Anesthesia for the cardiac compromised patient

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Anesthesiology

Overview

• Introduction
• Identification
• Preoperative optimalization
• Monitoring
• Intra-operative management
• Conclusion

Leerdoelen:

• Identificatie van patiënt ‘at risk’
• Preoperatieve optimalisatie
  – Onderzoeken
  – Medicatie
• Monitoring
• Peroperatief beleid

2014 ESC/ESA Guidelines on non-cardiac surgery: cardiovascular assessment and management

The Joint Task Force on non-cardiac surgery: cardiovascular assessment and management of the European Society of Cardiology (ESC) and the European Society of Anaesthesiology (ESA)
Introduction

• The perioperative period is associated with alterations in the neuroendocrine, metabolic, and immune systems, referred to as “stress response.”

Pharmacological modification of the perioperative stress response in noncardiac surgery

Hans-Joachim Priebe, MD, Professor Emeritus of Anesthesia

Myocardial Injury after Noncardiac Surgery

A Large, International, Prospective Cohort Study Establishing Diagnostic Criteria, Characteristics, Predictors, and 30-day Outcomes

<table>
<thead>
<tr>
<th>Table 4: 30-day outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients without MI MID (n = 10,263)</td>
</tr>
<tr>
<td>Outcome*</td>
</tr>
<tr>
<td>Nonfatal cardiac arrest</td>
</tr>
<tr>
<td>Congestive heart failure</td>
</tr>
<tr>
<td>Stroke</td>
</tr>
<tr>
<td>Mortality</td>
</tr>
<tr>
<td>Composite of major events</td>
</tr>
</tbody>
</table>

* Among the 10,263 patients, 94 patients did not complete the 30-day follow-up and were not included in these analyses except for the outcome mortality, which was not known for all patients on 27 patients who were not included in the mortality analysis. 1 Composite of major events = composite of mortality, nonfatal cardiac arrest, nonfatal congestive heart failure, and nonfatal stroke.

Myocardial Injury after Noncardiac Surgery

6 independent correlates

• High risk surgery
• Ischemic heart disease
• History of congestive heart failure
• History of cerebrovascular disease
• Insulin therapy for diabetes
• Preop serum creatinine > 2.0 mg/dl
<table>
<thead>
<tr>
<th>Revised Cardiac Risk Index</th>
<th>Derivation Set (n=2899)</th>
<th>Validation Set (n=1422)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Outcome</td>
<td>Adjusted OR</td>
</tr>
<tr>
<td></td>
<td>Data</td>
<td>(95% CI)</td>
</tr>
<tr>
<td>1. High-risk type of surgery</td>
<td>15/840 (2%)</td>
<td>2.5 (1.6, 4.3)</td>
</tr>
<tr>
<td>2. Ischemic heart disease</td>
<td>34/951 (4%)</td>
<td>2.4 (1.3, 4.2)</td>
</tr>
<tr>
<td>3. History of congestive heart failure</td>
<td>30/1543 (9%)</td>
<td>1.9 (1.1, 3.5)</td>
</tr>
<tr>
<td>4. History of cerebrovascular disease</td>
<td>17/739 (6%)</td>
<td>3.2 (1.8, 6.0)</td>
</tr>
<tr>
<td>5. Insulin therapy for diabetes</td>
<td>7/112 (6%)</td>
<td>3.5 (1.5, 7.1)</td>
</tr>
<tr>
<td>6. Preoperative serum creatinine &gt;2.0 mg/dL</td>
<td>9/103 (9%)</td>
<td>3.9 (1.4, 6.8)</td>
</tr>
</tbody>
</table>

*Based on logistic regression models including these 6 variables.

Four of the factors in the Revised Cardiac Risk Index were independent correlates of major cardiac complications in the validation cohort: high-risk type of surgery, ischemic heart disease, congestive heart failure, and history of cerebrovascular disease. There were trends for significant univariate associations with major cardiac complications for insulin and for preoperative serum creatinine.

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**Risk of surgery**

Surgical risk estimate according to type of surgery or intervention:

- Low-risk < 1%
  - Laparoscopic cholecystectomy
  - Vaginal hysterectomy
  - Transurethral prostatectomy
- Intermediate-risk 1-2%
  - Coronary artery bypass graft surgery
  - Cardiac surgery
  - Thoracic surgery
  - Peripheral vascular surgery
- High-risk > 2%
  - Open heart surgery
  - Severe neurologic deficit
  - Severe chronic lung disease
  - Severe peripheral vascular disease
  - Severe renal failure
  - Severe liver dysfunction
  - Severe coagulation disorder

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**Preoperative evaluation**
Table 9: Unstable cardiac conditions

- Unstable angina pectoris
- Acute heart failure
- Sign: No elective surgery
- Symptomatic pulmonary heart disease
- Recent myocardial infarction and residual myocardial ischemia

*Myocardial infarction within past 30 days, according to the universal definition*

Risk of surgery

Surgical risk estimate according to type of surgery or intervention

<table>
<thead>
<tr>
<th>Low risk &lt; 1%</th>
<th>Intermediate risk &gt; 1%</th>
<th>High risk &gt; 3%</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Local</em> surgery</td>
<td><em>Thoracoabdominal surgery</em></td>
<td></td>
</tr>
<tr>
<td>Breast</td>
<td>Cardiac surgery</td>
<td></td>
</tr>
<tr>
<td>Oral</td>
<td>Periph ental angioplasty</td>
<td></td>
</tr>
<tr>
<td>Endovascular</td>
<td>Bypass revascularization</td>
<td></td>
</tr>
<tr>
<td>Surgery</td>
<td>Mitral valve surgery</td>
<td></td>
</tr>
<tr>
<td>Reconstructive</td>
<td>Renal transplant</td>
<td></td>
</tr>
<tr>
<td>Gynecological</td>
<td>Renal transplant</td>
<td></td>
</tr>
<tr>
<td>Orthopedic</td>
<td>Renal transplant</td>
<td></td>
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<tr>
<td>Thoracic</td>
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<tr>
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</table>

(Non-)invasive testing

- ECG
- Echocardiography
- Cardiac stress testing
- Coronary angiography
Preoperative revascularization?

No coronary-artery revascularization

No revascularization

Coronary-artery revascularization

Survival by Group

Proportion of Patients with Coronary Artery Disease

Survival by Group

Proportion of Patients with Coronary Artery Disease

Preoperative revascularization?

No coronary-artery revascularization

No revascularization

Coronary-artery revascularization

Survival by Group

Proportion of Patients with Coronary Artery Disease

Survival by Group

Proportion of Patients with Coronary Artery Disease

Table 6 Summary of pre-operative cardiac risk evaluation and peri-operative management

<table>
<thead>
<tr>
<th>No.</th>
<th>Organ surgery</th>
<th>Cardiac surgery</th>
<th>Peri-operative intervention</th>
<th>Number of patients</th>
<th>Follow-up</th>
<th>1-year event-free survival</th>
<th>5-year event-free survival</th>
<th>Conclusions</th>
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<td>7</td>
<td>Organ surgery</td>
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<tr>
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Note: Table 6 Summarizes the pre-operative cardiac risk evaluation and peri-operative management.
Timing surgery after revascularization

- First 6 months after CABG = no problem
- After BMS = 3 months
- After DES = 6 months
- After balloon angioplasty = 2 weeks

Heartfailure

- HF is associated with a 63% increase risk of operative mortality (compared to CAD of no HF)
- TTE is a key element in HF
- LVEF <35% is a strong predictor
- Pharmacological optimization >3 months preoperative
**Valvular heart disease**

- Clinical and echocardiographic evaluation in known or suspected VHD if intermediate or high-risk surgery
- Aortic valve replacement in symptomatic patients with severe AS (only if no high risk for adverse outcome)

**Pharmacological management**

- Beta-blockers
- Ace-inhibitors
- Statins
- Aspirin

**Pulmonary hypertension or congenital heart disease**

- Ask the specialist!
Supply – Demand

Conclusion:
- Never stop betablokers
- Start early (> 3 months)
- Titrate 60-80 bpm

ACE inhibitors

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Class</th>
<th>Level</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combination of ACEIs or ARBs, under close monitoring, should be considered during non-cardiac surgery in stable patients with heart failure and LV systolic dysfunction.</td>
<td></td>
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</tr>
<tr>
<td>Initiation of ACEIs or ARBs should be considered at least 1 week before surgery in cardiac-eligible patients with heart failure and LV systolic dysfunction.</td>
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</tr>
<tr>
<td>Transthoracic echocardiography of ACEIs or ARBs before non-cardiac surgery in hypersensitive patients should be considered.</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

ACE = angiotensin converting enzyme inhibitor; ARB = angiotensin receptor blocker; LV = left ventricular.

*Class of recommendation.
Level of evidence.

Statins

period. A large meta-analysis, including 41 studies in 49,590 patients, which compared peri-procedural withdrawal vs. bleeding risk of aspirin, concluded that the risk of bleeding complications with aspirin therapy was increased by 50%, but that aspirin did not lead to greater severity of bleeding complications. In subjects at risk of—or with proven—NO, aspirin non-adherence/withdrawal tripled the risk of major adverse cardiac events.

Aspirin

Recommendations on anti-platelet therapy

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>It is recommended that aspirin be discontinued for 4 weeks after BPS implantation and/or 3-12 months after CABG implantation, unless the risk of life-threatening surgical bleeding on aspirin is unacceptably high.</td>
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<tr>
<td>Combination of aspirin in patients concomitantly treated may be considered in the perioperative period, and should be based on an individual decision, weighing the risk of bleeding complications against the risk of thrombotic complications.</td>
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</tr>
<tr>
<td>Duration of aspirin therapy, in patients previously treated with it, should be considered in those where teresistance is anticipated to be difficult to control during surgery.</td>
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</tr>
</tbody>
</table>

For patients undergoing spinal surgery or certain neurosurgical or ophthalmological operations, it is recommended that aspirin be discontinued for at least seven days.
A systematic review and meta-analysis on the hazards of discontinuing or not adhering patients at risk for corona

Giuseppe G.L. Bianchi-Zoccarati, Marzia Lottrion, Massimiliano Fusaro, Francesco Burzotta, Li

and another (2229) on aspirin discontinuation among aspirin non-adherence/waivers resulted in associated events (OR = 3.14 (1.75-5.61), P = 0.0001). This suggests, as discontinuation of antiplatelet treatment adverse events (OR = 89.78 (29.90-269.60).

Figure 3: Proposal for management of aspirin treatment in patients at risk for or with CAD undergoing surgery and/or invasive procedures with variable bleeding and thrombotic risk. The duration of antiplatelet therapy with aspirin and thienopyridines post-coronary stent implantation depends on the specific type of stent implanted, and generally from 4 weeks for bare-metal stents to 3 or more months for drug-eluting stents.

Management

- 2 belangrijke goals:
  - Behoud cardiac output (oxygen delivery)
  - Reductie van cardiale arbeid (oxygen demand)
- Belang van adequate vocht therapie en hemodynamische stabilité
- Strategie volgens protocol
- Regionale anesthesie?

Supply-Demand

- ECG
- Invasive pressure
  - Arterial
  - Central
  - PAC
- Echocardiography (TEE)
Nitraten

• Liao JK. Effects of statins on 3-hydroxy-3-methylglutaryl coenzyme a reductase inhibition beyond low-density lipoprotein cholesterol. J Am Coll Cardiol. 2005 Sep 5;96(5A):24F–33F.