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Giant Cell Tumor with an Unusual Cartilage Matrix
– A Case Report–

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Giant cell tumor of bone is a locally aggressive benign neoplasm, which is composed of oval or plump, spindle-shaped mononuclear cells and uniformly distributed multinucleated giant cells. Bone or cartilage matrix production by the tumor cells is usually not seen. We present a pathologically proven case of giant cell tumor, arising in the acetabulum and pubic bone, with unusual cartilage matrix production. We also discuss the differential diagnosis from a chondroblastoma as well as a giant cell-rich osteosarcoma.

Key Words : Giant cell tumor, Cartilage

Giant cell tumors of the bone are benign, locally aggressive neoplasms, composed of sheets of neoplastic ovoid mononuclear cells which are interspersed with uniformly distributed large osteoclast-like giant cells.[1] Radiographically, giant cell tumors of the bone are purely lytic, and exhibit well defined but nonsclerotic margins. Radiologically evident matrix production within tumors is quite rare.[2,3] Histologically, abundant matrix production renders the diagnosis of giant cell tumor highly questionable.[1,2,4,5]

Here, we report a case of giant cell tumor with unusual cartilage matrix production, and indicate the features which enable the differentiation of these tumors from chondroblastomas, and giant cell-rich osteosarcomas.

CASE REPORT

A 31-year-old man was admitted to our institution due to a pain in his right hip, of insidious onset, which had persisted for 2 months. There was no history of trauma. Upon physical examination, no palpable mass was detected in the region of the patient's hip joint and the range of movement was within normal limits. A plain radiograph of the pelvis evidenced a poorly-defined, osteolytic region of bone destruction in the right acetabulum and pubic bone, coupled with a large, contiguous, soft tissue mass. Evidence of mineralization was not found (Fig. 1). A magnetic resonance imaging verified the bone destruction in the right acetabulum and the large soft tissue mass, which measured 92 $\times 85 \times 85$ mm in size. The mass exhibited lobulated margins and a slightly high signal intensity, as compared with the adjacent muscles on T1-weighted coronal images (Fig. 2A), and diffuse high signal change on T2-weighted images (Fig. 2B). The fat-saturated, T1-weighted images showed diffuse enhancement with focal non-enhanced areas (Fig. 2C). An ultrasound-guided biopsy of the mass was conducted. The initial pathological diagnosis of the condition was a chondroblastoma. Then an intra-lesional excision was performed. The mass was soft, fleshy, and tan to yellowish in color, with associated hemorrhage. Microscopically, this tumor consisted of round, ovoid or polygonal

mononuclear cells, mixed with numerous, more or less uniformly distributed osteoclast-like giant cells (Fig. 3). The nuclei of the mononuclear cells showed an open chromatic pattern with one or two small nucleoli, and exhibited no clefts or longitudinal grooves (Fig. 4). The nuclei of the giant cells were quite similar to those of the mononuclear cells. No atypical mitoses or cellular pleomorphism were evident. Multiple areas of mature basophilic hyaline cartilage were apparent within the tumor (Fig. 5), as were areas of calcification (Fig. 6). An immunohistochemical staining result for S-100 protein was negative. The final pathological diagnosis was a giant cell tumor with an unusual cartilage matrix. At the 14-month follow-up, the patient is well without a recurrence.

Fig. 1. Plain radiograph of the pelvis shows poorly defined, osteolytic bone destruction in the right acetabulum and pubic bone. The medial portion of the right acetabulum shows extensive destruction with a bulging contour. In the medial portion of the pelvic cavity, a large soft tissue mass is noted, however, there is no evidence of any mineralization.

DISCUSSION

Giant cell tumor of bone is a benign, but locally aggressive neoplasm, which is characterized by large numbers of uniformly distributed, osteoclast-like giant cells and a more diagnostically pertinent background population of plump, epithelioid to spindle-shaped mononuclear cells.[2] Radiologically, giant cell tumor of bone is a purely lytic, eccentric subchondral lesion with well-

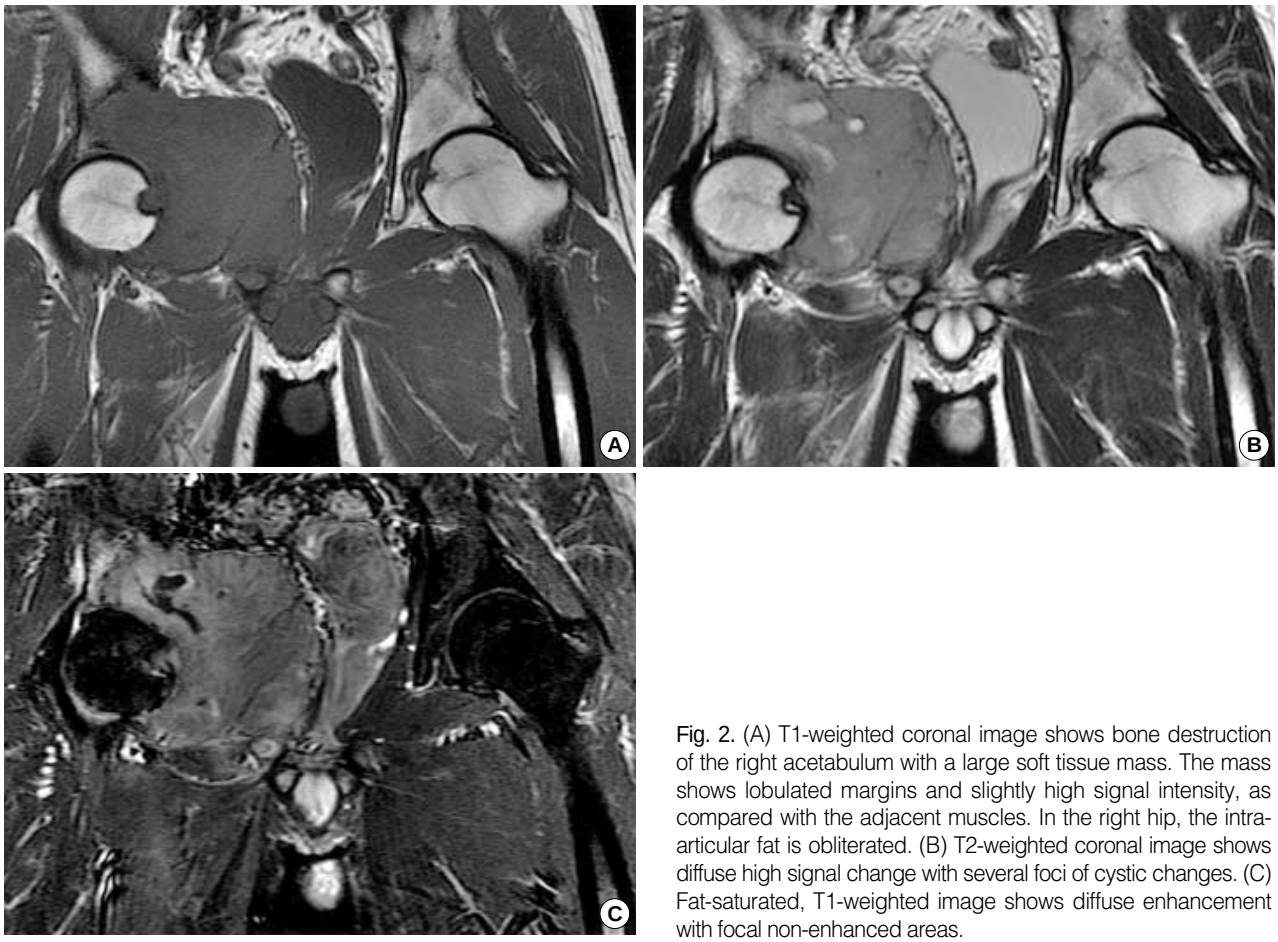

Fig. 2. (A) T1-weighted coronal image shows bone destruction of the right acetabulum with a large soft tissue mass. The mass shows lobulated margins and slightly high signal intensity, as compared with the adjacent muscles. In the right hip, the intra-articular fat is obliterated. (B) T2-weighted coronal image shows diffuse high signal change with several foci of cystic changes. (C) Fat-saturated, T1-weighted image shows diffuse enhancement with focal non-enhanced areas.

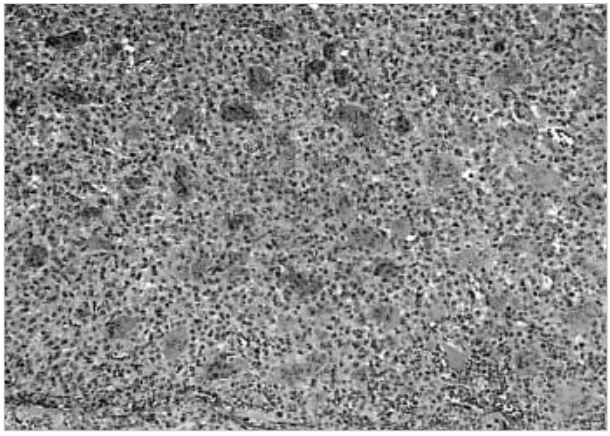

Fig. 3. Microscopically, the tumor is composed of a mixture of mononuclear round to oval cells and multinucleated giant cells. The multinucleated giant cells are distributed uniformly throughout the tumor.

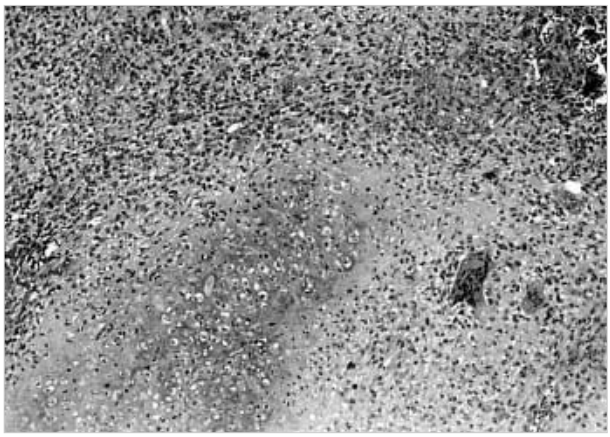

Fig. 5. Mature basophilic hyaline cartilage is seen within sheets of characteristic mononuclear cells with uniformly scattered multinucleated giant cells.

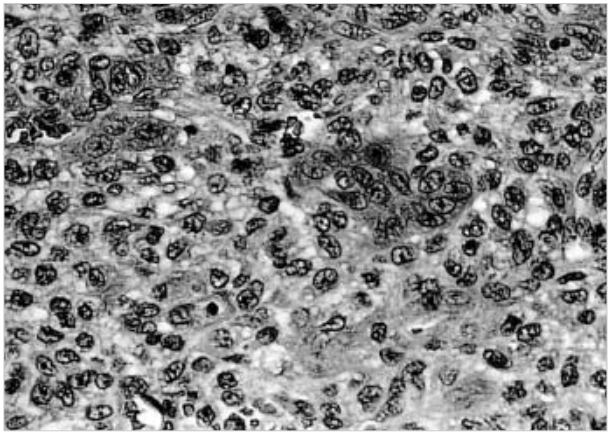

Fig. 4. Background mononuclear cells are characterized by round to oval nuclei with an open chromatin pattern and prominent nucleoli, and ill-defined cytoplasm. Nuclear grooves and indentations are not present. The nuclei of the multinucleated giant cells are similar to the nuclei of the mononuclear cells.

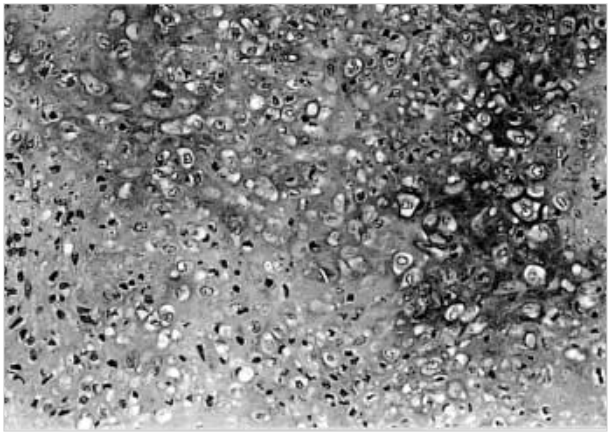

Fig. 6. The cartilage matrix contains mature chondrocytes. Calcification within the cartilage matrix is also noted.

defined margins, which is most frequently situated in the epiphysis and metaphysis of the long bones. Usually, sclerosis is not observed in the area surrounding the lesion.[3,5] Although radiologically evident matrix can be produced within the tumor, usually in long-standing lesions, the presence of a sclerotic rim and a calcified matrix with an open epiphysis are features which can be used to differentiate cartilage-forming tumors, such as chondroblastomas, from giant cell tumors of the bone.[1,3]

Small microscopic foci of bone formation can be observed within giant cell tumors, especially after a pathologic fracture or a biopsy.[1] Prominent focal reactive bone formations can sometimes be correlated with the presence of small cortical infractions. Reactive fibrous tissue formation with a prominent irregular whorled pattern and a xanthogranulomatous reaction have been reported to be associated with reactive bone formation.[6] A shell of reactive bone is usually observed at the periphery of giant cell tumors in both soft tissue and bone, as well as in pulmonary implants.[4,5,7,8] Cartilage matrix is not usually present in unfractured giant cell tumors.[2] Abundant production of matrix makes a diagnosis of giant cell tumor highly questionable.[1,2,4,6,7] In one study, however, matrix production, ranging from focal to moderate, was found to be present in approximately 9% of giant cell tumors with otherwise typical microscopic features. The matrix was identified as woven bone with osteoclastic rimming, woven bony trabeculae interconnected without osteoblastic rimming, osteochondroid matrix, confluent hyaline cartilage, or calcification.[9]

In our case, the patient was diagnosed with a giant cell tumor of bone with unusual chondroid matrix production. The latter feature is extremely rare, and when evident, the tumor must be differentiated from giant cell rich cartilage-forming tumors, espe-

cially a chondroblastoma. Microscopically, the background mononuclear cells in chondroblastoma tend to harbor irregular and indented nuclei with longitudinal clefts or grooves, whereas in giant cell tumors, the cells resemble histiocytes, with nuclei similar to those observed in giant cells.[2,10,11] The chondroid matrix of the chondroblastoma is eosinophilic in contrast to the basophilic pattern observed in our case. The cells within the matrix tend to maintain their chondroblastic appearance in a chondroblastoma, rather than the appearance of mature chondrocytes, as observed in our case. The fine network of pericellular calcification, which is characteristic of the chondroblastoma is not observed in association with giant cell tumors.[10,12]

Osteosarcoma with a large component of reactive giant cells and a paucity of osteoid also requires differentiation from giant cell tumors. Microscopically, background mononuclear cells in giant cell-rich osteosarcomas exhibit pleomorphism and atypical mitotic figures, rather than bland features as in giant cell tumors.

In this report, we have detailed the pathological and radiological features of a giant cell tumor of the pubic bone exhibiting unusual cartilage matrix production, occurring in a 31-year-old man. It is important that the correct diagnosis is made according to a careful consideration of the features of the background population of mononuclear cells, rather than the cartilage matrix, when the tumor is composed of round to oval mononuclear cells and multinucleated giant cells, and shows evidence of cartilage matrix production.

REFERENCES

1. Fletcher CD, Unni KK, Mertens F. World Health Organization classification of tumours Pathology and genetics of tumours of soft tissue and bone. Lyon: IARC Press, 2002; 309-13.
2. Fechner RE, Mills SE. Atlas of tumor pathology Tumors of the bone and joints. Washington, D.C.: Armed Forces Institute of Pathology, 1993; 173-86.
3. Stacy GS, Peabody TD, Dixon LB. Mimics on radiography of giant cell tumor of bone. AJR Am J Roentgenol 2003; 181: 1583-9.
4. Teot LA, O'Keefe RJ, Rosier RN, O'Connell JX, Fox EJ, Hicks DG. Extraosseous primary and recurrent giant cell tumors: transforming growth factor-beta1 and -beta2 expression may explain metaplastic bone formation. Hum Pathol 1996; 27: 625-32.
5. Dorfman HD, Czerniak B. Bone tumors. St. Louis: Mosby, 1998; 559-606
6. Oliveira AM, Dei Tos AP, Fletcher CD, Nascimento AG. Primary giant cell tumor of soft tissues: a study of 22 cases. Am J Surg Pathol 2000; 24: 248-56.
7. Cooper KL, Beabout JW, Dahlin DC. Giant cell tumor: ossification in soft-tissue implants. Radiology 1984; 153: 597-602.
8. Salm R, Sissons HA. Giant-cell tumours of soft tissues. J Pathol 1972; 107: 27-39.
9. Bertoni F, Inwards CY, Beabout JW. Giant cell tumors of bone with matrix production [abstract]. Modern Pathology 2000; 13: 8A.
10. de Silva MV, Reid R. Chondroblastoma: varied histologic appearance, potential diagnostic pitfalls, and clinicopathologic features associated with local recurrence. Ann Diagn Pathol 2003; 7: 205-13.
11. Fletcher CDM, Unni KK, Mertens F. World Health Organization classification of tumours Pathology and genetics of tumours of soft tissue and bone. Lyon: IARCPress, 2002; 241-2.
12. Fechner RE, Mills SE. Atlas of tumor pathology Tumors of the bone and joints. Washington, D.C.: Armed Forces Institute of Pathology, 1993; 91-5.