Short Report

Challenging Narrow Distal Aorta in Abdominal Aortic Aneurysm – Endovascular Repair Using a Reversed Flared Endoprosthesis

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A B S T R A C T

Introduction: Narrow aortic bifurcations are a challenging issue while treating abdominal aortic aneurysm by endovascular means. Off-the-shelf products are often not suitable and special considerations and custom-made endoprostheses are necessary.

Report: Alternatively, some morphologies qualify for a flared tube graft. We report two successful aneurysm exclusions using custom-made (Anaconda, Vascutek/Terumo) step-down diameter grafts in patients with tight distal aortas without the need for pre-interventional endograft adjustments.

Discussion: In these two cases, implantation of a custom-made proximally flared tube endograft in treating a localised abdominal aortic aneurysm with a narrow and calcified bifurcation seems feasible. They represent uncommon, yet challenging, issues worthy of attention.

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Endovascular management of abdominal aortic aneurysm calls for adequate proximal and distal landing zones. A narrow aortic bifurcation, limb kinking, extensive thrombus and poor outflow all seem to affect limb patency. Placement of a tube graft to exclude an aortic aneurysm is a valid alternative in a narrow setting. This modality does not further constrain the distal aorta. However, in these cases, reaching a tight seal and anatomical fit in the larger proximal neck and in turn smaller distal aorta is demanding. In an endovascular setting, off-the-shelf endoprosthesis for iliac limb extensions are readily available in a distally tapered fashion. We report two cases dealing with a narrow distal aorta in abdominal aortic aneurysm. Endovascular treatment was possible using a custom-made reversely mounted flared leg – typically used in iliac arteries – in aortic position as a tube graft to avoid further narrowing. After having acquired the respective measurements preoperatively, the endografts were manufactured in Scotland (Anaconda, Vascutek/Terumo, Renfrewshire, Scotland, UK).

Report

First, we report the case of an 85-year-old man (Fig. 1) who presented with an asymptomatic infrarenal saccular aortic aneurysm (diameter of 6.5 cm). The aortic neck was 21 mm in diameter, 25 mm long and straight. The aortic part distal to the aneurysm was 17 mm in diameter, 40 mm long and straight with a heavily calcified aortic bifurcation. We used an endoprosthesis with the following dimensions: proximal diameter 23 mm, distal diameter 17 mm and length 88 mm.

The second patient was a 73-year-old woman (Fig. 2) who had had a known small abdominal aortic aneurysm for 10 years, finally reaching a diameter of 5.0 cm. The computed tomography scan showed the following: neck diameter 19 mm, neck length 27 mm and neck angulation 50°. The aortic part distal to the aneurysm was 41 mm long, straight and 12 mm wide as well as severely calcified at the aortic bifurcation. We used an endoprosthesis with the following dimensions: proximal diameter 23 mm, distal diameter 12 mm and length 110 mm. After implantation, the on-table angiography showed a distal endoleak type 1, which was successfully treated with a graft extension (diameter 12 mm and length 60 mm).

The postoperative courses were uneventful; pre-discharge and 30 months (first case) and 7 months (second case) follow-up duplex scans confirmed successful endovascular aneurysm exclusion (i.e., stable or shrinking sac size, no endoleaks). Patients gave informed consent for the implantation and documentation of this device and the procedures were performed following the ethical guidelines of our department as approved by the local committee.

Discussion

A narrow distal aorta can predispose to graft limb thrombosis through graft impingement, infolding and kinking. In addition, calcifications might limit the graft conformability and therefore
constrain the two graft limbs.\textsuperscript{1–3} In order to avoid the threats of such a distinct narrow and calcified distal aortic morphology we did not want to implant a bi-iliac endograft, which could further diminish the available lumen. Deployment of a tube graft seemed feasible. However, the available endografts are, if flared at all, proximally smaller and distally larger. Furthermore, thoracic endografts are generally oversized when dealing with aortic bifurcations of as small as 12 mm. The use of an off-label self-made reversed endograft has been reported. It requires pre-interventional extracorporeal graft modifications.\textsuperscript{4} These self-made devices are more readily available, being not dependent on a custom-made device requiring manufacturing and entailing delivery time. However, these techniques require operating room time, hence adding procedural costs. Sterility remains an issue with extracorporeal endograft adjustments taking place.

We realise that the first endovascular devices in the 1990s were straight tubular grafts. Due to poor outcome, their use was abandoned. However, re-evaluation of this particular technique could be valuable. Grafts have undergone considerable evolution in the past years and, as described above, not just straight tubes, but flared endografts were used to support improved conformability in these demanding situations. Traditional open aortic repair or implantation of an aorto-uni-iliac graft with concurrent femoro-femoral crossover bypass and common iliac occlusion are an alternative, especially in short distal aortic necks. Clearly, such procedures would entail greater invasiveness.

**Figure 1.** a: Preoperative coronal view computed tomography. b: Pre- and post-implantation angiography.

**Figure 2.** a: Preoperative coronal view computed tomography. b: Pre- and post-implantation angiography.
In these two cases, implantation of a custom-made proximally flared tube endograft in treating a localised abdominal aortic aneurysm with a narrow and calcified bifurcation seems feasible. They represent uncommon, yet challenging, issues worthy of attention. There were no extra costs and delivery was timely (4 weeks), allowing for prompt treatment without the necessity of pre-interventional off-label endograft amendments. A long-enough segment of non-dilated aorta from the distal aneurysm end to the aortic bifurcation is needed for good fixation and sealing. Long-term durability remains an issue.

Conflicts of Interest

None.

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References