Endoscopic redo tricuspid valve replacement in complete situs inversus

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Clinical Summary

A 77-year-old woman with paroxysmal atrial fibrillation presented with right heart failure. She had a history of rheumatic mitral stenosis. Ten years earlier she had undergone mechanical mitral valve replacement via a sternotomy for mitral valve endocarditis. The chest x-ray film revealed dextrocardia (Figure 1, A). Transesophageal echocardiography confirmed dextrocardia with a normal mitral valve replacement, grade III tricuspid regurgitation with a tricuspid annulus diameter of 37 mm, a dilated right atrium (RA) with an impaired right ventricle, and a left ventricular ejection fraction of 65%. A contrast computed tomographic scan (Figure 1, B) and magnetic resonance imaging confirmed complete situs inversus with left-sided superior and inferior venae cavae (LSVC, LIVC) draining into a left-sided RA, atrioventriculoarterial concordance, and a right-sided descending aorta. The coronary arteries were normal, and right heart catheterization revealed severe tricuspid regurgitation, elevated RA pressure, and moderate pulmonary hypertension. Her calculated EuroSCORE was 10.

Surgical Technique

Operative setup. Our endoscopic technique for mitral or tricuspid valve surgery via port access has been published elsewhere.¹ We highlight salient modifications for the left-sided approach. After selective ventilation via the right lung and under transesophageal echocardiographic guidance, the left internal jugular vein was cannulated to drain the LSVC. Port creation in the left side of the chest was identical to the port-access approach. After full-dose heparinization, the LIVC was cannulated via the left femoral vein. The left femoral artery was used for arterial cannulation, and an endoscopic aortic balloon was negotiated from its side arm in the ascending aorta just above the sinotubular junction. Endoscopic cardiopulmonary bypass with kinetic assisted venous drainage was established. Due to dense adhesions between the LSVC, LIVC, and the pericardium, an endoscopic bulldog clamp was used to occlude the SVC and an occluding balloon was negotiated via the right groin to lie at the LIVC-RA junction (Figure 2). Asystolic cardiac arrest was achieved after inflation of the endoscopic aortic balloon and cold crystalloid antegrade cardioplegia.

Operative findings. The RA was opened. The tricuspid annulus was grossly dilated with floppy valve leaflets prolapsing far beyond the annulus into the right atrium. Tricuspid valve replacement was performed with a 31-mm Carpentier-Edwards Perimount mitral valve prosthesis (Edwards Lifesciences, Irvine, Calif) (Figure 2) using interrupted pledget-supported sutures. A temporary bipolar ventricular pacing wire was placed directly into the papillary muscle of the right ventricle. After RA closure, the LSVC and LIVC occluders were removed and the aortic endoclamp deflated to reperfuse the heart. The patient was gradually weaned off bypass in sinus rhythm without inotropic support. The total crossclamp and bypass times were 73 and 172 minutes, respectively.

Postoperative course. Twelve hours postoperatively the patient required re-exploration for bleeding via the working port. No active bleeding was found. She was extubated after 32 hours and her intensive care unit stay was 3 days. She was ambulatory by the fourth postoperative day and was discharged home on the eighth postoperative day with controlled atrial fibrillation.

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Figure 1. Chest x-ray film (A) showing dextrocardia and computed tomographic scan (B) confirming right-sided left ventricle with mitral prosthesis, left-sided right atrium, and right sided descending aorta.

Comment

Redo valve surgery via re sternotomy in elderly patients carries a mortality of 10.6%.² Burfeind and associates³ reported 30-day mortalities for redo valve surgery by port access, thoracotomy, and sternotomy of 0%, 22%, and 14%, respectively. Our patient carried a logistic EuroSCORE predicted mortality of 16%. To decide a precise approach in this complex case was challenging. Kambara and Michler⁴ have reported a sternotomy and right ventriculotomy approach because of difficult visualization of the tricuspid annulus, which was rotated 90° from the normal position. Furthermore, in dextrocardia both venae cavae are nearly posterior midline structures, making cannulation difficult via sternotomy. In our experience with the port-access approach for redo valve surgery, there is no need for extensive dissection of the heart and the pericardium. However, it is important to confirm the anatomic concordance and situs of cardiac structures by computed tomographic scan or magnetic resonance imaging. We did face problems encircling the

Figure 2. Balloon occlusion of the inferior vena cava with excellent view of the tricuspid valve prosthesis.

venae cavae, and hence innovative occlusive techniques in the form of an endoscopic bulldog clamp and intraluminal balloon were used for the LSVC and LIVC, respectively. The visibility of the tricuspid valve was enhanced because of the lateral view and video camera assistance (Figure 2). As it was a complex redo situation and the tricuspid annulus was dilated to 37 mm with floppy valve leaflets, the decision was made to replace the tricuspid valve.⁵ Apart from re-exploration for bleeding there were no major complications. Hence, in dextrocardia we strongly recommend a left endoscopic approach, which provides excellent exposure for redo tricuspid valve surgery and is a safe alternative to sternotomy.

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