

Subperiosteal ganglion cyst of the tibia

A COMMUNICATION WITH THE KNEE DEMONSTRATED BY DELAYED ARTHROGRAPHY

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We report a patient with a subperiosteal ganglion cyst of the tibia which was imaged by radiography, arthrography, CT and MRI. The images were correlated with the arthroscopic surgical and histological findings. Spiculated formation of periosteal new bone on plain radiographs led to the initial suspicion of a malignant tumour. Demonstration of the cystic nature of the tumour using cross-sectional imaging was important for the precise diagnosis. Communication between the ganglion cyst and the knee was shown by a delayed arthrographic technique, and the presence of this communication was confirmed at arthroscopy and surgically.

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A variety of cystic lesions including synovial cysts, bursae, meniscal cysts and ganglion cysts may be found around joints. In the knee, ganglion cysts can occur in Hoffa's fat pad next to the cruciate ligaments and, less often, in intramuscular, intraneural, intraosseous, or even subperiosteal sites.^{1,2} The precise pathogenesis of ganglion cysts remains obscure. There are many theories, including degeneration of connective tissue and migration of synovial fluid from an adjacent joint.¹⁻³ Subperiosteal ganglion cysts are uncommon. Sites of predilection include the tibia, femur, radius and ilium.¹⁻⁶

We describe a patient with a tibial subperiosteal ganglion cyst which communicated with the knee. On delayed radiographs and CT scans obtained after arthrography, a commu-

nication between the ganglion cyst and the knee was demonstrated. To our knowledge, the use of the delayed arthrographic technique has not been previously described in the orthopaedic literature for this condition.

Case report. A 57-year-old man was referred for evaluation of a painless mass along the anteromedial aspect of the middle portion of the right tibia. Although the tumour had been present for one year, it had increased in size markedly only during the previous few weeks. There was no history of trauma and the previous medical history was unremarkable.

The lesion was soft to palpation and the overlying skin appeared normal. The results of haematological and biochemical laboratory tests were normal. Cortical scalloping was evident on plain radiographs of the tibia and thick spicules of periosteal new bone extended from the tibial cortex (Fig. 1). On the basis of these radiological findings the initial diagnosis was that of a malignant tumour.

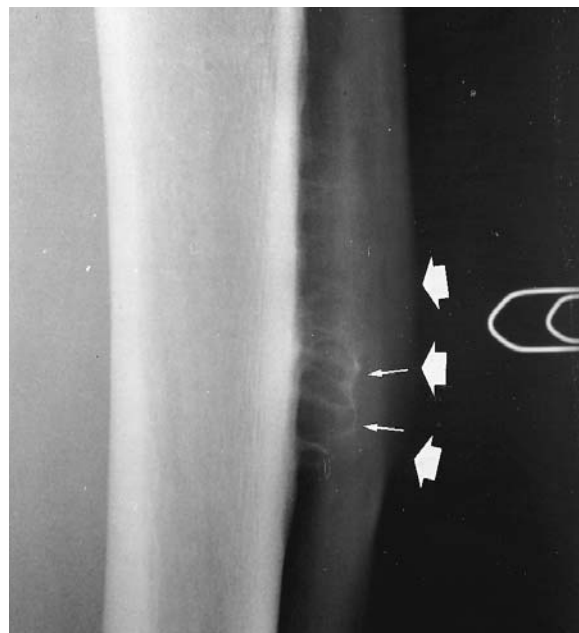


Fig. 1

A lateral radiograph of the right tibia. A paper clip indicates the area where a tumour was felt on clinical palpation (bold white arrows). A linear periosteal reaction with an orientation perpendicular to the tibial cortex is seen. Bridging between periosteal spicules is also apparent (small white arrows).

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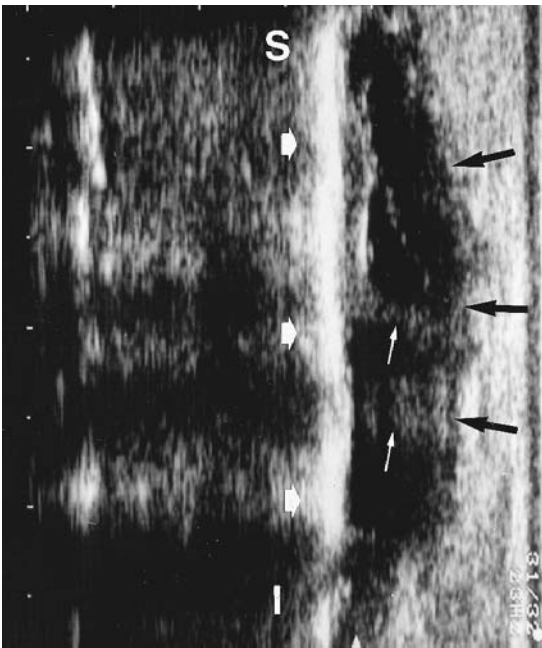


Fig. 2a

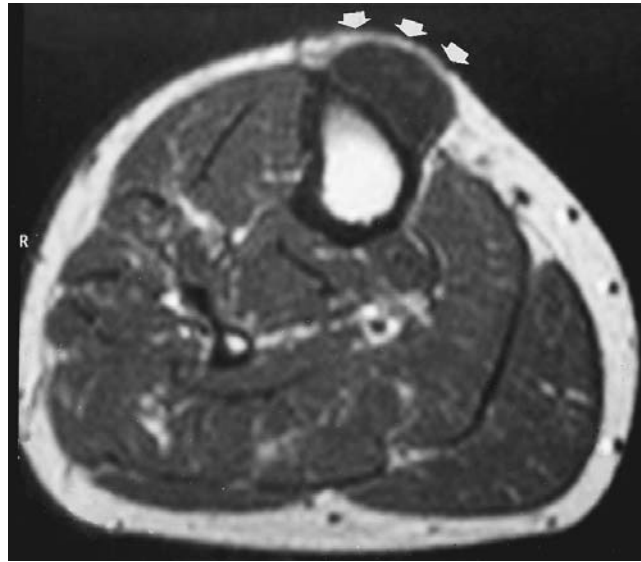


Fig. 2b

Figure 2a – A sonogram obtained along the sagittal imaging plane. Hypoechoic fluid-filled lobules are seen interspersed by a hyperechoic linear periosteal reaction (small white arrows). White arrowheads show the tibial cortex and black arrows the outer surface of the lesion (S, superior aspect; I, inferior aspect). Figure 2b – Transverse T1-weighted MR image (TR 500/TE 15). A hypointense pretibial tumour is seen (white bold arrowheads). Figure 2c – Coronal STIR-weighted MR image. A lobulated hyperintense pretibial ganglion cyst is seen (white arrows).



Fig. 2c

Sonography showed a large juxtacortical lesion, 6×4×2 cm made up of fluid-filled lobules and linear hyperechoic areas of new bone formation (Fig. 2a). On CT, the tumour had a soft-tissue density similar to that of muscle. On T1-weighted MR images the pretibial tumour showed a signal intensity which was similar to that of muscle (Fig. 2b). On T2- and STIR-weighted MR images it appeared markedly hyperintense (Fig. 2c). After administration of intravenous gadolinium there was no evidence of contrast enhancement. On the basis of the findings on cross-sectional imaging we made a diagnosis of a subperiosteal ganglion cyst.

Arthrography of the knee was carried out using 20 ml of intra-articular iodinated contrast medium (Hexabrix, Guer-

bet, France) to demonstrate a possible communication between the ganglion cyst and the knee. Radiographs were obtained immediately after joint puncture and after delays of one, three and five hours. CT was carried out after three and five hours. On the radiographs and CT scans obtained one hour after joint puncture, leakage of contrast medium into the soft tissues of the popliteal fossa was observed. After three hours, a contrast-filled communication was seen which connected the knee to the superior aspect of the pretibial cyst (Fig. 3). After five hours it was less evident because of dilution of contrast medium.

At arthroscopy, a tear of the medial meniscus was found. In addition, a large opening 4 mm in size was seen at the posterolateral aspect of the knee capsule (Fig. 4). When



Fig. 3a

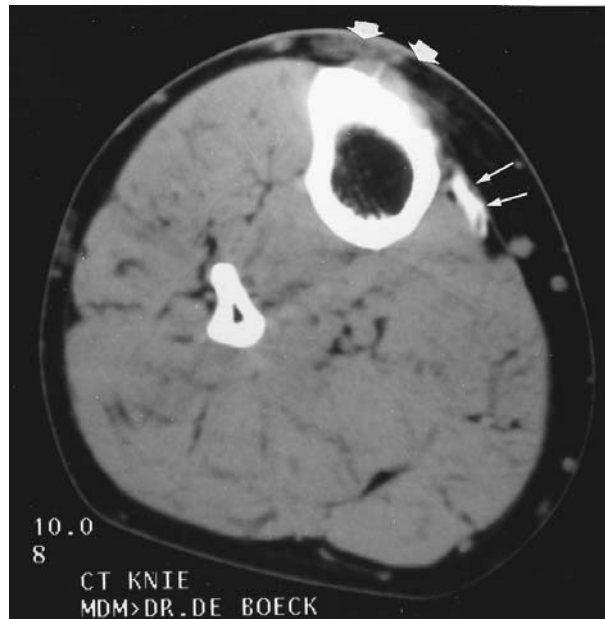


Fig. 3b

Figure 3a – A delayed radiograph obtained five hours after arthrography of the knee. A communication between the posterolateral aspect of the knee and the pretibial ganglion cyst is seen (black arrows). There is also cortical scalloping at the level of the tumour (white arrows). Figure 3b – A transverse CT scan obtained at the level of the superior portion of the pretibial ganglion cyst (small arrowheads). The small channel originating from the knee is seen to connect to the ganglion cyst (white arrows).

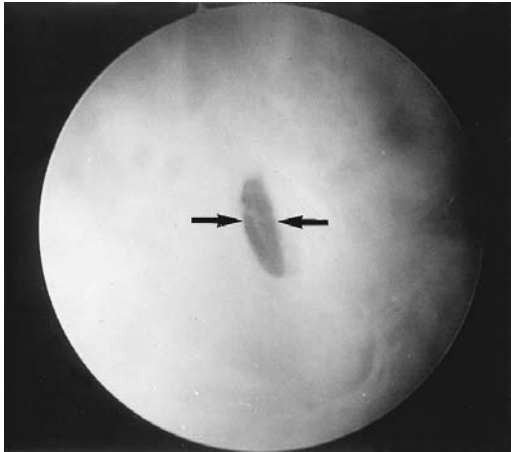


Fig. 4

An intra-articular photograph obtained during arthroscopy. A small opening corresponding to the origin of the communication between the knee and the ganglion cyst is seen along the posterolateral aspect of the knee capsule (arrows).

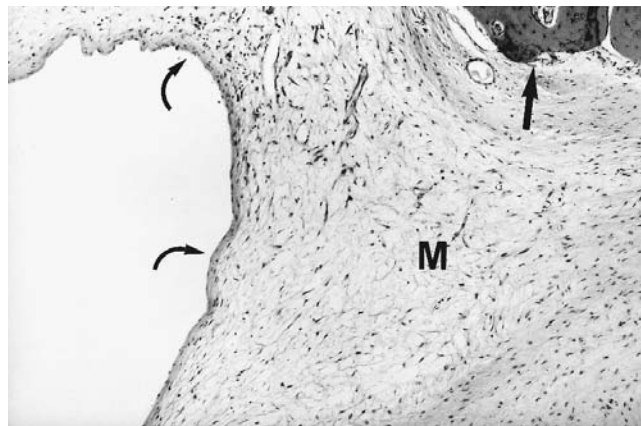


Fig. 5

A photomicrograph showing areas of formation of new bone (black straight arrow) embedded within loose connective tissue indicating degeneration (M). There is also a cavity lined by flattened pseudosynovial cells (curved black arrows) (haematoxylin and eosin $\times 195$).

iodinated contrast medium was injected into this opening the communication which had been previously demonstrated during arthrography was outlined. At operation a subperiosteal mucus-filled cystic tumour was evident. The underlying tibial cortex appeared irregular and was trimmed. A tract was observed along the superior aspect of the ganglion cyst and injection of contrast medium again showed the communication with the knee. After excision of the cyst the communication was obliterated using a sclerosing agent (Aethoxysklerol; Kreussler, Wiesbaden, Germany). The histological findings were consistent with a mucus-filled ganglion cyst (Fig. 5). When seen again at one year there was no evidence of a recurrence.

Discussion

Ganglion cysts consist of coalescing cavities containing jelly-like fluid. The wall of such cysts is composed of fibrous tissue, although in the most internal layer there may be flattened cells resembling synovium which have occasionally been termed pseudosynovial cells. Although the precise pathogenesis of ganglion cysts is still unknown, there are many theories.^{1,3} Some authors speculate that they form after degeneration of periarticular connective tissue. Others believe that they develop when fluid migrates from a distended joint and diffuses through the periarticular soft tissues. In our patient, a communication between the gang-

lion cyst and the knee was shown on delayed arthrographic images, supporting the latter theory. Ganglion cysts present as a slowly enlarging soft-tissue tumour with moderate pain. The tumours usually feel relatively soft to palpation.

The radiological features of subperiosteal ganglion cysts include a scalloped cortical defect with a sclerotic margin, and reactive formation of periosteal new bone.¹⁻⁷ The periosteal spicules may be orientated perpendicular to the cortex of the underlying bone. They appear thick and well-defined, and bridges of ossification may be evident between spicules, indicative of a slowly growing lesion. Delayed radiography and CT after knee arthrography may show a communication between the ganglion cyst and the adjacent joint⁸ but a delay of one to two hours after intra-articular injection may be necessary to demonstrate such a communication. On CT images, ganglion cysts usually appear to be hypodense with respect to muscle. Typically, contrast enhancement is absent, although slight enhancement of the wall of the ganglion cyst may be apparent.^{1,4,6} The sonographic findings with subperiosteal ganglion cysts have, to our knowledge, not been reported previously. In our patient there were hypoechoic juxtacortical collections interspersed among hyperechoic linear areas which corresponded to the formation of periosteal new bone as shown by radiography and CT. On MR images ganglion cysts demonstrate low signal intensity on T1- and high signal intensity on T2-weighted images. After intravenous administration of contrast agent, the ganglion cyst typically does not enhance.¹

On clinical examination subperiosteal ganglion cysts should be differentiated from other tumours of periosteal and subcutaneous origin, including juxtacortical chondroma and osteosarcoma, lipoma, haematoma, infection, erythema nodosum, giant-cell tumour of the tendon sheath, and subcutaneous granuloma annulare. Radiologically, a subperiosteal ganglion cyst may mimic a malignant neoplasm because of the cortical erosion and formation of periosteal new bone. The demonstration of the purely cystic aspect of the lesion with cross-sectional imaging virtually excludes

other diagnoses. Intravenous administration of a contrast agent may be necessary to define clearly the cystic nature.

There is no agreement regarding the ideal management of subperiosteal ganglion cysts. Reported treatments include excision, puncture and aspiration, with or without injection of corticosteroids. When a communication between the ganglion cyst and the adjacent joint is present there may be a recurrence after excision if this communication is left in place.⁹ A subperiosteal ganglion cyst should be included in the differential diagnosis of any juxtacortical soft-tissue mass. In the preoperative setting, the delayed arthrographic technique may show a communication between the ganglion cyst and the adjacent joint.

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No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

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