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# Updates on Y-incision aortic annular enlargement

Bo Yang, Katelyn Monaghan, Kenneth Hassler, Alexander Brescia, Farhang Yazdchi

Department of Cardiac Surgery, Michigan Medicine, Ann Arbor, MI, USA

Correspondence to: Bo Yang, MD, PhD. Department of Cardiac Surgery, Michigan Medicine, 1500 East Medical Center Drive, 5155 Frankel Cardiovascular Center, Ann Arbor, MI 48109, USA. Email: boyang@med.umich.edu.

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## Clinical vignette

A 70-year-old female with severe aortic stenosis, congestive heart failure, and 34 mm aortic root with severe longitudinal calcification of the ascending aorta on computed tomography angiography (CTA).

## Surgical technique

### Preparation

Transthoracic echocardiogram and left heart catheterization were obtained.

### Exposition

Median sternotomy was performed. Aortic cannulation was placed at the proximal arch.

### Operation

A complete transverse aortotomy was made approximately 2 cm anteriorly and 1 cm posteriorly above the sinotubular junction (STJ). The aortic root was dissected out to the dome of left atrium and nadir of non-coronary sinus. The aortic annulus was 23 mm. A Y-incision was made splitting the left-non coronary sinus commissure, parallel to the aortic annulus undermining the left and noncoronary annulus to each respective nadir, about 2–3 mm from the myocardium next to the left fibrous trigone, and membranous septum next to the right fibrous trigone (1). A 4 cm rectangular Hemashield Dacron patch (Boston Scientific, Massachusetts, USA) was sewn to the aortomitral curtain from the left fibrous trigone

to right fibrous trigone with running 4-0 PROLENE suture (Ethicon, New Jersey, USA). The suture line was transitioned to the aortic annulus at the nadir of both left and noncoronary sinuses, sutured along the longitudinal length of the patch to the level of the aortotomy incision, and secured with additional 4-0 PROLENE suture. With the patch pulled upward, the valve-shape end of the sizer was placed in the enlarged root touching all three nadirs of the aortic annulus to determine the prosthesis size to be 29. The position of the sizer was marked on the patch for valve suture placement. Non-pledgetted 2-0 ETHIBOND sutures (Ethicon, New Jersey, USA) were placed along the native aortic annulus and patch in a non-everting fashion starting from the left-right commissure and progressing clockwise. The valve sutures were divided by three and evenly distributed to the sewing ring of the three cusps of the bioprosthetic valve, with one strut aligned with the native left-right commissure. The sutures at the nadirs of the noncoronary and left coronary sinuses, the lowest point of aortic annulus, were tied first, including three sutures at the nadir of each sinus. After the prosthesis was tied down, a 2–3 cm longitudinal aortotomy was made at the posterior proximal ascending aorta, and the distal end of the rectangular patch was trimmed in a triangular shape symmetrically, with the tip of the triangle approximately 2 cm above the strut. The aortotomy was closed with 4-0 PROLENE, incorporating the triangular patch extension into the longitudinal aortotomy through the “Roof” technique (2).

### Completion

The post-cardiopulmonary bypass mean gradient across the

aortic valve (AV) was 6 mmHg. The patient was discharged without blood transfusion or complications. Three-month follow-up mean gradient across the AV was 5 mmHg and left ventricular outflow tract (LVOT) was 2 mmHg. CTA showed the aortic root was 40.5 mm, STJ was 38 mm, and no pseudoaneurysm.

## Comments

Tips and pitfalls of Y-incision: (I) the location of aortic cannulation should be at the distal ascending or proximal arch to save enough ascending aorta for the enlargement with a longitudinal incision at the posterior side of the ascending aorta (Roof technique) (2). (II) We use complete aortotomy for first-time AV replacement (AVR), which aligns the enlarged root and ascending well; and partial aortotomy in reoperative AVR when the medial side of the proximal ascending aorta is tightly adhered to the main pulmonary artery. (III) The Y-incision should be into the left and right fibrous trigones, not through them, allowing maximum enlargement of the aortic annulus and root. If the Y-incision is not wide enough into the fibrous trigones, the patch will be smaller and the enlargement limited to two valve sizes. (IV) We now routinely use a wider patch, 3.75–4 cm (>1.5 inches) or wider, for more extensive enlargement of aortic annulus. (V) The valve suture line marked over the sizer on the patch should be dome-shaped. The highest position of the valve sutures on the patch should be the height of the divided left-non commissure, and the same height of the valve sutures at the left-right and right-non commissures. The highest valve suture on the patch is approximately 2 cm above the bottom suture line of the patch sewing to the aorto-mitral curtain. If the valve sutures on the patch are placed too low (significantly lower than the height of the divided left-non commissure), upsizing is limited to 1–2 valve sizes; otherwise the large valve could pinch the right coronary ostium since the prosthetic valve tilts anteriorly and cephalad. If the coronary ostium is <5 mm from the aortic annulus, we recommend downsizing the valve one size. The non-tilted prosthetic valve also preserves laminar flow. (VI) Seating of the prosthetic valve: It is critical to start passing the valve sutures at the L-R commissure through the sewing ring on each side

of the strut of the prosthetic valve, so that the strut faces the L-R commissure and the coronary ostia are on each side of the strut equally. In some patients with bicuspid AV, Sievers type 0, and no L-R commissure, the valve suture at the middle point between the two coronary ostia should be placed through the sewing ring on each side of a strut to set the coronary ostia equally on each side. (VII) Aortotomy closure: It is important to enlarge the proximal ascending aorta, including the new STJ, for the future valve-in-valve transcatheter AVR. The longitudinal aortotomy at the posterior side of the ascending can achieve both as previously detailed in our description of the Roof technique (2). (VIII) In the reoperative AVR setting after prior surgical AVR, all pledgets should be removed and pannus resected to restore the normal size of the basal ring and LVOT. The Y-incision should be made underneath the aortic annulus through the space where the previous pledgets were placed, which is usually lower than one thinks (1). The patch is most frequently sewn to the mitral valve annulus since the aorto-mitral curtain is frequently damaged from removal of the previous prosthesis.

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## Footnote

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