



Case Report

Acute myocardial infarction in the setting of left bundle branch block: Chapman's sign



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ABSTRACT

Acute myocardial infarction (AMI) diagnosis in patients with pre-existing left bundle branch block (LBBB) can be difficult. Undiagnosed or delayed diagnosis of AMI in these patients can put them at risk of having shock, mechanical complications, and death. We present a case of 77-year-old Caucasian male with a known LBBB and coronary artery bypass surgery for coronary artery disease who presented to the emergency department with a chief complaint of chest pain and shortness of breath. The patient had recurrent chest pain despite using aspirin, nitroglycerine, and morphine. An electrocardiogram (ECG) showed a new notch in the upslope of the R wave in leads I, AVL that indicated a positive Chapman's sign. Troponin levels were initially normal, but serial troponin showed elevated enzyme giving evidence of acute coronary syndrome (ACS). The patient was started on heparin drip and underwent subsequent coronary catheterization. Physicians should be aware of Chapman's sign on ECG in patients presenting with chest pain who have baseline LBBB as it might represent myocardial ischemia and warrant emergent treatment for ACS.

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1. Introduction

The diagnosis of acute myocardial infarction (AMI) can be challenging in the presence of left bundle branch block (LBBB). Emergency medicine physicians are usually the first to evaluate patients presenting with chest pain (CP) in the emergency department (ED). Patients with AMI with either new or existing LBBB have higher morbidity and mortality [1]. Therefore, the correctly interpreting the electrocardiogram (ECG) in these patients is extremely important as it can affect treatment and subsequently the outcomes.

2. Case report

A 77-year-old Caucasian male with a history of coronary artery disease (CAD) and severe aortic valve stenosis status post-coronary artery bypass surgery and aortic valve replacement with bovine pericardial valve complicated by a heart block requiring pacemaker implant, presented to the ED with a chief complaint of CP with shortness of breath.

Abbreviations: ACS, Acute coronary syndrome; AMI, Acute myocardial infarction; CAD, Coronary artery disease; CP, Chest pain; ED, Emergency department; ECG, Electrocardiogram; EMS, Emergency medical service; LBBB, Left bundle branch block.

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The CP started 45 min before calling emergency medical service (EMS) and presenting to the ED. The patient described the pain as sharp, substernal without radiation, constant, at rest, and 10 out of 10 in severity that decreased to 8 out of 10 in severity after EMS gave him aspirin 324 mg and placed a nitroglycerine patch.

Physical exam: The patient was alert, oriented, and in no acute distress except for his chest pain. He had normal vital signs and physical exam except for a well-healed mid-sternal scar due to coronary artery bypass surgery.

ECG: Showed sinus rhythm, left axis deviation, LBBB, prolonged QT/QTc intervals 484/547 ms (Fig. 1).

Repeated troponin every 3 h showed elevation from 0.023 ng/ml upon presentation to the ED to 0.045 ng/ml followed by 0.292 ng/ml. At 6 h interval, he started having pain again that was relieved by sublingual 0.4 mg nitroglycerine twice and one dose of morphine 2 mg. A repeat ECG was obtained and showed a new notch in the upslope of the R wave in leads I, AVL that indicated a positive Chapman's sign (Fig. 2).

Due to elevated troponin, the patient was started on heparin drip for acute coronary syndrome (ACS). Subsequent troponin showed evidence of ACS with an increase up to 1.69 ng/ml. Upon starting the heparin, the patient was free of pain. A repeat ECG showed resolution of the Chapman's sign. He underwent cardiac catheterization that showed well-revascularized coronary disease and likely had a plaque rupture with spontaneous reperfusion. The patient was treated medically with complete resolution of the chest pain.

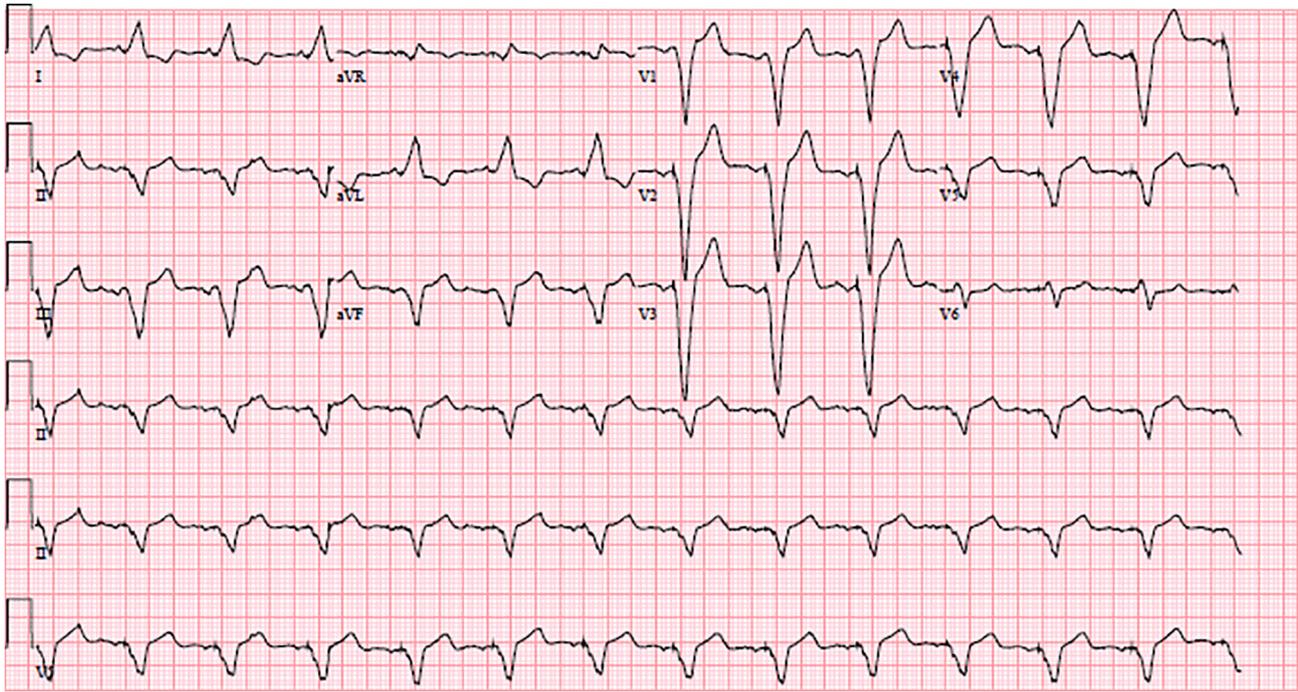


Fig. 1. The patient's 12 lead ECG showed sinus rhythm, left axis deviation, left bundle branch block, prolonged QT/QTc intervals 484/547 ms.

3. Discussion

LBBB is a common finding in ECG and can be found up to 7% of patients with AMI [2]. With LBBB or during ventricular pacing, the diagnosis of AMI is challenging because of the left ventricular activation is delayed; the directional change of septal activation from right to left instead from left to right; and the secondary ST-T wave changes in LBBB. In the current guidelines, LBBB is not always considered an ST segment elevation myocardial infarction (STEMI) equivalent and should not be

used as a sole diagnostic criteria of AMI. It is recommended to use transthoracic echocardiogram, cardiac troponin, the patient's clinical status and possible cardiac angiography for helping in the diagnosis of AMI [3].

Several signs in the past 60 years have been proposed for diagnosing AMI in LBBB including the widely used Sgarbossa's criteria [4], Cabrera's sign [5], and Chapman's sign [6].

The original Sgarbossa's criteria was first described in 1996 using a scale of 0 to 5 to aid in diagnosing AMI in the presence of LBBB [4]. The original Sgarbossa's criteria has been modified to enhance its

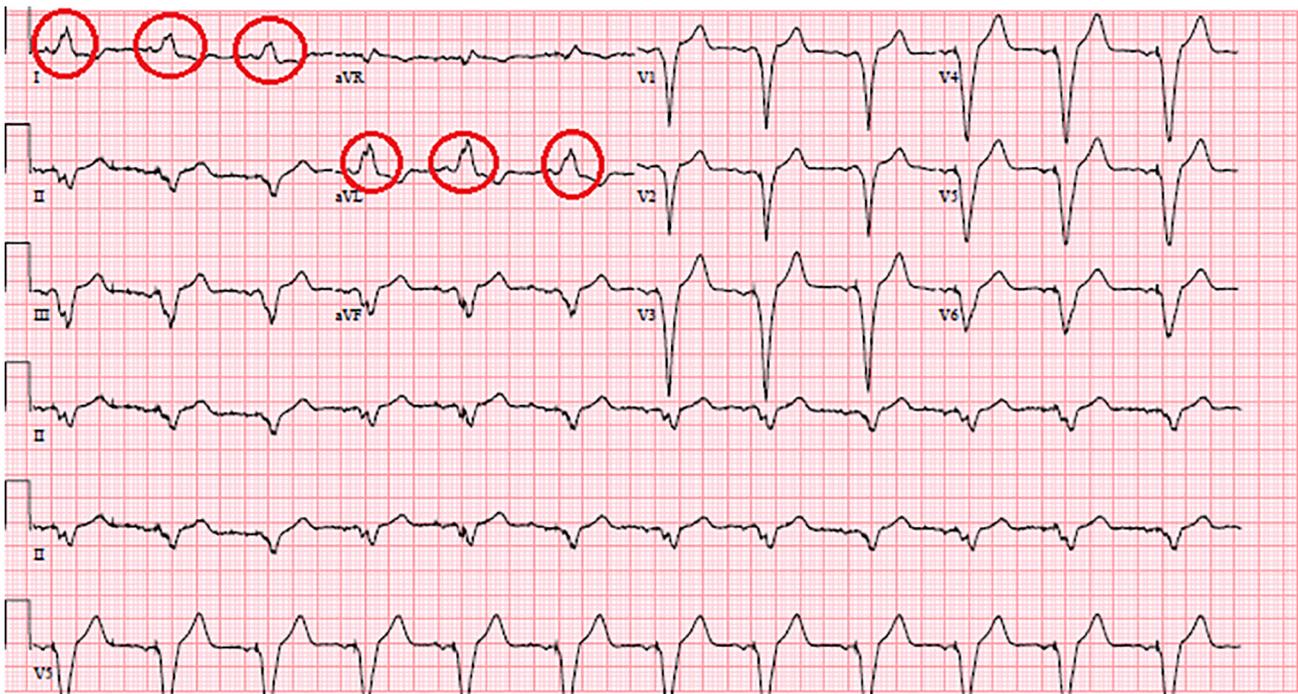
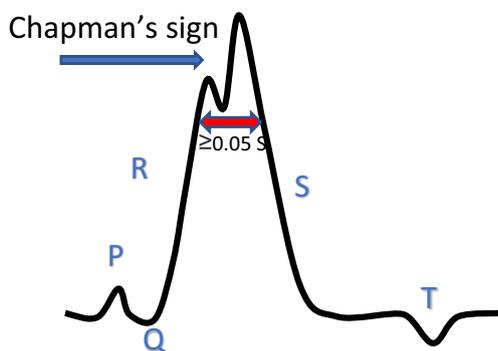


Fig. 2. The patient's 12 lead ECG showed a new notch in the upstroke of the R wave in leads I, aVL that indicates positive Chapman's signs.



Chapman's sign is a notching ≥ 0.05 s of upslope of the R wave in leads I, AVL or V6

Fig. 3. Chapman's sign with a notching ≥ 0.05 s of upslope of the R wave in leads I, AVL or V6.

sensitivity which was later validated in a different study [7,8]. According to the modified Sgarbossa's criteria study, the sensitivity improved from 52 to 91%, but reduced the specificity from 98% to 90%. Despite modifying the Sgarbossa's criteria, it is still not sensitive enough to detect some patients with LBBB and ACS and can have false negative results [9]. Therefore, if Sgarbossa's criteria is met, it can be helpful in diagnosing AMI, but its absence cannot eliminate the possibility of AMI.

Chapman's sign is a notching ≥ 0.05 s of upslope of the R wave in leads I, AVL or V6 and was first described in 1957 [6] Fig. 3. It has a low sensitivity, but a high specificity reaching up to 92% [10]. Chapman's sign can enhance diagnosing AMI in patients who have LBBB and do not meet the original Sgarbossa's criteria.

Our case showed that the diagnosis of AMI can be challenging in the presence of LBBB and highlights the importance of carefully interpreting the ECG in patients presenting with CP.

Performing serial ECGs in patients with LBBB may be helpful and reveal evolving changes as seen in our case. Serial ECG changes have been reported to be as sensitive as 67% [11].

4. Conclusion

A thorough ECG interpretation of all leads and serial ECGs are important for evaluating patients with cardiac ischemia. Chapman's sign may be suggestive of AMI in patients with complicated ECGs and can be useful to help make therapeutic decisions.

Disclaimer

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Declaration of Competing Interest

The authors have no conflicts of interest to declare.

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