Aortic valve: To buy or not to buy?

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Central Message

Reconstruction of the aortic valve leaflets requires compatible material with proper design. Both of the components have yet to be identified.

See Article page 2379.

With understanding of the anatomy and pathophysiology, surgical aortic valve repair techniques have undergone improvement during the past several decades.¹ The techniques, however, are mostly for aortic regurgitation, and thus, most patients with aortic stenosis are treated with surgical aortic valve replacement (SAVR) or transcatheter aortic valve replacement (TAVR). Severely calcified, thickened, and deformed leaflets are deemed basically nonrepairable, so surgeons proceed to remove them and reconstruct them.

In this context, Al Halees and colleagues² reported their up-to 16-year follow-up data of aortic valve reconstruction with pericardium in 2005. They used molds of varying sizes to produce neoleaflets with pericardium.³ Xenopericardium and glutaraldehyde-treated autologous pericardium are used for the reconstruction, and the authors concluded that aortic valve reconstruction is feasible, and both of the pericardia are useful as reconstruction material.

Ozaki and colleagues⁴ first published their initial experience on the aortic valve neo-cuspidization (AVNeo) with glutaraldehyde-treated autologous pericardium in 2011. They made neoleaflets with a large coaptation area after measuring respective intercommissural distances with their “self-developed aortic valve plasty system.” The theoretical basis of AVNeo is to obtain large coaptation area by oversizing and thus alleviating stress on each cusp, which results in increased longevity of the leaflets.

In this issue of the *Journal*, Ozaki and colleagues⁵ reported the midterm result of the AVNeo in 850 patients, with the longest follow-up being 118 months. AVNeo procedures were performed on virtually all the diagnoses of the aortic valve diseases, and the clinical outcomes were acceptable: in-hospital mortality (1.8%), actuarial freedom from death (85.9%), cumulative incidences of reoperation (4.2%), and recurrent moderate aortic regurgitation or greater (7.3%). On echocardiography, peak pressure gradients were on average 19.5 ± 10.3 mm Hg 1 week after surgery and 15.2 ± 6.3 mm Hg at 8 years.

AVNeo is attractive because of its low cost, universal indications without any limit in annulus size (possible pediatric application) nor any need for anticoagulation, and its potentially excellent hemodynamics. In contrast, we hesitate to perform the AVNeo because of its long aortic cross-clamp time (106.8 ± 27.5 minutes), complex procedure, unidentified flow dynamics, and lack of any long-term results.

There are 2 components in reconstructing the valve leaflets; material and design. First, there are several materials that can be used as leaflets; autologous pericardium treated with glutaraldehyde solution with various concentrations and treatment time, xenopericardium (ie, bovine and equine), and synthetic patches. The best material is yet to be identified. Second, the design of the new aortic valve could be a replica of a healthy aortic valve or a modified shape that might yield a superior hemodynamic profile with durability. Furthermore, in this era of TAVR, the compatibility with TAVR should be considered.

The authors should be commended for their efforts to develop a universal solution for aortic valvular diseases. However, numerous prosthetic tissue valves are in development with outstanding hemodynamics, prolonged longevity, and ease of implantation. AVNeo must prove its superiority over SAVR and TAVR to be accepted as the standard treatment modality; therefore, subsequent long-term follow-up studies including hemodynamics are warranted.

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