Valve repair for aortic regurgitation of a bicuspid aortic valve with root dilatation late after an arterial switch operation

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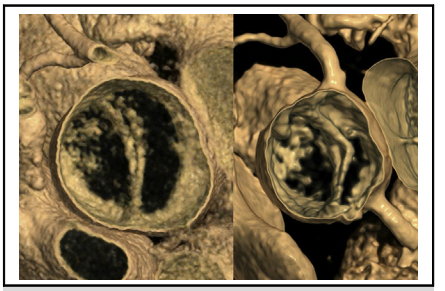


Cardiac CT enface view before and after David operation for AR developed late after ASO.

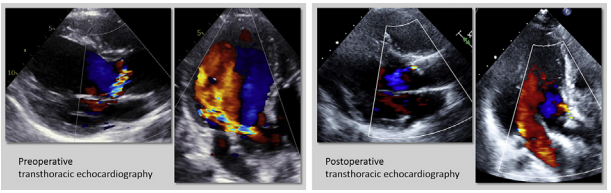
CENTRAL MESSAGE

Aortic regurgitation due to bicuspid valve with late root dilatation after arterial switch operation was repaired. Preoperative imaging and quantification of valve geometry provided great assistance.

See Commentary on page 62.

Video clip is available online.

A 13-year-old boy (body surface area: 1.77 m^2) was born with a transposition of the great arteries. He was treated with an arterial switch operation (ASO) at the age of 11 days. He thrived for 10 years, but periodical transthoracic echocardiography depicted progression of aortic regurgitation (AR) due to bicuspid aortic valve and neo-aortic root dilatation (Video 1, left). The left ventricular dimensions at end-diastole and systole were 69 and 47 mm. The measurements derived from cardiac computed tomography suggested valve repair would be feasible (Figure 1) and David operation was performed to treat the progressive dilatation of neo-aortic root and reliably reshape the valve geometry (Video 2). A 28 mm straight graft rather than a Valsalva graft was selected for the root reimplantation to keep higher commissure height with keeping the distance between the commissures within 28 mm. Central plication with 5-0 polypropylene suture and reinforcement of the free margin with 7-0 polytetrafluoroethylene (PTFE) suture were performed for both cusps. In addition, neo-chord technique was used for anchoring the fusion cusp to the graft wall by 5-0 PTFE suture (Figure 2). For bicuspid valve repair, neo-chord technique has been used since 2016 in our institution to prevent future prolapse and iatrogenic valve stenosis caused by excessive leaflet plication. While further study is needed in this regard, our short-term results of neo-chord technique are satisfactory.[1] Sufficient coaptation was obtained postoperatively in the present case (Figure 3, Video 3). He remains healthy with trivial AR at 1- and 2-year follow-up by echocardiography (Video 1, right).



VIDEO 1. Pre- and postoperative transthoracic echocardiography. Video available at: https://www.jtcvs.org/article/S2666-2507(21)00752-5/fulltext.

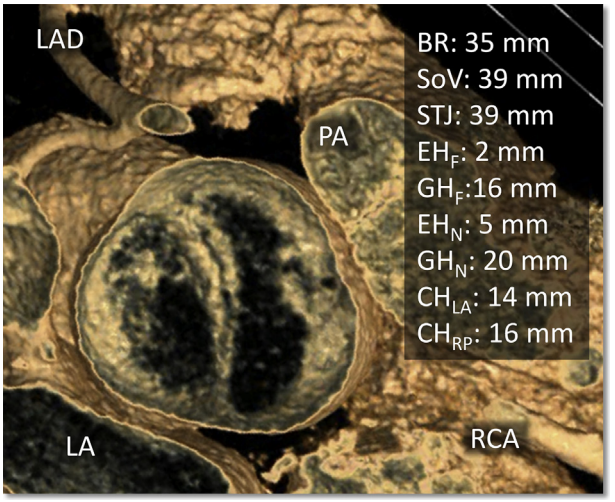
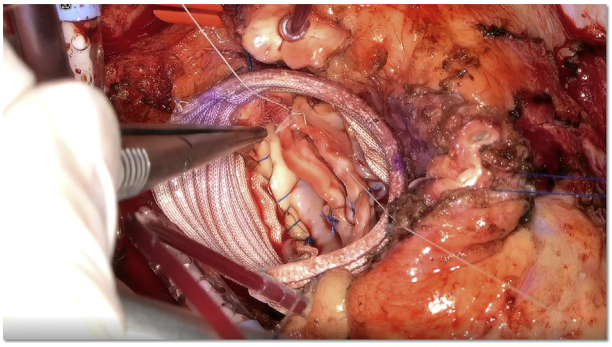


FIGURE 1. Enface view of aortic valve in diastole reconstructed by cardiac computed tomography (CT). Diameters of basal ring (*BR*), sinus of Valsalva (*SoV*) and sinotubular junction (*STJ*); effective heights in the fusion cusp (EH_F) and noncoronary cusp (EH_N); geometric heights of the fusion cusp (GH_F) and non-fusion cusp (GH_N); commissure heights in left anterior commissure (CH_{LA}) and right posterior commissure (CH_{RP}) measured by cardiac CT are shown. Diameters were calculated from perimeters. Commissure height was measured as vertical distance between commissure and basal ring plane. *LAD*, Left anterior descending artery; *PA*, pulmonary artery; *LA*, left atrium; *RCA*, right coronary artery.



VIDEO 2. Intraoperative video. Video available at: https://www.jtcvs.org/article/S2666-2507(21)00752-5/fulltext.

Patients who have had ASO occasionally require reoperation on the dilated neo-aorta and AR.[2,3] David operation can be used for the treatment of neo-aortic root when the aortic valve is salvageable.[4,5] The bicuspid aortic valve which is rarely encountered scenario after ASO could be successfully repaired. Assuming leaflet tissue quality is acceptable, current reparative techniques are utilized and precise assessment of the aortic root and leaflet dimension (ie, virtual basal ring, sino-tubular junction, effective height and geometric height), should enable a durable surgical reconstruction of the regurgitant aortic valve.

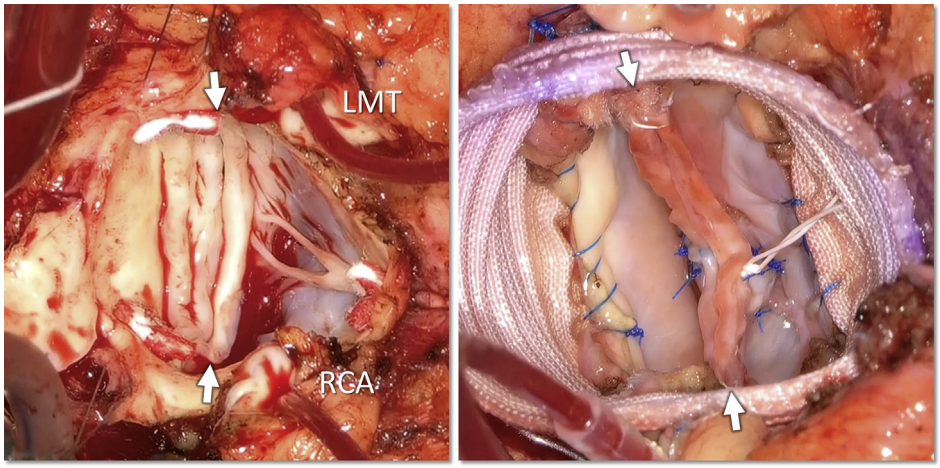


FIGURE 2. Surgical inspection before (*left*) and after (*right*) valve repair. Commissures are indicated by *arrows*. There were chords like structure at the raphe, which were removed during surgery. A 28-mm straight graft was selected for the root reimplantation. Central plication and reinforcement of the free margin were performed for both cusps. Neochord technique was used for the fusion cusp. *LMT*, Left main trunk; *RCA*, right coronary artery.

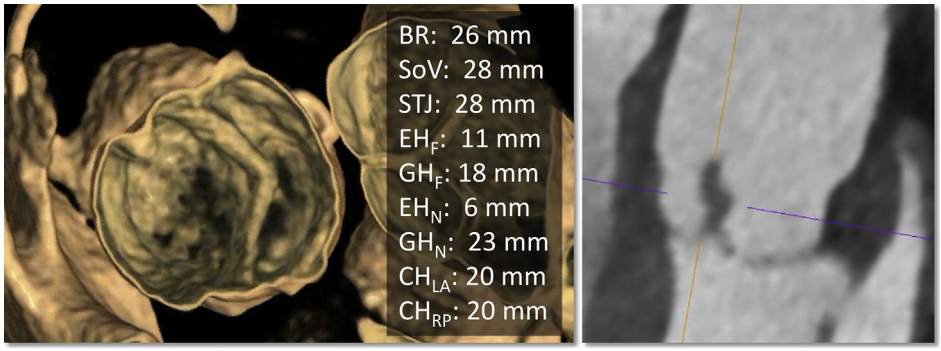
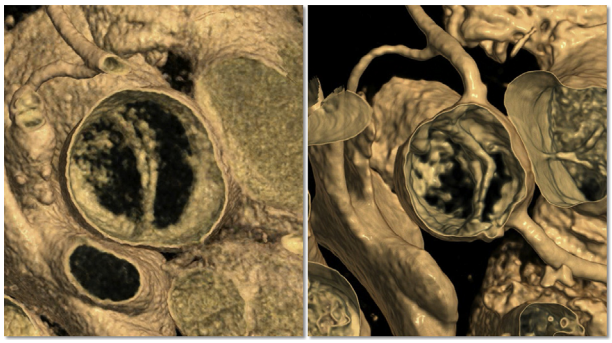


FIGURE 3. Postoperative enface view (*left*) and multiplanar reconstruction image (*right*) in diastole. Postoperative effective heights were 11 mm in fusion cusp and 6 mm in noncoronary cusp by cardiac computed tomography. Coaptation depth was 6 mm. Abbreviations are the same as those in Figure 1.



VIDEO 3. Pre- and postoperative enface view by cardiac computed tomography. Video available at: https://www.jtcvs.org/article/S2666-2507(21)00752-5/fulltext.

References

1. Obase K, Miura T, Eishi J, Nakaji S, Matusmaru I, Eishi K, et al. Neo-chord construction on fusion cusp for bicupid aortic valve repair in combination with aortic root repair. *Circulation*. 2019;140:A15783.
2. Co-Vu JG, Ginde S, Bartz PJ, Frommelt PC, Tweddell JS, Earing MG. Long-term outcomes of the neoaorta after arterial switch operation for transposition of the great arteries. *Ann Thorac Surg*. 2013;95:1654-9.
3. van der Palen RLF, Blom NA, Kuipers IM, Rammeloo LAJ, Jongbloed MRM, Konings TC, et al. Long-term outcome after the arterial switch operation: 43 years of experience. *Eur J Cardiothorac Surg*. 2021; 59:968-77.
4. Chen YS, Chiu IS, Huang SC, Chen SJ. Valve-sparing procedure and Lecompte maneuver in patients with late aortic regurgitation and aortic aneurysm after the arterial switch operation. *J Thorac Cardiovasc Surg*. 2010; 140:1191-2.
5. Liebrich M, Scheid M, Uhlemann F, Hemmer WB. Valve-sparing reimplantation technique for treatment of neoaortic root dilatation late after the arterial switch operation: raising the bar. *Thorac Cardiovasc Surg Rep*. 2014;3:16-8.