Acute Coronary Syndrome Update

Melanie Blair, MSN, ARNP-C
Disclosures

• None
Objectives

• Recognize high risk Acute Coronary Syndrome (ACS) presentation focusing on NSTE-MI (Non ST Elevation Myocardial Infarction)
• Discuss initial management of ACS
• Review medical management of ACS
• Determine the need for an early invasive vs. ischemia guided strategy based on risk stratification
• Discuss quality measures associated with ACS
Background

- Heart Disease is the leading cause of death in the United States for both men and women, accounting for 1 in every 4 deaths.

- The most common type of heart disease, coronary heart disease (CHD), kills more than 370,000 people annually.

- Approximately 735,000 Americans have a myocardial infarction each year. Of these, 525,000 are a first heart attack and 210,000 are subsequent heart attacks.

- The annual cost of heart disease in the US is about $207 billion annually.

CDC, 2016
The Spectrum of ACS

- Unstable Angina (UA)
- Non-ST Segment Elevation MI (NSTE-MI)
- ST Segment Elevation MI (STEMI)
Unstable Angina: Ischemic symptoms without positive troponin
NSTE-MI: Ischemic symptoms with positive troponin
STEMI:
Ischemic symptoms, positive troponin and ST elevation in two contiguous leads based on the following diagnostic thresholds: $\geq 0.1 \text{ mV (1 mm)}$ in all leads other than V2 and V3, where the following diagnostic thresholds apply: $\geq 0.2 \text{ mV (2 mm)}$ in men $\geq 40$ years, $\geq 0.25 \text{ mV (2.5 mm)}$ in men $<40$ years, or $\geq 0.15 \text{ mV (1.5 mm)}$ in women.

Third Universal Definition of MI

MI is classified into five major types, based primarily on clinical and pathological differences.

• Type 1: spontaneous MI related to atherosclerotic plaque disruption

• Type 2: a condition other than coronary artery disease contributes to an imbalance between myocardial oxygen supply and demand

• Type 3: cardiac death with antecedent symptoms and electrocardiographic changes, but without available biomarker data

• Type 4a: related to percutaneous coronary intervention

• Type 4b: related to stent thrombosis

• Type 5: associated with coronary artery bypass grafting

Third Universal Diagnostic Criteria for NSTE-MI

Detection of a rise and/or fall of troponin with at least one value above the 99th percentile upper reference limit [URL]) and with at least one of the following:

• Symptoms of ischemia

• New or presumed new significant ST-segment-T wave (ST-T) changes or new left bundle branch block (LBBB)

• Identification of an intracoronary thrombus by angiography or autopsy

• Imaging evidence of new loss of viable myocardium or a new regional wall motion abnormality

Elevated Troponin ≠ MI

Pathogenesis

• Myocardial ischemia secondary to oxygen consumption supply and demand mismatch.
• Typically caused by coronary obstruction
• Other conditions to consider:
  • Vasospasm
  • Myocarditis
  • Takotsubo cardiomyopathy
  • Sepsis
  • Severe heart failure
Coronary Obstruction
Chest Pain Differential Diagnosis (other than CHD)

- Aortic Dissection
- Pulmonary Embolus
- Pericarditis
- Tamponade
- GI
- Musculoskeletal
- Psychiatric
- Herpes Zoster
- Pneumonia
- Pleuritic
- Pericarditis
76 y/o male with resting CP on his way home from picking up a pizza

- Substernal chest pressure off and on for 3 weeks, worse with exertion, better with rest
- Sharp midscapular pain
- Vomiting x 1
- Denies SOB, palpitations, diaphoresis

PMH
- Prediabetes
- BPH

FH: negative for CAD

SH: quit smoking in 1973 with a 20 pack year history. No alcohol, retired, married

VS T 37.4, P 62, R 16, BP 210/116
What next? Everything except:

A. EKG
B. ASA
C. Anticoagulate
D. Nitrate
What next? Everything except:

A. EKG
B. ASA
C. Anticoagulate
D. Nitrate

Sharp midscapular pain was noted, rule out aortic dissection prior to anticoagulation
76 y/o male with resting CP on his way home from picking up a pizza

- ED: ASA 324 mg po, NTG 0.4 mg SL x 1, EKG, labs, CXR, CTA to rule out dissection
  - TnT 0.02 (0.01 – 0.10 ng/ml)
  - CTA negative for dissection
- BP remains elevated, NTG infusion started and upwardly titrated for BP and CP
Serial EKGs - presentation
What next?

A. Anticoagulate
B. P2Y$_{12}$ inhibitor
C. Metoprolol 5 mg IV
D. Titrate nitroglycerin for CP
E. A, B, D
What next?

A. Anticoagulate
B. P2Y$_{12}$ inhibitor
C. Metoprolol 5 mg IV
D. Titrate nitroglycerin for CP
E. A, B, D

Administration of intravenous beta blockers is potentially harmful in patients with NSTE-ACS who are at risk for cardiogenic shock
Serial EKGs
2 hours later with recurrent CP
Cath Results

Drug eluting stent to the proximal LAD
Initial management of ACS

• Diagnosis/Investigations
• Medications
• Risk stratification
• Intervention
Diagnostics

- EKG within 10 minutes of arrival (may repeat every 15 minutes based on presentation)
- Troponin (I or T) at 0-3-6 hours
- CK-MB and myoglobin are not useful for diagnosis of ACS (COR III)
- CXR
- Serial EKGs at 3 and 6 hours
- Renal profile, CBC, PT/INR/PTT
History and Physical

- HPI
  - typical vs. atypical symptoms
  - prior history
  - risk factors

- Physical
  - VS – hypo or hypertensive
  - tachycardia, bradycardia
  - arrhythmia
  - tachypnea
  - rales
  - edema
  - new murmur
## Medical Therapy

<table>
<thead>
<tr>
<th>Antiplatelet P2Y$_{12}$ inhibitors</th>
<th>Dose</th>
<th>COR LOE</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASA</td>
<td>162-324mg load 81 mg (75-100mg) daily indefinitely</td>
<td>I A</td>
<td>Consider clopidogrel if ASA allergic Max dose with ticagrelor 81 mg daily</td>
</tr>
<tr>
<td>clopidogrel</td>
<td>300-600 mg load 75 mg daily for 12 months</td>
<td>I B</td>
<td>Withhold 5 days prior to CABG</td>
</tr>
<tr>
<td>ticagrelor</td>
<td>180 mg load 90 mg BID for 12 months</td>
<td>I B</td>
<td>Withhold 5 days prior to CABG</td>
</tr>
<tr>
<td>prasugrel</td>
<td>60 mg load 10 mg daily for 12 months</td>
<td>n/a</td>
<td>NOT recommended for first line therapy, only for planned PCI (ACCOAST, TRITON TRILOGY ACS) Contraindicated with prior TIA/CVA, age &gt;75 or weight &lt;60 kg Withhold 7 days prior to CABG</td>
</tr>
</tbody>
</table>
## Medical Therapy

<table>
<thead>
<tr>
<th>GP IIb/IIIa inhibitors</th>
<th>Dose</th>
<th>COR LOE</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>tirofiban</td>
<td>25 mcg/kg IV x 1, then 0.15 mcg/kg/min for up to 18 hours</td>
<td>IIb B</td>
<td>Early invasive strategy with high risk features Renal dosing for CrCl&lt;60</td>
</tr>
<tr>
<td>eptifibatide</td>
<td>180 mcg/kg x 1, up to 22.6 mg, then 15 mg/hr for up to 72 hours (usually 12-18 hours post procedure)</td>
<td>IIb B</td>
<td>Currently in shortage Early invasive strategy with high risk features Renal dosing for CrCl&lt;50</td>
</tr>
</tbody>
</table>
### Medical Therapy

<table>
<thead>
<tr>
<th>Anticoagulant</th>
<th>Dose</th>
<th>COR LOE</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>unfractionated heparin (UFH)</td>
<td>60 IU/kg bolus 12 IU/kg/hr adjusted to aPTT for 48 hours or until PCI</td>
<td>I B</td>
<td></td>
</tr>
<tr>
<td>enoxaparin</td>
<td>1 mg/kg SC q 12 hr until PCI</td>
<td>I A</td>
<td>Renal dosing for CrCl &lt; 30 mL/min</td>
</tr>
<tr>
<td>bilvalirudin</td>
<td>0.10 mg/kg load 0.25 mg/kg/hr until LHC/PCI</td>
<td>I B</td>
<td>For early invasive strategy only</td>
</tr>
<tr>
<td>fondaparinux</td>
<td>2.5 mg SC daily</td>
<td>I B</td>
<td>Must use additional anticoagulant with anti-IIa activity (UFH or bivalirudin) if PCI is performed to avoid catheter thrombosis</td>
</tr>
</tbody>
</table>
## Medical Therapy

<table>
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<tr>
<th>Nitroglycerin</th>
<th>Dose</th>
<th>COR LOE</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL</td>
<td>0.3 – 0.4 mg q 5 minutes x 3</td>
<td>I C</td>
<td>Avoid with recent (24-48 hours) use of phosphodiesterase inhibitor, RV infarct, hypotension</td>
</tr>
<tr>
<td>IV</td>
<td>5 mcg/min, titrate</td>
<td>I B</td>
<td>For persistent ischemia, HF or HTN</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analgesic</th>
<th>COR LOE</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>morphine</td>
<td>IIb B</td>
<td>For continued ischemic chest pain despite treatment with maximum tolerated anti-ischemic medications</td>
</tr>
</tbody>
</table>
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<tr>
<th>Dose</th>
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<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>oxygen</td>
<td>To keep SPO2 &gt;90</td>
<td>I C for SPO2&lt; 90, respiratory distress or other high risk features of hypoxemia Not for routine use-may cause increased coronary vascular resistance, reduced coronary blood flow, and increased risk of mortality</td>
</tr>
</tbody>
</table>
# Medical Therapy

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<tr>
<th>Antianginal</th>
<th>COR LOE</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beta Blocker</strong></td>
<td>I A</td>
<td>Initiate within 24 hours unless evidence of HF, conduction abnormalities or risk of cardiogenic shock Avoid IV BB (III)</td>
</tr>
<tr>
<td>metoprolol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>carvedilol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bisoprolol</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Nondihydropyridine Calcium Channel Blocker</strong></td>
<td>I B</td>
<td>Patients with continued/recurrent ischemia or with contraindication to BB. Avoid with EF &lt;40%</td>
</tr>
<tr>
<td>diltiazem</td>
<td></td>
<td></td>
</tr>
<tr>
<td>verapamil</td>
<td></td>
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</tbody>
</table>
## Medical Therapy

<table>
<thead>
<tr>
<th>RAAS Inhibitors</th>
<th>COR</th>
<th>LOE</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE inhibitor</td>
<td>I A</td>
<td></td>
<td>For LVEF &lt; 0.40, HTN, DM, stable CKD</td>
</tr>
<tr>
<td>ARB</td>
<td>I A</td>
<td></td>
<td>For ACE intolerant</td>
</tr>
<tr>
<td>Aldosterone blockade</td>
<td>I A</td>
<td></td>
<td>Do not use if creatinine &gt;2.5 ♂, &gt;2.2 ♀, K+ &gt;5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cholesterol</th>
<th>COR</th>
<th>LOE</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>High dose statin</td>
<td>I A</td>
<td></td>
<td>Unless contraindicated</td>
</tr>
</tbody>
</table>
Risk Stratification

• TIMI (Thrombolysis in Myocardial Infarction)
  • Estimates mortality at 14 days for USA (unstable angina) and NSTEMI
  • Most common tool, score 0-7 based on presentation, risk factors and diagnostics
**TIMI**

**TIMI RISK SCORE for UA/NSTEMI**

<table>
<thead>
<tr>
<th>Points</th>
<th>Risk of Cardiac Events (%) by 14 Days in TIMI 11B*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age ≥ 65</td>
<td>Risk Score: 0/1, Death or MI: 3, Death, MI or Urgent Revasc: 5</td>
</tr>
<tr>
<td>≥ 3 CAD risk factors</td>
<td>Risk Score: 2, Death or MI: 3, Death, MI or Urgent Revasc: 8</td>
</tr>
<tr>
<td>Known CAD (stenosis ≥ 50%)</td>
<td>Risk Score: 3, Death or MI: 5, Death, MI or Urgent Revasc: 13</td>
</tr>
<tr>
<td>ASA use in past 7 days</td>
<td>Risk Score: 4, Death or MI: 7, Death, MI or Urgent Revasc: 20</td>
</tr>
<tr>
<td>Recent (≤24H) severe angina</td>
<td>Risk Score: 5, Death or MI: 12, Death, MI or Urgent Revasc: 26</td>
</tr>
<tr>
<td>↑ cardiac markers</td>
<td>Risk Score: 6/7, Death or MI: 19, Death, MI or Urgent Revasc: 41</td>
</tr>
</tbody>
</table>

*Risk criteria: UA or NSTEMI defined as ischemic pain at rest within past 24H, with evidence of CAD (ST segment deviation or +marker)*

For more info go to [www.timi.org](http://www.timi.org)

Antman et al JAMA 2000; 284: 835 - 842

[www.timi.org](http://www.timi.org)
Risk Stratification

• GRACE (Global Registry of Acute Coronary Events)
  • Estimates admission – 6 month mortality for ACS
  • 8 variables used for scoring
GRACE Calculator

http://www.gracescore.org/website/WebVersion.aspx
Early versus delayed strategy

**Figure 3.** Kaplan–Meier Cumulative Risk of the Primary Outcome, Stratified According to GRACE Risk Score at Baseline.

TIMACS Trial NEJM 2009;360:2165-75
Ischemia Guided Strategy

• Low risk TIMI or Grace Score
• Low risk female with negative troponin
• Patient/physician preference in absence of high risk features
NSTE-ACS Definite or Likely

Ischemia Guided

DAPT + Anticoagulation

Medical Therapy

Early Invasive

DAPT + Anticoagulation +/- GBI

Cath

PCI with Stent

CABG
Hospital Discharge Plan

- Cardiac rehab referral
- Patient education regarding therapeutic lifestyle changes
- Plan for musculoskeletal pain (avoid NSAIDs)
- Pneumococcal vaccine
JCAHO Core Measures

• Medications at discharge unless contraindicated
  • ASA
  • Statin
  • BB
  • ACE-I or ARB if Ejection Fraction < 0.40

• Smoking cessation education
Questions?