Management of Acute Lower Extremity Thrombosis Associated with Bilateral Popliteal Aneurysms Using Combined Thrombolytic Therapy and Stent Graft Repair

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To the Editor: This is a brief clinical report on different endovascular procedures in the treatment of popliteal artery aneurysms (PAAs).

A 75-year-old man presented at the vascular clinic with progressive left lower limb pain at rest associated with coolness, pain, and paresthesia. His medical history was significant for hypertension and hyperlipidemia. The femoral and popliteal pulsations were only felt in the left limb. Coldness, pallor, paresthesia, delayed capillary refilling, and color changes were noted in the left limb together with rest pain. Duplex ultrasound was performed and an embolization (Rutherford Grade 2b) and bilateral PAAs were found, which on computed tomography angiogram (CTA) measured 62 mm and 82 mm with the maximum diameters in the right and left popliteal artery, respectively. Thrombus was found in both aneurysm sacs [Figure 1a and b]. Thromboembolism from the left PAA could be seen in the distal arteries. Other potentially associated aneurysms were excluded by magnetic resonance angiography. The erythrocyte sedimentation rate and C-reactive protein were moderately elevated, and thrombophilia profile was negative, and history for any orogenital ulcers was negative.

The anticoagulation therapy administrated included low-molecular-weight heparin (LMWH) 4100 IU twice per day and aspirin 100 mg every day for 1 week in the outpatient clinic. Then, we treated the bilateral PAAs with different stent grafts under endovascular procedures.

After detailed diagnostic angiography, the aneurysm was crossed by a hydrophilic guidewire (Terumo Wire; Terumo Corp., Shibuya, Tokyo, Japan) and the stent grafts of Excluder Extension (EE) were delivered 30 cm through an 18-Fr sheath (St. Jude Medical, St. Paul, Minnesota, USA) and advanced over the 0.035-inch superstiff wire (Amplatz; Boston Scientific, Ratingen, Germany). The first EE (16–14.5 × 140 mm; W.L. Gore) was positioned in the distal aneurysm and the second one (16–10 × 70 mm; W.L. Gore) was positioned with an overlap of 2.5 cm. The stent grafts were then dilated using an angioplasty balloon with a diameter suitable for the vessel width at the proximal and distal anchorages to assist the sealing of the stent graft. We performed angiography that included knee flexion and achieved satisfactory results [Figure 1c]. Because the anatomical features of the knee and because of the giant aneurysm with a significant amount of thrombus, two bare stents were positioned in the proximal and distal landing zones to fix them. Multiple stent grafts were overlapped by at least 2 cm. The diameter of the stent graft was oversized by 15% compared with the caliber of the anchorage.

After angiography for the right PAA, intraoperative intravascular ultrasound indicated that the diameters of the distal and the proximal landing zones were 7.7 mm and 7.5 mm, respectively. Two of the same Viabahn stent grafts (VSG) (8 × 150 mm; W.L. Gore) were positioned using a 12-Fr sheath (St. Jude Medical). The distal stent was positioned first, and the other one was delivered to the proximal aneurysm with an overlap of 40 mm. Dilation was performed with a catheter balloon (diameter, 8 mm). Complete angiography suggested no endoleak or embolization [Figure 1d].

Dual antiplatelet therapy (aspirin 100 mg/d and clopidogrel 75 mg/d) was administrated after the procedures. The patient recovered slowly over the course of several weeks. The follow-up results of CTA at 6 months after the first procedure and at 3 months after the second procedure showed good stent position without migration and thrombosis in the aneurysm sac with a three-vessel run-off peripherally [Figure 1e and g]. However, we found two changes: In-stent restenosis (ISR) in the proximal stent and an indeterminate stent fracture in the distal bare stent [Figure 1f and h]. CYP2C19 genotype test showed the patient was a carrier of CYP2C19 with one loss-of-function allele (CYP2C19*1/*2). Because the patient was asymptomatic, continuation of dual antiplatelet therapy was recommended. Follow-up duplex study revealed the left aneurysmal sac was still present, with approximately 15% blood flow within the sac but no increase in size or diameter. The right aneurysmal sac was without blood flow in the sac, and there was no increase in size or diameter.

Unfortunately, 2 months later, the patients presented with left lower extremity rest pain associated with coldness, numbness, and paresthesia, which indicated critical ischemia [Figure 1i].

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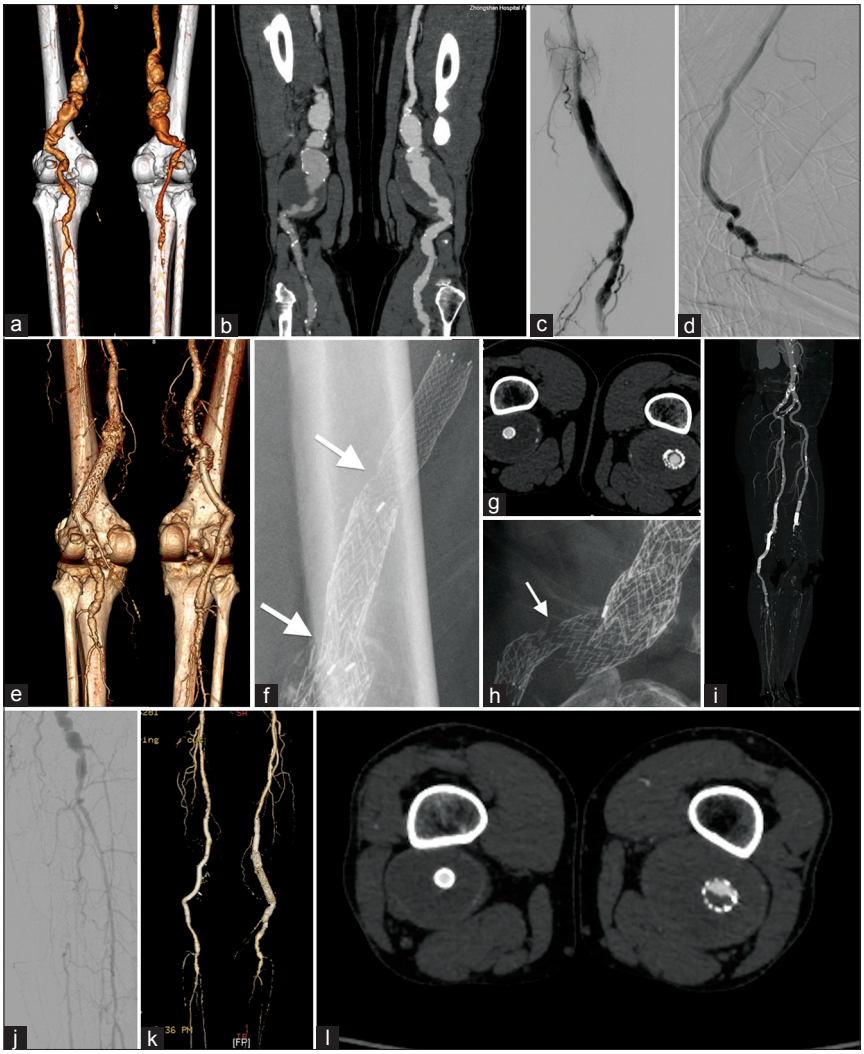

Figure 1: Computed tomography angiogram (CTA) showed bilateral popliteal artery aneurysms (PPAs) with a two-vessel run-off peripherally (a) and thrombus within the aneurysm sacs (b). The postprocedure angiography highlighted the results after stent placement with Excluder Extension (EE) stent grafts and two bare stents (c). Digital subtraction angiography showed the knee flexion angiography after stent placement with Viabahn stent grafts (d). CTA at 6 months showed 100% patency of the stent grafts, aneurysm exclusion, and three-vessel run-off peripherally (e and g). The X-ray showed a restenosis in the proximal region of the EE (arrows, f) and stent fracture in the distal bare stent (arrow, h). Postoperative CTA showed acute thrombosis in the left popliteal artery and below the knee. The vessels in the right lower extremity still retained patent (i). After thrombolytic therapy, the popliteal, anterior tibial, and posterior tibial arteries were almost patency (j). During the following-up, the EE involved thrombosis in the middle of the graft, but the Viabahn was without (k and l).

Angiography and thrombolytic therapy were performed. Then, the upper one-third of the peroneal artery was still thrombosed; the popliteal, anterior tibial, and posterior tibial arteries had almost complete patency [Figure 1j]. The single antiplatelet therapy (clopidogrel 75 mg/d) was maintained, and warfarin was added, with an international normalized ratio in the range of 2.0–2.5. The patient recovered slowly over the course of several weeks. Follow-up results at 6 months after the last procedure were satisfactory [Figure 1k and l]. The patient was not symptomatic, and reduction of vigorous exercises was recommended.

Many centers have reported that both open and endovascular treatments are feasible and safe.[1,2] However, there is few in the literature regarding the endovascular repair of PAAs using the EE. To the best of our knowledge, only Laganà *et al*.[3] reported that they used an EE to treat a femoropopliteal aneurysm. In our case, the left giant PAA was repaired by EE and the right side was repaired by VSG, creating a clear contrast between the two stents at 1-year follow-up. The primary patency rates of VSG at 6 and 12 months were both satisfying. In contrast, the patency rate with the EE in the same case was not good enough, with ISR, stent fracture, and thrombosis noted during follow-up. Although two bare stents were positioned in the proximal and distal landing zones to improve the flexibility of the EE and to prevent its migration, this strategy also increased the friction at the junction of the two stents, which may lead to stent fracture and ISR because of the "lever-arm effect." However, the VSG may can better adapt to the tortuous femoropopliteal vessels and resist the continuous mechanical stresses observed in this region. ISR and in-stent re-thrombosis remain the major complications of infrainguinal stenting, resulting in low stent patency. The best medical treatment for individuals, including antiplatelet and anticoagulation therapy, is indispensable and is of great interest and concern after endovascular procedures.

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