

SCCEP 2013 LLSA Course Article 8

Appropriate Cardiac Cath Lab Activation: Optimizing EKG interpretation and Clinical Decision-Making for Acute STEMI

Rokos IC, French WJ, Mattu A et al. Am Heart 2010;160:995-1003.e8.Nov 2007;357(18):1834-40.

Article: A “Curriculum in Cardiology” report, it presents a practical summary of updated EKG criteria for emergency PCI, thus allowing physicians to maximize the rate of appropriate Cath Lab activation, and minimize inappropriate activations. It reviews the evidence for EKG interpretation strategies that either increase diagnostic *specificity* for “classic” STEMI and LBBB OR improve the diagnostic *sensitivity* in identifying 4 STEMI-equivalents: (1) posterior MI, (2) acute left main occlusion, (3) de Winter ST/T-wave complex and (4) certain scenarios of resuscitation after cardiac arrest. **Conflicts: The 7th listed author receives support or honoraria from 8 different medical device and drug companies.**

Introduction:

- **A Single EKG that is diagnostic of acute STEMI instantly classifies as pt as high priority:**
 - 2004 ACC/AHA guidelines specify EKG criteria
 - New information in literature since 2004 hasn't been included in guidelines
- **3 Background concepts:**
 - **1. High risk EKG findings continue to be overlooked**
 - **2. "Efficiency Challenge"** of finding the STEMI's in the large group of CP pts in ED/EMS
 - 3. Coordinated systems-based approach is emphasized by ACC/AHA STEMI guidelines
 - Need to track all Cath Lab activations
 - Efficiency depends upon clearly defined criteria that distinguish appropriate activations
- To maximize *Appropriate Activations*:
 - Critically review real-time EKG interpretations that I.D. STEMI's and STEMI-equivalents
 - **"Stemi-equivalents" have become more standardized over time**
 - Any EKG pattern assoc with acute coronary occlusion but w/o ST elevation
- Article proposes 3 clinical questions when analyzing ECG:
 - Are ST-segments concocing with acute STEMI or STEMI -equivalent?
 - Has chronic ST elevation been excluded?
 - Is patient a reasonable candidate for PCI or thrombolytics?

Definitions and Background Concepts:

- 2004 Guidelines define "classic STEMI \geq 1mm ST-elevation in 2 adjacent leads"
 - $V_1 - V_4$ and II/III/AVF are most common and called Anterior or Inferior, respectively
 - However, all EKG leads are bipolar, thus "anterior" is really "anteriorseptal-posteriorlateral"
 - Thus, certain types of ST depression represent STEMI-equivalents (see 1-3 in Article sub-head)
- Guidelines state and this article emphasizes PCI as preferred modality for initial treatment, but EKG interpretations also apply when giving thrombolytics, with caveat of contraindication list

Maximizing Diagnostic Specificity for Acute Coronary Occlusion

- **Classic STEMI**
 - Inappropriate Cath Lab Activations
 - Occur 5-6% in ED evaluation, 20-25% in EMS
 - Increase costs, pt safety risk, puts stress on staff

- **Appropriate Vs. Inappropriate Cath Lab Activation**
 - Appropriate - IDEAL- PCI performed
 - Appropriate -Reasonable-
 - CABG needed instead of PCI
 - Coronary anatomy not amenable to PCI
 - Myocarditis or other clinical mimics
 - NO PCI lesion found but + biomarkers
 - STEMI but Pt dies before getting to lab
 - Following OHCA with shockable rhythm with ROSC
 - Inappropriate Goal < 5%
 - Cath cancelled by a physician
 - Angiography w/o PCI and negative enzymes, erroneous EKG interpretation
 - Advanced co-morbidities cause cancellation of PCI

- **Six EKG Interpretation Strategies to increase specificity in STEMIs**
 1. **ST Elevation in V₂ - V₃** should be 1.5 mm in women, 2 in men (2.5 in men < 40)
 2. **Know the 10 common condition with chronic ST elevation**
 - **Benign Early Repolarization**
 - **Pericarditis**
 - **LV Aneurysm**
 - **Normal Male Pattern**
 - **Pre-excitation**
 - **LVH**
 - **LBBB**
 - **Pacing**
 - **Hyperkalemia**
 - **Brugada Syndrome**
 3. **Reciprocal ST depression** in leads 180° opposite STEMI - if present, 95% specificity
 4. **Presence of q waves in leads with ST elevation supports diagnosis of STEMI**
 5. EKG machine reads 90% specific in ED, worse in EMS with ↑inappropriate activations
 6. **Physician interpretation of transmitted EKGs increase appropriate activations**

- **LBBB - Either a "Mimic" of STEMI or a STEMI-equivalent**
 - For decades new or presumed new LBBB was considered a STEMI-equivalent
 - Newer data suggest this leads to inappropriate Cath Lab activations- 90% are not having STEMIS
 - Possible Solutions to increase specificity:
 - Clinically unstable pts
 - Echo shows acutely abnormal anterior wall motion
 - Positive enzymes/biomarkers
 - Scarbossa criteria with concordance of ST segments with QRS

Maximizing Diagnostic Sensitivity of Acute Coronary occlusion:

- **Posterior Wall MI:**
 - ST Depression Noted in V₁ - V₃ (or elevation in posterior leads V₇ - V₉)
 - Guidelines and practice patterns conflict but SHOULD be treated as STEMI

- **Left Main Coronary Occlusion:** Rapidly lethal, often present in shock, poor prognosis
 - EKG findings are diffuse ST depression in 6 or more leads AND
 - ST elevation of 0.5 mm in aVR, or ST elevation in aVR > ST elevation in V₁
- **de Winter ST/T Wave Complex: Seen in V₁ - V₆**
 - Represent 2% of angiographically confirmed Anterior MI's
 - 1-3 mm of ST Depression, up-sloping at J point , with tall, upright, symmetric T Waves
 - Distinguish from Transient Hyper-Acute T Waves that may occur early in ischemia
 - Distinguish from Wellens Syndrome, which is biphasic T Waves in V₂ - V₃
 - this is caused by chronic high grade LAD obstruction
 - can usually be evaluated by non-emergent angiography
- **Resuscitated Cardiac Arrest:**
 - About 50% of patients with OHCA and ROSC have an acute coronary occlusion
 - Current Guidelines are silent on the role of emergent
 - Historically, only "ideal" post -arrest patients had immediate PCI (i.e. stable, neuro intact)
 - Registry data has demonstrated good outcomes in less than "ideal" patients
 - **Newer Policy/Data suggest early PCI in post -arrest, regardless of EKG findings .**
 - **Three Scenarios:**
 1. STEMI Pt with arrest witnessed by EMS and ROSC: Cath Lab already activated
 2. Witnessed OHCA, early CPR/911 with ROSC and STEMI: Cath Lab activation
 3. Same as #2, but post arrest EKG without STEMI: Consider Cath Lab activation
 - Note that paper suggest these patients be taken to "Cardiac Resuscitation Center"

Appropriate Patient Selection:

- Brief, careful assessment of age, comorbidities, functional status, DNR status, patient preference
- **Post-Cardiac Arrest**
 - **Current AHA expert statements are out-of-date (waiting 72 hours)**
 - **Neuro status immediately post resuscitation should not preclude Cath Lab activation**
 - Therapeutic hypothermia should begin immediately and continue during cath (NNT=6)

Conclusion:

- Comprehensive list of precise criteria for Cath Lab activation is needed
- Not all ST elevation is a STEMI, and not all STEMI pts are reasonable candidates for PCI
- Optimal EKG interpretation proficiency by front line clinicians is a cornerstone of STEMI system