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EDITORIAL COMMENT

Severe Aortic Stenosis With Coronary Disease

Do Not Get Distracted!*

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The unique and thoughtful case report by Marcus et al[1] of a patient with an anomalous left main coronary artery who was undergoing transcatheter aortic valve replacement (TAVR) provides a timely opportunity to review our goals when treating simultaneous severe aortic stenosis and coronary disease. In short, why not defer coronary assessment and treatment until after TAVR as our default strategy?

Three general timing options exist for percutaneous coronary intervention (PCI): before, during, and after the valve procedure. Registry data indicate that a small (8%) minority undergoes PCI leading up to TAVR,[2] a finding consistent with the rate observed in foundational randomized trials. Less than 2% of TAVR-treated patients in a massive nationwide registry underwent concurrent PCI during the procedure.[3] After the procedure, <0.5% of patients who underwent TAVR had PCI performed within 30 days,[3] and a large cohort found that just under 1% of patients who underwent TAVR had an unplanned PCI during the next 5 years.[4]

Thus approximately 10% of patients undergo PCI at some point after their diagnosis of severe aortic stenosis: 8% before TAVR, <2% during the procedure, <0.5% during the next month, and approximately 1% over the following 5 years. We can enumerate several indications. First, some operators may consider the coronary lesions to be too severe to tolerate rapid pacing during TAVR delivery, although the already low PCI incidence of 8% during this time frame still seems higher than expected. Alternatively, coronary obstruction or embolization during or soon after TAVR may occur despite careful procedural planning using upfront computed tomographic imaging. Finally, chronic coronary artery disease can produce refractory angina or can transform into an acute syndrome over the long term, although the best observational series showed that most unplanned PCI occurs within the first 12 months, with a slight excess of acute over chronic coronary artery disease presentations.[4]

How confident are we that PCI can be performed successfully after TAVR? After all, the device itself could obstruct coronary access, particularly with self-expanding valve designs. Observational cohorts suggest an extremely high 97% rate of procedural success,[4] with a randomized trial of before vs after timing expected to have results in 2023 (Optimal Timing of Transcatheter Aortic Valve Implantation and Percutaneous Coronary Intervention [TAVI-PCI]; NCT04310046).

What other drawbacks could arise from postponing or deferring PCI, apart from a seemingly very small reduction in successful coronary access? An important clue can be uncovered in the literature when comparing the rates of revascularization between cohorts randomized to TAVR and those randomized to surgical aortic valve replacement (SAVR). Namely, as summarized in **Table 1**,[5-9] TAVR in combination with PCI takes place at roughly one-half the rate of SAVR in combination with coronary

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TABLE 1 Less Coronary Revascularization When Percutaneous But Same Outcomes

Study	TAVI + PCI, %	SAVR + CABG, %	Follow-Up, y	Death, %		MI, %		KCCQ Change	
				TAVR	SAVR	TAVR	SAVR	TAVR	SAVR
PARTNER 2[5]	3.9	14.5	5	46.0	42.1	11.1	8.2	+15	+16
SURTAVI[6]	14.5	22.1	5	30.0	28.7	6.2	4.7	+15	+14
Evolut Low Risk[7]	6.9	13.6	2	3.5	4.4	2.2	1.6	+21	+20
PARTNER 3[8]	6.5	12.8	2	2.5	3.2	1.8	2.7	+19	+18
UK TAVI[9]	7.3	21.5	1	4.6	6.6	1.3	1.1	+10[a]	+7[a]
Pooled	8.0	16.8							

Values are % unless otherwise indicated. [a]Uses visual analog score from the EuroQol 5 Dimension 5 Level (EQ-5D-5L) survey.

CABG = coronary artery bypass grafting; Evolut Low Risk = Medtronic Evolut Transcatheter Aortic Valve Replacement in Low Risk Patients; KCCQ = Kansas City Cardiomyopathy Questionnaire; MI = myocardial infarction; PARTNER = Placement of AoRTic TraNscathetER Valves; PCI = percutaneous coronary intervention; SAVR = surgical aortic valve replacement; SURTAVI = Surgical Replacement and Transcatheter Aortic Valve Implantation; TAVR = transcatheter aortic valve replacement; UK TAVI = United Kingdom Transcatheter Aortic Valve Implantation.

artery bypass grafting (CABG). Despite a 2-fold difference in revascularization, no impact has been seen on all-cause death, myocardial infarction (MI), or improvement in symptoms out to 5 years. These data strongly suggest that many combined SAVR and CABG procedures overtreat coronary artery disease.

Could a benefit nevertheless exist for PCI to stabilize severe plaques and thus reduce the incidence of spontaneous MI vs medical therapy, as seen in several randomized trials? As detailed in **Table 2**,[5-10] MI after TAVR or SAVR remains uncommon, at approximately 1% per year, perhaps one-third to one-half the incidence in patients without severe aortic stenosis. Given this very low event rate (it is almost as if aortic stenosis provides a protective effect against MI), sample sizes need to be large. Of ongoing randomized trials in this area, only 1 study (Staged Complete Revascularization for Coronary Artery Disease vs Medical Management Alone in Patients With Aortic Stenosis Undergoing Transcatheter Aortic Valve Replacement [COMPLETE TAVR]; NCT04634240) will have the necessary (n = 4,000) enrollment and 3.5-year median follow-up to answer the question.

The case report by Marcus et al[1] thus brings together a common scenario (severe, symptomatic aortic stenosis and non-normal coronary arteries) and an uncommon scenario (anomalous left main coronary artery with intramural course in a patient >80 years of age). We fully support the view of Marcus et al[1] that the coronary artery abnormality represented "a bystander lesion and not the cause of current presentation." Indeed, much the same could be said of most coronary artery disease detected at the time of TAVR—do not get distracted!

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Dr Johnson has patents pending on diagnostic methods for quantifying aortic stenosis and TAVR physiology and on algorithms to correct pressure tracings from fluid-filled catheters; has received internal funding from the Weatherhead PET Center for Preventing and Reversing Atherosclerosis; has received significant institutional research support from Philips Volcano Corporation (DEFINE-FLOW; NCT02328820); and has an institutional licensing agreement with Boston Scientific for the smart-minimum FFR algorithm commercialized under 510(k) K191008. Dr Tonino has a patent pending on diagnostic methods for quantifying aortic stenosis and TAVI physiology; and has received significant institutional research support for a study of aortic stenosis physiology (SAVI-AoS; NCT04514250) from ZonMW (the Netherlands) and Biosensors (Switzerland). Dr Eerdekens has reported that he has relationships relevant to the contents of this paper to disclose.

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TABLE 2 Myocardial Infarction Is Rare After Treated Severe Aortic Stenosis

Study	Follow-Up, y	TAVI		SAVR	
		MI, During Follow-Up	N	MI, During Follow-Up	N
PARTNER 1A[10]	5	5	348	11	351
PARTNER 2[5]	5	84	1,011	62	1,021
SURTAVI[6]	5	53	864	37	796
Evolut Low Risk[7]	2	16	730	11	684
PARTNER 3[8]	2	9	496	12	454
UK TAVI[9]	1	6	458	5	455
Total		173	3,907	138	3,761
		6.0% at 5 y		5.1% at 5 y	
Pooled		5.6% at 5 y ≈1%/y			

Values are n unless otherwise indicated.

MI = myocardial infarction; other abbreviations as in Table 1.

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