

## CASE REPORT

# Sgarbossa Criteria in Left Bundle Branch Block in a Hypertensive Emergency, a Case Report

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### Abstract

Left bundle branch block and hypertensive emergency are very common conditions in clinical cardiovascular and emergency practice. Hypertensive emergency encompasses a spectrum of clinical presentations in which uncontrolled blood pressure leads to progressive end-organ dysfunction. Suspected acute myocardial infarction in the setting of a left bundle branch block presents a unique diagnostic and therapeutic challenge to the clinician. The diagnosis is especially difficult due to electrocardiographic changes caused by altered ventricular depolarization. However, reports on the use of the Sgarbossa's criteria during the management of hypertensive emergency are rare. My current case is a hypertensive emergency patient with acute chest pain and left bundle branch block. Sgarbossa's criteria were initially very weak and, over time, became highly suggestive of acute ST-segment elevation myocardial infarction. Interestingly, chest pain increased as the Sgarbossa's diagnostic criteria were met. Here, we present a case of developing ST-segment elevation myocardial infarction with left bundle branch block that is indicating for thrombolytic therapy. Thrombolytic therapy was strongly indicated because of a higher developing of Sgarbossa criteria scoring. Thus, the higher Sgarbossa criteria scoring in the case was the only indication for thrombolytic. Therefore, how did Sgarbossa criteria

developing during the course of the case to indicating the need for thrombolytic therapy?

### Introduction

Diagnosis of ST-segment elevation myocardial infarction (STEMI) in the setting of a left bundle branch block (LBBB) is difficult.<sup>1</sup> Timely and accurate identification of acute coronary occlusion in the presence of ischemic symptoms is critical for urgent angiography and appropriate reperfusion therapy.<sup>1</sup> Although ST elevation on the ECG is the primary indication for emergency reperfusion therapy,<sup>1</sup> identification of STEMI in the setting of left bundle branch block remains challenging.<sup>1</sup> LBBB is a major confounder for STEMI diagnosis using ECG.<sup>2</sup> Sgarbossa et al.,<sup>2</sup> introduced ECG criteria for detecting STEMI in the presence of LBBB. The criteria are based on concordant ST-segment elevation, discordant ST elevation and anterior ST depression in leads V1-V3, with points assigned for each criterion.<sup>2</sup> In terms of the specificity of the criteria, discordant ST-elevation criterion has been shown to be less useful than the other two criteria.<sup>2</sup> A Sgarbossa score  $\geq 3$  has been the most commonly used by researchers.<sup>2</sup> Sgarbossa et al. proposed a score of  $> 3$  points in the following criteria for the diagnosis of acute myocardial infarction in the presence of LBBB: (1) concordant ST-segment elevation of 1 mm (0.1 mV) in at least 1 lead (5 points), (2) concordant ST-segment depression of at least 1 mm in leads V1 to V3 (3 points), or (3) excessively discordant ST-segment elevation, defined as greater than or equal to 5 mm of ST-segment elevation when the QRS result is negative (2 points)<sup>3</sup> (Table 1).

A modified Sgarbossa rule<sup>4</sup> has been suggested for the diagnosis of acute myocardial infarction in the presence of LBBB. In this rule, the replacement of the third Sgarbossa

### Keywords

Bundle-Branch Block/ complications; Coronary Occlusion/ complications; Electrocardiography; Emergency Service Hospital; ST Elevation Myocardial Infarction/ complications.

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component (excessively discordant ST-segment elevation as defined by 5 mm of ST-segment elevation in the setting of a negative QRS) with one defined proportionally by ST-segment elevation to S-wave depth (ST/S ratio) was proposed to have better diagnostic utility for STEMI equivalent<sup>1</sup> (Table 1).

Hypertension is an extremely common problem, that affects one billion individuals worldwide,<sup>5</sup> and is responsible for an average 7.1 million deaths annually.<sup>6</sup> Arterial hypertension is the main independent risk factor for the development of cardiovascular disease and cardiovascular mortality in developed and developing countries.<sup>6</sup> Approximately 1% of these patients will develop acute elevations in blood pressure (BP) at some point in their lifetime.<sup>5</sup> Zampaglione et al.,<sup>7</sup> assessed the prevalence of hypertensive crises in an ED for 12 months in Turin, Italy.

An Italian study performed in 1992 showed that hypertensive crises (76% urgencies and 24% emergencies) represented 3% of all the patient visits, but 27% of all medical emergencies.<sup>8</sup> Hypertensive crisis is defined as levels of systolic BP > 180 mmHg and/or levels of diastolic BP > 120 mmHg.<sup>6</sup> Depending on whether there is damage to vital organs or not, we can distinguish between hypertensive emergency and hypertensive urgency.<sup>6</sup> Hypertensive emergencies occur in up to 2% of patients with systemic hypertension.<sup>8</sup> Hypertensive emergencies are life-threatening conditions because their outcome is complicated by acute damage to vital organs, and can be presented with neurological, renal, cardiovascular, microangiopathic and obstetric complications.<sup>6</sup> Hypertensive emergencies include hypertensive encephalopathy, left ventricular relaxation

associated with acute myocardial infarction or unstable angina, aortic dissection, subarachnoid hemorrhage, ischemic stroke, and severe pre-eclampsia or eclampsia.<sup>6</sup> Hypertensive urgency is a situation with a severe increase in BP without progressive dysfunction of vital organs. The most common symptoms are headache, dyspnea, nausea, vomiting, epistaxis, and pronounced anxiety.<sup>6</sup>

As therapeutic approach, an immediate BP reduction is required only in patients with acute end-organ damage.<sup>5</sup> Nitroglycerin as a potent venodilator that reduces BP by decreasing preload and cardiac output, and therefore is not acceptable as the first choice for hypertensive emergencies except in patients with acute coronary ischemia.<sup>9</sup>

## Case Report

A 53-year-old married heavy-smoker Egyptian male worker presented to the emergency department with acute chest pain, palpitations, rapid breathing, and dizziness. The patient had a recent history of psycho-familial problems. Chest pain had anginal characteristics. The patient used furosemide (40 mg once daily) and captopril (25 mg twice daily) for previous episodes of chest pain and hypertension, respectively. The patient denied any other relevant diseases. Upon examination, the patient appeared irritable, sweaty, anxious, and tachypneic. His vital signs were as follows: BP: 240/140 mmHg, heart rate: 100/minute, body temperature: 36.2°C, respiratory rate: 36/min, initial pulse oximetry: 92%. The patient was admitted to the intensive care unit (ICU) and initially managed with O<sub>2</sub> inhalation using a nasal cannula at a rate of 5 L/min and sublingual isosorbide dinitrate tablet

**Table 1 - The original and the modified Sgarbossa's criteria**

Criteria	Description	Score points	Notes
Sgarbossa A	Concordant ST elevation > 1 mm (0.1 mV) in at least 1 lead, in leads with positive QRS	5	
Sgarbossa B	Concordant ST depression ≥ 1mm in V1 - V3	3	
Sgarbossa C	Discordant ST elevation ≥ 5mm , in leads with negative QRS	2	
Modified Sgarbossa C (Smith criteria)	Discordant ST elevation and ST/S ratio ≤ 0.25 [1,3]		Modified Sgarbossa criteria: superior to original Sgarbossa criteria For Dx ACO in LBBB [4]

*Dx: diagnosing, ACO: acute coronary occlusion, LBBB: left bundle branch block.*

(4 mg). The initial emergency ECG tracing showed sinus tachycardia (VR;180 bpm) with LBBB (Figure 1). Of the Sgarbossa criteria, the only ECG finding was discordant ST elevation > 5 mm. Intravenous nitroglycerin (5 µg/min with intermittent titration) and sublingual captopril tablet (25 mg) were given. Serial ECG tracings were taken, with no significant changes within 12 minutes of the first ECG tracing (Figure 2 B). STEMI appeared in high lateral leads (I, aVL) with ST-segment depression in inferior leads (II, III, aVF) (Figure 2 C). Sgarbossa score was 7. Interestingly, chest pain got worse as the other Sgarbossa criteria were met, suggesting the presence of a severe underlying disease. BP was controlled within three hours of admission (140/85 mmHg), after administration of aspirin (four tablets, 75 mg), clopidogrel (four tablets, 75 mg), intravenous streptokinase (1.5 million units over 60 minutes). ECGs were performed within five hours of the first ECG tracing and within two hours of streptokinase infusion. Sgarbossa criteria returned to the initial score (2) (Figure 2 D). Troponin test was positive, and RBS was 223 mg/dl on admission. An echocardiography then revealed anterolateral hypokinesia with ejection fraction of 63%. Unfortunately, coronary angiography report was not available. No other abnormality was found. The patient became free of symptoms after streptokinase infusion and control of BP. The patient continued on captopril tablet (25 mg twice daily), aspirin tablet (75 mg, once daily), clopidogrel tablet (75 mg, once daily), nitroglycerin retard capsule (2.5 mg twice daily), and atorvastatin (40 mg once daily) until discharge on the fifth day.

The main differential diagnoses of the case are non-ST-elevation myocardial infarction and second type myocardial infarction (MI). Type-II MI that is defined as myocardial infarction secondary to ischemia due to either increased oxygen demand or decreased supply.<sup>10</sup> Presence of a higher Sgarbossa score ruled out this possibility.

## Discussion

### Highlights:

- The current case was LBBB with subsequently developed acute ST-segment elevation myocardial infarction that was indicating for thrombolytic therapy.
- Both hypertensive emergency and electrocardiographic LBBB pattern were encompassing the serious consequences in the case.
- Serial ECG tracings were showing a graded developing of Sgarbossa criteria of LBBB that is meeting with the diagnosis of acute myocardial infarction.

Upgrading of Sgarbossa criteria of LBBB had happened throughout the course of the hypertensive emergency.

- Presence of LBBB, angina, positive troponin, and Sgarbossa score of 7 were indications for the presence of acute ST-segment elevation myocardial infarction.
- The only initial electrocardiographic Sgarbossa criteria were discordant ST elevation > 5mm (score 2). This lonely ECG sign is an insufficient indication for a more serious condition.
- A concordant ST elevation > 1mm in leads (I, aVL) with reciprocal ST depression in inferior leads (II, III, aVF) are specified for a high lateral ST-segment elevation myocardial infarction rather than the extensive anterior infarction.
- Resolving of developed Sgarbossa criteria in LBBB to the initial condition after streptokinase infusion and controlling of blood pressure had occurred.
- The novelty in the case study was the marvelous progression of the LBBB to the acute infarction that is an indication for thrombolytic therapy.
- Unfortunately, there were similar cases for comparison in the past literature.

## Conclusion

Resolving of upgrading of Sgarbossa criteria in LBBB to the initial status after streptokinase infusion with controlling of blood pressure will strengthens the role of streptokinase and tight blood pressure control. The current case is considered the first reported case study where up-grading of Sgarbossa criteria for LBBB into acute ST-segment elevation myocardial infarction during the course of hypertensive emergency had happened. Moreover, this case report highlights the importance of adequate and tight controlling for patients of hypertensive emergency with LBBB.

## Author contributions

Conception and design of the research: El Sayed YMH. Acquisition of data: El Sayed YMH. Analysis and interpretation of the data: El Sayed YMH. Statistical analysis: El Sayed YMH. Writing of the manuscript: El Sayed YMH. Critical revision of the manuscript for intellectual content: El Sayed YMH.

### Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

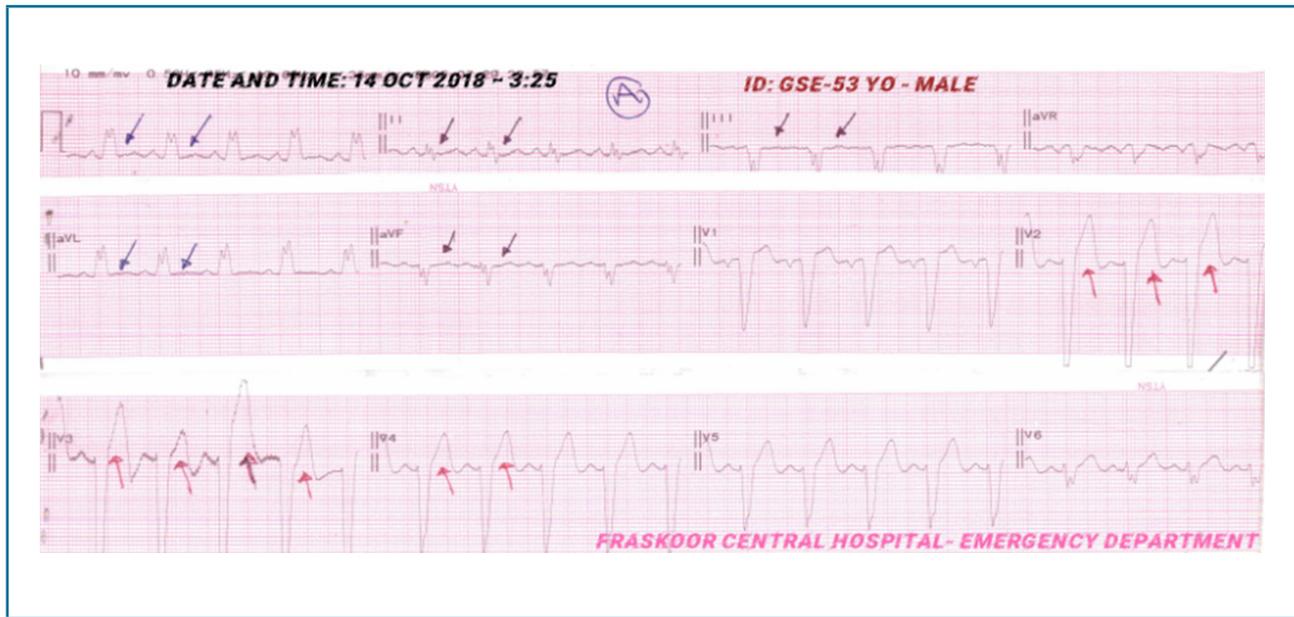


Figure 1A - Electrocardiographic tracing during admission to the emergency room showing sinus tachycardia (VR; 180 bpm) with left bundle branch block. Red arrows indicate discordant ST elevation > 5 mm (V2-4) (one of Sgarbossa criteria), and blue and black arrows indicate no other ST-segment abnormalities.

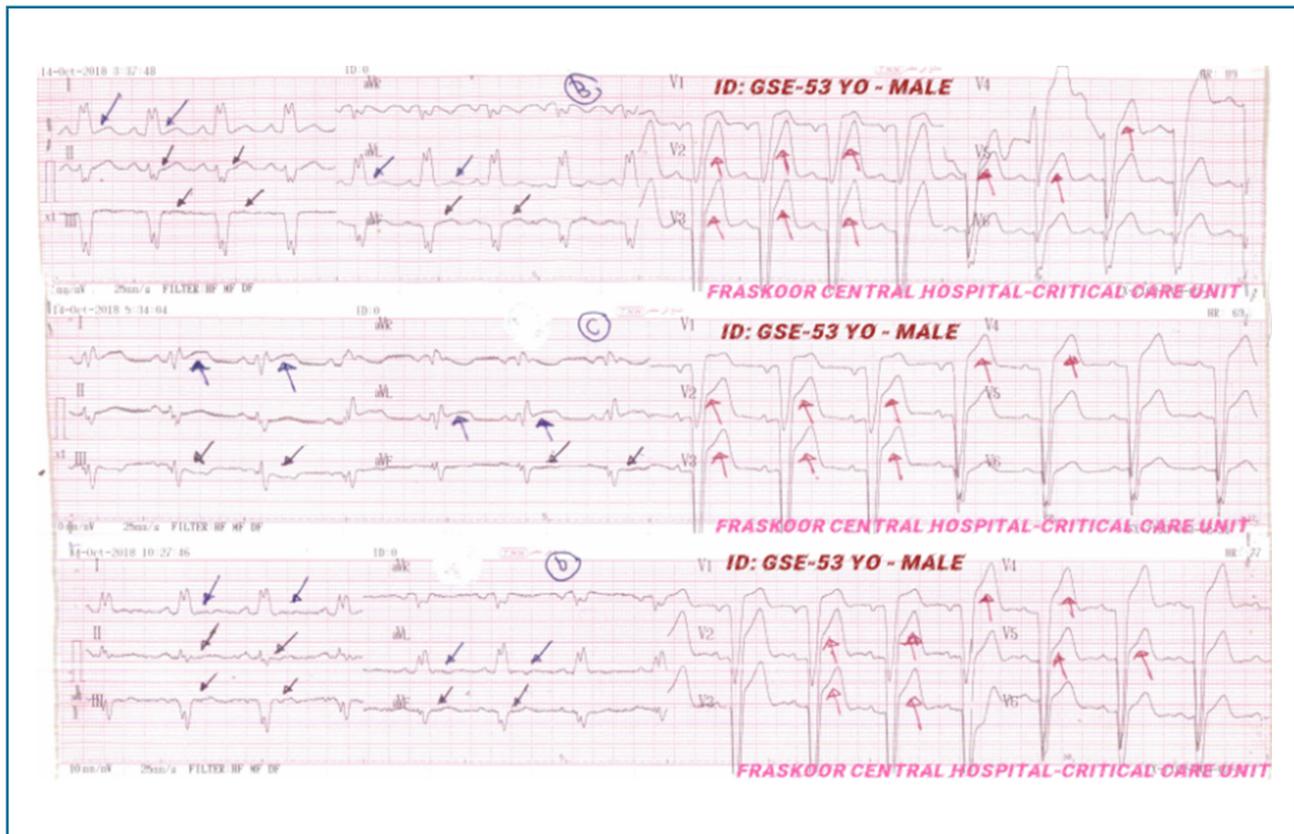


Figure 2 - Initial electrocardiogram (B) performed 12 minutes of admission to the emergency department showing no significant difference compared with A and C; blue arrows indicate concordant ST elevation > 5 mm in high lateral leads (I, aVL), with ST-segment depression in inferior leads (II, III, aVF) (= black arrows). (D) electrocardiogram taken within five hours of the first.

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### Study Association

This study is not associated with any thesis or dissertation work.

### Ethics approval and consent to participate

This study was approved by the Ethics Committee of the Egyptian Ministry of Health (MOH).

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