Endovascular Approach to Treat Aortic Pseudoaneurysms: Could It Be a Safe Alternative?

Altarabsheh Salah Eldien,¹ Salil Deo,¹ Ali Oluseun O,² Charanjit S. Rihal,³ Lyle Joyce¹

Divisions of ¹Cardiovascular Surgery, ²Interventional Cardiology, and ³Cardiovascular Medicine, Mayo Clinic, Rochester, Minnesota, USA

ABSTRACT

Aortic pseudoaneurysm is a rare complication after blunt chest trauma or cardiac surgical procedures and can occur at the site of cannulation or root vent insertion on the ascending aorta. These pseudoaneurysms have the potential to expand, erode, and rupture, and detecting this condition before complications occur is the key to successful management. We had replaced the mitral valve with a 31-mm bioprosthesis in an 82-year-old patient and repaired an ascending aorta aneurysm, but a computed tomography scan on postoperative day 18 revealed a pseudoaneurysm at the site of the previous aortic cannulation. Because of the patient's advanced age and multiple comorbidities, we sealed off the neck of the pseudoaneurysm with a 12-mm Amplatzer Vascular Plug in the interventional cardiology suite instead of subjecting her to a surgical repair involving redo sternotomy and a period of circulatory arrest. Deployment of the Amplatzer plug effectively shut off flow into the pseudoaneurysm, and the patient recovered well. Although the optimal management strategy for aortic pseudoaneurysms is a matter of controversy, endovascular interventions may be a safer alternative to surgery for patients with multiple comorbidities.

CASE REPORT

An 82-year-old female patient underwent mitral valve replacement with a 31-mm bioprosthesis and repair of an ascending aorta aneurysm with a 32-mm Dacron Hemashield graft with resuspension of the aortic valve. The patient's ascending aorta and arch were visualized preoperatively with transesophageal echocardiography, and both were free of significant atheromatous plaque. Hence, the aortic cannula was placed in the lateral aspect of the aortic arch. That allowed us to perform the initial surgery without the need for deep hypothermic circulatory arrest. The postoperative period was uneventful, and the patient was discharged home on the ninth postoperative day.

On the 18th postoperative day, the patient was referred to our emergency department for evaluation of chest pain and an episode of syncope. Along with other investigations, a contrast-enhanced computed tomography (CT) scan of the chest was done. The CT scan revealed a pseudoaneurysm in the lateral wall of the distal ascending aorta at the site of the previous aortic cannulation; the neck vessels were spared, however (Figure 1). Surgical repair of this pseudoaneurysm would have entailed a redo sternotomy and a period of circulatory arrest while the affected area of the aorta was repaired or replaced. Given the patient's advanced age and other risk factors, the morbidity associated with this procedure was significant. Therefore, closure of the pseudoaneurysm with a 12-mm Amplatzer Vascular Plug (AVP) (AGA Medical Corporation, Plymouth, MN, USA) was performed in the interventional cardiology suite. The patient was brought to the cardiac catheterization laboratory in a fasting state. Biplane fluoroscopy was used, access was obtained via the right femoral artery, and bivalirudin was used for anticoagulation. Retrograde access to the ascending aorta was obtained, and an ascending aortic angiography examination was performed with a 6F pigtail catheter. The angiogram revealed a moderately sized aortic pseudoaneurysm at the junction between the ascending aorta and the arch. The pseudoaneurysm was cannulated with an Amplatzer Left 2 diagnostic catheter, and a subselective
injection of the pseudoaneurysm was performed. An Amplatz extra-stiff wire with a tight J curve was then advanced into the pseudoaneurysm, and a delivery catheter (left coronary bypass catheter) was advanced into the pseudoaneurysm over this wire. On the basis of the dimensions of the pseudoaneurysm neck determined from the preprocedure CT scan, we chose a 12-mm AVP II plug, which was then deployed, with the mid and distal disks in the pseudoaneurysm and the proximal disk in the aorta. This plug effectively sealed the neck of the pseudoaneurysm. Plug deployment with minimal residual flow into the pseudoaneurysm was confirmed by a final aortic angiography evaluation. The patient did well, and the predismissal chest CT scan showed the AVP positioned at the neck of the pseudoaneurysm (Figure 2).

**DISCUSSION**

Aortic pseudoaneurysm is a rare complication, having been reported in <0.5% of patients after cardiac surgical procedures [Dumont 2004]. It is usually seen at the site of aortic cannulation, the root needle vent, or graft anastomosis line sites. It carries the risk of rupture, thrombosis, secondary infection, and distal embolization. Patients may be totally asymptomatic, or they may present with chest pain, cough, dysphagia, and distal embolic phenomena [Nakayama 2008]. Diagnostic methods used for such false aneurysms include CT scan, magnetic resonance imaging, or transesophageal echocardiography.

The conventional therapy for aortic pseudoaneurysms is still operative resection with either patch aortotomy or interposition graft placement [Saner 1987]. This surgical procedure requires a redo sternotomy, profound hypothermia, and a period of circulatory arrest. Because cardiac surgical patients have increasingly become elderly with multiple medical comorbidities, recent interest has shifted toward less invasive methods of therapy. Alternative approaches include coil embolization, thrombin injection, and percutaneous interventions using stent grafts or vascular occluder devices [Lin 2001; Fann 2002; Chuter 2003]. The benefits of the use of a closure device include its relative ease of use and its avoidance of general anesthesia and surgical morbidity and mortality [Kanani 2007]. The size of the aneurysm, width of the neck, location, and anatomic relationship with the adjacent structures are important in deciding on the type of percutaneous device to use. Coils might be appropriate for small to moderately sized aneurysms and for aneurysms in which mechanical compressive effects due to occluder devices are a concern. In contrast, vascular occluder devices are useful for moderate- to large-sized pseudoaneurysms with a relatively narrow neck. A potential advantage of vascular occluders over coils is their low risk for embolization into the circulation.

In the reported case, the surgical option to reconstruct the distal ascending aorta and arch under hypothermic circulatory arrest was not without an increased risk in a fragile 82-year-old woman. The increased risk of sternal reentry in the early period after sternotomy and the possibility of fatal hemorrhage from the pseudoaneurysm during reentry were the major deterrents to surgical therapy. Added to that are the increased risks related to the period of circulatory arrest, such as stroke, spinal cord ischemia, acute renal shutdown, and myocardial infarction.

**CONCLUSION**

The management of aortic pseudoaneurysms poses a great challenge to the cardiac surgeon. The optimal management strategy is a matter of controversy. Endovascular interventions may be a safer alternative to surgery for patients with multiple comorbidities. We believe that they will play a larger role in the management of such difficult clinical situations.
REFERENCES


