Preoperative Cardiac Evaluation for the Office-based Practitioner

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Preoperative Cardiac Evaluation

Risk Assessment
- Clinical Prediction Tools
- Noninvasive Stress Testing

Risk Reduction
- Coronary Revascularization
- Beta-blockers & statins

Question 1: Clinical Risk Prediction

A 73 y.o. man will undergo open repair of a 6-cm abdominal aortic aneurysm. He has no cardiac history, but has long-standing diabetes & HTN.

Meds: lovastatin, atenolol, glyburide, benazepril, ASA
PEx: BP=115 / 70 HR=60; normal heart & lung exam
ECG: NSR, LVH, otherwise normal

What increases this patient’s risk for perioperative cardiac complications?

1. Just the type of surgery
2. Type of surgery & history of diabetes
3. Type of surgery, h/o diabetes & h/o HTN
4. Type of surgery, h/o DM & HTN and ECG with LVH
Revised Cardiac Risk Index

Predictors:
- Higher risk operation*
- Ischemic heart disease
- Congestive heart failure
- Diabetes requiring insulin
- Creatinine > 2 mg/dL
- Stroke or TIA

* Defined as intraperitoneal, intrathoracic, or suprainguinal vascular surgery

** Defined as MI, pulmonary edema, cardiac arrest, complete heart block

Predictors | Complications**
--- | ---
0 | 0.5%
1 | 1.3%
2 | 4%
3 or more | 9%

How Good Are Prediction Rules?

1998 patients undergoing carotid endarterectomy
- 4% had cardiac complication

<table>
<thead>
<tr>
<th>Prediction Rule</th>
<th>AUC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goldman Index</td>
<td>.58</td>
</tr>
<tr>
<td>Revised (Lee) Index</td>
<td>.61</td>
</tr>
<tr>
<td>ASA Classification</td>
<td>.59</td>
</tr>
<tr>
<td>Halm CEA-specific</td>
<td>.62</td>
</tr>
</tbody>
</table>

Question 2: Utility of Stress Testing

A 73 y.o. man will undergo open repair of a 6-cm abdominal aortic aneurysm. He has no cardiac history, but has long-standing diabetes & HTN.

Meds: lovastatin, atenolol, glyburide, benazepril, ASA
PEx: BP=115 / 70 HR=60; normal heart & lung exam
ECG: NSR, LVH, otherwise normal

Should this patient receive further preoperative tests?

1. Go to O.R. without further testing
2. Noninvasive stress test prior to surgery

73 y.o. man s/f repair of AAA. No cardiac history, but has long-standing diabetes & HTN. ECG: LVH only

Should this patient receive further preoperative tests?

1. Go to O.R. without further testing
2. Noninvasive stress test prior to surgery
Noninvasive Stress Testing

Predictive value:
- Mainly studied in vascular surgery patients
- Strong negative predictive value ~ 98% (neg LR = 0.1 - 0.2)
- Weak positive predictive value ~10 - 20% (pos LR = 2 - 3)
- Adds little information to lower risk patients
- More useful for cases with increased risk

770 vascular patients with 1 or 2 of following:
- Age > 70, MI, angina, CHF, DM, stroke / TIA, Cr > 1.8

No stress test (n = 384)
- 30-day CV
  - Death or MI 1.8%
  - 1.1%

Stress test (n = 386)
- 352 with no or limited ischemia
  - 2.3%
- 34 with extensive ischemia (9%)
  - 15%
  - 12 had PCI or CABG

Poldermans et al. JACC, 2006

2007 ACC/AHA Guideline

Good Functional Capacity?
- yes → Go to OR
- no or ?
  - no predictors*
  - 1 or 2 predictors
  - ≥ 3 predictors

Vascular surgery?
- no → Go to OR
- yes → Control HR & go to OR or Consider stress test if results will change management

* CAD, CHF, DM, CKD, CVA/TIA

Question 3: Revascularization

60 y.o. man with coronary disease will undergo radical prostatectomy for prostate cancer. His P-Mibi showed mild inferior reversibility. Angiography last year showed a 75% RCA lesion and normal LVEF. He did not receive angioplasty or a stent.
- Meds: lovastatin, atenolol, benazepril, ASA
- PEEx: BP=115 / 70 HR=60; normal CV & lung exam

Where do you send this patient?
60 y.o. man with CAD will undergo an aorto-femoral bypass operation. His P-Mibi showed mild inferior reversibility. Angiography last year showed a 75% RCA lesion and normal LVEF. He did not receive PCI.

1. Urologist for planned operation
2. Cardiac surgeon for potential CABG
3. Invasive cardiologist for possible PCI

CARP Trial: Coronary Artery Revascularization Prophylaxis

- 510 patients undergoing vascular surgery
- At least 1 vessel with 70% occlusion
- Excluded left main dz, AS, or LVEF < 20%

Choice of CABG or PCI plus Medical management alone

1° Endpoint: Long-term mortality
2° Endpoint: MI, Stroke, Limb loss, Dialysis

Short-term Outcomes

<table>
<thead>
<tr>
<th>Patients randomized</th>
<th>CABG or PCI</th>
<th>Med Mgt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Died before vascular surgery</td>
<td>3.8%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Died &lt; 30 d after vascular surgery</td>
<td>3.1%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Postoperative MI</td>
<td>12%</td>
<td>14%</td>
</tr>
</tbody>
</table>

McFalls, et al. NEJM, 2004

Long-term Postoperative Survival

McFalls, et al. NEJM, 2004
Cardiac Complications in Vascular Surgery
Patients with Dobutamine-induced Ischemia

Amount of New Wall Motion Abnormality on DSE
(Based on a 16 segment model)

Preoperative Revascularization in
High-Risk Patients (DECREASE-V pilot)

101 patients undergoing vascular surgery, all with:
≥ 3 risk predictors for cardiac complications &
Extensive ischemia on DSE or P-Mibi

1. Coronary angiogram
2. CABG or PCI
3. Medical Management

Medical management alone (no angiogram)

Endpoint: Cardiac Death or Nonfatal MI

Preoperative Revascularization in
High-Risk Patients

Risk Factor for Cardiac Mortality
(192 patients having surgery after stenting)

Cardiac Death

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Cardiac Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF +</td>
<td>13%</td>
</tr>
<tr>
<td>RF -</td>
<td>0.6%</td>
</tr>
</tbody>
</table>

Early Surgery
- Bare-metal stent < 4 wk: 13%
- Drug-eluting stent < 3-6 mo: 0.6%

Antiplatelet drugs held for surgery
- 5.5%

Antiplatelet drugs held & early surgery
(versus continued therapy & early surgery)
- 31%
ACC/AHA Guidelines for PCI

- Avoid PCI if patient may have upcoming surgery that requires stopping dual antiplatelet therapy
- Delay elective surgery in patients with recent PCI
  - Balloon angioplasty: 4 weeks
  - Bare metal stent: 4 - 6 weeks
  - Drug eluting stent: 12 months
- If clopidogrel must be stopped, try to continue ASA
- No evidence for bridging with anticoagulants

Question 4: Beta-blockers

A 65 y.o. woman with diabetes and HTN will undergo total knee arthroplasty. Denies cardiac history or symptoms. She is not on a beta-blocker. Her examination and ECG are unremarkable.

1. Definitely start β-blocker
2. Probably start β-blocker
3. Probably would not start β-blocker
4. Definitely avoid β-blocker

2006 ACC/AHA Guidelines for β-blockers

Definite indications (class I):
- Already using β-blocker to treat angina, HTN, arrhythmia
- Patients with ischemic potential having vascular surgery

Probable indications (class IIa):
- CAD or multiple risk predictors* in vascular or other intermediate-to-high risk operation

Possible indications (class IIb):
- All vascular surgery patients
- Single risk predictor* in any intermediate-high risk surgery

*Predictors: Coronary disease, CHF, renal insufficiency, diabetes

Trial of Perioperative β-blocker in Vascular Surgery Patients with Ischemia

111 patients undergoing vascular surgery
All had ischemia on dobutamine echo

Bisoprolol (1 week preop until 30 days postop)  Standard Care

Patients followed for 30 days after surgery:
- Serial ECG and cardiac enzymes

Endpoints: Cardiac mortality & Nonfatal MI

Poldermans, et al. NEJM 1999
Effect of Bisoprolol on Cardiac Mortality and Nonfatal MI after Vascular Surgery

POISE: PeriOperative Ischemia Evaluation

8351 patients with s/f major noncardiac surgery
- CAD, CHF, CVA/TIA, CKD, DM, or high-risk surgery
- Not already taking β-blocker

Metoprolol XL (immediately preop until 30 days postop)  Placebo

Patients followed for 30 days after surgery:
- Serial ECG and cardiac enzymes
- Outcome: 30-day cardiac mortality & nonfatal arrest or MI

POISE Trial

Metoprolol XL: Reduced cardiac events (mostly ↓ nonfatal MI) but Increased risk of stroke & total mortality

Recommendations in 2008

Definite indications:
- Already using β-blocker to treat angina, HTN, arrhythmia
- Patients with ischemic potential having vascular surgery

Possible indications:
- Patients with ischemic potential having high-risk nonvascular surgery (e.g., > 5 hours or > 500 cc blood loss)
- Multiple risk predictors* in vascular or other high-risk surgery
  (*Coronary disease, renal insufficiency, diabetes)

Titrate dose up gradually (don’t start immediately preop)
Can Statins Prevent Perioperative Cardiac Complications?

Systematic Review of Observational Studies:
- Statins associated with lower mortality (OR = 0.7) and fewer postoperative MI after noncardiac surgery

Danger of Statin Withdrawal?
- Cohort study of 298 vascular surgery patients on statins
- Interruption of statin treatment associated with higher risk of cardiac death and MI (hazard ratio = 7)
- Effect persisted after controlling for confounders and propensity score

Kapoor, AS et al. BMJ, 2006
Schouten, O et al. Am J Cardiol, 2007

DECREASE III

497 statin naive patients s/f vascular surgery

Fluvastatin XL 80 mg/day
- Started > 1 month preop
- Continued > 1 mo postop

Patients followed for 30 days after surgery:
1° Endpoint: myocardial ischemia (ECG or ↑ troponin)
2° Endpoint: cardiac death or nonfatal MI

Patients

<table>
<thead>
<tr>
<th></th>
<th>Fluvastatin XL</th>
<th>Placebo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myocardial Ischemia</td>
<td>19.0%</td>
<td>10.9%</td>
</tr>
<tr>
<td>Cardiac Death or MI</td>
<td>10.1%</td>
<td>4.8%</td>
</tr>
</tbody>
</table>

No difference in rates of LFT or CPK elevation.


Statins: 2007 ACC/AHA Guideline

Definite indications (class I):
- Continue statin if already taking prior to surgery

Probable indications (class IIa):
- All vascular surgery patients

Possible indications (class IIb):
- At least one risk predictor* in any intermediate risk surgery

*Coronary disease, renal insufficiency, diabetes, CVA/TIA
### Take Home Points

**Be familiar with the Revised Cardiac Risk Index:**
- It's not really any better but is the "new standard"

**Reserve stress testing for highest risk patients:**
- Vascular surgery patients with multiple RCRI predictors
- Extensive ischemia in vascular patients predicts high risk that may not be modifiable -- will you cancel surgery?
- Limited ischemia predicts acceptable risk

### Take Home Points

**Avoid perioperative coronary revascularization:**
- No identified benefit as prophylactic strategy
- Don’t perform PCI if patient may have upcoming surgery that requires stopping antiplatelet therapy
- High risk if taken off antiplatelet therapy too soon

### Take Home Points

**Caution with β-blockers:**
- Continue perioperatively if already on β-blocker
- Start only for patients with ischemic potential going for vascular surgery & possibly other high-risk populations
- Start well in advance of surgery; titrate slowly

**Statins showing promise:**
- Start for vascular surgery patients
- Consider in other patients with cardiac risk predictors