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Management of giant cell tumor of lower third tibia with curettage and reconstruction by cementation and locking plate: A case report

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Abstract
Introduction: Giant cell tumour of bones is an unusual neoplasm that accounts for 4% of all primary tumours of bone, and it represents about 10% of malignant primary bone tumours with its different grades from borderline to high grade malignancy (1). GCT generally occurs in skeletally mature individuals with its peak incidence in in the third decade of life. Distal femur and proximal tibia are the commonest sites followed by distal radius (2), less than 4% of these tumours are known to affect the ankle joint, but the tumour's biological behavior at this site is quite unpredictable. Moreover, restoring the ankle joint functionality following tumour resection is a challenging task.
Case Summary: 27 year old female presented with pain over right ankle since last two years. Biopsy was suggestive of Giant Cell Tumor of lower third tibia. We managed this case with intralesional curettage using phenol and bone cement as an adjuvant and reconstruction of defect by cementation along with locking plate.
Conclusion: In cases of GCT, the management depends upon the various factors such as site, age, involvement of the bone, extent of bone involvement and whether there is articular involvement or not. Extra-articular GCT can be managed with extended intralesional curettage. Bone cement plays a dual role as an adjuvant as well as an agent for reconstruction of the defect.

Keywords: Giant cell tumour

Introduction
Giant cell tumour of bone is an osseous neoplasm that is histologically benign but clinically shows local aggression and a high rate of recurrence. It accounts for about 5% of all primary bone tumours in adults and predominantly occurs in the third and fourth decades of life with a slight predilection for females [1, 3, 5]. GCT of bone is very rarely seen in children or in adults older than 65 years of age [4]. Usually, the tumor site is at the long bone meta-epiphysis, especially the distal radius and femur, proximal humerus and tibia. Involvement of the foot and ankle is rare and comprises less than 4% of all GCT. GCT of hand and foot are more aggressive and aggressive treatment is recommended [1]. Clinically, patient presents as a dull aching or a vague pain around the affected joint and sometimes trauma brings notice to the existence of this lesion. Swelling and joint stiffness can also be the presenting complaints. Pathological fractures are seen in 12% of patients at the time of presentation. The diagnosis of giant cell tumor of bones depends mainly on clinical and radiological examination (plain X-ray and MRI) of the lesion along with bone biopsy from the site of the lesion [2]. The treatment of GCT is directed towards local control without sacrificing joint function. This can be achieved by intralesional curettage with autograft reconstruction by packing the cavity of the excised tumour with morselized illiac corticocancellous bone or using bone cement as packaging material for the defect.
Histologically, giant cell tumor of bone classically shows many large multi nucleated giant cells with interspersed haphazardly arranged mononuclear cells, and the nuclear features of both elements are described as similar [6]. Some tumors also have areas with a fascicular or storiform pattern devoid of giant cells resembling a benign fibrous histiocytoma.

Sometimes vascular invasion outside the boundary of the tumor can be seen [7]. Conventional radiographs often have classic findings and can be highly suggestive of the diagnosis of GCT. These findings include eccentric, lytic lesion centered in the meta-epiphysis extending up to the subchondral bone plate without internal mineralization in a patient with closed physis [7]. The margin of the lesion is typically nonsclerotic. MRI features suggesting giant cell tumor typically shows low T2 signal due to the fibrous component along with the deposition of hemosiderin within the tumor [8]. Following the administration of intravenous contrast, typically there is heterogeneous enhancement pattern. Imaging differential diagnosis includes primary Aneurysmal Bone Cyst (ABC) and Chondroblastoma. Intravenous contrast administration on MRI is helpful in distinguishing GCT with secondary ABC from primary ABC as the presence of enhancing soft tissue component is typically present in GCT but not in primary ABC [9]. Presence of extensive surrounding reactive edema within the marrow and soft tissues, sclerotic margin, and presence of chondroid matrix are helpful features distinguishing chondroblastoma from GCT. Additional differential diagnoses include metastasis, plasmacytoma, or multiple myeloma, which should be included based on patient's age, multifocality, and clinical history of known primary neoplasm [10]. The rate of local recurrence is varied, and is influenced by the completeness of surgical treatment, with high speed burring, adjuvants, and bone cement adding to the effectiveness of curettage treatment. On occasion giant cell tumors of bone undergo frank malignant transformation to undifferentiated sarcomas.

Case Report

27 years old female presented to us with complaint of pain over right ankle since last two years (figure 1). Onset was insidious and gradually progressive.Clinical examination revealed diffuse swelling at the anteromedial border of the left ankle with normal ankle movements and intact neurovascular status with full ankle range of motion. X-ray of right ankle with leg in anteroposterior and lateral views were done (figure 2 and 3). It showed a well-defined osteolytic lesion in the epiphysis involving the metaphyseal region of lower one third tibia without intra-articular extension. Magnetic resonance imaging was performed it revealed a well-defined lytic lesion measuring 8x4x4.2cms having narrow zone of transition in the lower third tibial epiphyseo-metaphyseal region. MRI findings were confirmed with bone biopsy. Microscopically, the lesion was presented by proliferating uniform oval mono-nuclear cells scattered around the background of numerous osteoclast-type giant cells. Ossification and osteoid production were noted in small foci at the periphery of the lesions, particularly in soft tissue extensions.

Patient was planned for extended intralesional curettage with phenol and bone cement as adjuvant and reconstruction of the defect with the help of bone cement and stabilization by locking plate. Antero medial skin incision was taken. Large cortical window to access the tumor was created. Extended intralesional curettage was done with the help of multiple angled curettes. A high power burr was used to break the bony ridges which helped in extending the curettage (figure 4). A pulsatile wash was given, to wash out tumor cells. Phenol and bone cement was used as adjuvant. Reconstruction of the defect was done with the help of Cementation. To give additional stability to the Construct we fixed it with Distal Tibia Medial Locking Plate (figure5). Post-operatively, the patient was given below knee slab support for 6 weeks and non-weight bearing with the help of crutches was encouraged. Weight bearing was allowed as tolerated only at 3rd month follow-up. Patient was followed up at six weeks, three months, six months after surgery. Series of Xrays were done at six weeks, three months, six months.

Discussion

Microscopically GCT consists of multinucleated giant cells scattered in vascularized network of proliferating round, oval or spindle shaped cells surrounded by indistinct cytoplasm. GCT of bone is a locally aggressive tumour with a high tendency to recur after removal. The rates of recurrence after simple curettage ranged from 12-65% as compared with 12-27% after curettage and adjuvant treatment and 0-12% after resection. In cases of GCT affecting the hand and foot the recurrence rate is higher in comparison with GCT at more conventional sites. Hence, adequate removal of tumour seems to be a more important predictive factor for the outcome of surgery

The treatment of GCT is directed towards local control without sacrificing joint function. Various limb salvage techniques for the distal tibia have been described in literature: extended curettage with a large window, high speed burring, and filling of the cavity with bone cement or bone graft, resection and ankle arthrodesis. Various modalities are available which use adjuvant therapies like phenol cauterization, cryotherapy, intralesional chemotherapeutic agents like Adriamycin or Methotrexate [12]. Resultant defect that is formed is treated based on location and size of tumour. In case of distal ulna, proximal radius, proximal fibula, coccyx, sacrum; resection of involved bone is performed [13]. For distal femur, proximal tibia, distal tibia, distal radius; bone cement or bone graft or combination of both is used as adjuvant therapy to reduce recurrences [14]. Phenol cauterisation and cryotherapy kills tumour cells at the margin of tumor [14]. Bone cement by exothermic reaction exerts a cytotoxic effect on tumour cells [14]. Cavity can be filled by bone cement or bone graft. Both methods have its own advantages and drawbacks. Advantages of bone cement are cement exerts thermal effect which kills cells, makes detection of recurrence easier and gives structural support and allows early weight bearing. Drawbacks are damage to articular cartilage when used in subchondral lesions. Also, Cement, though strong in compression, is weak when subjected to shear. A concern with using Allografts for reconstructing the lower extremity includes collapse or fracture, which is of particular concern in the distal tibia, a major weight bearing joint.Advantages of bone graft are that it undergoes remodeling along stress lines and once incorporated reconstruction is permanent. Drawbacks are donor site morbidity and autograft quantity is limited.

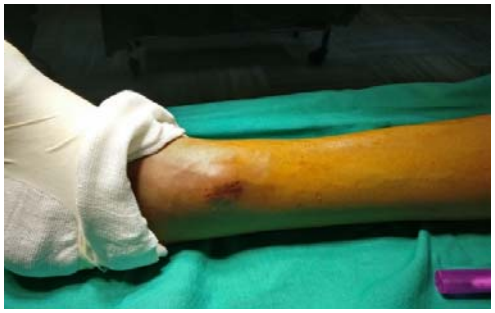

Fig 1: clinical picture

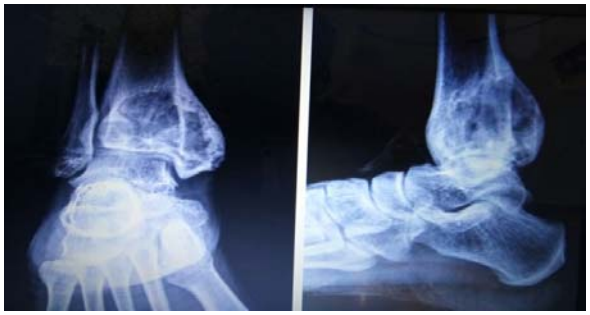

Fig 2: pre-operative AP and lateral view

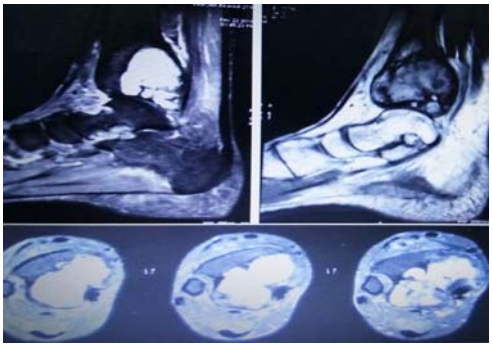

Fig 3: MRI findings

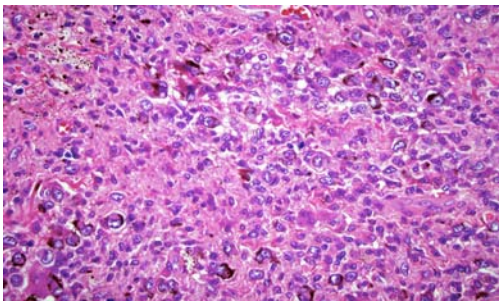

Fig 4: histology

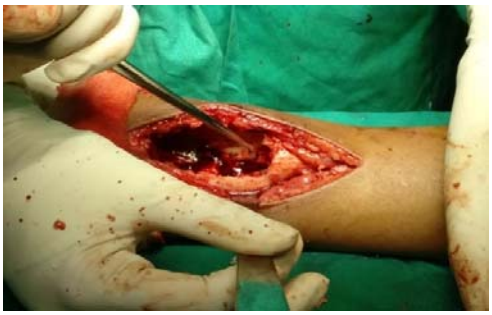

Fig 5: intra-operative clinical picture 1

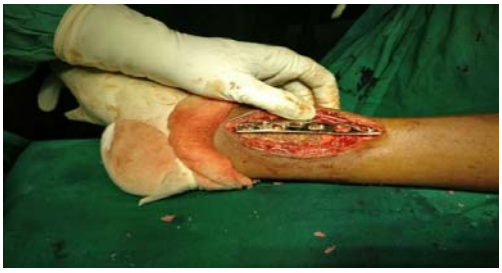

Fig 6: intra-operative clinical picture 2

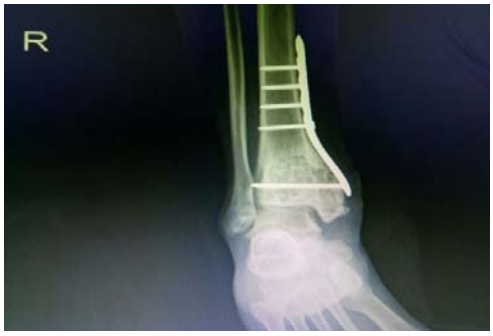

Fig 7: post-operative AP view

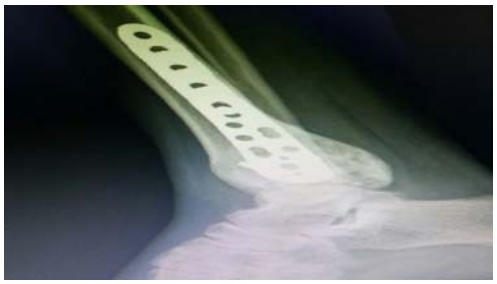

Fig 8: post-operative lateral view

Conclusion

GCT affecting the distal tibia are rare to encounter. Surgical management remain main treatment modality for GCT. Type of surgery depends on preoperative evaluation of patient clinically and radiologically for tumour site, size and involvement of surrounding tissue. Essential factor in the treatment of giant cell tumor is meticulous curettage of the affected bone. Reconstructing the defect after curettage can be quite challenging. Bony defects can be filled with autografts or bone cement. Stabilization of the defect with the help of locking plate serve additional benefit. This modality of treatment offers good stability and early ankle mobilization is possible. Nevertheless, a periodic follow-up is still warranted to watch out for late recurrences.

Abbreviations

GCT: Giant Cell Tumor of Bone.
ABC: Aneurysmal Bone Cyst.

Consent

For this case report to be published patient satisfactorily gave written informed valid consent for history, physical examination and publishing clinical photos and other relevant details.

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Conflict of Interests

The authors do not have any conflict of interests.

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