Aneurysmal Bone Cyst Arising From a Giant Cell Tumor of the Calcaneus

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A 26-year-old male presented with a pain over the lateral aspect of the right ankle and heel of 6 months’ duration. Radiographs of the right foot revealed an apparent multilocular unicameral bone cyst. Computed tomography scans revealed an eccentric lytic lesion. On T1-weighted images of magnetic resonance imaging, the bone lesion appeared as a low-to-intermediate intensity mass. On T2-weighted images, cystic lesion appeared as a mass of high intensity. These images were extremely informative and were important in planning the surgical treatment. The patient underwent excision and curettage and bone grafting of the lesion. Histologically, giant cell tumor of calcaneus was diagnosed, but the large amount of serosanguineous fluid and the acellular cavernous calcaneus suggested an aneurysmal bone cyst was also present. The clinical presentations of giant cell tumor of bone and aneurysmal bone cyst are similar. Thus the clinical presentation, anatomical location, radiographic findings and histologic appearance provide the basis for diagnosis and treatment.

Key Words: Aneurysmal bone cyst, Giant cell tumor, Calcaneus, Magnetic resonance images, Surgical treatment.

Introduction

Giant cell tumor of bone is a relatively uncommon tumor constituting 5% to 8% of primary bone tumors.¹,³ Since this tumor primarily originates in the end of long bones, involvement of tarsal bones is an extremely rare occurrence.⁴,⁵ Mechlin et al⁹ reviewed the world literature since 1940 and found only 35 cases of giant cell tumors involving the tarsal bones and added three more cases. The aneurysmal bone cyst was first described as a clinical pathological entity by Jaffe and Lichtenstein in 1942.⁷ According to Manaster and Doyle,⁸ 30%-50% of aneurysmal bone cysts are believed to arise within some pre-existing bone lesion, with giant cell tumor as the most common. The case presented demonstrates a rare finding of a calcaneal lesion with characteristics of giant cell tumor of bone with secondary aneurysmal bone cyst formation.

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Case Report

A 26-year-old male was seen in the orthopaedic clinic on March 25, 2000 with a six months history of pain in his right heel. He found it difficult to walk in shoes. Physical examination demonstrated a well-developed, well-nourished male in apparent good health. There was no history of trauma in the right ankle. Palpation of the lateral aspect of the right heel revealed tenderness over the calcaneus. Radiographs of the right foot revealed an apparent multilocular unicameral bone cyst located in one third of the posterior aspect of the calcaneus (Figure 1). Computed tomography scans revealed an eccentric lytic lesion. The lesion was predominantly lytic with some sclerotic change in the more posterior aspect. There was no calcification within the lesion (Figure 2). On T1-weighted sagittal and coronal images of magnetic resonance imaging, the bone lesion appeared as a low-to-intermediate intensity mass (Figure 3). The mass on this pulse sequence was homogeneous in signal intensity. In addition, there was thin, low signal intensity, well defined rim that outlines the lesion. On T2-weighted images,

Figure 1. Lateral (a) and axial (b) views of roentgen photographs of right calcaneus.

Figure 2. A direct coronal computed tomography scan through the calcaneus. The lesion is predominantly lytic with some sclerotic change in the more posterior aspect.
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cystic lesion appeared as a mass of high intensity. Both of sagittal and coronal T2-weighted images showed multiple fluid levels which is characteristic of serou-type fluid (Figure 4). Discussion of the patient's foot problem included the possibility that this lesion could expand or lead to a calcaneal stress fracture. To prevent a pathologic fracture of the calcaneus, this lesion was curetted and packed with iliac bone grafting with biosynthetic graft materials. These are composed of combination of hydroxyapatite and tricalcium phosphate (Seratite, Chugai Pharm Co, Tokyo). Intraoperatively, an incision was placed on the lateral aspect of the heel. The cortex of the calcaneus was noted to be thin. Several small holes were drilled and a rectangular window was removed from the lateral calcaneal cortex, exposing a cavernous two thirds

Figure 3. T1-weighted sagittal (a) and coronal (b) magnetic resonance images through the calcaneal lesion. The bone lesion appeared as a low-to-intermediate intensity mass.

Figure 4. T2-weighted sagital (a) and coronal (b) magnetic resonance images. The cystic lesion appeared as a mass of high intensity.
of posterior aspect of the calcaneus with no cancellous bone visualized. A total of 15 ml of serosanguineous fluid exuded. Several sections of brownish-red soft tissue were situated in the floor of the almost empty calcaneal interior. A corticocancellous bone was grafted with biosynthetic materials to fill the defect. Radiographs taken at 3 months showed good consolidation of the graft (Figure 5). The pathology report stated the tissue was consistent with a giant cell tumor of bone and aneurysmal bone cyst (Figure 6).

**Discussion**

The clinical presentations of giant cell tumor of bone and aneurysmal bone cyst are similar. Therefore, the clinical presentation, anatomical location, radiographic findings, and histologic appearance provide the basis for diagnosis and treatment.9)

The origin and histogenesis of aneurysmal bone cyst remain unknown. The most accepted theory to date suggests that the cyst forms in response to increased intraosseous venous pressure.10) Aneurysmal bone cysts have also been reported to arise from other preexisting lesions that undergo hemorrhagic or cystic changes.11,12) These secondary aneurysmal bone cysts have been found to coexist with giant cell tumors, rarely nonossifying fibromas, and chondroblastomas. In the present case, giant cell tumor of bone was diagnosed histologically, but the large amount of serosanguineous fluid and the acellular cavernous calcaneus suggested an aneurysmal bone cyst was also present. When a rapidly growing ballon-like cortical expansion occurs in a giant cell tumor of bone, secondary development of an aneurysmal bone cyst component is the most likely cause.13)

The lesion was primarily localized to the posterior aspect of the calcaneus. The case is unique also in that only few giant cell tumors with secondary aneurysmal bone cyst have been reported in podiatric medical literature.14,15)

In the present case, magnetic reso-
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nance imaging and computed tomography scans were used to further delineate the lesion and aid in preoperative planning. Computed tomography scans of aneurysmal bone cysts usually reveal an eccentric lytic lesion that may have a discrete sclerotic margin as seen our case. On T1-weighted images of magnetic resonance imaging, an aneurysmal bone cyst appears as low-to-intermediate intensity mass. On T2-weighted images, an aneurysmal bone cyst appears as mass of generally high signal intensity as seen our case. These images were extremely informative and important in planning the surgical treatment.

Our patient underwent excision and curettage and bone grafting of the lesion. Aggressive treatment should be pursued regardless of an aneurysmal bone cyst or giant cell tumor: this includes wide excision and curettage with bone grafting.\textsuperscript{13) Bone grafting tends to reduce the rate of recurrence.\textsuperscript{13) Finally, we should emphasize that clinical history and presentation, and intraoperative suspicion are needed to make an accurate diagnosis of this rare disease.

\textbf{Figure 6.} Microphograph (hematoxylin and eosin stain, x200) showing multiple giant cells scattered in a stroma of spindle cells.
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References