CASE REPORT

Thrombosed Popliteal Artery Pseudoaneurysm as Herald of Tibial Osteochondroma

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Background: Osteochondroma is the most common non-malignant tumour of bone, accounting for approximately one third of benign lesions in the skeleton. They often develop around the knee in the distal femur and in the proximal tibia and fibula. They present as a painless slow growing mass during adolescence and have been reported to cause damage to adjacent structures such as blood vessels; arterial damage is more common than venous injury and is usually a result of compression, stretching, and rubbing of the arterial wall. Such lesions include stenosis, thrombosis, and pseudoaneurysm formation possibly causing lower limb claudication or acute limb ischemia.

Methods: An 18 year old male patient with a 4 week history of pain, hematoma, and oedema of the left calf without previous trauma is reported. A computed tomography scan (CT) revealed a large popliteal artery pseudoaneurysm and its close relationship to a protrusion of the proximal tibia.

Results: The popliteal artery was repaired by an external saphenous patch and the exostosis was removed. The patient had palpable popliteal and distal pulses after surgery and during the first year follow-up.

Conclusions: Tibial osteochondroma should be considered in the differential diagnosis in young patients, among the potential causes of pseudoaneurysm of the femoral or popliteal artery. Surgical repair should be performed to restore normal blood flow with resection of the exostosis to prevent recurrence.

INTRODUCTION

Arterial pseudoaneurysm is an encapsulated hematoma communicating with the lumen of a ruptured artery. Its formation mechanism, associated with bone exostoses, has been well described in the literature.1–3 The distal superficial femoral artery and the popliteal artery are the most commonly injured vessels because of their anatomical proximity to the distal femur and proximal tibia, the most common sites of osteochondroma formation.4 Vascular pathology results from repeated abrasions to the artery during flexion of the knee, producing injury to the vessel wall, resulting in the formation of a pseudoaneurysm.5 Other complications caused by bony protrusions are less common and include arteriovenous and nervous compression, arterial rupture, and stenosis. Clinical manifestations include painful pulsatile mass associated with hematoma, functional abnormalities, oedema, and neuropathic pain.1,5 Exostoses are the most common benign tumours of bone. They account for 10–15% of both benign and malignant bone tumours.4 Their prevalence is 2.5:1 male to female ratio during the second decade of life. However, as they are usually asymptomatic, their real incidence is probably higher.5 Patients usually present during the second decade of life.

Arterial complications resulting from osteochondroma must be studied thoroughly, as this is an uncommon cause of limb ischemia. Complete physical evaluation including distal pulses at rest and with extension/flexion manoeuvres as well as the presence of a hard pulsatile mass, should suggest the diagnosis. Imaging includes duplex scanning to assess arterial structure and patency, plain radiographs, and magnetic resonance imaging to evaluate bone lesions.1 The use of CT scan is a good option to appraise vessel injury and its possible relation to the exostosis. Surgical treatment is indicated in symptomatic patients and it includes arterial reconstruction and excision of the bony protuberance. Surgical removal of the tumour is indicated if it is adjacent to the vessel, interferes with a joint, or if there is macroscopic or radiological suspicion of malignant transformation.1,5

This study presents the case of a young man with a large thrombosed popliteal pseudoaneurysm caused by a solitary exostosis with a sharp tip in the proximal tibia, who underwent surgical excision of the tumour and arterial reconstruction.
CASE REPORT

An otherwise healthy 18 year old male presented with a 4 week history of pain and oedema of the left calf, with no prior history of intermittent claudication, and no recent trauma. Physical examination of the left lower extremity showed a normal femoral pulse, with non-palpable popliteal, dorsalis pedis, or posterior tibial pulses. A non-pulsatile hard mass was noted in the popliteal fossa. Peripheral capillary filling was normal, with normal motor function, diminished perception of pain, and coldness of the foot.

A radiograph showed a pedunculated exostosis on the proximal tibia (Fig. 1). Doppler ultrasonography reported a hematoma in the popliteal fossa (Fig. 2). CT scan revealed a proximal tibial exostosis, and an 8 cm diameter largely thrombosed false aneurysm of the distal popliteal artery, in close relation to a proximal tibial exostosis (Fig. 3). MRI showed a unilateral lesion in the left tibia and no signs of malignancy of the soft tissue (Fig. 4).

Surgery was performed with the patient in the prone position under epidural anaesthesia and sedation, by both vascular and orthopedic surgeons. The pseudoaneurysm was exposed through a posterior approach to the popliteal fossa. The proximal and distal popliteal artery was dissected and controlled with vessel loops; dissection and resection of the pseudoaneurysm was performed as well as evacuation of the hematoma, to decompress adjacent neurovascular structures. The exostosis was removed by the orthopedic surgeon; the remaining bone edges were smoothed. Conservative excision of the protrusion was determined from the benign appearance of the lesion and a tumour biopsy was sent for histopathological analysis. A single 3 mm diameter orifice was found on the posterior wall of the popliteal artery. The damaged vessel was repaired by longitudinal arteriotomy and closure with an external saphenous vein patch (Fig. 5). Fasciotomy was required to decompress the muscular compartment.

Recovery was satisfactory; the patient was discharged 3 days after surgery. Normal vascular status was restored, with palpable distal pulses and less oedema in the left calf. Doppler ultrasonography performed 3 months later showed normal blood flow. The patient did not need physical rehabilitation, as he made a full recovery resuming his regular activities without any pain. Histologically, the resected exostosis was composed of bone and cartilage with no malignancy, confirming the diagnosis of osteochondroma.

Figure 1. Lateral plain radiograph of left leg: sessile protrusion from the posterior surface of the proximal tibia.

Figure 2. Duplex scan: hypoechogenic mass in the popliteal fossa adjacent to the popliteal artery with characteristic yinyan image of pseudoaneurysm.
At 6 and 12 month follow-up the patient had completely recovered a full range of movements, presented normal distal pulses, and had no residual pain or oedema.

**DISCUSSION**

Osteochondroma is one of the most common developmental lesions of the bone, accounting for 10–15% of both benign and malignant bone tumours. It may present as a solitary lesion or as hereditary multiple exostoses. The most common location is the distal femur. Clinical manifestations are usually absent, therefore the diagnosis is mostly incidental. Presenting complaints may include claudication or acute limb ischemia from stenosis, thrombosis, rupture of pseudoaneurysm, distal embolisation, neuropathic pain and vein thrombosis caused by compression.

Pseudoaneurysm formation is the most common as a result of arterial injury caused by exostosis. It has been hypothesised, that the bone exostosis causes intermittent chronic abrasion to the artery with flexion and extension of the knee joint, damaging the adventitia and leading to the false aneurysm. According to the literature there have been over 100 cases reported since the 1960s; 60% of these were in the distal femoral artery, 25% in the popliteal artery, and 15% in the distal vessels.

The differential diagnosis of benign bone exostoses in this location that may potentially cause vascular damage are osteochondroma, subungual exostosis, turret and traction

![Figure 3. CT scan axial and sagittal view: 8 cm mass in contact with tibial exostosis.](image-url)
exostoses, bizarre parosteal proliferation, and florid reactive periostitis. Radiological features of osteochondroma are often pathognomonic; the protuberance is composed of cortical and medullary bone with an overlying hyaline cartilage cap in continuity with the underlying parent bone cortex. CT scan and MRI are useful for identifying and studying complications including malignancy. Malignant transformation occurs in less than 1% of solitary osteochondromas.

Surgical vascular reconstruction and excision of the adjacent osteochondroma is considered to be the treatment of choice in symptomatic patients. Asymptomatic cases may be followed up by careful medical observation and annual plain radiographs. Ultrasound guided compression is not recommended because of the high risk of aneurysm rupture. Endovascular treatment in this age group is not recommended because of its shorter durability. The use of transarterial embolisation with helical microcoils has been described, mostly in older hemodynamically unstable patients but may also carry a risk of coil migration causing distal embolisation.

Surgical treatment by a multidisciplinary team including vascular and orthopedic surgeons is often required to restore normal vascular status and improve nerve compression symptoms. Conservative excision of the exostosis is
recommended in macroscopically benign lesions, and histopathology analysis is required to evaluate the need of adjuvant therapy post-operatively. Osteochondromas in adolescence may spontaneously recur, even after adequate resection, therefore annual radiographic follow-up is mandatory.5,9

The importance of correct treatment and follow-up of large osteochondromas to avoid complications such as further damage to neighboring neurovascular structures, and potential malignant degeneration is emphasised. In young patients with symptoms of limb ischemia, it is important to study non-atherosclerotic causes of vascular disease including coagulation disorders, heart disease, trauma history, and neoplasms such as the one in the case report. Post-operative care should include annual radiographic imaging to identify other lesions or recurrence.

CONFLICT OF INTEREST
None.

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Figure 5. Intra-operative image showing exostosis of the tibial bone before its resection.