A Giant Popliteal Artery Aneurysm Treated with Exclusion and Bypass Using a Saphenous Vein

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While popliteal artery aneurysm is the most common form of peripheral artery aneurysm, it is a rare condition in the general population. Furthermore, a giant popliteal artery aneurysm has not previously been reported in Korea. A 67-year-old male presented with left thigh pain that had begun 4 months earlier and was aggravated when in a sitting position. We found a giant aneurysm on the left popliteal artery and performed a bypass from the common femoral artery to the distal popliteal artery below the knee, using the autologous greater saphenous vein, and excluded the aneurysm at the sites of anastomoses.

Key words: 1. Peripheral vascular disease  
2. Popliteal artery  
3. Endovascular procedures

CASE REPORT

A 67-year-old male, having a history of diabetes mellitus and classified as a heavy smoker (50 pack-years), presented with left thigh pain that had been aggravated in sitting or squatting positions for the previous four months. The patient felt tenderness on the mass-like lesion on the left thigh, which was large and pulsatile. A computerized tomography angiography image revealed a giant aneurysm of the left popliteal artery and mild atherosclerotic aneurysmal change of the right popliteal artery (Fig. 1A, B). There were mild atherosclerotic calcifications in the lower abdominal aorta and iliofemoral arteries without significant aneurysmal changes.

Surgery was performed separately from upper and lower medial approaches to allow for a direct view of the aneurysm under spinal anesthesia. The patient was placed supine with the knee flexed over a sandbag. The line of the incision ran from four fingerbreadths above the adductor, opening downwards and backwards to a little behind the medial femoral condyle and avoiding the greater saphenous vein. The deep fascia was incised, and the anterior border of the sartorius muscle was identified. The muscle was displaced backwards to reveal the thicker aponeurosis of the adductor canal running into the tendon of the adductor opening. A lower medial approach was made along the posterior tibial border from the lower aspect of the medial condyle, avoiding the greater saphenous vein. The deep fascia was incised and the medial head of the gastrocnemius muscle was displaced backwards. The loose popliteal fat was dissected free from the vascular bundle to reveal the vein with the popliteal artery. Since the aneurysm was too large and long (6×6 cm) to dissect between the adductor opening and the sartorius muscle, we...
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Fig. 1. (A, B) A computerized tomography angiography scan revealed a giant aneurysm (*) of the left popliteal artery and mild atherosclerotic aneurysmal change of the right popliteal artery (red arrows in B). (C) Since the aneurysm was too large and long (6x6 cm) to clamp the distal end of the aneurysm, (D) we performed a bypass from the common femoral artery to the distal popliteal artery below the knee, with the autologous greater saphenous vein. R, right; L, left; K, direction to the knee; SVG, saphenous vein graft; FA, femoral artery; SFA, superficial femoral artery.

could not clamp the distal and proximal end of the aneurysm (Fig. 1C). We performed a bypass from the common femoral artery (end-to-side) to the distal popliteal artery (end-to-side) below the knee, using the autologous greater saphenous vein (Fig. 1D). An exclusion of the aneurysm by double ligation back and forth using black silks was performed at the sites of anastomoses (the proximal superficial femoral artery and the distal popliteal artery) following the identification of the distal pulse.

While the patient obtained good pulsation of the posterior tibial artery and the dorsalis pedis artery postoperatively, the popliteal artery aneurysm lost pulsatile movement immediately. The patient could walk five days after the operation because of severe postoperative wound pain. However, an immediate follow-up angiography showed a patent vein graft and a completely thrombosed aneurysm (Fig. 2A, B). The patient was discharged 19 days after the operation, and was able to walk without ambulatory equipment at that time. In addition, scanty delayed bleeding from the dissected medial gastrocnemius muscle occurred two months after the operation, and we performed a hematoma evacuation and a primary closure. At three months' follow-up, the patient was ambulating without leg pain or claudication. The previously palpable aneurysm had reduced in size and the tenderness on
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Fig. 2. (A, B) An immediate follow-up computerized tomography angiography scan showed the patent vein graft and the completely thrombosed aneurysm. The red arrows indicate mild atherosclerotic aneurysmal change of the right popliteal artery. R, right; L, left; SVG, saphenous vein graft.

the aneurysm had disappeared.

DISCUSSION

Popliteal artery aneurysms (PAAs) are rare, with a prevalence of <0.01% reported in hospitalized patients [1]. It was recently estimated that <0.1% of the overall population suffers from PAA and the percentage is increased to 1% for the 65- to 80-year age bracket [2]. These aneurysms are the most frequently diagnosed and account for up to 70% of all the peripheral arterial aneurysms [1,2]. The normal diameter of the popliteal artery is influenced by the patient’s gender, age, and body surface, and is 6.0±0.7 mm for women and 6.8±0.8 mm for men. PAA is defined as a widening of the popliteal artery by >50% of the original diameter [2]. A giant PAA, however, has not been defined by size criteria and has been reported only sporadically [3,4]. PAAs are most commonly caused by atherosclerosis, but there are some other causes, particularly in younger patients. Some of these include entrapment syndrome with pre- or post-stenotic arterial enlargements and pseudoaneurysms (iatrogenic or post-traumatic), mycotic aneurysms, and inflammatory arteritis (collagenoses or rheumatic diseases). Two case reports of PAA in Korea have been published: a case of bilateral popliteal artery entrapment syndrome [5] and one of traumatic popliteal artery pseudoaneurysm, developed during a soccer game [6].

The main complications of PAA include distal embolization, local compression increasing the risk for popliteal vein thrombosis, and thrombotic obstruction leading to a high risk of limb loss. Rupture is an uncommon complication affecting less than 2% of PAA. For these reasons, elective surgical management of asymptomatic aneurysms larger than 20 mm has been advocated by several authors [1,2,7]. Indications for interventions are well defined for patients who present with acute ischemia and for most of those who have chronic ischemic symptoms. Patients with severe claudication, resting pain, and tissue loss are considered for elective repair, as are patients who have symptoms of local compression. Indications for asymptomatic patients and for those with mild-to-moderate claudication are less well defined. Factors affecting the decision on surgery include the rate of development of symptoms, aneurysm size, mural thrombus, evidence of previous thromboembolism, risk from surgical repair, and long-term surgical outcome.

The most commonly performed surgical technique for PAA repair is aneurysm exclusion and autologous venous or polytetrafluoroethylene bypass grafting, and this technique remains the gold standard [2]. Open surgical repair is composed of a medial approach with ligation and resection of the aneurysm, along with above-knee to below-knee bypass, and a posterior approach with direct visualization and resection of the aneurysm and reconstruction with interposition of a vein or prosthetic graft [8].

Endovascular repair with a stent graft is a minimally in-
vasive alternative approach to that of conventional repair. Endovascular treatment, however, lacks long-term follow-up. Potential long-term problems, such as stent-graft migration and stent fracture with occlusion, are possible. A major concern when using this technique for the popliteal artery is that a flexion joint is crossed. The great mobility of the popliteal artery, along with the risk of device rotation, twisting, and kinking, remain a problem. The various devices employed for the stent-graft are relatively stiff and not ideally designed to be used in a small artery, which is subject to repetitive flexion and extension. The Hemobahn/Viabahn graft (WL Gore & Associates Inc., Flagstaff, AZ, USA) offers good flexibility and radial stiffness, minimizing the risk of kinking during knee joint flexion, and it is the most used graft for endovascular PAA repair [3]. In Korea, the endovascular stent-graft has been used since February 2012. Several authors [1,2,7,8] have analyzed the results of open surgical repair and endovascular repair. They suggest the following: 1) early repair, before ischemic symptoms, yields better results; 2) the greater saphenous vein seems to have better durability than that of a prosthetic graft; and 3) early and mid-term patency of the popliteal artery treated by open surgery and endovascular repair has similar results, but the endovascular repair needs frequent re-interventions during the early period.

An endovascular procedure using a stent-graft has recently come into use, and is thought to be a reasonable option for treating PAA. In the case of giant PAA, however, there is no established standard for treatment. We report the first case of successful treatment of a giant PAA through open surgical repair, using the saphenous vein graft.

**CONFLICT OF INTEREST**

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

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