

Successful Surgical Management of A Rare Popliteal Arteriovenous Fistula: A Case Report

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Abstract

Arteriovenous fistulas (AVFs) in the popliteal region present unique challenges in diagnosis and management because of their potential to cause significant complications. Surgical intervention, although uncommon, remains crucial in managing complex popliteal AVFs to preserve limb health and ensure optimal patient outcomes. This case underscores the importance of recognizing clinical evidence and employing diagnostic imaging to guide treatment decisions in lower extremity AVFs.

Keywords: Aneurysm, popliteal arteriovenous fistula, lower extremity vascular anomaly, vascular aneurysm

Introduction

Arteriovenous fistulas (AVFs) can occur in various locations throughout the body and may result from a range of causes, including congenital malformations, trauma, surgical procedures, or inflammation⁽¹⁾.

A specific type of AVFs that occurs in the popliteal region, known as a popliteal AVF, often poses clinical concerns due to its potential to cause complications,

including vascular steal phenomenon, venous hypertension, and increased risk of thrombosis. The diagnosis and management of popliteal AVFs require a comprehensive understanding of the vascular anatomy, imaging techniques, and interventional procedures.

Treatment options for popliteal AVFs include conservative approaches, pharmacotherapy, and interventional procedures. Such as embolization and surgical correction⁽²⁾.



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Case Presentation

A 58-year-old male presented with progressive swelling of the right leg and wounds in the foot with a history of knee operation and septic arthritis that required diagnostic functions. Lower limb digital subtracted angiography revealed a large popliteal AVF (Figure 1, 2). AVF is treated surgically at our center. AVFs of this



Figure 1. DSA image of the popliteal artery, popliteal vein and femoral vein-1
DSA: Digital subtraction angiography



Figure 2. DSA image of popliteal artery and popliteal vein-2
DSA: Digital subtraction angiography

size and morphology are rare. This case demonstrates a successful surgical method.

Our physical examination revealed edema around the right knee and thigh, with bruises. A strong thrill was detected in the medial and superior knee regions. The dorsalis pedis and tibialis posterior pulses were absent with palpation on the same side. Diagnostic Doppler USG was performed and showed monophasic flow in the crural arteries and a high-flow AVF between the popliteal vein and artery. Subsequent DSA revealed a prominent AVF with a width of 4 cm on a 5 cm segment in the popliteal region.

Surgery is planned. Because of the circumferential difference between the proximal and distal superficial femoral arteries, a treatment procedure with a covered stent was not possible. A 15 cm incision just superior to the knee was performed, and the popliteal vein and artery were exposed (Figure 3).

Tapes looped around the proximal and distal popliteal artery and vein. With vascular clamps following the injection of 1 cc fractionated heparin, the AVF connection is cut and both the popliteal vein and artery defects are repaired with over and over sutures (Figure 4, 5). A strong pulse was detected in the popliteal artery distal to the

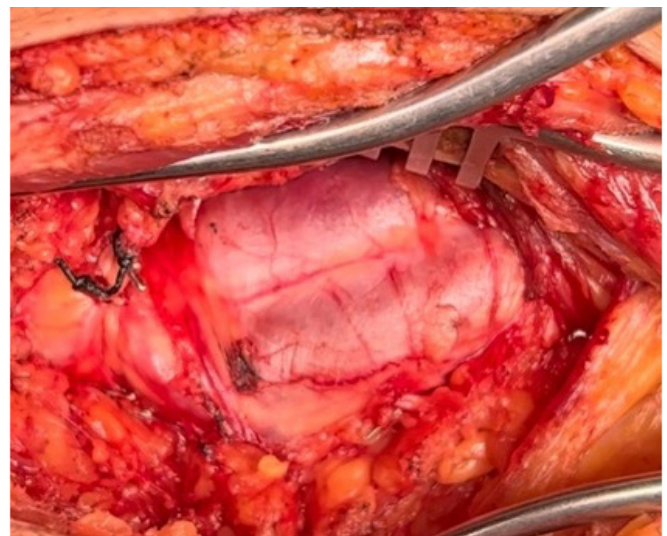


Figure 3. An intraoperative view showing the popliteal artery and popliteal vein

fistula connection. Informed consent was obtained from the patients prior to the procedure.

The patient is then extubated, and full subcutaneous anticoagulation plus compression socks treatment is recommended. The patient was extubated within 2 days of follow-up, with no to minimal symptoms.

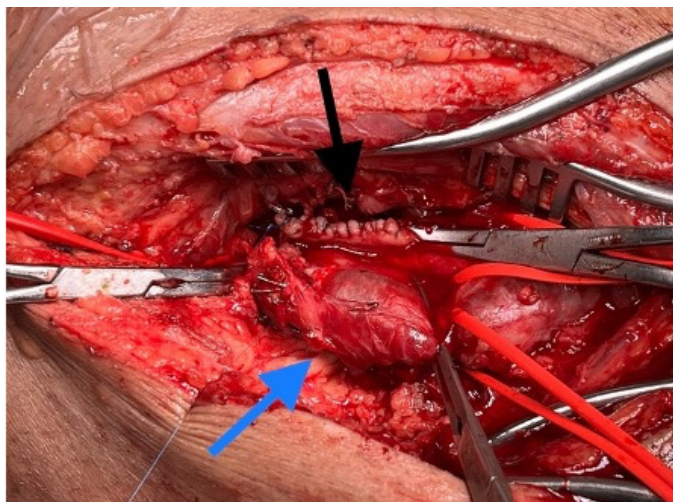


Figure 4. An intraoperative view showing AVF repairing
Blue arrow indicates popliteal artery
Black arrow indicates popliteal vein
AVF: Arteriovenous fistula

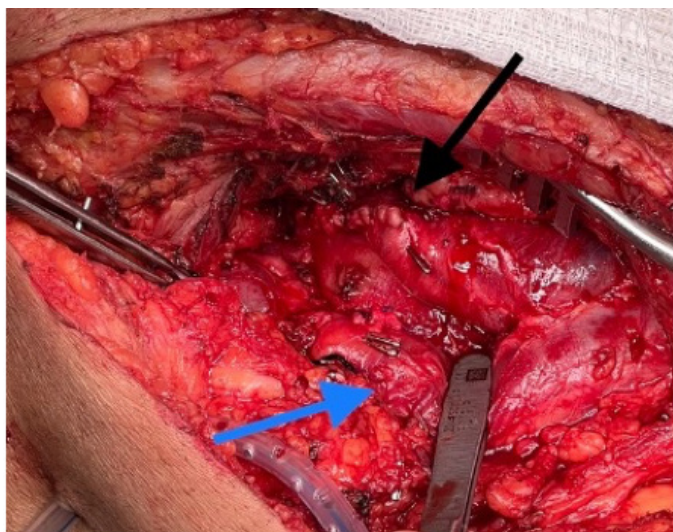


Figure 5. An intraoperative view showing AVF repairing
Blue arrow indicates popliteal artery
Black arrow indicates popliteal vein
AVF: Arteriovenous fistula

Discussion

This case report on a rare popliteal AVF emphasizes the importance of precise imaging, particularly digitally subtracted angiography, in directing the surgical approach. This patient had a considerably large AVF and our hospital lacked the experience of endovascular treatment (like embolization) experience of fistulas this size hence we have opted for surgery, specifically designed to the patient's unique vascular structure, due to the significant size and complexity of the AVF. Along with many surgical techniques like ligation (ligating the "neck" of the AVF, was not appropriate because of the size of the neck), resection, and end-to-end anastomosis-interposition with grafts (complete resection of the affected vascular structures and if possible anastomosing the remaining vascular ends if not possible using a graft be it vein or synthetic, for "interpositioning" the absent segment, which is not our first choice), we preferred clamping the vein and artery distally and proximally with proper anticoagulation and directly cutting the wide "neck", ending the pathological flow then repairing the defects on both artery and vein side with sutures. If the defects were too large to be repaired or after closing the defects, there was a sign of stenosis like presence of the thrill of the turbulent flow, we would have performed complete resection and anastomosis interposition or vein patchplasty for the optimal results. The successful outcome of surgical treatment led to alleviation of symptoms, demonstrating the value of customized surgical planning and teamwork across specialties in managing complicated vascular conditions.

This case highlights the critical need for careful monitoring in patients with a history of multiple surgeries.

Conclusion

Iatrogenic and traumatic incidents are common causes of AVFs in the lower extremities, and they are often treated with conservative or minimally invasive methods. The presence of excitement and specific clues in patients' history should alarm the physician. DSA is a reliable

tool for diagnosis and treatment planning. In this case, the patient required open surgery, and the reason for the surgical intervention was mentioned. Treatment of lower extremity AVFs is extremely important for limb health, and a personalized treatment method should be discussed thoroughly for every patient's sake⁽³⁾.

Ethics

Informed Consent: Informed consent was obtained from the patients prior to the procedure.

Footnotes

Authorship Contributions

Surgical and Medical Practices: Demirtaş H, Yiğit D, Doğan A, Özer A, Concept: Demirtaş H, Yiğit D, Doğan A, Özer A, Design: Demirtaş H, Yiğit D, Doğan A, Özer A, Data Collection and/or Processing: Demirtaş H, Yiğit D, Doğan A, Özer A, Analysis and/or Interpretation: Demirtaş H, Yiğit D, Doğan A, Özer A, Literature Search:

Demirtaş H, Yiğit D, Doğan A, Özer A, Writing: Demirtaş H, Yiğit D, Doğan A, Özer A.

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