Cardiology for the Boards

Leonard S. Lilly, M.D.
Professor of Medicine, Harvard Medical School
Chief, Brigham and Women’s/Faulkner Cardiology

Case Presentation

52 year old malpractice attorney presents to Emergency Department with left-sided chest pain since awakening. Pain is less intense sitting upright.

- No history of angina
- Father sustained MI at age 56
- Had URI 3 weeks ago

An electrocardiogram is obtained immediately...

A. Send directly to cardiac cath lab, if can achieve door-to-balloon time < 90 min
B. Administer fibrinolytic therapy if < 6 hours since onset of pain
C. Administer calcium channel blocker and nitrates
D. Administer aspirin and obtain echocardiogram

Which is most appropriate immediate action?

Management of Idiopathic (post-viral) Acute Pericarditis

<table>
<thead>
<tr>
<th>Pericarditis</th>
<th>Localized</th>
<th>Days-weeks</th>
<th>Diffuse</th>
<th>PR Segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute STEMI</td>
<td>Localized</td>
<td>Hours</td>
<td>Normal</td>
<td></td>
</tr>
</tbody>
</table>

- Aspirin (e.g., 650 mg q 4-6 h)
- NSAIDs (e.g., ibuprofen 400-800 mg q 6-8 h)
- Prednisone 60-80 mg/d (last resort)
- Colchicine (off-label; Class IIb: evidence favors efficacy)

Cardiology Overview for the Boards – Leonard S. Lilly, M.D.

**Cardiac tamponade**
(Pericardial fluid under pressure)
- Impaired diastolic ventricular filling
- Elevated venous pressures
- Jugular venous distension
- Pulmonary congestion
- Elevated venous pressures
- Reduced stroke volume
- Decreased Cardiac output

**Constrictive pericarditis**
(Abnormally rigid Pericardium)

**Cardiac Tamponade**
(Beck’s Triad)
- Jugular venous distention
- Hypotension with pulsus paradoxus
- “Small, quiet heart”

**Sinus tachycardia**
- Low voltage
- Electrical alternans

**Constrictive Pericarditis**
(Mayo Clinic Series; n=135)
- Idiopathic or post-viral 49%
- Prior cardiac surgery 18
- Prior radiation therapy 13
- Connective tissue disorders 7
- Others 13

*Circulation 1998;100:1380-6.*
Constrictive pericarditis             Cardiac tamponade

Pulsus paradoxus    +     +++
Kussmaul sign       +++    -

Which is most appropriate immediate action?
1. Send directly to cardiac cath lab, if can achieve door-to-balloon time < 90 min
2. Administer fibrinolytic therapy if < 6 hours since onset of pain
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STEMI – Initial Management

Invasive Strategy Preferred
- Skilled PCI lab available
- Door-to-balloon time < 90 min
- High risk STEMI (shock, HF)
- Contraindications to lysis
- Late presentation (>3 hrs)
- Diagnosis of STEMI is in doubt

Fibrinolysis Acceptable
- Early presentation (≤3 hrs)
- Skilled PCI lab not available
- Delay to invasive strategy
  - Door-to-balloon >90 mins
  - More than 1 hr added delay for PCI vs. immediate lysis

Antman EM et al. J Am Coll Cardiol 2004; 44:E1-E211

Cardiovascular Examination

56 year old man from New York comes for general evaluation; known to have abnormal ECG

Which of the following is likely present on exam?
- a) Widened splitting of S2
- b) Fixed splitting of S2
- c) Paradoxical splitting of S2
- d) He’s likely a Yankees fan -- I refuse to answer the question
### Effect of Maneuvers on Systolic Murmurs

<table>
<thead>
<tr>
<th>Maneuvers</th>
<th>Aortic Stenosis</th>
<th>Mitral Regurgitation</th>
<th>Hypertrophic Cardiomyopathy</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓ Filling</td>
<td>↓</td>
<td>↓</td>
<td>↑</td>
</tr>
<tr>
<td>↑ Filling</td>
<td>↑</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>↑ Afterload</td>
<td>↓</td>
<td>↑</td>
<td>↓</td>
</tr>
</tbody>
</table>

### Endocarditis Prophylaxis

Antibiotic prophylaxis in endocarditis

*American Heart Association 2007 Guideline*

"Recommended only for patients with underlying cardiac conditions associated with the highest risk of adverse outcome"

1. Prosthetic heart valve or valve repair with prosthetic material
2. Prior occurrence of endocarditis
3. Certain congenital heart diseases:
   - Unrepaired cyanotic lesions (e.g., Tetralogy of Fallot)
   - Prior repair with residual defects adjacent to prosthetic material
   - Complete repair with prosthetic material, for first 6 months only
4. Valve abnormality after heart transplant

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36 y.o. woman is scheduled for a tooth extraction. She has a history of a heart murmur and her dentist calls to determine if premedication is needed. For which one of the following conditions is antibiotic prophylaxis recommended?

A. Atrial septal defect with surgical repair 8 years ago
B. Hypertrophic cardiomyopathy with outflow tract obstruction
C. Bicuspid aortic valve with severe aortic regurgitation
D. History of MVP, s/p mitral valve repair (annuloplasty ring) 5 years ago, with no residual regurgitation
Antibiotic Prophylaxis in Endocarditis
American Heart Association 2007 Guideline

- Recommended for invasive dental procedures (manipulation of gingival tissue, periapical region of teeth, or perforation of oral mucosa)
- Not recommended for upper respiratory tract procedures, unless involves incision or biopsy of mucosa (e.g., tonsillectomy, bronchoscopy with biopsy)
- Not recommended for GU or GI procedures in absence of infection

Standard regimen: Amoxicillin 2 g 30-60 min prior
- If allergy: Clindamycin, azithromycin, clarithromycin, cephalexin
- If parenteral required: Ampicillin, cefazolin, ceftriaxone, clindamycin

Statins and Muscle Injury

A 62 year old woman with a history of hypertension, diabetes, and dyslipidemia takes simvastatin 40 mg daily. Most recent lipid profile reports LDL = 82, HDL = 40, Triglycerides 155.

Which one of the following medications would not increase the risk of muscle toxicity if added to her regimen?
A. Diltiazem
B. Amiodarone
C. Azithromycin
D. Gemfibrozil
E. Ketoconazole

Statin Muscle Side Effects

<table>
<thead>
<tr>
<th>CK</th>
<th>Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myalgia</td>
<td>Normal</td>
</tr>
<tr>
<td>Myositis</td>
<td>Elevated</td>
</tr>
<tr>
<td>Rhabdomyolysis</td>
<td>&gt;10-40 x ULN</td>
</tr>
</tbody>
</table>

Related to:
- Specific drug (metabolism, hydrophilicity)
- Dose of drug
- Concurrent medications

Statin Characteristics

<table>
<thead>
<tr>
<th>Metabolism</th>
<th>Most Hydrophilic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atorvastatin</td>
<td>CYP3A4</td>
</tr>
<tr>
<td>Lovastatin</td>
<td>CYP3A4</td>
</tr>
<tr>
<td>Simvastatin</td>
<td>CYP3A4</td>
</tr>
<tr>
<td>Fluvastatin</td>
<td>CYP2C9</td>
</tr>
<tr>
<td>Rosuvastatin</td>
<td>CYP2C9 +</td>
</tr>
<tr>
<td>Pravastatin</td>
<td>Neither +</td>
</tr>
</tbody>
</table>

Increased Risk of Myopathy

- Potent inhibitors of CYP3A4:
  - cyclosporine
  - ketoconazole
  - erythromycin
  - protease inhibitors
  - clarithromycin
  - grapefruit juice
- Moderate inhibitors of CYP3A4:
  - amiodarone
  - verapamil
  - diltiazem
- Gemfibrozil
2011 FDA Label Update: Simvastatin

- Restrict 80 mg dose to those who have taken > 1 year without toxicity
- **Do not use** in combo with: Ketoconazole, erythromycin, clarithromycin, HIV protease inhibitors, cyclosporine, gemfibrozil
- Do not exceed simva 10 mg daily with: verapamil, diltiazem, amiodarone
- Do not exceed simva 20 mg daily with: amlodipine

Largely based on SEARCH Trial (Am J Cardiol 2007; 100:815).

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**Imaging Example**

A 62 year old man sustained an anterior ST-elevation MI 3 weeks ago. He has been subsequently asymptomatic and presents for an exercise-echo study prior to entry into a cardiac rehab program.

Baseline echo images were obtained...

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**Which of the following would be appropriate?**

1. Proceed with the exercise test
2. Call cardiac surgeon
3. Initiate anticoagulation
4. Obtain cardiac MR study

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**LV Thrombus After MI**

- The major source of embolic CVA after STEMI
- Incidence in reperfusion era: 4-17%¹
- Most common after anterior STEMI with apical akinesis or aneurysm
- Majority develop within 2 weeks (mean 5-6 days) post-MI²
- No randomized trials of anticoagulation to prevent embolization; ACC/AHA Guidelines recommend warfarin (≥3 months) for established thrombus, and consider for prevention in post-MI patients with extensive wall motion abnormality (class Ila)

¹ Am J Cardiol 2004;93:1529.
Bonus Question

56 year old man presents with exertional dyspnea, marked jugular venous distention and peripheral edema. No pulsus paradoxus.

Has history of Hodgkin’s Disease 18 years earlier, treated with chemotherapy and thoracic radiation therapy.

As part of evaluation, right-sided heart catheterization was performed:

<table>
<thead>
<tr>
<th>Chamber</th>
<th>Pressure (mm Hg)</th>
<th>Normal (mm Hg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right atrium (mean)</td>
<td>16</td>
<td>≤ 8</td>
</tr>
<tr>
<td>Right ventricle</td>
<td>30/17</td>
<td>≤ 30/8</td>
</tr>
<tr>
<td>Pulmonary wedge (mean)</td>
<td>16</td>
<td>≤ 10</td>
</tr>
</tbody>
</table>

Which of the following is true?

A. Pericardiocentesis should be performed urgently
B. Therapy should include diuretic, ACE inhibitor and beta-blocker
C. CT scan would be more helpful than echocardiography in confirming diagnosis
D. Sinus bradycardia is likely present