Letter to Editor
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Electrocardiographic Criteria for Diagnosis of Acute Myocardial Infarction in Patients with Left Bundle Branch Block

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Abstract

In patients with normal heart and normal conduction system, the initial depolarized segment is interventricular septum which start with septal fascicle of the left bundle branch from left side and direction to right side, after that depolarization of the right and left ventricles free wall at the same time developed so that result of a narrow QRS complex(the duration of QRS less than 120 milliseconds).

In patients with left bundle branch is blocked, the initial septal activation is changing direction and become from right to left then the left ventricular activation is delayed becuase of the right ventricle will depolarize first and the left ventricle will depolarize after the right ventricle depolarization and resuts a wide QRS. Additionally, ST segment and T wave abnormalities occur, and septal Q waves indicative of an MI are absent in this condition. About 0.5 percent of patients with acute myocardial infarction had left bundle-branch block.

Because this changes the patients with left bundle branch block (LBBB) and acute myocardial infarction (MI) is challenge to the clinician. The diagnosis of MI with electrocardiogram (ECG) is so difficult in the setting of LBBB because of the characteristic ECG changes caused by altered interventricular septal and left ventricle free wall depolarization. Here we review the ECG diagnostic criteria included all criteria until now and short summary of patient with acute MI and LBBB condition.

Keywords: AMI, LBBB, ECG

Definition of Left bundle branch block (LBBB);

New criteria of LBBB suggested measurement a time to notch more than 75 milliseconds in lead I. additionally to the modern American College of Cardiology (ACC)/American Heart Association (AHA)/Heart Rhythm Society (HRS) ECG criteria for LBBB (1)

- QRS duration ≥120 milliseconds
- A broad notched or slurred R wave in leads I, avl, V5, and V6
- Absence of Q waves in leads I, V5, and V6
- R-wave peak time >60 milliseconds in leads V5 and V6
- ST and T waves usually opposite in direction to the QRS complex).
- A QS or rs pattern in leads V1 and V2
- Mid-QRS notching or slurring in ≥2 of leads I, avl, V1, V2, V5, and V6
- ***The measurement a time to notch more than 75 milliseconds in lead I****. Time to notch is measured as the time from QRS onset to the nadir of the notch or midpoint of a slur. If multiple notches or slurs are present in the QRS complex, the latest one is used. Figure 1*

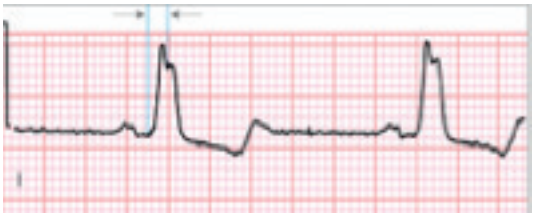

Figure 1: The measurement shown demonstrates a time to notch of approximately 90 milliseconds in lead I.

Diagnostic criteria of myocardial infarction in patient with LBBB.

The Sgarbossa criteria (2)

The Sgarbossa criteria is the most oldest criteria for the diagnosis of MI in the presence of LBBB. The Sgarbossa criteria were first introduced in 1996 to improve the diagnostic accuracy for acute MI in the presence of LBBB. The confirm diagnosis of MI must be need at least 3 or more points from the following criteria. Figure 2

1. ST-elevation of ≥1 mm and concordant with the QRS complex (5 points)

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2. ST-segment depression ≥1 mm in lead V1-3 (3 points)
3. ST elevation ≥5 mm and discordant with the QRS complex (2 points)

The specificity of 98%, but poorer sensitivity of 20%. The third criteria have only 2 point so that no add any significant value as it alone does not confirm diagnosis of acute myocardial infarction.

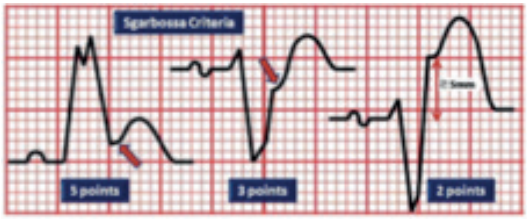

Figure 2: Sgarbossa criteria for myocardial infarction

Modified Sgarbossa (Smith-Sgarbossa) Criteria (3)

Because of the third criteria of Sagarbossa have only 2 point and does not confirm diagnosis of acute myocardial infarction. The modified Sgarbossa criteria was used to modified and support the third criteria by calculation the ratio of ST segment elevation to the depth S wave. The discordant ST/S ratio ≥ 0.25 mm in any lead suggested acute MI. Figure 3

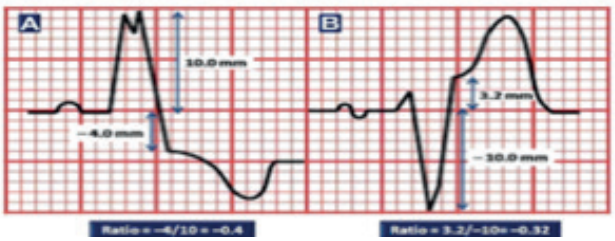

Figure 3: Modified Sgarbossa Criteria for myocardial infarction

The Barcelona Criteria (4)

Barcelona Criteria contains of 3 criteria, As with the prior Sgarbossa criteria , criteria 1 is the same. Criteria 2 is expanded to all leads (but in Sgarbossa just in V1-3). Criteria 3 is specific for the Barcelona criteria and suggested that discordance deviation of ≥ 1mm in any lead with a dominant R or S wave ≤ 6 mm.

A. ST deviation ≥1 mm concordant with QRS complex in any lead;

1. Concordant with QRS complex and ST depression ≥1 mm
2. Concordant with QRS complex and ST elevation ≥1 mm

B. Discordant ST deviation ≥ 1mm with QRS complex in any lead where the R or S is ≤ 6 mm.

For example, III AND aVL leads ST depression ≥1 mm discordant with QRS complex, and (S) wave voltage ≤ 6 mm. And aVR ST elevation ≥1 mm discordant with QRS complex, and (R) wave voltage ≤ 6 mm. figure 4

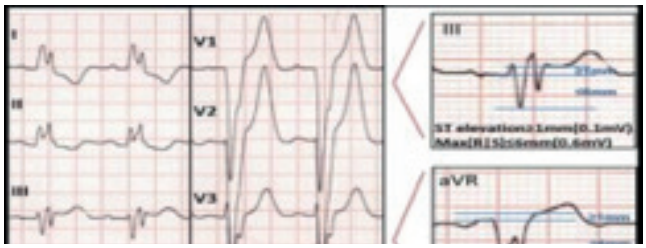

Figure 4: III AND aVL leads ST depression ≥1 mm discordant with QRS complex, and (S) wave voltage ≤ 6 mm. And aVR ST elevation ≥1 mm discordant with QRS complex, and (R) wave voltage ≤ 6 mm.

Summary of electrocardiographic criteria;

This is simple 6 steps for diagnosis patient with LBBB and suspected acute MI. Figure 4

1. Confirm diagnosis of LBBB. If yes go to 2nd step
2. Calculate ST segment deviation ≥ 1 mm in any lead If yes go to 3nd step
3. Concordant or Discordant with QRS complex?
4. If concordant and ≥ 1 mm ST segment deviation in any lead; **Acute MI**
5. If discordant in any lead with R or S is ≤ 6 mm; **Acute MI**
6. If discordant in any lead with R or S is ≥ 6 mm; calculate the ratio of ST segment elevation to the depth S wave. If ≥ 25%; **Acute MI**

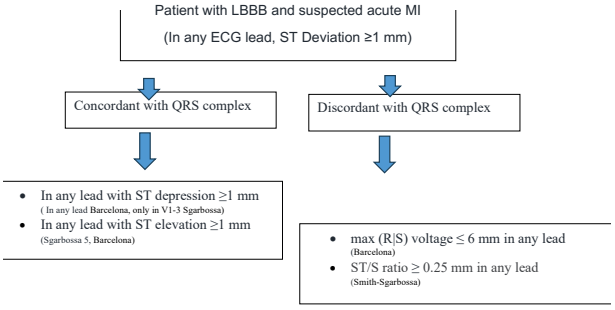

Figure 5: Summary of electrocardiographic criteria; ECG; Electrocardiogram, MI; myocardial infraction

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