Left side approach for aortic valve replacement in patient with dextrocardia and situs inversus totalis

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Aortic valve replacement in patients with dextrocardia and situs inversus totalis is technically challenging due to anatomical considerations. Modifications of the cannulation strategy and operative tool sets are helpful. We report a 47-year-old man who had dextrocardia with situs inversus totalis with severe aortic regurgitation. Our approach was precisely planned depending on the clear anatomy outlined by preoperative contrast-enhanced computed tomography of the chest. We used a surgical approach in which the main surgeon was standing on the left side of the patient. Left sided approach provided excellent exposure for aortic valve replacement in this case scenario.

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Introduction

Dextrocardia with situs inversus totalis is a mirror image of the norm. It represents a rare anomalous anatomy, in which the visceral organs and the heart are situated in the right side [1]. Preoperative contrast enhanced chest computed tomography (CT) is very helpful in delineating the precise anatomy of the major mediastinal structures. We report the case of a patient with dextrocardia and situs inversus...
totalis, who had severe aortic valve regurgitation needing surgical aortic valve replacement.

**Case report**

A 47-year-old man presented to the cardiology clinic with progressive shortness of breath and effort intolerance. He had been diagnosed during a pre-employment physical examination with mild aortic regurgitation, situs inversus totalis, and dextrocardia a long time ago. He had been asymptomatic until 2 months earlier. He did not have marfanoid features and he had Grade IV diastolic murmur just heard at the left third parasternal space. Chest X-ray demonstrated dilated heart directed to the right side with gastric bubble under the right hemidiaphragm (Fig. 1A).

Work up included transthoracic echocardiography, demonstrated dextrocardia with gross aortic valve regurgitation through a trileaflet aortic valve, with dilated left ventricular cavity and an estimated left ventricular ejection fraction of 40%. Contrast-enhanced chest CT with three-dimensional reconstruction showed a rightward orientation of the ventricular apex as well as the aortic arch exactly a mirror of the norm, with
mildly dilated ascending aorta, with an estimated diameter of 41 mm at the sinotubular junction, and 37 mm aortic root at the level of the coronary ostia (Fig. 1B). Coronary angiography demonstrated left main coronary ostium arising from the left sinus and a right coronary ostium arising from the right coronary sinus, and both had patent coronary territories.

Surgery was performed via median sternotomy. The main surgeon was standing on the left side of the patient for technical ease, and both cavae and the innominate artery were identified on the left side. Cardiopulmonary bypass was initiated using the distal ascending aorta for arterial inflow and the left sided right atrial appendage for venous drainage (Fig. 1C). Myocardial protection was achieved using ante and retrograde normothermic cardioplegia. Subsequently, the aorta was clamped and opened obliquely just above the sinotubular junction with extension leftward toward the noncoronary sinus. The three aortic valve cusps were excised and a 23-mm mechanical valve was inserted and fitted well. The patient was weaned from the cardiopulmonary bypass and came off in normal sinus rhythm. Early postoperative recovery period was uneventful; he was extubated after 5 hours and was out of the intensive care unit on Day 1, and out of hospital at Day 6 with therapeutic international normalized ratio of 2.5.

Discussion

Dextrocardia with situs inversus totalis is a very rare anomalous entity, affecting 1–2 individuals per 10,000 population [1]. Most patients are expected to live normally; however, anomalous abnormalities in the heart can occur in about 3–5% of the patients [2], and some cases need complex cardiac surgery in the adulthood period [3].

Many reports emphasize the value of contrast-enhanced chest CT in the postoperative assessment on coronary artery bypass grafting, valve replacement, aortic surgeries, and complex congenital cardiac surgeries [3]; however, in our case, this preoperative modality was extremely helpful for our surgical team to assess location and orientation of the major structures and to plan our cannulation strategy, and to set our operative tools in a way such that the main surgeon stands on the left side of the patient, which added much to the technical ease of the surgery. Performing surgery in this case was very interesting as the anatomy was opposite to what our minds are used to.

The ascending aorta measurement was 41 mm, not reaching a significant size warranting replacement as per published guidelines [4]. In addition, the patient’s body mass index was 25 kg/m², and he did not have marfanoid features to warrant ascending aortic replacement with this ascending aortic diameter. David [5] described conditions that may be considered for ascending aortic replacement at lower ascending aortic diameters such as family history of aortic dissection and Loyes–Dietz syndrome, neither of which was present in our patient.

Our adopted left-sided surgical approach for aortic valve replacement in this clinical setting is simple, and we can propose this approach for patients with such anomalous anatomy. We would like to stress the high importance of the preoperative chest CT scan in planning for such an approach.

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