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Case Report

An Elderly Woman with Exertional Dyspnoea and T-Wave Inversions on Electrocardiography

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ABSTRACT

We present a case of a 75-year-old woman with cardiac dextroposition who presented for preoperative cardiac evaluation because of exertional dyspnoea. On examination, heart sounds were best appreciated on the right, and bowel sounds were heard over the left hemithorax. Electrocardiography showed widespread T-wave inversions. No coronary artery ischemia was found. A large congenital diaphragmatic hernia with displacement of the heart to the right was found on chest radiography and confirmed on computed tomography. Surgery was subsequently uneventful. In conclusion, thorough pulmonary auscultation to detect bowel sounds in the thorax increases clinical suspicion of cardiac dextroposition.

RÉSUMÉ

Nous vous présentons le cas d'une femme de 75 ans présentant une dextroposition cardiaque ayant consulté pour subir une évaluation cardiaque préopératoire en raison d'une dyspnée à l'effort. À l'examen, les bruits du cœur étaient plus facilement audibles à droite, et des bruits intestinaux étaient audibles dans l'hémithorax gauche. L'électrocardiographie a révélé des inversions généralisées des ondes T. Aucune ischémie coronarienne n'a été observée. Une hernie diaphragmatique congénitale importante avec déplacement du cœur à droite a été constatée à la radiographie thoracique et confirmée à la tomodensitométrie. La chirurgie subséquente s'est déroulée sans problème. En conclusion, une auscultation pulmonaire approfondie afin de détecter des bruits intestinaux au niveau du thorax permet d'augmenter la suspicion clinique de dextroposition cardiaque.

Case Description

A 75-year-old woman attended preoperative cardiac evaluation with exertional dyspnoea and an abnormal electrocardiogram (ECG; Fig. 1). She had a background of uncorrected congenital diaphragmatic hernia. She was planned for nephrouretectomy of a left transitional cell carcinoma. On examination, she had dual heart sounds best appreciated on the right side of the chest, with no additional heart sounds or murmurs. Jugular venous pressure was not raised. Bowel sounds were audible on the left hemithorax, whereas breath sounds were normal on the right. Abdominal examination was unremarkable. ECG demonstrated widespread T-wave inversions and progressively decreasing R-wave voltages from V1 to V6. QRS complex in lead aVR was predominantly negative. Axis was normal and the patient had normal sinus rhythm.

Interpretation and Investigations

In the context of a preoperative assessment, exertional dyspnoea and T-wave inversions prompted investigation for coronary artery disease. Chest radiography demonstrated a large diaphragmatic hernia in the left hemithorax with displacement of the heart to the right (Supplemental Fig. S1). Transthoracic echocardiography revealed levo-orientation of the heart with normal left ventricular function and no regional wall motion abnormalities. Heart valves were normal and there was no evidence of left ventricular hypertrophy. Single-photon-emission computed tomography with dipyridamole showed the absence of cardiac ischemia. The hernia was confirmed on computed tomography of the thorax (Fig. 2). Although lung function testing was not performed, the patient

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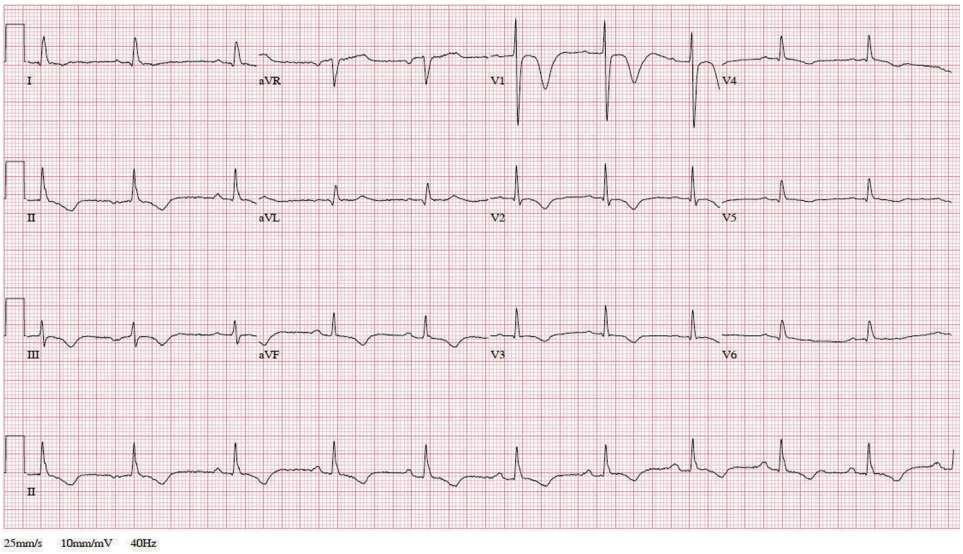

Figure 1. Electrocardiogram showing widespread T-wave inversions with progressively decreasing R-wave voltages from V1 to V6. QRS complex in lead aVR is predominantly negative. Axis is normal and patient is in normal sinus rhythm.

had no obvious pulmonary cause of dyspnoea from thoracic imaging. It was therefore concluded that exertional dyspnoea was secondary to the hernia. The patient subsequently underwent nephrouretectomy under general anaesthesia uneventfully.

Discussion

Cardiac dextroposition or pseudodextrocardia is a displacement of the heart to the right, secondary to extracardiac causes such as gastrointestinal, pulmonary, or diaphragmatic conditions. In this case, the cause was a Bockdalek hernia, a rare condition occurring in < 5 in 10,000 live births.[1] Patients with diaphragmatic hernias are generally asymptomatic but may present with heartburn. Exertional dyspnoea has also been reported.[2] Accompanied by T-wave inversions, this would prompt investigation for myocardial ischemia[3] in a preoperative risk assessment. Causes of T-wave inversions are broad and found in both nonischemic and ischemic states. Apart from ischemic heart disease (including non−ST-segment elevation myocardial infarction and Wellens syndrome), cardiac causes include digitalis therapy, pulmonary embolism, hypertrophic cardiomyopathy, and a juvenile T-wave pattern. Nonischemic causes include central nervous system events and anatomic reasons causing cardiac displacement.[4] Ventricular repolarisation is represented by the T-wave, with a net T-wave vector arising from regional differences in repolarisation timing (epicardium to endocardium and apex to base). Sympathetic and parasympathetic nervous system regulation of the myocardium also affects myocardial repolarisation. Intracranial events that affect autonomic regulation may affect myocardial repolarisation or T-waves.[5] However, the present patient did not have a history of intracranial events. Corrected QT interval (QTc) was normal and there was no significant change in QTc during dipyridamole stress testing. There are reports of dextroposition without T-wave changes. However, Hokamaki et al. also discussed a patient with giant hiatal hernia with widespread T-wave inversions. Although the mechanism of T-wave inversions remained unclear, they resolved with hernia resolution.[3] Our patient declined surgery for the hernia, so we were unable to assess for T-wave resolution.

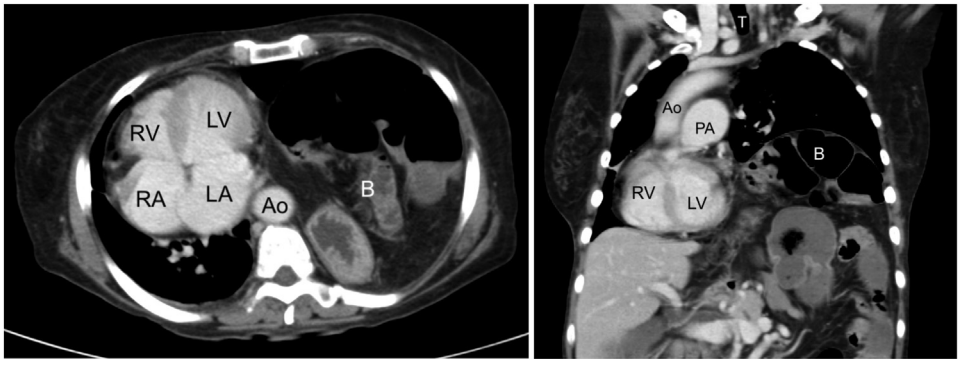

Figure 2. Computed tomography of the thorax showing bowel loops in the left hemithorax and displacement of the heart to the right. Ao, aorta; B, bowel loops; LA, left atrium; LV, left ventricle; PA, pulmonary artery; RA, right atrium; RV, right ventricle; T, trachea.

Differential diagnosis of dextroposition includes dextrocardia or dextroversion. However, this patient did not demonstrate other ECG features of dextrocardia, including an inverted P-wave, negative QRS complex in lead I, and positive P-wave in lead aVR. Definitive diagnosis can be obtained with the use of transthoracic echocardiography to demonstrate normal orientation of the heart. Thoracic imaging can clarify the spatial relationship between the hernia and the heart and demonstrate orientation of the heart chambers. Thorough pulmonary auscultation is essential to detect bowel sounds in the left hemithorax and thereby increase index of suspicion for this condition.

Novel Teaching Points

- There is a broad differential diagnosis for T-wave inversions on ECG.
- Both dextroposition and dextrocardia have decreasing amplitudes from V1 to V6, but P-wave is negative in dextroposition and positive in dextrocardia.
- Astute pulmonary examination increases clinical suspicion of dextroposition.
- Thoracic imaging is a useful modality to aid definitive diagnosis.

Disclosures

The authors have no conflicts of interest to disclose.

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Supplementary Material

To access the supplementary material accompanying this article, visit the online version of the *Canadian Journal of Cardiology* at www.onlinecjc.ca and at https://doi.org/10.1016/j.cjca.2019.08.019.