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EDITORIAL COMMENTARY

Do stentless valves make a difference?

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In the early 1960s, Ross and Barratt-Boyes separately introduced the aortic homograft into clinical practice. In 1965, Binet and colleagues¹ introduced a stentless porcine bioprosthesis, but this was not pursued because of difficulties with implantation at a time when myocardial protection was in its infancy. Stented bioprostheses were therefore developed because their placement required a much simpler technique and resulted in a reproducible performance. Nevertheless, the transvalvular gradients and limited durability became major concerns. The original free-sewn homograft circumvents most of these problems, but its limited availability prevents its widespread use. This

limitation eventually prompted the reconsideration of a stentless design, intended to reduce residual obstruction of transaortic flow by maximizing the available cross-sectional area. The removal of the stent brought several advantages: (1) a larger valve can be implanted into a given size of aortic annulus, (2) the distensibility and dynamic nature of the aortic annulus is preserved,² and (3) it is possible to remodel the native aortic root and preserve the sinotubular junction.

A number of randomized trials have been undertaken to compare stentless with stented valves in the aortic position. Although the effective orifice area of stentless valves is greater and the transvalvular gradients are lower, there is no significant difference in the resolution of left ventricular hypertrophy, as determined by left ventricular mass.³ It may well be that this is too crude a measurement, and that another instrument such as peripheral blood brain natriuretic peptide or a microRNA signature will be required to show a difference. In the real world of everyday cardiac surgery, however, it has not been possible to show a significant advantage of the stentless porcine valve. A large meta-analysis⁴ that examined 17 randomized, controlled trials involving 1317 patients concluded that despite the improved hemodynamics, there had been no impact on patient morbidity, mortality, or resource-related outcomes.

The article by Amabile and colleagues⁵ in this issue of the *Journal* is a cohort study that is based on prospectively collected data. Amabile and colleagues⁵ report on 500 patients who received a Freestyle valve (Medtronic, Inc, Minneapolis, Minn) in a subcoronary configuration in the majority (479/500). This is one of the largest series reported. The survivals from cardiovascular mortality was 67% for all ages and 83% for patients younger than 65 years. The freedoms from structural valve disease at 10 years were 94% overall and 89% for those younger than 65 years. It is frustrating that we do not have longer follow-up, because the hinge point for the onset of clinically significant structural valve disease is generally around the 12-year mark. It was hoped that the absence of a stent would enhance the durability of a stentless valve, but there is no evidence to support this so far. Amabile and colleagues⁵ regret that there are no hemodynamic data, as their patients did not undergo a protocol-led echocardiographic assessment. Nevertheless, these results at 10 years are definitely acceptable.

So what is the indication for the use of a stentless porcine valve in 2014? In the presence of infective endocarditis, it is a reasonable alternative to a homograft to limit the amount of foreign, man-made material.⁶ In reoperative aortic surgery, when a root replacement is required, a stentless valve is often an excellent choice of valve substitute. Smith and colleagues⁷ have used the Freestyle aortic root prosthesis in the setting of acute aortic dissection. During a 4-year period, 24 of 80 patients received a root replacement with the

Freestyle valve. The operative mortality was 25%, and the 5-year survival was 62.5%. During this follow-up period, no patients required reoperative aortic root replacement.

In the Ross operation, where a satisfactory pulmonary homograft may not be available, a Freestyle valve and root is a reasonable alternative provided a large size is chosen. But Hechadi and colleagues⁸ sound a word of warning. They used computed tomographic scanning to examine calcification in pulmonary homografts and stentless valves in the right ventricular outflow tract 2 years after the initial operation. They found that calcification occurred in both valve substitutes but progressed more rapidly in the porcine stentless valve. They suggested that the Freestyle valve is an acceptable alternative when a pulmonary homograft is not available.

For a patient wishing to have a hemodynamically superior bioprosthetic valve substitute, the stentless porcine valve is an excellent solution but valve durability is likely to be very similar to that of a stented valve. Reoperative root replacement can be a major undertaking, but valve-in-valve is possible in a stentless porcine valve larger than 25 mm and is associated with a lower 30-day mortality (3% vs 11%).⁹ In the current era of transcatheter aortic valve replacement, however, the Freestyle valve is very suitable for a transcatheter implant when the valve fails.¹⁰ This can be an attractive option for the patient who wishes to avoid the problems of long-term anticoagulation.

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