

Pseudoaneurysms Masquerading as Malignant Bone Tumours

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ABSTRACT

Swelling around the knees can be due to both neoplastic as well as non neoplastic aetiology. One of the rare cause for the same is pseudoaneurysm. Pseudoaneurysms can mimic a bone tumor or a soft tissue sarcoma. Pseudoaneurysms result because of the gradual growth occurring due to constant arterial pressure and development of a reactive fibrous capsule. Inappropriate diagnosis and management of these lesions may result in major morbidity and rarely mortality. We present two cases of pseudoaneurysms around the knees which were misdiagnosed as osteogenic sarcomas. These cases also stress on the importance of multidisciplinary care in preventing avoidable morbidity, mortality and providing safe and optimal care to the patients.

Keywords: Biopsy, Knee swelling, Osteogenic sarcoma, Yin-yang-sign

CASE 1

A 21-year-old male, presented with a history of swelling in the left popliteal fossa for a duration of six months. The swelling was progressively increasing in size and associated with mild pain and restricted range of motion. There was no history of trauma, fever or bleeding disorders. On local examination, there was a 12cm x 10cm firm swelling in the left popliteal fossa, tender to touch and non-pulsatile in nature. The knee joint was in 20 degree fixed flexion and further range of movement was painful and restricted [Table/Fig-1]. Distal pulsation in the posterior tibial and anterior tibial artery were well felt and no distal neurological deficit was noted. The antero-posterior and lateral radiographs of the distal end of the left femur suggested an osseous growth from the posterior cortex of the distal femur with large soft tissue opacity in the popliteal fossa [Table/Fig-2a]. The Magnetic Resonance Imaging (MRI) scan reported elsewhere, suggested a large solid-cystic mass in the popliteal fossa with altered marrow signal along with irregular cortical surface posteriorly over the distal femur, possibly a synovial sarcoma or an osteogenic sarcoma of the distal femur [Table/Fig-2b-d]. In view of the patient's age, symptoms, anatomical site and radiographical features (large soft tissue mass and altered marrow signal) a provisional diagnosis of malignant bone tumour probably a paraosteal osteogenic sarcoma was made.

A needle biopsy done from the distal femur, showed bony trabeculae interspersed with areas of fibroblastic proliferation

and areas of osteoid formation. Histopathologically it was reported as "suspect osteogenic sarcoma". As part of the staging investigations, a Fluoride Positron Emission Tomography (F-18 PET) was done. It was reported as increased radiotracer activity noted in the distal end of left femur representing the known site of primary with no evidence of skeletal metastases and the plain Computed Tomography (CT) of thorax on work up did not reveal any metastatic lung nodules [Table/Fig-3a]. In the tumour board joint clinic, an experienced musculoskeletal radiologist raised the suspicion of a vascular lesion on MRI images, secondary to irritation by the bony outgrowth from the posterior surface of femur. Hence, a Colour Doppler Ultrasonography examination of the local part was done, which revealed large cystic structure with characteristic typical swirling motion of blood flow within the cystic structure called the "yin-yang sign" [1]. A diagnosis of giant pseudoaneurysm arising from the popliteal artery with surrounding eccentric thrombus within the pseudoaneurysm was made [Table/Fig-3b]. The communicating channel (neck) between the sac and

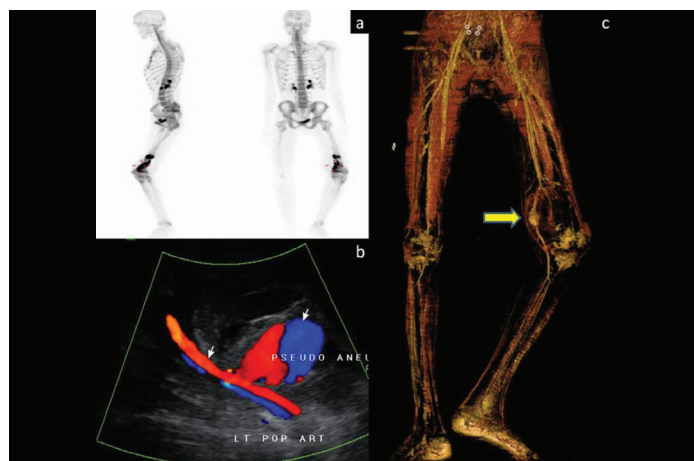


[Table/Fig-1]: Case-1 presented with 12cm x 10cm firm, tender, non-mobile swelling in popliteal fossa.



[Table/Fig-2a-d]: a) Plain radiograph of the distal femur showing osseous growth from the posterior cortex of the distal femur with large soft tissue opacity in the popliteal fossa. b&c) Sagittal T2 W and coronal STIR MRI images showing large soft tissue with hyperintense edematous marrow changes in distal metaphysis and epiphysis. d) Axial T1 W MRI image showing large popliteal artery pseudoaneurysm with sharp bony excrescence arising from the posterior cortex of the femur (Osteochondroma without cartilage cap).

the feeding artery with a “to-and-fro” waveform in duplex Doppler ultrasonography is considered to be a hallmark sign [3]. CT and conventional angiogram were done for further treatment planning which revealed wide neck of pseudoaneurysm with characteristics finding of osteochondroma on axial CT images [Table/Fig-3c].



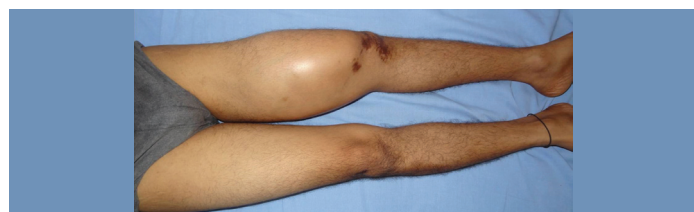
[Table/Fig-3a-c]: Fluoride PET which showed increased radiotracer activity in the distal metaphyseal end of left femur probably, secondary to inflammation and edematous changes in a long standing lesion; b) Colour Doppler ultrasonography showing giant pseudoaneurysm with characteristic swirling motion of blood flow within called the “yin-yang sign”; c) Computer tomography volume rendered image showing wide neck of the pseudoaneurysm and its relationship with artery and the osteochondroma.

CASE 2

A 27-year-old male presented with a progressive and painful swelling in the left thigh, present since three months following an intramedullary nail fixation for a femoral shaft fracture sustained during a road traffic accident. Clinico radiologically, patient was diagnosed to have an osteogenic sarcoma of the femur and was referred to us for further management. Local examination revealed a circumferential swelling in the lower part of thigh, which was tender, non-mobile, non-pulsatile and firm [Table/Fig-4]. Left knee range of movements were normal and distal pulsation were well felt.

All the serial images were reviewed at a multidisciplinary clinic. Initial radiograph showed a displaced spiral fracture at the diaphysis of the distal femur [Table/Fig-5a], which was stabilized by intramedullary nailing [Table/Fig-5b]. Three month follow-up radiographs showed periosteal new bone formation at fracture site with large soft tissue swelling [Table/Fig-5c,d]. MRI done elsewhere reported it as 11cm x 12cm x 15cm lesion in the distal thigh with cortical erosion at distal femur with a diagnosis of neoplastic aetiology possibly, an osteogenic sarcoma [Table/Fig-6a]. The imaging was discussed in our multidisciplinary meeting. Imaging showed characteristic pulsation and flow artifacts with T1 hyper intense areas due to associated thrombus and blood products. Colour Doppler Ultrasonography examination revealed large cystic structure with characteristic swirling motion of blood flow within the cystic structure (yin-yang sign) [Table/Fig-6b] and the diagnosis of pseudoaneurysm of femoral artery was confirmed. Thus, in this case a biopsy was avoided.

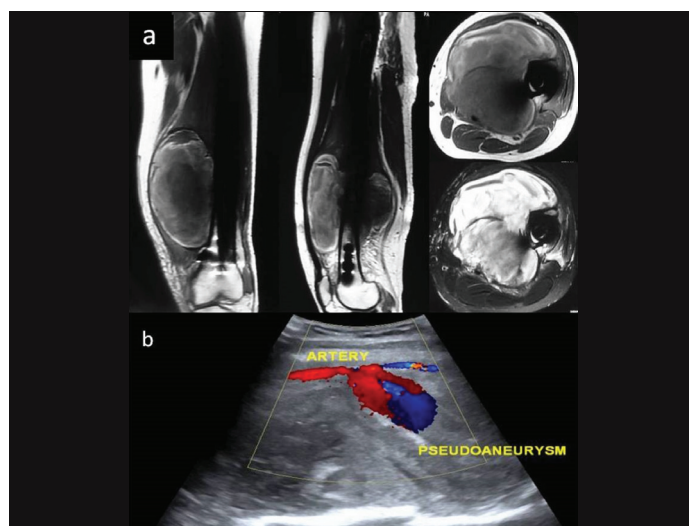
Both the patients underwent open repair of pseudoaneurysm and are doing well at 15 months and 12 months follow-up respectively.



[Table/Fig-4]: Case-2 presented with circumferential, tender, non mobile, non pulsatile, firm swelling in the lower part of thigh.



[Table/Fig-5a-d]: a) Plain radiograph showing displaced spiral fracture at the distal diaphysis of femur with sharp bony projection facing medially. b) Plain radiograph showing treated fracture femur with intramedullary fixation. c&d) Follow-up radiographs after 3 months of fracture stabilization revealing formation of callus at the fracture site and large soft tissue swelling



[Table/Fig-6]: a) MRI showing the magnetic susceptibility artifacts from the intramedullary implant with associated well defined swelling, which has hyperintense areas on T1W images. b) Colour Doppler ultrasonography showing giant pseudoaneurysm with characteristic “yin-yang sign”.

DISCUSSION

Pseudoaneurysms of lower extremity are rare varying from 0.88 to 8%. Pseudoaneurysm usually occurs following a penetrating injury, blunt trauma or an endovascular procedure, which results in the disruption of the arterial wall leading to extravasation of blood into surrounding tissue and gets contained in a reactive fibrous capsule over a period of time [2]. This lesion gradually progresses in size due to constant arterial pressure and may mimic a soft tissue tumour or the reactive sclerosis with reactive periosteal reaction and associated soft tissue component which can in some time lead to suspicion of a bone tumour. The other common differential diagnosis of these lesions are hematoma, an arteriovenous fistula, lymphadenopathy, lymphocele, deep vein thrombosis and compartment syndrome [3]. We report two cases of pseudoaneurysms around the knee, which were clinico-radiologically misdiagnosed as osteogenic sarcoma of the femur. The case reports also stress on the importance of multidisciplinary care for optimal treatment of such patients.

Knee is a common site for various soft tissue and bone swellings [4]. These include neoplastic aetiology like bone tumours, soft tissue

sarcomas, pigmented villonodular synovitis and nodal metastasis from lower extremity malignancies. Non-neoplastic pathologies that can cause similar swellings include infection, arterio-venous malformations and pseudoaneurysms. It requires an experienced musculoskeletal radiologist to diagnose these lesions correctly. An incorrect diagnosis in these situations may be very deleterious to final outcome as it may cause major morbidity or mortality by inappropriate intervention [5].

The signs and symptoms of a pseudoaneurysm can mimic an osteogenic sarcoma. There have been case reports of popliteal artery pseudoaneurysm diagnosed as a soft tissue tumour and also a femoral artery pseudoaneurysm being diagnosed as malignant mesenchymal tumour [1,2,6]. Sometimes it is difficult to differentiate vascular abnormalities from sarcomas on clinical grounds [1]. MRI can help in differentiating a sarcoma from a pseudoaneurysm. The pseudoaneurysm shows pulsation and flow artifacts, with T1 hyper intense areas due to associated thrombus and blood products. The dynamic contrast enhanced MR angiography shows the filling of contrast within the aneurysmal sac which confirms the diagnosis. Ultrasound with color doppler is a cheap, easily available bed side modality to diagnose pseudoaneurysm, though it is highly observer dependent.

The present cases are examples of pseudoaneurysms masquerading as malignant bone tumours. In the first case report the firm swelling around the knee of a relatively prolonged duration raised the suspicion of a low-grade tumour, probably parosteal osteogenic sarcoma and even the core needle showed new bone formation. Though the MRI was available, it was misinterpreted as primary tumour. In view of clinical scenario it was interpreted as suspected parosteal osteogenic sarcoma. In the second case too, patient was suspected to have primary bone sarcoma in view of progressing swelling in the distal thigh following fracture fixation of the femur and images demonstrating large soft tissue lesion in the distal thigh with erosion of femur cortex and referred to us for an open biopsy and further management.

Sarcomas are rare tumours, the general clinicians lack the expertise required to diagnose and treat these tumours correctly. The present clinical scenario emphasizes the role the dedicated multi-disciplinary sarcoma team to achieve correct diagnosis and manage these tumours. In the first case there was no history of trauma or endovascular procedure. However, imaging revealed a bony projection (osteochondroma without cartilage cap) from the lower end of the femur, which may be the probable cause of irritation to the popliteal artery, leading to the formation of the pseudoaneurysm. Guder et al., reported a case of intermittent

knee pain due to a pseudoaneurysm caused by the sharp tip of an osteochondroma [7]. The second case had a history of fracture femur following a road traffic accident and fracture fixation subsequently. Retrospectively, we could note the sharp bone spike at the proximal fracture fragment, which may have injured the femoral vessel at index injury. An alternative hypothesis is an injury to the femoral vessels during the manipulation of fracture fragment during close reduction and internal fixation.

Both patients were referred to a vascular surgeon for further management. Thus, we were able to avoid inappropriate intervention and treatment in these patients and prevent the morbidity or probable risk of mortality associated with those interventions and treatment.

CONCLUSION

Swellings around the knee can result due to a number of neoplastic and non-neoplastic aetiologies. Even though bone and soft tissue tumors are more common around the knee, the clinician should have high index of suspicion and keep other rare diagnosis like pseudoaneurysms as differential diagnosis. All suspected tumour lesions should be evaluated at a specialised treatment centre. A multi-disciplinary approach should be followed for diagnosis and treatment to deliver the best patient care.

ETHICAL APPROVAL

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

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