

# A UNIQUE CASE OF A GIANT POPLITEAL ARTERY ANEURYSM PRESENTING AS POPLITEAL MASS

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## Abstract

**Introduction:** Popliteal artery aneurysms (PAA) can be very challenging, especially in cases of very large PAAs, with a minimal number of case reports published in the literature.

**Methods:** This is a case report of a 68-year-old male patient with hypertension, hyperlipidemia, diabetes, and schizophrenia who was found to have a giant (10x8x6cm) partially thrombosed PAA, treated with interposition polytetrafluoroethylene (PTFE) graft via a posterior approach.

**Results:** Under general anesthesia, the patient was placed in a prone position, and an extended lazy "S" incision was made on the popliteal fossa. After obtaining proximal and distal exposure, the aneurysm sac was skeletonized, preserving the popliteal vein and the tibial nerve. After proximal and distal control was obtained, the patient was systemically heparinized, and the aneurysm sac was opened. Some genicular branches were ligated inside the aneurysm, and part of the aneurysm sac was excised. A 7 mm PTFE graft was used for reconstruction in an end-to-end fashion. Suction drains were placed in the popliteal space, and the fascia and skin were approximated. The patient was discharged home on the 2nd postoperative day on aspirin and statin with ultrasound surveillance. The patient has remained asymptomatic during follow-up with a patent graft.

**Conclusions:** Open surgical repair constitutes the gold standard of care for huge PAAs to prevent distal thromboembolic events and mass pressure effects from the aneurysm. Documentation of additional experience with open repair of huge PAAs would be beneficial and could help clinical decision-making.

**Keywords:** popliteal artery aneurysm, open repair, posterior approach

## INTRODUCTION

Popliteal artery aneurysms (PAA) are uncommon in the general population, with an estimated prevalence of less than 0.1%<sup>1</sup>. However, they represent the majority of peripheral arterial aneurysms (70%), being more frequent among older (65-80 years of age) male patients and patients with abdominal aortic aneurysms (AAA)<sup>1, 2</sup>. The pathogenic mechanism of PAAs is not precise, and it is believed that inflammatory as well as atherosclerotic degeneration play an essential role in their development<sup>3</sup>. Although rare and often asymptomatic, they may cause adverse thromboembolic

events in up to 40% of the cases associated with either acute or acute chronic symptomatology<sup>4</sup>. Resulted chronic limb-threatening ischemia (CLTI) has an overall poor prognosis and has been associated with significant adverse limb events, including amputation in about 15% of the cases<sup>4, 5</sup>. Open surgical repair of PAAs remains the gold standard for low or moderate-risk patients, offering promising patency over time<sup>6, 7</sup>. However, it may be challenging in large PAAs due to their proximity to significant structures, including the popliteal vein and the tibial nerve, posing a therapeutic challenge for open repair. Additional experience with available repair of huge PAAs would be beneficial and could

help clinical decision-making. Therefore, we present a case of a substantial popliteal artery aneurysm treated successfully with interposition bypass grafting.

## CASE REPORT

Informed consent was obtained from the patient for treatment and publication of these case reports and accompanying images. A 68-year-old male patient with hypertension, hyperlipidemia, diabetes, and well-controlled schizophrenia presented to the clinic for evaluation of a large right popliteal artery aneurysm. The patient presented with leg edema and soleal vein deep vein thrombosis and the aneurysm was incidentally found in venous ultrasound. Computed tomography angiography (CTA) showed giant partially thrombosed PAA measuring 10 x 8 x 6 cm, with three run-off vessels (Figure 1). The patient was not a smoker, had no history of trauma or local vs systemic infection, and had negative aneurysm family history. On the physical exam a palpable pulsatile mass was appreciated at the right popliteal fossa (Figure 2), with distal dorsalis pedis and posterior tibial artery pulses, and without any motor or neurological deficits. No abdominal or contralateral leg aneurysms were found.

The patient was operated under general anesthesia in the prone position. A larger than usual lazy "S" incision via a posterior approach was made in the popliteal fossa, the hamstring muscles were separated, and proximal control was obtained at the Hunter's canal around the distal superficial femoral artery. Similarly, the bottom part of the incision between the 2 heads of the gastrocnemius muscle distal control was obtained to the popliteal artery. Then, the aneurysm sac was skeletonized, preserving the popliteal vein and the tibial nerve. The popliteal artery was encircled with silicone rubber vessel loops for proximal and distal control. After the patient underwent systemic heparinization to achieve a target active clotting time (ACT) > 180 seconds, the aneurysm sac was opened, the thrombus was removed, and back-bleeding geniculate collaterals were oversewn from inside the aneurysm. Part of the aneurysm sac was sent to pathology, showing a degenerated fibrotic arterial wall with organized thrombus, compatible with degenerative aneurysm. A 7 mm polytetrafluoroethylene (PTFE) graft was used for reconstruction in an end-to-end fashion using 6–0 monofilament running sutures (Figure 3). Two suction drains were placed in the popliteal space, and the fascia and skin were closed (Figure 4). The patient was discharged home on the 2nd postoperative day on aspirin 81 mg, clopidogrel 75 mg and statin. The patient has remained asymptomatic during follow-up with a widely patent graft and triphasic waveforms on duplex ultrasound.

## DISCUSSION

Popliteal arterial aneurysms are the most common peripheral arterial aneurysms<sup>8</sup>, with half of the patients having bilateral disease and one-third having concomitant

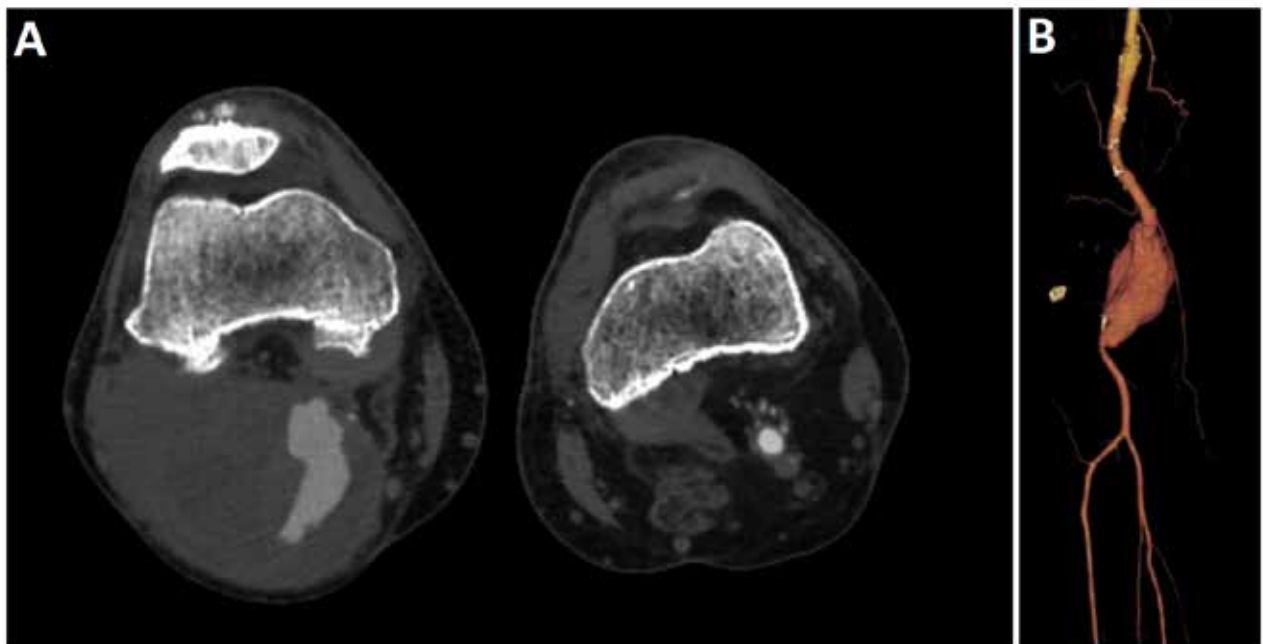
abdominal or thoracic aortic aneurysms<sup>7,9</sup>. The majority of PAAs are true aneurysms caused by atherosclerosis affecting male patients over 60 years old, while trauma, congenital collagen disorders, infection, or inflammatory processes have also been described as potential causes<sup>8</sup>. There are less than 10 cases reported in the literature regarding operative treatment of giant PAA, with all patients being treated with open surgery<sup>7,8,10-12</sup>.

Although a PAA may be found incidentally, most symptomatic patients will present with lower extremity ischemia due to aneurysm thrombosis or distal embolization to tibial runoff vessels. Less frequently, patients present with compressive symptoms, either the popliteal vein manifesting with deep venous thrombosis and chronic venous insufficiency symptoms or with pain and numbness due to compression of the adjacent nerves. In contrast to abdominal aortic aneurysms, which tend to rupture at these giant sizes, rupture is an unusual complication for PAAs, suggesting a different pathogenetic mechanism<sup>7-9</sup>.

For asymptomatic patients, the recommendation is to repair all PAAs with sizes larger than 2 to 2.5 cm or larger than 3 cm in selected patients with higher clinical risk or those without aneurysmal thrombus. For PAA less than 2 cm but with thrombus and clinical suspicion of embolism or imaging evidence of poor distal runoff, repair should be considered to prevent further thromboembolic complications and possible limb loss<sup>13</sup>. Additionally, in the presence of compressive symptoms or symptomatic aneurysm sac expansion, decompression of the aneurysmal sac is recommended<sup>13</sup>. Thus, all symptomatic patients with viable limbs should have their PAAs repaired with the adjunct of thrombolysis, surgical thrombo-embolectomy, or pharmacomechanical intervention depending on the severity of limb ischemia at presentation, with the optimal goal to maximize the tibiopedal outflow<sup>13</sup>.

Open surgical repair constitutes the gold standard of care, especially in young patients, those with giant aneurysms, compression syndrome, poor run-off, and the presence of infection, while endovascular repair is usually preferred in acute settings (i.e., rupture) and in older individuals that are at high surgical risk<sup>11,14,15</sup>. Currently, there are no endovascular covered stents for PAA repair approved by the U.S. Food and Drug Administration, rendering endovascular repair of PAAs an off-label procedure. Open surgical repair, compared to the endovascular approach, has been associated with lower perioperative (30-day) embolic and thrombotic occlusions, with superior primary patency and freedom from re-intervention rates over time, while also demonstrating a benefit in terms of all-cause mortality and amputation rates<sup>9,16</sup>.

Open surgical approaches for PAAs include a medial or a posterior approach. The decision for the approach should be tailored, taking into consideration the extent of popliteal artery involvement, the patient's symptoms, and comorbidities, as well as the runoff vessels<sup>11</sup>. The posterior approach seems to be superior to the medial approach regarding primary patency, secondary patency, and need



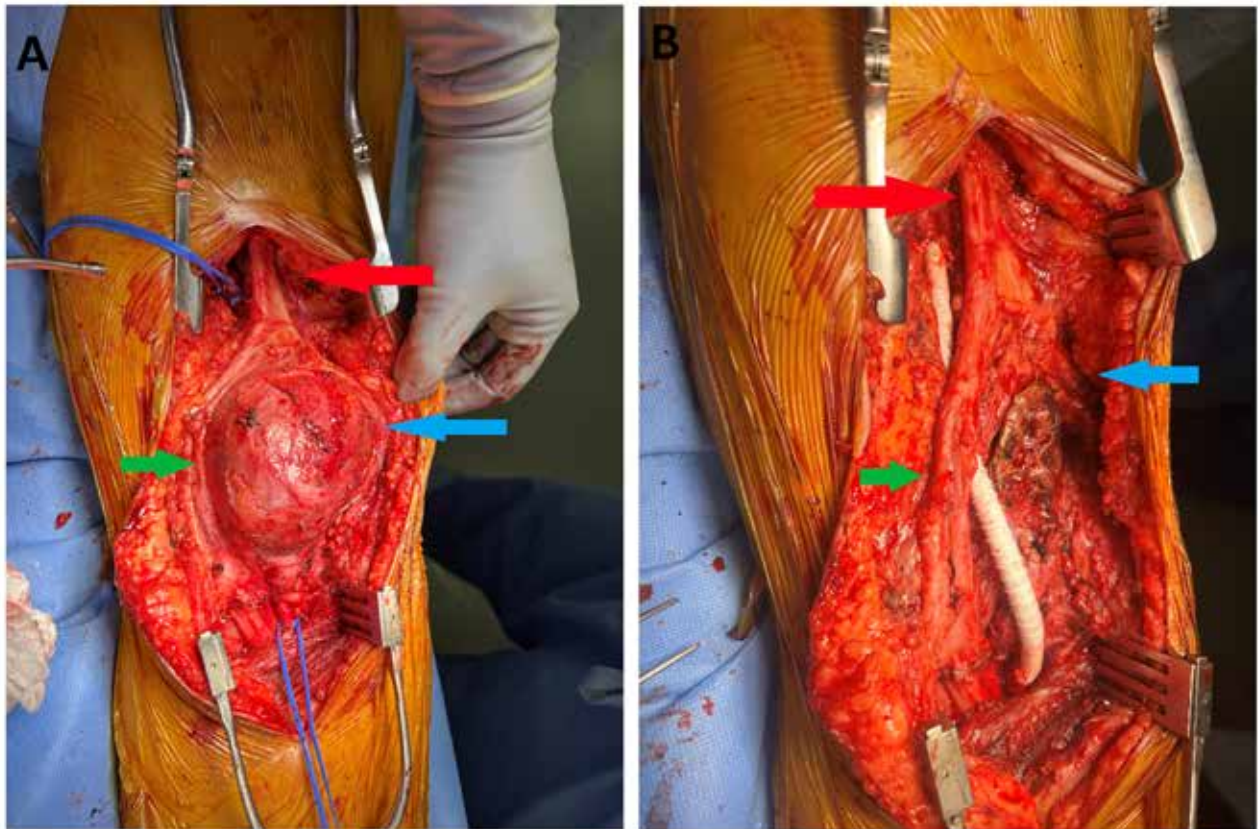
**Figure 1**

*Computed tomography angiography (CTA) showing the giant PAA measuring 10 x 8 x 6 cm (A), with three run-off vessels (coronal and 3D reconstruction) (B).*



**Figure 2**

*Giant right popliteal artery aneurysm manifesting as palpable pulsatile popliteal mass.*



**Figure 3**

*Giant right popliteal artery aneurysm (A) treated with 7mm polytetrafluoroethylene (PTFE) graft via posterior approach in an end-to-end fashion (B) [Red arrows: sciatic nerve; Blue arrows: common peroneal nerve; Green arrows: tibial nerve].*



**Figure 4**

*Extended lazy" S incision with two suction drains in place after the repair.*

for reoperation<sup>17,18</sup>. It also eliminates the postoperative complications associated with persistent collateral flow into the aneurysm sac and thus aneurysmal sac expansion<sup>17,18</sup>. Nevertheless, the medial approach is the most commonly performed for both elective and emergency PAA repair<sup>19</sup>.

In our case, given the large size of the aneurysm, we used an "extended posterior approach," which allowed the exposure of the entire aneurysm, including proximal and distal popliteal arteries, by a single skin incision<sup>10</sup>. Prosthetic conduits have been shown to yield comparable results to those with vein conduits regarding primary and secondary patency rates and major adverse limb events at 2 years as long as the target vessel is the below the knee popliteal artery and not an infra-popliteal arterial branch<sup>20</sup>. This approach can avoid neurologic complications if performed carefully.

## CONCLUSION

Open surgical repair remains the gold standard of care, especially in giant PAAs, to prevent distal thromboembolic events and mass pressure effect from the aneurysm.

## DISCLOSURES

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