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CASE REPORT

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Primary percutaneous coronary intervention for acute myocardial infarction in a patient with dextrocardia

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Abstract

Dextrocardia is a rare cardiac anomaly in which the heart is located in the right hemithorax. This developmental irregularity can occur in isolation as situs solitus, or in association with situs inversus or situs ambiguous. Although there are reports of coronary angiography in patients with dextrocardia, there are very few reported cases of mechanical intervention. We report a patient with dextrocardia and situs inversus who presented with an ST segment elevation myocardial infarction and was successfully treated with primary percutaneous coronary intervention. (Cardiol J 2009; 16, 2: 168–171)

Key words: acute myocardial infarction, intervention, dextrocardia

Case report

In September 2008, a 52-year-old Asian male was admitted with a 3-day history of intermittent, retrosternal chest tightness radiating to the right shoulder which had worsened in severity over the preceding 2 hours. His only risk factor for coronary artery disease was being a lifelong smoker, consuming approximately 20 cigarettes a day. There was no known family history of premature heart disease. His initial examination findings were unremarkable and an electrocardiograph (ECG) was performed (Fig. 1). This demonstrated an inverted P wave in leads I and aVL and an upright P wave and R wave

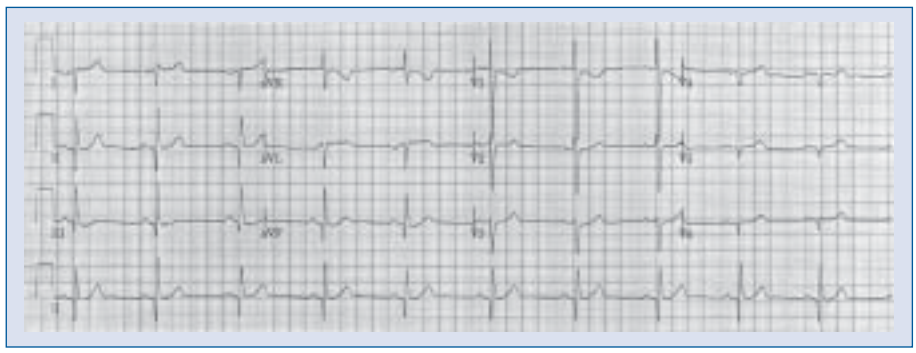

Figure 1. Admission left-sided ECG. Note the inverted P wave in leads I and aVL and the upright P wave and R wave in aVR, with poor progression of R waves in the pre-cordial leads.

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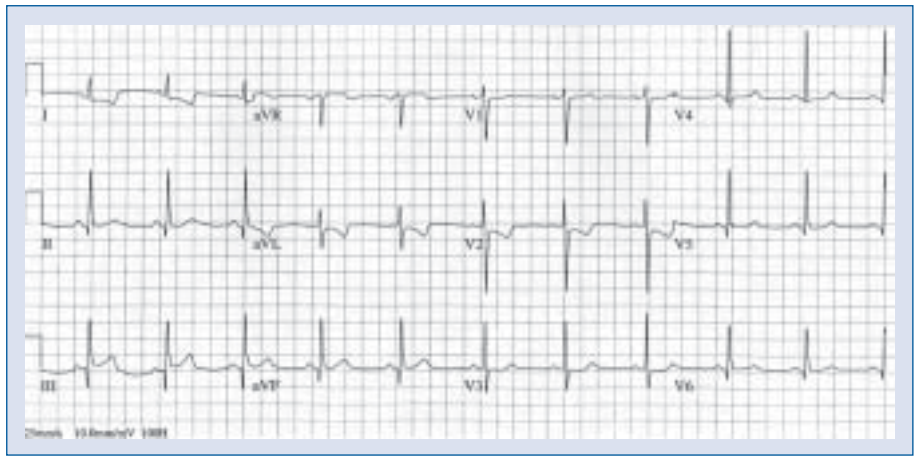

Figure 2. Right sided ECG. ST segment elevation in leads III and aVF with reciprocal changes in leads I, aVL, and V2. Note the corrected frontal plane P wave and QRS axis with R wave progression in the pre-cordial leads.

in aVR, with poor progression of R waves in the precordial leads. The difficulty in interpreting this abnormal ECG prompted an early cardiological opinion, and further examination revealed a right sided apex beat with a palpable liver on the left side. The ECG findings were consistent with dextrocardia; however, there was no evidence of ongoing ischemia. An ECG after limb and chest lead reversal was performed (Fig. 2), which demonstrated ST segment elevation in leads III and aVF, with reciprocal changes in leads I, aVL, and V2. Dextrocardia with inferior wall hypokinesia was confirmed with echocardiographic assessment, and a diagnosis of acute inferior ST elevation myocardial infarction (STEMI) was confirmed.

The patient was prescribed aspirin and clopidogrel and immediately transferred for primary percutaneous coronary intervention (PCI). Cardiac catheterisation was performed via the right femoral artery using mirror-image views with Judkins left (JL 4.0) and right (JR 4.0) diagnostic catheters (Cordis, USA). The left coronary ostium was engaged with the JL 4.0 catheter with ease. The right anterior oblique (RAO) cranial view demonstrates a normal left coronary system which lies to the right of the patient (Fig. 3A). Furthermore, the catheter can be seen to ascend within the descending thoracic aorta to the right of the vertebral spine. The right coronary ostium was engaged with the JR 4.0 catheter; however, counter-clockwise rotation with slight withdrawal was required. The right coronary angiogram in the RAO view demonstrates a complete occlusion at the middle right coronary artery (Fig. 3B).

In the RAO view, a 6 French JR4 guide catheter was engaged into the right coronary ostium, as described in the diagnostic procedure. The mid-RCA lesion was crossed with a BMW 190 cm straight tip wire. Heparin (5000 U) was administered peripherally with an intravenous abciximab bolus. A 6 French QuickCat thrombus extraction catheter was used to aspirate a large 10 mm × 2 mm thrombus (Fig. 4A) and a 3.5 × 18 mm Vision bare metal stent was deployed. Stent post-dilatation was performed using a non-compliant Quantum (4.0 × × 15 mm) balloon inflation at 18 atm resulting in TIMI III flow (Fig. 4B). The patient made an uneventful recovery and was discharged 3 days later on dual anti-platelet therapy for 12 months and remains symptom free at 30-day follow-up.

Discussion

Dextrocardia is a rare cardiac anomaly in which the heart is located in the right hemithorax with the axis directed to the right and caudally. This developmental irregularity can occur in isolation as situs solitus, or in association with situs inversus or situs ambiguous [1]. In situs solitus, the right lung has three lobes, and the left lung has two lobes, with the larger lobe of the liver on the right and the stomach and spleen on the left, as in normal individuals. The morphologic left atrium is to the left of the morphologic right atrium. With situs inversus, the left lung has three lobes, and the right lung has two lobes, with the larger lobe of the liver on the left. The stomach and spleen are on the right side of the body, and the morphologic left atrium to the right

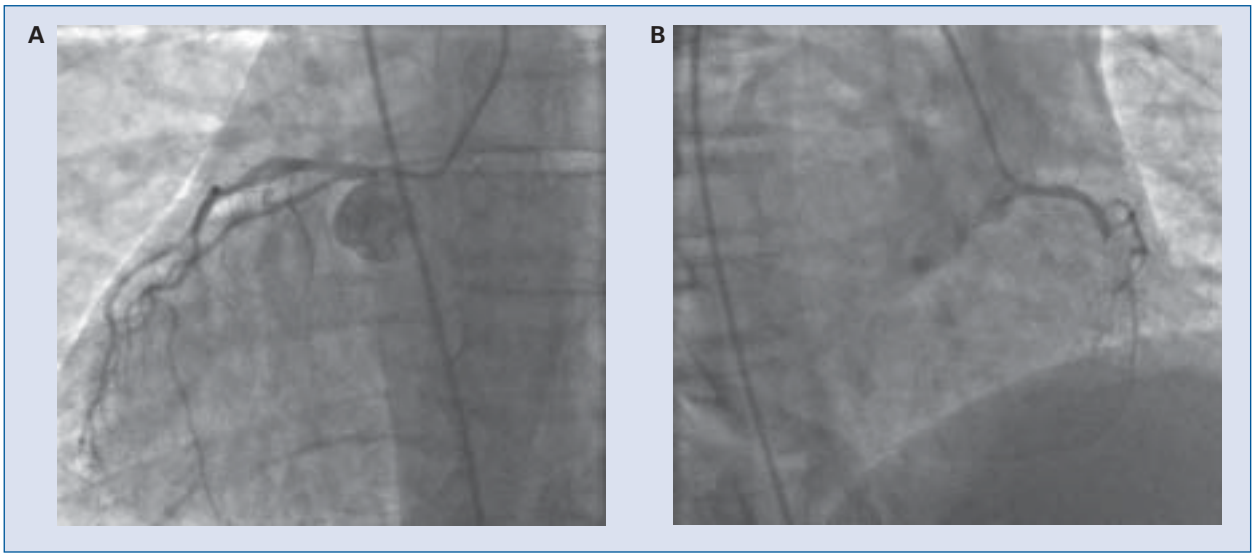

Figure 3. Diagnostic coronary angiography; **A.** The right anterior oblique (RAO) cranial view demonstrates a normal left coronary system; **B.** The right coronary angiogram in the RAO view demonstrates a complete occlusion at the middle right coronary artery.

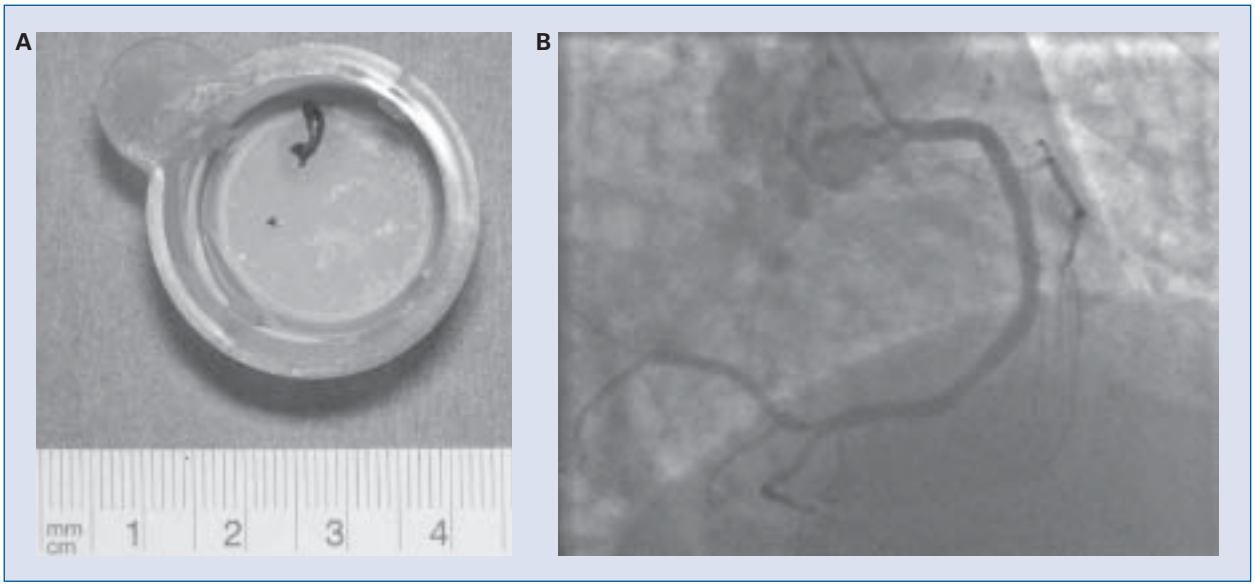

Figure 4. Coronary intervention; **A.** A large 10 mm × 2 mm thrombus aspirated using a QuickCat extraction catheter; **B.** Right coronary artery post-stent implantation and balloon dilatation resulting in TIMI III flow.

of the morphologic right atrium. With situs solitus and situs inversus, the atrial situs always corresponds to the visceral situs. In situs ambiguous the arrangement of the organs is not as ordered, and the relationship between the atria and the viscera is inconsistent. Furthermore, associated cardiac malformations include common atrioventricular canal, univentricular heart, transposition of the great arteries, and total anomalous pulmonary venous return [1, 2]. Dextrocardia with situs inversus occurs rarely, with an estimated incidence of approximately 1:10000 [1]. Unlike dextrocardia with situs solitus or situs ambiguous, the incidence of congenital heart disease is relatively low, estimated to be approximately 3% [2].

Although dextrocardia with situs inversus is rare, with 15% of these patients known to have Kartagener's syndrome (immotile cilia syndrome),

it is believed that these patients share the same risk as the general population for ischemic heart disease. The majority of patients with dextrocardia and situs inversus are ignorant of their variant anatomy until forced to seek medical attention. Our patient was not aware of his dextrocardia until this admission, and interestingly the pain was located in the retrosternal region radiating to the right shoulder. This atypical pain in patients with situs inversus has been previously described by Hynes in 1973 [3]. Importantly, the diagnosis of STEMI was confirmed only after confirmation of dextrocardia with echocardiography. The ST segment elevation became apparent only with the right sided ECG, which prompted referral for primary PCI. Normally, the atria are depolarised from right to left, and the left ventricular muscle mass results in increasing R wave voltage from right to left (V1 to V6). In dextrocardia, lead positioning as for a normal patient would suggest that the atria are depolarised from left to right, and that the R wave amplitude decreases from right to left (V1 to V6) (Fig. 1). Switching leads aVL and aVR corrects the frontal plane P wave and QRS axis (Fig. 2). Reversal of the precordial leads, so that V1 to V6 are positioned from the left parasternal to the right mid-axillary line, corrects the abnormal R wave progression.

Coronary angiography for dextrocardia was first reported in 1974 in a patient who underwent left ventricular aneurysmectomy [4]. Coronary artery bypass surgery in a patient with dextrocardia was described in 1982 [5], and coronary grafting with a right internal mammary artery was reported in 1988 [6]. As for PCI techniques, 2 patients undergoing coronary angioplasty were reported by Moreyra in 1987 and Gaglani in 1989 [7, 8]. To the best of our knowledge, since 1987 there have been only 3 previous reports of primary PCI for acute STEMI in patients with dextrocardia [9–11].

Moreyra et al. [7] reported that regular coronary catheters (Judkins) are difficult to use because of the reversed position of the coronary ostia, and recommended multipurpose catheters or a brachial approach. However, this difficulty was not encountered in our experience or in other previous reports [8, 12]. In our case, with a right-sided aortic arch, the right sided left coronary artery could be successfully cannulated with a left Judkins catheter manipulated to a mirror image of its normal position (Fig. 3A). Conversely, the left-sided right coronary artery was cannulated with a right Judkins catheter, again manipulated to a mirror image of its normal position (Fig. 3B). In mirror-image positions, catheters can be passed using the standard technique, except that the catheters are rotated in the opposite direction for patients with dextrocardia when compared to patients with normal cardiac anatomy. Counter-clockwise rotation was used to cannulate the ostium of the right coronary artery rather than the standard clockwise catheter rotation. It should be noted that for both the right and the left coronary arteries in biplane angiography, the left anterior oblique (LAO) and RAO angulations are essentially reversed from the normal biplane angulations. The selective left coronary angiograms were obtained in the RAO cranial, posteroanterior cranial, and LAO caudal views. The selective right coronary angiograms were obtained in the RAO 60, posteroanterior cranial, and LAO 30 views. For intervention to the right coronary artery, the RAO view provided excellent imaging.

In summary, we report an extremely rare case of primary PCI for the treatment of an STEMI in a patient with situs inversus. The use of Judkins catheters, standard image acquisition, and counter rotation of catheters allowed the interventional procedure to proceed without any complication.

Acknowledgements

The authors do not report any conflict of interest regarding this work.

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