Benign post-traumatic cortical cyst-like lesion following a distal radial fracture in a child

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 Section: Musculoskeletal system
 Area of Interest: Bones
 Procedure: Diagnostic procedure
 Imaging Technique: Conventional radiography
 Imaging Technique: MR
 Special Focus: Trauma Case Type: Clinical Cases
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 Patient: 7 years, female

Clinical History:

A 7-year-old girl fell on her left wrist and was diagnosed with a buckle fracture of the radius. Four weeks later there was a second trauma and re-fracture of the left distal radius was diagnosed.

Imaging Findings:

The initial radiograph showed a buckle fracture of the distal radius. The radiograph made after the second trauma demonstrated a fracture of the left distal radius with some periosteal reaction, and proximal of the fracture in the dorsal cortex a well-defined oval-shaped lucency. Over time, radiographs showed more demarcation of the lucency, with a discrete partially sclerotic margin, and diaphyseal migration. MRI demonstrated a small cortical lesion, on the dorsal surface of the distal radius, without periosteal reaction or bone marrow oedema. The lesion showed high signal intensity on the T1-, T2- and T2-weighted images with fat suppression, with an adjacent thin rim of low signal intensity on all sequences, corresponding with the discrete sclerosis on the conventional radiographs. On the dynamic images during contrast administration the lesion showed minimal rim enhancement. The lesion measured 3 x 3 x 5 mm (LR x AP x CC).

Discussion:

Since 1969, only 36 cases of post-traumatic cyst-like lesions in children have been reported in the medical literature. [1-7, 10] Other names used for these lesions are transient post-traumatic cortical defects, post-traumatic lipid inclusions, post-fracture subperiosteal cyst-like defects, post-fracture paediatric cyst and cyst-like cortical defects. [2, 6, 7, 10] The mean age at which these lesions occur is between 6, 5-7, 5 years (range 18 months - 15 years). [2-10] Approximately 90% of these lesions are located in the distal radius and are more often seen after greenstick and buckle fractures. [1-4, 7-10] They develop between four weeks to three months after the fracture. [2-7, 9, 10] They have also been described as an incidental finding during imaging after re-injury. [8, 9] They develop adjacent or proximal to the previous fracture site, within the area of periosteal reaction. [3-5, 7-10] Typically, the lesion is well-defined, round or oval-shaped, without surrounding sclerosis, and smaller than 10 mm. [1-9] Usually they are
solitary, but can be multiple. [2-5, 8, 10] The lesion tends to migrate in the direction of the diaphysis with growth and will resolve spontaneously, normally between 6 months and 3 years. [2, 3, 5, 6] This lesion is benign, asymptomatic and needs no long-term follow-up. [1-10]

The aetiology of this lesion remains controversial. The fat-inclusion theory is the most accepted one and was described in 1990 by Malghem. It describes the transcortical leakage of intra-medullary fat in the subperiosteal haematoma, after a fracture of the distal radius, in which the periosteum remains intact and is only detached from the bone. [10] The theory of Philipps and Keats is based on subperiosteal haemorrhage that will calcify or resorb. [11]

Normally on MRI the signal intensity of the lesion is consistent with adipose tissue on all sequences. There is no surrounding bone marrow oedema. After contrast administration, the lesion does not enhance. [6] Usually these lesions have a low signal intensity on T2-weighted fat-suppressed images, diagnostic for a lipomatous content. In this specific case the signal intensity on T2-weighted images with fat suppression was high, indicating absence of fat inclusion. Likely the high signal intensity on all sequences is due to haemorrhage. Because of these signal intensities we should, therefore, consider the possibility that the cortical cyst-like lesion is the same entity as a post-traumatic subperiosteal haematoma and can develop with or without fat inclusion.

Written informed patient consent for publication has been obtained.

**Differential Diagnosis List:** Post-traumatic cortical cyst-like lesion due to haemorrhage following a distal radial fracture in a child, Post-traumatic haematoma, Small aneurysmal bone cyst, Less likely osteomyelitis (Brodie abscess)

**Final Diagnosis:** Post-traumatic cortical cyst-like lesion due to haemorrhage following a distal radial fracture in a child

**References:**


Description: Dorsovolar (1a) and lateral (1b) radiographs of the left wrist show a buckling fracture of the left distal radial metaphysis, without an adjacent lucency. Origin: Department of Radiology, HMC Antoniudhove, Leidschendam, The Netherlands.
Description: Dorsovolar (1a) and lateral (1b) radiographs of the left wrist show a buckling fracture of the left distal radial metaphysis, without an adjacent lucency. Origin: Department of Radiology, HMC Antoniudhove, Leidschendam, The Netherlands.
Figure 2

Description: Dorsovolar (2a) and lateral (2b) radiographs. On the dorsal side of the distal radius, adjacent to the fracture line, there is a well-demarcated light oval-shaped lucency, without surrounding sclerosis. Origin: Department of Radiology, Reinier de Graaf Gasthuis, Delft, The Netherlands.
**Description:** Dorsovolar (2a) and lateral (2b) radiographs. On the dorsal side of the distal radius, adjacent to the fracture line, there is a well-demarcated light oval-shaped lucency, without surrounding sclerosis. **Origin:** Department of Radiology, Reinier de Graaf Gasthuis, Delft, The Netherlands.
Description: Dorsovolar (3a) and lateral (3b) radiographs. The oval-shaped lucency on the dorsal aspect of the distal radius, is now more demarcated with partially a sclerotic margin. Origin: Department of Radiology, Reinier de Graaf Gasthuis, Delft, The Netherlands.
Description: Dorsovolar (3a) and lateral (3b) radiographs. The oval-shaped lucency on the dorsal aspect of the distal radius, is now more demarcated with partially a sclerotic margin. Origin: Department of Radiology, Reinier de Graaf Gasthuis, Delft, The Netherlands.
Description: There is complete consolidation of the fracture. The lucency on the dorsal side of the distal radius is still sharply demarcated with partially a sclerotic margin, but now with mild diaphyseal migration of the lesion. Origin: Department of Radiology, Reinier de Graaf Gasthuis, Delft, The Netherlands.
Description: There is complete consolidation of the fracture. The lucency on the dorsal side of the distal radius is still sharply demarcated with partially a sclerotic margin, but now with mild diaphyseal migration of the lesion. **Origin:** Department of Radiology, Reinier de Graaf Gasthuis, Delft, The Netherlands.
Description: An axial (5a) and a coronal (5b) T1-weighted image. These images demonstrate a small well-defined subperiosteal and intracortical lesion, with a high signal intensity. Origin: Department of Radiology, Reinier de Graaf Gasthuis, Delft, The Netherlands.
Description: An axial (5a) and a coronal (5b) T1-weighted image. These images demonstrate a small well-defined subperiosteal and intracortical lesion, with a high signal intensity. Origin: Department of Radiology, Reinier de Graaf Gasthuis, Delft, The Netherlands.
Description: Sagittal T2–weighted fat-suppressed image (5c) showing the subperiosteal localisation of the lesion, with high signal intensity of the lesion indicating the absence of fat and suggestive of blood.

**Description:** The lesion shows minimal rim enhancement on the dynamic axial image during contrast administration. **Origin:** Department of Radiology, Reinier de Graaf Gasthuis, Delft, The Netherlands.
Description: Close-up of the dynamic axial image. Red arrow pointing at the minimal rim enhancement.

Description: Static coronal T1-weighted fat-suppressed image after contrast administration (5f). Enhancement is difficult to evaluate, due to the high signal intensity on all previous sequences. Origin: Department of Radiology, Reinier de Graaf Gasthuis, Delft, The Netherlands.