2019
Acute Coronary Syndrome

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ACS

Definitions: Acute Myocardial Ischemia

- Unstable Angina
- Non-ST-Elevation MI (NSTEMI)
- ST-Elevation MI (STEMI)

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2/3 \\
1/3
\end{array} \right. \]
Acute Coronary Syndrome

No ST Elevation

NSTEMI

Unstable Angina

Myocardial Infarction

ST Elevation

NQMI

QwMI
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- Pathophysiology: acute change/destabilization/rupture of coronary arterial plaque with inflammation and acute thrombus formation.
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Evaluation

- History
- Physical
- EKG

Serum cardiac markers/enzymes

* Elevation indicates myocardial injury !!
* Must be evaluated within clinical context !!
* R/O requires 8-12 hrs after sx onset

} treatment triage
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History

- **Age**
- **Symptoms:** Chest pain
  - Quality
  - Onset
  - Duration
  - But...1/3 present with symptoms other than chest pain (older, women, hx. of CHF, diabetes)
- **Past Cardiac History**
- **Coronary Risk Factors**
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Physical Exam

- **General:** signs of hypoperfusion (cool, clammy, ashen)
- **Vital Signs:** hypertensive, hypotensive, tachycardic
- **JVP:** elevated?
- **Lungs:** rales?
- **Heart:** murmur (new?), $S_3$
- **Neuro.:** signs of prior CVA
EKG: cornerstone of treatment decision

- **ST Elevation:** acute reperfusion recommended
  - > 0.1mV in 2 contiguous leads
    *exception: ≥ 2 mm male or ≥ 1.5 mm female for leads V2-3.
  - new LBBB
  - acute true posterior MI (ST V1-4 with tall R-waves right precordial leads and upright T-waves)

- **Non-ST-Elevation:** lytics not indicated
  - ST-depression
  - T-wave inversion
  - “normal”
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Serum Cardiac Markers: should not delay treatment

- Troponin (I, T): 6 hrs to 1-2 weeks
  - *preferred biomarker* to diagnose myocardial injury
  - specificity and sensitivity increased vs. CK-MB

* Myoglobin: 2 hrs to <24 hrs
  - Sensitivity increased: early
  - Not cardiac specific

* CK - MB: 6 hrs to 1-3 days
  - Specificity and sensitivity decreased vs. Troponin
  - Value = re-infarct, peri-procedural MI
  - Isolated = no value
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STEMI

- Reperfusion strategy
  - Thrombolytic therapy
  - “Primary” PCI (immediate angioplasty)
  - “Rescue” PCI (post-lytics)
  - “Non-emergent” PCI (post-lytics)
- Infarct related artery patency = predictor of survival
- GREATEST BENEFIT = 1st - 2 HRS
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STEMI

Thrombolytics: FMC-device time > 120 mins
Door-needle time <\= 30 mins

- Alteplase (TPA), Reteplase (rPA), Tenecteplase (TNK)
- 90-min patency rate = 75%-85%
- TIMI-3 Flow = 50-60%
- Efficacy in patients presenting with CHF or shock
- ACC/AHA: patients with cardiogenic shock or severe heart failure (Killip 3 or 4) should be transferred immediately to a hospital with a cath lab and PCI/CABG capabilities.
Primary Angioplasty:

- Patency and TIMI-3 flow rate: $\geq 90\%$
- Logistics
- The greater the risk = the greater the benefit (ie. anterior MI, heart failure, shock)

FMC-device time:

- $\leq 90$ mins (PCI hosp)
- $\leq 120$ mins (non-PCI hosp)
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STEMI
Antiplatelet Therapy

- ASA load: 160-325mg (uncoated)

PLUS

- P2Y₁₂ Inhibitor: eg = Clopidogrel
  * load = 300 mg (lytic tx & < 75 yo)
  * load = 600 mg (PCI)
  * Maintenance = 75 mg daily
  * newer = prasugrel (60 mg), ticagrelor (180 mg)
    - [avoid prasugrel if hx CVA / TIA] -
ACS - STEMI

Anticoagulant Therapy

- **Primary PCI:**
  - UFH
  - or...Bivalirudin

- **Lytics:**
  - UFH (48 hrs)
  - or...LMWH (duration of hosp)
  - or...Fondaparinux (duration of hosp)
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STEMI
Summary

PCI hosp → Primary PCI → FMC-device time ≤ 90 mins

Non-PCI hosp
Transfer for PCI if FMC-device time ≤ 120 mins
[Door-In-Door-Out ≤ 30 mins] or...
Lytics if FMC-device time > 120 mins... then transfer for cath

[* FMC = first medical contact]
Rescue Angioplasty

- **def.:** emergent PCI after **failed** fibrinolysis
  (determined by sx, EKG, hemodynamics)

- **Recommendations:**
  - Cardiogenic Shock
  - Severe heart failure
  - Ongoing ischemia = CP, ST↑ @ 90 min
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STEMI

- Delayed Invasive Management:
  Routine early cath (3-24 hrs) after lytic tx in all patients (class IIa) !!!
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NSTE MI

Treatment

- “Lytics” not indicated

- Angioplasty = “Early / Immediate Invasive strategy”
  * Early or immediate cath +/- PCI

- Medical therapy = “Ischemia-guided strategy”
  * Low risk patients = eg: normal ECG with neg troponin
  * Cath +/- PCI if spontaneous or inducible ischemia during hospitalization
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NSTEMI

Medical Therapy

Conservative: ischemia-driven strategy

ASA

Plus … Clopidogrel or Ticagrelor

Plus … Anticoagulant

Invasive Strategy: urgent/immediate or within 24-72 hrs

ASA

Plus … clopidogrel or ticagrelor, (or prasugrel if stent)

Plus … Anticoagulant

?? Plus… IIb/IIIa (high risk patients) = eptifibatide, tirofiban
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NSTEMI

Medical Therapy

- **Anti-Coagulant**
  - Low Molecular Weight Heparin
  - Unfractionated Heparin (UFH)
  - Fondaparinux
  - Bivalirudin (invasive strategy)

- **Anti-Platelet (enteral)**
  - Clopidigrel
  - Ticagrelor
  - Prasugrel (if stent)
Risk Stratification

- Historical
- Current: onset → post-discharge
- Predict event risk:
  - recurrent ischemia
  - (re) MI
  - Death
Risk Stratification

- Early invasive strategy: ? All
- TIMI score, GRACE, PURSUIT
- Hemodynamic or electrical instability
- Elevated cardiac markers
  - Troponin
  - ? BNP
- Acute EKG changes: ST-depression, new BBB
- Prior MI, CABG, PCI (in 6 mos)
- Age (> 75)
- Multiple coronary risk factors
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Adjunctive Medical Therapy

Nitrates = SL +/- IV
*Caution: recent Erectile dysfunction med use, RVMI, low BP, tachy, brady

Morphine:
* STEMI = class 1
* UA/NSTEMI = class IIb
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Adjunctive Medical Therapy

- Beta Blockers:
  - Oral = 1\textsuperscript{st} 24 hrs
  - IV = ? avoid unless HTN or tachyarrhythmia
  - * COMMIT = ↑risk cardiogenic shock (day 0-1)
    - ↓risk re-infarct & VFib (> day 1)

* Avoid: CHF, PR >240 ms, 2\textsuperscript{nd} or 3\textsuperscript{rd} degree AVB, asthma
* Caution - risk markers for shock:
  - age >70yo, BP< 120, HR >110 or <60, late presentation
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Adjunctive Medical Therapy

- ACE inhibitors: within 24 hours, oral dosing
  * Ant MI, or EF $\leq 40\%$, or CHF (class I)
  * All STEMI patients (class IIa)

- Aldosterone antagonist:
  * LVEF $\leq 40\%$ and CHF or diabetes (class I)

- Statin = high dose
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Adjunctive Medical Therapy

NSAID’s
All are contraindicated during hospitalization for AMI = except Aspirin

*↑ risk of death, reinfarct, HTN, CHF, cardiac rupture.
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Complications

- Hemodynamic instability = shock, CHF
- Electrical instability
- Depressed LV function (EF<40%)
- Recurrent ischemia
Complications: hemodynamic instability

- **CHF/shock**: stabilize ✈ transfer

- **Diagnosis**: Echo
  
  * Is it d/t LV dysfxn (“bad pump”) or a mechanical complication

- **Treatment**: Meds., IABP, Cath / revascularization
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Pump or Mechanical Complications

- “Pump” failure: right, left, both: reperfusion
- Acute MR
- Acute Septal rupture (“VSD”)
- Free wall rupture

} 
*echo
*surgery
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Right Ventricular Infarction - Complications

- Diagnosis
  - inferior MI = ~ 1/3 of patients
  - ST↑ V1, V4-R
  - Triad = Hypotension, JVD, “Clear” lungs
  - Echocardiogram

- Treatment - Volume, Catecholamines, maintain A-V synchrony, early reperfusion

- Prognosis - ↓
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Electrical Complications

- Brady-arrhythmia
- Tachy-arrhythmia
  - SVT < sinus tach
  - other
- VT
Electrical Indications for Pacing

- Prognosis: extent of myocardial necrosis
- Indications (transvenous or transcutaneous)
  - Symptomatic bradycardia
  - $2^0$ AVB - Mobitz II
  - $3^0$ AVB
  - RBBB plus fascicular block
  - New BBB
  - Asystole
  - Alternating BBB
Ventricular Arrhythmias

- VT/VF: ACLS guidelines
- Non-sustained VT, PVC's, idioventricular rhythm: no anti-arrhythmic
- VT/VF: electrophysiology evaluation for ICD
- NSVT: LVEF evaluation; electrophysiology evaluation
- Prophylaxis: ICD for recovered (> 6-13 wks)
  - EF < 30 (NYHA I) - 35% (NYHA II-III)

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Ventricular Arrhythmias

early
- VT/VF: ACLS guidelines
- Non-sustained VT, PVC’s, idioventricular rhythm: no anti-arrhythmic

Late
(>48 hrs.)
- VT/VF: electrophysiology evaluation for ICD
- NSVT: LVEF evaluation; electrophysiology evaluation
- Prophylaxis: ICD for recovered (> 6-13 wks)
  - EF < 30 (NYHA I) - 35% (NYHA II-III)
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Risk Stratification - Re-visited

- LVEF: Echo, Nuclear
- Ischemia: Stress testing
  - Submaximal: pre-discharge
  - Symptom limited: early post-discharge
- Risk: ischemia, ↓EF (<40%), hemodynamic instability/CHF, ventricular electrical instability, diabetes, prior revascularization
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Secondary Prevention

- Statin: atorvastatin 80 mg daily or rosuvastatin 20-40 mg daily
- ASA lifelong: 75-162mg (lifelong)
- ACE inhibitor: maybe all (but esp. reduced LV function)
- Beta-blocker: long term (metoprolol succinate, carvedilol, or bisoprolol if LVEF reduced <= 40%)
- Aldosterone antagonist: impaired LV (EF<=40%)… w/ CHF or Diabetes (EPHESUS trial)
- Anticoagulation (warfarin or DOAC): thrombus, atrial fibrillation, ? extensive regional wall motion abnormality (eg: anterior MI) = CAUTION with dual anti-plt tx.
- P2Y12 receptor inhib (eg: Clopidogrel): All ACS ~ 1yr (stent or no stent)
- Cardiac Rehab = class I recommendation (STEMI and NSTEMI)