Left-sided approach for mitral valve replacement in a case of dextrocardia with situs solitus

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Abstract

Mitral valve surgery in dextrocardia is technically challenging due to its anatomical malposition. Minor modifications are required in the surgical technique to counteract the problems during cannulation and exposure of the mitral valve. We report a case of a patient with dextrocardia, situs solitus, rheumatic heart disease, severe mitral regurgitation, moderate pulmonary artery hypertension, and severe left ventricular dysfunction who underwent mitral valve replacement using a two-stage right atrial cannulation with left-sided left atrial atriotomy, with the surgeon standing on the left side of the patient. Our approach for mitral valve surgery in this clinical setting is simple.

Keywords: Valve replacement • Dextrocardia • Situs solitus

INTRODUCTION

Dextrocardia with situs solitus is a rare congenital anomaly [1]. The anatomically malpositioned ventricle obscures the inferior vena cava and right atrium from the surgeon’s view. The main pulmonary artery covers the proximal part of the ascending aorta. The strategy for establishment of cardiopulmonary bypass and exposure of the mitral valve needs to be improvised.

CASE REPORT

A 23-year old male presented to our institute with breathlessness on exertion (New York Heart Association Class III). Past history of rheumatic fever was present. On examination, a pansystolic murmur (grade 3/6) was heard all over the precordium. Chest radiography showed situs solitus and dextrocardia. The electrocardiogram showed a sinus rhythm with ventricular premature contractions and reverse R-wave progression in the precordial leads. Transthoracic and transoesophageal echocardiography revealed situs solitus, dextrocardia, rheumatic heart disease, severe mitral regurgitation, with both leaflets being thickened and non-coapting, and the presence of subvalvular disease with mild tricuspid regurgitation, moderate pulmonary artery hypertension, and severe left ventricular dysfunction (left ventricular ejection fraction of 35%). A detailed clinical examination was performed to rule out any known syndrome. A genomic study to look for any genetic abnormality was not performed.

Operative technique

After median sternotomy and vertical pericardiotomy, the anatomy was assessed. The right ventricle obscured the inferior vena cava and the right atrium, but the right atrial appendage was accessible. The dilated main pulmonary artery covered a major part of the ascending aorta, and only a small part of the distal ascending aorta was visible. The aorta was cannulated in the routine manner, and venous cannulation was performed with a two-stage right atrial procedure through the right atrial appendage. Moderate hypothermic cardiopulmonary bypass was established. The main pulmonary artery was retracted caudally for cardioplegia cannulation. The heart was arrested with antegrade cold blood cardioplegia. The surgeon switched his position from the right to the left side of the patient after bypass was established. The mitral valve was exposed via an incision parallel to the junction of the left atrial appendage with the left atrium (Fig. 1). The mitral valve was found to be rotated by 90 degrees from its normal position such that the anterior leaflet was positioned to the right and the posterior leaflet on the left side. Both the leaflets were thickened and retracted however there was no calcification. The leaflets were non-coapting. Chordal thickening and chordal fusion were present. The mitral annulus was dilated. It was decided to replace the mitral valve because it was not possible to repair it. Histopathological examination revealed chronic rheumatic valvular inflammation. A 31-mm St Jude Medical mechanical heart valve prosthesis (St Jude Medical, Inc., St Paul, MN, USA) was seated using 2-0 polyester everting interrupted sutures. Total chordal preservation was performed using Miki’s technique [2]. The immediate postoperative course was uneventful, and the patient was discharged from the hospital on the 6th postoperative day. At present, the patient is in New York Heart Association Class I. Transthoracic echocardiography at the 6-month follow-up examination revealed a normally functioning mechanical prosthesis with a mean gradient of 4 mmHg across the prosthesis, with severe left ventricular dysfunction (left ventricular ejection fraction of 35%).

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DISCUSSION

Dextrocardia is a rare congenital anomaly and was first described by Fabricius in 1606 [1]. Dextrocardia can be associated with situs solitus, situs inversus or situs ambiguous; however, situs solitus is the commonest form [3]. There are only few reports of mitral valve replacement in cases of dextrocardia with situs solitus [1, 4]. With rotation of the heart, the right atrium and superior vena cava are displaced posteriorly, making their visualization difficult for cannulation. The main pulmonary artery covers the proximal part of ascending aorta. In our case, the patient had severe pulmonary artery hypertension with a dilated main pulmonary artery obscuring the major part of the proximal ascending aorta, and only a small part of the distal ascending aorta was seen, making aortic cannulation difficult (Fig. 2). St Rammos and colleagues described mitral valve surgery in a Jehovah’s Witness patient with previous bilateral thoracotomies. They established cardiopulmonary bypass by cannulating the aorta and left common femoral vein. The superior vena cava was cannulated after emptying the heart, and the mitral valve was exposed from the left side, with the surgeon standing on the left side [4]. Okamura et al. lifted the heart to the left side with the help of a Starfish heart positioner (Medtronic Inc., Minneapolis, MN, USA) and then established cardiopulmonary bypass in the routine manner. The mitral valve was exposed via a left-sided left atriotomy, with an incision made at the base of the left atrial appendage similar to our approach, with the surgeon standing on the left side [1]. In our case, we used two-stage right atrial venous cannulation, and the aorta was cannulated in the routine manner. Cannulation of the inferior vena cava was avoided. An approach to the mitral valve from the left side of the patient requires only little retraction, and we believe that this does not cause obstruction of the superior vena cava. Nevertheless, we monitored the central venous pressure throughout the operation.

We conclude that mitral valve surgery in dextrocardia with situs solitus can be accomplished with a two-stage right atrial venous cannulation (single venous cannulation) and left-sided left atrial atriotomy, with the surgeon standing on the left side of the patient. Our technique is simple because we avoided femoral cannulation and lifting the heart for inferior vena cava cannulation as done by St Rammos et al. [4] and Okamura et al. [1], respectively. Lifting the heart for inferior vena cava decannulation while a mitral valve prosthesis is in situ is fraught with danger of left ventricular rupture [5]. However, our strategy is not applicable to patients with associated tricuspid valve disease. This report underscores the importance of understanding the anatomy and making minor modifications in performing the mitral valve procedure.

Conflict of interest: none declared.

REFERENCES

