JACC: CASE REPORTS VOL. 1, NO. 5, 2019

CASE REPORT

ADVANCED

CLINICAL CASE

Endovascular Closure of 2 Subannular Pseudoaneurysms of the Aortic Root After Surgical Aortic Valve Replacement

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ABSTRACT

A 68-year-old woman was initially admitted with 2 subannular pseudoaneurysms of the aortic root after aortic valve replacement. The aneurysm expanded after 10 days and was treated using endovascular closure devices. (**Level of Difficulty: Advanced.**) (J Am Coll Cardiol Case Rep 2019;1:807–10) © 2019 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Aortic root pseudoaneurysm (PA) is a rare complication, which develops in <0.5% of cases after aortic surgery (1). It can be fatal, and in most cases results from anastomosis or cannulation of the aorta, leading to a poor healing process and defects in the layers of the wall (2). Conventional treatment includes surgical ligation or replacement of the ascending aorta with a graft. However, open surgery is associated with the increased morbidity and mortality rate (3,4). Percutaneous aortic root PA repair may reduce the risk of complications, and can be an alternative for these patients.

LEARNING OBJECTIVES

- To be aware of potential complications after aortic valve surgery.
- To determine diagnostic value of CT for detection of postoperative complications.
- To identify management options in such cases.
- To identify potential challenges of percutaneous closure of the aortic root PA.

We report the first experience of percutaneous treatment of 2 subannular PAs of the aortic root in a 68-year-old woman after aortic valve replacement.

CASE HISTORY

A 68-year-old woman with chest pain and dyspnea on exertion and severe aortic stenosis received planned aortic valve (23-mm bioprosthesis) replacement in our clinic. The surgery was done with no complications. Three days after surgery, the patient complained of severe shortness of breath.

PAST MEDICAL HISTORY

The patient had a history of hypertension, dyslipidemia, and chronic kidney disease. There was no family history of heart disease.

DIFFERENTIAL DIAGNOSIS

Given a progressively worsening dyspnea in the patient with the recently replaced aortic valve, there were initial concerns for prosthesis-related complications, including prosthetic valve obstruction owing to thrombosis, valvular or paravalvular regurgitation,

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Informed consent was obtained for this case.

Manuscript received August 19, 2019; revised manuscript received November 1, 2019, accepted November 2, 2019.

ISSN 2666-0849 https://doi.org/10.1016/j.jaccas.2019.11.011

ABBREVIATIONS AND ACRONYMS

ADO = Amplatzer Duct Occluder

CT = computed tomography

PA = pseudoaneurysm

and infective endocarditis. Besides prosthesis dysfunction, potential causes of dyspnea after surgical valve replacement include aortic root abscess and aneurysm.

INVESTIGATIONS

A transthoracic echocardiogram demonstrated normal prosthesis valve function with a mean systolic gradient of 15 mm Hg, and revealed an echo-free perivalvular cavity (18.8 × 15.8 mm in size) with the color Doppler flow inside. A PA was suspected and was then confirmed by computed tomography (CT), showing subannular PA of the aortic root with dimensions of 25 × 16 × 14 mm localized between the aortic root and right atrium (**Figure 1**). It was decided to repeat CT after 1 week to assess PA expansion dynamics. Further, progressive increase in the size of PAs (35 × 25 × 22 mm) was detected. Owing to the increased risk of reoperation, it was decided to attempt to perform a percutaneous closure of the PA.

MANAGEMENT

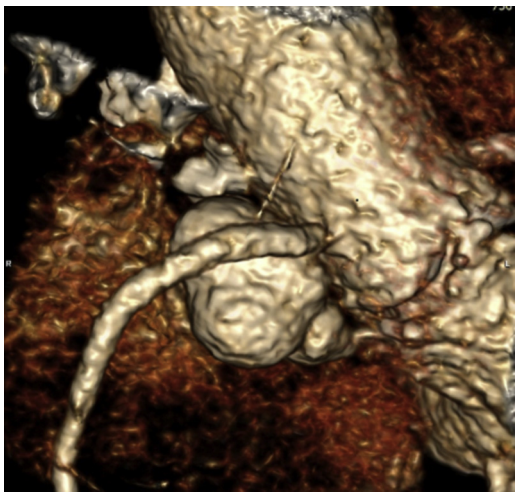
The procedure was performed with local anesthesia and conscious sedation. The patient received 300 mg of aspirin and 300 mg of clopidogrel before the procedure. The right radial artery access with a 6-F Destination Guiding Sheath (Terumo Medical Corporation, Tokyo, Japan) was used. Unfractionated heparin was administered to achieve the activated clotting time of more than 300 s. Using a 6-F Performa Pigtail (Merit Medical System, Malvern, Pennsylvania), angiographic evaluation of the left ventricle in anteroposterior and oblique views was performed to visualize the neck of the PA.

Multiple attempts to catheterize the PA with different catheter modifications (AL1, AL3, CLS, JL 4, AR3) failed. Finally, the neck of the PA was catheterized from the left ventricle cavity by the AL2 diagnostic catheter (Video 1).

Owing to poor support of the diagnostic catheter, a Headway microcatheter (MicroVention-Terumo, Tustin, California) was used to deliver 2 Cosmos coils (24 × 68 mm and 20 × 65 mm) (MicroVention-Terumo). The final angiogram showed no residual flow in the PA (**Figure 2**). The sheath was removed and hemostasis was achieved.

The post-procedure CT scan demonstrated complete occlusion of the PA; however, another subannular cavity was detected in the aortic root. The percutaneous closure procedure with 2 Cosmos coils (24 × 68 mm) was then reperformed (**Figure 3**, Videos 2 and 3). Complete occlusion of both PAs was confirmed by CT (**Figure 4**).

FIGURE 1 Subannular Pseudoaneurysm of the Aortic Root

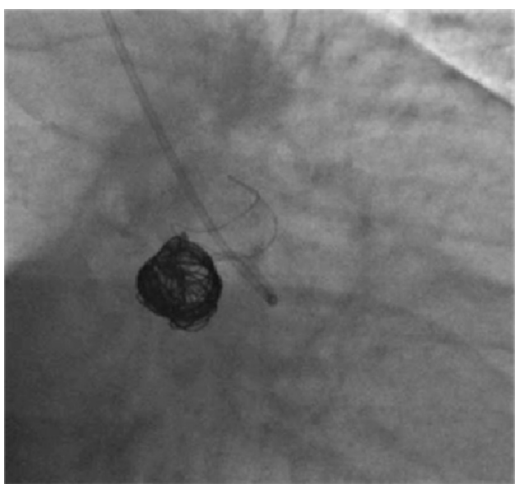


Computed tomography showed a subannular pseudoaneurysm of the aortic root with the dimensions of 35 × 25 × 22 mm and localization between the aortic root and right atrium.

DISCUSSION

To the best of our knowledge, this is the first description of endovascular coil embolization of 2 subannular PAs of the aortic root after surgical aortic valve replacement. Currently, surgical repair remains

FIGURE 2 Control Angiogram After Positioning of the Cosmos Coils



Angiography image showing 2 Cosmos coils packed into the pseudoaneurysm.

FIGURE 3 Second Pseudoaneurysm Closed With 2 Cosmos Coils

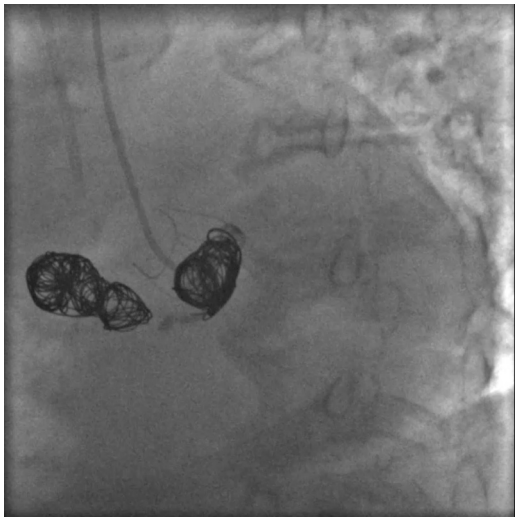
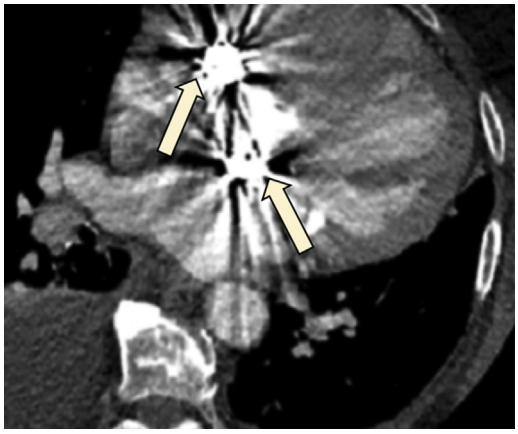


FIGURE 4 Total Occlusion of Subannular Pseudoaneurysms



The **arrows** show the position of the coil devices.

the gold standard, owing to longer experience of using this method. However, reoperation is associated with high mortality rate, and is sometimes not possible (3,4). Therefore, transcatheter treatment of a PA has become a promising alternative to open surgery in patients with high comorbidity. The mechanism of successful percutaneous PA repair is the blockage of blood flow to the PA cavity, leading to thrombus formation. Multiple techniques have been described, including thrombin injection and coil embolization, which all have been shown to effectively treat PA in several case reports (5–7).

There have been very limited reports released worldwide that describe transcatheter closure of aortic root and ascending aorta PAs. Al-Maskari et al. (8) reported the case of using the Amplatzer Duct Occluder (ADO) device for complex paravalvular aortic root PA and aorta-cavity fistulas. Bashir et al. (9) descried the case of an ascending aortic PA treated percutaneously using an ADO. De Boo et al. (10) reported the case of the PA closure with the off-label use of a type II Amplatzer vascular plug. However, there are no reports of transcatheter closure of subannular aneurysms in literature. In our case, the PA was localized below the aortic valve. Such localization of the PA creates technical challenges for endovascular repair. First, this may cause difficulties in PA catheterization and achievement of the proper support for catheters in ventricular cavity. Second, ventricular contractions can lead to the equipment dislocation in the ascending aorta and device migration during the procedure. Third, manipulations in the ventricular cavity can induce life-threatening arrhythmias. In our case, it was impossible to achieve sufficient support with catheters, as it required the use of microcatheter and MicroPlex Coil System Cosmos, generally intended for endovascular embolization of intracranial aneurysms and other neurovascular abnormalities. It provided safe and controlled delivery of closure devices.

FOLLOW-UP

The patient was discharged with no post-procedural complications and returned for the 3-month post-procedure follow-up without any symptoms.

CONCLUSIONS

This case demonstrates that percutaneous repair of post-cardiac surgery PA using a coil device can be performed successfully with excellent immediate results even in the presence of a challenging localization. Furthermore, it can be considered as an alternative to surgical correction, especially in high-risk patients.

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KEY WORDS aortic root, aortic valve surgery, complications, device closure, pseudoaneurysm

APPENDIX For supplemental videos, please see the online version of this paper.