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Masters of Cardiothoracic Surgery

Aortic root replacement with the reimplantation technique for recurrent root aneurysm, 24 years after root replacement with the remodeling technique in a Marfan patient

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Clinical vignette

A 36-year-old female with Marfan syndrome underwent aortic root replacement with the Yacoub (remodeling)-procedure for a root aneurysm at age 12. She returned 24 years later with recurrent severe aortic root dilation of 61 mm, and aortic annular enlargement of 35 mm, with moderate aortic regurgitation of her native aortic valve. Her left ventricular ejection fraction was mildly depressed at 45–50%. She also presented with moderate mitral regurgitation from an anterior mitral valve prolapse.

Her root enlargement was at risk for rupture, and required urgent repair.

Surgical technique

The patient was placed supine with both arms tucked to the sides. A redo sternotomy was performed with an oscillating saw. Adhesions were taken down sharply with scissors and electrocautery. Systemic heparin was administered, and the right groin cannulated after cut-down with a standard right femoral arterial cannula and a 25 French multistage venous cannula advanced into the right atrium and proximal superior vena cava under Echo guidance. Cardiopulmonary bypass (CPB) was initiated and the patient cooled to 30 ℃.

The aorta was cross-clamped and antegrade cold blood cardioplegia given via a root vent. A left ventricular vent was placed via the right superior pulmonary vein. Once the heart was arrested, the previous aortic graft was incised above the sino-tubular junction (STJ). The incision was carried down towards the STJ, and then posteriorly and circumferentially, leaving the left coronary artery attached to the distal aorta. Retraction sutures were placed to expose the aortic root and valve. Antegrade cardioplegia was then given every 15–20 minutes via direct coronary cannulation.

Upon inspection of the aortic root, it became evident that the tissues between the valve hinges and graft were dilated and effaced, which was a potential substrate for root rupture. The aortic root was therefore dissected circumferentially, and the old graft excised, along with the abnormal and enlarged tissues in the aortic root. A deep root dissection was performed, as previously described (1,2), to allow for an annuloplasty and placement of the prosthetic graft at the level of the virtual basal ring. A transaortic Alfieri stitch (A2/P2) was placed to address the mitral regurgitation.

The Valsalva graft (Gelweave^{TM} Valsalva, Terumo, Scotland, UK) was sized by measuring the height of the non/left-commissure (1), and 12 subannular sutures were placed utilizing pledgetted 2.0 Ticron sutures in a horizontal mattress fashion. One suture was placed under each commissure and three under each sinus, at the level of the virtual basal ring, except for the non/right-Commissure, where they were placed higher to avoid injury to the conduction system (1). A 30 mm Valsalva graft was used, and the lower skirt was completely removed. The

annular sutures were placed through the bottom of the graft and tied. The commissures were then suspended to the graft with a 4.0 Polypropylene suture, and the remnant of the aorta sewn to the graft in a running fashion with the same sutures. The bites in the aorta were taken close to the valve hinges. The left and right coronary buttons were reimplanted. The distal aortic anastomosis was then performed, and CPB weaned. The heart was de-aired with a 19-gauge needle. Initial review of the intraoperative Echo indicated some residual mitral regurgitation (MR) therefore the patient was re-arrested, and an annuloplasty with a 32 mm Memo 4D (LivaNova, London, UK) ring was added (sized by trigonal distance), via a left trans-atrial approach.

CPB was weaned, the heart deaired, and the left ventricular vent removed. Temporary pacing wires and chest tubes were placed prior to decannulation and sternal closure with sternal wires.

Comments

Patients with connective tissue disorders are at increased risk for aortic root and/or aortic valve disease. Several surgical options with good intermediate and long-term results have been previously reported. These entail valve replacing and valve preserving techniques (VSSR).

The Hopkins group has previously described their experience with aortic root operations (VSSR versus Bentall) in Marfan patients, and have found similar survival, freedom from reoperation and freedom from endocarditis at 10 years (3). Valve-sparing procedures, however, resulted in fewer thromboembolic or hemorrhagic events. In their earlier report, there was significantly better survival at 8 years in the VSSR versus Bentall cohorts (100% *vs.* 90%), but at 10 years the difference was no longer statistically significant (96.3% *vs.* 90.5%). We speculate, nonetheless, that this trend will tilt towards VSSR again with longer-term follow-up, as ample evidence now supports the notion that valve preservation restores life expectancy. Whether this also applies to patients with connective tissue disorders remains to be seen.

In a retrospective propensity-score matched analysis, the Toronto group recently published their experience with the reimplantation versus remodeling techniques in Marfan patients (4). No significant difference was observed in 20-year survival (82% *vs.* 72%), although more patients in the remodeling cohort developed > mild aortic regurgitation (13% *vs.* 5.8%) and required reoperations (18% *vs.* 0%).

The assumption that patients with Marfan syndrome who undergo root replacement with the remodeling technique are at increased risk for developing recurrent annular enlargement is not so far-fetched. However, the notion that these patients are also at increased risk for recurrent root aneurysm, is something we recently described to raise awareness of the need for ongoing surveillance in these patients (5). Recurrent root enlargement in this case was due to dilation of the interleaflet triangles, and in particular dilation of the aortic tissue between the valve hinges and the graft suture lines. Moreover, there was also severe annular dilation, which contributed to moderate aortic regurgitation. However, this was not the main indication for redo surgery. With an aortic root of 61 mm, the root was at high-risk for rupture. Utilizing the reimplantation technique, we were able to functionally exclude all tissues at risk for future dilation.

Although both the reimplantation and remodeling techniques can treat the acute pathology, the reimplantation technique seems better suited to treating patients with connective tissue disorders. Adding a simple annuloplasty to the remodeling technique may mitigate the annular enlargement in the future but will not prevent recurrent root dilatation.

Nonetheless, herein we have demonstrated that reimplantation after remodeling is feasible and can be safely performed in experienced hands.

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Footnote

Conflicts of Interest: The authors have no conflict of interest.

References

1. Jahanyar J, de Kerchove L, El Khoury G. Bicuspid aortic

valve repair: the 180°-Reimplantation technique. Ann Cardiothorac Surg 2022;11:473-81.
2. Jahanyar J, El Khoury G, de Kerchove L. Commissural geometry and cusp fusion insights to guide bicuspid aortic valve repair. JTCVS Tech 2021;7:83-92.
3. Price J, Magruder JT, Young A, et al. Long-term outcomes of aortic root operations for Marfan syndrome: A comparison of Bentall versus aortic valve-sparing procedures. J Thorac Cardiovasc Surg 2016;151:330-6.
4. Elbatarny M, David TE, David CM, et al. Improved Outcomes of Reimplantation vs Remodeling in Marfan Syndrome: A Propensity-Matched Study. Ann Thorac Surg 2023;115:576-82.
5. Jahanyar J, de Kerchove L, Munoz DE, et al. Twenty-year follow-up after valve-sparing aortic root replacement with the Yacoub or David procedure in Marfan patients. JTCVS Open 2021;7:47-9.

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