

Rescue mitral transcatheter edge-to-edge repair followed by interval mitral valve replacement



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Disclosures: The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

Received for publication May 17, 2023; revisions received June 6, 2023; accepted for publication June 12, 2023; available ahead of print July 22, 2023.

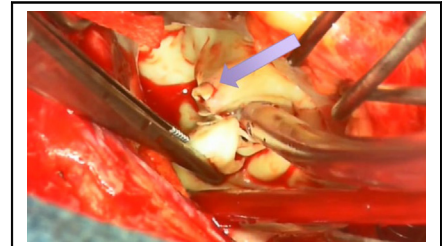
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JTCVS Techniques 2023;21:95-7

2666-2507

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<https://doi.org/10.1016/j.xjtc.2023.07.007>



Perforation of the anterior leaflet by the mTEER device (purple arrow).

CENTRAL MESSAGE

This case report describes the urgent use of mitral transcatheter edge-to-edge repair as a rescue intervention for a patient with severe degenerative mitral regurgitation in cardiogenic shock.

▶ Video clip is available online.

INTRODUCTION

Patients with severe, symptomatic degenerative mitral regurgitation (DMR) in cardiogenic shock face poor outcomes if they undergo mitral valve surgery and thus are at prohibitive surgical risk. Our case report presents a patient with severe, symptomatic DMR who was successfully rescued from cardiogenic shock with mitral transcatheter edge-to-edge repair (mTEER).

CASE REPORT

A 69-year-old woman with mitral regurgitation (MR), nonobstructive coronary artery disease, atrial fibrillation, hypertension, hyperlipidemia, and chronic obstructive pulmonary disease presented with acute decompensated heart failure. Echocardiography confirmed severe DMR due to myxomatous degeneration, with posterior mitral leaflet prolapse, an effective regurgitant orifice area of 106 mm², a regurgitant volume of 71 mL, and a left ventricular ejection fraction of 71% (Figure 1).

At 4 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 a Swan-Ganz catheter measuring a worsening pulmonary

capillary wedge pressure of 30 mmHg and a reduced cardiac index of 1. She was given pressors, inotropes, and after-load reduction, which produced 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 4 days later.

Under transesophageal echocardiography guidance, the interatrial septum was punctured, and a 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 the patient from cardiogenic shock, allowing removal of the IABP on postoperative day 0 and discharge on postoperative 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

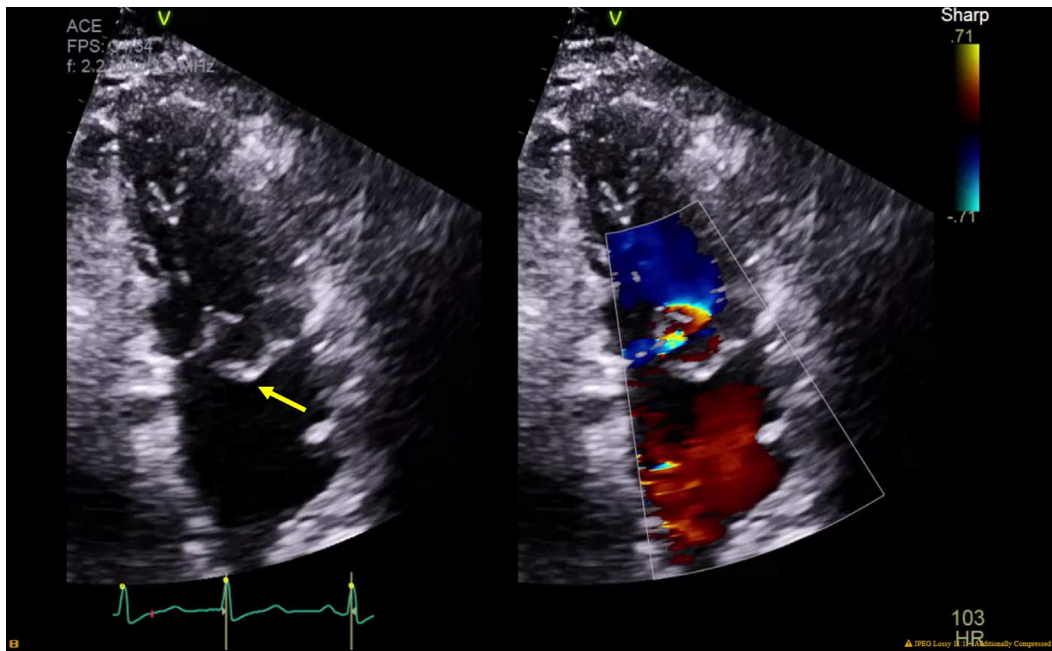
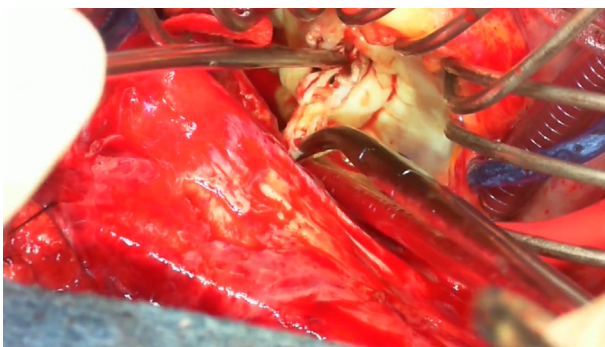


FIGURE 1. Transthoracic echocardiography demonstrating flail of the posterior mitral leaflet (yellow arrow).

surgery (Video 1). The mTEER device was removed, but the mitral valve was not repairable because of perforation of the A2 leaflet. The mitral valve was replaced with a 29-mm stented bovine pericardial valve, and the tricuspid valve was repaired with a 26-mm annuloplasty ring. Concurrently, the patient underwent a Cox-Maze III procedure with cryotherapy and left atrial appendage closure with an external device. The septal occluder device was removed, and the ASD was closed primarily. Predischarge echocardiography showed trivial MR and tricuspid regurgitation. The patient was in sinus rhythm at 3 months postoperation, and anticoagulation was discontinued at 9 months postoperation. She remains asymptomatic more than 3 years later.



VIDEO 1. During mitral valve surgery, it was found that the mTEER device had perforated the A2 mitral leaflet, necessitating valve replacement. Video available at: [https://www.jtcvs.org/article/S2666-2507\(23\)00223-7/fulltext](https://www.jtcvs.org/article/S2666-2507(23)00223-7/fulltext).

The Northwestern University Institutional Review Board determined that this project is not research, and that its approval was not required. Institutional patient consent for use of deidentified information was obtained.

DISCUSSION

Mitral valve surgery is the gold standard for severe, symptomatic DMR.¹ However, as many as one-half of patients present with prohibitive surgical risk due to high Society of Thoracic Surgeons (STS) mortality risk score, cardiogenic shock, frailty, or severe comorbidities.¹ 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.¹ Landmarks trials like the EVEREST II Study have found that mTEER is a safe procedure that improves functional and structural outcomes even at 5 years, with <3% of patients needing surgery within 1 year after undergoing mTEER.² However, these studies only examined 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.³ However, mTEER has been less well studied in patients with cardiogenic shock, with the literature mostly limited to case series and observational studies of functional MR. Two recent 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 50%.⁴ 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 remain, especially regarding the optimal timing of urgent mTEER intervention and the optimal management of patients who may require surgical reintervention.

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.^{4,5} This case underscores the need for improved risk stratification of patients pre- and post-mTEER to optimize the timing of transcatheter repair and possible surgical reintervention.

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