










Rare Cause of Leg Edema after Femoropopliteal Bypass Procedure in Patient with Previously Unrecognized Arteriovenous Fistulas: A Case Report

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Abstract

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BACKGROUND: Arteriovenous fistulas (AVFs) are pathological, congenital, or acquired communications between the arterial and venous vascular bed. Asymptomatic AVFs do not require surgical or endovascular treatment; however, if they are symptomatic, they must be treated to relieve the patient of symptoms and cardiovascular disorders.

CASE PRESENTATION: Our patient had an undiagnosed AVF that became symptomatic after femoropopliteal bypass surgery. We successfully treated these complications with four cover stents.

CONCLUSION: The presence of AVFs should be kept in mind in the case of rapidly developing leg edema after revascularization. Endovascular treatment of symptomatic AVF is a safe and effective treatment modality. Treatment of symptomatic AVFs is not only recommended for improving impaired arterial or venous blood flow, but also for preventing recurrent PE.

Introduction

Arteriovenous fistulas (AVFs) are pathological communications between the venous and arterial systems, which can be congenital, acquired, localized, or diffuse. Congenital AVFs usually present a major therapeutic challenge, and if they are asymptomatic, they do not require treatment [1]. The main indications for treatment include hemorrhage, secondary ischemic complications, and congestive heart failure due to arteriovenous shunting. Other indications for treatment include pain, functional impairment, and cosmetic deformity [1], [2]. We report a clinical case of a 63-year-old man who presented with acute leg ischemia who developed a symptomatic clinical presentation of a previously unrecognized AVF, after a femoropopliteal (FP) bypass was performed to salvage the limb.

Case Report

A 63-year-old man who presented to the clinic with acute ischemia of his right leg was urgently admitted. At admission, superficial and deep sensibility was preserved in the right foot, as well as motor skills, and only the femoral pulse present on the right leg.

The patient had recently recovered from COVID-19 a month ago and had history of a pulmonary embolisms (PE) in 2015 and March 2021, when he was diagnosed with thrombophilia (homozygous mutation of the methylenetetrahydrofolate reductase gene, factor V Leiden, and plasminogen activator inhibitor). The patient has been on novel oral anticoagulants-Rivaroxaban (15 mg, daily) therapy since March 2021. Doppler findings did not reveal any sign of lower extremity venous disorders.

On admission, ultrasound and Multislice computed tomography (MSCT) aortoarteriography was performed which revealed an occlusion of the popliteal and crural arteries in the right leg (Figure 1). Transpopliteal thrombectomy was indicated. Popliteal and crural artery thrombectomy was attempted; however, on first attempt, we were unable to pass with the Fogarty catheter proximally. We decided to perform a FP bypass with a 6 mm Vascutek Terumo PTFE graft. Proximal anastomosis was performed in common femoral artery (terminolateral [TL] anastomosis) and distally in the popliteal artery below the knee (TL). The procedure was performed smoothly without complications.

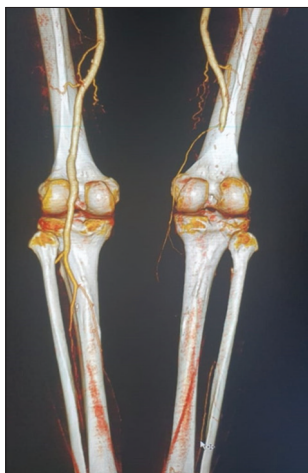


Figure 1: Multislice computed tomography angiography which represent thromboembolism of right popliteal and crural arteries

During the 1st post-operative day, the patient developed painful swelling in the right leg (Figure 2). After conservative treatment and dosed exercise, the patient's condition remained unchanged, without a reduction in symptoms. We discussed the possibility of a potential reperfusion injury and fasciotomy. To exclude other potential risks for developing these conditions, we performed Color duplex scan of the main blood vessels of the lower extremity. Due to the presence of significant edema, imaging was not interpretable, so we decided to perform MSCT angiography of the peripheral arteries.



Figure 2: Post-operative huge edema of the right leg (wounds after femoropopliteal bypass)

MSCT angiography verified multiple AVFs in the proximal segment of the right lower leg, which was not observed in the first MSCT (Figures 3-5). Endovascular treatment with cover stent implantation was indicated to occlude these pathological communications.

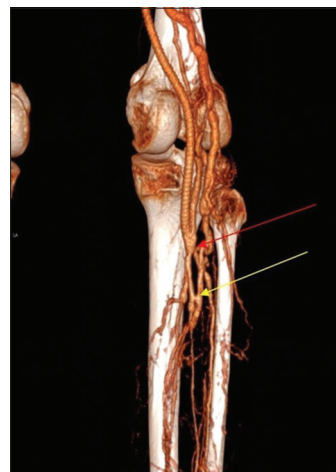


Figure 3: Multislice computed tomography angiography after femoropopliteal bypass- multiple Arteriovenous fistulas in the right lower leg (red arrow shows the communication between anterior tibial artery and its vein; yellow arrow shows the communication between tibioperoneal trunk and vein)

An antegrade puncture was performed on the right FP graft as well as selective angiography of the popliteal artery. Multiple AVFs were verified at the distal anastomosis of the FP graft and the proximal segment of the popliteal and crural arteries, with prompt filling of the rich knee-deep venous plexus (Figure 6).



Figure 4: Multislice computed tomography angiography after femoropopliteal bypass- multiple arteriovenous fistula in the lower leg with fast filling deep vein in right leg

Four cover stents (Biotronik Germany coronary stent PK-Papyrus 2.5 × 20 mm, 4.0 × 20 mm, 4.5 × 20 mm and 4.0 × 20 mm) were implanted with overlapping. The procedure went smoothly with a satisfactory final angiographic result that exhibited slow filling of the knee deep venous plexus with the contrast agent (Figure 7). After the endovascular procedure, the patient recovered with prompt reduction of the right leg edema. On the 3rd post-operative day, the patient was



Figure 5: Multislice computed tomography angiography after femoropopliteal bypass (coronal view)-multiple arteriovenous fistula in the right lower leg

discharged in good general condition, with continued low molecular weight heparin therapy (Enoxaparin-Sodium in dose 0.6 ml, daily), and instructed to continue with his initial Rivaroxaban (15 mg, daily) regimen.

The patient returned to the clinic after 1 week for a follow-up. On follow-up, the patient was subjectively better, without leg swelling and pain, with complete mobility of the limb, and claudication distance of 500–1000 meters.

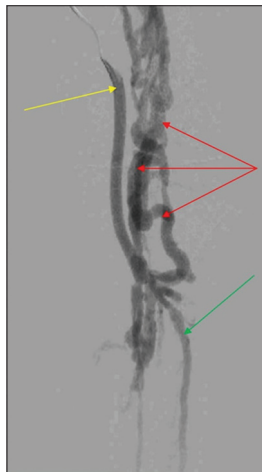


Figure 6: Conventional angiography after femoropopliteal bypass. Right lower leg rich in fast-shunting arteriovenous fistulas (yellow arrow shows catheter in FP graft; green arrow shows poor-filling tibial anterior artery; and red arrows shows fast-filling veins of the right leg)

Discussion

We did not find a similar case in the literature. Taking into account the rarity of this clinical pattern, we compared our experience with only a handful of cases that had similar clinical presentations and clinical courses. Reperfusion injury is a common condition after revascularization, and fasciotomy is the

best therapeutic option. However, in our patient, any fasciotomy could lead to catastrophic results because of venous hemorrhage and longtime open wounds.



Figure 7: Conventional angiography of the right leg (after implantation four cover stents)-better filling of crural arteries and poorer contrast staining of crurals and femoral veins

Furthermore, given our patient's history of multiple PEs, we believe that the PEs could be a consequence of the presence of numerous unrecognized AVFs and thrombophilia. Venturini *et al.* presented a similar case—PE as a consequence of AVF in the pelvic region and right gonadal vein with thrombus masses inside [3]. Similar to our approach, they were able to successfully treat the AVF endovascularly, and occluded the right gonadal vein at its confluence in order to avoid the recurrence of PEs [3]. Vidal *et al.* proved that endovascular embolization of symptomatic AVF secondary to autovenous in situ FP bypass is safe [4]. Some patients from this study had symptoms of arterial insufficiency and other had symptoms of venous congestion. Their study reported that 80% of patients with venous congestion experienced complete relief, while others had only partial relief and that 83% of patients with arterial deficiency had clinically significant improvement after endovascular treatment [4].

Contrary, Toker *et al.* suggested that treatment of arteriovenous malformations should be done using a combination approach – first endovascular embolization followed by subsequent surgery – to avoid unnecessary bleeding which can yield to the best results [5]. In the case reported by Ozcan *et al.* focused on the treatment of a female patient presenting with congenital AVFs in the left lower leg in the proximal segment, between the superficial femoral artery and the great saphenous vein. This patient was treated with two coil embolization procedures, that were unsuccessful, and then after 2 years, the patient underwent successful surgery [1].

Due to multiple inaccessible lesions, recent surgery, and presence of a crural atherosclerotic lesion, we decided to treat our patient only endovascular. Our patient had a complete relief of symptoms after only endovascular treatment.

Conclusions

The presence of AVFs should be kept in mind in the case of rapidly developing leg edema after revascularization. Endovascular treatment of symptomatic AVF is a safe and effective treatment modality. Treatment of symptomatic AVFs is not only recommended for improving impaired arterial or venous blood flow, but also for preventing recurrent PE.

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