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CASE REPORT

Left Ventricular Dyssynchrony in a Patient with Normal Perfusion and Stress-Induced Left Bundle Branch Block

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Introduction

Left bundle branch block (LBBB) is an electrocardiographic abnormality that occurs in approximately 0.5–1.1% of all patients who undergo exercise testing.[1] The diagnosis of complete LBBB is made with the 12-lead electrocardiogram (ECG) if all the following criteria are met: conduction originating above the atrioventricular node; a QRS duration of 120 milliseconds or more; predominantly upright complexes with broad-slurred R waves in leads I, V5, and V6; and a QS or RS pattern in V1 with a normal intrinsicoid deflection of 35 milliseconds.[2]

The precise mechanism and the prognostic significance of Exercise Induced-LBBB (EI-LBBB) remains unclear. EI-LBBB can be associated with coronary artery disease (CAD). However, in a group of patients, coronary arteries are normal.[3] Several authors have attributed EI-LBBB to functional alterations of the conduction system mediated by autonomic influences in non-ischemic cases.[4] We report a case of a 72-year-old female patient who developed LBBB during exercise stress testing and showed reversible abnormalities in cardiac contraction.

Case report

A 72-year-old female patient, with two risk factors for CAD, namely hypertension and dyslipidemia, underwent a coronary angiography in 2010 after typical chest pain, which showed left anterior descending artery (LAD) stenosis of 80%, right coronary artery (RCA) stenosis of 60% and left circumflex artery (LCX) stenosis of 60%. The patient started medical therapy with ACE inhibitors, β-blocker, antiplatelet agent and statins. In 2014, she underwent a pharmacological (dipyridamole IV, 0.84 mg/kg in 5 minutes) stress-rest myocardial perfusion imaging (MPI) with normal electrocardiogram (ECG) pattern and normal perfusion.

In March 2018 the patient came at our attention to undergo MPI as a routine exam. The patient was asymptomatic after 72h-wash out from β-blocker. She was submitted to a bicycle exercise stress testing using the modified Bruce protocol. Baseline heart rate (HR) was 89/min and blood pressure (BP) was 140/95 mmHg. The ECG showed first-degree atrioventricular block and left anterior fascicular block (figure 1A). Technetium-99m (Tc-99m) tetrofosmin (187 MBq) was injected IV at peak exercise at 4:30 min. HR and BP were 126/min and 180/110 mmHg respectively. She developed LBBB with a QRS width of 120 ms at the end of the 5th min of exercise test with a HR of 128/min (figure 1B) and no symptoms. The EI-LBBB disappeared at 3:52 min during recovery phase at a HR of 94/min (figure 1C).

Stress images were acquired 20 min after radiotracer administration with a Discovery NM/CT 530c CZT gamma camera (GE Healthcare, Haifa, Israel). Rest injection was administered 2 hours after the stress injection and the images were obtained 20 minutes later. Both stress and rest studies were acquired using the list mode using a gated 16 frame-per-cycle acquisition with a 20% acceptance window. Acquisition time was 9 minutes for the stress and 5 minutes for the rest study.

Stress and rest images were reconstructed on a dedicated workstation (Xeleris 4,0 GE Healthcare)

Keywords

Left Bundle Branch Block, Cardiac-Gated Single -Photon Emission Computer-Assisted Tomography; Myocardial Perfusion Imaging; Contraction Myocardial.

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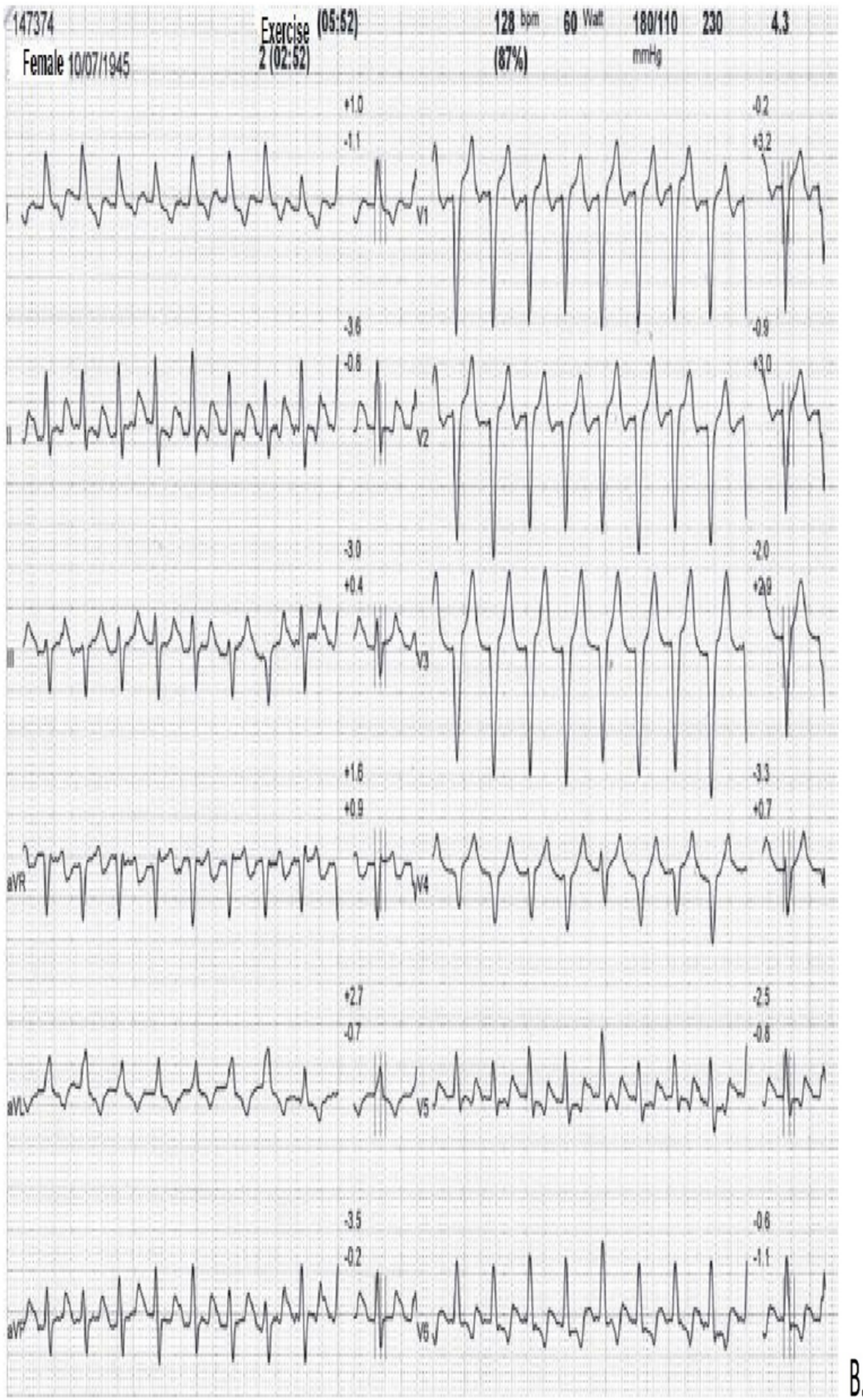
Figure 1 - ECG before exercise demonstrating sinus rhythm and first-degree atrioventricular block and left anterior fascicular block (A). At the 5th minute of exercise, the ECG showed a LBBB with a QRS width of 120 ms (B). ECG at 3:52 min into recovery phase demonstrating the disappearance of the LBBB (C).



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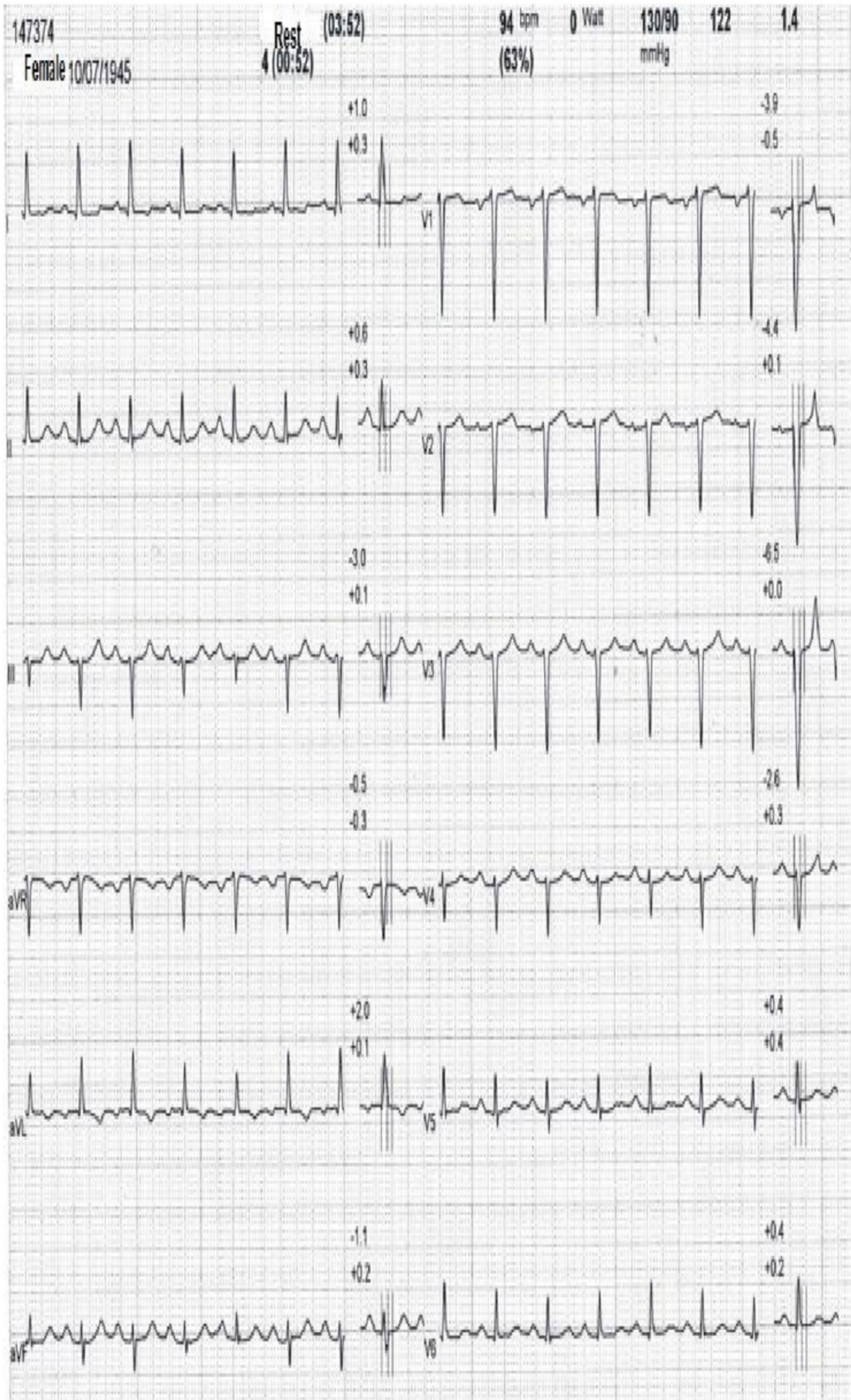

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using Lister Software from the Alcyone Miscellaneous Tools (GE Healthcare). Perfusion, regional wall motion scores and synchrony were analyzed by a commercially available software (Corridor 4DM, Invia, Ann Arbor, Michigan) using a 17-segment model.

Analysis of stress and rest images did not demonstrate any perfusion defect (figure 2), confirming the results of the previous single-photon emission computed tomography (SPECT); gated images revealed normal ejection fraction and volumes and an abnormal thickening and abnormal motion of the septal wall only in post-stress images. Post-stress dyssynchrony was detected as demonstrated by the delayed septal motion in the phase analysis. Rest images obtained without the presence of LBBB in the ECG showed a normal synchrony of the left ventricle walls.

DISCUSSION

We reported a case of a patient with EI-LBBB and post-stress dyssynchrony but with normal perfusion. It is known that interpretation of myocardial perfusion SPECT images in patients with persistent LBBB has decreased specificity because of the presence of fixed or reversible perfusion defects in the septal or anteroseptal regions, even with normal blood flow through the LAD artery.[5] In previous studies, septal or anteroseptal perfusion defects were estimated to be observed in approximately 75% of patients with LBBB, although significant LAD stenosis was detected only in 39%.[6] However, in this case the LBBB was transient because it was exercise-induced with spontaneous recovery at rest; this electrocardiographic abnormality was associated with mechanical dyssynchrony, as demonstrated by gated-SPECT and was associated with normal perfusion.

According to the literature and our experience, defects in myocardial perfusion SPECT are frequent in patients with persistent LBBB but are not commonly found in patients with EI-LBBB, in which normal myocardial perfusion is often found.[7] Myocardial perfusion PET-CT is a technique that can contribute to increase the accuracy of CAD evaluation in patients with LBBB. Recently, Falcão et al.,[8] demonstrated that 82Rb-PET relative myocardial perfusion could discriminate between LBBB patients with and without CAD, even when considering the LAD territory alone.

Sillanma et al.[9] demonstrated that LBBB should not be considered as a certain indicator of mechanical

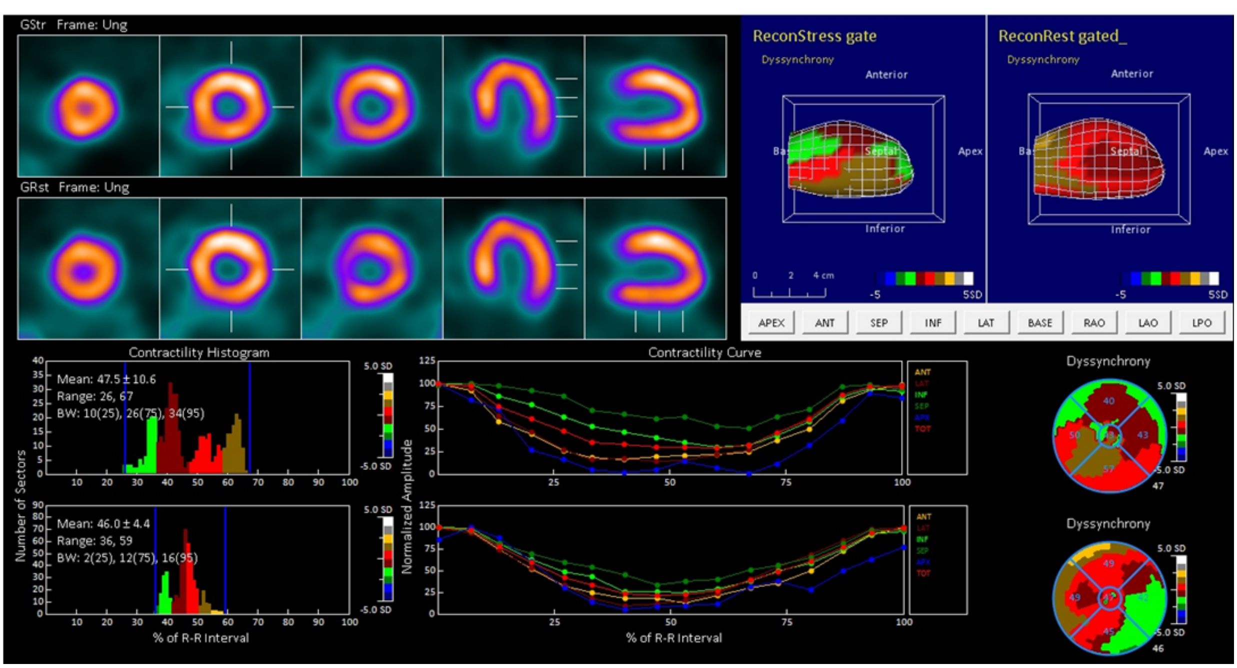

Figure 2 - GATED SPECT images demonstrating the normal perfusion pattern (upper left), abnormal septal contraction under stress (upper right) and abnormal synchrony after stress with deleted contraction of the septal wall (bottom).

dyssynchrony and patients with mechanical dyssynchrony associated to LBBB estimated by gated MPI have a worse outcome. Furthermore, Hertzeanu et al.,[10] demonstrated that the onset of EI-LBBB at an HR of 120-125/min or lower is strongly correlated with the presence of occlusive CAD, compared to patients who develop EI-LBBB at an HR of 120-125/min or higher, which have a better prognosis. Considering that our patient had an EI-LBBB at an HR of 126 bpm, dyssynchrony and evidence of normal perfusion, we can assume that the medical therapy is effective and provides a good prognosis. This case demonstrates the usefulness of Gated SPECT to evaluate not only the perfusion data but also the synchronous contraction and motility of the left ventricle walls, as well as to provide important prognostic information on cardiac function to guide the clinical management.

Conclusion

Gated SPECT was useful in the follow-up of the patient with extensive CAD by providing elements on perfusion, synchrony and thickening and in the evaluation of CAD.

Author contributions

Conception and design of the research:Gazzilli M, Mesquita CT. Acquisition of data: Gazzilli M, Durmo R. Writing of the manuscript: Gazzilli M, Durmo R, Giubbini R. Critical revision of the manuscript for intellectual content: Mesquita CT, Giubbini R.

Potential Conflict of Interest

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

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Study Association

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

Ethics approval and consent to participate

This article does not contain any studies with human participants or animals performed by any of the authors.

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