

## Thallium-201 myocardial SPECT in a patient with mirror-image dextrocardia and left bundle branch block

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A 53-year-old male patient with a previous diagnosis of situs inversus with mirror-image dextrocardia underwent thallium-201 (Tl-201) stress-redistribution myocardial perfusion single photon emission computed tomography (SPECT). Electrocardiogram (ECG) obtained on right hemithorax revealed constant complete left bundle branch block. Tl-201 stress-redistribution SPECT images revealed abnormal perfusion with reversible ischemia in the anteroseptal, septal and inferoseptal walls. Coronary angiography performed 1 month after SPECT study was normal. This case illustrates that false positive reversible perfusion defects can be seen in patients with mirror-image dextrocardia associated with constant complete left bundle branch block. To our knowledge, this is the first reported case of mirror-image dextrocardia and constant complete left bundle branch block with false positive Tl-201 SPECT findings.

**Key words:** thallium-201, myocardial SPECT, mirror image dextrocardia, left bundle branch block

### INTRODUCTION

THALLIUM-201 myocardial perfusion SPECT imaging is a non-invasive and easily applicable method that is used in the diagnosis of coronary artery disease (CAD). At the same time, Tl-201 studies are used in cases of noncoronary disease, such as valvular lesions, conduction abnormalities (e.g. left bundle branch block), cardiomyopathy, myocardial hypertrophy and congenital heart-coronary abnormalities.<sup>1</sup>

This case report illustrates the Tl-201 myocardial perfusion SPECT images of an unusual patient with suspicious CAD who had both situs inversus with mirror-image dextrocardia and constant complete left bundle branch block (LBBB).

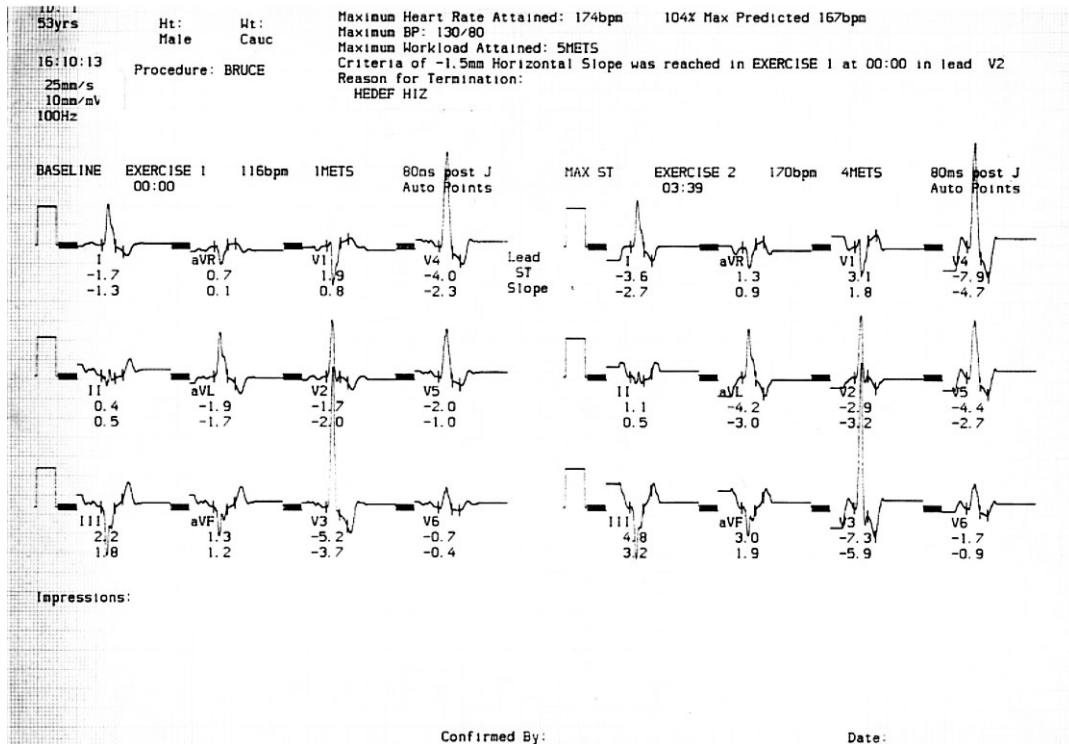
### CASE REPORT

A 53-year-old male patient with a previous diagnosis of situs inversus with mirror-image dextrocardia was referred to the nuclear medicine department for Tl-201 stress-redistribution myocardial perfusion SPECT imaging. The patient had been suffering from shortness of breath, fatigue, palpitation and chest discomfort on exertion for six months. He had some risk factors for CAD such as cigarette smoking and hypercholesterolemia. He did not have a previous history of myocardial infarction, diabetes mellitus, hypertension or family history for CAD. Cardiac sounds were heard from the right chest wall during the physical examination. Chest roentgenogram and echocardiography demonstrated that the heart was situated in the right chest. Echocardiography demonstrated a normal condition with mirror images of cardiac chambers in right hemithorax and normal left ventricular wall thickness. The left ventricular wall motion was also normal and no findings related with LBBB in echocardiography could be seen. Baseline heart rate and resting blood pressure were 76 bpm and 130/80 mmHg, respectively. Before treadmill exercise testing, baseline standard 12 lead ECG was obtained on right hemithorax

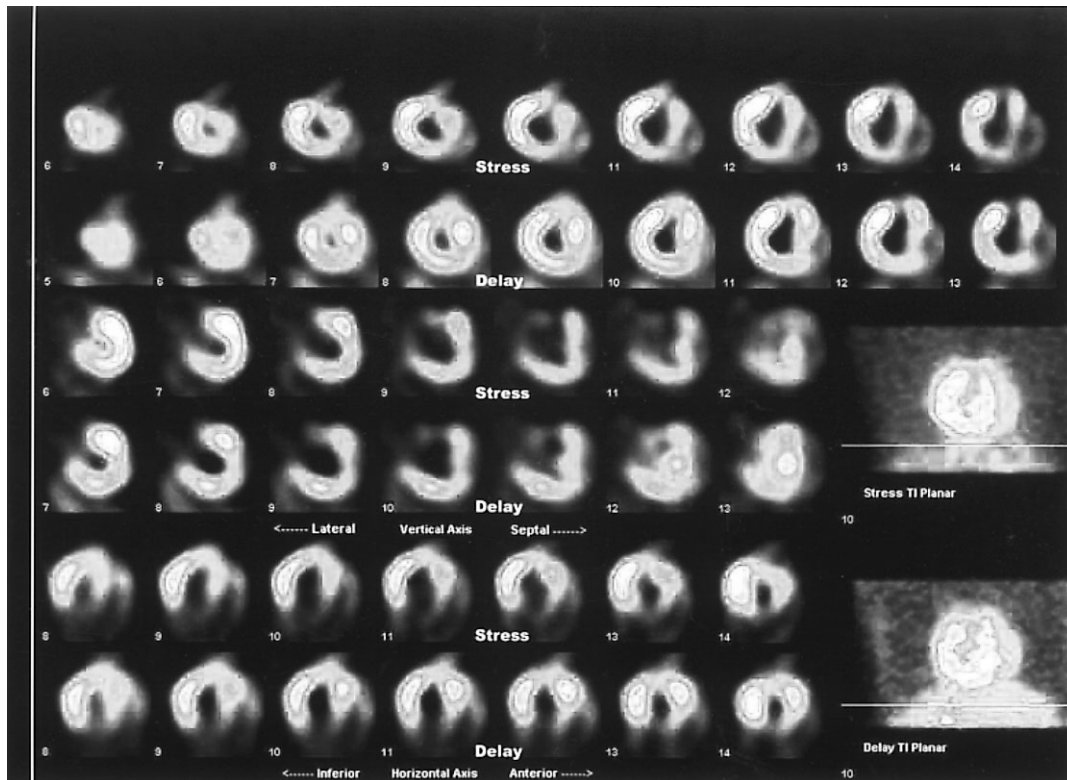
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**Fig. 1** 12 lead ECG which was obtained on right hemithorax.



**Fig. 2** TI-201 treadmill stress/rest myocardial perfusion SPECT short axis, horizontal and vertical long axis slices demonstrate abnormal perfusion with reversible ischemia in anteroseptal, septal and inferoseptal walls. During visual interpretation of left ventricular slices, mirror image of normal heart should be considered.

and showed sinus rhythm and prolonged QRS complex which revealed constant complete LBBB (Fig. 1).

Tl-201 treadmill exercise-redistribution myocardial perfusion SPECT was performed. The patient exercised to stage 2 of the Bruce protocol for approximately 4 minutes. Exercise was terminated due to maximum predicted heart rate (167 bpm and 5 METS). Three mCi (111 MBq) Tl-201 was injected intravenously at peak exercise. Stress and redistribution images were obtained by using a double head gamma camera (General Electric OPTIMA<sup>®</sup>, USA) equipped with low energy multipurpose collimators and connected with a dedicated computer system (General Electric-Starcam 4000i computer) for SPECT acquisition. SPECT images were obtained with a circular orbit over a 180 degree arc starting from 45 degree left anterior oblique projection and ending at the 45 degree right posterior oblique projection. Horizontal-vertical long axis and short axis slices of the left ventricle and polar maps were displayed. Tl-201 SPECT images revealed abnormal perfusion with reversible ischemia in the antero-septal, septal and infero-septal walls (Fig. 2). Coronary angiography performed at another center 1 month after SPECT based on these results was normal.

## DISCUSSION

In complete situs inversus the organs present a complete mirror image. Mirror-image dextrocardia associated with complete situs inversus is an unusual condition which is seen in 1–2 per 10,000 live births.<sup>1,2</sup> Mirror-image dextrocardia with situs inversus is usually associated with normal intracardiac anatomy<sup>3</sup> and these individuals do not have different morbidity or mortality rates from the normal population. Individuals with this malposition are believed to have an incidence of CAD similar to that of the general population.<sup>2,4</sup> Although, according to the early reports, individuals with this malposition were believed to have an incidence of congenital heart disease relatively low or similar to that of the general population; in recent investigations the authors believe that the incidence of congenital heart disease is as high as 40–50%.<sup>1,3</sup>

Constant complete LBBB in a patient with mirror-image dextrocardia is a rare clinical combination, even though some ECG findings, such as atrioventricular conduction abnormalities, ventricular hypertrophy, pathologic Q wave and incomplete LBBB have been reported in patients with congenital heart disease.<sup>1,3,5,6</sup>

There are some reports of various scintigraphic and Tl-201 imaging findings in patients with dextrocardia or situs inversus,<sup>7–10</sup> and numerous reports of interventions associated with situs inversus with mirror image dextrocardia,<sup>1,2,4,5,11,12</sup> we could not find any reports of Tl-201 SPECT findings in association with mirror image dextrocardia and constant complete LBBB. To our knowledge, no reports of these imaging findings have previously been reported in the literature.

Because of mirror-image dextrocardia in our patient, Tl-201 myocardial SPECT was applied by using 180 degree arc, starting from 45 degree left anterior oblique projection and ending at 45 degree right posterior oblique projection for the most suitable images. In spite of the absence of any coronary artery stenosis, false positive reversible perfusion defects were observed in antero-septal, septal and infero-septal walls of the left ventricle. We think that the observations in this case report have clinical and imaging importance.

Patients with normal heart condition and complete LBBB often show false-positive reversible perfusion defects in the interventricular septum on Tl-201 stress-rest myocardial perfusion SPECT without evidence of significant stenosis in left anterior descending coronary artery.

It has been reported that, although impaired septal wall thickening during systole, abnormal segmental contraction and abnormalities of microvascular function in the septum might be a potential mechanism of perfusion defects in patients with LBBB without CAD, definite reasons for septal perfusion abnormalities are not yet completely understood.<sup>13,14</sup>

Primary clinical studies have revealed good agreement between Tl-201 and Tc-99m sestamibi (MIBI) in the detection of stress induced defects and defect reversibility. According to the preceding reports reversible septal defects in patients with LBBB are frequently false-positive when these patients are studied with Tl-201 exercise. It was also reported that LBBB may be associated with false-positive Tc-99m MIBI SPECT.<sup>15</sup> Recently, several studies in patients with LBBB revealed that, Tc-99m MIBI and pharmacological coronary vasodilation with intravenous dipyridamole or adenosine might be more specific and more accurate for the evaluation of CAD in LBBB.<sup>16–19</sup>

In recent years, different interpretation criteria, such as quantitative methodology, pharmacological coronary vasodilation with intravenous dipyridamole or adenosine (Tl-201 dipyridamole stress testing, Tc-99m MIBI dipyridamole, exercise and ECG-gated SPECT applications) have been recommended for myocardial perfusion SPECT in patients with LBBB.<sup>20–26</sup>

This case serves to remind us of the possibility of the false positive Tl-201 SPECT imaging findings in patients with mirror image dextrocardia associated with LBBB.

Because non-invasive procedures are often nondiagnostic in LBBB, the final diagnosis of a CAD must be proven by angiocardiography in patients with mirror-image dextrocardia with LBBB.

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