

# Endovascular Repair of a Pseudoaneurysm Adjacent to the Ascending Thoracic Aorta Using a 25-mm Amplatzer Multi-Fenestrated Septal Occluder – Cribriform

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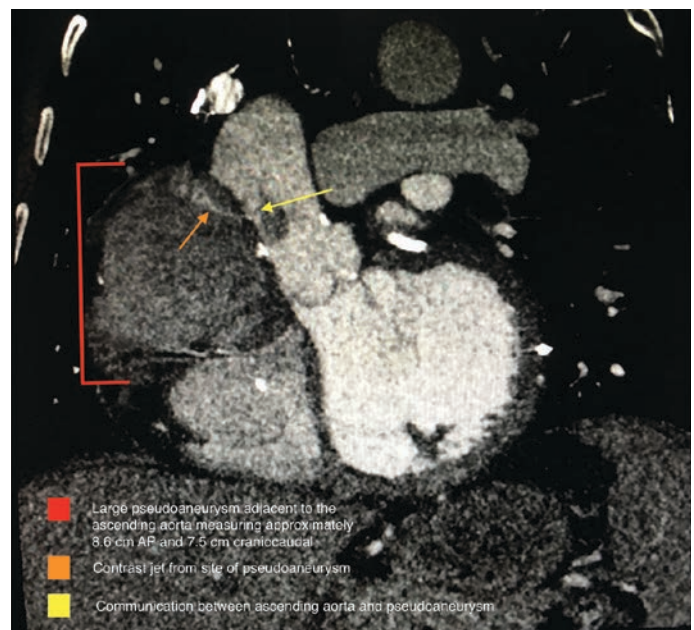
**Abstract:** Ascending aortic pseudoaneurysms are rare pathologies usually caused by prior aortic or cardiac surgery, trauma, or percutaneous surgical procedures. Today, surgical repair is still the gold standard in treating ascending aortic pseudoaneurysms. However, endovascular repair methods including stent grafts, coil embolization,<sup>1</sup> thrombin injections,<sup>2</sup> septal occluder devices, and vascular plugs have been reported, although these therapies are still limited to high-risk surgical patients. In the following case, an Amplatzer Cribriform Septal Occluder (AGA Medical Corporation) was used for treatment, abrogating the communication between a pseudoaneurysm and the ascending thoracic aorta. The Amplatzer Cribriform Septal Occluder is a percutaneous transcatheter atrial septal defect closure device intended for use in the closure of multi-fenestrated atrial septal defects (ASDs). It is a double-disc nitinol mesh occlusion device<sup>3</sup> that self-expands upon deployment and has a firm structural design allowing only a small amount of residual shunt as compared to other devices.<sup>4</sup> This case report shows that transcatheter implantation of the Amplatzer Cribriform Occluder can be a viable therapeutic option for treating ascending aortic pseudoaneurysms.

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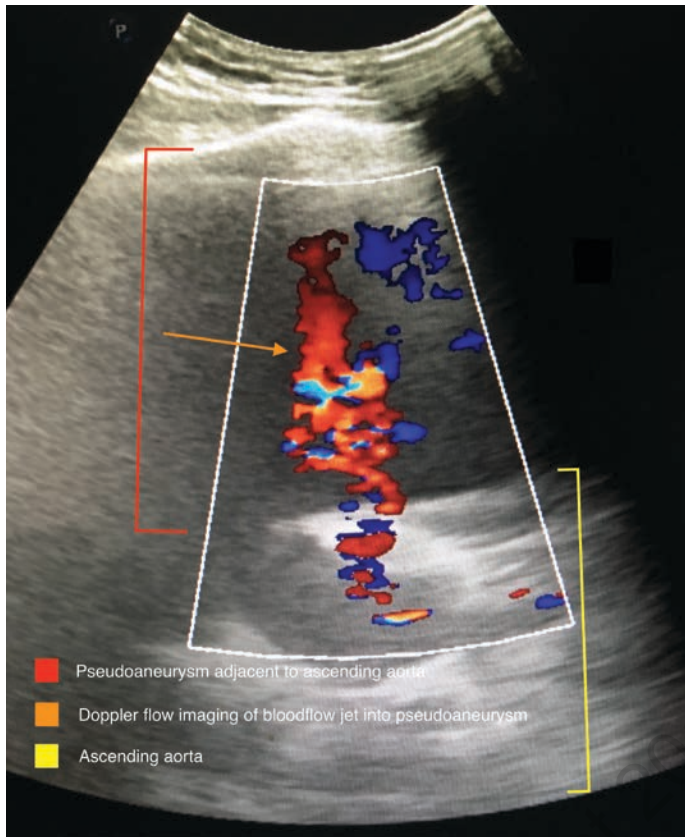
**Key words:** pseudoaneurysm; Amplatzer Cribriform Septal Occluder; endovascular repair

A 74-year-old man underwent diagnostic cardiac catheterization for acute coronary syndrome. The man had a past medical history significant for coronary artery disease status post coronary artery bypass grafting 5 years ago. He also had a history of ischemic cardiomyopathy with ejection fraction <25% and had had an internal cardiac defibrillator placed 3 years prior to presentation. Findings of the latest left heart catheterization revealed severe native coronary artery disease with occluded saphenous vein grafts as well as proximally occluded left anterior descending artery and patent left internal mammary artery to the left anterior descending artery.

The left circumflex was a non-dominant vessel with patent proximal stent. The distal right coronary artery filled via left-to-right collaterals. Injection of the right coronary artery showed staining around the aorta, and the contrast appeared to extravasate in the space around the aorta. The left ventriculogram revealed a dilated ventricle and an ejection fraction of <20% with no gradient on pullback from the left ventricle to the aorta. Aortic root angiogram was performed. Contrast was extravasating in a closed cavity around the aorta. These results led to the recommendation for a computed tomography (CT) angiogram of the chest and cardiothoracic surgical evaluation.



**Figure 1.** Preoperative CT image of large pseudoaneurysm adjacent to ascending thoracic aorta with contrast jet.



**Figure 2.** Preoperative transthoracic Doppler ultrasound image of pseudoaneurysm in ascending thoracic aorta.

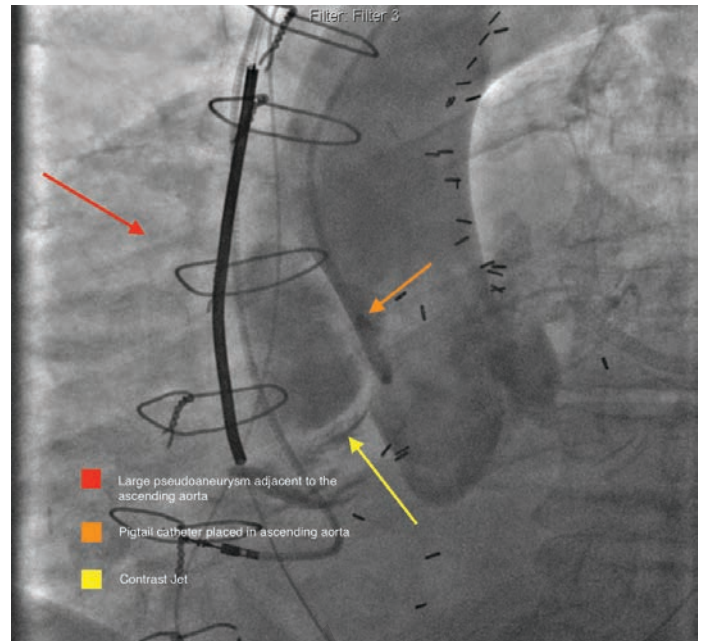
## DIAGNOSTIC RESULTS

Dynamic postcontrast retrospectively electrocardiograph (ECG)-gated helical CT angiography of the heart and coronary arteries was performed. The findings of the CT scan showed a large pseudoaneurysm adjacent to the ascending thoracic aorta measuring 8.6 cm anteriorposterior (AP) diameter by 7.5 cm craniocaudal diameter (**Figure 1**). There was a dependent portion of increased density consistent with extravasated contrast flowing into the pseudoaneurysm. The exact communication of the pseudoaneurysm and the aorta was not clear but was suspected to be near the origin of the right coronary artery. There was a moderately large filling defect in the ascending aorta contiguous with the origin of the right coronary artery, consistent with an intraluminal thrombus measuring 3 cm in diameter. The pseudoaneurysm mildly compressed the anterolateral aspect of the ascending aorta.

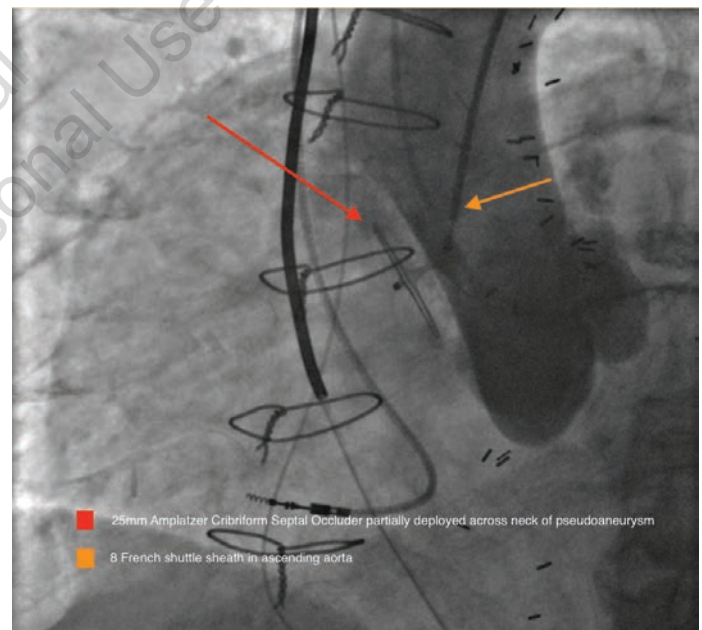
A transthoracic echocardiogram was also obtained, and the pseudoaneurysm was again seen adjacent to the ascending thoracic aorta. Doppler flow imaging further demonstrated the extravasation into the pseudoaneurysm (**Figure 2**).

## THERAPEUTIC INTERVENTION

Cardiothoracic surgery and interventional radiology were consulted. Based on the patient's multiple comorbidities, the treatment team decided to proceed with percutaneous intra-aortic repair of



**Figure 3.** Large pseudoaneurysm adjacent to the ascending thoracic aorta.



**Figure 4.** Amplatzer Septal Occluder positioned at the communication site.

the pseudoaneurysm. After informed consent, vascular access was obtained bilaterally using 6-Fr femoral arterial sheaths. A 6-Fr pigtail catheter was then advanced to the arch of the aorta. Selective arch aortogram was performed, and a large pseudoaneurysm was noted arising from the lower part of the ascending aorta (**Figure 3**).

A JR guide was then used to engage the pseudoaneurysm, and selective injections were made in the pseudoaneurysm. Next, intra-

vascular ultrasound was performed through the JR guide. Based on the measurements, at this time an 8-Fr shuttle sheath was used to deliver a 25 mm Amplatzer Cribriform Septal Occluder device across the neck of the aortic pseudoaneurysm (**Figure 4**). After adequate placement was confirmed, the device was deployed and released from the wire (**Figure 5**). Aortic root angiogram was repeated and the Amplatzer had good apposition with adequate seal of the pseudoaneurysm. At this time, the procedure was considered adequate with complete closure by endothelialization likely to occur with time. All hardware was removed and Perclose devices were deployed in both groins. The patient recovered in the hospital and was discharged home with instructions to continue taking clopidogrel and follow up for repeat noninvasive imaging to monitor the pseudoaneurysm.

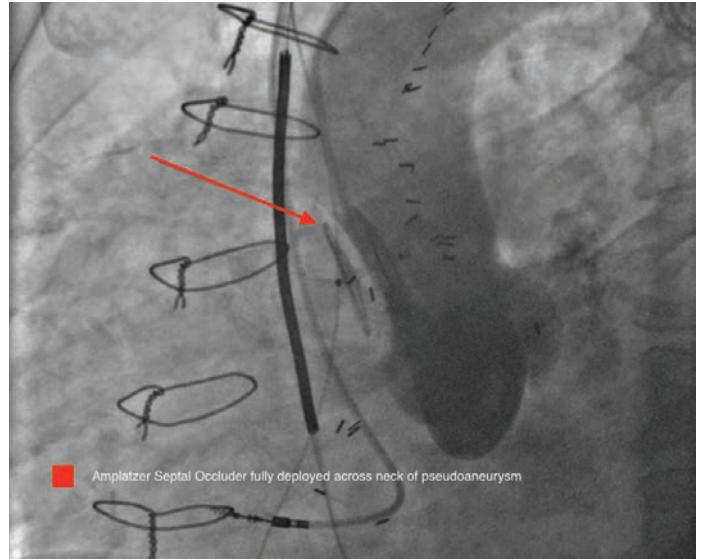
## DISCUSSION

Pseudoaneurysms are rare pathologies arising from different etiologies. Most cases involve prior aortic or cardiac surgery, but other factors have also been reported to cause ascending aortic pseudoaneurysms. These include inflammation, autoimmune diseases, blunt chest trauma, and, infrequently, mycotic pseudoaneurysms secondary to tuberculosis.<sup>5</sup> Compared with true aneurysms, pseudoaneurysms do not involve all 3 layers of an artery. Rather, after injury to the vessel, a blood-filled cavity forms between the 2 outer layers, the muscularis propria and the adventitia.

There is a possibility that progressive expansion of pseudoaneurysms can cause rupture or compression of nearby structures and lead to a variety of severe complications, so they are a potentially life-threatening condition. Other complications include persistent infections and development of potentially embolic thrombi in or around the pseudoaneurysm.<sup>5</sup> The Amplatzer Cribriform Septal Occluder is a nitinol mesh occlusion device, comprising 2 parallel discs with a narrow connecting waist that links the 2 discs together. The discs and waist are filled with polyester fabric to prevent flow through the mesh.<sup>3</sup> Compared with the Amplatzer Septal Occluder device, the multifenestrated cribriform variant used in this case is made of the same material but has a shorter connecting waist.<sup>6</sup> It has a firm structural design, self-expands, offers stabilization, and allows only minimal residual shunt.<sup>4</sup>

As a result of the longer period of experience and significant data on survival benefit, surgical repair is still the gold standard in treating ascending aortic pseudoaneurysms, although other possible treatments are starting to evolve.<sup>6</sup> Endovascular repair, including stent grafts, coil embolization,<sup>1</sup> thrombin injections,<sup>2</sup> septal occluder devices, and vascular plugs have been reported. However, these therapies are still limited to high-risk surgical patients and therefore only a limited number of reports of different experiences exist.

This case report presents another successful closure of a pseudoaneurysm at an uncommon and risky location. It highlights the importance and effectiveness of considering different kinds of treatment, especially endovascular repair to reduce possible risk factors and surgical complications. We describe here the use of the Amplatzer Cribriform Septal Occluder to treat a pseudoaneurysm adjacent to the thoracic aorta, which, to our knowledge, has rarely been reported. As more successful cases like this emerge, further prospective study comparing



**Figure 5.** Amplatzer Septal Occluder deployed at communication site and released from wire.

the percutaneous closure of pseudoaneurysms with surgical repair may be warranted. ■

*Disclosure:* The authors have completed and returned the ICMJE Form for Disclosure of Potential Conflicts of Interest. Dr Ali reports being a proctor for Amplatzer Training in the US for ASD/PFO closure. Ms Stabenow, Mr Byers, and Dr Malik report no conflicts of interest regarding the content herein.

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