Commentary: Incremental Improvement is Better Than No Improvement!

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Central Message: New data on improved bioprosthetic mitral valve durability supports a reassessment of ACC/AHA Guidelines for recommended use in younger patients

Central Picture Legend: Factors contributing to bioprosthetic valve durability and structural valve deterioration

Figure 1 Legend: Factors contributing to bioprosthetic valve durability and structural valve deterioration

Bioprosthetic heart valves (BPV) are widely used for valve replacement since they do not require long term anticoagulation, and have a lower risk of thromboembolic and bleeding complications than mechanical valves. Unfortunately, wider use of BPV in younger patients has been limited due to a high incidence of structural valve deterioration (SVD), which has been correlated with the patient’s age at the time of implantation. In patients less than 40 years of age, the average durability is only 10-12 years, with limited durability due to SVD being a prohibitive factor in patients up to age 65 years.\textsuperscript{1,2} Consequently, the American Heart Association-American College of Cardiology (ACC/AHA) Guidelines recommend BPV for mitral valve replacement (MVR) as reasonable only in patients ages 65 or older.\textsuperscript{3} In the current issue of JTCVS, Romano et al\textsuperscript{4} report follow-up data on 1544 patients who underwent BPV-MVR, demonstrating an overall 12-year incidence of re-intervention for SVD of only 9%. Of interest, patients between 40 and 70 years had a 12-year incidence of re-intervention of 12.4%, which was flat among all deciles. The 30-day mortality for re-intervention was also quite low at 5.4%. They conclude that the ACC/AHA Guidelines should be reassessed to consider recommending BPV for MVR in younger patients.
Several questions need to be considered. Are these data robust enough to prove a significant shift in the inflection point for SVD for patients between ages 40-70 years? Previous studies have shown that SVD after BPV-MVR increases significantly between 10 and 15 years post implant in patients in this age range.\textsuperscript{1,2} More importantly, based on our knowledge of the pathophysiology of SVD, can we reasonably expect a significant improvement in BPV durability with the current xenograft tissue preservation technology, which primarily relies on glutaraldehyde collagen cross-linking and specialized “coatings” to mitigate against SVD? Historically, dystrophic calcification has been identified as the major driving mechanism for SVD.\textsuperscript{5} More recent studies, however, have demonstrated that patients with BPVs have an ongoing host immune response consistent with chronic immune rejection.\textsuperscript{5-7} Alpha galactose (alpha-gal) and N-glycolyneuraminic acid (Neu-5GC) antigens are not removed by the glutaraldehyde collagen cross-linking process, and numerous integral antigenic membrane proteins persist in the extracellular matrix.\textsuperscript{6} Antibodies to alpha-gal and Neu-5GC persist in the blood of BPV recipients, and infiltration of host immune cells, predominantly CD3+ T cells and CD 68+ macrophages, has been demonstrated in explanted BHV leaflets.\textsuperscript{8} Therefore, major improvements in the techniques of xenograft tissue preservation are likely needed before a significant long-term improvement in durability is achieved.

Nonetheless, and despite these concerns, even modest improvements in BPV durability could have a positive impact on long-term complication free survival, given that the risk thromboembolic complications is much lower in BPVs than mechanical valves, and the current risk of re-intervention is low. The outcomes reported by Romano et al\textsuperscript{4} support that a reassessment of ACC/AHA guidelines for the use of BPVs in younger patients would be appropriate.
References:


Bioprosthetic Valve Durability Considerations

- Leaflet Thrombus
- Hypo-Attenuated Leaflet Thickening (HALT)
- Non-Structural Valve Deterioration/Endocarditis
- Age
- Valve Design/Mechanical Stress
- Noncalcified Leaflet Fibrosis/Deterioration
- Host Immune Response
- Dystrophic Calcification
- Leaflet Tear