

## Solitary Bone Cyst

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**Section:** Musculoskeletal system

**Area of Interest:** Musculoskeletal bone

**Procedure:** Diagnostic procedure

**Procedure:** Surgery

**Procedure:** Education

**Imaging Technique:** Conventional radiography

**Imaging Technique:** MR

**Imaging Technique:** Image manipulation /  
Reconstruction

**Special Focus:** Cysts Case Type: Clinical Cases

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**Patient:** 10 years, male

### Clinical History:

A 10-year-old boy presents to the Emergency Department with acute and spontaneous pain in the left hip, after playing a football-game.

At clinical examination, there was focal tenderness around the greater trochanter and pain at flexion and rotation of the hip.

### Imaging Findings:

On conventional radiographs of the hip, a well-circumscribed, radiolucent lesion was seen in the central metaphysis of the femur, without periosteal reaction. The lesion appeared multilocular and was described as "soap-bubble"-like. Subsequent magnetic resonance imaging (MRI), revealed the lesion to be of high signal intensity on fat suppressed T2-weighted images (WI) and isointense to muscle on T1-WI.

After intravenous administration of gadolinium, peripheral rim-enhancement was seen, whereas the central part of the lesion was not enhancing. Sagittal images showed no fluid/fluid levels.

Based on these findings, the diagnosis of a Solitary Bone Cyst was made.

Because no pathologic fracture was seen, the patient's pain was attributed to muscle contusion and the patient was initially treated with pain relievers and relative rest.

Because of the increased fracture risk due to the cortical thinning, a dynamic hip screw was placed.

### Discussion:

Solitary bone cysts (SBC) are defined as "tumour-like lesions of unknown etiology, attributed to local disturbance of bone growth" [1].

Because SBC's occur in patients whose growth plates are not yet or recently closed, patients are young (85% <20 years old) [2].

The lesions are usually located in the central metaphysis of long bones, most often the proximal humerus or femur, although a wide variety of locations has been described. Involvement of the calcaneus and/or ilium occurs in adult patients [1, 3].

Uncomplicated SBC's are merely asymptomatic, but occasionally, pain or stiffness may be present in the adjacent joint.

Large lesions are at risk for pathologic fracture through the cyst, and some patients present with acute pain following

these fractures [1].

On conventional radiographs, SBC's present as well-circumscribed, radiolucent lesions in the central metaphysis. Their long axis parallels the long axis of the affected bone.

They can appear multilocular on plain films, due to projection of the ridging of the walls of the cyst (pseudotrabeclation) but are macroscopically always unicameral.

After a pathologic fracture, small bony fragments may migrate through the fluid-filled cavity and create a pathognomonic 'fallen fragment sign': a fragment of cortical bone attached to the periosteum or lying in the dependent part of the lesion [3-5].

On MR-imaging, SBC's show the typical features of cysts, i.e. high signal intensity on T2-WI and low on T1-WI. After intravenous gadolinium-administration, a thin rim of peripheral enhancement is seen [5].

When a fracture has occurred, signal intensity on T2-WI may become heterogeneous, due to intralesional bleeding.

The most important differential diagnoses are [1]:

- Aneurysmal bone cysts: more eccentric located, fluid/fluid-levels on T2-WI.
- Fibrous dysplasia: 'ground glass' appearance on radiographs, variable appearance on MR-imaging (MRI does not provide additional information).
- Brodie abscess: causes severe pain, surrounding bone marrow oedema on MRI.
- Giant cell tumours: adult patients, juxta-articular location, heterogeneous intensity on T2- and T1+Gd –WI.

Asymptomatic SBC's require no treatment and regress spontaneously after closing of the growth plates.

Occasionally, treatment is advocated due to risk of pathologic fracture. The most accurate predictor of fractures is the Bone Cyst Index (BCI). SBC's with BCI larger than 3.5 (femur) or 4 (humerus) are at risk for pathologic fracture. Size of the lesion and cortical thinning are poorly correlated with fracture-risk. [6]

Possible treatments include curettage, corticoid injection, bone grafting or DHS placement (proximal femur).

Cysts that are complicated by a pathologic fracture usually regress during healing of the fracture.

**Differential Diagnosis List:** Solitary/Unicameral/Juvenile Bone Cyst (SBC), Aneurysmal Bone Cyst (ABC), Fibrous Dysplasia, Brodie Abscess (subacute osteomyelitis), Giant Cell Tumour (GCT)

**Final Diagnosis:** Solitary/Unicameral/Juvenile Bone Cyst (SBC)

## References:

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**Figure 1**

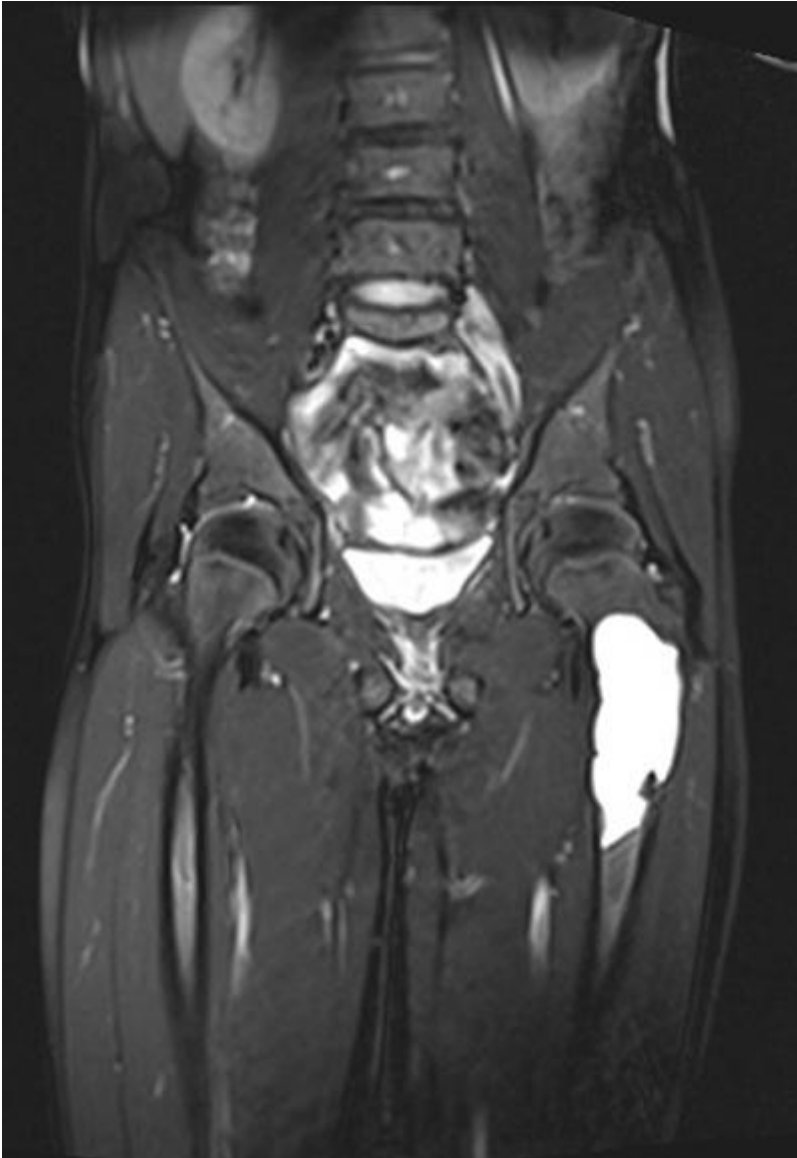
a



**Description:** Conventional radiograph of the left hip showing a well-circumscribed, \"soap-bubble\"-like lesion in the central metaphysis of the femur  
There are many septations, mimicking multilocularity (arrows). **Origin:** Vanhoenacker F, Department of Radiology, AZ Sint-Maarten, Duffel-Mechelen, Belgium

**Figure 2**

a



**Description:** On magnetic resonance imaging (MRI), the lesion is of high signal intensity on fatsuppressed T2-weighted images (WI) (a) and isointense to muscle on T1-WI (b). **Origin:** Vanhoenacker F, Department of Radiology, AZ Sint-Maarten, Duffel-Mechelen, Belgium

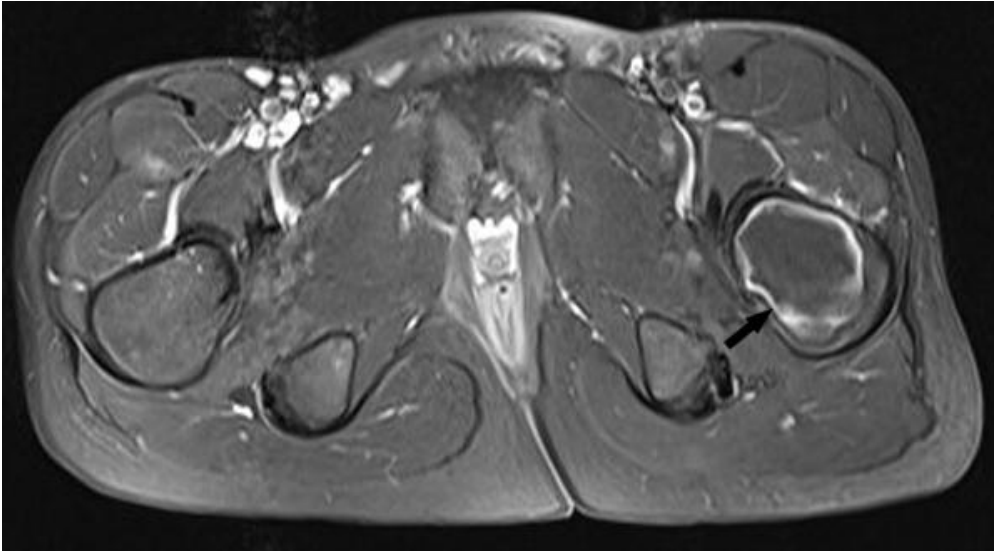
**b**



**Description:** On magnetic resonance imaging (MRI), the lesion is of high signal intensity on T2-weighted images (WI) (a) and low on T1-WI (b). **Origin:** Vanhoenacker F, Department of Radiology, AZ Sint-Maarten, Duffel-Mechelen, Belgium

**Figure 3**

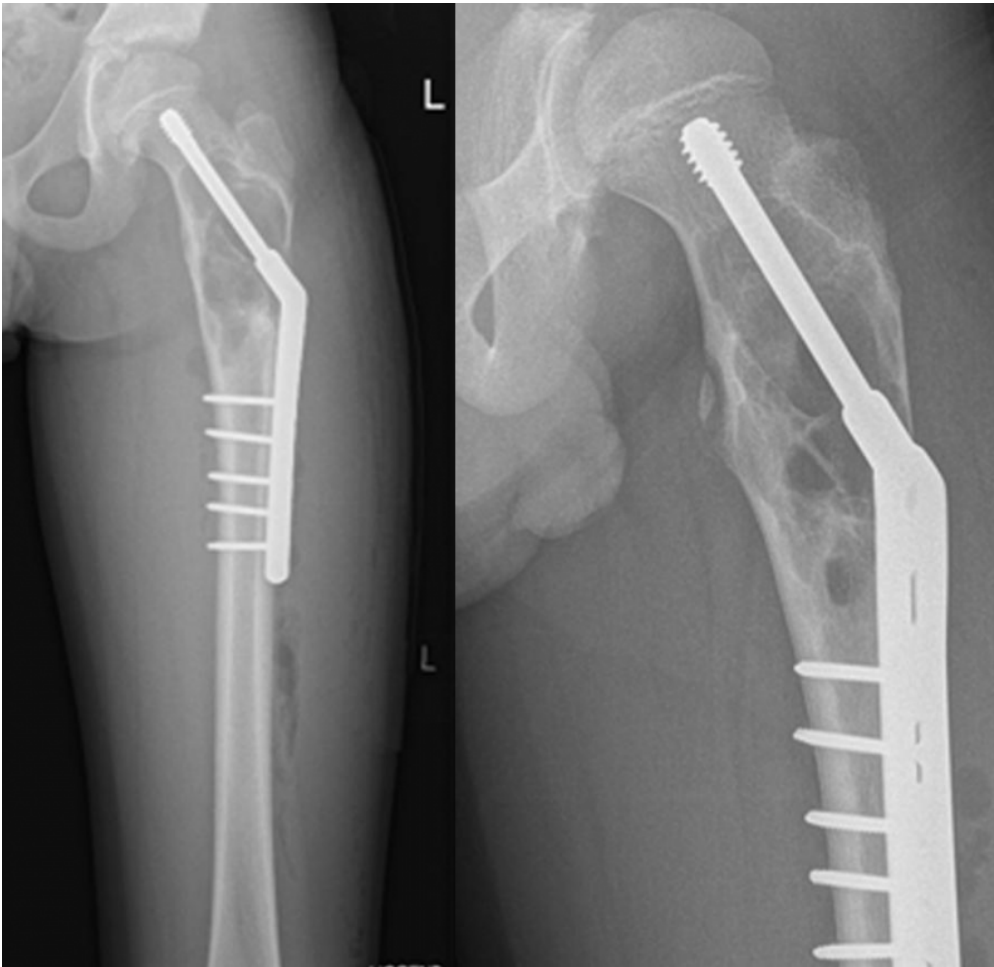
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**Description:** After intravenous administration of gadolinium, peripheral rim-enhancement is seen (arrow), whereas the central part of the lesion is non-enhancing. **Origin:** Vanhoenacker F, Department of Radiology, AZ Sint-Maarten, Duffel-Mechelen, Belgium

**Figure 4**

a

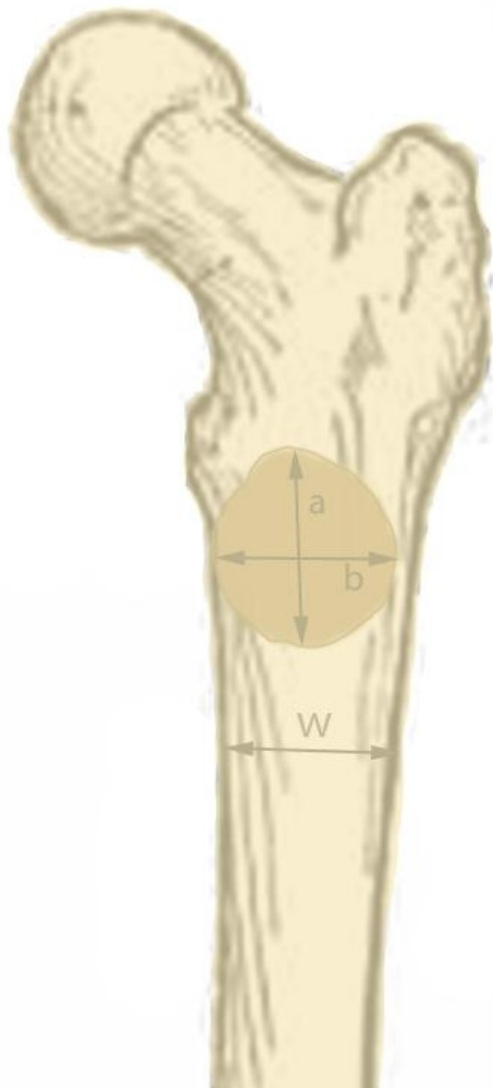


**Description:** Post-operative radiography, after placement of DHS. **Origin:** Vanhoenacker F, Department of Radiology, AZ Sint-Maarten, Duffel-Mechelen, Belgium



**Figure 5**

a



**Description:** The Bone Cyst Index (BCI) is obtained by dividing the cyst area ( $a \times b$ ) by the diameter of the host bone squared ( $w^2$ ).

$BCI = (a \times b) / w^2$  **Origin:** De Smet E, Department of Radiology, AZ Sint-Maarten, Duffel-Mechelen, Belgium