Masters of Cardiothoracic Surgery

Transcatheter aortic valve replacement explant and aortomitral curtain reconstruction

Michael T. Simpson, Rahul Kanade, Sparsha Mehta, Isaac George

Division of Cardiothoracic Surgery, New York-Presbyterian Hospital, Columbia University Medical Center, New York, NY, USA

Correspondence to: Isaac George, MD. Division of Cardiothoracic Surgery, New York-Presbyterian Hospital, Columbia University Medical Center, 177 Fort Washington Ave., Milstein Hospital, 7 Garden North, Rm 435, New York, NY 10032, USA. Email: ig2006@cumc.columbia.edu.

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Clinical vignette

The patient was an 80-year-old woman with history of treated breast and lung cancer and severe aortic stenosis treated with a 23 mm balloon expandable transcatheter aortic valve replacement (TAVR) in 2017. She presented with two weeks of chills and had positive blood cultures for *Enterococcus faecalis*. Transthoracic echocardiogram demonstrated a 1.4 cm × 1.1 cm mobile echodensity on the mitral valve with moderate mitral regurgitation and a cardiac computed tomography angiography demonstrated an abscess along the aortomitral curtain. She was referred for surgery; while undergoing further workup she developed conduction abnormalities and had a transvenous pacing wire placed. She was taken to the operating room the following day.

Surgical techniques

After induction of general anesthesia, median sternotomy is performed. After heparinization, preparation for cardiopulmonary bypass includes aortic cannulation, bicaval cannulation, and placement of a left ventricular vent.

We place antegrade and retrograde cardioplegia catheters for operations with complex cardiac reconstruction in order to easily re-dose cardioplegia. Our cardioplegia redosing strategy is summarized here (1).

After arrest, the aorta is opened and the TAVR is examined. In this case, there is significant vegetation encasing the TAVR. The TAVR is removed with a combination of sharp and blunt dissection, beginning by dissecting around the frame in order to place two clamps. These two clamps are rolled towards the center of the prosthesis, creating tension to enable continued dissection of the prosthesis off of the aortic wall. By rolling the frame inwards, the prosthesis diameter is reduced which limits damage to the aorta upon removal.

After removal of the prosthesis the aortic root is inspected. In this case, the viewer can see the abscess cavity extending underneath the left-non commissure to the aortomitral curtain. This extension of infection necessitates opening the left atrium to evaluate spread to the mitral valve. Here the mitral valve appears infected and is removed.

The first step is sizing of the mitral valve. The principles of "true-fit" sizing are to have the mitral prosthesis one centimeter below the aortic annulus and to keep in mind the anterior third of the prosthesis will be sewn to the aortomitral curtain patch. After prosthesis selection, the middle of a bovine pericardial patch is sewn to the anterior third of the sewing cuff with running suture. The width of the patch is sized to one-third the circumference of the mitral prosthesis and the full length of a large-sized patch is used and trimmed to meet the aortotomy medially. Posterior annular sutures are placed in non-everting fashion with ventricular pledgets to limit stress on fragile tissues. This allows supra-annular valve placement and avoids interaction with the left ventricular outflow tract (LVOT). These sutures are passed through the prosthesis which is parachuted into position and secured. In patients for whom there is a concern for a small LVOT, the patch can be fashioned wider than one-third of the mitral prosthesis. This modification serves to open up the LVOT.

Reconstruction of the LVOT and aortic root is

performed using the bottom half of the patch. Each side is sewn up into the noncoronary sinus with double layers of running polypropylene to ensure hemostasis. At this point, the aortic valve is sized. The size of the aortic valve determines the ultimate length of the reconstructed aortomitral curtain, which must be long enough to avoid tension but not too long such that the patch may fold or kink. The optimal length is approximately ten millimeters. After selection of the appropriately sized prosthesis, valve sutures are placed. We use pledgeted aortic valve sutures; along the patch no pledget is required. The aortotomy is reconstructed with the remainder of the patch and the left atrial dome is closed with the other half of the patch. There is no need to excessively enlarge the left atrium with this patch; it is used to reduce tension on the closure.

After completion of the cardiac reconstruction, the heart is de-aired and the cross clamp removed. Bypass is weaned and cannulae are removed. Surgical steel wire cerclage is used to reapproximate the sternal halves and the above tissues are closed in layers with absorbable suture.

Comments

Prosthetic valve endocarditis after TAVR necessitates explantation of the device and replacement of the aortic valve. Compared with TAVR explant for TAVR dysfunction, this cohort of patients has decreased intermediate term survival (2). Aggressive endocarditis invading the aortomitral curtain requires reconstruction using the commando operation (3).

Here we describe our technique combining TAVR explant and commando reconstruction. Important tips include development of a plane between the TAVR and aorta using a combination of blunt and sharp dissection to limit trauma to the aorta. Regarding the reconstruction, it is important to size the mitral valve to avoid tension on the patch. The length of the reconstructed aortomitral curtain should be approximately one centimeter. Too short and there will be tension and too long will result in possible folding of the patch. In a short series of patients undergoing commando, our institution demonstrated more favorable mitral valve-in-valve anatomy with this patch length (4). This is an important consideration in these patients who will be high risk reoperations.

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