How I Do It

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Hybrid Antegrade Thoracic Aortic Stenting via a Temporary Ascending Aortic Graft Conduit for a Patient with Poor Peripheral Vascular Access

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Abstract

In patients with poor peripheral vascular access, thoracic aortic stenting procedures can be technically very challenging. Antegrade aortic stent deployments during concomitant open ascending and arch procedures are well described, but the issue of long endovascular catheters and wires may make such an approach difficult and awkward. We describe a novel hybrid method involving a temporary graft conduit to the ascending aorta which is brought caudal toward the foot of the table to facilitate antegrade deployment of the thoracic stent graft.

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Key Words

Aortic operation · Hybrid theater · Endovascular procedures

Introduction

The most common vascular access for thoracic endovascular aortic repair (TEVAR) is the femoral artery; hence the majority of stent systems and related catheters and wires are designed for such an approach. Although antegrade TEVAR stent placement has been previously described as an intraoperative adjunct to concomitant open ascending and arch procedures, the problem with long wires and awkward positioning of the stent system in relation to the operative field and C-arm of the X-ray device has remained unsettled [1,2].

Technique

The patient is put under general anesthesia and the operation is performed in a hybrid operating room. After median sternotomy, the ascending aorta is isolated and a side-biting clamp applied to the ascending aorta at systolic pressure of 80 mm Hg. Systemic heparin is given to keep activated clotting time around 200-250 s. A 10 mm × 40 cm Hemashield Platinum graft (Maquet, Wayne, NJ, USA) is anastomosed to the ascending aorta (Fig. 1). The graft conduit is de-aired on releasing the aortic side-biting clamp and is brought down to the femoral level. Hemostasis is checked and secured and the sternal retractor is then removed to avoid interfering with the subsequent radiological image. The sternal wound is packed with gauze and an

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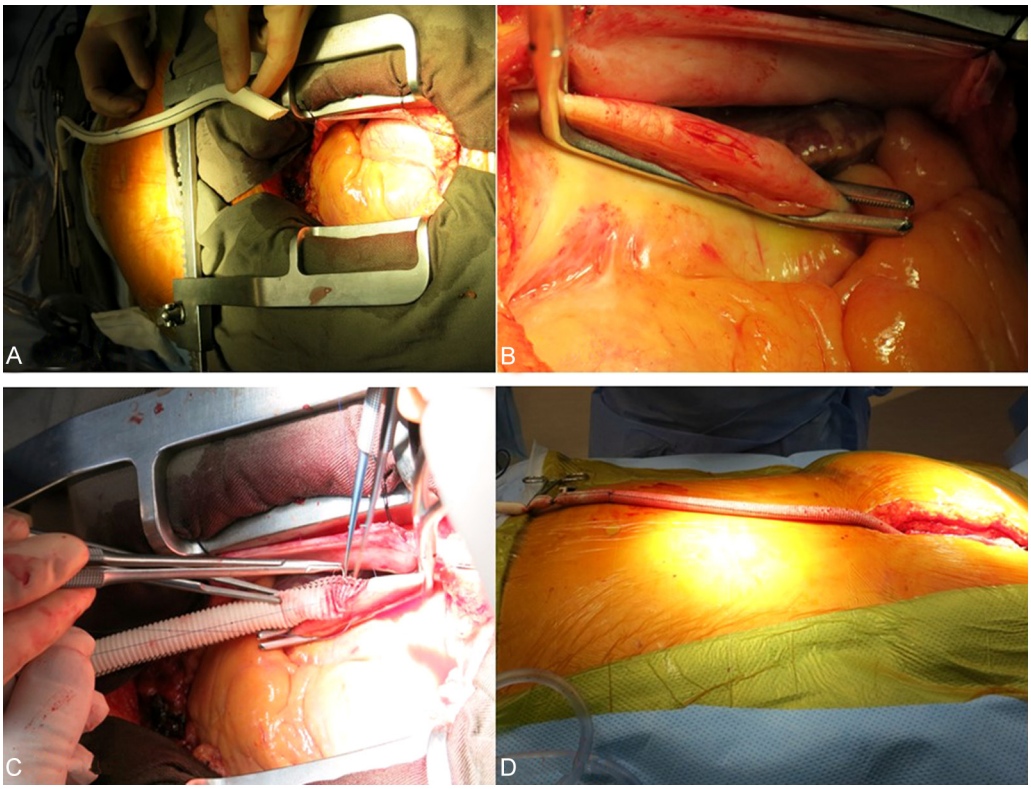

Figure 1. A. An operative view with the patient's head to the right of the figure. Median sternotomy was performed with the sternal retractor in place. The graft conduit was trimmed to leave an oblique end for better angulation during the introduction of endovascular catheters. B. A side-biting clamp was applied to the ascending aorta. C. The graft conduit was anastomosed to the ascending aorta. D. The sternal retractor was removed, and the graft conduit was clamped, de-aired, and brought down to the right femoral artery level.

adhesive film is used to cover the sternal wound and to fix the graft conduit to the patient's body to avoid excessive movement during introduction of the wires and stent (Fig. 2).

The free end of the graft conduit is snared against an 8 French sheath to allow passage of catheters and wires as per the usual TEVAR procedures (Fig. 3). A 4 French pigtail catheter is introduced via the 8 French sheath to the ascending aorta and an aortogram is taken and set as a roadmap for the subsequent TEVAR procedure. The pigtail catheter is then advanced to the distal descending thoracic aorta and a Lunderquist® Extra-Stiff guide wire (William A. Cook Australia, Brisbane, Australia) is introduced into the descending thoracic aorta. The endograft is deployed under fluoroscopic guidance.

As in a conventional TEVAR procedure, the concept of landing zones is applied, and the head and neck vessels may need to be reconstructed or bypassed before the final stent deployment. Embolization of the left subclavian artery with coils to prevent type II endoleak may be applied as indicated.

After removal of the catheters and wires, the temporary graft conduit is doubly ligated (or, alternatively, may be oversewn) at the origin of the anastomosis to the ascending aorta. The operation is completed in the usual manner after hemostasis and drain placement.

Clinical Experience

A 69-year-old Chinese woman with body mass index (BMI) of 35 presented to us with acute onset of chest pain. Computed tomography confirmed an 8 cm proximal descending thoracic aneurysm and small bilateral femoral arteries with diameter less than 7 mm. Her external iliac arteries were small and her common iliac arteries were short, heavily calcified, and very deep down at the retroperitoneal level (Fig. 4). In view of the small femoral access

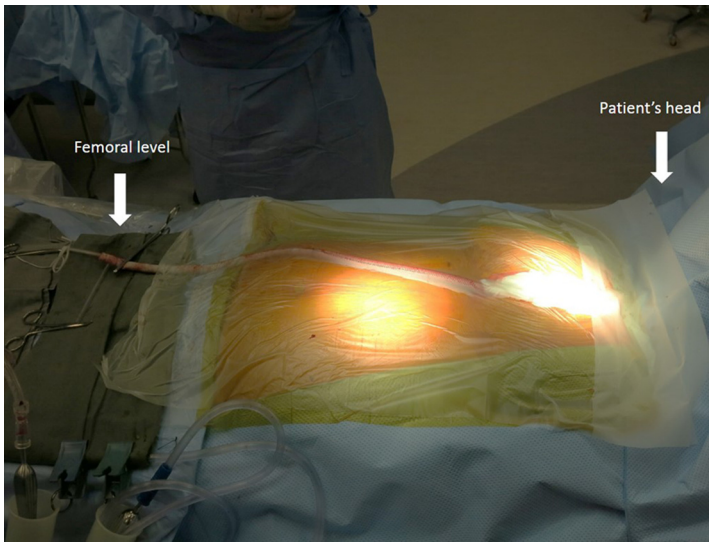

Figure 2. The sternal wound was packed with gauze and a transparent adhesive film was applied to fix the graft conduit.

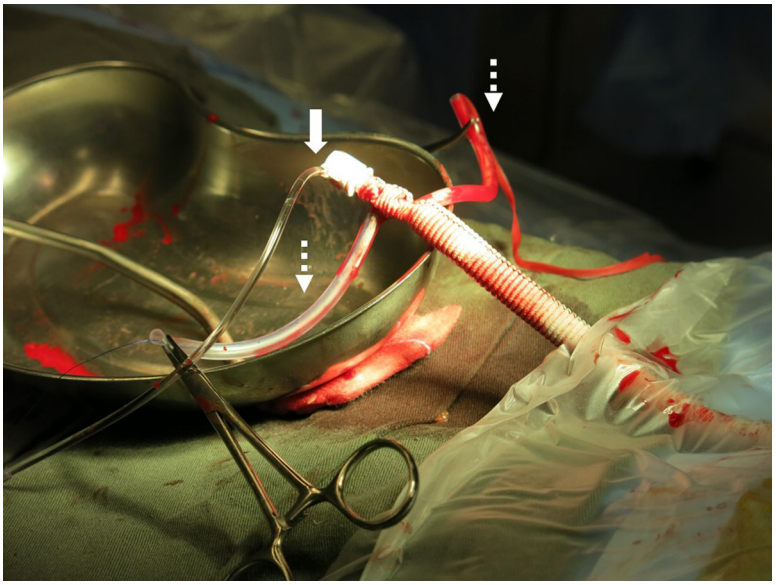

Figure 3. An 8 French vascular sheath (**white arrow**) was placed into the distal end of the graft conduit and doubly snared (**white dotted arrows**) to ensure a bloodless field during catheter exchange.

vessels and technically difficult iliac conduit, we decided to adopt our antegrade graft conduit approach for her TEVAR procedure. The operation was carried out as follows. After setting a roadmap via the antegrade graft conduit, a 42 mm × 150 mm Valiant® Thoracic Aortic Stent graft (Medtronic, Minneapolis, MN, USA) was deployed under fluoroscopic guidance. We noted a minor type Ia endoleak from the inferior aspect of the proximal landing zone. We proceeded to a second 42 mm × 150 mm Medtronic Valiant® Thoracic Aortic Stent graft deployment, and a postprocedural aortogram showed a completely excluded aortic aneurysm (Fig. 5). The left subclavian artery was embolized with embolization coils to prevent type II endoleak. The patient had a nondominant left vertebral artery and her circle of Willis was complete, hence left carotid-subclavian artery bypass was not necessary.

Figure 4. Preoperative three-dimensional reconstruction of the proximal descending thoracic aneurysm (**white arrow**) and the small femoral artery (**white dotted arrow**).

Comment

Although transfemoral access is the most accepted standard vascular access for TEVAR, it is reported that up to 30% of patients are found to have iliac arterial anatomy unsuitable for transfemoral access [3]. An iliac conduit is the most common nonfemoral access for TEVAR, but retroperitoneal exposure of the common iliac artery is particularly difficult in obese patients and those who have had previous operations in the same area of the abdomen [4]. Our patient had a BMI of 35, and she has short and calcified common iliac arteries that precluded a safe iliac approach. A common carotid approach for TEVAR has been described previously, based on the observation that the proximal common carotid arteries tend to be large and relatively free from atherosclerotic disease. However, we found that such an approach could be awkward because it involves usage of long wires and devices that extend up to the patient's neck region; the awkward approach required extra attention to operating room configuration and setup of the operative field.

We present a novel approach utilizing a temporary ascending aortic graft conduit to facilitate the TEVAR procedure. Since the free end of the conduit can be brought down caudally to the femoral level and fixed with an adhesive film, this procedure rendered possible a more convenient use of conventional TEVAR stent, catheters, and wires.

A Medtronic Valiant® graft was chosen because of its indistinct proximal and distal stent graft design, in contradistinction to the Zenith® TXZ® stent graft (William A. Cook Australia, Brisbane, Australia) which has sharp barbs over the proximal part of the stent. Also, the Medtronic Valiant® graft does not require the complex orientation required by the RELAY® thoracic

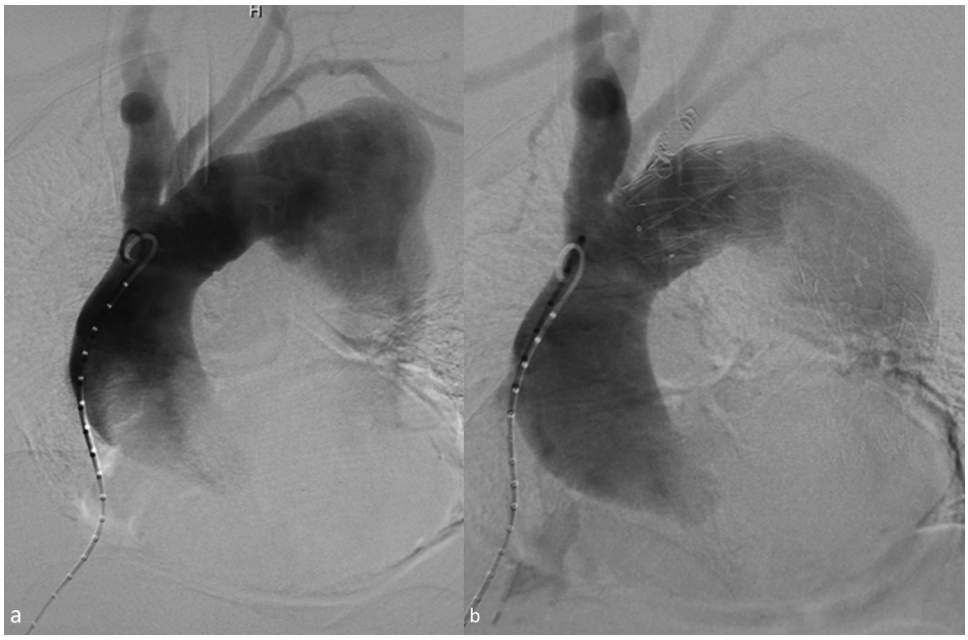

Figure 5. a. On-table antegrade digital subtraction angiogram showing the anatomical location and morphology of the descending thoracic aneurysm. b. On-table antegrade digital subtraction angiogram showing complete exclusion of the aneurysm after stent graft deployment and embolization of the left subclavian artery.

stent graft (Bolton Medical, Sunrise, FL), which has an S-bar that has to be aligned with the outer curve of the aortic arch. Although the GORE® TAG® stent graft (W.L. Gore and Associates, Flagstaff, AR, USA) is not available Hong Kong, it also has indistinct proximal and distal design that allows retrograde or antegrade placement and can be considered for use during antegrade deployment.

A hybrid operating theater is an essential and integral part of the antegrade approach. It avoids unnecessary transportation of the patient to a separate interventional radiology suite. Especially, in our case, it was unsafe to transport the patient with an open chest and a graft conduit.

Our case illustrates the technical feasibility of antegrade deployment of TEVAR via an elongated graft conduit. In the future, a parasternal or mini-sternotomy approach can be taken to minimize the access trauma and further improve patient satisfaction.

Conflict of Interest

The authors have no conflict of interest relevant to this publication.

Comment on this Article or Ask a Question

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