Interventional Closure of a Large Pseudoaneurysm of the Ascending Aorta in a Patient after Lung Transplantation

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INTRODUCTION

Pseudoaneurysm of the ascending aorta is a rare but life-threatening complication in patients undergoing cardiac surgery.[1] Surgical repair of pseudoaneurysms remains the standard treatment. Nevertheless, for patients with extensive aneurysms, urgent indication or renal failure, surgical therapy comes with a high perioperative morbidity and mortality.[2] Interventional occlusion of the aneurysmal sac may represent an alternative therapy for inoperable patients.

CASE PRESENTATION

A 48-year-old male patient presented to our echocardiography unit for evaluation of a rapidly progressing retrosternal mass. The patient had a history of repeat double-lung transplantation 7 months earlier due to chronic transplant dysfunction. At presentation the patient was critically ill. Post-transplant routine native computed tomography (CT) scans had shown a retrosternal mass in the mediastinum with close proximity to the aorta. The mass had developed after retransplantation and showed rapid progression at 5 months (Figure 1A and 1B) and 7 months (Figure 1C) after transplantation. Color-coded transthoracic echocardiography from a suprasternal view showed direct perfusion of the mass from the ascending aorta, supporting our suspected diagnosis of a large pseudoaneurysm that had developed at the site of aortic cannulation for cardioplegia after the second transplantation (Figure 1D). CT angiography confirmed this finding, showing a 7 × 6 cm pseudoaneurysm. The aneurysmal neck measured 1.6 cm in the ascending aorta in proximity to the brachiocephalic artery (Figure 1E).

After discussion among our heart team, the patient was deemed inoperable due to two previous sternotomies and considerable frailty (EuroScore II 59.69%). Thus, we decided to perform percutaneous closure of the aneurysm.

After insertion of a 6 french sheath into the femoral artery and introduction of a Proglide suture-mediated vascular closure system (Abbott Vascular, Santa Clara, CA), the femoral access was upgraded to a 12 FR sheath. The pseudoaneurysm was cannulated using a 6 FR right Judkins coronary catheter (JR4; Figure 2A) over which a 0.035′ Amplatz stiff guide wire was introduced into the pseudoaneurysm. The JR4 was removed, and an 11 FR Occlutech delivery sheath (Occlutech International AB, Helsingborg, Sweden) was placed into the aneurysm (Figure 2B and Video 1). Finally, a 21 mm Occlutech Figulla Flex II atrial septal defect (ASD) occluder was advanced into the cavity. Under echocardiographic guidance, the first disc was expanded into the aneurysmal sac. Following retraction of the disc to the aneurysmal neck, the second disc was expanded on the aortic side (Figure 2C; Video 2). Immediately after delivery of the occluder, we could not detect further perfusion of the aneurysm (Figure 2D). Safe deposition of the occluder was confirmed by a push and pull maneuver (Video 3). The patient was admitted to our intensive care unit for routine surveillance for 24 hours.

The patient's condition deteriorated further, and he developed a severe pneumonia. Unfortunately, the patient died 5 days after device implantation due to multiorgan failure.

VIDEO HIGHLIGHTS

Video 1: Introduction of the Occlutech at the delivery sheath into the pseudoaneurysm under echocardiographic guidance. We introduced the Occlutech at the delivery sheath into the aneurysmal cavity over an Amplatz stiff wire under echocardiographic guidance, which facilitated optimal placement of the sheath without using contrast medium.

Video 2: Delivery of the Figulla Flex II at the ASD occluder into the aneurysmal neck. After expansion of the first disc we retracted the ASD occluder to the aneurysm neck under echocardiographic guidance to ensure expansion of the second disc in the aorta.

Video 3: Push and pull maneuver testing the safe deposition of the occluder. Before release we tested the safe and stable deposition of the ASD occluder in the aneurysmal neck with a push and pull maneuver.

View the video content online at www.cvcasejournal.com.

DISCUSSION

Here we describe a technically successful closure of a large pseudoaneurysm of the ascending aorta with an Figulla Flex II ASD occluder using hybrid guidance with fluoroscopy as well as transthoracic echocardiography. Standard therapy remains surgical exclusion of the pseudoaneurysm in most patients. However, in inoperable patients, alternative treatment regimens are needed. Few case reports and case

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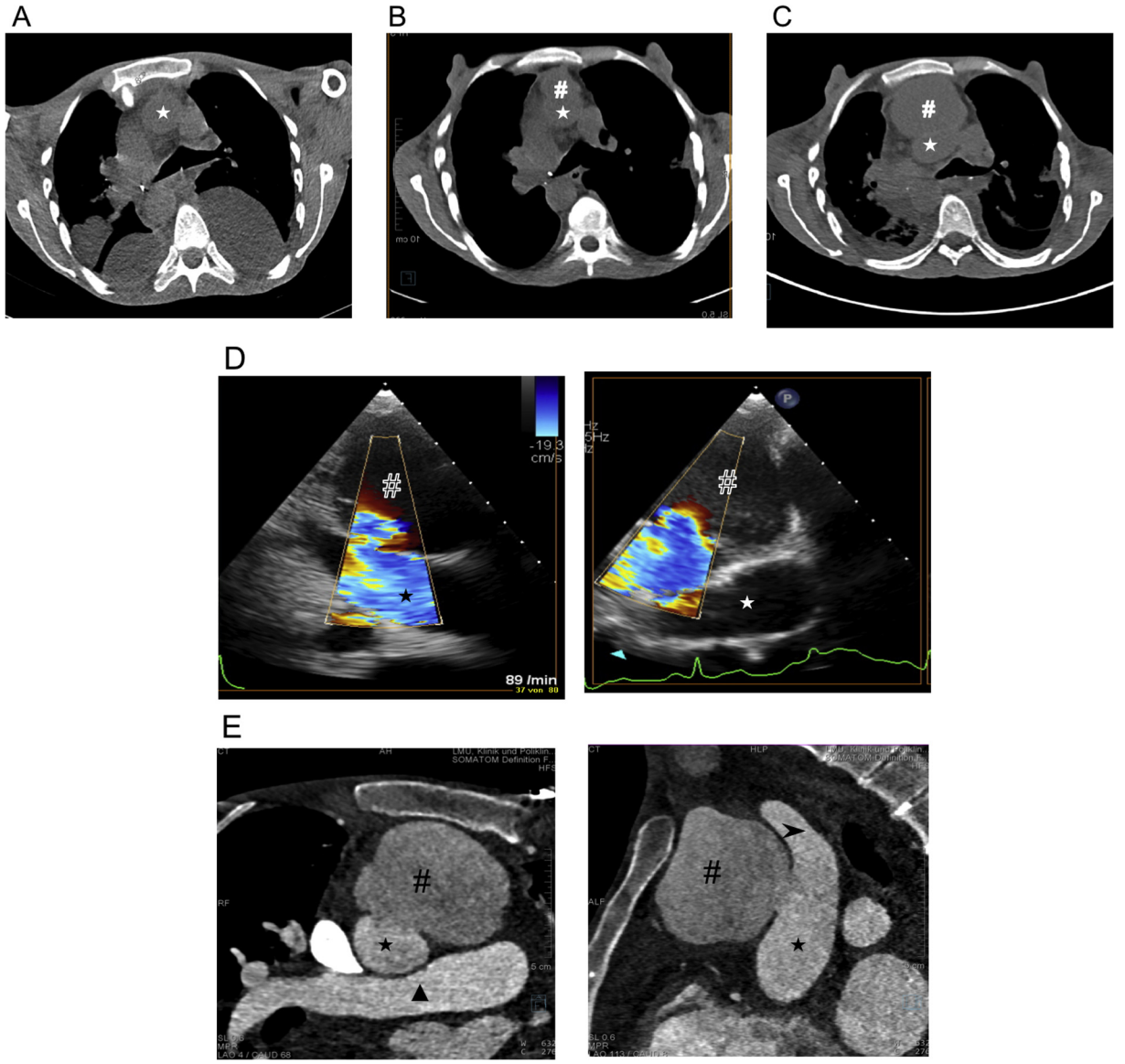

Figure 1 Incidental diagnosis of a large retrosternal pseudoaneurysm of the ascending aorta after lung retransplantation. **(A)** Chest CT scan 1 month after retransplantation showing normal mediastinal conditions. **(B, C)** Chest CT scan 5 **(B)** and 7 months **(C)** after retransplantation showing a rapidly progressive retrosternal mass in the mediastinum. **(D)** Color-coded echocardiography showing perfusion of a pseudoaneurysm originating from the ascending aorta with a broad aneurysmal neck. **(E)** CT angiography of the thorax confirming a pseudoaneurysm of the ascending aorta at the site of aortic cannulation. The *star* (★) shows the ascending aorta; the *pound sign* (#) shows the pseudoaneurysm; the *triangle* (▲) shows the main pulmonary artery; and the *arrow* (➢) shows the brachiocephalic trunk.

series have shown the feasibility of percutaneous treatment of aortic pseudoaneurysms using ASD occluders, vascular plugs, or coil embolization.[3-5] Nevertheless, more reports using multimodal guidance and detailed description of the percutaneous procedure are needed due to the complex anatomy, the fragility of the surrounding tissue, and, most importantly, the severity of possible complications. We performed the transfemoral closure of the pseudoaneurysm using the Figulla Flex II ASD occluder device. Selection of the Figulla Flex II occluder was based on the release mechanism in this device, which is configured with a ball-forceps connection. This allows a release also in very steep angles, which in this case was necessary due to the anatomical location of the pseudoaneurysm to minimize tension on the surrounding tissue.

CONCLUSION

In patients deemed inoperable, transfemoral closure using an ASD occluder device represents an off-label alternative to surgical repair to protect the patient from life-threatening complications.

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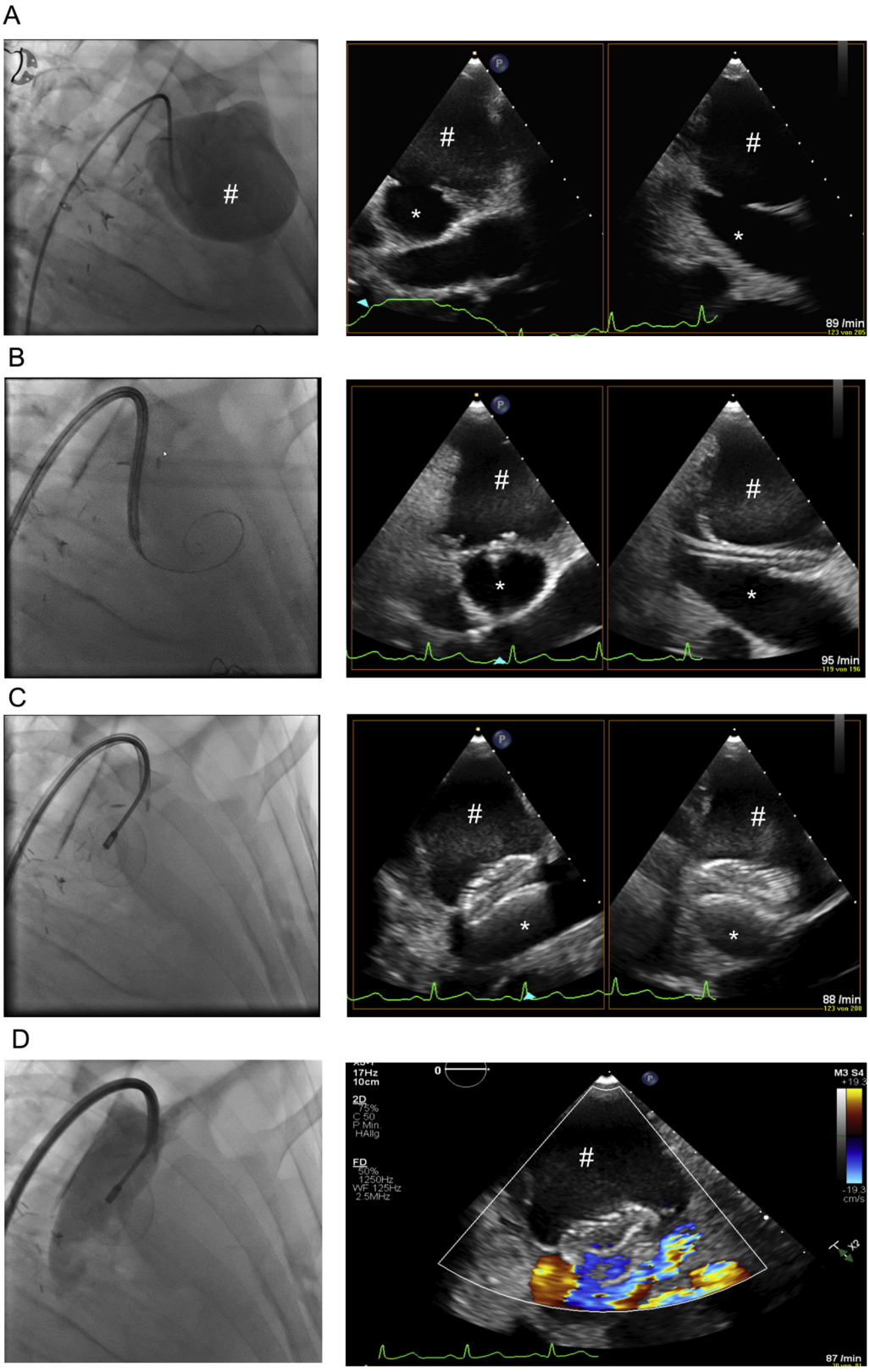

Figure 2 Transfemoral closure of the pseudoaneurysm using an Figulla Flex II ASD occluder. The left-side pictures show fluoroscopic images, and the right-side pictures show echocardiographic pictures of a suprasternal view. **(A)** (*Left*) cannulation and depiction of the pseudoaneurysm using a right JR4; (*right*) biplane echocardiographic depiction of the pseudoaneurysm including the anuerysmal neck. **(B)** Introduction of an Occlutech delivery sheath into the pseudoaneurysm over a pigtailed Amplatz stiff wire. **(C)** Successful implantation of an ASD Figulla Flex II occluder. **(D)** Complete exclusion of the aneurysm from the circulation. The *asterisk* (*) shows the ascending aorta, and the *pound sign* (#) shows the pseudoaneurysm.

SUPPLEMENTARY DATA

Supplementary data related to this article can be found at https://doi.org/10.1016/j.case.2019.08.002.

REFERENCES

1. Jung TE, Lee DH. Surgery for pseudoaneurysm of the ascending aorta under moderate hypothermia. J Cardiothorac Surg 2011;6:125.
2. Villavicencio MA, Orszulak TA, Sundt TM 3rd, Daly RC, Dearani JA, McGregor CG, et al. Thoracic aorta false aneurysm: what surgical strategy should be recommended? Ann Thorac Surg 2006;82:81-9; discussion 89.
3. Hussain J, Strumpf R, Wheatley G, Diethrich E. Percutaneous closure of aortic pseudoaneurysm by Amplatzer occluder device-case series of six patients. Catheter Cardiovasc Interv 2009;73:521-9.
4. Kumar PV, Alli O, Bjarnason H, Hagler DJ, Sundt TM, Rihal CS, et al. Percutaneous therapeutic approaches to closure of cardiac pseudoaneurysms. Catheter Cardiovasc Interv 2012;80:687-99.
5. Tang L, Lesser JR, Gössl M, Burns MR, Schneider LM, Schwartz JG, et al. Transcatheter closure of complex ascending aortic pseudoaneurysms after cardiac surgery. Circ Cardiovasc Interv 2018;11:e007052.