Online Case Report

Popliteal artery pseudo-aneurysm secondary to femoral osteochondroma: a case report and literature review

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A case of pseudo-aneurysm of the popliteal artery secondary to an osteochondroma of the femur in a young adult is described.

Keywords: Pseudo-aneurysm – Popliteal artery – Osteochondroma

Osteochondroma is the most common, benign, skeletal tumour occurring in 1% of the population and being more prevalent in males.^{1,2} Mostly metaphyseal in location, they develop from cortical bone hyperplasia at the epiphyseal plate.³ They are often incidental findings on plain radiographs during adolescence although, rarely, may be associated with vascular complications most often affecting the popliteal artery.^{4,5} We describe a case of pseudo-aneurysm of the popliteal artery secondary to an osteochondroma of the femur in a young adult.

Case report

An 18-year-old man was referred to our institution with a 2-year history of swelling in the right popliteal fossa following minimal blunt trauma during a football match. A rapid increase in size had been noted over the preceding 2 months.

A 10-cm, non-pulsatile, painless mass was found in the right popliteal fossa. Venous obstruction was evident with distal oedema and varicosities. There was no evidence of neurological compromise and distal pulses were palpable.

Plain radiography revealed an osteochondroma arising from the distal femoral shaft without evidence of fracture (Fig. 1). Duplex Doppler ultrasound demonstrated a large,

Figure 1 Plain radiograph demonstrating a distal right femoral osteochondroma with adjacent soft tissue mass.

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Figure 2 Intra-operative picture showing right popliteal artery with associated pseudo-aneurysm.

mixed echogenicity mass with no flow. CT angiography and MR angiography revealed a 10-cm popliteal pseudo-aneurysm without active perfusion. A second opinion was sought from the regional osteosarcoma centre due to the lack of demonstrable flow within the mass. They agreed with the diagnosis of popliteal artery pseudo-aneurysm.

One week after initial presentation, the patient complained of a rapid increase in size and pain. A repeat duplex Doppler ultrasound scan demonstrated active arterial flow within the aneurysm arising from a defect in the popliteal artery. Due to the rapidly increasing size, with associated pain, operative repair was undertaken as an emergency.

A posterior surgical approach was used with proximal tourniquet control. A 10-cm x 4-cm popliteal artery pseudo-aneurysm secondary to a single 1.5-cm anterolateral arterial defect was found (Fig. 2). The pseudo-aneurysm sac was opened longitudinally and cleared of mixed maturity thrombus and fresh blood (active perfusion prior to operation). The osteochondroma was spiked without a cartilaginous cap. Due to the size of the arterial defect, a venous patch angioplasty repair was performed. The osteochondroma was excised and the aneurysm sac was debulked and plicated to cover the osteochondroma site.

Histopathological examination of the bone specimen confirmed the diagnosis of osteochondroma. Postoperative recovery was uneventful and the patient was discharged

on day 3. The patient remains asymptomatic after 6 months' follow-up.

Discussion

Osteochondromas develop from skeletal elements that have undergone endochondral ossification and can occur at any time of the human skeletal growth phase. They are 'protected' by a soft hyaline cartilaginous cap that is identical to the epiphyseal plate and undergoes ossification following cessation of growth.³ They are often solitary (90% of cases) although when multiple represent a hereditary autosomal dominant condition.¹

Although vascular sequelae are extremely rare, the commonest complication is a popliteal pseudo-aneurysm secondary to a distal femoral osteochondroma presenting during the second decade of life.² Medline (1966–2004) and Cochrane library searches identified 27 cases of popliteal pseudo-aneurysm secondary to femoral osteochondroma described in the English literature.^{2,7–26} These cases are summarised in Table 1.

The popliteal artery is particularly susceptible to pseudo-aneurysmal change as it is fixed between Hunter's canal superiorly and popliteus muscle inferiorly thus preventing displacement from any underlying lesion. Many authors have speculated that, following cessation of

Table 1 Summary of English literature review of previous reported popliteal pseudo aneurysms secondary to femoral osteochondromas

Reference	Presenting complaint	Duration (weeks)	Size of aneurysm (cm)	Surgical approach	Repair technique	Age (years)	Osteochondromas (n)	Hx of trauma
Taneda <i>et al.</i> ¹⁵	Swelling and pain	26	10	Medial	Resection + end-to-end anastomosis	49	Solitary	No
Cardon <i>et al.</i> ¹⁶	Knee pain	4	NA	Posterior	Resection + end-to-end anastomosis	12	Solitary	Yes
Matsushita <i>et al.</i> ²⁷	Knee pain	12	6	Medial	Venous patch angioplasty	13	Solitary	Yes
Scott <i>et al.</i> ²¹	Swollen, painful calf	1 day	6 x 2.5	NA	Ligation and vein bypass graft	37	Solitary	No
Antonio <i>et al.</i> ¹⁰	Pain distal thigh	4	5 x 5	Medial	Primary closure	9	Solitary	No
Klebec <i>et al.</i> ⁹	Thigh pain	5	7 x 8.2	Medial	Primary Closure	15	Multiple	No
Otsuka <i>et al.</i> ²²	Enlarging mass	26	> 10	NA	Resection + end-to-end anastomosis	21	Multiple	Yes
Wiater <i>et al.</i> ⁷	Pain distal thigh	1	3	Posterior	Interposition vein graft	17	Multiple	Yes
Marcove <i>et al.</i> ²⁴	Knee pain	16	NA	Medial	Primary closure	30	Multiple	No
Kover <i>et al.</i> ²³	Swelling & pain	6	10 x 15	Anteromedial	Resection + end-to-end interposition vein graft	15	Solitary	Yes
Perez <i>et al.</i> ¹¹	Pain mass	2 days	6 x 4	Post	Primary Closure	14	Solitary	Yes
Lizama <i>et al.</i> ¹⁷	Swelling & pain	4	NA	NA	Ligation and vein bypass graft	16	Solitary	No
Kalinga <i>et al.</i> ¹⁹	Swelling & pain	1	15 x 20	Medial	Ligation and vein bypass graft	16	Solitary	No
Shah <i>et al.</i> ⁸	Cold pale leg	12	NA	Medial	Sac resection and primary closure	16	Solitary	No
Masson <i>et al.</i> ²⁰	Swelling & pain	3	NA	Posterior	Popliteal artery ligation	9	Multiple	No
Greenway <i>et al.</i> ²⁶	Pain knee	1	NA	NA	Resection + end-to-end anastomosis	16	Multiple	No
Hasselgreen <i>et al.</i> ²⁵	Swelling & pain	8	8 x 8	Medial	Ligation and Gortex bypass	45	Multiple	No
Harrington <i>et al.</i> ¹⁴	Pain knee	1	10 x 5.5	Post. & medial	Primary closure	22	Solitary	Yes
Lieberman <i>et al.</i> ¹⁸	Mass	12	6	Post	Venous patch angioplasty	19	Solitary	Yes
Vasseur <i>et al.</i> ²	Pulsatile swelling	NA	NA	Medial	Popliteal artery ligation	14	Solitary	Yes
	Pulsatile swelling	NA	NA	Medial	Primary closure	24	Multiple	No
	Pulsatile swelling	NA	NA	Medial	Primary closure	15	Multiple	No
	Acute ischaemia	NA	NA	Medial	Ligation and vein bypass	22	Solitary	No
	Pulsatile swelling	NA	NA	Medial	Resection + end-to-end anastomosis	14	Solitary	No
Burkhardt <i>et al.</i> ¹¹	Painful pulsatile, mass, distal oedema	2 days	6 x 4	Posterior	Primary closure	14	Solitary	Yes
Israels <i>et al.</i> ¹³	Swelling & pain	NA	NA	Posterior	Resection + end-to-end anastomosis	51	Solitary	No
Manner <i>et al.</i> ¹²	Swelling & pain	NA	NA	NA	NA	13	Solitary	No

NA, not available from article.

Post. = posterior

growth, the cartilaginous cap undergoes ossification resulting in a sharp bone spur. As the vessel becomes tethered, the resulting constant compression and pulsatile friction against the 'non-protected' osteochondroma causes continuous injury to the vessel wall, resulting in pseudo-aneurysm formation.²⁴⁻²⁶ However, Matsushita *et al.*²⁷ hypothesised that the loss of the protective cartilaginous cap was not the initiating factor, but that an initial traumatic compression of the popliteal artery against an osteochondroma leads to the development of the pseudo-aneurysm. As the pseudo-aneurysm expands, it causes pressure necrosis of the cartilaginous cap.²⁷

In our case, the cartilaginous cap was not evident at operation. We speculate that the development of the pseudo-aneurysm was exacerbated by the episode of blunt trauma leading to compression of a weakened arterial wall against a 'non-protected' osteochondroma.

Early surgical repair is mandatory as conservative management may increase the risk of secondary complications including venous thrombosis and distal emboli.^{2,15,16,26} Posterior and medial surgical approaches have both been described, with primary closure, venous patch angioplasty, vein/prosthetic bypass and ligation.⁷⁻²⁷ We adopted a posterior approach to the lesion, utilising a venous patch angioplasty repair. However, we would advocate a medial approach if a vein bypass graft was anticipated by pre-operative imaging.

Conclusions

Popliteal pseudo-aneurysms are the commonest, vascular sequelae of osteochondromas due to the superior and inferior fixation of the vessel and the relative frequency of femoral osteochondromas. Surgical repair is mandatory in all cases due to the potential for secondary complications. Postoperative care should include imaging investigations to identify other lesions as 10% of patients will have multiple osteochondromas.

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