Patients with Acute MI: Diagnostic Pearls and Pitfalls

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I. Background
AMIs inappropriately sent home
- Younger
- Less typical symptoms
- Less likely to have a history of prior CAD
- Less likely to have obvious ECG evidence of ischemia or infarction
- Mortality 25-35% (mortality 10-12% when admitted)
- Common pitfalls
  - Failure to recognize atypical presentations
  - Failure to consider cardiac risk factors and high-risk groups
  - Over-reliance on “negative” tests — as the number of tests performed increase, so does the number of false negatives
    - Cardiac enzymes
    - Stress tests
    - Angiography

II. Atypical Presentations
What the literature says about the AMI patient:
- Onset
  - Sudden onset in up to 70%
- Location
  - Upper abdominal pain in up to 20%
  - Other common sites — left arm, anterior neck/jaw, upper back
  - Case reports — posterior neck, right arm, hip, low back, headache, left ear
- Duration
  - Few minutes to few hours
  - Momentary — unlikely
  - Constant for days — unlikely
    - Beware intermittent pain (UA)
- Character
  - Crushing/pressure — 24% AMI, 30% UA
  - Mild ache — 13% AMI, 15% UA
• Sharp stabbing — 20% AMI, 17% UA
• Burning/indigestion — 20% AMI, 21% UA

Alleviating factors
• Some relief with antacids — 15%
• Complete relief with antacids — 7%

Aggravating factors
• Pleuritic or positional — 16%
• Reproducible with palpation
  • Somewhat — 15%
  • Completely — 7%

Activity at onset
• Heavy physical activity — 6%
• Mild-to-moderate physical activity — 29%
• Emotional stress — 7%
• Eating — 8%

Associated symptoms
• Nausea — 60%
• Vomiting — 39%
• Dyspnea — 60%
• Diaphoresis — 80%
  • May be the most specific symptom as well
• Belching — 47%

Radiation
• Occurs in 67%
• Left arm — 55% sensitivity, 76% specificity
• Right arm — 41% sensitivity, 94% specificity

Painless AMIs
• 18-33% overall
• Especially common in elderly and diabetic patients
• Dyspnea — the most common anginal equivalent

III. Cardiac Risk Factors
Gender
• Men are at greater risk of AMI
• Women are at greater risk of misdiagnosis
  • Especially true for young women with AMI
• 20% have no chest pain
• Isolated arm pain very common
• Often present with epigastric pain, nausea/vomiting, dyspnea, diaphoresis
• Present with neck or back pain more frequently than men
• Pain radiates to right side more frequently than men
• ECG issues
• Women (especially young women) with chest pain are less likely to undergo ECG evaluation
• ECG abnormalities tend to be more subtle than in men
• Women are more likely to have false-negative stress tests
  • Women present at an older age (69yo. vs. 60yo.)
  • Women more often are diabetic (53% vs. 23%)

Age
• Young patients
  • 123,000 AMIs per year in patients 29-44yo.
  • 5-10% of AMIs occur in patients < 45yo.
  • Minority are related to cocaine use
  • Autopsy studies from Korean/Vietnam wars demonstrated CAD in young patients
  • Autopsy study of 111 patients (< 35yo., avg. age 26yo.)
  • Victims of non-cardiac trauma
  • Evidence of atherosclerosis in 78%
  • 20% had LAD or “significant” 2- and 3-vessel involvement
  • 21% had > 50% lumenal narrowing
  • 9% had > 75% lumenal narrowing
• Elderly patients
  • Painless AMI in the elderly
    • 40% of patients > 65yo.
    • 60-70% of patients > 85yo.
  • Anginal equivalents in elderly patients
    • 30-40% present with dyspnea
    • 5-20% present with confusion/lethargy
    • 5-10% present with emesis/diaphoresis
    • 5-9% present with acute CVA
    • 3-8% present with acute weakness
    • 3-5% present with syncope
    • other symptoms — dizziness, palpitations, flu-like symptoms, loss of appetite, paresthesias, falls, hypotension, bradycardia, acute functional decline, sudden inability to walk

Diabetes
• “Medically unattended” AMI occurs three times more often (up to 40%)
• Atypical presentations (dyspnea, confusion, emesis, fatigue) in 40%
• Fazel, et al (Heart, 2005)
  • DM = CAD is now considered standard of care (“atherosclerotic disease equivalent”)
  • DM + ACS + negative cardiac enzymes = same risk of adverse events as non-DM + ACS + positive cardiac enzymes
Cocaine use — another independent risk factor
- Acute use associated with:
  - Coronary vasospasm/vasoconstriction
  - Platelet aggregation
  - Adrenergic stimulation causing dysrhythmias and ischemia
- Chronic use associated with:
  - Direct myocyte toxicity leading to cardiomyopathy
  - Accelerated atherosclerosis
  - Seven-fold increase in risk of AMI (Qureshi, *Circulation*, 2001)

Lupus — a significant but underappreciated risk factor
- Multiple studies in the literature documenting accelerated atherosclerosis
  - Nine-fold increase in risk of CAD in young patients (D’Agate, *J Invasive Cardiol*, 2003)
- Increased risk is unrelated to presence of other risk factors
- Increased risk is unrelated to steroid use

Human immunodeficiency virus infection — another independent risk factor
- ACS develops more than 10 years earlier than in non-HIV controls
- Higher re-stenosis rates occur after PCI
  - Protease inhibitors are associated with adverse metabolic effects
    - Insulin resistance
    - Elevations in triglyceride levels
    - Elevations in LDL levels

Chronic renal disease — yet another independent risk factor
- Increased risk of ACS due to
  - Concomitant conventional risk factors, including increased prevalence of…
    - Hypertension
    - Diabetes
    - Tobacco use
    - Family history of premature CAD
  - Chronic renal disease-induced risk factors
    - Metabolic factors
      - Dyslipidemias (HDL, LDL, TG levels all worse)
      - Elevated homocysteine levels
      - Elevated lipoprotein (a) levels
      - Elevated transforming growth factor-B1 levels
    - Other atherogenesis factors
      - Oxidative stress
      - Increased coronary calcification
**IV. Provocative and Invasive Testing**

How reliable is a recent “negative” stress test or angiogram? (“negative” or “normal” is not always normal)

- Good sensitivity for detecting “significant” (> 70% lumenal obstruction) lesions
  - Stress testing approximately 85-90% sensitive (not perfect!)
- Plaque composition is more important than plaque size
  - Smaller plaques may be more “unstable,” prone to rupture
    - Smaller plaques often associated with “negative” stress tests
- Angiography studies indicate that the infarct-related artery (IRA) is usually not critically stenosed
  - **IRA usually is < 50% obstructed before it ruptures!**
    - Often associated with negative stress testing prior to infarction
    - Severely limits the reliability of a recent “negative” stress test or angiogram
- Other causes for false negative angiograms
  - Intravascular ultrasound studies
  - Coronary artery remodeling produces “outward bulging” of the vessel walls
    - Significant plaques can be present despite an apparently “patent” lumen on angiography
  - Result — false negative angiogram
  - Angiography often fails to detect evidence of recent plaque rupture

**V. Summary**

- Always recognize the possibility of an atypical presentation.
  - Chest pain is not always present.
  - Beware the “GI presentation.”
  - Diaphoresis is bad!
- Pay attention to cardiac risk factors.
  - Don’t discount the risk in young patients.
  - Women, elderly and diabetics present atypically.
  - Cocaine use, lupus, HIV, and chronic renal disease deserve special concern.
- Don’t discount the risk just because of a recent “negative” stress test or angiogram.
- Documentation is key!
  - Use the best possible decision-making and medical care to protect the patient.
  - Use the best possible documentation to protect yourself.
  - The decision-making process and final disposition (especially for discharged patients) should be reflected in your documentation; be consistent!
- Remember Rules 1 and 2
  - Never say “It’s not your heart!” (you will sometimes be wrong)
  - Do what’s best for the patient (not what’s best for your consultant)
- Don’t forget about deadly non-ACS causes of chest pain!
VI. Recommended reading if you enjoy learning from “pitfalls”

VII. References: email me for full set of references
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