Case Report

Chest pain and exercise induced left bundle branch block – A clinical dilemma

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Abstract

Exercise-induced left bundle branch block is a rare electrocardiographic phenomenon. We present two patients with angina pectoris who developed left bundle branch block on ECG during treadmill test. The first patient had non-obstructive coronary arteries with slow flow and is a rarely reported entity. The second patient had typical chest pain with single vessel Coronary Artery Disease. Left bundle branch block occurred in stage I of Treadmill Testing and persisted for approximately 4 hours and then reverted spontaneously. These two interesting cases of this rare phenomenon are presented here with review of relevant literature.

Keywords: Angina pectoris, coronary artery disease, exercise induced, left bundle branch block

Introduction

Exercise induced left bundle branch block (EI-LBBB) is a rare electrocardiographic phenomenon and is seen in approximately 1.1% of patients undergoing treadmill testing.[1] The prevalence of EI-LBBB was 0.37% among 1885 patients who underwent GATED-SPECT ergometry for the diagnosis of ischaemic heart disease and was 6 times more common in women.[2] It has been shown to be an independent predictor for major cardiovascular morbidity and mortality. It is also shown to be associated with coronary artery disease (CAD) in 70% of patients. Presently, the knowledge about this phenomenon is dependent on case reports and case series only and the management is not well defined. Here, we are presenting two cases of EI-LBBB with brief review of the literature.

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Case Report

Case 1

A 57-year-old male, non-smoker, nondiabetic, normotensive presented with complaints of chest pain and dizziness on exertion for last 10 days. On examination, resting heart rate of 72 bpm, blood pressure 120/76 mmHg was recorded. Systemic examination was normal. Resting electrocardiogram (ECG) in supine position depicted normal sinus rhythm (NSR) with poor "R" wave progression in anterior precordial leads [Figure 1a]. Transthoracic echocardiography (TTE) revealed a normal left ventricle ejection fraction (LVEF ~60%) with no regional wall motion abnormality (RWMA). His troponin T levels were not raised. Stress ECG during Treadmill Test (TMT) was done on Bruce protocol during which he developed LBBB in stage 1 at the heart rate of 134/minute and complained of dizziness [Figure 1b]. TMT was terminated instantly. The LBBB was reversed after around 4 hours of TMT. Troponin levels were repeated after 6 hours and were normal. Coronary angiography revealed normal epicardial coronaries with slow flow.

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Case 2

A 58-year-old male, non-smoker, nondiabetic, normotensive presented with complaint of typical angina on-off. On examination his pulse rate was 54/min and BP was 120/62 mm Hg at rest. Resting ECG depicted sinus bradycardia with T wave inversion in V1-2 [Figure 2a]. TTE revealed a normal LVEF of 0.62, no RWMA. His Troponin T level was not raised. He was subjected to TMT on Bruce protocol during which he developed LBBB in stage 1 at the heart rate of 97/minute [Figure 2b]. TMT was terminated. He was observed in CCU and ECG monitoring was done. The LBBB spontaneously reversed after approximately 6 hours of stress test. Troponin level was repeated after 6 hours and was normal. Coronary angiography which revealed mild coronary artery disease.

Both the patients were managed with guideline directed medical therapy and were symptomatically and hemodynamically stable at 1-month and 3-month follow up.

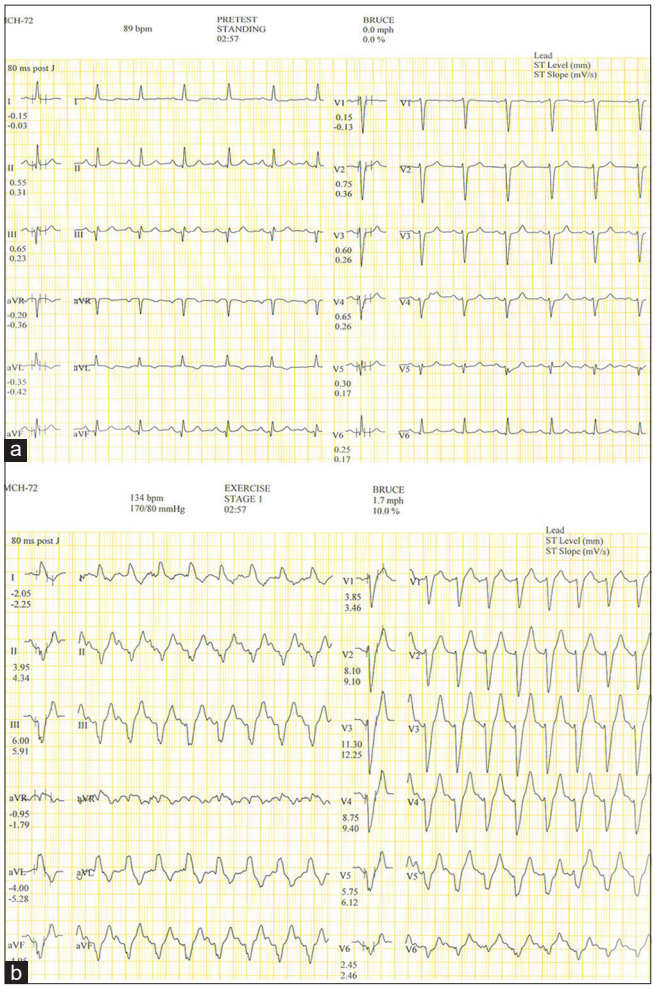

Figure 1: (a) Resting Electrocardiogram in during treadmill test revealing poor R wave progression in anterior precordial leads. (b) Stress electrocardiogram during treadmill test revealing Left Bundle Branch Block at the heart rate of 134/min

Discussion

EI-LBBB is most often detected during exercise testing performed in patients of chest pain. Exercise stress test commonly performed with treadmill (TMT) is a cheaper and easily available modality for the assessment of chest pain. The practising physician must be aware of the clinical significance of EI-LBBB and associated prognosis. Of the various causes of EI-LBBB, CAD is most common cause but it may also be due to underlying microvascular coronary artery disease, coronary vasospasm, and coronary slow flow but also sometimes without any cardiac disease like rate dependent bundle branch block.[3] It was first described in 1946 by Eischert in a 24-year-old young male smoker with palpitation and dizziness on exertion.[4] It was also described in patients with symptoms of angina pectoris and normal epicardial coronary arteries where it is presumed to be rate dependent LBBB.[5] Patients with EI-LBBB are also at increased risk of developing permanent LBBB and hence ventricular dysynchrony and dysfunction.[6] It is postulated that patients who present with angina and rate dependent LBBB at a heart rate of <125/min is usually indicative of CAD as in our second patient, whereas those who develop LBBB at heart rate of >125/min are generally cases of non-CAD.[7] But this postulation was contradicted by Hertzeanu *et al.* in follow up study of eleven patient with EI-LBBB and concluded that heart

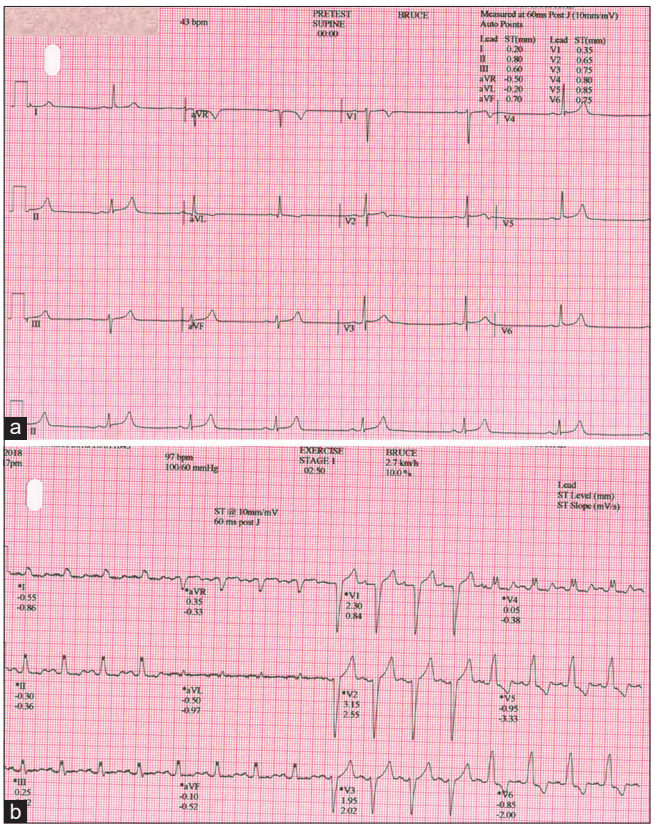

Figure 2: (a) Resting Electrocardiogram in during treadmill test revealing sinus bradycardia and T wave inversion in V1-2. (b) Stress electrocardiogram during treadmill test revealing Left Bundle Branch Block at the heart rate of 97/min

rate <125/min doesn't by itself constitute a sign of CAD.[8] Our two cases presents the two spectrum of EI-LBBB. Case 1 delineates EI-LBBB syndrome in non-obstructive coronary arteries with slow flow phenomenon. Our second patient developed LBBB at heart rate of 97/min and hence may be used as a marker of CAD in patients with EI-LBBB.

The mechanisms of EI-LBBB is not very well defined. Several pathological studies of the conduction system have highlighted that in subjects above the age of 40 years, degenerative fibrotic process involving the conduction system without significant involvement of the myocardium or other cardiovascular disease is responsible for bundle branch block. Bundle branch block appears when the heart rate is equal to, or exceeds the refractory period of one of the bundles in these conditions. Coronary slow flow and microvascular dysfunction may also be a contributing factor.[9] Often it has been noted that in cases of EI-LBBB, the onset and offset of LBBB occurs with stress at particular rate. But contrary to this in both of our cases, the reversal of LBBB took longer duration and lower heart rate than onset. It could be because during slowing of the heart rate, rate-related intraventricular conduction often fails to normalize at the critical cycle length which initiated the aberration. Therefore, to establish normal conduction, the heart rate has to slow down more than would be expected.

The prognosis of the patients with EI-LBBB depends on the extent of involvement of coronary artery disease. The higher mortality with EI-LBBB is largely explained by age and association with CAD and/or heart failure. It is noteworthy that the occurrence of EI-LBBB itself, without evidence of CAD and/or heart failure, may be due to conduction disease and can be associated with a relatively good prognosis.[10] Exercise-induced conduction disturbances alone do not carry an increased risk, but they may represent markers of cardiovascular abnormalities which should prompt further investigation.

Conclusion

EI- LBBB is a rare occurrence during routine clinical exercise testing and patients with this finding have significantly higher all-cause mortality rates than with normal test. It renders the ECG uninterpretable for ischemia during stress, and thereby mandates termination of the test, especially in the presence of chest pain. The practicing physicians should be aware of this rare electrocardiographic evidence of heart disease and investigate further for risk stratification by referring patients for further evaluation for the underlying CAD if present.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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