The Upper Humeral Notch

A Normal Variant in Children[1]

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A crescentic cortical notch in the medial humeral neck was demonstrated in six children without other extremity abnormality and in three with systemic diseases. Its bilaterally symmetric appearance and occurrence in many normal patients lends support to the belief that this finding is of limited value in the diagnosis of infiltrative storage diseases. Its true nature is unknown, but it seems to be a normal variant possibly related to the insertion of the shoulder joint capsule.

INDEX TERMS: Humerus

Radiology 113:699–701, December 1974

A CRESCENTIC DEFECT of the medial humeral neck in children has been considered of diagnostic and clinical importance in several diseases. Such a lesion has been described in Gaucher's disease (1), glycogen storage disease (4), and Niemann-Pick disease (3); a superficially similar but probably unrelated humeral change has been noted in Hurler's syndrome (5). While logical speculation may adduce a suitable mechanism for pathologic change in these conditions, it is quite probable that this finding is normal and is related to the anatomy or development of this area and thus of no clinical or diagnostic significance.

CASE MATERIAL

The material presented here is derived from nine patients, with 15 extremities involved. All examples were collected randomly, and only once was the patient specifically examined for a similar finding on the other side. No attempt has been made to determine the incidence of this finding in the general pediatric population, and no adult material has been reviewed.

The diagnoses on these children included tendonitis, idiopathic scoliosis, congenital scoliosis, acute clavicular fracture, cardiac murmur, Hodgkin's disease, and Gaucher's disease (two patients). Ages ranged from two to 19 years.

RADIOGRAPHIC FEATURES

A typical finding is a shallow, crescentic notch in the medial cortex of the humeral neck, situated 1 to 2 cm distal to the epiphyseal line. The defect rim may show polycyclic scalloping (Figs. 2 and 5, A). While the margins of this defect are usually quite sharp they may occasionally be indistinct (Fig. 3). A hazy or spiculated outline, suggesting periosteal reaction, may give the impression of an active, aggressive lesion (Figs. 2, 4, A, 4, C, and 5, B). The length and depth of this notch are variable. In one child the notch was noted on two examinations at five and 11 years of age (Fig. 1), and in another at 13 and 19 years (Fig. 3). The area of involvement is anatomically related to the insertion of the shoulder joint capsule (Fig. 7).

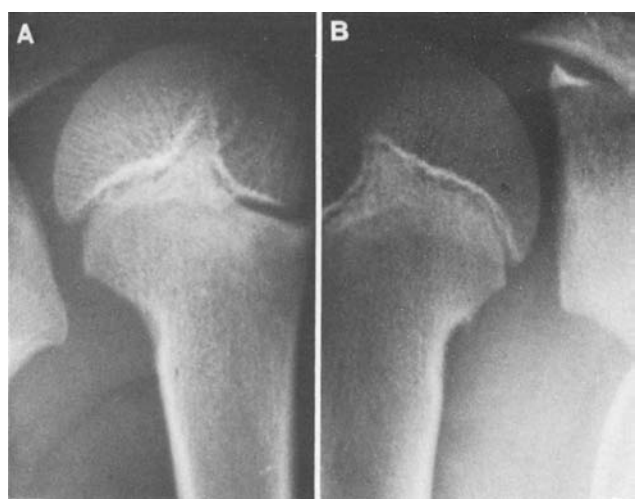

Fig. 1. A girl with idiopathic scoliosis. Radiographs of the left humerus at five years of age (A) and of the right humerus at 11 years of age (B) show a shallow semilunar concavity with distinct cortical margin. The spike-like superior extension is seen occasionally (compare with Fig. 2).

DISCUSSION

Plausible explanations of this cortical defect have been advanced for several infiltrative dis-

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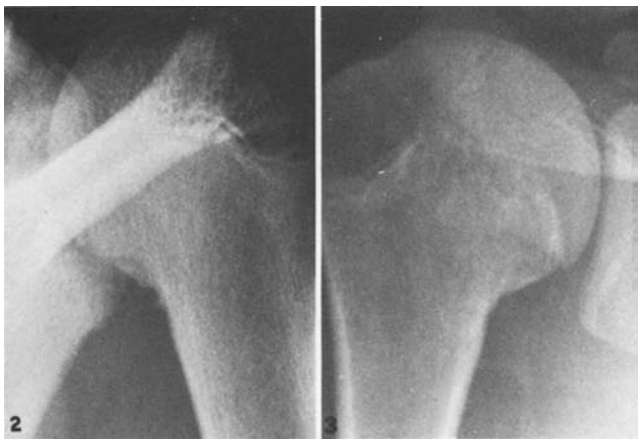

Fig. 2. A 15-year-old boy with a fracture of the clavicle. The notch profile is composed of several distinct concavities and does not have a clear cortical margin.

Fig. 3. A 19-year-old girl with congenital scoliosis. The cortical defect is shallow, angular, and with indistinct borders. Its appearance was similar when the girl was 13 years old.

eases, with most hypotheses based on the infiltration of capsular attachments (4) or the subperiosteal area (3) by abnormal substances or cells. It must be noted, however, that histological proof of these conjectures has not been advanced. In fact, when the site of a radiologically demonstrated humeral notch was examined at autopsy in a boy with Niemann-Pick disease, no abnormality was found (7).

The occurrence of this finding in three patients with known infiltrative disease (two with Gaucher's disease, one with Hodgkin's disease) may raise some doubt as to its normality. Nonetheless, the other 6 patients described had no condition possibly related to such a change in bone. In addition, pathologic lesions are rarely bilaterally symmetrical, as they were in the patients described here.

Why this notch is not seen more often is debatable. It is often noted on one examination and not on a subsequent one. Experience with one patient showed that it could be visualized only when the arm was in a neutral attitude. Rotation under fluoroscopic control demonstrated that it could not be seen when the humerus was rotated a few degrees in either direction. A survey of a large group of pediatric radiologists revealed that most had seen the "lesion" as an incidental finding in otherwise normal patients many times in the past. It was the opinion of many that the reason it is reported more often in systemic disease is that only these patients have general bone surveys including both arms.

The histological nature of cortical defects anywhere in the skeleton is debatable. Autopsy and biopsy studies have shown that similar lesions in the distal femur have been interpreted as representing osteochondroma-like areas with signs of recent injury (6) or fibrous periosteal thickening with osteoclastic activity (2). The true nature of the humeral notch lesion is not known—its location near the insertion of the shoulder joint capsule

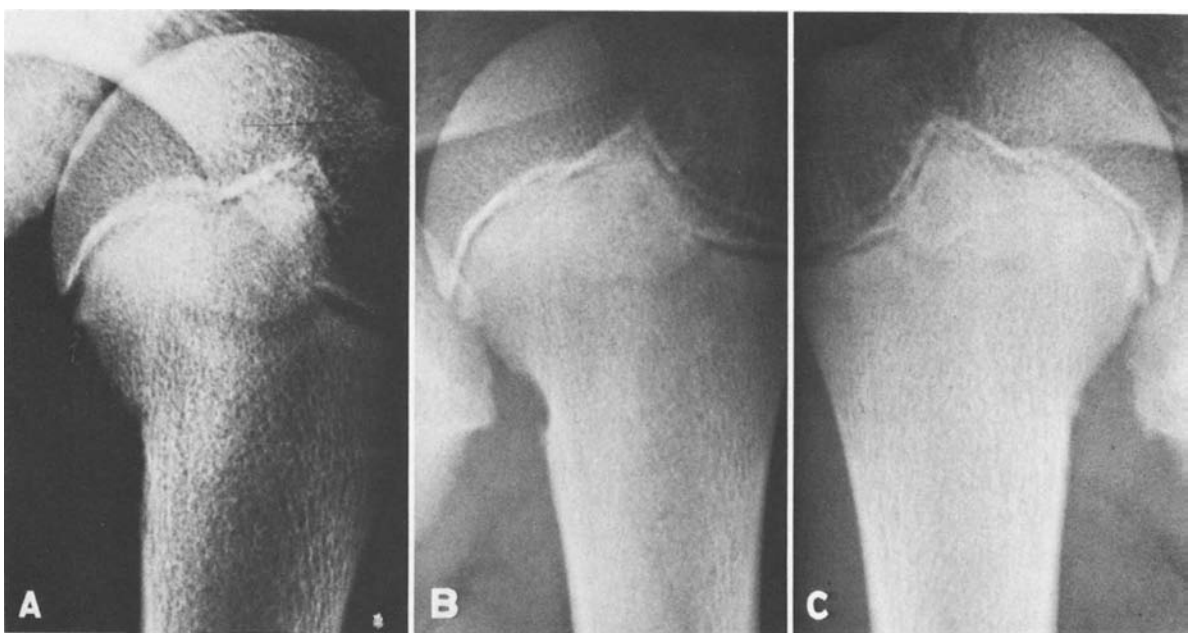

Fig. 4. A 14-year-old boy with pain in the left shoulder, later diagnosed as tendinitis. A. The notch is shallow and slightly angular. The borders are hazy. On consultation at a bone pathology center this lesion was termed "aggressive" because of its poorly defined borders.

B. An externally rotated view obtained two months later demonstrates a typical well defined notch.

C. The appearance of the right shoulder is similar to that of the left shown in Fig. 4, A.

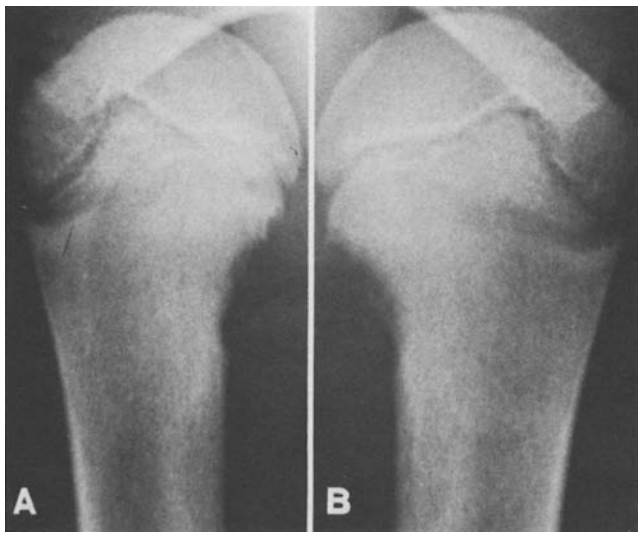

Fig. 5. An 8-year-old girl with Gaucher's disease. A. A long polycyclic defect is present in the right humerus. The upper margin is not distinct. The lower edge is more clearly defined.
B. In the left humerus the defect is long and poorly marginated.

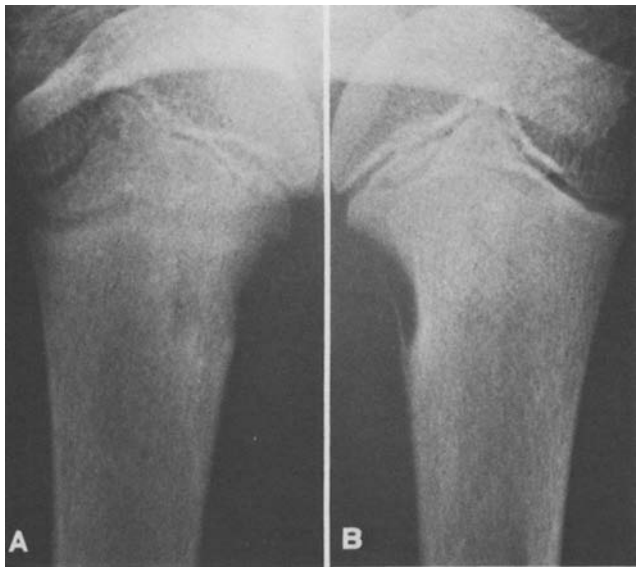

Fig. 6. An 11-year-old girl with Gaucher's disease. A. In the right humerus there is a long concavity with indistinct borders.
B. The defect is sharply demarcated in the left humerus.

leads to speculation that it is an anatomic finding related to this fibroskeletal attachment. The bilaterally symmetric occurrence in many patients would lend support to this hypothesis. Other possibilities include periosteal desmoid and non-ossifying fibroma.

The importance of recognizing this notch as an incidental normal finding is twofold. Its presence should not be used to further validate suspected systemic skeletal disease, and (as in Figure 4, A) there should be no reason to biopsy a typical lesion in a patient with no symptoms specifically referable to it.

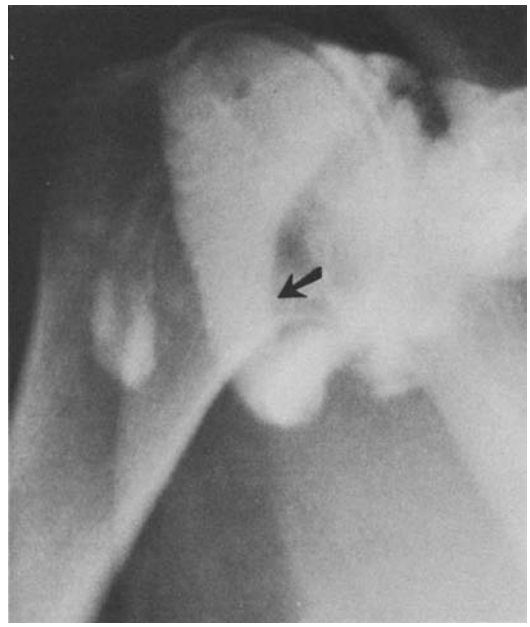

Fig. 7. A normal 17-year-old boy. No cortical notch is seen in the shoulder arthrogram. The area of the insertion of the joint capsule is indicated by arrow.

ADDENDUM: Since the submission of this report, one patient with Gaucher's disease has incurred a pathological fracture of the humeral neck, two years after the examination shown in Figure 6. The status of the underlying bone is difficult to evaluate now, as extensive callus is present.

A recent examination of the left humerus (shown two years ago in Fig. 6, B) now reveals patchy sclerosis of the entire humeral neck, none of which was present before. The sharply defined cortical defect is unchanged.

While it is doubtful that the cortical defects contribute to significant weakness of the humeral neck or represent cortical infarction, the possibility of subsequent local bone pathology in systemic disease must always be kept in mind.

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