CLINICAL CHALLENGE

Radiology Rounds

MYLES MARGOLIS, MD, FRCPC, AND MICHAEL K. MCLENNAN, MD, FRCPC

Figure 1. **Anterior view of the proximal left humerus**

CLINICAL HISTORY

An 8-year-old boy rolled off a sofa onto his outstretched left hand. He complained of pain in his left shoulder.

A. What is the most likely diagnosis?

1. Simple bone cyst
2. Aneurysmal bone cyst
3. Brown tumour
4. Ewing's sarcoma
5. Intraosseous ganglion

B. How can the patient's pain be explained?

Answer on page 1539

Dr Margolis *is a Staff Radiologist at Mount Sinai Hospital in Toronto.* **Dr McLennan** *is a Staff Radiologist at the Markham Stouffville Hospital in Markham, Ont.*

Answer to Radiology Rounds

continued from page 1535

A. 1. Simple bone cyst
B. Pain is caused by an associated pathologic fracture.

Radiologic findings

Figure 1 shows a radiolucent lesion in the metadiaphyseal region of the proximal left humerus. The lesion has well-defined margins and is somewhat expansile, with scalloping and thinning of the endosteal (inner) surface of the cortex. Portions of the lesion have a thin rim of sclerotic bone. The lesion is centrally located in the medullary canal and is oriented along the longitudinal axis of the humeral shaft. There is no extension across the epiphyseal (growth) plate or associated periosteal reaction. No adjacent soft tissue mass is obvious.

A pathologic fracture through the lucent lesion caused the patient's pain following a relatively light fall. Closer inspection of the radiograph reveals a cortical fracture fragment in the dependent (inferior) aspect of the lesion (*Figure 2*). The fact that this fragment has settled to the bottom of the lesion implies that it is cystic rather than solid, the so-called "fallen fragment" sign of a simple bone cyst.[1-3]

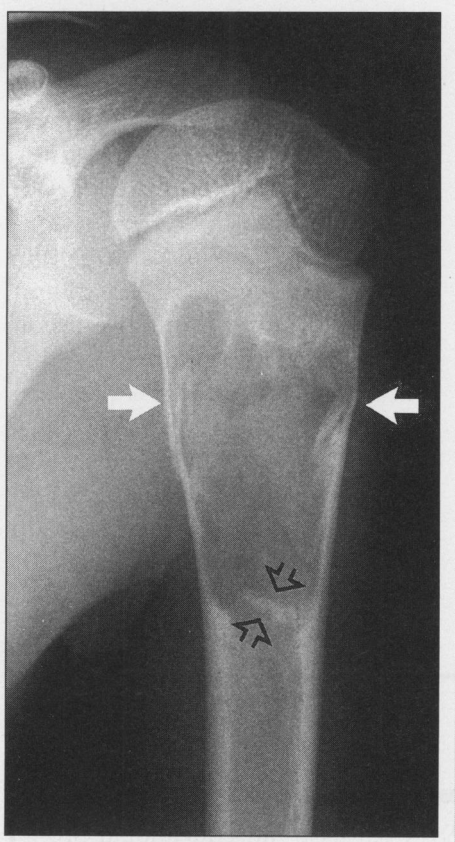

Figure 2. **Anteroposterior radiograph of proximal left humerus:** *The film was obtained at the same time as Figure 1 and taken at a slightly different angle. The jagged lucent line (between white arrows) and buckling of the lateral cortex show the pathologic fracture. The dense, linear, cortical fragment (open black arrows) has broken off the wall of the bone cyst and settled below (fallen fragment sign).*

Discussion

Simple bone cysts, also called solitary or unicameral bone cysts, are benign, tumourlike lesions of unknown origin.[1-4] They are usually seen in the first and second decades of life and are two to three times more common in male patients than female patients.[1-3] They most frequently arise in long tubular bones; the proximal humerus and proximal femur are the most common sites, accounting for 60% to 75% of cases.[1-4] The cyst is usually located in the metaphyseal region and centred on the medullary canal of the tubular bone involved.[1] Patients older than 20 years are more likely to have simple bone cysts in the innominate bones of the pelvis and in the calcaneus than in other sites.[1] Patients rarely have multiple lesions.[1]

Most simple bone cysts are asymptomatic, although they occasionally cause mild pain or limit movement.[1,2] They commonly present with pathologic fracturing following relatively minor trauma (as with this patient) or show up as an incidental radiographic finding on films obtained for other reasons.[1,2]

The cysts are lined with a membrane consisting of vascular fibrous tissue, hemosiderin, and occasional giant osteoclast cells and inflammatory cells.[1,2,4] The membrane might contain bony ridges that protrude into the cyst cavity, which is usually filled with clear or serosanguinous fluid.[1,2,4] The fluid tends to be bloody in cysts that have recently fractured.[1,2]

A simple bone cyst has a classic radiographic appearance: a well-defined, centrally located, radiolucent lesion, which has associated cortical thinning and mild expansion, in the metaphysis of a long bone.[1-3] Bony ridges, if present, appear multilocular, although they do not extend completely across the lesion.[1,2] Frequently, a thin sclerotic rim of bone surrounds the cyst.[1,2] Simple bone cysts are usually ovoid with their long axis parallel to that of the parent bone; they typically do not cross the epiphyseal plate; and early lesions tend to lie close to the growth plate and gradually migrate toward the diaphysis as the bone grows.[1,2]

As mentioned, pathologic fracturing of simple bone cysts is relatively common and can be diagnosed on radiographs. If present, the fallen fragment sign confirms the diagnosis.[1-3] Differential

diagnosis includes aneurysmal bone cyst (usually eccentric and more expansile), enchondroma (could contain internal calcification), and fibrous dysplasia.[1]

Because simple bone cysts do not usually regress spontaneously, treatment is advocated.[1,3] Treatment choices include traditional surgical currettage with bone chip packing and intralesional injection of corticosteroid solution.[1,2,4] A pathologic fracture should be allowed to heal before steroid medication is injected.[4]

Differential diagnosis

Aneurysmal bone cyst. Aneurysmal bone cysts are osteolytic lesions that typically have an aggressive, expanded appearance.[5] Similarities to simple bone cysts include a well-defined, lucent, and expansile appearance; a thin sclerotic border; metaphyseal or metadiaphyseal location within a long bone; lack of periosteal reaction unless fractured; and affecting relatively young patients.[1,5]

Most aneurysmal bone cysts are found among patients in the first to third decades of life.[5] These cysts are slightly more common among female patients and can arise in both the appendicular and axial portions of the skeleton.[5] Other typical features, such as an eccentric location within the affected bone and a rapid and aggressive ballooning growth pattern, help to differentiate aneurysmal bone cysts from simple bone cysts.[5]

Aneurysmal bone cysts can arise on their own (primary type) or accompany an existing lesion (secondary type).[5] Examples include giant cell tumour, fibrous dysplasia, chondroblastoma, osteosarcoma, chondrosarcoma, and chondromyxoid fibroma. Histologically, these cysts are made up of dilated blood-filled spaces lined by osteoid granulation tissue, fibrous connective tissue, and giant cells. Treatment involves scraping the entire lesion and possible bone grafting. A recurrence rate of 10% to 20% has been reported.[5]

Brown tumour. Several bony and soft tissue changes can be seen on radiographs of patients affected by hyperparathyroidism. These changes include signs of bone resorption, bone softening, osteosclerosis, soft tissue calcification, and erosive arthropathy. Brown tumours are non-neoplastic, focal areas of extensive bone resorption more often associated with primary than secondary hyperparathyroidism.[6] Hyperparathyroidism tends to be a disease of middle and old age.

Brown tumours are typically radiolucent, well-marginated, expansile, and frequently eccentric lesions that can affect any bone, but most commonly affect the mandible, pelvis, rib, long bone metaphyses, and facial bones.[6] Often, other radiographic signs of hyperparathyroidism also are present.[6]

Ewing's sarcoma. Ewing's sarcoma is a malignant bone tumour, made up of small, round cells.[6] Almost all of those affected are between the ages of 4 and 25 years. After osteosarcoma, Ewing's sarcoma is the next most common primary bone tumour affecting children.[6] Patients present with pain, a soft tissue mass, and possible systemic signs of fever, leukocytosis, and anemia.[6]

The tumours vary in radiographic appearance. However, typical lesions are lytic with permeating bony destruction and ill-defined margins, associated with an adjacent soft tissue mass and a lamellated ("onion skin") or spiculated periosteal reaction.[6] The most common bones affected are the flat bones of the pelvis and the long tubular bones. The lower extremity is involved in about 50% of cases. Ewing's sarcomas are usually located in the diaphysis or metadiaphysis of an affected long bone.[6]

Tumours can be complicated by pathologic fracture.[6] Metastasis, most commonly to the lungs or other bones, is relatively common (up to 30%) at the time of diagnosis;

Self-evaluation

We offer a sample question from *Self Evaluation*,[1] an educational program run by the College of Family Physicians of Canada and approved for 30 hours of Category 1 CME study credits, to test your skills.

Which of the following selection criteria predict positive results on computed tomography scans for patients with traumatic head injury?

1. Focal neurologic deficit
2. Blurred vision
3. Alcohol intoxication
4. Depressed sensorium

Answer on page 1543

5-year survival rates are about 60%.[6]

Intraosseous ganglion. Intraosseous ganglia are rare radiolucent bone lesions that are histologically identical to their more common soft-tissue counterparts; they are often an incidental finding on radiographs.[7] Typical patients are middle-aged.[7]

Radiographically, these lesions are lytic and well-defined with a sclerotic margin.[7] They are epiphyseal and subchondral in location and the adjacent joint space is usually preserved; knee, ankle, proximal femur, and carpal bones are the most commonly involved sites.[7]

The youth of this patient and the metadiaphyseal location of his lesion make an intraosseous ganglion very unlikely. ■

References

1. Resnick D, Kyriakos M, Greenway GD. Tumors and tumor-like lesions of bone: imaging and pathology of specific lesions. In: Resnick D, Niwayama G, editors. *Diagnosis of bone and joint disorders.* 2nd ed, vol 6. Philadelphia: WB Saunders Co, 1988:3820-31.
2. Schajowicz F. *Tumors and tumorlike lesions of bone and joints.* New York: Springer-Verlag, 1981:417-24.
3. Kirks DR. *Practical pediatric imaging – diagnostic radiology of infants and children.* Boston: Little, Brown and Co, 1984:261.
4. Malawer MM, Shmookler BM, Feffer S, Westring D. Principles of orthopedic oncology. In: Dee R, editor. *Principles of orthopaedic practice.* Vol 1. New York: McGraw-Hill Book Co, 1989:351-2.
5. Sundaram M. Aneurysmal bone cyst. In: Taveras JM, Ferrucci JT, editors. *Radiology: diagnosis – imaging – intervention.* Vol 5. Philadelphia: JB Lippincott Co, 1992:chap 81,1-9.
6. Dahnert W. *Radiology review manual.* Baltimore: Williams & Wilkins, 1991:35-48.
7. Sundaram M. Intraosseous ganglion. In: Taveras JM, Ferrucci JT, editors. *Radiology: diagnosis – imaging – intervention.* Vol 5. Philadelphia: JB Lippincott Co, 1992:chap 81A,1-2.

•••

Answer to Dermacase

continued from page 1537

4. Eczema herpeticum

This condition results from primary infection with herpes simplex virus. Such infection occurs in individuals with atopic dermatitis and occasionally in patients with Darier's disease or pemphigus foliaceus.[1] In the past, the disorder was called Kaposi's varicelliform eruption; it resulted from infection with the vaccinia virus used for smallpox vaccination.

Eczema herpeticum is usually a primary infection and, therefore, common during early childhood. It can occur at any age, and the source of infection is often unknown. Among young adults, recurrent herpes labialis virus is transferred by kissing.

Characteristic lesions are crateriform or umbilicated. Mild symptoms of itching, malaise, or fever can occur. At times, many lesions join together to create a rash. Secondary infection can follow; appropriate systemic antibiotics might be necessary.

The eruption lasts 4 to 6 weeks. Treatment with systemic acyclovir at a dose of 400 to 800 mg three times daily for 7 days is effective. ■

Reference

1. Rook A, Wilkinson DS, Ebling FJG, Champion RH, Burton JL. Virus and related infection. In: Rook A., Wilkinson DS, Ebling FJG, Champion RH, Burton JL, editors. *Textbook of dermatology.* 4th ed. Oxford: Blackwell Scientific Publication, 1986:chap 20,691-2.