Endovascular aortic aneurysm repair using a bifurcated stent graft in a patient with femoro-femoral bypass

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A challenging iliac anatomy remains a major obstacle to successful endovascular aortic aneurysm repair. The authors experienced an abdominal aortic aneurysm with bilateral common iliac artery aneurysms in a patient that had undergone femoro-femoral bypass due to left external iliac artery (EIA) occlusion. To treat this patient in a totally endovascular manner, a bifurcated stent graft was used. One iliac limb was deployed in the right internal iliac artery (IIA) and the other in the right EIA; the left IIA was embolized with coils. Here, the authors describe the procedure used and provide technical tips. [Ann Surg Treat Res 2015;89(2):107-110]

Key Words: Abdominal aortic aneurysm, Endovascular aneurysm repair

INTRODUCTION

Iliofemoral access-related difficulties are among the main problems encountered during endovascular aortic aneurysm repair (EVAR). These difficulties include combined iliac artery aneurysm, a short common iliac artery (CIA), stenosis or occlusion of the iliofemoral artery, and iliac artery tortuosity [1,2].

New stent graft/delivery systems and special techniques have been introduced to overcome these issues. Here, we introduce a novel technique based on a normal bifurcated stent graft to great abdominal aortic aneurysm (AAA) with bilateral CIA aneurysms and unilateral external iliac artery (EIA) occlusion.

CASE REPORT

A 77-year-old male patient was presented with an incidentally found AAA. The patient had undergone femoro-femoral cross-over bypass 8 years previously due to left EIA occlusion. His

medical history included severe chronic obstructive pulmonary disease, chronic kidney disease (stage 3), and rheumatoid arthritis. Computed tomography arteriography (CTA) showed a 5.3-cm infrarenal AAA, a 2.2-cm right CIA aneurysm, and a 3.9-cm left CIA aneurysm (Fig. 1). Both internal iliac arteries (IIAs) were patent. In such a patient, several endovascular methods are possible, such as, aorto-uni-iliac (AUI) device placement with IIA bypass, AUI device placement with sandwich technique, or the use of an iliac branch device (IBD). We planned to use a normal bifurcated stent graft (Fig. 2).

Initially, a 7-Fr Shuttle sheath (Cook Inc., Bloomington, IN, USA) was inserted through the left axillary artery to the left CIA, and then the left IIA was cannulated and embolized with coils (Fig. 3). After aortography, the main body of the bifurcated stent graft (Zenith, 24–82 mm; Cook Inc.) was introduced through the right common femoral artery and fully deployed. Another 8-Fr sheath was then introduced through the main body sheath, while a Lunderquist extrastiff guidewire (Cook Inc.) was kept in the main body. The contralateral gate of the

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Fig. 1. Preoperative computed tomography arteriography. Axial images (A, B) and volume rendering image (C).

Fig. 2. Preoperative anatomical measurements (A) and endovascular aortic aneurysm repair planning (B). Unit: mm.

main body was then cannulated, and a bridge iliac limb (Zenith, 8–54 mm) was deployed through the main body sheath. After this deployment, the Shuttle sheath on the left axillary artery was changed to a 12-Fr Ansel sheath (Cook Inc.) to introduce a 10-mm-sized Viabahn stent graft (W. L. Gore and Associates, Flagstaff, AZ, USA). The contralateral limb and the right IIA were cannulated through the Ansel sheath. Subsequently, 10 × 100-mm Viabahn stent graft was deployed from the bridge iliac limb to the right IIA. Finally, an ipsilateral iliac limb (Zenith, 12–90 mm) was inserted and deployed in the right EIA through the main body sheath. Final angiography showed no endoleak and good flow to the right IIA.

A follow-up CTA in 6 months revealed patent stent grafts and aneurysm shrinkage without endoleak (Fig. 4).

DISCUSSION

An AUI device offers the easiest way to perform EVAR for

AAA combined with unilateral iliofemoral occlusive disease. However, an additional procedure or special device is necessary to preserve pelvic perfusion if an ipsilateral CIA aneurysm is present or the CIA is too short. Actually the CIA is shorter in Asians than in Caucasians [3]. In a Korean study on 192 patients with AAA, the incidence of combined CIA aneurysm was 68.6% (33.3% unilateral and 24.8% bilateral) [4].

If we use an AUI device, we need adjunctive procedures (e.g., the sandwich technique, an IBD or EIA to IIA bypass) to preserve pelvic perfusion because our patient had bilateral CIA aneurysms.

Reported results for the sandwich technique are relatively satisfactory, although there is a risk of gutter endoleaks [5]. However, this technique is not feasible in all cases because of optimal size combinations for this [6].

Regarding IBDs, several reports have been issued on 138 Zenith IBDs (Cook Inc.). The technical success rate of EVAR using an IBD has been reported to be 94% with a branch

Fig. 3. Procedural details. (A) The left right internal iliac artery (IIA) was embolized with coils through the left axillary artery. (B) The main body stent graft (Zenith, 24–82 mm) was deployed after aortography. (C) The contralateral gate of the main body was cannulated via the main body sheath. (D) A contralateral bridge iliac limb (Zenith, 8–54 mm) was deployed. (E) The contralateral iliac limb was extended to the right IIA using a 10 × 100-mm Viabahn stent graft. (F) Finally, the ipsilateral iliac limb (Zenith, 12–90 mm) was deployed to the right external iliac artery.

Fig. 4. Follow-up computed tomography arteriography 6 months after endovascular aortic aneurysm repair. Axial images (A, B) and volume rendering image (C).

patency of 94.6% at 30 days and of 81.8% at 5 years [7]. However, these IBDs are not available in Korea. Furthermore, although a custom-made IBD has been described [8] and domestic IBD was recently introduced, no long-term data is available for either as yet.

The bell-bottom technique is also an option. In our patient, the diameter of the right CIA was 22 mm and Endurant stent graft (Medtronic Inc., Santa Rosa, CA, USA) provides up to 28-mm flared iliac limbs. However, concerns have been voiced about distal endoleaks or secondary interventions caused by continued iliac artery enlargement [9].

Minion et al. [10] previously reported a trifurcated endograft technique for hypogastric preservation using two bifurcated stent grafts. One bifurcated main body stent graft is used like an IBD. Our technique is a modification of this technique. We inserted one iliac limb to the ipsilateral IIA and the other into the ipsilateral EIA. The distal opening diameter of Zenith bifurcated main body was 12 mm and diameter of the right IIA was 8.8 mm, and thus, due to size discrepancy, a 8- to 54-mm Zenith iliac limb was deployed as a bridge, and then a 10

× 100-mm Viabahn stent graft was extended distally to the right IIA through the left axillary artery. The benefits of our technique are that it avoids the need for device modification and open surgery (EIA to IIA bypass), and presents a lower risk of a type III endoleak than sandwich technique. Furthermore, our technique may be applied in other specific situations, for example, it could be used combined with contralateral IIA and EIA embolization and femoro-femoral bypass to treat AAA with bilateral CIA aneurysms.

The described case demonstrates that both limbs of the main body can be used for the ipsilateral IIA and EIA. This novel technique may be applied in some challenging EVAR cases and help avoid open surgery. Nevertheless, precise preoperative planning and proper device selection are crucial.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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