The Cardiac Patient for Non-Cardiac Surgery

Brent Dunworth, CRNA, MSN, MBA

Learning Objectives

- Review the principles and management goals to prevent cardiovascular perioperative morbidity.
- Describe common patient presentations that require a customized approach to anesthetic management.
- Recite contemporary practice management strategies for patient with low output states, implantable devices, and transplant recipients.

Estimating Risk

PREOPERATIVE EVALUATION
**Question**

What percentage of adult surgical patients have or are at-risk for CAD?

- A) 10%
- B) 20%
- C) 40%
- D) 50%

**Estimating Risk**

40% of adult surgical patients will either have or be at-risk for CAD.

Silent Risk: new Q-wave on ECG or new wall-motion abnormality on echo
- 40% of women
- 30% of men

Guiding Principles

2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery

http://content.onlinejacc.org/article.aspx?articleid=1893784


Perioperative Approach to Cardiac Assessment

Known or Risk Factors

Emergency

• Clinical Risk Stratification
• Proceed to surgery

Evaluate and Treat

Acute Coronary Syndrome
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Perioperative Approach to Cardiac Assessment

Low Risk
- No further testing
- Proceed to Surgery

Moderate Risk
- Evaluated functional capacity

Evaluated Perioperative MACE Risk

Estimated Perioperative MACE Risk
- No further testing
- Proceed to Surgery

Low Risk
- Evaluated functional capacity

Elevated Risk
10


Perioperative Approach to Cardiac Assessment

Excellent
- >10 METS
- No further testing
- Proceed to surgery

Moderate/Good
- >4-10 METS
- No further testing
- Proceed to surgery

Functional Capacity

Elevated Perioperative MACE Risk

Functional Capacity

Metabolic Equivalents (METS)

1-4 METS
- Take care of yourself
- Eat, dress, use toilet
- Walk indoors and around house
- Walk a block or two on level ground, 2-3 mph
- Do light work around the house (dusting, dishes)

4-10 METS
- Climb a flight of stairs or walk up a hill
- Walk on level ground at 4 mph
- Do heavy work around the house (scrubbing floors, lifting furniture)
- Moderate recreational activities (golf, bowling, dance, doubles tennis, throwing football)
- Strenuous sports (swimming, football, singles tennis, basketball, skiing)
Perioperative Approach to Cardiac Assessment

Estimating Risk

1. Clinical Markers
   - Known CAD
   - Previous heart failure
   - Diabetes
   - Renal insufficiency (Cr >2 mg/dL)

<table>
<thead>
<tr>
<th>Number of markers</th>
<th>Risk of infarct or death</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>2%</td>
</tr>
<tr>
<td>≥3</td>
<td>8.5%</td>
</tr>
</tbody>
</table>

2. Functional Status
   - Difficulty with ADLs
     - Much higher risk
   - Poor “anaerobic threshold”
     - 10% risk of death
   - Walk 4 blocks or climb 2 flights of stairs
     - Risk for cardiac event doubled
Estimating Risk

- Surgical Risk

<table>
<thead>
<tr>
<th>LOW (&lt;1%)</th>
<th>MODERATE (1-5%)</th>
<th>HIGH (&gt;5%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orthopedic</td>
<td>Retroperitoneal</td>
<td>Major thoracic</td>
</tr>
<tr>
<td>Breast</td>
<td>Renal</td>
<td>Head and Neck</td>
</tr>
<tr>
<td>Thyroidectomy</td>
<td>Head and Neck</td>
<td>Retroperitoneal</td>
</tr>
<tr>
<td>Other</td>
<td>Other</td>
<td>Other</td>
</tr>
</tbody>
</table>


Noninvasive Testing

Considerations:
- Recent testing
- Concern for CAD, LV dysfunction, VHD
- Can patient exercise?

Conditions which dictate evaluation:
- Unstable CAD
- Decompensated HF
- Symptomatic arrhythmias
- Severe VHD

Will Results Lead to a Change in Care?

Noninvasive Testing

<table>
<thead>
<tr>
<th>Test</th>
<th>Positive Prediction Value</th>
<th>Negative Prediction Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thallium Imaging</td>
<td>12.5%</td>
<td>99%</td>
</tr>
<tr>
<td>Stress echocardiography</td>
<td>20%</td>
<td>93%</td>
</tr>
</tbody>
</table>

Preventing MACE

CORONARY STENTS

Coronary Stents

Bare Metal
- Limited endothelialization after implantation
  - High risk of restenosis

Risk:
- Acute thrombosis: first 6 weeks (major risk)
- Post-dilation injury

Rx:
- Dual antiplatelet therapy
  - Aspirin
  - Thienopyridine (Plavix)
  - Ticlodipine (Ticlid)

Drug-Eluting
- Limited endothelialization
- Limited restenosis
- Infinite risk of thrombosis
- Exposed stent struts
- Prothrombotic risk never goes away

Rx:
- Dual antiplatelet therapy
  - Aspirin
  - Clopidogrel (Plavix), ticlodipine (Ticlid)

Thrombotic Risk

Bare Metal Stents

<table>
<thead>
<tr>
<th>Event Rate</th>
<th>Timeframe from Implantation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low</td>
<td>&gt;30 days</td>
</tr>
</tbody>
</table>

Drug-Eluting Stents

<table>
<thead>
<tr>
<th>Event Rate</th>
<th>Timeframe from Implantation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.8%</td>
<td>6-8 weeks</td>
</tr>
<tr>
<td>1.2%</td>
<td>3 months</td>
</tr>
<tr>
<td>2.8%</td>
<td>6 months</td>
</tr>
<tr>
<td>1.8%</td>
<td>1 year</td>
</tr>
</tbody>
</table>

Endothelialization of Stents

Morbidity/Mortality

- Abrupt discontinuation of clopidogrel and ASA
- Prothrombotic states
- Incomplete endothelialization
- Rebound Effect
- Surgical Intervention
- MI
- Death


Approach to Perioperative Management

Bare metal stent
- Delay elective surgery 6 weeks

Drug-eluting stent
- Delay elective surgery 1 year

Evidence is growing… ACC/AHA 2014

- Discontinuation of dual antiplatelet therapy
- Maintenance of dual antiplatelet therapy
- Discontinuation of thienopyridine

Cessation of Antiplatelet Therapy
### Approach to Perioperative Management

#### Considerations
- Surgery
  - closed anatomical space
- Surgeon
- Risk/benefit
- Time since implantation
- Restart timeframe

#### Approach to Perioperative Management

**Bridging therapy**
- Short acting GP IIb/IIIa inhibitor
  - Abciximab (ReoPro)
  - Eptifibatide (Integrilin)
  - Tirofiban (Aggrastat)
- Direct thrombin inhibitor
  - Agatston
  - Leprudin (Refludan)
  - Bivalirudin (Angiomax)

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*Journal of the American College of Cardiology.* 2014;64(22):e77-e137.
Question

Your patient presents to the preoperative evaluation clinic prior to elective shoulder arthroscopy. He has a history of MI, 9 months prior, with a drug-eluting stent placed. What is the best course of action?

A) Continue with surgery and give sub-q heparin
B) Consult cardiology
C) Delay surgery by at least 3 months
D) Continue with surgery and maintain dual antiplatelet therapy

Considerations

A FEW SCENARIOS
Regional Anesthesia

ASA Guidelines
- Thienopyridines and dual antiplatelet therapy are contraindications to RA in noncompressible regions that cannot be monitored for bleeding
- Clopidogrel: 7 day discontinuation
- Aspirin does not appear to increase risk of neuraxial anesthesia
- LMWH: 10-12 hour delay in RA
- UFH: platelet count to rule out HIT
- Bridging therapy (eptifibatide, tirofiban): 8 hour delay in RA

Regional Anesthesia and Anticoagulants

<table>
<thead>
<tr>
<th>Anticoagulant</th>
<th>Recommended Interval Between D/C of Drug and Pain Procedure</th>
<th>Recommended Interval Between Pain Procedure and Resumption of Drug</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coumadin</td>
<td>5 days + normalization of INR</td>
<td>24 hours</td>
</tr>
<tr>
<td>IV heparin</td>
<td>4 hours</td>
<td>2 hours**</td>
</tr>
<tr>
<td>SC heparin</td>
<td>8-10 hours</td>
<td>2 hours**</td>
</tr>
<tr>
<td>LMW heparin</td>
<td>24 hours</td>
<td>24 hours</td>
</tr>
<tr>
<td>Thrombolytic agents</td>
<td>108 hours*</td>
<td>108 hours*</td>
</tr>
<tr>
<td>Fondaparinux</td>
<td>4 days</td>
<td>24 hours</td>
</tr>
<tr>
<td>Thienopyridine inhibitors</td>
<td>7 days</td>
<td>12-24 hours</td>
</tr>
</tbody>
</table>

**if moderate or high-risk procedure (bloody), then 24 hours


Beta Blockers

Continue beta blockers in patients who are on beta blockers chronically
It may be reasonable to begin perioperative beta blockers long enough in advance to assess safety and tolerability; preferably >1 d before surgery
Beta-blocker therapy should not be started on the day of surgery

Medication Management

Statins

- Continue statins in patients currently taking statins.
- Perioperative initiation of statin use is reasonable in patients undergoing vascular surgery.
- Perioperative initiation of statins may be considered in patients with a clinical risk factor who are undergoing elevated-risk procedures.

Device Management

- Patients with ICDs should be on a cardiac monitor continuously during the entire period of inactivation, and external defibrillation equipment should be available. Ensure that ICDs are reprogrammed to active therapy if surgical site is above the umbilicus, electrocautery interference is likely.

Heart Transplant

- Intact Frank-Starling mechanisms: arterial dilation does increase during demand making the patient “preload dependent.”
- Autonomic denervation: heart can maintain contractility and dilate in response to hypotension or hypertension.
- Absence of cardiac vagal tone: autonomic nervous system response to laryngoscopy, hypotension, cardiac massage.
- Inotropic or chronotropic therapy - DIRECT: dobutamine, epinephrine.