Management of the Patient With Chest Pain

SPEAKER

Jon A. Kobashigawa, MD

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Management of Chest Pain

Jon A. Kobashigawa, M.D.

DSL/Thomas D. Gordon Professor of Medicine
Associate Director, Cedars-Sinai Heart Institute
Director, Advanced Heart Disease Section
Director, Heart Transplant Program
Cedars-Sinai Medical Center, Los Angeles, California

Chest Pain

• 5 Million emergency department visits
• 2 million hospitalizations annually with cost of more than $8 billion
• Cardiac etiology found in less than one third
• 2% of patients with acute MI are unrecognized and discharged from the ED

Differential Diagnosis for Patients with Chest Pain†

<table>
<thead>
<tr>
<th>Cardiovascular</th>
<th>Pulmonary</th>
<th>Gastrointestinal</th>
<th>Chest Wall</th>
<th>Psychiatric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary stenosis</td>
<td>Pulmonary embolus</td>
<td>Esophageal varices</td>
<td>Costochondritis</td>
<td>Anxiety disorders</td>
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<tr>
<td>Coronary spasm</td>
<td>Pneumothorax</td>
<td>Esophageal spasm</td>
<td>Rib fracture</td>
<td>Hypertension</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>Pneumonia</td>
<td>Esophageal ulcer</td>
<td>Heart arrest</td>
<td>Panic disorder</td>
</tr>
<tr>
<td>Aortic dissection</td>
<td>Pericarditis</td>
<td>Gastroenteritis</td>
<td>Heart arrest (before the rash)</td>
<td>Primary anxiety</td>
</tr>
</tbody>
</table>

Emergent Causes of Chest Pain

• Acute coronary syndrome
• Aortic dissection
• Acute pericarditis
• Pulmonary embolism
• Tension Pneumothorax
• Pneumonia
• Esophageal perforation

Case Study #1

A 63 year old male comes to the emergency room after awakening at 6 AM with severe chest pain and shortness of breath.

Immediate Goals

- Cardiac or not?
- If cardiac, how to manage?

The ECG in the Diagnosis of Chest Pain

- ECG should be obtained within 10 minutes of presentation for patients with chest pain in the Emergency Department.
- High risk findings:
  - Dynamic ST-segment changes ≥ 0.5 mm which develop with rest angina
  - Deep precordial T-wave inversion ≥ 2 mm
- A normal ECG does not exclude the possibility of acute coronary syndrome.

Value of history

- Diagnosis (>50%)
- Cardiac risk factors
- Further information placed in context
- Guide to management

Risk Stratification for Chest Pain History and the Acute Coronary Syndrome

**Low Risk**: Pain that is pleuritic, positional, or reproducible with palpation or is described as stabbing.

**Probable Low Risk**: Pain not related to exertion or that occurs in a small infra-mammary area of the chest wall

**Probable High Risk**: Pain described as pressure, is similar to that of prior myocardial infarction or worse than prior anginal pain, or is accompanied by nausea, vomiting or diaphoresis

**High risk**: Pain that radiates to one or both shoulders or arms or is related to exertion

What are risk factors you would ask about for cardiac etiologies for chest pain?

- Past History of Coronary heart disease
- Family history
- Diabetes
- Hypertension
- Hyperlipidemia
- Smoking
- Male gender
- Cocaine use

Any exam findings that might help distinguish cardiac from non cardiac chest pain?

- General Appearance
  - may suggest seriousness of symptoms.
- Vital signs
  - marked difference in blood pressure between arms suggests aortic dissection
- Palpate the chest wall
  - Hyperesthesia may be due to herpes zoster
- Complete cardiac examination
  - pericardial rub
  - signs of acute AI or AS
  - Ischemia may result in murmur, S4 or S3
- Determine if breath sounds are symmetric and if wheezes, crackles or evidence of consolidation

Workup for Cardiac Chest Pain in the ED?

- Resting ECG
- Chest X-Ray
- Blood tests: Troponin, CK-MB

Any blood tests that might help to detect myocardial injury in the ED?

- CK-MB
  - CK-MB 88-90% sensitive at 4-6 hours
  - CK-MB 95-100% sensitive 8-12 hours after onset of myocardial necrosis
- Troponin
  - Ultrasensitive troponins now available
  - Troponin I >0.04 ng/mL, performed on admission has 90.7% sensitivity and 90.2% specificity for onset of myocardial necrosis

What does troponin tell us?

<table>
<thead>
<tr>
<th>Time</th>
<th>Injury</th>
<th>Thrombosis</th>
<th>Occlusion</th>
<th>Rupture</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(+) Troponin</td>
<td>Embolization</td>
<td>Reperfusion</td>
<td>Instability</td>
</tr>
<tr>
<td>Injury at some point in time</td>
<td></td>
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</table>

Labs return for this patient

- CK-MB = 15.1 (abnormal >5.5)
- Troponin I = 27 (abnormal >0.2 ng/ml)

What is the Acute Coronary Syndrome (ACS)?
ACUTE CORONARY SYNDROMES

- Spectrum of urgent presentation of coronary heart disease involving myocardial ischaemia or infarction
- Unstable angina (deteriorating frequency/duration, rest pain)
- Preinfarction angina (>10 min duration; ECG changes)
- Myocardial infarction (severity, duration, associated features) ST/non-ST elevation

ACS Physiology

Therapy in ST elevation ACS

- Pain relief (nitrates)/oxygenation
- Arrhythmic/hemodynamic standby
- Reperfusion ASAP (aspirin, thrombolysis, primary PCI [IIb/IIIa], [clopidogrel/prasugrel/ticagrelor], antithrombotics)
- Cardioprotection (beta-blockers, statins, ACEI)

Therapy in non-ST elevation ACS

- Pain relief (nitrates)
- Antiplatelet agents (aspirin, clopidogrel, IIb/IIIa antagonists e.g. tirofiban)
- Antithrombotic agents (heparin)
- Cardioprotection (beta-blockers or CCBs, ACEIs, statins)
- Risk stratification and consider revascularization

Intervention in ACS:
Primary Endpoint of TACTICS Study
- Death, MI, Rehosp for ACS at 6 Months

Case Study #2

A 57 year old male comes to clinic complaining of substernal chest pain that comes on with exertion and goes away with rest.
What tests could help determine if this man truly does have coronary artery disease causing his symptoms?

Indications for Nuclear Myocardial Perfusion Imaging
- Asymptomatic patients with high risk of CHD
- Patients with left bundle branch block on ECG
- Symptomatic patients with intermediate to high risk of CHD or who are incapable of maximal exercise
- Risk assessment in those with known CAD
- Risk stratification prior to vascular surgery


Is there a role for the newer imaging modalities such as the coronary calcification scan and the 64-slice computer tomography scan?

Coronary Artery Calcification Scoring by Computerized Tomography
- Indications for Coronary CT Scanning:
  - Asymptomatic patients with intermediate CHD risk (between 10-20% 10-year risk of estimated coronary events)
  - Patients at low risk of CHD with atypical cardiac symptoms to rule out obstructive CHD

ACC/AHA 2010 appropriate use guidelines J Am Coll Cardiol. 2010;56(22):1864-94

Multi-Slice Computerized Tomography
- Clinical advantages in the diagnosis of coronary anomalies and occluded bypass grafts.
- Low risk CHD patients with atypical chest pain
- High procedural risk for invasive angiography
- Equivocal stress test or thallium scan

Gaspar, Coron Artery Dis 2006;17:107-113

Limitations of Multi-Slice Computerized Tomography
- Increased radiation exposure compared to coronary angiography
- Accuracy for coronary stenoses impaired by associated calcification artifact
- Non-assessable bypass grafts remains a problem

Are there special considerations for women with chest pain?

Small Vessel CHD or Vascular Dysfunction

- Women with chest pain and normal coronary angiograms may have exaggerated pain perception which may be due to small vessel CHD
- Abnormal response to acetylcholine testing (vasoconstriction) detects coronary endothelial dysfunction which is a sign of early atherosclerosis.
- Perfusion imaging studies may reveal vascular dysfunction measured by reduced coronary blood flow reserve in the absence of obstructive flow limiting coronary stenoses.

Noninvasive Tests to Detect CHD in Women

- Low to Intermediate risk: ETT or Stress Echo
- Alternatively, EBCT scan with calcium score of 0 can rule out obstructive CHD
- Stress echo or exercise radionuclide study are preferred for women with abnormal baseline ECG

Case Study #3

- A 63 year old male comes in to the ED with sudden onset of “tearing chest pain” that radiates to his back.
  - What is your differential?
  - What exam findings might you look for?
  - What tests could you do and why?
  - What are the treatments for the most likely diagnoses?

What exam findings might you look for?

- Acute MI
- Hypotension in one extremity
- Aortic murmur
- Neurologic deficits, including paraplegia, stroke, or decreased consciousness
- Syncope, tamponade, and sudden death due to rupture of the aorta into the pericardial space
- Acute lower extremity ischemia

Clinical Findings in Aortic Dissection

- 96 percent of acute aortic dissections can be identified based upon some combination of the following three clinical features:
  - Immediate onset of aortic pain with a tearing and/or ripping character
  - Mediastinal and/or aortic widening on CXR
  - Variation in pulse and/or blood pressure between the right and left arm
What tests could you do and why?

- CXR: sensitivity 63%
- Chest CT: sensitivity 94%, specificity 87%
- Chest MRI: sensitivity 98%, specificity 85%
- Aortogram: sensitivity 88%, specificity 94%
- Transesophageal echocardiography

This patient is diagnosed with a dissecting aortic aneurysm and was taken to emergency aortic repair surgery.

Case Study #4

- A 47 year old female presents with 1 day history of severe chest pain which is worse when lying down and relieved when sitting up.
  - What is your prioritized differential?
  - What questions would help your differential?
  - What would you look for on physical exam?
  - What test would help confirm your diagnosis?

Pericarditis

- Usually described as sharp, retrosternal and aggravated by lying flat and improved by sitting up
- Exam may reveal a pericardial friction rub or knock
- The ECG usually reveals ST-segment elevation (absence of Q-waves and T-wave inversions help distinguish this from the ACS)

Case Study #5

- A 30 year old female presents with 3 hour history of sudden onset severe central chest pain which is worse upon breathing in.
  - What is your prioritized differential?
  - What questions would help your differential?
  - What would you look for on physical exam?
  - What test would help confirm your diagnosis?

Pulmonary embolism

- Usually described as sudden onset pleuritic chest pain with dypnsnea/tachypnea, with possible hemoptysis. Patient may have undergone recent travel or be on medications that thicken blood.
- Exam may reveal a pleural friction rub, left parasternal heave, raised JVP- however, is often normal.
- ECG may show signs of right heart strain/acute cor pulmonale— typically large S wave in lead I, a large Q wave in lead III, and an inverted T wave in lead III (S1Q3T3).
- D-dimer is often raised
- CTPA or ventilation/perfusion scan to confirm diagnosis
- Treated empirically
Summary Goals in Patients Who Present with Chest Pain

- Rapid recognition of management of true ACS
- Recognition of other life-threatening causes of chest pain
  - Aortic dissection
  - Pulmonary embolism
  - Tension pneumothorax
- Minimize cost and hospitalization in patients with chest pain of benign etiology.