



Emergency Medicine: Reviews and Perspectives

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Cardiology Corner: European Society of Cardiology (ESC) Guidelines on STEMI

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Take Home Points

- Improvement in chest pain after nitroglycerin is not diagnostic.
 - Patients may have some ST elevation in leads V2 and V3 at baseline.
 - The presence of Q waves on the EKG should not change reperfusion strategy.
 - Some patients with acute coronary occlusion may have an initial ECG without ST elevation.
 - ST depression > 1 mm in eight or more surface leads, coupled with ST-segment elevation in aVR and/or V1, suggests multi-vessel ischemia or left main obstruction.
- There are some differences between the ESC and AHA guidelines.
 - Ibanez, B et al. 2017 ESC guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The task force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). *Eur Heart J.* 2018 Jan 7;39(2):119-177. PMID: 28886621
- 1) **A reduction in chest pain after nitroglycerin administration can be misleading and is not recommended as a diagnostic maneuver.** There is literature indicating that the improvement in pain after nitroglycerin does not rule in ACS. Some of the mimics of ischemia such as esophageal spasm will often improve with nitroglycerin. On the other hand, true cardiac ischemia is just as likely to not improve with nitroglycerin as non-ACS conditions. **Response to nitroglycerin is neither sensitive nor specific for diagnosing ACS.**
 - **Failure to improve with nitroglycerin in patients with suspected cardiac ischemia may be concerning.** These patients may qualify for emergent catheterization for intractable cardiac ischemia.
 - 2) **The criteria for diagnosis of ST elevation MI on ECG is more complex than just 1 mm of elevation in two contiguous leads.** While ST elevation of 1 mm in two contiguous leads is concerning, the criteria is different for leads V2 and V3 based on age and gender. In men under age 40, you need to look for 2.5mm of elevation. In men over age 40, it is 2 mm. In women, it is 1.5mm. The criteria account for the fact that many patients have early repolarization or benign J-point elevation in V2 and V3. Morphology is also important. We are reassured by ST elevation that is concave upwards. If the ST elevation is oblique, straight or convex upwards like a tombstone, it is concerning. If there is reciprocal ST depression in other leads, it is concerning.
 - 3) **Q waves on the ECG should not change reperfusion strategy.** Some assume that Q waves indicate it is too late to do something. If there is ongoing pain with ongoing ST elevation, you should interpret it as viable myocardium that is still infarcting. You may still be able to save some of the myocardium even though Q waves have developed.
 - 4) **Should we routinely look at additional leads to evaluate for right ventricular and posterior MI?** If you see evidence of an inferior wall STEMI, it can extend to the right ventricle in about a third of cases or extend to the posterior heart.

- **Why is this important?** If the patient has an inferior STEMI extending to the right ventricle, it means you need to be careful with nitrates because these patients are very dependent on preload. Giving nitrates can lower the blood pressure. If there is right ventricular involvement, generally nitrates are avoided and the patient is given IV fluids. As long as their lungs remain clear, you can be aggressive giving fluids as this will maintain the blood pressure until the patient goes to the cath lab.
 - **If you already see evidence of inferior STEMI, it isn't that important to diagnose posterior STEMI.** You don't need to check for posterior STEMI if they also have inferior STEMI.
 - **The posterior STEMI is important because 4-5% of all STEMIs will be isolated posterior MI.** In other words, the patient has posterior STEMI but there is nothing seen in the inferior leads to help you. In cases of isolated posterior STEMI, you will see ST depression in leads V1, V2 and V3. If you see ST depression in these leads, you should do posterior leads and if there is ST elevation of at least 0.5mm, you have just diagnosed an isolated posterior STEMI. These patients qualify for emergent reperfusion.
 - **We are bad at diagnosing posterior STEMIs.** Only about 30% of all posterior STEMIs make it to the cath lab within 30 minutes because they are so frequently misdiagnosed. If you aren't able to diagnose a posterior STEMI, you are already missing 1 out of every 20 STEMIs in your practice.
 - **If you see a patient with concerning symptoms and ST depression in V1, V2 or V3, do the posterior leads.** If there is ST elevation in the posterior leads, call it a posterior STEMI and get them to the cath lab.
- 5) **The ECG diagnosis of acute myocardial infarction is difficult in the presence of a left bundle branch block but often possible if marked ST-segment abnormalities are present.** The presence of concordant ST-segment elevation appears to be one of the best indicators of ongoing MI with an occluded infarct artery. They do not discuss the modified Sgarbossa created by Steve Smith. Smith excluded the third Sgarbossa criteria because it doesn't perform well and replaced it with new criteria.
- *Smith, SW et al. Diagnosis of ST-elevation myocardial infarction in the presence of left bundle branch block with the ST-elevation to S-wave ratio in a modified Sgarbossa rule. Ann Emerg Med. 2012 Dec;60(6):766-76. PMID: 22939607*
 - **The reason that the modified Sgarbossa criteria aren't included in these guidelines may be due to the absence of validation.** Mattu believes the Steve Smith modified criteria are extremely accurate and he is confident that validation studies will confirm this.
 - **In the 1990s, Sgarbossa studied the criteria in patients with pacemakers and found that the criteria worked well in paced rhythms as well.** However, all of these studies have been small. There are not large studies of patients with pacemakers having coronary occlusions. However, the European guidelines have included this.
- 6) **Patients with MI and right bundle branch block have a poor prognosis. It may be difficult to detect transmural ischemia in patients with chest pain and RBBB. A primary PCI strategy should be considered when persistent ischemic symptoms occur with RBBB.** Mattu does not necessarily agree. It doesn't matter what the EKG shows (RBBB vs LBBB vs whatever) if the patient has clear-cut ischemia and isn't responding to your interventions. You need to activate the cath lab in this situation regardless of whether or not there is RBBB.
- **However, most of the literature seems to indicate that patients with RBBB and acute coronary occlusion do tend to show ST segment elevation.** All of your usual ST elevation criteria do still apply.
- 7) **Some patients with acute coronary occlusion may have an initial ECG without ST elevation.** This may be because they present early in symptom onset. It is important to repeat the ECG or monitor for dynamic ST segment changes. If your patient has concerning symptoms and the initial EKG is non-diagnostic, you need to get another EKG. Studies have shown that as many as 20% of patients diagnosed with STEMI are diagnosed with STEMI based on the subsequent EKG. If you are not repeating your EKGs, you may be missing as many as 20% of your potential STEMIs.
- Sometimes it may be difficult to get two or three repeat EKGs in a short period of time when it is busy. You can leave the EKG machine attached to the patient you are really worried about. It is rare that you will be getting EKGs every 15 minutes. This is for the patients where you are really worried they could be having acute MI.

- 8) **ST depression > 1 mm in eight or more surface leads, coupled with ST-segment elevation in aVR and/or V1, suggests multi-vessel ischemia or left main obstruction.** Most in emergency medicine have come to respect ST elevation in aVR. The European guidelines have incorporated this as an indication for primary PCI.
- **These are pretty sick patients.** Patients with left main occlusion or triple vessel occlusion have a large territory of myocardium involved. These are not the patients sitting in the gurney eating a turkey sandwich. They are often diaphoretic or have severe chest pain. If the patient has any of these findings and doesn't look sick, consider some of the other things that can produce elevation in aVR such as bad left ventricular hypertrophy, severe anemia, dissection, pulmonary embolism, extreme hypertension, SVT and tachydysrhythmia, etc.
- 9) **If the patient has a STEMI post-arrest, they should go to PCI.** If they don't have a clear STEMI, optimal management is less clear. If their initial rhythm was ventricular fibrillation or ventricular tachycardia, consider ACS as a cause and get them to PCI. The guidelines also discuss the use of opiates in ACS. We discussed this with Bryan Hayes on EM:RAP [March 2017 - Pharmacology Rounds – Are Opiates Bad for ACS?](#)