Proposal for bail-out procedures - Vascular thoracic

Use of the right brachio-femoral wire approach to manage a thoracic aortic aneurysm in an extremely angulated and tortuous aorta with an endoluminal stent graft

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Abstract

The presence of a tortuous, elongated thoracic aorta and an angulated arch poses a technical challenge for the delivery of an endoluminal graft to the target site. We describe a technique that can safely be used to advance an endoluminal graft up the hostile and tortuous arch.

A 75-year-old man with a past medical history significant for hypertension, hyperlipidemia, coronary artery disease, chronic obstructive lung disease, and prostate cancer post radiation therapy was admitted to the hospital for symptoms of back pain. He was considered high risk for open surgical repair and placement of bilateral arterial radial arterial lines, open percutaneous right brachial approach was therefore performed.

A road map angiogram was obtained through the left common femoral artery with a 5F sheath and a 5F Bernstein catheter formed with a 6F 35 cm sheath and a 5F angiographic pig-tail catheter demonstrated a thoracic aortic aneurysm juxta distal to the left subclavian artery with a very tortuous angled arch (Fig. 1a). Using intravascular ultrasound the proximal neck diameter at the level of the left carotid artery measured 31 mm × 24 mm and a distal neck diameter at the level of the celiac trunk measured 27 mm × 24 mm. Due to the extreme tortuosity of the thoracic arch aorta, it was evident that a thoracic endograft would not be able to negotiate the aortic arch curve and a brahico-femoral wire conduit technique would be required to help navigate the tortuous aortic arch. A retrograde percutaneous right brachial approach was therefore performed with a 6F 35 cm sheath and a 5F Bernstein catheter was used as a guiding catheter to navigate a 260-cm length 0.035-inch angled glide wire into the tortuous descending thoracic aorta under fluoroscopic guidance (Fig. 2b). The wire was subsequently secured through the right groin sheath with the help of a snare. A glide catheter was used as an exchange catheter and the 260 cm length 0.035 inch glide wire was exchanged to a stiff 260 cm length 0.035 inch Lunderquist wire (Cook Bloomington, IN, USA). The 9F sheath in the right groin was exchanged to a 22 F Gore sheath, which was advanced into the distal abdominal aorta. A road map angiogram was obtained through the left groin sheath pig-tail catheter. By keeping a constant tension on the brahico-femoral wire conduit from the right brachial end and the right common femoral end, a 34 mm × 20 cm Gore TAG (W.L. Gore & Associates, Flagstaff, AZ, USA) device was advanced through the tortuous descending aorta into the arch and deployed distal to the left carotid artery.
partially covering the left subclavian artery (Fig. 2c). A 31 mm × 15 cm Gore –TAG device was subsequently deployed distally just above the celiac trunk after an aortogram had been performed to demarcate the distal landing zone on the road map. A third device, 34 mm × 15 cm Gore TAG device, was necessary to cover the area of overlap between the proximal and distal endografts. A completion angiogram demonstrated successful exclusion of the thoracic aortic aneurysm with no endoleak (Fig. 2d). The 22F sheath was then exchanged to a 9F sheath and bilateral iliac angiograms demonstrated no extravasation of contrast. Bilateral 10 mm × 37 mm self-expandable stents were subsequently deployed at the area of previous iliac artery balloon angioplasty. Completion angiogram demonstrated satisfactory angiographic pictures with brisk flow through the iliac vessels and no pressure gradient. Sheaths and wires were removed and the right common femoral artery repaired and a closure device deployed to the left common femoral artery. The patient was extubated and transferred to the recovery room. A postoperative CT scan (Fig. 1b) demonstrated no endoleak with exclusion of thoracic aortic aneurysm.

3. Discussion

Despite improved surgical techniques, the operative mortality with open surgical repair of descending thoracic aortic aneurysms is between 4.8% and 20% [1, 2]. Many authors [3, 4] have confirmed the decreased morbidity and mortality with thoracic stent grafts to treat thoracic aortic aneurysms. An angulated arch and a tortuous aorta is a relative contraindication for deployment of an endoluminal graft. The use of a super stiff wire may not be sufficient to allow the sheath or the endograft to track proximally into the angulated arch.

Use of brachio-femoral access wires can help straighten the most angulated and tortuous aorta. The technique requires that a protective guiding catheter be placed to protect the subclavian artery from injury. It is important to have at least a 260-cm long wire and constant tension must be placed on both ends of the wire as the graft is advanced through the delivery sheath into the aorta. When applying this technique the prudent surgeon must always ensure that a guidewire remains in the aorta upon removal of a delivery sheath and an aortic occlusion balloon should always be available in the operating room in case of a suspected rupture.

In conclusion, proper preparation with adequate imaging should allow successful and safe endovascular repair of the tortuous and angulated thoracic aorta even in difficult access situations. The technique of a brachio-femoral wire should be used with a guiding sheath protecting the subclavian vessels to prevent shearing the vessel when traction on the wire is exerted and finally this technique does pose an inherent risk of thromboembolism from the arch vessels and should not be performed if imaging demonstrates atheroemboli in the arch vessels for fear of atheroemboli to the brain.
References


