SAGE Open Medical Case Reports
Volume 6: 1–3

DOI: 10.1177/2050313X18819933
journals.sagepub.com/home/sco
SAGE

Use of EN Snare device for successful repositioning of the newest self-expanding transcatheter heart valve

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Abstract

Once a self-expanding transcatheter aortic valve replacement is fully deployed, a snare device must be used to retrieve it. Minimal data are available regarding technique, efficacy, and complications associated with the retrieval of such valves. Here, we present two patients in which an EN Snare® Device (Merit Medical System, South Jordan, UT, USA) was safely and effectively used to retrieve and reposition the latest generation self-expanding transcatheter aortic valve replacement.

Keywords

Cardiovascular, surgery, CoreValve, aortic insufficiency, valve recapture, EN Snare, valve deployment

Date received: 16 March 2018; accepted: 22 November 2018

Introduction

Transcatheter aortic valve replacement (TAVR) is now considered an acceptable alternative to surgical aortic valve replacement (SAVR) for patients at increased surgical risk.[1,2] The Medtronic CoreValve transcatheter heart valve system (Medtronic, Inc., Minneapolis, MN, USA) offers many advantages, including the ability to recapture and reposition the bioprosthesis at deployments of up to 80%.[3] The recently approved Medtronic CoreValve Evolut™ Pro (CVEP) system has an extended sealing skirt designed to reduce paravalvular leak. However, once these valves are fully deployed, the only way to reposition or retrieve these valves is via the use of a snare. Little is known concerning the feasibility and success of snaring the new CVEP valve or even the previous generation self-expanding valves. We present here two cases in which repositioning via snaring was required following initial implantation of the Medtronic CVEP as well as the first-generation CoreValve.

Case series

Case 1

Patient 1 was a 70-year-old male with severe aortic stenosis (AS) and New York Heart Association (NYHA) class III heart failure. He was known for type 2 diabetes mellitus (DMII), chronic obstructive pulmonary disease (COPD), and a previous three-vessel coronary artery bypass grafting. His Society of Thoracic Surgeons' predicted risk of mortality (STS PROM) score was 3.2 and was deemed high risk for SAVR due to patient left internal mammary artery graft to the left anterior descending artery and a slowed 5 m walk test. Preoperative transthoracic echocardiogram (TTE) showed a preserved left ventricular ejection fraction (EF), a mean aortic valve gradient of 41 mmHg, and an aortic valve area (AVA) of 0.91 cm^2. Preoperative computed tomography (CT) scan of the thorax measured the aortic annular perimeter at 77 mm and a perimeter derived diameter of 25 mm. Preoperative left heart catheterization showed occlusion of the first obtuse marginal (OM) branch and 60% diffuse proximal disease of the second OM branch. Following percutaneous intervention of the second OM artery at the index procedure, a 0.035 double curved Lunderquist wire was

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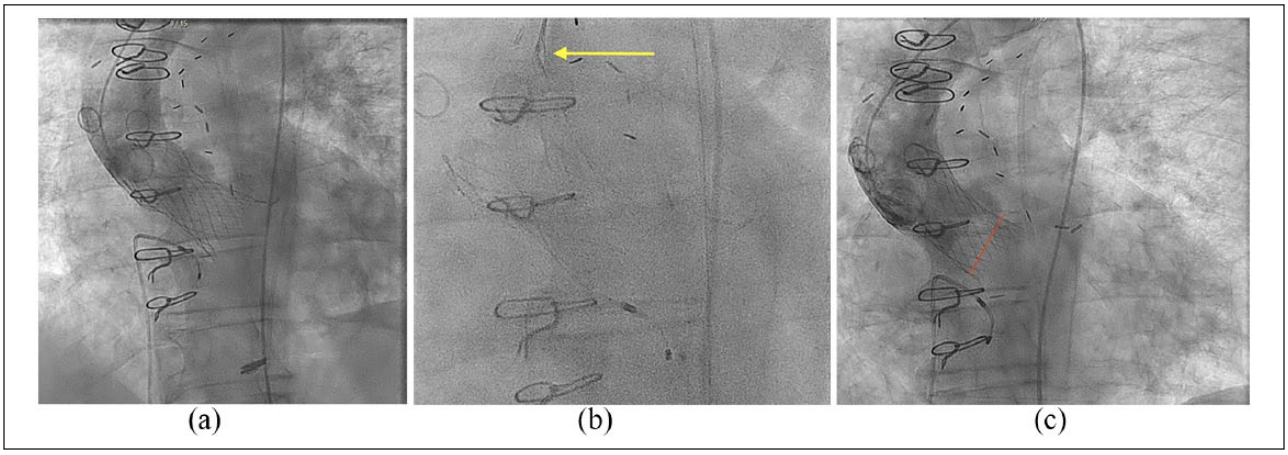

Image 1. (a) TAVR post-deployment; >20 mm depth. (b) Snaring of the Inner Tab. Location of the EN Snare device (yellow arrow). (c) Final position—4 mm with no AR observed. Level of aortic annulus was noted (red line).

placed into the left ventricle (LV) and utilized as a rail to advance a 29 mm Medtronic CVEP across the aortic annulus. Initial implantation, performed under rapid pacing at 120 beats/min, was at a depth of 3 mm; however, upon complete release, the CVEP migrated into the LV to a depth of 20 mm and severe aortic regurgitation (AR) was noted (Image 1(a)). A 6 F EN Snare® (Merit Medical System, South Jordan, UT, USA) was necessary to snare, first, the inner tab (Image 1(b)) and then the outer tab, allowing the bioprosthesis to be repositioned to a final depth of 4–5 mm (Image 1(c)). Following repositioning, the left ventricular end-diastolic pressure fell from 29 to 19 mmHg indicating a reduction in the AR. The patient was discharged on post-operative day (POD) 2 without further complications. A TTE at 2 months demonstrated a mean aortic valve gradient of 10 mmHg and no evidence of AR.

Case 2

Patient 2 was a 63-year-old male with severe AS with NYHA class IV symptoms and history significant for stage III chronic kidney disease, hypertension, COPD, and DMII. His STS PROM score was 5.6. Frailty, including a slow 5-m walk test, and a porcelain aorta deemed him high risk for SAVR. Preoperative TTE revealed an AVA of 0.72 cm^2, an EF of 20%, and a mean aortic valve gradient of 44 mmHg. The aortic annular perimeter measured 85.7 mm with a derived diameter of 27.3 mm by CT. Based on these measurements, a first-generation 31-mm Medtronic CoreValve transcatheter heart valve system was selected. Initial deployment of the bioprosthesis under rapid pacing at 120 beats/min required post-balloon dilatation for paravalvular AR which resulted in the TAV to fall to a depth of 12 mm below the annulus with subsequent moderate–severe AR. A 6 F EN Snare device was used to snare the inner tab of the CoreValve and reposition the bioprosthesis to a final implant depth of 8 mm, with no AR. The patient was discharged home without complications on POD 2. Follow-up echocardiogram at 90 days demonstrated a mean aortic valve gradient of 15 mmHg and no AR.

Discussion

TAVR is a well-established treatment for AS and has been found to be safe and effective in patients who are intermediate to high risk for SAVR.[4] Low-risk trials are currently under way. Repositioning a self-expanding TAVRS immediately following complete deployment is challenging but sometimes required to address perivalvular regurgitation. Recapturing and repositioning the CoreValve Evolut R transcatheter heart valve can be accomplished with up to 80% valvular deployment. Once completely deployed, however, recapturing of the valve is no longer possible. The recapturability of the Evolut R TAV has been shown to result in a significant reduction in malposition and valve migration when compared to earlier valve models.[5] Although the likelihood of having to snare the latest generation TAV after deployment may be reduced, it may still be required. The recently approved CVEP has an outer wrap for improved perivalvular-sealing.[3] The results, risks, and technical nuances of snaring these prostheses have not been previously described. It is possible that exerting too much force on the EN Snare while repositioning could result in embolic stroke or traumatic aortic dissection.[6] In addition, snaring a malpositioned TAV (>10 mm below the aortic annulus) has been shown to be an important cause of valve embolization.[7] In the two cases presented here, an EN Snare device was utilized to capture and reposition TAVs with optimal results. In both, we found it necessary to snare both the inner and outer CoreValve tabs to allow repositioning. Success is dependent upon careful traction on the EN Snare felt against the beating heart. Aggressive pulling on the valve system risks completes valve embolization. Neither case required predilatation, nor was there need for pacing during snaring of either valve.

Conclusion

Seldom it is necessary to reposition a self-expanding TAVR following deployment; however, when needed, few options are available to snare the valve in order to achieve proper positioning. There is limited literature regarding use of the EN Snare in this situation, thus requiring a well-trained proceduralist to approach with care. Although high-volume TAVR centers may have gained experience in snaring self-expanding valves, we hope this case series provides guidance for less experienced heart teams given the limited data of this procedure.

Acknowledgements

No additional assistance was taken in the study design, completion, or manuscript preparation.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

Our institution does not require ethical approval for reporting individual cases or case series.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Informed consent

Written informed consent was obtained from the patient(s) for their anonymized information, as well as images, to be published in this article. Verbal consent was initially solely obtained secondary to our institution not requiring verbal or written consent for <4 subjects per case series. Because of the decreased difficulty in receiving verbal consent, this was initially sought (and granted) prior to manuscript submission. Upon request, written request was retrospectively obtained.

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