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Commentary: The role of imaging in valve-in-valve transcatheter aortic valve replacement—more than meets the eye

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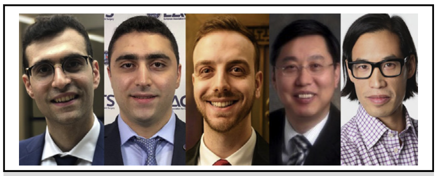

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CENTRAL MESSAGE

The role of imaging in TAVR has evolved from a diagnostic tool to a great asset in the preprocedural decision-making, intraprocedural execution, avoidance of complications, and follow-up surveillance.

In their manuscript, Kadri and colleagues[1] investigated the degree of discordance between invasive hemodynamic and echocardiographic assessment of mean transvalvular gradients across failed surgical aortic bioprosthesis in patients undergoing valve-in-valve transcatheter aortic valve replacement (ViV-TAVR). Their findings demonstrated that echocardiography estimated significantly greater transvalvular gradients than invasive measurements, mainly when aortic insufficiency was present (ie, both in pure aortic insufficiency and mixed stenosis/insufficiency), irrespective of valve size.[1] The authors should be congratulated for shedding light on the discordance between these 2 imaging modalities and reminding us of the importance of invasive assessment in the decision-making process of evaluating reintervention in patients with degenerated bioprostheses.

Several studies have assessed the correlation between echocardiographic and cardiac catheterization-based measurements in native aortic valve disease and found high levels of concordance.[2,3] However, these studies are 3 decades old and were done on diseased native valves, not bioprostheses.[2,3] The discordance revealed by Kadri and colleagues does not necessarily indicate that all patients with degenerated bioprostheses should undergo invasive catheterization; it is mostly applicable to borderline patients displaying high transvalvular gradients on echocardiography, but clinically well, without symptoms, and often lacking clinical indications for reoperation or reintervention on their bioprosthetic aortic valve. Symptomatic patients with correlating imaging findings of increasing bioprosthetic valve dysfunction, whether echocardiographic or invasive assessment, pose much less of a clinical conundrum and often improve with valve reintervention.

ViV-TAVR continues to gain popularity in the treatment of patients with degenerated bioprostheses, particularly in greater-risk and prohibitive-risk patients with suitable anatomy. Preprocedural imaging has a pivotal role in assessing the suitability for ViV-TAVR, specifically for procedural planning and minimizing complication risk. Multiphase computed tomography (CT) imaging has emerged as an important asset for preprocedural planning, and various specialized ViV CT protocols have been developed to predict and reduce the risk of coronary obstruction—one of the most worrisome complications of ViV-TAVR, with a risk 4- to 6-fold greater than when compared with TAVR deployed in native aortic valve.[4] Beyond structural imaging alone, an emerging area of interest is the role of multiphase CT and cardiac magnetic resonance imaging (CMR) as a powerful tool to assess tissue deformation characteristics to help assess myocardial reserve and potentially help predict early and late clinical outcomes.

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Having a noninvasive, nonradiating, and high-definition imaging modality such as CMR is remarkable in providing both structural and functional assessment.[5] CMR has made it possible to create 3-dimensional reconstruction of anatomical cardiac structures from volumetric images, and those are increasingly being used in a number of clinical applications, such as surgical planning, functional assessment, and deployment of TAVR in selected patients. With the advances in 4-dimensional flow and phase contrast CMR imaging, a full hemodynamic picture of the aortic valve, aorta, and left ventricular myocardial health is depicted in a model that aids not only in the preoperative planning of TAVR but has the potential ability through deep learning algorithms to predict patients' clinical outcomes and risks of complications.

In summary, the role of multimodal imaging has shifted from a pure diagnostic tool to becoming a great asset in the preoperative planning, surgical risk prediction, intraoperative execution, and follow-up surveillance of patients undergoing TAVR.

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