Combining Transcatheter Aortic Valve Replacement and Coronary Angiography/Percutaneous Coronary Intervention Procedures Ready for Prime Time?

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About half of elderly patients with severe aortic stenosis exhibit some degree of obstructive coronary artery disease that is routinely addressed at the time of surgical aortic valve replacement (SAVR). Transcatheter aortic valve replacement (TAVR) has emerged as a valid alternative to SAVR for the treatment of intermediate to high surgical risk patients. More than half of TAVR candidates have a history of coronary artery disease (about one third with prior coronary artery bypass grafting [CABG]), and coronary angiography prior to the procedure has been established as a routine examination to depict the presence of obstructive coronary lesions. Severe coronary stenoses located at the proximal-mid segment of the main coronary arteries are usually treated by percutaneous coronary intervention (PCI) at the time of coronary angiography, and this occurs in ≈20% of TAVR candidates. The timing between coronary angiography/PCI and TAVR is highly variable (from days to several weeks) depending on centers’ preference and logistic aspects. Some studies including a limited number of patients have evaluated the possibility of performing coronary angiography/PCI at the time of TAVR. The reasons for such an approach (rather than staged procedures) could be (1) to improve the logistics and patient comfort, and reduce the costs associated with the pre-TAVR workup and (2) to optimize vascular access and possibly reduce vascular complications by avoiding multiple punctures of the same or different vascular accesses at different time points. Although combining coronary angiography (±PCI) and TAVR procedures appeared to be safe in most of these studies, some suggested an increased risk of periprocedural complications, such as myocardial infarction or acute kidney injury.

See Article by Barbanti et al

In this issue of the journal, Barbanti et al reported the results of a large series of patients (n=604) who underwent coronary angiography (±PCI) at the time of (immediately before) TAVR. The study population had an intermediate surgical risk (median STS-PROM score =4.2%), more than half of the patients exhibited some degree of chronic kidney dysfunction, and <10% of the patients had a history of prior CABG. PCI was performed in the presence of severe coronary lesions subtending a large area of myocardium, but not chronic total occlusions, lesions in small or distal vessel segments, or those associated with a high calcium burden. The main prespecified reasons for aborting the TAVR procedure after coronary angiography (±PCI) were heart team reassessment, unsuccessful PCI, or the use of >80 mL of contrast (>50 mL in the presence of kidney failure). TAVR was canceled after coronary angiography in only 1 patient (referred to SAVR+CABG) and after PCI in 2 patients because of the use of a large amount of contrast. Coronary angiography (±PCI) was performed through the femoral access in 99% of cases. Severe coronary artery disease was encountered in 23% of patients, but less than half of them (<10% of the entire study population) had PCI. Most patients had a single coronary lesion dilation, which was successful in all cases. TAVR was subsequently performed using standard techniques. The 30-day mortality rate was 2.4%, and major vascular complications, acute kidney injury (stage III), disabling stroke, and myocardial infarction occurred in 5.5%, 3.3%, 0.5%, and 0.8% of patients, respectively. These results were similar to those of a cohort of 73 contemporary patients who underwent coronary angiography (±PCI) and TAVR as staged procedures. Also, the outcomes of patients who had concomitant PCI and TAVR were similar to those of patients who had concomitant coronary angiography and TAVR but not PCI.

This study proving the feasibility and safety of combined coronary angiography (±PCI) and TAVR procedures in a large cohort of patients represents another step forward toward combined (versus staged) coronary and TAVR procedures, particularly in an era where the increasing experience of heart teams along with the newer generation transcatheter valves has made TAVR procedures safer and simpler. However, some limitations of this study should be considered:

1. Patient selection bias. The patients included in this study had a low to moderate surgical risk, much lower than that in most prior TAVR studies. Even if similar results were obtained in a subanalysis of the smaller cohort of high risk patients, it remains uncertain whether the same results could be obtained in patients with a higher risk profile. Also, the prevalence of significant coronary artery disease in Barbanti’s work (<25%) seems to be much lower than that reported in previous studies (>50%). Furthermore, the number of
patients with prior CABG, a group that usually requires a much higher amount of contrast and more complex PCI procedures, was lower compared with most prior TAVR studies.

2. PCI selection bias. The fact that some lesions with significant calcification burden were excluded (not treated) represents an important bias in TAVR candidates. It is not infrequent to see this type of lesions in the elderly TAVR population, and the possibility of dealing with these complex lesions post-TAVR, with the additional difficulties related to interference with the transcatheter valve stent frame (particularly in the presence of some self-expandable valves largely overpassing the coronary ostia), is not optimal. Also, the fact that the authors were able to perform PCI and TAVR with a mean extra contrast amount of 50 mL (150 mL versus 100 mL in those patients who had coronary angiography and TAVR) is surprising, particularly, if we consider that the mean amount of contrast in large series of PCI procedures (without TAVR) has been systematically around 200 mL.8,9 Of note, the use of >100 mL of contrast has been associated with an increased risk of contrast nephropathy.5 In fact, the use of >80 mL (>50 mL in the presence of chronic kidney disease) of contrast for coronary angiography and PCI is a prespecified criterion for canceling the TAVR procedure in the Barbanti’s study, and only 2 patients had the TAVR procedure aborted because of an excessive amount of contrast during PCI. This again points toward a highly select group of patients with simple PCI procedures requiring small amounts of contrast.

In addition to these study limitations, some possible drawbacks of combining coronary and TAVR procedures should also be highlighted:

1. Vascular access, antithrombotic therapy. Combined procedures may mean obtaining the main or secondary femoral accesses for the TAVR procedure immediately after a coronary intervention under full anticoagulation and dual antiplatelet therapy. Although no increased risk of vascular or bleeding complications was observed in Barbanti’s study, it is well known that obtaining vascular access under such conditions may be associated with an increased risk of vascular and bleeding issues. Moreover, if PCI is performed and a severe bleeding complication should occur after TAVR, the management of the antithrombotic therapy would be more difficult and the risk of stent thrombosis may increase if the complication requires stopping antiplatelet therapy.

2. Logistic issues. While there has been a clear tendency toward the simplification of TAVR procedures, TAVR still involves the participation of multidisciplinary teams, as well as anesthesiologists in most centers. The possibility of either spending time in long PCI procedures or even aborting the TAVR procedure represents a major logistic issue in the organizational process and may have an important negative effect on the overall cost-effectiveness of such a combined procedure strategy. Also, the presence of severe coronary artery disease represents an important factor that may influence the clinical decision-making process in patients with aortic stenosis who are at intermediate to high surgical risk. This may be of particular importance in diabetic patients who represent up to one third of the current TAVR population. Combined procedures may jeopardize the possibility of an appropriate discussion among the members of the heart team and between the heart team and the patient about the risks and benefits of each therapeutic option (TAVR versus SAVR). It is also important to note that (1) more than half of the TAVR candidates with coronary artery disease exhibit a SYNTAX score ≥2210 and (2) patients with a high SYNTAX score or left main disease were excluded from the randomized trials comparing TAVR and SAIR.1

Some studies have shown a strong correlation between computed tomography (CT) coronary angiography and standard invasive coronary angiography for detecting the presence and severity of coronary stenosis in TAVR candidates.11,12 Chieffo et al12 showed the feasibility and safety of evaluating coronary disease by CT instead of invasive angiography in TAVR candidates (at the time of the CT examination evaluating aortic annulus/valve and iliofemoral access). While the higher amount of contrast needed and the relatively high percentage of patients with severe coronary artery calcification precluding an appropriate assessment of coronary lesion severity are the main limitations of CT coronary angiography, it would allow us to determine the presence and extension of coronary artery disease in most TAVR candidates. This would translate into more appropriate patient selection regarding combined PCI and TAVR procedures (ie, tailored combined strategy).

The management of concomitant coronary artery disease in TAVR candidates remains a largely unresolved issue. While waiting for the results of the ACTIVATION trial (a randomized trial comparing PCI versus no PCI in TAVR candidates with severe coronary artery disease; Percutaneous Coronary Intervention Prior to Transcatheter Aortic Valve Implantation), current standards recommend coronary angiography and PCI in case of obstructive lesions in the proximal-mid segments of the main coronary arteries. Barbanti et al17 should be congratulated for conducting an original and elegant study, which further opens the door to combined coronary angiography (±PCI) and TAVR procedures. However, the potential patient and coronary anatomy-PCI selection biases together with some important logistic issues linked to such a strategy may preclude generalizing the proposed strategy. A proposal based on selecting combined coronary intervention and TAVR procedures according to (1) clinical criteria (ie, excluding patients with prior CABG or severe kidney disease) and (2) coronary CT data (selecting simple PCI cases) may be the best option in the near future. Future studies are warranted.

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References


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