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The development of post-traumatic cyst-like lesions in bone

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Abstract. Cyst-like lesions in the radius and tibia were observed in two children as a post-fracture event. The pathogenesis of these lesions is discussed. Cut sections from anatomic specimens display extensive hemorrhage in subperiosteal as well as endosteal and trabecular bone. Cysts arising from hemorrhagic resorption in various locales may explain the occasional atypical appearance of these lesions.

Key words: Bone cysts – Post-fracture cysts – Cortical defect

Cyst-like cortical defects in the distal radial metaphysis in children have recently been described as post-fracture events which occur in the healing period [5]. Previously described cases have involved the distal radius, with one reported case in the fibula and an atypical case in the mid-tibia, and have usually been the result of simple greenstick fractures [1, 2, 5]. We wish to present two additional cases observed at the University of Virginia Hospital, one case very typical in appearance and location and the second unusual in appearance and location, although apparently representing the same post-traumatic cystic lesion. We also wish to discuss our theory concerning the etiology of these benign post-traumatic cysts.

Case reports

Case 1

T.Y., a 10-year 1-month-old male sustained a fracture of the distal portion of the left radius on October 30, 1980. Follow-up films after immobilization and casting disclosed the development of a cyst-like defect (Fig. 1). The final film obtained 8 months following the initial trauma showed a 3 mm cyst-like defect at the fracture site. No apparent interference with healing was noted. No additional follow-up is available.

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Case 2

L.J., a 10-year 10-month-old male sustained a Salter-Harris II fracture of the distal portion of his right tibia and a greenstick fracture of his fibula on March 1, 1981 (Fig. 2). Immobilization and casting were performed. The patient had no additional radiographic follow-up, but the cast was removed later with apparent good healing. On November 29, 1984, a minor trauma to the same region brought the patient back to the emergence room where radiography was performed. This disclosed no new trauma, but showed a round 3 mm cyst-like defect in a zone of remodeled bone corresponding to the area of trauma 3 years and 9 months earlier (Fig. 3).

Discussion

The most common fractures in children are of the greenstick or torus variety. Healing is usually uncomplicated, with nearly perfect remodeling in long-term follow-up. Post-traumatic cyst-like cortical defects are uncommon and apparently completely innocuous, and have been followed to complete resolution [5]. The only concern to the radiologist should be their recognition and association with a previous episode of trauma.

Our first case of post-traumatic cyst in the radius is typical of reported cases (Fig. 1). It appears to be clearly cortical in location, is precisely at the point of cortical disruption in the initial fracture, and is in the common site for the post-traumatic lesion. The second case is atypical, however, both in radiographic appearance and location (Figs. 2, 3). Extensive bony remodeling is noted with cortical buttressing and sclerosis along the fracture lines. The cystic defect is noted to be fairly removed from the cortical bone, apparently within the medullary cavity.

Fig. 1A, B. Development of post-traumatic cyst in case 1. **A** Initial radiograph with fracture of distal portion of radius. **B** Four months following fracture, healing and remodeling has occurred. Cyst-like lesion noted (*arrow*) at point of cortical break. **C** Six months following fracture, cyst-like lesion is unchanged

Fig. 2A, B. Development of tibial lesion. Three radiographs, anteroposterior (AP), lateral, and oblique views (**A**, **B**, **C**) obtained following initial trauma show fracture through tibial epiphysis and distal portion of fibula

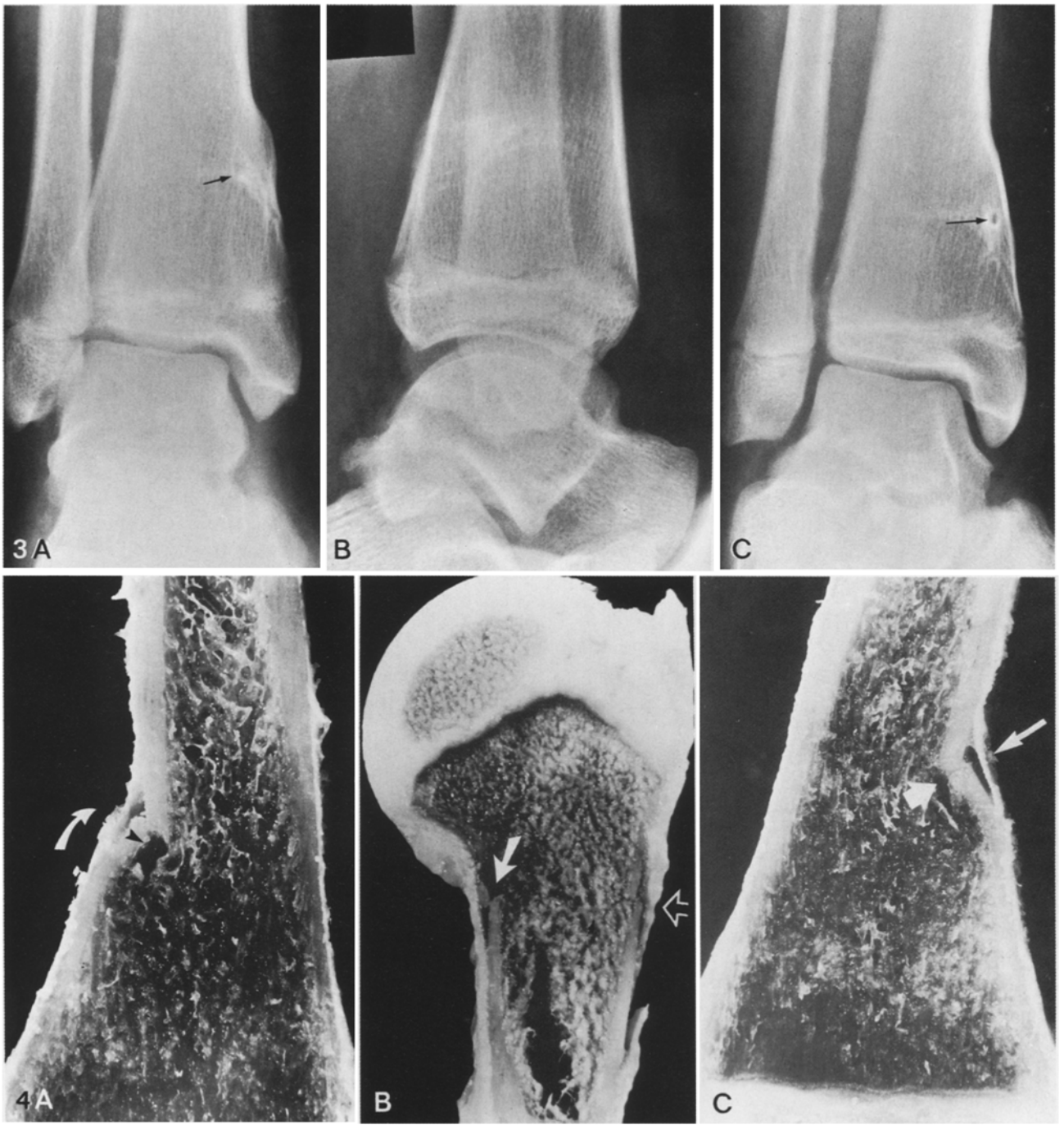

Fig. 3A–C. Three years and eight months following initial trauma a cyst-like lesion has developed in an area of extensive bony remodeling (*arrows*). AP, lateral, and oblique views (**A**, **B**, **C**)

Fig. 4A–C. Three cut specimens demonstrating similar trabecular disruption and intraosseous hemorrhage in endosteal location immediately adjacent to fracture site. Photographs reproduced with permission of authors and publisher [3]. (**A** *black arrowhead*; **B** *solid white arrow*; **C** *large white arrow*)

A recent article by Pfister-Goedeke and Braune [5] described a series of nine such lesions in the distal radius of children. It is their belief that excessive subperiosteal hemorrhage and its subsequent calcification and resorption can lead to these cyst-like lesions. They postulate that the lesion arises from resorption cysts within the periosteal reaction zone. However, in view of a recent excellent anatomic study by Light et al. [3], we feel that an alternate explanation can be proposed that would better fit our findings in our second case. In reviewing the findings in metaphyseal torus fractures, these authors present several figures that may be applicable in determining the etiology of post-traumatic bone lesions. They too found areas of subperiosteal hemorrhage in fracture specimens which would eventually calcify and resorb. They also found that often the damage to bone on cut sections was more extensive than could have been surmised from the radiographs of the whole specimen. Disruption of the internal trabeculae was noted, with propagation of the fracture extending outward from the cortical fracture site. It is the internal propagation that we find to be of the most interest, since hemorrhage is also present within disrupted trabecular bone. Resorption cysts associated with this hemorrhage would also lead to cyst-like defects in fractured bone either in the juxtacortical, cortical, or medullary region.

Several interesting figures with similar fractures studied in deceased traumatized children and animals show an additional area of significant hemorrhage immediately adjacent to the fractured endosteal cortical bone (Fig. 4). A resorption cyst in this location would be seen within the medullary cavity following remodelling and bone growth. This documented scenario is much like that of our second case.

Pfister-Goedeke and Braune indicated that their post-fracture lesion in the radius is typically cortical. However, we suspect that while this is true in their material, the same phenomenon may be seen in the medullary bone as well and that the common denominator is an intraosseous hemorrhage.

Kozlowski and Masel in a recent publication described a lesion they felt to be post-traumatic in nature in the mid-distal tibia [1]. Its clearly expansile nature with secondary pathologic fracture distinguishes this cyst from the classically described post-traumatic cyst. Expanding post-fracture cysts have been described [2] but are extremely rare. However, the persistence of this lesion in the tibia, the site of our second case, is of interest. Why lesions in locations other than the radius might remain for longer periods of time is unclear. Our tibial lesion appears to be in medullary bone where less active remodeling occurs, which may explain its relative longevity.

Since the submission of our original manuscript, a recent article [4] has appeared attributing these cyst-like lesions to medullary fat within subperiosteal hematoma. The authors base this theory on the finding of fatty density (−80 HU) on a CT scan of one patient. We find the significance of this CT number uncertain due to the difficulty in obtaining reliable CT numbers within or adjacent to dense cortical bone.

In summary, we have described findings in two post-traumatic cysts seen at our institution. We have also proposed an alternative theory concerning their etiology which may explain the persistence of these lesions in certain cases.

References

1. Kozlowski K, Masel J (1982) Simple bone cysts (report of two unusual cases). Australas Radiol 26:269
2. Levine BS (1969) Evolution of a post-fracture cyst of the fibula. J Bone Joint Surg [Am] 51:1631
3. Light TR, Ogden DA, Ogden JA (1984) The anatomy of metaphyseal torus fractures. Clin Orthop 188:103
4. Malghem J, Maldague B (1986) Transient fatty cortical defects following fractures in children. Skeletal Radiol 15:368
5. Pfister-Goedeke L, Braune M (1981) Cyst-like cortical defects following fractures in children. Pediatr Radiol 11:83