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Popliteal artery pseudoaneurysm in a child due to gunshot injury

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Summary

This is a case of a 12-year old boy who sustained gunshot injury to his left knee region. After initial debridement and closure of his wounds, the patient presented seven weeks later with a large pulsatile swelling of his lower thigh and painful flexion deformity of his knee. Angiography revealed large pseudoaneurysm of the popliteal artery and arteriovenous communication. The patient underwent successful repair of his popliteal artery with autologous long saphenous vein graft. The initial diagnostic difficulty in these cases, the different types of injury and the therapeutic modalities of similar cases in the literature are discussed.

Keywords: Gunshot injury, popliteal artery, pseudoaneurysm.

Résumé

Voici le cas d'un jeune garçon de 12 ans qui a reçu une balle au niveau de son genou gauche. Après le débridage initial et la fermeture de ses blessures, 7 semaines après, le malade, enflément de la cuisse inférieure et la flexion douloureuse du genou. L'angiographie révélait une pseudoanéurysme large de l'artère poplitale et la communication artère - veineuse. Le malade subit avec succès la réparation de l'artère poplitale avec une longue autologue saphéneuse de la veine. La difficulté initiale du diagnostic dans ces cas, les différents types de blessures et les modalités thérapeutiques des cas similaires dans la littérature sont discutées.

Introduction

Traumatic pseudoaneurysms of the popliteal artery are uncommon late complications of arterial injury. Although reviewed extensively in wartime, they occur less frequently in civilian trauma and have accordingly been less frequently studied[1]. Failure to recognize popliteal artery injury and restore continuity of blood flow after blunt trauma is a major cause of lower extremity amputation and morbidity. A high index of suspicion and early recognition of the injury are paramount for limb salvage, especially with posterior knee dislocation[2]. Here we are presenting a rare case of delayed presentation of popliteal artery pseudoaneurysm due to gunshot injury to the left knee region in a 12-year old boy. The diagnosis of arterial injury was missed on initial presentation and the patient was re-admitted seven weeks later with a large pulsatile swelling of the distal left thigh, which necessitated emergency operation. To our knowledge, the only two earlier, similar reports were in 10- and 8-year old children, but were secondary to blunt trauma[3,4].

Case Report

A 12-year old boy was transferred from a peripheral hospital with gunshot injury to the distal part of his left thigh. At Asir Central Hospital (ACH) in Abha, Saudi Arabia, the patient was hemodynamically stable with a blood pressure (BP) of 120/80 mmHg. On examination, there was edema of the left thigh.

with an inlet wound at the medial aspect of the left knee and an exit one on the lateral aspect of the distal 1/3 of the left thigh. There was incomplete flexion of the left knee, with good dorsiflexion of the left ankle and toes. Sensation was intact and the distal dorsalis pedis and posterior tibial pulses were palpable. Plain X-ray showed small cortical injury to the left femur with few bony splinters in the surrounding soft tissues (Figure 1).

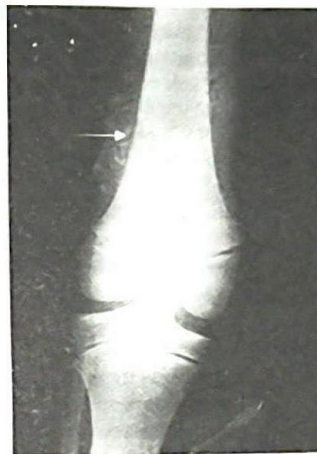


Fig. 1: Postero-Anterior plain X-ray of the left knee region on initial admission showing small cortical injury to the distal femur (arrow) and few bony splinters in the soft tissues on the outer aspect of the thigh

On initial surgical assessment, suspicion of vascular injury was excluded on the basis of clinical examination alone. The patient underwent emergency debridement and primary closure of the inlet wound. The exit wound was left open for secondary sutures and the limb immobilized in posterior slab.

Seven weeks later, the patient presented to the emergency room with progressive swelling of the distal part of the left thigh associated with fever, sweating and inability to walk. On general examination, the patient looked ill, in pain, tachypnic, febrile (38°C), but was hemodynamically stable. Local examination revealed a massive pulsatile swelling of the distal part of the left thigh, which was tense, tender, and hot with redness of the overlying skin. There was no fluctuation, discharge or sinus formation. There was also flexion deformity and inability to extend the knee with weak dorsiflexion of the ankle and toes. Plain X-ray showed soft tissue shadow behind the knee, which was thought initially to be due to abscess cavity. On vascular assessment, pedal pulses were impalpable and continuous wave Doppler (CWD) ultrasound showed increased venous signal over both the swelling and the pedal (anterior and posterior tibial) veins. The left anterior and posterior tibial arterial pressures were both measured at 90mmHg compared with 140mmHg on the right side. The clinical impression was that of a popliteal artery pseudoaneurysm with possible post-traumatic arteriovenous fistula (AVF) and the angiogram showed a large pseudoaneurysmal cavity of the popliteal artery with a big thrombus inside (Figure 2).

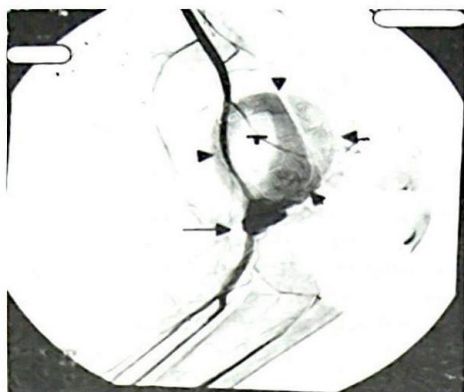


Fig. 2: Lateral view of a left lower limb arteriogram showing huge pseudoaneurysm cavity of the popliteal artery (arrowheads) with a thrombus (T) inside. The outer part of the aneurysm is overshadowed by the lower part of the femur. Note the normal filling of the popliteal artery proximal and distal to the site of the aneurysm. The lower arrow indicates the site of arterial rupture

At operation, under general anesthesia, proximal control of the common femoral artery was obtained through an inguinal incision. Another incision was made along the medial aspect of the lower thigh, knee and upper leg to gain control of the popliteal artery both proximal and distal to the pseudoaneurysm site. The aneurysm cavity was incised and the hematoma evacuated. The damaged segment of the artery was transfixated-ligated with non-absorbable suture and the tear in the popliteal vein was primarily repaired with continuous 6/0 prolene suture. A bypass graft was then anastomosed between the above- and below-knee popliteal arteries using the right long saphenous vein. Postoperatively, both the dorsalis pedis and the posterior tibial pulses were palpable normally. Three weeks later, the patient was discharged home in a good condition, but with partial drop foot deformity on the affected side.

Discussion

While aneurysms of the arterial system are rare in children, aneurysms of the popliteal artery are extremely rare in the pediatric population[4]. Popliteal artery injuries resulting in acute occlusion are associated with the highest rate of amputation for any site of vascular injury. For example, ligation of the popliteal artery resulted in a 73% amputation rate during World War II. This high amputation rate is due to the lack of preformed collaterals around the knee; and associated venous, soft tissue, skeletal and neurologic injuries. Associated trifurcation and popliteal vein injuries occur in about 30% of patients[5].

The popliteal artery is particularly susceptible to blunt injury because of its tight attachment to the adductor magnus tendon above and to the fibrous arch of the soleus muscle and inter-osseous membrane below the knee. Knee dislocation (posterior or anterior) or fracture of the supracondylar femur or tibial plateau causes stretch of the vessel, which may produce intimal tears. One-third of patients with knee dislocation have a popliteal artery injury that can be documented by arteriography[5]. Out of 36 MEDLINE case reports on popliteal artery pseudoaneurysms between 1983 and 2000, only 6 were due to penetrating trauma by gunshot injury 4, iron plate and acupuncture in 1 each. The remaining cases resulted mainly from therapeutic arthroscopy and blunt trauma. Other rare causes included fracture femur, total knee replacement, tibial osteotomy,

Iliizarov limb lengthening, osteochondromas, femoral embolectomy and atherectomy.

Patients can present as early as few weeks, as in the present case of our patient, or as late as 10 years after the initial, usually blunt, trauma[6]. A pulsatile swelling and an audible bruit are the usual presenting features as in this patient. Patients may also present with deep vein thrombosis[7,8] or intermittent claudication of the calf and painful flexion deformity of the knee[9], which was also present in our patient. A high index of suspicion, careful clinical examination and early referral to a vascular surgeon are important since many of the reported cases in the literature had palpable distal pulses and no obvious signs of arterial injury on initial presentation[10]. Although in our patient, popliteal artery injury was initially excluded on the basis of clinical examination alone, ankle Doppler pressures, duplex ultrasound, arteriography, magnetic resonance arteriography or even CT-scan are all useful in confirming the diagnosis once it is suspected. However, in some reported cases, lower extremity pulses, ankle systolic pressures and even angiograms were normal on initial presentation[11,12,13]. Routine arteriography has been recommended for all knee dislocations. However, careful pulse examination by an experienced physician and the use of ankle/brachial pressure index (ABI) can detect all significant injuries that require operative repair[5]. Experienced trauma surgeons can be more selective in their use of arteriograms[14].

Popliteal artery pseudoaneurysm with or without arteriovenous fistula can be treated successfully with either autologous saphenous vein graft, as we did with our patient, or by endoluminal repair using uncovered metallic intravascular stent or PTFE stent-graft[15,16]. The popliteal artery is best exposed through a medial incision, which allows proximal or distal extension. Posterior approach may be used if the location of the injury is precisely known by preoperative arteriography. Associated popliteal vein injuries should be repaired whenever possible to minimize postoperative venous hypertension and compartment syndrome[5]. Also, early systemic anticoagulation in the absence of any contraindication is essential to arrest thrombus formation in the small vessels of the leg distally. Concurrent use of Mannitol, an oxygen free radical scavenger, has been reported to markedly decrease the incidence of compartment syndrome and its sequelae[5].

Conclusion

Popliteal artery injury is an uncommon but serious condition. The high morbidity of a missed popliteal artery injury mandates the need for a high index of suspicion, careful physical examination, early referral to a vascular surgeon and arterial evaluation by either arteriography or ultrasonography. Repair of the injured popliteal artery should always be attempted, since primary ligation is associated with a very high amputation rate, up to 73%, and successful repair has been reported in up to 89% of the cases[5].

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