Successful Endovascular Treatment for High Take Off Aorto-iliac Occlusive Disease

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Abstract

A 73-year-old man with a history of intermittent claudication for the previous six years visited our hospital. His ankle-brachial index (ABI) was very low on both sides, and computed tomography (CT) indicated bilateral aorto-iliac occlusive disease (AIOD). As he refused to undergo open surgery, endovascular treatment (EVT) was administered. After the first and second EVT sessions, the intermittent claudication improved completely. In addition, the ABI normalized (right: 1.01, left: 0.99), and CT demonstrated full expansion of the stents. His post-EVT course was uneventful for 18 months. The use of EVT to treat AIOD is technically feasible and may serve as a potential treatment option for patients with an inoperable condition.

Key words: aorto-iliac occlusive disease, endovascular treatment

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Introduction

Aorto-iliac occlusive disease (AIOD) is characterized by the onset of marked gradual occlusion of the terminal aorta and/or bilateral iliac arteries. Although surgical reconstruction is recommended in patients with AIOD according to the Trans-Atlantic Inter-Society Consensus Document on the Management of Peripheral Arterial Disease (TASC) II guidelines, we successfully treated the high take off AIOD in the current case using endovascular treatment (EVT) in a patient with an inoperable condition. In this report, we demonstrate the detailed technical methods of EVT for AIOD.

Case Report

A 73-year-old man with a history of myocardial infarction (MI) visited our hospital with a history of intermittent claudication lasting for six years. The culprit lesion of the MI was the first diagonal branch of the proximal left anterior descending coronary artery (LAD) (seg.6), which had been successfully treated with bare metal stent implantation three weeks prior to the patient’s current visit. However, angiography showed chronic total occlusion (CTO) of the mid-LAD with a moderate collateral flow from the left circumflex and right coronary arteries. The patient’s comorbid coronary risk factors included hypertension, dyslipidemia and current smoking. He had no history of vasculitis, allergies or autoimmune diseases. Upon an examination, the bilateral common femoral arteries were not palpable. The patient’s body mass index was 21.6 kg/m², with the following laboratory data: hemoglobin, 12.8 g/dL; serum creatinine, 0.85 mg/dL (estimated GFR, 65 mL/min/1.73 m²); hemoglobin A1C, 5.7%; and total cholesterol, 144 mg/dL (under statin treatment). Sinus rhythm with T wave inversion in leads I and aVL was noted on an electrocardiogram. The ankle-brachial index (ABI) was very low on both sides (right: 0.41, left: 0.39), and severe bilateral limb artery stenosis and/or occlusion was suspected. A three-dimensional computed tomography (3D-CT) angiogram subsequently indicated bilateral AIOD (Fig. 1A). Although the patient first planned to undergo open surgery, vascular surgeons at our institution believed that open surgery in this case would carry high perioperative risks because the proximal occluding lesion was located just below the renal arteries (high take off) and a large CTO lesion remained in the mid-LAD.

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In addition, the patient strongly refused to undergo open surgery. Regarding the mid-LAD CTO lesion, we planned to perform percutaneous coronary intervention following treatment for AIOD.

We approached the occluding lesion from three points, including the bilateral femoral arteries using 6-F sheaths and the left brachial artery using a 4-F sheath. First, we approached the lesion from the left femoral groin and left brachial artery with a 4-Fr 90-cm long sheath and employed a 0.018” Astato wire (Asahi Intecc, Nagoya, Japan) to successfully penetrate the occluding lesion in an antegrade manner from the aorta to the left external iliac artery (EIA). The intravascular ultrasound system (IVUS) showed that almost all wire paths traced the true lumen, although only the common iliac artery (CIA) lesion was suspected to be located in the subintima. The wire was changed to a 0.014” Spindle 300 (Asahi Intecc) from the left femoral sheath in a retrograde fashion. We subsequently used the bilateral approach on the right side of the occluding lesion, and both 0.018” Truefinder superhard (Zeon, Tokyo, Japan) wires from the right femoral sheath and left brachial sheath eventually touched together at the iliac bifurcation (Fig. 1B). The ENSnare device (Merit medical systems, South Jordan, USA) was used to pull the mass into the right groin sheath, which allowed us to successfully penetrate it from the aorta to the right common femoral artery (CFA). We then changed the wire to a 0.014” Spindle 300 from the right femoral sheath in a retrograde fashion, as on the left side. IVUS on this side also showed that almost all wire paths traced the true lumen, although only the CIA was suspected to be located in the subintima. Following pre-dilatation [Starling (Boston Scientific, Marlborough, USA) 4.0x120 mm], six self-expandable stents [Luminexx (BARD, Covington, USA): 12x60 mm ×2; 10x100 mm ×2; and 8x120 mm ×2] were successfully implanted from the abdominal aorta to the bilateral EIA, covering the entire occluded site (Fig. 1C). While neither stent expanded sufficiently, post-dilatation was performed using relatively small balloons [Starling and RxGenity (Kaneka, Osaka, Japan) 6x100 mm]. However, the patient experienced severe pain during CIA dilation, and we were unable to expand the stent sufficiently. Although post-dilatation was considered incomplete, final arteriography showed successful recanalization from the abdominal aorta to the bilateral EIA (Fig. 1D). The total time of the procedure was 4 hours and 45 minutes, the amount of contrast medium administered was 200 mL and the exposure time was 111 minutes and 37 seconds (the estimated exposure dose was 1.1 Gy). The postoperative ABI was elevated (right: 0.54, left: 0.61), the intermittent claudication improved and the patient was discharged three days after the procedure.

At the two-month follow-up, ABI showed a lower score for the right side (right: 0.49, left: 0.92). Contrast-enhanced CT also showed complete occlusion of the stent site from the right CIA to EIA. Therefore, we planned additional EVT for the occluding lesion.

Arteriography images obtained during the second EVT procedure are shown in Fig. 2A. We approached the lesion from the left brachial artery using a 6-F sheath and the right femoral groin using a 4-F sheath. The occluding lesion was penetrated by a 0.035” J-tip wire with a 4-F 65-cm GlideCath (Terumo, Tokyo, Japan) using the knuckle wire technique via the right femoral sheath. The wire was then changed to a 0.014” Spindle 300 from the right groin sheath, and the ENSnare device was employed to hang the Spindle wire (Fig. 2B), after which a 0.014” Cruise wire
(St. Jude Medical, St. Paul, USA) was passed in an antegrade fashion from the left brachial artery through the right CIA to the site of EIA occlusion (in order to deploy the stent via a 6-Fr brachial sheath). Pre-dilation [Amphilion deep 4×120 mm (Medtronic, Minneapolis, USA)] of the occluding lesion was performed, and an additional balloon expandable stent [ExpressLD (Boston Scientific) 7×27 mm] was implanted in the lesion occluding the right CIA (Fig. 2C), the site of incomplete dilation during the first EVT procedure, due to the patient’s severe pain. No back pain was noted during stent implantation, and full expansion was obtained. Final arteriography showed successful recanalization of the right CIA to the EIA-occluding lesion. Two months after the second EVT procedure, the intermittent claudication improved completely. In addition, the ABI normalized (right: 1.01, left: 0.99), while CT showed good stent patency from the aorta to the bilateral EIA and a 3D-CT angiogram indicated full expansion of the stents (Fig. 2D). The patient’s post-EVT course has been uneventful for 18 months.

**Discussion**

We herein experienced a case of high take off AIOD that was successfully treated with EVT using self-expandable stents and an additional balloon expandable stent. Although surgical reconstruction is recommended for patients with AIOD according to the TASC II guidelines, this case shows that EVT for AIOD is technically feasible and may serve as a potential treatment option for AIOD in patients with an inoperable condition.

One special type of AIOD is so-called “Leriche syndrome,” which is characterized by marked gradual occlusion of the terminal aorta and/or bilateral iliac arteries (1). Characteristic symptoms of this condition include: i) the inability to maintain penile erection; ii) fatigue in both lower limbs; iii) intermittent bilateral claudication with ischemic pain; and iv) absent or diminished femoral pulses with pallor or coldness of both lower extremities. In this case, the patient did not complain of penile erection dysfunction and was thus diagnosed simply with AIOD.

Although the current patient had complained of prolonged intermittent claudication with fatigue of both lower limbs, he was misdiagnosed with spinal canal stenosis. Indeed, the absence of both femoral pulses was first noted at the time of myocardial infarction. Even in the emergency setting, it is necessary to check the femoral pulses in order to evaluate whether the patient has aorto-iliac occlusion, the first step in detecting this disease.

Regarding stent selection and the configuration of aorto-iliac kissing stenting, we selected oversized nitinol stents using the crossing stent technique. Compared to the abutting stent technique, the crossing stent technique is useful in patients with long segment aorto-iliac disease due to its relative simplicity and customizability to a wide range of pathologies. Primary stenting with the use of self-expanding prostheses without pre-dilation may reduce the risk of embolization induced by multiple cycles of individual balloon inflation across various occluded or severely diseased segments, rather than deploying balloon-expanding stents (2). In the present case, the right-sided self-expandable stent became occluded within two months. The site of occlusion corresponded to the site of the lesion at which the stent had not fully expanded due to the onset of severe pain during the first EVT procedure. The possible etiology of in-stent occlusion in this case may be stent thrombosis, as well as incomplete stent expansion, based on the IVUS images obtained during the second EVT procedure. On the post-IVUS
examination, the pressure gradient should be considered in order to determine the need for an additional intervention and/or determine whether the application of a distal filter protection device may prevent in-stent occlusion. However, these procedures were not performed in this case because the devices did not pass completely through the lesions via the stents. Furthermore, an additional balloon-expanding stent was deployed at the site of the occluding lesion during the second EVT procedure. Self-expandable stents may also have been selected for the lesion; however, the occluding lesions appeared to be limited to the short CIA lesion following successful maximum pre-dilatation and a balloon-expanding stent was finally selected to minimize in-stent stenosis.

It remains unclear whether EVT is appropriate in cases of aorto-iliac occlusive disease as opposed to bypass surgery. The patency rate in AIOD patients undergoing open bypass surgery has been reported to 80-86% at five years and 72-79% at 10 years (3). In contrast, the rate of primary patency in TASC C or D patients undergoing EVT is 64% at five years (4). Furthermore, a systematic review and meta-analysis demonstrated that the rates of both primary and secondary patency for open surgery are superior to those for EVT in patients with AIOD (5). Indeed, patients classified as belonging to TASC II category D (6), including those with AIOD, are indicated for open reconstructive surgery, although the majority of practitioners reserve aorto-femoral bypass grafting for subjects with a history of one or two failed endovascular interventions based on the good clinical outcomes of this procedure (7). In addition, it remains controversial which procedure is best for treating aorto-iliac occlusive disease safely and effectively. For now, clinicians should select the procedure based on the characteristics of the lesion and the patient’s comorbidities and/or wishes (e.g., declining open surgery).

As the Japanese society continues to age, more patients are not undergoing open surgery, but rather EVT, due to their high age and/or comorbidities, as in this case. Indeed, open bypass for AIOD carries a higher risk of perioperative complications and 30-day mortality than EVT (5). Recently, Dohi et al. reported a favorable secondary patency rate (94% at three years) after EVT for AIOD in Japanese patients (8). Furthermore, Aihara et al. demonstrated feasible primary patency rates (87% at one year and 73% at five years) in Japanese patients with aorto-iliac bifurcation lesions included in the real-AI registry (9). These data indicate that EVT may have the potential to achieve patency rates surpassing those of bypass surgery (3). Further accumulation of supporting medical evidence as well as technical standardization, device improvements and larger multicenter randomized controlled studies may make this procedure safer and more effective for use in Japanese patients with AIOD.

The authors state that they have no Conflict of Interest (COI).

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References