The Heart Surgery Forum #2011-1099
15 (1), 2012 [Epub February 2012]
doi: 10.1532/HSF98.20111099

Online address: http://cardenjennings.metapress.com

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 Joyce[1]

Divisions of [1]Cardiovascular Surgery, [2]Interventional Cardiology, and [3]Cardiovascular 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.

INTRODUCTION

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 an intrinsic potential to expand, erode, and rupture. Detection of this condition before these complications occur is the key to successful management. Surgical repair is a very extensive procedure requiring a long cardiopulmonary bypass time and may even need a period of total circulatory arrest. A few reports of interventional procedures for managing this difficult condition have been described in the literature.

Received July 10 2011; accepted September 21, 2011.

Correspondence: Dr. Lyle D. Joyce, Division of Cardiovascular Surgery, Mayo Clinic, 100 Second St SW, Rochester, MN, USA 55905; 1-507-775-7064; fax: 1-507-255-7378 (e-mail: joyce.lyle@mayo.edu).

We present a case of a pseudoaneurysm of the aortic arch that was treated with endovascular plugging.

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 Amplatz Left 2 diagnostic catheter, and a subselective

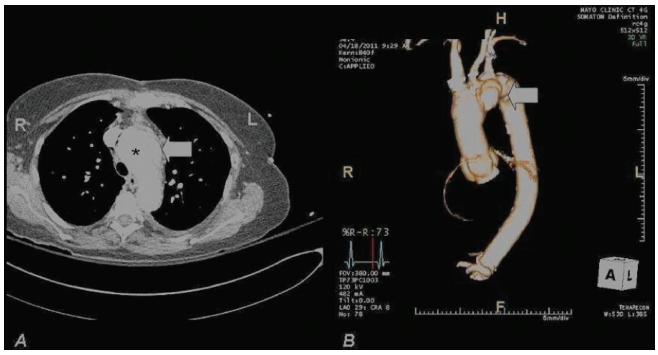

Figure 1. A, Chest computed tomography (CT) scan shows the pseudoaneurysm (arrow). B, Chest CT scan with 3-dimensional reconstructions revealing the pseudoaneurysm at the junction of the distal ascending aorta and the aortic arch (arrow).

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).

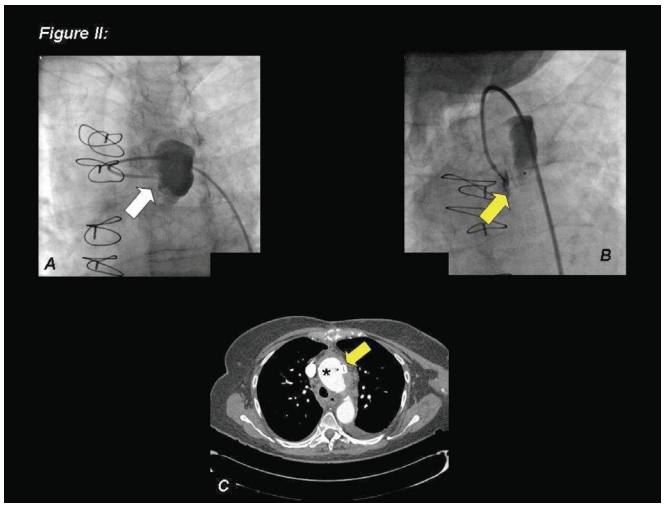

Figure 2. An ascending aortogram demonstrates the aortic pseudoaneurysm prior to the procedure (A) and its exclusion at the termination of the procedure with the AVP II occluder device in situ (arrow) (B). A contrast-enhanced computed tomography scan of the ascending aorta 5 days after the intervention shows the AVP II device in situ (arrow) (C). The device has plugged the neck of the pseudoaneurysm, because it fails to fill with the intravenous contrast.

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

Chuter TA, Schneider DB, Reilly LM, Lobo EP, Messina LM. 2003. Modular branched stent graft for endovascular repair of aortic arch aneurysm and dissection. J Vasc Surg 38:859-63.

Dumont E, Carrier M, Cartier R, et al. 2004. Repair of aortic false aneurysm using deep hypothermia and circulatory arrest. Ann Thorac Surg 78:117-20.

Fann JI, Samuels S, Slonim S, Burdon TA, Dalman RL. 2002. Treatment of abdominal aortic anastomotic pseudoaneurysm with percutaneous coil embolization. J Vasc Surg 35:811-4.

Kanani RS, Neilan TG, Palacios IF, Garasic JM. 2007. Novel use of the Amplatzer septal occluder device in the percutaneous closure of ascending aortic pseudoaneurysms: a case series. Catheter Cardiovasc Interv 69:146-53.

Lin PH, Bush RL, Tong FC, Chaikof E, Martin LG, Lumsden AB. 2001. Intra-arterial thrombin injection of an ascending aortic pseudoaneurysm complicated by transient ischemic attack and rescued with systemic abciximab. J Vasc Surg 34:939-42.

Nakayama T, Saito T, Asano M, Nomura N, Mishima A. 2008. An aneurysm at the cannulation site discovered 40 years after cardiac surgery: report of a case. Ann Thorac Cardiovasc Surg 14:267-9.

Saner HE, Asinger RW, Homans DC, Helseth HK, Elsperger KJ. 1987. Two-dimensional echocardiographic identification of complicated aortic root endocarditis: implications for surgery. J Am Coll Cardiol 10:859-68.