INTRODUCTION

Preoperative cardiac interventions may be performed before a planned noncardiac surgical procedure in order to optimise the patient’s status, to reduce perioperative morbidity and mortality and therefore to improve short and long-term outcome. Preoperative interventions are only justified or may be recommended if the overall benefit outweighs the risk and therefore consideration must be given to the urgency and extent of the surgical procedure and the severity of cardiac disease and the urgency have to be included.

Underlying cardiac disease and preoperative intervention procedures are listed in table 1. The overall risk of a preoperative intervention strategy are summarized in table 2 [1].

<table>
<thead>
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<th>TABLE 1: PREOPERATIVE INTERVENTION PROCEDURES.</th>
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<td>Coronary artery disease</td>
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<td>CABG-surgery</td>
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CORONARY ARTERY DISEASE

CORONARY ARTERY BYPASS GRAFT (CABG) SURGERY

The ACC/AHA (American College of Cardiology/American Heart Association) guideline update of patients prior to perioperative cardiovascular evaluation for noncardiac surgery (NCS) states that the indications for CABG-surgery before noncardiac surgery are similar to those listed in the ACC/AHA guidelines for coronary artery bypass graft surgery from 1999 [2, 3].

Class I indications (conditions for which there is evidence and/or general agreement that a given procedure or treatment is useful and effective) are [3]:

- **In asymptomatic or mild angina**
  - significant left main coronary artery stenosis
  - left main equivalent (≥ significant > 70%) stenosis of the proximal LAD and proximal circumflex artery.
  - Three vessel disease (benefit greater with abnormal Left ventricular (LV) function).

- **In stable angina**
  - significant left main coronary artery stenosis
  - left main equivalent
  - three vessel disease
  - two vessel disease with significant proximal left anterior descending (LAD) stenosis and either ejection fraction (EF) < 0.5 or demonstrable ischaemia
  - one or two vessels coronary artery disease (CAD) with significant proximal LAD stenosis, but with a large area with viable myocardium
  - disabling angina despite maximal non-invasive therapy

- **In unstable angina/non Q-wave myocardial infarction (MI)**
  - significant left main coronary artery stenosis
  - left main equivalent
  - ongoing ischaemia not responsive to maximal medical therapy.
Eagle et al analysed the CASS-database and found that CABG-surgery before noncardiac surgery was most “protective” in severe angina and/or multivessel disease [4]. Two groups used decision analysis models in trying to justify each step of preoperative assessment and intervention, and to assign probability for each outcome [5, 6].

After summarizing the results of available clinic studies, the findings of decision models and the comments of Task Forces, the following statements may be made:

- Clinically stable patients undergoing low and intermediate risk procedures will not benefit from extensive preoperative testing and revascularization procedures.
- A potential benefit only exists for patients with severe CAD, if these patients undergo high risk procedures.
- New concepts of perioperative beta blocker therapy modify preoperative strategies in the near future.

**PERCUTANEOUS CORONARY INTERVENTION (PTCA)**

The ACC/AHA guidelines are similar to CABG-surgery and recommend PTCA prior to noncardiac surgery based on the same indications as PTCA in general. They have been revised by the ACC/AHA in 2001 [7].

Class I indications are:

- In class I angina patients;
  - without treated diabetes
  - with asymptomatic ischaemia or mild angina
  - with one or more significant lesions in one or two coronary arteries
  - and suitable for PTCA with a high likelihood of success and a low risk of morbidity and mortality.

- Patients with one or more significant lesions in one or more coronary arteries suitable for PTCA with a high likelihood of success and low risk of morbidity and mortality.

Most recent information has come from a retrospective study published by Posner et al [8]. They found that patients revascularized by PTCA > 90 days before noncardiac surgery seem to have a lower risk than non-revascularized patients. However this was not true for PTCA patients < 90 days before NCS.

**STENTING**

Cardiologists increasingly use coronary artery stenting during PTCA, as this lowers the re-stenosis rate and can be used to treat complex lesions, such as ruptured plaques and dissections. In a recent analysis of the United States of America national cardiovascular data registry, a coronary stent was placed in 77% of procedures during PTCA and this percentage is increasing with time [9]. Based on the cardiological data, patients, surgeons and anaesthesiologists may consider the risk of perioperative MI to be minimal, if CAD is preoperatively treated with successful PTCA and stenting. Unfortunately, this is deducted (what does this mean?) from the cardiological literature and may not necessarily apply to the perioperative period. The disadvantage of stents is their potential for thrombogenicity at the blood/tissue interface, which may result in complications such as local thrombosis or distal embolization. Antiplatelet therapy is the most effective treatment strategy and though they reduce the risk of stent thrombosis they result in an increased risk of bleeding. Recent case reports have shown an increased risk with recent stent implantation, ranging from acute perioperative stent thrombosis and MI to bleeding at the surgical site or even at other regions [10, 11, 12].

According to the available cardiological and anaesthesiologic literature the following precautions are suggested [13]:

1. With the current stent material and cardiological drug regimen, patients scheduled for major NCS are at risk from perioperative stent thrombosis or bleeding. The risk of bleeding exists as long as either a single antiplatelet drug or more particularly drug combinations are given.
2. Preoperative stenting cannot be generally recommend as an intervention to increase perioperative safety. Surgery should be postponed as long as possible.
3. If urgent surgery is required, a patient with a recent stent implantation should be classified as high-risk. Stringent monitoring of myocardial ischaemia and coagulation is required. Close contact with an interventional cardiological consultant is mandatory.

In the near future the risk may be changed by new cardiological drug strategies as well as new stent materials.
**Table 2**

<table>
<thead>
<tr>
<th>M/M&lt;sub&gt;a&lt;/sub&gt;</th>
<th>M/M&lt;sub&gt;b+c+d+e&lt;/sub&gt;</th>
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<tbody>
<tr>
<td>M/M</td>
<td>Morbidity and mortality resulting from</td>
</tr>
<tr>
<td>a</td>
<td>Non-cardiac surgery without intervention</td>
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<tr>
<td>b</td>
<td>Pre-operative extensive testing</td>
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<tr>
<td>c</td>
<td>Pre-operative revascularization procedure</td>
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<tr>
<td>d</td>
<td>Delay of non-cardiac surgery</td>
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<tr>
<td>e</td>
<td>Non-cardiac surgery after intervention</td>
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</table>

Table 2: A net benefit of preoperative intervention only exists if M/M<sub>a</sub> is greater than M/M<sub>b+c+d+e</sub>

**SEVERE AORTIC STENOSIS**

Severe valvular disease is a major clinical predictor of increased perioperative cardiovascular risk [2]. Severe and symptomatic aortic stenosis seems to present the greatest risk. If the surgery is either elective or urgent, the three preoperative treatment strategies which may be adopted are:

1. Preoperative aortic valve replacement
2. Clearance for surgery without any intervention
3. Balloon valvuloplasty.

If the surgical procedure is elective, and the patient is a candidate for cardiac surgery, the noncardiac surgical procedure should be postponed and the patient undergo aortic valve replacement. In those patients needing urgent surgery or considered unsuitable for aortic valve replacement, two strategies are possible:

1. Clearance for surgery without any further intervention
2. Aortic balloon valvuloplasty.

Neither of the two strategies has been prospectively evaluated. Improvements in anaesthesia and perioperative care may justify clearance for surgery after careful medical pretreatment without preoperative intervention. Two retrospective studies confirm an acceptable incidence of perioperative cardiac complications [14, 15].

Aortic balloon valvuloplasty is given a class IIb (usefulness-efficacy is less well established by evidence) recommendation in the ACC/AHA guidelines for the management of patients with valvular heart disease [16].

Reports of balloon valvuloplasty before NCS date back to late eighties. No new clinical studies are available. In addition, due to the risk of procedure related complications and re-stenosis rates, only few cardiologic centers are currently experienced in this technique and support this interventional strategy.

**REFERENCES**


