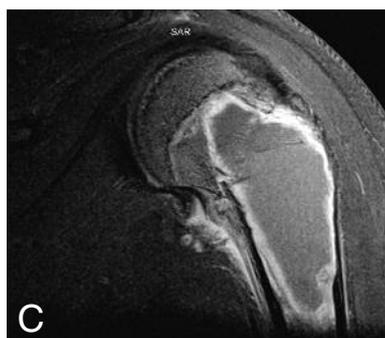
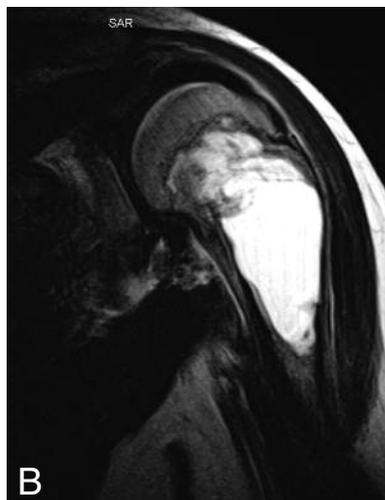


IMAGES IN CLINICAL RADIOLOGY



Fallen fragment sign

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A 16-year-old boy presented at the emergency room after he fell on his left shoulder while playing American football. Plain radiographs showed a pathological fracture through a well-defined expansile radiolucent lesion within the proximal meta-diaphysis of the left humerus (Fig. A). The lesion caused cortical thinning and contained multiple linear cortical fragments within the central part of the lesion (arrows in Fig. A). Based on the age, location and the plain radiographic characteristics ("fallen fragment sign"), the diagnosis of a solitary bone cyst (SBC) was suggested.

Subsequent Magnetic Resonance Imaging (MRI) confirmed the cystic nature of the lesion. Indeed, the lesion was homogeneously hypointense on T1-weighted (WI) images and hyperintense on T2-weighted images (Fig. B) and there was only faint peripheral enhancement of the lesion (Fig. C). There is also minor enhancement at the periosteal side of the medial cortex of the humerus, which can be attributed to pathological fracture. No solid enhancing parts were seen. The lesion contained no internal septations. The patient was treated by immobilisation. Follow-up after ten months showed adequate fracture healing and gradual remodeling of the lesion.

Comment

Simple bone cysts (SBC) are benign bone tumors, which are often discovered as incidental findings on plain radiographs or diagnosed after a pathological fracture.

They typically occur in the proximal humerus or the femoral neck in children.

Although such cysts have also been described in the spine, the pelvis and even in flat bones the metaphyseal region of long bones is a site of predilection.

Diagnosis can be made based on the combination of clinical presentation (age of the patient less than 20 years old and skeletal distribution) and plain radiographic findings.

The main differential diagnoses on plain radiography include aneurysmal bone cyst (ABC) and fibrous dysplasia.

Simple bone cysts typically affect young growing children. During the growth period the lesion may enlarge until skeletal maturity. After fusion of the growth plate, the cyst will stop growing and will spontaneously disappear over years without any radiologic sequelae.

On plain radiographs a mild form of septation can be suspected but on macroscopic section these cysts are hollow, fluid-filled and without any obvious partitioning. Therefore, the synonym "unicameral cyst" is often used. They have a sharply margined radiolucent center surrounded by a dense cortical border of reactive bone.

When complicated by a pathologic fracture, the fallen fragment sign on plain films or computed tomography (CT) is highly suggestive for SBC. This sign is explained by displacement of one or more cortical fracture fragments within the dependent zone of the hollow lesion cavity. This sign will not be seen in lesions with internal septations (such as ABC) or lesions containing solid components (such as fibrous dysplasia). It appears in approximately 20% of cases.

MR imaging provides more information about the cystic contents and about the relationship of the lesion to the physal plate. Prolonged T1 and T2 relaxation suggests a cyst, although T1 shortening may occur due to protein content or haemorrhage after a pathologic fracture. Following intravenous injection of gadolinium chelates, a thin rim of enhancement is seen.

Because of the natural evolution of simple bone cysts is spontaneous regression after the growing period of long bones, no therapy is required unless prevention of pathological fractures. When a patient presents with a pathologic fracture, healing of the fracture often will be the trigger for healing of the cyst. Alternative therapeutic options have been suggested ranging from corticoid injection into the cyst to curettage. Recently, percutaneous grafting with allografts or bone substitutes has been described.

Malignant transformation of a SBC is extremely rare.

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