

Mitral valve replacement in dextrocardia with situs inversus totalis: a good exposure

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ABSTRACT

Situs inversus totalis with dextrocardia is a rare congenital anomaly. This is a reverse isomeric form of the thoracic and abdominal viscera or the complete mirror image. Left atrial approach for mitral valve surgery is required particularly in the treatment. Herein, we present a case of situs inversus, dextrocardia, and rheumatic mitral regurgitation. Standing in the left side of the patient, biatrial cannulation and left atrial approach for mitral valve replacement were performed. We described a new technique for biatrial cannulation and decannulation without lifting the heart.

Keywords: Dextrocardia; mitral valve replacement; situs inversus totalis.

The incidence of situs inversus totalis with dextrocardia is 1/10,000 to 50,000 births.^[1] There is only one mitral valve surgery case with isolated dextrocardia without situs inversus totalis in the literatures in Turkey.^[2] Dextrocardia situs inversus totalis is defined as the heart and all visceral organs being the mirror image of one another.^[3] In most cases, the diagnosis is made incidentally on imaging studies in adults.

Herein, we present a case of situs inversus totalis and dextrocardia and rheumatic mitral regurgitation, in which mitral valve replacement was done under cardiopulmonary bypass (bicaval cannulation) through left atriotomy.

CASE REPORT

A 61-year-old woman presented to our clinic with palpitation and dyspnea. She was in Class III New York Heart Association. On physical examination, grade 3/6 pansystolic murmur was heard all over the precordium. The patient had diabetes mellitus, chronic obstructive lung disease, and hypertension. She was in normal sinus rhythm on electrocardiography (ECG). Chest X-ray revealed dextrocardia. Carotid Doppler ultrasonography and blood test results were normal. The patient was diagnosed with severe mitral regurgitation with mild stenosis by transthoracic and transesophageal echocardiography. She had a left ventricular end-systolic diameter of 42 mm, an end-diastolic diameter of 55 mm, a left atrial

anteroposterior diameter of 40 mm, and an ejection fraction of 60% by echocardiography. The coronary arteries were normal in the preoperative coronary angiography (Figure 1). During the preoperative period, abdominal tomography was performed to discover any pathology in the inferior vena cava and abdominal organs. She was found to have abdominal situs inversus totalis. The continuity of the inferior vena cava was normal (Figure 2).

Surgical technique

Following a median sternotomy and pericardiotomy, superior vena cava and inferior vena cava were widely separated from the pericardium for cannulation and decannulation without lifting the heart. Arterial cannulation was performed on ascending aorta and venous cannulation was done through bicaval cannulation of the superior and inferior vena cava (Figure 3). Moderate hypothermia was induced. The surgeon switched his position from the right to the left side of the patient after establishment of cardiopulmonary bypass. Cardioplegic arrest was achieved using antegrade blood cardioplegia. There

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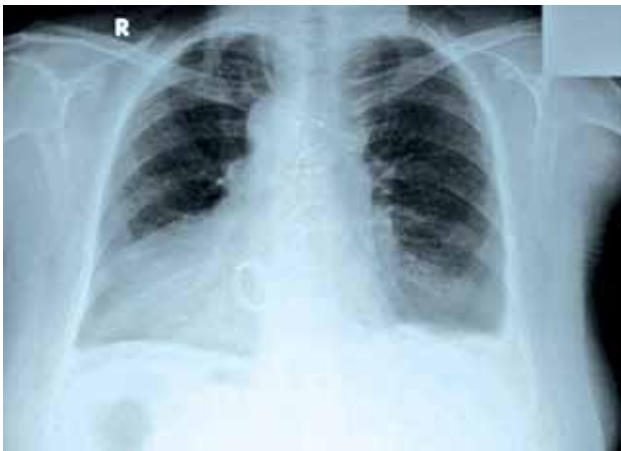


Figure 1. A postoperative chest X-ray image showing dextrocardia and prosthesis mechanical mitral valve shadow.

was no major problem on the tricuspid valve. Then, we decided to approach to mitral valve through the left atriotomy. Atrium was vertically opened from the superior part in front of the right pulmonary veins. We achieved the excellent mitral valve exposure by using the left atrial retractor. Intraoperative findings revealed that the repair of the mitral valve was not feasible, as the valve structure was severely calcified and degenerated. Chordal thickening and chordal fusion were also present. In addition, the anterior leaflet was calcified, making it unsuitable for valve repair. Additionally, the mitral annulus was dilated. Therefore, the native valve was excised, preserving the posterior leaflet, and replaced with a 29 mm mechanical valve prosthesis (Figure 4). The postoperative course was uneventful

and the patient was discharged on the postoperative fifth day. She was followed for three months without any complaints.

DISCUSSION

Although dextrocardia can be associated with situs solitus, situs inversus or situs ambiguus, situs solitus is the most common form.^[4] Situs inversus totalis, as in our case, is a reverse isomeric form of the thoracic and abdominal viscera or complete mirror image. Such patients may have an interrupted inferior vena cava in the intrahepatic segment. These abnormalities may cause problems during the inferior venous cannulation. Therefore, inferior vena cava abnormalities should be definitely examined by computed tomography or magnetic resonance imaging.

To date, several approaches for mitral valve surgery in dextrocardiac patients have been published. As in our case, almost all surgeons prefer to stand on the left side of the patient. St. Rammos et al.^[5] established cardiopulmonary bypass by cannulating the aorta and left common femoral vein. The superior vena cava was cannulated after emptying the heart. Okamura et al.^[6] lifted the heart by using a heart positioner and then made bicaval venous cannulation and the aorta was cannulated in the routine manner. The mitral valve was exposed via 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. However, lifting the heart for inferior vena cava decannulation while a mitral valve



Figure 2. Preoperative normal coronary angiography image.



Figure 3. Contrast-enhanced abdominal computed tomography indicating the presence of situs inversus totalis.

prosthesis is *in situ* is fraught with danger of the left ventricular rupture.^[7] In another study, Kikon et al.^[8] used a two-stage single venous cannula and performed left atriotomy. This method may lead to obstruction of the superior vena cava during the traction to the left atrium.

Furthermore, we established cardiopulmonary bypass by cannulating the aorta and superior and inferior vena cava separately without using any heart positioner for lifting the heart, since we performed cannulation by widely separating vena cava superior and inferior from the pericardium. This may be a technical trick for safe bicaval cannulation in dextrocardiac patients. We approached the mitral valve via left atriotomy. We provided excellent exposure with a little traction. Of note, although there are few bleeding complications with the transeptal approach, the extension of the septal incision to the anterior of the coronary sinus may lead to nodal rhythm.^[9] The other concern is probability of damaging the sinus node artery in the superior septal approach. Therefore, we avoided risk of groove tear during decannulation in mitral valve replacement by not lifting the heart. We also abstained superior venous obstruction and rhythm problems by bicaval venous cannulation and left atriotomy.

In conclusion, we suggest that standing on the left side of the patient and widely separating the vena cava inferior and superior from the pericardium for cannulation and decannulation without lifting the heart through bicaval venous cannulation and left atriotomy is more useful approach for the treatment of dextrocardiac mitral valve.

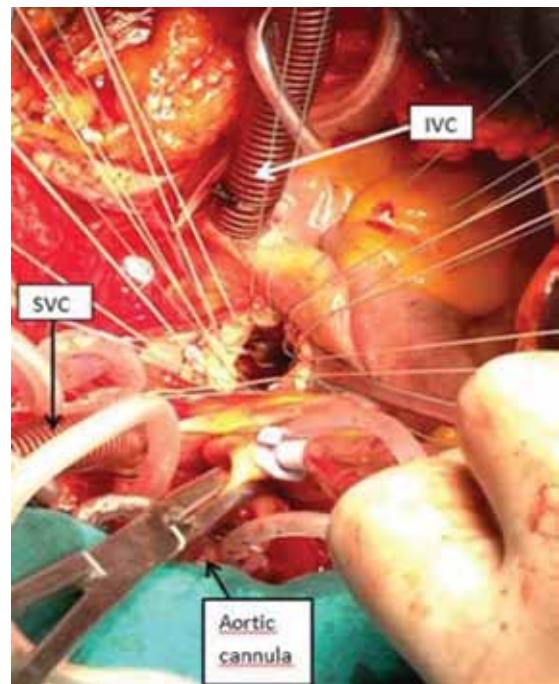


Figure 4. Intraoperative view showing the left atriotomic approach to the mitral valve and ascending aortic and bicaval venous cannulation. IVC: Inferior vena cava; SVC: Superior vena cava.

Declaration of conflicting interests

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REFERENCES

1. Garg N, Agarwal BL, Modi N, Radhakrishnan S, Sinha N. Dextrocardia: an analysis of cardiac structures in 125 patients. *Int J Cardiol* 2003;88:143-55.
2. Durukan AB, Gürbüz HA, Uçar Hİ, Serter FT, Yorgancıoğlu C. Mitral valve replacement surgery in isolated dextrocardia: a case report. *Turk Göğüs Kalp Dama* 2013;21:756-8.
3. Oliveira N, Oliveira F, Dias E, Borges L, Cássio I. Leriche Syndrome in a Patient with Situs Inversus Totalis. *Ann Vasc Surg* 2015;29:1317.e5-8.
4. Lev M, Liberthson RR, Eckner FA, Arcilla RA. Pathologic anatomy of dextrocardia and its clinical implications. *Circulation* 1968;37:979-99.
5. St Rammos K, Bakas AJ, Panagopoulos FG. Mitral valve replacement in a Jehovah's Witness with dextrocardia and situs solitus. *J Heart Valve Dis* 1996;5:673-4.

6. Okamura H, Yamaguchi A, Adachi K, Adachi H. Mitral valve replacement in a case of dextrocardia with situs solitus. *J Heart Valve Dis* 2010;19:794-6.
7. Kouchoukos NT, Blackstone EH, Doty DB, Hanley FL, Karp RB. Mitral valve disease with or without tricuspid valve disease. In: *Kirklin/Barratt-Boyes Cardiac Surgery*. Vol. 11. 3rd ed. Philadelphia: Churchill Livingstone; 2003. p. 535-9.
8. Kikon M, Kazmi A, Gupta A, Grover V. Left-sided approach for mitral valve replacement in a case of dextrocardia with situs solitus. *Interact Cardiovasc Thorac Surg* 2013;17:900-2.
9. Lukac P, Hjortdal VE, Pedersen AK, Mortensen PT, Jensen HK, Hansen PS. Superior transseptal approach to mitral valve is associated with a higher need for pacemaker implantation than the left atrial approach. *Ann Thorac Surg* 2007;83:77-82.