A Novel Technique in Complex Primary Mitral Valve Repair using an Inverted Basal Triangular Posterior Leaflet Resection plus Neo Chordae

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Title:

A Novel Technique in Complex Primary Mitral Valve Repair using an Inverted Basal Triangular Posterior Leaflet Resection plus Neo Chordae

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GLOSSARY of abbreviations

MR Mitral regurgitation

MV Mitral valve

LV Left Ventricle

TTE Trans-thoracic echo

TOE Trans-oesophageal echo

CPB Cardio-pulmonary bypass

SAM Systolic anterior motion

Key words: Mitral repair; Novel techniques in mitral repair; Triangular resection; Basal triangular resection
Central message

By combining the teachings of the classic ‘French correction’ with more recent techniques, minimal leaflet resection, neo-chordae and annular stabilisation we add to the armamentarium for MV repair.

Central picture

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

Perspective statement

By combining the principles of the classic ‘French correction’ with a more limited resection and neo-chordae insertion this reproducible technique can be added to the armamentarium in complex MV surgery whilst following the 10 commandments for MV repair
INTRODUCTION

Mitral regurgitation (MR) is the second most frequent indication for valve surgery in Europe. The commonest 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’s triangular resection, published in the landmark paper the ‘French correction’, is reproducible with excellent long-term results (3). 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 NYHA II symptoms was referred for MV surgery. Clinical examination revealed a pan-systolic murmur. TTE revealed thickened MV leaflets, 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.
2D and 3D-TOE 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 aorto-mitral angle of 120°, LV size, minimal septal bulge, the risk of SAM was mainly going to be due to the excess tissue of P2.

Cardiac dimensions were normal with no other valvular pathology, pulmonary hypertension or TR.

**SURGICAL TECHNIQUE**

The patient was prepped and draped supine in standard fashion. Access was via median sternotomy. Bi-caval cannulation instituted for cardio-pulmonary bypass (CPB) with perfusion at 28°C and Custodiol® instilled to achieved cardiac quiescence. MV access was via Sondergaard’s groove.

Intra-operative valve interrogation to assess the mechanism of MR was performed prior to 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 are placed.

Repair commences with a basal inverted triangular resection centred on the annular aspect of P2 to reduce the height of the scallop. The P2 scallop is extended to its full length by temporarily anchoring the free margin anteriorly with a sliding 5/0 Prolene® ‘stay suture’.

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
20mm to 15mm. A 5/0 Prolene® running suture closes the triangular defect. The deep cleft between P1 and P2 is also closed. Three Goretex® neochords correct the P2 prolapse. In the pre-operative TOE 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 is stabilised with a 36mm Physio II Ring® and secured using CorKnot®. Final insufflation confirms a satisfactory repair which is now completed with fine neochordal length adjustments. Dye test showed 8mm leaflet coaptation. Technical steps are summarised in Figure 1. The atrium is closed using a harnessed 3/0 Prolene® running suture. Pacing wires are inserted. De-airing manoeuvres are performed under TOE guidance with the cross-clamp removed while continuously venting of residual air. Once the valve is assessed for absence of MR and SAM, weaning from CPB is commenced. The patient weaned easily with minimal support and the operation is 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 as suture material is isolated to the base of the leaflet under the annuloplasty ring. Neochords as a sole approach would warrant deep ventricularisation of the long posterior leaflet and potentially decreased posterior leaflet mobility. An aggressive resection could also unfurl minor clefts causing mild residual regurgitation. This reproducible technique adds to the armamentarium in complex MV surgery whilst following the 10 commandments for MV repair (5).
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Figure 1: Summary of the main steps of the surgical procedure

A. The mitral valve is interrogated to establish the mechanism of MR.

B. The P2 scallop is measured at 2cm.

C. A basal triangular resection is performed with the base of the triangle centred 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 1.5cm.

F. Goretex® neo chordae and fine adjustments complete the repair.
The mitral valve is interrogated to establish the mechanism of MR. The P2 scallop is measured at 2 cm. A basal triangular resection is performed with the base of the triangle centred 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. Goretx® neo chordae and fine adjustments complete the repair.