Complex Robotic Mitral Valve Redo Repair After Failed Transcatheter Edge-to-Edge Repair

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Central Picture Legend:
Echo of flail leaflet with clip; intra-operative view of leaflet and clip

Central Message
Robotic mitral valve surgery is a feasible option in the setting of failure of recent TEER, both in retrieval of the clip and repair of the valve.
Introduction

Robotic technology has become increasingly widespread in cardiac surgery for procedures such as CABG, valve procedures, septal defect closure, among others. Mitral valve repair is a mainstay of minimally invasive robotic cardiac surgery. Robotic-assisted repair has become a preferred method of mitral valve repair due to exceptional outcomes.\(^1\)

Transcatheter edge-to-edge repair (TEER) is another increasingly popular minimally invasive intervention for mitral regurgitation in those not eligible for surgical intervention. The ACC/AHA 2022 guidelines assigned a class 2A recommendation for mitral TEER (M-TEER) for patients with “persistent symptoms despite guideline-directed medical therapy (GDMT), appropriate anatomy on transesophageal echocardiography and with LVEF between 20% and 50%, LVESD ≤70 mm, and pulmonary artery systolic pressure ≤70 mm Hg” not undergoing concomitant coronary artery bypass grafting (CABG).\(^2\)

Single-leaflet device attachment (SLDA) is an infrequent but serious complication of M-TEER. Multiple clinical trials have shown a progressive decrease in the incidence of SLDA since TEER’s inception, from EVEREST (11.0%) to Mitra EXPAND (1.9%) and G4 (1.7%).\(^3\) The majority of SLDAs occur within 30 days, and many are noted during the procedure and are corrected with repeat M-TEER\(^3,4\). Most of those not corrected acutely require surgical intervention. Chikwe et al noted in a review of the STS database, that 15,000 patients received M-TEER between 2014 and 2020, and 524 patients underwent first-time mitral surgery after TEER in that timeframe.\(^5\) Ninety-five percent of these patients received mitral valve replacement over repair. Only a small fraction of mitral valve surgeries are performed robotically. This case provides valuable insight into the technical nuance of a complex and infrequent procedure.

Presentation of case

An 83-year-old female presented with heart failure symptoms 6 weeks post-TEER. Transesophageal echocardiography showed mitral regurgitation with flail posterior leaflet and a mitral clip attached only to the anterior leaflet. The decision was made to pursue mitral clip removal and mitral valve repair and mitral valvuloplasty via minimally invasive robotic surgery. This report was waived from institutional review board approval; consent was obtained at the time of this case on the condition that it contain no personal health identifiers and be used for educational purposes.

Operative Technique (Video)

Three 8mm retractor ports were placed in the 2nd, 6th and 5th intercostal spaces. The patient was heparinized and cannulated with a 25 Edwards through the left femoral vein and side-arm Edwards cannula through the right femoral artery. Through the side-arm, balloon occlusion device was prepositioned in the ascending thoracic aorta. After pericardiotomy, diaphragmatic pericardial stays were placed. Working through the transverse sinus, a 35 mm AtriClip was was deployed at the base of the left atrial appendage. The crossclamp balloon then occluded the aorta with echo confirmation. The heart was arrested with cold blood cardioplegia. Vertical left atriotomy was made, and the remnant ASD was oversewn with 2-layer running Ethibond. The clip was removed from the anterior mitral leaflet, leaving the leaflet intact. We resected a triangular section of P2 and repaired at the base with 4-0 Gore-Tex. A 34 mm ATS band was
then secured to the posterior annulus, trigone to trigone, with interrupted horizontal nonpledgeted sutures of Ethibond seated and secured with a Cor-Knot. Saline check performed and found to be satisfactory. After completion of the mitral valve repair, the left atriotomy was closed over an LV vent with running Gore-Tex suture and with strong suction on both vents the crossclamp was removed.

**Discussion:**

The patient was successfully extubed day-of-surgery without complication. The patient was discharged uneventfully on post-operative day 4. At a single institution, we identified 5 similar cases of SLAD in a three-year period which were treated with robotic surgical replacement (3/5) and repair (2/5). Many factors may affect which patients are eligible for repair versus replacement, including amenability of native valve pathology to repair, extent of post-TEER fibrosis and sclerosis of the valve, and technical familiarity of the surgeon with advanced mitral reconstructive techniques. This case illustrates that mitral valve repair after failed percutaneous mitral valve clip can be performed safely and effectively by those with relevant expertise in eligible patients.

**Citations:**


**Video Legend:** Operative technique