

CASE REPORT

ADVANCED

CLINICAL CASE

Severe MR With Prior Alfieri Stitch Treated With Transcatheter Edge-to-Edge Repair and a Vascular Plug



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ABSTRACT

We present a case of a high-risk surgical patient with prior surgical Alfieri stitch and recurrent severe mitral regurgitation. In cases with suitable anatomy, mitral valve transcatheter edge-to-edge repair and vascular plug closure of a small regurgitant orifice can be used with excellent results. (**Level of Difficulty: Advanced.**) (J Am Coll Cardiol Case Rep 2022;4:1314-1318)
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HISTORY OF PRESENTATION

A 65-year-old man with 2 prior sternotomies for aortic valve replacement and mitral valve repair presented with New York Heart Association functional class III symptoms with a year of progressive dyspnea on exertion and lower extremity edema despite escalation of diuretic therapy. In the clinic, he was afebrile, and his blood pressure was 125/71 mm Hg, heart rate was 76 beats/min, respiratory rate was 20 breaths/min, oxygen saturation was 98% on room air, and

body mass index was 36 kg/m². Physical examination demonstrated a jugular venous pressure of 15 cm H₂O above the right atrium, bibasilar rales, an II/VI blowing holosystolic murmur at the apex with radiation to the axilla, and 2+ lower extremity edema.

PAST MEDICAL HISTORY

History was significant for native aortic and mitral valve *Streptococcus mutans* endocarditis in 2007, treated with a 26-mm homograft surgical aortic valve replacement and mitral valve debridement and leaflet repair. In 2011, he developed severe homograft stenosis and recurrent severe mitral regurgitation (MR). He underwent a second surgical aortic valve replacement with a mechanical On-X prosthesis and a mitral valve edge-to-edge repair with an Alfieri stitch along the A1/P1 scallops.

DIFFERENTIAL DIAGNOSIS

The differential diagnosis for patients with progressive dyspnea and symptoms of left and right heart

LEARNING OBJECTIVES

- To understand the limitations of mitral valve TEER alone in the setting of 2 complex regurgitant jets when 1 or both jets are commissural.
- To understand the potential applications of various percutaneous strategies to address severe MR with prior surgical mitral valve repair.

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failure can be extensive. In this circumstance, physical examination revealed a blowing holosystolic murmur in the apex with radiation to the axilla, highly suggestive of recurrent MR. Additional etiologies to consider in postsurgical patients include constrictive pericarditis, although no Kussmaul sign was seen on examination. Additionally, thrombosis of a mechanical valve can lead to similar features, although the systolic murmur was not consistent with prosthetic aortic valve obstruction.

INVESTIGATIONS

Laboratory values showed a plasma creatinine level of 0.94 mg/dL and an elevated N-terminal pro-B-type natriuretic peptide level of 627 pg/dL. Transthoracic echocardiogram demonstrated normal left ventricular systolic function with an ejection fraction of 65%, mildly enlarged left ventricular end-diastolic diameter of 6.1 cm, normal right ventricular size and function, and severe eccentric posteriorly directed mitral regurgitation with a mean transmitral gradient of 5.5 mm Hg. Coronary angiography and right heart catheterization demonstrated no obstructive coronary artery disease, right atrial pressure of 11 mm Hg, pulmonary artery pressure of 40/16 mm Hg, pulmonary capillary wedge pressure of 17 mm Hg with ventricular

waves to 24 mm Hg, and a Fick cardiac index of 2.4 L/min/m². Assessment by transesophageal echocardiography (TEE) showed severe complex MR along the anterior-lateral commissure with 2 significant jets. Jet 1 originated medial to the A1/P1 Alfieri stitch, while jet 2 was lateral to the Alfieri stitch in the lateral commissure (Video 1, Figures 1 and 2).

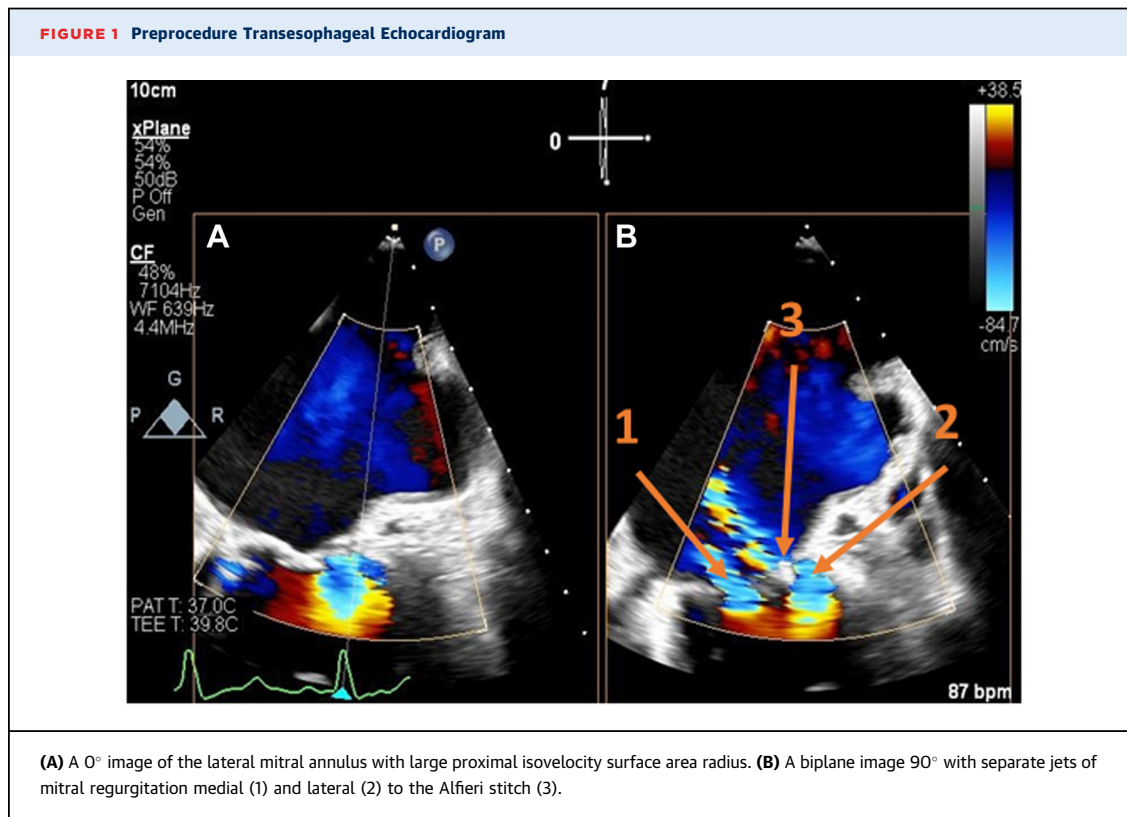
The proximal isovelocity surface area radius of the MR jet medial to the stitch was 1.2 cm, and the proximal isovelocity surface area radius of the jet lateral to the stitch was 1.1 cm. The mean transmitral gradient was 4 mm Hg, and systolic flow reversal was noted in the pulmonary veins.

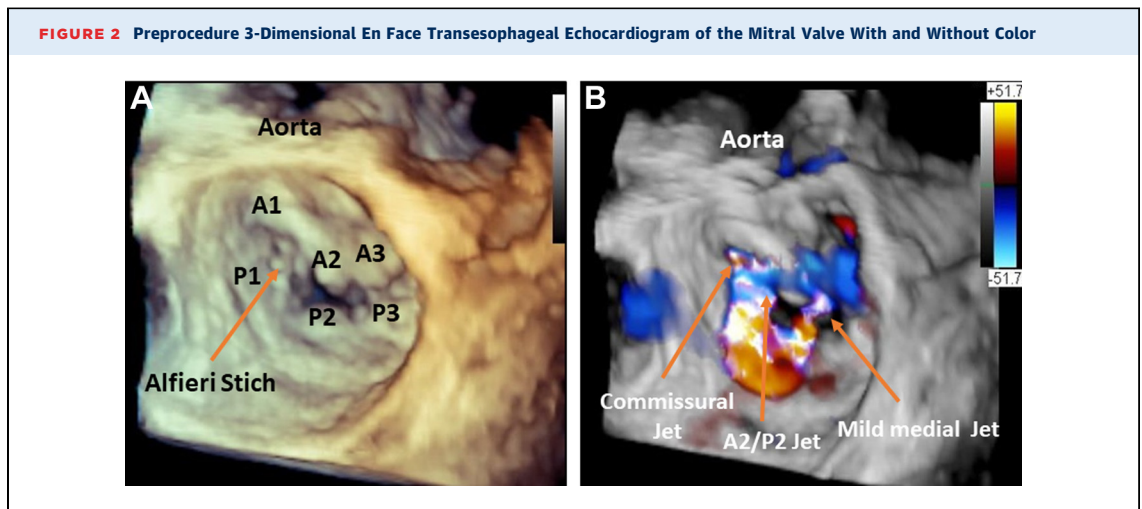
MANAGEMENT

After heart team review, the recommendation was to proceed with mitral transcatheter edge-to-edge repair (TEER) using a MitraClip XT (Abbott Vascular) for the medial jet with adjunctive closure of the lateral commissural jet with an Amplatzer II vascular plug (Abbott Vascular). Following transeptal crossing, a steerable Agilis sheath (Abbott Vascular), angled catheter, and 0.035-inch guidewire were used to cross the regurgitant orifice lateral to the stitch (Videos 2 and 3). A 10-mm vascular plug was deployed

ABBREVIATIONS AND ACRONYMS

- MR = mitral regurgitation
- TEE = transesophageal echocardiography
- TEER = transcatheter edge-to-edge repair





between the lateral commissure and the Alfieri stitch. Subsequent imaging on TEE demonstrated no residual MR lateral to the stitch but ongoing severe MR arising medial to the stitch from the A2/P2 scallops (Video 4). Upon inspection of the mitral leaflet morphology and MR jet width, a MitraClip XT device was applied medial to the Alfieri stitch with excellent leaflet capture and reduction in the degree of MR from severe to mild (Videos 5 and 6).

DISCUSSION

Untreated severe symptomatic mitral regurgitation carries a high risk of mortality, hospital readmissions, and societal burden.¹⁻⁵ In patients who have severe complex mitral regurgitation, interventional options are challenging, particularly in those who are considered high- to prohibitive-risk surgical candidates. This patient was clearly a high-risk surgical candidate given his 2 prior sternotomies. Additionally, as a trained opera singer, his wishes were to avoid prolonged intubation time from a surgical mitral valve replacement. Transcatheter mitral valve replacement was not an option because of the intact Alfieri stitch and lateral commissural mitral regurgitation. A transcatheter mitral TEER and simultaneous vascular plug closure were carefully selected as 2 unique approaches to address the complex regurgitant jets. For complete resolution of the lateral commissural MR, the regurgitant orifice dimensions were carefully sized by 3-dimensional TEE procedural imaging and measured at approximately 6 × 6 mm (Figure 3). A 10-mm vascular plug was chosen to achieve 40% oversizing of the lateral orifice. Oversizing by the recommended 30% to 50% is known to limit the risk of embolization, persistent

leak, or hemolysis because the nitinol frame of the vascular plug conforms to the surrounding tissue. When evaluating for the appropriate TEER device for treatment of the MR on the medial aspect of the Alfieri stitch, the XT device was chosen over the NT device and the newer-generation, wider devices for multiple reasons. Because the origin of the residual MR jet was medially displaced from the stitch and because of the posterior leaflet calcification and restriction, we needed to achieve high closing forces on the leaflets and annulus without sacrificing the residual mitral valve orifice area postdeployment. Although the preprocedure transmitral gradient was 5.5 mm Hg, the Doppler pattern demonstrated a dominant E-wave with sharp descent, indicating a volume-driven gradient without mitral stenosis. Postprocedure, with near complete resolution of MR, we achieved a balance in the preserved orifice area with a 3-dimensional planimetered area of 3.9 cm² and a final gradient of 4 mm Hg at a heart rate of 80 beats/min with blood pressure of 130/60 mm Hg. Left atrial pressure was reduced from 20 mm Hg with V waves up to 35 mm Hg to a final left atrial pressure of 14 mm Hg with V waves to 20 mm Hg.

FOLLOW-UP

The patient was discharged home in stable condition 2 days postprocedure. At the 30-day follow-up visit, the patient's functional status had improved, with New York Heart Association functional class II symptoms, and transthoracic echocardiography demonstrated no residual MR, with a mean transmitral gradient of 5.8 mm Hg at a heart rate of 85 beats/min (Figure 4).

FIGURE 3 Transesophageal 3-Dimensional Multiplanar Reconstruction of the Lateral Orifice Dimensions and Area

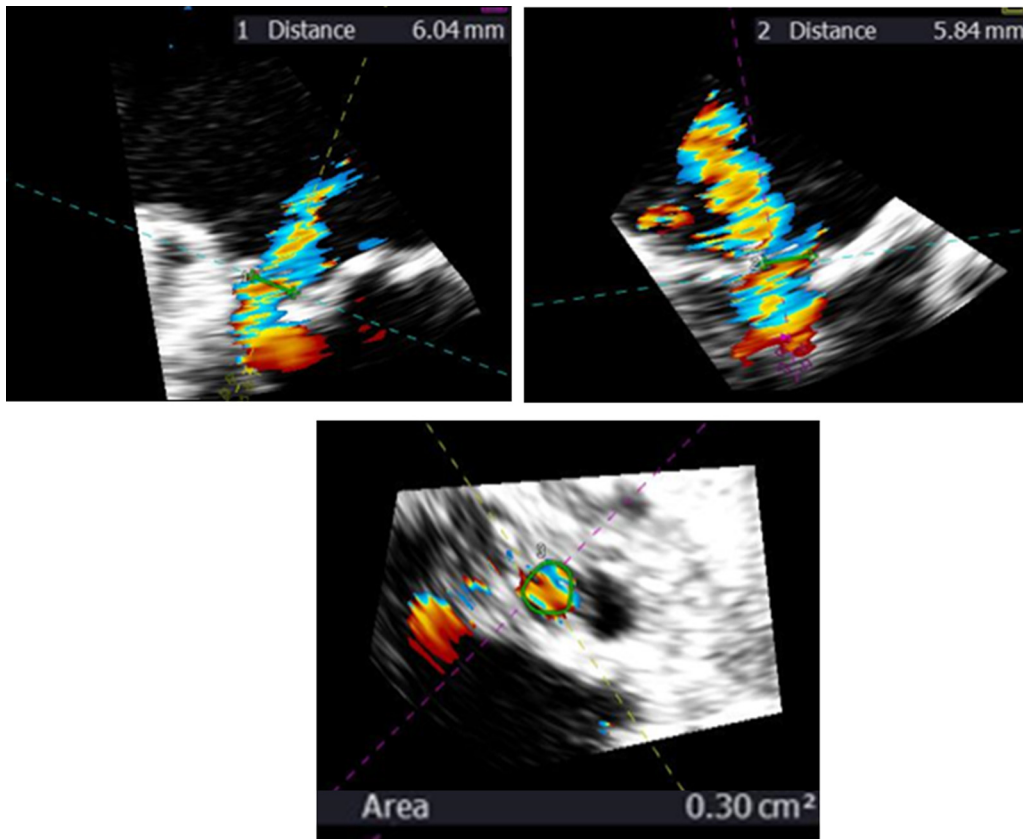
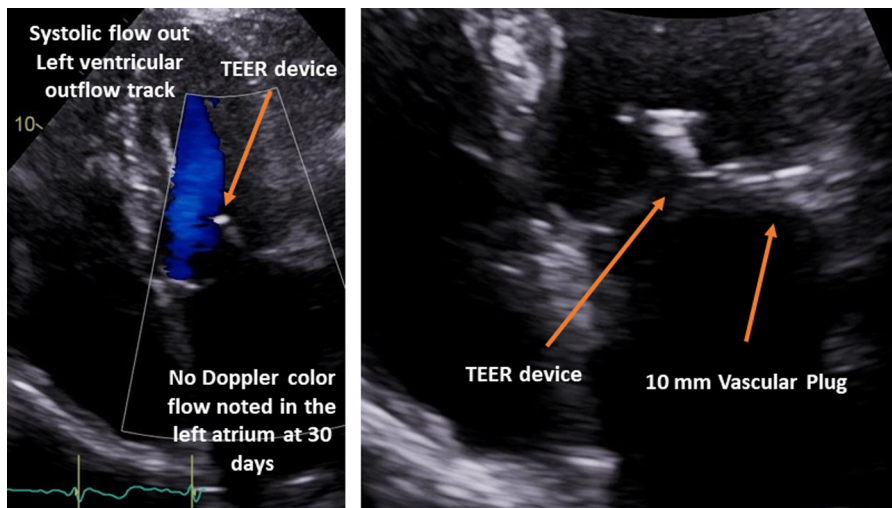


FIGURE 4 The 30-Day Follow-Up Transthoracic Echocardiogram



Four-chamber images showing no residual mitral regurgitation after mitral TEER device and vascular plug. TEER = transcatheter edge-to-edge repair.

CONCLUSIONS

This case highlights the use of a mitral TEER treatment strategy in conjunction with a vascular plug closure device to address severe symptomatic complex MR in a high-risk surgical patient with a history of prior surgical mitral valve repair with lateral Alfieri stitch.

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Dr Song has served as an education consultant for Medtronic Inc. Dr Golwala has served as an advisory consultant for Medtronic Inc.

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KEY WORDS Alfieri stitch, mitral regurgitation, MitraClip, vascular plug

APPENDIX For supplemental videos, please see the online version of this paper.