



Best transcatheter approach for a failed mitral valve ring

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The use of an annuloplasty band or ring to restore the mitral valve (MV) annulus and geometry is a key principle of MV repair for degenerative or functional pathology. The need for re-operation after MV repair is just over 5% at ten years for degenerative disease from a number of large case series reported from expert MV centers (1). This is much higher in those undergoing MV repair for ischemic mitral regurgitation (MR)—at two years after surgery for severe ischemic MR, there was recurrent moderate or severe MR in 58.8% of patients with MV repair, compared with 3.8% in those with MV replacement (2). Unfortunately, the true rate of MV repair failure is difficult to estimate due to the relatively short period of follow-up in large national databases. Re-operative MV surgery (including previous MV replacement) consists approximately 10% of all MV surgery and is associated with high mortality—11% in a large regional US database (3). However, the results of re-operative MV surgery after previous MV repair may be lower at 1–9%, as reported in a number of smaller case series (4,5).

Transcatheter valve technology has increased the options for patients requiring re-operative mitral valvular repair surgery. Transcatheter MV replacement within a degenerated MV bioprosthesis (MViV) is associated with good results and is becoming a common alternative to re-operative surgery. However, transcatheter MV replacement in a previous annuloplasty (MViR) is more challenging. The most common complication remains the risk of left ventricular outflow tract (LVOT) obstruction as the anterior MV leaflet is displaced by the prosthesis into the outflow tract. The commonly used balloon-expandable valves are effective in most cases, but may be difficult to anchor in all but semi-rigid complete annuloplasty rings, and are not big enough to be implanted in ring sizes greater

than 34 mm. Dedicated transcatheter MV prostheses, such as the Tendyne (Abbott, Abbott Park, IL, USA), have improved anchoring and sealing in replacement of the native MV. There are reports of this device being used in a failed annuloplasty ring (6) with success, but have not been approved for use in the United States (U.S.) or worldwide.

The overall number of MViR cases included in registries remains small. The VIVID Registry includes 222 patients who have had MViR (51% transapical); whilst procedural mortality was low (0.5%), 30-day mortality was 8.6% and procedural success 63% (7). In the TMVR Multicenter Registry, 141 patients undergoing MViR (65% transapical) were included and reported to have 9.9% 30-day mortality and 57% procedural success (8). Although there remains trans-apical (TA) or trans-septal (TS) approaches for delivery of the transcatheter MV replacement, the clear preference of Heart Teams is to use the TS approach. A recent analysis from the national U.S. Society of Thoracic Surgeons (STS)/American College of Cardiology (ACC) Transcatheter Valve Therapies (TVT) database showed an increase in TS approach from <16% in 2006–2013 to >80% in 2018–2020 (9). The most commonly used valve for MViR procedures remains the balloon-expandable SAPIEN valve (Edwards Lifesciences, Irvine, CA, USA) which can be delivered across the interatrial septum using the Commander delivery system (Edwards Lifesciences, Irvine, CA, USA) from the femoral vein. The location of the transeptal puncture is important and should be inferior and posterior to allow enough room for the delivery system to perform the approximately 90-degree bend required to traverse the prior MV prosthesis. It is possible that paravalvular regurgitation between the prior MV prosthesis and SAPIEN valve can occur and the operators should be skilled to close these gaps using transcatheter

closure devices.

A major limitation of the MVIR procedure is the risk of LVOT obstruction by displacement of the anterior leaflet by the prosthesis towards the interventricular septum. LVOT is associated with a high mortality and may occur when the neo-LVOT is $<250 \text{ mm}^2$. In some instances, the Laceration of the Anterior Mitral leaflet to Prevent Outflow Obstruction (LAMPOON) procedure, which uses catheter electrosurgery to lacerate the anterior leaflet in the septo-lateral (or anterior-posterior) plane may prevent LVOT obstruction (10). In brief, two retrograde sheaths are placed from the femoral arteries, one in the left atrium and the other in the LVOT. An electrified wire is passed through the base of the anterior MV leaflet and captured by a snare placed through the left atrial catheter. Under tension and electrified through a small area on the wire stripped of its insulation, the anterior MV leaflet is lacerated from its base along the length of the A2 segment. This laceration allows lateral and medial displacement of each “half” of the anterior leaflet, preventing obstruction of the LVOT.

Although the outcomes of re-operative surgery for failed surgical MV repair are better than those for a failed MV replacement, a reliable less invasive transcatheter option that delivers equivalent or superior outcomes to re-operative surgery would be ideal. The adjuncts to MVIR to prevent LVOT obstruction, such as LAMPOON, are effective, and large reference centers with transcatheter programs should become competent in their execution.

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Footnote

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