiologist; however, no twitches were noted. The train-of-four test was repeated 15 minutes later still yielding no twitch response. Ulnar nerve stimulation at that time confirmed full recovery from the neuromuscular blockade. Following emergence from anesthesia it was discovered that the patient had undergone multiple bilateral cosmetic facial BTA injections in early pregnancy. To the best of my knowledge this complication of BTA injections in pregnancy has not been previously reported.

Discussion: Facial enhancement by the use of BTA has revolutionized the treatment of “the aging face”, and it remains the most popular aesthetic procedure performed in the United States. In the year 2005 over 3.6 million of BTA procedures were preformed in the United States (1). The duration of BTA effect when used for the treatment of facial lines is generally 6–11 months.

As the incidence of pregnancy in older women is increasing, preoperative questioning regarding BTA injections in this group should be considered.


11AP1-2
Ten years of experience with post dural puncture headache and accidental dural perforation in a tertiary obstetric anaesthesia department
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Background and Goal: Accidental dural perforation (DT) and post dural puncture headache (PDPH) are two common complications of obstetric regional anaesthesia (1,2). PDPH is incapacitating, interferes with maternal-infant interaction and is a cause of increased staff workload and prolonged hospitalisation. We report on all cases of DT and PDPH in a tertiary care obstetric anaesthesia unit, using predominantly combined spinal epidural anaesthesia (CSE), over a 10 year period.

Material and Methods: Following institutional approval, the obstetric anaesthesia database in a tertiary care teaching hospital was searched to identify patients that experienced a DT or PDPH between Jan 1st 1997 and Oct 31st 2006. Since 1997 all patients that received obstetric anaesthesia are visited or contacted on the second postpartum day and data is prospectively gathered on all patients. The anaesthetic and obstetric charts of all patients with the diagnosis of DT and PDPH were retrospectively evaluated. Data were analysed using Chi-square analysis.

Results and Discussion: During the study period, 17610 patients received regional anaesthesia. We excluded those lost to follow-up and thus 17198 patients remained. An accidental DT occurred in 55 patients (DT-rate of 0.32%). Of these 31 (56%) developed PDPH and 26 (47%) required a blood patch (BP) and 4 (7%) needed a repeat BP inserting an epidural catheter intrathecally and leaving it there for at least 24 hours does not reduce the incidence of PDPH or BP. A further 34 patients developed PDPH without a clear DT. Overall
65 patients in our series developed PDPH (PDPH-rate 0.38%). The need for BP occurred in 82% of patients and in 15% a repeat BP was required. The interval between regional block and onset of PDPH was 32 ± 20 hours. Caffeine was not successful in treating PDPH and in 1 patient caused seizures.

**Conclusion:** In our teaching unit, using predominantly CSE, PDPH and DT occur with a similar incidence as reported in the literature (1,2,3). Contrary to some evidence, intrathecal catheters do not protect against PDPH or BP in our series. The incidence of BP and repeat BP in the present study confirms previous data.

**References:**

**11AP1-3**

**Obstetric and neonatal outcome of twin pregnancies in a tertiary care obstetric unit in relationship to the anaesthetic technique used during labour and delivery**

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**Background and Goal:** Twin pregnancies are associated with more obstetric risks, such as Caesarean section (CS) and neonatal risks. The liberal use of epidural analgesia may reduce the need for CS in twins considered good candidates for vaginal delivery (1). The purpose of this trial was to determine the relationship between obstetric and neonatal outcome and anaesthetic technique in twins.

**Material and Methods:** Following institutional approval, the obstetric database of a tertiary care hospital was searched to identify all patients that delivered a twin pregnancy of at least 24 weeks gestation between Jan 1st 1997 and Aug 31st 2004. A retrospective chart analysis was performed and obstetric, anaesthetic and neonatal outcome data were recorded. Data were analysed using the Fisher’s exact test and Chi-square analysis.

**Results and Discussion:** A total of 533 twins were identified. Sixty-one patients were excluded from analysis due to incomplete datasets. Final analysis consisted of 492 patients. Planned CS was performed in 229 parturients. From 263 patients undergoing planned vaginal delivery (VD), 70 required an unplanned CS. Ultimately, 299 mothers underwent CS and 193 VD. Neuraxial analgesia was used in 179 patients undergoing planned VD. The incidence of neuraxial labour analgesia was much higher in patients that ultimately delivered vaginally then in those that needed an unplanned CS (77% vs 50%, p < 0.01). Regional anaesthesia was used in 253 CS, whilst general anaesthesia (GA) in 46 patients (15%). The risk for GA was increased in patients that underwent unplanned CS as compared to patients that underwent planned CS (33% vs 10%; p < 0.05). The risk increased if neuraxial analgesia was not used during labour in planned VD patients as compared to patients that did use neuraxial analgesia (91% vs 15%, p < 0.05). Regional anaesthesia during CS resulted in better neonatal outcome when compared to GA.

**Conclusion:** Despite the retrospective design of our study, several conclusions can be drawn. Firstly, many vaginal deliveries ended in an unplanned CS. Secondy, established labour analgesia seems to protect against unplanned CS and GA during CS. Finally, neonatal outcome was better in planned CS deliveries and in CS under regional anaesthesia.

**Reference:**

**11AP1-4**

**Multidimensional evaluation of pain during early and late labor: a comparison of nulliparous and multiparous women**

S. Stirparo, M. Camorcia, C. Bertaina, C. Cifarelli, G. Capogna

**Anesthesiology, Città di Roma, Roma, Italy**

**Background and Goal of Study:** This study evaluates and compares the characteristics of labor pain during early and late labor in nulliparous (N) and multiparous (M) women using the McGill Pain Questionnaire (MPQ) (1).

**Materials and Methods:** After informed consent we interviewed 83 parturients divided in 4 groups according to parity and stage of labor. According to the standard MPQ the words describing qualities of pain were categorized into sensory, affective, evaluative and miscellaneous subclasses. Pain Rating Index (PRI) was calculated and scored by dividing the sum of the obtained ranks within each dimension by the total possible score for a particular dimension (2). Intensity of pain was evaluated by both VAPS (0–100) and Present Pain Intensity (PPI) (0–5). Statistical analysis was performed using Student’s test and linear regression.

**Results and Discussions:** Both N and M had mean intensity of pain which increased with greater cervical dilatation. N having more pain in early labor and M in late labor (P < 0.05). In M a significant correlation between the values of VAPS and PRI was noted (P < 0.01). Concerning parity, in N sensory and evaluative PRIs were higher during early labor while affective PRI was higher in late labor (P < 0.05). In M all the subclasses had higher PRIs during early labor (P < 0.05). Concerning the stage of labor, during early labor N reported higher evaluative and lower sensory and affective PRIs than M (P < 0.05). During late labor N reported lower sensory and higher affective PRIs than M (P < 0.05). In all groups pain was described in more than 50% of cases as: jumping, pricking, lacerating, tugging, stinging, tiring and unbearable.

**Conclusion:** Intensity of pain increases with cervical dilatation. N reported more pain in early labor and M in late labor. Perceptual, motivational and cognitive aspects of pain may vary depending on parity and stage of labor.

**References:**

**11AP1-5**

**Preoxygenation in pregnancy: a computational modelling investigation**

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**Background and Goal of Study:** Hypoxaemia during anaesthetic induction in obstetrics is hazardous for mother and baby. Ethical and practical issues constrain clinical studies. Following configuration of a computational model to replicate pregnancy physiology, we investigated the optimal technique for preoxygenation.

**Materials and Methods:** Using the Nottingham Physiology Simulator (1), we modelled three pregnant and three non-pregnant women, representing normal population variation according to published physiological values. They underwent preoxygenation by tidal and vital capacity (VC) breathing of 100% oxygen for 10 minutes.

**Results and Discussion:** Results for the six subjects during the first 3 min of non-VC preoxygenation are shown in the figure. The median time to achieve the maximum PE O2 of 95% was 1 min 40 sec in pregnant compared to 3 min 6 sec in non-pregnant women. Vital capacity preoxygenation required 11 breaths in 1 min 10 sec to achieve 95% of the maximum PE O2 for both pregnant and non-pregnant women.

**Conclusions:** Preoxygenation is more rapid in pregnancy. During tidal breathing, the PE O2 plateau was reached approximately twice as quickly. Vital capacity breathing accelerates preoxygenation to produce a similar rate in pregnant and non-pregnant women. The traditionally-advised four vital capacity breaths do not achieve optimal preoxygenation.

**Reference:**

**11AP1-6**

**Factors affecting women’s ambulation during labor**

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**Background and Goal of Study:** It is commonly believed that upright position may be beneficial for labor although it has not been demonstrated (1). This study was designed to investigate the factors affecting the parturient’s ambulation during labor and its incidence and duration.
Materials and Methods: This study was conducted on 124 parturients in active labor, 65 nulliparous (N) and 59 multiparous (M) women, who gave their informed consent to answer a questionnaire during their labor. The logistic linear and the regression logistic models were used to evaluate the factors affecting the ambulation.

Results: Epidural analgesia was received by 90% of N and by 60% of M. During labor the majority of parturients walked (96% N and 60% M). Each mean single continual period of time women ambulated during labor was 32 min (range 15–50) in N and 12 min (range 2–34) in M. The mean total duration of walking throughout the entire labor in N was 88 min (range 0–122) and in M was 35 min (range 0–55).

Factors affecting the choice in favour of parturient’s ambulation were: midwife’s suggestion (P < .001), absence of pain due to epidural analgesia (P < .005), participation in active management labor classes (P < .05), on call gynecologist’s opinion (P < .0001). Factors discouraging or preventing parturient’s ambulation were: longer labors (P < .0001), dystocic labors (P < .001), the frequency of obstetrical assessment and the need for FHR monitoring (P < .0001), longer duration of prodromic phase of labor (P < .0001). Formal education and socioeconomic status were not significant factors for all the groups.

Conclusion: Many factors other than epidural analgesia may affect the parturient’s decision to walk during labor and its duration.

Reference:

11AP1-7
Efficacy of a single dose of epidural neostigmine for postpartum pain
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Background and Goal of Study: Severe perineal pain is a common problem after vaginal delivery. Single dose epidural morphine decreases postpartum use of oral pain medication (1). Epidural neostigmine produces analgesia devoid of side effects during labor (2). The study evaluates the benefit of a single dose epidural neostigmine on postpartum pain and analgesics requirements.

Material and Methods: After informed consent, 26 parturients, with epidural analgesia for labor (ropivacaine combined with sufentanil), were randomly allocated to receive after delivery 5 mL saline (group S; n = 11) or neostigmine 500 μg in 5 mL saline (group N; n = 15). All the parturients were allowed to receive diclofenac (max 150 mg/d), with oral paracetamol (max 3 g/d) at their discretion as rescue analgesia. Postpartum pain scores (VAS=0–10) and analgesics consumption were recorded for 72 hours. Statistical analysis used unpaired T-test, P < 0.05 was considered significant.

Results and Discussion: Demographic data (including duration of first and second stage of labor, neonatal weight, episiotomy, perineal lacerations and instrumentation rate) did not differ between the groups. Postpartum VAS was similar between the groups. Expressed as mean value (95% CI), single dose diclofenac consumption was 300 mg (176–723) in S group and 283 mg (173–393) in N group; total paracetamol consumption was 4454 mg (1227–7867) in S group and 2366 mg (834–3899) in N group. Paracetamol consumption (mean ± SD) was significantly reduced in N group, at 48h (536 ± 842 mg vs 1944 ± 1703 mg; p = 0.014) and at 72h (600 ± 975 mg vs 1867 ± 1650 mg; p = 0.045).

Conclusions: Single dose epidural neostigmine 500 μg administered after delivery allowed a reduction of postpartum paracetamol consumption but did not affect pain scores as previously observed with epidural morphine (1). In contrast with epidural morphine, epidural neostigmine administration was devoid of side effects.

References:

11AP1-9
Closing the gap between decision an delivery – 18 months of rescue service for obstetrical emergencies
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Background and Goal of Study: After implementation of a reporting system for critical incidents at our institution an optimized alerting system for obstetrical emergencies (cesarean delivery, ECD) was introduced in 1/2005. Midwives contact the switchboard via a special number and a team consisting of a staff anesthesiologist, anesthese nurse, gynecologist and operating room (OR) nurse are contacted by special pagers and dispatch immediately to the OR without returning the call. We report our experience with the ECD alerting system in our institution.

Materials and Methods: Data from the on-line anesthese documentation system as well as the midwives’ records were analyzed regarding time course and outcomes of ECD since the introduction of the alerting system (group 1). For comparison the records of the past 2 years-period (2003–2004) were used (group 2, n = 57). For maternal and fetal outcomes the charts from the ward were analyzed.

Results and Discussions: Within a 18 month period from 1/2005 to 6/2006 this system was used 24 times, representing an incidence of approximately 1% of all live births and 3% of all cesarean section (n = 702). The most common causes were eclampsia, maternal bleeding or fetal asphyxia and one case of maternal and neonatal cardiac arrest following amniotic fluid embolism (AFE). Time from decision to incision was shorter in group 1 (9.8 ± 3.5 min vs. 17.5 ± 10.7 min; p < 0.001) as was time from decision to delivery (12.7 ± 3.9 min vs. 21 ± 12 min; p < 0.001). Maternal outcome did not differ between groups. All mothers were discharged home after 8 (7–11.7) vs. 9 (8–13) days, p = 0.3 (median (interquartile) range). Neonates had good outcome in both groups. In group 1 two premature infants (weight < 500 g) with asphyxia did not survive. Apgar scores (median [range]) at 1, 5 and 10 min did not significantly differ between groups (7 [0–9] vs. 6 [0–9]; 8 [0–10] vs. 8 [3–10]; 9 [0–10] vs. 9 [5–10] p = 0.3). Likewise unicharial pH-values did not show statistical differences (7.16 ± 0.6 vs. 7.15 ± 0.2).

Conclusion(s): The introduction of an ECD service led to a significant reduction in time between decision and delivery. Despite comparable results concerning outcome we are convinced that in the individual (AFE) patient(s), the short decision to delivery time may be crucial for superior outcome of both mother and child.

11AP1-10
Maternal morbidity after pregnancy suffering from HELLP syndrome
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Background and Goal of Study: HELLP syndrome is a severe, life-threatening form of preeclampsia, described by Weinstein in 1982 (1). Its importance lies in the fact that maternal and fetal morbidity, as well as mortality, are significantly elevated (2).

Materials and Methods: Between January 1st, 1995 and December 31th, 2004, 107 patients were treated for HELLP syndrome at the 1st Department of Obstetrics and Gynecology of Semmelweis University. We retrospectively analyzed the incidence of complications and necessary interventions due to these complications.

Results and Discussions: Our patients on average spent 3 days in our intensive care unit. Pulmonary oedema was the most common cardiopulmonary complication (11%), and it occurred mostly in group I. (21%). Infarction occurred in all of the tree groups in a notable proportion. The complications of HELLP syndrome are shown in the table.

<table>
<thead>
<tr>
<th></th>
<th>Mississippi I.</th>
<th>Mississippi II.</th>
<th>Mississippi III.</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>38</td>
<td>52</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Pulmonary</td>
<td>8 (21%)</td>
<td>6 (12%)</td>
<td>0 (0%)</td>
<td>*p = 0.029</td>
</tr>
<tr>
<td>oedema</td>
<td>4 (10,5%)</td>
<td>4 (7,7%)</td>
<td>0 (0%)</td>
<td>4 (4%)</td>
</tr>
<tr>
<td>Thrombo-emboly</td>
<td>0</td>
<td>0</td>
<td>0 (0%)</td>
<td>(0%)</td>
</tr>
<tr>
<td>Eclampsy</td>
<td>4 (11%)</td>
<td>4 (8%)</td>
<td>0 (0%)</td>
<td>NS</td>
</tr>
<tr>
<td>Oliguria</td>
<td>5 (13%)</td>
<td>5 (10%)</td>
<td>2 (12%)</td>
<td>NS</td>
</tr>
<tr>
<td>Infection</td>
<td>20 (52,6%)</td>
<td>17 (32,7%)</td>
<td>6 (35,3%)</td>
<td>NS</td>
</tr>
<tr>
<td>DIC</td>
<td>6 (16%)</td>
<td>1 (2%)</td>
<td>0 (0%)</td>
<td>*p = 0.02</td>
</tr>
<tr>
<td>Intensive care</td>
<td>3,6 ± 2</td>
<td>2,7 ± 1,6</td>
<td>2,6 ± 2</td>
<td>NS</td>
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<tr>
<td>(day)</td>
<td></td>
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<td>3 ± 2</td>
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</tbody>
</table>

62% of our patients received transfusion during treatment. In five cases, hysterectomy was performed. Intrauterine examination and abrasion was necessary in 5% of all cases.

Conclusion(s): Our study shows that the rate of cardiopulmonary and haematology complications are significantly higher in Mississippi I. group than in other cases. The increased need for transfusion of erythrocyte concentrate and FFP in the postpartum time of Mississippi I. group patients must be considered.

References:
11AP2-1
Epidural tramadol for controlling pain after caesarean section
T. Sanjoaquín, A. Hernández, C. Teixeira, R. López
Anestesiología y Reanimación, Hospital MAZ, Zaragoza, Spain

Objectives and Goal of the Study: Epidural tramadol has been used for controlling pain, establishing 100 mg as optimal dose. The aim of the study is comparing the analgesic quality obtained with 100 mg of epidural tramadol and with IV non-steroidal anti-inflammatory drugs (NSAD) after cesarean section.

Material and Method: 120 patients who underwent cesarean section with epidural anesthesia were randomly allocated into two groups: T (n = 60) received 100 mg epidural tramadol and S (n = 60) epidural saline when arriving at post-anesthetic care unit (PACU). Supplementary analgesia (IV NSAD) was prescribed for both groups, registering the moment it was supplied. Pain scores (PS) (0 = no pain, 10 = maximum pain) and medium blood pressure (MBP) were recorded at 1, 6 and 12 hours of arriving at PACU, at rest and with movement, as well as side effects.

Results: Both groups were compared in population variables. Surgical incision and epidural anesthesia used were the same. When arriving at PACU PS and MBP were similar in both groups. At 1, 6 and 12 hours statistically relevant differences were found in PS at rest and in movement (p < 0.01).

Conclusions: 100 mg of epidural tramadol provide an adequate analgesia for controlling pain the first hours after cesarean section, without severe side effects, achieving a better analgesia quality than using only IV NSAD.

11AP2-2
Relation between the direction of Whitacre needle hole and Mean Local Anaesthetic Dose of subarachnoid Ropivacaine 0.75% in Caesarean section
D. Valsamidis, S. Leonotopoulu, P. Klimi, O. Petropoulou, A. Karathanos Anaesthesiology, General Hospital Alexandra, Athens, Greece

Background and Goal of Study: The relation between the direction of spinal needle hole to the Mean Local Anaesthetic Dose [MLAD] in Caesarean Section has not yet been established. We measured the MLAD of subarachnoid Ropivacaine 0.75% plus 15 µg fentanyl when given through a 26G Whitacre needle, with cephalad or caudal direction.

Materials and Methods: Lumbar [L2–3] puncture was performed in lateral decubitus position in 56 health parturients scheduled for elective CS. The epidural and subarachnoid space was identified with Combined Spinal Epidural technique [needle through needle]. In the first 28 parturients [group Ca] the Whitacre needle hole was directed caudal and in the rest cephalad [Group Ce]. The dose of Rc 0.75% was administered according to the Dixon and Massey up-and-down method[1]. The dose for the first parturient of each group was 2.05 and 1.00 ml [group Ca and Ce respectively]. In both groups fentanyl 15 µg was added to the solution. An ineffective dose, defined as a verbal analog pain score of greater than 2/10, no spread of dermatomal level of block up to T4 and duration of anaesthesia of less than 60 min after injection, directed an increase of 0.05 ml to the next parturient and vice versa. Two tailed t-test was performed for statistical analysis and P = 0.01 was considered significant.

Results: The results are shown in the above figures. CI = confidence interval 95%.

11AP2-3
A randomised comparison of 0.5% levobupivacaine with Lidocaine/Epinephrine/Fentanyl mixture for epidural top-up for emergency caesarean section after “low dose” epidural analgesia for labour
P. Balaji, P. Dhillon, I.F. Russell Anaesthetics, Hull Royal Infirmary, Hull, United Kingdom

Background and Goal of Study: Levobupivacaine, an enantiomer of bupivacaine is now commonly used for epidural top-up for emergency caesarean section for women who have been receiving “low dose” labour analgesia. We decided to compare our standard epidural top-up solution [Lidocaine/Fentanyl/Epinephrine (LEF)] with 0.5% levobupivacaine in those patients.

Materials and Methods: In a prospective, single blind study, we compared 0.5% levobupivacaine (50 patients) with LEF mixture (50 patients) for epidural top-up in 100 patients. We compared the time taken for top-up drug preparation, time to inject via epidural catheter, time duration to achieve T6 block from injection, as well as side effects.

Results: One patient had spinal anaesthesia as the block was not sufficient even after 30 minutes in levobupivacaine group. Data (Mean ± SD) are in the table:

<table>
<thead>
<tr>
<th></th>
<th>Levobupivacaine (n = 49)</th>
<th>LEF (n = 50)</th>
<th>Statistical Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time – start of drug preparation to inject (min)</td>
<td>3.66 ± 1.31</td>
<td>6.9 ± 2.42</td>
<td>P &lt; 0.0001</td>
</tr>
<tr>
<td>Time to achieve T6 block from injection (min)</td>
<td>15.2 ± 6.21</td>
<td>10.7 ± 5.08</td>
<td>P &lt; 0.0001</td>
</tr>
<tr>
<td>Time from preparation to T6 (min)</td>
<td>18.8 ± 6.4</td>
<td>17.6 ± 5.72</td>
<td>NS</td>
</tr>
<tr>
<td>Supplementation</td>
<td>14/50</td>
<td>6/50</td>
<td>P &lt; 0.04</td>
</tr>
</tbody>
</table>

Conclusion(s): 1) Speed of onset was faster and 2) intraoperative supplementation with opioids or entonox was significantly less with LEF group. In order to get clinical benefit time-wise, we would need to have LEF mixture ready and drawn up.

References:

11AP2-4
Audit of side effects of neuraxial opioids used for analgesia after Caesarean section
P. Lee, R. Fanning, M. Carey
Perioperative Medicine, Coombe Womens Hospital, Dublin, Ireland
11AP2-5

The effect of intrathecal S (+) ketamine addition to spinal anaesthesia with ropivacaine or bupivacaine in parturients undergoing caesarean section

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Anaesthesiology, Cukurova University, Adana, Turkey

Background and Goal of Study: In this prospective, randomized, double-blind, controlled study, we investigated the sensory, motor, analgesic block characteristics and side effects of S (+) ketamine given intrathecally (IT) in addition to 0.75% plain ropivacaine (15 mg) for spinal anaesthesia and compared with S (+) ketamine 0.5% plain bupivacaine (10 mg) combination given IT in parturients undergoing caesarean section (CS).

Materials and Methods: Following faculty ethic committee approval and written parturient consent, 120 ASA I or II adult parturients undergoing CS were randomly allocated to one of the four groups. Group I (n = 30) received 10 mg of 0.5% (2 ml) plain bupivacaine + 0.9 saline (1 ml) in group B, Group II (n = 30) received 10 mg of 0.5% (2 ml) plain bupivacaine + 0.05 mg kg⁻¹ S (+) ketamine (1 ml) in group BK, Group III (n = 30) received 15 mg of 0.75% (2 ml) plain ropivacaine + 0.9 saline (1 ml) in group R, Group II (n = 30) received 15 mg of 0.75% (2 ml) plain ropivacaine + 0.05 mg kg⁻¹ S (+) ketamine (1 ml) in group RK. We recorded onset and duration of sensory and motor block, the level of maximal sensory height, duration and quality of spinal analgesia, pain and sedation scores at 5, 10, 15, 20, 25 and 30 min after the injection, and subsequently every 15 min for 120 minutes.

Results and Discussions: The onset time of sensory and motor block was significantly shorter in BK and RK groups than in B and R groups (p < 0.001). The duration of sensory and motor block was significantly longer in B and R groups than in BK group (p = 0.007) (p < 0.001); it was similar in BK and BK groups. The level of maximal sensory height, were significantly higher in par- turients receiving S (+) ketamine (p < 0.003). Duration of spinal analgesia was similar between groups. Mean sedation scores were found significantly higher in BK and RK groups at 10, 15, 20, 25, 30 and 45 minutes than in groups B and R (p < 0.001).

Conclusion(s): In patients undergoing CS with spinal anaesthesia, the addition of S (+) ketamine (0.05 mg kg⁻¹) intrathecally to 15 mg of spinal paravinecine 0.75%) led to rapid onset of both sensory and motor blockade and enhanced the segmental spread of spinal block without prolonging the duration of spinal analgesia, but provided sedation in the dose used in this study (0.05 mg kg⁻¹).

11AP2-6

Randomized double-blinded comparison of phenylephrine versus ephedrine for treating hypotension during spinal anaesthesia for emergency Caesarean section

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Background and Goal of Study: Recent studies suggest phenylephrine (Phe) may have advantages over ephedrine (Eph) for maintaining blood pressure (BP) during spinal anaesthesia (SA) for Caesarean section (CS). However, most data are from elective CS. Few data are available for emergency CS where potential for fetal compromise may influence the relative risks and benefits of vasopressors. Therefore, we designed this double-blinded study to compare Phe and Eph in patients having emergency CS.

Materials and Methods: After ethics approval, we obtained consent from 869 patients admitted to the labour ward. Of these, 204 progressed to emer- gency CS under SA and were randomized to receive a bolus of either Eph 10 mg or Phe 100 µg each time systolic BP measured <70 mm Hg. The study terminated at delivery. We compared maternal haemodynamics and neonatal outcome including umbilical arterial (UA) and venous (UV) blood gases and lactate concentration.

Results and Discussions: 148 patients required a vasopressor. For the Phe group (n = 74) vs the Eph group (n = 74), there was less nausea/vomiting (4 vs 30%, P = 0.0001) despite similar minimum recorded BP; lower UA lactate (mean 2.3 vs 2.7 mmol/l, P > 0.0001) and UV lactate (2.2 vs 2.6 mmol/l, P < 0.0001) but lower UA PO₂ (2.2 vs 2.5 kPa, P = 0.027) and UV PO₂ (3.9 vs 4.1 kPa, P = 0.012) although UA and UV oxygen content were similar. There were no differences in UA pH (7.29 vs 7.28), UA base excess (−2.6 vs −2.2 mmol/l) or other biochemical outcomes. Apgar scores were similar.

Conclusion(s): The results of this study support the safety and efficacy of Phe in emergency CS.

Reference:
11AP2-8
Low-dose S-ketamine for postoperative pain in cesarean section with spinal anesthesia
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Anesthesia and Intensive Care, Catholic University of the Sacred Heart, Rome, Italy

Background and Goal of the study: Numerous studies showed the anti-hyperalgesic effects of small-dose ketamine on postoperative pain in patients under general anesthesia. We investigated the analgesic efficacy and safety of low-dose S-ketamine infusion in patients undergoing cesarean section with spinal anesthesia.

Material and Methods: Twenty-eight ASA I-II women, 18–40 years old, with uncomplicated pregnancies at term, scheduled for elective repeated cesarean section, were randomized to receive S-ketamine or placebo. In both groups, subarachnoid anesthesia was performed with 0.5 % hyperbaric bupivacaine (8–10 mg) plus sufentanil 5 μg. Study group received 0.5 mg/kg i.m. S-ketamine bolus 10 min after birth, followed by 2 μg/kg/min continuous i.v. infusion for 12 h. Control group received normal saline in the same way. At the end of surgery a 24 h PCA i.v. morphine analgesia was started in all patients. Time to first request of analgesia, total morphine consumption, VAS, Ramsay Sedation Scores (RSS) and side effects were collected at 1, 4, 8, 12, 24 h. RM- and M-ANOVA and Student’s T-tests were used for statistical analysis.

Results and Discussion: Patients characteristics (mean ± SD) were: age 33.9 yrs ± 4.3, weight 74.5 kg ± 10.2, height 175 cm ± 4.8.

Mean time to first morphine request was 382 min ± 275 for the S-ketamine group, versus 220 min ± 102 for the control group (P = 0.022). Cumulative morphine consumption in S-ketamine and control group was respectively 9.86 mg ± 6.18 and 15 mg ± 5.43 at 12 h (P = 0.014) and 21.71 mg ± 10.2 and 32.72 mg ± 6.53 at 24 h (P = 0.026). Side effects observed in S-ketamine group only were: dizziness and drowsiness in 100%, diaphoria in 43% (P = 0.004) and nystagmus in 36% (P = 0.012) of patients. All side effects were mild and transient. There were no significant differences in VAS and RSS.

Conclusions: Low-dose S-ketamine, administered by i.m. bolus and continuous i.v. infusion, reduced morphine consumption and prolonged postoperative analgesia after cesarean section with spinal anesthesia. Only minor side effects were detected. Low-dose S-ketamine has shown to be beneficial in awake surgical patients with neuraxial block.

11AP2-9
Low-dose combined spinal-epidural anaesthesia vs. conventional epidural anaesthesia for caesarean section in preeclampsia patients
M. Lerintiu, O. Karoly, A. Ilie, F. Stamatin
Department of Anesthesia and Intensive Care, University Emergency Hospital, Cluj-Napoca, Romania

Background and Goal of Study: Epidural anaesthesia is the anesthetic technique of choice for cesarean section in pregnant women with preeclampsia. Low-dose combined spinal-epidural anaesthesia ensures spinal block with minimum hemodynamic impact. The question is whether or not this is an alternative to conventional epidural anaesthesia for cesarean section in preeclampsia patients.

Material and Methods: This prospective, randomized study included 30 pregnant women with preeclampsia who underwent cesarean section between 2005 and 2006. The patients were divided into two groups. The CSE group (n = 15) received low-dose combined spinal-epidural anesthesia with 7.5 mg bupivacaine 0.5% and 25 µg fentanyl. Epidural volume extension was performed in case of insufficient spinal block. The EA group (n = 15) underwent conventional epidural anesthesia with 20 ml lidocaine 2%, 1/200000 ephedrine and 100 µg fentanyl. All patients received 3 mg of epidural morphine for postoperative anesthesia. Low blood pressure was corrected with ephedrine according to the same protocol. The data were analyzed using the 3.3.2 Epinifo program. The statistical significance level was p < 0.05.

Results and Discussions: The demographic data were similar in the two groups.

<table>
<thead>
<tr>
<th></th>
<th>CSE gr.</th>
<th>EA gr.</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successful anesthesia induction at 10 minutes</td>
<td>100%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Initial SAP (mean- mmHg)</td>
<td>153.33</td>
<td>158.66</td>
<td>P = 0.41</td>
</tr>
<tr>
<td>Lowest SAP (mean- mmHg)</td>
<td>121.66</td>
<td>128.33</td>
<td>P = 0.39</td>
</tr>
<tr>
<td>SAP at 10 minutes (mean-mmHg)</td>
<td>135.33</td>
<td>132</td>
<td>P = 0.55</td>
</tr>
<tr>
<td>Ephedrine requirement (mg)</td>
<td>16.66</td>
<td>18.66</td>
<td>P = 0.82</td>
</tr>
<tr>
<td>Apgar score at 5 min (inc.)</td>
<td>14.00</td>
<td>15.00</td>
<td>P = 0.5</td>
</tr>
</tbody>
</table>

SAP - systolic arterial pressure

Conclusion(s): Low-dose combined spinal-epidural anaesthesia administered in preeclampsia patients ensures a spinal block that is similar in terms of quality and hemodynamic involvement with that provided by conventional epidural anaesthesia. The use of anesthetics is also decreased.

11AP2-10
Postoperative analgesic effects of epidural neostigmine after non-elective cesarean section
E. Hardy, Fabinne, Roelants, Patricia. Lavandhomme
Anesthesiologie, Cliniques Universitaires St Luc, Brussels, Belgium

Background: Epidural neostigmine (N), a cholinesterase inhibitor, produces antinociceptive effects. At dose of 4 µg/kg, epidural N provides moderate analgesia after elective cesarean section (CS) (1). Because pain may activate spinal noradrenergic and hence cholinergic pathways (2), the present study evaluates the postoperative effects of epidural N administered in laboring women undergoing semi-urgent CS under epidural anesthesia.

Material and Methods: After informed consent, healthy parturients in labor with indwelling epidural catheter (ropivacaine/sufentanil analgesia) who needed semi-urgent CS (ropivacaine 0.75% used for epidural anesthesia) were randomly assigned to receive after cord clamping either saline 5 mL (n = 13) or N 500 µg in 5 mL saline (n = 12). Postoperative pain scores at rest and movement (VAS=0–10), time to first analgesic request and PCA morphine needs were recorded at 4, 6, 12, 24 h. RM- and M-ANOVA was used at NOVA, P < 0.05 was significant.

Results: Demographic data did not differ (age, pregnancy term, history of previous CS), LOR duration (400 ± 200 min), cervical dilatation (6 ± 1.7 cm) and epidural doses of ropivacaine (90 ± 45 mg) and sufentanil (20 µg) received at the time of CS were similar in both groups. Evaluation of labor analgesia demonstrated similar average VAS in saline (1 ± 0.7) and N group (2 ± 1.5). VAS at rest at 4 h (1 ± 0.6 vs 5 ± 1) and at 6 h with movement (3 ± 2 vs 6 ± 1) were significantly decreased in N group. Respectively in saline and N group, time for first analgesic request was 174 ± 103 min and 157 ± 123 min, and PCA morphine use was similar with 48 h total dose of 32 ± 17 mg and 38 ± 19 mg. No particular side effects occurred related to N use.

Discussion and Conclusion: As previously reported with elective CS (1), epidural N only provides short-lasting postoperative analgesia in laboring women undergoing CS. The results are in agreement with the lack of evidence for spinal cholinergic system activation during labor (3).


11AP2-11
Spinal anesthesia for cesarean delivery: effects of low dose isobaric bupivacaine on maternal hemodynamics
Z. Tiri, S. Kallef, F. Amouri, H. Chikrouhou, A. Karoui
Anesthesiologie, CHU Hôpital Bourguiba, Sfax, Tunisia

Background: Hypotension remains an important side effect of spinal anesthesia for cesarean delivery. There is. We designed the present randomized trial to test the hypothesis that reducing the spinal dose of local anesthetics results in equally effective anesthesia, less maternal hypotension and reduced incidence of nausea and vomiting (1).

Material and Methods: After ethical committee approval and written informed consent, 60 term pregnant patients were randomly assigned to two study groups. In the HIGH group spinal anesthesia was performed using 10 mg isobaric bupivacaine combined with 10 µg fentanyl and 100 µg morphine. In the LOW-group spinal anesthesia was performed using 8 mg isobaric bupivacaine combined with same doses of morphiniques. Spinal anesthesia was achieved in the L3/L4 interspace. In both groups, 6 mg of ephedrine in bolus are administered if systolic arterial blood pressure decreased more than 90 mmHg or 25% than the reference value.
Demographic data, obstetrical data, maternal hemodynamics, incidence of nausea and vomiting and neonatal outcome were recorded. Comparisons between groups were evaluated with the chi-square test and Student’s t test, p < 0.05 was considered significant.

**Results:** Anaesthetic and hemodynamic data in the table:

<table>
<thead>
<tr>
<th></th>
<th>HIGH group</th>
<th>LOW-group</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n = 30)</td>
<td>(n = 30)</td>
<td></td>
</tr>
<tr>
<td>Incidence hypotension (%)</td>
<td>93,3</td>
<td>60*</td>
</tr>
<tr>
<td>Duration hypotension (min)</td>
<td>6,36 ± 4,14</td>
<td>2,03 ± 2,34*</td>
</tr>
<tr>
<td>Ephedrine (mg)</td>
<td>40,03 ± 25,9</td>
<td>11,4 ± 12,83*</td>
</tr>
<tr>
<td>Nausea (%)</td>
<td>66,7</td>
<td>16,7*</td>
</tr>
<tr>
<td>Vomiting (%)</td>
<td>23,3</td>
<td>3,3*</td>
</tr>
<tr>
<td>Block. &gt; T4 (%)</td>
<td>83,3</td>
<td>53,4*</td>
</tr>
<tr>
<td>Adequate anaesthesia (%)</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Apgar &lt; 7 (%)</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Data are presented as a mean ± SD
Block. > T4: block higher than dermatoma level T4
*p < 0.05 versus High-group

**Intensive Care Medicine**

12AP1-1

The effect of time on the estimation of lung recruitability

D. Chiumello, F. Tallarini, M. Chierichetti, F. Polli, S. Azzari

Institute of anestheisa and critical care, Pollicino Hospital, Milano, Italy

**Background and Goal of Study:** The Acute Respiratory Distress Syndrome (ARDS) is a clinical syndrome characterized by inflammatory pulmonary edema, severe hypoxemia, small lungs and a diffuse endothelial – epithelial lung injury. Although PEEP may improve oxygenation and reduce barotrauma may also cause lung injury. Thus the effect of PEEP depends on the lung recruitability. We recently found that the lung recruitability can be estimated with a certain degree of accuracy based on physiological respiratory variables (1).

Aim of this study was to evaluate the effect of time on the prediction of lung recruitability.

**Materials and Methods:** Intubated, sedated and paralysed ALI/ARDS patients were studied during controlled mechanical ventilation at constant minute ventilation at two level of PEEP (5 and 15 cmH2O). Blood gas analysis and dead space measurements were performed at 5, 15, 30, 60 minutes. Patients were defined as responder (i.e., a patient who presented a high lung recruitability) when the PaO2/FiO2 ratio was less than 150 mmHg at PEEP of 5 cmH2O, the alveolar dead space decreased and respiratory compliance increased when PEEP was changed from 5 to 15 cmH2O.

**Results and Discussions:** Fourteen patients (10 males) with a mean weight of 68 ± 10 Kg and age of 60 ± 12 yrs. PaO2 of 89.1 ± 20.2 mmHg, PaCO2 of 41.6 ± 7.3 mmHg with a PEEP level of 10 cmH2O were enrolled. The distribution of responders and non responders was the same at 5, 15 and 30 minutes.

**Conclusion(s):** These data show that the computation of these respiratory variables allows the clinician, to estimate the lung recruitability, just after only five minutes.

**Reference:**

12AP1-2

The accuracy of dead space measurements in critically ill patients

D. Chiumello, F. Pagan, M. Chierichetti, F. Tallarini, M. Cressoni

Institute of Anesthesia and Critical Care, Policlinico Hospital, Milano, Italy

**Background and Goal of Study:** The dead space is defined as the fraction of tidal volume that does not participate to the gas exchange (i.e., the anatomical and alveolar dead space). Being a fundamental index in patients with acute respiratory failure but there are very little data of use this method in patient with Pulmonary Contusion. The purpose of our research was study changes in arterial blood gas during the mechanical ventilation in PP.

**Materials and Methods:** We studied 24 patients with sever PC (Chest X-ray and CT-scan local infiltration, ARDS > 3, admission PaO2/FiO2 < 100 mmHg). Repeated arterial gas blood tests were made in supine position and after 30 minutes ventilation in PP on 1, 3, 5 and 7 day of observation. Changes in intrapulmonary shunting (Qs/Qt) and PaO2/FiO2 were analyzed. Statistical analysis of difference of the data arterial blood gas (before and after the change of position) was performed by Wilcoxon Matched Pairs Test, p-value less than 0.05 was considered to indicate statistical significance.

**Results:** Data (Median [25-75 percentages]) are shown in the table:

<table>
<thead>
<tr>
<th>Day #</th>
<th>PaO2/FiO2, mmHg</th>
<th>Qs/Qt, %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Supine</td>
<td>Prone</td>
</tr>
<tr>
<td>1</td>
<td>105.7</td>
<td>150.4</td>
</tr>
<tr>
<td></td>
<td>[83.9–125.8]</td>
<td>[129.7–171.3]</td>
</tr>
<tr>
<td>3</td>
<td>140.7</td>
<td>235.7</td>
</tr>
<tr>
<td></td>
<td>[136.8–147.8]</td>
<td>[224.3–252.7]</td>
</tr>
<tr>
<td>5</td>
<td>157.5</td>
<td>325.1</td>
</tr>
<tr>
<td></td>
<td>[154.5–196.4]</td>
<td>[253.7–344.3]</td>
</tr>
<tr>
<td>7</td>
<td>211.0</td>
<td>330.7</td>
</tr>
<tr>
<td></td>
<td>[207.6–214.2]</td>
<td>[289.8–344.3]</td>
</tr>
</tbody>
</table>

*p < 0.001

We observed a significant improvement of arterial oxygenation and decreased the value of intrapulmonary shunt during all days of using prone position. Influence ventilation in sit-in position on gas exchange was like the effect of the prone position.

**Conclusions:** PP improves oxygenation with decrease of intrapulmonary shunt and increase PaO2/FiO2 ratio in patients with PC.

**References:**

12AP1-4

Prevention of nosocomial pneumonia in patients with Pulmonary Contusion: role of early fiberoptic bronchoscopy

I. Kuchyn, F. Glumcher, D. Dmitriev

Anesthesiology and Intensive Care, National Medical University, Kyiv, Ukraine

**Background and Goals:** Pulmonary Contusion (PC) is the main cause of respiratory failure after blunt thoracic trauma (1). Prone position (PP) was proposed to improve the arterial oxygenation in patients with various forms of acute respiratory failure but there are very little data of use this method in patient with Pulmonary Contusion. The purpose of our research was study changes in arterial blood gas during the mechanical ventilation in PP.

**Materials and Methods:** We studied 24 patients with sever PC (Chest X-ray and CT-scan local infiltration, ARDS, PaO2/FiO2 < 100 mmHg). Repeated arterial gas blood tests were made in supine position and after 30 minutes ventilation in PP on 1, 3, 5, 7 day of observation. Changes in intrapulmonary shunting (Qs/Qt) and PaO2/FiO2 were analyzed. Statistical analysis of difference of the data arterial blood gas (before and after the change of position) was performed by Wilcoxon Matched Pairs Test, p-value less than 0.05 was considered to indicate statistical significance.

**Results:** Data (Median [25–75 percentages]) are shown in the table:

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<tr>
<td>1</td>
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<tr>
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<td>157.5</td>
<td>325.1</td>
</tr>
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<td>[154.5–196.4]</td>
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</table>

*p < 0.001

We observed a significant improvement of arterial oxygenation and decreased the value of intrapulmonary shunt during all days of using prone position. Influence ventilation in sit-in position on gas exchange was like the effect of the prone position.

**Conclusions:** Using the same functional respiratory monitor we did not observe any significant variability in the measures of dead space.
Background and Goals: Impairment of patency of airways by blood and sputum in patients with Pulmonary Contusion (PC) reduces regional lung ventilation with increase of lung dyslectasis and intrapulmonary shunt. It creates conditions for infection. The most effective strategy of maintenance of patency of airways and prevention of atelectasis is the Fiberoptic bronchoscopy (FOBr) (1). The purpose of our research was the estimation of the role of early FOBr in prevention of nosocomial pneumonia (NP) in patient with PC.

Material and Methods: 158 patients with PC were observed. We used early FOBr (in first 3 days) in 82 patients. In 32 patients FOBr was done in deferred term (more than 3 days). The analysis of incidence of NP was done. Statistical analysis included Chi-square test, Kaplan&Meier method and Cox’s F-Test, p-value less than 0.05 was considered to indicate statistical significance.

Results: Total rate of NP was 14.6% (23 pts): 9.6% (8pts) in early FOBr group and 46.9% (15 pts) in deferred FOBr group (p < 0.001 by Chi-square test). In order to exclude the influence of differences in terms of hospitalization we used Kaplan&Meier method and Cox’s F-Test to estimate the differences in NP incidence. Results of Kaplan&Meier method are shown in the picture.

Cumulative proportion surviving (Kaplan-Meier)

- Complete
- Censored

The result of Cox’s F-Test confirmed differences in incidence rate of NP in patients with PC: F = 8.98, p = 0.00002.

Conclusion(s): Deferred FOBr in comparison with Early Fiberoptic bronchoscopy may be the risk factor of NP in patients with PC.

Reference:
1 Clinical practice guideline Respir Care1993; 38: 1173–1178.

12AP1-5
Propofol attenuates pulmonary edema induced by collapse and reventilation of lung in rabbits
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Background and Goal of Study: To study the effects of propofol on the pulmonary edema caused by collapse-reventilation injuries of the lungs in rabbits.

Materials and Methods: There were five groups of animals: (1) the Sham group – normal ventilation (n = 14); (2) the collapse group – the right lung was collapsed (n = 14); (3) the collapse-reventilation group – the right lung was collapsed for 3 hours then reventilated for 3 hours (n = 14); (4) the propofol group – collapse-reventilation for 3 hours with administration of propofol in 5 or 20 mg/kg/hr dosing schedules (n = 28). Mean arterial pressure, heart rate, arterial blood oxygen tension, leukocyte and platelet counts in the peripheral blood were recorded hourly for 6 hours starting at the 0-hour of experiment.

The wet to dry (W/D) weight ratio of the lung and lung injury score were calculated to assess tissue edema. In addition, the bronchoalveolar lavage fluid (BALF) from both lungs was analyzed for leukocytes, albumin, malondialdehyde (MDA) and interleukin-8 (IL-8) 6 hour after the start of experiment in both lungs.

Results and Discussions: There was a global elevation of all parameters in the collapse-reventilation group, namely the W/D weight ratio of the lungs, the lung injury scores, the counts and percentages of leukocytes, and concentrations of albumin, MDA, and IL-8 in BALF. These changes were greater in the fluids from the collapse-reventilated right lung than from the left lung. Significantly, there was a global improvement in these parameters with the administration of propofol. The only exception to this response was the leukocyte counts which remained elevated.

Conclusion(s): The findings of our study indicated that collapse-reventilation of the lungs leads to pulmonary edema in rabbits. In addition, we showed that propofol has a protective effect on the pulmonary edema caused by collapse-reventilation injuries in rabbits.

12AP1-6
Chaotic variation of tidal volumes adds further benefit to the open lung approach in experimental acute lung injury
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Background and Goal of Study: Biological systems seems to benefit from chaotic variability. We tested if chaotic variation of tidal volumes (noisy ventilation) adds further benefit to a lung protective ventilatory strategy aimed at keeping the lungs open after a recruitment maneuver (open lung approach) in experimental acute lung injury.

Materials and Methods: Acute lung injury was induced in 12 pigs by repetitive saline lung lavage. Following injury, animals were randomly assigned to a standard lung protective therapy with (n = 6) or without (n = 6) administration of chaotic variable tidal volumes (mean VT = 6 ml/kg). Gas exchange, lung mechanics and hemodynamics were assessed. After 6 h, animals were killed and lung damage was evaluated histologically. Gas exchange and lung mechanics were tested with univariate analysis of variance, histological results were tested by means of the Mann-Whitney-U-Test.

Results and Discussions: Groups were comparable at baseline and after injury. Variables of gas exchange (PaO2, PaCO2, SvO2) hemodynamics as well as peak and mean airway pressures did not differ significantly between groups. Mean lung elastance and alveolar stress index (%E2) were significantly reduced in the noisy ventilated animals (p < 0.05). Histological analysis of diffuse alveolar damage showed a trend toward better lung protection with noisy ventilation (p = 0.08), and less inflammatory infiltration was observed in noisy ventilated lungs (p < 0.05).

Conclusion(s): Chaotic variation of tidal volumes adds further benefit to protective ventilation according to the open lung approach.

12AP1-7
Levosimendan pretreatment improves systemic hemodynamics and metabolism during acute hypoxia in dogs
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Background & Goal of Study: Levosimendan (LEVO) improves regional tissue oxygenation under physiological, normoxic conditions, as we demonstrated recently [1]. It is unclear, however, if LEVO exerts beneficial effects also under pathological, hypoxic conditions, particularly in respect to systemic hemodynamics and metabolism. Thus we studied the effects of LEVO pretreatment during acute hypoxia on systemic hemodynamics and metabolism.

Materials & Methods: Chronically instrumented dogs (bodyweight ~30 kg, n = 10 experiments) were anesthetized (sevoflurane, 1.5 MAC) and mechanically ventilated (FiO2 = 0.3; etCO2 = 35 mmHg). The animals were randomized to undergo hypoxia (FiO2 = 0.1 for 15 min) with or without LEVO pretreatment [1]. To assess systemic hemodynamics we measured cardiac output (CO), stroke volume (SV) and the inotropy marker dP/dTmax. To assess systemic metabolism, we measured O2-consumption (VO2, DeltatracII) and arterial lactate levels. Data are mean ± SEM.

Results & Discussions: Hypoxia (FiO2 = 0.1) reduced arterial PO2 from ~130 mmHg to ~30 mmHg in both groups, i.e., hypoxia with and without LEVO pretreatment. LEVO pretreatment significantly improved systemic hemodynamics during hypoxia, i.e., CO (104 ± 4 vs 83 ± 5 ml/kg/min), SV (25.2 ± 1.7 vs 19.8 ± 1.2 ml) and dP/dTmax (553 ± 41 vs 377 ± 36 mmHg/sec). Interestingly, LEVO pretreatment prevented an increase in arterial lactate levels during hypoxia (1.8 ± 0.1 to 1.9 ± 0.1 mmol/L), whereas lactate significantly increased in the group without LEVO (1.7 ± 0.1 to 2.1 ± 0.1 mmol/L).

Conclusion(s): LEVO pretreatment markedly improved systemic hemodynamics during acute hypoxia, without increasing oxygen consumption. Furthermore, LEVO pre-treatment prevented the increase in arterial lactate levels during acute hypoxia, indicating an optimized O2-distribution and/or utilization by LEVO. Thus, if our data apply to the clinical setting, LEVO pre-treatment is a promising option to improve systemic hemodynamics without
increasing VO₂ and furthermore to optimize lactate balance in patients at risk of hypoxia.

Reference:

12AP1-9
Comparative effect of acute hypoxia on contractile and energetic properties of diabetic diaphragm
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Département d'anesthésie Réanimation, Hôpital de la Pitié Saïpapière, Paris, France

Background and Goal of Study: Hypoxia adversely affects respiratory muscle function. In the rat diaphragm, diabetes results in an increase in low (Type I) myosin heavy chain characterized by an aerobic metabolism. Therefore, a different effect of acute hypoxia between diabetic and control rat diaphragm could be hypothesized.

Materials and Methods: In vitro contractile and energetic properties were measured with ventral diaphragm strips obtained from 2 months streptozotocin-induced diabetic (4 mo old, n = 12) and control (4 mo old, n = 12) male Wistar rats submitted to acute hypoxia (Po₂ ~ 6.5 kPa). Data are mean ± SD and comparison between groups was performed using ANOVA.

Results and Discussions: Compared to control animals, diabetic rats were characterized by an increase in active force (100 ± 6 vs 79 ± 10 mN mm⁻²) associated with an increase in the total number of cross-bridges per sectional area (11.1 ± 1.2 vs 8.5 ± 1.3 10⁶ mm⁻²). Moreover a decrease in maximal unloaded shortening velocity was observed between diabetic and control rats (6.3 ± 0.9 vs 7.9 ± 1.0 Lmax * s⁻¹). Under hypoxia, diabetic rats were characterized by a slower decrease in active force and a faster recovery in re-oxygenation conditions (Figure).

Conclusion(s): These results suggest that diabetic induced modifications in diaphragm contractility are associated with a better resistance to acute hypoxia.

12AP2-1
High dependency care unit after major cancer surgery: medical and economic impact
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Service d’Anesthésie, Institut Gustave-Roussy, Villejuif, France

Background and Goal of Study: The intensity of care is part of a better post-surgery rehabilitation (1,2). The aim of this study was to evaluate the impact of the introduction of a high dependency care unit (HDU) for postoperative care on patient outcome and cost.

Materials and Methods: 1506 patients who have undergone major cancer surgery were studied. 753 were hospitalised in the HDU during 2004 and 2005 (After Group). They were compared to a control group (753 patients hospitalised during 2002 and 2003 before the opening of HDU: Before Group) matched on sex, age, type of surgery (LAS – Lower Abdominal Surgery, UAS – Upper Abdominal Surgery, GS – Gynaecological Surgery). Length of hospital stay was defined as number of days between entrance and discharge from the hospital. Data from the analytic accounts of our hospital for the year 2004 were used to estimate the cost.

Results and Discussions: are shown in the table (data are expressed as mean ± SD).

<table>
<thead>
<tr>
<th>Before group</th>
<th>Aftergroup</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>n = 753</td>
<td>n = 753</td>
<td></td>
</tr>
<tr>
<td>Length of hospital stay, days</td>
<td>15.8 ± 12.2</td>
<td>14.2 ± 9.8</td>
</tr>
<tr>
<td>Patients admitted in ICU</td>
<td>96 (12.7%)</td>
<td>41 (5.4%)</td>
</tr>
<tr>
<td>Outcome at discharge</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>724 (96.1%)</td>
<td>735 (97.6%)</td>
</tr>
<tr>
<td>Another hospital</td>
<td>17 (2.3%)</td>
<td>11 (1.5%)</td>
</tr>
<tr>
<td>Died</td>
<td>12 (1.6%)</td>
<td>7 (0.9%)</td>
</tr>
</tbody>
</table>

For the patients admitted in HDU, total cost of the hospital stay was reduced by 15.68%.

Conclusion(s): The creation of a HDU was effective to improve the cost of care by decreasing the length of stay and the rate of ICU hospitalisation, without change in patient outcome.

References:

12AP2-2
How frequent and important are iv medication errors in an ICU?
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Background and Goal of Study: Medication safety in ICU practice is of utmost importance (1), but hard data are missing on the prevalence of errors during the infusion process (2). Also there are no proven solutions on guarding and preventing this type of serious errors.

Aim of study: to present data on frequency and nature of iv drug administration errors during daily ICU practice, and study the potential benefit of a guarding system.

Materials and Methods: A 6-bedded ICU unit was equipped with a new infusion pump set which records automatically all infusion administrations. Via its pre-adjustable drug library it also controls infusion pump settings: it warns by overriding the “soft limits”, and intercepts drug administration automatically if “hard limits” are intended to exceed. All infusion administrations of a study period from 31st Jan to 13th of Sep 2006 were recorded. Each automatic data recordings were downloaded and the events which occurred were analysed in detail according to type, frequency, timing, etc.

Results and Discussions: Total 656 infusions during study period: 6957. There were 668 alerts generated over this period (9,88%), including 64 hard limit alerts (0,91%). nearly 10% of all events were for infusions attempted above hard max. limits, insulin and cordarone had ~68% of them. Analysis of events by day time, by week days and by months of study timeframe revealed typical risky periods, demanding modifications of working conditions. On the other hand our system prevented successfully all of 64 severe medication errors, including e.g.; 7 overdosing of cordarone 10–50 times the max. dose; 3 of vancomycine incl. one of 10 times the max. dose; 1 of morphine 5 times the max. dose; and 5 of dobutamine, one of 5 times the max. dose.

Conclusion: According to our data prevalence of IV medication errors is substantially high at an ICU. As without an automated documentation system far most of errors remain undiscovered and therefore unavoidable, our data probably support the use of intelligent monitoring and warning devices as mandatory for prevention of potential harm of patients(3).

References:

12AP2-3
Weaning from mechanical ventilation: protocol vs physician decision
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Background and Goal of Study: Due to the increased risk of complications associated with prolonged mechanical ventilation (MV), early liberation from the ventilator is important and protocol directed weaning seems to be the answer (1). We decided to evaluate a ventilator weaning protocol in our intensive care unit (ICU) in terms of length of MV, ICU stay and reintubation rate.

Materials and Methods: After Ethical Committee approval, 103 patients starting MV (EVITA IV Dräger) were included over a 6 months period, being
randomly distributed in two groups: group A – undergoing classical ventilator disconnection and group B – assigned to the weaning protocol. Patients already on ventilatory support as well as pediatric subpopulation (<18 years) were excluded. Severity of illness was assessed using the APACHE II and SOFA scores. Demographic data, duration of MV and superficial breathing index were analyzed. Secondary analysis focused on reintubation rate and possible correlation with mortality. Means and standard deviations were used. Comparison between groups was made with the t-test (p < 0.05).

Results and Discussions: The 103 patients represented 78% of the total number of hospitalized patients in the ICU during the study period. Group A had 52 patients, 37 survivors and group B had 51 patients, 33 survivors. By applying the weaning algorithm, the average duration of the MV decreased with 1.24 days.

The patients having survived were ventilated 5.83 ± 5.15 days, while the length of ventilation in non-survivors was 12.79 ± 13.71 days (p = 0.002).

Regarding reintubation analysis, group A had a 24.32% ventilator reconnection, compared to 15.15% in the group B. No influence on mortality rate was noticed.

Conclusion(s): Using a weaning protocol led to a decrease in the number of MV days and to a lower reintubation rate.


12AP2-5
Cost reduction in paediatric parenteral nutrition
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Background and Goal of Study: In paediatric intensive care, two approaches to parenteral nutrition are available: individualized admixtures or commercial standard solutions. Even though individualized admixtures can be tailored to sometimes highly intricated requirements, standard solutions are able to meet the demands (1) of the majority of paediatric patients. To address the growing importance of costs in intensive care, we investigated whether relevant differences between individualized admixtures and standard solutions in terms of costs can be found.

Materials and Methods: Actual costs of individualized admixtures (prepared following national guidelines) in 20 postoperative paediatric patients with uncomplicated requirements were compared with retrospectively determined theoretical costs of standard solutions. As standard solutions do not contain vitamins and trace elements, these had to be added in the calculation. Daily costs (in 2006 Euro values) per patient were calculated as means ± standard deviation. Student’s t-test (p < 0.05) was used to evaluate any differences between the two groups (actual costs vs. theoretical costs).

Results and Discussions: Mean actual costs of individualized admixtures of €75.92 (±12.50) per patient and day were significantly higher (p < 0.05) than the theoretical costs of standard solutions, which amounted to €58.35 (±8.85). In the setting of an intensive care unit with 400 patient days per year of paediatric parenteral nutrition, this difference would add up to a cost reduction of approximately €7,000 per year.

Conclusion(s): The use of standard solutions instead of individualized admixtures is able to markedly decrease the costs of paediatric parenteral nutrition.


12AP2-6
Impact of one-year Surviving Sepsis Campaign (SSC) guideline on implementation of ‘Sepsis Care Bundles’ on outside Critical Care Units
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Background and Goal of Study: ‘Surviving Sepsis Campaign (SSC) guideline for management of severe sepsis and septic shock’ was launched in 2004, which has introduced the ‘sepsis care bundle’ into clinical practice. Our group conducted a prospective observational study in 2005 to evaluate compliance of 6-hour and 24-hour sepsis care bundles and their impact on hospital mortality. Over the year, a great deal of work has been carried out to promote for implementation of Sepsis Care Bundles worldwide. We have therefore conducted another prospective observational study aiming to assess impact of one-year Surviving Sepsis Campaign (SSC) guideline on implementation of ‘Sepsis Care Bundles’ on outside Critical Care Units.

Material and Methods: Total of 102 patients was recruited from medical, surgical wards or emergency departments of four acute NHS Trust Teaching hospitals in England, using proximate look-back data extraction. The results of 2006 with 2005 using unpaired t-test or Fisher’s Exact test.

Results and Discussion: Patients’ demographic data, early warning scores (MEWS), rate of ICU admissions and type of infections are identical between two studies. The Table shows improved compliance with 6-hour sepsis care bundle. Hospital mortality remains unchanged.

<table>
<thead>
<tr>
<th></th>
<th>2005 study</th>
<th>2006 study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers</td>
<td>101</td>
<td>102</td>
</tr>
<tr>
<td>Compliance of 6-hour bundle</td>
<td>52%</td>
<td>64%</td>
</tr>
<tr>
<td>Lactate</td>
<td>52/101 (51%)</td>
<td>70/102 (69%)</td>
</tr>
<tr>
<td>Blood cultures</td>
<td>74/101 (74%)</td>
<td>56/102 (54%)</td>
</tr>
<tr>
<td>Antibiotics given</td>
<td>74/101 (74%)</td>
<td>96/102 (84%)</td>
</tr>
<tr>
<td>Fluid resusc.</td>
<td>84/101 (84%)</td>
<td>86/102 (84%)</td>
</tr>
<tr>
<td>CVP &gt; 8</td>
<td>2/101 (2%)</td>
<td>91/102 (89%)**</td>
</tr>
<tr>
<td>SvO₂ &gt; 70%</td>
<td>1/101 (1%)</td>
<td>10/102 (9.8%)*</td>
</tr>
<tr>
<td>Oxygenation</td>
<td>33/101 (33%)</td>
<td>61/102 (60%)***</td>
</tr>
<tr>
<td>Hosp. mortality</td>
<td>37%</td>
<td>40%</td>
</tr>
</tbody>
</table>

Conclusion: Surviving Sepsis Campaign (SSC) guideline appears to improve implementation of ‘Sepsis Care Bundles’ on outside Critical Care Units.

12AP2-7
A method for contact-less quantitation of movements of intensive care patients
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Background and Goal of Study: The factor self-movements of patients during the intensive care therapy is widely unattended. Complete bed rest has been found as contraindicated in many clinical cases [1]. For further evaluation of the impact of movements to the outcome of the therapy, a quantitative measurement of the movements of patients is needed. In this work, a contact-less method for measuring those movements is presented.

Materials and Methods: Using a digital video camera, movements of patients are captured and recorded. An adopted image-differencing technique [2] is applied to determine the amount of motion during the day as the sum of absolute intensity differences. For this work, 5 patients were observed from 6am to 6pm for 4 days each.

Results and Discussions: The cumulative amount of movements during the day and a comparison of the daily variation is shown in the figure below. It can be seen how the amount of movements of the patient changes during and in between the days. Subjective comparisons to the simultaneously recorded SAS (sedation agitation scale) values have been done and demonstrated similar variances.

Conclusion: Compared to various clinical scales like RSS, SAS, VICS... [3], the presented method is a first automated approach to study the impact of movement for intensive care therapy with the final goal to study its impact on outcome.

12AP2-8
Effects of staff training regarding care of mechanically ventilated patients on duration of mechanical ventilation
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Department of Anaesthesiology and Intensive Care Medicine, University Hospital Jena, Jena, Germany

Background and Goal of Study: Reduction of time on the ventilator is a key concept to avoid complications in critically ill patients. Recommendations include semirecumbent positioning and low tidal volume ventilation (tidal volumes <6 ml/kg) [1]. Care of patients on mechanical ventilation also consists of prophylaxis for stress ulcer [2] and deep vein thrombosis [3]. The goal of this study was to investigate whether staff training regarding a bundle of predefined treatments would decrease days on mechanical ventilation.

Materials and Methods: All Patients of a 50 bed ICU with mechanical ventilation for >24 hrs were included. From 06/2005 to 09/2005 (Audit I), patients were examined daily for semirecumbent position (>30°), low tidal volume ventilation, deep vein thrombosis prophylaxis, and stress ulcer prophylaxis by an independent task force. After completion of the audit, all nurses and physicians were trained about importance and methods of the monitored treatments. A second audit was then performed from 03/2006 to 06/2006 (Audit II).

Results and Discussions: 133 patients (1389 ventilator days) were included in Audit I and 141 patients (1002 ventilator days) in Audit II.

There was no effect on frequency of pneumonia, ICU length of stay, or survival. Conclusions: Semirecumbent positioning could be successfully improved by staff training. Enhanced implementation was associated with reduction in days on ventilator.

References:

12AP2-9
Influence of remifentanil on duration of mechanical ventilation, ICU length of stay and ICU costs
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Institute for Medical Technology Assessment, Erasmus MC, Rotterdam, The Netherlands

Background and Goal of Study: To estimate the impact of remifentanil-based sedation (RS) vs. conventional sedation (CS) on the direct medical costs, the length of stay (LOS) and the duration of mechanical ventilation (MV) in ICU patients requiring MV for 2–3 days.

Materials and Methods: A Markov model was employed to describe the patient flow on the ICU. Three states were defined: MV before start of weaning, MV after start of weaning, and post-MV before ICU discharge. Data to derive the hourly transition probabilities was obtained from UTISAFE, a recent Dutch open label, centre-randomized, centre-crossover trial including patients with an expected MV-time of 2–3 days. Study medication was either CS (morphine or fentanyl combined with propofol, midazolam or lorazepam according to Dutch guidelines) or RS (remifentanil, combined with propofol when required). ICU LOS, time of start weaning and of extubation, plus all study medication were recorded. Study drug costs were derived from the trial, whereas all other ICU costs (with and without MV) were estimated in a Dutch micro-costing study. All costs were measured from the hospital perspective (price level of 2006). According to the study target population we only included those patients in the analysis who started weaning within 72 hours of start of treatment. Patients were followed for 28 days.

Results and Discussions: The average total 28-day costs were €11,932 with CS versus €10,356 with RS, meaning a difference in costs of €1756 (85% CI 32-3110). The average length of stay on the ICU was 7.7 days in the CS group versus 6.6 days in the RS group (difference 1.1, 95% CI 0.6–1.6), while the average MV time was 3.8 days for CS versus 2.8 days for RS.

Conclusion: Compared to CS, RS significantly decreases the ICU LOS, the overall costs and the duration of MV. As a decreased duration of MV reduces the risk of ventilator-associated morbidity, RS seems to be the preferred regimen.

12AP3-2
Association of TNF – 308A/G polymorphism with TNF alpha level, illness severity and outcome in septic patient
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Department of the Anaesthesiology and Reanimatology, Riga Stradins University, Riga, Latvia

Background and Goal of Study: Several studies have found association of prevalence of the TNF – 308A allele and susceptibility to and outcome from severe sepsis and septic shock. The aim of this study was to examine association of the TNFA – 308A/G polymorphism with TNFα level, illness severity and clinical outcome among septic patients in our clinic.

Materials and Methods: 15 critically ill patients with confirmed severe sepsis or septic shock were included. TNFα and severity of the patients’ condition (SOFA score) was measured at the day of admission to the ICU. Patients were followed up throughout their stay in the ICU for clinical outcome. TNFA – 308A/G polymorphism was detected by direct sequencing using ABI prism sequencer.

Results and Discussions: Table 1 Patient characteristic according to TNFA – 308A allele carriage

<table>
<thead>
<tr>
<th>TNFA – 308G/G (n = 10)</th>
<th>TNFA – 308A/G (n = 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOFA (≥5)</td>
<td>8.2 (4.8)</td>
</tr>
<tr>
<td>TNFα (pg/L) (≥150)</td>
<td>129.8 (271.6)</td>
</tr>
<tr>
<td>Shock (%)</td>
<td>50</td>
</tr>
<tr>
<td>Mortality (%)</td>
<td>50</td>
</tr>
</tbody>
</table>

Conclusion(s): The present study was failed to demonstrate association of TNFA – 308A/G polymorphism with TNFα level at the day of admission to ICU, severity of illness (SOFA score) and mortality in septic patients.

More investigations are needed to determine the role of TNFA – 308A/G polymorphism analysis in the ICU.

12AP3-3
Microcirculatory changes in patients with septic shock treated with vasopressin
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Anaesthesiology and Intensive Care, Friedrich Schiller University, Jena, Germany

Introduction: Microcirculatory dysfunction leads to inadequate tissue oxygenation and multi organ failure during sepsis or septic shock.

We tested the effects of arginine vasopressin (AVP) on tissue oxygenation (StO2), micro vascular reactivity and oral mucosa microcirculation in patients with septic shock.

Methods: In 20 critically ill patients (12M/8F, age 63; 35–78 years) with severe sepsis or septic shock tissue microcirculation was determined before treatment with AVP (2IU/h), after 2 h of treatment and 2 h after AVP was stopped. Thenan muscle StO2 was measured by near-infrared spectroscopy (InSpectra™), using the artery occlusion method (3 minutes of brachial artery occlusion). Microvascular reactivity alterations was evaluated by the calculation of the slope of the decrease in StO2 during the first 14 seconds after the occlusion of the brachial artery and the calculation of the slope of the increase in StO2 during the first 14 seconds following the ischemic period. Oral mucosal tissue oxygen saturation, microcirculatory blood flow and blood flow velocity were measured in depth of 1 and 4 mm with a laser Doppler flowmetry and remission spectroscopy system (O2C™). Time points: Before, during and 2h after the treatment with AVP. Statistics were performed with Wilcoxon test.

Results: Vasopressin infusion led to a significant decrease of oral mucosal tissue oxygen saturation, blood flow and flow velocity. There were no changes in thennar tissue perfusion.
Conclusion: Vasopressin infusion causes deterioration of oral mucosal blood flow and not of peripheral perfusion independent of mean arterial pressure.

12AP3-4
Removal of inflammatory cytokines with high volume hemofiltration
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Background and Goal of the Study: The removal of inflammatory mediators in septic patients treated by high volume hemofiltration might depend by the adsorption of the membrane (1) and by the filtration rate (2).

The aim of this study was to evaluate the efficiency of high volume continuous veno-venous hemofiltration (CVVH) with a 12Kd cut-off filter, in removing pro-inflammatory and anti-inflammatory cytokines from the blood compartment of severe sepsis patients.

Materials and Methods: We enrolled 31 severe sepsis patients. 6 out of 31 developed ARF and required CVVH (filtration rate of 40 mL/kg/h). Cytokine serum levels were measured at the beginning and after 48 hours of the CVVH treatment. Pre-filter, post-filter venous blood and filtrate samples were collected.

Cytokines (IL-2, IL-18, IL-10 and TNF-α) serum levels were quantified by ELISA.

Results: In septic patients not treated by CVVH, at day 1 median cytokines levels (pg/mL) were: IL-18 (1028,6), IL-2 (18,86), TNF-α (17,92), IL-10 (185,7). Cytokine concentrations (pg/mL) in patients treated by CVVH were expressed, as median, in the table below:

<table>
<thead>
<tr>
<th></th>
<th>Before CVVH</th>
<th>After CVVH</th>
<th>Pre-filter</th>
<th>Post-filter</th>
<th>Filtrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>IL-18</td>
<td>902</td>
<td>1016</td>
<td>1480</td>
<td>1276</td>
<td>*</td>
</tr>
<tr>
<td>IL-2</td>
<td>15,6</td>
<td>*</td>
<td>*</td>
<td>*</td>
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<tr>
<td>TNF-α</td>
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<td>130</td>
<td>28</td>
<td>*</td>
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</table>

*not measurable

Conclusions: After 48 hours of high volume hemofiltration cytokines serum levels are not significantly decreased.

In our opinion adsorption is the main mechanism by which extracorporeal elimination techniques can remove mediators from the blood compartment: the conventional hemofilters are able of a low removal of mediators, because of the low cut-off point of the membrane.

References:

12AP3-5
Upregulation of TLR2 and LPS receptor TLR4 in septicemic patients
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Background and Goal of Study: Sepsis is a systemic response to a generalized infection leading to multiple organ dysfunction. Hyporesponsiveness towards lipopolysaccharide (LPS) has been claimed to contribute to disease progression. Recent data indicate that members of the transmembrane toll-like receptor (TLR) family, called TLR2 and TLR4, are involved in LPS signalling. These receptors are necessary for LPS-signalling and endotoxin tolerance in mouse peritoneal macrophages correlates with down-regulation of surface TLR4 expression. Therefore we investigated the expression of pro-inflammatory cytokines and TLRs during sepsis.

Materials and Methods: After approval of the local Ethics Committee and signed consent we studied septic patients and healthy subjects. Septic patients were enrolled within 24 hours after meeting criteria for diagnosis (1). Blood samples were collected on days 1, 3, 7, 10 and 14. PBMCs from blood samples of sepsis patients were prepared. RNA was prepared from either PBMCs of healthy donors treated in vitro with LPS did not reach mRNA levels of untreated PBMCs from septic patients. Therefore an unknown mechanism must account for elevated TLR2 and TLR4 levels in septic patients. Correlations with clinical parameters demonstrate the possible use of TLR2 and TLR4 as new diagnostic markers for the outcome of sepsis.

Conclusion: The upregulation of TLR2 and TLR4 in human patients may contribute to the pathophysiology of sepsis and may result in a self perpetuating cycle leading to septic shock. Interference of this vicious cycle may lead to new therapeutic options for the treatment of sepsis.

Reference:

12AP3-6
Protein C correlation with SOFA score and etiologie of sepsis
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Background and Goal of Study: Protein C plays a central role in hemostasis and in host response to infection. Protein C deficiency is characteristic of sepsis and has been shown to predict morbidity and mortality. Aim of the study was to check if Protein C deficit correlate with the pathogens cause of sepsis (Gram + vs Gram –).

Materials and Methods: All patients (pts) consecutively admitted in our ICU were included prospectively at the first appearance of SIRS (T0). Exclusion criteria: hepatic failure, pre-existent hemostasis alteration, plasma administration. Pts were divided into 2 groups depending on bacteriologic cultures: Group A (Gram –) and Group B (Gram –). Pts with mixed infections were excluded. Protein C plasmatic levels (daily from T0, using a cromogenic method) and clinical evaluation scores (SAPS II, at T0, and SOFA, daily from T0) were measured. T-Student test for not paired data was used.

Results: 10 pts were studied. Group A: 5 pts (M3/F2; age 53,4 ± 22 y.; SAPS II: 48 ± 4), Group B: 5 pts (M4/F1; age 69,4 ± 14 y.; SAPS II: 48,8 ± 13). Protein C (% activity) was lower in Group B (statistically significant from T2: *p < 0,05). Mean SOFA score was higher in Group A (ns).

Mortality in Group A was 80%; in Group B 40%.

Conclusions: Although the limited number of pts, our data show that Gram – infections seem to be linked with lower Protein C concentration. No correlation with severity and/or outcome was observed. Correlation between protein C level and type of infection may have interesting clinical applications. More focused studies are needed.

12AP3-7
Central venous catheter colonization and catheter-related bloodstream infection in intensive care unit: comparing standard with silver integrated catheter
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Anesthesia and Intensive Care, County Emergency Hospital Cluj, University of Medicine and Pharmacy Iuliu Hatieganu, Cluj-Napoca, Romania

Background and Goal of Study: We compared the rates of positive quantitative culture (QOC) and catheter-related bloodstream infection of standard polyurethane central venous catheters (s-CVC) with rates for silver integrated catheters (SI-CVC) (1).
Materials and Methods: A prospective, descriptive study. Data was collected over 12 months from 20 surgical-medical ICU beds. Double and triple lumen standard Vygon catheters and silver integrated Multicath expert Vygon catheters were used. After their removal the tips of the catheters were cultured by the roll-plate method and the quantitative culture technique. Peripheral blood cultures were obtained at the time of catheter removal. Continuous demographic and clinical data were analyzed. The CVC colonization was expressed in terms of cumulative incidence and incidence density. The Kaplan-Meier test was used to compare the risk of POC over time between s-CVC and SI-CVC.

Results and Discussions: A total of 175 CVC, 75 SI-CVC, 714 catheters days and 100 s-CVC, 846 catheter days, in 147 patients, were studied. There was no significant difference in the colonization rate between s-CVC and SI-CVC (p = 0.19). The mean duration of s-CVC was 8.46 days and of SI-CVC was 9.52 days. There was no significant difference in the colonization rate between s-CVC and SI-CVC. The cumulative incidence of catheter infection was 2.67% for SI-CVC and 8% for s-CVC (p = 0.24). The incidence density of catheter infection was 2.8 for SI-CVC and 9.5 for s-CVC (p = 0.19). The cumulative incidence of catheter colonization was 24% for SI-CVC and 25% for s-CVC (p = 0.88) and the incidence density was 25 for SI-CVC and 29 for s-CVC (p = 0.60). Using the Kaplan Meier test there was a significant difference in the incidence of infection and colonization over time between SI-CVC and s-CVC (p = 0.04).

Conclusion(s): SI-CVC could not prevent catheter colonization in critical care patients, but it is a significant difference in the incidence of colonization over time between s-CVC and SI-CVC.


12AP3-8
Meropenem administered in 3-hour infusion significantly shortens ICU stay of patients with severe intraabdominal infection &f8211; initial report.
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Background and Goal of Study: Due to the increase of antibiotic resistance the direct application of the rules of pharmacodynamics (PD) calls for extra attention and may improve results. The aim of the study was to assess the impact of the change in meropenem administration on the rate of the disappearance of symptoms of severe abdominal infection.

Material and Methods: 42 pts with recognized cancer (age: 48–76 yrs) were admitted post-operatively to the ICU due to severe intra-abdominal infection. The patients all received meropenem 3 × 1 g but were randomized into two groups regarding the mode of administration: group I received meropenem in 20 minute infusions, group 2 – in 3-hour infusions (time set acc. to literature data – calculations of T > MIC). Additionally all pts. received fluconazole 400 mg per die. No other differences were noted between the groups as to postoperative treatment. During the ICU stay clinical evaluation (APACHE II – 2 × daily) and procalcitonine level (PCT – 1 × daily) were performed at pre-set time points and all complications were noted. ICU discharge criteria included a PCT level of less than 2 ng/ml, normal WBC and no fever. The efficacy of eradication was assessed microbiologically (complete culture sets 2 × weekly). Patient observation terminated on discharge from ICU.

Results: Mean post-op. ICU stay of pts. treated for severe intraabdominal infections was, on average, 7 days in Group I and 5 days in Group II, in which the mode of antibiotic administration followed the PD-dicated approach.

Conclusion: Although this prospective study is still being conducted the initial observations suggest a very significant positive impact of meropenem administered in a prolonged infusion on the duration of ICU stay in case of pts. with severe abdominal infections. We believe that the clinical implication of this finding call for such an early report.

12AP4-1
Melatonin preconditioning improves liver function after hemorrhagic shock
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Background and Goal of Study: Exogenous administration of pineal hormone melatonin has been demonstrated to attenuate organ damage in septic shock and ischemia-reperfusion models. Here, we investigated whether melatonin pretreatment before hemorrhagic shock improves liver function, hepatic perfusion index and hepatocellular redox state.

Materials and Methods: Sprague-Dawley rats underwent hemorrhagic shock (MAP ≤ 35 mm Hg) for 90 min. Animals were resuscitated with shed blood and Ringer’s. Pretreatment was performed with melatonin 10 mg/kg, melatonin plus melatonin receptor antagonist luzindole 2.5 mg/kg, or vehicle (each n = 10). Sham-operated controls with and without melatonin were included (each n = 8). After 2 hours of resuscitation, animals underwent either measurement of Plasma Disappearance Rate of indocyanine green (PDRICG) as a sensitive marker of liver function, or intravalitral microscopy for assessment of hepatocellular redox state (measured by NAD(P)H autofluorescence) and hepatic perfusion index.

Results and Discussion: Melatonin preconditioning before hemorrhage improved PDRICG (melatonin/shock 15.02%/min ± 1.2 SD vs. vehicle/shock 8.18%/min ± 1.9 SD; p = 0.003), hepatic perfusion index (melatonin/shock 516.6 pl/sec/mm ± 103.9 SD vs. vehicle/shock 361.0 pl/sec/mm ± 25.5 SD; p = 0.002) and redox state (melatonin/shock 110.27 aU ± 2.36 SD vs. vehicle/shock 129.37 aU ± 3.94 SD; p = 0.006), compared to vehicle controls. Pretreatment with luzindole completely abolished this protective effect with respect to PDRICG (7.31 ± 1.4), Improvements regarding hepatic perfusion index and redox state were not affected by luzindole administration.

Conclusion(s): These data suggest that the beneficial effects of melatonin are not only due to oxygen radical scavenging properties. With respect to liver function, melatonin preconditioning exhibits protective mechanisms that are dependent on melatonin receptor activation.

12AP4-2
Maintaining normoglycemia and not glycemia-independent actions of insulin preserves myocardial performance by protecting mitochondrial function
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Background and Goal of Study: Intensive insulin therapy (IIT) reduces mortality and morbidity of critically ill patients. Several investigations suggest that insulin might ameliorate myocardial contractility independently of its actions on blood glucose.

Materials and Methods: In a rabbit model of prolonged critical illness using a 4-arm design (n = 8 per group), blood glucose (normal NG-high HG) and plasma insulin levels (normal NI-high HI) were independently manipulated over 7 days, to elucidate relative impact of maintaining normoglycemia and glycaemia-independent actions of insulin on left ventricular contractility in an open chest preparation, cellular ultra-structure and by electron microscopy, the activities of the respiratory chain complexes in biopsies from the left ventricle, and plasma levels of serum heart-fatty-acid-binding-protein.

Results and Discussions: Contractility increased in HI/NG animals and decreased in HI/HG animals compared to other groups and healthy controls. Cardiac output and surrogate parameters of preload and afterload did not differ among groups. Electron microscopy revealed severely damaged mitochondria in cardiac myocytes in particular in HI/HG rabbits. Concomitantly, the activities of complex I, II and V were compromised in the left ventricle biopsies of both hyperglycemic groups, in particular in the HI/HG group. Both normoglycemic groups revealed no changes in ultra-structure and complex activity compared to healthy controls. Compromised mitochondrial enzyme activities correlated with cardiac damage assessed by plasma levels of heart-fatty-acid-binding-protein, suggesting that mitochondrial protection mediated part of the prevention of organ failure.

Conclusions: In our animal model of prolonged critical illness, insulin ameliorated myocardial contractility but only when normoglycemia was maintained concomitantly. Maintaining normoglycemia and not glycaemia-independent actions of insulin appear crucial for preserving mitochondrial function in the myocardium.

12AP4-3
Normoglycemia and not glycemia-independent actions of insulin maintain physiologic NOS-activity by preserving physiological regulation of ADMA-levels
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Department of Intensive Care Medicine, Catholic University of Leuven, Leuven, Belgium

Background and Goal of Study: In critical illness, both hyperglycemia and elevated levels of asymmetric dimethylarginine (ADMA), an endogenous inhibitor of NO-synthase (NOS) that is released during catabolism, are associated with organ dysfunction and increased mortality. Controlling glycaemia by intensive insulin therapy (IIT) reduces morbidity and mortality, lowers
ADMA plasma levels, and thus presumably preserves local NO bioavailability. The effects on ADMA levels can be mediated by affecting proteolysis and/or the activity of dimethylarginine dimethylaminohydrolase (DDAH), the enzyme breaking down ADMA. We thus hypothesized that controlling glyceria or glycemia-independent actions of insulin preserve regional NOS-activity by modulating ADMA levels in tissues and plasma.

Materials and Methods: In a rabbit model of prolonged critical illness we studied the impact of maintaining normoglycemia/normoinsulinemia, normoglycemia/hyperinsulinemia, hyperglycemia/normoinsulinemia and hyperglycemia/hyperinsulinemia over 7 days on NOS-activity (by radio-labelled enzymatic assay), NOS transcription (by real time PCR) and ADMA levels (by High-Performance Liquid Chromatography (HPLC)) in muscle, kidney and liver biopsies and plasma, plasma urea/creatinine ratio (U/C) as a parameter for proteolysis, and the DDAH-activity (by HPLC) in the biopsies.

Results and Discussions: In both hyperglycemic groups NOS-activity was reduced despite up-regulated NOS-transcription, independently from insulin levels. In both normoglycemic groups NOS-activity and -transcription remained unchanged compared to healthy controls. ADMA levels in plasma and tissues were increased in both hyperglycemic groups and not affected in both normoglycemic groups. ADMA levels correlated with NOS-activity in the biopsies. U/C was low in hyperglycemic groups, indicating minor proteolysis. DDAH-activity was preserved in normoglycemic groups and deteriorated in both hyperglycemic groups. DDAH-activity correlated with ADMA levels.

Conclusion: Maintained normoglycemia and not glycemia-independent actions of insulin preserved physiologic tissue NOS-activity not by modulating NOS transcription but by preventing increased levels of ADMA through preserving physiological DDAH-activity.

### 12AP4-5

**Recovery of temperature homeostasis and metabolism after long abdominal surgery under combined anesthesia**

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#### Background and Goal of Study: The seasonal diagnosis and adequate correction of homeostasis disorders influence significantly on surgical operations outcomes. It is important to assess the postoperative recovery, too. The aim of the study is to evaluate recovery of temperature homeostasis and metabolism.

#### Materials and Methods: We study 66 patients, underwent long abdominal surgery under combined anesthesia. The mean age was 62.1 (34.0–69.0) yrs. A core and peripheral temperature, central hemodynamics, tissue delivery (DO2), consumption (VO2) and extraction of oxygen (ERO2), glucose profile and nitrogen balance were assessed in all patients up to 24 hours after surgery end. Depending on the oxygen extraction ratio (ERO2) at the admission into ICU, all patients were divided in three groups: group 1 (n = 12) – ERO2 = 10–21%, group 2 (n = 26) – ERO2 = 24–30%, and group 3 (n = 27) – ERO2 = 35–40%. Statistical analysis include Kruskall-Wallis test.

#### Results and Discussions: Heterogeneity of metabolism recovery was revealed between the groups. After admission in ICU there were differences in core temperature between groups 1, 2 and 3 (35.1 (34.9–35.6)°C, 35.2 (35.0–35.6)°C and 34.3 (33.7–34.9)°C, respectively), which determine delayed recovery in group 3 by 4–7 hour, compared with 1 and 2 group, in which recovery occurred in 1–3 hour. Also was found differences in VO2 between groups (0.75–1.2) ml/kg/min, 2.58 (2.3–4.5) ml/kg/min and 2.5 (2.8–3.7) ml/kg/min, respectively). DO2 in all groups was decreased. In oxygen status there were following differences SvO2 between the groups: 1 – (85.9 (81.4–87.7)%), 2 – (70.1 (69.5–74.4)%), 3 – (60.8 (56.7–62.8)%). The glyceria level was not different between the groups. All the patients had negative nitrogen balar after admission in ICU. After the 12th postoperative hour the nitrogen balance in group 3 was significant less (p = 0.021, 62.8%) compared with 1 and 2 group, in which recovery occurred in 1–3 hour.

#### Conclusions: The state of the patients, who had normal values ERO2 after the long abdominal surgery under combined anesthesia may be characterized as compensated. The decreased ERO2 allow to consider this patients as high risk of delayed metabolism recovery. Patients with increased ERO2 requires correction of hemodynamic branch of oxygen transport system.

### 12AP4-7

**Serum sodium concentration into model for end-stage liver disease and liver transplantation outcome**

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Anesthesiology, Hospital Vall d’Hebron, Barcelona, Spain

#### Background and aim: Actually have been demonstrate the efficay to incorpo- rate serum sodium (Na) into model for end-stage liver disease (MELD). This new score (“MELD-Na” = MELD + 1.59 (135 – Na) seems to provide more accurate survival prediction in patients with liver disease than MELD alone. So, “MELD-Na” scores > 20 were associated with higher risk of death(1). The aim of this study was to determine the effects of MELD-Na on post-transplantation outcome in patients with cirrhosis.

#### Methods: In this retrospective study we enrolled patients with end-stage liver disease undergoing liver transplantation during a 2-year period. This patients were separated in two groups according to the MELD-Na score > or < 20. We compare the postoperative complications between groups during the first postoperative month, and the overall survival of both groups.

#### Results: Complete date were available in 148 patients in whom the median “MELD-Na” score was 14.84 ± 12.71. “MELD-Na” > 20 was present in 47 patients (31.8%) of whom 36.6% developed renal failure and 28.6% liver failure, there were no significant differences between groups for these com- plications (p = 0.148 and p = 0.368, respectively). Also, the overall survival was similar between groups (Kaplan-Meier, p = 0.777).

#### Conclusions: In this study, the patients who were going to receive liver transplantation, MELD-Na score > 20 wasn’t associated with a higher rate of renal and liver failures during the first month after transplantation. Also, we can’t demonstrate that the incorporation of Na into MELD provides an accu- rate survival prediction in these postoperative patients.

#### Reference:

12AP5-1
Regulation of renal sodium transporters during severe inflammation
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Background and Goal of Study: The pathogenesis of endotoxemic tubular dysfunction with failure in urine concentration and increased fractional sodium excretion is poorly understood (1). Since expression of NHE3, ROMK, NKCC2, ENaC and Na+/K+-ATPase is essential for tubular sodium reabsorption (2), we investigated the regulation of these transporters during severe inflammation.

Materials and Methods: By agreement of the animal protection committee C57BL/6J mice were injected with lipopolysaccharides (LPS) or proinflammatory cytokines. Hemodynamic, renal parameters and the expression of renal sodium transporters were investigated. To clarify the role of cytokines and renal ischemia in the regulation of renal sodium transporters, experiments with cytokine knock-out mice, glucocorticoid-treated mice, and mice with renal artery clipping serving as model for renal ischemia were performed. The influence of cytokines on the expression of renal sodium transporters in cultured cortical collecting duct (CCD) cells was investigated.

Results and Discussions: LPS reduced blood pressure and GFR, increased fractional sodium excretion and strongly decreased the expression of NHE3, ROMK, NKCC2, ENaC and Na+/K+-ATPase. Injection of TNF-α, IL-1β or IFN-γ decreased renal function and expression of renal sodium transporters. LPS-induced downregulation of sodium transporters was not affected in knockout mice with deficiencies for TNF-α, IL-receptor-1 or IFN-γ. Glucocorticoid pretreatment, which inhibited LPS-induced increase of tissue TNF-α, IL-1β or IFN-γ concentration, attenuated LPS-induced renal dysfunction and downregulation of tubular sodium transporters. Renal ischemia did not influence sodium transporter expression. In vitro, proinflammatory cytokines decreased expression of ROMK, ENaC and Na+/K+-ATPase in CCD cells.

Conclusion(s): Our findings demonstrate downregulation of renal sodium transporters which likely accounts for tubular dysfunction during sepsis and suggest that this regulation is mediated by proinflammatory cytokines.

References:

12AP5-2
Prophylactic adrenomedullin infusion prevents pulmonary hypertension and lactic acidosis in ovine endotoxia
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Background and Goal of Study: Sepsis-associated arterial hypotension is often complicated by an impaired oxygen supply/demand relationship, as reflected by increased arterial lactate concentrations.(1)

We hypothesized that prophylactic infusion of the endogenous vasodilatory peptide hormone adrenomedullin (AM) may improve tissue oxygenation and thereby limit arterial lactate production in ovine endotoxia.

Materials and Methods: Fourteen adult female sheep were instrumented for chronic hemodynamic monitoring. Thereafter, the sheep were randomized to receive either AM at incremental doses (10, 50, 100 ng/kg min−1; each for 30 minutes; doses were chosen for dose/response studies) or the vehicle (normal saline). Twenty-four hours later, endotoxin (Salmonella typhosa endotoxin, 10 ng/kg min−1) was infused for 24 hours in all sheep.

Results and Discussions: Endotoxin infusion increased heart rate, cardiac index and decreased mean arterial pressure and systemic vascular resistance index to the same extent in AM pre-treated and control animals. However, AM pre-treatment prevented the endotoxin-associated increase in mean pulmonary arterial pressure (18 ± 1 vs. 25 ± 1 mmHg, p < 0.01 AM vs. control), pulmonary vascular resistance index (86 ± 7 vs. 132 ± 18 dynes · cm−5 · m2; p < 0.05 AM vs. control) and arterial lactate concentrations (0.6 ± 0.1 vs. 1.4 ± 0.3 mmol · dl−1; p < 0.01 AM vs. control).

Conclusion(s): These data demonstrate that prophylactic infusion of AM prevents sepsis-associated pulmonary hypertension and lactic acidosis in ovine endotoxia.

Reference:

12AP5-3
Beneficial effects of low-dose dexamethasone on cardiovascular and kidney function in septic shock in the rat are not related to iNOS inhibition
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Background and Goals: The pathogenesis of acute renal failure (ARF) in sepsis is multi-factorial and only partially understood. A controversially discussed molecule to play a role in ARF is nitric oxide (NO), which is known to be suppressed by dexamethasone (1). The hypothesis of this study was that inhibition of iNOS by low-dose dexamethasone would improve an impaired cardiovascular and kidney function in sepsis.

Materials and Methods: 12 male Wistar rats received a 30-min iv-infusion of lipopolysaccharide (LPS), 2 h later, in all rats fluid resuscitation was started. Additionally to the fluid (Voluven®) 6 animals received dexamethasone (DEX; 0.1 mg/kg). Systemic hemodynamic parameters were continuously recorded. Furthermore plasma NOx levels (Sievers NO-analyzer), renal iNOS mRNA expression (in situ hybridization) and creatinine clearance (Clcrea) were determined. Statistics were performed using two-way ANOVA for repeated measurements.

Results: Data are presented as mean ± SD.

<table>
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<tr>
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<th>Endotoxia (120 min)</th>
<th>Resuscitation (300 min)</th>
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<td>Voluven®</td>
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<td>59 ± 12†‡</td>
<td>67 ± 12*†‡</td>
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<td>DEX</td>
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<td>6.3 ± 1.4</td>
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<td>DEX</td>
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<td>751 ± 234</td>
<td>756 ± 150</td>
<td>231 ± 59*</td>
<td>231 ± 59*</td>
</tr>
<tr>
<td>NOx (μM · L−1)</td>
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<td>16 ± 9</td>
<td>17 ± 3</td>
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‡ P < 0.05 vs baseline. † P < 0.05 vs control. ‡ P < 0.05 vs Voluven®. * = anuria.

DEX did not reduce renal NOx mRNA expression.

Conclusion: The restoration of systemic hemodynamics and kidney function in dexamethasone-treated animals was not related to iNOS inhibition.

References:

12AP5-4
Nicotine protects from renal ischemia/reperfusion injury
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Background and Goal: Kidney ischemia/reperfusion (I/R) injury is responsible for delayed graft function and worsens long-term allograft survival. Recently, nicotine has been shown to protect mice from the ischemia–induced shock through the modulation of innate immune response. As sepsis and renal I/R share similar inflammatory patterns, we tested the potential protective effect of nicotine in renal I/R.

Material and Methods: I/R was induced by a bilateral 35 minutes clamping of renal arteries in mice. Sham animals have been operated without clamping (n = 5/group). Nicotine was administrated 30 minutes before surgery. Control and nicotine pretreated animals underwent a bilateral renal artery clamping and were sacrificed 24 and 72 hours after reperfusion (n = 12 to 15/group).

Renal dysfunction was assessed by plasma creatinine levels. Tubular damage was scored from 0 to 5 according to the presence of 4 criteria: loss of brush border, tubular casts, necrosis and tubule dilatation. TNF-α levels were measured using ELISA and neutrophil infiltration was assessed by Ly-6G immunostaining.

Results: Nicotine pretreatment significantly improved renal function as shown by lower creatinine plasmatic levels in comparison with controls (7.10 ± 11.7 vs 41.1 ± 7.7 μmol/l and 54.3 ± 14.9 vs 28.1 ± 7.4 μmol/l; p < 0.05, mean ± SEM, day 1 and day 3 after I/R, respectively). Similarly, tubular damage score was lower in nicotine pretreated groups compared with controls (3.6 ± 0.2 vs 2.4 ± 0.5 and 4.0 ± 0.1 vs 1.9 ± 0.6; p < 0.05, day 1 and day 3 after I/R, respectively). The anti-inflammatory effect of nicotine was attested by a down-regulation of renal TNF-α (25.2 ± 1.9 and 9.2 ± 0.4 ng/mg protein, untreated I/R vs treated I/R, p < 0.01) and by a suppression of neutrophil infiltration (247.7 ± 14.6 and 96.2 ± 41.7 cells/10 fields, untreated I/R vs treated I/R, p < 0.05).
Conclusion: Nicotine protects kidney from renal I/R through the dampening of innate immune response.

12AP5-5
Flecainide acetate reduces mortality to endotoxin induced acute lung injury in rats
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Background and Goal of Study: To clarify the effects of flecainide acetate, an antiarrhythmic drug, on mortality and interleukin-8 (IL-8) response to endotoxin induced acute lung injury in rats.

Materials and Methods: Animals were randomly assigned to one of five groups: rats receiving subcutaneous (SC) injection saline (S-S group, n = 14), those receiving SC injection of saline and intraperitoneal (IP) injection saline (S-E group, n = 28), those receiving SC injection of flecainide acetate 0.2 mg/kg/hr and IP injection of saline (F-S group, n = 14), those receiving SC injection of flecainide acetate 0.1 mg/kg/hr and IP injection of endotoxin (F 0.1-E group, n = 14), those receiving SC injection of flecainide acetate 0.2 mg/kg/hr and IP injection of endotoxin (F 0.2-E group, n = 17) SC infusion of saline or flecainide acetate using by mini-osmotic pump was started 3 hours before IP injection of saline or endotoxin and continued until 24 hours after IP injection of saline or endotoxin when all rats were killed. The wet/dry weight/dry weight (W/D) ratio of lung, lung injury score and number of WBC, % polymorphonuclear cells and concentration of IL-8 in bronchoalveolar lavage fluid (BALF) and mortality rate were calculated 24 hours after IP injection of saline or endotoxin.

Results and Discussions: The mortality rates for F 0.1-E groups (0%) and F 0.2-E groups (17.7%) were significantly lower than that for the S-E group (43%). The increases in W/D ratio, lung injury score and number of WBC, % polymorphonuclear cells and concentration of IL-8 in BALF were attenuated for the F-E group than the S-E group.

Conclusion(s): Flecainide acetate dramatically reduced the mortality rate and attenuated IL-8 and inflammatory response to the endotoxin induced acute lung in rats. These findings suggest that flecainide acetate has a therapeutic effect to the acute lung injury to sepsis.

12AP5-6
Inhibitor of apoptosis proteins cIAP1, cIAP2 and XIAP regulate apoptosis in sepsis
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Background and Goal of Study: During sepsis lymphocytes undergo accelerated apoptosis, which contributes to immunosuppression. Inhibitor of Apoptosis Proteins (IAP) are endogenous inhibitors of caspase activity (1), but their role in sepsis is unknown. The aim of the study was to investigate the expression of IAP's and their regulator smac/diablo in patients with severe sepsis.

Materials and Methods: With approval by the local ethics committee 18 patients with severe sepsis were included and blood was obtained as soon as the criteria of severe sepsis were fulfilled. 10 patients with mild systemic inflammatory response syndrome (SIRS) and 11 healthy volunteers served as two separate controls. Caspase activity and antigen expression in lymphocytes were measured by flowcytometry, and mRNA expression in whole blood was quantified by light-cycler rtPCR. ANOVA-analysis was performed to test for statistical significance.

Results and Discussions: In severe sepsis but not in SIRS phosphatidyl serine externalisation increased and the central executioner caspase 3 was found to be active in an expanded subpopulation of T- and B-cells. In healthy controls, mRNAs for cIAP1, cIAP2 and XIAP were expressed at relatively low levels. While all three may inhibit caspase 3, XIAP is also known to inhibit caspase 9. In patients suffering from severe sepsis, the transcription of cIAP1, cIAP2 and XIAP was increased significantly (p < 0.001) 2.4-fold, 4.8-fold and 9.5-fold. Surprisingly, in SIRS the respective transcripts were elevated even more (8.5, 8.8 and 20.5-fold, p < 0.001). The expression of the IAP-inhibitor smac/diablo remained unchanged.

Conclusion(s): We hypothesize that elevated levels of IAP's in SIRS aide to abrogate caspase-3 activation. In sepsis, the compensatory increase in IAP transcripts may not be strong enough to efficiently block caspase-3 activation thereby rendering lymphocytes susceptible to cell death.

Reference:

12AP5-7
Impact of food-restriction on the outcome after abdominal sepsis in the rat
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Background and Goal of Study: We sought to evaluate the differences in outcome 120 hours after induction of abdominal sepsis between well-nourished (WN) and food-restricted (FR) rats.

Materials and Methods: After approval, in Trial 1 30 FR and 30 WN rats of the same age received antibiotic prophylaxis and underwent peritoneal infection on day 20. In Trial 2 20 FR rats were weight matched to 20 WN, but younger rats. All had i.v. antibiotic prophylaxis with cefuroxime 3mg/metrondazol 10mg/kg 1 h before surgery and peritoneal stool inoculation. In 10 rats of Trial 2, plasma cytokines TNF-α, IL-6 and MIP-2 were measured (ELISA) 1 h after infection. Primary endpoint was the 120 hour survival rate analysed using Chi-square test. Cyto-kine data were analysed with the Kruskal-Wallis test and post hoc Bonferroni correction. Means ± SEM are shown.

Results and Discussions

FR rats were more resistant to infection than WN rats of same age (others found that FR mice had less neoplasms, auto-immune disease and lived longer compared with WN controls, 1). However this advantage disappeared when we compared weight-matched rats in Trial 2, but pro-inflammatory cytokines were reduced in FR rats (as in 2).

Conclusion(s): Food restriction per se appears to be no independent risk factor for postoperative sepsis. Immuno-modulatory effects should be further evaluated.

Reference:
Results and Discussion: Mortality was significantly decreased in CAPE + sepsis(0) (3deaths/brats) and CAPE + sepsis(12) (3deaths/brats) groups compared to the sepsis group (8deaths/brats). IL-1, IL-6, and IL-10 increased except TNF-α levels in sepsis group compared to control group. All cytokine levels were similar to control levels only in CAPE + sepsis(12) group. Apoptosis, iNOS and HSP70 evaluation were significantly changed between all groups in following order; control < CAPE + CAPE < CAPE + sepsis(12) < CAPE + sepsis(0) < sepsis. SOD and GSH-Px levels were not different among groups. MDA, CAT were increased sepsis.

Conclusion: CAPE reduced mortality in sepsis and histopathological changes best when it was administered after sepsis formation.

12AP6-1
Microbiology Ward rounds within Critical Care
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Background: Direct microbiological input to critical care is essential for the management of the septic patient. Early broad spectrum antimicrobial therapy with appropriate diagnostic studies to ascertain causative organisms is well established, there should be reassessment with the aim of using narrow spectrum antibiotics to prevent the development of antimicrobial resistance, reduce toxicity and reduce costs(1). In systematic analysis of ward rounds in ICUs the information most commonly missing from a patient’s file concerned microbiology findings(2).

Methods: We performed a telephone survey of all NHS critical care units in the North West of England, (n = 31). Each unit was telephoned and the duty consultant was asked a series of questions relating to the type of microbiology input to their critical care unit.

Results: We achieved a 100% response rate.

The study looked at 11 teaching Hospitals & 21 DGHs. representing 12% of UK ICUs. 26 (83%) critical care units had live computerised access to microbiology data.

21 (68%) units had an antibiotic policy in place.

19 (61%) units had a formal microbiology ward round.

Frequency ranging from once per week, (1 unit) to 7 days per week, (4 units), most units with a microbiology ward round had this service monday–friday (12 units).

When asked to rate the value of this ward round the mean score was 8.6 out of a possible 10. (Range 10–5, mode 9).

In those units without a microbiology ward round the desirability of such a service was scored on average at 8.5 out of 10. (Range 10–3, mode 9).

Conclusion: Direct microbiological advice at the bedside is highly valued by ICU consultants. Antibiotic prescribing is generally well controlled with 2/3rds of units having an agreed antibiotic policy in place. Work will continue to determine whether these results reflect the national picture in the UK.

References:
1 At Widmer, Intensive Care Medicine, June 2005 pS7–11.

12AP6-2
Microbiology of intra-peritoneal comminatory peritonitis
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The delay of surgery and efficient antibiotherapy may increase the severity of the peritonitis. That’s why it’s important for the physicians to check periodical the ecology of bacteria in the peritonitis to adapt the antibiotic strategy.

The aim of our study was to evaluate the bacteria ecology of the comminatory peritonitis treated in the abdominal surgery unit.

Materials and Methods: Study design: prospective. Inclusion criteria: all patients admitted in the visceral surgery unit with the diagnosis of peritonitis treated in the abdominal surgery unit.

Results and Discussion: We included in this study 30 consecutive patients (23 males and 7 females). The diagnosis of peritonitis was confirmed by the surgery for all patients. The origin of the peritonitis was perforate duodenal ulcer (20%), appendicitis (23%), biliar peritonitis (37%) and intestinal perforation for the other cases. The bacteriological analysis was positive for 16 patients (53.3%) and negative for the others. The bacteriological analysis isolated 6 types of bacteria (4 streptococcus, 3 staphylococcus, 2 enterococcus, 4 E coli, 2 klebsiella and 2 pseudomonas) and in one case, we identified a Candida albicans. In three patients, the isolated bacteria were resistant to primary antibiotics and 2 patients died in the few postoperative days. We noted too, a high level of resistance to amoxicillin-clavulanic acid (31%).

Conclusion: These results invite us to change our antibiotic strategy for comminatory peritonitis because of the high level of resistance of the bacteriological ecology mainly in severe peritonitis with organ failure.

12AP6-3
Effect of Enteral Nutrition in VAP and Immunologic Status
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Background and Goal of Study: Even the improvement of diagnosis, therapy and prevention measures the hospital acquired pneumonias cause high morbidity and mortality in the ICU. The aim of this study is the effect of enteral nutrition in VAP and immunologic status.

Materials and Methods: This prospective study is made in the ICU of the UCC in Pristhina. 43 mechanically ventilated patients are divided in two groups, gr. A (n = 21) did received enteral nutrition and gr. B (n = 22) received parenteral nutrition. At all of the patients included in the study is been evaluated the prognosis by APACHE II system in the first 24 hours from the admittance. The aim of the nutrition in both groups was 0.2 g N/kg bw/day and 30–40 kcal/kg/day of the non proteinic calories. The levels of the Ig A and lymphocytes were followed up. Samples for microbiological studies have been taken from oropharyngs, aspirate of the NGS and trachea, in order to identify the path of colonization and later on the respiratory infections in two groups of patients.

Results and Discussions: Pneumonias had only 9 (42.8%) of the enterally fed patients compared with 18 (81.1%) with parenteral nutrition, which is statistically significant. In gr. A 6 patients died, while 10 of them died from the gr. B. From the beginning levels of Ig A from 1.84 g/L on the gr. A were raised on 2.10 g/L, while on the group B the beginning levels of Ig A from 1.85 g/L were raised on 1.92 g/L.

Lower respiratory tract colonization in the gr. A was 33% and in the gr. B 50.1%, with more pronounced from oropharynx flora than gastrointestinal flora.

Conclusion(s): Because enteral feeding is physiologic, less invasive, safer, has a good outcome in immunoglobulin secretion and for us it’s important that is cheaper, lowers the incidence of septic complications and hospital acquired pneumonias.

12AP6-4
TPN as a vector of infection in ICU
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Background and Goal of study: In our hospital ICU, TPN (total parenteral nutrition) infusions are administered over 24 hours at room temperature. We postulated that TPN is a potential growth medium for pathogens and that contamination of infusion systems could lead to bloodstream infections. This study was undertaken to investigate the ability of common pathogens to establish and grow in TPN solution at room temperature.

Materials and Methods: NuTRIflex® is the currently used TPN in our Institution. It contains 20 g/l soya oil, 20 g/l medium chain triglycerides, 38 g/l amino acids, and 120 g/l glucose. Inoculated NuTRIflex® was incubated at constant room temperature (21 ± 1°C) and at 35°C. Four common local pathogens (MRSA, S maltophilia, P mirabilis and C albicans) were used at inoculum weights of 10^4 cfu/ml throughout. Periodic subcultures were made onto blood (Oxoid), sabouraud (Oxoid) and cled (Oxoid) agars, Antimicrobial activity was determined using 10 ml NuTRIflex® onto a blood agar seeded with S aureus (ATCC 29213). Growth curves were performed with all four pathogens in undiluted NuTRIflex®. Subsequently, administration setups were contaminated at potential contamination sites (mechanical junctions) with equal inocula of the four pathogens. Systems were maintained at room temperature, sampled at 0, 1, 2, 4, 8 and 24 hours onto appropriate media as above.

Results and Discussions: At room temperature (21 ± 1°C) C albicans grew poorly whilst MRSA, S maltophilia and P mirabilis merely survived, even at inoculum weights 100 times greater than found on the hands of Health Care Workers in our hospital. At 35°C none of the pathogens grew exponentially and failed to migrate upstream in NuTRIflex®. Subsequently, administration setups were contaminated at potential contamination sites (mechanical junctions) with equal inocula of the four pathogens. Systems were maintained at room temperature, sampled at 0, 1, 2, 4, 8 and 24 hours onto appropriate media as above.

Conclusions: C albicans, MRSA, S maltophilia, and P mirabilis survived, but failed to grow exponentially and failed to migrate upstream in NuTRIflex® infusion systems. At room temperature during the first 24 hours of administration, NuTRIflex® can act as a vector but does not multiply the risk of bloodstream infection.
12AP6-6

The use of the laryngeal mask airway during percutaneous dilatational tracheostomy: an alternative to the endotracheal tube

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Background and Goal of Study: Percutaneous Dilatational Tracheostomy (PDT) facilitates the bedside insertion of a tracheostomy tube in the Intensive Care Unit. Accidental puncture of endotracheal tube (ETT) cuff and unintended tracheal extubation are the potential complications during PDT. Our purpose was to evaluate the safety and efficiency of the use of the laryngeal mask airway (LMA) during percutaneous dilatational tracheostomy under bronchoscopic guidance with comparing the ventilation via (ETT).

Materials and Methods: The bedside PDT was performed in 30 critically ill patients-15 in each group: LMA group and ETT group- that fulfilled the criteria of this study: \( \text{PaO}_2 > 100 \text{mmHg} , \text{PaCO}_2 < 45 \text{mmHg} \) under preemptive positive pressure ventilation (IPPV) with a mean ventilation pressure of <25 mmHg. The positioning of the LMA was done at least 30 min before the tracheostomy was performed.

Blood samples for arterial blood gas analyses were taken 5 min before the procedure (first value) and just after (1 min) the insertion of tracheostomy tube (second value). Mean arterial pressure (MAP), heart frequency (HF) and peripheral oxygen saturation (SpO2), endexpiratory CO2 and minute ventilation volume (MVV) were registered every 60 seconds.

Results and Discussions: There was no significant difference in MAP, HF, SpO2, pH, PaCO2 or PaO2 between groups before the procedure. The operating time was significantly shorter in LMA group (8.5 ± 0.8 min versus 7.9 ± 1.4 min, \( P < 0.05 \)). Hypercarbia was noted in 33.3% in the LMA group and 26.7% in the ETT group.

Conclusion(s): The LMA provides a safe and effective alternative to an endotracheal tube for airway management during guidewire dilating forceps tracheostomies in selected patients and prevents the difficulties associated with the use of ET such as cuff puncture, tube transection by the needle, and accidental extubation.

12AP6-7

Comparison of sensitivity and specificity of the protected specimen brush (PSB) technique and the tracheo-bronchial aspirate (TBS) in the diagnostics of ventilator associated pneumonia (VAP)

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Background and Goal of Study: Invasive bronchoscopic techniques improve early prognosis in critically ill patients with suspected VAP by reducing antibiotic therapy and its costs and suppressing the growth of resistant microorganisms (1). The aim of the study was to compare sensitivity and specificity of the PSB technique with the TBS method in the diagnostics of VAP.

Materials and Methods: The prospective study included 50 patients with the predicted ventilation period of at least 6 days. VAP was confirmed using clinical, radiological and microbiological criteria. Material from the lower respiratory tract was obtained using the TBS technique and PSB on the 1st, 4th and 6th day of therapy (a total of 150 samples). Significance of differences in specificity and sensitivity of used methods was assessed by test of structural indicators.

Results and Discussions: VAP was confirmed in 16 patients. The following microorganisms were isolated from the material obtained using the PSB technique: MSSA, S. agalactiae, P. aeruginosa, P. mirabilis, A. baumannii, E. aerogenes. The following were isolated using the TBS technique: MSSA, MRSE, S. agalactiae, P. aeruginosa, Enterobacter spp., P. mirabilis, A. baumannii, K. pneumoniae, E. coli, E. faecalis. The sensitivity of the PSB technique was 90% and its specificity – 95%, while the sensitivity of the TBS technique was 85% and its specificity – 65%. The difference between specificity of both techniques was statistically significant (\( p < 0.01 \)). Analogical difference between sensitivity was not statistically significant.

Conclusion(s): High sensitivity and specificity of the PSB technique in comparison with the TBS method confirm the suitability of invasive techniques in the diagnostics of VAP.

Reference:


12AP6-8

Central venous catheter infections in cancer patients – the ICU and the Wards or is management an issue?

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Background: Central venous catheters (CVC) are a common site of infection, with inadequate management listed as one of the most common causes. Cancer pts. are believed to be at an increased risk of infection due to immunosuppression. Goal of the study: To assess the risk of CVC infections in cancer pts and to evaluate whether upgraded management (by anaesthesiologists & ICU nurses) reduces the risk of CVC infection.

Material and method: We performed a prospective analysis of all catheters introduced and removed over a period of 12 months in a 750-bed oncological hospital. Cultures were obtained from all removed catheters.

Results: Overall number of inserted catheters – 253; overall CVC infection rate – 5.92% (15 cases). The CVC patients were divided into 2 groups: group I–204 pts. after elective CVC introduction in the operating theatre (189 jugular, 14 subclavian, 1 femoral) for chemotherapy and/or parenteral nutrition and group II – 49 pts. – non-elective introduction in the operating theatre due to intraoperative complications (28 pts. – 24 jugular, 4 subclavian) and in the ICU due to emergency admissions – (21 pts – 19 jugular, 2 subclavian). All group II pts. were hospitalised in the ICU (duration 6–513 days). In Group I the CVC infection rate was 1.47% (3 cases) and in Group II – 24% (12 cases), of which 5 cases (10%) occurred in the ICU and 7 (14%) cases in the wards after discharge from ICU. Summarising: in the ICU there were 5 infections per 1630 CVC-patient-days (all emergency infections); in the wards there were 10 infections per a total of 1630 CVC-patient-days (3 elective insertions and 7 emergency insertions).

Conclusions: (I) Non-elective, emergency-related CVC introduction in cancer pts. is associated with a high infection rate. (II) Correct CVC maintenance as recommended and performed in the ICU facilitates an acceptable infection rate.

12AP7-1

Intra-peritoneal microdialysis for detection of post-operative mesenteric ischaemia

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Background and Goal of Study: Intra-peritoneal microdialysis (IPMD) identifies elevations of peritoneal fluid lactate/pyruvate ratio, a maker of mesenteric ischaemia (1). This observational study assessed the utility of IPMD following colorectal surgery.

Materials and Methods: 11 patients having elective left sided colorectal resection with primary anastomosis at a university teaching hospital were recruited to have IPMD monitoring for up to 48 hours post-operatively. Concurrent physiological and biochemical parameters were recorded.

Results and Discussions: Median (range) age was 60 (29–76) years and median (range) length of hospital stay was 11 (6–33) days. IPMD sample collection demonstrated a mean (95% CI) intraperitoneal lactate/pyruvate ratio of 24 (17–30), normal range being 19 ± 4. Two patients developed early post-operative anastomotic complications, displaying elevations in lactate/pyruvate ratio of 240% and 177% over baseline, these episodes associated with consecutive periods of systemic hypotension. A rise of greater than 60% in lactate/pyruvate ratio has been shown to be suggestive of mesenteric ischaemia (1). No other patients demonstrated elevations of lactate/pyruvate ratio to this extent. Primary pathology, volume of fluid administration, use of vasopressor therapy and use of epidural analgesia was not shown to significantly affect IPMD results.

Conclusion(s): Post-operative intra-peritoneal microdialysis analysis performed in the critical care unit highlighted that in two patients, one with clinical suggestion of mesenteric ischaemia and one with a confirmed anastomotic leak, an early elevation of lactate/pyruvate ratio in the post-operative period was recorded. Further evaluation of IPMD as an adjunct to guiding administration of fluid or vasoactive therapies in the critical care unit following colorectal resection is warranted.

Reference:

12AP7-2

Is intrathoracic blood volume index an ideal target parameter of resuscitation after burn injury?

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Introduction: A number of target parameters are used for fluid replacement in severely burned patients. The aim of our prospective randomised study was to examine the effect of two types of fluid resuscitation regimes on the central venous oxygen saturation of the haemoglobin (ScvO₂) and multiple organ dysfunction score (MODS).

Materials and Methods: Twenty four consecutive patients were involved in the study. Inclusion criteria were the presence of burn injury affecting more than 15% of body surface area. Exclusion criteria were chronic left heart or renal insufficiency, age under 18 years, and acute renal failure developed within three days after injury. In Group I (n = 12) the fluid resuscitation was guided by the hourly urine output, in Group II (n = 12) by the intrathoracic blood volume index (ITBVI).

Results: Mean ScvO₂ was significantly lower in Group I than in Group II (p < 0.05) in the first 24 hours. MODS was significantly higher in Group I than in Group II calculated at 48 hours (p < 0.05) and 72 hours after injury (p < 0.05). The two main outcome parameters i.e. MODS calculated at 48 and 72 hours after injury were in a significant negative linear correlation with ScvO₂ measured on day 1 (r = -0.684, p < 0.01; r = -0.677, p < 0.01, respectively). Significant linear correlation was found between ITBVI and ScvO₂ (r = 0.855, p < 0.001). ITBVI and cardiac index (r = 0.491, p < 0.001), ITBVI and left ventricular contractility index (r = 0.523, p < 0.001). Extravascular lung water index did not show significant differences between Group I and II on the first and second days after admission. No sign of fluid overload were detected neither in Group I nor in Group II. Hourly urine output, central venous pressure and central venous pressure minus positive end expiratory pressure did not show any correlation neither with ScvO₂ nor with other hemodynamic parameters.

Conclusion: Our data suggest that ITBVI may be a better target parameter than hourly urine output in fluid resuscitation of severely burned patient in the first two days.


12AP7-3

Picco PLUS monitoring hemodynamic parameters in critically ill patients

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Background and Goal of Study: To assess Picco PLUS monitoring hemodynamic parameters in critically ill patients.

Materials and Methods: 10 patients with hemodynamic instability (7M, 3F, age 52–79 years) admitted to ICU for more than 48 hours, were enrolled and divided into 3 groups. Gr1: cardiac pathology (5); Gr2: septic with a positive haemat, BAL or urinary culture; Gr3: post-surgicals with history of intraoperative haemorrhage (2). All the patients have been subjected to a careful clinical surveillance, a baseline and a Picco PLUS monitoring hemodynamic.

Results and Discussions: Gr1: impressive hypotension with cardiac index (CI)(ml/min/m²) between 1.86 and 2.94, CFI (l/min.under 4.5, GEDVI (ml/m2) > 1000, ITBVI(ml/m2) > 1200, EVLWI between 8 and 18. Echocardiography M-B mode and trans-theracic Doppler evidenced indices of depressed systolic function (EF between 22 and 25%). Such parameters have confirmed a deficit of cardiac pump. In particular on the base of the CI and CFI values we have been able to establish a treatment with inotropic and vasoactive drugs, to titrate their administration, and by the GEDVI and its relationship with EVLWI to manage the fluid budget accurately. Values of EVLWI (ml/kg) > 10 have been considered normal, while values > 15 came deals with diuretic on indication of the other hemodynamic and volumetric parameters; some patients have been treated with dobutamine, others with levosimendan. Gr2: hemodynamic instability with CI between 2.04 and 4.02, CFI between 4 and 7, SVRI < 1000. Such parameters have confirmed the diagnosis of massive peripheral vasodilatation (septic origin), and in relation to the values suggested the necessity to associate vasopressor and inotropic drugs. The aim of the study was to evaluate IAP as a risk factor for hemodynamic, respiratory and renal complications after emergency major abdominal surgery 48 hours postoperative.

Materials and Methods: In this prospective study, to date, are reported 30 patients.

IAF was measured after 24 hr and 48 hr postoperative. Intra-abdominal hypertension were graded as mild (10–14 mmHg) and severe (15–25 mmHg). We considered hemodynamic, respiratory and renal complications as follows: MAP < 60 mmHg, need for mechanical ventilation and urinary output < 1 ml/kg/h. Data are reported as mean values +/- standard deviation. For comparison of IAP and organ functions we used Student’s t-test and Mann-Whitney U-test.

Results and Discussions: Average age of patients was 66.35 +/- 16.33, range 19–84. All patients had increased values of IAP, 18 patients mild and 12 patients severe one. Hemodynamic complications were found in 4 patients, respiratory in 12 patients and renal in 13 patients. Values of IAP were not statistically significant associated with hemodynamic, respiratory and renal complications (p > 0.5).

Conclusion(s): Increased IAP was not found to be a risk factor for hemodynamic, respiratory and renal complications after emergency major abdominal surgery 48 hours postoperative.

12AP7-8
Changes in serum lactate, mix-venous oxygen saturation and indocyanine green plasma disappearance rate in postoperative cardio surgical patients
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Background and Goals: Parameters of global and regional, in particular hepato-splanchnic, blood flow may be used for guiding therapy in critically ill patients. However, regional conditions may not be adequately reflected by global parameters. In this study, we analysed changes in cardiac index (CI), mixed-venous oxygen saturation (SvO₂), serum lactate, gastric mucosal PCO₂ (PmCO₂) and indocyanine green plasma disappearance rate (ICG-PDR) in patients after cardiac surgery.

Methods: With ethics approval and written consent we studied 52 patients (39 male, 13 female, age 65 ± 10 years). All patients underwent pulmonary artery catheterisation for clinical indication. Serum lactate and SvO₂ were determined by a blood gas analyser. ICG-PDR was measured by a transcutaneous system and PmCO₂ by air tonometry. All parameters were determined immediately postoperatively on the ICU and 2 hours later. Linear regression was used for statistical analysis. A p < 0.05 was considered statistically significant.

Results: Cardiac index (2.8 ± 0.8 vs 3.2 ± 0.7 l/min/m²), serum lactate (1.9 ± 1.2 vs 2.4 ± 1.6 mmol/l) and PmCO₂ (5.2 ± 1.0 vs 5.6 ± 1.1 kPa) significantly increased during the study period while SvO₂ (66 ± 7 vs 68 ± 6 %) and ICG-PDR (21.4 ± 6.9 vs 21.8 ± 7.4 %/min) remained unchanged. Furthermore, central venous pressure (8 ± 3 vs 8 ± 4) and haemoglobin content (6.2 ± 0.9 vs 6.0 ± 0.8 mmol/l) did not change significantly. However, body temperature (36.0 ± 0.8 vs 36.6 ± 0.7°C) and dosages for noradrenaline (mean 0.04 vs 0.02 μg/kg/min) and epinephrine (mean 0.02 vs 0.03 μg/kg/min) changed significantly. The changes in SvO₂ and CI correlated moderately (r = 0.43, p < 0.001). However, no correlation was found between changes in CI and ICG-PDR (r = 0.07, p = 0.82) and CI and lactate (r = 0.37, p = 0.91). The correlation between changes in CI and PmCO₂ was r = 0.37 (p = 0.006). There was no relationship between changes in variables of global oxygen transport and regional blood flow: r = 0.06 (p = 0.65) for ΔICG-PDR /ΔSvO₂ and r = 0.009 (p = 0.95) for ΔICG-PDR /Δlactate.

Conclusion: Changes in serum lactate, SvO₂, ICG-PDR and PmCO₂ do not correlate with changes in cardiac index and also changes within regional parameters are not reflected by each other. Thus it is not possible to draw definite conclusions from one to the other parameters.

12AP7-9
Stroke volume variations obtained with Vigileo® monitor predicts fluid responsiveness in critically ill ventilated patients
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Background and Goal of Study: Optimal monitoring of cardiac preload is paramount for precise hemodynamic management. Dynamic indices such as stroke volume variation (SVV) usually predict adequately the individual response to fluid challenge FC. The aim of this study was to assess whether SVV obtained with the new Vigileo® monitor can predict fluid responsiveness.

Materials and Methods: Inclusion criteria were mechanically ventilated patients undergoing liver transplantation and clinical requirement for a rapid fluid challenge (20 ml x body mass index (BMI) of 4% human albumin over 15 min). Exclusion criteria were patients younger than 18 years, arrhythmias, BMI upper than 40 kg/m² or less than 15 kg/m², left ventricular systolic dysfunction, valvular heart disease, intracardiac shunt and spontaneous breathing activity. Patients were monitored with pulmonary arterial catheter (PAC) and with Vigileo® monitor. Measurements of CO, CVP, PAOP with PAC, of ΔPeak with transthoracic echocardiography, of MAP and DeltaP, and of SVV with Vigileo® were made before and after FC. Patients were separated into responders(R) and non-responders (NR) according to the change in CI: >10% or <15% after FC. Statistical analysis was made using Wilcoxon test and Spearman rank test. p < 0.05 was considered significant.

Results and Discussions: Sixteen patients (13 males/3 females; age 50 ± 8 years) were enrolled. 9 were NR and 7 were R. SVV before FC were significantly higher in responder patients (p < 0.05). Change of cardiac output (% of BL) after FC was significantly correlated with SVV before FC (r² = 0.88; p < 0.001). A SVV value up to 9% predicted responsiveness in FC with 100% sensitivity and 89% specificity.

12AP7-10
"Liver dysfunction in critical Care Unit: relationship between PDR (indocyanine green plasma disappearance rate), with LIMON® monitor (Pulsion®), bilirubin and mortality"
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Background and Goal of Study: In Critical Care Units (CCU), liver function (LF) is evaluated with bilirubin which can be easily modified and it wastes time in laboratory. Indocyanine Green (IG) Plasma Disappearance Rate (PDR) measured with LIMON® (PULSION®) by pulse densitometry is a newly non-invasive technique to assess LF at patient's bedside in few minutes (1). This prospective study was aimed to evaluate whether this method could be comparable to bilirubin as a marker of liver dysfunction in CCU.

Materials and Methods: 15 patients (8M, 7F) were included in 4 groups according to their initial diagnosis: 6 Cardiac Surgery (age 42–81); 1 Severe Brain Trauma (age 82); 6 Septic Shock (age 51–79); 2 Liver/Bile/Pancreatic Surgery (age 65–69). We measured PDR (0.5 mg/kg of IG in a central catheter twice a day) and bilirubin levels once a day. Survivor: patient who was discharged from the unit alive. APACHE II was performed in SFAR web. Taking into account the worst results, Pearson coefficient of correlation was used for statistical analysis.

Results and Discussions: Preliminary data are given as Mean ± SD. PDR and bilirubin are correlated (r). Lower values of PDR were found in non-survivors and liver surgery, followed by sepsis, PDR and severity is not enough (r). At least 50% of patients had liver dysfunction (PDR < 18%/min).

<table>
<thead>
<tr>
<th>PDR (%/min)</th>
<th>BL (mg/dl)</th>
<th>APACHE II</th>
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<tbody>
<tr>
<td>Cardiac</td>
<td>17.1 ± 4.8</td>
<td>1.1 ± 0.63</td>
</tr>
<tr>
<td>Liver</td>
<td>6.4 ± 5.8</td>
<td>10.8 ± 13</td>
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<tr>
<td>Sepsis</td>
<td>15.6 ± 5.7</td>
<td>1.1 ± 1.1</td>
</tr>
<tr>
<td>1ST</td>
<td>16.3</td>
<td>0.25</td>
</tr>
<tr>
<td>Survivor</td>
<td>16.3 ± 4.9</td>
<td>1.1 ± 0.57</td>
</tr>
<tr>
<td>No Surv</td>
<td>8.6 ± 6.6</td>
<td>11.8 ± 11.6</td>
</tr>
<tr>
<td>Total</td>
<td>15.3 ± 5.5</td>
<td>2.5 ± 4.9</td>
</tr>
</tbody>
</table>

(PDR vs BL) n = 0.578 (significant for n ≥ 15 with p < 0.05)
(PDR vs APACHE II) n = 0.21 (non-significant with p < 0.05)

Conclusions: In critically ill patients, increased bilirubin levels are well-correlated with a poor percentage of PDR, but not with severity. PDR could be used as a fast marker of global LF in scores. More patients must be studied.

Reference:
1 Sakka SG.

12AP8-1
HDU bed requirement after major spine surgery
S. Sebastian, A. Kozhukunnah, M. Peters
Anaesthetics, Manor Hospital, Walsall, United Kingdom

Background and Goal of Study: Post spinal surgery intensive care requirement in a general hospital is different from that of a spine unit (1,2). Aim of this study was to find out the HDU admission rate after elective major spine surgery and to determine any surgical factors contributing to the need for HDU admission in a UK District General Hospital.

Materials and Methods: Retrospective chart review of elective spine surgery patients booked for HDU bed, during an 18 month period in 2005–06. Results and Discussions: Of the 32 cases, only 13 (41%) went to HDU or ICU and only 7 (22%) of them needed any specific intervention there. HDU admission rate was 13% for ASA grades 1 and 2, but 65% for grade 3 patients. The
type of surgery did not show any specific correlation with HDU requirement. None of the patients who went back to the ward needed HDU care later. Conclusion(s): The preoperative general condition of the patient is more important than the type of surgery determining the need for HDU care after major spine surgery and most of the patients could be managed in an appropriate surgical extended care unit.


**12AP8-2**

New-onset atrial fibrillation in the Intensive Care Unit: a survey of current practice in the United Kingdom


Anaesthesiology, Southend Hospital NHS Trust, Westcliff-on-sea, United Kingdom

**Background and Goal of Study:** New-onset atrial fibrillation (AF) is a common problem in the ICU environment, with no universally accepted guidelines on its management. This study sets out to elucidate current practice in its management in the UK.

**Materials and Methods:** The lead clinicians of 126 ICUs in the UK responded to a questionnaire regarding their management of new-onset AF. It addressed: type of hospital and unit, whether there was a formal treatment protocol in place, satisfaction with the current management plan, the therapeutic target, and the immediate management strategy for the unstable and stable patient. Participants were then asked to rank their treatment preference from a list of drugs that have been described in the literature for the management of AF.

**Results and Discussions:** Of the 126 respondents, 96 described their hospital as District General Hospitals, with the remaining 30 as teaching institutions. Most units (122) were mixed medical-surgical. When asked about which would be regarded as a satisfactory outcome following treatment, reversion to sinus rhythm was chosen by 112, with rate control of 50–100/min (56) as a second best option. With regard to the immediate treatment of acute-onset AF, there was a preference for electrical cardioversion for the unstable patient (92), and chemical cardioversion for the stable (83). Where drugs were thought appropriate, there was a clear preference for either amiodarone (73) or magnesium (51) as the first choices [ranked results shown in the table].

<table>
<thead>
<tr>
<th>Ranked choice of drug</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amiodarone</td>
<td>73</td>
<td>38</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Magnesium</td>
<td>51</td>
<td>28</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>Digoxin</td>
<td>6</td>
<td>37</td>
<td>44</td>
<td>19</td>
</tr>
<tr>
<td>B-Blockers</td>
<td>3</td>
<td>14</td>
<td>19</td>
<td>32</td>
</tr>
<tr>
<td>Calcium channel blocker</td>
<td>3</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Flecainide</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Sotalol</td>
<td>1</td>
<td>6</td>
<td>7</td>
<td>1</td>
</tr>
</tbody>
</table>

**Conclusion(s):** Our survey has confirmed that a uniform approach to the management of new-onset AF is lacking, and that it may be time to arrive at a consensus for the treatment of this common problem.

**12AP8-3**

Applicability of the Acute Physiology and Chronic Health Evaluation II (APACHE II) and simplified Acute Physiology Score II (SAPS II) in predicting hospital mortality for neurosurgical Intensive Care Unit (ICU) patients

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Anaesthesiology, Neurosurgery, Hanyang University Medical Center, Seoul, Republic of Korea

**Background and Goal of Study:** To study the applicability of APACHE II and SAPS II in whole patients and neurosurgical patients who were admitted to the surgical ICU (1).

**Materials and Methods:** Retrospective investigation was conducted to 672 patients who were admitted to the neurosurgical ICU. Data were collected during the first hours of the admission and were calculated to obtain predicted mortality. First, in a whole ICU patients predicted mortality was compared each other and, univariate and multivariate analyses were conducted on patients with SAH and TBI.

**Results and Discussions:** Observed mortality was 24.8% whereas predicted mortalities by the APACHE II and SAPS II were 37.7% and 38.4%. Calibration curve was close to the line of perfect prediction. SAPS II was not statistically significant in Lemoshow-Hosmer test, but slightly favor in AUC. In 2 subsets of patients, univariate and multivariate analyses showed that the strongest independent predictor for mortality was SAPS II.

**Conclusion(s):** In this study, both systems can be used to predict mortality and measure performance in the neurosurgical ICU some extent, but not in the individual basis. The main reason for such discrepancy is the fact that the outcome of NICU patients would not simply follow the initially given physiologic parameters. A certain factor (natural healing or following resuscitation) are deemed responsible for improvement after initial insult(2).


**12AP8-4**

Quality of life 6 months after surgical intensive care

F. Abelha, P. Maia, C. Santos, M. Castro

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**Background and Goal of Study:** Apart from mortality, Health Related Quality of Life (HRQOL) has increasingly been claimed to be an important outcome variable. The aim of this study was to assess HRQOL and activities of daily living (ADL) and identify its determinants after discharge from a surgical intensive care unit (ICU).

**Materials and Methods:** All 375 post-operative adult patients, admitted to a surgical ICU between October 2004 and July 2005, were eligible for the study. From 333 hospital survivors, 226 completed the questionnaires. The following variables were recorded on admission: age, gender, ASA physical status (ASA), type and magnitude of surgical procedure; ICU and hospital length of stay (LOS); mortality and Simplified Acute Physiology Score II (SAPSII). Six months after discharge, a Short Form-36 questionnaire (SF-36) and a questionnaire to assess the dependency on ADL was sent to all survivors. Means, medians, standard deviations, and ranges were calculated for SF-36. Comparisons between patients groups were performed with non-parametric tests. A logistic regression analysis was performed to identify covariates affecting each component of outcome dependency for ADL tasks and for the change in health question SF-36.

**Results and Discussion:** From all the patients who survived (333), 226 completed the questionnaires. Fifty nine percent of patients reported that their general level of health was better six months after discharge from hospital. Patients with greater co-morbidities (ASA III/IV), had lower SF-36 scores in all domains and were more often dependent in instrumental and personal ADL tasks. Logistic regression showed that SAPS II was associated with health changes (OR 1.06, 95%CI 1.01–1.11, p = 0.016). Six months after discharge from ICU, 60% and 34% of patients were dependent in at least one activity in instrumental ADL, and in personal ADL, respectively. ASA (OR de 3.00, 95%CI de 1.31–8.67, p = 0.009) and age (OR de 2.36, 95%CI de 1.04 a 5.34, p = 0.04) were associated with dependency in ADL and for ADLP only ASA (OR de 4.58, 95%CI de 1.68–12.46, p = 0.003) was associated with more dependency.

**Conclusions:** ICU variables and patients’ background were significant determinants of HRQOL. ASA physical status, age, type of surgery and LOS could be seen as determinants of HRQOL.

**12AP8-5**

National Survey of Standards of Inter-hospital Transfers followed by Critical Care Networks in England

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Anaesthesia, Bradford Royal Infirmary, Bradford, United Kingdom

**Background and Goal of study:** The Intensive Care Society (ICS) of England has published guidelines for the transport of critically ill patients outside of the normal critical care environment (1). It recommends that all equipment and transport documentation across a critical care network be standardized. Our objective was to find out if the ICS recommendations were followed by the Critical Care Networks in England.

**Materials and Methods:** A survey of the 29 Critical Care Networks within England was made to establish whether the transfer equipment used by the hospitals within their networks were standardised and conformed to ICS guidelines. We asked whether the networks were using local or Intensive Care Society checklists for transferring critically ill patients. We also checked whether the networks had any guidelines for the provision of emergency drugs for use during the inter-hospital transfer of critically ill patients.

**Results and Discussion:** 16 of 29 networks responded to our questionnaire. Only 6 out of the 16 networks had their transfer equipment standardised as recommended by the ICS. 10 of the 29 networks had recommendations for the checking of the transfer equipment but these varied. All 16 networks had their own pre-transfer checklists which conformed to the pre-transfer checklists recommended by the ICS, and which they claimed were used by all hospitals within their networks for transferring patients between hospitals. However, only 6 of them had audited the use of these checklists. None of the 16 networks had any
guidelines for the provision of emergency drugs for the inter-hospital transfer of patients within the network.

**Conclusion:** More than one third of the Critical Care Networks in England did not meet the ICS recommendation of having their transfer equipment and documents standardised. Many of the Critical Care Networks do not have any guidelines in place for checking the transfer equipment. All Critical Care Networks should adhere to Intensive Care Society recommendations and work towards standardising their transfer equipment and documentation.

**Reference:**

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### 12AP8-6

**Patients aged 65 years and more treated in university Intensive Therapy Unit (ITU) in 2001–2005**

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**Anaesthesiology and Intensive Therapy, Medical University of Gdańsk, Gdańsk, Poland**

**Background and Goal of Study:** Progress in medicine results in increasing expectation of life duration and quality. More and more older patients undergo surgery and ITU treatments. In this study authors analysed reasons for admission to the ITU and hospital mortality in a group of patients aged 65 and more and compared results to the same parameters in a group of patients below 65 years old.

**Materials and Methods:** There were 1770 admissions to the mixed university, adult ICU from 01.01.2001 to 31.12.2005. 92 patients were readmitted, four of them more than twice. Population of 1674 patients was divided into two groups; I-patients > 65 years old (n = 726), II-patients < 65 years old (n = 948). Statistical analysis was performed using ch-square test for categorical data and U Mann-Whitney test for continuous data (none of the data had normal distribution as checked with W Shapiro and Wilk test).

**Results:** Data are presented in the table as median (range) – age, Apache II, length of ITU stay and as percents – the rest of the parameters.

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Apache II</th>
<th>Male pedestrians</th>
<th>Death in ITU</th>
<th>Death after ITU discharge</th>
<th>stay in ITU in days days</th>
</tr>
</thead>
<tbody>
<tr>
<td>I 75 (65–92)</td>
<td>16 (2–102)</td>
<td>68</td>
<td>25.1</td>
<td>20.3</td>
<td>1.9 (0.014–149)</td>
</tr>
<tr>
<td>II 51 (14–65)</td>
<td>15 (0–103)</td>
<td>67.4</td>
<td>26.1</td>
<td>12.1</td>
<td>3.2 (0.01–231)</td>
</tr>
</tbody>
</table>

**Conclusion:** There was no difference in ITU mortality between analyzed groups of patients. Older patients were treated in ITU for a shorter period of time. Mortality after ITU discharge was higher in group I. Readmission was more frequent in group I.

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### 12AP8-7

**Quality of life after surviving sepsis**

E. Agustin, M. Rodriguez, S. Pico, E. Lopez-Zayas, J. Rico-Feijoo

**Anaesthesiology and Postoperative Critical Care, Rio Horta University Hospital, Valladolid, Spain**

**Background and Goal of Study:** The aim of our study is to assess the quality of life of patients that survived from severe sepsis and septic shock in our Post-surgical Critical Care Unit by analyzing several medical factors (1,2).

**Materials and Methods:** We studied 78 surviving patients from our Surgical Critical Care Unit between January 1999 and July 2006 by means of the Short Form 36 questionnaire (SF-36) (3). Data from 5 of the 8 subscales (physical functioning, emotional role, physical role, general health perception, social functioning and transition to the state of health) were surveyed by phone. Age, APACHE II score, medical-surgical records, length of stay in our unit and presence of cancer pathology were registered. Statistical analysis was carried out with the SPSS v.10.0 package using p < 0.05.

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### 12AP8-8

**Postoperative outcomes in patients with Pseudomyxoma Peritonei undergoing cytoreductive surgery and hyperthermic intraoperative chemotherapy – a UK perspective**

P. Kochhar, S. Sagade, S. Beards, D. Tansey, S.L. Maguire

**Anaesthesia, South Manchester University Hospital, Manchester, United Kingdom**

**Background and Goal of Study:** Definitive treatment for Pseudomyxoma Peritonei (PMP) involves extensive cytoreductive surgery with heated intraoperative intraperitoneal chemotherapy (HIPEC) and only occurs in two centres in the UK. Anaesthetic issues include long operative times, extensive fluid shifts, blood loss, temperature swings and disturbances in coagulation and biochemical parameters. We wanted to establish the pattern of post-operative complications.

**Materials and Methods:** We prospectively analysed 28 patients who had undergone elective cytoreductive surgery and HIPEC at our institution detailing critical care use and adverse outcomes.

**Results and Discussion:** Patients were predominantly female (71.4%) with a mean age of 54 years (range 16–71). Mean surgical time was 445 mins. Mean fluid used was 7687 mls crystalloid and 1358 mls of colloid. The average stay in a critical care facility was 5.9 days (2–10d) with a mean stay of 3.0 days in ITU (2–7d) and 3.7 days in HDU (1–8d). 19 patients were extubated in theatre but 9 taken to ITU and ventilated for a mean of 5.43 hrs (1–18h). Reasons for ventilation: facial/laryngeal oedema (4); unstable cardiovascular status (3); massive blood transfusion (1); metabolic derangements (1). Organ failure: no organ failure (25); liver failure (1); respiratory failure (1); LFT (1). Other complications: dysrhythmias (3); epithelial damage due to cooling packs (1); pneumothorax (1); confusion (1). Intra-operative serum lactate was high (>2 mmol/L) in 9 patients and very high (>3 mmol/L) in 6. These correlated with patients having upper abdominal disease and stripping of peritoneum around the liver. Patients with a lactate greater than 3 had a higher rate of complications in the immediate post-operative period. 7 patients developed an abnormality in LFTs (raised AST, LDH and gGT).

**Conclusion:** The majority have an uneventful recovery. The surgical process of stripping quantities of peritoneum, organ resection and liver trauma, allied to the process of HIPEC may leave some patients at a higher risk of liver damage, and this may be detected by lactate rises peri-operatively.

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### 12AP8-9

**The impact of risk factors for the development of pneumonia in burned patients**

M.I. Rochera Villach, A. Lacasta Fornells, I. Coll Rosell, O. Martinez Silva, J. Roige Sole

**Anaesthesiology, Hospital Universitari Vall d’Hebron, Barcelona, Spain**

**Results and Discussions:** The mean age was 67.91 ± 14.59 years. The mean stay in our Unit was 9.59 ± 8.36 days and the mean score of APACHE II was 17.94 ± 6.60. The mean number of comorbidities was 2.13 ± 1.35. 39.5% presented some kind of malignance. Statistical significance was found between APACHE II scores and general health and social functioning scores (Fig. 1) and between social functioning scores and the number of comorbidities.
Background and Goal of Study: Clinical experience has shown that concomitant diseases and risk factors have a significant influence on the burned patient's complications. Pneumonia is one of the most frequent complications of the critically ill patients (1). The aim of this study was to identify the risk factors and their significance for the development of pneumonia in burned patients.

Materials and Methods: Retrospective, observational study in burned patients. Patients were eligible for inclusion if they have had an acute burn injury and had been admitted to a Burn Unit of a 3rd Level University Hospital between Jan. 1997 and Sep. 2006. Patients with symptoms of respiratory tract infection at the moment of admittance were excluded. The following variables were recorded: sex, age, smoking habit, COPD antecedents, TBSA burn, presence of inhalation injury, surgery, enteral nutrition (EN), the number of transfusions. A logistic regression model was used to identify the risk factors and their significance for the diagnostic of pneumonia.

Results and Discussion: Among the 4,268 patients, 3,894 were included in the study. Results are shown in the table:

<table>
<thead>
<tr>
<th></th>
<th>p</th>
<th>Odds ratio</th>
<th>95% confidence int.</th>
</tr>
</thead>
<tbody>
<tr>
<td>COPD</td>
<td>0.046</td>
<td>2.273</td>
<td>1.014, 5.099</td>
</tr>
<tr>
<td>Enteral Nutr.</td>
<td>&lt;0.0001</td>
<td>3.595</td>
<td>2.171, 5.953</td>
</tr>
<tr>
<td>Surgery</td>
<td>0.001</td>
<td>2.842</td>
<td>1.052, 5.039</td>
</tr>
<tr>
<td>Smoking</td>
<td>0.379</td>
<td>0.806</td>
<td>0.499, 1.303</td>
</tr>
<tr>
<td>Inhalation injury</td>
<td>&lt;0.0001</td>
<td>5.181</td>
<td>3.207, 8.369</td>
</tr>
<tr>
<td>Age</td>
<td>0.001</td>
<td>1.021</td>
<td>1.008, 1.033</td>
</tr>
<tr>
<td>TBSA</td>
<td>&lt;10%</td>
<td>0.001, 2.712</td>
<td>1.493, 4.924</td>
</tr>
<tr>
<td>11–20%</td>
<td>0.014</td>
<td>2.625</td>
<td>1.217, 5.664</td>
</tr>
<tr>
<td>21–30%</td>
<td>&lt;0.0001</td>
<td>5.796</td>
<td>2.562, 13.113</td>
</tr>
<tr>
<td>31–40%</td>
<td>0.005</td>
<td>4.577</td>
<td>1.602, 13.072</td>
</tr>
<tr>
<td>41–50%</td>
<td>&lt;0.0001</td>
<td>13.293</td>
<td>4.488, 39.368</td>
</tr>
<tr>
<td>51–60%</td>
<td>&lt;0.0001</td>
<td>15.652</td>
<td>3.681, 66.557</td>
</tr>
<tr>
<td>61–70%</td>
<td>&lt;0.0001</td>
<td>36.690</td>
<td>11.087, 121.417</td>
</tr>
<tr>
<td>71–80%</td>
<td>&lt;0.0001</td>
<td>12.639</td>
<td>3.431, 46.557</td>
</tr>
<tr>
<td>&gt;80%</td>
<td>0.058</td>
<td>5.369</td>
<td>0.941, 30.624</td>
</tr>
<tr>
<td>Sex (woman)</td>
<td>0.293</td>
<td>0.774</td>
<td>0.480, 1.248</td>
</tr>
<tr>
<td>Total nr. transfusions</td>
<td>0.018</td>
<td>1.027</td>
<td>1.005, 1.051</td>
</tr>
</tbody>
</table>

TBSA as an indicator of burn severity is a significant risk factor increasing with the % of burned area, except for the gravest patient, probably because they die soon.

Conclusion(s): Among all risk factors, EN is the only one that can be controlled during the evolution. Special care should be put on EN administration in order to minimize hazards. Other factors, although relevant, are not modifiable.


12AP9-1

Is ketamine the right sedative for intensive care unit patients?

E. Elamin, D. Drew

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Background and Objectives: Little is known about the potential hemodynamic benefits of continuous ketamine sedation and analgesia in adult ICU patients.

Methods: In a pilot multi-center, prospective, double-blind, randomized controlled trial, we screened 66 adult ICU patients who required sedation and analgesia. Patients meeting entry criteria were randomized and received continuous infusion of ketamine or fentanyl for analgesia. Patients meeting entry criteria were randomized and received continuous ketamine or fentanyl for continuous ICU sedation and analgesia. The results of our study were published in the literature (1).

Measurements and Main Results: In addition to demographic data, we recorded mean blood pressure, (MBP), heart rate, requirements of any intravenous (IV) vasopressor or any additional sedatives. Sixty % of patients (3/5) received ketamine for 24 hours followed by midazolam while 40% (2/5) received fentanyl infusion. MAP was statistically significant higher in the study group compared to the control group (p < .05), figure 1. In addition, patients who received ketamine did not require any additional vasopressors & were less likely to be diagnosed with shock state, comparing to the fentanyl group (p < .05).

Conclusions: This preliminary report illustrated the possible value of ketamine for continuous ICU sedation and analgesia. The results of our ongoing study will provide more information about the impact of ketamine in early weaning from mechanical ventilation and hence decrease in ICU length of stay.

*Supported by a grant from the American Lung Association.

12AP9-2

Treatment of peptic ulcer bleeding in ICU settings: an algorithmic approach

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Chair of Anaesthesiology and Intensive Care, Northern State Medical University, Arkhangelsk, Russian Federation

Background and Goal of Study: This study assessed outcomes of acute peptic ulcer bleeding (PUB) in patients treated in the intensive care unit (ICU) of a city emergency hospital before and after implementation of an internal diagnostic and treatment algorithm based on the current published literature (1).

Materials and Methods: We studied 104 patients, who presented with bleeding gastric and duodenal ulcers between October 2003 and October 2005 (56 retrospective pts [control group, age 49 ± 16 yrs]; 48 prospective pts [study group, age 51 ± 15 yrs], admitted after the algorithm implementation in October 2004). The algorithm rested on Rockall risk scoring and use of parenteral proton pump inhibitors (omeprazole) as anti-secretion agents. Pts with Clinical Rockall Scores >3 were assigned for ICU admission and urgent endoscopy. Total Rockall Scores (TRS) were calculated, and lower risk (TRS < 4) or high-risk (TRS ≥ 5) pts were recognised and treated differentially. The control group was stratified in the same manner retrospectively; parenteral PPI were not applied. Both groups were similar on age, gender, co-morbidities, shock presence on admission and mean TRS’s.

Results and Discussions: Mortality and rebleeding (RB) were lower in the study group. RB difference reached statistical significance owing to improvement in high-risk pts’ outcomes. Data [cases and controls (totals); Odds Ratios (95% CI); p (2)] are shown in the table:

<table>
<thead>
<tr>
<th>Cases</th>
<th>Controls</th>
<th>OR</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>2 (48)</td>
<td>7 (56)</td>
<td>0.35 (0.08-1.57)</td>
</tr>
<tr>
<td>RB, Total</td>
<td>15 (48)</td>
<td>31 (56)</td>
<td>0.37 (0.17-0.83)</td>
</tr>
<tr>
<td>RB, TRS ≥ 5</td>
<td>9 (27)</td>
<td>21 (29)</td>
<td>0.20 (0.07-0.62)</td>
</tr>
</tbody>
</table>

Mean ICU stay was significantly lower in the study group (69.9 ± 11.8 vs. 86.0 ± 13.9 hours, p < 0.05) due to rare rebleeding and readmissions. Mean hospital stay (17 ± 2.5 vs. 18 ± 2.8 days, p > 0.05) and surgery rate (16 vs. 14%; OR = 1.49 (0.64-3.49); p > 0.05) were similar in both groups.

Conclusions: In ICU management of acute PUB: (1) a structured algorithmic approach improves outcomes; (2) Rockall scoring system and parenteral PPI use is preferable for rebleeding prevention in high-risk patients.


12AP9-3

What can predict atrial fibrillation after coronary artery bypass grafting (our experience)?

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Heart Center Sarajevo, KCUS, Sarajevo, Bosnia and Herzegovina

Background and Goal of Study: Postoperative atrial fibrillation (AF) occurs in up to 50% of coronary artery revascularization and presents the most common postoperative arrhythmic complication. Its etiology in open-heart surgery is incompletely understood, so prevention remains suboptimal. The goal of our study was to find correlation of AF with pre- and intraoperative factors.

Materials and Methods: Two comparable groups who underwent coronary artery bypass grafting (CABG) in period January 1st to November 15th 2006
were studied. Group I consisted of 37 patients who developed AF postoperatively and group II 37 patients who did not develop AF postoperatively. We analyzed preoperative and intraoperative factors in both groups relevant for AF appearance as follows below. Parson chi-squared test was used.

**Results and Discussions:** Results of correlation of preoperative factors and AF development shown in Table 1.

<table>
<thead>
<tr>
<th>Preoperative factors</th>
<th>Group I</th>
<th>Group II</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low ejection fraction (EF &lt; 40%)</td>
<td>12</td>
<td>5</td>
<td>0.05</td>
</tr>
<tr>
<td>BMI &gt; 30</td>
<td>13</td>
<td>5</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Results of correlation of intraoperative factors and AF development shown in Table 2.

<table>
<thead>
<tr>
<th>Intraoperative factors</th>
<th>Group I</th>
<th>Group II</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long extracorporeal circulation (&gt; 100 min)</td>
<td>12</td>
<td>5</td>
<td>0.05</td>
</tr>
<tr>
<td>Increased inotropic support</td>
<td>13</td>
<td>5</td>
<td>0.03</td>
</tr>
</tbody>
</table>

**Conclusion(s):** Results suggest that the incidence of AF in patients undergoing CABG can be predicted by some pre- and intraoperation factors – in our case low EF, BMI over 30, long extracorporeal circulation time (>100 min) and increased inotropic support caused postoperative AF appearance, so in future we can plan prophylactic measures for these factors.

**References:**

**12AP9-4**

**High thoracic epidural anesthesia versus general anesthesia in surgery for ischemic dilatative cardiomyopathy**

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**Background and Goal of Study:** The purpose of this study was to compare the results high epidural thoracic anesthesia (HTEA) versus general anesthesia (GA) in treatment of patients with ischemic dilatative cardiomyopathy (IDC).

**Materials and Methods:** From May 2006 to November 2006, 40 patients were subjected to open-heart surgery for IDC. Unstable angina was present in 20 (50%). Thirty-three (82%) were classified as New York Heart Association class III or IV. Previous myocardial was diagnosed in 24 (60%). Preoperative ejection fraction was 27 ± 3. Group 1 consisted of 20 patients subjected to HTEA, and group 2 the other 20 subjected to GA. Median sternotomy was performed in all. Aorto coronary bypass (ACB) was done in all patients, with 1 off pump case and 5 (12%) with assisted circulation, ventriculoplasty and valve reconstructive surgery in 8 (20%), valve replacement in 4 (10%) of the patients, valve reconstruction in 2 (5%). Three patients required intra aortic balloon pump support.

**Results and Discussions:** All patients remained stable throughout the procedure, with 3 (7%) patients from group 1 extubated in the operating theater versus 0 for group II, 4 (10%) extubated within 5 hours following the procedure in group I versus 1 (2%) for group II, 7 (17%) within 10 hours in group I versus 6 (15%) in group II. Average Sufentanil usage was 25 μg per patient in group I versus 250 μg in group II. Average first mobilization time was 33 ± 16 hours for group I versus 75 ± 57 for group II. Average intensive care unit stay (ICU) was 36 ± 17 hours for group I and hospital stay of 6.1 ± 1.4 days versus 71 ± 50 and 6.6 ± 1.7 for group II. Average postoperative visual analog scale for pain was 2.7 ± 0.3 for group I versus 3.2 ± 0.5 in group II.

**Conclusion(s):** HTEA in patients with IDC has been shown to be safe during surgery and postoperative period, allowing fast extubation with minimal pain, with early mobilization and shorter ICU and hospital stay compared to GA.

**Reference:**

**12AP9-5**

**Time-course of recovery from botulinum toxin-induced neuromuscular disorder**

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**Background and Goals:** Infection with *C. botulinum* causes paralysis of the affected muscles, leading to respiratory failure. Recovery typically takes place over weeks to months. Therefore, we studied the effects of botulinum toxin (BTX) on time-course and extent of neuromuscular block, and muscle fatigability.

**Methods and Methods:** Rats (n = 36) were injected with 2.5U BTX into the tibialis muscle. The contralateral side received no injection and served to study distant effects. Control animals (n = 34) received an equivalent volume of saline. At 0, 4, 16 and 128 days after injection, neuromuscular transmission was tested by mechanomyography.

**Results:** On day 0 after injection, tibialis muscle tensions and muscle mass did not differ between groups and sides. On day 4, there was complete paralysis of the BTX-injected side, while its contralateral side showed a decrease in muscle contraction. On day 16 and 128, evoked and tetanic tensions, including muscle mass were decreased on the toxin-injected side relative to the contralateral, and side to saline injected controls. At day 16, tetanic fade was increased on the toxin-injected side. Normalized to muscle mass, specific evoked and tetanic tensions (tensions/muscle mass) were reduced on the contralateral side at day 4 and the toxin-injected side at day 16. At 128 days, there were no differences in specific tensions between groups.

**Conclusion:** Infection with BTX follows a time-course from complete paralysis to severely depressed muscle dysfunction. Muscle contraction partially recovers by 128 days. At this time, loss of tension is almost exclusively related to muscle atrophy, as the specific tension did not change. The presence of fade at day 16 and its absence at 128 days suggest that pre-junctional related muscle dysfunction disappears by 128 days.

**12AP9-6**

**Anesthesia for combined liver/kidney transplantation in primary hyperoxalurie**

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**Background and Goal of Study:** Primary hyperoxalurie type-1 (PH-1) is an autosomal recessive inborn error of glyoxylate hepatic metabolism in which excessive production of oxalate results in nephrocalcinosis followed by end-stage renal failure. Combined liver-kidney transplantation (LKTx) corrects the metabolic defect and prolongs kidney graft survival. PH-1 transplanted patients require particular care to avoid oxalate precipitation and acute renal dysfunction during the immediate postoperative period. There is no literature on anesthagia management during LKTx for PH-1 patients. The goals of our study were to compare anaesthesia and postoperative data in two Tx centers and to propose specific rules to conduct anesthesia during LKTx for PH-1 patients.

**Materials and Methods:** We retrospectively included all PH-1 patients with combined liver/kidney transplantation in two large French transplantation centers of (C1 and C2). Anesthesia management (anesthetic and antibio prophylactic drugs, hemodynamic monitoring etc.) was recorded. Postoperative data were hospital length of stay and plasma creatinine levels at three months.

**Results and Discussions:** Between 1991 and 2006, 17 adult patients were LK-transplanted (6 in C1 and 11 in C2). There was no difference in age population (41 ± 11 vs 40 ± 15 years, p = 0.9) between the two centers. Differences in management were mainly found in hemodynamic monitoring (0/6 vs 11/11 right catheter), prophylactic antibiotics (6/6 vs 11/11 associations of two nephrotoxic antiobiotics) and the use of aprotinin (0/6 vs 11/11). Patients from C1 had a longer non-ICU (33 ± 23 vs 19 ± 18 days, p = 0.049) and total hospital length of stay (57 ± 30 vs 32 ± 12 days, p = 0.032). At 3 months, plasma creatinine was significantly lower (170 ± 48 vs 117 ± 39 μmol/l, p = 0.048) for the patients transplanted in C2. Aprotinin does not appear to alter renal function.

**Conclusions:** The role of anesthesia management on the observed differences remains unclear. However, our results suggest that hemodynamic monitoring and avoidance of nephrotoxic drugs during LKTx are important for PH-1 patients.

**12AP9-7**

**Is ventilator therapy mandatory for anaesthesia management in staged abdominal repair: intubation-extubation and re-intubation**

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**Background and Goals:** Ventilator therapy is usually considered a “must” for ICU patients with a high APACHE score who require Staged Abdominal Repair
(S.T.A.R.) (1). Yet such patients can be managed with limited duration of ventilator therapy namely by sequences of intubation-extubation and re-intubation which might be helpful for weaning.

**Materials and Methods:** Ten consecutive patients who underwent S.T.A.R for moderate to severe secondary peritonitis and mesenteric vascular occlusion were evaluated retrospectively for anaesthesia management.

**Results:** The mean age of the patients was 54.2 years (range 23–78 years), and 7 of them were male. All APACHE scores were over 10. Eight of the patients had postoperative peritonitis and 2 had mesenteric vascular occlusion. All patients underwent STAR every 24 hours and abdomen was covered temporarily with “Bogota Bag” until definitive closure was done. Mean number of operation was 5 (range 2–11). Nitrous oxide was not used in any of the patients. Endotracheal intubation was performed only for index operation and definitive abdominal closure. Other than these operations, intravenous general anaesthesia or general anaesthesia with mask was preferred for STAR which usually lasted for approximately 20 minutes. When respiratory parameters were acceptable after index operation, the patients were extubated until definitive abdominal closure. Five patients who could not be extubated underwent ventilator therapy during their ICU stay and two of them had tracheotomy. Mean ICU stay was 12.2 (3–23) days. Overall mortality rate was 50%. The reason for death was respiratory failure in three patients whereas urinary sepsis and AMI were encountered in the other two. Remaining patients recovered uneventfully.

**Conclusions:** Patients with an APACHE score > 10 undergoing STAR can be managed without ventilator therapy but with sequences of intubation-extubation and re-intubation when respiratory parameters are acceptable. Patients who required ventilator support had a higher APACHE score and mortality rate.


**12AP9-8**

Severe acute pancreatitis – is there a place for HBO treatment?

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**Results and Discussions:** The demographics and severity of SAP were similar in two groups. The SOFA score improved faster in HBO group. MDA decreased on average for 41.69% in HBO group, for 66.46% in C gr. Reduction of CL was more intensive in HBO group on av for 15.78% v 12.23% in C gr. Level of vit E was normal in 7 p, but in 1 p increased for 32.64% after HBO c. An early low plasma Se concentration, established in 8 p (100%), wasn’t affected by HBO c. IL-6 was increased in all patients with SAP. HBOT induced no significant elevation of IL-6 during first 3 s for 13.9% with consequent diminishing after 6th s. sTNFR2 and SAA were elevated in all 8 p (100%), though TNF-a only in 2 p (50%) in each gr.

**Conclusion(s):**

1. Addition of HBOT to the therapy of SAP diminished the severity and formation of lipid peroxides and hydroperoxides, possibly due to improvement of tissue oxygenation and metabolism
2. HBOT did not affect deficiency of selenium
3. We noted putative immuno-modulating effect of HBOT because of IL-6 temporary elevation and decrease
4. It seems that HBOT induced some favorable effects as an adjunct method of PIC in patients with SAP

The level of urgency of booked cases for emergency operation in our hospital is determined by a categorical scale chosen by the surgeon booking the case. 70% of patients booked as category 1 (cases to be done within 1 h) were done on time, 66% of 2a (within 4 h) were done on time, 70% of 2b (within 12 h) and 50% of category 3 (24 h) were done within the stipulated time. **Conclusion(s):** There is a 25% increase in number of cases done per day as well as an overall improvement of theatre efficiency. This can be attributed to increased awareness (brought about by the 2005 audit) of cancellation of booked cases and under-utilization of CEPD theatre and the introduction of a dedicated CEPD consultant anaesthetist.

**References**


13AP1-5

Comparison of different strategies for ventilation in a simulation of an entrapped car accident victim

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**Background and Goal of Study:** Airway management, considered of highest priority in trauma victims, may be impaired when patients are entrapped in vehicles. Different supraglottic airway devices are compared with facemask ventilation and tracheal intubation for ventilation of a manikin placed in a car.

**Materials and Methods:** A manikin (Ambu Megacode Trainer) with an extrication collar was fixed in the driver seat of a Volkswagen Golf IV. Ventilation was attempted by 21 paramedics and 17 emergency physicians through the window of the driver’s door and from the backseat with facemask, tracheal intubation, LMA-Fastrach (LMA), Combitube (CT), Easytube (EZT), and Laryngeal Tube Suction (LTS II). Number of attempts (maximum 3) until successful insertion (tidal volume > 400 ml achieved by the participant), time (picking up the device until first tidal volume), and signs of gastric inflation were recorded.

**Results and Discussions:** 8 (21.1%) participants succeeded with facemask ventilation from the side (1st/2nd/3rd attempt: 3/4/1), 21 participants (55.3%) from the backseat (5/5/11). Gastric inflation from side/backseat was recorded in 97.4/100%. From the side, 29 participants achieved tracheal intubation (78.3%; 14/9/6) with a duration of 46.6 (20–74) sec for the successful attempt. From the backseat, 35 participants succeeded with intubation (82.1%; 24/6/5), duration 40.8 (23–93) sec. Gastric inflation by failed intubation attempts from side/backseat occurred in 55.3/39.5%. From the side position, the following results were found for the supraglottic airway devices: LMA 1st/2nd/3rd attempt 97.4/2.6/0.1%, 19.4 (11–45) sec, no gastric inflation; CT 92.1/3.5/2.6%, 35.7 (17–100) sec, no gastric inflation; EZT 92.1/3.5/2.6%, 30.9 (18–61) sec, gastric inflation 2.6%; LTS II 94.7/5.3/0%, 18.9 (11–34) sec, gastric inflation 2.6%. From the backseat, results were as follows: LMA 97.4/4.2/6.0%, 20.1 (9–39) sec, no gastric inflation; CT 100/0/0%, 29.6 (15–57) sec, no gastric inflation; EZT 100/0/0%, 28.2 (13–52) sec, no gastric inflation; LTS II 94.7/5.3/0%, 20.1 (12–38) sec, no gastric inflation.

**Conclusion(s):** Supraglottic airway devices offer ventilation more rapidly and with higher reliability than facemask ventilation and tracheal intubation in this simulation of a patient entrapped in a car. With LMA and LTS II, ventilation is faster than with CT and EZT.

13AP1-6

M-GAP, a new score to establish the vital prognosis of multiple trauma patients

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**Background and goals:** In order to improve the survival of multiple trauma patients, they have to be sent to level 1 trauma centers where rapid intervention and prompt definitive care can be purveyed (1). It is therefore of particular importance for them to be evaluated quickly and accurately. The purpose of this study was to develop a triage tool predictive of mortality for multiple trauma patients that would be easy to use and that would encompass objective clinical and contextual elements available in the prehospital setting.

**Material and methods:** 1360 multiple trauma patients were included from January 2003 to march 2004 by 22 french centres. We performed a multivariate analysis taking into account only elements available in the prehospital setting to identify factors predictive of mortality. The score was built with the coefficients obtained. We used ROC curves to compare the new score (M-GAP) with the Revised Trauma Score (RTS) (2).

**Results:**

<table>
<thead>
<tr>
<th>M-GAP</th>
<th>OR 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penetrating Mechanism</td>
<td>3.7 (2.1–6.6)</td>
</tr>
<tr>
<td>GCS</td>
<td>19 (12–27.2)</td>
</tr>
<tr>
<td>Age</td>
<td>1.9 (1.4–2.7)</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>2.8 (2.0–4.0)</td>
</tr>
</tbody>
</table>

The surface under the ROC curve of the RTS and the new score (M-GAP) were 0.78 ± 0.025 and of 0.89 ± 0.014 (p < 0.05).

**Conclusions:** The new score M-GAP is calculated from 4 objective factors all available in the prehospital setting. It is much more easier to use than the other existing triage scores and is as predictive in terms of mortality as the Revised Trauma Score (RTS).

**References:**


13AP2-1

Cardiopulmonary resuscitation: Early Results and Success Predictors, A Single Center Registry

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Cardiopulmonary Resuscitation: Early Results and Success Predictors, A Single Center Registry

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**Background and Goal of Study:** Cardiopulmonary resuscitation (CPR) is one of the most important and unfortunately disappointing components of the standard hospital cares. This study was designed to evaluate the early results and success predictors of the CPR.

**Materials and methods:** 86 patients (n = 86) underwent standardized theoretical CPR-instructions, including demonstration of the cardiopulmonary-check technique. Thereafter, the soldiers had to perform cardiopulmonary-check on a supine normotensive, normo-frequent person under 5 conditions (A–E); Before (A) and after (B) practical (“hands-on”) CPR-training, before (C) and after (D) defined physical exercise and (E) under combined physical/psychological stress. Data are mean ± sem, p < 0.05.

**Results and Discussions:** The time required for cardiopulmonary-check significantly decreased from solely theoretical training (A, 9.7 ± 1.0 seconds) to practical training (B, 7.7 ± 0.7 seconds). In contrast, the cardiopulmonary-check-time significantly increased from rest-condition (C) to physical exercise condition (D, 9.3 ± 1.2 seconds). Surprisingly, the shortest time required for cardiopulmonary-check was achieved under combined physical/psychological stress (E, 5.0 ± 0.4 seconds).

**Conclusions:** Standardized resuscitation training significantly improved practical resuscitation skills, e.g., the cardiopulmonary-check to accepted performance levels (1,2). Although we demonstrate significant improvement from solely theoretical to practical training, this benefit is merely lost under physical stress. Interestingly, the best performance was achieved under the condition of combined physical/psychological stress.

**References:**


13AP2-2

Cardiopulmonary Resuscitation: Early Results and Success Predictors, A Single Center Registry

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**Background and Goal of Study:** Cardiopulmonary resuscitation (CPR) is one of the most important and unfortunately disappointing components of the standard hospital cares. This study was designed to evaluate the early results and success predictors of the CPR.

**Materials and methods:** This study was performed on our center database which contains demographical and clinical data for each resuscitated patient. CPR in the operating rooms was excluded. Successful CPR was defined as survival without any residual sequel or complication. Regarding CPR results patients were in one of these groups: successful or unsuccessful. Also regarding first observed rhythm (FBR) patients were divided into 2 groups: Ventricular Fibrillation, Ventricular Tachycardia (VF/VT); Asystole, Bradycardia (Asys).
Results and Discussions: Between January 2005 and March 2006, 577 patients (320 men, 257 women, Mean age: 65.24 ± 13.7) were resuscitated. The most important causes of the CPR were arrhythmia (38.4%), respiratory failure (30.8%), and homodynamic instability (20.0%). Survival after resuscitation, at 24 hours and at discharge was 51.0%, 40.0% and 28.3%, respectively. Regarding FA survival rates were 74.1%, 66.7% and 40% [VF-VT] vs. 43%, 25.8% and 14.3% [Asyst] (P < 0.05). Age, sex, concurrent diseases, and serum pH were similar between groups. Predictors of successful CPR are shown in table.

### Predictors

<table>
<thead>
<tr>
<th>Predictor</th>
<th>OR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admission due to unstable angina</td>
<td>2.14 (1.34-3.41)</td>
<td>0.001</td>
</tr>
<tr>
<td>VF/VF vs. Asystole</td>
<td>3.79 (2.42-5.93)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Atropine dose &lt; 2 mg</td>
<td>1.85 (1.23-2.78)</td>
<td>0.003</td>
</tr>
<tr>
<td>No need for epinephrine</td>
<td>9.81 (5.96-16.18)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Epinephrine dose &lt; 3 mg</td>
<td>1.83 (1.21-2.78)</td>
<td>0.004</td>
</tr>
<tr>
<td>Time to first shock &lt; 60 sec</td>
<td>1.91 (1.18-3.10)</td>
<td>0.009</td>
</tr>
<tr>
<td>Cardiac massage time &lt; 15 min</td>
<td>16.27 (8.34-31.73)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>CPR time &lt; 30 min</td>
<td>4.21 (2.91-6.10)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Serum potassium &lt; 6 mEq/L</td>
<td>2.49 (1.27-4.87)</td>
<td>0.007</td>
</tr>
<tr>
<td>GCS level &gt; 8 (6 h after CPR)</td>
<td>22.17 (5.15-95.39)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

OR: Odds Ratio; CI: Confidence Interval

Conclusion: Our results are comparable with the former studies. Further studies are required to determine other predictors of the successful CPR.

### 13AP2-3

**Bispectral index (BIS) helps predict neurological outcome in hypothermia-treated cardiac arrest patients**

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**Goal of the study:** Comparison of BIS values with the neurological outcome in all patients admitted to our intensive care unit (ICU) after successful resuscitation from cardiac arrest and treated with therapeutic hypothermia.

**Material and methods:** After return of spontaneous circulations, 24 patients (age 53.6 ± 18 years) were all treated with therapeutic hypothermia (33°C) for 24 hours. In all patients hypothermia was induced by cold iv fluid infusion and for maintenance we either used iv cooling devices (Alsius®) or by additional IV infusion of saline or glucose solutions. Analgesia was performed by morphine, fentanyl and 1.5 µg/kg/h and paralysis (cisatracurium 0.1 mg/kg/h). At the end of the ICU-stay, neurological assessment was done using Cerebral Performance Category Score (CPC).

**Results:** Target temperature of 33°C was achieved in all patients within 195 ± 94 min, after cardiac arrest. At the end of the ICU-stay, 14 (58%) patients survived and 10 (42%) died (CPC5). All survivors had excellent (CPC1) or good (CPC2) neurological outcome, except for 2 (8%) having severe neurological impairment (CPC3) and for 1 (4%) who remained in a vegetative state (CPC5). Distribution of BIS-values, with a good signal quality, over 80 and of baseline after epinephrine/vasopressin (p < 0.001 and p < 0.01 versus epinephrine), respectively. Cerebral perfusion pressure was 23 ± 7 and 19 ± 9 mm Hg after epinephrine, and 40 ± 10 and 33 ± 7 mm Hg after epinephrine/vasopressin (p < 0.001 and p < 0.01 versus epinephrine), and cerebral laser doppler flow was 30 ± 10 and 27 ± 11 % of baseline after epinephrine, and 65 ± 40 and 50 ± 31 % of baseline after epinephrine/vasopressin (p < 0.05 versus epinephrine), respectively. Return of spontaneous circulation (ROSC) did not differ significantly between the epinephrine group (0/8) and the epinephrine/vasopressin group (3/8).

**Conclusion:** Epinephrine/vasopressin resulted in higher coronary and cerebral perfusion pressure, and cerebral laser doppler flow, while ROSC was comparable.

### References:

### 13AP2-5

**Effect of ventilation on resuscitation from cardiac arrest: impact of different compression-ventilation ratios during BLS-CPR**

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**Background and Goal of Study:** The 2005 revised guidelines for cardiopulmonary resuscitation (CPR) recommend a compression-to-ventilation (C/V) ratio of 30:2 (1, 2). The effects of this CPR mode in a realistic CPR scenario have not yet been fully elucidated.

**Materials and Methods:** Following approval of the Animal Investigation Committee, ventricular fibrillation (VF) was induced in 24 anaesthetised pigs. After 4 min of untreated VF, animals were randomly assigned to 6 min of basic-life support (BLS) CPR, and either (1) compressions only ("C/C" group, n = 8), or (2) 30 compressions followed by two rescue breaths with a self-inflating bag (P02 0.21, C/V ratio 30:2; "30:2" group, n = 8) or (3) two breaths, followed by 15 compressions (C/V ratio 15:2; "15:2" group, n = 8), followed by advanced cardiac life support.

**Results:** Arterial PO2 during BLS-CPR was higher in the 15:2 compared to the 30:2 and CC group (74 ± 3 vs. 59 ± 2 and 31 ± 4 mmHg, respectively; p < .05). Mixed venous PO2 was comparable between groups. The 15:2 group remained normocapnic, and arterial PO2 was lower compared to the 30:2 and CC group (32 ± 2 vs. 47 ± 3 and 65 ± 3 mmHg, respectively; p < .05). In parallel, arterial pH decreased in the 30:2 and CC group compared to the 15:2 group (7.33 ± 0.03 and 7.25 ± 0.02; vs. 7.25 ± 0.04, respectively; p < .001). 4/8, 2/8, and 0/8 animals in the 15:2, 30:2, and CC group, respectively, had return of spontaneous circulation at the end of the study period (p = ns).

**Conclusion(s):** Ventilation during BLS-CPR after prolonged cardiac arrest has an important impact on both oxygenation and acid-base status; however, from our data we cannot comment on the optimal C/V ratio.

### References:

### 13AP2-8

**Perioperative cardiac arrest in 36,313 non-cardiac anesthetics in a tertiary hospital**

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**Background and Goal of Study:** Synergistic effects of epinephrine and vasopressin may be beneficial during cardiopulmonary resuscitation (1-3). However, it is unknown whether either epinephrine alone or an alternating administration of epinephrine and vasopressin is superior for restoring vital organ perfusion following basic life support (BLS) according to the revised algorithm with a compression-to-ventilation (C/V) ratio of 30:2.

**Materials and Methods:** After 4 minutes of ventricular fibrillation, and 6 minutes of BLS with a C/V ratio of 30:2, sixteen pigs were randomized to receive either 45 µg/kg epinephrine alone, or alternating 45 µg/kg epinephrine and 0.4 µg/kg vasopressin, respectively, every 5 minutes. Data were analyzed using two-way repeated measures analysis of variance factoring for time and treatment effects.

**Results and Discussions:** Coronary perfusion pressure (mean ± SD) 20 and 25 minutes after cardiac arrest was 7 ± 4 and 5 ± 3 mmHg after epinephrine, and 25 ± 4 and 17 ± 3 mmHg after epinephrine/vasopressin (p = 0.001 and p < 0.01 versus epinephrine), respectively. Cerebral perfusion pressure was 23 ± 7 and 19 ± 9 mm Hg after epinephrine, and 40 ± 10 and 33 ± 7 mm Hg after epinephrine/vasopressin (p < 0.001 and p < 0.01 versus epinephrine), and cerebral laser doppler flow was 30 ± 10 and 27 ± 11 % of baseline after epinephrine, and 65 ± 40 and 50 ± 31 % of baseline after epinephrine/vasopressin (p < 0.05 versus epinephrine), respectively. Return of spontaneous circulation (ROSC) did not differ significantly between the epinephrine group (0/8) and the epinephrine/vasopressin group (3/8).

**Conclusion:** Epinephrine/vasopressin resulted in higher coronary and cerebral perfusion pressure, and cerebral laser doppler flow, while ROSC was comparable.

**References:**
1. 2006; 112: IV1-203.
Background and Goals: To determine the incidence of perioperative cardiac arrest in patients undergoing non-cardiac procedures and to study its relationship to physical status, age, and type of surgery (elective vs. emergency).

Material and Methods: This prospective study is part of a quality improvement program from 1994–1999. Physical status was assessed preoperatively according to the classification of the American Society of Anesthesiologists (ASA). Data from 313 non-cardiac anesthetics were collected. Adverse events, including cardiac arrest (CA), were recorded intraoperatively by the attending anesthesiologist, in the post anesthetic unit (PACU) by the nurse, and postoperatively by another anesthesiologist. Data were encoded using a customized data base program, and analyzed using SAS software.

Results: 29.9% of the patients were ASA (3,4,5), 39.6% were ASA(2) and 30.5% were ASA(1). Results were reported as rates per 10,000. Cardiac arrest was encountered in 5.51. Intraoperative was 3.03 and PACU was 2.48. (CA) correlation to ASA was highly significant (p < 0.001). The incidence in the adult age group (<1 year) was 11.8, from (1 to <5 years) was 2.8 and it was zero from (5–15 years), indicating a negative correlation in the pediatric group (r = −0.808). The incidence in the adult age group from (15–20) was none, (20 to <40) was 3.05 and from (40 to <60) was 5.06, indicating positive correlation in the adult group (r = 0.927). In emergency procedures the incidence was (15.15), higher than in elective procedures (2.57), with P = 0.0763.

Conclusions: Cardiac arrest has a negative correlation with age in the pediatric group, and a positive one in the adult group. Children younger than 1 year, patients with higher ASA and emergency procedures have a higher incidence of cardiac arrest. Preoperative optimization of co-morbid conditions could improve this adverse event.

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3 Keenan, RL. JAMA 1985; 250: 2373-2377.

13AP3-1

Influence of air-purifying respirators on the simulated emergency treatment of chemical, biological and radionuclear victims

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Background and Goal of Study: Medical first responders as well as emergency room personnel are potentially threatened by exposure to primary or secondary intoxication by chemical, biological, or radionuclear (CBRN) substances. The impact of personal respiratory protection by air-purifying respirators on the performance of resuscitation requires evaluation. This will help to improve major incident planning and measures for protecting medical pre-hospital or hospital staff.

Materials and Methods: We investigated the influence of two modern air-purifying respirator designs on the resuscitation of simulated CBRN victims. Fourteen UK paramedics followed a standardized resuscitation algorithm, either unprotected or wearing a bi-ocular and a panoramic visor respirator in a randomized crossover design. Treatment times and wearer comfort was determined and compared.

Results and Discussion: We did not find any difference in treatment times between the groups wearing respiratory protection and the controls (189 ± 8.3 seconds for the controls, 191 ± 9.5 seconds for the panoramic visor mask and 206 ± 9.1 seconds for the biocural respirator [Mean ± SEM]). Intubation intution appeared to be the most time consuming task. In a questionnaire, volunteers expressed that orientation whilst wearing the respirator with the panoramic visor was better compared to the bi-ocular one (85% versus 15%). With respect to the fit, the majority (75%) rated the bi-ocular respirator as more comfortable.

Conclusions: Modern personal respiratory protection has only a negligible effect in the delay of treatment of simulated CBRN casualties. Furthermore, compared to bi-ocular designs, air-purifying respirators with panoramic visors seem to allow a better orientation for medical first responders during simulated resuscitation.

References:

13AP3-2

Uneven distribution of ethanol in rat brain following acute administration, with highest level in striatum

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Background and Goal of Study: Evidence exists for unequal extracerebral levels of ethanol in different areas of the brain (1) after acute administration of ethanol. The aim of this study was to investigate the relative tissue levels and rates of decline of ethanol in various regions of the brain and in the plasma of rats.

Materials and Methods: Adult male Wistar rats (250-300 g) were injected intraperitoneally with a 40%, w/v ethanol/water solution at a dose of 1 g/kg body weight. Brain were dissected into cerebral cortex (CX), diencephalons (DE), striatum (ST), hippocampus (HP), pons (PN), midbrain (MB), medulla (MD), cerebellum (CB), and spinal cord (SC) and plasma samples (BL) were analyzed thereafter at specified times for ethanol content by an enzymatic rate method (2).

Results and Discussions: The highest tissue and plasma concentrations of ethanol occurred 30 minutes after administration, with concentrations of ethanol being highest in the striatum. Data are expressed as mean ± SD.

Conclusion(s): Ethanol was eliminated more slowly from the brain than from plasma. The higher level of ethanol in the striatum, an area implicated in movement regulation and substance addiction, may thus have a significant bearing on the neurological effects and addictive properties of ethanol.

References:

13AP3-3

Evaluation of M-AID, a mobile phone first aid application

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Background and Goal of Study: Cardiopulmonary resuscitation (CPR) by bystanders has been shown to reduce mortality due to sudden cardiac arrest when it is effectively performed. Telemedicine applications might support bystanders by giving specific instructions for handling an emergency situation. M-AID is a mobile phone first aid application. With an algorithm of ‘yes’ or ‘no’ questions, the software judges the current situation and instructs the user in detail what to do. The aim of this study was to evaluate the benefit of M-AID in an emergency scenario of sudden cardiac arrest.

Materials and Methods: 119 volunteers were randomly assigned either to the test or the control group. All participants had to manage the same emergency scenario – acute coronary syndrome leading to cardiac arrest. The participants were either equipped with a mobile phone running M-AID test group or had to handle the situation without any support (control group). The participants received a certain amount of credits for each action taken according to a pre-defined protocol. These credits were added to a score and compared between both groups. Furthermore, all participants were divided into subgroups according to their medical and technical experience.

Results and Discussions: The test group achieved a slightly higher average score that was not statistically significant (21.11 vs. 19.97; p = 0.302). In contrast, the performance of the individuals in the control group was significantly faster (2.41 min. vs. 4.24 min; p < 0.001). Subgroup analysis showed that experienced mobile phone users performed significantly better than non-experienced individuals, but not as good as participants with advanced first aid knowledge.

Conclusions: Experience in the use of mobile phones is a precondition for the efficient use of the tested M-AID version. Furthermore, the software cannot replace skills acquisition by practical training. In a subgroup with experience in the handling of mobile phones and basic knowledge in CPR, the device improved performance of CPR.
**13AP3-4**

Comparison of three techniques for emergency cricothyrotomy in a human cadaver study

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**Background and Goal of Study:** Cricothyrotomy is the final lifesaving option whenever neither ventilation nor endotracheal intubation is possible [1]. Efficient management is indispensable to reestablish oxygenation and thus the quickest and safest method should be used. Therefore, this study aimed to compare three cricothyrotomy techniques.

**Materials and Methods:** Cricothyrotomy was performed in 61 human cadavers by 61 participants (57 medical students, 4 anaesthesiology residents). After theoretical instruction, participants were assigned to one of the following techniques: 1. surgical technique (n = 21, modified ATLS® approach), 2. catheter-over-needle technique (n = 20, Quiktrach, VBM-Medizintechnik), 3. wired guided cricothyrotomy (Seldinger) technique (n = 20, Melker Cricothyrotomy Set, Cook). Time to insertion of the cannula as well as success rate and complication rate were recorded. Statistics: mean ± SD, ANOVA and Chi-square tests, Bonferroni.

**Results and Discussions:** Cricothyrotomy was successful in 95% in the surgical group, in 85% in the Quicktrach group and in 75% in the Seldinger group (not significant). Speed was comparable between the surgical (106 ± 65 sec) and the Quicktrach technique (114 ± 94 sec). Seldinger-cricothyrotomy took significantly longer (180 ± 111 sec, p < 0.05). No complications were observed in the surgical group. One or more complications were found in 55% of cadavers in the Seldinger group and in 85% in the Quicktrach group (both groups p < 0.001 vs. surgical).

**Conclusion:** Surgical cricothyrotomy had the lowest complication rate and tended to be quicker and more successful than the other techniques.

**References:**

**13AP3-5**

Risk Analysis for emergency missions with physician-staffed ambulances compared to rescue helicopters

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**Background and Goal of Study:** In Germany, annually approx. 2 million ground-rescue missions with physician-staffed ambulances (PSA) were carried out. In addition approx. 60,000 helicopter emergency medical services (HEMS) air-missions were accomplished [1]. National and international data [2, 3] revealed 10.8 accidents/100,000 flight-hours (0.54 accidents/10,000 flight-hours). Data for the risk during PSA ground-missions are not available. The aim of the present study was to compare the accident risk of PSA to HEMS in a 10-year period.

**Materials and Methods:** A retrospective analysis ranging from 1996–2005 was carried out using published accident data from the BASt (Federal Highway Research Institute) for PSA and flight accident reports from the BFU (Federal Agency for Flight Accident Investigation) for HEMS. Additional data (operating hours, missions, accident characteristics) were gathered and compared to published data [2, 3, 4]. Fisher’s exact test was used for statistical analysis; P < 0.05 was considered statistically significant.

**Results and Discussions:** In the analyzed period per year 1.245 PSA and 775 helicopters were at service (1.74 million vs. 36.775 operating hours). Each year 90 vs. 4 accidents occurred. On the basis of 10,000 missions data were comparable (0.43 vs. 0.5 accidents, n.s.). A significant difference was found per 100,000 operating hours (5.17 vs. 10.87, P < 0.05). International data were partly discrepant [3, 4].

**Conclusion(s):** The risk for accidents on the basis of missions is comparable for PSA and HEMS, but significantly higher for HEMS on the basis of operating hours. For Germany, published studies on this topic are not available and denominator data are not published sufficiently. Denominator data are often inhomogeneous and discrepant making direct comparisons difficult or nearly impossible.

**References:**

**13AP3-6**

Basophil activation test in perioperative anaphylaxis.

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**Background and Goal:** The basophil activation test (BAT) is a method for investigation of perioperative anaphylaxis. BAT specificity is high and correlates well with skin prick testing; however sensitivity may be low. We noticed apparent basophil cell loss in allergen-stimulated samples and postulated that this might account for false negatives. In this preliminary work, we sought to determine whether the basophil activator formyl-methionyl-leucyl-phenylalanine (fMLP) caused a dose-dependent decrease in basophil count and activation.

**Methods:** With UREC approval, whole blood was taken from 6 volunteers with no allergy history. Duplicate samples were exposed to increasing concentrations of fMLP (10⁻⁹ to 10⁻⁴ M) or controls. Flow cytometry was used to identify basophils by CD45 and IgE expression; cell activation was assessed by CD63 expression [1]. Cell count was enumerated using CellBeads [2].

**Results:** MLF caused a concentration-dependent stimulation of CD63 expression between 10⁻⁷ and 10⁻⁴ M, maximal at 10⁻⁶ and 10⁻⁵ M. Basophil count appeared to decrease with increasing concentration, though this was statistically significant only at 10⁻⁵ M.

**Conclusion:** Basophil activation is dose-dependent. This preliminary data suggests count may be affected by fMLP concentration. Further work will investigate whether significant cell loss occurs in patients with a confirmed allergy to neuromuscular relaxants.

**References:**

**13AP3-7**

Life guarded delight – implementation of a rapid response team in the semperoper

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**Background and Goal of Study:** With more than 350 performances annually and an evening audience of about 1000 guests the Dresden opera house “Semperoper” is well known and highly frequented. To ensure audience’ medical security and to acquaint artists as well as audience with immediate and specialized medical care in case of emergency events a medical rapid response team (RRT) was established in 2001.

**Materials and Methods:** For initial treatment in emergencies a physician with fundamental experience in emergency medicine as well as the Opera staff trained in logistics and medical basic emergency algorithms create a rapid response team (RRT). The team is demanded via a central alerting system operated pager. A room with complete emergency equipment such as defibrillator, ekg, oxygen and emergency bags was set up in the centre of the building. All emergency cases since the initiation in 2001 were evaluated to challenge the proceedings’ benefit. Therefore emergency documentation performed was retrospectively analyzed.

**Results and Discussions:** Within a six year period the RRT was demanded in 291 cases of emergency. The team was on scene within a maximum of 5 minutes of call. Patients were in average 63 years of age [14-88] and 68% of the patients were female. In 56% the RRT was confronted with cardiac,
pulmonary and metabolic emergencies. Surgical emergency was documented in 31.6%, neurological emergency in 3.8% and psychiatric emergency was reported in 3.8%. In 10.6% of all cases patients tripped on stairs and fell. NACA score 1 and 2 were found in 64.2%. 20.6% were classified with NACA 3. NACA 4 was documented for 8.2% and in 5.1% NACA 5. Three cases of cardiac arrest occurred during this six year period, 1 person died. 23% of all patients were admitted to hospital immediately by ambulance.

Conclusion(s): The introduction of an own rapid response team with a specialized physician in highly frequented public institutions such as theaters and opera houses enables an early detection and treatment of severe emergency and ensures reliable evaluation of enhanced treatment or hospital admission.

13AP4-1
Whole blood viscosity in the initial phase of the acute coronary syndrome
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Background and Goal of Study: Elevated whole blood viscosity (η) has been observed in atherosclerotic disease [1]. We investigated the association of whole blood viscosity with acute coronary syndrome (ACS) in an out-of-hospital setting.

Materials and Methods: 113 patients (age range: 19–96 years) treated by the emergency service were studied. We used a novel capillary viscometer (Rheologics, Exton, USA), which enables the assessment of viscosity over a wide range of shear rates [2].

Results and Discussions: Whilst mean η in ACS patients (n = 33) was higher compared to emergency patients without atherosclerotic disease (n = 80), the difference did not reach significance. Viscosity was mainly determined by hematocrit (r = 0.43; P < 0.001) but did not correlate with classical risk factors like arterial hypertension, smoking habits and hyperlipoproteinemia.

Fig. Mean and 95% confidence interval of shear rate dependent whole blood viscosity (η).

Conclusion: In our heterogenic population of emergency patients, η was no significantly elevated in the initial phase of ACS.

References:

13AP4-2
Effect of intraoperative fluid optimisation on renal function in patients undergoing emergency abdominal surgery; a randomised controlled pilot study
J. Harten, J. Crozier, B. McCreath, A. Hay, J. Kinsella
Anaesthesia, University of Glasgow, Glasgow, United Kingdom

Back ground and Goal of the Study: This pilot study aims to examine the effect of goal directed therapy using fluid alone on postoperative renal function score (PMS) in patients following emergency abdominal surgery [1].

Materials and Methods: This prospective randomized study included patients over the age of 50 undergoing emergency abdominal surgery. Patients presenting following trauma, undergoing vascular surgery or who were on immunosuppressive therapy were excluded from the study. Research ethic committee approval and informed consent was obtained in the intervention group the Lidco monitor (Lidco plus system, Lidco Ltd., UK) was used to guide fluid boluses of 250 ml of 6% Hydroxyethylstarch 130/0.4 (Voluven, Fresenius Ltd., UK) based on pulse pressure variation measurement (bolus given if >10%). The control group received standard care. Serum urea, creatinine and cystatin C levels were measured prior to and at the end of surgery, and postoperatively on days 1 & 3 & 5. Data are median (range) and were analyzed using chi-square test or Mann Whitney test as appropriate.

Results: 30 patients were recruited. Their age was 65 yrs (51–76), 23 patients were male, ASA – 3 (1–4), Lee risk score – 3 (2–4). One patient died prior to surgery and was excluded from the analysis. 10 patients had upper and 19 lower abdominal surgery. Duration of surgery was 110 min (40–295). There were no demographic differences between the groups. The intervention group received a median of 750 ml of hydroxyethylstarch. The peak values of postoperative urea were 6.9 (2.7–31.8) vs 6.4 (3.5–11.5) mmol/l (P = 0.425), creatinine 100 (60–300) vs 85 (65–150) µmol/l (P = 0.085) and cystatin C 1.09 (0.66–4.94) vs 1.01 (0.33–2.29) mg/dl (P = 0.352) in the control and intervention group respectively.

Conclusions: Replacing the identified fluid deficit was not associated with a change in renal function in this study. These results do not preclude that goal directed therapy may have an effect on renal function but they would suggest that the effect size of fluid optimization alone on renal function is small.

13AP4-3
Effect of intraoperative fluid optimisation on postoperative morbidity score in patients undergoing emergency abdominal surgery; a randomised controlled pilot study
J. Harten, J. Crozier, B. McCreath, A. Hay, J. Kinsella
Anaesthesia, University of Glasgow, Glasgow, United Kingdom

Back ground and Goal of the Study: This pilot study aims to examine the effect of goal directed therapy using fluid alone on postoperative morbidity score (PMS) in patients following emergency abdominal surgery [1].

Materials and Methods: This prospective randomized study included patients over the age of 50 undergoing emergency abdominal surgery. Patients presenting following trauma, undergoing vascular surgery or who were on lithium therapy were excluded from the study. Research ethic committee approval and informed consent was obtained in the intervention group the Lidco monitor (Lidco plus system, Lidco Ltd., UK) was used to guide fluid boluses of 250 ml of 6% Hydroxyethylstarch 130/0.4 (Voluven, Fresenius Ltd., UK) based on pulse pressure variation measurement (bolus given if >10%). The control group received standard care. PMS were measured postoperatively on days 5 & 15 & 30. Data are median (range) and were analyzed using chi-square test or Mann Whitney test as appropriate.

Results: 30 patients were recruited. Their age was 65 yrs (51–76), 23 patients were male, ASA – 3 (1–4), Lee risk score – 3 (2–4). One patient died prior to surgery and was excluded from the analysis. 10 patients had upper and 19 lower abdominal surgery. Duration of surgery was 110 min (40–295). There were no demographic differences between the groups. The intervention group received a median of 750 ml of hydroxyethylstarch. On day 5 & 30 there were no differences in PMS scores. Day 15 data as displayed in table.

<table>
<thead>
<tr>
<th>Day 15</th>
<th>Control</th>
<th>Intervention</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>In hospital (yes/no)</td>
<td>4/11</td>
<td>9/5</td>
<td>0.042</td>
</tr>
<tr>
<td>PMS score</td>
<td>0 (0–5)</td>
<td>1 (0–7)</td>
<td>0.328</td>
</tr>
<tr>
<td>Complication (yes/no)</td>
<td>4/11</td>
<td>7/7</td>
<td>0.196</td>
</tr>
</tbody>
</table>

Conclusions: Goal directed therapy using fluid alone may be associated with an increased incidence of hospital stay at 15 days.

Reference:

13AP4-4
Severe perioperative allergic reactions to non-steroidal anti-inflammatory drugs
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Back ground and Goal of the Study: There isn’t any study about the incidence and severity of allergic reactions (AR) to non-steroidal anti-inflammatory drugs (NSAID) during the perioperative period. We investigated the incidence, severity, evolution and immunological mechanisms of these AR in our hospital.

References:
Material and Methods: A prospective study was carried between 1996 and 2005. We included all the anaesthetized patients exposed to NSAID in the operating room and in the postoperative care unit. We recorded the medical history and description of the allergy reactions. During the first 24 hours we performed the immediate immunological study (IIS): histamine, serica tryptase, urine methylhistamine, complement factors, latex and other drugs and histamine release test (HRT). Posteriorly, we performed the delayed immunological study (skin test, Ig E and histamine release tests specific).

Results and Discussions: 148.399 vials of NSAID were administered: 81.893 of metamizol, 44.315 of paracetamol, 12.015 of diclofenac and 10.176 of desketo profeno. 10 severe AR occurred: 7 cases to metamizol and 3 cases to diclofenac. All patients had a good evolution. The IIS was positive in all cases and the delayed immunological study was positive in the patients studied.

Conclusion: The incidence of severe perioperative RA was 1 in 14.840 vials of NSAID used. Metamizol is more common cause of adverse reaction than diclofenac. Paracetamol and desketo profeno didn’t cause RA. The immune mechanism of the reaction was confirmed by the IIS, and the delayed immunological study diagnosed anaphylactic reactions mediated by IgE antibody.

13AP1-1
N-Methyl-D-Aspartate receptor blocking therapy and post-operative analgesia: the methadone option
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Background and Goal of Study: N-Methyl-D-Aspartate receptor (NMDA) receptor dependent enhancement of nociceptive synaptic transmission is considered a key mechanism in the development of perioperative acute opioids tolerance and hyperalgesia observed after remifentanil based anaesthesia(1,2). Methadone is both a µ-opioid receptor agonist like morphine both an NMDA receptor antagonist like ketamine. Our hypothesis is that NMDA receptor antagonism activity of methadone could reduce opioids requirement after surgery. The aim of the study was to compare methadone and morphine consumption after major abdominal surgery.

Materials and Methods: We studied 10 patients undergoing major abdominal surgery. All patients received a propofol-remifentanil based anesthesia (TCI modality) supplemented with low-dose Ketamine(2). Patients were randomly assigned to receive morphine (Mo group) or methadone (Me group) for post-operative analgesia. Opioids were administered with a loading dose of 0.15 mg/Kg 40 minutes before the end of surgery and 1–2 mg/10 minutes if pain score (Numerical Rating Scale; NRS) was > 3 in recovery room (RR). Patients were monitored for 2h in RR: we registered vital signs and NRS every 10 minutes by a physician blind to the treatment, and a Blood Gas Analysis after 2 hours. Data are presented as mean ± DS, comparisons between groups were performed with test One way ANOVA (Sigma-stat 2.0).

Results: Methadone group presents a significantly lesser cumulative opioids consumption and a better pain scores during the first two postoperative hours without significantly breathing depression.

<table>
<thead>
<tr>
<th></th>
<th>RR</th>
<th>Opioid mg</th>
<th>BSA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2h</td>
<td>2h</td>
<td>pO2</td>
</tr>
<tr>
<td>Me</td>
<td>3 ±3</td>
<td>2 ±1</td>
<td>7 ±2</td>
</tr>
<tr>
<td>Me</td>
<td>1 ±3</td>
<td>0 ±0</td>
<td>2 ±2</td>
</tr>
<tr>
<td>p</td>
<td>&lt; 0.05</td>
<td>&lt; 0.05</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>

supplemented with Venturi face mask: FI02 35%.

Conclusion: Our data suggest that Methadone permits a good postoperative pain control with a reduction in opioid consumption after propofol-remifentanil based anaesthesia supplemented with Ketamine.

References:

13AP1-2
Fascia iliaca compartment block for pre-operative pain relief in adult fracture neck of femur: a nurse led initiative in luton and dunstable hospital UK
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Anaesthesia, Luton and Dunstable Hospital NHS Trust, LUTON, United Kingdom

Aim: To provide a nurse led service in our Hospital and to assess the efficacy of fascia iliaca compartment block administered by Pain Specialist Nurses for fractured neck of femur pain relief for first twenty four hours.

Methodology: Following the approval of the guideline for the management of pain relief in fractured neck of femur by the Hospital Guidelines Committee, trained the pain specialist nurses to perform this block. Patients audited were either referred by A & E personnel or the Trauma/Ward sister. Exclusion criteria included patient’s refusal, unconscious, demented and anticoagulated patients. Others include patients with known sensitivity to local anaesthetic, body mass index (BMI) more than 40 and peripheral neuropathy. After obtaining verbal consent, preceded by explanation of the procedure to the patient, fascia iliaca compartment block was instituted. Twenty to thirty ml of 0.25% plain bupivacaine was given. Pain score using a verbal rating score was assessed at 15 minutes, 2, 8 and 24 hours after the block.

Result: The 14 patients were made the age range is 63 to 91 years. All of them had oral paracetamol 1g and variable doses of oral and parenteral opioid on admission. The pain score at presentation for all the patients was 10. 71%, 78%, 84% and 83% of the patients had a pain score of 3 or less at 15 minutes, 2, 8 and 24 hours respectively after the block. There were no reported complications as result of the procedure.

Conclusion: The audit showed that fascia iliaca compartment block provided pain relief after fractured neck of femur in more than 70% of the situations. It also showed that non-anaesthetic personnel can be trained to do the block successfully. Although no complication was recorded in the series, it must be noted that the number of patients done is small. The audit is ongoing.

Future Prospect: It is hoped that more personnel, as mentioned above will be trained to provide this service in our hospital.

References:
**14AP1-3**

**Effects of perioperative i.v. infusion of low dose ketamine associated with thoracic epidural analgesia for abdominal aortic surgery on postoperative analgesia and early postoperative outcome**

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**Background and Goal of Study:** Thoracic epidural analgesia (TEA) provides effective analgesia and improves outcome after abdominal surgery (1). Some peritoneal nociceptive inputs are not blocked by TEA (2). Ketamine (K.) pre-  

**Results and Discussions:** Demographic data, pain scores at rest (p < 0.1), coughing (p < 0.2) and mobilization (p < 0.24) and pritramide consumption (p < 0.56) (table) were not significantly different between the groups.

<table>
<thead>
<tr>
<th>Pritramide</th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>K (mg)</td>
<td>8.4 ± 12</td>
<td>16.6 ± 20</td>
<td>12.8 ± 14</td>
<td>8.4 ± 9</td>
</tr>
<tr>
<td>S. (mg)</td>
<td>5.8 ± 7</td>
<td>15.2 ± 16</td>
<td>14.7 ± 13</td>
<td>3 ± 5.2</td>
</tr>
</tbody>
</table>

There was no difference with regards to morbidity or postop. outcome between the two groups.

**Conclusion(s):** When associated with TEA using local anaesthetic and opioid, perioperative i.v infusion of low dose ketamine does not improve analgesia nor early postop. outcome after open AAS.

**References:**

**14AP1-4**

**Intraoperative ketamine does not improve postoperative analgesia after scoliosis surgery in adolescent**

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**Background and Goal of Study:** Major surgeries with remifentanil-based anaesthesia are associated with severe postoperative pain. Large-dose remifentanil causes acute opioid tolerance and hyperalgesia. The NMDA receptor antagonist ketamine may be appropriate for preventing postoperative hyperalgesia. There are controversial results concerning the pre-emptive effect of ketamine on postoperative pain after a remifentanil-based anaesthesia in adults (1-3). We therefore tested the hypothesis that intraoperative small-dose ketamine improves postoperative analgesia after scoliosis surgery with remifentanil-based anesthesia.

**Materials and Methods:** After ethics committee approval and obtaining patient informed consent, 46 patients were enrolled in a prospective, double blinded, controlled study. Patients were randomly allocated to receive either 0.25 mg/kg of ketamine before anesthesia induction and 4 μg/kg/min during the procedure or saline. Analgesia was induced with Propofol 2.5 mg/kg and remifentanil 0.5 μg/kg maintained with the same drugs. The drugs infusion rate was adjusted according to blood pressure and heart rate. All patients had intrathecal morphine 5 μg/kg before induction, paracetamol and ketoprofen at the end of surgery. We recorded: hemodynamic parameters, intraoperative drug consumption, blood loss, time to anesthesia recovery, pain scores, time to first analgesic rescue and morphine requirement (VA > 30).  

**Results and Discussions:** Demographic data and mean procedure time were similar in both groups. There was a tendency for better hemodynamic stability in ketamine (K) group. But, intraoperative blood loss and drug consumption were similar in both groups. Time for extubation was longer in K group (30.1 min vs 20.4 min). Pain scores were low in both groups. Morphine consumption was significantly lower in K group but only during the first postoperative hour (2.8 mg vs 4.5 mg).

**Conclusion(s):** intraoperative low-dose ketamine had no effect on morphine consumption after remifentanil-based anesthesia for scoliosis.

**References:**

**14AP1-5**

**The effect of low dose magnesium sulphate on early postoperative pain after laparoscopic cholecystectomy**

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anesthesiology and Intensive Care, General Hospital Varazdin, Varazdin, Croatia

**Background and Goal of Study:** As a NMDA receptor antagonist, magnesium sulphate (MgSO4) has analgesic properties(1). The study was designed to evaluate whether preemptive, low intravenous dose of MgSO4 affects postoperative pain after laparoscopic cholecystectomy.

**Materials and Methods:** 60 ASA I-II patients undergoing laparoscopic cholecystectomy were enrolled to the study. Anaesthesia was performed with the same drugs in all groups. After anesthesia induction, prior to surgical incision, patients in group C (n = 20) received saline, group Mg1 (n = 20) 5 mg/kg MgSO4 and group Mg2 (n = 20) 7.5 mg/kg MgSO4. Pain intensities at rest according to visual analog scale (VAS) were evaluated at 1,3,6,9 and 24 h postoperatively. Postoperative analgesia included iv methamizol 2.5 g (VAS 2-4), diclofenac 75 mg (VAS 5-7) or tramadol 1 mg/kg (VAS 8-10).Whole analgesic consumption in 24 h was documented.

**Statistics:** Mann-Whitney, X2 and t-test (p < 0.05 significant).

**Results and Discussions:** Demographic data were comparable in all groups.

**Conclusion:** Preemptive dose of 7.5 mg/kg MgSO4 given to the patients undergoing laparoscopic cholecystectomy is the lowest efficacious dose against early postoperative pain (first 3 h). Analgesic consumption in the first 24 h is highly reduced in those patients when compared to patients who received 5 mg/kg MgSO4 or placebo.

**Reference:**

**14AP1-6**

**Patient-controlled epidural analgesia and its influence on postoperative pain and vegetative status after major abdominal surgery**

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**Background and Goal of Study:** The patient controlled epidural analgesia (PCEA) is supposed to be an effective manner of postoperative analgesia after major surgery (1). However, association between intensity of pain and patient’s vegetative status remains unclear. Therefore, the main goal of our study was to compare the efficacy of epidural bupivacaine and morphine administered as a bolus vs. PCEA of these drugs and its influence on the dynamic of vegetative status of patient after laparotomy.

**Materials and Methods:** Sixty-five adult patients underwent major abdominal surgery were enrolled in a prospective randomized study. All patients were randomized to two groups. In the PCEA group (n = 34), patients have received controlled epidural analgesia with morphine 100 mcg/ml in 0.125% bupivacaine solution. In the EBI (Epidural Bolus Injection) group (n = 31), these analgesics were given in same concentrations via bolus injections. Pain scores were assessed during first 24 hours after surgery by 100-mm visual analogue.
scale (VAS). Measurements were done hourly during first 3 hours postoperatively and then every 3 hours. The dynamic of the stress index of R.M. Baevsky (SI) were assessed every 3 hours postoperatively. Data were compared by using Student’s t-test. \( p < 0.05 \) was regarded as statistically significant.

**Results and Discussions:** At 6, 12 and 24 h after ICU admission, VAS was significantly lower in the PCEA group compared with the EBI group \( (p < 0.05) \). The dynamic of the SI have shown, that PCEA provides better stability of sympathetic nervous system of patient after laparotomy when bolus epidural injection method.

**Conclusion(s):** The PCEA profile of postoperative analgesia using bupivacaine and morphine in patients after major abdominal surgery allowed adequate postoperative analgesia. Moreover, PCEA provided the stability of vegetative status of patient while improving the quality of analgesia.

**Reference:**


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**14AP1-8**

**Postoperative mapping of sensitive dysesthesia and residual pain after sternotomy for cardiac surgery**

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**Background and Goals:** Residual pain (RP) is not rare after sternotomy for cardiac surgery (1). Abnormal postoperative skin sensitivity seems associated with higher risk to develop RP after surgery. Although both hypoesthesia and hyperalgesia have been reported after heart surgery (2), their correlation with RP remains unknown. The study compares early postoperative hypoesthesia (at day5 and day30) between patients presenting with RP (RP group) or not (control) at postoperative day 5 and 30, presence and area of both hypoesthesia (HYPO) and mechanical hyperalgesia (MH) surrounding sternotomy incision were assessed. Two months after surgery, incidence of chest RP was questioned by mail. Statistical analysis used one way ANOVA and chi-square analysis, \( p < 0.05 \) significant.

**Results:** Demographic data did not differ between groups: average age 64 ± 10 yrs, BMI 28 ± 5. Respectively in C and RP group, M/F ratio was 25/12 vs 20/2 and CABG/VR ratio was 19/15 vs 19/7. One patient died before postoperative day/D3. At D 5, all patients were evaluated while only 34 patients were available for D30 examination. RP development was unreliable to age, weight, length, preoperative Hb value and total fluid administered. The three groups were comparable with respect to weight, age, length, preoperative Hb value and total fluid administered. Morphine consumption is shown below.

**Table:**

<table>
<thead>
<tr>
<th></th>
<th>0–12 h</th>
<th>12–24 h</th>
<th>24–36 h</th>
<th>36–48 h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placebo</td>
<td>28 (4)</td>
<td>16 (4)</td>
<td>13 (4)</td>
<td>5 (2)</td>
</tr>
<tr>
<td>Parecoxib</td>
<td>18 (9)</td>
<td>5 (2)</td>
<td>3 (1)</td>
<td>1 (0)</td>
</tr>
<tr>
<td>Diclofenac</td>
<td>23 (2)</td>
<td>6 (1)</td>
<td>6 (1)</td>
<td>2 (1)</td>
</tr>
</tbody>
</table>

\*: significantly less than placebo with \( p < 0.05 \). MWU-test.

Side-effects such as nausea, vomiting or stomachache were minimal and comparable between groups.

**Conclusion(s):** Parecoxib and diclofenac are equally effective in preventing postoperative pain after vaginal hysterectomy, but parecoxib has a faster onset.

**Reference**


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**14AP1-10**

**Intra-operative remifentanil might influence pain levels in the immediate post-operative period after major abdominal surgery**

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**Background and Goals:** Remifentanil, a widely used analgesic agent in anaesthesia, has a rapid onset and short duration of action. In clinical settings, this requires an appropriate pain strategy to prevent unacceptable pain in the post-operative period. The aim of this study was to investigate whether remifentanil had impact on post-operative pain and opioid consumption after major abdominal surgery.

**Material and Methods:** Fifty patients undergoing major abdominal surgery were randomized to receive either remifentanil 0.4 mg/kg/min or placebo intra-operatively, in addiction to basic combined general and epidural anaesthesia, in this double-blind study. Patients received patient-controlled analgesia with morphine for 24 h post-operatively. Morphine consumption, assessment of pain at rest and during coughing, side-effects and levels of sensory block were recorded during the first 24 h post-operatively.

**Results:** Twenty-one patients receiving remifentanil and 18 patients receiving placebo completed the study. The median visual analogue scale (VAS) score at rest from 0 to 2 h was significantly increased in the remifentanil group (40 mm [27–61 mm]) vs. placebo [13 mm (3–35 mm)] \( (p < 0.05) \). No significant differences in morphine consumption, VAS score during coughing or adverse effects were observed between the groups.

**Conclusions:** The results are weak and difficult to interpret. They could indicate that a high dose of remifentanil added to otherwise sufficient combined general and epidural anaesthesia may induce opioid-induced hyperalgesia and/or clinically acute opioid tolerance after major abdominal surgery; however, as no significant differences could be observed between the groups after 2 h post-operatively, the clinical relevance of these observations is questionable.

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**14AP2-1**

**Interaction between serotonin and clonidine in spinally mediated analgesia in rats**

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**Background and Goal of Study:** Serotonin receptor and \( \alpha_2 \) adrenergic receptor had a great role in pain mechanism in the spinal cord. We investigated the analgesic interaction between spinally administered serotonin and \( \alpha_2 \) receptor agonist, clonidine in two different pain models in rats.

**Materials and Methods:** Sprague–Dawley rats with lumbar intrathecal catheters were tested for their thermal tail withdrawal response using the tail flick test and for their paw flinches by formalin injection after intrathecal administration of serotonin or clonidine. The effects of the combination of serotonin and clonidine were tested by an isobolographic analysis using ED50 (50% effective dose) values. Eight rats were used in each dose group. Behavioral side effects were also investigated.

**Results and Discussion:** ED50 values are shown as mean and 95% confidence interval (in parenthesis).
Alldynia was observed in 25% rats with 0.3 µg clonidine, 12.5% rats with 100 µg serotonin and 12.5% rats with 1/2 ED₅₀ of the combination. Motor disturbance shown in 12.5% rats with 3 µg clonidine was not observed in combination.

Conclusions: Intrathecal serotonin and clonidine had synergistic analgesic effects on thermal induced acute pain and inflammatory induced acute and facilitated pain.

**14AP2-2**

The effect of dexamethasone on the spinal glutamine synthetase and glutamate dehydrogenase expression in morphine tolerant rats

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**Background and Goal of Study:** Excitative amino acids (EAAs) play an important role in morphine tolerance. Recently, we demonstrated that morphine challenge induced an increase in CSF EAAs concentration in morphine-tolerant rats, and dexamethasone co-infusion attenuated morphine tolerance. The present study further examined the effect of intrathecal (i.t.) dexamethasone infusion on morphine tolerance and the expression of intracellular glutamate metabolizing enzymes, glutamine synthetase (GS) and glutamate dehydrogenase (GDH) in the rat spinal cords.

**Materials and Methods:** Male Wistar rat tolerance was induced by morphine infusion (15 µg/hr, i.t.) for 5 days. Other group of rats received either saline (1 µl/hr), or dexamethasone (2 µg/hr), or dexamethasone (2 µg/hr) plus morphine (15 µg/hr) infusion. On day 5, the spinal cords were removed and prepared for Western blot analysis of GS and GDH.

**Results and Discussion:** Down-regulation of GS and GDH expression was observed in morphine-tolerant rat spinal cords. Co-infusion of dexamethasone attenuated morphine tolerance and the associated GS and GDH down-regulation.

**Conclusions:** Intrathecal dexamethasone attenuates morphine tolerance; the preventing of GS and GDH down-regulation also play a role.

**References:**


**14AP2-3**

Neuropeptide and behavioural expressions in chronic neuropathic pain using the intercostal nerve ligation model


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**Background and Goal of Study:** We reported here an original animal model for study of post-thoracotomy pain. Specifically we measured the number of degenerating neurons in the dorsal root ganglion (DRG) and their relationship to pain behaviors following a intercostal nerve chronic constriction injury.

**Materials and Methods:** Twenty male Wistar rats (200-250g) received a tie (10-0 nylon) on the right 5th intercostal nerve. The same intercostal space was used for each animal. The same intercostal space was used for each animal. The same intercostal space was used for each animal. A 6 cm incision was made on the 5th left rib. The nerve was transected, and 5 mm of the nerve stump was removed. The incision was sutured with nylon. For the study of the effect of post-thoracotomy pain, we used a 6 cm incision on the right 5th rib.

**Results and Discussion:** We found increased S-100 positive neurons on the dorsal root ganglion after intercostal nerve ligation may be one of the leading causes of post-thoracotomy pain.

**References:**


**14AP2-4**

Axotomy alters sodium and ATP-sensitive potassium currents elicited by action potential waveform voltage commands in mammalian primary afferent neurons

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**Background and Goal of Study:** Certain membrane ion currents regulate neuronal excitability and protection from cell death, functions pertinent to the pathophysiology of neuropathic pain. We investigated changes of Na⁺ and K⁺ currents on DRG neurons stratified by size, after spinal nerve ligation (SNL) [1], using each individual neuron’s action potential (AP) as a voltage command stimulus, in a fashion that simulates normal physiological excitation.

**Materials and Methods:** We studied whole-cell Na⁺ and K⁺ currents in control DRG neurons from sham operated rats, as well as axotomized neurons from L5 DRG, or adjacent L4 DRG neurons from rats with hyperalgesia following L5 SNL. In order to record KᵥAP currents and to identify changes of other currents sensitive to ATP [2,3] we used internal pipette solutions with low ATP. Each neuron’s AP was recorded in Tyrode’s solution in current clamp, and replayed as a voltage command. Following AP, drugs were applied to the bath and recordings were repeated at the same input. The analysis was done on spines with SNL, and on Spinal cords with SNL.

**Results and Discussion:** 1) blocking Na⁺ current with NMDG and TTX; 2) addition of the KᵥAP opener diazoxide; 3) blocking KᵥAP current with glibenclamide; and 4) blocking remaining K⁺ current with the addition of 4-AP and TEA-CI. Currents were estimated by trace subtraction indicating sensitivity to modulators, and normalization for cell capacitance. Peak current density and charge transfer were estimated digitally, and analyzed by ANOVA, testing for the main effect of neuronal size (indicative of functional modality) and injury status (control versus axotomized or adjacent).

**Conclusions:** Recording of KᵥAP current in DRG neurons is a novel finding. Decrease of KᵥAP current by axotomy may explain pertinent pathophysiological changes leading to neuropathic pain. Both findings provide opportunities for selective pharmacological targeting at the DRG.

**References:**

Local application of CB1 and CB2 antagonists had no effect on withdrawal latencies after incision. IT application of WIN552122 did not modify thermal hyperalgesia after incision demonstrating that spinal cannabinoid receptors are not involved in thermal nociception.

Conclusion(s): Peripheral CB2 receptors but not spinal cannabinoid receptors are involved in modulation of thermal hyperalgesia after incision. Since adverse effects of cannabinoids are mainly based on CB1-receptor activation, the peripheral application of selective CB2 agonists might prove an effective and safe therapeutic option.

14AP2-6

High dose remifentanil prevents development of thermal hyperalgesia in a neuropathic pain model in rats

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Background and Goal of Study: This study investigated whether remifentanil (remi) administered intraoperatively can prevent the development of thermal hyperalgesia in a neuropathic pain model in rats.

Materials and Methods: After approval of the ethics committee, 65 male Sprague-Dawley rats were anesthetized with isoflurane, paralyzed, intubated, and the tail vein was instrumented with a catheter for drug infusion. Remi was given low-dose (2 μg/kg/min, ld) or high-dose (20 μg/kg/min, hd), Rats that received saline intraoperatively served as controls. 10 to 12 rats of each group (ld, hd, and saline) received a L5 spinal nerve transection (modified Chung model), another 10 to 12 rats were sham operated. A blinded experimenter tested for thermal hyperalgesia using the Hargreaves test at different time points before and after surgery. Paw withdrawal latencies (PWL) were measured, and tested for statistical significance between groups.

Results and Discussions: Rats that received saline (fig.1) or ld remi (data not shown) intraoperatively developed significant thermal hyperalgesia starting on postoperative day (po) 3. Animals that received hd remi showed significantly longer PWL to heat as compared to saline (fig. 1, data presented as mean ± SEM) and ld remi (data not shown) groups.

Conclusion: In this study hd remi administered intraoperatively was capable of preventing thermal hyperalgesia that normally develops after spinal nerve L5 transection.

14AP2-7

Effects of sodium diclofenac in spinal cords of rats

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Background and Goal of the Study: NSAIDs are widely used for patients suffering from pain. Some accidental administrations of sodium diclofenac has been reported (1). In this study we aimed to investigate the neurotoxic effects of intrathecally given Na diclofenac.

Material and Methods: After ethics committee approval 24 male Sprague Dawley rats weighing 250–300 g were randomly divided into 3 groups. Following intraperitoneal anaesthesia with ketamine HCl and Xylasin HCl rats were anesthetized with isoflurane, paralyzed, intubated, and the tail vein was instrumented with a catheter for drug infusion. Remi was given low-dose (2 μg/kg/min, ld) or high-dose (20 μg/kg/min, hd), Rats that received saline intraoperatively served as controls. 10 to 12 rats of each group (ld, hd, and saline) received a L5 spinal nerve transection (modified Chung model), another 10 to 12 rats were sham operated. A blinded experimenter tested for thermal hyperalgesia using the Hargreaves test at different time points before and after surgery. Paw withdrawal latencies (PWL) were measured, and tested for statistical significance between groups.

Results and Discussions: Rats that received saline (fig.1) or ld remi (data not shown) intraoperatively developed significant thermal hyperalgesia starting on postoperative day (po) 3. Animals that received hd remi showed significantly longer PWL to heat as compared to saline (fig. 1, data presented as mean ± SEM) and ld remi (data not shown) groups.

Conclusion: In this study hd remi administered intraoperatively was capable of preventing thermal hyperalgesia that normally develops after spinal nerve L5 transection.

14AP2-8

Mu-opioid receptor and binding affinity to fentanyl is affected by sex but not by A118G polymorphism

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Background and Goals: Opioids are widely used for management of pain, even though they display large inter-individual variability in efficacy and side effects. The µ-opioid receptor (µOR) is the primary site of action for endogenous peptides including β-endorphin, and the major target for opioid analgesics such as fentanyl. The µOR displays genetic variability. In vitro, the G118 allele of A118G polymorphism increases the binding affinity of µ-endorphin (1), and a reduced ED50 of spinal fentanyl for labor analgesia in women with the G118 allele has been shown (2). We examined whether subjects carrying the G118 allele have increased binding affinity to fentanyl.

Material and Methods: Blood samples were obtained from volunteers for genotyping of µOR (2). In addition, we determined by radioligand binding assays the capacity of fentanyl to displace [³H]-naloxone bound to whole, freshly isolated lymphocytes (3). Displacement of [³H]-naloxone (20 nM) by fentanyl (20 μM) was compared to the maximal displacement by unlabeled naloxone (20 μM) itself.

Results: While the A118G polymorphism of µOR did not seem to affect µOR binding affinity, we found a significant difference between and regardless of genotype (data presented as relative ‘naloxone displacement ability’ of fentanyl, in %).

Men % %
Total (n = 12) 41.1 ± 2.8 Total (n = 12) 74.5 ± 4.8
A118 (n = 9) 40.1 ± 3.5 A118 (n = 8) 73.3 ± 3.6
A118G (n = 3) 44 ± 1.73 A118G (n = 4) 77.0 ± 6.4

Mean ± SD, p < 0.0001 (between and )

Conclusions: We found a difference between men and women with regards to fentanyl binding properties. This finding is congruent with previously described sex differences in opioid analgesia (4) and may explain why women have been shown to require less opioids for management of pain. However, other pathways such as expression, transduction or receptor trafficking rather than µOR binding affinity need to be explored to investigate the potential mechanism by which A118G polymorphism appears to affect the clinical response to opioid therapy.

References:

14AP2-9

Effect of superoxide on the development of complex regional pain syndrome – type I

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Background and Goal of Study: Reactive oxygen species (ROS) and inflammatory responses contribute to development of neuropathic pain, (1,2) Superoxide (O₂⁻) serve to mediate cell signaling processes, directly induce tissue injury during inflammation. A neuropathic pain syndrome was produced in rats following prolonged hindpaw ischemia/reperfusion, creating an animal model of complex regional pain syndrome-Type I (CRPS-I). This study was designed to evaluate the effects of O₂⁻ on the development of CRPS-I.

Material and Methods: Male adult SD rats were used for CRPS-I model. Plasma O₂⁻ production rate was measured via cytochrome c reduction in the presence xanthine (without xanthine oxidase, kinetics, 550 nm). Superoxide dismutase (SOD, 4000 U/kg) was treated before ischemia (preemptive, G1), just after reperfusion (beginning of increased O₂⁻ production, G2), or 3 days after reperfusion (the lowest withdrawal threshold on von Frey stimulation, G3) Mechanical and cold allodynia were measured in both hindpaws. The effects of SOD were confirmed by histologic changes of the hindpaws.
Results and Discussions: Allopurinol-inhibitable, xanthine oxidase-mediated plasma O$_2^·$ production was the highest at just the reperfusion and lasted at least 1 week. Mechanical and cold allodynia were present in both hindpaws as early as 4 hr after reperfusion, and lasted at least 4 weeks. Pain behavior was significantly attenuated in G1, G2 and G3 compared with control. In G3, pain behavior was less attenuated than that in G1 and G2. Microscopic findings showed less inflammatory reaction in the G1 and G2.

Conclusion(s): This study suggests that the O$_2^·$ is partly responsible for development of the CRPS-I. Even though O$_2^·$ inhibition is less effective after CRPS-I has been already developed, O$_2^·$ inhibition is still effective for reduce CRPS-I pain.

References:

14AP2-10

Analgesic and hyperalgesic effect of single intrathecal dose of morphine under normal and neuropathic conditions

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Background: Beyond shortlasting analgesic effect, spinal opioids can also induce paradoxical pain and longlasting hyperalgesia (1,2). Further, opioid effectiveness and development of tolerance remain subject to discussion in chronic pain conditions. The study compares the effect of single intrathecal (it) dose of morphine (MOR) under normal (C, controls) and NP conditions.

Materials and Methods: Adult male Wistar rats, C (n = 6) and established NP (n = 6) induced by partial ligation of the right sciatic nerve were implanted with lumbar l catheter. After recovery, animals received it MOR 20 μg (1).

Thermal and mechanical hyperalgesia were evaluated by paw withdrawal latency (PWL, in sec) from radiant heat and by paw withdrawal threshold (PWT, in g) to application of electronic von Frey filament before MOR (baseline, BL) and at day (2h, 4h, day1, 2, 3 and 7). Statistical analysis used repeated t-test, P < 0.05 was significant.

Results: PWL are expressed in table; P < 0.05 (*) with baseline, (#) with C rats. PWT were not affected by it MOR 20 μg in any group.

<table>
<thead>
<tr>
<th></th>
<th>Day0</th>
<th>Day1</th>
<th>Day2</th>
<th>Day3</th>
<th>Day7</th>
</tr>
</thead>
<tbody>
<tr>
<td>C group</td>
<td>12.1 ± 1.5</td>
<td>17.8 ± 1.9</td>
<td>9.1 ± 1.4</td>
<td>9.4 ± 1.4</td>
<td>9.9 ± 1.3</td>
</tr>
<tr>
<td>NP group</td>
<td>9.5 ± 0.5</td>
<td>17.4 ± 2.4</td>
<td>10.3 ± 0.9</td>
<td>11 ± 0.8</td>
<td>11 ± 0.5</td>
</tr>
</tbody>
</table>

Discussion and Conclusion: As reported, after analgesia, normal rats develop delayed longlasting thermal hyperalgesia (1). In contrast, NP animals do not display hyperalgesia and show long duration analgesic effect on thermal sensitivity. The results confirm the efficacy of spinal MOR to relieve some NP components.

References:

14AP2-11

Amotriptyline activates GABAergic neurons in the dorsal horn of the spinal cord in rats

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Background and Goal of Study: Findings to date indicate that tricyclic antidepressants, such as amitriptyline, have an antinociceptive effect. It is supposed that descending inhibitory neurons are involved in the antinociceptive action of antidepressants. The mechanism whereby descending inhibitory neurons, including noradrenergic neurons, produce antinociception remains unclear. Recent electrophysiological studies have shown that noradrenaline activates GABAergic interneurons in the spinal cord, suggesting its role in mediating the antinociceptive effect. In the present study, we investigated whether amitriptyline activates GABAergic interneurons in the spinal cord using c-Fos protein as a marker for neuronal activation.

Materials and Methods: Adult male Wistar rats were administered 0 (control), 15, 30, 60 or 90 μg of amitriptyline intrathecally. After 4 hours, animals were anesthetized with intraperitoneal injection of pentobarbital and perfused with paraformaldehyde for fixation. The spinal cords were dissected at the lumbar level and frozen-sectioned. Sections were then stained for c-Fos protein using diaminobenzidine and the number of c-Fos positive cells was counted. Sections also double stained for c-Fos and glutamic acid decarboxylase (GAD; a rate-limiting enzyme for GABA synthesis) using fluorescent conjugated secondary antibodies.

Results and Discussions: Amitriptyline administration increased GAD positive cells in the dorsal horn of the spinal cord in a dose-dependent manner. The number of Fos positive cells per section was 40.8 ± 2.3 (mean ± standard error) in control group, whereas 89.2 ± 6.0 in 90 μg group. Amitriptyline-induced c-Fos protein expression was localized within the laminar I, II, III and IV. Analysis by double staining indicated that approximately 80% of c-Fos-positive cells were colocalized with GAD positive cells.

Conclusion(s): Results from the present study indicate that amitriptyline activates GABAergic interneurons in the dorsal horn of the spinal cord. Our finding suggests that GABAergic interneurons and their downstream effectors play at least a part in the antinociceptive action of amitriptyline in the spinal cord.

14AP3-1

Distinction of pain mechanisms in pregnant women with low back pain at the end of pregnancy

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Background and Goal of Study: Low back pain (LBP) in pregnancy is a common complaint causing substantial disability and cost (1). The etiology is not entirely clear. The aim was to differentiate pain mechanisms between LBP provokable by provocation maneuvers (i.e. musculoskeletal pain) and non-provokable pain and to compare with pain free controls.

Materials and Methods: After approval of the ethics committee 102 pregnant women (age 31.6 ± 1.0, 3rd trimester) were assigned to 3 groups using pain provocation maneuvers (34 provokable pain, 34 non-provokable pain, 34 pain free controls). Quantitative sensory testing for heat, cold, pressure and mechanical threshold was carried out by a blinded examiner in 3 dermatomes (forearm, T1; lower back, T11; pelvis, L1).

Results and Discussions:

<table>
<thead>
<tr>
<th></th>
<th>Pressure T11</th>
<th>Heat T11</th>
<th>Pressure L1</th>
<th>Heat L1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provok</td>
<td>2.73 ± 0.2*</td>
<td>37.66 ± 1.24</td>
<td>2.89 ± 0.3*</td>
<td>40.05 ± 1.5</td>
</tr>
<tr>
<td>NonProv</td>
<td>3.39 ± 1.5</td>
<td>39.35 ± 1.4</td>
<td>3.32 ± 0.3</td>
<td>41.35 ± 1.4</td>
</tr>
<tr>
<td>Control</td>
<td>3.68 ± 0.4</td>
<td>40.30 ± 1.4</td>
<td>3.50 ± 0.5</td>
<td>41.61 ± 1.3</td>
</tr>
</tbody>
</table>

Pressure pain threshold (kg) and heat pain threshold (°C) in T11(back) and L1 (ventral), mean ± 95% CI, n = 34/group.

Provokable LBP vs pain free control *p < 0.05
Provokable vs non-provokable LBP *p < 0.011 *p < 0.007
No group differences were found for mechanical and cold pain thresholds.

Conclusion(s): Thresholds for pressure and heat pain are highly significantly reduced in pregnant women with provokable LBP, but remain normal in pregnant women without provokable LBP and pain free women. Our results allow for the first time the distinction of sensitization of nociception in an important subgroup of pregnant women suffering from pain and provides the basis for further studies on mechanism based pain therapy.

References:

14AP3-2

Acute postoperative pain predicts chronic pain after breast surgery for cancer

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Background and Goal of Study: Postoperative pain may constitute a risk factor leading to the development of chronic pain few months after surgery. We hypothesized that the intensity of acute postoperative pain, documented by actual recorded VAS scores, as well as postoperative anagelics consumption, may predict chronic pain and the need for analgesics after breast surgery for cancer.

Materials and Methods: We retrospectively examined postop. pain scores and anagelics in 98 patients who underwent breast surgery for cancer and served as controls in 4 previous studies [1–4]. We averaged VAS scores at rest
and with movement: 1) during the first 9 postop. hrs, and 2) during postop. days 1 to 6. We also calculated the total opioids (parenteral morphine equivalent dose) and paracetamol consumed during the acute postop. period. These data (early and late postop. VAS, and analgesics) were compared between those patients who had chronic pain or those who needed analgesia, versus those who were pain free or did not need analgesia, 3 months later.

Results and Discussions: Demographics, type of surgery, or radio- or chemo-therapy did not differ. Patients with chronic pain had higher VAS scores at the first 9 postop. hours, but not from days 1–6. Patients needing analgesics at 3 mo. had higher VAS scores, as well as analgesic consumption postop. Analgesics at the acute postop. period, and prevalence of chronic pain at 3 mo. differed depending on the type of the placebo interventions used.

Conclusion: Early postoperative pain predicts chronic pain and need for analgesia after breast surgery for cancer.

References:

14AP3-3

nociceptive innervation of the sacroiliac joint-consequences for invasive treatments

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Background and Goals: A positive outcome of intra-articular infiltration with local anesthetics is used to confirm sacroiliac joint pain (1). However, current anatomical and histological knowledge concerning the nociceptive innervation of sacroiliac joint is insufficient to explain the efficacy of intra-articular application of local anesthetics, due to the use of unspecific histochemical visualisation techniques. Use of accurate methods for detection of nociceptors, such as antigen tagging of Calcitonin Gene-Related Peptide (CGRP), should provide better understanding of the nociceptive innervation of the Sacroiliac joint, and therefore explain the analgesic mode of action of intra-articular infiltration with local anesthetics.

Material and Methods: Anterior and intersosseus sacroiliac ligaments tissue of five human cadavers (3 male and 2 female, aged 61–91), were used to trace nerve fibres with primary antiseraum against CGRP (Chemicon International Inc., Temecula, catalog no. AB59923). Free-floating sections, 40 μm thick, were stained according to the avidin-biotin method.

Results: Immunohistochemical analysis of anterior and intersosseus sacroiliac ligaments showed CGRP-immunoreactive axons. Thick, wavy formed bundles, classified as myelinated fibres (Aβ-type), were observed in dense and loose connective tissue. The single nerve fibres, classified as unmyelinated (C-type) were classified as myelinated fibres (Aα- and Aβ-type), were observed in dense and loose connective tissue. Additionally, Pacini corpuscles were found in the intersosseous ligament, which contained immunoreactive free nerve endings.

Conclusions: Presence of CGRP immunoreactive fibres in anterior and intersosseus ligament, provide a base for pain originating from the sacroiliac joint. Invasive treatments for sacroiliac joint pain should reach the sacroiliac joint as well.

Reference:

14AP3-4

influence of psychosomatic and somatic chronic pain on patient's life quality and depression

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Background and Goal of Study: Complex Regional Pain Syndrome type I (CRPS I), is characterized by sensory, autonomic, motor and trophic disturbances in an extremity A variable progression has been recognized [1], but few data are available on the course of symptoms on the long term. We performed a 6–9 years follow up measurement on CRPS I patients participating in a RCT [2].

Materials and Methods: 47 CRPS I patients (33 female, 14 male; mean age 59 years (SD: 13.9)); median CRPS I duration in first study 109 days (IQR 80–168); upper (UE)/lower extremity (LE) 29/18) who participated in a RCT (1997–1999), were assessed using the impairment level Sum Score (ISS) [3], which comprised pain (VAS, McGill), temperature (infrared thermometer), volume (water displacement volumeters) and Active Range of Motion (AROM; universal goniometers) measurements. The Wilcoxon signed ranks test was used for analyses.

Results and Discussions: ISS data are presented in Table 1:

<table>
<thead>
<tr>
<th>UE RCT</th>
<th>UE follow up</th>
<th>LE RCT</th>
<th>LE follow up</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISS 11(9–18)</td>
<td>17(13–23)*</td>
<td>17.5(10.5–23)</td>
<td>18(1–6.5)</td>
</tr>
<tr>
<td>VAS 1(1–3.5)</td>
<td>6(1–6)*</td>
<td>4.5(1–8.25)</td>
<td>3.5(1–7.5)</td>
</tr>
<tr>
<td>McIlroy 3(–5)</td>
<td>5.5(–7)</td>
<td>3.5(–6.25)</td>
<td>3.5(1–6.25)</td>
</tr>
<tr>
<td>Temp. 2(1–3)</td>
<td>3(2–5)*</td>
<td>2.5(1–4.75)</td>
<td>4.5(1–6.5)</td>
</tr>
<tr>
<td>Volume 1(1–2)</td>
<td>3(1–3)</td>
<td>1.5(1–2.25)</td>
<td>1(1–1.25)</td>
</tr>
<tr>
<td>AROM 3(2–5)</td>
<td>2(2–4)</td>
<td>3(3–4.25)</td>
<td>1(1–3.25)*</td>
</tr>
</tbody>
</table>

ISS range 5–50 points; Data in medians (IQR); * p < 0.01

A significant ISS deterioration was found for upper extremity CRPS, due to higher levels of VAS-pain. Lower extremity CRPS I improved significantly on AROM.

Conclusions: Complaints on impairment level for upper extremity CRPS I may increase after 6–8 years, related to a relapse in pain intensity. Long term clinical follow up seems advisable for CRPS I patients in order to prevent deterioration of complaints in the course of time.

References:

14AP3-5

Long term follow up of impairments of Complex Regional Pain Syndrome type I

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Background and Goal of Study: Complex Regional Pain Syndrome type I (CRPS I), is characterized by sensory, autonomic, motor and trophic disturbances in an extremity A variable progression has been recognized [1], but few data are available on the course of symptoms on the long term. We performed a 6–9 years follow up measurement on CRPS I patients participating in a RCT [2].

Materials and Methods: 47 CRPS I patients (33 female, 14 male; mean age 59 years (SD: 13.9)); median CRPS I duration in first study 109 days (IQR 80–168); upper (UE)/lower extremity (LE) 29/18) who participated in a RCT (1997–1999), were assessed using the impairment level Sum Score (ISS) [3], which comprised pain (VAS, McGill), temperature (infrared thermometer), volume (water displacement volumeters) and Active Range of Motion (AROM; universal goniometers) measurements. The Wilcoxon signed ranks test was used for analyses.

Results and Discussions: ISS data are presented in Table 1:
Background and Goal of Study: Common disease pathways based on similarities in clinical features have been suggested for Complex Regional Pain Syndrome type 1 (CRPS1), Fibromyalgia (FM), and repetitive strain injury (RSI) (1). To evaluate clinical manifestations of these disorders, the test-retest reliability of the TREND Symptom Inventory (TSI), measuring complaints on sensory, motor, autonomic, visceral and spinal domains, was assessed in CRPS1 and FM patients.

Materials and Methods: The overall and domain item reliability, calculated with Intra Class Coefficient (ICC), was calculated for 27 CRPS1 and 45 FM patients. Student-t test and Mann-Whitney U test were used to compare groups.

Results and Discussions: Patient characteristics, ICC’s and comparisons are shown in Table 1:

<table>
<thead>
<tr>
<th>CRPS1 (N = 27)</th>
<th>FM (N = 45)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender Male/female</td>
<td>5/22</td>
</tr>
<tr>
<td>Age (year)</td>
<td>54.0 (16.43)*</td>
</tr>
<tr>
<td>Duration complaints (year)</td>
<td>2.6 (2.26)*</td>
</tr>
<tr>
<td>Age (year)</td>
<td>0.95 (0.058)</td>
</tr>
<tr>
<td>Domain ICC(2)</td>
<td>0.88-0.92</td>
</tr>
<tr>
<td>Sensory(3)</td>
<td>0.67 (0.60-0.73)*</td>
</tr>
<tr>
<td>Motor(3)</td>
<td>0.64 (0.52-0.72)*</td>
</tr>
<tr>
<td>Autonomic(3)</td>
<td>0.66 (0.52-0.74)*</td>
</tr>
<tr>
<td>Visceral(2)</td>
<td>1.41 (1.2-1.6)*</td>
</tr>
<tr>
<td>Spinal(2)</td>
<td>0.67 (0.67-1.67)*</td>
</tr>
</tbody>
</table>

Table 1: * mean (SD), † min-max domain reliability, ‡ median domain complaints (IQ), higher scores correspond to higher levels of complaints p < 0.05.

Conclusion(s): The TSI questionnaire is a reliable instrument to evaluate similarities and differences between CRPS1 and FM. Although significant differences between CRPS1 and FM were found in sensory, autonomic visceral and spinal complaints, a substantial part of both patient groups reported to have complaints in each of these domains.

Reference:

14AP3-7
Study of cortisol and the pituitary-adrenal function in our population of fibromyalgia patients

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Background and Goal of Study: Current understanding of the pathophysiology of the fibromyalgia (FM) suggests that dysfunction of central pain regulation and neuroendocrine mechanisms are probably important factors (1,2). We decided to evaluate the alteration of the pituitary-adrenal function in our population of FM patients.

Materials and Methods: We included all women newly referred for family physician or rheumatologist consultation in a 18-month period who met the 1990 American College of Rheumatology (ACR) criteria for the diagnosis of FM. We recorded demographic data and clinical characteristics: body mass index (BMI), duration of pain, number of tender points, Lettinnen test, Fibromyalgia Impact Questionnaire (FIQ) and visual analog scales for pain, disturbed sleep, fatigue and current health status. Pituitary-adrenal function were evaluated with insulin-induced hypoglycemia. Blood sampling was performed for cortisol, adrenocorticotropic (ACTH), insulin and glycerina at basal, 30, 60 and 90 minutes.

Results and Discussion: We evaluated 98 patients but only 12 (12.24%) were finally diagnosed of FM. The final diagnoses for these 86 (87.76%) excluded patients were: low back pain (18), musculoskeletal pain no FM (35), depression (14), arthralgia (13), shoulder pain (8). There were no significant differences between the means of demographic data and BMI, for FM patients FIQ was 77.22 ± 10.38, duration of pain 40.80 ± 24.13, number of tender points 13.81 ± 2.96, Lettinnen test 13.3 ± 1.82 and FIQ 77.22 ± 10.38. The area under the curve (AUC) in FM patients respect to control patients were (mean ± SEM) for cortisol 72.05 ± 2.45 vs 25.74 ± 3.06; for ACTH 70.87 ± 12.24 vs 131.55 ± 31.38; for hypoglycemia 53.78 ± 5.06 vs 42.58 ± 3.87 but there were not significant.

Conclusions: We have observed a disturbing inaccuracy in the diagnosis of FM by referring physicians. We have found disturbances but not significant in pituitary-adrenal axis in FM patients.

References:

14AP3-8
Effect of single high dose of spinal clonidine under normal and neuropathic conditions

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Background: Spinal α2-adrenoceptor agonist, clonidine (CLO), is widely used for acute and chronic pain management, particularly to relieve neuropathic pain (NP). However, both continuous administration and high dose intravascular injection might induce paradoxical pain and hyperalgesia (1,2). The study evaluates the effect of CLO single high dose under normal (C) controls and NP conditions.

Materials and Methods: Adult male Wistar rats, C (n = 6) and established NP (n = 6) produced by partial ligation of the right sciatic nerve were implanted with lumbar intrathecal (LT) catheter. After recovery, animals received it CLO 300 μg (1). Thermal and mechanical hyperalgesia were evaluated by paw withdrawal latency (PWL, in sec) from radiant heat and by paw withdrawal threshold (PWT, in g) to application of electronic von Frey filament before CLO and at day(1,20,24,26,h), day2 and day7. Statistical analysis used repeated t-test, p < 0.05 was significant.

Results: Baseline PWL was 12.4 ± 0.7 sec in C and 9.7 ± 1.7 sec in NP (p < 0.05). Spinal CLO injection increased significant thermal hyperalgesia, PWL 10 ± 1.4 sec, at day1 and day2 in C group but not in NP rats. Baseline PWT was 123 ± 19 g in C group and 84 ± 40 g (ligated paw)/141 ± 30 g (contralateral paw) in NP rats. Spinal CLO significantly decreased PWT at day1 in C rats (101 ± 10 g, p < 0.05 with baseline) and decreased contralateral paw PWT only from day1 to day7 while PWT of ligated paw were not affected in NP animals.

Discussion and Conclusion: In contrast with normal animals which display delayed thermal and mechanical hyperalgesia, NP do not develop hyperalgesia. These findings support the clinical use of spinal CLO, even at high doses, to relieve NP (3).

References:

14AP3-9
Changes in pain perception threshold and chronic pain outcome following sternotomy

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Background and Goal of Study: Chronic pain has an incidence of approximatively 30% in patients following cardiac surgery (1). Patients undergoing sternotomy are prone to develop thoracic neuropathic injury, and consequent areas of chest wall dysaesthesia (2). The aim of this study was to determine whether changes in chest wall sensitivity are associated with the development of chronic post sternotomy pain.

Materials and Methods: With institutional ethical approval, and having obtained written informed consent, patients undergoing elective coronary artery bypass graft surgery, were studied. Pre-operatively, at 5 days, and at 2 months after surgery we measured anterior chest thresholds to sensation (ST), pain perception (PPT), and pain tolerance (PTT), 2.5 cm both sides of midline at the level of T4, using electrical stimulation (100 Hz, square wave pulse, duration 0.2 msec). The presence of chronic post sternotomy pain (CPS) at 2 months was determined by a positive response to the question; “have you had chest pain within the last 2 weeks, which is not angina, and which you believe arose as a result of your surgery?”

Results and Discussion: Seven male patients (mean age 63.3 years, SD 10.1) are included in this interim analysis. The absolute change in PPT from pre-operation to 2 months post-op was calculated for each patient. Patients were grouped according to the presence (n = 4), or absence (n = 3) of CPS. The mean (SD) chPPT (ma) for each group was calculated, as shown in the table:

<table>
<thead>
<tr>
<th>No CPS (n = 3)</th>
<th>CPS (n = 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>chPPT Left Chest</td>
<td>0.2 (0.11)</td>
</tr>
<tr>
<td>chPPT Right Chest</td>
<td>−1.65 (2.77)</td>
</tr>
</tbody>
</table>

Conclusion(s): These preliminary data appear to indicate that PPT increases in patients who develop CPS, compared with those who do not, and that this increase is most pronounced over the left chest.

References:
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14AP4-1
Effectiveness and safety of catheter related postoperative pain management – a survey of 18925 consecutive patients between 1998 and 2006

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Background and Goal: Optimal treatment regimes in postoperative pain therapy are still a matter of debate. The aim of this study was to investigate the efficacy, adverse effects and safety in catheter related postoperative pain management under "real life conditions" by analysing the patients treated by an acute pain service.

Methods: We analysed prospectively raised data documented by the acute pain service team in a computer based system concerning the quality of analgesia, adverse effects, and risks of the special pain management techniques in an university hospital. Adverse events were validated and evaluated in detail by written consultations from neurologists, surgeons and radiologists.

Results: We obtained data of 18925 patients visited in the postoperative period between 1998 and 2006. 14.223 patients received patient controlled epidural analgesia, 1.591 patient controlled intravenous analgesia, 1.737 continuous axillary or interscalene plexus blockade and 1.374 continuous femoral axillary blockade. Mean pain dynamic pain scores (VAS 0–100) with patient controlled epidural analgesia were 16.4 (SEM 0.62) or less during the observation period of five postoperative days. This was significantly lower (P < 0.05) than dynamic pain scores of patients with patient controlled intravenous analgesia (30.4; SEM 5.06 or less) and continuous peripheral nerve blockades (24.7; SEM 0.47 or less).

In 8.3% of these 18925 patients the initial pain strategy failed because of insufficient pain relief, occlusion or dislocation of the catheter whereupon an alternative treatment was necessary. Severe complications that implies additional treatment, were observed in 26 cases (0.14%). One patient developed an epidural hematoma, one patient suffered from epidural abscess after insertion of an epidural catheter.

Conclusion: Pain treatment with catheter related regimens, observed by an acute pain service in the early postoperative period was effective and practicable. However, adverse effects and complications are not negligible supporting supervision of these techniques by an acute pain service.

References:

14AP4-2
An effect of non-opioid analgesics in addition to continuous thoracic epidural analgesia on postoperative pain in abdominal surgery

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Background and Goal of Study: Effect of non-opioid analgesics as supplement to continuous epidural analgesia (CEA) on postoperative pain relief is unclear. The goal of our study was to assess the effect of concomitant use of thoracic CEA and ketorolac or ketorolac and paracetamol on postoperative pain in abdominal surgery.

Materials and Methods: In a randomized controlled study, 75 patients underwent surgery for abdominal cancer lesions (epidural 0.75% ropivacaine and general anaesthesia). Postoperatively, all patients received thoracic CEA with the mixture of 0.12% ropivacaine and 2 mg/ml fentanyl (4–12 ml/hr). All patients were randomized to receive either CEA alone (group CON, 54 ± 13 yrs) or 30 mg ketorolac i.m. every 8 hrs (group KET, 59 ± 11 yrs) or 30 mg ketorolac i.m. every 8 hrs and 1 g paracetamol i.v. every 6 hrs (group PAR, 53 ± 12 yrs). The rescue patient-controlled analgesia was provided with morphine i.v. Visual analog scale (VAS) in coughing at 3, 6, 12, 18, and 24 hrs of the postoperative period, the consumption of ropivacaine-fentanyl solution and morphine during 24 hrs and the rates of pruritis, nausea, and vomiting were recorded. Data were analyzed by one-way ANOVA followed by Tukey’s post hoc test and χ² test accordingly.

Results and Discussions: The VAS score in the CON group was higher than in the KET group, while VAS score in the KET group was higher than in the PAR group at all time points during the study period. However, significant differences were found only between the CON group and the PAR group at 6, 12, 18, and 24 hrs. The consumption of ropivacaine and morphine in the CON group was greater compared with the KET and PAR groups (p < 0.05). The incidence of adverse effects did not differ between the groups.

Conclusion: The addition of both ketorolac and paracetamol to thoracic CEA with ropivacaine-fentanyl solution improves postoperative pain control and reduces the analgesic consumption after abdominal surgery.

14AP4-3
A comparative study on the analgesic effect of patient controlled morphine, pethidine and tramadol for postoperative pain management after abdominal hysterectomy

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Background and Goal of Study: This prospective, randomized, double-blind study, was designed to compare the analgesic effectiveness and side effects of intravenous patient controlled (IV-PC) morphine, pethidine and tramadol for postoperative pain management after abdominal hysterectomy.

Materials and Methods: Following Ethics Committee approval and informed patient consent 90 ASA I or II patients undergoing abdominal hysterectomy were allocated randomly to receive IV-PC morphine (M), pethidine (P) or tramadol (T) for postoperative analgesia. Twenty minutes before the end of surgery, all patients received a standardised loading dose of morphine (0.1 mg kg⁻¹), pethidine (1 mg kg⁻¹) or tramadol (1 mg kg⁻¹) for postoperative analgesia in a double-blind fashion. They were then allowed to use a patient-controlled analgesia (PCA) device giving boluses of morphine (0.02 mg kg⁻¹), pethidine (0.2 mg kg⁻¹) or tramadol (0.2 mg kg⁻¹). Pain, sedation and nausea scores, cumulative analgesic consumption, the number of patient requiring rescue fentanyl, time to recovery, and any side effects were recorded after recovery and at 1, 2, 6, 12 and 24 hours after the start of PCA.

Results and Discussions: The total analgesic consumptions were 25.7 ± 9.5 mg for morphine, 266 ± 90 mg for pethidine and 341 ± 111 mg for tramadol in 24 hour. The ratio of morphine/pethidine/tramadol dose sizes, used for postoperative pain management, was a ratio 1/10/13, respectively. Twenty-four patients (26.6%); four in group M (13.3%), six in group P (20%) and fourteen in group T (46.6%), complained of pain during the first twenty-four hour after the PCA therapy. The number of patients requiring rescue fentanyl and average supplementary fentanyl dose used were significantly higher in T group than in M and P groups (p < 0.05). However, there was no difference between group M and P.

Conclusion(s): In patients, who underwent abdominal hysterectomy, patient controlled morphine and pethidine has provided better pain control with similar side-effects than tramadol, perhaps making them better suited for IV-PCA. Thus, tramadol should be reserved for those patients, in whom morphine or pethidine is judged inappropriate because of high rescue fentanyl requirement.

14AP4-4
Opioids or NSAID in postoperative analgesia after total hip arthroplasty? Comparison of adverse events

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Background and Goal of Study: NSAID and opioid analgetics have both their own spectrum of adverse events. Paracetamol has the safest profile but is not for enough for pain relieving after hip arthroplasty. This study tries to assess the best analgesic regimen for those patients.

Materials and Methods: After Hospital Ethics Committee approval 90 patients who underwent hip arthroplasty under spinal anaesthesia were randomized in two groups: Group O (n = 45) received Tramadol and Group NSAID (n = 45) received iv Diclofenac or Ketonolac as supplementary analgesic (all pts. received Paracetamol iv 4 g/day for at least 5 days, gastric protection therapy and DVT prophylaxis with Enoxaparine). We assessed the quantity of transfused blood, the incidence of vomiting, the increase in creatinine serum level and the quality of sleep during the first five postoperative days and the incidence of digestive hemorrhage during the first 42 days after surgery.

Results and Discussions: The groups did not differ regarding the demographic data, blood loss during surgery and postoperative sedation and analgesia (VRS – none or mild for >90% of time). The NSAID group received more blood during the first 5 postoperative days (p < 0.05), have a lower incidence of vomiting episodes (p < 0.01) and an increased in creatinine levels not statistically significant. The quality of sleep was better in the group O (p < 0.01). In group O no digestive hemorrhage was recorded; in group NSAID 2 patients were readmitted with digestive hemorrhage and 2 patients experienced this during the first 10 days after surgery.
Conclusions: We consider it advisable to avoid NSAID in these patients because of demonstrated increase in postoperative blood loss and the increased risk of gastrointestinal bleeding. A regimen of iv. paracetamol and a weak opioid as Tramadol provides good pain relief with just one inconvenient side effect: nausea and vomiting.


14AP4-5
Intranasal tramadol versus intravenous tramadol in patients that have undergone a laparoscopic cholecystectomy
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Anesthesiology, Hospital Universitari de Tarragona Joan XXIII, Tarragona, Spain

Introduction: The goal of the study was to compare intranasal tramadol with intravenous tramadol in patients that have undergone a laparoscopic cholecystectomy.

Materials and Methods: With the approval of the ethical committee of our hospital, the “Agencia Española del Medicamento” and the informed consent of patients, we did a randomised double-blind controlled study with 30 patients scheduled for laparoscopic cholecystectomy.

Patients were divided into two groups: group IV, which received intravenous tramadol (100 mg) and normal saline intranasal (2 mL) and group IN, which received intravenous normal saline (100 mL) and tramadol intranasal (100 mg).

Exclusion criteria were patients younger than 18 or older than 65, with liver, kidney or respiratory chronic diseases, history of allergy to opioids, nasal mucosa disease, pregnancy, etc.

All patients were assessed by an ENT specialist to evaluate the nasal mucosa status before going to OR and the day after surgery. After surgery, patients were admitted into the post-anaesthetic care unit. Pain intensity was measured by using visual analog scale (VAS) and categorical pain scale at rest and coughing. When patients referred VAS > 3 or moderate pain, analgesia was started. Other variables recorded were arterial pressure, heart rate, breathing rate, Ramsay’s sedation scale, nasal and systemic side-effects. The day after surgery patients answered a satisfaction questionnaire.

Statistical tests were Mann-Whitney U and Chi-square or Fisher’s test. Statistical significance were p < 0.05.

Results and Discussions: No demographic differences were found unless in sex. Thirteen patients in each group said that analgesia had been good or excellent. Seven patients in IV group and ten in IN group demanded rescue analgesia. However, ten in IV group and twelve in IN group received the same technique of general anesthesia (GA).

Patients that have undergone vertical bypass (VBG). All of them received the same technique of general anesthesia (GA).

Conclusion: Intranasal tramadol produces analgesia without significant side-effects.

14AP4-6
The postoperative analgesic efficacy of intraperitoneal tramadol compared to intravenous tramadol to normal saline for laparoscopic cholecystectomy
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Background and Goal of Study: The aim of this study was to compare the postoperative analgesic efficacy of intraperitoneal (ip) tramadol with intravenous (iv) tramadol or normal saline in patients undergoing laparoscopic cholecystectomy.

Materials and Methods: 60 patients undergoing laparoscopic cholecystectomy were randomized into three groups in a double-blind manner via coded syringes. The patients received either 100 mg tramadol in 20 mL iv twice (predissection and postdissection) in the group ipT, or 100 mg tramadol twice in group ivT or normal saline in group C (control group). All patients received a standard anesthetic protocol and postoperative analgesia with PCA morphine. Postoperative parietal (pNRS) and deep (dNRS) numeric rating pain scores, 1 h and 24 h morphine consumption, and side effects (opioid-related symptom distress scale, SDS score) (1) were recorded. For statistical analysis, ANOVA, Kruskal-Wallis, Chi-square, paired t test, student t tests were used.

Results and Discussions: No significant differences were noted between the three groups at any of the time points. The mean pain scores at 1 h and 24 h were 3.2 and 2.9, respectively, which were comparable to the pain scores in the control group (1.8 and 1.2, respectively). The mean morphine consumption at 1 h and 24 h was 0.7 and 0.6 mg, respectively, which were comparable to the consumption in the control group (0.5 and 0.4 mg, respectively). The side effects were minimal and comparable in all three groups.

Conclusion: Intraperitoneal tramadol was as effective as intravenous tramadol or normal saline in reducing postoperative pain.

14AP4-8
Effectiveness of intraperoperative bolus IV administration of three different doses of morphine for postoperative analgesia in remifentanil-based anesthesia for major surgery
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Background and Goal of Study: To evaluate the postoperative analgesic efficacy of morphine after intraperoperative analgesia based on remifentanil.

Materials and Methods: We studied 75 patients ASA I, II underwent major operations under general anesthesia using remifentanil for intraoperative analgesia. Patients were divided randomly into three groups with comparative demographic characteristics. A morphine bolus of 0.2 mg kg⁻¹ (A Group, n = 25) or 0.25 mg kg⁻¹ (B Group, n = 25) or 0.3 mg kg⁻¹ (C Group, n = 25) was administered IV 30 min before the end of operation. Pain evaluation was assessed 5, 10, 20, 30, 45 and 60 min postoperatively using the numerical pain scale scores of 0–10. Complementary IV morphine of 2 mg was used depending on the need. We recorded: a) the postoperative pain level, b) the need for complementary morphine, c) the modified Aldrete scale, d) the adverse reactions. Statistical analysis was done using the ANOVA test. Values of p < 0.05 were accepted as statistically significant.

Results and Discussions: There were no demographic differences between all groups. Postoperative analgesia was ineffective in all three groups except in three patients of group C who experienced adequate analgesia (p = NS). Mean pain level comparison was statistically significant between all groups with the highest pain levels noted in group A (p < 0.05). Statistically significant differences in the mean pain level between the three groups were noted at 20 min (p < 0.001), 30 min (p < 0.002), 45 min (p < 0.001) and 60 min (p < 0.004). The complementary use of morphine was 10.6 ± 3.5 mg in group A, 9.3 ± 1.9 mg in group B and 7.8 ± 3.5 mg in group C (p < 0.004). The comparison between the values of the three groups using the modified Aldrete scale did not yield significant differences. No statistical differences were found in the side effects in each group.

Conclusion: When intraoperative analgesia is based on remifentanil, administration of morphine (0.2–0.3 mg kg⁻¹) 30 min prior to the end of major surgery cannot provide adequate immediate postoperative analgesia.

14AP4-9
Intra-peritoneal bupivacaine alone or in combination with morphine in patients undergoing vertical bypass gastropasty
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Background and Knowledge: Intra-peritoneal instillation of local anaesthesia and morphine has been used to alleviate post-operative pain in laparoscopic surgery. Controversy exists about the efficacy of this technique.

Methods: We studied 48 patients scheduled for Vertical Bypass Gastropasty (VBG). All of them received the same technique of general anesthesia (GA).
Patients were randomly allocated into four equal groups. They received equal volumes of the test drug instilled in the peritoneal cavity at the end of laparoscopy, 50 ml of normal saline (Group S); 50 ml of bupivacaine 0.25% (Group B); 50 ml of bupivacaine 0.25%, plus morphine 40 mcg. kg⁻¹ (maximum of 5 mg) Group M or (Group D) patients received the same regimen as Group M in addition, they received 75 mg intra-muscular dicyclonphenac after induction of general anaesthesia. Wound edges were infiltrated with 10 ml bupivacaine 0.25% in all patients. Morphine 25–50 mcg. kg⁻¹ was given intravenously every 10 min as a rescue analgesic to control postoperative pain in Post Anesthesia Care Unit (PACU). Post operative pain was evaluated using Visual Analogue Scale (VAS), vital signs, and morphine consumption, and time to receive rescue analgesia were measured at different intervals. The incidence of post-operative complications (respiratory depression, oxygen desaturation, nausea and vomiting) was recorded as well as hospital stay.

**Results:** There was significant decrease in VAS, HR, MBP and morphine consumption in Groups M & D when compared to Groups S & B on admission and on discharge from PACU. There were significant decrease in time to receive rescue analgesia as well as significant reduction in hospital study in Groups M and D when compared to Groups S and B. However, there was no significant difference between Group S & B regarding the same parameters.

**Conclusions:** The presented technique is safe and easy to use with good postoperative morphine sparing analgesia, excellent patient satisfaction and short hospital stay.

**14AP4-10**

**Parecoxib is equal effective to morphine for postoperative pain management after nasal septoplasty**

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**Background and Goal of Study:** Parecoxib is an injectable cyclooxygenase-2 inhibitor which has proved effective analgesic after laparotomy surgery. The purpose of the study was to compare the analgesic efficacy of parecoxib with that of morphine in nasal septal surgery under total intravenous anaesthesia with propofol and remifentanil.

**Materials and Methods:** Fifty ASA I patients scheduled to undergo nasal septoplasty were randomized to receive either parecoxib (P) 40 mg (n = 25) or morphine (M) 0.05 mg/kg (n = 25) after induction of anaesthesia with propofol 1–1.5 mg/kg and remifentanil 0.05 μg/kg/min. All patients received epidural ropivacaine 4 mg and lidocaine 0.5 mg/kg during induction. Cis-atracurium was used for tracheal intubation. Anaesthesia was maintained with a propofol and remifentanil infusion. All patients received local anaesthesia at the operative site (lidocaine 2% with epinephrine).

Postoperative pain assessment was made on a visual analog scale (VAS; 0 = no pain and 10 = worst pain) at 0, 30 and 60 min after emergence from anaesthesia. During the postoperative period, parecoxib was administered for analgesia at the patient's request. The total paracetamol consumption by each patient within 24 h was determined and noted. Patients were questioned the next morning about the occurrence of any side effects. Statistical analysis was performed on unpaired Student’s t-test and χ²-test.

**Results:** There were no significant differences between the two groups with respect to age, weight and duration of surgery. All patients in group M and 23/25 in group P had no pain (VAS score = 0) during the 1st postoperative hour. Fourteen patients (56%) in each group requested no analgesia (they felt no pain) and 11 patients (44%) requested additional analgesia because of moderate pain during the first 24 hours. There were no differences between the two groups in the total paracetamol consumption and in the time to first analgesic request. No side effects were observed.

**Conclusion:** As evaluated in this study, parecoxib 40 mg is at least as effective as morphine 0.05 mg/kg for the management of postoperative pain after nasal septum surgery.

**Reference:**


**14AP5-1**

**Preemptive Gabapentin for postoperative pain relief in gynaecological surgery**

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**Background and Goal of Study:** Gabapentin (G) has been suggested to be beneficial in the management of acute and chronic pain. However, the data about its effectiveness for improving postoperative pain control remains controversial (2). The aim of this study was to determine the preemptive use of G for postoperative pain relief and fentanyl (F) consumption following hysterectomy.

**Materials and Methods:** The 80 patients (ASA I-II, aging 45–65) were randomized to receive either oral placebo (group P, n = 40) or gabapentin (group G, n = 40) 1200 mg two hours prior to induction of anaesthesia. Anaesthetic technique was standardised. After surgery were given F 40 mg/kg/h i.v. continuously and on demand bolus dose of F 20 mg/kg i.v. with the lock-out time 15 min. Assessments of postoperative pain included visual analogue scale (VAS) scoring for pain at 1, 4, 8, 12 and 24 hr and F consumption during 24 hr after surgery. Side effects were controlled.

**Results:** The VAS scores were lower in the G group on average: at 1 hr by 5% (p < 0.05), at 4 hr by 33% (p < 0.05), at 8 hr by 16% (p < 0.05), at 12 hr by 16% (p < 0.05) and at 24 hr by 5% (p < 0.05). F consumption was less in G group (by 9.5%, p < 0.05). G was well tolerated. There were no differences in the incidence of side effects.

**Conclusion:** Gabapentin given preoperatively decreased pain scores and fentanyl consumption in the first day after abdominal hysterectomy.

**References:**


2. Fassoulaki A. et al., EJA, 2006; 23(2), 136–141.

**14AP5-2**

**Preemptive analgesia with paracetamol in postoperative analgesia for abdominal surgery**

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**Background and Goal of Study:** Balanced analgesia usually includes non- opioid analgesics. Paracetamol does not increase the risk of hemorrhagic complications, that is important in major surgery for malignancies. Thus, the goal of our study was to assess the effect of single dose of paracetamol for preemptive analgesia after abdominal surgery with perioperative epidural analgesia (EA).

**Materials and Methods:** In a randomized, double-blind study, 50 patients underwent surgery for abdominal or cancer lesions (epidural 0.75% ropivacaine and general anaesthesia). All patients were randomized to receive either 1 g intravenous paracetamol (group PAR, 59 ± 13 yrs) or placebo (group PLB, 61 ± 9 yrs) 30 min prior to incision. Postoperatively, all patients received continuous EA with 0.25% ropivacaine (10–15 mg/hr). In cases when visual analog scale (VAS) in coughing ≥40, fentanyl (0.05 mg) was added as an epidural bolus. Fentanyl consumption (mg), time of first fentanyl injection (hr), VAS at 2, 3, 6, 12, 18, and 24 hrs, and nausea rate were recorded. Data (mean ± SD and relative frequencies) were analyzed by Student’s t-test and χ² test.

**Results and Discussions:** Data are shown in the table:

<table>
<thead>
<tr>
<th>Group</th>
<th>PAR</th>
<th>PLB</th>
</tr>
</thead>
<tbody>
<tr>
<td>p</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender (M/F)</td>
<td>17/8</td>
<td>11/13</td>
</tr>
<tr>
<td>Ropivacaine (mg)</td>
<td>310 ± 62</td>
<td>304 ± 51</td>
</tr>
<tr>
<td>Fentanyl (mg)</td>
<td>0.13 ± 0.06</td>
<td>0.11 ± 0.05</td>
</tr>
<tr>
<td>First fentanyl (hr)</td>
<td>9.3 ± 7.8</td>
<td>7.8 ± 5.6</td>
</tr>
<tr>
<td>Nausea (%)</td>
<td>13 / 42</td>
<td>40 / 40</td>
</tr>
</tbody>
</table>

There were no significant differences in VAS score at any time-point during the 24 hrs of the study period (p > 0.35). The nausea rate only had the explicit tendency to decrease in the group PAR that could partly be caused by the greater proportion of females in group PLB.

**Conclusion:** The use of 1 g of paracetamol as a single intravenous preemptive dose in abdominal surgery with perioperative epidural analgesia does not reduce the analgesic consumption and the intensity of pain in the postoperative period.

**14AP5-3**

**Safety and effectiveness of acute post-surgical pain management: observational database of 2836 patients**

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**Background Goal of Study:** The absence of clearly, well defined, and widely accepted outcome indicators of Acute Postoperative Pain (APP) Management, makes difficult to assess the effectiveness of our clinical daily practice and impedes benchmarking and improvement (1). We defined indicators of outcome to assess the treatments employed in APP and to evaluate our results comparing them with extracted external data of the literature review (2).
Methods: A form in the computerized Clinical Informatics Medical Chart of our Hospital (HP Doctor) was elaborated to record daily follow-up variables, previously defined, of patients controlled by the Acute Pain Unit (APU). With semester regularity the data of 4 groups of outcome indicators are analysed.

Results: We classified the indicators in 4 blocks, Case – mix (5), Effectiveness (7), Safety (8) and Patient’s Satisfaction (1). We present the data of 2836 patients, all of whom were treated in the APU from May 2004 to December 2006. We present 19 indicators, among them: Average Time follow-up 3.06 days (1–12 days), Effectiveness (Patient with numeric Pain Scale Rate (NRS) < 3 with adverse events solved or without adverse events) 91%. Severe Pain (7), Safety (6) and Patient’s Satisfaction (1).

Conclusions: The existence of a large sample observational database, facilitates the knowledge of treatments that really work in APP management.

References:

14AP5-4
The effect of patient-controlled epidural analgesia on cytokine response after gastrectomy

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Background and Goal of study: The postoperative period is associated with the increased production of cytokines, which augments the sensitivity to pain (1). Epidural analgesia might reduce the postoperative stress response and influence the immune function (2). This study evaluated the effect of patient-controlled epidural analgesia (PCEA) on the cytokine response, compared with patient-controlled intravenous analgesia (PCA) after gastrectomy.

Materials and Methods: Twenty-nine patients undergoing gastrectomy were randomly assigned to one of two postoperative pain management techniques: PCEA (fentanyl 15 μg/ml) or PCA (fentanyl 3 μg/ml in 0.1% ropivacaine). Postoperative pain was assessed at rest and during coughing using the visual analog scale (VAS). The plasma concentrations of the tumor necrosis factor (TNF-α), interleukin (IL)-1, IL-6, IL-8, IL-1ra, IL-10, and IL-2 were assessed before administering anesthesia and 6, 24, and 48h after surgery. Data were analyzed with t-test, repeated measures of ANOVA and Bonferroni test. Results and Discussions: The patients in the PCEA group showed lower VAS pain scores during 72h after surgery (P < 0.05), compared with the patients in the PCA group. There were no changes in the levels of TNF-α and IL-2 between the two groups at all times examined. In both groups, the levels of IL-1, IL-6, IL-8, IL-1ra, and IL-10 increased after surgery (each group, P < 0.05), but there were no significant differences between the two groups.

Conclusions: These results suggest that PCEA has no added influences on the cytokine responses after gastrectomy.

References:

14AP5-5
Esmolol decreases the postoperative morphine consumption in septorhinoplasty

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Background and Goal of Study: Intraoperative use of esmolol may attenuate intraoperative nociceptive stimuli and influence the depth of anaesthesia. Esmolol may also have anxiolytic activity and reduce the anxiolytic consumption (1).

Materials and Methods: We studied 60 patients (30 pts receiving esmolol (E) + R), 30 pts receiving placebo + remifentanil (P + R) undergoing septorhinoplasty. Mean blood pressure (MBP), heart rate (HR), BIS value and total remifentanil consumption were recorded. After surgery, the patients whose VAS score were >3 received i.v. morphine by a patient-controlled analgesia device. VAS score, effective analgesia time and total morphine consumption were recorded. T-tests and χ² tests were used for statistical analyses.

Results and Discussions: Data (mean ± SD) are shown in the table.

<table>
<thead>
<tr>
<th></th>
<th>E (n=30)</th>
<th>R (n=30)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAS 0th minute</td>
<td>2.38 ± 1.59</td>
<td>3.50 ± 1.76</td>
<td>0.004</td>
</tr>
<tr>
<td>VAS 20th minute</td>
<td>3.68 ± 1.56</td>
<td>4.81 ± 2.19</td>
<td>0.001</td>
</tr>
<tr>
<td>Effective analgesia time</td>
<td>48.92 ± 1.35</td>
<td>50.44 ± 0.78</td>
<td>0.093</td>
</tr>
<tr>
<td>Total remifentanil</td>
<td>0.83 ± 0.49</td>
<td>1.58 ± 0.78</td>
<td>0.001</td>
</tr>
<tr>
<td>Total morphine</td>
<td>7.13 ± 8.41</td>
<td>12.90 ± 6.69</td>
<td>0.001</td>
</tr>
<tr>
<td>BIS values</td>
<td>81.59* 43.83</td>
<td>80.78* 42.49</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Conclusion(s): Intraoperative use of esmolol: 1) do not influence the depth of anaesthesia; 2) decrease the total morphine consumption in the postoperative period.

Reference:

14AP5-6
The use of pre-emptive analgesia in major reconstructive orthopaedic surgery lizarov method: the gabapentin effect

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Background and Goal of Study: Gabapentin(G) is an anticonvulsant structurally related to the neurotransmitter γ-aminobutyric acid (GABA). Preventing the initial neural cascade could lead to long-term benefits by eliminating the hypersensitivity produced by noxious stimuli. The aim of the study was to evaluate the pre-emptive effects of G on postoperative pain and morphine requirement in major reconstructive orthopaedic surgery (MROS). The hypothesis tested was that premedication with gabapentin diminish morphine consumption.

Materials and Methods: Forty (40) patients, ASA I-II, aged 24–56, who were scheduled to undergo MROS after traumatic injury using the lizarov method, were recruited in this randomized double – blind controlled trial. They were assigned into two groups. They either received 800 mg of gabapentin per os (Group G) or placebo (Group P) 60 minutes prior to the operation. Patients were given access to a PCA device set to deliver 1–mg boluses of intravenous morphine (M) with a lockout period of 8 minutes and a constant flow of 2 mg per hour. The pain score was recorded at rest on a visual analogue scale (VAS; 0–10 cm; 0 = no pain and 10 = worst possible pain) at the 1st, 2nd, 4th, 8th, 16th, 24th hour after the end of the operation, morphine consumption was recorded at the same time.

Results and Discussions: Forty patients, twenty per group enrolled in the study. The variable in the analysis was the changes from baseline of these measures. The statistical method used was repeated measures ANOVA. The p-value for the comparison of the rate of change at M consumption between the groups was 0.0007, final M consumption was 62.1 ± 13.8 for G group and 92.65 ± 30.7 for P group. Data are reported as mean ± standard deviation (SD). The p-value for the comparison of VAS score was 0.0871 and p-value for the comparison of the rate of change of VAS score changes between the groups was 0.23.

Conclusion(s): In conclusion, the pre-emptive use of gabapentin significantly decreases postoperative pain and analgesic requirement in MROS. Gabapentin, appears to have significant analgesic properties on post-operative pain.

14AP5-7
Acute postoperative pain management in Serbia-clinical audit

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Background and Goal of Study: The postoperative pain management is still unsatisfactory in many hospitals world wide. Adequate pain relief is integrated in many quality assurance programs in US (1) and EU countries (2). Aim of this study is to assess the postoperative pain management in Serbian hospitals and health centers.

Materials and Methods: On the sample of 200 anesthesiologists from 15 medical centers (regional hospitals and clinics) a survey was performed. Data about the acute pain services (pain protocols, evaluation and documentation
of postoperative pain, the preferred analgesic techniques were analyzed. The colleagues also were asked about the satisfaction with own therapy and suggestion for improving the domestic postoperative pain management. Statistical data were analyzed by hi square and Student t-tests.

**Results and Discussions:** Data showed that 27% of asked medical institutions have pain protocols and acute pain teams. In 18% of surgical wards the postoperative pain is documented and has be visible. For pain intensity assessment visual analogue scale (VAS), numerical rating scale (NRS) and verbal rating scale (VRS) are used. In 64% of medical centers the anesthesiologist is in charge for pain therapy. Nonsteroid anti-inflammatory drugs (NSAID), weak and strong opioids are used for pain killing in surgical patients. The application route of analgesics in 73% of hospitals mainly was intravenous. Regional analgesic techniques like epidural analgesia (EDA) and peripheral nerve blocks (PNB) are used in 27% of asked institutions. Individual analgesia is preferred in 82% of hospitals. 64% of interviewed anesthesiologists are not satisfied with the quality of postoperative pain therapy in own institution.

**Conclusion(s):** Improvement of postoperative pain management in Serbia needs: (1) better education of medical stuff, (2) new pain protocols, guidelines and (3) reform in health policies.

**References:**

**14AP5-8**

Clonidine improves postoperative analgesia and reduces nausea and vomiting after laparoscopic cholecystectomy

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**Background and Goal of Study:** Laparoscopic cholecystectomy is associated with some postoperative problems, especially pain and nausea or vomiting. Clonidine has been shown to reduce postoperative nausea and vomiting (PONV) after breast cancer surgery [1]. The postoperative analgesic effect of clonidine was also known in previous studies [2]. The purpose of this study was to investigate the clinical efficiency of clonidine in postoperative management after laparoscopic cholecystectomy.

**Materials and Methods:** Following ethical committee approval and informed consent, we conducted a prospective randomized double blind study including 44 patients aged 20 to 65 years who were randomly allocated to two groups: Group C (22 patients): received an IV perfusion of 3 μg/kg clonidine in 20 ml of saline solution over 20 min before surgery; Group P (22 patients): received the same volume of a saline solution over 20 min before surgery. The anesthetic protocol was standardized. Patients with Visual Analogic score ≥30 were treated with nefopam (20 mg IV up to six times per 24 h). Pain scores, the analgesic use, occurrence of nausea/vomiting shivering and the frequency of clonidine side effects (hypotension and bradycardia) were recorded.

**Results and Discussions:** Demographic data and mean surgery time were similar in both groups. Pain scores were significantly lower in group C in the first six postoperative hours. The main results are in the table below.

<table>
<thead>
<tr>
<th></th>
<th>Group P</th>
<th>Group C</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>First analgesic requirement (min)</td>
<td>67.7 ± 460.8</td>
<td>1096.5 ± 416.9</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Rescue analgesia (%)</td>
<td>77.2%</td>
<td>45.4%</td>
<td>0.03</td>
</tr>
<tr>
<td>PONV (%)</td>
<td>54.5%</td>
<td>18.1%</td>
<td>0.01</td>
</tr>
<tr>
<td>Postoperative shivering (%)</td>
<td>45.4%</td>
<td>9%</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Hypotension (%)</td>
<td>13.6%</td>
<td>9%</td>
<td>0.64</td>
</tr>
<tr>
<td>Bradycardia (%)</td>
<td>9%</td>
<td>4.5%</td>
<td>0.46</td>
</tr>
</tbody>
</table>

**Conclusion(s):** Our findings suggest that preoperative administration of 3 μg/kg clonidine statistically improves postoperative analgesia, and reduces nausea/vomiting and shivering after laparoscopic cholecystectomy.

**References:**

**14AP5-9**

The efficacy and safety of dexmedetomidine-ketamine combination for analgesic sedation


**Anaesthesiology and IC, Charles University, 3rd Medical Faculty, Praha, Czech Republic**

**Background and Goal of Study:** The aim of our clinical randomized blinded study was to assess the efficacy and safety of the combination of dexmedetomidine and ketamine for analgesic sedation.

**Materials and Methods:** After ethic committee approval and written consent patients scheduled for Duputreyn’s contracture repair under local anaesthesia were randomly divided in groups C and D. D group were administered the mixture of dexmedetomidine 1 microgram and ketamine 1 mg in 1 ml normal saline according to the scheme: 10 minutes before surgery, bolus 0.04 ml · kg⁻¹ was administered and followed by infusion 2 ml · kg⁻¹ · h⁻¹ for the first 10 minutes and 1 ml · kg⁻¹ · h⁻¹ for the rest of surgery. Group C were administered normal saline in the same regimen. Vital functions, quality of analgesia and sedation using Ramsay score were measured. The patients were questioned in the afternoon and next day about side effects and amnesia.

**Results and Discussions:** The study was early terminated because differences between D and C were evident. There were 7 patients in C and 8 patients in D. There were differences in C vs. D in Ramsay score (all in C scored 1 vs. 7 pts, scored 2 and 1 pt. scored in D, p < 0.001), absent reaction to painful application of local anesthetic and tourniquet (D vs.6, p = 0.02), amnesia (D vs.6, p = 0.02) and light-headedness 1 hour after surgery (D vs.7, p = 0.005). Five patients in D remembered dreams, but the difference was not significant. There was slight fall in blood pressure (25–30% below baseline line) in 4 pts. in D (insignificant) and no fall in ventilation. The effects of combination of dexmedetomidine-ketamine except of light-headedness lasted up to 2 hours after surgery) subsided 10 minutes after the infusion had been stopped.

**Conclusion(s):** The combination of dexmedetomidine 1 μg and ketamine 1 mg in 1 ml saline can be used for sedation during surgery. It provides good analgesia, amnesia and has no effect on ventilation.

**14AP5-10**

Effects of intrathecal morphine on pulmonary function and postoperative analgesia in patients undergoing coronary surgery

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**Department of Anaesthesiology, Heart Institute, São Paulo, Brazil**

**Background and Goal of Study:** Changes on pulmonary function due to pain contributes to pulmonary morbidity in postoperative cardiac surgery. Central neuroaxial analgesia may reduce risks of pulmonary complications and improve outcome after cardiac surgery 1. The purpose of this study was to evaluate the effect of intrathecal morphine on pulmonary function and postoperative analgesia in patients undergoing coronary artery bypass surgery.

**Materials and Methods:** We studied 27 patients undergoing CABG randomized to either general anesthesia (control group, n = 13) or general anesthesia plus intrathecal morphine 400 mcg (intrathecal group, n = 14). Intraoperative anesthetic management was standardized and for the postoperative analgesia patients received intravenous morphine via patient-controlled analgesia. The patients had an spirometry test and arterial blood gas analysis before surgery, in first and second postoperative days and postoperative pain during cough was assessed using a numeric pain score (0 – no pain, 1 = mild, 2 = moderate, 3 = strong). Intravenous morphine consumption, forced expiatory volume in first second (FEV1) and forced vital capacity (FVC), FEV1/FVC ratio and PO2/FIO2 ratio were evaluated. Data were compared by ANOVA (p < 0.05).

**Results and Discussion:** Consumption of morphine was greater in control group during the first 36 hours of postoperative. Intrathecal group has reduced pain scores (1.79 in control group and 0.77 in intrathecal group, p = 0.001). Mean PO2/FIO2 ratio was 286.73 in control group and 351.65 in morphine group (p = 0.002). Significant reduction in FEV1, CVF and VE/F1/CVF was observed in both groups after surgery (p < 0.01) without difference between them.

**Conclusions:** Although intrathecal morphine was not associated with mechanical respiratory improvement it provided reduction in dynamic pain scores and better blood oxygenation. These benefits could allow effective pulmonary toilet and better outcomes in postoperative period.

**Reference:**

**14AP5-11**

The Influence of the alpha-2 Agonist Clonidine on Perioperative Haemodynamic Stability, Sedation, Anxiety and Analgesia in Medium Amplitude Abdominal Surgery

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**Background and Goal of Study:** Prospective, randomised, double-blind study designed to evaluate the haemodynamic pattern, pain control, the degree
of anxiety and sedation and the incidence of side effects when Clonidine preanaesthesia (the only α2 agonist locally available at the moment) was compared to placebo.

**Materials and Methods:** Two equivalent groups of 40 patients (ASA I–III) were randomised to receive Diazepam in the evening before and oral Clonidine 150 µg or placebo in the morning of the surgery. They have received equivalent before getting general anesthesia for medium amplitude abdominal procedures.

Intra- and postoperative haemodynamic was assessed, as well as opioid consumption during surgery, opioid antagonisation at emergence. Anxiety, sedation, postoperative respiratory depression and analgesia were quantified at 5 min postoperatory, at 1 h, then each 3 h until 24 h. Patients’ satisfaction (pain control, side effects) was assessed by a self-administered questionnaire in day 4.

The statistical significance of the differences observed in the evolution of these parameters was tested by T student test.

**Results and Discussion:** Haemodynamic was better in the Clonidine group (variation greater than ±20% for arterial pressure and heart rate at induction and during surgery for placebo group, p < 0.05). This was even stronger for hypertensive patients.

Opioid consumption reported to the duration of the intervention was comparable in the two groups: Sedation and respiratory depression was slightly higher in the Clonidine group during the first 12 hours (p < 0.05). Analgetic consumption was not statistically different in the two groups, as well as the pain control. Postoperative satisfaction (pain control, sedation, other side effects) was equivalent in the two groups.

**Conclusion(s):** Clonidine premedication for moderate amplitude abdominal surgery ensures a better haemodynamic both intra- and post-operatively, with minor side effects concerning sedation and respiratory depression.

**References:**

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### Education, Research and Presentation

**15AP1-1**

**Conflicts between anaesthetists and surgeons**
A. Pelayus, M. Rochera, M. Rocca, M. De Miguel, J. Roigé
Department of Anaesthesia, Vall d’Hebron Hospital, Barcelona, Spain

**Background and Goal of Study:** This survey sought to determine the main situations that lead to conflicts between anaesthetists and surgeons and their causes.

**Materials and Methods:** We e-mailed a 20 question-survey to the Heads of Anaesthesia Departments of all public hospitals in Catalonia (Spain) accompanied by an explanatory letter, in which we begged them to deliver the survey among the anaesthetists of each hospital. Residents were excluded.

**Results and Discussion:** A total of 117 surveys were returned (about 13.76% of all specialists in Catalonia; 60.7% of respondents had arguments with the surgeons: 33.3% once a month, 21.4% once a week, and 6% more than once a week. The frequency of conflicts was neither related to the hospital size, nor to the years of experience as anaesthetist. The most frequent conflictive situation was an exceedingly long surgical program (97.5%), which occurred sometimes (56.8% of the respondents), very often (48.7%) and always (12%), 95.8% considered that the surgeons try to operate elective cases in the emergency OT on the day they are on call (55.4% sometimes, 45.8% very often and 14% always). The 3rd place (94%) went for the constant complaints of the surgeons about the patients not being relaxed enough; and the 4th (92.3%) to the disagreement on whether the patient should or should not be operated. Of this group, 31.6% agreed that the situation was more common when dealing with general surgeons. Other conflictive situations were: the patient did not undergo a preoperative assessment (88.9%), the surgeon only arrives when the patient is asleep (85.5%), the surgeon informs the family before extubation (82.9%).

**Conclusion(s):** A harmonious operating environment, does not always exist, and conflicts touch more often on behavioural and attitude issues than on expertise ones. Therefore we agree with some respondents that common sessions between surgeons and anaesthetists could enable to discuss different points of view, fortify the feeling of a team as well as strengthen interpersonal relationships. Furthermore, a clear horizontal division of the work is capital to avoid interference between specialties.

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### Assessment of educational objectives with problem-based learning in undergraduate students of Anaesthesiology

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Anaesthesiology, Universitat Autònoma de Barcelona, Faculty of Medicine, Hospital Germans Trias i Pujol, Badalona, Spain

**Background and Goal of Study:** After 5 years’ experience in problem-based learning (PBL) in Anaesthesiology we consider that it helps our fifth-year undergraduate students toward better interactive learning and its acceptance is excellent. The aim of the study was to assess the accomplishment of educational objectives in these students of Anaesthesiology based on PBL.

**Materials and Methods:** Educational objectives were defined and included in 12 PBL-cases. During each PBL session the tutor evaluated content, oral presentation and development of PBL-related competencies, such as ability to work in a team, interpersonal skills, problem solving, self-directed learning, information gathering, and task-supporting competencies. At the end of the teaching programme the students were asked to undergo a voluntary and anonymous test (100 true/false sentences) in order to analyse the understanding and assimilation levels of theoretical knowledge acquired with the PBL method. Data are presented as mean ± standard deviation.

**Results:** All students (n = 24: 5 men and 19 women; mean age: 23.5 ± 2.2 years) filled in the test. The mean total score was 72.1 ± 1.5 (minimum score, 0; maximum score, 10). The issues with the highest percentage of correct answers (>70%) were preoperative assessment, cardiopulmonary resuscitation, informed consent, acute and chronic pain therapy, regional anaesthesia, airway management and postoperative care. 40% of the answers on anaesthesics and obstetric anaesthesia were wrong.

**Conclusion:** PBL seems to be valid for meeting educational objectives among undergraduate students of Anaesthesiology. Further studies are necessary to demonstrate whether PBL improves academic results and favours better comprehension and assimilation of knowledge as a long-term effect compared to a conventional curriculum.
Reference:

15AP1-4
Medical students perception of their capacity for reflection-in-learning
P. Chalmers, G. Shorten, M. O'Rourke, S. Ofynn, S. Curtin Lawton
Department of Anaesthesia and Intensive Care Medicine, Cork University Hospital, Cork, Ireland

Background and Goal of Study: At our university, reflective practice is being integrated into a competence-based curriculum for the undergraduate, medical education programme. It is reported that this practice promotes critical thinking, self-awareness and self-regulated learning.[1,2] The goal of this study was to examine the association between reflection-in-learning scores and students’ self-perception of reflective capacity. This is one component of a larger evaluation of the influence of reflective practice on learning efficacy, professionalism and identity amongst final year medical students.

Materials and Methods: Following ethical approval and informed consent, 99 of a class of 110 final year medical students, at the beginning of the school year, completed a two part, previously validated, questionnaire [3]: i. a 14 item reflection-in-learning scale with a response graded on a 7-point Likert scale ranging from 1, never to 7, always; ii. a graded tool for self-assessment of the level of personal skill in reflective practice (null/minimal to maximal).

Results:

Table 1. Reflection-in-learning (R-i-L) Scores and Self-perception of Reflective Capacity

<table>
<thead>
<tr>
<th>Self-perception Category</th>
<th>R-i-L Score median (range)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Null/Minimal (8)</td>
<td>39.5 (25–64)</td>
<td>&lt;0.04</td>
</tr>
<tr>
<td>Restricted (39)</td>
<td>55 (36–83)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Partial (35)</td>
<td>62 (40–79)</td>
<td>0.004</td>
</tr>
<tr>
<td>Ambie (21)</td>
<td>65 (37–84)</td>
<td>&lt;0.002</td>
</tr>
<tr>
<td>Minimal (68)</td>
<td>69 (57–85)</td>
<td>&lt;0.002</td>
</tr>
</tbody>
</table>

*relative to null/minimal

Conclusion(s): Final year medical students demonstrate substantial self-perception of their capacity for reflection-in-learning. The completed investigation will follow this association over the duration of the final year of the medical curriculum.

References:

15AP1-5
Temperament and anxiety of anaesthesiologists and comparison with other specialists
P. Hernández, S. Beltrán de Heredia, X. Santiveri, M.A. Cruz, L.I. Gallart
Anaesestesiologia, Hospital del Mar, Barcelona, Spain

Background and Goal of Study: Medical staff, and particularly anaesthesiologists, are daily exposed to high levels of risk and stress, as well as to the need to take immediate reaction. Zuckerman created in the 70s the “Sensation Seeker Scale” (SSS) applied in professions such as firemen or pilots to identify the mechanisms behind diseases more often compared to students not involved (mean 6.0 vs. 4.74, 95% CI – 1.713—0.803, p < 0.001). Students involved with scientific work were more interested in solving problems compared to students not involved (mean 5.69 vs. 4.61, 95% CI – 1.889—0.680, p < 0.001). An interesting specialty (mean 6.03 vs. 5.02, 95% CI – 1.463—0.566, p < 0.05) and a topic (mean 5.86 vs. 4.86, 95% CI – 1.371—0.455, p < 0.05) were important to both student groups. Great impact factor of the publishing journal was not very important for them (mean 4.84 vs. 3.33, 95% CI – 2.036–1.012, p < 0.001).

Conclusions: Interest of the subject and the relevance are more frequent motivating factors than competitive approach. Successful career was more important as a motivating factor to male students than to females.

Reference:

15AP2-1
3-D visualization of cardiac murmur improves teaching of cardiac auscultation
H. Makino, Y. Sanjo, T. Katoh, Y. Shiraishi, S. Sato
Anesthesiology and Intensive Care, Hamamatsu University School of Medicine, Hamamatsu, Japan

Background and Goal of Study: We have tried to invent a new technology for changing the breathing sounds signals into a visual form. We could visualize breathing sounds in a three-dimensional (3-D) color visual form continuously in the previous study. We applied our system (VisiStetho) to explain to patients who have cardiac disease about changes of their cardiac murmur before and after cardiac surgery. Patients were satisfied with this explanation, VisiStetho was appreciated as a good tool for explaining the characteristic of the cardiac sound for a non-physician. In this study, we tried to apply our system to cardiac auscultation training for under graduate medical students.

Materials and Methods: 11 typical cardiac murmurs were chosen from Compact Disk which is a supplement of cardiac auscultation textbook. 29 medical students were involved in the study. Students were classified into two groups: (1) a visualization group, who were lectured on the 11 cardiac murmurs with visualizing the murmurs as 3-D wave form, (2) a control group, who were lectured on the cardiac murmur with only sound without 3-D visualization. Two groups were tested using a pretest and posttest methodology.

Results and Discussions: The 15 subjects in the visualization group improved from 33.9 ± 15.4 to 88.6 ± 15% following the lecture (mean ± SD). Sixteen students (14 %) scored 80% or more. In the control group, improvements were 9% from 30.4 ± 17 to 70.9 ± 24.1% (p < 0.05).
by analysis of variance). Lecture with 3-D Visualization got good opinions from questionnaires.

**Conclusion(s):** Lecture on cardiac murmur with 3-D visualization might be effective for medical students.

### 15AP2-2

**Teaching cricothyroidotomy and retention of the skill performance**

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**Anesthesiology, University Hospital Bern, Inselspital, Bern, Switzerland**

**Background:** Cricothyroidotomy (CrT), a rarely used life-saving emergency skill, needs special training on manikins or cadavers. Anaesthetists are thought to perform the skill on a competent level after the training. Knowledge about the retention of skill performance over time has an impact on CME-program organization. We assessed retention of skill performance 1, 3, and 6 months after a CrT-training to determine the appropriate time for refresher training.

**Methods:** With IRB approval and informed consent anaesthesia personnel performed CrT after 1, 3, and 6 months of an airway workshop in which CrT was performed 5x on prepared pig larynxes. Performance time was measured from skin palpation until tracheal ventilation.

**Results:** Of the 64 airway course participants only 48 participated after 1 month of the training, 40 after 3 and 6 months. Only the 36 participants who attended all the training were analyzed. See table for duration of different attempts in the original training and the follow up.

**Comparison:** original training vs. follow up (n = 36)

<table>
<thead>
<tr>
<th>Original Training</th>
<th>Time of performance (mean ± SD, sec)</th>
<th>P</th>
<th>% of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st attempt</td>
<td>94 ± 48</td>
<td>&lt; 1 min</td>
<td>19</td>
</tr>
<tr>
<td>5th attempt</td>
<td>50 ± 19</td>
<td>75</td>
<td>3</td>
</tr>
<tr>
<td>1 month</td>
<td>75 ± 30</td>
<td>0.023 &lt; 0.001</td>
<td>33</td>
</tr>
<tr>
<td>3 months</td>
<td>69 ± 27</td>
<td>0.002 &lt; 0.05</td>
<td>47</td>
</tr>
<tr>
<td>6 months</td>
<td>78 ± 32</td>
<td>0.053 &lt; 0.05</td>
<td>27</td>
</tr>
</tbody>
</table>

The number of participants who performed the skill in a clinically reasonable time of less than 1 minute dropped from 3/4 at the end of the original training to 1/3 after 1 month, and less after 6 months.

**Conclusion:** The high level of competence of this rarely used skill was lost within 1 month and all the competence within 6 months. This has impact on all efforts to maintain a certain competence level, on training and further teaching strategies, as well as for global costs for clinical teaching of skills that are not used on a regular basis.

### 15AP2-3

**A qualitative approach to defining learning determinants of spinal anaesthesia**

Z. Kulcsar, A. Aboulafia, T. Hall, D. Sabova, G. Shorten  
**Department of Anaesthesia and Intensive Care Medicine, Cork University Hospital, Cork, Ireland**

**Background and Goal:** The objective of this study was to perform a structured, prospective, qualitative analysis of the determinants of teaching and learning components of spinal anaesthetic technique in an acute teaching hospital environment.

**Materials and Methods:** Standard qualitative research techniques (audio taping, transcribing, “post its”) were employed to extract and analyse participants’ opinions, behaviors and experiences. Data were collected in three phases: 1. preliminary questionnaires (completed by 18 anaesthetic trainers and 24 trainees), 2. focused questionnaires (completed by nine trainers and 22 trainees) 3. focus group interviews (with participation of four trainers and ten trainees). (1)

**Results and Discussions:** Preliminary questionnaires: Although most trainees (88%, 21/24) learned the technique from a trainer, only a minority of trainers (39%, 7/18) had formal background in teaching methodology. The most stressful elements in both teaching and learning were related to patient safety (43%, 18/42). Some trainees expressed that the tactile element of spinal anaesthesia can be acquired only by hands-on experience (44%, 8/18) and that this was difficult to explain verbally to trainees (33%, 6/18). Focused questionnaires: Both trainers (89%, 8/9) and trainees (95%, 21/22) judged the overall quality of the teaching programme to be the greatest influence on the teaching-learning continuum. Trainers considered that their characteristics (e.g. motivation, patience) (100%, 9/9) and experience in education (89%, 8/9) were important determinants. In contrast, most trainees (77%, 17/22) identified the quality of trainer-trainee interaction as critical. Focus group interviews: Four important points emerged: i. need for a formal, structured training programme, ii. the importance of the visualisation, iii. the critical role of trainer-trainee interaction and iv. optimising the teaching environment (specifically the correct balance between teaching and working).

**Conclusion:** Our findings indicate that both trainers and trainees believe that the provision of a formal, structured training programme was an important determinant of the learning. Trainees emphasised the importance of the trainer-trainee interaction and of the teaching environment.


### 15AP2-4

**Times in learning fiberoptics**

J. Balaguer, A. Lluch, J. Soliverees, C. Sife, C. Solaz  
**Anaesthesiology and Critical Care, Hospital Universitario Dr Peset, Valencia, Spain**

**Background and Goal of Study:** Fiberoptic intubation (FOB) in anaesthesia is widespread used for the difficult airway management (1). Learning fiberoptics is mandatory in anaesthesia practice, and should be performed in non-difficult airway patients. Our objective is to know if learning FOB delays starting surgery.

**Materials and Methods:** After local ethics committee approval, and obtaining written informed consent, 60 ASA I-III patients were enrolled in the study. Patients with anticipated difficult airway were excluded. Patients were randomly allocated to FOB (FOB group) or oral intubation (O group). In the FOB group, after standard monitoring, atropine 10 mcg/kg and 6–10 mcg/kg propofol were administered to reach level 5 in the Ramsay’s sedation score. 10% lidocaine was used in the best air-pass-through nostril and supraglottic region, and a 6,5 or 7,5 mm diameter nasotracheal tube was used as appropriate. Time to intubation was considered as time from atropine injection until capnography was present in the monitor. In the O group, after standard monitoring, atropine 10 mcg/kg and fentanyl 0.1 mg were administered, followed by preoxygenation and administration of propofol 2–4 mg/kg and atracurium or cis-atracurium. When the best air-pass-through nostril was decided, the larynx was intubated an mechanical ventilation started. Time to perform oral intubation was defined as time from atropine administration until capnography was present. T-test was used at 5% significance level. Data show number or mean ± SD.

**Results and Discussions:** 8 patients were excluded. FOB intubations were performed by 4 anaesthesiologists with 4–9 FOB intubation experience. Oral intubations were performed by 5 blinded experienced anaesthesiologists.

<table>
<thead>
<tr>
<th>ASA (II/III)</th>
<th>Age (years)</th>
<th>Weight (kg)</th>
<th>Height (cm)</th>
<th>Time (*) (min:ss)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOB</td>
<td>12/8/7</td>
<td>52.6 ± 19</td>
<td>80.3 ± 21</td>
<td>164.8 ± 11</td>
</tr>
<tr>
<td>O</td>
<td>10/9/6</td>
<td>55.4 ± 17</td>
<td>81.3 ± 22</td>
<td>166.4 ± 9</td>
</tr>
</tbody>
</table>

*p < 0.0001

**Conclusion(s):** FOB under deep sedation with propofol introduces a statistically significant but not clinical relevant delay in starting surgery.

**Reference:** 1 Heidegger T. Curr Opin Anaesthesiol. 2004 Dec; 17(6): 483–4

### 15AP2-5

**Patients, nurses and physicians beliefs and attitudes towards pain in the surgical emergency department**

L. Niemi-Murola, D. Grenman, E. Kalso  
**Department of Anaesthesiology and Intensive Care Medicine, Helsinki University Hospital, Helsinki, Finland**

**Background and Goal:** Inadequate pain management appears to be related to poor staff assessment of pain (1). The aim of this study was to examine patients’ and physicians’ attitudes towards pain.

**Materials and Methods:** A questionnaire with 31 pain-related items was distributed to 50 physicians and 82 nurses at the surgical Emergency Department at Helsinki University Hospital, Finland. Six of these items were interviewed from 100 consecutive patients. The respondents were asked to answer the questions using Likert scale (1 = totally disagree, 5 = totally agree). Factor loading of the questionnaire consisting of 31 items was made using maximum likelihood analysis and varimax rotation. Six scales were constructed: Patients and pain, Treatment, Measurement of pain, Encouragement, Problems with analgesics.

**Results:** Statistics: Student’s t-test, 2-tailed ANOVA.
Results and Discussion: The questionnaire was returned by 57.31% of the nurses (N = 47), 58.06% of the physicians (N = 29) and 73.03% of the patients (N = 73). The nurses were more positive towards scales Measurement of pain (scale mean 4.19 vs. 3.66, 95% CI 0.02–1.04, p < 0.05) and Encouragement (scale mean 3.80 vs. 3.06, 95% CI 0.31–1.11, p < 0.001) than the physicians. The physicians were less concerned about Problems with analgesics than the nurses (scale mean 3.05 vs. 2.32, 95% CI 0.23–1.25, p < 0.01). The patients agreed more with items “It is easier to suffer from pain than the side effects” [F2,133] = 17.823, p<0.001”, “Pain complaint might distract the doctor from my real problem” [F2,134] = 5.505, p<0.01”, “Analgesics should be given only when pain is unbearable” [F2,134] = 9.481, p < 0.001 than the nurses and the physicians.

Conclusions: The ED personnel need education about measurement of pain and pain medication. Pain history affects the patients’ willingness to report their pain and their attitudes towards pain medication. The patients should be encouraged to talk about their pain.

Reference:

15AP2-6
A design based approach to development of a mixed interface simulator for learning spinal anaesthesia
Z. Kulcsar, E. Lovguist, M. Fernstrom, A. Aboulafia, G. Shorten
Department of Anaesthesia and Intensive Care Medicine, Cork University Hospital, Cork, Ireland

Background and Goal: The goal of this study was to apply end-user input (both expert and naïve) to the design of a simulator for learning spinal anaesthesia. (1) This forms part of a larger project, Design Based Medical Training, which may optimise training in medical procedural skills. The specific aims were to provide the data necessary for programming a realistic simulator device for teaching and learning of spinal anaesthesia and to test the hypothesis that a body of tacit information exists regarding tactile elements of this technique.

Materials and Methods: This study comprised two phases: 1. The design of Tactile Landscapes 2. The testing phase. The first (design) phase was informed by: i. analysis of video material acquired in the operating room, ii. previously identified determinants of teaching and learning efficacy of spinal anaesthesia, and iii. input on tactile sensation relevant to the procedure from practicing anaesthetists. The second phase involved 24 experts (anaesthetic doctors) and 12 non-experts (medical students) who were invited to test three basic sensations – individually and combined – which typically occur during the performance of spinal anaesthesia with a 25 G pencil point needle: 1. touching different surfaces (skin, bone), 2. the “pop” sensations when the needle passes through skin and dura mater, 3. the sensations of advancing the spinal needle through particular tissues (subcutaneous tissue, ligaments, intradural space). This study was performed using a haptic device simulating the above sensations. (2) The perception of each participant was recorded, and analysed for “best fit” consistency and expert/non-expert comparison using one way ANOVA statistical analysis.

Results: 1. Variation within i. experts and ii. non-experts. 2. At haptic values closest to “best fit”, expert and non-expert perceptions were similar (within 20%) for most sensations, but different for dura puncture (59% less for experts), intradural space and subcutaneous tissue (50% and 30% less for non-experts, respectively).

Conclusion: Experts appear to possess a “tactile knowledge” regarding some sensations (e.g. dura puncture). This is not true for some other sensations relevant to the performance of spinal anaesthesia.

References:

15AP2-7
Patient feedback on preoperative assessment
K. Chelliah, C. Janakiraman, I. Hodzovic
Anaesthetics, Royal Gwent Hospital, Newport, United Kingdom

Background: Doctor patient interaction is an essential part of medical practice. Preoperative assessment has been used as a tool to evaluate anaesthetist’s communication skills (1). This survey was designed to record the patient’s assessment of anaesthetist’s ability to communicate.

Materials and Methods: Four hundred unpremedicated adult patients scheduled for elective surgery in four hospitals in South Wales (UK) were asked to fill the consultation and relational empathy questionnaire (CARE) (1). The patients scored the anaesthetists on a five point scoring system (poor to excellent) preoperatively.

Results: The findings are presented in the table. Values are number (proportion out of 400 presented as %).

<table>
<thead>
<tr>
<th>How good was the doctor at...</th>
<th>Poor</th>
<th>Fair</th>
<th>Good</th>
<th>Very good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Making you feel at ease</td>
<td>6 (1)</td>
<td>4 (1)</td>
<td>63 (15)</td>
<td>163 (40)</td>
<td>170 (42)</td>
</tr>
<tr>
<td>Letting you tell your story</td>
<td>4 (1)</td>
<td>14 (3)</td>
<td>55 (13)</td>
<td>170 (42)</td>
<td>142 (35)</td>
</tr>
<tr>
<td>Really listening</td>
<td>1 (0.3)</td>
<td>8 (2)</td>
<td>66 (16)</td>
<td>153 (38)</td>
<td>155 (38)</td>
</tr>
<tr>
<td>Treating you as a whole person</td>
<td>2 (0.5)</td>
<td>20 (5)</td>
<td>83 (20)</td>
<td>160 (40)</td>
<td>124 (31)</td>
</tr>
<tr>
<td>Understanding your concerns</td>
<td>3 (0.7)</td>
<td>16 (4)</td>
<td>60 (15)</td>
<td>171 (42)</td>
<td>146 (36)</td>
</tr>
<tr>
<td>Showing care and compassion</td>
<td>1 (0.3)</td>
<td>5 (1.2)</td>
<td>66 (16)</td>
<td>160 (40)</td>
<td>155 (37)</td>
</tr>
<tr>
<td>Being positive</td>
<td>0 (0)</td>
<td>4 (1)</td>
<td>72 (18)</td>
<td>167 (41)</td>
<td>157 (39)</td>
</tr>
<tr>
<td>Explaining things clearly</td>
<td>0 (0)</td>
<td>12 (3)</td>
<td>52 (13)</td>
<td>157 (39)</td>
<td>175 (43)</td>
</tr>
</tbody>
</table>

Conclusion: Our survey shows that patients are satisfied with the communication skills of anaesthetists, with 95% of patients scoring anaesthetists as good or excellent. As specific patient comment plays an important role in delivery of anesthetic service (2), we believe “CARE” scoring system would be invaluable in appraisal of anaesthetists.

References:

15AP2-8
Postoperative intake of oral paracetamol: an evaluation of ward based educational strategies to change administration practice
G. Mathew, K. Grimsehl, I. Christie
Anaesthetics, Derriford Hospital, Plymouth, United Kingdom

Background and Goal of Study: Paracetamol is widely used as part of a multi-modal approach to analgesia (1). Although it is recommended that paracetamol should be taken regularly for maximum analgesic effect (2), our experience is that paracetamol administration in the post operative period is variable. We assessed whether educational interventions were effective in changing this practice.

Materials and Methods: A prospective audit was performed on 50 neuro-surgical patients with GCS 14–15 and ASA I–III undergoing either spinal or intracranial procedures. The intake of oral paracetamol in the post operative period was obtained from the prescription chart. The reason for omission of doses was noted. Based on the initial results the acute pain team undertook an intensive program of ward staff education. This included lectures, presenations, and workshops stressing the effectiveness of regular simple analgesia. Posters of the analgesic ladder were prominently displayed on all wards. A re-audit was done a year later on a further 50 patients meeting the same criteria. The data were compared using χ2-test

Results and Discussions: 45 patients were prescribed regular paracetamol in the first audit. Despite this, in the first 24 hrs after surgery, only 24 patients received paracetamol regularly. In 19 patients this was due to patient refusal. In the re-audit that followed the educational programme, 38 of the 45 patients prescribed regular paracetamol received it (p < 0.01); and patient refusal had decreased to 6 (p < 0.01).

Conclusion(s): We have shown that a targeted educational strategy can significantly improve regular administration of paracetamol, an effective analgesic with minimal adverse effects. However, patients still need encouragement to take this analgesic regularly.

References:

15AP2-9
Development of a curriculum for catastrophe preparedness
E. Pfenninger, S. Himmelseher
Anesthesiology, University of Ulm, Ulm, Germany

Background and Goal of Study: The new German Federal Regulations on the provision of anesthetic service (2), we believe “CARE” scoring system would be invaluable in appraisal of anaesthetists.

References:
Materials and Methods: Educational objectives were the provision of core components of catastrophe medicine; the conceptual construction was based on a modular approach incorporating experiential training. The exploration of international principles on education for major community threatening events (1), and analysis of Public Health Physician Competencies for Disaster Preparedness as demanded by German Authorities (2) formed a foundation for content development.

Results and Discussions: In a step-by-step design of 28 units, catastrophe (medicine) terminology, legal basics of catastrophe management, psychological and ethical issues relevant in disaster situations, and preparedness planning are taught. Lectures on management of mass casualties and for care in case of release of radioactive, biological, and chemical agents with special attention on infectious diseases and terrorist attacks follow. To provide primary care, fundamentals of shock therapy, analgesia, sedation, and anesthesia as well as trauma care in the field are taught. Limitations of individual patient medicine in disaster are discussed. At least 25% of the course consist of practical training experiences, such as emergency room simulations or exposure to agency-led activities.

Conclusions: Because of its fociussed applicability and readiness, the curriculum met with enthusiastic response from participants, and has been established as an option of the 4th year student obligatory program at the University of Ulm. It is taught by anesthesiologists, who fulfill historical tasks by preparing for effective medical disaster response.

References:

17AP1-1
The Anaesthetic Room – Friend or Foe? An audit to assess the frequency of incidents relating to patient safety, occurring on transfer of anaesthetised patients from the anaesthetic room to the operating theatre
T. Hinde, T. Gale
Anesthetist, Derriford Hospital, Plymouth, United Kingdom

Background and Goal of Study: In the USA, anaesthetic rooms have all but disappeared [1]. At a time of proposed refurbishment in our hospital, an audit was carried out to assess the frequency of incidents relating to safety, on transfer of anaesthetised patients from the anaesthetic room to the operating theatre. This transfer process was once described by a barrister prosecuting in an anaesthetic death as “clumsy and ill conceived” [2].

Materials and Methods: The audit, in our General Emergency Theatre, looked at 101 patients in a 1 month period. An anonymous questionnaire was completed by the anaesthetists of all grades working in Luton & Dunstable Hospital, Peterborough, United Kingdom.

Table 1 Summary of incidents on patient transfer:

<table>
<thead>
<tr>
<th>Incident</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient ‘light’</td>
<td>6/21(29%)</td>
</tr>
<tr>
<td>Lines tangled</td>
<td>3/21(14%)</td>
</tr>
<tr>
<td>Missing part of circuit</td>
<td>3/21(14%)</td>
</tr>
<tr>
<td>Monitoring delay in OR</td>
<td>3/21(14%)</td>
</tr>
<tr>
<td>Hypoxia – SpO2 &lt;93%</td>
<td>2/21(10%)</td>
</tr>
<tr>
<td>Manual handling issue</td>
<td>2/21(10%)</td>
</tr>
<tr>
<td>Lines not working</td>
<td>1/210.5%</td>
</tr>
<tr>
<td>Delay in transfer assistance</td>
<td>1/210.5%</td>
</tr>
</tbody>
</table>

Conclusion(s): We are more likely to anasthetise ASA 3 and 4 patients in the OT. Of those patients anaesthetised in the AR, incidents relating to safety occurred in 18% of patients in our emergency theatre. 90% of these incidents were felt to be avoidable had the patients been anaesthetised in the OT. This has implications in both patient and staff safety.

References:
1 Meyer-Wittington, Anesthesia 1992; 47: 1011–1012
2 Braham,D. Anesthesia 1990; 45: 332–333

17AP1-2
Post anaesthesia care units are lacking in most Italian hospitals: a survey in the Veneto region
P. Trevisan
Anaesthesia and Intensive Care, Ospedale S. Martino, Belluno, Italy

Background and Goal of Study: International guidelines state that the Post Anaesthesia Care Unit (PACU) is an essential facility to guarantee patient safety (1). In Italy only a few hospitals are equipped with a PACU, but there are no published data. It was conducted a survey to find out how many PACUs are present in the Veneto region (Italy; north-east),

Materials and Methods: on the 18th and 19th October 2006 the author contacted by phone all public hospitals in Veneto undertaking surgical activity – n° 49. An anesthetist from every department of anaesthesia was asked: 1) n° of operating rooms (ORs) 2) presence/absence of PACU 3) if PACU present, n° of beds. The reply rate was 100%.

Results and Discussions: In Veneto there are 49 public hospitals where surgical activities are undertaken; 6 hospitals (12%) are equipped with a PACU. The PACU beds/ORs ratio is shown in the table:

<table>
<thead>
<tr>
<th>Hospital</th>
<th>OR</th>
<th>PACU beds/ORs</th>
</tr>
</thead>
<tbody>
<tr>
<td>N° PACU beds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>6</td>
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</table>

This survey shows that in Veneto only 12% of public hospitals are equipped with a PACU. The optimal PACU beds/ORs ratio is thought to be 1.5–2 (2). In Veneto the ratio is far less than optimal, therefore PACU beds are insufficient even where a PACU is present. A previous study demonstrated that this is difficult to guarantee a proper and safe post-anaesthesia care without a PACU (3).

Conclusion(s): In Veneto only 6 out of 49 public hospitals are equipped with a PACU. As it is very difficult to guarantee post-anaesthesia safety and care within a PACU, it is mandatory for every hospital in Veneto to open a PACU with a sufficient number of beds.

References:

17AP1-3
Should patients be anaesthetised in a dedicated anaesthetic room? A survey of attitude of anaesthetists and patients in a District General Hospital in UK
A. Obidoyi
Anaesthesia, Peterborough & Stamford Foundation Hospitals NHS Trust, Peterborough, United Kingdom

Background and Goals: 94% of UK hospitals have anaesthetic rooms. The usefulness of these rooms is controversial. A survey of the attitude of Anaesthetists and that of patients in a District General Hospital in the UK on their preferred site of induction of anaesthesia was conducted between February and April 2006.

Methodology: Two questionnaires were designed. The first questionnaire was completed by the anaesthetists of all grades working in Luton & Dunstable Hospital, UK. The second set was completed by patients scheduled for operation in the same hospital.

Results:

<table>
<thead>
<tr>
<th>Grades</th>
<th>Cons</th>
<th>TDs</th>
<th>SpRs</th>
<th>SHOs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR</td>
<td>15</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>26</td>
</tr>
<tr>
<td>OT</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>12</td>
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<tr>
<td>AR</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>12</td>
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<tr>
<td>OT</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Yes</td>
<td>7</td>
<td></td>
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<td>7</td>
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<tr>
<td>Never</td>
<td></td>
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<td>17</td>
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</table>

Table I (Anaesthetists)
Table II Patients’ preferential site for induction

<table>
<thead>
<tr>
<th></th>
<th>No previous operations</th>
<th>1 or &gt;1 operations</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR</td>
<td>5</td>
<td>19</td>
<td>24 (80%)</td>
</tr>
<tr>
<td>OR</td>
<td>2</td>
<td>3</td>
<td>5 (12.5%)</td>
</tr>
<tr>
<td>No preference</td>
<td>4</td>
<td>7</td>
<td>11 (27.5%)</td>
</tr>
</tbody>
</table>

AR = Anaesthetic room, OT = Operating theatre, Cons = Consultants, TDs = Trust Doctors, SpRs = Specialist Registrars, SHOs = Senior House Officers

Discussion: Although anaesthetic rooms have been in existence in the UK for decades, a robust argument for their continuous use is largely lacking from the literature. Patient safety, medico legal liabilities and the prevailing financial situations of most hospitals may lead to their disappearance as is the practice in most developed countries around the world. Educating the surgical patients may alter their preferential site for induction of anaesthesia.

References:

17AP1-4
Full-scale simulator training rapidly improves crisis resource management skills
E. Michael, R. Krage, O. Picker
Klinik fuer Anaesthesiologie, Universitaetsklinikum Duesseldorf, Duesseldorf, Germany

Introduction: Health care is not as safe as it should be. Deaths in hospitals due to preventable adverse events still remain in the top 10 of the leading cause of death (1). Roughly 80% of these events are related to the so called human factor due to a lack of knowledge of proper Crisis Resource Management (2). Patient simulators are receiving increasing support as an educational tool. Therefore, we studied whether frequent simulation sessions during an anaesthesia residency programme increase knowledge of CRM and thus patient safety.

Methods: All members of our department (n = 62) participated in simulation sessions on a regular basis (residents twice a year, board-certified anesthetists once a year) to teach both, technical abilities (hard skills) as well as Crisis Resource Management (soft skills). All scenarios were developed using a full-scale-simulator (HPS, METI). After 18 months the quality of the simulation sessions was evaluated using a standardized questionnaire (20 questions). All questions could be answered by using standard school grades (1–6). Grades were then divided in three groups (1–2: agree, 3–4: intermediate, 5–6: disagree).

Results: Simulation sessions on a regular basis improved hard skills (68%) and soft skills (81%). After 18 months of simulation training, 53% of the participants reported that simulations sessions influenced their everyday practice. 51% stated that they altered their behaviour in an OR setting in terms of communication and team organisation. All scenarios were evaluated as being very realistic (92%) and appropriate in terms of skill level (95%). 52% of the questionnaires were answered.

Conclusion: 18 months after establishing a full scale simulation programme modulating the individual performance can clearly be attributed to our programme. Therefore, consequent and frequent simulation sessions increase knowledge of CRM and may thus contribute to the improvement of patient safety.

References:

17AP1-5
Quantitative comparison of weight-bearing areas on the body surfaces before and after the induction of general anesthesia
H. Kang, S. Kim, S. Ryu
Department of Anaesthesiology and Pain Medicine, College of Medicine, Chungbuk National University, Chungju, Republic of Korea

Background and Goal of Study: While surgical position is very important for the prevention of excessive pressure on the specific body surfaces during anesthesia, resulting in pressure sores and peripheral nerve damage, we quantitatively determined weight-bearing areas by measuring pressure on the body surface areas of patients before and after the induction of general anesthesia.

Materials and Methods: Fifteen men patients (aged over 20 and ASA class 1) scheduled for elective surgery were selected for this study. A manikin equipped with a force sensing resistor (FSR) placed on the operating table was used to determine pressure on the body surfaces in the supine, lateral and prone position. The pressure signal generated by this manikin was processed using an analogue-digital converter (ADC), and then quantitatively displayed as pressure distribution (%) on a computer screen (pressure points before and after general anesthesia were compared qualitatively, and, for quantitative comparison, were digitally expressed as pressure distribution).

Results and Discussions: Pressure was concentrated on the shoulder and sacral areas in the supine position before and after the induction of general anesthesia. There was significant difference (p < 0.05, paired t-test) in pressure distribution on the shoulder before (29.8%) and after (20.3%) the induction of anesthesia. In the lateral position, the shoulder and trochanteric areas were identified as the main weight-bearing areas. Pressure distribution on the shoulder (21.6%) and trochanteric areas (15.3%) after anesthesia was significantly higher (p < 0.05) than before anesthesia (11.2% and 8.1%, respectively). In the prone position, the chest was the main weight-bearing area. Pressure distribution in the chest area was 30.8% and 24.4% before and after the induction of anesthesia, respectively. Tilting the operating table in each surgical position also produced marked changes in pressure distribution on the weight-bearing areas before and after anesthesia was induced.

Conclusion(s): In each surgical position, weight-bearing areas before anesthesia did not migrate to other areas after anesthesia, but there was change in pressure distribution on some specific weight-bearing areas after the induction of anesthesia.

17AP2-1
Does sleep deprivation cause cognitive dysfunction in residents in training?
M. Vila, A. Garrido, P. Vila, J. Canet
Anaesthesiology, Hospital Germans Trias i Pujol, Badalona, Spain

Background and Goal of Study: Sleep deprivation and night work have been identified as causes of cognitive dysfunction and technical errors. By applying the principles of chronobiology to resident work schedules, the effect of sleep deprivation on cognitive function was assessed in trainees of a University Hospital after they were 24 hours on call.

Materials and Methods: Prospective, controlled, single-blind study. Thirty residents from first to fifth year of academic training in different medical specialties were studied. Residents were randomized to answer a battery of neuropsychological tests either after 24 hours on call when they had slept no more than three continuous hours (A) or after a normal day and sleep hours (B). The test battery consisted of the Visual Learning Test, Letter Digit Coding Test and Stroop Colour Interference Test. The tests were presented in random order to compensate for a learning effect. Time used and number of errors were recorded. Vital signs (blood pressure, heart rate, pulse oximetry and core body temperature) were also recorded. ANOVA, χ² tests and linear regression analyses were performed.

Results and Discussion: Stroop test performance was significantly different after sleep deprivation (A: 31.3 ± 6.2 s) than after a normal shift (B: 29.1 ± 6.8 s; p < 0.005); no significant differences were observed on the other neuropsychological tests. There was also a significant negative correlation between time on the Stroop test and sleep deprivation (hours slept γ = −0.395; p < 0.03). All vital signs were similar at the different moments studied.

Conclusion: Specific neuropsychocognitive performances (i.e.: attention measured by the Stroop test) are vulnerable to sleep loss. The controversy over resident work hours and the effect on education, professionalism, wellness and safety should be further reviewed.

References:

17AP2-2
High incidence of distracting events and diverted time during induction of general anesthesia for urgent surgical cases
Anesthesia, Geneva University Hospital, Geneva 14, Switzerland

Background and Goal of Study: Distractions and interruptions in the workplace have been shown to decrease vigilance and increase errors. Although sources of distraction appear to be common in the operating room, little is known about their origin and their effect on anesthesia providers. The goal of this pilot study was to determine the origin, the frequency and the impact of distracting events (DE) on anesthesia tasks during the induction phase of general anesthesia (IGA) for urgent surgical cases.

Materials and Methods: Thirteen IGAs were videotaped. The videotapes were reviewed and analyzed using an original scoring system developed by...
expert consensus in order to identify and characterize DEs. The duration, the origin (whether internal, i.e. related to anesthesia tasks — e.g. information-sharing dysfunction, equipment problem — or external, i.e. all other events — e.g. pager) and the impact of DEs on team activities were categorized.

**Results:** On average we observed 5.2 DEs per IGA. This represented 25.3% of total IGA time. DEs directly impacted on the activity of the “airway manager” and the “operator injecting the drugs” in 51.5% and 61.8% of instances respectively (e.g. task switching, multitasking, break in task).

<table>
<thead>
<tr>
<th>IGA</th>
<th>DE</th>
<th>Int DEs</th>
<th>Ext DEs</th>
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<tr>
<td>13</td>
<td>68</td>
<td>43</td>
<td>25</td>
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<tr>
<td>106</td>
<td>26.8</td>
<td>17.4</td>
<td>9.4</td>
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<tr>
<td>NA</td>
<td>25.3</td>
<td>16.4</td>
<td>8.8</td>
</tr>
<tr>
<td>Mean</td>
<td>8.2 [2.6]</td>
<td>0.4 [0.4]</td>
<td>0.4 [0.3]</td>
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</table>

**Conclusions:** During IGAs, DEs are frequent and significantly divert anesthesia-related tasks. This pilot work will help us to further characterize how DEs are generated, how they affect performance and patient care. In the future, this may lead to the design and implementation of preventive and/or coping strategies which could be incorporated in a team-oriented training approach to improve patient safety.

**References:**

**17AP2-5**

**The value of a voluntary reporting system of perioperative complications as quantitative key performance indicator**

K. Soufidi, T. Schouten, T. Kappen, J. Bijker, C. Kalkman
Division of Perioperative Care and Emergency Medicine, University Medical Center Utrecht, Utrecht, The Netherlands

**Background and Goal of Study:** Since 2004 the University Medical Centre Utrecht participates in a national anaesthetic quality assurance programme for reporting perioperative incidents. Following each anaesthetic a standardized computerized audit form is completed by the anaesthesiologist. Perioperative incidents are defined according to a categorized list of the 20 most frequent perioperative adverse events, including process outcomes such as hypotension, hypertension and hypoxemia. Goal of the study is to evaluate the accuracy of complication reports and completeness of the list of categories.

**Materials and Methods:** The computerized voluntary record system is a module within the hospital anaesthesia information management system. The audit form can be amended up to 24 hours after the anaesthetic. An automatic reminder is sent by email if the audit form is not completed. All surgical procedures in 2005 were selected, excluding cardiothoracic surgery and patients younger than 18 years. Reported incidents were checked by two independent reviewers and judged on misclassification.

**Results:** In 13,346 cases 634 (4.8%) adverse events were reported, spread over 618 (4.6%) procedures. There were 579 cases in which the audit form was not filled in, resulting in a reporting rate of 95.7%. Misclassification was noticed in 119 (18.8%) of the reported events. Reclassification in the appropriate category was possible in 91 (76.5%) reports. Altogether 92 (14.5%) reports did not correspond with the list of 20 most frequent perioperative adverse events.

**Conclusion:** Voluntary reporting in our hospital shows a 4.6% incidence of adverse events with a compliance of 95.7%. Because of a misclassification of 18.8%, we consider the reliability of the completion registration system to be low. A large number of events urges to reassess the list of definitions. Based on these findings the current voluntary reporting system should not be used as a quantitative key performance indicator.

**17AP2-6**

**Hypotension as perioperative complication: self-reported records versus computerized analysis of the anesthesia information management system**

T. Kappen, T. Schouten, K. Soufidi, J. Bijker, C. Kalkman
Division of Perioperative Care and Emergency Medicine, University Medical Center Utrecht, Utrecht, The Netherlands

**Background and Goal of Study:** Since 2004 the University Medical Centre Utrecht participates in a national anaesthetic quality assurance programme. Following each anaesthetic a standardized computerized audit form is completed by the anaesthesiologist, based on the 20 most frequent perioperative adverse events, including process outcomes such as hypotension. Hypotension is defined as a mean arterial pressure below 40 mm Hg longer than 5 minutes, which requires intervention. In this study the accuracy of reporting of hypotension by anaesthesiologists consistent with the definition is verified.

**Materials and Methods:** The surgical procedures in 2005 were reviewed, excluding cardiothoracic surgery and patients younger than 18 years. Using computer software (Lab/View, National Instruments) the hemodynamic variables of the anesthesia information management system were analyzed for hypotension according to the aforementioned definition, without the requirement of intervention. The number of analyzed cases with hypotension was compared with the number of reported cases.
Results and Discussions: Of the 13,346 anaesthetics the audit form was not filled in 597 cases, resulting in a reporting rate of 95.7%. Of 131 (1.0%) reported hypotension cases, 15 were confirmed by analysis (positive predictive value 11.5%; sensitivity 8.9%). In 154 anaesthetics no hypotension was reported in contrast with the analysis (negative predictive value 98.8%, specificity 99.1%).

Conclusion(s): Although the negative predictive value and specificity are high, the positive predictive value and sensitivity are very low. Apparently anaesthesiologists use a different definition of hypotension. Moreover the low sensitivity can be explained by a low compliance. Therefore the current definition of hypotension in our voluntary reporting system is inappropriate as a key performance indicator.

17AP2-7
Analysis of incidents using a system approach
J.M. Marzal, J.A. Santa-Ursula, G. Puelba, D. Arnal, A. Bartolome
Unidad de Anestesia y Reanimacion, Fundacion Hospital Alcorcon, Alcorcon, Spain

Background and Goal of Study: A critical component of a comprehensive strategy to improve patient safety is to establish an incident reporting system. The goal of this study is to describe incidents reported last year and analyzed using a system approach.

Materials and Methods: Anaesthetists were invited to report, on an anonymous and voluntary basis, any unintended incident which reduced, or could have reduced, the safety margin for a patient. Any incident could be reported, not only those which were deemed preventable or were thought to involve human error. All the incidents were reported using a computerised intranet accessible form. A five anaesthetists committee analyzed every incident using a system approach to determine why it happened (active errors and latent factors in the system) and what should be done to prevent this type of incident from recurring.

Results and Discussions: Between October 1st 2005 and October 1st 2006 12692 anaesthetic procedures were performed and 93 incidents were reported (0.73%). The three most frequent types of incident reported were equipment failure (n = 25), communication (n = 21) and drug related (n = 16). In 83 incidents (67.2%) 66 active errors were identified: 24 skill-based slips, 5 skill-based lapses, 21 rule-based mistakes, 11 knowledge-based mistakes and 5 violations of protocols. 201 latent factors were identified: 24 patient factors (21 of them complexity), 18 work environment factors (7 unavailable protocols), 49 individual factors (20 lack of knowledge), 40 team factors (19 communication problems), 37 task factors (12 poor equipment design) and 33 organisational factors (19 deficient safety culture). Main implications and action points each finding. Results calculated as percentages.

17AP3-1
Comparison of different positions of the safety frog on the ventilator in case of technical failure
J.P. Muller, G. Van Droogenbroek, M. Weiss
Anaesthesiology, St Jan AV Brugge, Brugge, Belgium

Background and Goal of Study: The safety frog device from MedecBenelux nv is an intelligent pressure release valve opening in case of a continuous elevated airway pressure. Goal of this study was to analyze what the best position is in case of a blocked inspiratory or expiratory line and in case of an occluded inspiratory or expiratory tubing line.

Materials and Methods: An artificial lung (no patient or animal) with a compliance of 12 ml/mmHg is connected to an aspier S/5 ventilator from Datex-Ohmeda. The active safety frog is put in four positions while the different defects are mechanical simulated during spontaneous (simulated with the artificial lung) and during controlled volume ventilation. The APL valve is open. If a continuous pressure above 20 cmH2O is measured in the artificial lung in one of the simulated technical failures the position is noted as dangerous.

Results and Discussions: Table gives the different results. During spontaneous breathing with an open APL valve high airway pressure is not possible in any simulated failure on this ventilator. With an occluded tubing however the patient can only inspire and not expire and will finally get a volutrauma if no safety frog is positioned on the inspiratory line. An occluded inspiratory valve or inspiratory tubing does not give volutrauma in contrary to an occluded expiratory valve or tubing during mechanical ventilation.

A position in the manual breathing bag line fails to protect during mechanical ventilation because of exclusion. The expiratory line position at the ventilator fails to protect during occlusion of the expiratory tubing. The inspiratory line position is simpler than the patient’s connection position. Both protect the lungs in all investigated failures.

Conclusion: The position at the inspiratory line of the ventilator is mandatory to obtain the best safety protection.

17AP3-2
The carina as a landmark for evaluation of adequate central catheter tip position with computerized tomography
Anesthesiology and Pain Medicine, Gyeongsang National University Hospital, Jinju, Republic of Korea

Background and Goal of Study: The aim of this study was to determine whether the carina can be used as a landmark for evaluation of adequate central catheter tip position, and to examine the relationship between easily measurable body size and variable anatomical parameter.

Materials and Methods: The SVC dimensions and relationship to radiographic landmarks were retrospectively determined from computerized tomography (CT) scans of 200 patients. The CT findings were assessed in terms of SVC length (SCVL), the distance between the carina and the right atrium inlet (CAL), and the sternal length (STL). Pearson’s correlation and a regression test for height versus SCVL, STL versus SCVL and CAL were performed.

Results: The median length of the SVC was 4.2 cm (range: 1.6 to 7.2 cm) and the distance between the carina and the right atrium inlet was 2.4 cm (range: 0.8 to 5.6 cm). With the regression test, height was correlated with SCVL (r2 = 0.05), and STL was correlated with both SCVL (r2 = 0.12) and STL (r2 = 0.04).

Conclusion: The carina was located always above the right atrium inlet. The carina was a reliable, simple anatomical landmark for the determination of correct place with computerized tomography.

References:

Table 1. Means of measured SCVL and CAL

<table>
<thead>
<tr>
<th></th>
<th>All patients (n = 200)</th>
<th>Men (n = 114)</th>
<th>Women (n = 86)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCVL(cm)</td>
<td>Mean 4.2 ± 1.1</td>
<td>4.5 ± 1.0</td>
<td>3.9 ± 1.1</td>
</tr>
<tr>
<td>Range</td>
<td>1.6 to 7.2</td>
<td>1.6 to 7.2</td>
<td>2.4 to 7.2</td>
</tr>
<tr>
<td>CAL(cm)</td>
<td>Mean 2.4 ± 1.1</td>
<td>2.5 ± 1.0</td>
<td>2.4 ± 1.0</td>
</tr>
<tr>
<td>Range</td>
<td>0.8 to 5.6</td>
<td>0.8 to 5.6</td>
<td>0.8 to 5.6</td>
</tr>
</tbody>
</table>

Data are expressed as mean ± SD. SCVL = SVC length, CAL = the distance between the carina and the right atrium inlet. * p < 0.05 compared to Men.

17AP3-3
Safe placement of central venous catheter tips: an analysis
N. Smart, R. Sundaram, S. Koteswaran
Department of Anaesthesia and Pain, Victoria Infirmary, Glasgow, United Kingdom

Background and Goal of Study: Optimal positioning of central venous catheters (CVC) is contentious. While recommendations for correct CVC placement usually include placing the tip of the catheter in the SVC, above the atrium, and parallel to the vessel wall, numerous publications draw attention to the association between catheter related thrombosis and proximal positioning(1,2). The purpose of this study was to identify catheter tip position on post procedure radiograph and determine if the guideline requirements for safe placement had been met.

Materials and Methods: Over a 6 month period, 134 consecutive intensive care patients with 139 CVCs (internal jugular or subclavian) were included. Using the carina as a surrogate marker for the pericardial reflection, tip position was identified independently by both an anaesthetist and radiologist. The angle of the tip to the vertical was used as a proxy for the angle of incidence with the superior vena cava. Finally, the original radiology report was compared with each finding. Results calculated as percentages.
Results and Discussions: Catheter placement below the carina was common with 50(35.9%) right sided and 85(7.7%) left sided so sited. All right sided catheters above the carina had a shallow angle of incidence (~30°) to the vertical whereas more than 75% (24) of left sided lines had a steep angle of incidence (~30°). Differences in perception of tip position were common with 25(18%) of radiology reports failing to match study findings. The SVC is relatively mist and parturient rotation about the axial plane associated with the use of semi-erect and kyphotic projections may explain this apparent anomaly (3).

Conclusions: This study demonstrates a high proportion of CVCs suboptimally positioned, despite current guidelines. However, for left sided catheters, these results also suggest that satisfying all criteria for safe placement is difficult.

References:

17AP3-4
Risk mortality in surgical patients: two years analysis
J. Gil Bona, A. Sabaté, R. Adroier, E. Jaurrieta
Anesthesiology, Bellvitge Hospital, Hospital de Llobregat, Spain
Objective: Risk mortality factors for surgical patients in a university tertiary hospital
Material and Method: We performed a cross-sectional study. Data from surgical death patients at the first 30 days after surgery for two years (2004–05) period were collected. Pre, intra and postoperative data were analysed. A bivariate and multivariate analysis was performed relating death cause with pre and postoperative observations. Chi square of Pearson and regression analysis were made.
Results: 4559 and 5044 patients under ambulatory surgery for 2004–05 period were excluded of this study.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of operations</th>
<th>Number of deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Emergency</td>
<td>Elective</td>
</tr>
<tr>
<td>2004</td>
<td>1983</td>
<td>10489</td>
</tr>
<tr>
<td>2005</td>
<td>1998</td>
<td>10500</td>
</tr>
</tbody>
</table>

Mortality-relationship with preoperative risk factors, only arterial hypertension, diabetes mellitus and cancer diagnosis had significance with mortality in the postoperative period.

Age was related to associated diseases, need for ICU, and death at the first 48h. Men have a tendency to toxic habits and kidney diseases as preoperative risk factors, while women have it to neurological and psychical diseases. Patients with cancer or hepatics diseases need more for ICU. The most aggressive surgery has more intra and postoperative complications, including sepsis. To admit in ICU is an independent risk factor for sepsis and death for sepsis.

Cardiac death (ischemic events, heart failure, arrhythmias) was related with reperations, postoperative sepsis, and postoperative bleeding. Sepsis related death was associated to admittance in ICU and reperations. Respiratory death was related to bronco aspiration, pneumonia, and acute respiratory failure. Neurological death was related with stroke.

Conclusion(s): Surgical patients continue to account for a large number of dead in the hospitals. A more exhaustive control of cardiac complications and sepsis should improve the outcome. More studies should be necessaries to confirm if admission of these patients in ICU could meliorate results.

17AP3-5
Family member presence during induction of anesthesia in elderly patients – a feasibility study
A. Perel, Y. Mishuk, I. Matot
Anesthesiology and Intensive Care, Sheba Medical Center, Tel Aviv University, Israel, Tel Aviv, Israel
Background and Goal of Study: Elderly patients who undergo anesthesia often present with varying degrees of dementia, disorientation and sensory impairment which may cause communication problems and increase anxiety before anesthesia. We have therefore explored the feasibility of the presence of a family member (FM) during induction of anesthesia in elderly patients by recording its acceptability and its effects on the patient, the FM and the staff.

Material and Methods: Patients >70 years old who were escorted by a FM on arrival to the OR were included in the study. Following informed consent, the FM’s escorted the patients into the OR, and stayed throughout the induction period. Separate questionnaires were filled by patients and FM’s before and after anesthesia, and by the anesthesiologist and OR nurse post-operatively.

Results and Discussions: Out of the 33 (out of 40, 82.5%) that gave consent (age 76.8 ± 4.9, range 70–89), 67% spoke Hebrew well, and 21%, 70% and 88% reported symptoms of mental, hearing and sight impairments, respectively. Their reported anxiety from anesthesia (VAS score 10 – not anxious; 0 – very anxious) was 6.7 ± 3.4 pre- and 8.8 ± 2.2 post-operatively (p < .006). FM’s overestimated patients’ anxiety both pre- (5.4 ± 3.3, p < .05) and post-anesthesia (6.0 ± 3.2, p < .0001). Anesthesiologists and nurses also overestimated the patient’s anxiety from anesthesia (7.1 ± 2.6, p < .001, 7.0 ± 2.7, p < .002, respectively). Patients had 21 general, 10 regional and 2 combined anesthetic procedures. IV lines were inserted in 19 and regional anesthesia performed in 5 patients in the FM’s presence. Post-operatively, 85% of the patients reported that the FM’s presence improved their feeling in the OR and 76% would like to be escorted again if needed. Of the FM’s, 97% enjoyed the experience, 91% felt that their presence was helpful, and 85% would prefer to do it again if needed. Of the anesthesiologists and the nurses 44% and 79%, respectively, thought that the FM presence was helpful, and 50% and 18%, respectively, that it made no change.

Conclusions: The presence of family member during induction of anesthesia in elderly patients reduces patients’ anxiety, is well accepted by patients, FM’s, and most of the OR staff, and should be considered as an integral part of the anesthetic management of elderly patients.

17AP3-6
Unexpected postoperative hypoxia during patients transfer from operating theatre to the recovery room
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Anaesthesiology and Intensive Therapy, Medical University of Gdańsk, Gdańsk, Poland

Background and Goal of Study: Transport of postoperative patients from the operating theatre (OP) to the recovery room (RR) without any monitoring and oxygenation may lead to the unexpected ventilatory disturbances.

Materials and Methods: 90 ASA II–III patients, mean age 58.8 (±15.3) years, after general anesthesia were studied during transfer from OP to RR. During the transport no oxygen and monitoring were used. Last SpO2 measurement in the OT and the first in the RR were estimated. To evaluate the breathing improvement while oxygenation the acid-based balance (ABB) were performed 10 minutes after admission to the RR. Mean postoperative times of: T1 – transfer, T2 – without monitoring, T3 – without oxygenation were measured.

Results and Discussions: Mean SpO2 in the OT was 96.9% (±10.5), in the RR – 94% (±6.35). After 10 min of oxygenation in the ABB test acidosis was observed with mean values: pH 7.31 (±0.054), pCO2 48.01 (±6.39) mmHg, the pO2 was normal—126 (±44.45) mmHg. The mean T values were: T1 – 90 (±94.2) s, T2 – 152.63 (±86.63) s, T3 – 122.9 (±86.8) s.

Conclusion(s): 1. Although transfer time takes only about 90 s, decrease in SpO2 was observed in every patient. 2. The transfer time takes 90 s, but the time without monitoring and oxygenation is longer. 3. In 73% of studied patients after 10 min of oxygenation there was acidosis with hypercapnia observed in the ABB, 4. Right after admission to the RR hypoxemia was observed in every patient, but after 10 min oxygenation the pO2 was normal. 5. After general anesthesia patient should be oxygenated during the transfer because of hypoxemia and admitted to the RR because of the risk of hypoventilation.

17AP3-7
Automated anesthesia medication dispensing systems: single-issue, limited-access drawers may reduce medication errors
L. Cooper, M. Barron, C. Gallagher, J. Sciarra
Anesthesiology, University of Miami Miller School of Medicine, Miami, USA
Background and Goal of Study: Although automated medication dispensing systems (AMDS) have been shown to reduce medication errors in the nursing environment, the same is not true in the anesthesia environment. Previous reports have suggested that anesthesia medication error is not eliminated with AMDS. However, due to lack of pharmacist review prior to administration of anesthetics, and the element of human error that exists in the anesthesia realm, AMDS have gained widespread use throughout the United States. We present the first report that suggests a reduction in anesthesia medication error when an AMDS is used.
EAMS (European Airway Management Society) – Airway Management

19AP1-1
Comparison of three video laryngoscopes with Macintosh laryngoscope in simulated difficult intubation: a manikin study
H. Saijo, S. Sugino, N. Kanaya, H. Watanabe, A. Namiki
Department of Anesthesiology, Sapporo Medical University School of Medicine, Sapporo, Japan

Background:
A new video laryngoscope (Airwayscope™, CO, Japan) (AWS) has recently been developed. The AWS is designed to provide a view of the glottis without requiring alignment of the oral, pharyngeal, and tracheal axes. Although this novel device may have advantages over conventional direct laryngoscopes (DL), its performance in a clinical setting has not been elucidated. The aim of this study was to compare the performance of an AWS and that of a DL for tracheal intubation.

Materials and Methods:
Following approval of the protocol of the present study by the Ethics Committee of our institution and obtaining informed consent, 36 patients (ASA I, II) who were scheduled to undergo surgery were randomly assigned to an AWS group (n = 18) or a DL group (n = 18). After general anesthesia had been induced with propofol and vecuronium IV, the lungs were ventilated with 100% oxygen and 5% sevoflurane via a facemask. All tracheal intubations were performed after ventilating for five minutes. Number of attempts, time to successful intubation, and the changes in hemodynamics after 1 min of intubation were measured. Cormack grades, the use of sniffing position, and the use of the BURP maneuver were also evaluated. The differences were analyzed using unpaired Student t-tests and chi-square tests. P values of <0.05 were considered statistically significant.

Results and Discussions:

<table>
<thead>
<tr>
<th></th>
<th>AWS group (n = 18)</th>
<th>DL group (n = 18)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attempts</td>
<td>1.4 ± 0.8</td>
<td>1.3 ± 0.5</td>
</tr>
<tr>
<td>Time (sec)</td>
<td>40.8 ± 24.5</td>
<td>35.1 ± 12.3</td>
</tr>
<tr>
<td>Increase of BP (%)</td>
<td>140 ± 30.8</td>
<td>161 ± 34.0</td>
</tr>
<tr>
<td>Increase of HR (%)</td>
<td>115 ± 14.0</td>
<td>136 ± 31.1</td>
</tr>
<tr>
<td>Cormack</td>
<td>1.2 ± 0.5</td>
<td>1.4 ± 0.5</td>
</tr>
<tr>
<td>Sniffing</td>
<td>2 / 18*</td>
<td>10 / 18</td>
</tr>
<tr>
<td>BURP</td>
<td>0 / 18*</td>
<td>8 / 18</td>
</tr>
</tbody>
</table>

* P < 0.05 vs. LS group.

Conclusions:
The AWS is less invasive than a conventional DL for tracheal intubation in clinical situations.

19AP1-3
Anesthetic implications of Morquio syndrome: impossible intubation though fiberoptic endoscopy
M. Sandby-Thomas, E. Duff, I. Hodzovic
Anaesthesia and Intensive Care, Wales College of Medicine, Cardiff, United Kingdom

Background and Goal of Study:
Morquio syndrome is a subtype of the mucopolysacharidoses characterized by the intracellular accumulation of keratin sulphate. The prevalence of this disease is 1:100,000. Infiltration of tissues leading to distortion of upper airway anatomy with difficult or impossible endotracheal intubation, infiltration of the cervical spine with odontoid hypoplasia places these patients at risk of atlantoaxial subluxation.

Case Report:
A 16 years old, 22-kg girl, with Morquio syndrome was proposed for a bilateral cornea transplant. Physical examination revealed broadened face, short and wide nose, macroglossia amygdaline hypertrophy, short neck, and Mallampati III classification. Ten years before the patient was submitted to general anesthesia for implantofix implantation and due to postoperative respiratory difficulties was transferred to an intensive care unit. Inhalation induction was performed, but assisted ventilation was ineffective. Intubation with a bronchofiberscope was attempted, but also failed due to mucous membrane hypertrophy. Thus, intubation with a larvengal mask was performed with adequate ventilation. Maintenance and recovery of anesthesia were unremarkable.

Conclusions:
Spontaneous respiration is recommended in the induction of general anesthesia until the patient is intubate, as airway anomalies, bleeding and salivation may make intubation extremely difficult. To prevent cervical spine movement we choose intubate the patient with a bronchofiberscope. The exuberant hypertrophy of the oropharynx mucous membrane and of the hypopharynx of this patient prevented the visualization of the larvengal structures, which made intubation impossible. Confronted with the need to ventilate patient, it was then advanced to the intubation with a larvengal mask with success.

References:
19AP1-4
Prospective clinical trial comparing AirWay Scope with Macintosh laryngoscope in 306 patients
J. Koyama, K. Hongo
Neurosurgery, Shinshu University School of Medicine, Matsumoto, Japan

Background and Goal of Study: The AirWay Scope was developed expecting to alleviate the difficult intubation, and to reduce the invasiveness for patients (1). The purpose of this study was to describe basic usability of the AirWay Scope in comparison with Macintosh laryngoscope for tracheal intubation.

Materials and Methods: Three hundred and six patients were randomly assigned to intubation using Macintosh laryngoscope (DLS, n = 153) or intubation using the AirWay Scope (AWS, n = 153). A Cormack and Lehane (C&L) grade, time taken for intubation (TTI), optional techniques necessary to intubate and complications were recorded.

Results and Discussion: Concerning C&L grade, 149 patients (97.4%) showed grade 1, and remaining 4 patients (2.6%) in grade 2 in the AWS group. This was significantly low in compared with 89 patients (58.2%) in grade 1, 59 patients (38.5%) in grade 2, and remaining 5 patients (3.3%) in grade 3 in the DLS group (p < 0.0001). TTI was 28.9 ± 15.7s in the AWS group. It was significantly longer than 21.6 ± 9.4s in the DLS group for 7.3s (p < 0.0001). Optional techniques such as neck extension and BURP maneuver were necessary less frequently in the AWS group significantly (p = 0.0056 and p < 0.0001).

Conclusion: The AirWay Scope provided a better laryngeal view than that of direct laryngoscopy with few opportunities for optional techniques. Although it took an additional 7.3s to intubate the trachea, the AirWay Scope is the device having equal to or higher potential than the Macintosh laryngoscope for ordinary and difficult tracheal intubation.

Reference:

19AP1-5
Evaluation of airways in patients with Benign Symmetrical Lipomatosis of the neck
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Anesthesiology Reranimatolog, State Medical and Pharmaceutical University, Chisinau, Republic of Moldova

Background and Goal of Study: Possible anaesthesiological problems related to Benign Symmetrical Lipomatosis of the Neck (BSLN) – Syndrome Madelung

Lanosis and Bensauda are difficult airways, insufficiency of peripheral veins, polynephropathy and delayed drug metabolism, and related to this delayed weaning. The goal of our study was to describe particularities of anaesthesiology assistance in patients with BSLN in comparison to general population.

Materials and Methods: Were investigated 81 patients: 51 with BSLN and 30 surgical patients non-BSLN from general population (control) comparable for age, weight, duration of anesthesia (DA). Was compared risk of difficult airway, spontaneous respiration and extubation.

Results and Discussions:
Criteria BSLN (n = 51) Control (n = 30)
Age, years 47 ± 0.9 46 ± 0.8
BW, kg 78 ± 0.4 77 ± 0.5
Mallampati I 8 (12%) 12 p-nts (40%)
Mallampati II 24 p-nts (47%) 11 p-nts (37%)
Mallampati III 18 p-nts (35%) 6 p-nts (20%)
Mallampati IV 3 p-nts (6%) 1 p-nt (3%)
Wilson: 0–2 12 p-nts (24%) 16 p-nts (53%)
Wilson: 3–4 31 p-nts (61%) 12 p-nts (40%)
Wilson: 5–6 8 p-nts (15%) 2 p-nts (7%)
Belhousse-Dore: I 5 p-nts (10%) 13 p-nts (43%)
Belhousse-Dore: II 29 p-nts (57%) 15 p-nts (50%)
Belhousse-Dore: III 17 p-nts (33%) 2 p-nts (7%)
VC, % 80.4 ± 4.7* 112.5 ± 6.2
FVEV, % 64.5 ± 4.3** 88.2 ± 5.6
DA, h. 3.1 ± 0.3 3 ± 0.33
RRS, h 10.5 ± 0.62** 0.13 ± 0.09
ET, h. 2.75 ± 0.86* 0.65 ± 0.31

* – p < 0.05; ** – p < 0.02; *** – p < 0.01

Conclusions: Patients with BSLN in comparison to general population present higher risk of difficult airway, and delayed time of restoration of spontaneous respiration and extubation.

19AP1-6
Postoperative Stridor resulting from paradoxical vocal cord motion
D. Varveris, F. Henderson, N.G. Smart
Department of Anaesthesia, Southern General Hospital, Glasgow, United Kingdom

Background and Goal of Study: Upper airway obstruction following general anaesthesia requires prompt diagnosis and treatment. We report a case of stridor following laryngeal mask anaesthesia caused by paradoxical vocal cord motion (PVCM). PVCM is very rare following anaesthesia and all previous reported cases occurred after endotracheal intubation (1).

Materials and Methods: A case report

Results: A 44 year old woman presented for PIP joint replacement. Past history included asthma, psoriatic arthropathy, and breathing difficulties following a previous anesthetic which had been diagnosed as hyperventilation. A regional block was declined. After an uneventful general anaesthesia, she had no respiratory difficulty for the first 45 minutes and then started retching. Immediately thereafter, she developed difficulty in breathing, inspiratory stridor, and increasing anxiety. Nebulised salbutamol 5 mg, nebulised epinephrine 1 mg, hydrocortisone 100 mg, and midazolam 5 mg all failed to improve the stridor. Although tachycardic (120bpm), SaO2 and arterial blood gases remained within normal limits, and there was no hypotension, rash or bronchospasm. An ENT consult was obtained and a decision to proceed to endoscopy made. On passing the scope through the nostril, stridor disappeared. Pharynx and larynx were normal with no blood, edema or trauma evident. Recovery was thereafter uneventful, the whole episode lasting 2 hours.

Conclusions: Resulting from intrinsic laryngeal muscle dysfunction, PVCM is more common in females and may be associated with anxiety states. As a cause of postoperative stridor, it should be considered only after elimination of life threatening conditions such as airway or pulmonary edema, foreign body aspiration, and bronchospasm. Diagnosis is by laryngoscopic evidence of vocal cord adduction in inspiration and abduction in expiration. Management should concentrate on ensuring oxygenation. Sedation with benzodiazepines (2) and reassurance can be successful but CPAP, bag and mask ventilation, or tracheal intubation may be required.

References:

19AP1-8
A comparison of hemodynamic response during anesthetic induction between AirWay Scope™ and Macintosh laryngoscope
H. Tokoryama, T. Yokoyama, R. Yokoyama, K. Yamashita, M. Manabe
Department of Anesthesiology and Critical Care Medicine, Kochi Medical School, Nankoku, Japan

Background and Goal of Study: AirWay Scope™ (AWS, Pentax Co. Tokyo) is a newly developed fiberoptic laryngoscope with fiber optic light source and a rigid disposable polycarbonate blade (INTLOCK). This device does not require direct laryngoscopy, thus it may be less effective on hemodynamic response. In this study, we examined the effect of orotracheal intubation using AWS on the hemodynamic response and compared to Macintosh laryngoscope.

Materials and Methods: After institutional approval and written consent, 20 patients undergoing elective surgery were randomly assigned to receive orotracheal intubation with the AWS or the Macintosh laryngoscope. Anesthesia was induced with fentanyl 2 μg/kg and Midazolam 0.1 mg/kg, and lung were ventilated manually with 2% sevoflurane in oxygen. Vecuronium 0.1 mg was administered when BIS decreased to 60. Endotracheal intubation was performed after muscular relaxation. Heart rate and blood pressure were measured continuously during induction, and blood samples were collected before and 2 min after the orotracheal intubation.

Results and Discussions: There were no significant differences in patients’ background between the AWS group and the Macintosh group. Systolic BP decreased to 73.1% (AWS) and 73.7% (Macintosh) to the baseline before intubation, and recovered to 96.1% (AWS) and 97.0% (Macintosh) after intubation. Orotracheal intubation with the AWS required 31 ± 22 seconds for intubation, while the Macintosh laryngoscope required 23 ± 7 seconds. Serum noradrenaline after intubation was 196 ± 87 pg/ml (AWS) and 192 ± 34 pg/ml (Macintosh). There were no significant differences in HR, BP, intubation time and serum noradrenaline concentration.

Conclusion: The AWS has a wide monitor with a good view and easy to operate, but the hemodynamic response to orotracheal intubation was not significantly different from that with the Macintosh laryngoscope.
19AP1-9
The temperature if laryngoscope light bulbs compared to light emitting diodes
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Department of Anaesthetics, University Hospital of Wales, Cardiff, United Kingdom

Background and Goal of Study: Oropharyngeal burns due to laryngoscope light bulbs reaching high temperatures have been documented. This is a particular hazard in neonates where the thin immature surface mucosa is at increased risk. Light emitting diodes (LEDs) are thought to emit less heat. The aim of this study was to measure the temperature of incandescent laryngoscope bulbs, currently used in the UK in laryngoscope blades, and an LED in a custom-made laryngoscope blade.

Materials and Methods: The temperature of a xenon bulb (A), a vacuum bulb (B) and an LED (C) contained in different laryngoscopes blades was measured using a K-type thermocouple under standardized conditions. The current used by the laryngoscopes was also documented.

Results and Discussions: The temperature of the LED was much lower than either of the incandescent bulbs. The current recorded for the LED was 40 mA compared to that recorded for the incandescent bulbs at 750 mA. The lower temperature of the LED bulb will reduce the risk of oropharyngeal burns particularly if laryngoscopy is prolonged. The much lower current requirements of the LED reflect its greater efficiency with less energy being lost as heat.

Conclusion(s): The LED bulb is less likely to cause thermal injury at laryngoscopy. This may be particularly important in neonates or where difficult and prolonged laryngoscopy is anticipated.


19AP1-10
Radiographic evaluation of cervical spine motion during airway management comparing flexible bronchoscopy (FB) with the Lo-Pro GlideScope (LP-G)
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Department of Anesthesia, Toronto Western Hospital, University Health Network, University of Toronto, Toronto, Canada

Background and Goal of Study: It is essential to prevent or minimize cervical spine motion in patients with c-spine injury. Fiberoptic bronchoscopy (FB) is widely regarded as the gold standard for intubating patients with airway instability. The Lo-Pro Glidescope (LP-G) is a new improved video laryngoscope and may be associated with less c-spine movement. We aimed to compare c-spine motion during intubation with FB versus LP-G.

Materials and Methods: After ethics board approval 28 consenting adults with no cervical spine abnormality were randomized to be intubated with either Fiberoptic bronchoscopy but this study has shown that there is some movement associated even with this technique.

Results and Discussions: Demographic and clinical characteristics of the study patients were statistically similar between the two treatment groups. In the control group, a significant increase in the heart rate, systolic, diastolic and mean blood pressure were observed1,3,5 and 10 min following intubation.

Conclusion: Preoperative administration of Lornoxicam attenuates the haemodynamic response to intubation in elderly
W.R. Soliman, A.A. Moussa, M.A. Nassef
Anesthesia, King Khaled Eye Specialist Hospital, Riyadh, Saudi Arabia

Background and Goal of Study: Lornoxicam is a novel non-steroidal anti-inflammatory drug (NSAID) with marked analgesic properties. Laryngoscopy and endotracheal intubation cause a reflex increase in sympathetic activity that results in hypertension, tachycardia, arrhythmia and may cause myocardial ischemia in susceptible patients. Minimizing perioperative adverse events especially in elderly patients is of utmost importance. The aim of this study is to demonstrate the effect of preoperative administration of Lornoxicam on haemodynamic changes during laryngoscopy and tracheal intubation in elderly.

Materials and Methods: After obtaining approval from the Hospital Ethics Committee and patients’ informed consent, 50 elderly patients, aged between 65–75 year, ASA class I and II enrolled in this study. All patients received no premedication. Patients randomly assigned into two groups using sealed envelope technique, to received either Lornoxicam 8 mg or placebo in 5 ml covered syringe half hour before surgery, anaesthesia was induced with fentanyl, propofol and atracurium to facilitate tracheal intubation. Systolic, diastolic, mean arterial blood pressure and heart rate were recorded before and after administration of the intravenous anesthetic, also at 1, 3, 5 and 10 min after intubation.

Results and Discussions: No significant differences between the two treatment groups. In the control group, a significant increase in the heart rate, systolic, diastolic and mean blood pressure were observed1,3,5 and 10 min following intubation.

Conclusion: Preoperative administration of Lornoxicam attenuates the haemodynamic response to laryngoscopy and endotracheal intubation in elderly population.

19AP2-2
Effects of low dose ketamine on intubation conditions with rocuronium
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Background and Goal of Study: Ketamine due to its sympathomimetic effects would reduce the onset time of rocuronium and would be beneficial for better intubation conditions (1,2). This study investigated the effects of low dose ketamine and priming on onset time of rocuronium and intubation conditions.

Materials and Methods: After ethics committee approval and informed consent, 120 patients were recruited for the study and they were randomly allocated into four groups (Priming, Ketamine-priming, Ketamine and Control groups) and anaesthesia was induced with 2.5 mg.kg⁻¹ propofol. Additional ketamine dose was 0.5 mg · kg⁻¹. Rocuronium at a priming dose 0.06 mg · kg⁻¹ followed by 0.54 mg · kg⁻¹ after 2 min was used. In Ketamine and Control groups,
runcuronium dose was 0.6 mg/kg. S/5 M-NMT neuromuscular transmission module (Datek-Oxhemda, Madison, WI) was used for neuromuscular transmission monitoring. One-way Anova, Kruskal-Wallis, Mann-Whitney U and Bonferroni tests were used for statistical analysis. The results are given as percentages, 95% confidence interval.

Results and Discussions: In groups with ketamine, intubation conditions were better compared to priming and control groups (p < 0.001) (Table 1). Onset time of runcuronium in ketamine receiving groups was not shorter after post-hoc correction (ketamine; 162.7 sec, ketamine-priming; 168.8 sec, priming; 212.8 second control; 216.8 sec) (p > 0.05). Priming hadn’t any effects on intubation conditions and on onset time (p > 0.05).

Table 1

<table>
<thead>
<tr>
<th></th>
<th>Excellent</th>
<th>Good</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ketamine</td>
<td>14</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>Priming</td>
<td>9</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Ketamine-priming</td>
<td>17</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Control</td>
<td>6</td>
<td>10</td>
<td>14</td>
</tr>
</tbody>
</table>

Conclusion(s): Addition of low dose ketamine (0.5 mg · kg⁻¹) with or without priming ameliorated the intubation conditions. It can be used in cases where smooth intubation is desired.

References:

19AP2-3  
LMA ProSeal™ in the veterinary anaesthesia – the animal is patient as well
M. Bokdizar, K. Pelikan, D. Repel, P. Vidrichkova, A. Sevcik  
Clinic of Surgery, Orthopedic & Radiology, University of Veterinary Medicine, Kosice, Slovakia

Background and Goal of Study: Airway management during general anaesthesia (GA) is a cardinal problem in the veterinary anaesthesia as well. Open airways can be achieved by a change of a patient’s head position, a face mask [FM] or by an insertion of an endotracheal tube [ETT]. These techniques have advantages and disadvantages. The introduction of the laryngeal mask [LMA] into human anaesthesia was a revolutionary breakthrough at the end of the 20th century which solved problems connected with the FM and ETT. The first use of LMA Classic™ in the veterinary anaesthesia dates back to 1991 and LMA ProSeal™[PLMA] to 2005.

Materials and Methods: The use of PLMA on animals n = 49 in three species [dogs 35, sheep 7, swines 7] was studied. In all the animals Propofol without myorelaxants for the induction into GA, the cuff pressure 40 cm H₂O, lubricant jelly without a local anaesthetic were used. Ventilation time [VT] through the PLMA, the signs of the gastric reflux [RL], successful PLMA insertion on the first attempt [SI] and the malposition [MP] were followed up. The proper position of PLMA cuff in the hypopharynx was held in check by X Ray. The proper position of the distal aperture of the drain tube [DT] was confirmed by insertion of a gastric tube into oesophagus via DT. Three insertion techniques recommended for human anaesthesia as well as bubble test were tested.

Results: The three insertion techniques recommended for human anaesthesiathesia are unsuitable in a veterinary anaesthesia. The bubble test is necessary to be modified because performing a suprasternal test in animals is impossible. Statistical data are shown in the table:

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>VT min</th>
<th>R %</th>
<th>SI %</th>
<th>MP %</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOG</td>
<td>35</td>
<td>76.43 ± 45.56 SD</td>
<td>8.6</td>
<td>91.4</td>
<td>5.7</td>
</tr>
<tr>
<td>SHEEP</td>
<td>7</td>
<td>50.71 ± 30.99 SD</td>
<td>71.4</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>SWINE</td>
<td>7</td>
<td>115.71 ± 41.98 SD</td>
<td>0.0</td>
<td>100</td>
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</tr>
</tbody>
</table>

Conclusion: The use of PLMA in the veterinary anaesthetic practice significantly improves airway management in animals during GA.

19AR2-4
Awake nasotracheal retrograde intubation using the subcricoid region: A comparison of two techniques
S.K. Nadarajan, D. Sethuraman, M. Ravishankar  
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Background and Goal of Study: An important drawback of the retrograde tracheal intubation (RI) is inadvertent oesophageal intubation. The subcricoid approach (1) and the use of fibroscope as antegrade intubation guide before the removal of the guidewire were advocated to prevent oesophageal intubation (2). In this study we compared two RI techniques using the subcricoid approach.

Materials and Methods: After obtaining the hospital ethics committee’s approval, 40 adult patients (ASA I-III) with anticipated difficult intubation scheduled for elective maxillofacial surgery, were recruited. Awake nasotracheal RI using the sub-cricord approach was performed under topical anaesthesia and sedation with the Cook’s RI kit (C-retro-14.0-70-38J-110-CAE, Cook Critical Care Inc. Bloomington, IN). After subcorticoid positioning of the retrograde intubation guide and the endotracheal tube (ETT), patients were randomized into two groups. In group 1 (n = 20) the intubation guide was advanced into the mid-trachea after removing the GW and the ETT was advanced over it. In group 2 (n = 20), before removing the guidewire (GW), the intubation guide was withdrawn antegradely and passed through the ETT by the side of the GW into the trachea.

Results and Discussions: Nasotracheal intubation was successful in 38 patients (95%). Oesophageal intubation occurred in 1 patient in each group. Achieving intubation in Group 1 was easier and less time consuming although the mean time for intubation was not statistically significant between the groups (241.7 ± 76.4 sec vs. 281.1 ± 64.1). Complications were minor and self-limiting.

Conclusion(s): We conclude that nasotracheal RI using the Cook’s RI kit, with the subcricoid approach is a safe and effective way of securing the airway in patients with anticipated difficult intubation. Both the retrograde techniques are simple and can be performed without significant patient discomfort under topical airway anaesthesia and sedation.

References:

19AP2-5
Transtracheal high-frequency jet ventilation using a two-lumen central venous catheter for laryngomicrosurgery
K. Lee, B. Choi  
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Background: Transtracheal jet ventilation can be used for endoscopic laryngeal surgery and patients with acute airway problems. We report a case of transtracheal high-frequency jet ventilation (HFJV) using a two-lumen central venous (CV) catheter for laryngomicrosurgery (LMS) to remove a vocal cord polyp.

Case: A 33 years old female, 54 kg and 167 cm, was scheduled for laser LMS to remove a polyp arising from posterior 1/3 of vocal cord. Anesthesia was induced with intravenous alfentanil 10 μg/kg, propofol 1.5 mg/kg, and atracurium 0.5 mg/kg, then a laryngeal mask airway (LMA) was inserted and maintained with 3% sevoflurane in O₂. After confirming that the patient was ventilated appropriately at the extended neck position, a 7 Fr., 20 cm two-lumen CV catheter, containing a 14 G distal lumen and an 18 G proximal lumen, inserted into the trachea caudal via cricothyroid membrane using Seldinger’s technique. Then, 2 mg of midazolam and 10 μg/kg of additifentanil were administered intravenously and the LMA was removed, then the surgeon confirmed that the catheter tip was positioned about 2 cm above the carina via a direct bronchoscope. Jet ventilation was started via the distal tubing of CV catheter using the following settings: rate 2 Hz, I/E ratio 0.5, driving pressure 2.5 bar, FiO₂ 0.3. A carbon-coated spatula was used by the surgeon for protection of CV catheter from laser beam during the surgery. The vocal polyp was removed and bleeding was controlled, and 1 mL of arterial blood was sampled for gas analysis. After ending of the surgery, jet ventilation was stopped, and the spontaneous respiration was recovered with ventilatory support via a face mask with 100% O₂. The CV catheter was removed and the patient was transported to the PACU.

Conclusion: We could supply an unobstructed and good operation field with less vibration to the surgeon by transtracheal HFJV using a two-lumen CV catheter for laser LMS to remove a vocal cord polyp. And we suggest that capnography and airway pressure monitorings during jet ventilation are possible using the proximal tubing of CV catheter, and also barotrauma can be prevented by supplying another gas outlet via the proximal tubing of CV catheter.

19AP2-6
Comparison of different doses of remifentanil for insertion of IMA using etomidate
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Background and Goal of Study: Concurrent use of opioids or succinylcholine with etomidate, the induction agent, can reduce the occurrence of airway...
reflexes and increase the success rate of LMA. We aimed to compare effectiveness of different doses of remifentanil on inserting LMA with etomidate.

Materials and Methods: 120 adult patients, ASA I–II, scheduled for urologic or orthopaedic procedures under general anaesthesia, were randomly allocated into four groups: remifentanil was applied at 1 μg kg⁻¹ in group RI, 0.75 μg kg⁻¹ in group RII and 0.5 μg kg⁻¹ in group RIII. Then 0.3 mg kg⁻¹ etomidate was applied. In group L, after isotonic saline, 0.3 mg kg⁻¹ etomidate and 1 mg kg⁻¹ succinylcholine were applied. LMA was inserted by a blinded anaesthesiologist. All patients were assessed with a 4 point scale (1: easy, 2: moderate, 3: difficult, 4: impossible). We compared the time for LMA placement, haemodynamic changes and additional doses of remifentanil (ADR), succinylcholine (ADS), and conditions for LMA placement. Data were analysed using Appendix, Kruskall–Wallis, Mann Whitney U and Chi-square tests, with p < 0.05 considered statistically significant (mean ± SD).

Results and Discussions: Though there was no difference in ease of LMA insertion between the groups (p = 0.065), LMA was inserted within the first attempt and less than 10 seconds (easy) in 90% of the patients in group R and RII, while 82% in group RIII and 77% in group L. ADR was less needed in group RI and RII compared to groups L and ADS while, (ADS) was less needed in groups RI and L compared to group RII and RIII (p < 0.05). Significantly fall in systolic blood pressure (SBP) in groups RI, RII and RIII, the mean of lowest SAP values of groups RI, RII and RIII were all above the 100 mmHg.

Conclusion(s): 1 μg kg⁻¹ dose of remifentanil with etomidate would be a good alternative for LMA insertion with the less additional doses of succinylcholine and remifentanil.

Reference:

19AP2-7
Haemodynamic response to fiberoptic nasotracheal intubation in deeply sedated patients
J. Balaguer, J. Martin, M. Estruch, J. Soliveres, C. Solaz
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Background and Goal of Study: Fiberoptic intubation (FOB) in anaesthesia is widespread used for the difficult airway management (1). Although haemodynamic response to awake fiberoptic intubation uses to be a rise in blood pressure, haemodynamic response in deeply sedated patients is not well studied yet (2,3). The objective of this paper is to study the haemodynamic response to fiberoptic nasotracheal intubation in the patient deeply sedated.

Materials and Methods: After local ethics committee approval and obtaining written informed consent, 30 consecutive ASA I–II patients were enrolled in the study. Hypertensive patients were excluded. Patients with basal SBP (systolic blood pressure) over 150 mmHg were also excluded. After standard monitoring, atropine sulfate (10 μg kg⁻¹) was given i.v. and sedation was started with propofol at 8–10 mg kg⁻¹ h⁻¹ until Ramsay 3 sedation score was achieved. 2% lidocaine with epinephrin 1% was used for nasal mucosa; 2% lidocaine 2cc was sprayed on the supraglotic region. Paired samples t-test obtained at 5% significance level. Data shows mean ± SD.

Results and Discussions: 9 patients were excluded because of basal SBP > 150 mmHg. 21 patients were analysed (ASA III/IV: 10/5/6. Height: 166.4 ± 9.9 cm. Weight: 81.3 ± 20.2 kg. Gender M/F: 12/9). Table shows SBP basal, basal diastolic blood pressure (basal DBP), mean blood pressure (basal MBP), and immediately after FOB (post SBP, post DBP and post MBP).

<table>
<thead>
<tr>
<th>SBP(*)</th>
<th>MAP(*)</th>
<th>DBP(*)</th>
<th>FC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basal</td>
<td>133.9 ± 18.5</td>
<td>90.5 ± 9.3</td>
<td>68.7 ± 11.0</td>
</tr>
<tr>
<td>Post</td>
<td>115.5 ± 18.5</td>
<td>79.2 ± 12.4</td>
<td>58.6 ± 11.1</td>
</tr>
</tbody>
</table>

(*p < 0.05)

Conclusion(s): FOB under deep sedation with propofol perfusion produces a statistically significant but not clinically significant diminution in blood pressure, while FC is not affected.

References:

19AP2-8
Utility of HFJV in management of upper airway complication after thyroid surgery – a case report
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Department of Anaesthesiology, Clinicaj Centre Novi Sad, Novi Sad, Serbia

Airway management

Background and Goal of Study: High frequency jet ventilation (HFJV) has been an established anaesthetic technique of ventilation for laryngomicro surgery (1). Bilateral cord palsy due to lesion recurrent laryngeal nerves is a serious upper airway complication of thyroid surgery. The aim of the study was to evaluate the efficiency of HFJV during the surgical treatment of bilateral vocal cord paralysis after thyroidectomy.

Materials and Methods: We report successful use of HFJV, infraglottic technique, with the patient with serious breathing problems.

Results and Discussions: A 36-year-old female (BMI 23 kg/m²) was admitted with noisy difficult breathing. The thyroidectomy was performed 10 months before. Preoperative examination revealed inspiratory stridor with chest wall retraction. Arterial blood gas on the room air showed pH 7.34, PaO₂ 71.5 mm Hg, PaCO₂ 39.8 mmHg and SaO₂ 94%. Preoperative pulmonary function test showed FEV₁ 70%, FVC 75%, PEF 58%. A flow-volume loop showed a flattening of inspiratory curve. On airway evaluation, Mallampati Class II, hyoid–mental distance of 3 cm with no limited neck extension. Anaesthesia was induced and maintained with continuous intravenous propofol(8–10 mg/kg/h), remifentanil(0.2–0.5 mg/kg/min) and paralysis was obtained with rocuronium (0.5 mg/kg). After bag-and-mask ventilation with 100% oxygen the jet catheter (Accucath, Acutronic) was inserted through the vocal cords into trachea. HFJV was applied with the commercial jet ventilator (Minstral, Acutronic Switzerland) using mix air-oxygen (40%, 60%), driving pressure 1.6 bar, frequency 160/min and inspiratory time 40%. Monitoring included EKG, NIBP, SaO₂, ETCO₂. The laryngomicrosurgical procedure was completed in 40 min. Return to spontaneous breathing was established. Haemodynamic variables were satisfactory. The surgical access and viewing of the larynx was excellent.

Conclusion: HFJV for laryngomicro surgery offers: optimal visibility, immobility of vocal cords, accessibility and exposure of the operation field with a patient with bilateral vocal cord paralysis after thyroidectomy.

Reference:

19AP3-1
Airway device preference in difficult airway scenarios
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Background and Goal of Study: There are few randomized clinical trials evaluating airway devices and little consensus regarding optimal equipment use in various situations(1). The purpose of this study was to determine anaesthetist preference in difficult intubation and can’t intubate can’t ventilate(CICV) situations.

Materials and Methods: Using a piloted questionnaire, 77 anaesthetists at 2 UK hospitals were asked their preferences for alternative airway devices in a difficult intubation scenario, and infraglottic airways in a CICV scenario. Previous use and comfort level in use were assessed on a 5 point Likert scale. Awareness of the Difficult Airway Society CICV guideline and previous attendance at an airway workshop were also assessed. Likert scale data were converted to a binary variable: comfortable (score 4 or 5) and uncomfortable (score 1 or 2). Equivocal data (score 3) were excluded. Results calculated as percentages and compared by Chi square analysis (p < 0.05 significant).

Results and Discussions: Response rate was 87%. In the difficult intubation scenario the preferred first choices were alternative blade (63%), ILMA(18%), and fiberoptic laryngoscope(15%). Over 56% had experienced a CICV situation in practice. For this, the preferred infraglottic device was Meeker(29%) followed by Quicksitch(26%), tracheotomy/bronchoscopy by IV catheter(16%), surgical tracheostomy(13%), open surgical cricothyroidotomy(8%), and Minitrach 2%(5%). Comfort levels were significantly lower than those for equipment used in the difficult airway scenario (p < 0.05), and those for OSC the final step in the DAS CICV guideline, were very low. In both scenarios, previous use of an airway device was associated with significantly higher comfort levels (p < 0.05). Only 62% had attended an airway workshop while 68% were familiar with the DAS guideline.

Conclusion(s): Comfort levels for devices chosen in the difficult airway scenario were significantly higher than for infraglottic devices. This may reflect previous use and experience. Training on models has been shown to improve manual skills(2). These results suggest that airway training may be underused.

References:
The image contains a page from a document discussing various medical topics, including ultrasound and magnetic resonance imaging (MRI) techniques for medical purposes. The text is in English and appears to be from a medical journal or conference proceedings. The page number is 196, and it includes references and discussion points related to airway management and intubation techniques.

### 19AP3-2
**Ultrasound can be a useful tool for predicting the diameter of a left mainstem bronchus: tracheal width measured by ultrasonography vs. tracheal and bronchial width measured by computed tomography**

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**Background and Goal:** Left double-lumen tubes (DLT) are used to isolate and/or collapse the lungs selectively during thoracic procedures in over 98% of patients. One of the most important steps to avoid the complications associated with tube is appropriate selection of the size of the DLT. There is direct correlation between tracheal and left main bronchial (LMB) width and measurement of the tracheal width can be used as a guide to help predict diameter of LMB and the size of LDLT. Our hypothesis is that tracheal width measured by ultrasound correlate with tracheal and bronchial width measured by computed tomography (CT), and that US can be a useful additional tool for predicting of the size of a LMB and LDLT.

**Materials and Methods:** Twenty-five adult patients (14 male; 11 female) aged 23–80 yr who required a DLT during anesthesia for elective thoracic surgery were entered into this study. The inclusion criteria included patients who already had a preoperative CT scan performed in our institution. Measurements of the internal tracheal diameter were made by radiologist at the coronary plane 0.5 cm above sterno-clavicles joints. Measurements of the internal diameter of the LMB were made 1 cm below carina, in coronary (transversal) plane, too. Ultrasound measurement of outer diameter of the trachea was performed on the level just above sterno-clavicles joints in transversal section.

**Results:** There was strong and statistically significant correlation between outer tracheal width measured by US (TW US) and inner tracheal (TWCT) and LMB width (LMBW) measured by MSCT, as well as strong correlation between tracheal and LMB width itself.

**Conclusion:** This study shows that measurement of outer tracheal width by ultrasound can be an useful tool for predicting of the diameter of a left mainstem bronchus.

**Reference:**


### 19AP3-4
**Sniffing position and three axis theory: evaluation by MRI in Japanese subjects**

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**Division of Emergency Medicine, Shinshu University Hospital, Matsumoto, Japan**

**Background and Goal of Study:** A previous study has already reported measurement values of some anatomical positions using MRI, and discussed the sniffing position is not useful for tracheal intubation (R-1). Our purpose was to investigate the relationship between the sniffing position and three axis theory in Japanese using MRI when tracheal intubation was performed.

**Materials and Methods:** Using MRI apparatus (Siemens, Germany), two T1 weighted images (i.e., in neutral (N) and sniffing (S) positions) were obtained in 14 volunteers. The sniffing position was obtained by placing a 5-cm pillow beneath the head. Four lines were drawn on the MRI films, and then three angles were measured by following the method described in R-1. Shortly, (1) the axis of the mouth (MA); (2) the pharyngeal axis (PA); (3) the laryngeal axis (LA); and (4) the line of vision were drawn on each film. Alpha angle (A) was defined as the one obtained between MA and PA; beta angle (B) between PA and LA, and delta angles (D) between line of vision and LA. When the intersection of the axes was located under the Th-2 level, B was regarded to be unmeasurable in the present study although all the images could show above Th-2 level in R-1. Data were expressed as mean (SD) and statistical analysis were performed using paired t-test.

**Results and Discussions:** Six male volunteers with no history of diseases in their upper airways were enrolled. The age was 38.4 years (10-20-49). Height was 162-cm (8, 160–175), Body Mass Index (BMI) was 23.2 (2.23-28). B in four volunteers could not be measured since the intersection of the axes was under the Th-2 level. A was 71.5 degrees in N, 51 degrees in S, respectively (P = 0.03). D was 43.5 in N and 35 in P (P = 0.02). Our results indicated the sniffing position provided smaller D values, which suggested the better vision for tracheal intubation.

**Conclusions:** One of the reasons for the discrepancy between our study result and R-1 result might be the racial difference. Further studies would be necessary to determine an influence of the sniffing position on the tracheal intubation.

**Reference:**


### 19AP3-5
**Does cigarette smoking affect the haemodynamic response after tracheal intubation?**

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**Background and Goal of Study:** Tracheal intubation results in marked sympathemic overactivity. Smokers are more prone to coronary vessel disease than nonsmokers and an exaggerated increase in rate-pressure product may cause critical myocardial ischemia (1). In our study we aimed to investigate heart rate, blood pressure and rate-pressure product changes in smokers and non-smokers after tracheal intubation.

**Materials and Methods:** In a prospective, blinded study, 72 ASA I patients aged 20–49 year, who were scheduled for elective surgery requiring tracheal intubation were studied. Patients were stratified into four groups (n = 18 in each group); Group FN (Female, nonsmokers), Group MN (Male, nonsmokers), Group FS (Female, smokers), Group MS (Male, smokers). After the stabilization period, baseline measurements were recorded. Time was started after administration of neuromuscular bloking drug and haemodynamic values were measured at every minute during a period of 3 min before intubation, at the completion of intubation and 60 s intervals thereafter for a period of 5 min.

**Results:** After tracheal intubation, maximum positive percentage change in heart rate (50 ± 18%) and rate-pressure product (40 ± 29%) was seen in Group MS at the completion of intubation. The rise in heart rate and rate-pressure product in Group MS was different from group FN until 4 and 3 min after intubation, respectively (p < 0.05). The rise in rate-pressure product was significantly different between Group MS and MN at the completion of intubation (p = 0.022).

**Conclusion:** We concluded that blunting the rise in haemodynamic response after intubation are important in respect to the prognosis of patients, especially in male smokers with preexisting coroner heart disease.

**Reference:**


### 19AP3-7
**Post-operative tracheal extubation practices at a district general hospital**

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**Background and Goals:** Previous studies have shown a correlation between extubation related complications and extubation techniques (1–2). The aims of this study were to establish current practices and investigate the problems associated with extubation.

**Materials and Methods:** Anaethetists of all grades completed questionnaires, which detailed their extubation practices following non-obstetric elective and emergency cases. The tick-box questionnaires provided information about the type of surgery, patient profile, extubation techniques and complications encountered.

**Results:** In total, 100 questionnaires were analysed, out of which 56 were elective cases and 44 emergency cases. Most patients were extubated awake (98%). The position during extubation included 53 in supine position, 27 in left lateral position and 20 in head up position. Actual management of extubation is illustrated by the table below.

<table>
<thead>
<tr>
<th>Management of tracheal extubation</th>
<th>n &amp; %</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 % oxygen for 2-5 mins before extubation</td>
<td>100</td>
</tr>
<tr>
<td>Reversal agents</td>
<td>69</td>
</tr>
<tr>
<td>Direct laryngoscopy and suction</td>
<td>64</td>
</tr>
<tr>
<td>Extubated at the end of inspiration</td>
<td>18</td>
</tr>
<tr>
<td>Use of any Airway Devices</td>
<td>20</td>
</tr>
<tr>
<td>Transfer with oxygen to recovery</td>
<td>97</td>
</tr>
</tbody>
</table>

Complications included apnoea (4%), desaturation (4%), coughing (4%), laryngospasm (2%), breath holding (2%) and aspiration (2%). Majority of
complications were managed with oxygen, jaw support and suctioning if needed and none required re-intubation.

**Conclusion:** This survey shows marked differences in practice amongst a small group of anaesthetists in our hospital. About 70% used reversal agents to reverse neuromuscular blockade and only 20% used airway adjuncts in the peri-intubation period. The complications associated with extubation were also quite common, as shown by our survey. Guidelines have been suggested in the past (2), but there is still a huge variation in the practice of extubation.

**References:**

### 19AP3-8
**Is nasotracheal intubation an “at risk” manipulation of bacteremia?**

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**Background and Goal of Study:** Different Expert Committees on prevention of Bacterial Endocarditis have suggested substantial differences on the importance of the intubation technique as “at risk” manipulation. This lack of consensus could be justify because the prevalence of bacteremia related to endotracheal intubation found in the literature varies between 0% and 33%. The present study aims to investigate the prevalence of bacteremia following orotracheal intubation (B-OTI) and nasotracheal intubation (B-NTI).

**Materials and Methods:** The study group was formed of 110 patients who underwent elective surgery under general anaesthesia in the Santiago de Compostela University Hospital. Venous blood samples were collected from each patient at baseline (before performing any manipulation) and 30 seconds after completing the orotracheal intubation (OTI) or the nasotracheal intubation (NTI). Samples were inoculated in BACTEC plus aerobic and anaerobic blood culture bottles, and were processed in the Bactec 9240. The subculture and further identification of the isolated bacteria were performed by conventional microbiological techniques. Level of difficulty of endotracheal intubation and oral health status were recorded in all patients.

**Results:** At baseline, the percentage of positive blood cultures detected was 2%. The prevalence of bacteremia at 30 seconds after finishing the endotracheal intubation was 11.8% (13 cases). OTI provoked bacteremia in 12% of patients (6 cases) and NTI in the 11.7% (7 cases). Staphylococcus spp. and Streptococcus spp. were the most commonly isolated genera. Level of difficulty of endotracheal intubation and oral health status didn’t conditioned the development of bacteremia.

**Conclusion:** Endotracheal intubation is associated to a low percentage of bacteremia, this being similar following OTI and NTI. In consequence, the inclusion of nasotracheal intubation as “at risk” manipulation needing antibiotic prophylaxis of bacterial endocarditis recently suggested by the British Society of Antimicrobial Chemotherapy needs further discussion.

**Reference:**

### 19AP3-9
**A simplified risk score to predict difficult endotracheal intubation**

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**Background and Goal of Study:** Despite the presence of numerous predictive tests for the difficult airway and substantive criticism concerning the usefulness of predictive tools in this setting (1), most anaesthesiologists feel that there is still a tool missing that allows an easy bedside and reliable estimation of the likelihood that an individual patient will present difficult intubation (DI). This lengthens the sterno mandibular distance and seems to elevate the thoracic column in obese patients to improve the intubating conditions. (1) This increases the difficulty of intubation by increasing the time required for a successful intubation.

**Materials and Methods:** A total of 3763 patients were screened for a number of potential risk factors for DI. A random sample (n = 2509) was subjected to a multivariate stepwise logistic regression analysis. The remaining risk factors were used to build a simplified model. The latter was validated in a validation dataset (n = 1254) by calculating the AUC under a ROC-curve and by analysing the calibration characteristics of each model.

**Results and Discussions:** The following factors (odds-ratio) were associated with DI: presence of upper front teeth (3.61), a history of difficult intubation (2.88), Mallampati status higher than “1” (2.55) and equal to “4” (1.91), and mouth opening <4 cm (1.80). The validation in the data of the 1254 patients not used for the creation of the model suggests that the predictive power of both scores is acceptable. For DI it was 0.72 (95%-confidence interval: 0.63–0.81). The likelihood for DI increases from 0% (when no risk factors is present) to 2%, 4%, 8%, and 17% when 1, 2, 3, and more than 3 factors are present.

**Conclusion:** The present simplified composite risk score that can be viewed as a modification of the Mallampati-scoring system might facilitate the prediction of a difficult intubation.

**Reference:**
Yentis SM: Predicting difficult intubation-worthwhile exercise or pointless ritual? Anaesthesia 2002; 57: 105–9

### 19AP3-10
**A manikin study into the effect of handedness on the ability to bag-mask ventilate**

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**Background and Goal of Study:** Bag-Mask Ventilation (BMV) is a core medical skill requiring a good seal between mask and patient to ensure effectiveness. Operator technique is central to its success. In our study we have looked at which hand is used to hold the mask, dominant (DH) or non-dominant (NDH), and how this affects the performance when performing BMV.

**Materials and Methods:** This was a prospective paired crossover manikin study. We recruited 57 anaesthetists and 54 non-anaesthetist healthcare workers from our Hospital. Personal details and grip strengths were recorded. The equipment used was the Basic Airway Manikin (BAM) (which measures volumes expelled from the bag and volumes delivered to the manikin’s lungs during BMV) and a standard bag and mask. Volunteers were asked to BMV the manikin at a rate of 10 breaths per minute for 2 minutes using their DH and NDH at both easy and difficult settings. We measured the effectiveness and efficiency of BMV. Effectiveness was a measure of the lung volumes delivered (>400 mls per breath was considered successful). Efficiency was a measure of the leak produced (proportion of lung volume to bag volume).

**Results and Discussions:** 84% of anaesthetists used their NDH for BMV which equated to the left hand in 91%, 59% of non-anaesthetists used their NDH for BMV which equated to the left hand in 59%. Anaesthetists were significantly more effective and efficient with their NDH in all settings. Non-anaesthetists were significantly more effective and efficient with their DH at the easier setting. Hand size, grip strength and gender had no effect on ability to BMV. Anaesthetists were, as expected, significantly better at BMV than non-anaesthetists although the standard was generally disappointing.

**Conclusion(s):** Anaesthetists were better at BMV with their NDH which probably reflects training and the need to simultaneously use their DH for fine motor skills whilst performing BMV. Non-anaesthetists were naturally better with their DH. This suggests that occasional practitioners of BMV should be trained to use their DH to maximize their effectiveness. The overall standard was poor and we would recommend that more training is required for all in this vital skill.

There are no references or acknowledgements.

### 19AP4-1
**Intubation time with and without inflatable intubation device**

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**Background and Goal of Study:** A special inflatable pillow was made to elevate the thoracic column in obese patients to improve the intubating conditions. (1) This lengthens the sterno mandibular distance and seems to improve the vocal cord visualization. The goal of this study was to evaluate its impact on the intubation condition by measuring the intubation time.

**Materials and Methods:** 43 Obese patients with a BMI above 40 and scheduled for a bariatric operation get an inflatable pillow under their thorax. A resident in training and an anesthetist with more than 10 years experience intubate patients with measurement of the time in seconds between introduction of the laryngoscope till inflation of the cuff. The pillow is inflated at random. A boogie was used in every intubation. Two attempts with oxygenation in between are given before an other intubation technique or anesthetist is chosen. Time count is halted then and the case is noted as a failed intubation.
Airway management

Results and Discussions:

Table 1

<table>
<thead>
<tr>
<th></th>
<th>sec with A</th>
<th>sec without A</th>
<th>sec with R</th>
<th>sec without R</th>
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<td>14</td>
<td>16</td>
</tr>
<tr>
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<td>2</td>
<td>0</td>
<td>1</td>
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<tr>
<td>Mean</td>
<td>40</td>
<td>48</td>
<td>26</td>
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</tbody>
</table>

Table 1 gives the mean, standard deviation and t test between inflated and non-inflated pillows for trainees (R) and experienced anaesthetists (A). The number of failed intubations is given too. The time was only significant longer in an experienced anaesthetist probably because the number of patients was larger. Failures could not be analyzed because of the small number of patients. The intubation time has some outliers in one direction what would require a non-parametric test. The shorter intubation time could also be explained by the easier introduction of the laryngoscope with a longer sterno-mandibular distance.

Conclusion: More patients are needed to confirm the shorter intubation time when the inflatable positioning device is used.

Reference:

19AP4-2

Airway management during major intranasal surgery - A study of practices among different anaesthetists

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Background and Goal of Study: Reinforced Laryngeal Mask Airway (LMA) forms a reliable seal around laryngeal inlet and protects the airway from blood and other debris. It also forms an unobstructed airway for surgeon produces minimal hemodynamic changes compared to endotracheal tube, we audited the practices among different anaesthetists for maintaining airway during intranasal surgeries and incidence of complications associated with various airway adjuncts used.

Materials and Methods: We collected data for 5 weeks in all elective major intranasal surgeries.

Results and Discussions: A total of 47 patients were audited during a period of 5 weeks. Consultants and trainee registrars shared equally the case load (51%: 49%). Anaesthetic technique most commonly used was an intravenous bolus of anaesthetic agent followed by maintenance with inhalational agent (72%), followed by remifentanil infusion + inhalational agent technique (23%) and Total intravenous Anaesthesia was used in 5% cases. Airway was maintained in 68% cases with endotracheal tube (standard tube 10%) and preformed RAE tube 58%, Reinforced LMA was used to maintain airway in 32% patients. Patients who had endotracheal tube to maintain their airway had more postoperative complications than patients who had LMA to maintain their airway (46.8% vs 13.3%). Blood loss in upper airway, upper airway obstruction, laryngospasm, aspiration of blood and reintubation were complications noted.

Conclusion(s): In our prospective audit endotracheal tube is the popular choice of maintaining airway compared to LMA. Postoperative complications were more common in patients who had endotracheal tube for their airway protection than LMA. Despite its remarkable safety, LMA was not the first line of choice to maintain the airway in nasal surgery in our institute.

Reference:

19AP4-3

Algorithm of action in the case of acute intraoperative airway obstruction in a patient with a large goiter

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Background and Goal of Study: Intraoperative airway obstruction in the patient with a large goiter is a challenging situation and requires prompt and coordinated response (1). We are introducing stepwise approach in the management of this anesthetic emergency.

Case Report: 46 years old male, 146 kg, 173 cm with past medical history of hypertension, morbid obesity, obstructive sleep apnea, large goiter. He complained of difficulty breathing lying flat. On physical exam patient had Mallampati class 3 airway and prominent neck mass. Remaining physical exam was noncontributory. X-ray of the neck showed right sided tracheal deviation. Anesthesia was induced safely after awake fiberoptic intubation. During surgical manipulation of the trachea and one of the lobes of the goiter, sudden decrease of the tidal volume and increase of peak airway pressure noticed. Oxygen saturation decreased to 93%.

Algorithm: 1. Hand ventilate patient with 100% oxygen to assess compliance and chest excursion. 2. Auscultate chest for bilateral breath sounds and exclude wheezing. 3. Examine surgical field for possible external compression. 4. Suction endotracheal tube to rule out mucous plug or secretions. 5. Fiberoptic bronchoscopy to exclude tube malpositioning and possible foreign body. In the case described above fiberoptic examination revealed endotracheal tube pressed against the tracheal wall. Position of the tube corrected and ventilation restored.

Conclusion(s): Development of the structured algorithm of action leading through possible differential diagnosis in the case of intraoperative airway obstruction is very powerful tool in management of this critical anesthetic problem.

Reference:

19AP4-4

Fiberoptic bronchoscopic intubation for difficult airways in emergency situations

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Background and Goal of Study: Unexpected difficult airways (DA) are one of the most critical situations in anaesthesia, intensive care practice. The goal of this study was to detect the early and late complications of fiberoptic bronchoscopic intubations (FBI) in patients in emergency situations with: a) previously not predicted and unexpected DA; b) maxillo-facial and cervical injuries (MF/SCI); c) for the predicted DA in the acute abdominal surgery.

Materials and Methods: The study was conducted in 46 patients (pts). Among them 19 pts were with previously unpredicted difficult tracheal intubations, that was unsuccessful; 15 pts with MF/SCI and 12 pts with acute abdominal pathology and risk of aspiration. In 7 pts nasotracheal and in 39 pts orotracheal intubations were performed under the local anaesthesia with Sol. Lidocain 2% and sedation with Midazolam in doses 1–5 mg. Early complications during FBI procedures were recorded.

Results and Discussions: There was no difference between patients groups as related to demographic factors. The average age was 49 ± 14 years. There was no unsuccessful FBI. The mean time for performing of FBI was statistically significant longer in group a – 142 sec (55–62), versus group b – 67 sec (32–182) and group c – 43 sec (17–138; p < 0.05). The early detected complications after FBI in all patients’ groups were: laryngospasms in 7 pts (15.2%), epistaxis in 6 pts (13%), cough in 9 pts (19.5%), regurgitation in 1 pts (2.2%) and aspiration in 1 pts (2.2%). The late complications were: sore throat in 15 pts with unexpected DA under usage of conventional method (79%), in both other groups sore throat was statistically significant (p < 0.05) lower – only 9 pts (30%) had sore throat. Pneumonia, verified as complication after aspiration on prehospital stage was detected in 1 pts (2.2%). Mortality was 8.7% due to multiple organ dysfunction and acute respiratory syndrome.

Conclusion(s): 1. The duration of FBI depends on the concrete emergency situation. In unexpected cases there is need for longer procedure. 2. The complications of FBI are epistaxis, laryngospasm and cough, sore throat was observed more frequently after unsuccessful conventional intubation. 3. FBI is the effective method of management of difficult airways and prevention of severe hypoxia in emergency situations.

19AP4-5

Using video feedback to train anesthesia residents in fiberoptic intubation

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Background and Goal of study: FOI requires practice to establish competency. We explored the feasibility of DVD recording of performed FOI by anesthesia residents as a tool for feedback.

Materials and Methods: This is a prospective study using DVD recorded real time video to enhance FOI training by anesthesia residents. Clinical Anesthesia (CA) 1–3 residents were randomly picked to do FOI. Seven residents from each level of training were chosen. FOI is performed after IV induction of anesthesia with muscle relaxant, regardless of airway class (AWC). Hemodynamic changes (HR, BP, etc.) are also recorded. Recorded DVD video is edited into time-framed intervals. Time-framed video segments were compared with consecutive FOI attempts by the same operator with different patients. A scoring system is used in order to establish competency.
Results and Discussion: 152 fiberoptic intubations were performed; surgeon satisfaction regarding the fiberoptic intubations was 100%, 99% among attending anesthesiologists. There was no significant difference between the difficulty of airway and penalty score. There were no significant differences between the three levels of anesthesia residency training. Significantly less hemodynamic changes during fiberoptic intubation when compared to classical laryngoscopy. The most common mistakes made by the residents were secondary to over-estimation of fiberoptic movements.

Conclusion: The study had a tremendous positive feedback from surgeons, anesthesiologists, and residents. As a result, this study evolved to a training rotation for all 70 residents in the program with daily evaluations of personal performance using a DVD recorder.

Reference:

19AP4-6
Laryngoscopy versus fiberoptic intubation: cardiovascular and catecholamines level changes
E. Congedo, P. Aceto, R. Sicuranza, R. Petrucci, G. De Cosmo
Anaesthesiology and Intensive Care, Catholic University of Sacred Heart, Rome, Italy

Introduction: The aim of this study was to compare stress response degree during intubation with direct laryngoscopy and fiberoptic-facilitated oral intubation.

Materials and Methods: After obtaining informed consent, 40 patients, aged 25–70 years, ASA I–II, undergoing minor abdominal surgery, were enrolled in the study. At the induction of anaesthesia, propofol 2 mg/kg, alfentanil 20 mcg/kg and cisatracurium 0.25 mg/kg were administered to patients. They were randomly assigned to be intubated with two different methods: laryngoscopy (A group) and fiberoptic (B group). Cardiovascular parameters (arterial blood pressure and heart rate) were recorded at the following times: before induction (T1), 1 minute after induction (T2) and 5 minutes after induction (T3). Blood samples were also taken at the same times to measure plasmatic catecholamines level. MANOVA test was used for stastical analysis.

Results: Heart rate values increased at T2 compared with T1 in both groups. At T3, heart rate values remain invariate in B group and decreased in A group with a significant gap (p < 0.01). Arterial blood pressure values raised at T2 and decreased at T3 in a comparable way in the two groups. Catecholamines levels followed the same trend as arterial pressure without differences between the groups.

Conclusions: Fibero optics does not protect from stress response compared with laryngoscopy.

Reference:

19AP4-7
Effect of blade angulation on field of vision in rigid optical laryngoscopes
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Background and Goal of Study: We previously defined a 2-dimensional “field of vision” as the measure of angle from the distal straight segment of a laryngoscope blade to the maximum view away from it [1]. We planned to compare EVO2, Glidescope and Airtraq laryngoscopes. Direct comparison is otherwise difficult because the viewing systems are quite different.

Materials and Methods: We constructed a bench model to test image linearity using a 5 × 5 mm paper-graph fastened to a rigid board. The blade tips were positioned in contact with the board and the apparatus allowed alteration of the angle between the distal straight segment of the blades and the board. Each blade was rotated 30 degrees either side of the (90 deg) normal position in 10 deg. intervals steps. Airtraq and EVO2 were connected to monitor stack systems for image recording to digital outputs. Glidescope has its own monitor which was photographed for subsequent analysis. Based on an assumption of linearity and the starting normal position, a mathematical model was used to predict the expected cell sizes.

Results and Discussions: Simple linear modelling gave good representation of the imaging systems. It was less good for Airtraq where distal straight segment and field of vision were difficult to measure accurately. Squares were only represented as squares when the object was at 90 degrees to the blade tip. At more acute angles the field of vision increased with the cells coming vertically closer and horizontally more compact as distance from the blade tip increased (i.e. they became more rhomboid). The opposite was the case with more obtuse angles. Any increase in the field of vision is at a cost of greater image distortion.

Conclusion(s): Ideally the anaesthetist wants to have a perfect image projection (i.e. squares represented as squares). In our view this is unlikely to be true for clinical settings with these blades. Further clinical trials will determine whether or not this is the case in practice.

Reference:
1 Sethuraman D, Darshane S, Charters P. Br J of Anaes 2006; 97: 434R.

19AP4-8
Use of a new tapered endotracheal tube guide to facilitate rapid intubation by novice laryngoscopists
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Background and Goal of Study: Prehospital personnel have poor success with intubation in non-obtunded patients. Lack of experience and limited availability of airway adjuncts contribute to the poor success rates. A readily-available, simple device to facilitate passage of an endotracheal tube (ETT) would be an advantage for field intubations. The RADlyn endotracheal tube guide (ETT-R) has a malleable tip and tapered balloon to facilitate ETT placement in spontaneously breathing patients. This study compares use of the ETT-R, an ETT with stylet (ETT-S), and an ETT with Eschmann tracheal tube introducer (ETT-E) by novice laryngoscopists.

Materials and Methods: Protocol was institutionally reviewed and monitored. 110 novice laryngoscopists intubated a mannequin (Airway Management Trainer, Laerdal Medical, USA) using an ETT-S, ETT-R and ETT-E in randomized order after instruction / practice on all methods.

Results and Discussions:

<table>
<thead>
<tr>
<th>Device</th>
<th>Mean Time (seconds)</th>
<th>Mean Attempts</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETT-S</td>
<td>28.3 ± 1.8 #</td>
<td>1.05 ± 0.03*</td>
</tr>
<tr>
<td>ETT-R</td>
<td>47.7 ± 4.5 #</td>
<td>1.09 ± 0.03*</td>
</tr>
<tr>
<td>ETT-E</td>
<td>86.0 ± 8.5 #</td>
<td>1.21 ± 0.06*</td>
</tr>
</tbody>
</table>

# P < 0.001 * P = NS

Time/Attempts (Mean ± SEM) shown in the table. On a 5-point Likert scale, 68% of subjects report ETT-R use as easy/easier than ETT-S (p = 0.003). 84% report ETT-R use as easy/easier than ETT-E (p < 0.001).

Conclusions: For the novice laryngoscopists increasing with ETT-S was performed most quickly; despite this, ETT-R was reported to be as easy/easier than intubation with both ETT-S and ETT-R. For prehospital providers who rarely intubate non-obtunded patients the RADlyn ETG may be an important yet simple adjunct to facilitate rapid and correct placement of an ETT.

Reference:

19AP4-9
Use of the UNIBLOCKER-bronchial blocker tube to facilitate one-lung ventilation during video-assisted thoracoscopic surgery
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Background and Goal of This Study: In this study, we evaluated the efficacy of a wire-guided bronchial blocker, UNIBLOCKER™ (Fuji Systems Corporation, Tokyo, Japan) for achieving one-lung ventilation (OLV) during a video-assisted thoracoscopic surgery (VATS).

Materials and Methods: 16 patients undergoing a VATS approach with the UNIBLOCKER™ to establish OLV were studied. The time to place the UNIBLOCKER™ to the right or the left mainstem bronchus, the quality of lung deflation was rated by the surgeon under direct visualization as excellent, good, fair, or poor.

Results and Discussions: In all 16 patients, placement of the UNIBLOCKER™ was easily with fiberoptic aided technique. Speed of insertion increasing as experience improved. One-lung ventilation was well tolerated in all. The quality of lung deflation was judged as being excellent or good in all patients, and the surgical field was excellent in all cases.
Conclusions: Lung isolation with the new device, UNIBLOK® is both safe and very effective in VATS. In this study, UNIBLOK® showed ease to placement to the right main bronchus, but a better quality of lung collapse showed left > right. The development and clinical use of UNIBLOK® proved to be effective and easy to use for establishing OLV.

19AP4-10
Comparison of two different techniques to prevent loss of airway control during percutaneous tracheostomy
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Cardiothoracic Surgery Department, Carmel Hospital, Haifa, Israel

Background and Goal of Study: Loss of airway control during percutaneous tracheostomy (PCT) is one of the serious complications. It may happen due to unstable position of the endotracheal tube (ETT) with its tip in the larynx and cuff above the vocal cords. This position of ETT is the main request for PCT performance. We retrospectively reviewed our experience with additional use of fiberoptic bronchoscope (FOB) and tube exchanger (TE) for stabilization of ETT during PCT.

Materials and Methods: From the 160 adult critically ill patients that underwent PCT by Griggs technique between January 2000 and August 2001, we selected 33 patients receiving anesthesia from the same anesthetist. From this group 12 patients were ventilated through ETT by standard technique; in 11 patients pediatric FOB was used to control and stabilize the position of ETT during PCT, and in the rest 10 patients, 15 F TE was used with the same aim instead of pediatric FOB. The optimal diameters of FOB and TE suitable for ETT (7.5 mm, 8 mm) were found in our previous experiments, using mechanical lung simulator.

Results and Discussions: Loss of airway control during PCT has happened in 3 pts, where ventilation through ETT was performed by standard technique. This complication was corrected by expeditious actions of anesthetist and surgeon. In the other patients, additional use of pediatric FOB or TE has created secure and proper position of ETT and PCT passed smoothly without complications. Moreover, we could not register negative influence of pediatric FOB and 15 F TE presence in ETT on ventilation parameters during PCT performance.

Conclusion(s): Stabilization of ETT position and prevention of airway control loss during PCT performance can be reached by the use of pediatric FOB or by 15 F TE with the same reliable results. Employment of pediatric FOB is more expensive than TE.

19AP5-2
A comparison of the truview-EV02 blade with the Macintosh blade for tracheal intubation
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Background and Goals: The optical system of new Truview-EV02 blade (Truphatek, Israel), offers the possible advantage of improved laryngeal view. The goal of this study was to compare the use of Truview-EV02 and Macintosh blades in humans and in order to assess the effectiveness of the Truview-EV02 in providing glottic exposure.

Material and Methods: We recruited 70 ASA I and II patients to our randomized controlled trial. Group M (n = 35) had tracheal intubation performed using the Macintosh blade (size 3). Group T (n = 35) were intubated using the Truview-EV02 blade. Under full monitoring, anesthesia was induced with fentanyl 4 μg/kg IV, propofol 1.5 mg/kg IV, followed by rocuronium 0.6 mg/kg IV for muscle relaxation. We recorded the following: Mallampati score, oropharyngeal distance (cm), max mouth opening (cm), best laryngeal view (assessed by Cormack and Lehane grade), time taken for successful tracheal intubation, grading of ease of intubation (I: difficult, II: common, III: easy), hemodynamics and signs of trauma (24 hours after the intubation). Data were analyzed using the two-tails t-test and Chi-square test, with a p-value < 0.05 considered statistically-significant (mean ± SD).

Results: The Cormack and Lehane grade was significantly better in Group T than Group M (6/8/8/8/8 M: 1/21/1/21/10, P = 0.002). The grading of ease of intubation was significantly improved in Group T than Group M (P = 0.003). Group T had longer intubation time than group M (mean 18 ± 7 s vs. mean 14 ± 6 s, P = 0.016). After the intubation, there was one case of visible bloodstain on the blade in the two groups respectively. There was no difference in hemodynamics and signs of trauma between two groups.

Conclusions: Compared to the Macintosh blade, The Truview-EV02 blade significantly improved glottic exposure and easily intubate as well as no more trauma.

Reference:

19AP5-3
Comparison of Truview® Laryngoscope Blade with Macintosh Blade in Normal and Anticipated Difficult Intubation Adult Patients
Y. Katz, M. Barak, P. Philipchuck, P. Abecasis
Anesthesiology, Rambam Health Care Campus, Haifa, Israel

Background and Goal: Difficult intubation may lead to grave morbidity and mortality (1). Several airway devices are used to assist intubation when the vocal cords are not visualized by direct laryngoscopy (2). Truview® EVO2™ laryngoscope blade facilitates indirect view of the vocal cords by optical lenses and prisms. We prospectively compared intubating parameters of Truview® blade with Macintosh blade in adult patients with normal and anticipated difficult airway.

Materials and Methods: One hundred and seventy patients who were scheduled to receive general anesthesia were randomly allocated into two: Group 1 patients were intubated with Truview® blade and group 2 patients were intubated with Macintosh blade. The following parameters were recorded: pre-operative airway evaluation, laryngoscopic view, duration of intubation, maximal force applied during intubation, anesthesiologist’s estimation of intubation effort on 1 to 3 scale, and post-operative teeth and soft tissue damage, stridor and hoarseness.

Results and Discussion: Truview® blade enabled better laryngoscopic view than Macintosh blade (p = 0.002). Mean duration of intubation using Truview® blade was longer (33 ± 12 sec) compared with Macintosh blade (24 ± 13, p = 0.0001). Maximal force applied during intubation was lower using Truview® blade (7.2 ± 2.9 kg) compared with Macintosh blade (13.5 ± 4.5, p = 0.002). No significant difference was found in the anesthesiologist’s estimation of intubation effort, teeth damage, stridor and hoarseness. Significantly fewer patients suffered soft tissue damage following intubation with Truview® blade than with Macintosh blade (p = 0.0004).

Conclusion: Truview® laryngoscope blade may be beneficial in difficult intubation when direct laryngoscopy with Macintosh blade does not allow viewing of the vocal cords.

References:

19AP5-4
Importance of direct visualization in preglottic larynx tumors: glidescope® + cook intubation guide
O. Valencia, R. Lopez-Vicente, MA. Escudero
Anesthesiology, Hospital 12 de Octubre, Madrid, Spain

Background and Goal of Study: The anesthetic management of patients with critical upper airway obstruction from tumours involving the area around the larynx can be a challenging problem.

We present a technique which allows to avoid local anaesthetic tracheostomy with the patient awake, and also allows to direct see the entering of the endotracheal tube into the larynx, avoiding any impact in tumours’ area which can result in dangerous bleeding, and airway obstruction.

Materials and Methods: We present the case of a 45 years old man, who presented into the operating room for making a biopsy of a scamous cells cancer. The patient was very nervous and rejected the possibility of a tracheostomy with local anaesthesia and sedation. We made a probe of deep intubation guide – cook intubation guide

Reference:
After that and always under direct visualization we railroaded an endo-
tracheal tube and turned the bevel of the tube in order to avoid the impact
on the tumour mass.

**Conclusion(s):** The use of glidescope video laryngoscope plus a cook intu-
bation catheter allows to avoid the impact in supraglottic tumoral masses
and direct the bevel of the endotracheal tube in order to avoid this impact,
because of direct visualization along the whole process.

**References:**

**19AP5-5**

Fiberoptic laryngo/bronchoscope as the flexible lighted stylet

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**Background and Goal of Study:** Lightwand (Trachlight™, Laerdal) is useful
for the cases of difficult intubation. But the use is limited because it cannot
mold easily to every patient’s anatomy. In contrast, flexible fiberoptic bron-
cho/laryngoscope can mold easily to any patient’s anatomy. So we devised
a new intubating method using fibrescope as flexible lighthand named “Firefly
Intubation”. The aim of our study is to evaluate the efficacy of this method com-
paring with Trachlight™.

**Materials and Methods:** The technique of “Firefly Intubation”:
Attach endotra-
cheal tube to proximal site of fibrescope (LF2™, Olympus). Introduce
fibrescope to patient orly through Ovassapian airway or mouthpiece with
jaw lift. Dim room light. Operate fibrescope until distal tip shows well-defined
glow transilluminated through anterior neck of patient just below thyroid
prominence. Advance fibrescope with flexing distal tip slightly posterior until
glow begins to disappear at sternal notch. Pass endotracheal tube over
fibrescope into trachea. 78 adult patients undergoing elective surgery were
investigated. After induction of general anaesthesia with propofol, fentanyl and
vecuronium, 34 patients (Group A) were intubated with “Firefly Intubation”.
44 patients (Group B) were intubated with Trachlight™. The success or failure
and the time for intubation were recorded in each patient. Success rate and
time for intubation were recorded in each patient. Success rate and
time for intubation were compared in the groups. Data were analysed using
unpaired t-test and time for intubation were compared in the groups. Data were analysed using

**Results and Discussions:** Height, age, M/F ratio showed no differences in the
two groups. Body weight is heavier in group B (P = 0.26 and P = 0.57).

**Conclusions:** This method can be applied for the case of difficult intubation,
as same as Trachlight™. It may be more widely applicable. And it could be an
alternative method to fibreoptic intubation in the case of copious oral secre-
tions or bleeding.

**19AP5-6**

Comparison of the shikani optical stylet and the bougie in simulated difficult intubation

J. Butcher, A. Scholz, A. Evans, J. Hall, A. Wilkes
Anaesthetics and Intensive Care Medicine, Cardiff University, Cardiff, United Kingdom

**Background and Goal of Study:** Direct laryngoscopy remains the standard
method for tracheal intubation (1). However difficulty occurs in 1–3% of the
population (2). The bougie remains popular but is not infallible (3). The Shikani
Optical Stylet™ is a rigid fiberoptic endoscope and may provide an alternative in
difficult intubation. In this study we compared the Shikani Optical Stylet™
with a bougie in a simulated Cormack and Lehane grade 3 laryngoscopy in
patients.

**Materials and Methods:** We studied 25 adults undergoing elective surgery in
a randomized cross over study. 17 were female and 8 male. The mean age was
48 years (range: 24 to 81). Anaesthesia was induced with propofol and paral-
ysis achieved with a non-depolarizing muscle relaxant. Direct laryngoscopy
was performed to ensure no unwanted airway abnormalities and the epiglot-
tis was allowed to fall back to simulate a grade 3 view. Each patient was then
intubated twice using a bougie (Frova, Cook Medical) and the Shikani Optical

**Stylet™ (Clarus Medical). Time in seconds was recorded from laryngoscopy
to confirmation of tracheal intubation by capnography. Any oesophageal intu-
bations that occurred were also recorded.

**Results and Discussions:** The Median [IQR] time (s) taken to detect success-
ful tracheal intubation was analyzed using Wilcoxon signed rank test. The time
taken was significantly longer for the stylet than for the bougie: 4.1 [3.4 to 8.1]
and 3.7 [3.2 to 4.0] respectively (p = 0.001). The stylet took longer in 21 patients,
the bougie took longer in 3 patients and there was one tie. The number of
oesophageal intubations was analyzed using McNemar’s test. Oesophageal
intubation occurred on 6 occasions (24%) using the stylet and 2 occasions (8%)
for the bougie (p = 0.22).

**Conclusion(s):** The Shikani Optical Stylet™ offers the advantage of being able
to visualize the vocal cords. Despite this we found that tracheal intubation
was achieved quicker using a bougie.

**References:**
3 Gataure PS. Anaesthesia 1990; 51: 935–938.

**19AP5-7**

Optimal spectral irradiance for laryngoscopy

E. Lewis, MA, Hampson, AR, Wilkes, S, Wentworth, JE Hall
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**Background and Goal of Study:** Changing the colour of light produced by
laryngoscopes may improve the view at laryngoscopy. This may be crucial
when presented with a difficult airway. Anaesthetists have expressed a pref-
erence for blue/white light to facilitate laryngoscopy. Infra red light has been
shown to be detrimental to an optimum view. Light emitting diodes (LEDs)
have the advantage of producing light in a more appropriate part of the spec-
trum. The aim of this study was to compare the spectral irradiance of laryn-
goscopes currently used in the UK which contain incandescent bulbs) with
a custom made laryngoscope containing an LED bulb.

**Materials and Methods:** The spectral irradiance from laryngoscope blades
was measured under standardized conditions, using the Bentham spectro-
 radiometer. The tip of each laryngoscope blade was placed in contact with
the sample port of the spectroradiometer. The mains voltage supply was set
at 2, 2.5 and 3 V for the incandescent bulbs and 3, 3.3 and 3.6 V for the LED.
The maximum voltages are those specified by the manufacturers.

**Results and Discussions:**

**Figure 1.** Spectral irradiance from incandescent bulbs (A) and LED (B).

The output from laryngoscopes currently available in the UK is mainly at the
infrared (>600 nm) end of the spectrum. Laryngoscopes fitted with LEDs
produced most output in the blue/green (400–550 nm) part of the spectrum.
Enhanced blue/green light output with minimal infrared output is thought to
optimize the view at laryngoscopy.

**Conclusion(s):** Laryngoscopes with LED bulbs may provide superior intubat-
ing conditions than those currently available with incandescent light sources.

**References:**

**19AP5-8**

Use of Truview EVO 2 optical laryngoscope system in anticipated difficult airway situation

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Department of Anaesthesia and ICM, Medical School of Ankara University, Ankara, Turkey

**Background and Goal of Study:** Detecting patients at risk of difficult endo-
tracheal intubation and adequate preparation of additional airway devices
are crucial (1). The new “Truview EVO 2” system (Truphatek, Natanya, Israel)
a Macintosh-type blade with an optical lens attached is designed to improve the glottic view during intubation (2). The estimated potential advantages of Truview EVO 2 system are diminished force applied during intubation, reduced trauma, facilitated insertion of an endotracheal tube into the trachea, shortened “time to intubation” and decreased incidence of “blind intubation” in patients with difficult airway and enhanced opportunities for teaching, data collecting and archiving. We presented our experience with Truview EVO 2 system in a number of patients with anticipated difficult airway.

Material and Methods: All of the patients were know as difficult intubation (Cervical stabilization n = 3, Anoclyosing Spindilis n = 2, short neck n = 1) as they experienced a previous “can ventilate, can’t intubate” situation. Anesthesia was induced with 7 mg/kg thiopental and succinylcholine 2 % was initiated after ensuring the adequate mask ventilation. All standard laryngoscopy and intubation attempts were failed. However, all endotracheal intubations were successfully performed with Truview EVO 2 system.

Results:

Table 1: Review of the cases

<table>
<thead>
<tr>
<th>#1</th>
<th>#2</th>
<th>#3</th>
<th>#4</th>
<th>#5</th>
<th>#6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>48</td>
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<tr>
<td>Time to Intubation (sec)</td>
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</table>

Conclusion: Truview EVO 2 system provides better glottic view and laryngoscopy condition which leads successful endotracheal intubation in patients with anticipated difficult intubation.

References:

19AP5-9

The Truview EVO2: Initial clinical evaluation of a new optical laryngoscope system
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Background and Goal of Study: The availability of different laryngoscope blades loaded with optical devices improves the view of glottic structures during tracheal intubation (1). Truview optical laryngoscope system (Truphatek, Natanya, Israel) is a Macintosh-type blade with an optical lens attached, providing the magnified image of the glottis near the tip of the laryngoscope blade (2). The aim of this randomized, prospective trial was to investigate the intubation conditions and intubation time of Truview EVO2 system, and compare them with the Macintosh blade in patients with estimated normal airway.

Material and Methods: With IRB approval and informed consent 75 ASA I-II adult patients were allocated to two groups at random via sealed envelope technique. Thyromental distance, hyomental distance, maximal voluntary mouth opening distance were recorded and upper lip bite test and Mallampati tests were performed before the initiation of general anesthesia. Laryngoscopy was performed twice in random order once first using a regular Macintosh 3 blade (Group M [n = 38]) and once first using a Truview EVO2 blade (Group T [n = 37]). Cormack and Lehane score was used to assess the laryngeal view during intubation. The laryngoscopy time was recorded consecutively for both blades. The ease of laryngoscopy score was assessed via verbal rating score from 0 (difficult) to 100 (easy). Mann-Whitney U and Chi-Square test were used and p < 0.05 was considered as significant. Values are expressed as median and quartiles.

Results: Patients characteristics and demographic data were similar among groups. The study parameters among groups were comparable for the same airway.

Conclusion: Truview EVO2 system compared to Macintosh blade provides better glottic view and laryngoscopy conditions with comparable laryngoscopy times.

References:
1. Anesthesiology 2003; 98: 1269–77

19AP5-10

The performance of senior vs Junior anesthesiology residents on airway mannequin intubation with Truview EVO2 system and Macintosh blade
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Background and Goal of Study: The airway management training via airway mannequin is much safer than patient based training and also provides extra features for both the trainees and trainers. Truview optical laryngoscope system (Truphatek, Natanya, Israel) is a Macintosh-type blade with an optical lens attached, providing the magnified image of the glottis near the tip of the laryngoscope blade (1). The aim of this study was to investigate direct laryngoscopy features of Macintosh blade and Truview EVO2 system of inexperienced and experienced anesthesia residents.

Material and Methods: With IRB approval, 14 anesthetist resident (Group S, n = 7, Group J, n = 7) were enrolled to the study. A standard airway mannequin was used. Standard teaching tools such as video tapes and drawings were used to teach Cormach Lehane score and the use of Truview EVO2 system and standard Macintosh blade. Each resident had five intubation attempts with each system. Cormath Lehane score (I–IV) and ease of intubation (0 (difficult) to 100 (easy)) were assessed by the residents for all individual intubation attempts. The time to intubation (sec) was recorded by an independent observer. The residents were also rated their impression (0 – dissatisfied, 4 – Fully satisfied) for all individual intubation attempts. Mann-Whitney U and Wilcoxon Rank sum test were used and p < 0.05 was considered as significant. Values are expressed as median and quartiles.

Results: Residents in Group S (56 mon. [50–59]) were more experienced than Group J [0.75 mon. (0.5–11)] (p = 0.002). The total intubation (6 attempts) time for Truview EVO2 in Group S [49 sec (41–57)] was shorter than Group J [74 sec. (66–76)] (p = 0.002), however it was similar for Macintosh blade (Group S 47 sec (42–63) and Group P [46 sec (44–69]). The Median Cormack-Lehane score for all attempts in both groups were lower with Truview EVO2 compared to Macintosh blade. The impression scores (mostly 4) were comparable among groups and also similar for both systems.

Conclusion: Senior residents perform quicker intubations than junior residents with Truview EVO2 system but the performance is similar for Macintosh blade. Additionally, Truview EVO2 system provides better glottic view.

Reference:

19AP6-1

Re-evaluation of the AmbuAuraOnce laryngeal mask after modification of the distal cuff reinforcement
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Background and Goal of Study: Due to the modification of the distal cuff reinforcement by the manufacturer in September 2006, the single-use Ambu laryngeal mask “AuraOnce” underwented re-investigation in our institution following participation in an international multicenter trial (1) and conduction of an own comparative trial (2) with the original device.

Materials and Methods: After approval of the local ethics committee and written consent, 50 ASA I to III patients, 18 to 75 years, scheduled for elective ambulatory interventions were ventilated with the redesigned AuraOnce. Following standardized induction of general anesthesia, the completely deflated airway device was placed and cuffs were inflated according to manufacturer’s instructions. Number of attempts (maximum 2), time until first tidal volume, initial cuff pressure, airway leak pressure with cuff pressure adjusted to 60 cmH2O, intraoperative airway pressures and tidal volumes (goal: petCO2 of 35 mmHg) were recorded. Devices were inspected for traces of blood after removal. Patients were questioned for postoperative complaints.

Results and Discussions: The device was successfully inserted in all 50 patients after a maximum of two attempts (first attempt: 96%), 28 patients were male, 22 female. Size 4 was used in 20 patients, size 5 in 30 patients. Average age was 43.5 ± 16.5 years, weight 81.0 ± 14.2 kg, BMI 27.5 ± 4.8 kg² m⁻². Time until first tidal volume was 22.5 ± 6.0 seconds. Initial cuff pressure with recommended inflation volumes was 70.8 ± 19.6 cmH2O, airway leak pressure was 25.7 ± 5.3 cmH2O with cuff pressure adjusted to 60 cmH2O. Peak airway pressure was 14.1 ± 3.2 cmH2O with tidal volumes of 7.2 ± 0.9 ml kg⁻¹. No intraoperative dislocation of the device occurred, no traces of blood attachments were found after removal in the recovery area, 6 patients explained of sore throat (visual analogue scale 1–10: 2 patients VAS 1, 3 patients VAS 2, 1 patient VAS 3); no complaints were stated after 24 hours.
Conclusion(s): After redesign of the distal cuff portion, the performance of the Amбу AuraOne remains unimpaired with a high insertion success rate and airway leak pressures comparable to those described in earlier trials. Postoperative complaints are infrequent and minor.

References:

19AP6-3
Laryngeal Tube Suction II versus the Proseal laryngeal mask in anesthetized children with spontaneous ventilation
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Background and Goal of Study: The Laryngeal Tube Suction II is a new supraglottic device with a channel for the gastrointestinal tube. Preliminary studies in anesthetized adult patients have proved its role in mechanical ventilation (1). Recently, size 1, 2 and 2.5 LTS II have been introduced for use in pediatric anesthetics. This study compared the LTS II and Proseal Laryngeal Mask Airway (PLMA) with respect to: 1) insertion success rate and times; 2) efficacy of seal; 3) fiberoptic view; 4) oxygenation and ventilation; 5) orogastric tube insertion; 6) intraoperative complications.

Materials and Methods: Informed consent was obtained from the parents. Fifty pediatric patients (ASA I) undergoing general anesthesia for routine minor procedures with spontaneous ventilation were randomly assigned to either the LTS II or PLMA group for airway management. Unpremedicated children were induced with Sevoflurane up to 8% in Oxygen 100%. Anesthesia was maintained with Sevoflurane in 33% oxygen and fentanyl 2–3 μg · kg⁻¹ · h⁻¹. The devices were inserted according to the manufacturer's recommendation.

Results and Discussion: First attempt insertion success rate was higher with the LTS II – 98%, PLMA 95%. Median seal leak pressure was similar in both groups; LTS II 34.5 ± 3 cmH₂O and 35.2 ± 2 cmH₂O with the PLMA. Oxygen saturation and end-tidal CO₂ were 99 ± 0.6% and 41 ± 1.8 ± 3 mmHg respectively for the LTS II and 98.5 ± 1% and 40.3 ± 2 mmHg respectively for the PLMA.

The median fiberoptic score was 2.9 for the LTS II and 3.8 for the PLMA. Successful insertion of the orogastric tube was achieved in 100% of both groups.

Blood staining was detected in 2 patients with LTS II and 2 patients with PLMA.

Conclusion(s): This study suggests effectiveness of the LTS II for spontaneous ventilation in pediatric patients under minor elective surgery.

Reference:

19AP6-4
Comparison of placement of the disposable Laryngeal tube suction and the reusable ProSeal Laryngeal mask airway
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Goal of Study: Because of possible infection with prions or other pathogens disposable extraglottic airway devices became much more common in the last few years. We compared the reusable ProSeal laryngeal mask airway (PLMA, Intavent, UK) and the laryngeal tube suction disposable (LTS-D, VBM, Germany) with respect to ease of insertion and time to achieve sufficient ventilation in a standardized clinical setting.

Methods: With institutional review board approval and written informed consent 40 patients scheduled for minor elective gynecological surgery were randomly allocated to receive either a PLMA or the LTS-D. Anesthesia was induced and maintained with remifentanil and propofol. No neuromuscular blocker was given. After completion of induction, loss of eyelash reflex and jaw relaxation, insertion of the LTS-D or PLMA was done as recommended by the manufacturer. 3 attempts for insertion of the airway device were allowed. The time between removal of the facemask for manual ventilation and sufficient ventilation either through LTS-D or PLMA was recorded. Ease of insertion was graded as easy (1 attempt), difficult (2 or 3 attempts) or impossible. A gastric drain tube was placed after sufficient ventilation and the number of attempts of insertion were recorded.

Statistics: Mann-Whitney-U-test, data are mean ± SD.

Results: The time for insertion was shorter, but not significantly, for the PLMA compared to the LTS-D (29.8 ± 23.3 sec versus 49.9 ± 42.6 sec, p > 0.05).

Ease of insertion was also not significantly better for any device (easy 85% (LTS-D) versus 80% (PLMA); difficult 15% versus 15%, impossible 0% (LTS-D) versus 5% (PLMA) respectively, p > 0.05). With both devices placement of a gastric drain tube was always possible at the first attempt after sufficient ventilation was confirmed.

Conclusion: Concerning rapidity and ease of insertion the laryngeal tube suction disposable compares similar to the ProSeal laryngeal mask airway and can be used for elective surgery without any risk of infection.

19AP6-5
Laryngeal Mask ProSeal™ in prolonged anaesthesia
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Background and Goal of Study: Tracheal intubation (TI) has been traditionally used in airway management for prolonged anaesthesia for two reasons: facilitation of positive pressure ventilation and protection of the airway – due to an increase in aspiration risk with time. The LMA ProSeal (PLMA), with its unique anti-aspiration strategy, seems to be an ideal airway protection in prolonged anaesthesia.

Materials and Methods: We studied adult female patients (n = 41) undergoing microsurgical breast replacement using abdominal wall tissue free flaps.

Age range: 28–63 years, average: 45.8 ± SD 11.61; BMI: 17.9–33.9; average: 24.1 ± SD 3.9. Induction of anesthesia with midazolam, sufentanil, propofol, maintenance with isoflurane, sufentanil, cisatracurium. Pressure controlled ventilation, FGF 02/AIR 200 ml/min. PLMA size 4 (85,7%), size 3 (14,3%) was used to obtain a clear airway. Midline approach placement – first attempt in 80,5%. Bougie guidewire technique was used in 2nd (14,6%) and 3rd (4,9%) placement attempts. The cuff was well lubricated with water spray and neutral jelly.

Results and Discussion: The PLMA was successfully used in all cases (n = 41). Ventilation time with PLMA: total: 19908 min, average 485.6 min. ± SD 87.58; max: 689 min. There was no perioperative regurgitation or aspiration. Smooth emergence with PLMA removal in OR in only 9,8% cases; 91,2% in PACU: 80,4% removal by trained nurse, 9,8% by patient. PLMA cuffs were observed after use – in all cases internal and external parts were clean. There were no major postoperative complications and morbidity: mild sore throat in 9,8%.

Conclusion: PLMA is suitable and a safe alternative to TI in prolonged anaesthesia. According to our experience there is no increase in aspiration risk with prolonged ventilation time.

References:

19AP6-6
A comparison of Easytube and standard endotracheal tube for intubation during routine surgical procedures
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Background and Goal of Study: The Easytube® Rüsch (EZT) is a relatively new disposable airway device developed for both endotracheal intubation and as a supraglottic airway device (1). The purpose of this prospective, randomized, controlled trial was to assess endotracheal intubation with the Easytube® (EZT) and a standard endotracheal Tube (ETT) in routine clinical practice.

Materials and Methods: After IRB approval and written informed consent 40 patients (ASA I–III) were randomly allocated to endotracheal intubation with the EZT (size 4 or 7.0 cm) or ETT (ID 7.5 or 8.0 cm) followed by controlled ventilation. Anesthesia was induced with sufentanil and propofol. Neuromuscular blockade was provided with rocuronium 0.5 mg · kg⁻¹. Both devices were inserted by a single experienced anesthesiologist; cuff was inflated to 20–30 cmH₂O. Capillary blood gas samples were taken before induction of anesthesia, and after 10 minutes of ventilation. After five and 10 minutes of ventilation SpO₂, EtCO₂, VTmin and PAP were recorded. Time of insertion and insertion rate were measured. Patients were asked about sore throat, dysphonia, and dysphagia 24 hours after surgery (post-operative airway morbidity).

Results and Discussion: There were no differences in demographic data between groups at baseline. Time of insertion and failure rate were significantly higher with the EZT vs. ETT (median) 80 sec; range, 36–240 sec vs. 23; 10–70; P < 0.0001; failure rate (intubation impossible): EZT 11/20 vs. ETT 1/20, Blood
were set to obtain 8 ml/kg end tidal volume and Pet CO2 of 40 according the manufacturer. Anaesthesia was not standardized. The size of the device was determined according to manufacturer’s recommendations. Ventilatory parameters were set to obtain 8 ml/kg end tidal volume and Pet CO2 of 40 ± 5 cmH2O. We have recorded ease of insertion and number of attempt, leak pressure, peak pressure, complications after insertion and removal, ventilatory parameters and ease of nasogastric tube insertion. Leak pressure was not allowed to exceed 30 cmH2O. Results were mean and standard deviation.

Results and discussion: Age range from 8 to 17 years and weight from 30 to 76 kg, 45 size 3 and 5 size 4 i-gel were inserted. The first-attempt success rate was 100%. The mean seal pressure was 24.9 ± 5.8 cmH2O. The peak pressure was 13.5 ± 2.7 cmH2O. Neither airway obstruction nor displacement occurred. Well lubricated nasogastric tubes were easy to insert in 100% of cases. Morbidity was very low. No regurgitation occurred. Blood staining was found in one case. There were 2 episodes of desaturation and 4 episodes of transient cough.

Conclusion: This was the first clinical study in children evaluating the i-gel. The results appear similar to previous study concerning laryngeal mask airway in terms of leak pressure and rate of complications. The insertion success rate is excellent. I-gel is safe for paediatric airway management.

19AP6-10
Iima proeseal management in body contouring surgery after bariatric surgery in morbidly obese patients
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Anesthesiology, Hospital General Universitari Vall d’Hebron, Barcelona, Spain

Background and Goal of Study: Body contouring surgery is done between 18-24 months after bariatric surgery in morbidly obese patients[1]. Recent advances in bariatric surgery have improved the safety and efficacy of weight-loss operations[2]. The goal of our study is to show the efficacy of LMA ProSeal (PLMA) in airway management in these patients.

Materials and Methods: 62 patients were scheduled for elective body contouring surgery from January 2005 to December 2006, TIVA anesthesia was performed with a standardized application of propofol, fentanyl and rocuronium. PLMA was used. Gastric tube through PLMA and 2 intravenous lines 16G were placed. Were measured heart rate, arterial blood pressure, end tidal CO2, pulse oximetry, anesthetic gas analysis, urine output.

Results: Abdominoplasty vertical modify procedures were performed in all patients. Airway management was done with PLMA n° 4. Placement of PLMA and gastric tube was done at first attempt. Not one patients needed intubation. PLMA allowed airway control in 15 patients that needed fibrescope for intubation in previous gastric by pass surgery.

Conclusion: PLMA showed her efficacy in airway control in patients operated of body contouring surgery after gastric bypass in morbidly obese patients. PLMA allowed airway control in those patients that previously needed fibrescope intubation. It gives a tighter seal against glottic opening, separates the digestive tube from the respiratory tract and allows gastric tube placement against possible regurgitation.

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