Rescue Mitral Transcatheter Edge-to-Edge Repair Followed by Interval Mitral Valve Replacement

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Conflicts of Interest Disclosures: None declared.
Funding: This work received no grants or funding.
IRB: Northwestern University IRB has determined the project is not research and no IRB approval required. Institutional patient consent for use of de-identified information was obtained.

Patient Consent Statement: Institutional patient consent for use of de-identified information was obtained.

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Word count: 730
Glossary of Abbreviations

- DMR, Degenerative Mitral Regurgitation
- IABP, Intra-Aortic Balloon Pump
- LV, Left Ventricle
- LVEF, Left Ventricular Ejection Fraction
- mTEER, Mitral Transcatheter Edge-to-Edge Repair
- MVR, Mitral Valve Repair or Replacement
- MR, Mitral Regurgitation
- TEE, Transesophageal Echocardiography
Central Picture Legend: Perforation of the anterior leaflet by the mTEER device (purple arrow).

Central Message

Our case report describes urgent use of mitral transcatheater edge-to-edge repair (mTEER) as a rescue intervention for a patient with severe degenerative mitral regurgitation in cardiogenic shock.
**Case Presentation**

A 69-year-old woman, with mitral regurgitation (MR), non-obstructive coronary artery disease, atrial fibrillation, hypertension, hyperlipidemia, and chronic obstructive pulmonary disease, presented with acute decompensated heart failure. Echocardiography confirmed severe degenerative mitral regurgitation (DMR) due to myxomatous degeneration, with posterior mitral leaflet prolapse, effective regurgitant orifice area of 106 mm², regurgitant volume of 71 mL, and left ventricular ejection fraction (LVEF) of 71% (Figure 1). Northwestern University IRB has determined the project is not research and no IRB approval required. Institutional patient consent for use of de-identified information was obtained.

Four days after admission, despite aggressive medical management with diuresis, the patient developed altered mental status, hypoxic respiratory failure, and hypotension with poor perfusion. She thus underwent urgent intubation and intra-aortic balloon pump (IABP) placement, with Swan-Ganz measuring a worsening pulmonary capillary wedge pressure of 30 and reduced cardiac index of 1. She was given pressors, inotropes, and afterload reduction, with minimal improvement. Because she was in cardiogenic shock, she was considered at prohibitive risk for surgery by the Heart Team but was deemed a reasonable candidate for mTEER, which she underwent urgently four days later. Under transesophageal echocardiography (TEE) guidance, the interatrial septum was punctured, and one clip device was placed to approximate the A2 and P2 scallops, resulting in trivial residual regurgitation. The delivery system was then withdrawn, and a transcatheter occluder device was deployed to close a visible atrial septal defect (ASD). This procedure rescued her from cardiogenic shock, allowing removal of the IABP on post-op day 0 and discharge on post-op day 10. Dismissal echocardiography showed moderate MR.
Six months later, the patient presented with progressive exertional dyspnea. Echocardiography demonstrated return of severe MR with a residual segment of P2 prolapse medial to the mTEER device, along with moderate functional tricuspid regurgitation. Now an appropriate candidate for surgery, she underwent elective mitral and tricuspid valve surgery (Video 1). The mTEER device was removed, but the mitral valve was not repairable due to perforation of the A2 leaflet. The mitral valve was replaced with a 29mm stented bovine pericardial valve, and the tricuspid valve was repaired with a 26mm annuloplasty ring. Concurrently, the patient underwent a Cox-Maze III procedure with cryothermy and a left atrial appendage closure with external device. The septal occluder device was removed, and the ASD was closed primarily. Pre-discharge echocardiography showed trivial MR and tricuspid regurgitation. The patient was in sinus rhythm at 3 months post-op, and anticoagulation was discontinued at 9 months post-op. More than 3 years later, she continues to remain asymptomatic.

**Discussion**

Mitral valve surgery is the gold standard for severe, symptomatic degenerative mitral regurgitation (DMR). However, as many as half of patients present with prohibitive surgical risk due to high Society of Thoracic Surgeons (STS) mortality risk scores, cardiogenic shock, frailty, or severe comorbidities. mTEER has recently emerged as an alternative intervention, in which a transcatheter approach is used to approximate the free edges at the site of impaired leaflet coaptation. Landmarks trials like the EVEREST II Study has found that mTEER is a safe procedure that improves functional and structural outcomes even at 5 years, with less than 3% requiring surgery within a year after undergoing mTEER. However, these studies only examine stable patients with chronic MR.
There is also a role for mTEER as an urgent rescue therapy in unstable patients. Patients with severe DMR in cardiogenic shock face especially high mortality and morbidity, with limited options for intervention and challenging approaches to pharmacologic and mechanical support. However, mTEER has been less well-studied among patients with cardiogenic shock, with most of the literature limited to case series and observational studies of functional MR. Recently, two retrospective studies using data from the STS and American College of Cardiology Transcatheter Valve Therapy Registry and Centers for Medicare and Medicaid Services found that among patients with DMR or functional MR complicated by cardiogenic shock, mTEER can lower in-hospital mortality, 1-year mortality, and number of heart failure admissions by as much as half. The first randomized controlled trial, MINOS (Transcatheter Mitral Valve Repair for Inotrope Dependent Cardiogenic Shock), will compare mTEER to medical therapy alone. However, many questions still remain, especially regarding the optimal timing of urgent mTEER intervention and the optimal management of patients who may require surgical re-intervention.

Conclusions

Our case report adds to the growing literature highlighting the role of mTEER as an urgent rescue therapy for patients with severe DMR in cardiogenic shock. This case underlines the need for improved risk stratification of patients pre- and post-mTEER to optimize timing of transcatheter repair and possible surgical re-intervention.
References


Figures

Figure 1. Transthoracic echocardiography demonstrating flail of the posterior mitral leaflet (yellow arrow).

Video 1. During mitral valve surgery, it found that the mTEER device had perforated the A2 mitral leaflet, requiring valve replacement.