Pediatr Radiol (1990) 20: 334–336

Pediatric Radiology

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A "hole in a rib" as a sign of child abuse

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Received: 3 April 1989; accepted: 25 October 1989

Abstract. Cyst-like radiolucencies ("holes") in ribs can be a manifestation of many different abnormalities. Two cases of child-abuse are presented in which the initial clue leading to the diagnosis of a battered-child was a cyst-like lytic lesion in the posterior rib cage.

Rib fractures are an important sign alerting the physician to possible child abuse [1–4]. Kleinman [5] has emphasized that rib fractures of a non-traumatic etiology are unusual in infants and children and that unexplained fractures of ribs should be regarded with suspicion for occult trauma. The mechanism of production of the posteriorly located rib fracture in cases of child abuse and their etiological implications in establishing the diagnosis of occult trauma are discussed in detail in Kleinman's book [5].

Cyst-like radiolucencies in long bones have been recognized as a sequelae of fractures [6, 7]. That these radiolucencies ("holes") in ribs can also be an important diagnostic clue of the battered-child syndrome will be presented in two cases.

Results

Case 1

E.W., an 11 month black male was admitted to hospital because of abdominal distension and "failure to thrive". Physical examination revealed an alert patient, afebrile, without evidence of organomegaly. Weight was below the third percentile; laboratory studies were within normal limits.

A supine abdominal study (Fig. 1) revealed on 0.5×1.0 cm lytic and expansile lesion of the tenth rib posteriorly. A bone survey evaluation revealed a fracture of the distal left humerus with callus deposition (Fig. 2) and metaphyseal irregularities of both the right and left proximal tibiae (Fig. 3, 4).

While trauma was considered as an etiology of these lesions, a pathologic fracture of the rib lesion could not be excluded. A biopsy of the rib lesion revealed decalcified bone without evidence of an underlying abnormality.

Case 2

Baby boy I.J., a four month old black male twin was seen in the emergency room for respiratory problems and vomiting. His mother was a known intravenous drug abuser.

Physical examination revealed a febrile, irritable infant exhibiting a frothy, white nasal discharge and displaying several scars scattered over his body.

The chest x-ray study (Fig. 5 a) demonstrated a right upper lobe pneumonia and an eight mm lytic bone lesion with slight expansion in the ninth rib medially. Slight irregularities in contour were also present in this rib and in the eighth rib. An earlier chest x-ray examination on the second day of life revealed no rib abnormalities.

A bone survey study initiated by the cyst-like rib abnormalitiy revealed a subtle fracture of the distal left tibia and multiple skull fractures in the right and left parietal bones (Fig. 6). This subsequently led to a C.T. scan of the head which demonstrated a chronic subdural hematoma (Fig. 7).

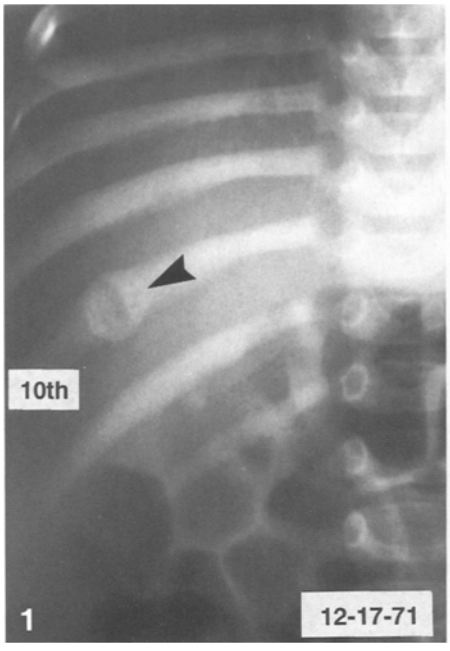
In a follow-up chest x-ray study four months later the rib had returned to normal (Fig. 5 b).

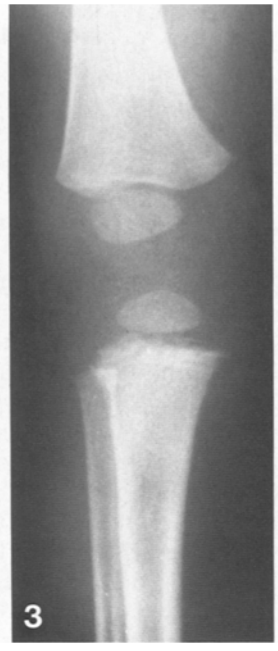
Because of the suspicion of child abuse the twin brother was brought in for evaluation. The twin also had multiple fractures in the long bones, skull, and ribs. An acute subdural hematoma was found in the twin's head C.T. examination.

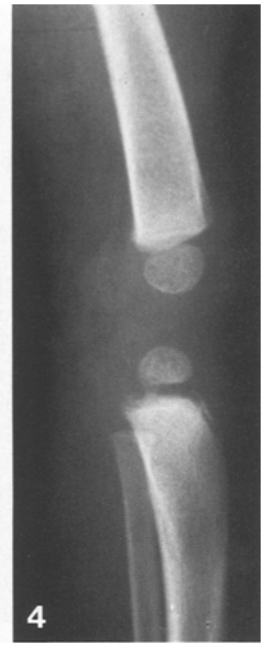
Following hospital discharge both children were placed in foster homes.

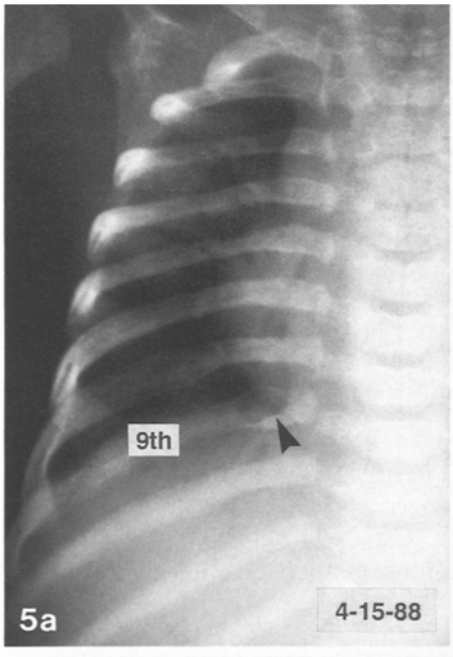
Discussion

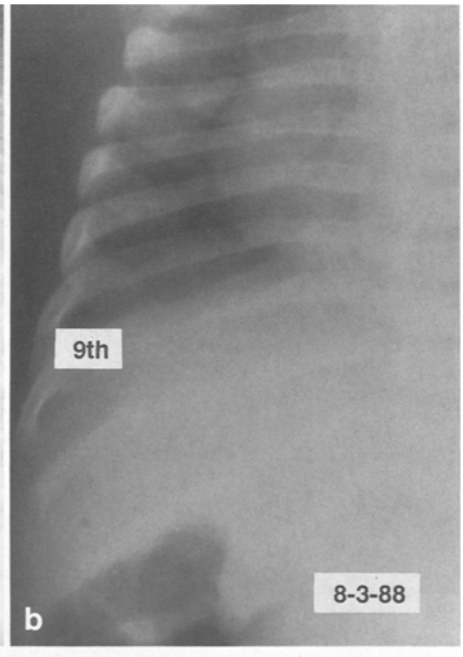
The cause of lytic defects in bone following fracture is a subject of current controversy. Philips and Keats [7] have suggested that cysts arising from hemorrhage, either in

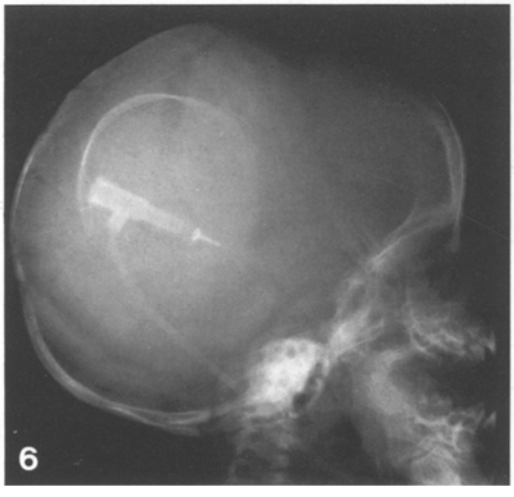












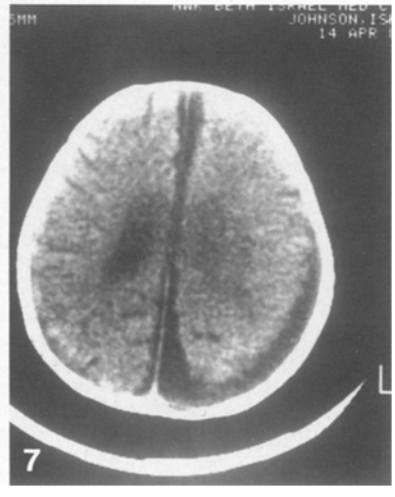


Fig. 1. Case 1 – Close-up View of Right Rib Cage – A lytic, expansile lesion is present in the right tenth rib (arrow). Its configuration suggests a hematoma at the site of a rib fracture

Fig. 2. Case 1 – Distal Left Humerus – There is a fracture of the distal left humerus with abundent callus deposition

Fig. 3. Case 1 – Right Knee AP View – Metaphyseal fracture and irregularities of proximal tibia

Fig. 4. Case 1 – Left Knee LAT. View – Metaphyseal fractures and irregularities of the proximal tibia

Fig. 5 a, b. **a** Case 2 – AP View Of Right Rib Cage (4-15-88) – There is a lytic, expansile lesion in the ninth rib posteriorly. The ninth rib more laterally is also slightly irregular. This rib was normal in a chest X-Ray four months earlier. The lesion is consistent with a "subperiosteal resorbtion cyst."
b Case 2 – AP View of Right Rib Cage (8-3-88) – Three and a half months later the lytic, expansile lesion in the ninth rib has completely resolved

Fig. 6. Case 2 – Lat. View of the Skull – There are multiple fractures of the right and left parietal bones. There is also bulging of the anterior fontanelle and widening of the intracranial sutures suggesting increased intracranial pressure. A scalp vein catheter overlies the sites of fracture

Fig. 7. Case 2 – Transverse Non-Contrast C. T. Scan of the Hand – There is a chronic subdural hematoma in the left parieto-occipital region extending into the sagittal fissure. There is a lesser amount of subdural fluid on the right

cortical, medullary, or subperiosteal locations, may explain these lesions. In case 1 we hypothesize that the hemorrhage and bone reabsorption (possibly accentuated by the lack of immobilization) at the site of an incompletely healed rib fracture was responsible for the lytic configuration. Kleinman in his book on child abuse discusses a similar case [5].

The rib lesion in case 2 was probably subperiosteal (without additional projections its precise location within the rib is not firmly established). Rib deformity more lateral to the lytic lesion may have been the site of earlier fractures. Phister-Goedeke and Braune [6] have suggested that some of these radiolucencies developing in bone following trauma are resorption cysts within the zone of periosteal reaction. These lucencies are not at the site of fracture but occur more proximally within an area of excessive periosteal reaction. The ovoid configuration of the radiolucency in the rib lesion in case 2, its subsequent clearing within four months, and the lack of a fracture deformity at the site of the cyst-like lucency would favor this hypothesis.

While there are many causes for lytic bone lesions ("holes" in ribs) such as malignant and benign bone tumors, malformations (neurofibromatosis), storage disease deposits, histiocytosis-x (especially eosinophilic granuloma), the possibility of a "cystic" sequelae of fracture should now be included in the differential diagnosis. Recognizing that rib fractures in particular can be an important clue in alerting to possible child abuse, the finding of "holes" in the ribs should also raise the possibility of abuse and should be an initiating factor for further clinical and radiographic evaluation of a possible battered-child.

Acknowledgements. We wish to thank Mr. T. Coulihan for his help in preparation of the photographs, Dr. L. Spindell for his help in reviewing the manuscript, and Ms. E. Magid for her help in preparation of the manuscript.

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