JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY VOL. 71, NO. 13, 2018

PUBLISHED BY ELSEVIER

EDITORIAL COMMENT

Aortic Valve Replacement in an Era of Rapid Innovation

Better the Devil You Know*

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Iterative and transformative innovations in prosthetic valve design have resulted in improved long-term outcomes for patients with heart valve diseases. Nonetheless, astute clinicians will often warn their patients that there is no real "cure" for aortic valve disease; there is only a substitution toward a more benign disease that is a prosthetic heart valve. The clinical indication for aortic valve replacement for any individual patient is often very clear. The "how" is more complex as the selection of type of prosthesis and optimal method of delivery for an individual patient has become much more complicated in recent years. Physicians have an exponentially growing toolbox to treat heart valve disease. The landscape is rich with a growing list of readily available valve prostheses, particularly when selecting an aortic bioprosthesis. Use of a "heart team" approach for such complex decisions is sometimes beneficial (1).

Each aortic bioprosthesis has subtle differences in biomaterial sources (bovine pericardium or porcine valve), configuration (stented, stentless, or sutureless), and varied proprietary processing strategies with anticalcification treatments to help delay or prevent structural valve degeneration (SVD). Surgeons often show a preference for a particular bioprosthesis based on ease of implantation as specific to their own technical approaches, experiences, training, and eccentricities. It is sometimes difficult to navigate through the considerable marketing hype in this area and identify pragmatic innovations in design that can actually enhance outcomes. Not all valve innovations are beneficial; let us not forget the unfortunate saga of silver-coated sewing rings (2). Surgical aortic valve replacement (SAVR) with a

*Editorials published in the *Journal of the American College of Cardiology* reflect the views of the authors and do not necessarily represent the views of *JACC* or the American College of Cardiology.

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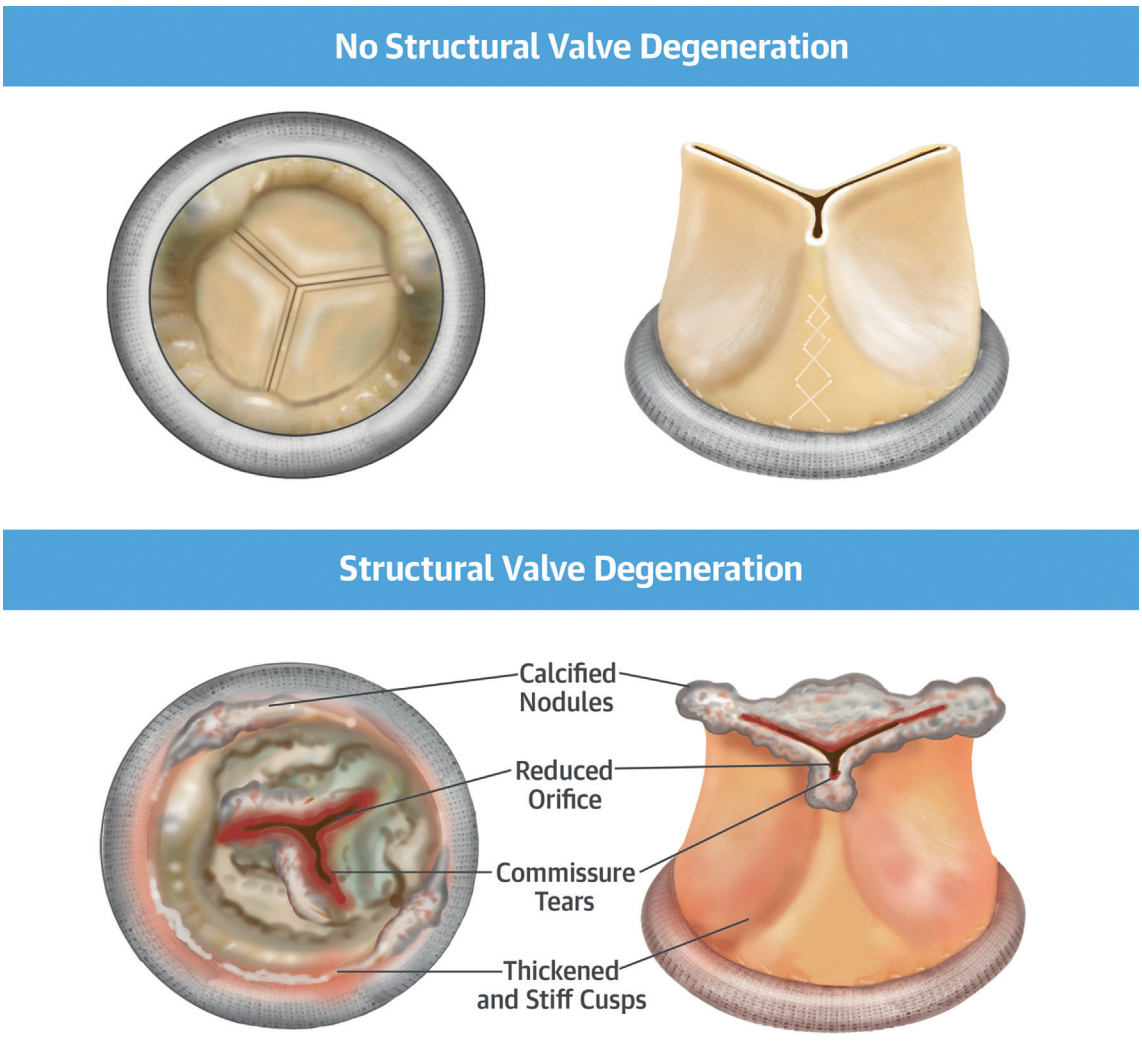
ISSN 0735-1097/$36.00 https://doi.org/10.1016/j.jacc.2018.02.007

FIGURE 1 SVD of a Bioprosthetic Aortic Valve



(Upper panels) Mitroflow bioprosthesis without any structural valve degeneration (SVD). **(Lower panels) Left:** Mitroflow bioprosthesis with severe SVD showing a reduced orifice area. Extensive calcified nodules are noted, particularly at the cusp commissures. **Right:** Infiltration and diffuse thickening of the 3 aortic bovine pericardial cusps results in severe stiffening and valve dysfunction with stenosis. Cusp tears at the sewn commissures are also a common mode of failure for the Mitroflow bioprosthesis.

biological valve can now be performed with an exceedingly low procedural risk in experienced hands. As such, the challenge for the treatment of aortic valve disease is not the SAVR procedure itself but rather the unpredictable long-term fate of the slowly degenerating aortic bioprosthesis. SVD is the sine qua non of the disease inherent to a bioprosthesis and the Achilles heel for its use in patients with aortic valve disease (Figure 1), especially when they are on the younger end of the age spectrum.

Which valve bioprosthesis is the most benign with the lowest risk of SVD? In the era of precision medicine, can we inform patients and direct them toward prostheses that are perhaps more benign in them compared with others? Can we use evidence-based decisions to direct appropriate patients toward a mechanical prosthesis when the risk of SVD is high? We are faced with rapid disruptive innovations in which novel devices can be used in clinical practice long before the real-world risk of SVD is