clinical case study

Osteoid osteoma of the os calcis in a teenage athlete

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ABSTRACT

CHANG, J. L. and M. L. IRELAND. Osteoid osteoma of the os calcis in a teenage athlete. *Med. Sci. Sports Exerc.*, Vol. 25, No. 1, pp. 2–8, 1993. Osteoid osteomas are small, benign bone tumors most commonly located in the proximal femur or tibia. The classic presentation is localized pain increasing in severity at night, and relieved by the use of anti-inflammatory medications. In a young athlete complaining of foot pain, many conditions should be included in the differential diagnosis. A case of osteoid osteoma of the os calcis in a teenage basketball player is presented.

OSTEOID OSTEOMA, OS CALCIS, BENIGN TUMOR

Osteoid osteomas are small benign tumors of bone that occur most commonly in the lower extremity. Although reported in all of the bones of the foot, osteoid osteoma most often involves the talus (6,10,12). A case of osteoid osteoma in the calcaneus in a teenage basketball athlete follows. Diagnostic tests, differential diagnosis, workup, and surgical management are emphasized.

CASE REPORT

A 14-yr-old white male basketball player insidiously developed increasing pain on the lateral aspect of his left foot and ankle. Although there was no specific traumatic event, the patient quit playing basketball 4 months before presentation because of foot pain. He had no other bone or joint complaints. He denied eye or genitourinary problems. He was noted by his parents to be in a growth phase. Written consent from the patient and parents was obtained to use this case for publication.

On physical examination, the patient had pes planus, localized pain over the peroneal tendon sheath but normal subtalar motion. There was no swelling and no tenderness on palpation of the Achilles tendon, calcaneus, or plantar fascia. Neurovascular examination was normal. On observation of gait, there was no limp but the patient said pain occurred at heelstrike.

Initial plain radiographs of standing lateral, anteroposterior (AP), and obliques appeared normal except on standing lateral view. A small area of sclerosis was noted that was thought to be a normal variant (Fig. 1). He was placed on aspirin, wore high top shoes, and did an ankle rehabilitation program. He had improvement of pain but was unable to run. The patient developed a gastrointestinal bleed from the aspirin. When the aspirin was discontinued, acetaminophen was started. His pain, especially at night, increased significantly.

Neurologic and rheumatologic consults were obtained. Workup for the arthrides was negative including negative HLA B27, normal erythrocyte sedimentation rate, and normal white blood cell count. Conditions involving the lumbar spine, peripheral nerves, inflammation and infection were excluded. History was negative for eye or genitourinary complaints. The pain was felt to be mechanical in origin by consultants.

Despite normal oblique radiographs, the possibility of tarsal coalition was considered. A computerized tomogram (CT) was obtained. The CT scan showed a 7-mm radiolucency with surrounding sclerosis in the cancellous bone of the os calcis (Fig. 2). There was no tarsal coalition. To assess the activity of the lesion and determine joint or other areas of involvement, a technetium bone scan was obtained. Bone scan showed intense increased activity in the central aspect of the calcaneus (Fig. 3). The presumptive diagnosis was osteoid osteoma. Surgery was suggested.

Excisional biopsy of the calcaneus utilizing a Cloward drill was performed. Indelible ink was used to mark the skin at the site of radiolucency by preoperative CT scan. Marking the skin and lateral intraoperative photograph with smooth K wire confirmed tumor location (Fig. 4). Plain radiograph was done to confirm the drill would be inserted at the correct level.

A lateral approach was utilized to expose the peroneal tendons and lateral dorsal cutaneous branches of the sural nerve (Fig. 5). Intraoperative lateral approach shows the close relationship between the peroneus longus tendon in the forceps and lateral dorsal cutaneous

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Figure 1—Initial lateral foot radiographs show normal cancellous bone pattern. A small area of sclerosis was felt to be normal on initial review of film (*arrow*).

Figure 2—CT scan demonstrating the radiolucency with surrounding sclerosis in the central portion of the left calcaneus (*arrow*) compared with the opposite normal right side.

branch of sural nerve below (Fig. 6). Excisional biopsy with a Cloward circular drill removed a plug of bicortical bone that included the tumor. Cultures were negative. No bone graft was performed. The resected specimen shows tumor of soft red caviar appearance in the center, cortical bone medially on the left, and adherent tumor to lateral cortex on right (Fig. 7).

Prior to surgery, the patient was injected with technetium. A bone scan of the surgical specimen confirmed excision of the nidus. Immediate postoperative bone scan of the specimen showed intensely increased activity (Fig. 8). Repeat bone scan of the feet was performed on the first postoperative day. This showed minimal calcaneal activity on lateral view, further confirmation of complete excision. Histologically, diagnosis of osteoid osteoma was confirmed with the findings of a nidus, osteoid trabeculae rimmed with osteoblasts, and multinucleated giant cells.

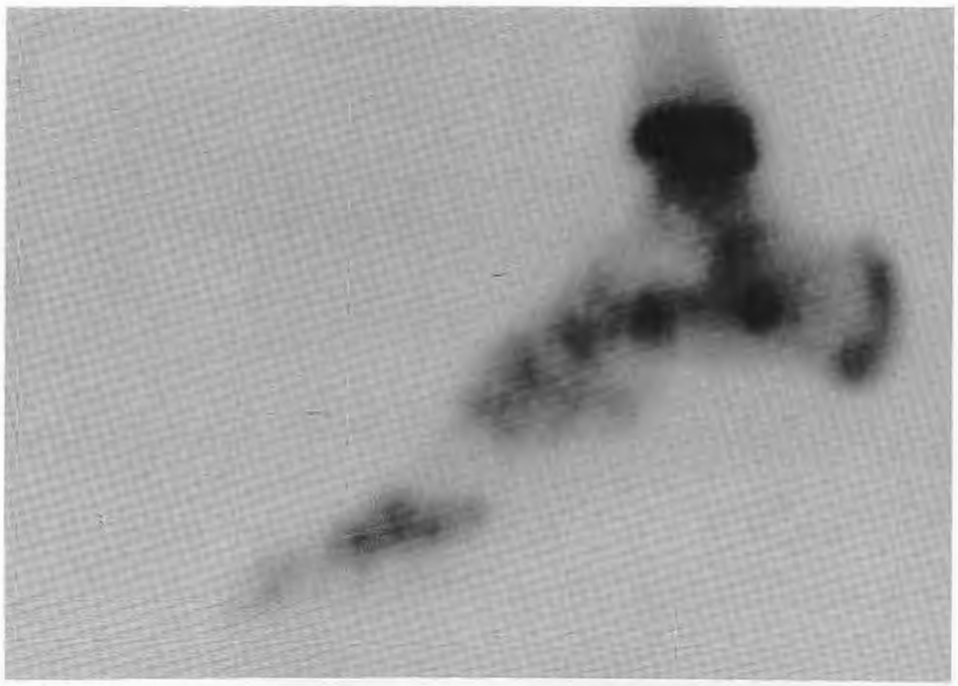

Figure 3—Lateral bone scan showed intensely increased activity in the central aspect of the calcaneus.

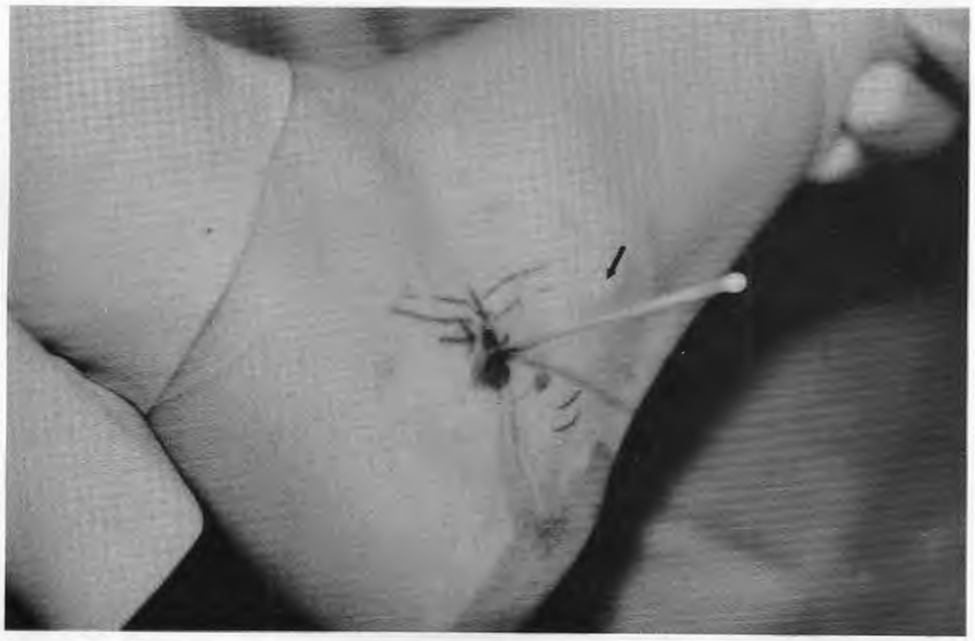

Figure 4—Intraoperative photo shows K-wire drilled at the level of the tumor in the calcaneus. Intraoperative radiographs confirmed the K-wire going through the central radiolucency surrounded by sclerosis. This method was used to localize the tumor, which could not be palpated or actually seen due to its cancellous central calcaneus location. The *arrow* shows the lateral malleolus.

The patient had immediate pain relief. Lateral radiograph of the calcaneus confirmed complete excision (Fig. 9). He was casted for 2 wk and then began partial weight-bearing in a castbrace walker. At 6 wk the patient was fully weight-bearing without pain and was placed on a rehabilitation program. He was cleared for full activities including basketball 6 months postoperatively. At follow up 4 yr following excisional biopsy, he remains asymptomatic and follow-up radiographs (Fig. 10) show complete filling in at biopsy site.

DISCUSSION

Osteoid osteomas are small benign tumors that have a predilection for the long bones of the lower extremity. This entity was initially described by Jaffe in 1935 (3). By definition, tumors of this type that are less than 1.5 cm are classified as osteoid osteomas, while those larger than 1.5 cm are considered to be osteoblastomas (3,9). Osteoid osteomas have a peak incidence in the second decade, and have a male to female ratio of 3:1.

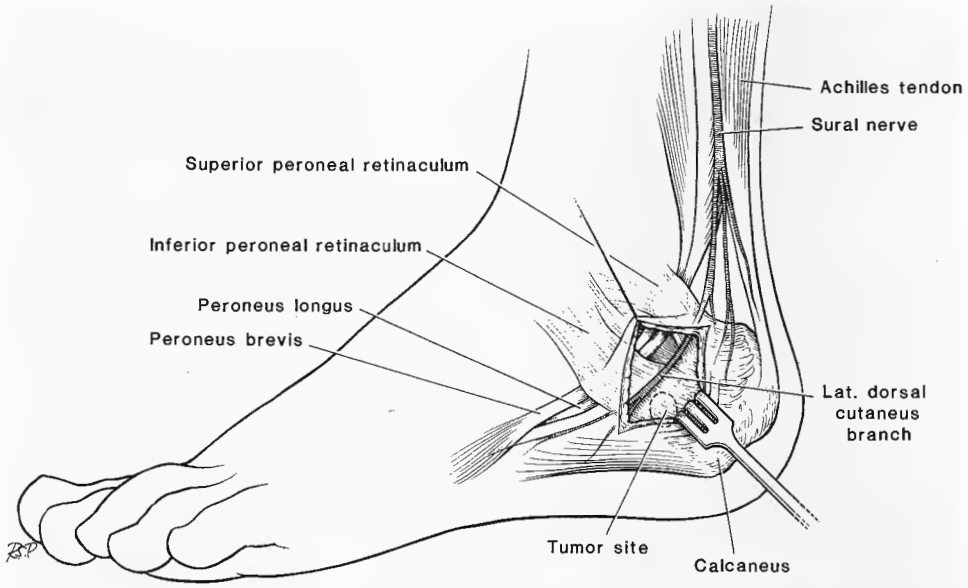

Figure 5—Diagram of approach lateral aspect of the left foot with peroneal tendons anteriorly and dorsal lateral cutaneous branch of the sural nerve inferiorly.

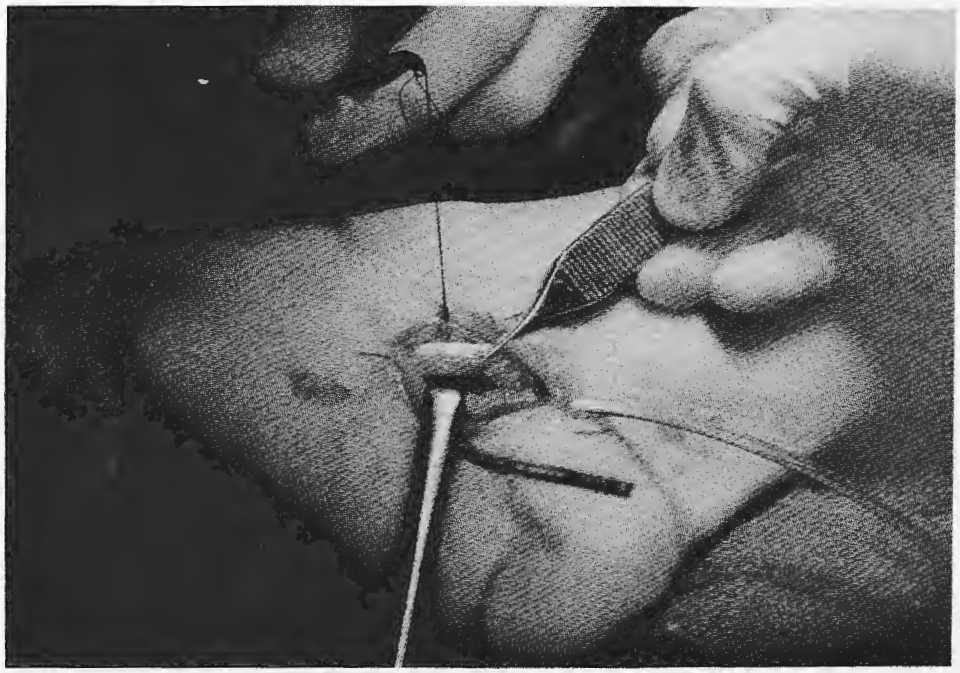

Figure 6—Intraoperative photograph of peroneus longus superiorly being held by the forceps and inferiorly the lateral dorsal cutaneous branch of the sural nerve. The tumor was directly deep to this which correlates with the patient's symptoms of a peroneal spastic flat foot and pain over the lateral aspect of his foot.

The reported incidence of osteoid osteomas in the bones of the foot ranges from 2 to 10%, with a predilection for the talus (4,6,10). Resnick and Niwayama (11) reported 661 cases of osteoid osteoma, 32 were in the femur, 24 in the tibia, and 11 in the foot. Osteoid osteomas of the calcaneus have been reported (10–12). Of 10 cases of osteoid osteoma of the foot, three were in the talus and one in the calcaneus (12). A larger but similar histologic appearance of a benign osteoblastoma has been reported in the calcaneus (5).

Clinically, most osteoid osteomas produce an aching discomfort or pain that classically increases in severity at night. Many patients report that the pain is lessened with the use of anti-inflammatory medication, which blocks prostaglandin formation. When present near a joint, referred pain can occur (1,4,6,10). Osteoid osteoma in unusual locations can make the diagnosis difficult (8).

Based on the location of the nidus, these tumors have been described as subperiosteal, cortical, or cancellous. Radiographically, 66–75% occur in the cortex with the typical appearance of a radiolucent nidus and surround-

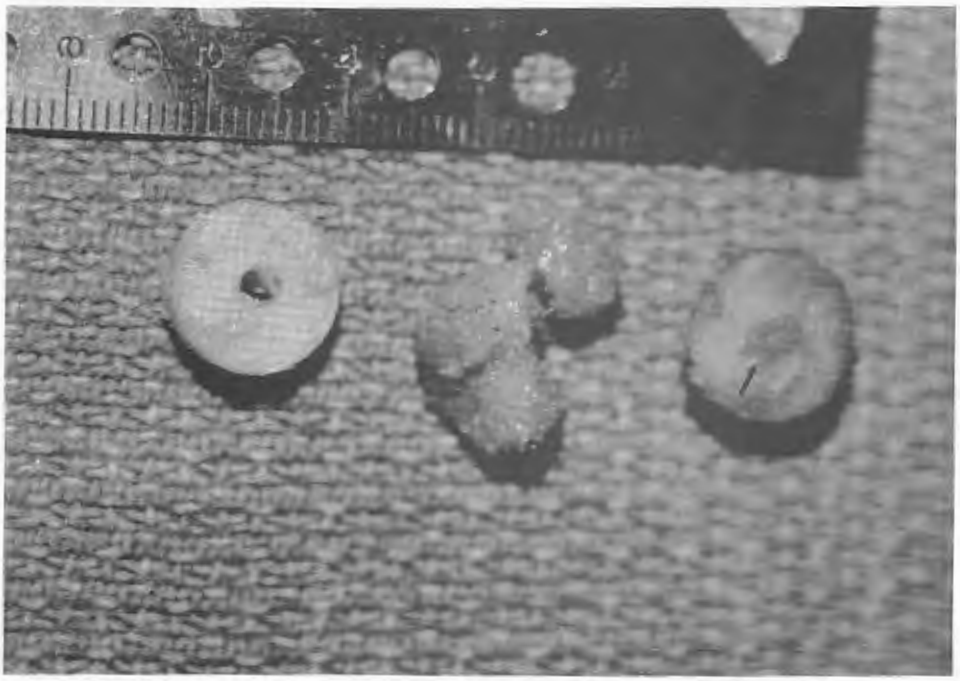

Figure 7—The appearance of the gross specimen is red caviar consistency shown in the middle. Osteoid osteoma adheres to the lateral cortical bone on right (arrow) and medial cortex from Cloward drilling is seen on left.

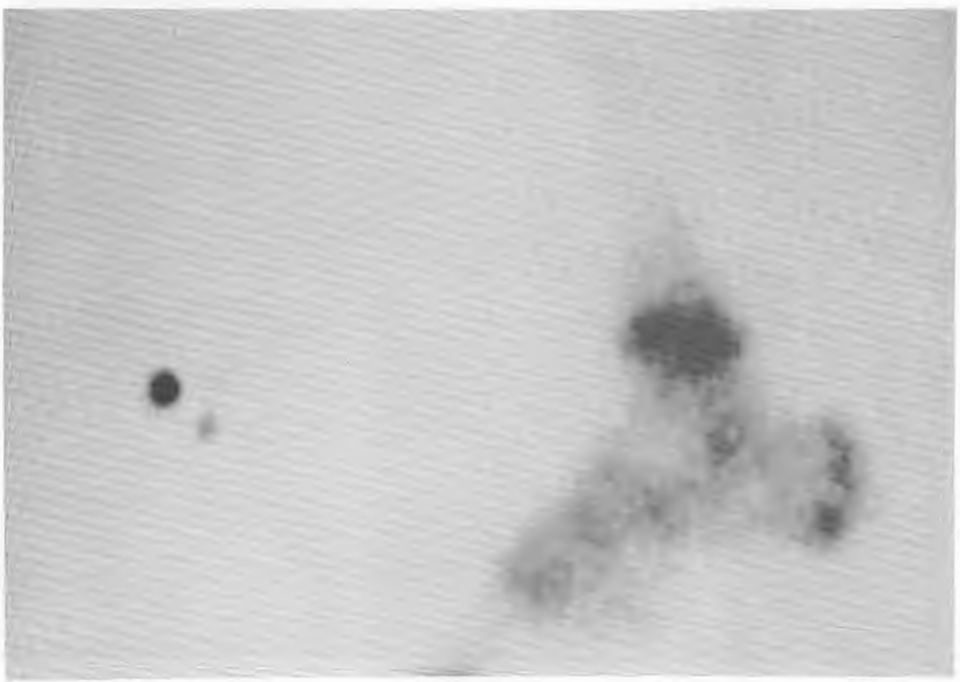

Figure 8—Bone scan of the immediate post-excision biopsy specimen shows intense increased activity as shown on the left. Bone scan of the patient's foot on the first postoperative day confirms complete excision. The patient was injected with technetium 4 h prior to surgery. There is no activity at the prior osteoma site in the mid calcaneus. Increased activity in the patient was at the distal tibial epiphyseal plates and calcaneal apophysis.

ing sclerotic cortical bone (1). Lesions in cancellous bone demonstrate only minimal sclerosis on plain radiographs (12). Plain radiographs are often negative in the intracapsular location of the proximal femur and talus (7). In these locations, CT scanning may be helpful for diagnosis (1,6).

The leading differential diagnoses of lateral heel pain in an athlete are tarsal coalition, peroneal tendinitis, and stress fracture. In this age group, categories of trauma, growth phase, inflammation, arthritis, infection, and tumors should be included in the differential diagnosis (Table 1). Benign bone tumors include osteoid osteoma, osteoblastoma, fibrous dysplasia, hemangioma, bone cyst, and lipoma. Less likely but more aggressive lesions include Ewing's sarcoma, osteosarcoma, and chondrosarcoma.

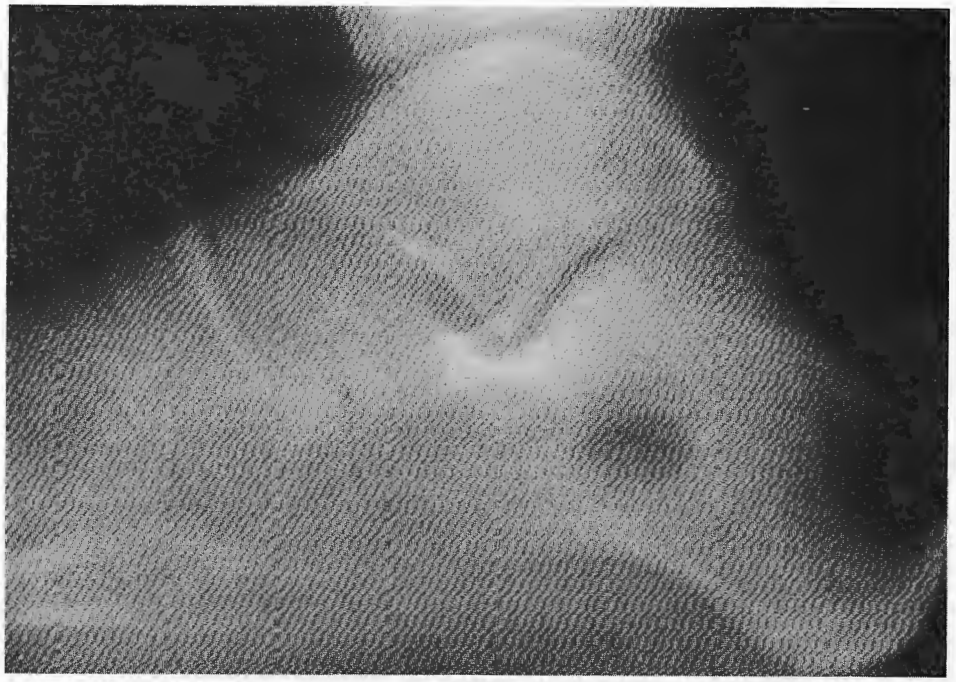

Figure 9—Lateral radiograph is shown immediately following the biopsy with central area of excised bone and normal appearing surrounding bone.

Figure 10—Now normal lateral radiograph 4 yr post-op shows filling in of biopsy site. Patient remains asymptomatic.

Once the diagnosis is made, the treatment of choice is surgical resection of the nidus and possibly bone grafting, depending on the size of the bone defect. Intraoperative bone scan is helpful to locate the increased activity of the nidus in difficult locations such as the hip (2,7). Locating the lesion at the time of surgery requires thoughtful preoperative planning. CT scan to localize the lesion and intraoperative technetium bone scan make the excision technically easier and improve the rate of complete resection. Incomplete removal may lead to recurrence of the tumor and pain. Successful treatment depends on establishing the correct diagnosis and complete surgical resection. Dramatic relief of pain after complete excision is the rule. Return to full painless activities is then possible.

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TABLE 1. Lateral heel pain.

Traumatic
Stress Fracture
Growth phase
Musculotendinous
Imbalance
Calcaneal
Apophysitis
Inflammatory
Peroneal tendinitis
Achilles tendinitis
Retrocalcaneal bursitis
Plantar fasciitis
Arthritides
Juvenile rheumatoid
Spondyloarthropathy
Reiter's syndrome
Autoimmune
Infection
Brodie's abscess
Chronic osteomyelitis
Septic arthritis
Tumor
Benign
Osteoid osteoma
Osteoblastoma
Fibrous dysplasia
Hemangioma
Bone cyst
Lipoma
Malignant
Ewing's sarcoma
Osteosarcoma
Chondrosarcoma

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