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# Unusual cause of acute lower extremity ischemia in a healthy 15-year-old female: A case report and review of popliteal artery aneurysm management in adolescents

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ABSTRACT

Limb ischemia in healthy teenagers is unusual. While traumatic or iatrogenic injury is the most common etiologies of limb ischemia in the pediatric population, anatomic variants such as true aneurysms should be considered [1]. We report the second documented pediatric case of an idiopathic, isolated true popliteal aneurysm resulting in acute limb ischemia in a previously healthy 15-year-old female. We also review the proper evaluation and surgical management of this anatomic anomaly. In this case, surgical management included resection of the aneurysm, reconstruction with reverse saphenous vein grafting, and distal endarterectomies to restore adequate distal blood flow. Ultimately, this patient's limb and function were salvaged with minimal consequences.



Popliteal artery aneurysms are a rare cause of peripheral arterial ischemia in the pediatric population. While they account for 70% of peripheral aneurysms in the adult population, the prevalence within the general population remains at only 1% [2]. Most affected adult patients have a well-described history of atherosclerosis and may have an associated abdominal aortic aneurysm [3]. In the pediatric population, peripheral aneurysms and pseudoaneurysms have been described in patients with inherited connective tissue diseases that weaken the structure of vascular tissue, such as Ehlers-Danlos and Marfan syndrome [4,5]. Aneurysm formation has also been reported in cases of traumatic injury or in disease states such as fibromuscular dysplasia, osteochondroma, infection, and vasculitides [1, 6–11]. Review of the literature revealed 29 cases from 1834 to 2015 of children with multiple congenital aneurysms involving several anatomic locations without a defined etiology or syndrome [11–18]. However, isolated, idiopathic popliteal artery aneurysms are exceptionally rare in the pediatric population. Review of the literature has shown only one previously reported isolated, idiopathic true popliteal artery aneurysm [19].

We present the second case reported of an isolated, true idiopathic popliteal aneurysm in a 15-year-old previously healthy female who developed acute limb ischemia. We also review the evaluation, management and potential sequelae of popliteal aneurysms in the pediatric population.

## 1. Case report

A 15-year-old previously healthy, female cross-country runner presented with acute onset of severe right lower extremity pain. She reported a 2-month history of severe episodic right foot pain unassociated with physical activity, which was initially diagnosed as foot strain. On the morning of admission, she experienced moderate pain in her foot, which escalated over the course of 5 h to 9 of 10 in severity. She was brought to the emergency department at an outside hospital where initial examination demonstrated a palpable right femoral artery pulse but absent distal pulses. Investigational workup at the outside hospital included arterial duplex scanning which demonstrated normal flow through the right superficial femoral artery. However, blood flow was documented as 9 cm/s (normal 80–108) in the distal femoral artery and 5 cm/s (normal 55–83) at the popliteal artery with absent flow below the popliteal artery. She was diagnosed with acute

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limb-threatening ischemia and transferred via helicopter to a tertiary facility for further evaluation.

Nine hours after the onset of symptoms, she presented to the tertiary hospital. Physical exam confirmed the findings at the referring hospital. A computed tomography (CT) angiogram was performed to determine the level of occlusion and evaluate for distal emboli. The aorta below the diaphragm and vessels proximal to the superficial femoral artery (SFA) were unremarkable but a complete cutoff at the distal SFA was identified (Fig. 1). The limb-threatening ischemia was presumed to be due to a thrombotic event in the region of the popliteal artery, yet the etiology of thrombosis remained unclear.

The patient was immediately taken to the operating room. A hypercoagulability panel was sent prior to operation but was not immediately available. Coagulation studies including a thromboelastogram were normal. The popliteal artery was explored through a standard medial incision. A large aneurysmal dilation of the popliteal artery with absent distal blood flow was identified (Fig. 2). The intraoperative decision was made to excise the aneurysm and perform a reverse saphenous vein graft reconstruction. The resected aneurysm was 4 cm in diameter and showed concentric dilation with a complete luminal thrombosis (Fig. 3). Microscopic examination of the aneurysm demonstrated vessel wall dilation with evidence of degenerative changes. Catheter thrombectomies were performed in the superficial femoral artery and in all three limbs of the trifurcation prior to saphenous vein grafting. Reverse saphenous vein grafting was performed using interrupted 7-0 Prolene® polypropylene suture (Ethicon LLC, Somerville, NJ, USA) suture.

Following repair, intraoperative Doppler confirmed adequate blood flow through the vein graft, yet there remained absent flow through the distal vessels at the ankle. Surgical exploration and an arteriotomy of the posterior tibial (PT) artery revealed a chronic and

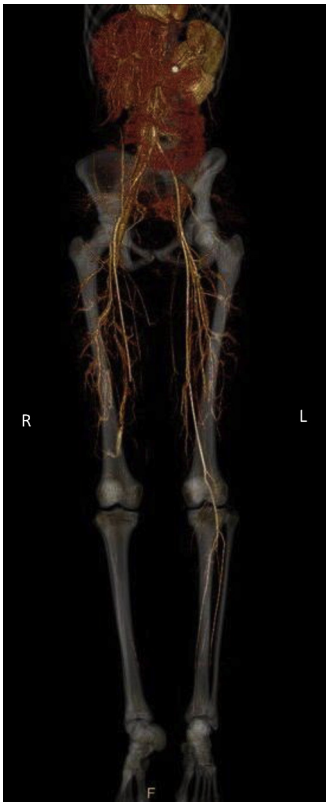


**Fig. 1.** 3-D reconstruction of CT angiogram demonstrating cutoff of blood flow at the right distal SFA.

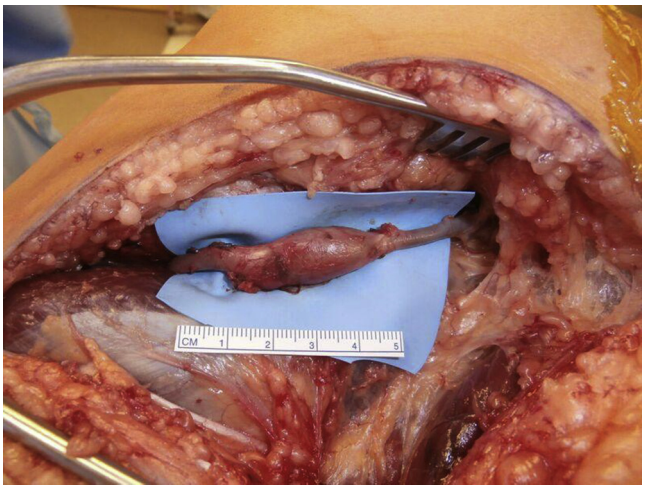

**Fig. 2.** Intraoperative photo demonstrating aneurysmal sac in the popliteal fossa.

well-organized embolic occlusion that was densely adherent to the vessel wall. Given the extensive thrombosis of the PT artery, exploration of the dorsalis pedis (DP) artery was also performed, revealing a similar chronic distal occlusion. Faced with probable limb loss, the decision was made to perform an endarterectomy of both the PT and DP vessels. A 2 cm long by 2 mm diameter chronic white-tan embolus was extracted from the PT and a 1 cm long by 2 mm diameter embolus was extracted from the DP. Fogarty catheters were passed retrograde from the PT and DP arteries, but no significant clots were removed. The arteriotomies were then closed with standard microvascular techniques with 8-0 Ethilon® nylon sutures (Ethicon LLC, Somerville, NJ, USA).

Despite adequate surgical reconstruction of the popliteal artery and complete distal endarterectomies, intraoperative angiography continued to show absent blood flow to the foot without occlusion. Clinical examination of the foot, however, demonstrated a marked overall improvement in circulation with a capillary refill time of 2–3 s and therefore the patient's inadequate flow on angiography was felt to be due either to vasospasm or chronic microvascular embolic occlusion. A prophylactic four-compartment fasciotomy in the lower leg was performed to prevent compartment syndrome secondary to ischemia-reperfusion injury. The patient was

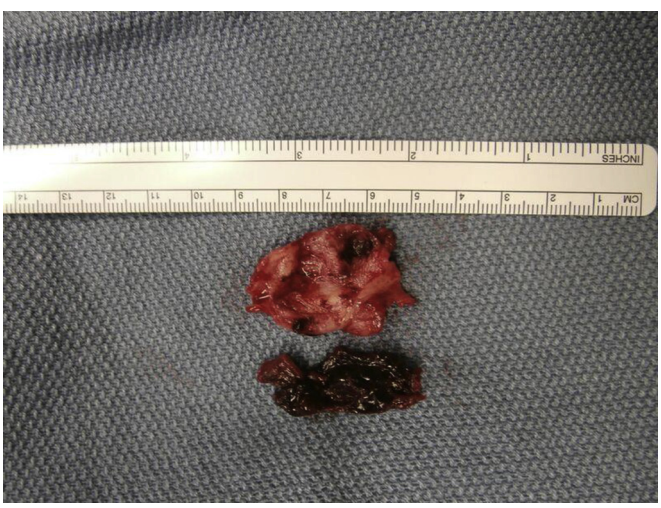

**Fig. 3.** Resected aneurysm and associated thrombus removed from aneurysm. Microscopic examination confirmed this to be a true aneurysm.