PERIOPERATIVE EVALUATION AND ANESTHETIC MANAGEMENT OF PATIENTS WITH CARDIAC DISEASE FOR NON-CARDIAC SURGERY

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I have no disclosures

WHICH PATIENT IS AT HIGHEST RISK?

1. 70 yo asymptomatic patient with history of heart failure with recent echocardiogram with EF 28%
2. 55 yo with previous history of myocardial infarction with fixed defect on nuclear medicine stress test 3 wks ago
3. 60 yo with stable angina “once/month if he “hurries upstairs”

PERIOPERATIVE RISK OF HF

- Surgical survival worse
  - with HFrEF (systolic dysfunction) <30% versus HFrEF >30%
  - with HFrEF > HFpEF (diastolic dysfunction)
  - with HFpEF > without HF

- Mortality and Morbidity
  - Highest in patients with symptomatic HF (49%)
  - Asymptomatic HFrEF (23%)
  - Asymptomatic HFpEF (18%)
  - Normal LV function (10%)

Heart Failure

- 2/3 of patients with HFrEF have CAD
- Diabetes, hypertension contribute
- 1/3: genetic causes, viral infection (often unrecognized), alcohol abuse, chemotherapy
- 50% of HF patients have HFpEF
- Hypertension #1 cause of HFpEF

HEART FAILURE

Assessment of LV function

It is reasonable for patients with dyspnea of unknown origin to undergo preoperative evaluation of LV function

If it is reasonable for patients with HF with worsening dyspnea or other change in clinical status to undergo preoperative evaluation of LV function

Reassessment of LV function in clinically stable patients may be considered

Routine preoperative evaluation of LV function is not recommended

Grade

Ia

IIa

IIIa

No Benefit
• Preop natriuretic peptide levels predict 30 day CV events in vascular surgery
• Significantly improves RCRI
• Negative predictive value (NPV) of preop NT-proBNP & BNP higher than positive predictive value (PPV)
• Normal preoperative levels highly predictive of survival

Ryding ADS. Anesthesiology 2009;111:311
Rodseth RN. J Am Coll Cardiol 2014;63:170

INTRAOPERATIVE ISSUES
• Limited cardiac reserve with HFrEF
• Dependent on atrial contraction and synchronized contraction of the LV
• Acute deterioration occurs with:
  • Development of atrial fibrillation or LBBB
  • Additional hemodynamic load on the failing heart with:
    • Anemia
    • Increase in afterload
    • Stress of surgery
• HFpEF (diastolic dysfunction) may be most challenging
  • Highly intolerant of tachycardia & volume shifts

Regnier B. J Heart 2003;85:505

AORTIC STENOSIS: AN UNDERESTIMATED RISK FACTOR FOR PERIOP COMPLICATIONS IN PATIENTS UNDERGOING NONCARDIAC SURGERY

Echocardiogram:
• If suspected moderate or greater stenosis and no echo in last 12 months
• Q3-5 yrs in patients with history of mild AS
• Significant change in clinical status or examination
• All patients with undiagnosed murmurs if:
  • > 50 yrs old
  • Associated symptoms (DOE, CP, edema)
  • Abnormal ECG

JACC. 2014;64:e77–e137

2.4. Valvular Heart Disease: Recommendations

ACS:
• Unstable angina-
  New onset
  Rest
  Worsening
  Acute MI
  Postop MI rates
  0–30 days from MI to OR: 33%
  31–60 days from MI to OR: 19%
  61–90 days from MI to OR: 8.5%

≥60 days should elapse after a MI before noncardiac surgery
3. RCRI (6 predictors)
   • Major surgery (thoracic, intra-peritoneal, suprainguinal vascular)
   • Diabetes requiring insulin
   • Creatinine > 2.0 mg/dL
   • Cerebrovascular disease
   • Heart failure
   • Ischemic heart disease
   • 0-1 predictor(s): low risk of MACE
   • >2 predictors: elevated risk of MACE

Gupta Perioperative Cardiac Risk
Estimated risk of perioperative myocardial infarction or cardiac arrest: 0.18%

JACC. 2014;64:e77-e137.
MANY PATIENTS WHO DIE POSTOPERATIVELY ARE SUBJECTIVELY JUDGED AS LOW-RISK BEFORE SURGERY

- Measurement of exercise tolerance (METs) before surgery
- Participants ≥40 years with ≥1 risk factor for CAD or known CAD and major non-cardiac surgery (n=1399)
- Outcomes: Death or MI within 30 days of surgery and at 1 year
- Subjective rating of preoperative functional capacity
- Anesthesiologists in the preop clinic or on the DOS asked to make a subjective judgment of participants' functional capacity after assessing their usual preop history
- Cardiopulmonary exercise testing
- Measured peak O2 consumption
- Duke Activity Status Index (DASI) questionnaire
- N-terminal pro-B type natriuretic peptide (NT-pro-BNP)

CONCLUSIONS

- Subjective assessment of functional capacity should not be used
- This common practice does not accurately identify patients with poor fitness or increased risk for postop morbidity & mortality
- Objective measures (DASI questionnaire & NT-pro-BNP & perhaps CPET) can predict complications after major non-cardiac surgery

Harmful Revised Cardiac Risk Index

1. High risk surgery: thoracic, intra-peritoneal, suprainguinal vascular
2. Ischemic heart disease
3. Heart failure
4. Cerebrovasc disease
5. Diabetes mellitus
6. Renal insuff (Cr >2)

BMJ 2010;340:5526

OUR PREOCCUPATION WITH CORONARY LUMINOLOGY: THE DISSOCIATION BETWEEN CLINICAL AND ANGIOGRAPHIC FINDINGS IN ISCHEMIC HEART DISEASE

CIRCULATION 1995;92:2333

- Overestimation of lumen gain angiographically after angioplasty
- Angiographically unrecognized left main disease

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Fig 2: Association of preoperative stress testing with one year survival in the subgroup

Before PCI After PCI

- X-ray beam

Bobbie Jean Sweitzer, MD
Perioperative Evaluation and Anesthetic Management of Patients with Cardiac Disease
What about a preoperative ECG for a baseline?

The current use of ECgs may have developed as a method to screen for MI when little else was routinely available.

A standard age or risk factor cutoff for use of preoperative electrocardiographic testing has not been defined.

Likewise, the optimal time interval between obtaining a 12-lead ECG and elective surgery is unknown.

High risk patients: routine ECG and troponins measured
40% had elevated troponin levels
Only 6% had ischemia on ECG
Elevations in troponins predicted death at 1 year; ECGs did NOT

THE VALUE OF ROUTINE PREOPERATIVE ELECTROCARDIOGRAPHY IN PREDICTING MYOCARDIAL INFARCTION AFTER NONCARDIAC SURGERY

- 2967 non-ambulatory, noncardiac surgery pts > 50 yrs
- Preoperative ECG in 80% of patients
- 45% ECgs with at least one abnormality
- Bundle branch blocks (RBBB & LBBB) on the preop ECG were related to POMI & death
- Did not improve prediction beyond risk factors identified on patient history

CMS (Medicare and Medicaid) does NOT reimburse for preoperative, or age-based ECgs

Mounting Evidence for Lack of PCI Benefit in Stable Ischemic Heart Disease

What More Will It Take to Turn the Tide of Treatment?
Perioperative coronary revascularization can cause harm and does not improve clinical outcomes, even in high-risk patients.

"Interventional cardiology is doing cosmetic surgery on coronary arteries, making them look pretty, but it's not treating the underlying biology of these arteries," [Dr. Ozner, author of "The Great American Heart Hoax" who received the 2008 AHA Humanitarian Award]
6.1. Coronary Revascularization Before Noncardiac Surgery: Recommendations

Class III: No Benefit

1. It is not recommended that routine coronary revascularization be performed before noncardiac surgery except to reduce perioperative cardiac events (IIb, Level of Evidence: B)

CABG can prolong life and reduce angina in select populations (left main, 3-vessel disease)

PCI should be limited to:

1. L main disease if CABG too high
2. Unstable CAD (imminent risk of infarction)
3. STEMI or non-ST elevation ACS

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JACC 2014;64:e77-137

**WHY DOES MEDICAL MANAGEMENT MAKE SENSE AND REvascularization DOESN’T?**

Medical management stabilizes plaques, prevents thrombosis and supply-demand mismatch

- Most non-periop events due to plaque rupture/thrombosis
- Type 1 MI
- Most common in vessels with >70% blockage
- Most periop events 2nd supply-demand mismatch
- Type 2 MI
- Frequently NOT critical stenoses
- Commonly: <70% blockage

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Circulation


(302). The combination of aspirin, beta blockers, and statin therapy was associated with better 30-day and 12-month risk reduction for MI, stroke, and death than any of the 3 medications independently.

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Aspirin in Patients Undergoing Noncardiac Surgery

Table 1. Characteristics of the Patients at Baseline

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Aspirin (N=4984)</th>
<th>Placebo (N=1012)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eligibility criteria met — no. (%)</td>
<td>1634 (22.7)</td>
<td>1635 (22.6)</td>
</tr>
<tr>
<td>History of vascular disease</td>
<td>1133 (22.7)</td>
<td>1105 (20.8)</td>
</tr>
<tr>
<td>Coronary artery disease</td>
<td>418 (8.4)</td>
<td>427 (8.5)</td>
</tr>
<tr>
<td>Peripheral arterial disease</td>
<td>256 (5.1)</td>
<td>292 (5.8)</td>
</tr>
<tr>
<td>Stroke</td>
<td>210 (4.2)</td>
<td>217 (4.1)</td>
</tr>
<tr>
<td>Other medical history — no. (%)</td>
<td>241 (4.8)</td>
<td>240 (4.4)</td>
</tr>
<tr>
<td>History of coronary artery bypass grafting</td>
<td>234 (4.7)</td>
<td>238 (4.8)</td>
</tr>
<tr>
<td>History of percutaneous coronary intervention</td>
<td>128 (2.6)</td>
<td>127 (2.3)</td>
</tr>
<tr>
<td>Diabetic patient</td>
<td>74 (1.5)</td>
<td>65 (1.3)</td>
</tr>
<tr>
<td>Known coronary artery disease</td>
<td>21 (0.4)</td>
<td>24 (0.4)</td>
</tr>
</tbody>
</table>

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Circulation 2016;134:e123
Continue aspirin, 75-100 mg for ALL patients with stents
If at all possible

Circulation 2016;134:e123.

Statin users have 5-fold reduced risk of 30-day death
Vascular surgery patients on statins have 57% lower chance of perioperative MI or death at 2-yr follow-up

Cullar, J Thorac Cardiovasc Surg 2006
Schoubben, An J cardio 2007
Le Marois, Anesth Analg 2007

AVOID HYPOTENSION!!!!

Anesthesiology 2017;126:47-65

Table: Relationship Between Peak Postoperative
Fourth-Generation Tropin T and 30-Day Mortality

<table>
<thead>
<tr>
<th>Peak Tropin T (ng/ml)</th>
<th>0.01</th>
<th>0.02</th>
<th>0.03-0.29</th>
<th>&gt;0.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-Day Mortality (%)</td>
<td>1</td>
<td>4</td>
<td>9</td>
<td>17</td>
</tr>
<tr>
<td>Time to Death (d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sessler D. Anesth Analg 2016;123:850

The Use of Antiplatelet Therapy in the Outpatient Setting: Canadian Cardiovascular Society Guidelines

2015

Use of NSAIDs in patients on ASA

All NSAIDs and coxibs should be avoided in patients at increased cardiac risk (Class III, Level A).

Individuals taking ASA for vascular protection should avoid the concomitant use of traditional (non-coxib) NSAIDs (Class III, Level C).

Can J Cardiology 2011;27:51-53
Heart failure, valvular abnormalities and atrial fibrillation pose higher perioperative risk than CAD

Risk reduction best accomplished with drugs not stents

Benefits of aspirin, statins, beta blockers

Optimal anesthetic management and monitoring lowers risk

Attention to postoperative care!