

# Endovascular repair of an ascending aortic pseudoaneurysm

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Open repair is the gold standard for ascending aortic and aortic arch diseases.<sup>1</sup> The endovascular approach has become the first choice for infrarenal, complex abdominal aortic, and thoracoabdominal aortic aneurysms in experienced centers.<sup>2</sup> However, the unique characteristics of the ascending aorta and aortic arch, including respiratory movement, angulation, hemodynamics, and proximity to the aortic valve and coronary arteries, impose significant challenges for endovascular repair.<sup>3</sup> Patients with a prohibitive risk for open repair could benefit from an endovascular approach in exceptional situations. Although investigational devices are on trial, no dedicated ascending aortic stent grafts are currently commercially available in the United States.<sup>4</sup> We report the case of an 83-year-old man with two prior sternotomies with an ascending aortic pseudoaneurysm. The patient provided written informed consent for the report of his case details.

His relevant surgical history included an aortic valve replacement 30 years prior and redo sternotomy with ascending and hemiarch replacement with two 36-mm Dacron grafts, which were anastomosed in the mid-portion of the anterior mediastinum 2 years prior, exactly at the origin of the pseudoaneurysm. Following this surgery, he required sternal debridement and superficial skin infection treatment, which ultimately healed. His medical history was notable for malignant pleural mesothelioma diagnosed in the same year he was referred to vascular surgery with a good response to chemotherapy and immunotherapy, chronic anticoagulation therapy because of a mechanical aortic valve, hypertension, and hyperlipidemia. Despite all these factors, he was a very functional and fully active person.

Computed tomography angiography of the chest, abdomen, and pelvis demonstrated an extensive bilobed ascending arch pseudoaneurysm immediately adjacent to the sternum in the suture line between the hemiarch and the ascending aortic grafts. In addition, the coronary arteries were widely patent, and the previously known mesothelioma posteriorly was again seen. The centerline of flow demonstrated 21 cm from the left coronary artery to the innominate artery using the greater curvature as reference; the neck of the pseudoaneurysm had 3 cm. The diameters in the proximal and distal sealing zones were 4 cm. The preoperative evaluation included echocardiography showing an ejection fraction of 63% and a well-functioning aortic valve with trivial regurgitation. A positron emission tomography scan demonstrated avid radiotracer uptake by the pleural mass but no uptake by the aortic grafts. Blood cultures were performed, and, importantly, the findings were negative.

A multidisciplinary discussion involving oncology, palliative care, cardiovascular and vascular surgery, and infectious disease was undertaken. Given his adequate response to chemotherapy, our final decision was to proceed with endovascular repair. In a hybrid operating room with the patient under general anesthesia and with rapid ventricular pacing in place, we performed bilateral percutaneous femoral access just before advancing a 24F sheath on the right femoral and a 12F sheath on the left. The ascending aorta was catheterized with a hydrophilic guidewire and exchanged for a Lunderquist wire in the mid-ascending aorta to avoid damage to the mechanical valve. Transesophageal echocardiography in real-time demonstrated no active aortic regurgitation during the procedure. The innominate artery was catheterized and used as an anatomic landmark to facilitate stent graft deployment.

Following an arch angiogram to calibrate the onlay fusion, a stent graft with a 45-mm diameter and 100-mm length was advanced into the ascending aorta. Under rapid ventricular pacing for accurate positioning, we performed c-TAG (W.L. Gore & Associates) active control deployment in two stages. A second stent graft with a 45-mm diameter and 150-mm length was also deployed under rapid ventricular pacing to optimize the distal seal. The technical details are characterized in the [Supplementary Video](#) (online only). The patient was dismissed home on postoperative day

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2 with no complications and promptly resumed chemotherapy. At 9 months postoperatively, computed tomography angiography demonstrated the stent graft in an adequate position, no pseudoaneurysm flow, and widely patent coronary and innominate arteries. However, the patient developed oncologic complications, including metastasis to the thoracic spinal canal, and died 1 year after surgery.

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