

# Chordal Preservation Mitral Valve Replacement for Delayed MitraClip Failure

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*Mitral valve replacement may be indicated in delayed MitraClip (Abbott) failure. Although it would be best to preserve the chordal apparatus during surgical mitral valve replacement, this has not been reported for delayed MitraClip failure, probably because there is almost always impressive inflammation around the MitraClip, which has likely precluded previous attempts at chordal preservation. A successful surgical chordal preservation mitral valve replacement in delayed MitraClip failure is reported here. (Tex Heart Inst J. 2022;49(6):e217599)*

**M**itraClip (Abbott) failure can require mitral valve (MV) replacement. Surgical experience suggests that chordal preservation is the preferred option for surgical MV replacement, but grossly abnormal chordae tendinae may prevent the preservation of the anterior leaflet and associated subvalvular apparatus.<sup>1</sup> Such is likely the situation during operation for delayed MitraClip failure where there is often a MitraClip-related phlegmon.<sup>2</sup> In this report, it is hypothesized that it would be possible to preserve the anterior leaflet and subvalvular apparatus during MV replacement for delayed MitraClip failure.

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## Case Report

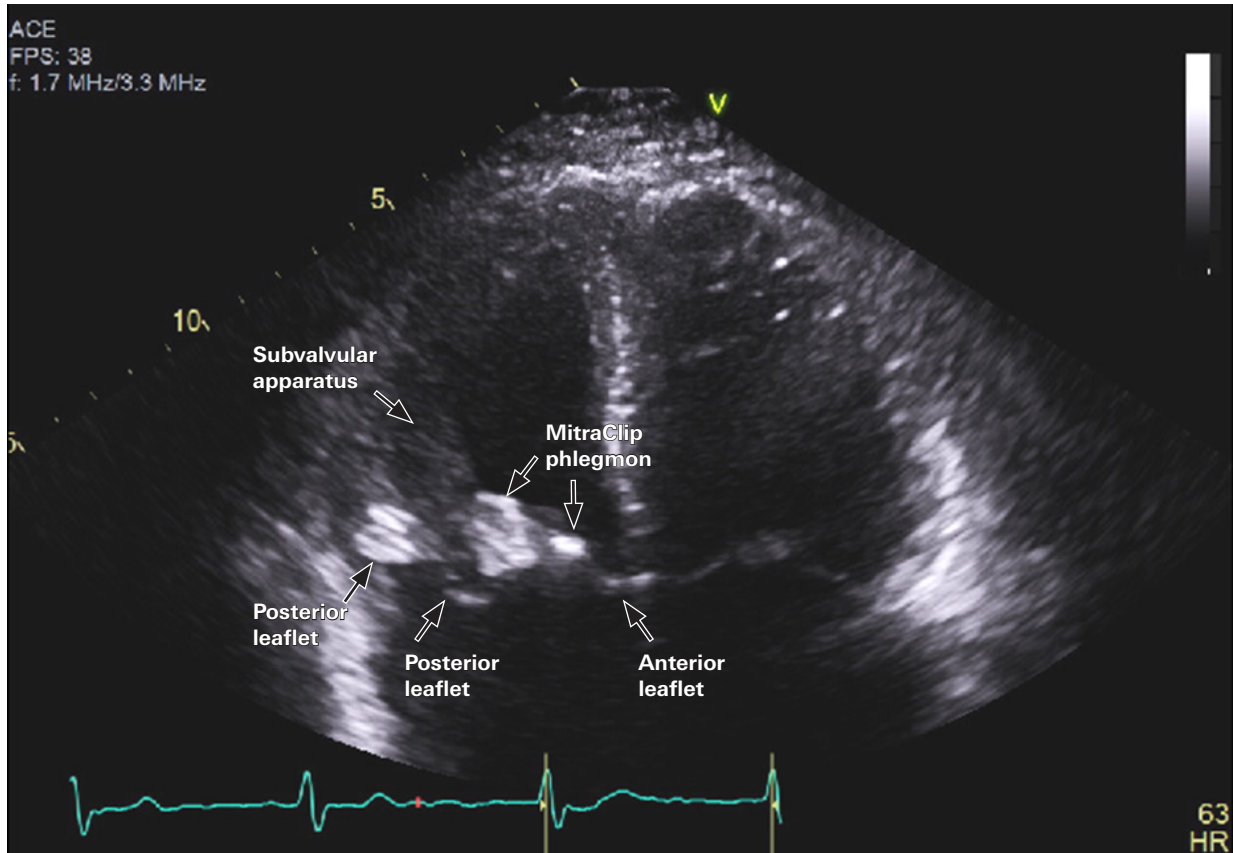
The Mayo Clinic Rochester institutional review board waives approval for a case report. The patient signed a waiver of informed consent at the time of treatment.

A 60-year-old man with class III dyspnea and mixed MV disease related to delayed MitraClip failure was evaluated. The patient had chronic atrial fibrillation, cirrhosis (Model for End-Stage Liver Disease score of 9), and a history of ascites with gastrointestinal bleeding.

Approximately 17 months before presentation, the patient had a single MitraClip for severe valve regurgitation placed at an outside institution. Two months later, he had 2 additional MitraClips placed to treat persistent severe MV regurgitation. Neither procedure resolved the valve regurgitation. He was subsequently denied MV operation at the outside facility because he had cirrhosis.

Transthoracic echocardiography at the Mayo Clinic institution demonstrated an ejection fraction of 57% with no regional wall motion abnormality. Pulmonary hypertension was present, with an estimated right ventricular systolic blood pressure of 76 mm Hg (systemic systolic blood pressure, 125 mm Hg). There was significant mixed MV disease, with a mean diastolic mitral transvalvular gradient of 10 mm Hg (heart rate, 74/min) and severe MV regurgitation (multiple eccentric jets) (Fig. 1). There was also mild tricuspid valve regurgitation.

No transcatheter treatment options were available, so surgical MV operation was performed. Intraoperative transesophageal echocardiography demonstrated associated mild to moderate tricuspid valve regurgitation with a dilated annulus of 48 mm. The MV was exposed through a superior transseptal approach. Examination demonstrated myxomatous changes in the MV leaflets. There was



**Fig. 1** Preoperative transthoracic echocardiography image of apical 4-chamber view demonstrating the mitral valve anterior leaflet, posterior leaflet, subvalvular apparatus, and MitraClip phlegmon. The supplemental motion image shows the interaction of the components during the cardiac cycle.

Supplemental motion image is available for [Figure 1](#).

also significant inflammation around the previously placed MitraClips. This indicated that the MV was not repairable.

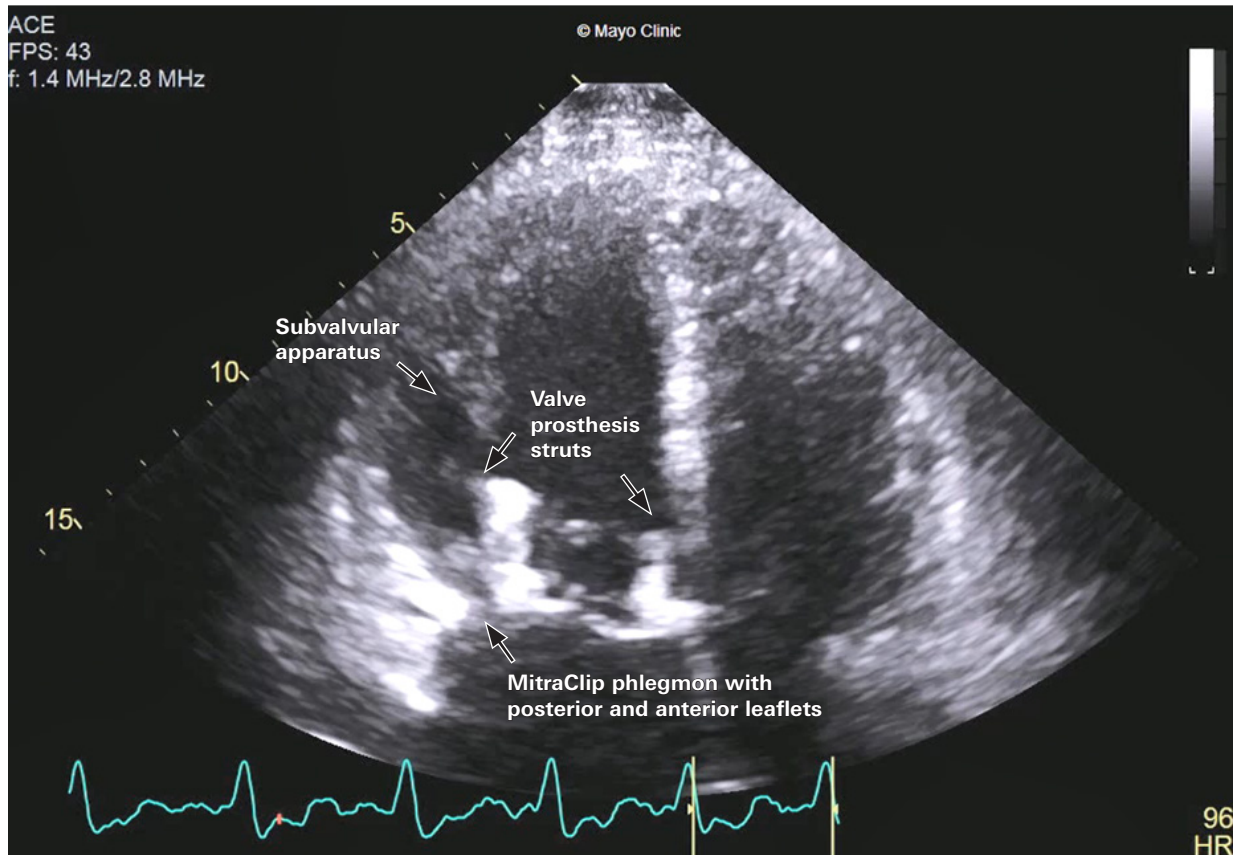
The anterior leaflet of the MV was incised radially approximately 5 mm from the annulus, and the incision continued down through both commissures. The entire MitraClip–MV leaflet complex (ie, free anterior leaflet, MitraClips, and posterior leaflet) was dropped posteriorly. Valve replacement sutures went through the cut-free anterior MV leaflet edge and then the posterior leaflet in a chordal preservation technique. The suture pledgets were positioned on the ventricular side. A 33-mm porcine prosthesis was easily sutured into position. The left atrial appendage was amputated, and the tricuspid valve was repaired with a 26-mm, partial-ring annuloplasty.

The patient separated from cardiopulmonary bypass without difficulty. Completion transesophageal echocardiography demonstrated an ejection fraction of 45%, with ventricular pacing–induced apical hypokinesis. There was normal function of the MV prosthesis with trivial prosthetic and no paravalvular prosthetic regurgitation. The mean diastolic mi-

tral transvalvular gradient was 4 mm Hg (heart rate, 100/min). There was trivial tricuspid valve regurgitation, and it was not possible to obtain a gradient across the tricuspid valve.

The patient was discharged home 11 days after surgery. Discharge transthoracic echocardiography demonstrated an ejection fraction of 44% with no regional wall motion abnormality. There was normal function of the MV prosthesis: trivial central prosthetic regurgitation, no paravalvular regurgitation, and a mean diastolic mitral transvalvular gradient of 6 mm Hg (heart rate, 84/min; hemoglobin level, 8.8 gm/dL). The MitraClip/MV leaflet complex appeared to be effectively constrained in the area behind the prosthesis posterior valve strut (Fig. 2), and there was trivial tricuspid valve regurgitation. The mean diastolic tricuspid transvalvular gradient was 1 mm Hg. The peak tricuspid regurgitation velocity for pulmonary artery systolic pressure calculation could not be detected.

Over 7 months of follow-up, the patient experienced no cirrhosis-related complications, and he maintained New York Heart Association class I func-



**Fig. 2** Postoperative transthoracic echocardiography image of apical 4-chamber view demonstrating the mitral valve prosthesis/struts, subvalvular apparatus, and MitraClip phlegmon. The MitraClip phlegmon is constrained behind the prosthesis posterior valve strut. The supplemental motion image shows the interaction of the components during the cardiac cycle. The MitraClip phlegmon appears well stabilized by the valve prosthesis.

Supplemental motion image is available for [Figure 2](#).

tion. Transthoracic echocardiography demonstrated an ejection fraction of 40% with no regional wall motion abnormality, and there was continued normal function of the MV prosthesis and tricuspid valve. The estimated right ventricular systolic pressure was not reported.

## Discussion

The present case demonstrates the feasibility and efficacy of surgical chordal preservation biological prosthetic MV replacement for delayed MitraClip failure. The presenting patient had the expected MitraClip-related phlegmon, but the myxomatous changes of the MV leaflets likely facilitated the success of this procedure. It appears that the perceived benefits of surgical chordal preservation MV replacement should not be denied to patients with delayed MitraClip failure.

Mitral valve replacement may be indicated for delayed MitraClip failure.<sup>3,5</sup> Surgical experience suggests that chordal preservation is ideal during valve

replacement.<sup>6</sup> The classic teaching is to split the anterior leaflet down the middle and then suture the anterior leaflet attachments to the annulus near the trigone area,<sup>7</sup> but in this case, the MitraClip phlegmon prevented division of the anterior leaflet down the middle and required suturing of the anterior leaflet to the posterior annulus. Anterior leaflet suture to the posterior annulus has been studied in an animal population and has produced similar results to those with the classic technique.<sup>8</sup>

A literature review on PubMed did not lead to the identification of any previous reports of surgical chordal preservation MV replacement for delayed MitraClip failure. There is a single case series of transcatheter electrosurgical laceration and stabilization of MitraClip (ELASTA-Clip).<sup>9</sup> In that series, Lisko et al<sup>9</sup> reported percutaneous laceration of the anterior leaflet coupled with placement of a transcatheter MV implantation in 5 patients supported with intra-aortic balloon pump counterpulsation. One of the patients experienced “hemodynamic instability,” and another 2 patients required reoperation

for bleeding from the apical puncture site. At 30 days of follow-up, 2 patients had moderate paravalvular regurgitation.

It is unclear whether this option will work with a mechanical valve. The bulky MitraClip-related phlegmon may be at risk of interfering with prosthetic leaflet motion. Additional study is warranted.

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### References

1. David TE. Chordal preservation in mitral valve replacement. *Oper Tech Thorac Cardiovasc Surg.* 1998;3(2):130-133. doi:10.1016/S1522-2942(07)70082-X
2. Geidel S, Schmoeckel M. Impact of failed mitral clipping on subsequent mitral valve operations. *Ann Thorac Surg.* 2014;97(1):56-63. doi:10.1016/j.athoracsur.2013.07.038
3. Takayuki G, Sören S, Kristin R, et al. Surgical revision of failed percutaneous edge-to-edge mitral valve repair: lessons learned. *Interact Cardiovasc Thorac Surg.* 2019;28(6):900-907. doi:10.1093/icvts/ivy361
4. Kreidel F, Alessandrini H, Wohlmuth P, Schmoeckel M, Geidel S. Is surgical or catheter-based interventions an option after an unsuccessful Mitral Clip? *Semin Thorac Surg.* 2018;30(2):152-157. doi:10.1053/j.semthoracs.2018.03.005
5. Monsefi N, Zierer A, Khalil M, et al. Mitral valve surgery in 6 patients after failed MitraClip therapy. *Tex Heart Inst J.* 2014;41(6):609-612. doi:10.14503/THIJ-13-3626
6. David TE, Uden DE, Strauss HD. The importance of the mitral apparatus in left ventricular function after correction of mitral regurgitation. *Circulation.* 1983;68(3 Pt 2):II76-II82.
7. Chowdhury UK, Kumar AS, Airan B, et al. Mitral valve replacement with and without chordal preservation in a rheumatic population: serial echocardiographic assessment of left ventricular size and function. *Ann Thorac Surg.* 2005;79(6):1926-1933. doi:10.1016/j.athoracsur.2004.10.029
8. Moon MR, DeAndra A Jr, Daughters GT II, Ingels NB Jr, Miller DC. Experimental evaluation of different chordal preservation methods during mitral valve replacement. *Ann Thorac Surg.* 1994;58(4):931-944. doi:10.1016/0003-4975(94)90436-7
9. Lisko JC, Greenbaum AB, Guyton RA, et al. Electrosurgical detachment of MitraClips from the anterior mitral leaflet prior to transcatheter mitral valve implantation. *JACC Cardiovasc Interv.* 2020;13(20):2361-2370. doi:10.1016/j.jcin.2020.06.047