Minimally Invasive Two-Stage Procedure of Aorto-Bi-Iliac Stent-Graft Implantation Performed in a Patient with an Abdominal Aortic Aneurysm and Long-Segment Iliac Artery Occlusion: A Case Report

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Patient: Male, 76-year-old
Final Diagnosis: Abdominal aortic aneurysm (AAA)
Symptoms: Lower back pain
Medication: —
Clinical Procedure: —
Specialty: Surgery

Objective: Unusual setting of medical care
Background: Patients with an abdominal aortic aneurysm and long-segment iliac artery occlusion are usually treated with aorto-uni-iliac stent-graft implantation with femoro-femoral crossover bypass. However, it is more invasive than aorto-bi-iliac stent-graft implantation and poses patency issues. Herein, we describe a minimally invasive two-stage procedure of aorto-bi-iliac stent-graft implantation following iliac artery endovascular recanalization.

Case Report:
A 76-year-old man was diagnosed with an abdominal aortic aneurysm and long-segment left iliac artery occlusion. Abdominal aortic aneurysm was diagnosed during the examination of lower back pain. There were no other symptoms, including intermittent claudication. Factoring in his frail constitution and multiple comorbidities, we decided to perform aorto-bi-iliac stent-graft implantation after iliac artery endovascular recanalization to improve the patency of the left iliac artery. Aorto-bi-iliac stent-graft implantation was performed 2 days after iliac artery endovascular recanalization to avoid distal embolization. The postoperative course and 1-year follow-up were uneventful, with computed tomography revealing no endoleak and good patency.

Conclusions:
The stent-graft implantation used in this patient is minimally invasive and results in good patency while reducing the risk of embolization. Furthermore, the long-term outcome of aorto-bi-iliac stent-graft implantation following iliac artery endovascular recanalization is more favorable than that involving treatment with aorto-uni-iliac stent-graft implantation with femoro-femoral crossover bypass.

Keywords: Aortic Aneurysm, Abdominal • Iliac Artery • Minimally Invasive Surgical Procedures • Vascular Patency

Abbreviations: AAA – abdominal aortic aneurysm; ABIS – aorto-bi-iliac stent-graft; AUIS – aorto-uni-iliac stent-graft; CTA – computed tomography angiography; FFB – femoro-femoral crossover bypass; IAER – iliac artery endovascular recanalization; TASC – Trans-Atlantic Inter-Society Consensus Classification

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Background

Patients with an abdominal aortic aneurysm (AAA) and long-segment iliac artery occlusion are usually treated with aorto-uni-iliac stent-graft (AUIS) implantation and femoro-femoral crossover bypass (FFB) [1]. However, compared with aorto-bi-iliac stent-graft (ABIS) implantation, AUIS is more invasive and poses patency issues. Herein, we describe a minimally invasive two-stage procedure of ABIS implantation following iliac artery endovascular recanalization (IAER) to improve the patency of the iliac artery in a patient with an AAA and long-segment iliac artery occlusion.

Case Report

A 76-year-old man was referred to our department for AAA treatment. AAA was diagnosed during the examination of lower back pain. There were no other symptoms, including intermittent claudication. Computed tomography angiography (CTA)
revealed an AAA and left iliac artery occlusion (Figure 1). The patient was blind, regularly underwent hemodialysis, and was receiving steroid therapy for eosinophilia. Considering the substantial risk of perioperative complications with open surgery, we decided to perform a two-stage procedure of ABIS implantation following IAER. The aim was to improve the patency of the left iliac artery and to achieve better outcomes than those associated with AUIS and FFB.

First, IAER was performed under local anesthesia. A 6-Fr balloon-assisted guiding catheter (Optimo PPI; Tokai Medical Products, Aichi, Japan) was retrogradely inserted via the left common femoral artery and inflated to prevent distal embolization. A 0.014-inch guidewire (Astato XS 9-12; Asahi Intecc Co. Ltd., Japan) was successfully passed from the completely occluded distal external iliac artery to the aorta. Under intravascular ultrasound guidance, percutaneous old balloon angioplasty with a 3.0/180-mm balloon (Jade; OrbusNeich Medical, Japan) and a 6.0/150-mm balloon (Metacross; Terumo Cardiovascular Systems Corporation, Ann Arbor, MI, USA) was performed. Intraoperative angiography revealed good opening of the iliac artery with no distal embolization (Figures 2-4).

ABIS was implanted under general anesthesia 2 days after IAER. Both common femoral arteries were exposed via 3-cm-long transverse oblique incisions in the groin immediately below the inguinal ligaments. The main body and ipsilateral leg of ABIS (Zenith Alpha; Cook Medical, Bloomington, IN, USA) were deployed via the right femoral artery in a standard manner. A 79-mm covered stent (Viabahn VBX; Gore Medical, Flagstaff, AZ, USA) was used as a contralateral leg and was deployed via an 8-Fr sheath placed in the left femoral artery and dilated with a 12-mm balloon (Armada; Abbott Laboratories, Abbott Park, IL, USA). A bare stent (Luminexx; Bard Inc., Murray Hill, NJ, USA) was placed in the external iliac artery and connected to the Viabahn VBX covered stent. No complications occurred during the procedure. Intraoperative angiography revealed no endoleak (Figures 5, 6), which was further confirmed by postoperative CTA, along with good patency (Figure 7). The patient’s postoperative course and 1-year follow-up were uneventful.
Figure 6. Intraoperative angiography image obtained during endovascular aortic aneurysm repair. Angiography image obtained after endovascular aortic aneurysm repair shows no endoleak.

Figure 7. Postoperative computed tomography angiography image shows no endoleak and good patency.

Discussion

Our patient was not eligible for open surgery using a bifurcated graft with distal anastomosis of the right common iliac artery and left common femoral artery because he had multiple comorbidities. AUIS implantation with FFB is the most commonly performed procedure for IAER. However, compared with ABIS, it is more invasive and poses patency issues. Baptiste et al reported that ABIS implantation resulted in better patency than AUIS implantation [2]. Moreover, primary patency rates at 5 years after FFB have been reported to range from 44% to 86% [3].

Our patient had a long-segment iliac artery occlusion classified as a Trans-Atlantic Inter-Society Consensus Classification (TASC) D lesion. Although TASC D lesions are generally treated with open surgery [4], a primary endovascular approach may be considered for treating aortoiliac TASC D lesions in patients with severe comorbidities, provided it is performed by an experienced team [5].

We used intravascular ultrasound guidance to observe the wire passing through the true lumen. The use of a 6-Fr Optimo PPI catheter enabled us to arrest the iliac artery flow and augment active iliac artery flow reversal. Consequently, any particle released during IAER passes through the catheter in a retrograde manner and can be retrieved from the arteriovenous conduit filter outside the body, thereby preventing distal embolization [6]. In contrast, the use of a retrograde approach often results in embolization in the completely occluded common iliac artery at a site different from the original occlusion site; therefore, it is necessary to use a short main body to deploy the contralateral gate at a level higher than the new aortic bifurcation.

A previous study has reported the safety and a low rate of distal embolization after treating aortoiliac occlusive disease with IAER [7]. However, another previous study reported that acute thrombosis (<24 h) can occur due to intimal injury, which leads
to platelet activation and aggregation, inflammatory cascade activation, and subsequent smooth muscle proliferation during the procedure [8,9]. As the thrombus formation mechanism had been activated during IAER, immediately performing another procedure that included the use of a thick endovascular aortic repair sheath would have put the patient at high risk of distal embolization. Therefore, a two-stage procedure was considered safer than the single procedure.

In this case, we performed ABIS implantation 2 days after IAER, and we selected the Zenith Alpha stent-graft with the thinnest body, which has a contralateral gate of 11 mm, can be connected to a 79-mm Viabahn VBX, requires an 8-Fr sheath, and can be dilated to 8 mm. Because it is thinner than the 12-Fr sheath, we could prevent distal embolization and avoid additional IAER and open surgery, reduce fluoroscopy times, and decrease the length of hospital stay [10].

Conclusions

We performed the two-stage procedure of ABIS implantation following IAER in a patient with an AAA and iliac artery occlusion. We considered it to be minimally invasive, and the long-term outcome is more favorable than that of AUIS implantation with FFB. Moreover, we noted increased vascular patency with minimal postoperative issues for a patient with multiple comorbidities, suggesting that the procedure has multiple advantages. To the best of our knowledge, this is the first report of the use of a minimally invasive two-stage procedure of ABIS implantation following IAER in a patient with an AAA and iliac artery occlusion.

Declaration of Figures’ Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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