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EDITORIAL COMMENT

Coronary Access Following TAVR

It Is Important

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Transcatheter aortic valve replacement (TAVR) is increasingly performed in relatively young patients with severe aortic stenosis in the absence of major comorbidities. Such patients may anticipate a relatively long life, increasing the likelihood of subsequent percutaneous coronary diagnostic and interventional procedures and of late reinterventions on the aortic transcatheter heart valve (THV) itself.[1] As a consequence a growing emphasis has been placed on understanding the inherent variability among different TAVR platforms in relation to their long-term hemodynamic performance and durability, as well as the feasibility of selective coronary access following TAVR and, very importantly, the feasibility of redo TAVR.[2,3]

THE CAvEAT STUDY

Multiple reports have highlighted problems with selective coronary access after TAVR but have been limited by their small size, retrospective nature, and both variable patient and device selection. In this issue of *JACC: Cardiovascular Interventions*, Tarantini et al[4] report the results of the CAvEAT (Coronary Access After TAVI) study; a multicenter, prospective registry comparing the feasibility of coronary access following transfemoral TAVR with 4 different THVs.

The investigators enrolled 632 patients and assessed the ability to selectively cannulate and opacify coronary arteries. As expected, the ability to access the coronary arteries varied significantly among different THV platforms (**Figure 1**). The feasibility of selective coronary access was significantly greater with the short-frame balloon-expandable SAPIEN 3/Ultra THV platform (Edwards Lifesciences) as compared with the tall-frame self-expanding THVs. Selective coronary cannulation amongst tall-frame THVs that incorporated larger open cells adjacent to the coronaries, such as the Portico/Navitor (Abbott Vascular) and the Acurate Neo/Neo2 (Boston Scientific), was more often feasible than with the Evolut Pro/Pro+ THV (Medtronic) with its smaller open cells. Coronary access with the Evolut platform was particularly a concern in patients with small annuli, in whom this particular platform might otherwise find favor due to the possible benefits of supra-annular valve function in small annuli.[5]

In this study, when selective coronary cannulation was not achievable, nonselective access sufficient for adequate coronary opacification was usually achievable (**Figure 1**). Rates of "nonfeasible coronary access" (where even nonselective coronary opacification could not be achieved) were generally low and more often associated with failure to cannulate the right than the left coronary artery (5.5% vs 0.5%, respectively).[4] In fairness, it seems reasonable to argue that with more aggressive attempts, specialized techniques, and greater experience selective coronary access might have been achieved in larger numbers of patients, but undeniably variability with regards to the feasibility and ease of cannulation remains a real concern.

So, the presence of a tall stent frame extending to the supracoronary aorta and the presence of smaller open cells were the major device-related predictors of difficult coronary access. However, in addition to device factors, procedural factors related to the index TAVR were also identified as independent predictors of the feasibility of achieving subsequent coronary access. These procedural factors include implant depth and commissural alignment.

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the Author Center.

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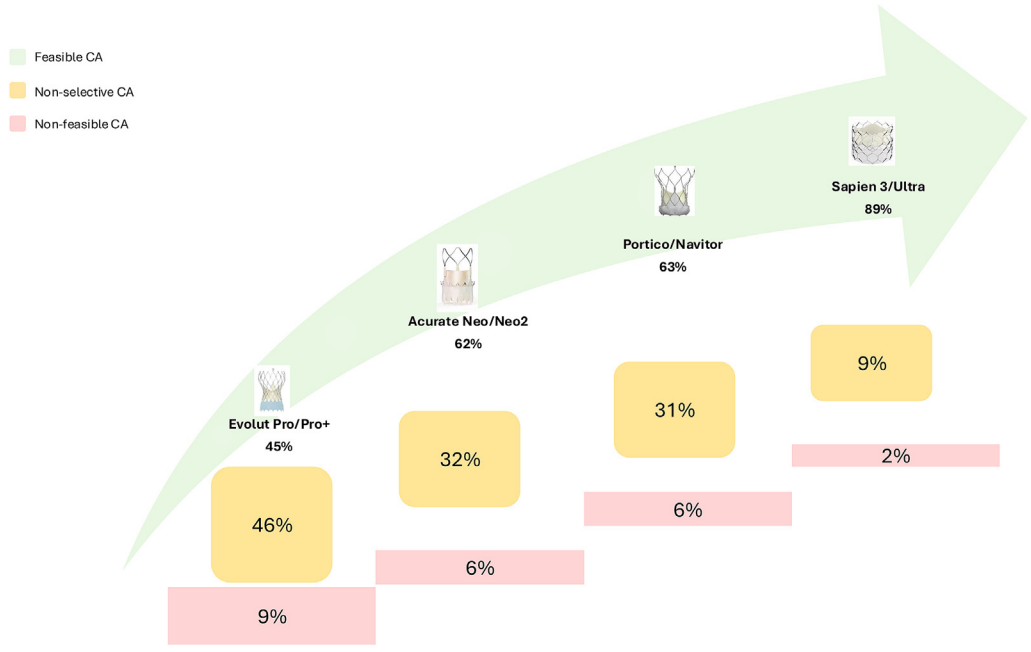
FIGURE 1 The Feasibility of Coronary Access Following TAVR According to the CAvEAT Study



CA = coronary access; CAvEAT = Coronary Access After TAVI; TAVR = transcatheter aortic valve replacement.

Greater implant depth was an independent predictor of problems with coronary access; presumably with higher implants sealing cuffs, commissural attachments, and leaflets are more likely to extend above the coronary ostia.[4] This issue is of a particular concern for tall-frame THVs, in which evolving implantation strategies have been recommended to reduce the risk of pacemaker insertion rates.[6,7] Although short-frame SAPIEN-type valves are commonly said to be infracoronary, this is often not the case. Short-frame valves certainly can extend over the coronary ostia and interfere with coronary cannulation. This is increasingly a concern as current trends are to implant THVs higher in the annulus to reduce the likelihood of pacemaker dependence. Lower implantation may help maintain coronary access, but considerations need to be paid to the competing risk of permanent pacemaker insertion with a deep implant.[8] In such patients, the operator may need to choose what is more important: conduction block or compromised coronary access.

Commissural misalignment was also found to be an independent predictor of limited coronary access following TAVR.[4] Presumably commissural frame and leaflet attachments extending over the coronary ostia may also interfere with catheterization. It appears that commissural alignment may be less important, at least with respect to coronary access, in the presence of a short-frame valve, where the frame is less likely to extend above the coronary ostia.

THE NEAR FUTURE

Newer generations of the commercially available THVs are attempting to address these concerns. Improved implantation techniques have made commissural alignment with the Evolut platform increasingly achievable.[9] Recently, similar success has been demonstrated with the Acurate THV, and design modifications with the Navitor platform appear to facilitate alignment as well. Although commissural alignment with short-frame valves may be less important, the next generation SAPIEN X4 (Edwards Lifesciences) has design features intended to facilitate routine commissural alignment as well.[10] Similarly, the next-generation Evolut FX+ (Medtronic) incorporates larger open cells that, when the THV is correctly aligned, are intended to facilitate coronary catheter access.[9] It seems that all THV manufacturers are aware of these issues. With time as the procedure and devices evolve, these issues may become more manageable.

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THE MORE DISTANT FUTURE

The CAvEAT study highlights the role of individualized treatment strategy based on the baseline characteristics of the patient at the time of the index TAVR procedure, but also the anticipated subsequent procedures in the future.

Maintaining coronary access following TAVR is particularly desirable in younger patients who have long life expectancy and a greater chance of developing obstructive coronary artery disease during their lifetime. However, younger patients are also at greater risk of outliving their valves. For such patients, the repeatability of TAVR may be a more important consideration.[11] Redo TAVR in patients in whom the failing THV has leaflets that extend above the coronaries may result in coronary ostial occlusion or sinotubular sealing and coronary sequestration. The risk of obstruction to coronary flow is a very real concern. This may present acutely as cardiogenic shock requiring hemodynamic resuscitation and revascularization, or may present late as angina or heart failure.

Some would argue that commissural alignment at the time of index TAVR, combined with "snorkel" stenting or various—still evolving—leaflet modification procedures, such as leaflet spitting, tearing, or excision during redo TAVR, may facilitate the repeatability of TAVR. It is often suggested that commissural alignment may facilitate subsequent leaflet modification procedures and allow for repeatable procedures. Whether this is wishful thinking or not may become evident in the not-too-distant future as we will see a lot of failed THVs over the coming decades.

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