Perioperative Cardiology
Consultations for Noncardiac Surgery
*Ischemic Heart Disease*

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ECG

CLASS IIb

1. Preoperative resting 12-lead ECG may be reasonable in patients with at least 1 clinical risk factor who are undergoing intermediate-risk operative procedures. (Level of Evidence: B)

CLASS III

1. Preoperative and postoperative resting 12-lead ECGs are not indicated in asymptomatic persons undergoing low-risk surgical procedures. (Level of Evidence: B)
Evaluation of Resting LV function

CLASS IIa
1. It is reasonable for patients with dyspnea of unknown origin to undergo preoperative evaluation of LV function. (Level of Evidence: C)
2. It is reasonable for patients with current or prior HF with worsening dyspnea or other change in clinical status to undergo preoperative evaluation of LV function if not performed within 12 months. (Level of Evidence: C)

CLASS IIb
1. Reassessment of LV function in clinically stable patients with previously documented cardiomyopathy is not well established. (Level of Evidence: C)

CLASS III
1. Routine perioperative evaluation of LV function in patients is not recommended. (Level of Evidence: B)
Case

- M/68
- Asymptomatic
- Osteoarthritis:
  plan to operation
- Medical history:
  - Hypertension; 7yr  DM; 5yr
The goal of the consultation is the optimal care of the patient.

A critical role of the consultant is to determine the stability of the patient’s CV status and whether the patient is in optimal medical condition within the context of the surgical illness.

No test should be performed unless it is likely to influence patients treatment.
Preoperative Cardiac Assessment

• **Stepwise Approach:**
  - Urgency of Surgery
  - Clinical Assessment
  - Surgical Risk
  - Functional Capacity
  - Risk factor

• **Disease Specific Issues**
Active Cardiac Conditions

• Unstable coronary syndromes
  - unstable angina (CCS III/IV)
  - acute (~1 wk)/recent (1 wk-1 mo) MI

• Decompensated HF (NYHA IV, worsening/new-onset HF)

• Significant arrhythmia

• Severe valvular diseases
  - AS (PG>40mmHg, AVA<1.0cm²)
  - symptomatic MS
# Surgery-Related Risk

<table>
<thead>
<tr>
<th>High (&gt;5%)</th>
<th>Aortic and other major vascular surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Peripheral vascular surgery</td>
</tr>
<tr>
<td>Intermediate (1–5%)</td>
<td>Carotid endarterectomy</td>
</tr>
<tr>
<td></td>
<td>Head and neck surgery</td>
</tr>
<tr>
<td></td>
<td>Intraperitoneal and intrathoracic surgery</td>
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<tr>
<td></td>
<td>Orthopedic surgery</td>
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<td></td>
<td>Prostate surgery</td>
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<tr>
<td>Low (&lt;1%)</td>
<td>Endoscopic procedures</td>
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<tr>
<td></td>
<td>Superficial procedures</td>
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<td></td>
<td>Cataract surgery</td>
</tr>
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<td></td>
<td>Breast surgery</td>
</tr>
<tr>
<td></td>
<td>Ambulatory surgery</td>
</tr>
</tbody>
</table>

Cardiac risk = death/nonfatal MI
Stepwise Approach

STEP 1: Need for Emergency Non-cardiac surgery
- Yes (Class I, LOE C)
- No

STEP 2: Active cardiac conditions?
- Yes (Class I, LOE B)
- No

STEP 3: Low risk surgery
- Yes (Class I, LOE B)
- No

Operating Room
- Perioperative surveillance
- Postoperative risk stratification and risk factor management

Evaluate and treat per ACC/AHA guidelines

Proceed with Planned surgery

2007 ACC/AHA Guidelines
Stepwise Approach

Good functional capacity (MET level greater than or equal to 4: Light work around the house) without Sx

Yes (Class IIa, LOE B)

Proceed with Planned surgery

Functional Capacity

Correlates with maximum oxygen uptake on treadmill testing

Demonstrated predictor of future cardiac events

In highly functional asymptomatic pts, management will rarely be changed based on the results of any further cardiovascular testing.
**Stepwise Approach**

**STEP 4**
Good functional capacity (MET level greater than or Equal to 4) without Sx

Yes (Class I, LOE B) → Proceed with Planned surgery

**STEP 5**
No or unknown

Consider testing clinical risk factors

- Ischemic Heart disease
- Compensated or prior HF
- Diabetes mellitus
- Renal insufficiency
- Cerebrovascular disease
Stepwise Approach

3 or more clinical risk factors
- Vascular surgery
  - Consider testing (Class IIa, LOE B) if it will change management

1 or 2 clinical risk factors
- Intermediate risk surgery
  - Consider noninvasive testing (Class IIb, LOE B) if it will change management
## Value of Myocardial Perfusion Imaging for Preoperative Assessment of Cardiac Risk

<table>
<thead>
<tr>
<th>Study, n</th>
<th>Ischemia: Positive predictive value(%)</th>
<th>Normal: Negative predictive value(%)</th>
<th>Events(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boucher et al, 48</td>
<td>19</td>
<td>100</td>
<td>6</td>
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<tr>
<td>Cutler et al. 116</td>
<td>20</td>
<td>100</td>
<td>10</td>
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<tr>
<td>Eagle et al. 200</td>
<td>16</td>
<td>98</td>
<td>8</td>
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<tr>
<td>Baron et al. 457</td>
<td>4</td>
<td>96</td>
<td>5</td>
</tr>
<tr>
<td>Koutelou et al. 106</td>
<td>6</td>
<td>100</td>
<td>3</td>
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<tr>
<td>Van Damme et al. 142</td>
<td>na</td>
<td>na</td>
<td>2</td>
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<tr>
<td>Huang et al. 106</td>
<td>13</td>
<td>100</td>
<td>5</td>
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<tr>
<td>Cohen et al. 153</td>
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<tr>
<td>Harafuji et al. 302</td>
<td>2</td>
<td>100</td>
<td>1.3</td>
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</table>
## Value of Dobutamine Stress Echocardiography for Preoperative Assessment of Cardiac Risk

<table>
<thead>
<tr>
<th>Study, n</th>
<th>Ischemia: Positive predictive value(%)</th>
<th>Normal: Negative predictive value(%)</th>
<th>Events(%)</th>
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<tbody>
<tr>
<td>Lalka et al, 60</td>
<td>23</td>
<td>93</td>
<td>15</td>
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<tr>
<td>Polderman et al. 131</td>
<td>14</td>
<td>100</td>
<td>4</td>
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<tr>
<td>Ballal et al. 233</td>
<td>0</td>
<td>96</td>
<td>3</td>
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<tr>
<td>Bossone et al. 46</td>
<td>25</td>
<td>100</td>
<td>2</td>
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<tr>
<td>Das et al. 530</td>
<td>15</td>
<td>100</td>
<td>6</td>
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<tr>
<td>Boersma et al. 1097</td>
<td>14</td>
<td>98</td>
<td>4</td>
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<tr>
<td>Morgan et al. 78</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>Tores et al. 105</td>
<td>18</td>
<td>98</td>
<td>10</td>
</tr>
<tr>
<td>Labib et al. 429</td>
<td>9</td>
<td>98</td>
<td>2</td>
</tr>
</tbody>
</table>
Utility of Cardiac Testing in Intermediate Risk Patients receiving adequate beta-blocker therapy (DECREASE-II)

Randomly assigned to cardiac testing (n=386) or no testing (n=384)

Cardiac testing can be safely omitted in intermediate-risk pts, provided that beta blockers are prescribed

Poldermans et al. JACC 2006;48:964
• Perioperative cardiac risk appears to be directly proportional to the amount of myocardium at risk as reflected in the extent of reversible defects found on imaging.

• Because of the overall low positive predictive value of stress imaging, it is best used selectively in patients with a high clinical risk of perioperative cardiac events.
Most ambulatory patients

Unable to exercise
Abnormal resting ECG (WPW, LBBB)

Cardiac arrhythmia
Large/sx aortic aneurysm

Dipyridamole/adenosine rMPI

Bronchospastic lung ds
Severe carotid stenosis

Dobutamine Stress Echo

3 CRFs, FC <4 METs and vascular surgery (class IIa/LOE B)
1-2 CRFs, FC <4 METs & intermediate-risk or vascular surgery (IIb/B)

Preoperative Non-invasive Stress Testing
Prophylactic Revascularization
• **Eagle et al**: 3368 patients in the CASS database (*higher-risk surgical procedures*)

  patients who had undergone prior CABG had a lower risk of death (1.7% versus 3.3%, *P* < 0.03) and nonfatal MI (0.8% versus 2.7%, *P* < 0.002) than patients without prior CABG

  most benefit among patients with *multivessel CAD* and those with more severe angina.

• **Rihal and colleagues**: 2000 patients enrolled in the CASS Study

  Compared with coronary bypass surgery in patients with *both CHD and peripheral vascular disease*, surgically treated patients with 3-vessel disease had significantly better long-term survival than those treated medically after adjustment for all covariates, including clinical measures of *disease stability, stress test results, and LV function*
Coronary Artery Revascularization Prophylaxis before Elective Major Vascular Surgery (CARP)

Randomly assigned 510 patients (74% intermediate risk, 80% beta blocker) with significant coronary stenosis among 5859 pts scheduled for vascular operations to either coronary artery revascularization (n=225) or no revascularization (n=237)

59% PCI and 41% CABG

Coronary revascularization before elective vascular surgery among pts with stable cardiac symptoms cannot be recommended.

McFalls et al. NEJM 2004;351:2796
Randomized Trial to Evaluate the Safety of a Noninvasive Approach in pts with >3 risk factors with Extensive Stress Induced Ischemia (DECREASE-V Pilot study)

Prophylactic coronary revascularization in high risk pts with preop extensive stress induced ischemia was not associated with an improved outcome.

Poldermans et al. JACC 2007;49:1763
Indications for Revascularization

Class I (A)

- Significant left main disease
- Multi-vessel CAD with LV dysfunction
  - 3 vessels disease
  - 2 vessels disease with proximal LAD
- Acute coronary syndrome:
  - High-risk unstable angina
  - NSTEMI
  - STEMI
PCI before Anticipated Surgery

Acute MI, high-risk ACS, or high-risk cardiac anatomy

Bleeding risk of surgery

Low

Not low

Stent and continued dual antiplatelet therapy

BMS
COR IIa/C

DES
COR IIa/C

Time of Surgery

14 to 29 days
Balloon angioplasty
COR IIb/LOE C

30 to 365 days
BMS
COR IIa/C

Greater than 365 days
DES
COR IIa/C
Timing of Surgery after PCI

- **Previous PCI**
  - Balloon angioplasty
    - <14 days: Delay for elective or nonurgent surgery
    - >14 days: Proceed to the operation room with aspirin
  - Bare-metal stent
    - >30-45 days: Delay for elective or nonurgent surgery
    - <30-45 days: Proceed to the operation room with aspirin
  - Drug-eluting stent
    - <365 days: Proceed to the operating room with aspirin
    - >365 days: Delay for elective or nonurgent surgery

Time since PCI

<14 days

>14 days

>30-45 days

<30-45 days

<365 days

>365 days
Effects of extended-release metoprolol succinate in patients undergoing non-cardiac surgery (POISE trial)

8,351 patients with, or at risk of, atherosclerotic disease who were undergoing non-cardiac surgery to receive extended-release metoprolol succinate (n=4174) or placebo (n=4177).

Benefits & Risks
- ↓MI, revascularization, Af
- ↑death, stroke, hypotension, bradycardia

Study treatment (extended-release metoprolol 200mg/d) was started 2–4 h before surgery & continued for 30 days.

Lancet 2008;371:1839
Class III: Routine administration of high-fixed dose beta blockers in the absence of dose titration is not useful and may be harmful to patients not currently taking beta blockers who are undergoing noncardiac surgery. (Level of Evidence: B)
## Perioperative β-Blocker Therapy

<table>
<thead>
<tr>
<th>Vascular</th>
<th>No CRFs</th>
<th>≥1 CRFs</th>
<th>CHD or High Cardiac Risk</th>
<th>Taking BB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IIb/B</td>
<td>IIb/B</td>
<td>✓Myocardial ischemia on pre-op testing (IIa/B) ✓CHD on pre-op assessment (IIa/B)</td>
<td>I/B</td>
</tr>
<tr>
<td>Intermediate risk</td>
<td>...</td>
<td>...</td>
<td>IIa/B</td>
<td>I/C</td>
</tr>
<tr>
<td>Low risk</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>I/C</td>
</tr>
</tbody>
</table>

Beta blockers titrated to heart rate and blood pressure
Conclusions (I)

• Extensive testing is rarely needed to determine risk

• Evaluation/testing NOT needed if:
  - low risk surgery
  - good functional capacity & no cardiac sxs
  - no clinical risk factors
Conclusions (II)

Revascularization (CABG/PCI) should be considered only if standard indications are present.

If PCI to be done, delay before non-cardiac surgery should be:
- POBA: 14 days
- BMS: 30-45 days
- DES: > 365 days

Outcomes in high risk patients optimized with:
- β blockers
How to best serve the patients?

Careful teamwork & communication are the key!
경청해주셔서 감사합니다.