Stress-Rest Thallium-201 Myocardial Perfusion SPECT Pattern in Patients with Exercise Induced Left Bundle Branch Block

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Exercise-induced left bundle branch block (EI-LBBB) is a rare entity, occurring in approximately 0.5 % of patients who undergo exercise stress testing. It may be associated with underlying coronary artery disease (CAD) [1, 2]. We report two cases that developed EI-LBBB while undergoing treadmill stress-rest thallium-201 myocardial perfusion SPECT (MPS).

Case 1 A 50-year-old woman who presented with a history of atypical chest pain of 2 months duration. She was of thin build, hypertensive, non-diabetic, a non-smoker and had raised serum lipid levels. Treadmill exercise stress-rest thallium-201 MPS was done for diagnosis of CAD. The patient's resting blood pressure (BP) and heart rate (HR) were 130/80 mmHg and 90 beats per minute (bpm) respectively. Resting electrocardiogram (ECG) showed normal sinus rhythm (Fig. 1a). Sudden onset of left bundle branch block (LBBB) rhythm was noted during treadmill stress testing at 1.30 min of the Bruce protocol (Fig. 1b). At this time, BP and HR were 148/80 mmHg and 134 bpm (78 % of target HR) respectively. The patient complained of dizziness simultaneously with onset of LBBB. Thallium-201 (3 mCi) was

injected intravenously. The patient was not able to continue the exercise. Approximately 30 s into the recovery phase, ECG changes returned to normal sinus rhythm and the patient's dizziness subsided. Immediate post-stress and 3-h rest redistribution MPS images were acquired. In stress images, moderately reduced radiotracer uptake is noted in the septum and anteroseptal wall of the left ventricle. The above-mentioned defects show significant redistribution on the resting images, indicating reversibility of the perfusion defect (Fig. 2). Follow-up coronary angiography revealed absence of any significant CAD. This case demonstrates that false-positive perfusion defects occur in EI-LBBB cases similar to those seen in cases with permanent LBBB [3].

Case 2 A 63-year-old woman who presented with history of atypical chest pain. She was non-hypertensive, non-diabetic, obese and a non-smoker. Treadmill exercise stress-rest redistribution thallium-201 MPS was done for diagnosis of CAD. The patient's resting BP and HR were 160/76 mmHg and 70 bpm respectively. Resting ECG showed normal sinus rhythm (Fig. 3a). Sudden onset of LBBB rhythm was noted during treadmill stress testing at 3.30 min of Bruce protocol (Fig. 3b). At this time, BP and HR were 180/80 mmHg and 110 bpm respectively. The patient continued to exercise till 8.41 min, when exercise was stopped due to dyspnea. An HR of 131 bpm (83 % of THR) was achieved. Three millicuries of thallium-201 was injected intravenously during the last minute of exercise. Approximately 3.30 min into the recovery phase, ECG changes

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Fig. 1 Case 1. **a** Resting ECG. **b** Sudden onset of LBBB noted on the ECG during treadmill stress testing

Fig. 3 Case 2. **a** Resting ECG. **b** Sudden onset of LBBB noted on the ECG during treadmill stress testing

Fig. 2 Case 1: Stress-Rest Thallium-201 MPS images

Fig. 4 Case 2: Stress-Rest Thallium-201 MPS images

returned to normal sinus rhythm. Immediate post-stress and 3-h rest redistribution MPS images (Fig. 4) showed normal radiotracer distribution in the left ventricular myocardium in both stress and rest images. Follow-up coronary angiography showed normal coronary arteries.

Different perfusion patterns on MPS (normal perfusion, reversible defects involving the septum, antero-septal wall or apical region and irreversible defects) have been reported in EI-LBBB cases. The reversible perfusion defects may be secondary to the asynchronous ventricular contraction after LBBB onset, as in cases with permanent LBBB [4–7]. In patients who develop EI-LBBB, MPS has limited accuracy for diagnosing left anterior descending artery disease. The occurrence of EI-LBBB for the first time cannot be predicted and vasodilator stress cannot be planned beforehand, as done in permanent LBBB cases undergoing stress-rest MPS [3, 8]. Aborting exercise stress and planning for vasodilator stress MPS may be a reasonable approach to be used when a patient undergoing exercise stress as part of stress-rest myocardial perfusion

SPECT develops EI-LBBB to increase specificity of MPS in such cases.

Conflict of Interest Harmandeep Singh, Chetan D Patel, Sundeeep Mishra and Balram Bhargava declare that they have no conflict of interest.

References

1. Grady TA, Chiu AC, Snader CE, Marwick TH, Thomas JD, Pashkow FJ, et al. Prognostic significance of exercise-induced left bundle-branch block. *JAMA*. 1998;279:153–6.
2. Williams M, Esterbrooks D, Nair C, Sailors M, Sketch M. Clinical significance of exercise-induced bundle branch block. *Am J Cardiol*. 1988;61:346–8.
3. Ten Cate CJ, Kelder JC, Bogaard MD, Van Hemel NM, Fred VJ. The prognostic significance of typical perfusion defects on vasodilator stress myocardial perfusion SPECT in patients with left bundle branch block or right ventricular apical pacing. *Nucl Med Commun*. 2009;30: 232–9.
4. Gholamrezanezhad A, Mirpour S, Sarabandi F, Jazayeri B. Rate dependent left bundle branch block: the pattern of myocardial perfusion SPECT. *Nucl Med Rev Cent East Eur*. 2012;15:143–8.
5. La Canna G, Giubbini R, Metra M, Arosio G, Cumis A, Cicogna R, et al. Assessment of myocardial perfusion with thallium-201

- scintigraphy in exercise-induced left bundle branch block: diagnostic value and clinical significance. *Eur Heart J*. 1992;13:942–6.
6. Riera JC, Martínez GO, Vega J, Gordillo E, Ferreira I, Pena C, et al. Exercise-induced left bundle-branch block in patients with coronary artery disease versus patients with normal coronary arteries. *Rev Esp Cardiol*. 2002;55(5):474–80.
 7. Bozkurt MF, Yildirim A, Kabakçi G, Caner B. Exercise-induced left bundle branch block during thallium 201 myocardial perfusion scintigraphy: a case report. *Angiology*. 2001;53:145–8.
 8. Rockett JF, Wood WC, Moinuddin M, Loveless V, Parrish B. Intravenous dipyridole thallium-201 SPECT imaging in patients with left bundle branch block. *Clin Nucl Med*. 1990;15:401–7.