

# Management of giant popliteal artery aneurysm using in situ saphenous vein bypass: A case report

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## ABSTRACT

Popliteal artery aneurysm is the most common type of peripheral artery aneurysm. These lesions are associated with atherosclerotic disease and other arterial aneurysms. The timing and approach of surgery are critical for limb preservation and reducing the risk of amputation in symptomatic cases. This case report presents our surgical approach, technique, and graft selection for a 75-year-old female patient with swelling and pain in the leg due to a giant popliteal artery aneurysm complicated by thrombosis. We bypassed the superficial femoral artery to the distal popliteal artery below the knee, using the in situ saphenous vein. We excluded the enlarged segment by ligating it at the anastomosis sites. In situ bypass is considered a highly effective method with excellent patency rates that minimizes surgical trauma in the treatment of popliteal aneurysms extending below the knee.

**Keywords:** Giant aneurysm, popliteal artery aneurysm, in situ bypass

Popliteal artery aneurysm (PAA) is the most frequently encountered peripheral arterial aneurysm, though its prevalence remains relatively low at less than 0.1% in the general population [1]. Typically affecting elderly men, PAA is closely linked to atherosclerotic disease and the presence of other arterial aneurysms [2, 3]. If left untreated, giant or complicated PAAs can lead to severe consequences, including limb-threatening ischemia or amputation [4]. In this report, we discuss a rare case of a giant PAA managed successfully with an in situ saphenous vein bypass, highlighting the surgical considerations and technical approach involved.

## CASE PRESENTATION

A 75-year-old female with a history of diabetes mellitus and chronic kidney disease, presented with left

thigh pain that had been aggravated in sitting or squatting positions for the previous six months. The patient was admitted to the emergency department with leg pain. She described a painful, firm, mass-like lesion on her thigh. In the last two days, she complained of numbness and pain extending to her foot. On examination, a large pulsatile mass was detected in the popliteal region. Peripheral pulses were absent on palpation and weakly detected via handheld vascular Doppler. The patient was subsequently interned for further investigation and treatment.

Computed tomographic angiography revealed a thrombosed popliteal artery aneurysm with a maximal diameter of 13.88 cm, with post-aneurysmal distal vascular occlusion in the left popliteal artery. Mild atherosclerotic changes were noted in the right popliteal artery. Fig. 1. illustrates the thrombosed aneurysm and associated occlusions. Mild atherosclerotic calcifica-

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tions were observed in the lower iliofemoral arteries without significant aneurysmal changes.

### *Surgical Technique*

The surgery was performed under general anesthesia with the patient placed in a supine position and the knee flexed. The femoral artery was explored through an inguinal incision and turned with a nylon tie. An incision was made to access the popliteal region from the posteromedial level of the sartorius muscle to the adductor space. A third incision was made along the posterior tibial border from the lower aspect of the medial condyle below the knee. The deep fascia was opened, and the medial head of the gastrocnemius muscle was gently retracted posteriorly to enhance access to the vascular structures. Double ligation of the aneurysm was performed at the sites of anastomoses (proximal superficial femoral artery and distal popliteal artery). The aneurysm sac was opened, the thrombus was evacuated, the retrograde bleeding collateral artery ends were subsequently ligated and the sac was reduced in size and subsequently closed.

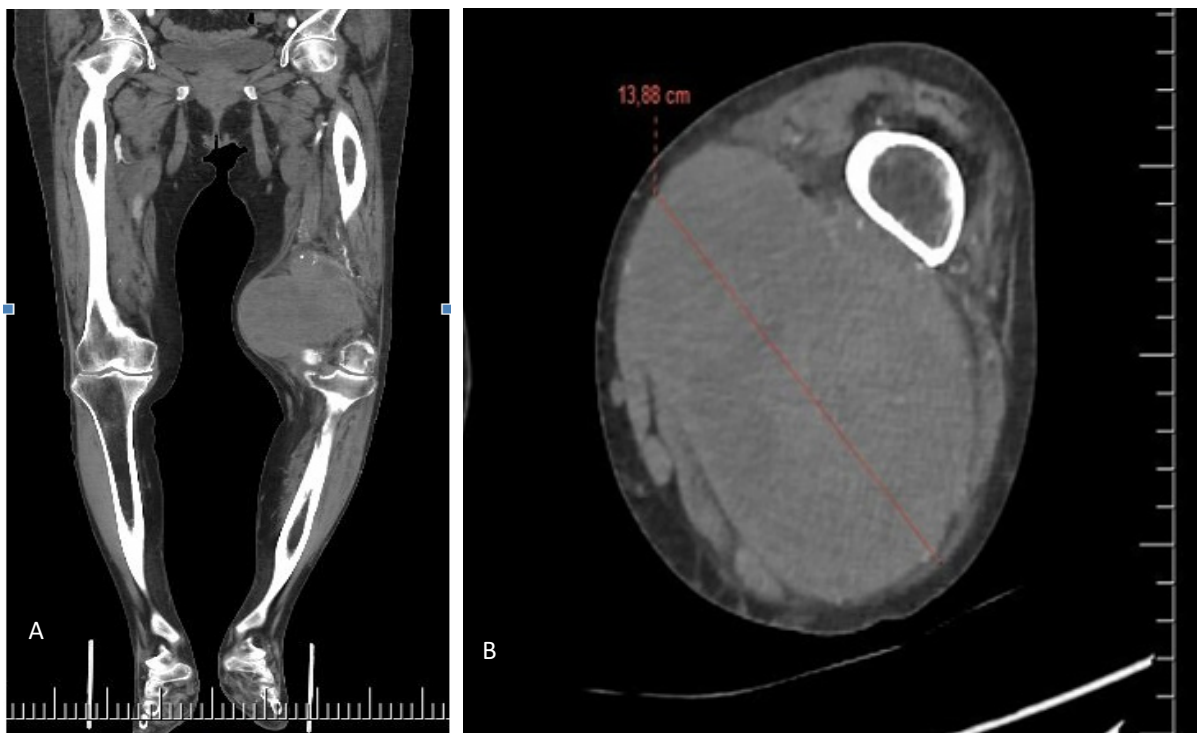
A bypass from the superficial femoral artery (end-

to-side) to the distal popliteal artery (end-to-side) just below the knee was performed using the saphenous vein. A valvotomy was carried out to disrupt vein valves that could impede flow. The retrograde bleeding collateral artery ends were subsequently ligated.

Postoperatively, the patient exhibited good pulsation in the posterior tibial and dorsalis pedis arteries. The pulsatile mass associated with the popliteal artery aneurysm has disappeared. Fig. 2. shows that the leg diameter completely returns to normal in the aneurysm region after the operation. The patient was discharged two days postoperatively and ambulated without assistance. At three months, the patient reported no pain or claudication.

### **DISCUSSION**

Despite being the most prevalent type of peripheral artery aneurysm, the occurrence of PAA remains rare, with a prevalence of less than 0.001% [1-6]. Its incidence rises significantly in males aged 65 to 80, reaching approximately 1% within this demographic [2-8].



**Fig. 1.** The left superficial femoral artery was observed to be totally occluded after the level of origin, and a total thrombosed aneurysm was present in the distal part. The diameter of the aneurysm was measured approximately 13.88 cm. (A) Longitudinal, (B) Cross-sectional view.



**Fig. 2.** Aneurysm had reduced in size and mass of the aneurysm had disappeared.

The normal diameter of the popliteal artery varies based on gender, age, and body surface, typically measuring less than 8 mm. Aneurysms are defined as a dilation of 50% above normal. Though no formal size criteria exist for ‘giant PAA,’ this case's 14 cm diameter justifies the designation.

The primary etiological factor for PAA is atherosclerosis; however, other causes, including popliteal artery entrapment syndrome, inflammatory arteritis, and pseudoaneurysms, have also been documented [9]. The major complications associated with PAAs include embolization, compression, and an increased risk of deep vein thrombosis. Rupture, though a potentially catastrophic event occurs in less than 2% of cases [1, 2, 7]. Surgical intervention is often recommended for asymptomatic aneurysms larger than 20 mm to prevent future complications.

Indications for surgery include acute ischemia, chronic ischemic symptoms, claudication, resting pain, and tissue loss. For asymptomatic patients, factors influencing surgery include aneurysm size, thrombus, previous thromboembolism, surgical risks, and outcomes [9].

The current gold standard for PAA repair involves the exclusion of the aneurysmal segment combined with bypass using an autologous vein graft. In the presented case, the bypass procedure utilized the proximal

superficial femoral artery as the inflow and the distal popliteal artery below the knee as the outflow. An in situ saphenous vein bypass was chosen due to its superior long-term patency and suitability for extensive reconstructions in cases involving complex PAAs extending below the knee. The adequate diameter of the saphenous vein (approximately 8 mm) and its minimal associated surgical trauma further supported this decision.

Traditional surgical approaches include a medial route with aneurysm ligation and bypass, or a posterior approach that provides direct visualization of the aneurysm, followed by resection and reconstruction using vein or prosthetic grafts [8]. In this particular case, given the thrombosis of the proximal superficial femoral artery and the popliteal artery, a segmental bypass was performed. The aneurysmal segment was safely excluded by proximal ligation at the anastomosis sites. This approach ensured effective management of the aneurysm while preserving limb viability and minimizing postoperative complications.

## CONCLUSION

In symptomatic popliteal artery aneurysms, the surgical approach is determined based on the aneurysm size

and the presence of concomitant occlusive vascular disease. Surgical intervention is crucial for managing hyperextended aneurysms to prevent limb ischemia and preserve function. The use of an autogenous venous graft remains the gold standard for vascular occlusions extending below the knee. Especially in-situ saphenous vein grafts continue to be a reliable option for complex cases. This case underscores the importance of timely surgical intervention in symptomatic giant PAA to prevent limb ischemia, enhance postoperative recovery, and maintain long-term graft patency.

#### *Ethical Statement*

This case study was approved by Tekirdağ Dr. İsmail Fehmi Cumalıoğlu City Hospital Clinical Research Ethics Committee (Decision date: 08.03.2024, decision no: 89).

#### *Patient' Consent*

Patient was informed about the purpose of the case report, and informed consent was obtained from the patient for this publication.

#### *Authors' Contribution*

Study Conception: GY; Study Design: GY; Supervision: GY, HH; Funding: GY; Materials: GY, HH; Data Collection and/or Processing: HH; Statistical Analysis and/or Data Interpretation: GY; Literature Review: GY; Manuscript Preparation: GY, HH and Critical Review: HH.

#### *Conflict of interest*

The authors disclosed no conflict of interest during the preparation or publication of this manuscript.

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