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EDITORIAL COMMENT

Difficult coronary access after transcatheter aortic valve implantation: Brace for impact!

Acesso coronário difícil após TAVI. Preparem-se para o impacto!

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Transcatheter aortic valve implantation (TAVI) has been widely adopted as the default treatment for most older patients with severe aortic stenosis (AS), and guidelines recommend it in some circumstances even for patients in the 65–75 year age range.[1,2] However, major limitations such as large-bore vascular access, frequent need for permanent pacemaker implantation, paravalvular regurgitation and uncertain long-term valve durability, restrict its expansion to younger patients. One additional issue that still confronts the technique is percutaneous coronary access after TAVI. Severe AS and coronary artery disease (CAD) frequently coincide and it is estimated that around 50% of stable patients with severe AS have significant CAD.[3,4] Moreover, up to 10% of TAVI patients will have an acute coronary event at mid-term follow-up.[5] Unlike previously treated extreme- and high-risk cohorts, younger, low-risk patients have longer survival horizons that potentially expose them to a greater lifetime likelihood of requiring coronary angiography (CA).

The reported rate of difficulties with coronary access after TAVI varies considerably, and the real impact of TAVI on the feasibility of CA and percutaneous coronary intervention (PCI) remains unclear.[6,7]. The ability to engage the coronary ostia depends on the complex interplay between the TAVI device itself, the implantation technique, and aortic root anatomy. Stent frame height, cell design, length of the sealing skirt designed to prevent paravalvular regurgitation, implantation depth, overlap between the device commissures and the coronary ostia, length and pliability of the native valvular leaflets, coronary ostia height and size of the sinuses of Valsalva may combine in various ways to make the interaction between the device and catheter cannulation of the coronary ostia difficult to predict.

In this issue of the *Journal*, Silva et al.[8] set out to assess the need for CA and the feasibility of re-engaging the coronary ostia after TAVI. To this end, the authors used a single-center retrospective database to analyze 810 patients who underwent TAVI between 2007 and 2020. During a median follow-up of 33 months, 28 (3.5%) patients underwent CA. The main indication was acute coronary syndrome (ACS) (21/28 patients). CoreValve, CoreValve Evolut and Edwards SAPIEN systems were used in nearly 80% of the cases in which CA was attempted.

The findings are reassuring. Using radial access in about half of cases, selective CA (the study's primary endpoint) was successfully performed in 90% of cases. The unsuccessful attempts occurred in patients with supra-annular, self-expanding devices (two CoreValve/Evolut and one ACU-

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RATE neo). Particularly relevant is the fact that in all cases in which PCI was attempted (16 patients) this was successful.

However, the study has several limitations. First, the authors conclude that CA is rarely needed in the post-TAVI population, but this may mostly reflect selection bias. Indeed, the study only considered cases in which patients were eventually referred for CA. As the authors acknowledge, it is likely that in this high clinical risk population with previously known coronary anatomy, clinicians avoided CA after TAVI in some cases due to real or perceived increased risk or futility. It is illustrative that even in those who underwent CA, right coronary angiography was not attempted in almost one quarter of cases, due to known chronic total occlusions. In fact, larger studies report up to 10% of ACS within two years of TAVI, suggesting that the 1.5% rate of ACS reported in this retrospective cohort may be an underestimation. It would therefore be useful to know the cardiovascular event rates after TAVI, including mortality, acute coronary events or admission for heart failure with or without subsequent referral for CA. In addition, the rate of preemptive PCI before TAVI was not disclosed. This could have had an impact on subsequent revascularization rates. Additionally, the method for calculating the CA rate did not adequately consider the surviving population at risk. Like most angiography and PCI series, this study does not report the total denominator of surviving patients at a given time point for CA. To this end, a Kaplan-Meier analysis might have been more appropriate for this study population with a relatively long inclusion period.

Second, there is no consensual definition of selective coronary ostial cannulation, which is prone to subjective reporting when not centrally and prospectively validated. Semi-selective cannulation may be sufficient to elicit a conclusive angiography and, more importantly, it may not be associated with PCI failure. Thus, other variables such as procedure duration, fluoroscopy time, contrast volume, number of guiding catheters needed, operator experience and radial-to-femoral conversion rates could be more objective and reliable indicators of procedural complexity. Since most patients with AS undergo CA before TAVI, it would also be possible, and certainly more conclusive, to compare these variables from the CA before and after TAVI in the same patients. Although clinical success among patients undergoing PCI after TAVI is lower than in the general population, this difference may be related more to baseline patient risk than to technical issues with PCI. In fact, it stands out from this and other reports that success of PCI after TAVI does not seem to suffer compared to the non-TAVI population. The technical success rate seems to be over 90% in cases in which PCI is attempted.[7] Current PCI equipment and techniques (catheter extension devices, low profile stents and anchoring) have reduced the need for extra catheter support.

All three cases of unsuccessful coronary cannulation in this report occurred in devices in supra-annular position. It seems intuitive that the procedure would be more difficult among patients with long-framed supra-annular or small cell devices. However, other variables, such as device to Valsalva sinus ratio, implantation depth, and size and shape of CA catheters, may interact and render cannulation difficult to predict.[9,10]

Device selection is of particular importance when considering lifetime management in younger TAVI candidates. Coronary access certainly has to be factored into the equation and could favor short-framed or large-cell devices. However, other variables unrelated to coronary access, such as post-TAVI permanent pacemaker implantation, or residual gradients that could impact durability, especially in small annuli and bicuspid valves, may support supra-annular devices and thus have to be accounted for.

In conclusion, Silva et al. should be commended for their efforts in providing reassuring real-world data on coronary access after TAVI. However, the clinical implications of the findings remain to be established, particularly given the apparently low impact on the current PCI success rate. Larger, prospective larger studies using current implantation techniques (including commissure or computed tomography-derived coronary alignment) with longer follow-up in younger and lower-risk patients will be necessary to determine the real impact of TAVI or device selection on subsequent CA and PCI.

Conflicts of interest

The authors have no conflicts of interest to declare.

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