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RESEARCH LETTER

Outcome of Coronary Ostial Stenting to Prevent Coronary Obstruction During Transcatheter Aortic Valve Replacement

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Coronary obstruction (CO) can occur in patients with high-risk anatomic features undergoing transcatheter aortic valve replacement (TAVR).[1] The snorkel technique consists of implanting a stent at the coronary ostium with protrusion into the aorta, maintaining coronary patency. The aim of our international registry is to describe a multicenter experience regarding the procedural outcomes and follow-up of planned snorkel technique in TAVR procedures preventing CO. The primary end point was a device-oriented composite end point that includes target vessel myocardial infarction, target lesion revascularization and definitive, probable and possible stent thrombosis. Secondary end point was the device success rate and all-cause mortality. Outcomes were defined according to the Valve Academic Research Consortium 2 criteria[2] and the Academic Research Consortium.[3] The authors declare that all supporting data are available within the article.

Between March 2015 and May 2019, 48 patients underwent coronary ostial stenting to prevent CO during TAVR (Figure). The study was approved by an institutional review committee and the subjects gave informed consent. Twenty-eight patients (58.3%) received a stent in ostial left main, in 15 cases (31.2%) both coronary arteries were treated. Snorkel stenting was successfully performed in all the cases except one in which, due to the conformation of the aortic root/transcatheter heart valve, the stent was not deployed. The patient had a fatal left main occlusion. The rate of device success was 80%. After a median follow-up time of 338.5 days (interquartile range 279.5) 8 patients (16.6%) died; 4 of these (8.4%) died for cardiovascular reasons. The rate of device-oriented composite end point was 4.2% with one thrombosis (2.1%) of the sinus of Valsalva in correspondence of the snorkel stent that lead patient to death (Figure [A]–[C]) and one target lesion revascularization (2.1%) presenting with a non–ST-segment–elevation myocardial infarction due to ostial in-stent restenosis (Figure [D]–[F]).

CO is a life-threatening complication that occurs in <1% of TAVR. Aortic scallop intentional laceration to prevent iatrogenic coronary artery obstruction (BASILICA [Bioprosthetic Aortic Scallop Intentional Laceration to Prevent Iatrogenic Coronary Artery Obstruction]) is a valid alternative to avoid this complication but time-consuming and with a not negligible rate of complications.[4] We demonstrated that (1) snorkel stenting to prevent CO during TAVR is feasible, safe and with a low rate of complications; (2) mid-term outcome of the snorkel stenting technique was acceptable; and (3) device success rate is acceptable but negatively influenced by the residual high gradients observed in the 12.5% of the patients. Nevertheless, we report a very late thrombosis of the right sinus of Valsalva in correspondence of the snorkel

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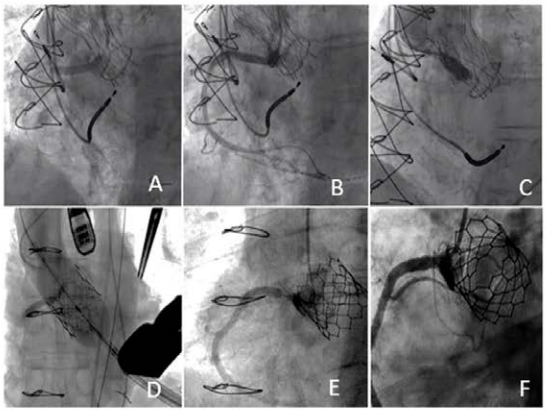
Variables	Overall (n=48)
Age, years†	81 ± 5.4
Male	14 (29 %)
Previous coronary artery by-pass	13 (27.7%)
Society of Thoracic surgeons score†	6.8 ± 5.9
Valve in Valve	41 (85.4%)
Bicuspid aortic valve	1 (5%)
Mitroflow ViV	30 (62.5 %)
CT scan analysis	
Mean perimeter (mm)†	69.74 ± 10.8
Mean LCA height (mm)†	8 ± 3.6
Mean RCA height (mm)†	10.2 ± 4.7
Sinus of Valsalva diameter (mm)†	28 ± 4.3
Virtual transcatheter valve to coronary ostium distance (mm) †	5.3± 2.3
Virtual transcatheter valve to coronary ostium distance < 4 mm	34 (70,8%)
Procedural data and outcomes	
Trans femoral access	46 (95.8%)
Sapien XT / Sapien 3	4 (8.3%)
Corevalve/Evolut	17 (35.4%)
Portico	21 (43.7%)
Other devices	6 (12.5%)
Left main mean stent length (mm) †	22.8 ±8
Right coronary mean stent length (mm) †	26.6 ± 6.7
Procedural mortality	1 (2.1%)
Residual high gradient (> 20 mmHg)	6 (12.5%)
Stent thrombosis	1 (2.1%)
Target lesion revascularization	1 (2.1%)



Events at follow-up Mean follow-up time = 338.5 days (IQR: 279.5)	Overall (n=48)
Overall Mortality	8 (16.6%)
Cardiovascular mortality	14 (29%)
Stroke	13 (27.7%)
DOCE	2 (4.2%)
Hospitalization for HF	6 (12.5%)

Figure. Main results of the snorkel stenting registry to avoid coronary obstruction.
At follow-up, 2 patients had device-oriented cardiovascular events: one patient died as consequence of a massive thrombosis of the sinus (**A**–**C**) which resulted in an inferior myocardial infarction and death. Another patient had recalcitrant ostial stenting restenosis (**D**–**F**) which required repeated revascularization. CT indicates computed tomography; DOCE, device-oriented composite end point; HF, heart failure; IQR, interquartile range; LCA, left coronary artery; RCA, right coronary artery; VIV, valve in valve. †Data are presented as mean and SD.

stent that poses questions about the safety of this technique: significant protrusion of thin-strut stents in narrow anatomies can create strict interaction between the protruded stent and the valve cage with theoretical risk of stent crush, a potential trigger for thrombosis. The protruded stent, and the valve cage, could alter the rheological properties of the blood and increase the risk of sinus of Valsalva thrombosis. The use of prolonged dual antiaggregant could be useful to mitigate the potential risk of thrombosis. Limitations of this multicenter analysis include its relatively small simple size and the lack of a homogeneous clinical follow-up. The decision to perform ostial stenting, device, and patient selection were left to the operator decision; clinical and echocardiographic outcomes were self-reported and not adjudicated by a clinical event committee. The median follow-up was about 12 months, although, longer follow-up is needed to confirm the safety of this technique.

ARTICLE INFORMATON

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