

A novel technique in complex primary mitral valve repair using an inverted basal triangular posterior leaflet resection plus neochordae



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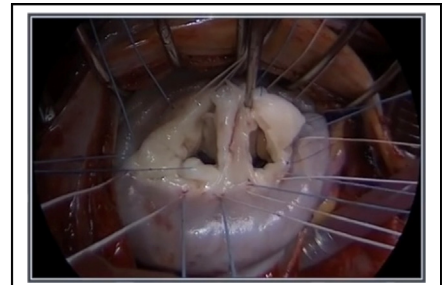
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Basal triangular resection in P2 prolapse with myxomatous tissue to reduce leaflet height.

CENTRAL MESSAGE

By combining the teachings of the classic French correction with more recent techniques, minimal leaflet resection, neochordae, and annular stabilization we add to the armamentarium for MV repair.

▶ Video clip is available online.

Mitral regurgitation (MR) is the second-most frequent indication for valve surgery in Europe. The most common cause of primary MR is degenerative mitral valve (MV) prolapse. Surgery is recommended for symptomatic, operable, non high-risk patients with severe primary MR.¹ MV repair in preference to replacement is a Class I recommendation, MR due to degenerative valve disease is mostly caused by segmental leaflet prolapse with ruptured or elongated chordae tendineae. The P2 scallop is the most affected and a durable repair can be performed in most patients with a low mortality.²

Carpentier's³ triangular resection, the French correction, is reproducible with excellent long-term results. Alternative paradigms introducing the concept of respect versus resect have also produced durable results for functional correction of MR.⁴ Our approach, combining both philosophies, achieves a successful MV repair.

CASE

A 55-year-old gardener with New York Heart Association functional class II symptoms was referred for MV surgery. Clinical examination revealed a pan-systolic murmur. Trans-thoracic echocardiography revealed thickened MV leaflets and a flail posterior leaflet resulting in a severe eccentric jet of regurgitation, anteriorly directed. Coronary

angiography was normal. MV surgery was offered with a >95% chance of a successful repair. The patient provided informed written consent for the publication of their study data.

Two-dimensional and 3-dimensional transesophageal echocardiography revealed a myxomatous posterior leaflet with excess leaflet tissue, P2 prolapse with a flail P2 scallop, and ruptured chordae. MR was severe with an anteriorly directed jet and regurgitation across the entire coaptation line. With the aortomitral angle of 120°, left ventricle size, and minimal septal bulge, the risk of systolic anterior motion was mainly going to be due to the excess tissue of P2. Cardiac dimensions were normal with no other valvular pathology, pulmonary hypertension, or tricuspid regurgitation.

SURGICAL TECHNIQUE

The patient was prepped and draped supine in standard fashion. Access was via median sternotomy. Bicaval



VIDEO 1. The mitral valve is interrogated to establish the mechanism of mitral regurgitation. The P2 scallop is measured at 2 cm. A basal triangular resection is performed with the base of the triangle centered on the annular leaflet attachment with preservation of the leaflet body and free margin. Leaflet continuity is restored with a running 5–0 Prolene suture. The leaflet height is reduced to 1.5 cm. GoreTex (W. L. Gore & Associates, Inc) neochordae and fine adjustments complete the repair. Video available at: [https://www.jtcvs.org/article/S2666-2507\(23\)00306-1/fulltext](https://www.jtcvs.org/article/S2666-2507(23)00306-1/fulltext).

cannulation was instituted for cardiopulmonary bypass with perfusion at 28 °C and Custodiol (Essential Pharmaceuticals LLC) was instilled to achieved cardiac quiescence. MV access was via Sondergaard’s groove.

Intraoperative valve interrogation to assess the mechanism of MR was performed before choosing a repair technique (Video 1). P2 prolapse with ruptured chordae and significant clefts at P1/P2 and P2/P3 were revealed. Anterior leaflet pathology with prolapse of A1/A2 was also noted. Annuloplasty sutures were placed.

Repair commenced with a basal inverted triangular resection centered on the annular aspect of P2 to reduce the height of the scallop. The P2 scallop was extended to its full length by temporarily anchoring the free margin anteriorly with a sliding 5–0 Prolene. Applying minimal tension aids the resection of myxomatous tissue whilst preserving the main body and free margin of the MV leaflet. Varying the incision lengths allows width and height of the resection to be adapted to the repair requirements. Leaflet continuity is restored by approximating the 2 sides of the triangle to the annular base. Leaflet height was reduced from 20 to 15 mm. A 5–0 Prolene running suture closes the triangular defect. The deep cleft between P1 and P2 was also closed. Three GoreTex (W. L. Gore & Associates Inc) neochords correct the P2 prolapse. In the preoperative transesophageal echocardiogram long-axis view, the anterior leaflet appeared to be level with the annulus; however, following the saline test, achieving a perfect repair required additional A1/A2 neochordae. The annulus was stabilized with a 36-mm Carpentier-Edwards Physio II Ring and secured using CorKnot (LSI Solutions). Final insufflation confirms a satisfactory repair that is now completed with fine neochordal length adjustments. Dye test showed 8 mm leaflet coaptation. Technical steps are summarized in Figure 1. The atrium is closed using a harnessed 3–0 Prolene running suture. Pacing wires are inserted. De-airing maneuvers were performed under transesophageal echocardiogram guidance with the crossclamp removed while continuously venting of residual air. Once the valve was assessed for absence of

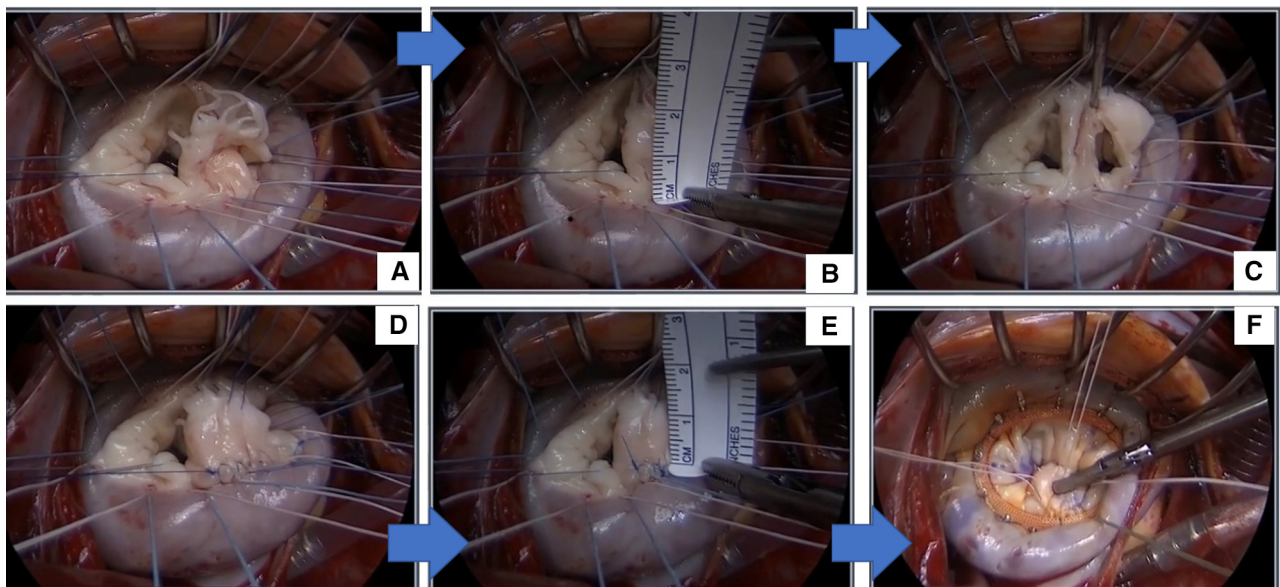


FIGURE 1. Summary of the main steps of the surgical procedure. A, The mitral valve is interrogated to establish the mechanism of mitral regurgitation. B, The P2 scallop is measured at 2 cm. C, A basal triangular resection is performed with the base of the triangle centered on the annular aspect of the leaflet attachment with preservation of the leaflet body and free margin. D, Leaflet continuity is restored with a running 5–0 Prolene suture. E, The leaflet height is reduced to 1.5 cm. F, GoreTex (W. L. Gore & Associates, Inc) neochordae and fine adjustments complete the repair.

MR and systolic anterior motion, weaning from cardiopulmonary bypass was commenced. The patient weaned easily with minimal support and the operation was completed.

DISCUSSION

Many surgeons have a preference for either resect or respect. A combined approach can be preferable to provide a durable repair and address excess leaflet tissue whilst reducing leaflet height. This technique additionally eliminates suture lines at the coaptation surface of the leaflet because suture material is isolated to the base of the leaflet under the annuloplasty ring. Neochords as a sole approach would warrant deep ventricularization of the long posterior leaflet and potentially decreased posterior leaflet mobility. An aggressive resection could also unfurl minor clefts and cause mild residual regurgitation. This reproducible technique adds to the armamentarium in complex MV surgery whilst following the 10 commandments for MV repair.⁵

Conflict of Interest Statement

The authors reported no conflicts of interest.

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

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