Imaging of Aneurysmal Bone Cyst of the Rib: Case Report

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The aneurysmal bone cyst was first described by Jaffe and Lichtenstein in 1942. Subsequent research has suggested that this lesion is not uncommon and it may be easily confused with other types of bone tumor or cyst. We present a case of aneurysmal bone cyst in the rib that was diagnosed after a series of imaging study.

The aneurysmal bone cyst presented as an expansile mass over the third rib in chest radiograph. Computed tomography (CT) images showed a soft tissue mass in the rib with cortical bone erosion and mild heterogeneous enhancement after contrast administration. T1- and T2-weighted magnetic resonance (MR) images showed high-signal, and bright-signal intensity, respectively. The mass appeared to have a lobulated contour with internal septa and heterogeneous gadolinium enhancement. Roentgenographically, aneurysmal bone cyst is difficult to differentiate from malignant lesions of the rib. Thorough imaging studies or biopsy for pathological confirmation may be needed before surgery.

Key words: Aneurysmal bone cyst; Rib

CASE REPORT

19-year old man complained of a persistent, painful sensation in the left upper chest for six months. Respiration had no effect on the pain and did not respond to conservative treatment. Chest radiography revealed an eccentric expansile mass over the third rib on the left side of the chest (Fig. 1a).

During admission, the patient underwent computed tomography (CT) and magnetic resonance (MR) imaging of the chest. CT images revealed an expansile, soft tissue mass with bony erosion and interrupted cortex (Fig. 1b). The mass showed mild heterogeneous enhancement following contrast administration (Fig. 1c). T1- and T2-weighted MR images showed high- and bright-signal intensity, respectively (Fig. 1d, 1e). The mass had a lobulated contour with internal septa and heterogeneous enhancement after gadolinium administration (Fig. 1f). Tumor involvement of the rib was neither visible nor palpable superficially. All findings in the laboratory studies were within normal limits, while the findings
from the imaging studies indicated a possible malignant lesion. Four days later, transthoracic resection of the tumor mass was performed and pathologic diagnosis was aneurysmal bone cyst (Figure 2). The patient was discharged on the tenth postoperative day after an uneventful recovery.

**DISCUSSION**

Before aneurysmal bone cysts were first described in 1942, they were known by a number of names, such as bone hemangioma, aneurysmal variant of giant cell tumor, ossifying hematoma, periosteal hematoma, benign bone aneurysm, and
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The term, aneurysmal bone cyst, was suggested by Jaffe and Lichtenstein because of its morphological and histological appearance of the tumor. Microscopically, aneurysmal bone cyst is filled with cavernous, blood-containing vascular spaces, which are devoid of endothelial and muscular lining. The vascular space is lined by fibrous septa [1, 4].

Aneurysmal bone cyst is usually found in the long bone of the extremity, the membranous, or flat bone of the thorax and pelvis, or in the vertebra. It is rarely found in the rib. Approximately 80% of patients with primary aneurysmal bone cysts are younger than 20 years of age [2–7]. Females are affected slightly more often than males and children younger than 5 years of age are almost never affected.

The pathogenesis of aneurysmal bone cysts remain unclear. Jaffe postulated in two of his reports that the aneurysmal bone cyst might be a secondary phenomenon occurred from a hemorrhagic blowout in a preexisting lesion (most commonly a giant cell tumor), which was destroyed in the process. Like Jaffe, Lichtenstein also suggested a vascular origin, postulating a disparity between arterial and venous flow with a net effect of venous obstruction. This obstruction, leaded to the formation of different-sized vascular channels that contain stagnant blood, a diagnostic hallmark of aneurysmal bone cyst [3, 4, 6].

The most common symptoms of an aneurysmal bone cyst of the rib are chest pain (46% of patients) and swelling. Other symptoms include a palpable mass, dyspnea, paraplegia and pathologic fracture. The incidental finding from images accounts for 29% of patients [4].

Radiographically, a typical aneurysmal bone cyst show an eccentric, lytic lesion with an expanded, remodeled, blowout or ballooned bony contour of the involved bone, with a delicate trabeculated appearance. Expansion into adjacent soft tissue may also be evident, with a thin layer of subperiosteal new bone formation. Marginal sclerosis is also seen in 32% of cases. In 64% of cases, the margins are geographic demarcated without sclerosis; in 14% of cases, the margins are poorly defined [5-7].

CT is useful in demonstrating interrupted cortex and multiple fluid-fluid levels [1, 4]. MR imaging, which is valuable in defining the full extent of the lesion, typically shows a well-defined lesion with lobulated contours, internal septa, or fluid-fluid levels. Dark signal intensity of the thin internal septa is thought to be carried by the fibrous tissue [6, 7].
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The natural history of aneurysmal bone cyst has been described as an evolution through four radiologic phases: initial, active, stabilization, and healing phase. In the initial phase, the lesion is characterized by a well-defined area of osteolysis with discrete elevation of the periosteum. In the active (growing) phase, the lesion grows rapidly with progressive destruction of bone and development of characteristic blowout radiologically. Following the growth phase is the stabilization phase in which the characteristic soap-bubble appearance develops as the bony shell matures. In the final phase, healing results in progressive calcification and ossification, which causes the lesion to be transformed into a dense bony mass [4, 6].

The aneurysmal bone cyst in our case is unique in its uncommon location, which occurred in a rib. The lesion is in the active phase characterized by a blowout radiologically. Rapid growth of the lesion during this phase results in bone destruction. T1- and T2-weighted MR images show high- and bright-signal intensity with internal septa rather than fluid-fluid levels. The presence of internal septa is due to cavernous space with hemorrhage separated by fibro-osseous septa.

The differential diagnosis of aneurysmal bone cyst in the rib should include hemangioma, fibrous dysplasia, chondromyxoid fibroma, chondrosarcoma, eosinophilic granuloma, and metastatic lesion. Hemangioma have a honeycomb-like appearance on plain radiography and a mottled pattern of increasing intensity on T1- and T2-weighted MR images. In fibrous dysplasia, the medullary bone is replaced by fibrous tissue. T1-weighted MR images often show intermediate-signal intensity, T2-weighted images show low-signal intensity for predominantly fibrous lesions and high-signal intensity for highly cartilaginous and proteinaceous content. The lesion shows peripheral rim enhancement after the administration of a gadolinium-based contrast agent. Chondromyxoid fibroma usually lack of thick trabeculation. Characteristic findings of this disease include geographic bone destruction, well-defined sclerotic margin, and stippled calcifications within the tumor. Chondrosarcoma usually presents as a large soft tissue mass attached to the bone with aggressive, rapid tumor growth, typically associated with chondroid calcifications. Eosinophilic granuloma involves the medulla of the bone with a hole-within-hole appearance and button sequestrum. Since it is difficult to differentiate an aneurysmal bone cyst (which is a benign lesion) from a malignant lesion radiographically, we recommend thorough imaging studies or biopsy before surgery. Conservative radiation therapy may be needed for surgically inaccessible areas after open biopsy [5].

In conclusion, we present a case of an aneurysmal bone cyst of the rib with uncommon imaging appearance. Since there is difficulty in differentiating this benign lesion from a malignant rib lesion on radiographs, we recommend thorough imaging studies or biopsy before surgery.

REFERENCES

動脈瘤狀骨囊腫在肋骨上的影像特徵—病例報告

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動脈瘤狀骨囊腫最早在1942年Jaffe和Lichtenstein所提出，後來陸續被提出來討論，所以它不是一個少見的疾病，動脈瘤狀骨囊腫容易和其它骨腫瘤混淆，好發在長骨、扁平骨、和脊椎但少見於肋骨。我們提出這個有趣的病例是原發性肋骨的動脈瘤狀骨囊腫，影像上呈現擴張而糜爛的肋骨皮質，有的囊腫內有不同層次的液體，有的囊腫內有間隔，而在影像上較難和其它肋骨的惡性腫瘤鑑別，因此完整的影像學檢查將有利於爭議性的手術切除。

關鍵詞：動脈瘤狀骨囊腫：肋骨