Acute Chest Pain in a Patient with Left Bundle Branch Pacing

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Abstract:

We present a patient with left bundle branch (LBB) electronic ventricular pacing with chest pain. ECG showed ventricular pacing and ST elevation in the inferolateral leads. At first it was felt that the Sgarbossa criteria for STEMI in electronic ventricular pacing are not met. However, as symptoms persisted, emergency coronary angiography was performed showing complete occlusion of the left circumflex artery. As LBB pacing results in narrow QRS complexes with incomplete right bundle branch block, ST-segment deviation should not be ignored and the Sgarbossa criteria for patients with LBB block or right ventricular electronic pacing should not be applied.

Introduction:

The common practice is not to proceed with further electrocardiographic (ECG) analysis of the QRS and ST segments in patients with right ventricular (RV) electronic pacing. Specifically, diagnosis of acute coronary occlusion in patients with RV pacing is considered inaccurate (1). It has been suggested that the use of the original Sgarbossa criteria can assist in diagnosing acute occlusion myocardial infarction in patients with RV pacing; however, the reported sensitivity is very low (1,2).

Left bundle branch (LBB) pacing is a new pacing modality, involving pacing via a lead placed near the LBB using a trans-ventricular septal approach (3). LBB pacing typically results in a relatively narrow QRS complex with incomplete RBBB configuration (1). In many instances the resulting QRS resembles the non-paced QRS configuration. There have been no previous reports or guidelines recommendations concerning the ECG diagnosis of acute occlusion myocardial infarction in patients with LBB pacing, and it is unclear whether the Fourth Universal Definition of Myocardial Infarction (4) recommendations for patients with narrow QRS complexes should be applied for patients with LBB pacing.

Here we describe a patient with LBB pacing who presented with chest pain and ECG changes compatible with ST elevation myocardial infarction (STEMI).

A 74-year-old female with hypertension, type 2 diabetes, dyslipidemia, and recurrent falls with resultant subdural hematoma six months before presentation was admitted for recurrent syncope. Admission ECG showed transient complete atrio-ventricular (AV) block. There were Q waves in the inferior leads (present on a previous ECG eight months earlier) without ST deviation. High-sensitivity cardiac troponin-I was 18 pg/ml (upper limit of normal 17 pg/ml). Coronary angiography revealed a non-flow-limiting dissection in the left circumflex artery (LCX) without significant narrowing in the other arteries. The patient underwent implantation of a Medtronic dual-chamber system with LBB pacing and was discharged the next day. A week later, the patient presented with acute substernal chest pain. Presenting ECG (Figure 1) showed atrial-sensed, ventricular-paced rhythm with discordant ST elevation in the inferolateral leads. Initially, it was felt that the ECG did not meet Sgarbossa criteria for STEMI in a patient with electronic ventricular pacing. However, due to persistence of symptoms the patient was taken to the catheterization laboratory. A 100% occlusion of the LCX was found and stented. Following the procedure, high-sensitivity cardiac troponin-I peaked at >50,000 pg/ml. ECG obtained the next day (Figure 2a) showed sinus rhythm with LBB pacing, ST deviation resolved, suggesting reperfusion. Subsequent ECG (Figure 2b) showed sinus rhythm without LBB pacing. The QRS configuration resembles the previous ECG with LBB pacing.

To our knowledge, this is the first description of STEMI in a patient with LBB pacing. The case illustrates that as LBB pacing results in near normal QRS configuration with incomplete right bundle branch pattern, ST deviations should not be dismissed as non-specific, and diagnosis of STEMI can be made. The Sgarbossa criteria and other criteria for diagnosing acute occlusion myocardial infarction in patients with LBB block or RV pacing (1) should not be used in patients with LBB pacing presenting with symptoms compatible with myocardial ischemia.

Figure 1: Presenting ECG showing sinus rhythm with LBB pacing. There are Q waves in III and aVF. There is ST elevation in II, III, aVF, and V5-V6. There is ST depression in aVL, and V1-V3.

Figure 2: a. ECG post LCX stenting. Sinus rhythm with LBB pacing. Incomplete RBBB with left axis configuration. There are Q waves in the inferior leads. ST elevation in the inferolateral leads resolved. There is less ST depression in V1-V3. **b.** ECG post LCX stenting without LBB pacing. Sinus rhythm. Right bundle branch block with right superior QRS axis. There are Q waves in II, III, aVF, and V5-V6. There is mild ST elevation in II, and V5-V6 and ST depression in V1-V3. Overall, QRS configuration resembles the previous ECG with LBB pacing.

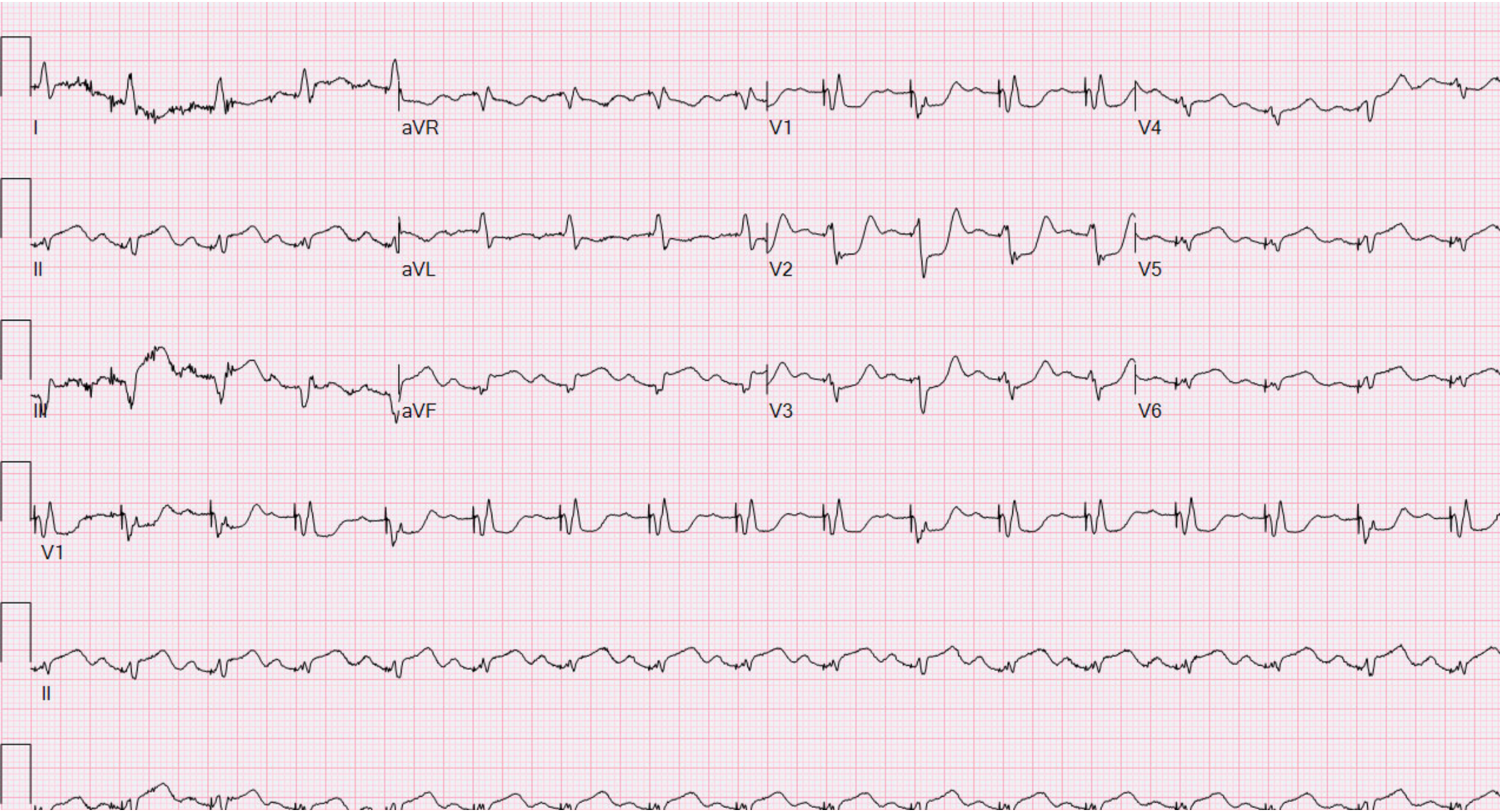
References:

1 Khawaja M, Thakker J, Kherallah R, Ye Y, Smith SW, Birnbaum Y: Diagnosis of occlusion myocardial infarction in patients with left bundle branch block and paced rhythms. Curr Cardiol Rep 2021;23:187.

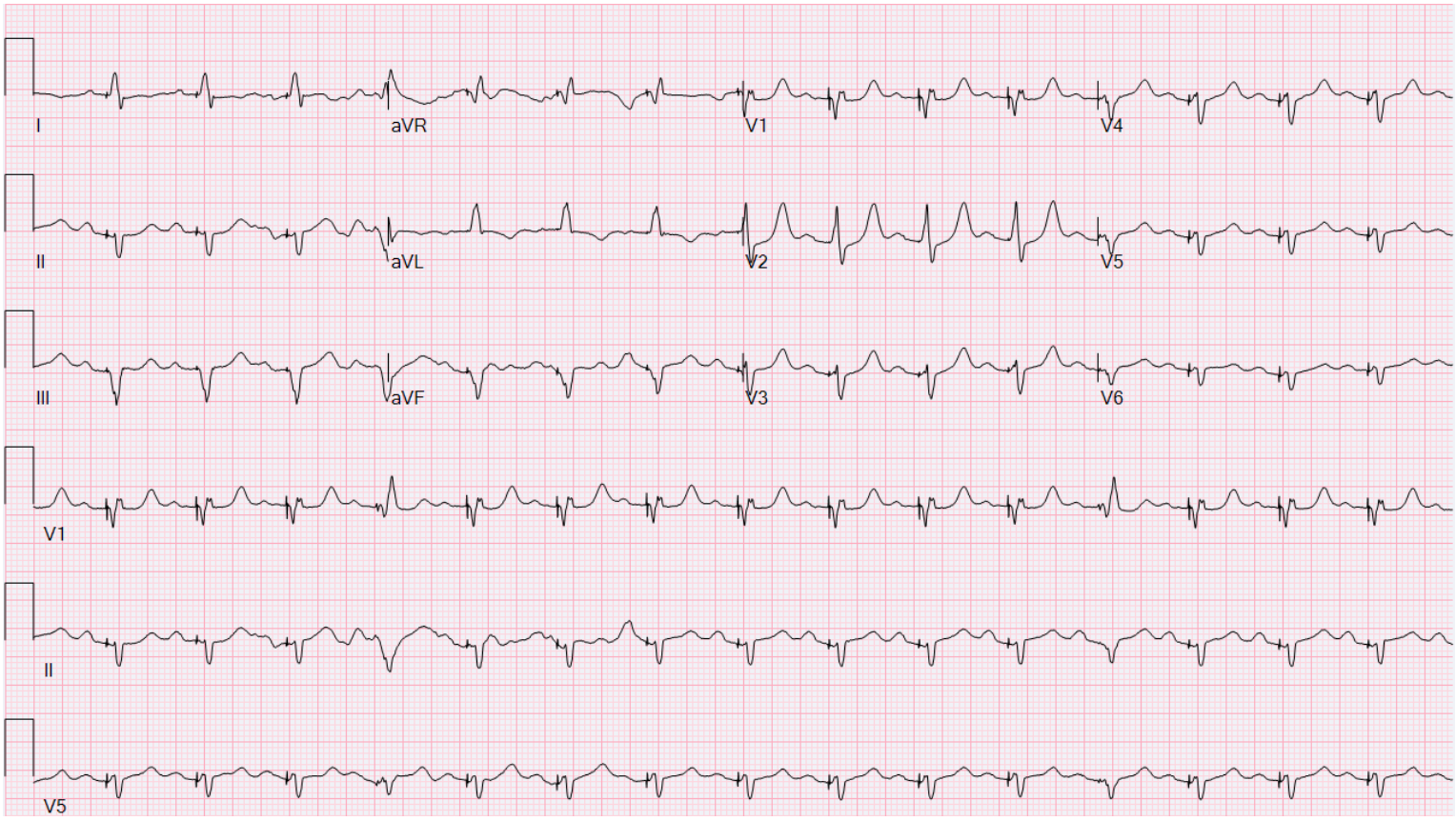
2 Dodd KW, Zvosec DL, Hart MA, Glass G, 3rd, Bannister LE, Body RM, Boggust BA, Brady WJ, Chang AM, Cullen L, Gomez-Vicente R, Huis In 't Veld MA, Karim RM, Meyers HP, 3rd, Miranda DF, Mitchell GJ, Reynard C, Rice C, Salverda BJ, Stellpflug SJ, Tolia VM, Walsh BM, White JL, Smith SW, investigators Ps: Electrocardiographic diagnosis of acute coronary occlusion myocardial infarction in ventricular paced rhythm using the modified sgarbossa criteria. Ann Emerg Med 2021;78:517.

3 Zhang S, Zhou X, Gold MR: Left bundle branch pacing: Jacc review topic of the week. J Am Coll Cardiol 2019;74:3039.

4 Thygesen K, Alpert JS, Jaffe AS, Chaitman BR, Bax JJ, Morrow DA, White HD, Executive Group on behalf of the Joint European Society of Cardiology /American College of Cardiology /American Heart Association /World Heart Federation Task Force for the Universal Definition of Myocardial I: Fourth universal definition of myocardial infarction (2018). Circulation 2018;138:e618.


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
V1
II

a. Post LCX stenting. Sinus rhythm with LBB pacing



b. Post LCX stenting. Sinus rhythm without LBB pacing