

Essential Bone Cyst of the Humeral Diaphysis: A Rare Localization - A Case Report and the Importance of Imaging

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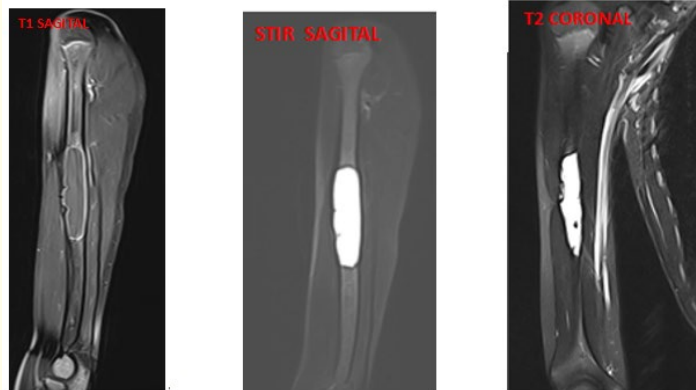
Abstract

The essential, solitary, or unicameral bone cyst is a cystic bone disorder of uncertain origin that results in a pseudo-tumor-like lesion. He's the third most common bone lesion after non-ossifying fibromas and exostoses. During its evolution, it can lead to one or more fractures, which are often the circumstances of its discovery. Imaging is a key factor in the positive diagnosis and the assessment of severity.

Keywords: *Unicameral Bone Cyst; Essential Bone Cyst; Children; MRI; Complications; Imaging*

Case Report

A 16-year-old child, without particular ATCD who presents with bone pain in the right arm and a slight swelling of the limb. The MRI revealed an expansive process in the diaphysis of the middle third of the humerus. It appears well-defined with regular contours, hypointense on T1, heterogeneous hyperintensity on T2 and STIR, slightly expansive and containing thin septa that enhance after Gadolinium injection. Its dimensions measure 19 x 19 x 85 mm. This process thins and disrupts the cortical bone. It is located 101 mm from the trochlea at the lower end, 98 mm from the growth plate cartilage at the upper end, and 120 mm from the humeral head. The estimated corticomedullary index is 0.17.



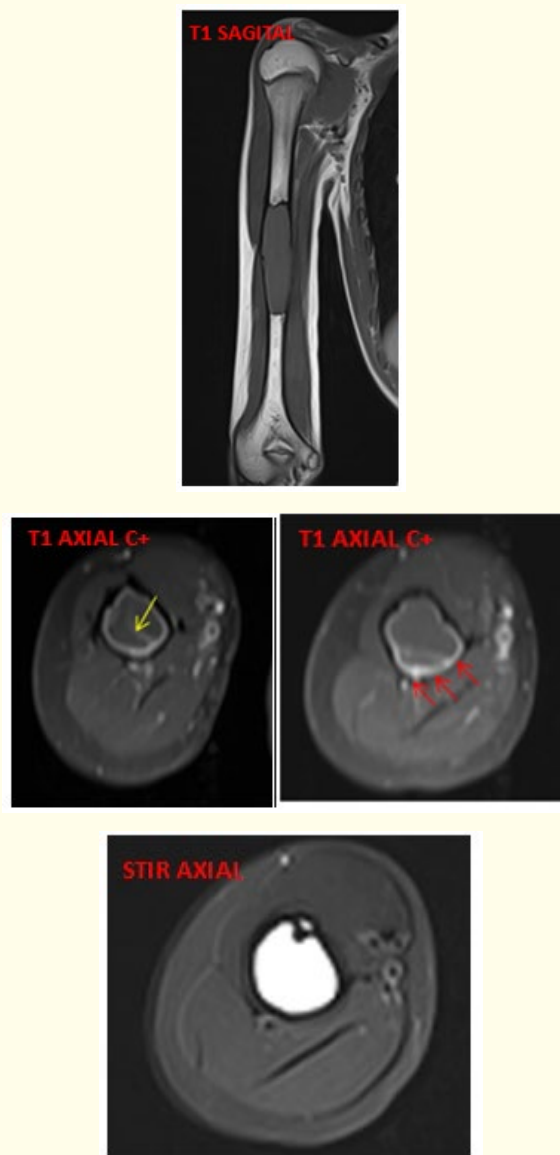


Figure 1: MRI images depicting the intramedullary lesion in the right humerus, which was previously mentioned in detail.

Red arrow: Laminated bone cortical.

Discussion

Epidemiological and clinical findings

It tends to affect boys more than girls, with a predominance between the ages of 5 and 15 [1].

There are two forms: The conventional form and the specific forms.

Conventional form: It is often singular but can also be multiple. The essential bone cyst is a benign lesion that occupies a central metaphyseal position and increases in volume by weakening the bone through thinning of the cortical wall. In a few rare cases, it is diaphyseal, broad, multilocular, and slightly expansive as in the case of our patient [2].

In adults: The lesion then becomes latent and gradually moves to a diaphyseal position.

Specific forms: The specific forms include the bone cyst of the calcaneus and in adults.

The essential bone cyst typically remains asymptomatic. It is usually discovered when a pathological fracture occurs or due to pain caused by microtrauma.

Radiological findings

Standard radiography is usually sufficient to establish the diagnosis. Typically, the essential bone cyst presents as a metaphyseal defect in the humerus or proximal femur, creating a characteristic “fallen fragment of a coconut” appearance. The occurrence of fractures leads to the formation of septae, which can pose a differential diagnostic challenge with aneurysmal bone cysts. Typically, the “fallen fragment sign” is observed as a result of the fracture [3].

The “Trapped door sign” is a modification of the “fallen fragment sign” as documented in the literature. In this variation, a periosteal hinge prevents the fragment from falling down and permits it to shift in tandem with the patient’s movement [4].

The rising bubble sign, its gas bubble at the most independent edge of a lytic bone lesion that has experienced a pathological fracture [5].

The egg cup sign: Peripheral sclerosis, more accentuated on the diaphyseal side.

Kaelin and Mac Ewen’s cystic index: It is a marker of fracture risk = the ratio between the area occupied by the cyst and the square of the diameter of the bone shaft: $IK = S/D^2$, is no longer recommended.

MRI is useful in the differential diagnosis with an aneurysmal bone cyst. Typically, it shows hypointensity on T1 and hyperintensity on T2. In case of complications, septations and fluid levels can be observed. Regression of the essential bone cyst may be associated with the filling of the bone defect with fatty tissue [6]. After injection of gadolinium, the periphery of the cyst and the septa may be enhanced:

1. Magnetic resonance angiography plays a role in the differential diagnosis between a simple bone cyst and aneurysmal bone cyst [7].
2. In the radiologist’s report, it is important to specify:
 - Whether the cyst is active or not: The closer the cyst is to the growth plate cartilage, the more likely it is to be active.
 - The longitudinal diameter in relation to the diaphysis.
 - Cortical thinning: The thinner the cortical bone, the more weakened the bone becomes, and the higher the risk of fracture.
 - The corticomedullary index can be used to assess the remaining cortical bone; it measures the thickness of the diaphysis [4] at the site of the lesion on the transverse diameter of the lesion [5] at the same level. The normal corticomedullary index is 0.5 in children.

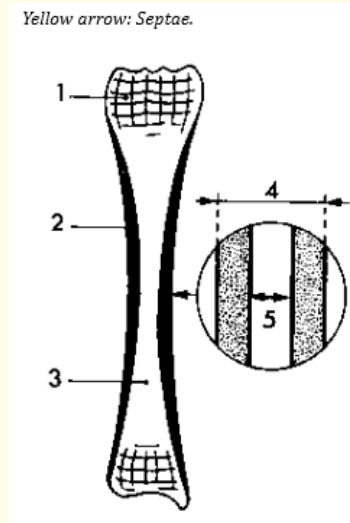


Figure 2: A radiological diagram of a long bone showing the normal corticomedullary index.

Differential diagnoses

Even though the typical radiological signs provide guidance, caution should be exercised. The main differential diagnoses are made with aneurysmal bone cysts, non-ossifying fibromas, eosinophilic granulomas, and bone dysplasia.

Treatment

The lesion heals spontaneously, and invasive treatment is not necessary. A minimally invasive treatment involving injections is recommended, such as corticosteroids, bone marrow, or demineralized bone matrix. In the case of the femur in a patient over the age of 6, a fracture or a significant risk of fracture may require osteosynthesis.

The treatment is controversial and currently includes minimally invasive curettage, corticosteroid injections, decompression, bone marrow grafting, and stable elastic intramedullary nailing (ECMES).

Complications include fractures, microtrauma, and epiphysiodesis in the case of rare epiphyseal extension [1].

Conclusion

Essential bone cyst is a benign condition that mainly affects individuals between 5 and 15 years of age and is typically painless unless complications arise. Diagnosis is typically confirmed through standard X-ray imaging. Considering the potential for natural healing in essential bone cysts, treatment should prioritize minimally invasive approaches.

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Conflict of Interest

The authors declare no conflict of interest.

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