JSHD
Journal of Structural Heart Disease

Case Report

Journal of Structural Heart Disease, April 2019,
Volume 5, Issue 2:48-51
DOI: https://doi.org/10.12945/j.jshd.2019.030.18

Received: September 09, 2018
Accepted: September 15, 2018
Published online: April 2019

Stenting the Snorkel: PCI of a Restenosed Left Main Stent Placed for Coronary Obstruction after Valve in Valve TAVR

Hazim El-Haddad, MD, Jon Resar, MD*

Division of Cardiology, Johns Hopkins University School of Medicine, Baltimore, Maryland, United States

Abstract

Acute coronary artery occlusion is a known complication of transcatheter aortic valve replacement. One bailout strategy to treat acute coronary artery occlusion is deployment of a "snorkel" stent from the coronary artery behind the TAVR valve. While this approach will restore coronary artery patency, the long-term concern of this method is the ability to re-intervene on the stented coronary artery in the future. We demonstrate the complexity of re-intervention in a case of acute coronary syndrome due to ostial restenosis of a "snorkel" stent.

Key Words

TAVR • Left Main intervention • Percutaneous coronary intervention

Introduction

Transcatheter Aortic Valve Replacement (TAVR) is a well-established alternative to surgical aortic valve replacement for the treatment of aortic stenosis. As the indications for TAVR have expanded from prohibitive, high, and intermediate risk patients to clinical trials in low-risk patients, and as the overall population ages, the procedure is becoming increasingly common [1]. As such, it is important to be familiar with the possible risks of TAVR. A known risk of TAVR is coronary obstruction by the native valve (or bioprosthetic surgical valve) leaflets after deployment of the TAVR valve. Although the incidence is relatively uncommon (<1%), the consequence of acute coronary occlusion can be devastating, with a mortality risk as high as 40% [2, 3]. It is a risk that should be carefully considered and planned for during TAVR, especially if the coronary ostium originates less than 12 mm from the plane of the valve annulus, and particularly in the Medtronic self-expanding valves, which extend above the coronary ostia by design [4, 5]. The risk of coronary occlusion is increased for valve-in-valve procedures compared to native aortic valves and may be up to 3.5% [4]. Additionally, the height of the coronary ostium is not as straightforward a guide as in a native valve, due to the variable relationship between the native annulus and the bioprosthetic leaflets, and careful imaging is critical in order to understand the patient-specific anatomy [6]. The most common treatment strategy in the event of coronary obstruction during TAVR is PCI with stent deployment, and this is associated with a >90% success rate [4]. This is generally performed by pulling back and deploying a stent that has been pre-delivered to the coronary artery. Another novel option is intentional laceration of the aortic valve leaflet (BASILICA) [7]. With TAVR becoming increasingly common as the indications have expanded, so too will patients returning with coronary artery disease requiring intervention after TAVR.

Fax +1 203 785 3346
E-Mail: jshd@scienceinternational.org
http://structuralheartdisease.org/

ISSN 2326-4004

Accessible online at:
http://structuralheartdisease.org/

* Corresponding Author:
Jon Resar, MD
Division of Cardiology
Johns Hopkins University School of Medicine
1800 Orleans St, Baltimore, MD 21287, USA
Tel. +1 410 614 1132; Fax: +1 443 287 3180; E-Mail: jresar@jhmi.edu

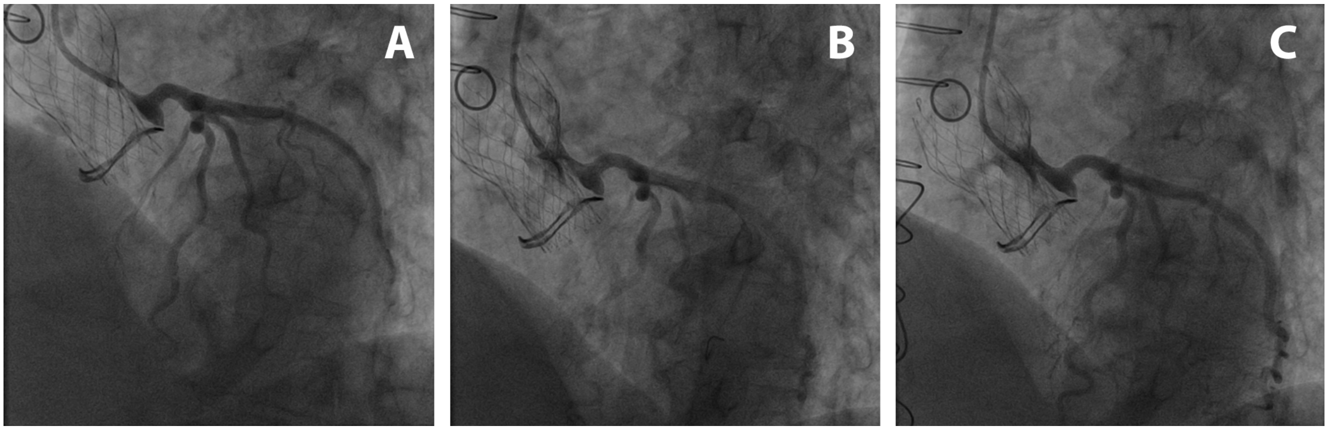

Figure 1. Initial coronary angiogram demonstrating severe stenosis of the aorta to LM "snorkeled" stent *(Panel A)*. Subsequent coronary angiogram after initial stent placement *(Panel B)*. Final coronary angiogram after second stent placement *(Panel C)* .

Case Presentation

We present a case of a 71-year-old woman with coronary artery disease and aortic stenosis treated 10 years previously with single-vessel coronary artery bypass (SVG- RCA) and surgical aortic valve replacement with a 21 mm Mitroflow for non-rheumatic aortic valve stenosis. She then presented 8 years later with bioprosthetic valve degeneration and severe aortic regurgitation and underwent TAV-in-SAV with a 23 mm Medtronic Evolut R valve. Because of concern for left main (LM) occlusion with TAVR deployment due to a low take-off of the LM (8 mm from the plane of the annulus) a 4.0 x 15 mm Xience Alpine drug-eluting stent was positioned over a 0.014 Luge guidewire prior to valve placement. PEA arrest due to LM obstruction occurred immediately with TAVR deployment, and subsequently, the stent was pulled back and deployed in a snorkel fashion from the left main to the aorta behind the side struts of the Evolut R valve with the successful return of circulation and completion of the procedure.

The patient did well for two years but developed chest pain and progressive dyspnea on exertion. A pharmacologic PET stress test provoked chest pain and demonstrated marked ischemia in the LAD and LCx distribution. She was admitted for coronary angiography and possible intervention in the setting of the markedly abnormal stress test.

Coronary angiography was performed via right radial arterial access. The previously placed "snorkel" stent in the LM was engaged with an EBU 3.5 guide catheter. Angiography demonstrated a 90% ostial in-stent stenosis at the location where the stent passed over the Mitroflow valve strut behind the Evolut R valve (Figure 1, Panel A). The stent and left main was wired with a Pilot 50 guidewire into the circumflex coronary artery. Intravascular ultrasound was performed in the LM with a Volcano Eagle Eye Platinum ultrasound catheter. The "snorkel" segment of the LM stent demonstrated a severe stenosis at the upper edge of the strut of the Mitroflow valve. The stenosis was predilated with an NC Sprinter 4.0 x 15 mm balloon, and a Xience Alpine 4.0 x 18 mm drug eluting stent was placed within the previous stent, extending through the cell of the Evolut R into the aorta. The stent was post-dilated with an NC Quantum Apex 4.5 x 15 mm balloon. We attempted to repeat IVUS imaging but were unable to fully advance the IVUS catheter over the Pilot 50 guide wire. The Pilot 50 wire was exchanged for a Wiggle wire through a Turnpike LP, and the IVUS catheter was able to be advanced into the stent. IVUS imaging demonstrated an ellipsoid shape to the new stent. (Figure 2, Panel A, Figure 1, Panel B) It was thought that increased radial strength was required to maintain stent patency against the external compression, and so a 4.0 x 12 mm Xience Alpine stent was placed and post-dilated with an NC Quantum Apex 5.0 x 12 mm balloon, inflated to 20 atmospheres. IVUS was repeated at the LM "snorkel" stent segment and demonstrated an improved, less ellipsoid geometry with an MLD of 5.0 x 3.5 mm

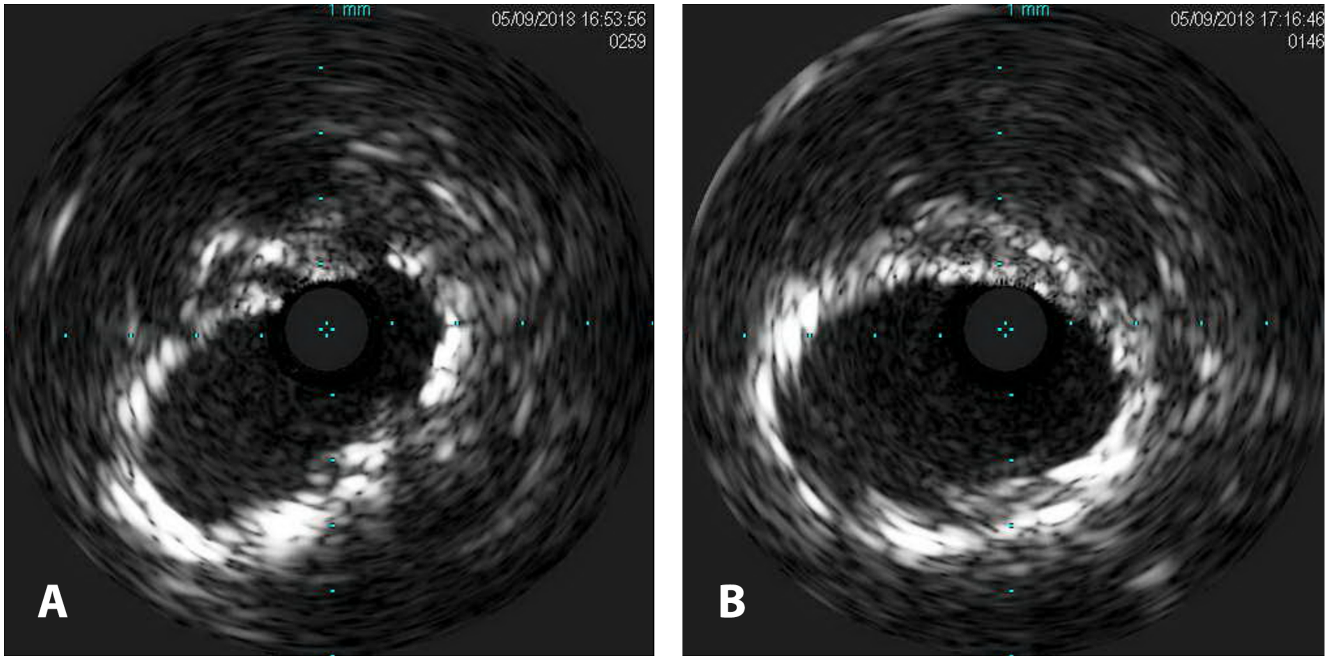

Figure 2. Intra vascular ultrasound demonstrating after initial stent placement demonstrating an ellipsoid geometry after initial stent placement *(Panel A)* and improved geometry after second stent placement *(Panel B)*.

(Figure 2, Panel B). The wire was removed and final angiography was performed (Figure 1, Panel C). The patient had an uneventful post-procedure recovery. She was chest pain-free at rest and with ambulation and was discharged home the next day.

Discussion

Avoidance of coronary occlusion is obviously the optimal approach whenever feasible with TAVR, and this requires careful imaging, planning, and device selection [8]. Planning for a bailout strategy for a patient at high risk of obstruction is critical. PCI with stent deployment can be employed to manage coronary occlusion in approximately 80% of patients [3]. The long-term concerns of a stent extruding into the aorta, especially behind the side cells of a TAVR valve, is stent patency and the ability to re-engage the stent for further treatment should this be necessary. A review of the literature demonstrates that, while PCI of the left main de novo prior to and after TAVR has been performed, this is the first published case of repeat intervention through a snorkeled LM stent [9, 10].

One alternative consideration for a treatment option was a surgical approach to revascularization, such as a single vessel LIMA rather than PCI. Given the complexity of this case, a heart team approach was taken with a full discussion between the referring cardiologist, the interventional cardiologist, and the cardiac surgeon regarding the best therapeutic approach. Her STS risk of mortality for the coronary bypass was calculated at 5.7%, driven largely by the acute progression of symptoms, prior cardiac surgery, cerebrovascular and peripheral arterial disease, gender, and morbid obesity.

The patient was deemed a poor surgical candidate, and it was determined that an attempt at PCI to resolve her ischemia was warranted rather than directly proceeding to bypass. If further restenosis develops in the LM stent segment then CABG will likely be required because of the complexity of the stent configuration in the LM coronary artery.

Another consideration for treatment when there is a concern for a low-lying coronary ostium would be the BASILICA procedure (Bioprosthetic Aortic Scallop Intentional Laceration to prevent Iatrogenic Coronary Artery obstruction) [7]. This would involve the intentional laceration of the bioprosthetic (in this case) valve leaflet prior to TAVR deployment in order to attempt to prevent iatrogenic coronary artery obstruction. In our presented case, however, it is likely this would not have prevented the initial obstruction as the bioprosthetic valve strut was positioned at the ostium of the left main, and as such lacerating, the leaflet would likely not have prevented obstruction of the coronary ostium.

Conclusion

Given that the incidence of coronary artery disease in patients undergoing aortic valve replacement is as high as 30-50%, coronary intervention after TAVR is a relatively common and necessary procedure that has been demonstrated to be feasible [11]. With that in mind, this case presents a unique example of intervention in a "snorkeled" LM stent. While prevention of coronary obstruction during TAVR is the goal, PCI bailout is a reasonable strategy that should be considered and prepared for ahead of time in high-risk patients. Although challenging, reengagement and retreatment of such a "snorkeled" stent is feasible. However, the long-term outcomes of such interventions remain uncertain and will require further study.

Conflict of Interest

The authors have no conflict of interest relevant to this publication.

Comment on this Article or Ask a Question

References

1. Nishimura RA, Otto CM, Bonow RO, Carabello BA, Erwin JP 3rd, Fleisher LA, et al. 2017 AHA/ACC Focused Update of the 2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. J Am Coll Cardiol. 2017;70(2):252-289. DOI: https://doi.org/10.1016/j.jacc.2017.03.011
2. Ribeiro HB, Sarmento-Leite R, Siqueira DA, Carvalho LA, Mangione JA, Rodes-Cabau J, et al. Coronary obstruction following transcatheter aortic valve implantation. Arq Bras Cardiol. 2014;102(1):93-96. DOI: https://doi.org/10.5935/abc.20130252
3. Sultan I, Siki M, Wallen T, Szeto W, Vallabhajosyula P. Management of coronary obstruction following transcatheter aortic valve replacement. J Card Surg. 2017;32(12):777-781. DOI: https://doi.org/10.1111/jocs.13252
4. Ribeiro HB, Webb JG, Makkar RR, Cohen MG, Kapadia SR, Kodali S, et al. Predictive factors, management, and clinical outcomes of coronary obstruction following transcatheter aortic valve implantation: insights from a large multicenter registry. J Am Coll Cardiol. 2013;62(17):1552-1562. DOI: https://doi.org/10.1016/j.jacc.2013.07.040
5. Yudi MB, Sharma SK, Tang GHL, Kini A. Coronary Angiography and Percutaneous Coronary Intervention After Transcatheter Aortic Valve Replacement. J Am Coll Cardiol. 2018;71(12):1360- 1378. DOI: https://doi.org/10.1016/j.jacc.2018.01.057
6. Dvir D, Leipsic J, Blanke P, Ribeiro HB, Kornowski R, Pichard A, et al. Coronary obstruction in transcatheter aortic valve-in-valve implantation: preprocedural evaluation, device selection, protection, and treatment. Circ Cardiovasc Interv. 2015;8(1). DOI: https://doi.org/10.1161/CIRCINTERVENTIONS.114.002079
7. Khan JM, Dvir D, Greenbaum AB, Babaliaros VC, Rogers T, Aldea G, et al. Transcatheter Laceration of Aortic Leaflets to Prevent Coronary Obstruction During Transcatheter Aortic Valve Replacement: Concept to First-in-Human. JACC Cardiovasc Interv. 2018;11(7):677-689. DOI: https://doi.org/10.1016/j.jcin.2018.01.247
8. Arai T, Lefevre T, Hovasse T, Garot P, Benamer H, Unterseeh T, et al. Incidence and predictors of coronary obstruction following transcatheter aortic valve implantation in the real world. Catheter Cardiovasc Interv. 2017;90(7):1192-1197. DOI: https://doi.org/10.1002/ccd.26982
9. Chakravarty T, Sharma R, Abramowitz Y, Kapadia S, Latib A, Jilaihawi H, et al. Outcomes in Patients With Transcatheter Aortic Valve Replacement and Left Main Stenting: The TAVR-LM Registry. J Am Coll Cardiol. 2016;67(8):951-960. DOI: https://doi.org/10.1016/j.jacc.2015.10.103
10. Fiorina C, Curello S, Maffeo D, Lorusso R, Chizzola G, Ettori F. Management of acute left main obstruction after transcatheter aortic valve replacement: the "tunnel technique". Cardiovasc Revasc Med. 2012;13(2):142.e5-142.e9. DOI: https://doi.org/10.1016/j.carrev.2011.09.001
11. Htun WW, Grines C, Schreiber T. Feasibility of coronary angiography and percutaneous coronary intervention after transcatheter aortic valve replacement using a Medtronic self-expandable bioprosthetic valve. Catheter Cardiovasc Interv. 2018;91:1339–1344. DOI: https://doi.org/10.1002/ccd.27346

Cite this article as: El-Haddad H, Resar J. Stenting the Snorkel: PCI of a Restenosed Left Main Stent Placed for Coronary Obstruction after Valve in Valve TAVR. Structural Heart Disease. 2019;5(2):48-51. DOI: https://doi.org/10.12945/j.jshd.2019.030.18