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Case Report

Functional & radiological outcome of juxtaarticular giant cell tumour of long bones managed with extended curettage with and without fixation at a government tertiary care centre

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Abstract

Giant cell tumour of bone (GCT-B) is a locally aggressive tumour with a significant risk of recurrence. Management of juxtaarticular GCTs is particularly challenging due to the need to preserve joint function while reducing recurrence rates. This study aims to evaluate the functional and radiological outcomes of patients with juxtaarticular GCTs managed with extended curettage, with and without fixation, in a govt. tertiary care facility.

Three cases of GCT-B (distal radius, proximal humerus, and distal femur) were managed with extended curettage. Surgical techniques included wide excision of the tumour, curettage of the cavity with adjuvants (phenol, hydroxyapatite granules), and fixation in cases with pathological fractures. Functional outcomes were evaluated using range of motion (ROM), and radiological outcomes assessed bone healing and recurrence.

At 3 and 6 months post-operatively, all patients showed significant improvements in joint function with signs of bone healing and no signs of recurrence. Case 1 (distal radius) achieved wrist flexion of 55°and extension of 60°. Case 2 (proximal humerus) regained full ROM, and Case 3 (distal femur) showed active knee flexion of 50°and passive flexion of 100° with union of the fracture.

Extended curettage with adjuvants and appropriate fixation in cases of pathological fractures effectively preserves joint function and reduces recurrence risk. This approach is feasible even in resource-constrained settings, offering patients improved quality of life post-operatively.

Keywords: Giant cell tumour, Curettage, Distal femur, proximal humerus, Distal radius, Pathological fracture, Sandwich technique.

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1. Introduction

Giant cell tumour of bone (GCT-B) is a locally aggressive, intermediate-risk tumour classified by the World Health Organization (WHO) as a bone neoplasm.[1] It typically arises after physeal closure in young adults, with a predilection for long bones, affecting the epi-metaphyseal region and abutting the subchondral bone, resulting in a characteristic "soap bubble" appearance on X-rays (GCT).[2] Though metastasis is rare, occurring in less than 2% of cases, GCT-B is notorious for its local recurrence, making its management particularly challenging.

GCT-B accounts for 3-5% of all primary bone tumours, most commonly presenting in the second and third decades of life, with a higher prevalence in females. The distal femur and proximal tibia are the most affected sites (50-60%), followed by the distal radius, humerus, and vertebrae.[3] Rare association with Paget's disease and Goltz syndrome has also been found.

Table 1: Campanacci's radiographic classification[6]

Campanacci's Radiographic Classification	
Grade	Description
I	No cortical disruption and have a well-defined sclerotic medullary margin.
II	Bone insufflation, with cortex thinning, and a well-defined non-sclerotic medullary margin.
III	Unclear margins, cortical disruption and soft tissue extension.

Source[6]

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2. Pathophysiology and Treatment

Histopathology reveals the presence of mononuclear neoplastic cells alongside multinucleated giant cells, confirming the diagnosis. While histopathological examination (HPE) is confirmatory, magnetic resonance imaging (MRI) plays an essential role in surgical planning by identifying the tumour's extent and invasion into soft tissues.[5]

Management options range from intralesional curettage to en bloc resection.[7] The use of adjuvants such as phenol, liquid nitrogen, and bone grafts, along with advanced surgical instruments like high-speed burrs, has significantly reduced the recurrence rate.[9] Pharmacological treatments, including RANK-L inhibitors and bisphosphonates and recent advances like RFA, serial angioembolisation, have also shown promising results, particularly in cases with residual disease or for patients unsuitable for surgery.[4]

3. Case Presentation

This case series includes three patients with juxtaarticular GCTs treated at a tertiary care centre. All patients presented with progressively worsening symptoms such as pain and swelling but no history of trauma. Each patient underwent extended curettage with the use of adjuvants and bone grafting. In one case involving a pathological fracture, fixation was performed using a locking compression plate.

3.1. Case 1: Distal end radius GCT

Age/Gender: 27-year-old-female

Chief complaint: Progressive painful swelling in the right wrist for 6 months. No history of trauma.

Diagnosis: X-rays showed osteolytic lesion of the distal end of radius with an intact articular space (**Figure 1**). MRI confirmed a Grade III GCT of the distal radius.

Surgical procedure: Tumour exposed via *Modified Henry's approach*, wide excision of the tumour and extended curettage of the cavity were performed. Margins were cauterised using a monopolar cautery in splaying mode and pulsed lavage was given to rid debris from deep crevices, followed by cavity packing with iliac crest cortico-cancellous bone graft and abgel soaked in 5% phenol.

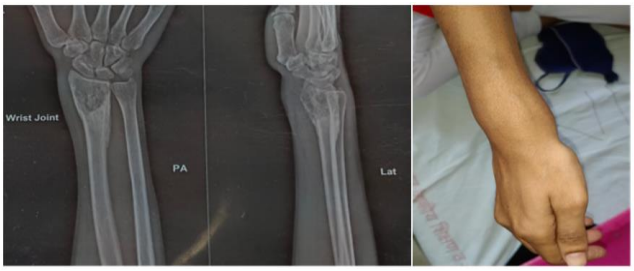

Figure 1: Preoperative x-rays and clinical photo showing osteolytic lesion

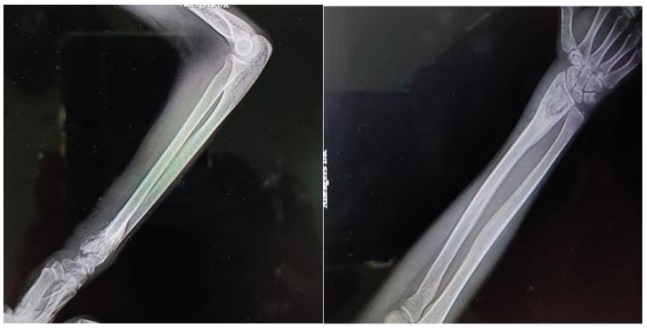

Figure 2: Immediate postoperative (A) AP and (B) lateral x-rays

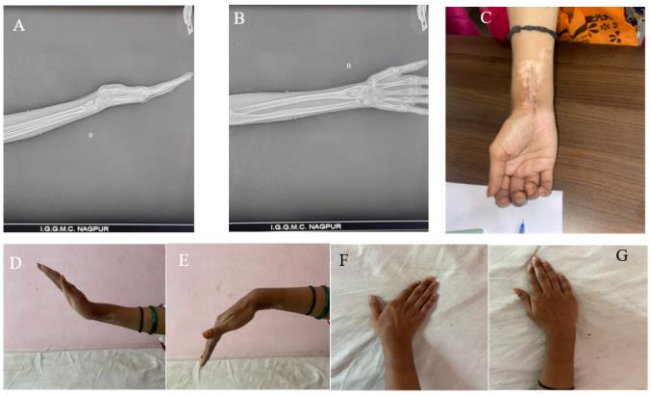

Figure 3: Six months postoperative (**A**) lateral, (**B**) AP x-rays. Clinical images of (**C**) scar condition, (**D**) Dorsiflexion of 60°, (**E**) palmar flexion of 55°, (**F**) & (**G**) normal ulnar and radial deviation respectively

Case 2: Proximal humerus GCT

Age/Gender: 22-year-old male

Chief complaint: Pain in the right shoulder for 6 months. No history of trauma.

Diagnosis: 3D CT scan and x-rays showed expansile lytic lesion of the proximal humerus (**Figure 4**). HPE and immunohistochemistry (IHC) confirmed GCT.

Surgical procedure: Standard *deltopectoral* approach used. Tumour sized bone window was made followed by excision of the tumour mass and extended curettage of the cavity left behind. The cavity was finally filled with hydroxyapatite granules (**Figure 5**).

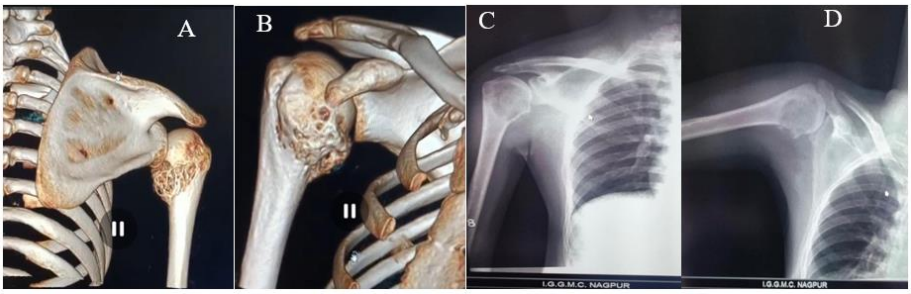

Figure 4: (**A**) & (**B**) Preoperative 3D CT images. (**C**) & (**D**) showing well defined lytic lesion of proximal humerus

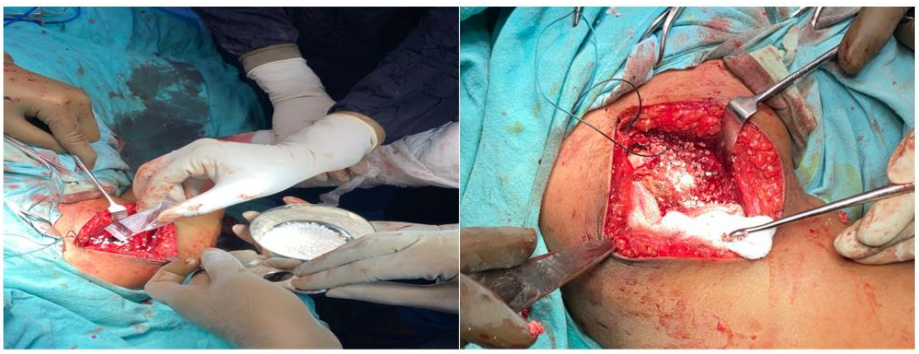

Figure 5: Intraoperative images showing the cavity being packed with Hydroxyapatite granules

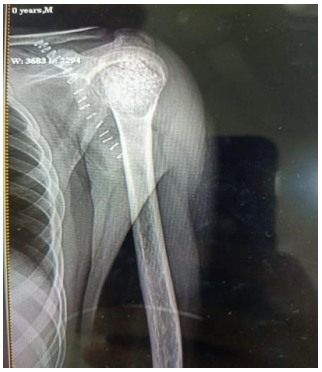

Figure 6: Immediate postoperative x-rays

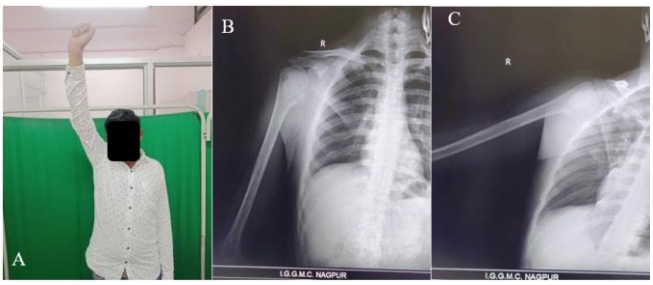

Figure 7: (**A**) Full ROM, (**B**) & (**C**) X-rays at 3 months followup.

Case 3: Distal femur GCT with pathological fracture

Age/Gender: 39-year-old male

Chief complaint: Painless swelling in the left knee for 6 months, aggravated by a fall at home 2 months ago.

Diagnosis: Preoperative x-rays showed fracture of the distal femur with a lytic lesion involving the lateral condyle not extending to the articular surface as confirmed in MRI (**Figure 8**). FNAC revealed multinucleated cells. CECT showed no metastasis. Post-operative HPE confirmed GCT.

Surgical procedure: En masse tumour excision was done via *anterolateral approach* with a curvilinear skin incision. Extended curettage of the tumour cavity was performed, and it was tightly packed with morsellised iliac crest bone graft and hydroxyapatite granules[10] using the 'sandwich technique' (**Figure 9**). Open reduction and internal fixation (ORIF) was done using a distal femur locking compression plate.

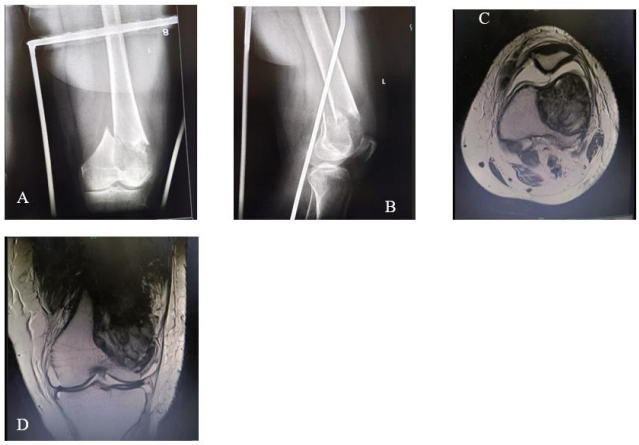

Figure 8: **(A)&(B)** Preoperative AP & Lateral X-rays showing well defined lytic shadow with fracture of the distal femur. (**C**) Axial and (**D**) coronal MRI sections showing involvement of lateral condyle with intact subchondral bone.

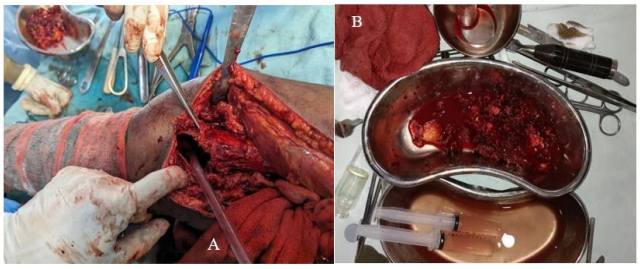

Figure 9: (A)&(B) Intraoperative images of 'en masse excision' of the tumour

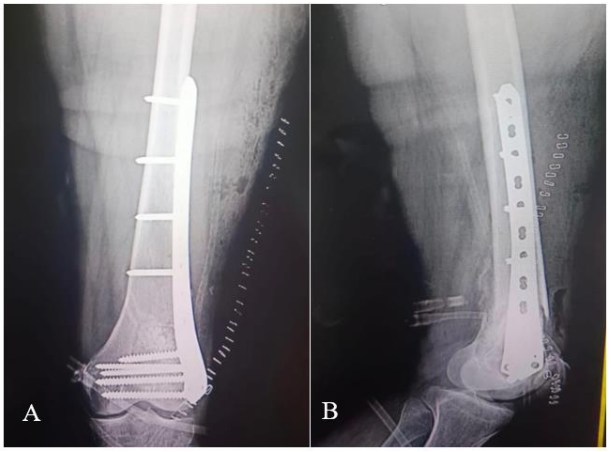

Figure 10: Immediate postoperative (**A**) AP & (**B**) lateral x-rays

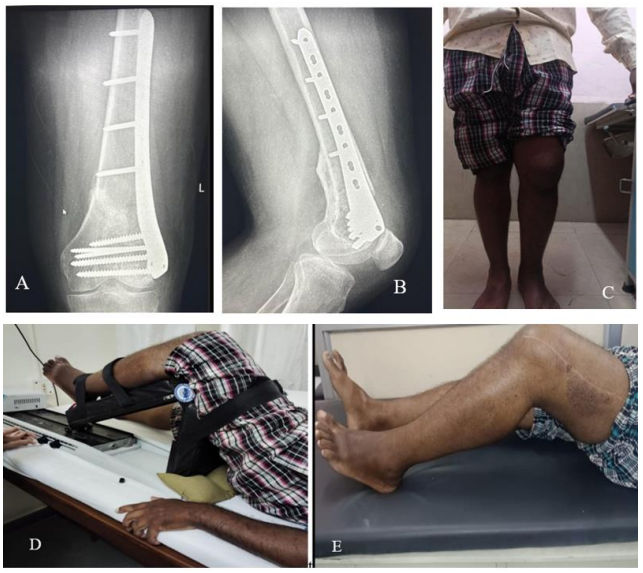

Figure 11: Six months postoperative (**A**) AP, (**B**) lateral X-rays showing complete fracture union, (**C**) full weight bearing by the patient, (**D**) CPM assisted flexion upto 100° and (**E**) active flexion upto 50°

4. Results

Patients were followed up at 3 and 6 months post-operatively. Functional outcomes were measured by joint range of motion (ROM) and ability to perform daily activities, while radiological outcomes evaluated graft acceptance, bone healing, and absence of any signs of recurrence.

Case 1: Distal end radius GCT

Immediate postoperative X-rays showing the cavity filled with Iliac crest cortico-cancellous bone graft (**Figure 2**)

Follow-up: 3 and 6 months ROM:

At 3 months: Wrist flexion 45°, extension 45°.

At 6 months: Flexion 55°, extension 60°(**Figure 3**)

Outcome: Mild hypertrophic scar, no complications; graft well-accepted, bone healed with no recurrence (**Figure 3**)

Case 2: Proximal humerus GCT

Immediate postoperative X-ray showed the tumour cavity well packed with Hydroxyapatite granules (**Figure 6**)

Follow-up: 3 months

ROM: Full ROM, normal day-to-day activities resumed. Outcome: No complications; no signs of recurrence (**Figure 7**).

Case 3: Distal femur GCT with pathological fracture

Immediate postoperative X-ray showing fracture reduction and consequent fixation with a locking compression plate (**Figure 10**)

Follow-up: 3 and 6 months ROM:

At 6months: Active knee flexion 50°, passive knee flexion up to 100° (CPM Assisted)

Outcome: Fracture union seen with no signs of recurrence (**Figure 11**).

5. Discussion

The management of juxtaarticular GCTs poses a unique challenge due to the need to balance tumour excision with joint preservation. This case series demonstrates that extended curettage of the tumour, combined with adjuvants and bone grafting, provides a viable treatment option in a Government setup that minimizes recurrence and aids in bone healing while maintaining functional outcomes. The use of fixation in pathological fractures, as seen in Case 3, further highlights the benefits of concurrent ORIF for improving patient outcomes both functionally and radiologically.

6. Comparison with Existing Literature

The recurrence rates in GCT management have been reported to be as high as 25-50% when curettage alone is used. However, the addition of adjuvants, such as phenol and bone grafting, has been shown to reduce these rates significantly.[8] Our findings corroborate these results, with no recurrences observed in our 6-month follow-up.

7. Conclusion

Extended curettage with adjuvants and bone grafting, when combined with fixation in cases of pathological fractures, offers excellent functional and radiological outcomes for patients with juxtaarticular GCT. This approach is feasible in resource-constrained settings and provides a cost-effective treatment that maintains limb function, promotes bone healing and reduces recurrence risk. Long-term follow-up is recommended to monitor for late recurrences.

8. Source of Funding

None.

9. Conflict of Interest

None.

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