



A Clean Cut: Minimally Invasive Mitral Valve Replacement after Heart Transplantation

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Abstract

A 50-year-old female presented with progressive heart failure due to obstruction of the mitral valve after heart transplantation in 2008. Through the occlusion catheter (IntraClude Intra-Aortic Occlusion Device), aortic cross-clamping, antegrade cardioplegia, and aortic root venting were performed.

Keywords

- ▶ heart transplantation
- ▶ heart valve surgery
- ▶ minimally invasive surgery; includes port access
- ▶ minithoracotomy
- ▶ reoperation

Our case reports the first published study on minimally invasive mitral valve replacement for valve stenosis through intraluminal aortic clamping. The hazard of traumatic injuries can be reduced by avoiding re sternotomy and circumventing adhesions between the aorta and the pulmonary artery after heart transplantation. Minimally invasive valve surgery is a safe and effective method with regard to short- and long-term results, especially in redo operations.

Introduction

Fifty years after the first heart transplantation (HTX), post-transplant survival is continuously improving. The mean survival in adult patients is 10.7 years; pediatric patients present a mean survival of 16.1 years. Main causes of death remain primary graft failure, infections, and multiorgan failure.¹ With better survival rates, the incidences of cardiac pathologies such as cardiac allograft vasculopathy and valvular diseases will occur more often.

We report on a patient with mitral valve (MV) stenosis 10 years after successful HTX. We performed an MV replacement due to severe atrioventricular valve degeneration through a minimally invasive approach through right thoracotomy.

Case Report

A 50-year-old female presented with progressive heart failure due to obstruction of the MV after an uneventful HTX for dilative cardiomyopathy in October 2008. Initial postoperative echocardiography showed normal pump function and no signs of rejection.

Standard immunosuppression regime consisted of a combination of prednisone, mycophenolate, and tacrolimus. However, due to persistent diarrhea, mycophenolic acid was changed in benefit of everolimus in 2009. Since 2010, the patient has been under immunosuppressive treatment with tacrolimus and azathioprine.

In 2012, doming of the MV with mild stenosis was detected. An elective balloon valvuloplasty procedure for MV stenosis in 2018 (valve orifice area of 1.3 cm², peak pressure gradient [PPG] 24 of mm Hg, mean pressure gradient (MPG) of 14 mm Hg) was unsuccessful. The patient was admitted for surgical valve replacement and deobstruction of the left ventricular outflow tract (LVOT) (PPG of 35 mm HG, MPG of 19 mm Hg) (→ Fig. 1).

Repeated coronary angiography showed a known LCX (left circumflex artery) stenosis aggravated from 25% (since HTX) to 50 to 75%, and a percutaneous transluminal coronary angioplasty was performed and two-drug eluting stents were placed.

Operative Technique

After sternotomy during HTX in 2008, we performed a right minithoracotomy with videoscopy and cardiopulmonary bypass through peripheral right femoral cannulation. Transesophageal echocardiography confirmed a subvalvular

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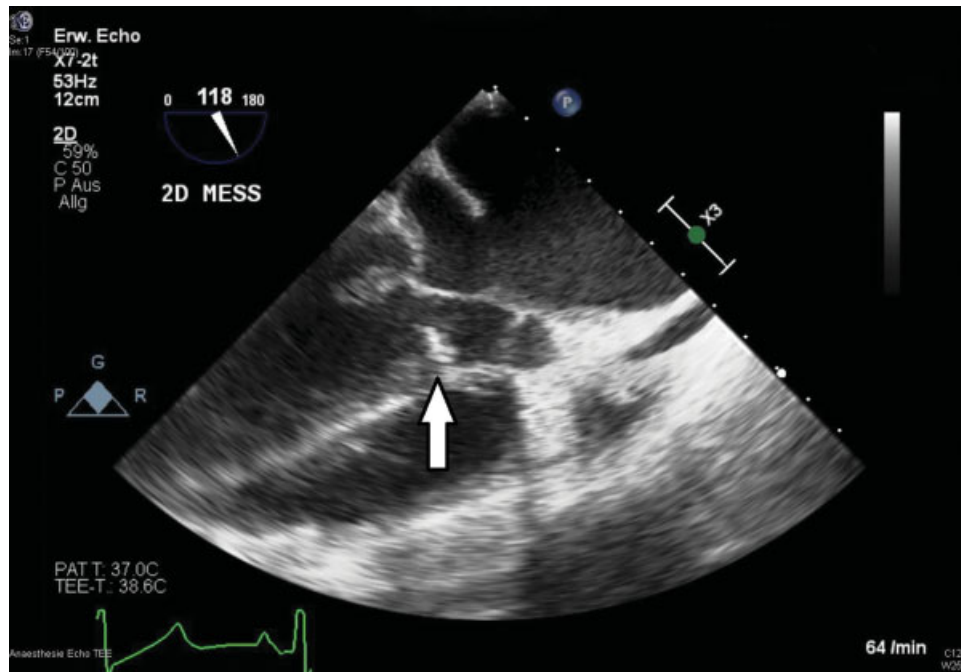


Fig. 1 Intraoperative transoesophageal echocardiography of a subvalvular membrane in the left ventricular outflow tract (marked by an arrow), measuring 1.0×0.5 cm, with probable connection to the anterior mitral valve leaflet.

membrane in the LVOT, measuring 1.0×0.5 cm, with probable connection to the anterior mitral leaflet (**Fig. 1**). Invasive PPG in the LVOT was 25 mm Hg.

The fifth intercostal space was opened through minimal skin incision in the submammary crease. Through the occlusion catheter (IntraClude Intra-Aortic Occlusion Device, Edwards Lifesciences Corporation), aortic cross-clamping, antegrade cardioplegia, and aortic root venting were performed.² Cardiac arrest was established by 2-L Custodiol (Dr. Franz Köhler Chemie GmbH) after inflation of the IntraClude balloon.

Incision of the left atrium was followed by excision of the MV and the subvalvular membrane (**Fig. 2**). MV leaflets showed severe endocardial thickening. The subvalvular membrane of the LVOT was identified and excised as well. Due to the rigidity of the endocardial tissue, MV replacement with a biological prosthesis was agreed upon in accordance with previous agreement of the patient. We implanted a 27-mm Hancock II MV prosthesis (Medtronic).

Aortic cross-clamp time was 81 minutes, and overall CBP time was 145 minutes.

Postoperative Course

After 1 day in intensive care unit and 5 days in the intermediate care ward, the patient was discharged on postoperative day 10.

Histological work-up showed hyaline and myxomatous degeneration with calciferous parts. There were no signs of previous endocarditis.

Discussion

Cases of MV dysfunction after HTX are rare. There are only a few studies and case reports that mention MV repair, mainly due to MV regurgitation. In a retrospective study, Goekler et al first described MV replacement for stenosis after hemodialysis for 2 years following HTX.³ Our case reports the first study published on minimally invasive MV replacement for valve stenosis with intraluminal aortic clamping. Despite worldwide long experience in the field of HTX, numbers of secondary surgical interventions in HTX recipients are scarce. Overall prevalence of reoperations after successful HTX is estimated to

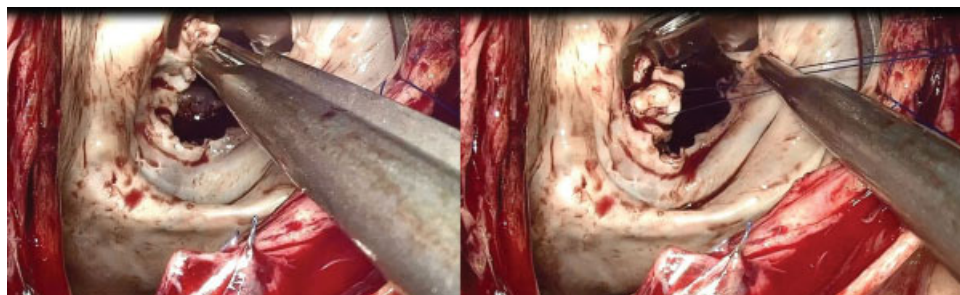


Fig. 2 Excision of the subvalvular membrane through the left atrium (filmed by videoscapy).

be between 2 and 5%. Even high-volume centers describe only a small number of reoperations.³⁻⁵

Considering the high possibility of adhesions from preceding HTX, the hazard of traumatic or iatrogenic injuries can be reduced by avoiding re sternotomy. After aortic and pulmonary artery anastomosis during HTX, the chances for severe adhesions are more relevant. In our opinion, intraluminal aortic clamping via a three-lumen catheter to circumvent severe adhesions between the aorta and the pulmonary artery after great vessel anastomosis during HTX is a safe option. Main complications using intraluminal clamping are described as aortic dissection, iliac artery injury, and cerebrovascular events. Nevertheless, minimally invasive valve surgery is considered being a safe and effective method in short- and long-term results, especially in redo operations.⁶

In a large retrospective study, Pasca et al showed that renal insufficiency is a risk factor for degenerative mitral stenosis.⁷ In patients suffering from MV calcification, kidney disease is more common in patients younger than 50 years.⁸ We consider the renal insufficiency of our patient due to immunosuppression therapy as the main cause for the aggravation of MV degeneration over a time period of 10 years.

This case was discussed in our multidisciplinary team of cardiac surgeons and cardiologists before indication for reoperation was decided upon after conventional catheter approach was unsuccessful.

Conclusion

We report the first case of successful MV replacement in an HTX recipient through minimally invasive right thoracotomy using aortic endoclamp. Considering the lack of international recommendations and guidelines for this specific patient cohort, we emphasize the multidisciplinary approach in

treating these patients who need secondary cardiac interventions after HTX.

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Conflict of Interest

The authors report no conflict of interest or relevant disclosures.

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