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EDITORIAL COMMENT

Lifetime Management of Aortic Stenosis

Initial TAVR Device Selection Matters

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Indications for transcatheter aortic valve replacement (TAVR) are expanding toward younger patients with a longer life expectancy.[1,2] The evidence for hemodynamic durability of transcatheter aortic valves is also growing, with a relatively low risk of structural valve deterioration observed in midterm follow-up studies.[3] This growth may be compounded if TAVR is extended to patients with severe asymptomatic and moderate aortic stenosis, with the EARLY-TAVR (Evaluation of TAVR Compared to Surveillance for Patients With Asymptomatic Severe Aortic Stenosis trial) (NCT03042104) and PROGRESS (Management of Moderate Aortic Stenosis by Clinical Surveillance or TAVR trial) (NCT04889872) trials, among others, addressing the role of earlier intervention. Accordingly, the total number of TAVR procedures is expected to continue to rise, establishing TAVR as the dominant therapy for the majority of patients with significant aortic stenosis across the surgical risk spectrum.[4] On this basis, there will be an increasing need for repeat coronary angiography (CA) or percutaneous coronary intervention (PCI) following TAVR because of the progression or development of new coronary artery disease (CAD). Therefore, optimal lifetime management of CAD following TAVR needs to become an important part of structural heart multidisciplinary discussions because this may pose new technical challenges for interventional cardiologists.

In this issue of *JACC: Cardiovascular Interventions*, the study by Phichaphop et al[5] makes a further contribution to the expanding literature on the clinical outcomes of patients requiring CA after TAVR and factors related to the risk of unsuccessful coronary reaccess. The authors identified that unplanned CA was required in just under 7% of patients who underwent TAVR at a tertiary center between 2015 and 2021. Nearly one-half were performed within the first year after TAVR, with the most common indication being acute coronary syndrome (ACS). Subsequent revascularization with PCI was performed in 50% of these patients with low periprocedural complications. Significant pre-existing CAD, particularly multivessel disease and previous coronary artery bypass grafting, increased the need for unplanned CA after TAVR. Five-year survival was the lowest in patients after unplanned CA in comparison to those with and without significant prior CAD and no CA (29.9% vs 38.9% vs 50.6%, respectively).

Despite the high angiography and PCI success rates observed (88%), this study highlights several potential technical challenges precluding rapid and selective coronary engagement after TAVR, which is especially important in the context of ACS, particularly if the patient resides remote from the TAVR center and is admitted to a hospital without TAVR expertise. The main factors associated with technically challenging coronary cannulation and selective engagement were related to the following:

1. The size of the sinuses of Valsalva and the final distance between the TAVR device and coronary ostia; in patients with narrow sinuses of Valsalva, there may be little space to maneuver the catheter behind the stent frame to achieve selective coronary cannulation.
2. Commissural misalignment, resulting in an overlap between transcatheter heart valve posts and the coronary ostia, creating a potential barrier to successful coronary cannulation. This has resulted in various procedural techniques attempting to improve commissural alignment.

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3. The use of supra-annular self-expandable devices with a higher leaflet position compared to short-frame balloon-expandable valves; successful cannulation can be improved by modifying the catheterization technique, which includes engaging the ostia from the frame cells above the coronaries, downsizing the guide catheter, using a coronary wire as a rail for the guide, and using a guide extension or an anchoring balloon. A lower initial implantation depth of self-expandable devices can improve access to the coronaries in the future but at the expense of an increased risk of permanent pacemaker implantation and significant paravalvular regurgitation, both of which may have prognostic consequences.

The findings of the investigators are consistent with previous studies and demonstrate the importance of understanding 3-dimensional features that can potentially impair coronary reaccess.[6] For elective procedures, evaluation using computed tomography imaging before coronary angiography may assist with assessing feasibility and support procedural planning.[7]

This clinically relevant study supports the findings of several previous investigations[8-10] and highlights the increased lifetime risk of unplanned CA or PCI in these patients. Most of the initial TAVR trials excluded patients with complex CAD and left main disease, rendering the questions about the prognostic benefits of PCI in TAVR patients unanswered. The ACTIVATION (Percutaneous Coronary intervention prior to transcatheter aortic valve implantation trial) trial indicated a neutral effect of PCI in patients undergoing TAVR with significant CAD and without angina.[11] Although the event rates were similar between patients who underwent preprocedural PCI and those who did not (41.5% vs 44%), noninferiority was not met. In addition, most patients recruited into this trial were elderly (>80 years), and it remains unclear whether the strategy for coronary intervention should be different in the increasingly younger TAVR cohort. Several ongoing trials will provide essential evidence to better understand the prognostic benefits of treating CAD in TAVR patients according to disease severity, location and complexity, and the optimal timing of revascularization in these patients. The COMPLETE-TAVR (Staged Complete Revascularization for Coronary Artery Disease vs Medical Management Alone in Patients With AS Undergoing Transcatheter Aortic Valve Replacement trial) trial (NCT04634240) of 4,000 patients will help to elucidate if complete revascularization using staged PCI is superior to medical therapy for improving clinical outcomes post-TAVR. The NOTION-3 (Revascularization in Patients Undergoing Transcatheter Aortic Valve Implantation trial) (NCT03058627) and FAI-TAVI (Functional Assessment In TAVI trial) (NCT03360591) trials will help to assess the role of physiology-guided revascularization before TAVR. The TAVR-PCI (Optimal Timing of Transcatheter Aortic Valve Implantation and Percutaneous Coronary Intervention trial) trial (NCT04310046) will help to better understand the timing of revascularization by assessing the safety and efficacy of fractional flow reserve-guided PCI before and after TAVR. Until further evidence is available, a recent consensus document suggests that PCI before TAVR should be performed in patients with severe proximal CAD, particularly if presenting with ACS or symptoms of angina.[12]

Future transcatheter heart valve iterations with improved commissural alignment technology and larger open cells will help to facilitate rapid, reliable, and reproducible coronary reaccess. Additionally, dedicated catheters for use with TAVR devices may facilitate selective coronary cannulation. However, this should not detract from the need for careful heart team discussions during the initial procedure planning stage, which are crucial for anticipating and mitigating the potential issues with coronary reaccess after TAVR. The recognition of important anatomical features that can interfere with coronary engagement after TAVR should guide the choice of the initial transcatheter heart valve device, particularly for patients with longer life expectancy.

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