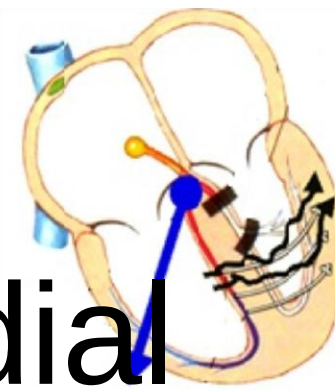




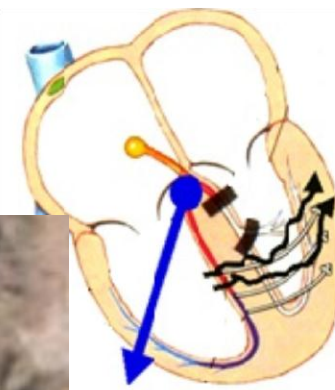
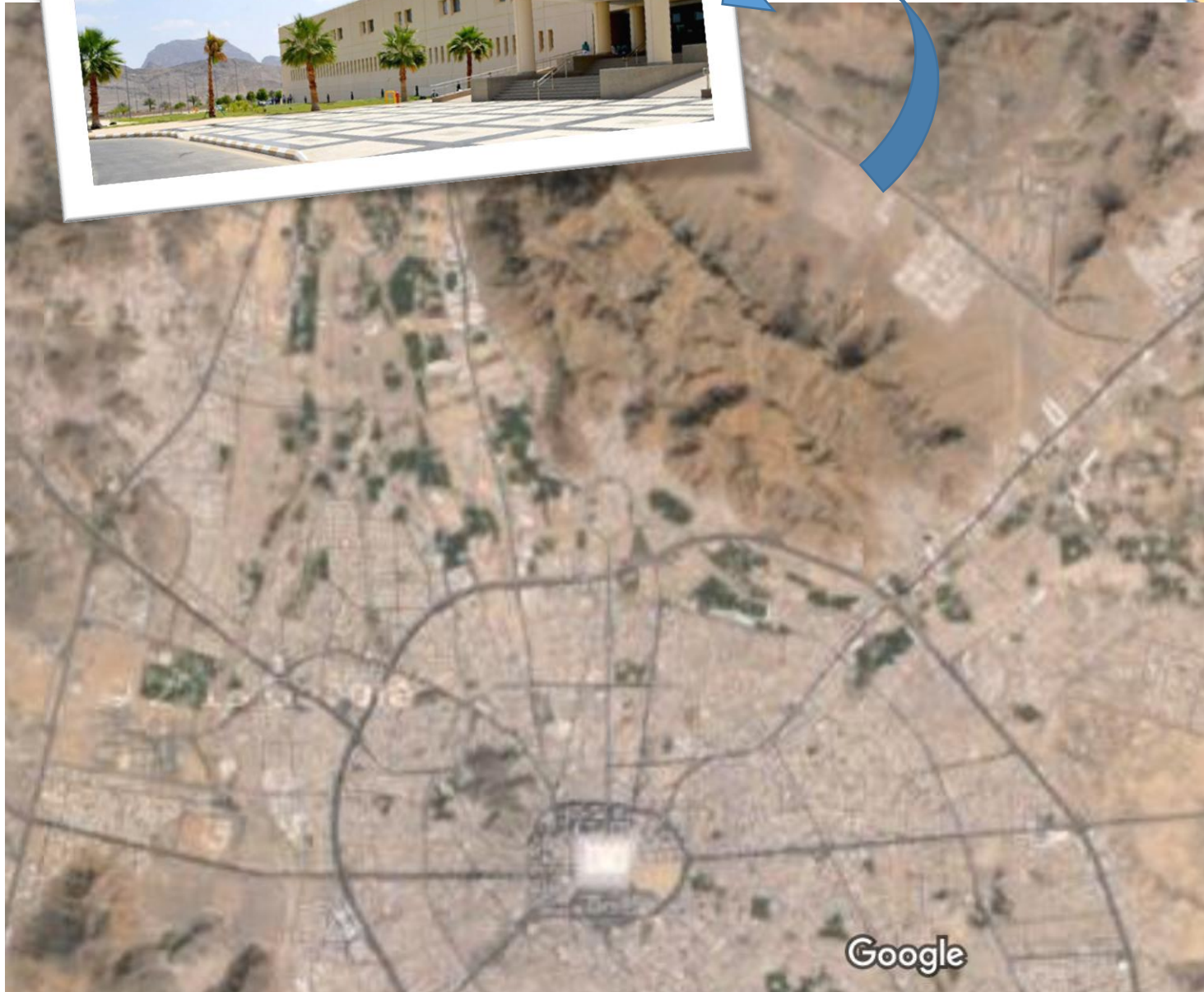
ST-Elevation Myocardial Infarction in the Presence of LBBB

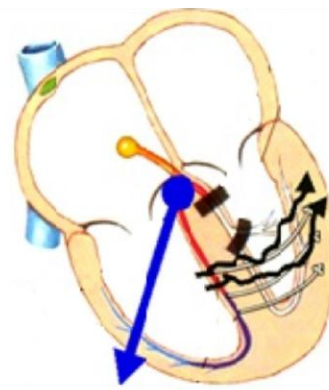
Dr. Abdulhadi Tashkandi

E.D chairman

Regional Director Postgraduate education and Academic Affairs

National Guard hospital-Al-Madinah Al-Munawarah

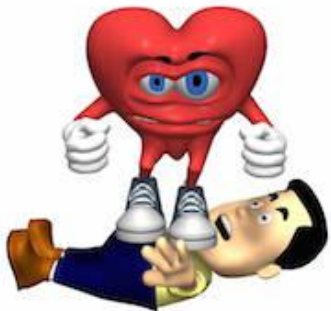


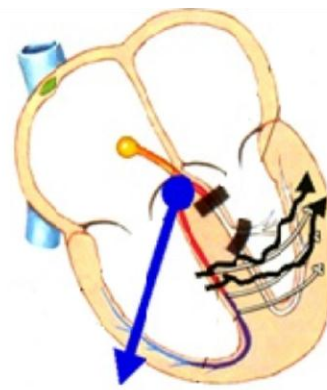


A 75 year old female patient, a known diabetic and hypertensive presented with sudden onset of chest pain 60 min ago...

No other significant history

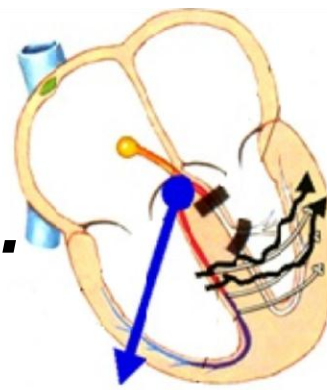
An ECG done 3 months ago reported to be normal.



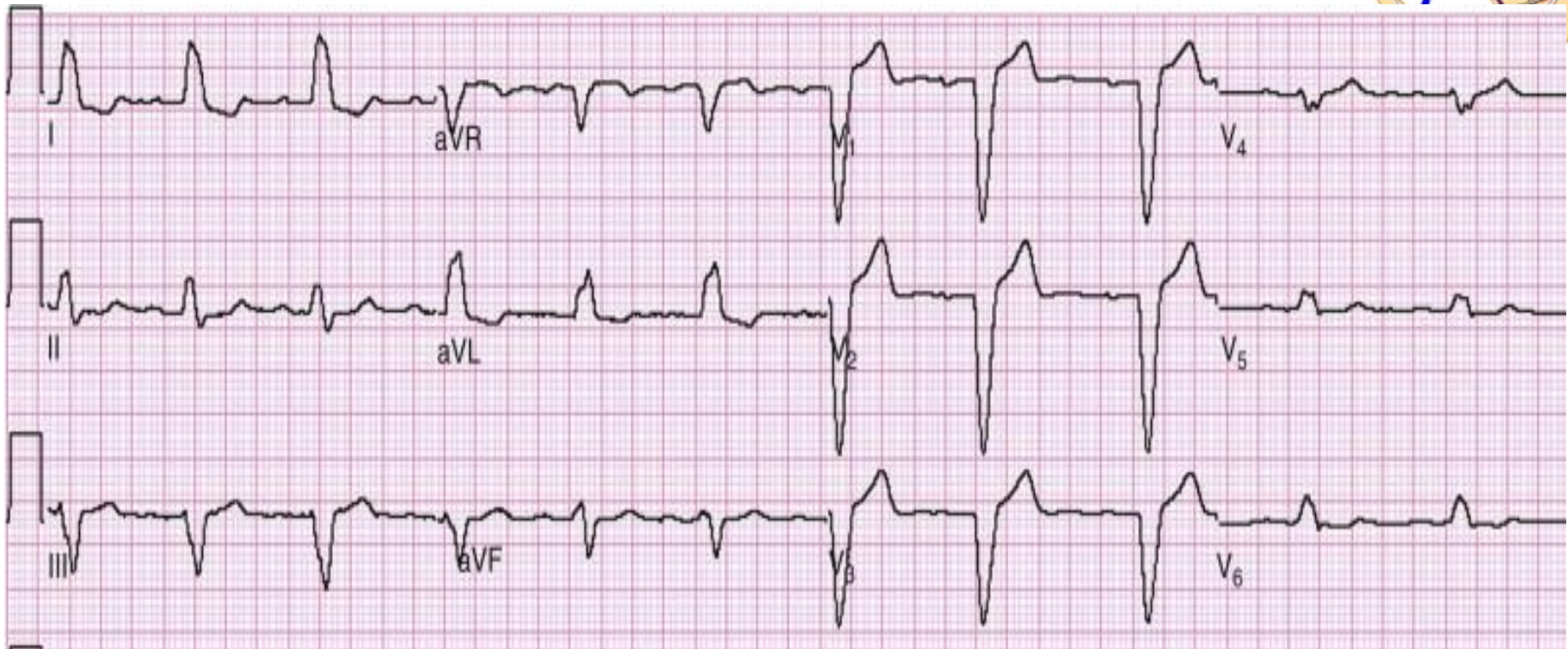
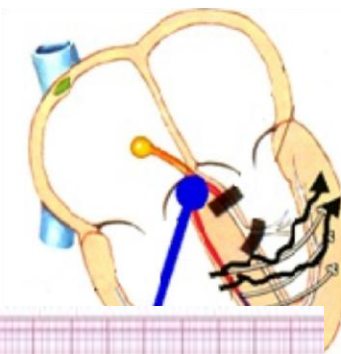


- O/E patient was
conscious
oriented
HR: 120/min, regular
BP: 180/110 mmHg
CVS: S1+S2+0
Chest: NAD

12-Lead Electrocardiogram.

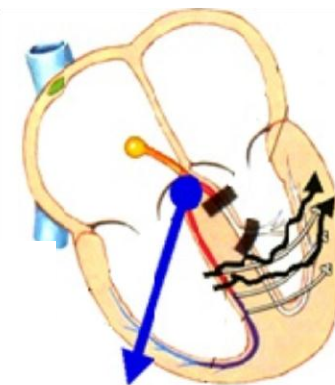


- Is the key determinant of eligibility for fibrinolysis.
- The electrocardiographic findings include two basic issues:
 - (1) ST segment elevation of 1 mm or more in two or more anatomically contiguous *standard limb* leads or elevation of 2 mm or more in two or more contiguous *precordial* leads, and
 - (2) new or presumed new LBBB.



- This tracing demonstrates the classic findings of LBBB:

- 1) QRS complex width greater than 0.12 second;
 - 2) absence of Q wave in lead V₆;
 - 3) monophasic R wave in leads V₅, V₆, I, and aVL;
 - 4) discordant ST segment-T wave changes in leads V₁ to V₃ (simulating acute myocardial infarction), I, and aVL.
- 1st - degree atrioventricular block noted.



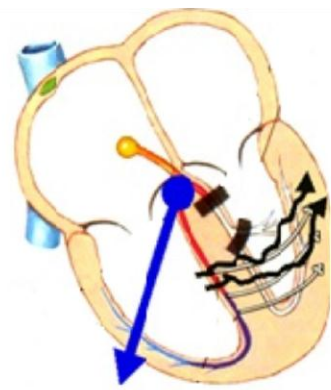
Bundle Branch Blocks



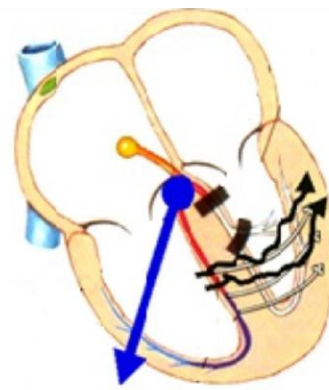
- The QRS duration ≥ 120 ms
- QS or rS complex in lead V1
- notched ('M'-shaped) R wave in lead V6

CAUSES OF LBBB

- Aortic stenosis
- Dilated cardiomyopathy
- Acute myocardial infarction
- Extensive coronary artery disease
- hypertension
- 1ry disease of electrical conduction system

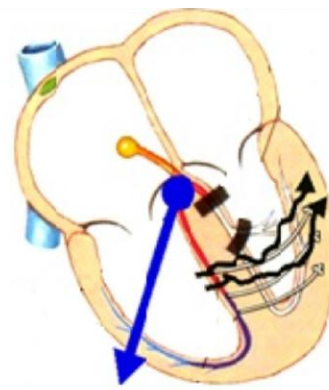


GENERAL PRINCIPLES



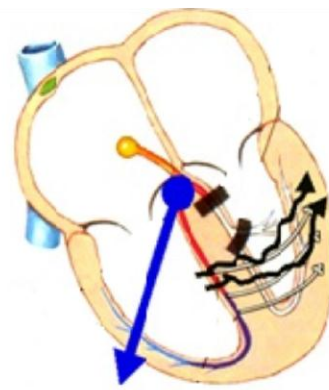
- The ECG diagnosis of MI is more difficult when the baseline ECG shows a bundle branch block pattern.
- The frequency of bundle branch block was best assessed in a review of almost 300,000 infarctions from the National Registry of Myocardial Infarction investigators.
 - RBBB present in approximately 6% and
 - LBBB in 7 % of infarctions.

LBBB WITH MI



- The diagnosis of MI in the presence of LBBB is considerably more complicated and confusing than that of RBBB.
- The reason is that LBBB alters *both the early and the late phases* of ventricular depolarization and produces secondary ST-T changes.

LBBB WITH MI



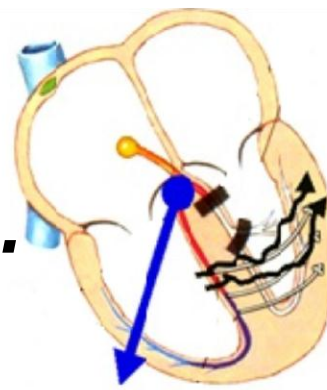
- LBBB confers increased risk for mortality in the setting of suspected AMI
- the increased risk is significantly associated with:
 - older age and
 - co-morbidity risk factors.

Two specific patient settings might be encountered:



1. Patient with new-onset LBBB,
which in many occasions is accepted as **the equivalent of electrocardiographic findings supportive of AMI**
2. When the patient has LBBB on arrival and is known to have LBBB on previous ECGs

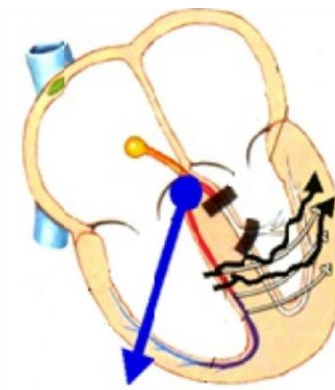
12-Lead Electrocardiogram.



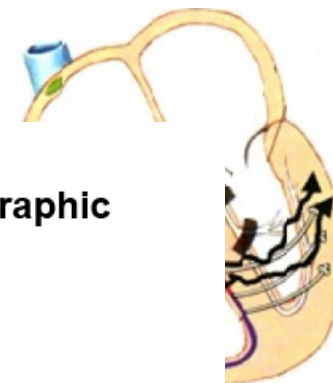
- Patients with new LBBB and AMI are at an increased risk for a poor outcome and need rapid reperfusion therapy.
- The new development of LBBB in the setting of AMI suggests proximal occlusion of the left anterior descending artery and places a significant portion of the left ventricle in ischemic jeopardy.
- Unfortunately, patients with LBBB receive fibrinolytic agents less often than those with the more electrocardiographically alarming STEMI.

LBBB-MI

STATISTICAL ANALYSIS



- The proportion of patients with LBBB and acute chest pain having an acute MI in different studies has been between 13 to 32 %.
- As a result, inaccurate diagnosis can lead to both under-treatment and unnecessary overtreatment of patients.
- In one report, for example, thrombolysis was given to only 73% with LBBB and an acute MI and to 48% of patients with LBBB and chest pain but no biochemical evidence of infarction.
- In addition to difficulties in ECG interpretation, approximately one-half of patients with LBBB and an acute MI do not have chest pain .
- These patients are much less likely to receive appropriate medical therapy (eg, aspirin, beta blockers) or reperfusion therapy than LBBB patients with chest pain.



J Accid Emerg Med. 1999 Sep;16(5):331-5.

Suspected myocardial infarction and left bundle branch block: electrocardiographic indicators of acute ischaemia.

Edhouse JA¹, Sakr M, Angus J, Morris FP.

+ Author information

Abstract

OBJECTIVES: To examine the use of thrombolytic treatment in patients with suspected acute myocardial infarction (AMI) and left bundle branch block (LBBB). To evaluate electrocardiographic criteria for the identification of AMI in the presence of LBBB, and examine the implications of using these criteria in the clinical setting.

METHODS: A retrospective study over two years, based in two Sheffield teaching hospitals. Patients presenting with LBBB and suspected AMI were studied by analysis of an AMI database. The proportion of patients with LBBB and AMI receiving thrombolysis, and the in-hospital delay before the start of treatment, were used as indicators of current performance. Three predictive criteria were applied to the electrocardiograms (ECGs) retrospectively, and their ability to identify acute ischaemic change assessed. The implications of using the predictive criteria in the clinical setting were explored.

RESULT: Twenty three per cent (5/22) of patients with LBBB and AMI did not receive thrombolysis, in the absence of documented contraindications. The mean in-hospital treatment delay for thrombolysed patients was 154 minutes. Forty eight per cent (16/33) of those thrombolysed did not have a final clinical diagnosis of AMI. In the majority of cases (8/12), the decision not to administer thrombolysis was based on a single ECG recording. The presence of any of the predictive electrocardiographic criteria was associated with a diagnosis of AMI, with a sensitivity of 0.79 (95% confidence interval 0.63 to 0.95), specificity 1, positive predictive value 1, and negative predictive value 0.79. The kappa scores between four independent observers showed either substantial or near perfect agreement.

CONCLUSION: Currently, thrombolytic treatment is under-utilised in patients with LBBB and AMI, and those who are thrombolysed endure lengthy delays before treatment. Patients with any of the predictive criteria should be thrombolysed immediately. When the diagnosis is in doubt, serial ECGs may demonstrate evolving ischaemic change.



Emerg Med J. 2005 Sep;22(9):617-20.

Simplifying thrombolysis decisions in patients with left bundle branch block.

Reuben AD¹, Mann CJ.

+ Author information

Erratum in

Emerg Med J. 2006 Feb;23(2):163.

Emerg Med J. 2005 Nov;22(11):836.

Abstract

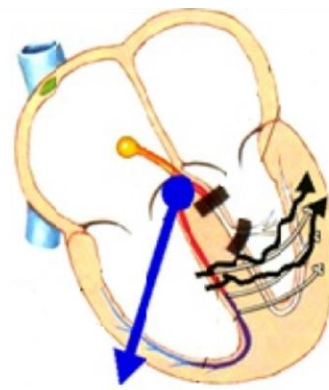
OBJECTIVES: To redesign and simplify an existing decision algorithm for the management of patients who present to the emergency department with chest pain and left bundle branch block (LBBB) based on the Sgarbossa criteria. To compare its reliability with the current algorithm.

METHODS: A simplified algorithm was created and tested against the existing algorithm. Electrocardiograms (ECGs) of patients with LBBB were presented to 10 emergency department doctors with both old and new algorithms a week apart. Six ECGs displayed the relevant criteria for thrombolysis and had proven acute myocardial infarction (AMI) based on a gold standard of enzyme measurements. Subjects were asked whether or not they would thrombolysed a patient presenting with the given ECG using each of the algorithms as a guide.

RESULTS: The new algorithm has demonstrated improvements in terms of an increase in appropriate thrombolysis and a reduction in inappropriate thrombolysis. Specificity for AMI rose from 0.85 to 0.99 and sensitivity from 0.38 to 0.6. kappa score showed greater agreement with the gold standard.

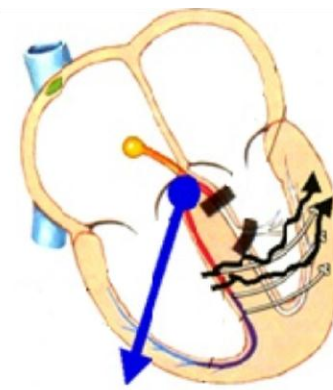
CONCLUSION: Patients with AMI and LBBB have a significantly poorer outcome than those without LBBB. Despite this, thrombolysis is less likely to be given to patients with AMI and LBBB. This study demonstrates that in part this is because of cognitive difficulties using the current algorithm. The proposed proforma addresses these issues and provides a simple tool to aid appropriate treatment in this group of patients.

Issues:



1. The impact of LBBB on the diagnosis of acute MI; and
2. The effect on diagnosis of a prior MI.
 - There are issues that vary with the site of the infarct and there are changes that are independent of the site of the infarct, such as the ST-T changes that can occur.
 - Because of these difficulties, careful attention to the strength of the clinical history and confirmation of the diagnosis of an acute MI by cardiac enzyme elevations is essential.

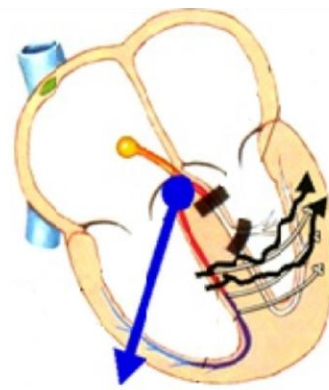
Sgarbossa criteria



- A large trial of thrombolytic therapy for acute MI (GUSTO-1) provided an opportunity to revisit the issue of the electrocardiographic diagnosis of evolving acute MI in the presence of LBBB .
- Among 26,003 North American patients who had a MI confirmed by enzyme studies, 131 (0.5%) had LBBB.
- A scoring system, often called the Sgarbossa criteria, was developed from the coefficients assigned by a logistic model for each independent criterion, on a scale of 0 to 5.

Sgarbossa EB, et al: Electrocardiographic diagnosis of evolving acute myocardial infarction in the presence of left bundle-branch block: GUSTO-1 (Global Utilization of Streptokinase and Tissue Plasminogen Activator for Occluded Coronary Arteries) Investigators. N Engl J Med 1996

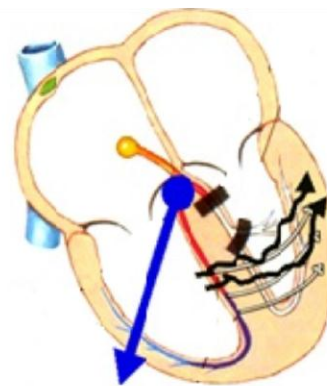
SGARBOSSA CRITERIA



Used in case of a LBBB and suspicion of AMI are:

- ST elevation $> 1\text{mm}$ in leads with a positive QRS complex(V5-V6) (score 5)
- ST depression $> 1\text{ mm}$ in V1-V3 (score 3)
- ST elevation $> 5\text{ mm}$ in leads with a negative QRS complex(V1-V3) (score 2).

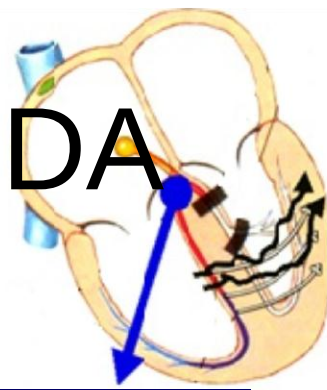
At a score-sum of 3, these criteria have a specificity of 90% for detecting a myocardial infarction.



Sgarbossa et al.'s (1996) clinical prediction tool (adapted)

Criterion	Score
ST segment elevation >1 mm which is concordant with the QRS complex	5
ST segment depression >1 mm in V_1 , V_2 or V_3 leads	3
ST segment elevation >5 mm which is discordant with the QRS complex	2

CONCORDANCE/DISCORDANCE



□ Refers to whether the last portion of the QRS complex goes in the same or different direction as the T wave

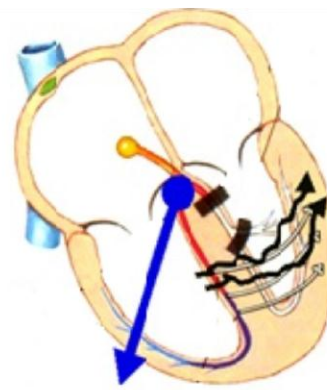
□ Discordance=good=secondary



□ Concordance=bad=primary



LBBB in V₁



Left BBB in V₁



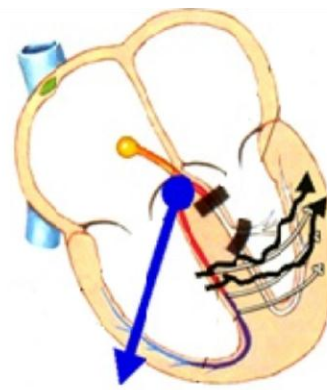
Secondary (normal, discordant)
ST-T Wave changes

Left BBB in V₁



Primary Ischemic (concordant)
ST-T Wave Changes

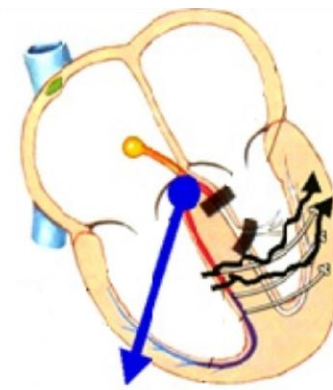
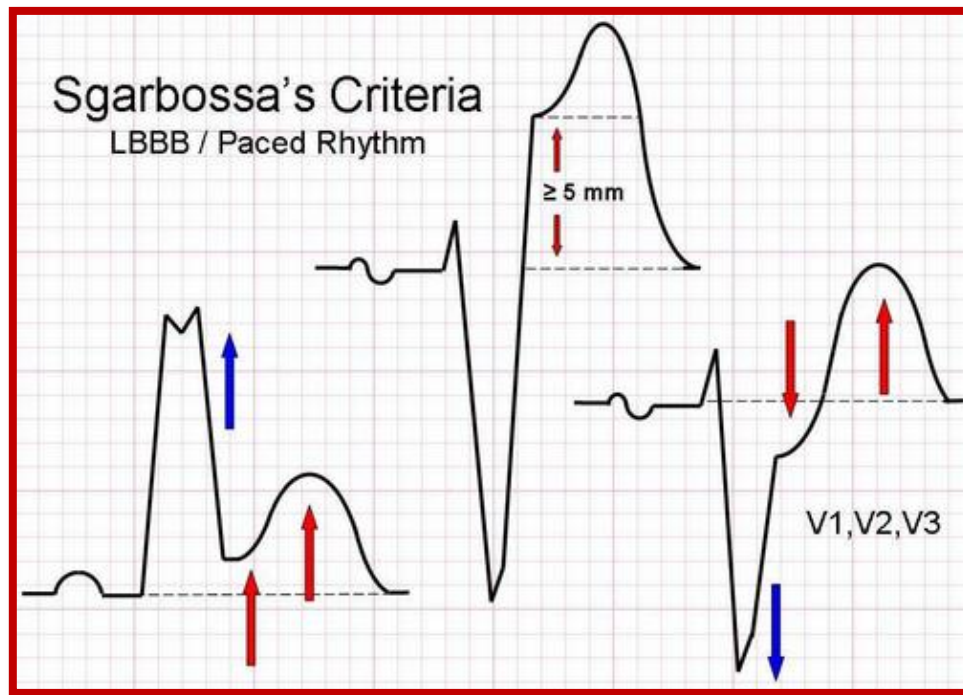
LBBB-V6



Secondary (normal, discordant)
ST-T Wave changes

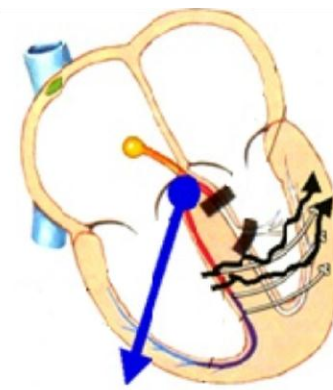


Primary Infarction (concordant)
ST-T Wave Changes

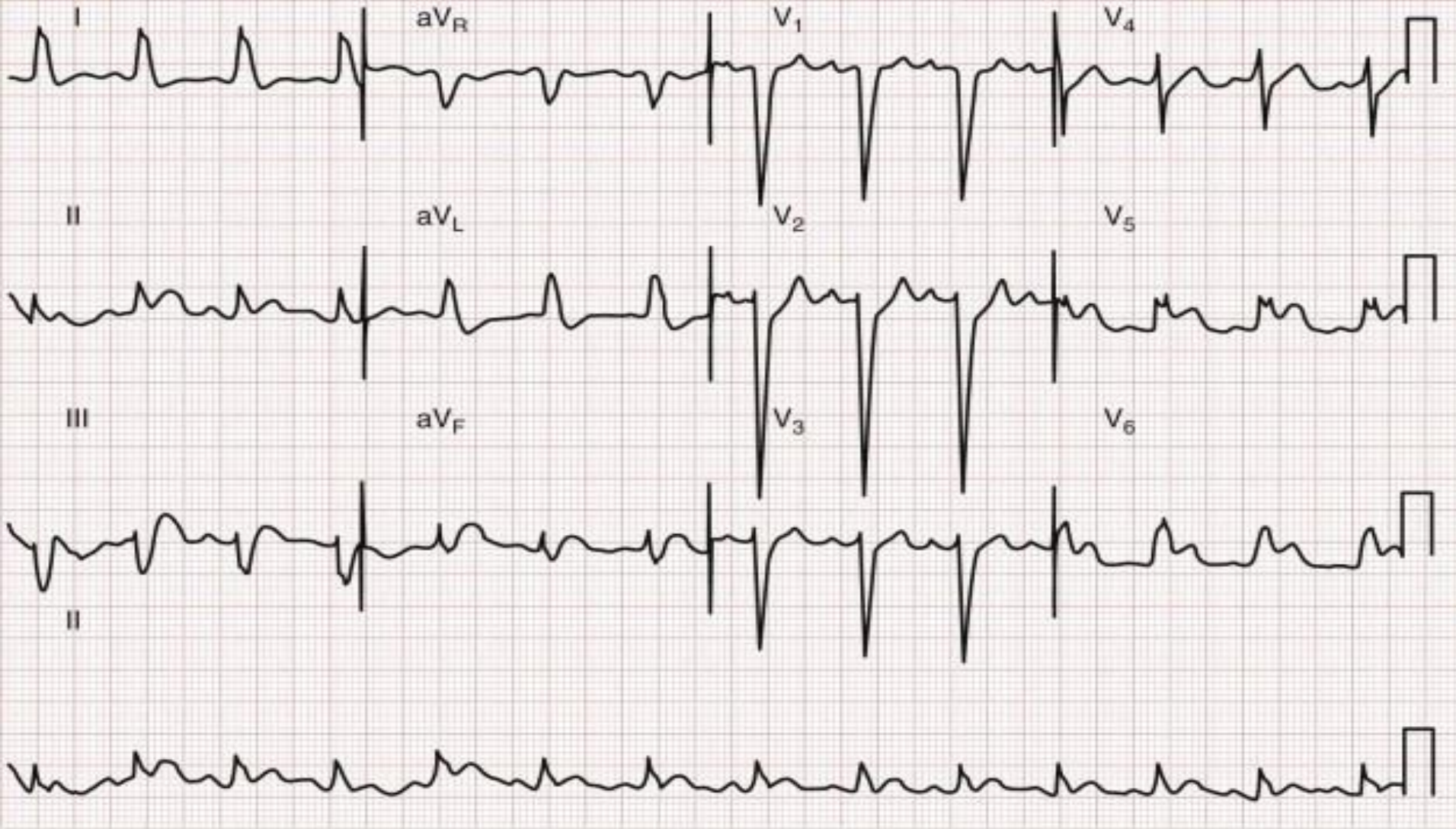


- ☐ 5 points for concordant 1 mm ST elevation. (any lead)
- ☐ 3 points for concordant 1 mm ST depression in v1 to v3
- ☐ 2 points for discordant 5 mm ST elevation. (any lead)

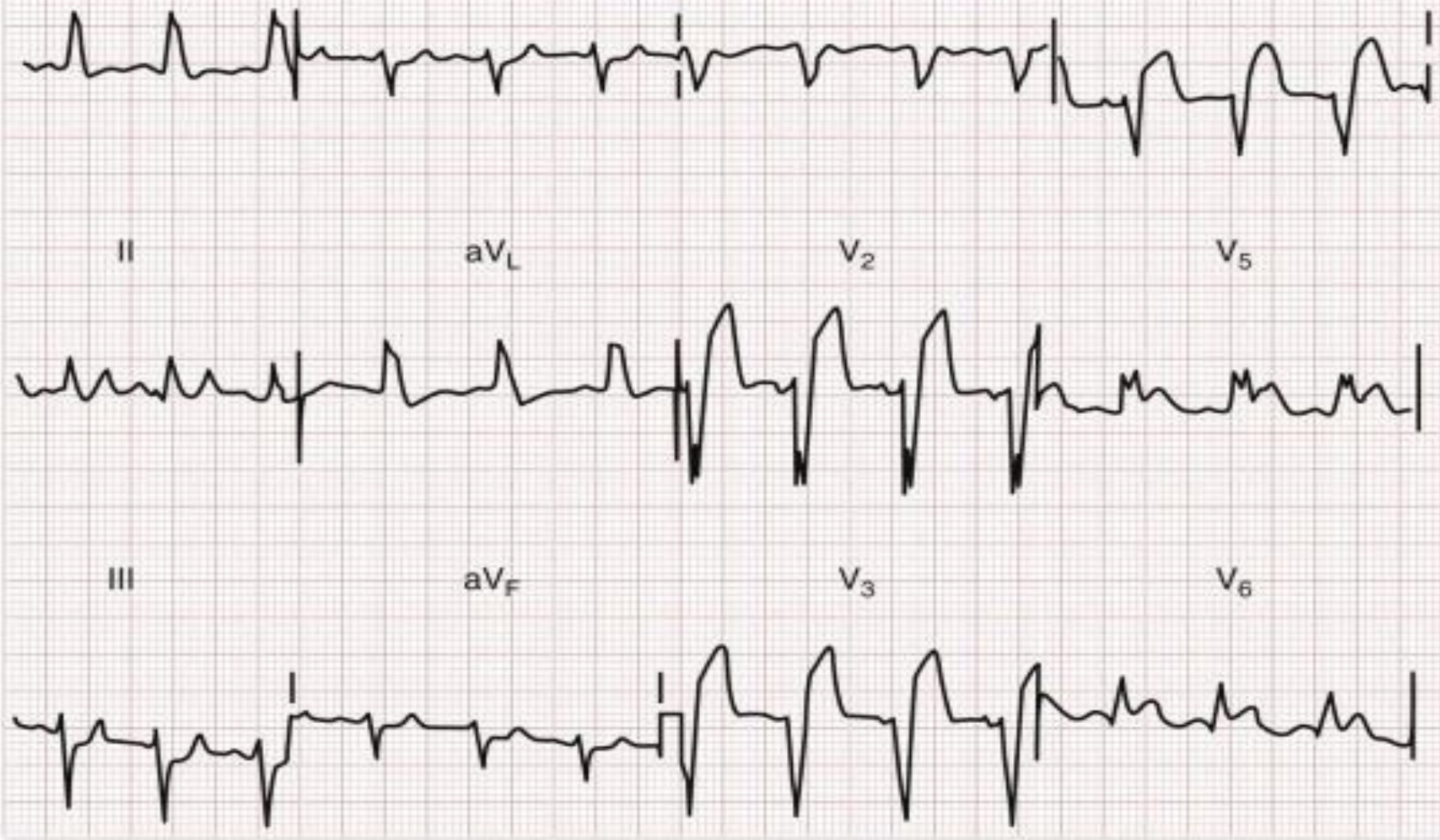
A minimal score of 3 was required for a specificity of 90%



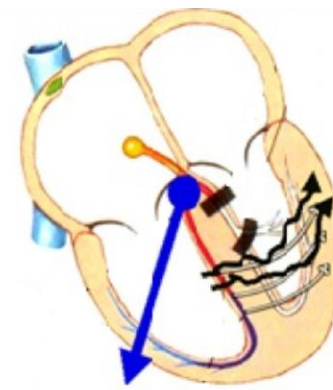
- A Sgarbossa score of ≥ 3 was highly specific (ie, few false positives) but much less sensitive (36%) in the validation sample in the original report .
- Similar findings were noted in a subsequent meta-analysis of 10 studies of 1614 patients in which a Sgarbossa score of ≥ 3 had a sensitivity of 20% and a specificity of 98%.
- The sensitivity may increase if serial or previous ECGs are available.
- In addition to their utility in diagnosis, the Sgarbossa criteria may also predict prognosis in patients with acute MI.



- Using the Sgarbossa criteria, there is strong evidence of AMI because of the concordant ST segment elevation greater than 1 mm in leads II, V5, and V6 ; also suggestive is the ST segment depression seen in V2

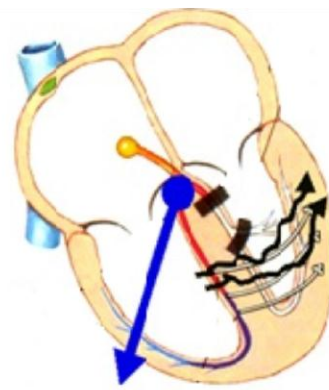


- Applying the Sgarbossa criteria to this tracing with underlying LBBB, AMI is strongly suggested.
- There is concordant ST segment elevation in leads V5 and V6 that appears to exceed 1 mm; furthermore, there is excessively discordant ST segment elevation in leads V2 and V3, greater than 5 mm.

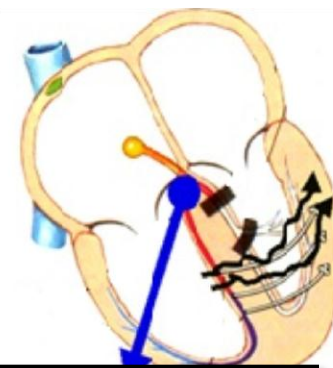


- Recent findings from the ASSENT 2 and 3 trials validated the utility of Sgarbossa's tool for diagnosing AMI in the presence of LBBB (Al-Faleh et al., 2006).
- This tool may be utilized in an emergency setting and will enable this diagnostically challenging group of patients to be '**ruled in**' rather than '**ruled out**' for treatment

Attempts to improve ECG diagnosis



- Several studies have systematically evaluated the value of different ECG findings of acute MI in LBBB.
- An analysis by Wackers correlated ECG changes in LBBB with localization of the infarct by thallium scintigraphy .
- The most useful ECG criteria were:
 - Serial ECG changes — 67% sensitivity
 - ST segment elevation — 54% sensitivity
 - Abnormal Q waves — 31% sensitivity
 - Initial positivity in V1 with a Q wave in V6 — 20% sensitivity but 100% specificity for anteroseptal MI
 - Cabrera's sign — 27% sensitivity overall, 47% for anteroseptal MI



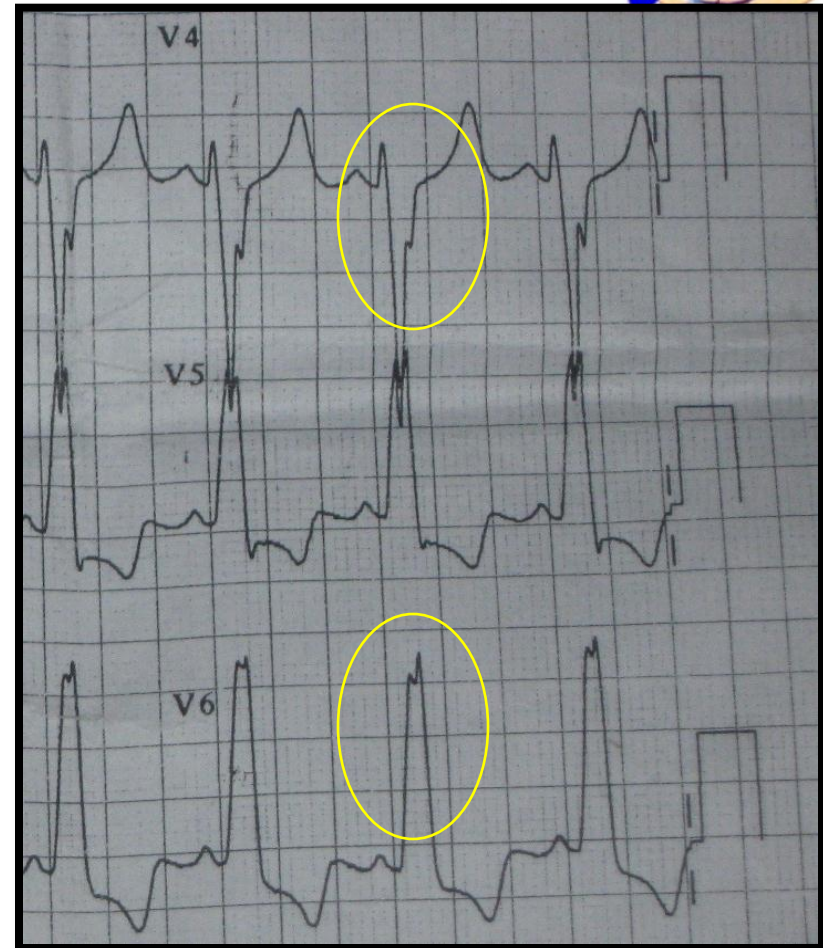
- **Cabrera sign**

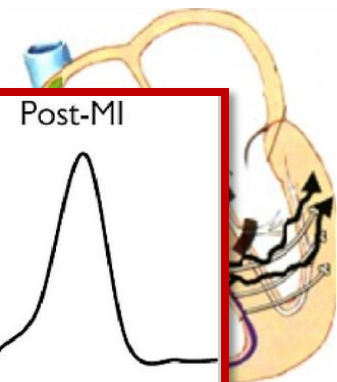
Prominent (>0.05 sec) notching in the ascending limb of the S wave in leads V3 –V5

- **Chapman sign**

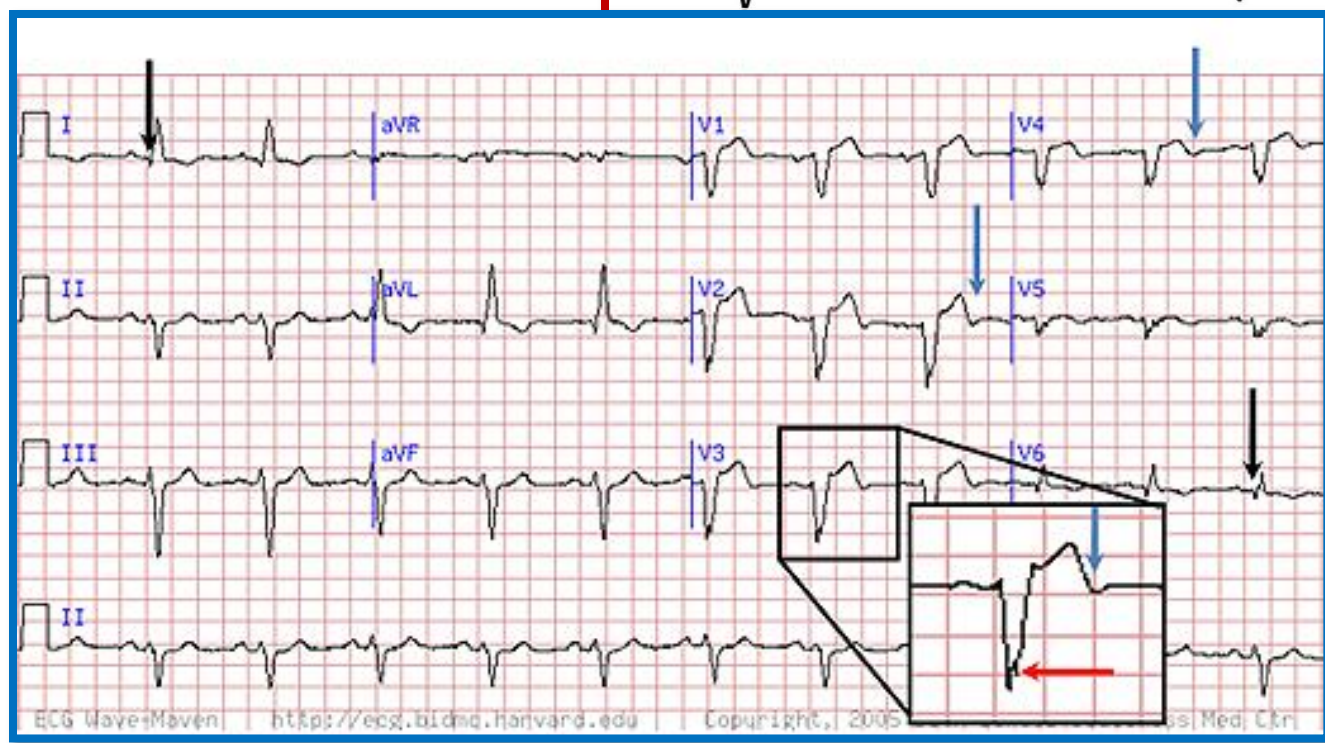
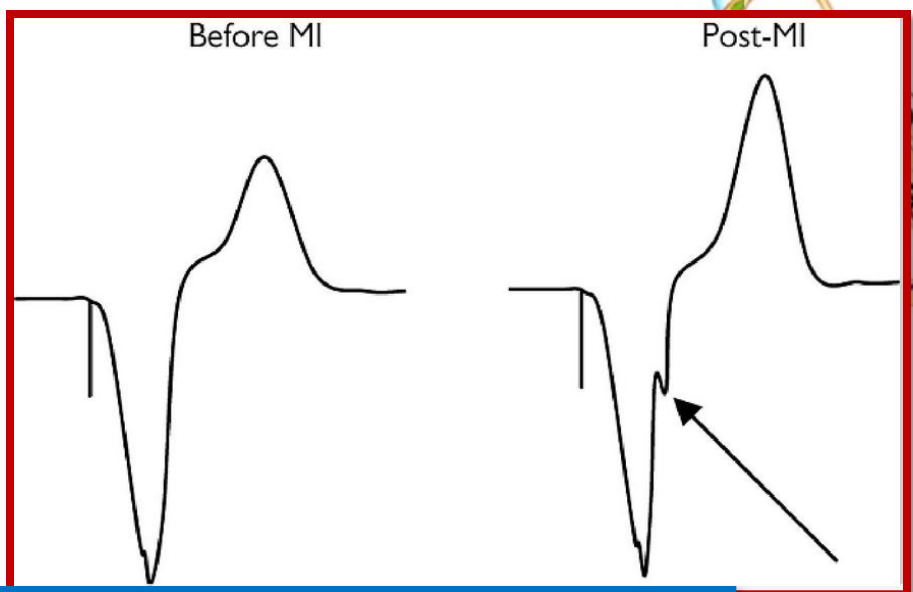
Prominent notching (≥ 0.05 sec) of the ascending limb of the R wave in lead V5 or V6

- These signs have a specificity that approaches 90 percent.



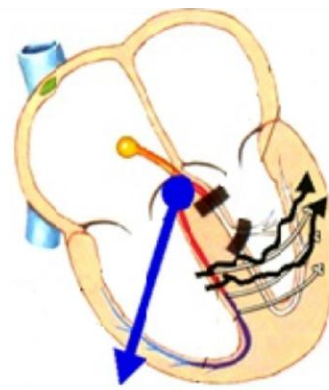


- **Cabrera's sign** refers to prominent (0.05 sec) notching in the ascending limb of the S wave in leads V3 and V4;

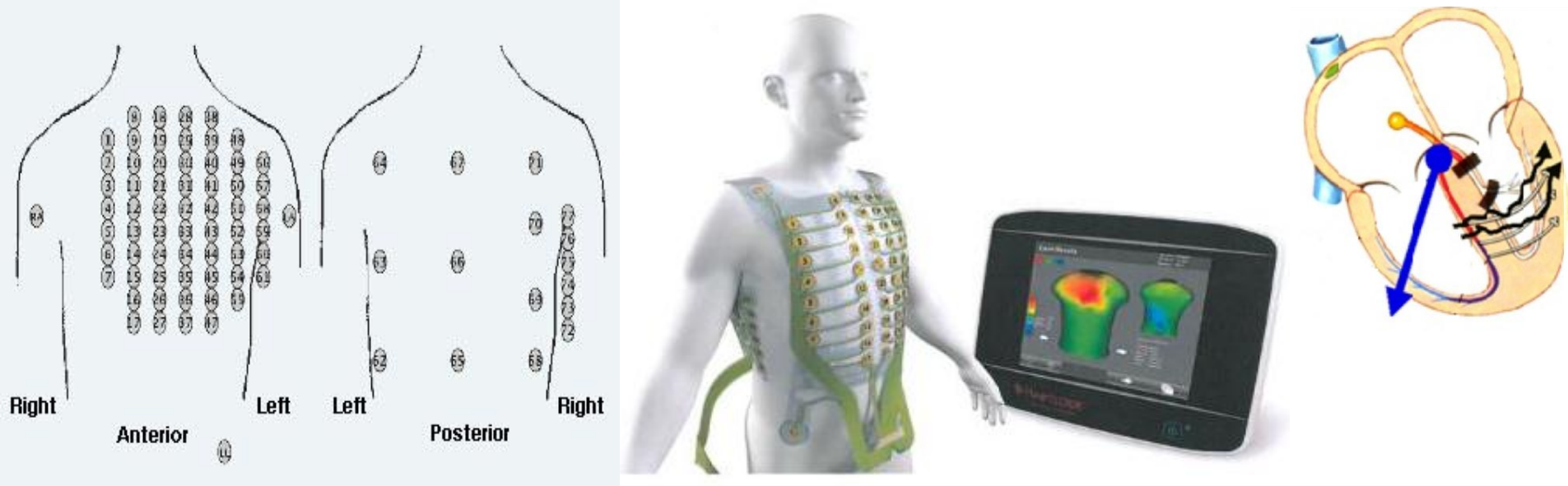


Chapman's sign- prominent notching of the ascending limb of the R wave in lead V5 or V6

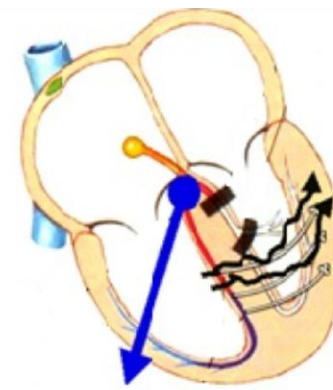




- These signs have a specificity that approaches 90%.
- However, there may be a high degree of interobserver variability in accurate identification and their sensitivity is quite low.



- In the Optimal Cardiovascular Diagnostic Evaluation Enabling Faster Treatment of Myocardial Infarction (OCCULT MI) trial, the 80-lead ECG provided an incremental 27.5% increase in STEMI detection as compared with the 12-lead ECG.



Reuben and Mann's (2005) algorithm (adapted)

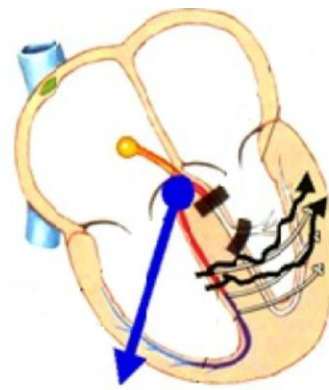
Patient with chest pain and LBBB and any of the following criteria

1. ST segment elevation >1 mm in leads where the QRS complex is predominantly positive
2. ST segment elevation >5 mm in leads where the QRS complex is predominantly negative (usually leads V_1 – V_3 in LBBB)
3. ST segment depression >1 mm in leads V_1 , V_2 or V_3

♥Thrombolyse if there are no contraindications

- simplify Sgarbossa criteria,
 - removing reference to concordancy and discordancy of the ST segment and
 - avoiding the scoring system

Summary



- A new LBBB, together with a clinical impression of AMI, remains an indication for fibrinolytic therapy or PCI.
- The Sgarbossa criteria have high specificity but low sensitivity ; thus, their presence is highly suggestive of acute infarction but their absence has little value.
- Sgarbossa criteria provide a tool to identify AMI in this group of high-risk patients
- Reuben and Mann's simplified interpretation of these criteria may enable practitioners to make therapeutic decisions in a more timely fashion.



THANK you!!