Percutaneous thoracic endovascular aortic repair for ascending aortic pseudoaneurysm after prosthetic aortic valve repair

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Ascending aortic pseudoaneurysms are an uncommon and challenging surgical problem that requires intervention to avoid rupture and hemorrhage. Preceding cardiac procedures often compound the high rate of morbidity and mortality associated with open repair. A case is described of an iatrogenic pseudoaneurysm in a patient with a recently placed prosthetic aortic valve and a clinical course precluding repeat open operative procedure. An endovascular approach was used, with placement of a thoracic aorta endograft with temporary cardiac pacing and a double-curved Lunderquist wire to avoid instrumenting the prosthetic aortic valve. At 9 months of follow-up, the patient returned to his baseline activity status, and at 24 months, had no symptoms or signs of infection, and a computed tomography angiogram demonstrated pseudoaneurysm exclusion with no graft migration. (J Vasc Surg Cases 2015;1:283-6.)

The mainstay of treatment for ascending aortic pathology is open repair. Cardiothoracic surgeons have long performed open procedures for ascending aorta aneurysms and type A aortic dissections, often with repair of concurrent aortic valve anomalies (bicuspid and unicuspid valves with stenosis or insufficiency). These procedures require cardiopulmonary bypass and may be unsuitable for some patients. Endovascular approaches for ascending aortic pathology have been described more frequently in recent years, often as case reports or limited case series.[1-3] Most reports of endovascular approaches focus on treatment of ascending aorta aneurysmal disease as well as type A dissections, with less attention to other aortic pathology.

Pseudoaneurysms of the ascending aorta are seen in rare circumstances, typically after cardiac surgery or chest trauma. The potential for rupture or significant hemorrhage mandates surgical intervention. However, open operative procedures for aortic pseudoaneurysms carry a high risk of morbidity, with mortality rates of 41% to 60%.[4,5]

Endovascular approaches to ascending aortic pseudoaneurysms (AAPs) are varied. Septal occluder devices have been used in a few cases[6,7]; however, complications, including device embolization, have been reported.[8] Endograft placement for AAPs has also been described in case reports[9-11]; yet, complications such as graft migration,[12] ventricular perforation, or pseudoaneurysm formation have been reported,[3] and technical approaches vary significantly. We discuss a unique case of endograft exclusion of an iatrogenic AAP in a patient with a prosthetic mechanical aortic valve and the techniques that led to successful treatment. The patient presented in this case report consented to the publication of this information.

CASE REPORT

A 60-year-old obese man had undergone a minimally invasive sternotomy with prosthetic aortic valve replacement. His postoperative course was complicated by a cardiac arrest with mediastinal bleeding requiring re-exploration. An anterior ascending aorta injury was found and was repaired primarily. He was discharged home, but returned 10 days later after a syncopal episode and fall with recurrent mediastinal bleeding.

Repeat sternal exploration was performed after computed tomography diagnosed continued anterior aortic bleeding. Purulent fluid was also drained from the pericardium, and cultures were positive for *Escherichia coli* and *Proteus mirabilis*. He was subsequently discharged to a skilled nursing facility but returned in 1 week with wound dehiscence and recurrent bleeding. A sternotomy was once again performed, and the site of aortic bleeding was repaired with biologic glue because the tissue was felt unsuitable for suture retention. A pectoralis major flap was placed in the sternal wound bed. Three subsequent sternal site washouts followed during the next week, and anticoagulation was held. Unfortunately, he once again became hypotensive, with chest pain and evidence on examination of active bleeding, and underwent another mediastinal hematoma evacuation.

The patient was transferred to our hospital on broad-spectrum antibiotic therapy and concern for continued ascending aorta bleeding and infection. He arrived with imaging demonstrating

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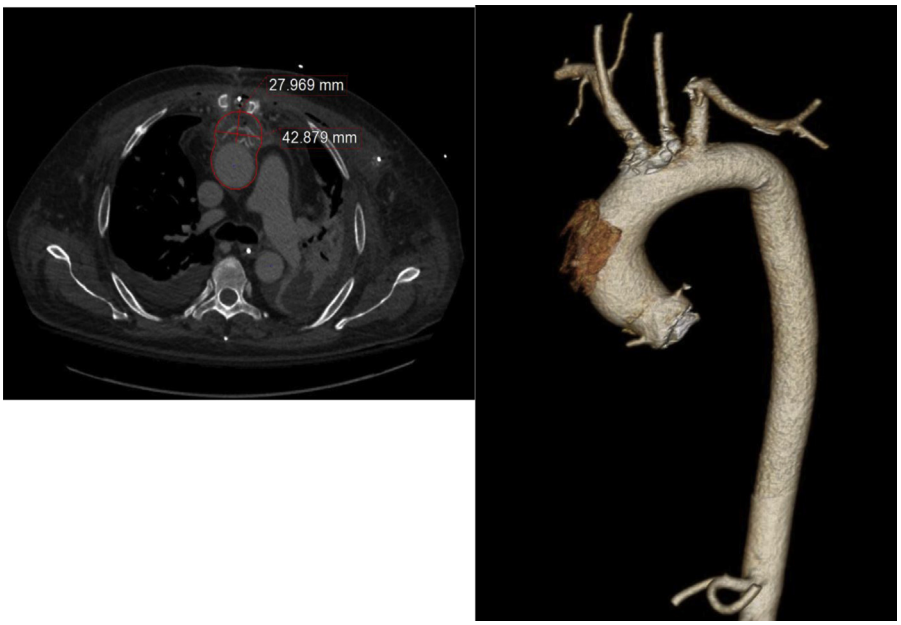

Fig 1. Infected pseudoaneurysm of anterior ascending aorta is seen on **(left)** a computed tomography scan and **(right)** volume-rendered image.

Fig 2. CTAG (W. L. Gore and Associates., Flagstaff, Ariz) device placement in the ascending aorta.

a pseudoaneurysm on the anterior portion of the ascending aorta (Fig 1). Multiple cardiothoracic surgeon consultants judged he was too severely deconditioned to tolerate a repeat open operative intervention requiring cardiopulmonary bypass and ascending aortic graft placement. He was managed initially with pharmacologic hypotension and no anticoagulation, despite the prosthetic aortic valve; however, he had had a recurrent bleeding episode during medical management.

The decision was made to attempt endovascular repair with off-label endograft use for exclusion of the AAP. This was deemed a viable option based on a preoperative computed tomography angiogram showing the ascending aorta was at least 10 cm long. This was confirmed with catheter-based angiogram measurements of the outer wall length; therefore, we chose a 45-mm diameter by 10-cm length CTAG device (W. L. Gore & Associates, Flagstaff, Ariz).

A multidisciplinary team was organized, consisting of a cardiac anesthesiologist, echocardiographer, interventional cardiologist, cardiac surgeon, and vascular surgeons. A temporary pacemaker was placed to provide rapid ventricular pacing for accurate graft deployment. Percutaneous catheterization of the right common femoral artery was performed under ultrasound guidance. A Prostar 10F XL (Abbott, Abbott Park, Ill) device was inserted and deployed with the preclose technique.

After access into the ascending aorta and placement of a Lunderquist double-curved wire (OptiMed, Ettlingen, Germany), a 24F sheath was inserted. Thoracic arch aortography and transesophageal echocardiography showed the prosthetic aortic valve was intact. The Lunderquist wire was advanced and allowed to deflect off of the valve ring. The prosthetic valve was not crossed, reducing the possibility of wire entrapment on the valve and decreasing the risk of damage to the valve leaflets.

A pigtail catheter was passed retrograde from the right brachial artery into the aorta for arch aortography during graft deployment and to facilitate real-time localization of the innominate artery at the point where the brachial and transfemoral wires crossed. A transesophageal echocardiogram was used to confirm ascending aortic diameter measurements and to precisely locate the coronary ostia and the innominate artery orifice.

The CTAG device was advanced into position (Fig 2). A rescue wire was placed from the right brachial artery through the