Cardiac evaluation for the non-cardiac patient

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Objectives

- Review ACC / AHA guidelines as updated for 2009
- Discuss new recommendations with β-blockers.
- Discuss issues surrounding revascularization and stents in the perioperative setting


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<table>
<thead>
<tr>
<th>Level</th>
<th>Class I</th>
<th>Class IIa</th>
<th>Class IIIa</th>
<th>Class IIIb</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Benefit &gt;&gt; Risk</td>
<td>Benefit &gt;&gt; Risk</td>
<td>Benefit &gt;= Risk</td>
<td>Risk &gt;= Benefit</td>
</tr>
<tr>
<td></td>
<td>Procedure/Treatment SHOULD be performed/administered</td>
<td>IT IS REASONABLE to perform procedure/administer treatment</td>
<td>Procedure/Treatment MAY BE CONSIDERED</td>
<td>Procedure/Treatment should NOT be performed/administered</td>
</tr>
<tr>
<td>Level A</td>
<td>Multiple (2-5) population risk strata evaluated</td>
<td>General consistency of direction and magnitude of effect</td>
<td>Recommendation that procedure or treatment is useful/effective</td>
<td>Recommendation's usefulness/efficacy less well established</td>
</tr>
<tr>
<td>Level B</td>
<td>Limited (2-5) population risk strata evaluated</td>
<td></td>
<td>Recommendation in favor of treatment or procedure being useful/effective</td>
<td>Greater conflicting evidence from multiple randomized trials or meta-analyses</td>
</tr>
<tr>
<td>Level C</td>
<td>Rare (1-2) population risk strata evaluated</td>
<td></td>
<td>Recommendation in favor of treatment or procedure being useful/effective</td>
<td>Recommendation that procedure or treatment not useful/effective and may be harmful</td>
</tr>
</tbody>
</table>

Notes:
- Recommendation that procedure or treatment is useful/effective
- Sufficient evidence from multiple randomized trials or meta-analyses
- Some conflicting evidence from multiple randomized trials or meta-analyses
- Recommendation's usefulness/efficacy less well established
- Greater conflicting evidence from multiple randomized trials or meta-analyses
- Recommendation that procedure or treatment not useful/effective and may be harmful
- Limited evidence from single randomized trial or non-randomized studies
- Only diverging expert opinion, case studies, or standard-of-care

* Class I: Benefit >> Risk
* Class IIa: Benefit >> Risk
* Class IIIa: Benefit >= Risk
* Class IIIb: Risk >= Benefit

*Recommendation that procedure or treatment not useful/effective and may be harmful
*Limited evidence from single randomized trial or non-randomized studies
*Only diverging expert opinion, case studies, or standard-of-care
General approach:

- Goal is not “medical clearance” for surgery.
- Rather it is a discussion about cardiac risk for a given procedure and patient.
- Ideally this allows for medical planning to minimize risk, and utilize maximal therapy prior to surgery.
Who should you worry about?

- Patients with known CAD.
- Patients with new symptoms indicating CAD
- Asymptomatic patients over age 50:
  - This group is the reference in the Revised Cardiac Risk Index
  - More extensive evaluation may be warranted – starting with focused cardiac history
What are the active cardiac conditions?
Active Cardiac Conditions: The Big Five

1. Unstable coronary syndromes
   - Unstable angina / recent MI (within 30 days)

2. Decompensated Heart Failure
   - Class IV or new onset

3. Significant Arrhythmias
   - High grade AV block, 3rd degree block, symptomatic ventricular arrhythmias, SVT’s without rate control, severe bradycardia, new VT
Active Cardiac Conditions:

4. **Severe AS* 
5. **Severe MS* 

- Presence of Active Cardiac Conditions warrants further evaluation unless case is emergent. (Class I)
  - Non-invasive testing vs catheterization based on patient scenario and previous workup.
What’s next-

- Absence of the **big five** leads to the OR most of the time
- Based on functional capacity and surgical risk.
Low Surgical Risk:

- Combined incidence of cardiac death or nonfatal MI < 1%
- Ambulatory surgery, Cataracts, Breast surgery, endoscopic procedures, superficial procedures
- Noninvasive testing not useful in low risk surgery (Class III)
Intermediate Risk Surgery:

- Cardiac Risk 1-5%
- Orthopedic surgery, head and neck, carotid endarterectomy, prostate surgery, intraperitoneal surgery, & intrathoracic surgery.
High Risk Surgery

- Cardiac risk reported > 5%.
- Aortic and major vascular surgery along with peripheral vascular procedures.
- Key point: For intermediate or high risk surgery, further testing should be based on clinical risk factors & undertaken only if it will change management. (Class IIa / IIb)
Step 5 is often the key

- These patients fall into the unknown category.
- Not clearly healthy, but not clearly unhealthy
- Assessment based on physical ability, and clinical risk factors.
<table>
<thead>
<tr>
<th>1 MET</th>
<th>Can you...</th>
<th>4 METs</th>
<th>Can you...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Take care of yourself?</td>
<td></td>
<td>Climb a flight of stairs or walk up a hill?</td>
</tr>
<tr>
<td></td>
<td>Eat, dress, or use the toilet?</td>
<td></td>
<td>Walk on level ground at 4 mph (6.4 kph)?</td>
</tr>
<tr>
<td></td>
<td>Walk indoors around the house?</td>
<td>Walk a block or 2 on level ground at 2 to 3 mph (3.2 to 4.8 kph)?</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Run a short distance?</td>
</tr>
<tr>
<td>4 METs</td>
<td>Do light work around the house like dusting or washing dishes?</td>
<td></td>
<td>Do heavy work around the house like scrubbing floors or lifting or moving heavy furniture?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Participate in moderate recreational activities like golf, bowling, dancing, doubles tennis, or throwing a baseball or football?</td>
</tr>
<tr>
<td>Greater than 10 METs</td>
<td>Participate in strenuous sports like swimming, singles tennis, football, basketball, or skiing?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
How about low activity or unclear activity patients?

- Must rely on clinical risk factors to determine surgical risk
Clinical Risk Factors:

- ACC / AHA guidelines used Revised Cardiac Risk Index as basis or recommendations.

Derivation and Prospective Validation of a Simple Index for Prediction of Cardiac Risk of Major Noncardiac Surgery

Circulation 1999;100;1043-1049
Results:

Revised Cardiac Risk Index

1. High-risk type of surgery
2. Ischemic heart disease
3. History of congestive heart failure
4. History of cerebrovascular disease
5. Insulin therapy for diabetes
6. Preoperative serum creatinine > 2.0 mg/dL
Clinical Risk Factors

- Ischemic heart disease:
  - Hx of MI, + treadmill, **NTG use**, current angina, Q waves on ECG**.

- CHF
  - Hx of CHF, Pulm Edema, Bilateral Rales

- Cerebrovascular Disease
  - **TIA** or full stroke
Clinical Risk factors:

- Number of factors correlates to class, i.e., class I, II, III, IV.
- History of MI or abnormal Q wave on ECG is a clinical risk factor.
- Acute MI < 1 month is an active cardiac condition.
- Class correlated with risk based on type of surgery.
Using clinical factors

- High risk surgery with 3 or more risk factors warrants testing **IF management may be altered**! (Class IIa)
- Intermediate risk regardless of clinical factors can proceed with optimal HR control or consider noninvasive testing **IF management may be altered**! (Class IIb)
How different from 2002:

- Elimination of intermediate and minor clinical predictors
  - Use Revised cardiac risk index
  - Minor predictors not proven to independently increase cardiac risk perioperatively
  - Age, Abnl ECG, Rhythm not SR, HTN*

- Goal to identify patients who may benefit from revascularization
Preoperative testing:

- Active Cardiac Conditions warrant invasive testing most of the time
- Resting LV function not a consistent predictor of ischemic events
- ECG warranted within 30 days if:
  - Major surgery and at least 1 risk factor
  - Intermediate surgery and known CAD
  - Age > 50
- Stress test gives best information*
Problems with guidelines

- Higher level of Class II evidence used
- Reduced amount of Class I evidence (10%)
- Places high importance on risk of surgery – but increased endovascular therapies (AAA endografts etc) may alter classic risk groups
Case Scenario:

- 58 yo female, SSO for elective hip replacement
- Daughter tells you she had a heart attack 10 months prior – they placed a stent in one of her coronary vessels
- DM – not on insulin
- Patient is not active.
- BP 185/95 in pre-op. Baseline 160/85
Assessment:

- Intermediate Risk Surgery - Elective
- Pre-op labs
  - Hct 42. Cr 1.1.
- Review Medications
  - On B-Blockade, Statin therapy, ASA. Stopped Plavix 5 days prior.
- Get ECG → Q waves in II / III
Case Scenario

- Should we stress test the patient?
- How about further revascularization?
- What about her β-blockers?
- What about her existing stent?
Basic changes are a discussion of the POISE trial and how this has impacted recommendations for β-blocker therapy.
Effects of extended-release metoprolol succinate in patients undergoing non-cardiac surgery (POISE trial): a randomised controlled trial

POISE Study Group*

Lancet 2008; 371: 1839-47

- 8351 pts for non-cardiac surgery
- Randomized to metoprolol extended release vs placebo
- 190 hospitals, 23 countries.
- Tx initiated 2-4 hours before surgery – continued for 30 days.
A – primary outcome was composite of cardiac death, non-fatal MI, non-fatal cardiac arrest within 30 days.

B - Myocardial Infarction
C – Stroke
D - Death
Conclusions: Reduction in cardiac related events, but increased risk of stroke and overall increase in mortality using extended release Metoprolol.
<table>
<thead>
<tr>
<th>Study</th>
<th>Procedure</th>
<th>n</th>
<th>Control</th>
<th>Drug and Dosage</th>
<th>Myocardial Ischemia</th>
<th>MI</th>
<th>Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pastemack et al., 1987 (374)</td>
<td>Abdominal aortic aneurysmectomy</td>
<td>83</td>
<td>Case-control</td>
<td>Metoprolol 50 mg PO preoperatively</td>
<td>17.6% (9/55)</td>
<td>3.1% (1/32)*</td>
<td></td>
</tr>
<tr>
<td>Pastemack et al., 1989 (78)</td>
<td>Vascular</td>
<td>206</td>
<td>Unblended</td>
<td>Metoprolol 60 mg PO preoperatively</td>
<td>0.8 ± 1.0 episodes*</td>
<td>0.8 ± 1.6 episodes*</td>
<td></td>
</tr>
<tr>
<td>Stone et al., 1998 (79)</td>
<td>Noncardiac</td>
<td>128</td>
<td>Placebo</td>
<td>Levobradal 200 mg PO</td>
<td>28.2% (11/39)</td>
<td>2.2% (2/93)*</td>
<td>0% (0/39)</td>
</tr>
<tr>
<td>Wüstemann et al., 1999 (80)</td>
<td>Vascular</td>
<td>112</td>
<td>Unblended</td>
<td>Bisoprolol 5 to 10 mg PO</td>
<td>17% (9/55)</td>
<td>0% (0/58)*</td>
<td>17% (9/55)</td>
</tr>
<tr>
<td>Kaly et al., 1999 (376)</td>
<td>Vascular</td>
<td>26</td>
<td>Placebo</td>
<td>N esmolol</td>
<td>72.7% (9/15)</td>
<td>43.3% (5/15)*</td>
<td></td>
</tr>
<tr>
<td>Wallace et al., 1999 (381)</td>
<td>Noncardiac</td>
<td>200</td>
<td>Placebo</td>
<td>Atenolol 10 to 20 mg IV or 50 to 100 mg PO</td>
<td>39/101 (38.8%)</td>
<td>24/99 (24.2%)</td>
<td></td>
</tr>
<tr>
<td>Urban et al., 2000 (382)</td>
<td>Noncardiac</td>
<td>107</td>
<td>Placebo</td>
<td>N esmolol on the day of surgery, followed by metoprolol starting at 25 mg PO qid and increased to maintain an HR less than 80 bpm, and continued for the next 48 h</td>
<td>14.5% (6/55)</td>
<td>5.8% (3/52)</td>
<td></td>
</tr>
<tr>
<td>Brady et al., 2005 (374)</td>
<td>Vascular</td>
<td>103</td>
<td>Placebo</td>
<td>Metoprolol 60 mg PO qid preoperatively until 7 d after surgery</td>
<td>9% (4/44)</td>
<td>9.4% (6/53)</td>
<td></td>
</tr>
<tr>
<td>Perioperative Prophylactic Anti-Ischemia Medications and Cardiac Morbidity</td>
<td>Noncardiac</td>
<td>923</td>
<td>Placebo</td>
<td>Metoprolol 100 mg, sustained release 1 d preoperatively, until up to 5 d postoperatively</td>
<td>5% (72/459)</td>
<td>16% (74/462)</td>
<td></td>
</tr>
<tr>
<td>Yang et al., 2006 (373)</td>
<td>Vascular</td>
<td>496</td>
<td>Placebo</td>
<td>Weight-adjusted metoprolol, 50, 75, or 100 mg</td>
<td>21/250 (8.4%)</td>
<td>19/246 (7.7%)</td>
<td>4/250 (1.6%)</td>
</tr>
</tbody>
</table>

*p < 0.05 for drug versus control.

BD indicates twice per day; bpm, beats per minute; HR, heart rate; IV, intravenous; MI, myocardial infarction; n, number of patients; NDSR, nitroglycerin, and PO, by mouth.
What to do.

- **Class I:** Continue β-blockade for pts on medication.
- **Class IIa:** *Probably good* to titrate β-blockade for high cardiac risk pts in both high and intermediate risk surgery, and for patients with > 1 clinical risk factor.
- **Class IIb:** Use of β-blockade is *uncertain* in intermediate risk surgery and low / intermediate cardiac risk groups.
What not to do.

- **Class III: Don’t give to patients with absolute contraindications to β-blockade**
  - Based on POISE – routine administration of β-blockade on day of surgery **cannot** be advocated
Revascularization

- Multiple studies, some randomized, some not looking at both CABG and PCI
- Entire lecture series
- Multiple questions: CABG vs PCI, what type of testing best, which group of patients best…..
Does Revascularization Matter??

Coronary-Artery Revascularization before Elective Major Vascular Surgery

Coronary-Artery Revascularization before Elective Major Vascular Surgery

- 5859 pts for major vascular surgery
- 510 Pts – angiographically stable CAD
  - 1/3 with 3 vessel disease
- 33% aortic, 66% peripheral vascular
- Active Cardiac Conditions excluded
- Randomized to intervention or not before surgery (CABG 41%, PCI 59%)
Coronary-Artery Revascularization before Elective Major Vascular Surgery

- Of 510 pts studied:
  - 49% had 2 Clinical Risk Factors
  - 13% had 3 Clinical Risk Factors
  - 62% had nuclear perfusion scanning
    - Perfusion defect moderate or large in 226 patients
  - Mortality was final end point
  - One year follow-up minimum
Figure 1. Long-Term Survival among Patients Assigned to Undergo Coronary-Artery Revascularization or No Coronary-Artery Revascularization before Elective Major Vascular Surgery.
<table>
<thead>
<tr>
<th>High-Risk Variable</th>
<th>Patients (N=510)</th>
<th>Hazard Ratio (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angina</td>
<td>198 (38.8)</td>
<td>1.45 (0.79–2.64)</td>
<td>0.23</td>
</tr>
<tr>
<td>Positive stress imaging test†</td>
<td>226 (44.3)</td>
<td>1.26 (0.77–2.06)</td>
<td>0.35</td>
</tr>
<tr>
<td>Fulfillment of criteria of Eagle and colleagues‡</td>
<td>142 (27.8)</td>
<td>0.90 (0.51–1.62)</td>
<td>0.73</td>
</tr>
<tr>
<td>With large stress-induced defect</td>
<td>37 (7.3)</td>
<td>3.96 (0.82–19.11)</td>
<td>0.09</td>
</tr>
<tr>
<td>Category of revised Cardiac Risk Index§</td>
<td>248 (48.6)</td>
<td>1.20 (0.76–1.89)</td>
<td>0.44</td>
</tr>
<tr>
<td>With large stress-induced defect</td>
<td>50 (9.8)</td>
<td>1.65 (0.64–4.25)</td>
<td>0.30</td>
</tr>
<tr>
<td>Prior CABG</td>
<td>77 (15.1)</td>
<td>1.81 (0.81–4.05)</td>
<td>0.15</td>
</tr>
<tr>
<td>Three-vessel disease and left ventricular dysfunction</td>
<td>74 (14.5)</td>
<td>1.29 (0.62–2.65)</td>
<td>0.50</td>
</tr>
<tr>
<td>Pain at rest and tissue breakdown</td>
<td>152 (29.8)</td>
<td>0.76 (0.43–1.34)</td>
<td>0.34</td>
</tr>
</tbody>
</table>
Figure 2. Long-Term Use of Medical Therapy in the Revascularization and No-Revascularization Groups at 24 Months after Randomization.
“Principle finding of this study is that among patients with stable coronary artery disease, revascularization does not improve long term survival.”
Revascularization:
Poldermans - J AM Coll Cardiol 2007;49: 1763-9

- Decrease V: Looked at value of preoperative revascularization
- Screened patients with >3 risk factors
- 1880 patients screened, 430 high risk patients found
- 101 patients randomized with extensive ischemia after testing
- End points were death or MI at 30 days and one year.
Results:

- 43% vs 33% incidence, but not statistically significant between groups
- Overall study was a pilot study, and underpowered.
- Key point: High risk study group with relatively high complication rates
- Aggressive medical management with ASA, and B-Blockade
“CONCLUSIONS: In this randomized pilot study, designed to obtain efficacy and safety estimates, preoperative coronary revascularization in high-risk patients was not associated with an improved outcome.”
Table 1. Summary of Studies About the Role of Coronary Artery Bypass Grafting or Percutaneous Coronary Intervention Before Noncardiac Surgery

<table>
<thead>
<tr>
<th>Author of publication</th>
<th>No. of patients studied; Design</th>
<th>Inclusion/Exclusion criteria</th>
<th>Type of surgery</th>
<th>Type of revascularization</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studies of coronary artery bypass grafting/percutaneous coronary intervention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hertzer et al., 1984</td>
<td>1000; prospective</td>
<td>i: consecutive, refusal, malignancy</td>
<td>Major vascular</td>
<td>CABG</td>
<td>Low rate of perioperative cardiac complications</td>
</tr>
<tr>
<td>Hertzer et al.; 1987</td>
<td>246; retrospective</td>
<td>i: consecutive, refusal, malignancy</td>
<td>Aortic aneurysm</td>
<td>CABG</td>
<td>Late cardiac mortality reduced</td>
</tr>
<tr>
<td>Hertzer et al.; 1987</td>
<td>386; retrospective</td>
<td>i: consecutive, refusal, malignancy</td>
<td>Peripheral vascular</td>
<td>CABG</td>
<td>Late cardiac mortality reduced</td>
</tr>
<tr>
<td>Eagle et al.; 1997</td>
<td>3368; retrospective</td>
<td>i: CAG and noncardiac surgery</td>
<td>Abdominal, vascular, thoracic, head and neck</td>
<td>CABG</td>
<td>Perioperative mortality and myocardial infarction rates reduced</td>
</tr>
<tr>
<td>Fleisher et al.; 1999</td>
<td>6895; retrospective</td>
<td>i: random sample of Medicare patients</td>
<td>Major vascular</td>
<td>CABG or PCI</td>
<td>Lower rate of cardiac events for aortic patients; reduction in 1 yr mortality</td>
</tr>
<tr>
<td>Hassan et al.; 2001</td>
<td>501; retrospective</td>
<td>i: 2- or 3-vessel disease, severe angina, ischemia</td>
<td>Noncardiac</td>
<td>CABG or PCI</td>
<td>Late cardiac death and myocardial infarction rates reduced</td>
</tr>
<tr>
<td>Back et al.; 2002</td>
<td>425; prospective</td>
<td>i: consecutive, elective vascular patients</td>
<td>Major vascular</td>
<td>CABG or PCI</td>
<td>Prior CABG ≤5 yr, PCI ≤2 yr reduced perioperative cardiac events</td>
</tr>
<tr>
<td>Landesberg et al.; 2003</td>
<td>502; retrospective</td>
<td>i: elective, consecutive</td>
<td>Major vascular</td>
<td>CABG or PCI</td>
<td>Better late survival</td>
</tr>
<tr>
<td>Landesberg et al.; 2006</td>
<td>624; retrospective</td>
<td>i: the same as above</td>
<td>Major vascular</td>
<td>CABG or PCI</td>
<td>Better late survival for patients at intermediate risk</td>
</tr>
<tr>
<td>Poldermans et al.; 2007</td>
<td>101; prospective</td>
<td>i: severe myocardial ischemia</td>
<td>Major vascular</td>
<td>CABG or PCI</td>
<td>No difference in survival compared to medical therapy</td>
</tr>
</tbody>
</table>

CABG = coronary artery bypass grafting; PCI = percutaneous coronary intervention; CAG = coronary angiography; i = inclusion; e = exclusion.
<table>
<thead>
<tr>
<th>Author; year of publication</th>
<th>No. of patients studied; Design</th>
<th>Inclusion/Exclusion criteria</th>
<th>Type of surgery</th>
<th>Type of revascularization</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allen et al.; 1991 \textsuperscript{17}</td>
<td>148; retrospective</td>
<td>i: PCI before vascular surgery&lt;br&gt;e: history of CAGB/PCI, missing data</td>
<td>Major vascular</td>
<td>PCI</td>
<td>Lower perioperative cardiac mortality</td>
</tr>
<tr>
<td>Elmore et al.; 1993 \textsuperscript{18}</td>
<td>2452; retrospective</td>
<td>i: PCI before vascular surgery&lt;br&gt;e: patients without an index admission $\geq$30 days</td>
<td>Major vascular</td>
<td>PCI or CAGB</td>
<td>Perioperative rate of myocardial infarction for patients with PCI is lower, higher rate of late events</td>
</tr>
<tr>
<td>Gottlieb et al.; 1998 \textsuperscript{19}</td>
<td>194; retrospective</td>
<td>i: PCI before vascular surgery</td>
<td>Major vascular</td>
<td>PCI</td>
<td>Low rate of perioperative cardiac events</td>
</tr>
<tr>
<td>Posner et al.; 1999 \textsuperscript{20}</td>
<td>2841; retrospective</td>
<td>i: PCI before surgery&lt;br&gt;e: patients without an index admission $\geq$30 days</td>
<td>Noncardiac</td>
<td>PCI or no revascularization or normal</td>
<td>Reduced risk of cardiac events compared to no revascularization</td>
</tr>
<tr>
<td>Godet et al.; 2005 \textsuperscript{21}</td>
<td>1152; retrospective</td>
<td>i: consecutive, elective&lt;br&gt;e: emergency, thoracoabdominal, patients with CAGB</td>
<td>Abdominal aortic surgery</td>
<td>PCI or no revascularization</td>
<td>No significant reduction in cardiac risk or death</td>
</tr>
</tbody>
</table>

**Coronary artery revascularization prophylaxis trial and substudies**

<table>
<thead>
<tr>
<th>Author; year of publication</th>
<th>No. of patients studied; Design</th>
<th>Inclusion/Exclusion criteria</th>
<th>Type of surgery</th>
<th>Type of revascularization</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>McFalls et al.; 2004 \textsuperscript{22}</td>
<td>510; prospective</td>
<td>See Table 4</td>
<td>Major vascular</td>
<td>CABG or PCI or medical therapy</td>
<td>No reduction in perioperative and long-term cardiac events</td>
</tr>
<tr>
<td>Ward et al.; 2006 \textsuperscript{23}</td>
<td>222; retrospective</td>
<td>Same as for the original study (see Table 4)</td>
<td>Major vascular</td>
<td>CABG or PCI or medical therapy</td>
<td>CABG associated with reduction in myocardial infarction and hospital stay than PCI</td>
</tr>
<tr>
<td>Raghunathan et al.; 2006 \textsuperscript{24}</td>
<td>307; retrospective</td>
<td>Same as for the original study (see Table 4)</td>
<td>Surgery for critical limb ischemia and intermittent claudication</td>
<td>CABG or PCI or medical therapy</td>
<td>Low perioperative and long-term mortality, no reduction by coronary revascularization</td>
</tr>
</tbody>
</table>
Revascularization

- Bottom Line:
- CABG probably better than PCI overall
- Only recommended if significant myocardium at risk
But wait......

Systematic Strategy of Prophylactic Coronary Angiography Improves Long-Term Outcome After Major Vascular Surgery in Medium- to High-Risk Patients
A Prospective, Randomized Study

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Study designed to determine impact of systematic coronary angiography on intermediate and long term outcomes in medium risk patients for vascular procedures.

- Basically – in between CARP and Decrease V.
208 pts for elective Vascular surgery

- Randomized – Control group had invasive testing based on positive stress test (ACC guidelines strategy)

- Study group had initial coronary angiography from start
Anti-platelet agents stopped and pts bridged with LMWH
If stents placed, BMS used. Surgery done in 30-60 days. Plavix stopped for surgery, ASA maintained.
Surgical intervention by OPCAB if indicated
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Figure 1 Cumulative Survival
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Figure 2  Freedom From Major Cardiac Events
For patients at medium to high risk for cardiac events – presenting for elective vascular surgery, a systematic angiographic approach guiding cardiac therapy confers a survival benefit.
What to do.

- **Class I:** Revascularize pts with significant left main disease (CABG), 3 vessel disease, 2V disease + proximal LAD lesions, high risk unstable angina or with acute ST-elevation MI.
What not to do.

- **Class III, Level B:** Due to elevated risk of re-stenosis, and lack of support by current clinical trials PCI is not routinely recommended unless patient has active cardiac condition amenable to intervention.

- **Class IIb:** PCI not well established for pts with abnormal stress echocardiography (low or high risk).
What about surgery after Stenting?

- Questions recently regarding use of bare metal stents vs drug eluting stents.
- Elevated risk of thrombosis in BMS until endothelialization occurs at 6 weeks if anti-platelet therapy stopped.
- Risk of thrombosis elevated with DES for 12 months if anti-platelet drugs stopped (plavix)
Approach for previous PCI management
Need for stenting along with noncardiac surgery
Case Scenario:

- Take effort to assess physical activity
- If on Beta-blockade, ASA, and Statins then I would proceed after reducing BP in pre-op.
- Stent: Assume DES – could be justified in delaying surgery until 12 months out.
- Definite increase risk in stopping Plavix with DES before 6 mos – with low risk of stenosis after 12 months. No real data on patients 10-12 months out.
Recommended reading:

Preoperative Coronary Revascularization in High-Risk Patients Undergoing Vascular Surgery: A Core Review

Miklos D. Kertai, MD, PhD*†

Patients undergoing vascular surgery are at increased risk for cardiac complications related to the presence of underlying coronary artery disease. Preoperative cardiac evaluation may help to identify high-risk patients in whom coronary angiography may be planned with subsequent coronary revascularization for the purpose of improving perioperative and long-term cardiac outcomes. However, the indications and efficacy for type of revascularization for the reduction of cardiac complications compared to medical therapy has been controversial. My aim in this review is to summarize the role of preoperative revascularization compared to conservative medical therapy before elective vascular surgery using current evidence from published studies.

(Anesth Analg 2008;106:751-8)
Concluding thoughts:

- Use published guidelines to guide decision making
- Discuss risk with patient and outline potential options
- Most of time the OR will be the answer given ideal medical therapy
- **Documentation of discussion is vital**
- **Tight hemodynamic control is key in high risk cardiac patients**
References: