

Superficial femoral artery pseudoaneurysm caused by a solitary femoral shaft osteochondroma in a young adult

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ABSTRACT

We discuss the presentation, diagnosis, and surgical management of a young man presenting with a symptomatic superficial femoral artery pseudoaneurysm caused by a solitary femoral shaft osteochondroma. We review the existing literature regarding the incidence and management of this problem. (*J Vasc Surg Cases and Innovative Techniques* 2020;6:235-8.)

Keywords: Pseudoaneurysm; Osteochondroma; Arterial reconstruction

CASE REPORT

A healthy and active 18-year-old white man presented with a 2-month history of persistent right posterior knee and thigh pain with pulsatile mass. This was preceded by a sudden onset of sharp pain after standing from a sitting position. Since then, the posterior leg has felt heavy and sore, with a pulsatile fullness behind the posteromedial lower right thigh. The pain is exacerbated by exercise, such as leg lifts or squats. There is no history of blunt trauma to the region.

There is a visible fullness over the right posteromedial thigh with a strong palpable pulse, no focal tenderness or overlying skin changes, no palpable thrill, and a loud bruit audible on auscultation. There is no significant soft tissue edema. There is no leg length discrepancy or evidence of varicose veins. Both lower extremities remain neurovascularly intact with palpable pedal pulses.

Consent has been obtained from the patient to publish the clinical information and images.

Radiographic investigations. An outpatient musculoskeletal right leg ultrasound examination was performed before the patient's referral to our emergency department. This suggested a 5-cm pseudoaneurysm arising from the distal superficial femoral artery (SFA).

Subsequent computed tomography angiography evaluation confirmed the presence of a 3.4- × 4.0- × 5.0-cm contained distal SFA pseudoaneurysm secondary to local injury from a 2-cm bone lesion along the posterior distal femur with a sharp, marginated tip and no radiographic evidence of malignant

degeneration (Figs 1 and 2). There was no evidence of arteriovenous fistula, pseudoaneurysm rupture, or distal arterial compromise. There were no other ipsilateral or contralateral bone abnormalities noted on computed tomography angiography.

On review with our radiology and orthopedic surgery colleagues, this femoral shaft lesion was believed to be most consistent with a benign isolated osteochondroma, also referred to as exostosis. No further investigations were deemed necessary before proceeding with surgical pseudoaneurysm repair.

Right leg duplex ultrasound vein mapping demonstrated a patent great saphenous vein ranging from 4 to 5 mm in diameter, which was suitable for use as bypass conduit.

Surgical repair. Following right leg great saphenous vein harvest, a medial approach was taken to expose the SFA and the above-knee popliteal artery. After proximal and distal control was obtained, the SFA pseudoaneurysm was opened, and thrombus was evacuated from the thickened capsule (Fig 3). A sharp, fin-shaped posterior femoral shaft bone spike was visualized from within the pseudoaneurysm capsule, with a partially dislodged hardened cartilaginous cap overlying its tip. The artery was adherent to the bone surface and was gradually mobilized away from the femoral shaft and inspected. A corresponding longitudinal and irregular anterolateral SFA defect was visualized. An interposition bypass was favored over patch repair of the SFA defect because of concern that chronic inflammation at the pseudoaneurysm site may contribute to circumferential intimal hyperplasia at this level. The defect was oversewn to prevent potential backbleeding after construction of the bypass. We then ligated and divided the SFA above and below the pseudoaneurysm site, thereby excluding the intervening 5-cm segment. The transected proximal and distal SFA ends were slightly spatulated and appeared soft and healthy. There appeared to be an excellent size match of the saphenous vein with the SFA to allow it to be used as an end-to-end interposition bypass conduit.

With the aid of our orthopedic colleagues, the femoral shaft exostosis was then excised completely to facilitate short interposition bypass construction thereafter. Given the size and adequate exposure of the lesion, this took a few minutes, and we did not place a temporary arterial shunt. We exposed the

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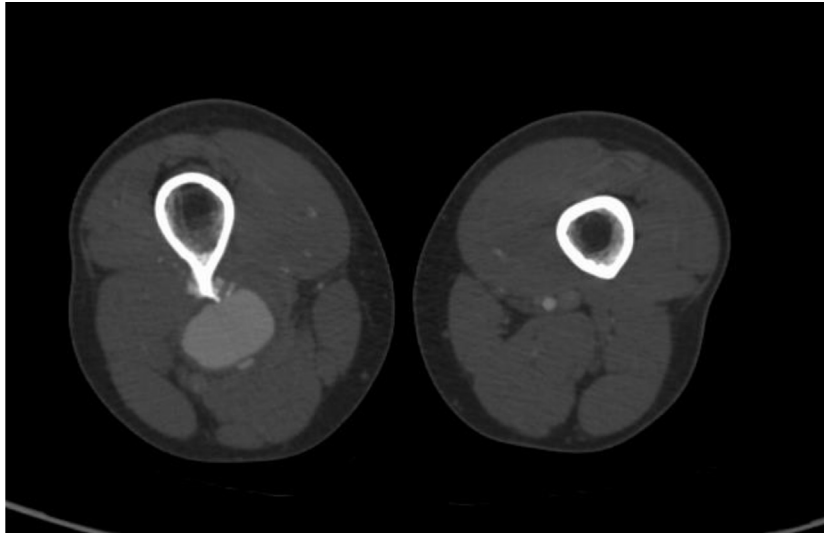


Fig 1. Axial computed tomography angiography image demonstrating a sizable right superficial femoral artery (SFA) pseudoaneurysm adjacent to a posterior femoral shaft cortical lesion believed to be most consistent with a benign isolated osteochondroma.

long base of the fin-shaped mass and then resected it in a plane parallel to the linea aspera of the femoral shaft using a combination of bone saw and osteotomes. The resulting femoral shaft surface was smooth and free of any residual shards or steps.

We constructed a roughly 10-cm-long interposition reversed saphenous vein graft from the distal SFA to the above-knee popliteal artery. The graft coursed superficially to the excluded intervening native SFA segment, away from the femoral shaft and the scarred tissue around the pseudoaneurysm.

Postoperative radiography confirmed a smooth femoral shaft surface. The right foot remained neurologically intact with palpable pedal pulses.

Recovery and follow-up. The patient had an uncomplicated postoperative course and was discharged home ambulating independently. He was maintained on aspirin 81 mg orally daily, which we recommended he continue for a minimum of 6 months. Pathologic assessment of intraoperative specimens revealed benign recent thrombus within the pseudoaneurysm capsule and benign bone fragment with focal reactive changes including fibrosis and benign osteoids. Routine ultrasound bypass graft surveillance performed 3 months postoperatively demonstrated a patent graft without hemodynamic impairment and normal bilateral ankle-brachial index of 1.2. Annual ultrasound surveillance was recommended thereafter.

DISCUSSION

Osteochondromas, or exostoses, are the most common benign bone tumors, observed in 1% to 2% of the population.¹ They are osseous cortical outgrowths with a cartilaginous cap, arising mostly from the metaphyseal or metadiaphyseal region of long tubular bones, such as the femur, humerus, and tibia.¹⁻⁴ They occasionally develop from the bony pelvis, scapula, ribs, and vertebrae, with rare reports of involvement of the tubular



Fig 2. Three-dimensional reconstruction of computed tomography angiography image demonstrating the local arterial injury caused by the sharp femoral shaft osteochondroma resulting in pseudoaneurysm.

bones of the hands and feet.^{1,4} They are most often solitary lesions that are slow growing during childhood and adolescence and tend to stop growing after fusion of the bone growth plate.⁴ In 10% of cases, multiple hereditary exostoses (an autosomal dominant disorder) may be manifested as multiple skeletal lesions with

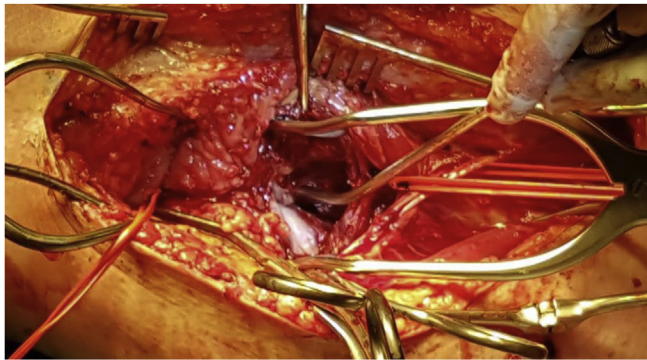


Fig 3. Evacuation of right superficial femoral artery (SFA) pseudoaneurysm capsule following proximal and distal control through a medial approach. A sharp bone spike was noted within the pseudoaneurysm capsule.

subsequent bone shortening or bowing and a 10-fold increased risk of malignant chondrosarcomal degeneration.^{1,4,5}

The natural history of solitary osteochondroma is most often uncomplicated; the majority of lesions are identified incidentally in late adolescence, with a 3:1 male predilection.⁴ Lesion size and location often dictate symptoms of complicated exostosis, which occurs in roughly 4% of cases and encompasses growth deformity, nerve compression, rare malignant degeneration, and arteriovenous complications.^{2,5} Vascular complications of osteochondromas are rare and include pseudoaneurysm; thrombosis, distal embolization, or extrinsic compression, causing ischemic symptoms; arteriovenous fistula; and phlebitis.^{1,3} Of reported vascular complications, 91% are arterial, with pseudoaneurysm being the most common.¹ The majority of pseudoaneurysms caused by osteochondroma involve the femoropopliteal segment (>80% of cases), with far fewer cases involving the tibial vessels and brachial artery.^{1,6}

The popliteal segment is particularly vulnerable to osteochondroma erosion and pseudoaneurysm formation because of its fixation across the adductor canal and at the trifurcation, thereby limiting its mobility in the face of extrinsic pressure from an exophytic bone mass.^{2,6} The mechanism of arterial injury and pseudoaneurysm formation may be that of chronic friction and adventitial abrasion or direct vessel puncture by a sharp bone spike.^{3,7,8} It is suggested that the ossification of the cartilaginous cap overlying osteochondromas in early adulthood relates to the increased incidence of vascular injury in this period as the resulting sharp bone spur is more likely to disrupt adjacent vessel walls, particularly after trauma or vigorous exercise.^{1,7,9}

As in the case presented here, most individuals with pseudoaneurysm secondary to osteochondroma present with an average 3-week duration of pain and a pulsatile mass.^{1,6} More than one-third of patients report a preceding history of trauma or vigorous exercise often involving

repeated knee flexion.¹ Other presenting symptoms may be related to pseudoaneurysm rupture, mass effect on neighboring nerve or venous structures, or distal ischemia.^{6,8,10} Reflective of the demographic distribution of exostoses, pseudoaneurysm complications are most often diagnosed in male patients aged 10 to 30 years with solitary exostoses.^{6,7}

Cross-sectional imaging is most useful in confirming the presence of osteochondromas and delineating their relationship to an associated pseudoaneurysm. Duplex ultrasound may be useful in characterizing the flow through a pseudoaneurysm, whereas angiography alone may fail to visualize the extent of a thrombosed pseudoaneurysm. In cases of suspected multiple hereditary exostoses, screening radiography of the extremities and trunk may be informative.

In all reported cases of pseudoaneurysm from osteochondroma, prompt open surgical repair consisting of exostosis resection, pseudoaneurysmectomy, and vascular reconstruction or repair has been performed. Given the need for concurrent exostosis resection to prevent further injury, this condition is not suitable for endovascular therapy alone. Maximal exostosis resection aids in confirming a histopathologic diagnosis and preventing recurrent injury; subsequent exostosis recurrence rates are as low as 2%.⁶ Primary suture arterial repair is preferred only for small isolated arterial defects, with some authors suggesting a threshold of <5 mm.⁶ Interposition bypass with exclusion of the damaged arterial segment has been frequently described, along with primary end-to-end arterial repair where there is sufficient length to do so.^{1,6} Adjunctive procedures, such as distal thrombectomy and thrombolysis, may be required in the setting of concurrent distal arterial occlusion. Postoperative antiplatelet therapy is recommended for several months, especially in the setting of bypass reconstruction.⁶

Whereas long-term data are limited, most published series suggest excellent postoperative outcomes in these otherwise young and healthy patients. One review identified a 2% rate of postoperative neuropathic sequelae such as foot drop, 1% incidence of bypass graft stenosis, and 1% incidence of recurrent osteochondroma during a median follow-up of 120 days.⁶

There are no official guidelines pertaining to preventive resection of uncomplicated osteochondroma. Resection may be considered in the setting of proximity to vascular structures, perceived risk of joint interference, fracture, or any clinical or radiographic suspicion of malignant transformation.^{3,5}

CONCLUSIONS

Vascular complications of osteochondromas are rare and primarily include pseudoaneurysms of the femoropopliteal segment. Successful management of this condition demands an interdisciplinary open surgical

approach. Concomitant osteochondroma resection with repair or replacement of the injured arterial segment provides the most durable repair in a relatively young patient.

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