SHORT REPORT

Descending Thoracic Endovascular Aneurysm Repair: Antegrade Approach via Ascending Aortic Conduit

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Abstract  Challenging access situations continue to arise in endovascular aneurysm repair, despite evolving arterial access techniques. We report a modified access approach, where an ascending aortic conduit was successfully used for antegrade delivery of a thoracic endograft to repair a descending thoracic aortic aneurysm, in a patient with previous surgical ligation of the infra-renal aorta.
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Introduction

Achieving safe and effective access is of critical importance during thoracic endovascular aneurysm repair (TEVAR). Retrograde device delivery via the trans-femoral route remains the conventional access route, but up to 30% of patients have severe iliac occlusive disease or small calibre vessels, which may preclude endograft delivery. Alternative antegrade access routes have been described, including the transcarotid route,1 transapical delivery,2 direct aortic arch access3 and via aortic arch conduit.4 We report a modified antegrade access technique, where an ascending aortic conduit was used for device delivery during TEVAR, in a patient with a descending thoracic aortic aneurysm and previous ligation of the infra-renal aorta.

Report

A 56-year-old male hypertensive smoker presented with a 7 cm asymptomatic descending thoracic aortic aneurysm. Previous medical history included emergency open repair of a ruptured infra-renal aortic aneurysm; subsequent repair
of aortoduodenal fistula with excision of infected aortic graft, ligation of the infra-renal aorta and axillo-bifemoral graft. Echocardiogram confirmed good left ventricular function and FEV₁ was 2.4L (60% predicted).

Pre-operative CTA demonstrated a 7 cm aneurysm of the mid-descending thoracic aorta, with occlusion of the infra-renal aorta and a single functioning left kidney (Fig. 1).

A median sternotomy was performed and an end-to-side ascending aortic conduit fashioned with a 10 mm Dacron graft, using a side-biting aortic clamp for aortic control. A 0.035-in guidewire was introduced by direct conduit puncture and advanced to the distal descending thoracic aorta, followed by catheter exchange for an Amplatz extra-stiff 0.035-in wire (Boston Scientific, Natick, MA, USA). A slightly higher conduit puncture was used for the introduction of a 5F pigtail catheter to allow for digital subtraction angiography (DSA).

A modified Relay thoracic endograft (Bolton Medical Inc., Sunrise, Florida) was used for the repair, consisting of a 200 mm reverse-tapered endograft with a proximal diameter of 34 mm and a distal diameter of 36 mm, with bare stents proximally and distally. The primary sheath had been shortened from 600 mm to 400 mm, with removal of the spiral support strut.

The endograft was advanced in an antegrade fashion over the stiff wire, using a #11 blade to slightly enlarge the conduit puncture hole, allowing the device introducer sheath to fully enlarge the graft opening. Positioning of the graft was confirmed by DSA and the endograft was deployed in a caudal-cranial fashion. Following angiographic confirmation of the position, the proximal and distal bare stents were released. A final angiographic run confirmed successful exclusion of the aneurysm, with preservation of the left subclavian artery (Fig. 2). Following removal of the delivery system, the ascending aortic conduit was excised leaving a 3 mm cuff, used to oversew the aortotomy. The patient made an uneventful post-operative recovery and was discharged home on the fifth day postoperatively. One-month follow-up CT scan confirmed exclusion of the aneurysm.

Discussion

Antegrade delivery via the carotid arteries was initially considered as an alternative approach, but concerns were raised regarding the risk of peri-procedural stroke, in the presence of small calibre carotid arteries and challenging arch vessel anatomy.5

Antegrade aortic arch access has been previously documented for treatment of distal aortic arch or descending

Figure 1  Posterior view of a volume rendered CT image demonstrates the descending thoracic aortic aneurysm and ligated infra-renal aorta.

Figure 2  Completion DSA confirming successful aneurysm exclusion, with preservation of the left subclavian artery.
thoracic aortic aneurysms. Direct access to the aortic arch can be successfully achieved via aortotomy between the left common carotid and subclavian arteries, suturing the proximal end of the stent-graft circumferentially onto the aortic wall, followed by closure of the anterior arteriotomy. This technique requires circulatory arrest with extracorporeal circulation. Access to the aortic arch using a conduit technique has been previously performed without haemodynamic compromise, but excessive intimal debris may limit access sites due to the risks of cerebral embolisation.

In this case, optimal access was achieved at the level of the ascending aorta at median sternotomy. The technical aspects of fashioning the conduit were straightforward and performed without circulatory arrest or haemodynamic manipulation.

A custom-made stent was required, using a shortened primary delivery sheath to facilitate access and a reverse-taper to allow for caudal-cranial deployment. Removal of the spiral support strut reduced the relative rigidity of the introduction system and no problems were encountered when crossing both curvatures of the aortic arch. Generous proximal and distal sealing zones were planned, whilst preserving the left subclavian and lower intercostals arteries, aiming to reduce the higher risk of spinal ischaemia due to previous intra-renal aortic surgery.

This technique could provide a valuable alternative access route in carefully selected patients unsuitable for iliofemoral or other antegrade access techniques.

Conflict of Interest/Funding

None.

References