
Case reports

Coronary artery bypass grafts in a patient with isolated cardiac dextroversion

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Despite several controversies, the term "dextrocardia" usually defines a rare type of intrinsic cardiac abnormality due to a rotation disorder and resulting in a right-sided direction of the cardiac axis. According to the majority of experts, the extent of a dextrocardia associated with a *situs solitus* is termed "dextroversion". In such a rare condition, therefore, the relationships between the cardiac chambers and the other structures (that is superior and inferior venae cavae, liver, stomach) are modified whereas in case of dextrocardia with *situs inversus*, the relationships between the cardiac chambers and neighboring structures are preserved and the classical "mirror image" is shown. In 95% of cases with dextroversion, an associated cardiac abnormality has been described and, therefore, acquired heart diseases in patients with isolated dextroversion are extremely rare. To our knowledge, the present is the first case report describing a coronary artery bypass graft performed in a patient with isolated dextroversion. The technical aspects of the surgical procedure are also discussed.

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Background

The term "dextrocardia" defines a cardiac malformation in which, due to an embryological rotation disorder, the apex of the heart points to the right side^{1,2}. This term, therefore, differentiates those cases in which the right-sided position of the heart is attributable to a cardiac malformation from "dextroposition", in which the right-sided position of the heart is due to the displacement of a normal heart into the right hemithorax². Moreover, dextrocardia can be associated with a *situs solitus* (normal position of the abdominal organs) and in such conditions the term "dextroversion" is commonly used³⁻⁵. The main difference between dextroversion and dextrocardia with *situs inversus* is that in dextroversion the relationships between the cardiac chambers and the neighboring organs are modified whereas in dextrocardia with *situs inversus* the relationships are preserved and the classical "mirror image" is shown^{6,7}.

As recently confirmed by extensive reports, dextroversion is a rare congenital abnormality and even rarer is dextroversion without further congenital defects^{4,8,9}. We report a case of a coronary artery bypass in an adult patient with isolated dextroversion.

The technical aspects of the surgical procedure are described together with a review of the literature.

Case report

A 56-year-old man suffering from unstable angina was admitted to the Cardiology Department of a peripheral hospital in order to undergo a coronary angiography. The past medical history revealed a diagnosis of dextrocardia since the age of 18 years and the patient had been completely asymptomatic for almost 50 years. The chest X-ray confirmed the right-sided position of the heart with a concomitant *situs solitus* of the abdominal organs (Fig. 1). Coronary angiography (Fig. 2) showed the left anterior descending coronary artery (LAD) clearly pointing to the right, and revealed the presence of multivessel coronary artery disease including a significant stenosis of the left main coronary artery. Transthoracic echocardiography confirmed the absence of associated congenital abnormalities (Fig. 3), leading to the diagnosis of "isolated dextroversion". The patient was then referred to our division and scheduled for myocardial revascularization.

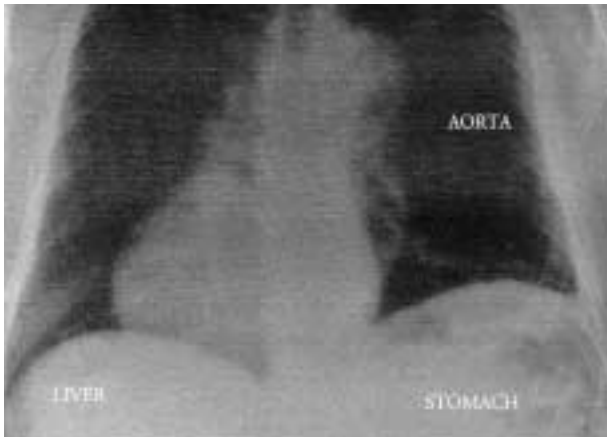


Figure 1. Plane chest X-ray showing the dextrorotation of the cardiac axis with a normal position of the abdominal organs and the aorta (situs solitus).

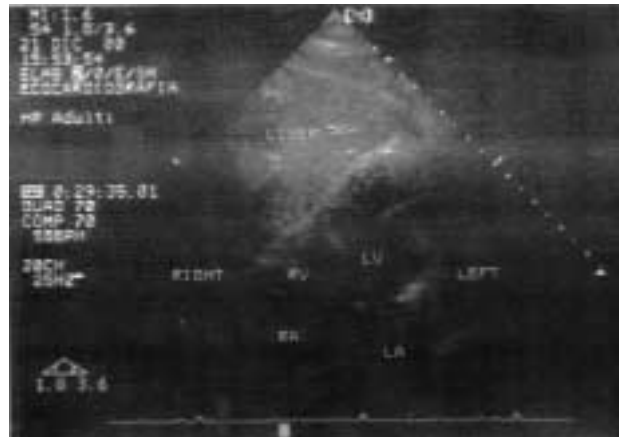


Figure 3. Transthoracic echocardiography: atrioventricular concordance with dextrorotation of the cardiac axis. There are no associated cardiac abnormalities. LA = left atrium; LV = left ventricle; RA = right atrium; RV = right ventricle.

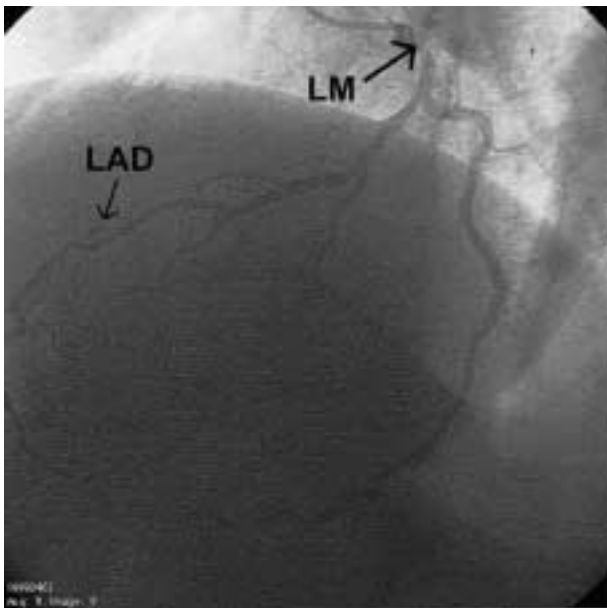


Figure 2. Selective arteriography of the left coronary artery showing the left anterior descending coronary artery (LAD) pointing to the right side of the chest and a significant stenosis of the left main coronary artery (LM).

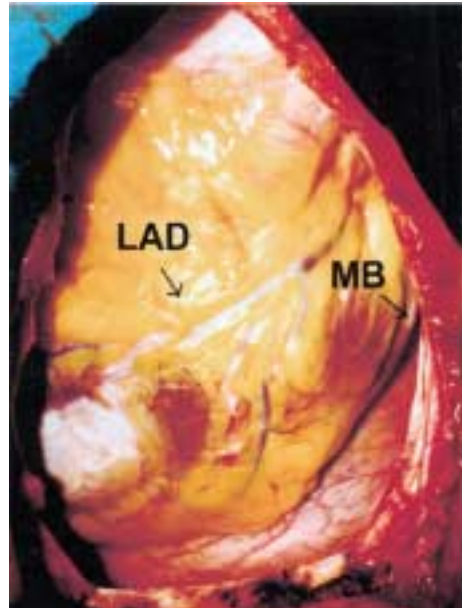


Figure 4. Intraoperative picture after midline sternotomy and pericardial exposure: the left anterior descending coronary artery (LAD) pointing the right side is clearly identified. The marginal branch (MB) of the circumflex coronary artery is also visible without traction of the heart.

After midline sternotomy, the pericardium was opened and, having visualized the LAD (Fig. 4), it was decided to use the right internal thoracic artery. After harvesting of the conduits, the aorta and right atrium were cannulated. The aorta was easily cannulated. In contrast, due to the extreme rotation of the right atrium, cannulation of this structure was rather difficult. Two distal anastomoses were sequentially performed on the posterior descending artery and on the marginal branch of the circumflex artery, using a single vein segment. The circumflex artery, due to heart rotation, was easily visualized (Fig. 2) without traction. Finally, the right internal thoracic artery was anastomosed to the LAD. The outcome was uneventful and the patient was discharged to the rehabilitation clinic on the fifth postoperative day.

Discussion

We report a case of dextrocardia with *situs solitus* and without associated cardiac abnormalities. This is an extremely rare condition. Despite several controversies about the terms dextrocardia, dextroversion and dextroposition^{1,10,11}, dextrocardia is commonly used to define the situation where, due to a cardiac malformation, the apex or the major axis of the heart points to the right². Dextrocardia can occur either in concomitance with a *situs inversus*, that is the malposition of the other organs and a consequent “mirror image”, or in concomitance with a *situs solitus* that is normal position of all other organs^{2,7}. The condition of dextrocardia with *situs solitus*,

according to Arcilla's classification and to several other authors, is termed "dextroversion"²⁻⁵. On the basis of their extensive experience, Comstock et al.⁴ and Borgida et al.⁹ respectively reported values of 0.1 and 0.5% for the incidence of dextrocardia. In 50% of cases, dextrocardia presents as *situs solitus* and, therefore, should be referred to as dextroversion. Moreover, in 95% of cases dextroversion is indeed associated with other abnormalities and, therefore, the overall incidence of isolated dextroversion is about 0.01-0.07%. In case of severe associated abnormalities, the patient is referred to a pediatric cardiac surgeon during childhood, whereas in asymptomatic patients further diagnostic tests could be avoided. In the present case report, even if the diagnosis was made almost 40 years before, the patient was completely asymptomatic until the onset of angina. Due to the extreme rarity of this cardiac malformation, only a few cases of surgery for acquired cardiac disease have been reported in patients with dextroversion¹² compared to those reported in patients with dextrocardia and "mirror image"¹³⁻¹⁵. More precisely, coronary artery bypass in patients with dextrocardia has been previously reported by Asiatic authors^{16,17} but, to our knowledge, this is the first case of coronary artery bypass performed in a patient with isolated dextroversion. As far as the surgical technique was concerned, the extreme rotation of the heart results in an altered relationship between the cardiac chambers and the neighboring structures, such as the inferior vena cava. This renders cannulation of the right atrium difficult and, therefore, access via the femoral vein could be considered as a good option in such a condition. Finally, with regard to the position of the coronary arteries, the main difference concerns the marginal branch of the circumflex artery the visualization of which on the left side of the heart is easy and does not necessitate any traction. The right internal thoracic artery seems to be, moreover, the best choice for treatment of disease of the LAD.

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