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EDITORIAL COMMENT

Surgical Aortic Valve Replacement for Failed TAVR Prostheses

One More Piece of the Puzzle*

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The rise of transcatheter aortic valve replacement (TAVR) has led to a revolution in the management of symptomatic aortic stenosis. With the publication of early results from the 2019 low-risk TAVR trials (1,2), we are now offering transcatheter valve replacement to patients across the risk spectrum with the expectation that early outcomes will be at least as good as, if not better than, surgical aortic valve replacement (SAVR). Although longer-term TAVR outcomes as well as outcomes of TAVR in special groups, including those with bicuspid valves, remain to be fully elucidated, we can be sure that the population of patients undergoing TAVR will continue to grow, become healthier, and younger. This shift will also undoubtedly lead to an increase in the number of patients experiencing valve failure, and the number of patients who will subsequently require and be candidates for reintervention.

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In this issue of the *Journal*, Hirji et al. (3) retrospectively queried the Medicare Provider profile for patients undergoing TAVR from 2012 to 2017 who subsequently underwent SAVR. These data represent an important contribution to the growing published data describing the cohort of patients requiring surgical reintervention following failure of TAVR devices. Recently, we published in *JACC: Cardiovascular Interventions* the first large national series of patients undergoing SAVR following TAVR ever reported using data captured in the Society of Thoracic Surgeons Adult Cardiac Surgery Database (STS ACSD) (4). As both data sources have unique strengths and weaknesses, examining the key findings from both studies in tandem serves to paint a more complete picture of early outcomes following SAVR in patients with a failed TAVR valve.

A strength of the Medicare database is its longitudinal follow-up, which is not documented in the STS ACSD. One of the most important findings reported by Hirji et al. (3) is the 30-day and 1-year mortality rates following SAVR after TAVR of 13% and 23%, respectively. These statistics are consistent with the 17% 30-day or in-hospital mortality reported in our STS ACSD analysis and the 12% in-hospital mortality rate observed in a single-center case series reported by Fukuhara et al. (5) from the University of Michigan. Clearly, these are risky procedures associated with significant morbidity and mortality. Perhaps more important than the raw mortality data, however, is contextualizing these findings. The primary analysis of the study by Hirji et al. (3) compared outcomes between TAVR patients who did and did not require reoperation with SAVR. This comparison is of limited clinical utility, illustrating the unsurprising finding that device failure is associated with poor outcomes. Our analysis, however, compared early outcomes following SAVR after TAVR to that of risk-matched patients undergoing redo SAVR. We found significantly increased observed mortality for SAVR after TAVR than what would be expected after redo SAVR, despite the SAVR after TAVR cohort not requiring redo sternotomy.

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Given the high-risk nature of these procedures, the ability to appropriately risk-stratify patients prior to surgery will be vital for pre-operative planning, clinical decision making, and patient counseling. Pre-operative risk estimation is a complicated feat that is influenced by a number of factors including comorbidities, indication for surgery, and time since the index TAVR procedure. In their Medicare analysis, Hirji et al. (3) stratified patients into lower-, medium-, and higher-risk subgroups using Charlson comorbidity scores and found no significant association between pre-operative risk group and post-operative mortality. When we stratified patients using the validated STS predicted risk of mortality (PROM) model, however, we did observe that the raw operative mortality rate was highest for higher-risk patients with PROM >8% (21%), although when compared with redo SAVR procedures, the highest observed-to-expected mortality ratios were seen among lower-risk patients with PROM <4% (observed-to-expected mortality ratio 5.5). Indication for SAVR is also an important consideration. Hirji et al. (3) stratified patients into 2 groups, requiring SAVR for either endocarditis or bioprosthetic valve failure; there was no significant association between operative indication and mortality. Utilizing the more granular ACSD, we found a lower mortality rate associated with SAVR for prosthetic valve deterioration compared with SAVR for endocarditis or perivalvular leak/sizing issue/failed repair.

Examining the association between time from TAVR until SAVR and post-SAVR mortality also has important clinical implications but is undoubtedly confounded by indication for surgical repair and case urgency. A notable strength of the Medicare study was the ability to robustly examine this time interval, which was documented as a median time-to-surgical-explant of 212 days (interquartile range: 69 to 398 days). These data were only available for a small subgroup of patients in the STS ACSD study and, as a result, could not be analyzed as robustly. Neither study, however, found a clear association between the length of this time period and post-SAVR mortality.

As we look ahead to 2021 and beyond, where the landscape of symptomatic aortic stenosis management will be increasingly dominated by the transcatheter approach, we must remind ourselves that our understanding of the surgical management of TAVR device failure is still in its infancy. It has now been convincingly demonstrated that SAVR after TAVR is associated with significant and perhaps greater than expected morbidity and mortality. We have much to learn, however, regarding how to effectively risk-stratify patients prior to surgery, as well as the role of SAVR after TAVR versus valve-in-valve TAVR in the management of TAVR device failures. Further, analyses of outcomes associated with SAVR after TAVR performed thus far have largely been composed of patients who were initially not candidates for SAVR and also experienced device failure in the early months to years following TAVR. Future studies including younger, low-risk TAVR patients as well as those experiencing structural valvular degeneration many years later will be incredibly important to enhancing our understanding of how to best care for this rapidly growing population of patients. Last, the 321-min median operative time documented in our STS ACSD analysis reflects the high degree of technical complexity associated with surgically explanting TAVR valves, which are subject to progressive neointimal growth over time. Sharing and refining best practices for surgical technique in these cases, including the development of specific techniques for individual valve types, will help to ensure that as a community, our patients are receiving the best possible surgical outcomes.

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