Acute Coronary Syndrome: Unstable Angina

See also Ischemic chest pain algorithm

Background

1. Definitions
    - Angina: Chest pain/discomfort resulting from inadequate arterial blood flow to the heart
        - Causes: plaque rupture and thrombosis from coronary artery disease (CAD)
    - Acute coronary syndromes (ACS): 3 CAD manifestations
        - UA - Unstable angina
        - NSTEMI - Non-ST Elevation Myocardial Infarction
        - STEMI - ST Elevation Myocardial Infarction
    - NSTEMI
        - Considered non-ST elevation ACS
        - Cardiac biomarkers - positive
    - UA
        - Considered non-ST elevation ACS
        - Cardiac biomarkers - negative
2. UA can manifest in
    - Rest angina (lasting >20 min)
    - New onset angina limiting physical activity
    - Angina w/ greater frequency/ duration, or w/ a lower exertional threshold
3. General Information
    - ACS
        - Assoc w/ incr risk of death and ischemia related complications
        - Predictive of future events
        - 2 million episodes/yr
        - Leading cause of death in the developed world
        - UA and NSTEMI presentation indistinguishable
            - Rise of cardiac biomarkers delay

Pathophysiology

1. Pathology of Disease
    - Coronary artery plaques fissure → disrupt blood flow
        - Expose sub-endothelium
            - Causing thrombosis/ vasoocclusion
            - Unstable clot → partial occlusion
    - CP due to ischemia
        - O2 supply/demand mismatch
    - Signifies high risk of MI, cardiac death
    - Many pts have multivessel CAD
    - For more information
        - Acute Coronary Syndrome (ACS)
2. Incidence, Prevalence
    - Incidence increasing
        - > 1 million admissions/yr
    - Mean age: 66 yo

        - 44% > 65 yo
    - 30% MI - w/ in 3 mos of Sx
3. Risk factors
    - Same as for CAD
    - Non-modifiable risk factors
        - Advancing age
        - FHx of CAD (42%)
            - Early age MI
        - Male gender
        - Prior MI (36%)
        - Previous angina (66%)
    - Modifiable risk factors
        - HTN (60%)
        - DM (26%)
        - Hyperlipidemia (43%)
        - Smoking (4%)
        - Sedentary lifestyle
        - Stress
        - Hyperhomocysteinemia
4. Risk Stratification
    - Identifies highest risk pts → aggressive therapy
    - Seven variables at presentation predict outcomes
    - Risk Factor: 1 point each
        - Age ≥ 65
        - ≥ 3 CAD risk factors
        - Prior coronary art stenosis >50%
        - ST ↕ changes = 0.5 mm
        - ≥2 anginal episodes x 24 hrs
        - ↑ cardiac biomarkers
        - ASA use in last 7d
    - TIMI Score[4]
        - 0-2 = low risk
        - 3-4 = intermediate risk
        - 5-7 = high risk
5. Morbidity/mortality
    - 30-day Risk
        - Death=3.5%
        - MI=8.5%
        - Major bleed=1.5%[15]

Diagnostics

1. Symptomatology
    - Chest pain / discomfort
        - New / recent onset Sx (< 4-8 wk)
        - Quality
            - Substernal
            - Exertional
            - Radiate to jaw, shoulder, inner arm

        - Relief w/ rest or NTG in < 10 min
    - Change in existing CP
        - At rest, more severe/ freq/ longer duration
        - Less responsive to NTG
    - N/V, dyspnea, diaphoresis, abd pain, lightheadedness
    - Atypical Sx:
        - Fatigue
        - Dyspnea
        - Presyncope
    - 1/3 of MIs present w/o CP
        - Dyspnea alone
        - N/V
        - Palpitations
        - Syncope
        - Cardiac arrest
2. Physical examination
    - R/O other causes of CP
        - Inf, PTx, dissection
    - Paradoxically split S2, abnormal precordial movements
    - Higher risk signs
        - SBP < 110 mmHg, JVD, S3/S4, crackles, new/worse murmur
    - DRE
        - r/o GI bleeding
3. Diagnostic testing
    - Labs
        - CBC: leukocytosis, r/o anemia, low plts
        - Electrolytes, BUN/Cr, Ca, Mg, phos, r/o abnl renal funct
        - Coags: adjust Tx protocol as necessary
    - Cardiac biomarkers
        - Measured in pt w/ symptoms of ACS (SOR:C)[1]
        - Monitor serial trends (Q 8-12 hr)
        - CK / CK-MB
            - MB > CK
                - Higher specificity
                - Pref over total CK
            - Detectable
                - 4-6 hr post MI
            - Peaks
                - 18-24 hr
            - Returns to baseline
                - 48-72 hr
            - False positives
                - Non-cardiac dz: myocarditis, GI tract
                - Trauma: uterus, prostate, skeletal muscle
        - Troponin I and T
            - Marker - myocardial necrosis
                - Highly sensitive / specific for injury
            - Doubling of upper limit ref range: cardiac injury diagnosis

- Time course
  - Similar to CK-MB
- False positive causes
  - PE, myocarditis, renal dz, sepsis
- Test of choice
  - Retrospective MI diagnosis
  - Elevated x 10 d
  - Perioperative MI
- Infarct size correlation
  - 72 hr Troponin T

▪ High sensitivity C-reactive protein (hs-CRP)
- Marker
  - Inflammation and infection
- ↑ CRP assoc w/ worse prognosis in ACS pts
- Combine with troponin
  - Aggressive therapy for high risk pts
    - Coronary angiography, stenting
- False positives
  - late pregnant women
  - active/ mild inflammation
  - Bacterial/ viral infections
  - Burns

o Imaging
▪ CXR
- R/o CHF, pneumonia, PTx
- Dissection/widened mediastinum
- Heparin contraindication

o Other diagnostic testing
▪ ECG
- w/ in 10 min of CP presentation (SOR:C)[1]
  - Normal ECG
    - Does not r/o ACS (SOR:C)[1]
  - R/o MI, pericarditis, abnl electrolytes

▪ Lipid profile w/ in 24 hrs
▪ ECHO
- LV function - EF < 40%, wall motion abnl
  - Worse prognosis

4. Diagnostic Criteria
o High risk (> 1 of the following)
▪ Hx
- Incr ischemic Sx in past 48 hr

▪ Pain character
- Prolonged (>20 min) at rest

▪ Findings
- Hypotension, bradycardia, tachycardia
- Pulmonary edema
- New/ worsening MR
- S3, new /worsening rales

        - Age >75
    - ECG
        - ST depr> 1 mm (I, aVL)[1]
        - Angina at rest
            - w/ ST-segment changes >0.5 mm
        - Bundle branch block
        - Sustained V-tach
    - Cardiac biomarkers
        - ↑ TnT, TnI (>0.1ng/ml)
        - ↑ CK-MB
- Intermediate risk
    - Hx
        - Prior MI
        - PVD, cerebrovascular dz
        - CABG
        - Prior ASA use
    - Pain Character
        - Prolonged (>20 min) rest
            - Now resolved, w/ high CAD risk
        - Rest angina (>20 min) or
            - Relieved w/ rest or sublingual NTG
        - Nocturnal angina
        - New-onset pain Canadian Cardiovascular Society Class. (in past 2 wks)
            - Class 3: Angina w/ mild exertion
                - Walking 1-2 level blocks at normal pace
                - Climbing 1 flight of stairs at normal pace
            - Class 4: Angina at any physical exertion
    - Age >70 yrs
    - ECG
        - T-wave changes
        - Pathological Q waves or
        - Resting ST-depr <1 mm (anterior, inferior, lateral leads)
    - Cardiac markers
        - Slightly elevated TnT, TnI, CK-MB
            - i.e. TnT 0.01 to 0.1 ng/ ml
- Low risk
    - High/intermediate risk features absent
    - Any of the following
        - Pain character
            - Incr angina freq, severity, duration
            - low threshold angina provoked
            - New onset angina
                - 2 wks - 2 mos prior to presentation
        - ECG
            - Normal or unchanged
        - Cardiac markers
            - Normal

Differential diagnosis

1. MI, aortic dissection, aortic aneurysm, tamponade
2. PE, pericarditis, pneumothorax, mediastinitis, myocarditis
3. Esophageal spasm, pneumonia, costochondritis, GERD

Therapeutics

1. Acute treatment
    - Nonpharmacologic care
        - Bed rest
        - Continuous ECG monitoring
        - Supplemental oxygen
        - Pulse oximetry / ABG measurements (hypoxemia)
    - Pharmacologic care
        - NTG SL spray/tablet (all pts)
        - Sx not relieved by NTG
            - Morphine sulfate IV
        - Continuing CP
            - Beta blocker (if not contraindicated)
            - Non-dihyropyridine CCB (verapamil or diltiazem)
                - Initial Tx (in absence of severe LV dysfunction)
            - ACEi
                - DM, heart failure, LV ejection fraction <40%,HTN
2. Immediate care
    - Anticoagulation therapy
        - Aspirin 162-325 mg PO (tell pt to chew)
            - Q: Combination of aspirin + warfarin for ACS?
            - A: Warfarin alone appears to be as effective as combination therapy and safer
        - Clopidogrel 300 mg PO load
        - UFHn 50 = 100U/kg IV Bolus, 15-25 U/kg/hr IV infusion
          or LMWH Enoxaparin 1mg/kg SQ q12h
    - Arrhythmia management / prophylaxis
        - Vfib, Vtach, PVCs
    - Consider further / invasive therapy
        - NSTEMI
3. Long-Term Care
    - Reduce CAD risk factors
        - Weight loss
        - Smoking cessation, exercise
        - DM, HTN, hyperlipidemia Tx
        - AHA step I & II diet
    - Normal activity pt counseling
    - Encourage daily physical activity
        - Walking
    - Cardiac rehabilitation
        - Pts w/ UA / NSTEMI (SOR:B)[14]

Further Management (> 24 hrs)

1. Monitor complications
    - Reoccur of UA/NSTEMI
    - MI
    - Stroke
    - CHF
2. Diagnostic testing
    - ETT, perfusion scan: when stable
3. Procedures
    - Cath: diagnostic & therapeutic (w/ PCI)
        - Consider w/ TIMI > 3
        - Indications
            - Recurrent isch, ST depr >1mm, positive troponin
        - Risk stratification of coronary stenosis / need for CABG, PCI
    - PCI: Assoc w/reduced death / MI rates; high risk attributes recomm early intervention
        - Recurrent / at rest angina despite Tx; new ST depr
        - Sx of CHF, decr EF (< 40%); incr troponin
        - Hemodynamic instability; sustained VTach
        - Hx of PCI w/in last 6 mos; Hx of CABG
        - Drug coated stents red. rates of restenosis
    - CABG indications
        - Left main dz; severe valvular dz
        - Poor EF, significant 2-3 vessel dz
        - DM w/ multiple focal stenosis
4. Medications
    - ASA if no contra-ind, clopidogrel
    - BBlkrs (metoprolol): decr O2 demand, improves outcomes
    - CCBs: if BBlkrs contraindicated
    - Statins: use w/ in 24 hr, reduced risk of death/MI
    - ACEi: use w/in 24 hr if Sx of CHF
    - Thrombin inhibitors hirudin, bivalirudin: not yet in guidelines
        - More effective in achieving TIMI grade 3 flow, reduced reinfarction, death vs UFH

Follow-Up Care

1. Return to Office
    - Time frame
        - Low risk: 2-6 wks
        - High risk 1-2 wks[16]
2. ASA/clopidogrel indefinitely
    - Q: clopidogrel plus ASA> ASA alone?
    - A: Although combination may be superior to aspirin alone for preventing serious cardiovascular outcomes in patients w/ established CAD (secondary prevention)
    - There is no indication that similar benefit is found among patients at high risk due to multiple risk factors (primary prevention)

3. Anticoag (warfarin)
    - INR 2 - more effective
    - Freq monitoring, higher incid of bleeding

Prognosis

1. 30-day mortality
    - Unstable angina - 2.4%
    - NSTEMI - 5.7%
    - STEMI - 6.1%
2. 6 mos mortality
    - 9-19% pts w/ ACS[13]
3. Long-term survival post ACS
    - Limited published data
4. 1-year mortality[19]
    - Unstable angina - 7%
    - NSTEMI - 11.1%
    - STEMI - 9.6%

Prevention and Patient Education

1. American Heart Association guidelines
    - Preventative measures
        - Patients
            - http://www.hearthub.org
        - Providers
            - http://www.americanheart.org/presenter.jhtml?identifier=3003999

Evidence Based Medicine

1. Does addition of aspirin to warfarin prophylaxis for Acute Coronary Syndrome increase benefits or harms?
2. Is clopidogrel plus aspirin superior to aspirin alone for primary prevention of cardiovascular outcomes among patients with multiple risk factors?

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