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EDITORIAL COMMENT

Feasibility of TAVR in Small Surgical Valves

Vive la Valve-in-Valve*

Danny Dvir, MD,[a] Vinayak Bapat, MD[b]

Transcatheter aortic valve replacement (TAVR) in patients with failed surgical bioprostheses is a very appealing procedure. Valve-in-valve (ViV) obviates the need for repeat open heart surgery in a patient population that is typically elderly and at increased surgical risk (1,2). However, there are several subgroups in which ViV is associated with inferior clinical outcomes (3). It has become clear that the characteristics of the surgical valves are important determinants of clinical outcomes after treating these valves when they fail. Valve size, mechanism of failure, fluoroscopic markers, and others are associated with clinical outcomes after ViV (3-6). A challenging group to treat with ViV includes patients with small and stenotic aortic bioprostheses.

SMALL-BIOPROSTHESIS ViV PARANOIA

Data from the VIVID registry showed that patients with small surgical valves have worse outcomes than those with larger bioprostheses (1,7,8). Other studies showed higher mortality in patients who have elevated post-procedural gradients after ViV, a result that is often correlated with surgical valve size (9). Later, it became clear that it is not merely the size of the surgical valve that is associated with worse outcomes, but rather it is the phenomenon of pre-ViV severe prosthesis-patient mismatch (10). Therefore, for several years, the narrative was that although redo open heart surgery is a more invasive procedure than TAVR, it may still be superior to ViV, even in the early term, in patients with small surgical valves. This has led, in some way, to small-bioprosthesis ViV paranoia.

PREVENTION OF SUBOPTIMAL HEMODYNAMIC STATUS AFTER ViV

A major challenge with ViV in small bioprostheses is the associated risk for suboptimal hemodynamic status, which is potentially related to poor device durability (1). Some of these etiologies are unfortunately nonmodifiable. Small, stenotic, stented surgical valves, especially those with baseline severe prosthesis-patient mismatch, are prone to residual stenosis after ViV (4). Nevertheless, operators may reduce the risk for elevated gradients by proper transcatheter device selection (supra-annular valves), aiming for high implantation, and in selected cases by intentionally breaking the surgical valve ring (bioprosthetic valve ring fracture [BVF]) (11-13). In addition, post-ViV anticoagulation therapy seems to improve hemodynamic status, and its role is being studied (14). On the basis of our understanding of the mechanism for residual stenosis, we are now able to treat small surgical valves more successfully than before.

VIVA, A SMALL BIOPROSTHESES ViV STUDY?

In this issue of *JACC: Cardiovascular Interventions*, Tchétché et al. (15) describe an important cohort in the evolution of ViV. The VIVA (Valve in Valve) registry is a European prospective cohort of TAVR procedures performed in failed surgical bioprosthetic valves, using CoreValve and Evolut R self-expandable devices. This registry included a very challenging group of patients with failed bioprostheses that are especially associated with poor outcomes. Almost

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From the [a]University of Washington Medical Center, Seattle, Washington; and the [b]Columbia University Medical Center, New York, New York. Dr. Bapat is a consultant for Edwards Lifesciences, Medtronic, Boston Scientific, and 4C. Dr. Dvir is a consultant for Edwards Lifesciences and Medtronic.

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one-half of VIVA patients (42%) had small surgical valves. In addition, 37% had failed Mitroflow valves, which are associated with high risk for coronary obstruction after ViV (16). In comparison, the PARTNER (Placement of Aortic Transcatheter Valve) II ViV study excluded patients with very small surgical valves (label size 19 mm), while the CoreValve U.S. study very rarely included Mitroflow surgical valves (2.2%) (9,17).

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For its very challenging group of patients, VIVA achieved surprisingly good clinical outcomes (15). At 1 year, the mean gradient was 15.5 ± 7.5 mm Hg, and mortality was only 9%. The study was limited by its relatively small sample size (n = 202) and lack of assessment of implantation depth. It is conceivable that some of the remaining suboptimal hemodynamic parameters after ViV are associated with deep device implantation. Both meticulous bench testing and vast clinical data reveal that to optimize these devices' potential supra-annularity, very high implantation is required (11,12). In addition, the VIVA registry did not include novel techniques known to reduce the risk for adverse events after selected ViV cases, such as BVF and bioprosthetic or native aortic scallop intentional laceration to prevent coronary artery obstruction (BASILICA). It is conceivable that the reported successful clinical outcomes could have been improved even further.

NOVEL APPROACHES IN ViV PROCEDURES AND FUTURE PERSPECTIVES

BVF is clearly an effective approach to improve hemodynamic status after ViV. However, the safety of this approach still needs to be determined (13,18). The clinical outcomes of VIVA provide an argument that we can treat many patients with small bioprostheses with reasonable hemodynamic status without additional maneuvers. Selected patients with suboptimal hemodynamic status after ViV in small surgical valves can still be considered for post-ViV ad hoc BVF, to improve clinical outcomes and prolong device durability. It is currently challenging to accurately define the target population for BVF, but future analyses will surely guide us.

Five cases in the VIVA registry (2.5%) had coronary obstruction. This is a similar rate to previously published ViV cohorts and is not unusual considering the very high rate of externally mounted leaflet surgical valves in this cohort (1,16). Coronary obstruction is a life-threatening complication; its risk must be identified before the procedure, and prevention strategies should be implemented. BASILICA seems to be an effective approach in preventing coronary obstruction, and experience with it is rapidly growing (19,20).

Understanding how to optimally perform ViV and implementing new techniques in selected high-risk cases may optimize clinical outcomes. This will enable us to continue to expand transcatheter therapies. The future of ViV indeed looks brighter than ever. Vive la valve-in-valve.

ADDRESS FOR CORRESPONDENCE: Dr. Danny Dvir, University of Washington, 1959 NE Pacific Street, C502-A, Box 356422, Seattle, Washington 98195-6422. E-mail: ddvir@uw.edu.

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