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Gabriele M. Iacona, MD, Syed O. Ali, MD, Shinya Unai, MD, Serge C. Harb, MD, Gosta B. Pettersson, MD, PH D

1 From the Department of Thoracic and Cardiovascular Surgery, Heart Vascular & Thoracic Institute, Cleveland Clinic, Cleveland, Ohio.
2 From the Cardiovascular Imaging, Heart and Vascular Institute, Cleveland Clinic, 9500 Euclid Ave, J1-130, Cleveland, OH, 44195, USA.

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Address to reprints: Shinya Unai, MD, the Department of Thoracic and Cardiovascular Surgery, Heart Vascular & Thoracic Institute, Desk J4-1, 9500 Euclid Avenue, Cleveland Clinic, Cleveland Ohio 44195 (E-mail: unais@ccf.org)

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CENTRAL MESSAGE
Mitral valve replacement with severe mitral calcification requires debridement of calcium to place a prosthesis of acceptable size and rely on the strength of patch supported valve sutures.

CENTRAL PICTURE LEGEND
3-D TEE: calcified mitral annulus and mitral leaflets. A atrial view, B ventricular view.

CASE REPORT
Mitral annular calcification (MAC) is a chronic degenerative process in the fibrous base of the mitral valve complicating mitral valve surgery and resulting in higher mortality. We present a case of mitral valve replacement (MVR) with severe MAC, tricuspid valve repair, and aortic valve replacement.

IRB approval and patient’s informed consent were not required for this report.
Our patient was a 74 years old lady with severe mitral stenosis and severe mitral annular calcification, moderate aortic valve stenosis, moderate tricuspid regurgitation, and prior history of coronary artery bypass graft (patent left internal mammary artery to left anterior descending, patent vein grafts to obtuse marginal and diagonal branches). After repeat median sternotomy, standard cardiopulmonary bypass (CPB) was initiated and the heart arrested with antegrade and direct retrograde cardioplegia. The mammary graft was dissected and clamped. Aortotomy was performed and aortic valve was excised and annulus debrided. The mitral valve was approached through the right atrium and atrial septum. Valve leaflets were excised preserving anterior chordae (video). To achieve a debridement of the MAC we used a combined trans-septal and trans-aortic approach. The MAC was debrided as much as needed to seat a valve of acceptable size making
sure not to violate the posterior capsule of the calcium bar. The mitral annulus was thoroughly sized. A half oval bovine pericardial patch was first sewn at the transition between MAC and healthy myocardial muscle in the left ventricle using a running suture with 4-0 RB1 monofilament suture. Valve sutures with pledgets were placed circumferentially. Posteriorly these sutures passed through the ventricular side of the patch, through the atrial lip of the calcium bar, and back through the patch on the atrial side. Then we secured the patch to the atrial wall with a running suture.

Aortic valve sutures were placed and aortic valve was sized. A mitral bio-prosthesis was then implanted and sutures tied, following which an aortic bio-prosthesis was placed. A tricuspid repair was performed with a ring annuloplasty. Patient was weaned of CPB with inotropic support. Post operatively she developed right ventricular dysfunction requiring, junctional bradycardia requiring a permanent pacemaker, acute renal failure, left pleural effusion and atrial fibrillation. She was discharged from hospital on post-operative day 21, with underlying controlled atrial flutter on warfarin therapy.

Different approaches to MAC have been described from very limited MAC removal to extended de-calcification.\textsuperscript{2-4} Too aggressive attempts to remove MAC may cause atrio-ventricular groove rupture.\textsuperscript{1} Most surgeons are wary of MAC as it is associated with low likelihood of a successful mitral valve repair or replacement and often results in implantation of a small prosthesis with a high risk of para-valvular leaks. Our debridement is guided by the ability to implant a prosthesis of appropriate size and place sutures through or around calcium when the calcium bar is not too wide. After debridement (and before/after patch placement), the mitral valve should be carefully sized with valve sizers to be sure that a suitable prosthesis can be implanted. Debridement, however, often results in a wide groove with some remaining calcium in the bottom and intact capsule. The valve sutures rely on the strength of this capsule. The placement of these sutures must
leave no tension on the patch and the ventricular suture line. Oversizing of the patch is a critical step. When a patch is used, the exposed debrided mitral annulus is completely covered with the patch which adds further support for the sutures and may reduce the risk of calcium embolization.\(^5\) This technique has several limitations as it adds further to the duration of the procedure. The patch is sutured directly to the myocardium on the ventricular side. Often the residual calcium and its ventricular extension makes placing a patch difficult and time consuming and just using a continuous felt strip in the bottom of the calcium groove is an acceptable alternative. In old patients this myocardial muscle can be fragile and prone to bleeding and patch dehiscence soon after removal of the aortic cross clamp. Debridement of the MAC is always a long procedure that requires perfect myocardial protection with antegrade and direct retrograde cardioplegia delivery. It is critically important to review preoperatively the echocardiogram (central picture) and the cardiac computed tomography (figure 1) looking at the extent of calcium and location of the circumflex artery.

A dual, trans-septal and trans-aortic approach, limited debridement of calcium, well anchored and supported valve sutures are keys to successful and safe MVR in patients with severe MAC.
REFERENCES


FIGURE LEGEND

Central Picture 3D Transesophageal echocardiography showing narrow calcified mitral annulus with retracted and calcified mitral leaflets: A atrial view, B ventricular view.
Figure 1 Cardiac computed tomography
Mitral annular calcification (MAC) is a chronic degenerative process in the fibrous base of the mitral valve complicating mitral valve surgery. We present a case of mitral valve replacement (MVR) with severe MAC approached with the patch technique.

The mitral valve is exposed through the right atrium and atrial septum. Valve leaflets are excised preserving some anterior chordae.

Our debridement is guided by the ability to implant a prosthesis of appropriate size and place sutures through or around calcium when the calcium bar is not too wide.

Debridement, however, often results in a wide groove with some remaining calcium in the bottom and intact capsule.

To achieve a debridement of the MAC through a perfect exposure we normally use a combined trans-septal and trans-aortic approach.

The exposed debrided mitral annulus has to be completely covered with the patch which adds support for the sutures and may reduce the risk of calcium embolization. Oversizing of the patch is a critical step. The patch is first sewn at the transition between MAC and healthy myocardial muscle in the left ventricle.
Then posterior valve sutures are passed through the patch, through the capsule, and the atrial lip of the MAC. The placement of these sutures must leave no tension on the patch and the ventricular suture line.

Valve stitches go back through the patch.

The patch is trimmed and secured to the atrial wall.

Anterior stitches with pledgets are placed.

Mitral valve replacement is completed.

The patch technique is a safe procedure for mitral valve replacement with MAC. Trans-septal and trans-aortic approach, limited debridement of calcium, well anchored and supported valve sutures are keys to success. It is a complex surgical technique for expert cardiac surgeons.
4-chamber view

“MV surgeon’s” view

2-chamber view

Short axis (“MV surgeon’s”) view