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EDITORIAL COMMENT

# Structural Valve Degeneration in the Era of Transcatheter Aortic Valve Replacement*

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The incidence of structural valve degeneration (SVD) globally is expected to increase in the next decade because of a considerable steady increase in the use of aortic bioprostheses, both numerically and relative to mechanical prostheses (1). SVD is a gradual process, ultimately resulting in valvular dysfunction, with the eventual development of valvular stenosis (40%), regurgitation (30%), or a combination of stenosis and regurgitation (30%) (2). Numerous factors are known to increase the likelihood of SVD, and they can be divided into 3 broad categories: direct patient-related factors; concomitant cardiovascular risk factors; and bioprosthesis-related factors (**Figure 1**). The strongest direct patient-related factor is age of the patient at the time of valve implantation; the rate of SVD at 10-year follow-up is usually <10% in older adult patients and rises to 20% to 30% in patients <40 years of age (3). In addition, concomitant risk factors, including smoking, hypertension, diabetes mellitus, and dyslipidemia, have been identified as predictors of SVD (4). Although each bioprosthesis has advantages and disadvantages when compared with other bioprostheses, the main direct bioprosthesis-related factors that may contribute to an increased incidence of SVD are small prosthesis size and prosthesis-patient mismatch, thus causing an abnormally high gradient across the valve secondary to increased mechanical stress (5). Importantly, the reported >85% durability of surgical aortic bioprostheses over 10 years is likely to be overestimated because most studies report rates of reoperation instead of valve performance to define valve durability (3). Furthermore, the groups of patients that informed these findings were heterogeneous and predominately had native valves; hence extrapolation of study findings to all patients must be done with caution.

The development of transcatheter aortic valve replacement (TAVR) resulted in a paradigm shift in the management of patients who have undergone previous surgical bioprosthetic valve replacement. Initially introduced for patients with severe aortic stenosis who had prohibitive risk for surgical aortic valve replacement, TAVR has evolved to include treatment options in high- and intermediate-risk patients. In parallel, its feasibility in valve-in-valve and pure aortic regurgitation cohorts has also been demonstrate, hence avoiding the inherent risk associated with redo surgery (6,7). In this issue of *JACC: Case Reports,* Shouls et al. (8) describe a fascinating case of the "cooing pigeon" in which their patient presented to the hospital after noticing an audible murmur, that of acute severe aortic regurgitation, resonating from his precordium and audible at the bedside. Following heart team discussion, valve-in-valve TAVR was successfully performed, and it was preferred to redo surgery given the high surgical risk associated with a third sternotomy. Of note, acute failure of an aortic valve homograft or stentless bioprostheses is not uncommon, and the main differential diagnosis is infective endocarditis. However, unlike in chronic aortic

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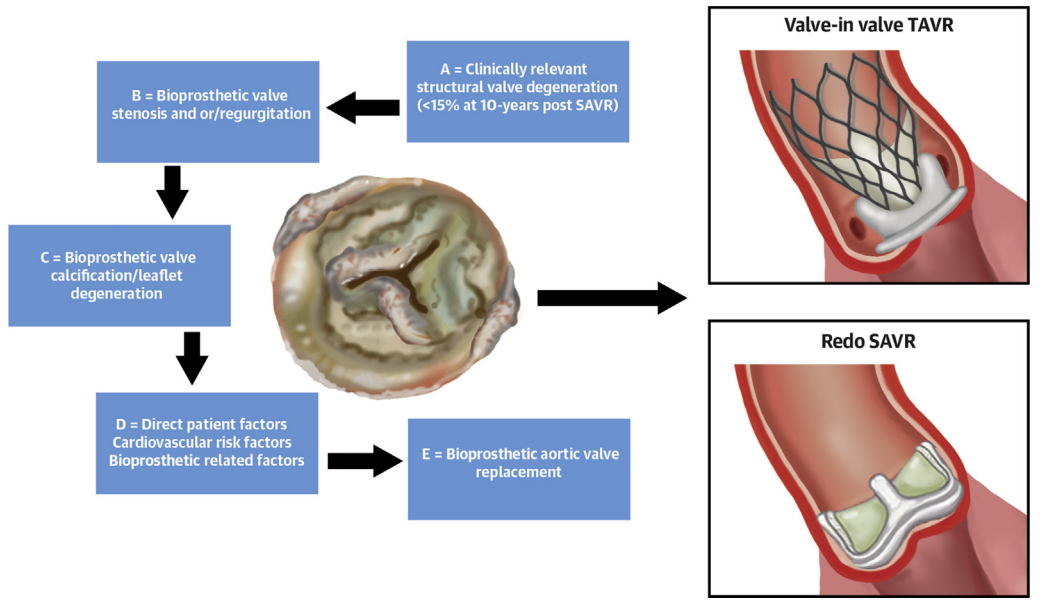
**FIGURE 1** Structural Valve Degeneration Following Bioprosthetic Aortic Valve Replacement




SAVR = surgical aortic valve replacement; TAVR = transcatheter aortic valve replacement.

regurgitation, the left ventricle is usually unable to adapt to the rapid increase in end-diastolic volume encountered during acute severe aortic regurgitation, which can consequently result in acute left ventricular failure. Therefore, prompt valve replacement is fundamental under these circumstances. Valve-in-valve TAVR has been demonstrated to be a feasible and less invasive treatment option in patients with surgical bioprosthesis SVD, and the American College of Cardiology and American Heart Association joint guidelines currently recommend this approach in high-risk patients with aortic bioprosthesis dysfunction (9). Despite the trend for increased use of TAVR for failed surgical bioprostheses, it is crucial to acknowledge the limitations of valve-in-valve procedures, principally transcatheter valve durability. Durability of transcatheter valves is an area of great clinical interest, with current data demonstrating very low rates of SVD post-TAVR; however, these data are mainly limited to 5- or 10-year follow-up, similar to data on surgical bioprostheses (10–12). Although redo surgery has been the gold standard for treating aortic bioprosthesis failure, valve-in-valve TAVR has become a valid alternative (12). It is expected that iterative technological advancement of TAVR prostheses and development of new TAVR prostheses in the coming years will inevitably lead to even greater use of valve-in-valve procedures.

## AUTHOR DISCLOSURES

Dr. Taramasso is a consultant for Abbott Vascular, Boston Scientific, and 4tech; and has received fees from Edwards Lifesciences, CoreMedic, Swissvortex, and Mitraltech. Dr. Demir has reported that he no relationships relevant to the contents of this paper to disclose.

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**KEY WORDS** aortic valve, transcatheter aortic valve implantation, valve degeneration