

THV DEGENERATION SOLUTIONS

Current Approaches to the Management of Degenerated Transcatheter Heart Valves

Treatment of THV failure is complex and requires a thorough patient evaluation with meticulous preprocedural planning.

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Bioprosthetic heart valves, whether implanted surgically or percutaneously, have finite durability. Although robust long-term data on the durability of transcatheter heart valves (THVs) beyond 5 years are scarce, it is expected that the incidence of degenerated THVs will rise as transcatheter aortic valve replacement (TAVR) volume continues to increase in the general population, as well as in younger patients,¹ many of whom are expected to outlive their bioprosthetic valve. Thus, the lifetime management of THVs necessitates a thorough understanding of management options, challenges, and technical approaches to THV failure.

According to Valve Academic Research Consortium-3 (VARC-3), bioprosthetic valve failure is defined as the presence of bioprosthetic valve dysfunction with associated clinical sequelae, such as symptoms or evidence of left ventricular dysfunction or pulmonary hypertension. Bioprosthetic valve dysfunction is classified into four categories: (1) structural degeneration of the valve due to intrinsic irreversible changes from wear and tear, leaflet flail or tear, pannus formation, or leaflet thickening and calcification; (2) nonstructural deterioration due to extrinsic factors such as paravalvular leak, THV malpositioning, or prosthesis-patient mismatch; (3) thrombosis; and (4) infection.² The clinical presentation varies according to the underlying etiology and can be either aortic stenosis or regurgitation. The first and most important step in the evaluation

of a failing THV is to characterize the underlying mechanism of failure. Multimodality imaging with transthoracic echocardiography, transesophageal echocardiography, and CT plays a fundamental role in the evaluation of THV failure mechanism and planning for potential treatment strategies.

Management options for degenerated THV include redo TAVR,³ surgical THV explantation,⁴ SURPLUS (hybrid surgical resection of the prosthetic valve leaflets and implantation of a THV under direct visualization and cardiopulmonary bypass),⁵ or palliative care. In the absence of contraindications, redo TAVR is likely to be the preferred strategy in most patients because surgical THV explantation tends to be technically challenging and is associated with high observed rates of mortality and morbidity that exceed expected risk.⁴ The 30-day mortality after surgical explantation is reported to be up to 20%, and 75% of patients develop in-hospital complications.⁶⁻⁹ In addition, half of patients undergoing THV explantation require a simultaneous procedure, such as aortic repair or mitral valve surgery, adding to the complexity of the surgery.⁷ One caveat to reported THV explantation outcomes is the high proportion of patients in whom explantation was performed for endocarditis, which is associated with higher morbidity and mortality and should probably be considered separately to surgery performed for THV degeneration. Notably, the reported surgical explant series represent the early experience of this procedure and mainly include high-surgical-risk patients.

Outcomes may improve with the growing expertise in specialized centers and inclusion of lower-risk patients requiring TAVR explantation. In comparison, the 30-day mortality from redo TAVR in appropriately selected patients is 2.9%.¹⁰ However, not all patients with degenerated THVs are candidates for redo TAVR, and published series do not include a denominator (ie, how many patients were considered for redo TAVR but excluded due to unfavorable anatomy). Contraindications include increased risk of coronary obstruction caused by the tube graft/neoskirt formed by the leaflets of the failing THV that are pinned open by the new THV, risk of prosthesis-patient mismatch in the setting of very small annulus, and mechanisms of failure not amenable to redo TAVR, such as infection, thrombosis, or existing prosthesis-patient mismatch.

Given the complexity of the management of degenerated THVs and the multitude of factors that can affect the decision between redo TAVR versus surgery candidacy, early heart team involvement and detailed preprocedural planning are critical. In addition to identifying the mechanism and time frame of THV failure, patient evaluation starts with identification of the failing THV type, generation, design specs, and size. THVs have either short or long stent frames and annular or supra-annular leaflet designs, with significant implications for both redo TAVR and surgical explantation. It is also important to obtain all records related to the index TAVR procedure, with attention to native anatomy, implantation depth, commissural alignment, oversizing or underexpansion of the THV, and presence of snorkel stenting. Knowledge of all these parameters has significant implications on the risk of coronary obstruction and need for leaflet modification/BASILICA (bioprosthetic or native aortic scallop intentional laceration to prevent iatrogenic coronary artery obstruction during TAVR),¹¹ redo TAVR valve selection and sizing, and depth of implantation within the failing THV. The predicted neoskirt height, distance from the coronaries, and distance from the sinotubular junction should all be carefully analyzed as part of the assessment of coronary obstruction risk.¹² Finally, it is important to acknowledge the current lack of data to support one type of THV over another for redo TAVR.¹³ In the United States, only the balloon-expandable Sapien THV (Edwards Lifesciences) currently has an FDA-approved indication for redo TAVR.

The treatment of THV failure is complex and requires a thorough patient evaluation with meticulous preprocedural planning. This issue of *Cardiac*

Interventions Today focuses on current approaches to the management of degenerated THVs. The topics of TAVR surgical explantation, redo TAVR technical considerations, and redo TAVR clinical evidence will be discussed in detail in the articles that follow. ■

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