ORIGINAL RESEARCH

Multidisciplinary approach in the management of Giant cell tumors of long bones - case series

[1]Dr. Kandasamy Natesan, [2]Dr. Makesh Ram Sriraghavan, [3]Dr. Poornima Kumararaja

[1]Assistant Professor, [2]Associate Professor, Department of Orthopaedics, Government Thoothukudi Medical College Hospital, Thoothukudi, Tamilnadu, India
[3]Assistant Professor, Department of Pathology, ACS Medical College Hospital, Chennai, Tamilnadu, India

Corresponding Author
Dr. Kandasamy Natesan
Assistant Professor, Department of Orthopaedics, Government Thoothukudi Medical College Hospital, Thoothukudi, Tamilnadu, India
Email: akkshay999@gmail.com

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ABSTRACT

Background: Giant cell tumor (GCT) of bone is a well-defined tumor with a nonsclerotic margin.Commonly it is described as an eccentrically expansile lytic lesion placed located in the metaphyseal epiphyseal junction. The commonest site of occurrence in order is distal femur, proximal tibia, proximal humerus, distal ulna and radius. Cases have been reported as it can occurin small bones of hand and feet. Distal end of femur, can sometimes extend to the articular surface,and most often occurs in patients with closed physis. **Materials and methods**: Our study is a prospective design with 21 cases of giant cell tumours of long bones. All the cases were evaluated thoroughly and all the patients underwent effective surgical management with a follow up of upto5-8 years. Results: All cases were analyzed based on age, site of occurrence, presentation with first symptoms and further evaluated by Musculoskeletal Tumor Society Score. All cases had good outcome at final follow-up except in one case who reported with local recurrence. **Conclusion:** Wide surgical excision / Thorough curettage of the lesion without leaving any residual tumor tissueconstitute the mainstay of success in clearing GCT lesions.

INTRODUCTION

Giant cell tumor (GCT) of bone was first described by Cooper and Travers in 1818.[1] GCT is most often benign tumour and characterized histologically by multinucleated giant cells (MNGC) with mononuclear stromal cells in its background. This MNGC is similar to osteoclasts, and so called in older term as osteoclastoma.[2,3] Despite being categorized as a benign lesion family, GCT is very often locally aggressive and can recur after surgical resection. GCTB accounts for 4–5% of all primary bone tumors and 13–20% of all benign bone tumors.[4]

GCT usually has a well-defined but with a nonsclerotic margin, it is eccentrically placed, can sometimes extend to the articular surface, and most often occurs in patients with closed physis.[5] However, it may also have aggressive features or fluid-fluid levels (GCT variants) and can mimic other lesions at both radiologic evaluation and histologic analysis. The majority of GCTBs are located at the end of long bones, and 50 to 60% of them are located around the knee - distal femur and proximal tibia, then it can occur in proximal humerus, distal ulna, proximal fibula and distal fibula.[6,7,8] It's also being reported in tendon sheath and small bones of hand and feet. Its reported that pulmonary metastases develop despite the presence of benign histological features in 3% of patients. In addition, GCTBs display a slight female preponderance. GCTBs may undergo malignant transformation rarely due to dedifferentiation of the primary tumor, or secondary to prior radiation therapy.[9,10]

The multidisciplinary approach emerged in oncology in the mid-1980s, when the addition of one procedure to another or chemotherapy to radiotherapy and/or surgery was proven to improve survival of the patient.[11,12]

MATERIALS AND METHODS

This is a prospective study of 21 cases of giant cell tumours of various long bones admitted in the Department of Orthopaedics, Kilpauk Medical College and Thoothukudi Medical College, Tamilnadu, India. which was effectively managed.

Study design: Prospective study
Study Period: March 2014- February 2022 Study Population: 21 cases

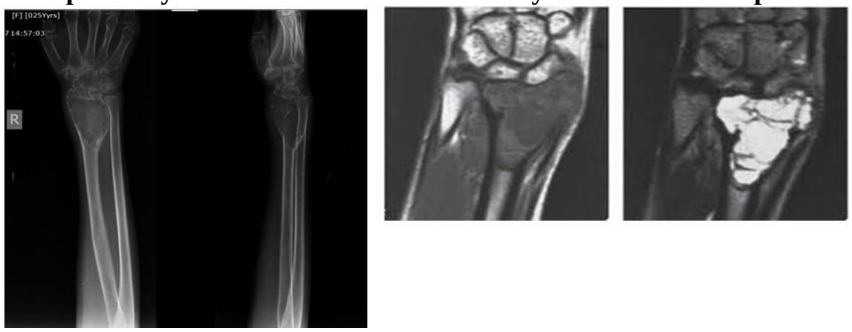
INCLUSION CRITERIA
1. Age 15- 63 years
2. Both sexes
3. Biopsy confirmed.
4. Classification used: Campanacci Grading of Giant Cell Tumor
5. Scoring System: Musculoskeletal Tumor Society Score

EXCLUSION CRITERIA
1. Pathological fractures
2. Metastasis

CLINICAL EVALUATION
When the patient presents to our department, we evaluated them thoroughly. The following data were obtained:
- Proper history
- Duration of pain/swelling
- H/o trivial trauma present or absent.

Then a thorough clinical examination done. They were subjected to routine blood investigations - complete blood count, Serum Calcium, Serum Alkaline Phosphatase, Erythrocyte Sedimentation Rate, Radiography of the involved bone and adjacent joint (Figure 1), Computerized Tomogram (CT) of involved bone and chest and MRI of the involved region and its compartment. Then finally, Fine Needle Aspiration Cytology (FNAC) done as outpatient and oncethe report confirms as GCT, patient was admitted for surgical management.

Figure 1- eccentric expansile lytic lesion in distal radius – X-ray and MRIFollow up Protocol:



Patients were followed up every month for first 6 months and then after every 6 months. Reassurance given at every follow up until 5 years. Assess the functional outcome using Musculoskeletal Tumour Society Score.

SURGICAL PROCEDURE
Under regional anaesthesia, the surgical parts were painted and draped. Once the plane of the tumour was exposed (Figure 3 & 4), A Large cortical window was made to access the tumour. Then Thorough Curettage done, dental Burr (with damaging the bony cortex) and Hydrogen peroxide was used in all the cases. A pulsatile jet wash given to wash out the tumour cells. FurtherReconstruction of the defect was done with the help of bone cement. Thorough hemostasis securedand the wound was closed with suction drain in situ.

Figure 2- Surgical exposure of distal radius with excised mass lesion

POSTOPERATIVE PROTOCOL

In upper limb GCT:

Immobilsed in arm sling. Gradual mobilsation from 3rd day as pain tolerated. Sutures removed on12th day after surgery (Figure 5).

In lower limb GCT:

Non-weight bearing crutch walking was started immediately. After 10 weeks, partial weightbearing as tolerated. Full weight bearing by the end of 12 weeks.

Zolendronic acid given in all the cases.

RESULTS

Cases analyzed based on following criteria:

1. Based on age group:

Cases were predominant in 15-25 years of age (Table 1).

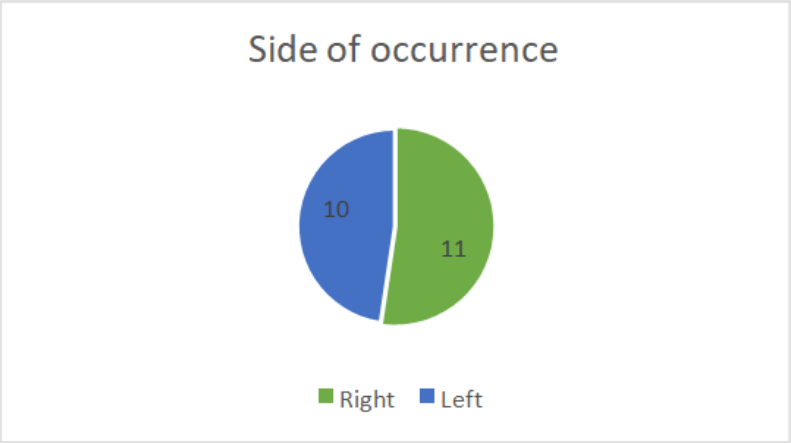
Table1 – Age distribution

Age group	Number of cases (n=21)
15-25 years	10
26-35 years	4
36-45 years	3
46- 55 years	2
56- 68 years	2

2. Gender distribution:

There was equal number of male and female cases in our case series.

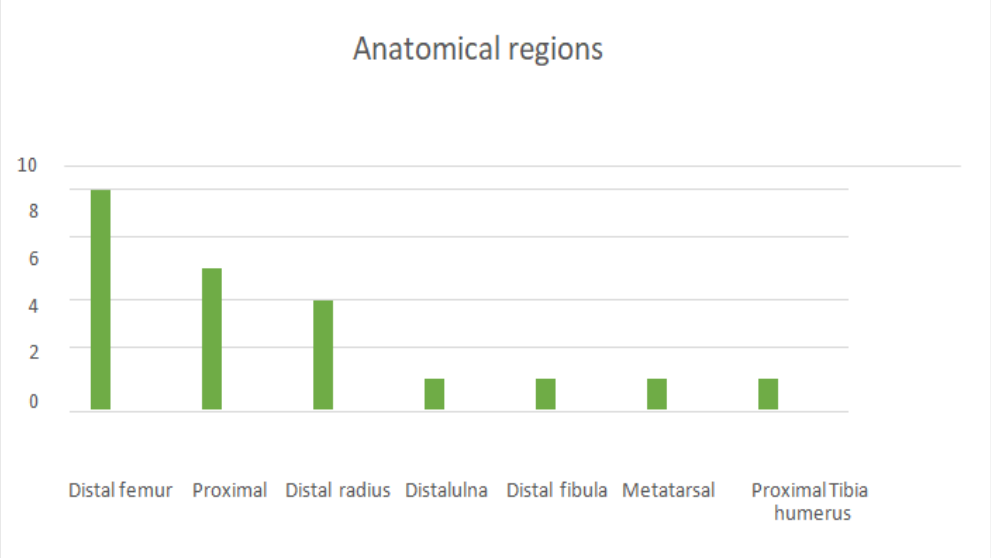
3. Side of occurrence: There was slightly increase in occurrence of cases on left side compared toright side (Graph 1).



Graph 1 – showing the side of occurrence

4. Involvement of anatomical bony regions:

Distal femur was the commonest site of occurrence in our series (Graph 2).



Graph 2 – showing the site of occurrence

5. Procedure performed:

Pulsed lavage was used in all of our cases. We performed wide resection and proximal fibula replacement in our cases of distal radius GCT, no lateral popliteal nerve palsy was reported. For cases of curettage, we used dental burr with hydrogen peroxide and replaced the defects with autologous bone grafts, in skeletally immature patients we used bone substitutes (Table 1).

Table 1 – Surgical procedures performed

Surgical procedure performed	Number of cases
Wide resection and proximal fibula replacement	4
Curettage, burr, hydrogen peroxide and bone cement	10
Wide resection	3
Curettage, hydrogen peroxide and bone substitutes	4

6. Scoring by Musculoskeletal Tumor Society Score:[13,14,15,16]

Our case series showed excellent to good results in 17 cases. There was one case of poorperformance in one case (Table 2).

Table 2 – shows Scoring system by Musculoskeletal Tumor Society Score

Performance	6 months	1 year	2- 5 years	5-7 years
Excellent	Nil	Nil	5	2
Good	Nil	1	6	3
Fair	Nil	2	1	Nil
Poor	Nil	1	Nil	Nil

7. Campanacci grading:

In our study, most of the cases were in Campanacci grading I (Table 3)

Table 3 – Grading by Campanacci complications:

Grading system	Number of cases
Grade I	14
Grade II A	3
Grade II B	1
Grade III	3

Stiffness during recovery but recovered gradually and did not restrict any day to day daily activities. Local Recurrence was reported in one case. Infection was not reported in any of the cases in the study.

DISCUSSION

The diagnosis of giant-cell tumors is based mainly on the investigations like**:**

Biopsy

Multinucleated giant cells with up to a hundred nuclei that have prominent nucleoli. Surrounding mononuclear and small multinucleated cells have nuclei similar to those in the giant cells;

X-ray

Giant-cell tumors are lytic/lucent lesions that have an epiphyseal location and grow to the articularsurface of the involved bone, characteristic 'soap bubble' appearance - nonsclerotic and sharply defined border.

About 5% of giant-cell tumors metastasize, usually to a lung, which may be benign metastasis, when the diagnosis of giant cell tumor is suspected

CT scan

Our patient's thoracic CT findings did not show the spread of the disease in terms of lung metastases, which are rare, according to the literature.

MRI scan

can be used to assess intramedullary and soft tissue extension.

One case had local recurrence now on follow-up. Wide local excision is associated with a lower recurrence rate but has greater morbidity. The patient is now included in the chemotherapy protocol (Denosumab), with calcium and vitamin D supplementation. (Denosumab is a human monoclonal antibody (immunoglobulin G2, IgG2) that targets and binds RANKL with high affinity and specificity, preventing the activation of its receptor, RANK, on the surface of giant cells, osteoclast precursors, and osteoclasts). Enneking proposed the functional evaluation of GCT by Musculo Skeletal Tumor Society(MSTS) system based on pain, function and emotional acceptance; support, walking ability and gait; each of 6 factors for 5 points each to maximum of 30 points. Campanacci reported a recurrence rate of 34% after intralesional excision, 7% after marginal excision and none after wide excision.

Figure 3- wide cortical window made in proximal humerus and filled with bone substitutes

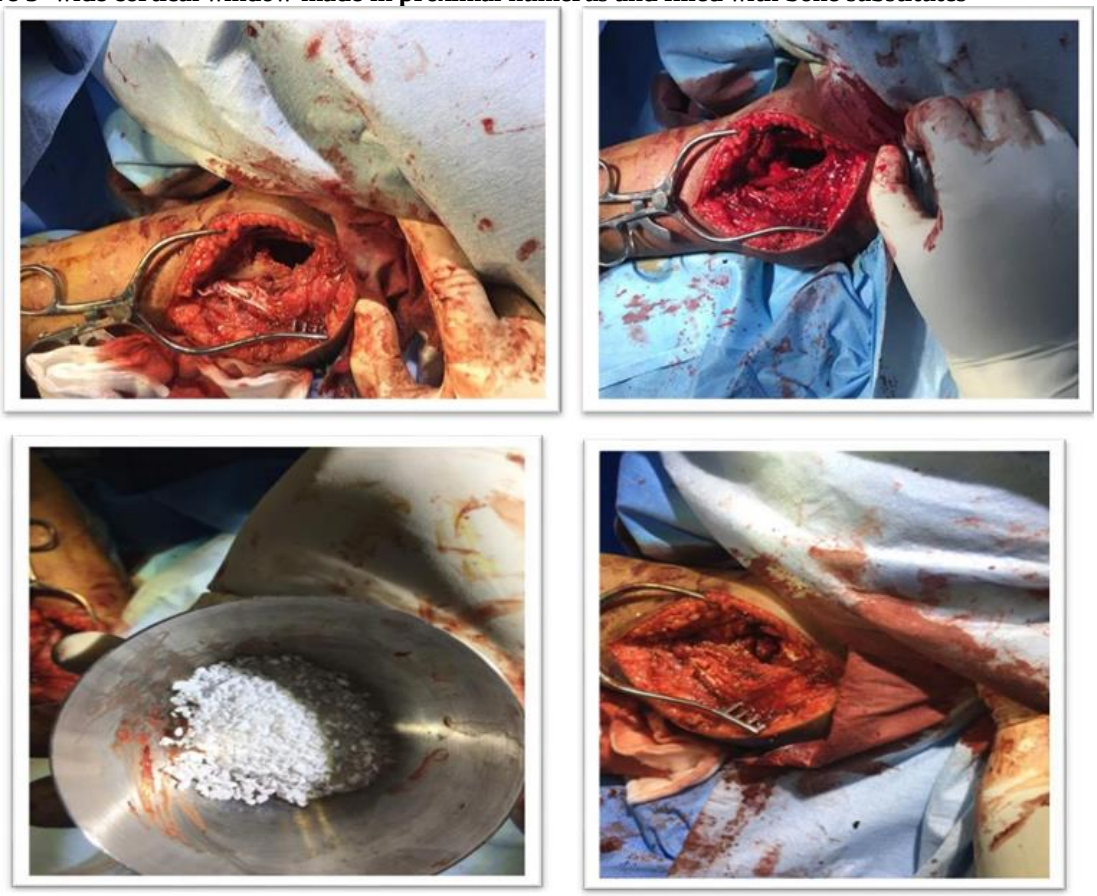
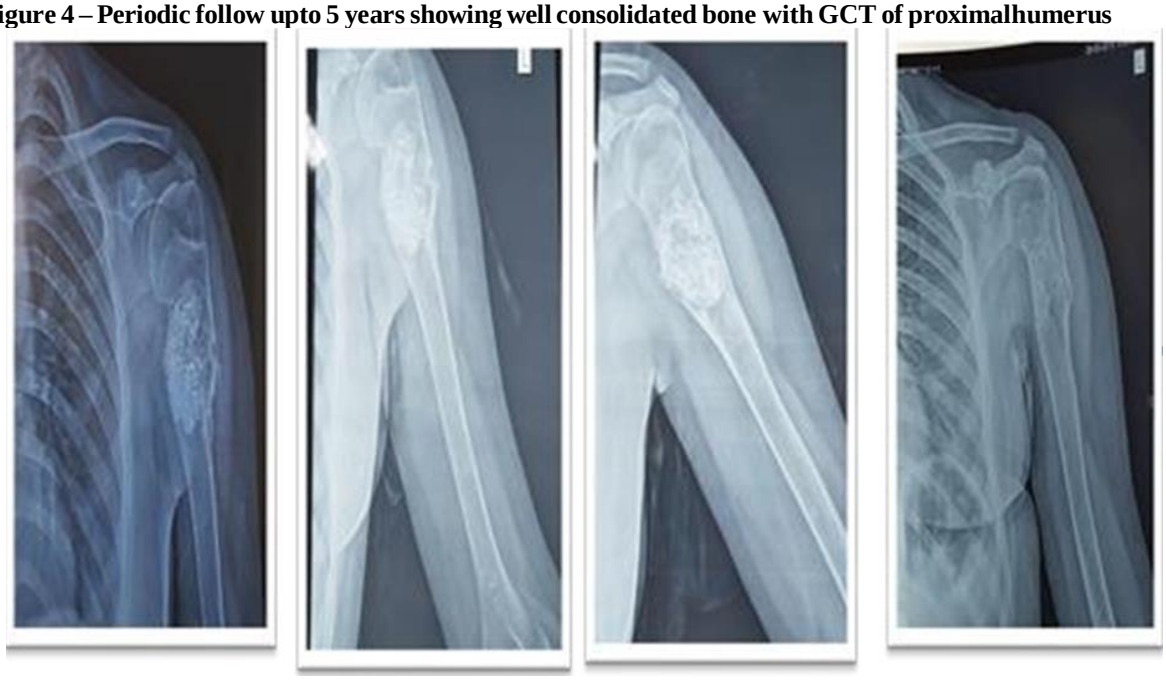


Figure 4 – Periodic follow upto 5 years showing well consolidated bone with GCT of proximalhumerus



RECURRENCE RATES

Curettage can be performed alone or combined with local adjuvants. Curettage alone has the worst recurrence rates (range: 21–65%). Local adjuvants including cementation with polymethyl methacrylate (PMMA), alcohol, phenol, hydrogen peroxide, zinc chloride, cryoablation with liquid nitrogen, speed burr drilling, local application of Zolendronic acid, and combinations have reduced local recurrence rates. Curettage with PMMA has been associated with local recurrence rates of 0–29%; when combined with local phenol application the local recurrence rates are 3-

33%. Local recurrences can be treated with repeat curettage, phenol, and PMMA, with re- recurrence rates of 9–34%. Cryoablation with liquid nitrogen is associated with local recurrence rates of 8–42% and 0–20% when combined with bone grafts and PMMA**.**

Figure 5 – At 1 year follow up showing local recurrenceCONCLUSION

Treatment based on multidisciplinary approach. Serum Calcium, ESR and Alkaline PO4 were elevated in aggressive lesions.[17,18] For all cases, radiological investigations were informative. FNAC was diagnostic and proper pre-op planning done and executed. Thorough curettage of the lesion without leaving any residual tumor tissue constitute the mainstay of the surgery. Obtaining a stable construct after thorough curettage helps in getting better functional outcome. Sandwich technique where ever necessary done.[19,20] Zolendronic acid given in all cases.[21,22] Further, usage of pulse lavage and chemical cauterization techniques with addition of adjuvants can help in decreasing the chance of recurrence. Timely diagnosis and adequate surgical treatment are important for long-term survival and minimizing postoperative patient disability.

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