

Mitral valve repair with decalcification of the annulus and pericardial patch repair via the trans-septal approach

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Clinical vignette

A 43-year-old gentleman presented with dyspnea on exertion for 6 months. Transesophageal echo (TOE) showed severe mitral regurgitation (MR) with bi-leaflet prolapse. There was moderate mitral annular calcification (MAC) from P2 to P3. The ejection fraction was 60% and the left ventricle (LV) was dilated.

Surgical technique

Preparation and exposition

Median sternotomy was performed and cardiopulmonary bypass was established using bi-caval cannulation. Cardiac standstill was obtained with antegrade cardioplegia after cross-clamping the aorta. The caval tapes were snared and the right atrium (RA) was opened. An incision was made in the fossa ovalis and was extended into the left atrium (LA). Stay sutures were placed on the edge of the incision for exposure. Annulus sutures with 2-0 Ethibond were placed for better exposure.

Operation

The valve analysis showed a redundant P2 with prolapse and normal P1 and P3. There was possible prolapse of the anterior leaflet. The MAC was assessed and extended from P2 to the medial commissure, bulging deep into the LV and LA around P2. Assessment of the shape of the MAC at this stage is important because the repair could become difficult if the MAC was to extend into the anterior annulus, and a portion of the anterior calcification could be left *in situ* if there was narrowing. If the leaflets were calcified, little

leaflet tissue may remain after resection of the MAC and they may require augmentation with pericardium.

The first step of decalcifying the MAC is detachment of all the attached leaflets. In this case, a small triangular resection was performed in P2 to access the MAC. A No. 11 blade was used to detach the leaflet. Once the leaflet is detached and the whole MAC exposed, resection usually begins from the surgeon's right using No. 11 blade or scissors and moves towards the left. The key is to stay on the MAC consistently and try to resect it en bloc.

Once the MAC was removed, the defect was closed with a pericardial patch. The patch was tailored with some margin to allow stitching and reduction of tension. Beyond the marking of the proposed neo-annulus line, the extra pericardium should be preserved in case augmentation of the valve leaflets is required. One typical approach is to begin with 5-0 Prolene from the middle of the defect on the LV side, taking one big bite of the edge of the defect, and then suture onto the patch. The patch is lowered down and the suture is tied. Suturing is then continued with a forehand to avoid cutting through the LV, with inclusion of muscle to achieve good hemostasis. Once the leaflet is repaired, this patch cannot be accessed for further suturing and bleeding from this site is catastrophic.

Once the continuous sutures for the patch reached the LA/annulus, another set of 5-0 Prolene was used at the juncture of the LA/annulus, LV and patch to secure the continuous 5-0 Prolene sutures on each side of the patch. Subsequently interrupted 2-0 Ethibond sutures were placed from the LV side into the patch and then the LA edge as annuloplasty sutures. This suture line will become the neo-annulus and was reinforced with 5-0 Prolene mattress sutures from both sides. The patch was trimmed here, as

no augmentation of the leaflet was required. From this stage, the procedure was similar to standard mitral repair techniques.

A few CV-4 Gore-Tex sutures were placed on the papillary muscle for future use, while the exposure of subvalvular apparatus was good. The excess posterior leaflets were trimmed and were re-attached to the neo-annulus as performed in the sliding plasty technique. CV-4 Gore-Tex sutures were placed on the P2 edge and the annuloplasty was performed using 40 mm Physio II ring and 2-0 Ethibond. The water test was satisfactory and the left and right atria were closed. The aorta was declamped and the heart resumed beating spontaneously.

Completion

The weaning from bypass was performed and TOE confirmed satisfactory mitral valve repair with less than trivial MR. Decannulation and hemostasis was carried out and the patient was transferred to the ICU in a stable condition. The patient was discharged from the hospital on day 5 post-operatively.

Comments

MAC poses a surgical challenge. Various techniques have been proposed for either repair or replacement of the valve. However, if there is at least moderate MAC, the only logical way to repair the valve is the complete annulus decalcification developed by AF Carpentier (1). Decalcification of MAC is associated with high mortality and morbidity. The reported operative mortality ranges from 2.9% to 14% (1-4). The risks associated with this operation include atrioventricular disruption, hemorrhage, and injury to the circumflex artery.

The trans-septal approach may be underused in this kind of operation. Although it is more complex and time-consuming to open and close than the conventional approach, it provides the advantages of an easier view and easier angle for instruments when resecting the MAC and repairing the defect with a patch. This approach is especially useful for patients with expected poor exposure of the mitral valve due to features such as a deep chest, redo surgery, and small LA. As loose sutures on the patch or a gap between sutures could lead to deadly complications such as atrioventricular disruption, neat suturing under good exposure is the key to success in this operation. If the calcification is extending into the deep LV muscle,

towards the apex of the LV or behind the anterior leaflet, this approach provides better exposure. Every aspect of this procedure needs to be performed meticulously, step by step, and with patience to achieve a good outcome.

Since May 2012, mitral annular decalcification via the trans-septal approach has been performed in 20 cases with various degrees of MAC (ten extensive, seven medium, three small). There was neither mortality nor annulus dehiscence and the mitral valve repair rate was 85% (17/20).

In conclusion, the trans-septal approach should be considered in mitral annular decalcification operations, especially when good exposure is required such as in the case of a deep chest or extensive MAC.

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Footnote

Conflicts of Interest: The author has no conflicts of interest to declare.

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