


Redo Mitral Valve Replacement Using St. Jude Medical Mechanical Prosthesis via Transseptal Approach in a Patient with Degenerated Mitral Epic Bioprosthesis: A Video Presentation

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Abstract

Keywords

- ▶ redo mitral valve replacement
- ▶ mechanical mitral valve replacement

A 58-year-old male patient with degenerated St. Jude Epic mitral bioprosthesis underwent successful mitral valve replacement using 29 mm St. Jude Medical mechanical prosthesis. Case history presented here to prevent organ injury via a transeptal approach for a degenerated epic bioprosthesis.

Introduction

The ideal mitral valve substitute remains elusive. Debate on the choice between a mechanical versus tissue valve continues.

The following are the guidelines of choosing mechanical versus bioprostheses according to American College of Cardiology and American Heart Association 2006:

Class I

A bioprosthesis is indicated for mitral valve replacement in patients who cannot take warfarin (level of evidence: C).

Class IIa

1. A mechanical mitral prosthesis is reasonable in patients aged less than 65 years with long-standing atrial fibrillation (level of evidence: C)

2. A mitral bioprosthesis is reasonable in patients aged more than 65 years. (level of evidence: C)
3. A mitral bioprosthesis is reasonable in patients aged less than 65 years in sinus rhythm who elect to receive this valve for lifestyle considerations (level of evidence: C).¹

Published data indicate that strong consideration should be given to choosing a tissue over a mechanical prosthesis in patients aged more than 60 years, but the issue remains largely unsettled in patients aged less than 60 years.^{1–4}

Patients' preference to avoid anticoagulation, decreasing operative risks for valve reoperations, and the availability of catheter valve-in-valve techniques have created a need to re-examine bioprosthetic valve durability, particularly in young patients undergoing valve replacements.^{5–8}

Younger patients with rheumatic heart disease undergoing mechanical mitral valve replacement require lifelong

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anticoagulation and are at risk of bleeding and thromboembolic complications.⁵⁻¹⁵ The reported incidence of survival following mechanical mitral valve replacement in the published literature at 10, 20, and 30 years is 61 to 75, 36.5 to 39, and 22.6%, respectively.⁵⁻¹⁵ Although tissue heart valves are an established choice in older age groups, there is a reluctance in using tissue valves in younger age groups because of higher reoperation rates which are inversely proportional to the age of the patients.⁵⁻¹⁵

Over the last 20 years, there is a shift away from a clear-cut age limit towards patients' wish and lifestyle considerations.^{2,16,17}

The St. Jude Medical porcine bioprostheses include Biocor and Epic. Biocor is formulated with no calcium mitigation therapy, whereas Epic is treated with Linx AC, an ethanol-based therapy for calcium mitigation. Both valves are tricomposite bioprostheses with low-pressure glutaraldehyde preservation. They have low-profile flexible stent with a pericardial shield designed to aid in valve durability providing a tissue-to-tissue contact when the valve opens and closes.¹⁸⁻²⁰

Studies on long-term new generation St. Jude Epic mitral bioprosthetic implantation have documented excellent hemodynamic profile and a low incidence of structural deterioration with freedom from reoperation being $89.5\% \pm 5\%$ at 15 years.^{6,7,18-20}

With this background, a group of 295 patients aged less than 40 years underwent mitral valve replacement using St. Jude Medical Epic, and Carpentier Edwards PERIMOUNT bioprosthesis by the corresponding author at All India Institute of Medical Sciences, New Delhi, India, between January 2000 and December 2019.²¹

Among them, 130 patients underwent St. Jude Epic mitral bioprosthetic implantation. The actuarial survival at a median follow-up of 134 (interquartile range: 99.5-178.50) months was $96.36\% \pm 0.01\%$ (95% confidence interval: 93.11-98.10). Thirty patients developed severe bioprosthetic degeneration with predominant stenosis between 7 and 10 years after primary tissue valve replacement.²¹

We report herein a male patient aged 58 years from this series who underwent mitral valve replacement 12 years back using a 29 mm St. Jude Epic mitral bioprosthesis. He underwent redo mitral valve replacement using St. Jude Medical mechanical prosthesis. The indication for reoperation was severe bioprosthetic degeneration.

Surgical Techniques

Following systemic heparinization, elective right femoral arteriovenous cannulation was done using long femoral arterial and venous cannulae (Edwards Lifesciences LLC, One Edwards Way, Irvine, California, United States) (**►Supplementary Video 1**).

Supplementary Video 1

Techniques of explantation of degenerated mitral Epic bioprosthesis. Online content including video sequences viewable at: <https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0042-1757365>.

Under cardiopulmonary bypass, secondary median sternotomy was performed with the heart decompressed on bypass. The Dacron synthetic patch overlying the aorta, right ventricular outflow tract, and superior vena cava was dissected.

The superior caval vein was dissected and cannulated directly using an angled metal tipped venous cannula and drained directly into the oxygenator. An 18-Fr sump suction vent was placed over the main pulmonary artery for further decompression of the heart to facilitate dissection. The intrapericardial inferior caval vein was dissected and looped for later occlusion. The patient was planned for transeptal approach of mitral re-replacement.

The aorta was cross-clamped using an atraumatic aortic vascular clamp. Myocardial preservation was achieved by integrated myocardial protection using direct ostial St. Thomas (II)-based cold blood cardioplegia (4:1) and topical cardiac cooling using ice cold saline. Successive doses of cardioplegia were repeated every 30 minutes.

After snugging the inferior caval vein, the pericardium overlying the right atrium was directly incised in between stay sutures. The interatrial septum was incised and opened in between stay sutures.

Two stay sutures of 2-0 Ethibond (Johnson and Johnson Ltd., Ethicon, LLC, San Lorenzo, California, United States) were placed over the prosthetic mitral annulus to facilitate later explantation of the mitral prosthesis.

An incision was made on the mitral prosthetic ring using a No. 11 scalpel blade. The prosthetic valve was detached from the anterior atrioventricular groove by a combined sharp and blunt dissection.

A small right-angle forceps was insinuated within the opening to facilitate explantation of the mitral prosthesis. The prosthetic valve was explanted by incising the prosthetic fibrous capsule on both atrial and ventricular surface. Extreme precautions were taken not to cause type I atrioventricular groove rupture. Precautions were also taken not to dislodge the thrombus contained within the prosthetic mitral valve. The posterior chordal apparatus was retained. The ventricular cavity is irrigated using cold normal saline.

Re-replacement of the mitral valve is done using a 29 mm St. Jude mechanical prosthesis (St. Jude Medical; St. Jude Medical; St. Paul, Minnesota, United States) and interrupted 2-0 Ticon mattress suture.

The surgically created atrial septal defect was reconstructed using a Dacron polyester patch (Bard Savage filamentous knitted polyester fabric, Bard Peripheral Vascular Inc., Tempe, Arizona, United States). The right atrium was closed in two layers using 2-0 polypropylene suture. The cardiac chambers were covered using a patch of bovine pericardium (**►Video 1**).

Results

The patient had an uneventful postoperative recovery. He was weaned off cardiopulmonary bypass on dopamine $5\mu\text{g}/\text{kg}/\text{min}$ and dobutamine $10\mu\text{g}/\text{kg}/\text{min}$ and adrenaline $0.01\mu\text{g}/\text{kg}/\text{min}$ with stable hemodynamics. At 12 months

follow-up, he is in New York Heart Association functional class I with left ventricular ejection fraction 0.60, normal mitral prosthetic valve function, and/or oral anticoagulation with warfarin.

Conclusions

Elective institution of cardiopulmonary bypass through femorofemoral arteriovenous cannulation prior to sternotomy prevents accidental injury to the cardiac chambers and great vessels during sternal entry. Pulmonary artery venting and cannulation of the superior vena cava further facilitate dissection of the cardiac chambers without causing injury. Placement of two stay sutures on the prosthetic annulus and intracapsular dissection greatly facilitates explantation without causing rupture of the atrioventricular groove.

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None.

Conflict of Interest

None declared.

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