

Distal femoral cortical irregularity in a 13-year old boy. A case report

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Distal femoral cortical irregularity (DFCI) is a benign entity presenting with either an irregular appearance or a focal radiolucency within the posterior cortex of the distal femur. Atypical cases should be differentiated from malignant lesions. The typical location of the lesion at the attachment of the head of the medial gastrocnemius muscle can be visualised using different imaging techniques. We report a case of a DFCI in a 13-year old boy. The diagnosis was based on CT-imaging. Two years later, no radiological abnormalities could be observed. A review of the literature is presented.

CASE REPORT

A 13-year old boy was admitted to our emergency department after sustaining a twisting injury to his left knee during a fight at school. Clinical examination showed marked swelling of the knee and an associated popliteal cyst. Arthrocentesis yielded 80ml of blood with a few fat drops. After aspiration, no ligamentous laxity was observed. Apley and McMurray tests for meniscal tears were negative. The lateral femoral trochlea and the lateral patella were tender to pressure, suggesting traumatic subluxation of the patella with an osteochondral fracture.

The patient reported no previous history of trauma, pain or discomfort in the involved extremity. Swelling, fever, chills or night sweats were absent.

Plain lateral radiographs revealed a dense abnormality on the posterior surface of the distal femoral metaphysis (fig 1). This anomaly was located immediately proximal to the growth plate, originating from the cortex, and was somewhat spiculated

in its distal portion (fig 2). No evidence of cortical disruption, periosteal reaction, or fracture was present. An Insall-Salvati index of 0.71 and a Blackburn-Peel index of 0.73 indicated a high riding patella, which is considered an important risk factor for patellar (sub)luxation. Based on these radiographic findings, the differential diagnosis for the lesion included: surface osteosarcoma, non-ossifying fibroma or distal femoral cortical irregularity (DFCI).

The computerised tomography scan revealed an irregular cortical defect of the distal medial femoral metaphysis, located at the origin of the medial head of the gastrocnemius muscle (MGM) (fig 3). Calcifications were present within the thickened origin of this muscle. These radiographic findings were consistent with a distal femoral cortical irregularity (DFCI), also designated as cortical desmoid, a distal metaphyseal femoral defect and a periosteal desmoid. Further technical investigations were felt not to be justified.

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Fig. 1. — Lateral and AP plain radiographs of the left knee show a dense abnormality (arrow) on the posterior surface of the distal femoral metaphysis.

A radiography of both knees taken two years later, showed no abnormalities present at the posterior cortex of the involved knee clearly indicating full resolution of the lesion (fig 4).

DISCUSSION

Distal femoral cortical irregularity (DFCI) is a benign entity presenting with either an irregular appearance or a focal radiolucency within the posterior cortex of the distal femur. These lesions have been reported to occur in 11.5% of male and 3.6% of female children between the ages of 3 and 17(1). They are bilateral in up to 35% of cases (1, 2).

Resnick and Greenway were the first to classify this entity into excavations and proliferative cortical

irregularities based on the observations made on dry femurs (3). The cortical excavations would be related to the stress from the attachment of the medial gastrocnemius muscle (MGM) resulting in reactive soft tissue formation at the osteo-tendinous junction of the MGM, while the proliferative cortical irregularity would be due to trauma to the periosteum or exaggeration of normal changes occurring in the metaphysis. However, the authors failed to demonstrate any tendinous structures attached to the excavations or irregularities in their cadaveric dissection study.

Since their report, only few documents have been published using either CT (4) or MRI (5, 6) in the diagnostic work-up of DFCI, although these imaging techniques can provide additional infor-



Fig. 2. — Close-up of the plain lateral radiography of the left knee. The anomaly is located just proximal of the growth plate, originating from the cortex, and somewhat spiculated in its distal portion.

mation about the anatomic structures. Suh *et al* (5) found DFCI in 44/100 femurs and divided them into concave (4 cases), convex (36 cases) and divergent (4 cases) irregularities based on MRI and conventional radiographic techniques. No proliferative cortical irregularities were seen in their patient group, which they attributed to the fact that most patients were adults. The mean age for the concave-shaped irregularity was 10.3 years, which was significantly younger than the mean age of 34.9 years for the other irregularities. All DFCIs were located at the attachment of the medial gastrocnemius muscle.

To our knowledge there is only one report on the use of computerised tomography and DFCI, also



Fig. 3. — Computerised tomography of the distal femur reveals a cortical defect of the distal medial femoral metaphysis located at the origin of the medial head of the gastrocnemius muscle (MGM). There are some small calcifications (arrows) in the origin of the MGM.

clearly demonstrating the anatomic location of the lesion at the origin of the MGM (4).

A technetium bone scan typically shows no increased uptake in the area of the irregularity, although this negative finding can be masked by the proximity of the lesion to the distal femoral epiphyseal growth plate in children (7).

Histologically, the lesion has been described as containing fibrous tissue with irregular spicules of bone, along with osteocytes, a few fibrocytes and fibroblasts, with a mild lymphocytic infiltrate indicating inflammation (2). Young *et al* (8), on the contrary, found the lesion to be indistinguishable from an osteochondroma with a layer of cartilage and an underlying fibroblastic layer. Resnick and Greenway (3) found thickened periosteum with fibrous connective tissue in the proliferative cortical irregularity.

In our patient the irregularity can be radiographically described as a concave DFCI with a proliferative component indicating an active erosive process with periosteal reaction at the origin of the MGM.



Fig. 4. — A radiograph taken two years later shows no abnormalities at the posterior cortex of the involved knee, clearly indicating resolution of the lesion. A : lateral view. B : AP view.

The convex and divergent DFCIs seen in the MRI study of Suh *et al* are probably later stages of the same benign process. This might also explain the mean age difference between concave and convex/divergent lesions and the differences described histologically.

DFCI must be differentiated from surface osteosarcoma and non-ossifying fibroma. A surface osteosarcoma is a progressive unilateral lesion with bone (cortical or medullary) and soft tissue involvement. The soft tissue invasion can be extensive. A non-ossifying fibroma is an isolated osseous lesion without a soft tissue component ; it tends to migrate more proximally with growth.

Although DFCI is occasionally associated with mild pain, the majority of patients are asymptomatic, and the lesion is discovered as an incidental finding when conventional radiography is performed for some other purpose. Additional imaging is sometimes required to differentiate a benign (normal variant) process from significant pathological processes. Computerised tomography is an asset in the diagnosis because of its ability to show the anatomical relationship of the lesion with the attachment of the medial gastrocnemius muscle. This relationship is a *sine qua non* condition for the diagnosis of distal femoral cortical irregularity.

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