



GIANT CELL TUMOR IN UNCOMMON SITES: IMAGING SPECTRUM

Radiodiagnosis

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ABSTRACT

Giant cell tumor is one of the most common benign bone tumors. It accounts for 4-10% of all primary bone tumors that occur typically at epiphysis metaphyseal region in young adults. The three most common sites affected are distal femur, proximal tibia, distal radius. We discuss some of the uncommon sites of involvement of giant cell tumors and their radiological features.

KEYWORDS

giant cell tumor- radiography-atypical sites

INTRODUCTION:

Giant cell tumor (GCT) is a benign and locally aggressive bone tumor that is histologically characterized by the presence of multinucleated giant cells with osteoclastic activity. They appear as well defined osteolytic lesion in a long bone eccentrically placed at epiphysis - metaphyseal location. Majority of them are seen between 20-50 years and are common in females. The lesion typically show non sclerotic margin without periosteal reaction or mineralized tumor matrix. (fig 1) More than 80% of the cases occur in long bones with the following incidence, distal femur (23-30%), proximal tibia (20-25%), distal radius (10-12%).^{1,2} Some of the atypical sites of involvement of GCT include spine, sacrum, feet, patella, talus, hands etc. GCT has been classified into three grades based on plain radiographic changes³.

Grade 1 (latent) well defined lytic lesion with intact cortex

Grade 2 (active) well defined lytic lesion with no sclerotic margin, cortex is thinned and bone expanded.

Grade 3 (aggressive) the tumor show cortical destruction with poorly defined margins.

Although plain radiography show typical features of GCT, CT scan findings are mostly non specific.

On Magnetic Resonance imaging, GCT show decreased signal intensity on T1 weighted and increased signals on T2 weighted and FLAIR imaging and enhance after contrast administration.

Technetium 99m - methylene diphosphonate scintigraphy show increased trace uptake in the periphery of the lesion.⁴

CASE SERIES:

A retrospective study of the radiological features of giant cell tumors operated in our institute during the last 6 years was done. Out of the 32 cases of GCT treated 19 cases involved the long bones (tibia, femur and radius). In the remaining 13 cases the sites of involvement are varied and uncommon.

They include fibula, metacarpal, scapula, ulna, patella, ileum, humerus, cervical vertebra. All the cases showed the imaging features typical of giant cell tumor on plain radiographs and MR imaging. The histopathology confirmed the diagnosis. (Fig 2-8)

Table : show the sites of giant cell tumors in the study

Bone Involved	Number Of Cases
Proximal tibia	7
Distal femur	6
Distal radius	6
Fibula	3
Metacarpal	2
Scapula	2
Ulna	2
Patella	1
Ileum	1
Humerus	1
Cervical vertebra	1
Total No Of Cases =	32

DISCUSSION:

The diagnosis of GCT is based mainly on the presence of 4 well described criteria in long bones that include A) epiphysis must be closed B) the lesion must abut the articular surface C) the lesion must be eccentric D) the lesion must be well defined with a non sclerotic margin. Giant cell tumor is a benign neoplasm but can have local aggressive growth. GCT was grouped into 3 stages of development⁵. Stage 1) benign latent GCT stage 2) benign active GCT and stage 3) locally aggressive GCT. The radiological signs of aggressive growth are cortical thinning, wide zone of transition, expansion of bone, cortical bone destruction and soft tissue mass. In 14% of cases of GCT, secondary aneurysmal bone cyst formation seen which results in fluid fluid levels on MR imaging due to haemorrhage.⁶ Although described to occur in long bones about 15% of GCT can occur in flat and other bones like pelvis, ribs, scapula, calvaria, sacrum, metacarpals, metatarsals. Some of the atypical sites involved include metacarpal bone,⁷ ileum⁸, patella⁹, calcaneus¹⁰ and proximal ulna¹¹. In the present study we have encountered one case of GCT involving patella, ileum, two cases involving metacarpals. Of the two cases that are seen in metacarpal, one showed radiological features of aggressive growth with cortical disruption. We also recorded two cases of GCT affecting distal ulna of which one presented with stage 3 signs. One case of GCT scapula showed fluid-fluid levels on MR imaging indicating the development of changes of aneurysmal bone cyst which was confirmed on surgery. Aoki¹² described the radiological findings of GCT of scapula in 13 cases out of which 8 patients are below 20 years. In the spine, sacrum is occasionally affected. We have seen a case of GCT involving 5th cervical vertebra presenting with quadriplegia.

Absence of periosteal reaction, punctuate calcification and mineralized tumor matrix are very typical of GCT¹³. Some of the unusual findings of GCT include multicentric presentation, metastases to lungs, malignant transformation which occur in less than 1 %^{14,15}.

The differential diagnosis of GCT include the lesions that exclusively involve the epiphysis of which chondroblastoma is the most important condition. Chondroblastoma is identified by the presence of sclerotic margin, central calcification soft tissue and bone marrow edema on MR imaging. Other conditions that mimic GCT are aneurismal bone cyst, non ossifying fibroma, hyperparathyroidism (brown tumors). Telangiectatic and clear cell chondrosarcoma have similar imaging features as aggressive GCT and has to be differentiated from them.

In the present study the diagnosis of GCT was made mainly based on radiological and MR imaging only which was confirmed at surgery. Though CT scan provides better evaluation of cortical disruption than conventional plain radiographs, it was performed in a few selected cases only.

About 25 % of GCT are locally aggressive and tend to recur locally within 2-3 years¹⁶. The treatment of choice in GCT is surgery. Curettage along with local adjuvants like polymethyl methacrylate (PMMA), alcohol and systemic agents like denosumab have yielded better results in controlling local recurrences.

Conclusions : giant cell tumor is a benign, typical eccentrically placed epiphysio metaphyseal lytic lesion in the 3rd decade that involves multiples sites in the skeleton besides the long bones.

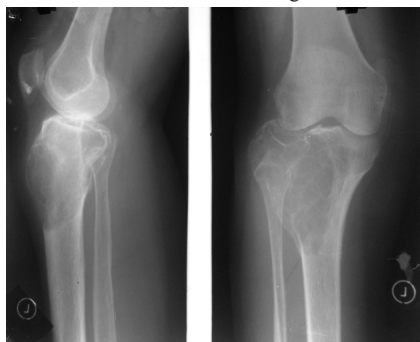


Fig 1) typical GCT proximal tibia



Fig 2 A) GCT proximal fibula showing both benign latent and aggressive features

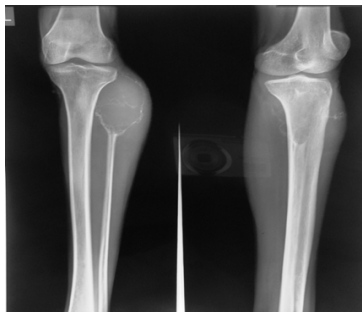


Fig 2 B) GCT proximal fibula showing both benign latent and aggressive features



Fig 3 A) GCT distal ulna showing both benign latent and aggressive features



Fig 3 B) GCT distal ulna showing both benign latent and aggressive features



Fig 4 A) GCT scapula

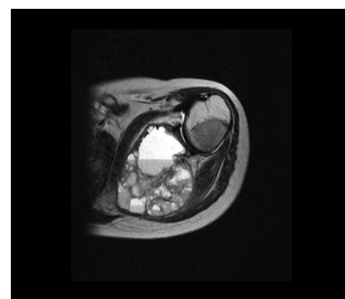


Fig 4 B) MRI scapula show GCT with secondary aneurismal bone cyst



Fig 5 A) GCT 2nd metacarpal bone



Fig 5. B) GCT patella



Fig 6A) GCT distal fibula



Fig 6. B) GCT right ileum

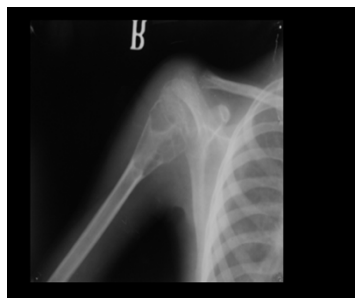


Fig 7) GCT proximal humerus



Fig 8) aggressive GCT distal radius

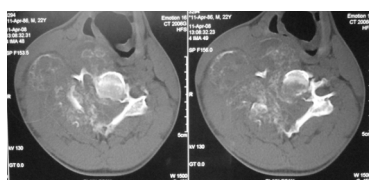


Fig 9 A) CT&MR images of C 5 vertebra show GCT with secondary ABC

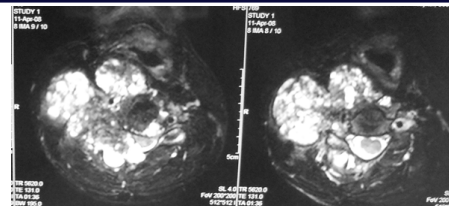


Fig 9 B) CT&MR images of C 5 vertebra show GCT with secondary ABC

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