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Research Article

# Giant Cell Tumour of Bone at Unusual Sites and Uncommon Clinical Presentations: A Case Series, Retrospective Study

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**Abstract:** ***Introduction:*** Giant cell tumour (GCT) of bone is a benign but locally aggressive neoplasm composed of mononuclear stromal cells and multinucleated osteoclast-type giant cells. It accounts for approximately 5% of all primary bone tumours and up to 20% of benign bone tumours, with an unusually high prevalence in southern India. While most lesions arise in the epiphyseal regions of long bones around the knee, unusual sites including the small bones of the foot and hand, flat bones, and apophyseal equivalents are well recognised and present distinct diagnostic and surgical challenges.[1-3]**Methods**We present seven cases of GCT at atypical locations: the talus (two cases of differing grade), the fourth metacarpal, the distal tibia, the proximal femur complicated by pathological femoral neck fracture, recurrent proximal tibial giant cell tumour with malignant transformation and pulmonary metastasis, and the clavicle. Diagnosis was confirmed histopathologically in all cases. Management was individualised according to Campanacci grade, site-specific anatomy, and clinical presentation.**Results**Most reviewed cases achieved satisfactory functional outcomes with good local disease control. One patient with a pathological femoral neck fracture underwent successful extended curettage, cement reconstruction, and dynamic hip screw fixation. Another patient developed local recurrence with malignant transformation and pulmonary metastases, ultimately requiring above-knee amputation. These cases illustrate the diverse biological behaviour of giant cell tumour of bone.**Conclusion**GCT at atypical sites demands a site-specific and grade-directed approach. Radiological staging with plain films, CT, and MRI is essential. Surgical strategies range from intralesional curettage to en bloc resection, and each unusual location carries its own considerations regarding recurrence risk, reconstruction, and long-term surveillance.

**Keywords:** Giant cell tumour (GCT), CT, MRI

## INTRODUCTION

Giant cell tumour of bone was first characterised by Cooper and Travers in 1818 and further delineated by Jaffe and Lichtenstein in 1940. It is a benign but locally destructive tumour with a well-recognised tendency for local recurrence and, in a small proportion of cases, pulmonary metastasis or malignant transformation. The tumour predominantly affects young adults between the second and fourth decades of life, with most series showing a slight female predominance, though Indian series have at times reported a higher proportion of male patients.

The three most common locations are the distal femur, proximal tibia, and distal radius, collectively accounting for the majority of cases. Flat bone and apophyseal involvement occurs in approximately 15% of cases, and involvement of the bones of the hand and foot is reported in less than 2% of cases. GCT of the clavicle is even rarer, with fewer than 20 cases reported in the literature over the past four decades. These unusual locations are disproportionately challenging: the anatomy limits surgical access, the thin cortical shell is prone to early breach, and the proximity of neurovascular structures at certain sites constrains the use of adjuvant local therapies.[1,4-6]

This review presents seven published cases of giant cell tumour occurring at unusual anatomical locations and demonstrating uncommon clinical behaviour, encompassing the talus, fourth metacarpal, distal tibia, proximal femur with pathological femoral neck fracture, recurrent proximal tibial giant cell tumour with malignant transformation and pulmonary metastasis and the clavicle. We discuss the imaging approach, grading, surgical rationale, and outcomes at each site, with reference to the available literature.[1,4-6]

## Methodology

This retrospective case series included seven patients diagnosed with Giant Cell Tumour of Bone at Unusual Sites and Uncommon Clinical Presentation and treated at our institution between. Clinical records, radiographic findings, treatment details, and follow-up outcomes were reviewed and analyzed.

To provide additional context and compare clinical outcomes, two previously published cases with similar clinical characteristics were identified through a review

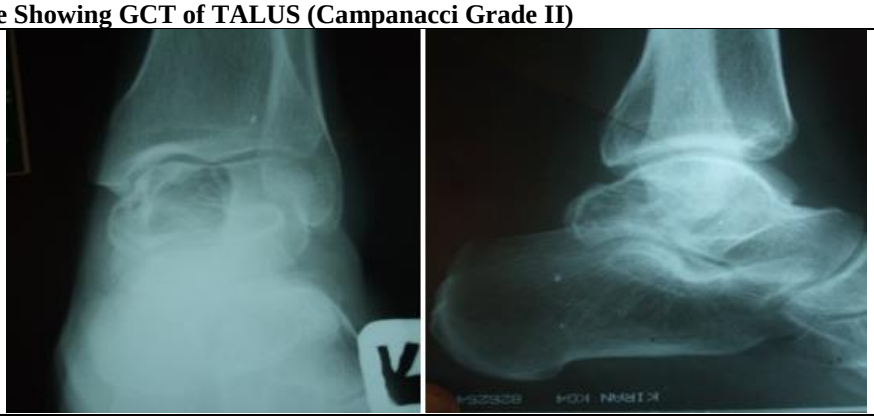
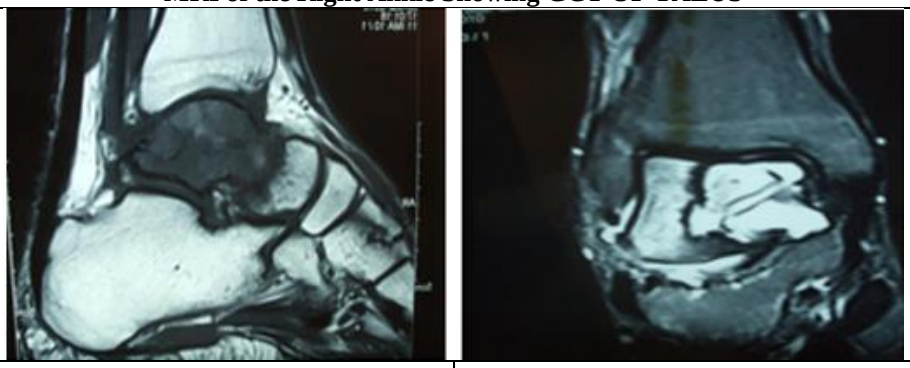
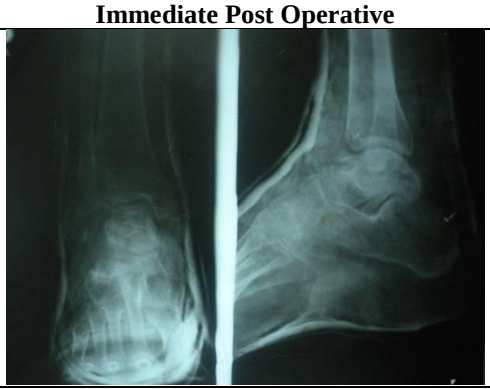
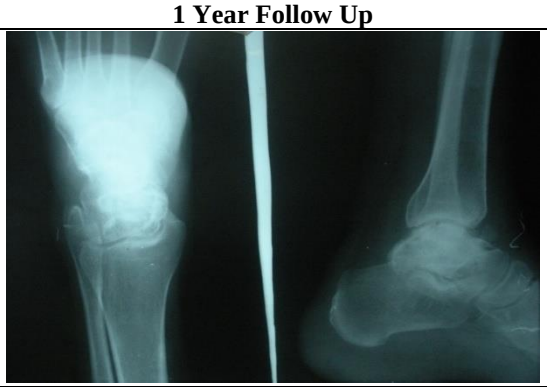
of the literature and included in the descriptive analysis. Data extracted from these reports included patient demographics, clinical presentation, management, and outcomes.

The primary analysis was based on institutional cases, while literature-derived cases were used as supplementary cases for comparison and discussion. Clinical data from institutional cases were collected retrospectively from medical records, while data from published cases were extracted from the literature. Demographic characteristics, treatment details, and outcomes were analyzed collectively.

**Case 1:** Giant Cell Tumour of the Talus, Campanacci Grade II (Right Ankle)

A 23-year-old man presented with progressive pain and swelling of the right ankle for three months without antecedent trauma. Radiographs demonstrated an expansile lytic lesion involving the body of the talus with cortical thinning but no definite cortical breach. MRI showed marrow replacement confined to the talus without soft-tissue extension, consistent with a Campanacci Grade II lesion. CT was obtained to better define cortical integrity and assist operative planning.

Histopathological examination confirmed giant cell tumour of bone. Given the contained nature of the lesion and preservation of the cortical shell, joint-preserving surgery was considered feasible. Extended intralesional curettage was performed using a high-speed burr through a cortical window, followed by reconstruction with autologous cancellous graft harvested from the ipsilateral iliac crest. Follow-up imaging showed satisfactory graft incorporation without evidence of local recurrence.[4,7]

<table>
<tr><td colspan="2">X-Ray Right Ankle Showing GCT of TALUS (Campanacci Grade II)</td></tr>
<tr><td colspan="2">  </td></tr>
<tr><td colspan="2">MRI of the Right Ankle Showing GCT OF TALUS</td></tr>
<tr><td colspan="2">  </td></tr>
<tr><td>Immediate Post Operative</td><td>1 Year Follow Up</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>2 YEARS FOLLOW UP</td><td>CLINICAL OUTCOME</td></tr>
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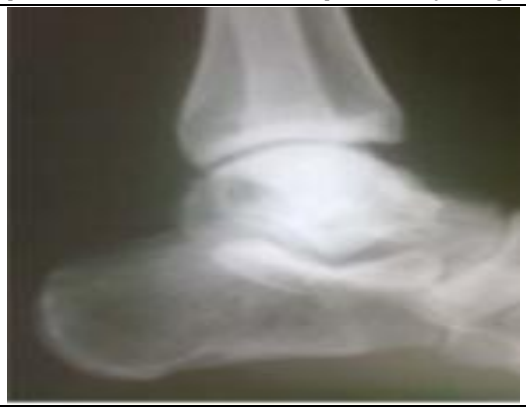
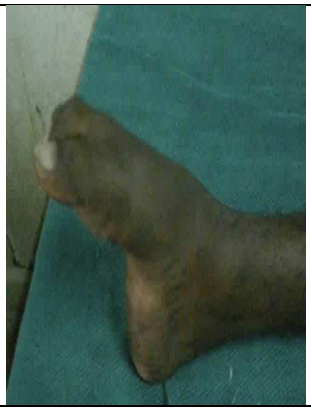
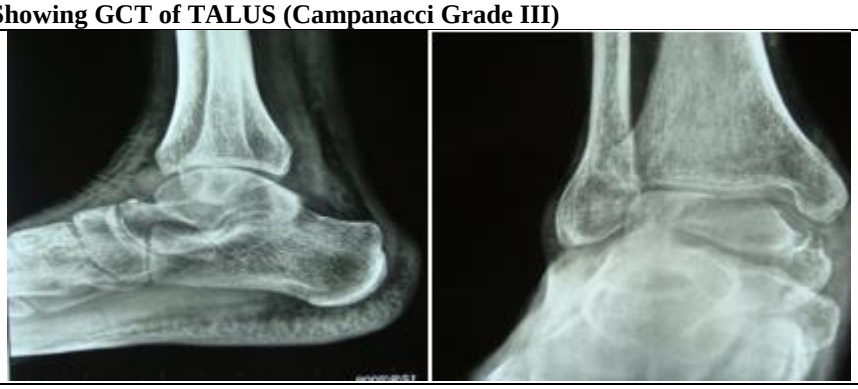
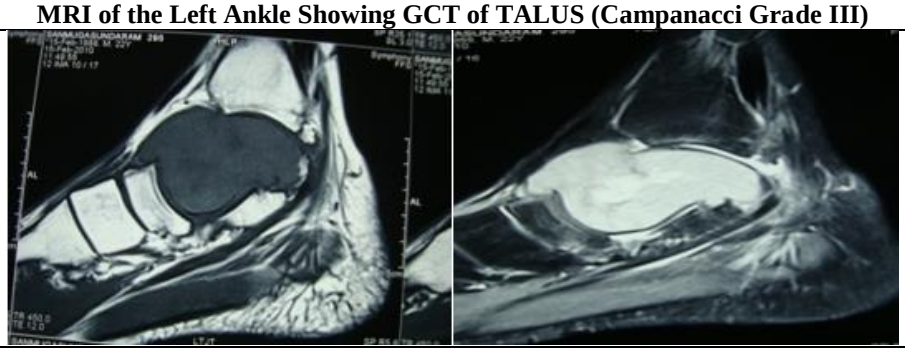



**Case 2:** Giant Cell Tumour of the Talus, Campanacci Grade III (Left Ankle)
A 24-year-old man presented with progressive left ankle pain and swelling. Imaging demonstrated a destructive lytic lesion occupying most of the talar body with cortical breach and soft-tissue extension, consistent with Campanacci Grade III disease.
The degree of talar destruction made joint-preserving treatment impractical. The patient underwent talectomy through an anterolateral approach followed by tibiocalcaneal arthrodesis using a 6.5-mm cancellous screw. Radiographs at follow-up demonstrated solid fusion, and the patient regained independent ambulation without external support.

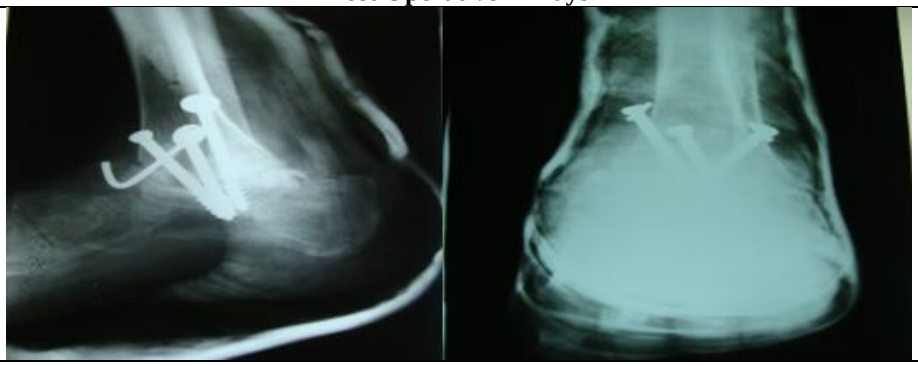
**X-Ray Left Ankle Showing GCT of TALUS (Campanacci Grade III)**



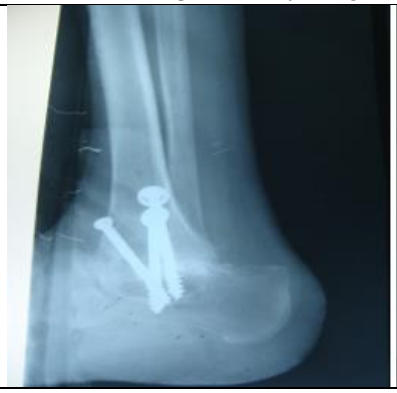
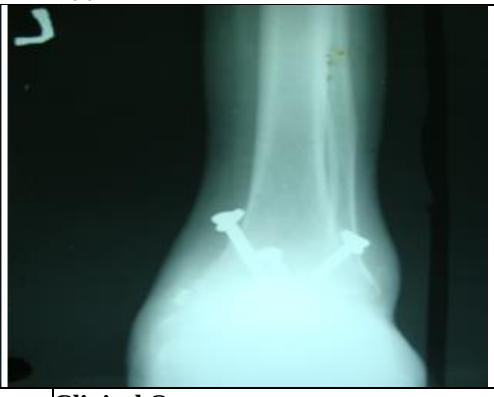
**MRI of the Left Ankle Showing GCT of TALUS (Campanacci Grade III)**

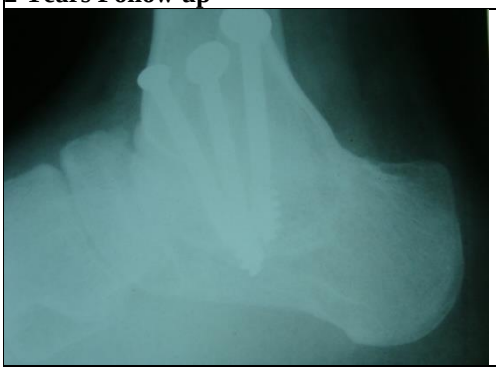
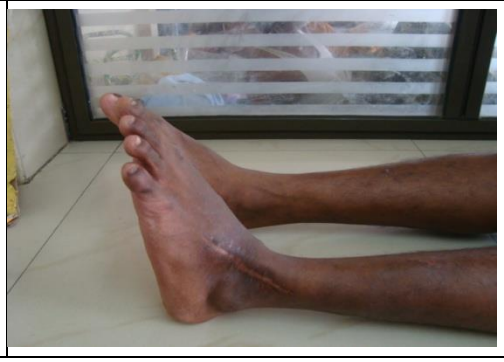


**Post Operative X-Rays**

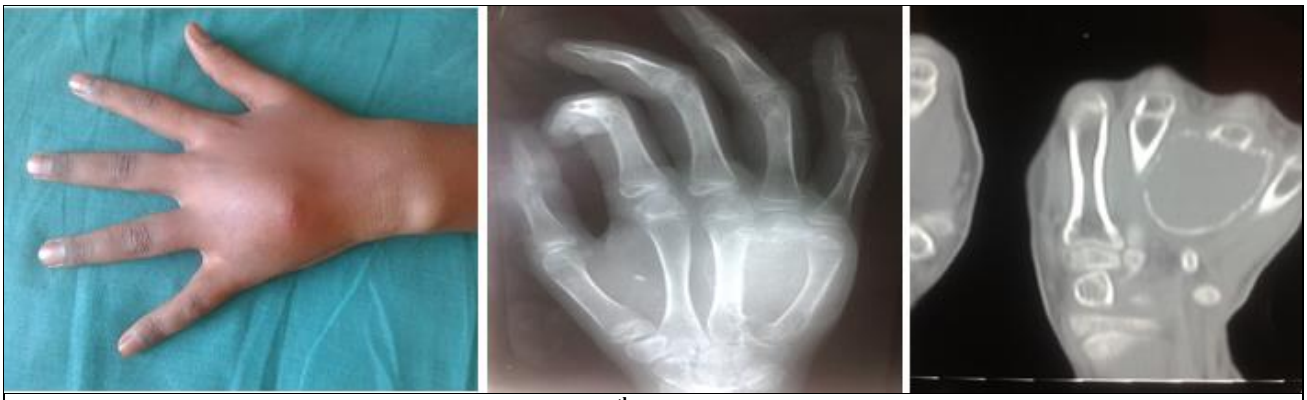


**1 Year Follow Up**

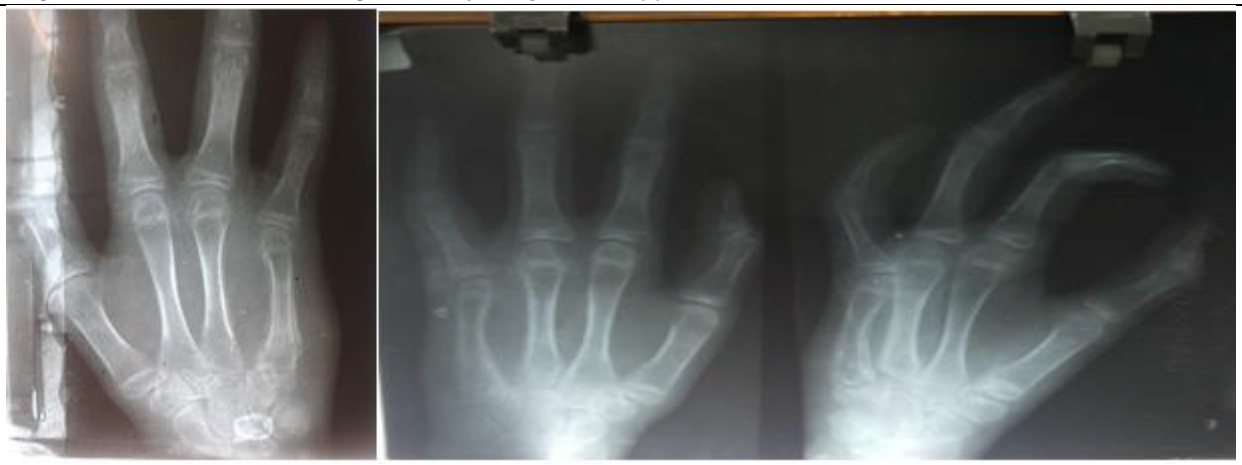



| **2 Years Follow up** | **Clinical Outcome** |
|---|---|
|  |  |

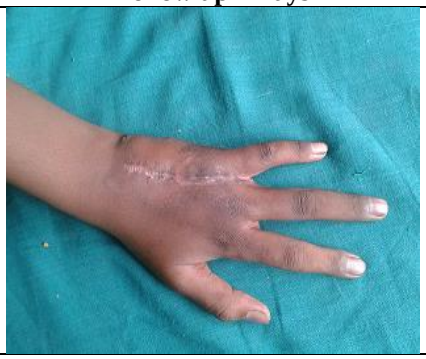
**Case 3:** Giant Cell Tumour of the Fourth Metacarpal, Campanacci Grade III (Left Hand)
A 17-year-old male presented with a gradually enlarging dorsal swelling of the left hand of two years' duration, associated with worsening pain during the preceding three months. Radiographs and CT demonstrated an expansile lytic lesion involving the shaft of the fourth metacarpal with marked cortical destruction.
Histopathology confirmed giant cell tumour. Given the extensive cortical loss and the recognised recurrence risk associated with intralesional surgery in metacarpal GCT, definitive excision was favoured. Ray amputation of the fourth metacarpal was performed. At follow-up, the patient had adapted well functionally, with acceptable grip and pinch function.



**X-Ray & CT Showing GCT of 4$^{th}$ Metacarpal (Campanacci Grade III)**



**Follow up X rays**

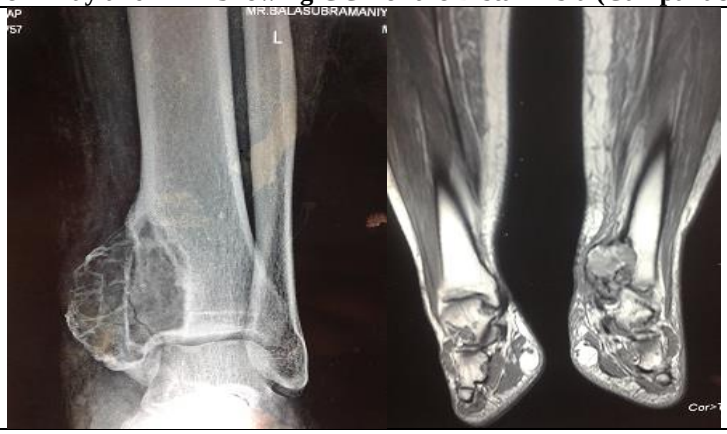


**Clinical Outcome**

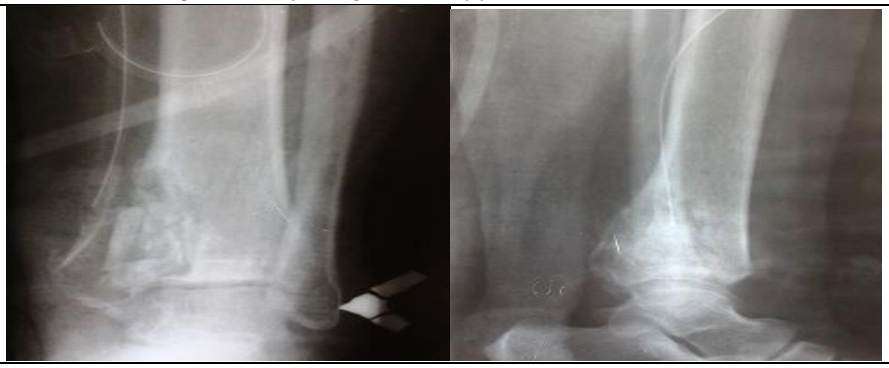
**Case 4:** Giant Cell Tumour of the Distal Tibia, Campanacci Grade III (Left Leg)
A 39-year-old man presented with swelling around the distal left leg for one year, associated with pain over the preceding five months. Radiographs demonstrated a lytic lesion involving the distal tibia with cortical erosion. MRI showed aggressive radiological features but preserved articular integrity without intra-articular extension.

Because the ankle joint remained uninvolved, a joint-preserving approach was pursued. Extended curettage was performed through a posteromedial approach, and the cavity was reconstructed using autologous cancellous bone graft. The limb was protected in a below-knee plaster slab postoperatively. The patient remained pain-free during follow-up, with no evidence of recurrence.

**Pre-Operative X-Ray and MRI Showing GCT of the Distal Tibia (Campanacci Grade III)**




**Post-Operative**



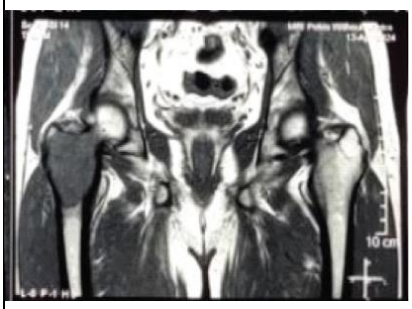
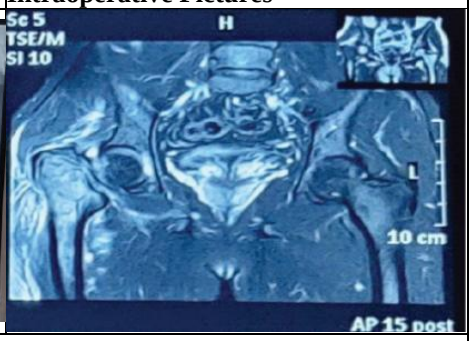
**Case 5 –** Giant Cell Tumour of the Proximal Femur with Pathological Femoral Neck Fracture, Campanacci Grade III (Right Hip)

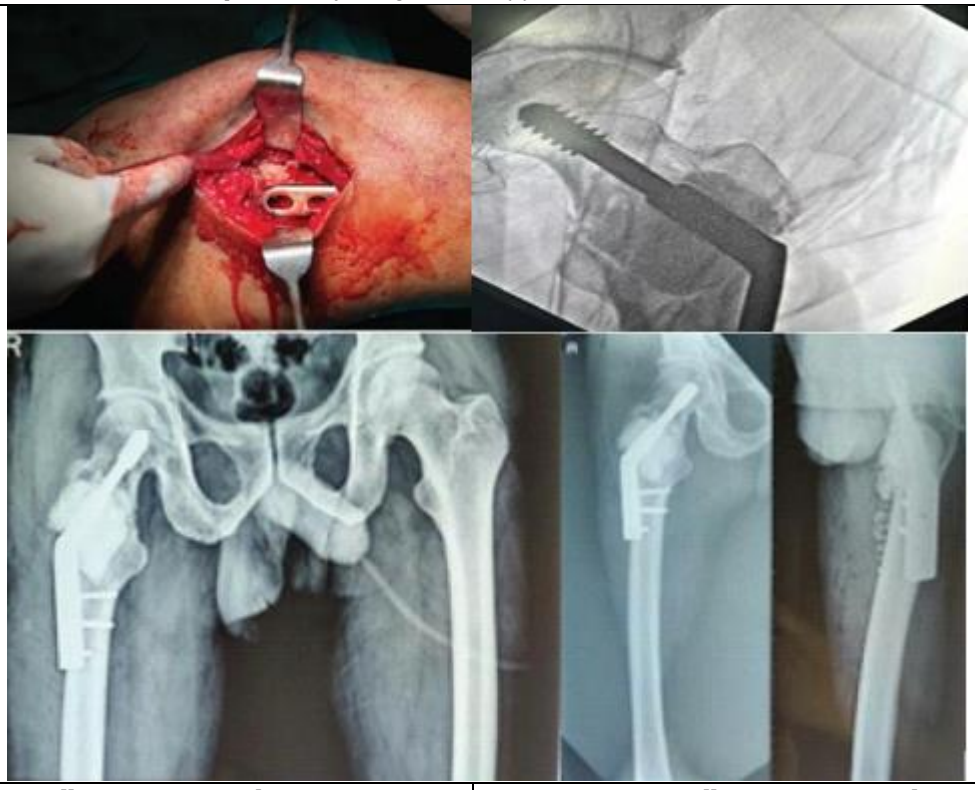
A 43-year-old man presented with pain and inability to bear weight on the right lower limb. He reported a history of a fall from stairs three months earlier, following which he experienced persistent pain around the right hip but remained ambulatory. MRI performed at the time demonstrated an expansile lytic lesion measuring approximately 5.6 × 4.1 cm in the metaphyseal region of the proximal femur, predominantly involving the greater trochanter, without evidence of pathological fracture.

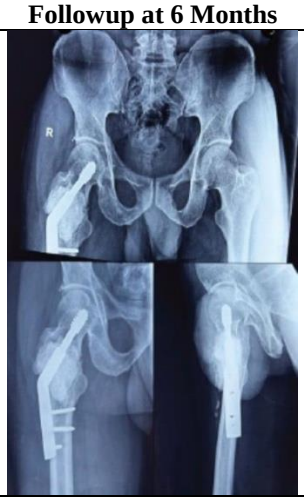
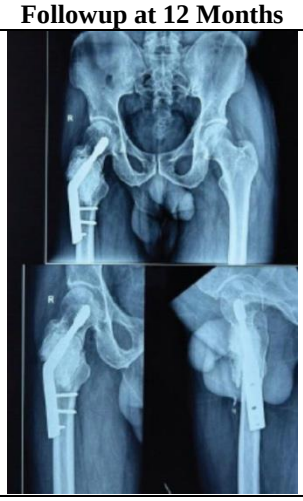
One day prior to presentation, he developed sudden worsening of hip pain while performing routine movements and became unable to bear weight. Clinical examination revealed the right lower limb to be externally rotated and abducted. Radiographs demonstrated a pathological fracture of the femoral neck associated with a lytic lesion involving the proximal femur. MRI of the pelvis showed an expansile lobulated lesion arising from the greater trochanter with extension into the femoral neck, associated with cortical thinning and pathological fracture, raising suspicion for giant cell tumour.

The patient underwent extended intralesional curettage through a lateral approach followed by open reduction and internal fixation using a dynamic hip screw (DHS). The tumour cavity was treated with hydrogen peroxide and reconstructed using polymethylmethacrylate (PMMA) bone cement. Tissue obtained intraoperatively was sent for histopathological examination, which confirmed giant cell tumour of bone.

The postoperative period was uneventful. The patient was mobilised non-weight-bearing for six weeks followed by gradual progression to weight-bearing. Serial follow-up at 1, 2, 4, 6, and 12 months demonstrated satisfactory fracture healing, maintenance of implant position, and no evidence of local recurrence.

| **X-Ray and MRI Findings at the Time of Diagnosis** | | **Intraoperative Pictures** |
|---|---|---|
|  |  |   |
| **Postoperative X-Ray (POD-1)** | | |



| Followup at 6 Months | Followup at 12 Months |
|---|---|
|  |  |

**Case 6 –** Recurrent Giant Cell Tumour of the Proximal Tibia with Malignant Transformation and Pulmonary Metastasis, Campanacci Grade III (Left Knee)

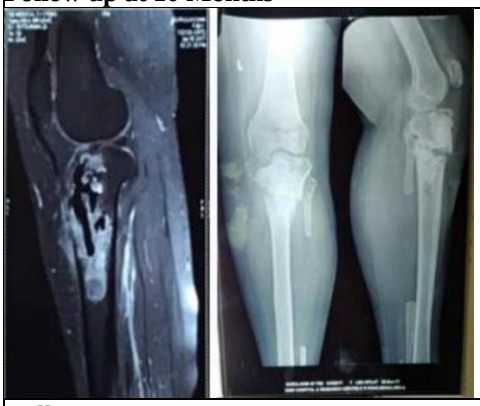
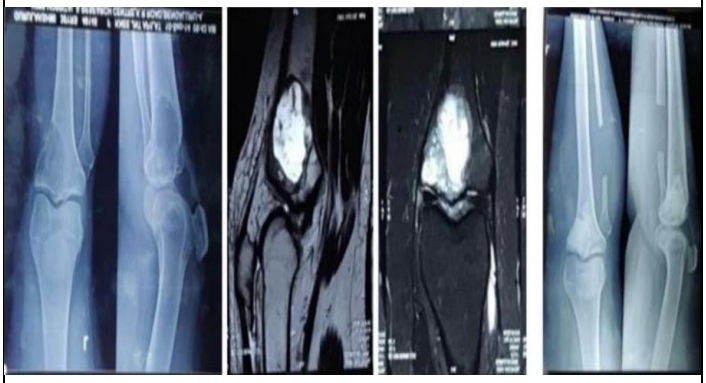
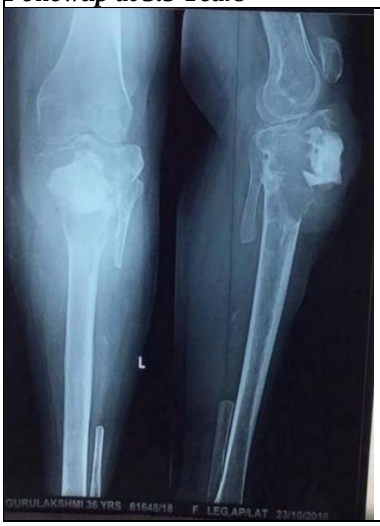
A 38-year-old woman initially presented with pain over the medial aspect of the left knee. Radiographs demonstrated an expansile eccentric osteolytic lesion involving the medial tibial condyle with a soap-bubble appearance and cortical thinning. MRI showed an expansile subarticular meta-epiphyseal lesion of the proximal tibia with cystic components and contrast enhancement, consistent with giant cell tumour of bone.

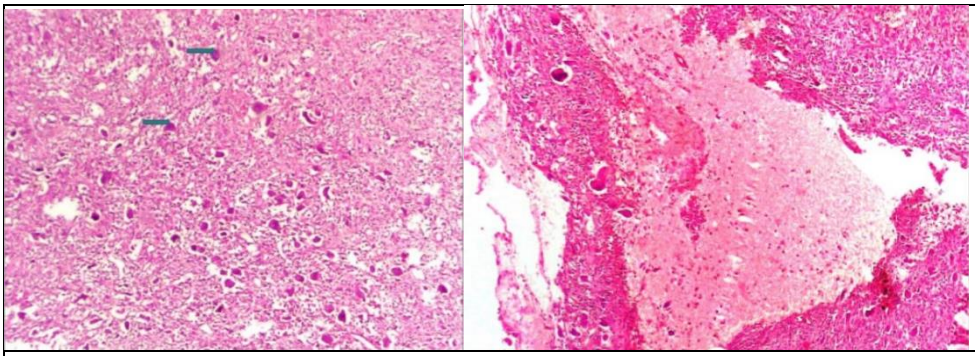
The patient underwent intralesional curettage with fibular grafting, iliac crest bone grafting, and cement augmentation. Histopathological examination confirmed giant cell tumour of bone. Postoperative follow-up was initially uneventful.

Approximately four years later, she re-presented with increasing pain and swelling around the proximal tibia. MRI demonstrated a recurrent expansile osteolytic lesion with cortical breach, articular surface involvement, and extensive local destruction. Progressive enlargement of the lesion was subsequently noted, with MRI revealing a large multiloculated lytic mass involving the proximal tibia and extending into the surrounding soft tissues.

PET-CT demonstrated multiple bilateral pulmonary nodules consistent with metastatic disease. Given the extent of local progression and functional impairment, the patient underwent above-knee amputation. Histopathological examination of the resected specimen confirmed malignant transformation of the recurrent giant cell tumour.

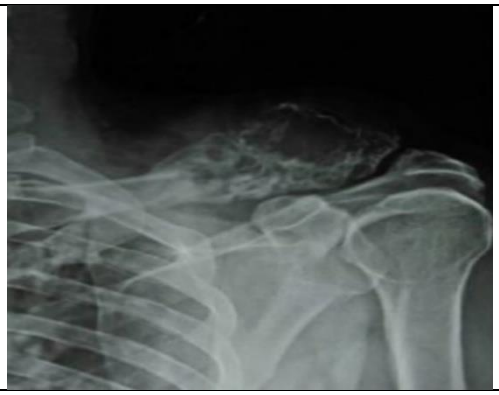
This case illustrates the uncommon but recognised potential for local recurrence, pulmonary metastasis, and malignant transformation in giant cell tumour of bone, highlighting the importance of long-term surveillance following initial treatment.

| **Follow up at 10 Months** | **Followup at 1 Year** |
|---|---|
|  |  |
| ***Followup at 3.5 Years*** | **Clinical and MRI Images-Second Presentation** |
|  |  |



**Histopathology Images**

**Case 7:** Giant Cell Tumour of the Clavicle, Campanacci Grade II (Left Clavicle)
A 60-year-old man presented with pain and swelling over the lateral end of the left clavicle. The swelling had gradually increased in size over four months. On examination, it was tender, lobulated, hard in consistency, and not adherent to the overlying skin. There was no associated neurovascular deficit or regional lymphadenopathy.
Plain radiographs demonstrated an expansile osteolytic lesion involving the lateral end of the clavicle with geographic bone destruction. No periosteal reaction or soft tissue component was identified. MRI findings were suggestive of giant cell tumour. Fine needle aspiration cytology was subsequently performed and confirmed the diagnosis.
Considering the expendable nature of the clavicle and the patient's relatively low functional demands, wide local excision was planned. The lesion was excised en bloc with approximately 3 cm of healthy bone margin. Reconstruction was not performed. Histopathological examination of the excised specimen confirmed giant cell tumour of bone.
The postoperative period was uneventful. The patient regained full shoulder range of motion without neurovascular deficit and returned to normal daily activities. At two-year follow-up, there was no evidence of local recurrence or metastatic disease.



***X-Ray Image***

## RESULTS

Cases 1–5 and 7 demonstrated satisfactory local disease control during the reported follow-up period. Functional outcomes were acceptable following both intralesional and resective procedures. Case 5 demonstrated successful fracture healing following extended curettage, PMMA cement reconstruction, and dynamic hip screw fixation for a pathological femoral neck fracture. Case 6 represented the most aggressive tumour behaviour within the review. Despite initial treatment, the patient developed local recurrence, malignant transformation, and pulmonary metastases, ultimately requiring above-knee amputation. No major perioperative complications were reported in the reviewed cases.

| Case | Age/Sex | Site | Grade | Key Radiological Findings | Treatment | Outcome |
|---|---|---|---|---|---|---|
| 1 | 23/M | Talus (Right) | II | Expansile lytic lesion with cortical thinning | Curettage + iliac crest graft | No recurrence |
| 2 | 24/M | Talus (Left) | III | Cortical breach with soft tissue extension | Talectomy + arthrodesis | Solid fusion |
| 3 | 17/M | Fourth Metacarpal | III | Extensive cortical destruction | Ray amputation | Good hand function |
| 4 | 39/M | Distal Tibia | III | Cortical erosion; preserved joint surface | Curettage + bone graft | No recurrence |
| 5 | 43/M | Proximal Femur | III | Greater trochanter lesion extending into femoral neck with pathological fracture | Curettage + DHS + PMMA | Fracture healed |
| 6 | 38/F | Proximal Tibia | III | Recurrent lesion with pulmonary metastases | Curettage → Above-knee amputation | Malignant transformation |
| 7 | 60/M | Lateral Clavicle | II | Expansile osteolytic lesion without soft tissue extension | Wide excision | No recurrence at 2 years |

***Table 1: Summary of all seven cases***

***Campanacci grading:***
*Grade I: latent lesion, intact cortex*
*Grade II: active, cortical thinning/expansion*
*Grade III: aggressive, cortical breach with soft tissue involvement.*
*PMMA = polymethylmethacrylate*

## DISCUSSION

### Epidemiology and Demographic Profile

GCT accounts for approximately 5% of all primary bone tumours and up to 20% of benign bone tumours, with a disproportionately high prevalence in southern India and China where it may represent up to 20% of all primary bone tumours. The peak incidence is in the third decade, with 80% of cases presenting between the ages of 20 and 50 years. Fewer than 3% occur before the age of 14 and only 13% in patients over 50. The slight female predominance noted in Western series is not uniformly reproduced in Indian series, and a male predominance, as seen in cases 1 through 5 of our series, has been reported in other institutional studies from the subcontinent.[1,2,8]

### Radiological Evaluation

Imaging underpins both the diagnosis and surgical planning of GCT. As described by Chakarun et al., the classical plain radiograph appearance is an eccentric, purely lytic lesion with a well-defined but non-sclerotic margin, extending to the subchondral bone, occurring in a skeletally mature patient. Matrix calcification is absent, distinguishing GCT from cartilaginous tumours. In small-calibre bones such as the talus, metacarpal, or clavicle, the compact geometry of the bone means the lesion may occupy its entire cross-section by the time of presentation, altering this classic eccentric appearance.[1,4,7]

MRI is the modality of choice for local staging and surgical planning. Signal characteristics are typically low to intermediate on T1-weighted sequences, reflecting replacement of marrow fat, and increased on fluid-sensitive T2 sequences. Enhancement occurs in the solid component after gadolinium administration. Areas of haemosiderin deposition from prior intratumoural haemorrhage produce foci of low T2 signal, a subtle but useful finding in narrowing the differential. Secondary aneurysmal bone cyst (ABC) formation, manifesting as fluid-fluid levels, occurs in up to 14% of GCTs; when present, biopsy must be directed at the solid component to obtain diagnostic tissue. MRI was pivotal in our series in two specific respects: first, in distinguishing the Grade II talar lesion (Case 1, no soft tissue extension) from the Grade III lesion (Case 2, confirmed soft tissue mass), which directly determined whether joint-preserving surgery was feasible; and second, in Case 4, in demonstrating intact articular surface in a Grade III distal tibial lesion, justifying curettage over resection.[1,4,7]

CT contributes primarily through superior delineation of cortical integrity, particularly at sites with complex three-dimensional anatomy. In Case 3 (fourth metacarpal), CT confirmed the extent of cortical destruction that was critical to the decision for ray amputation. In Case 5 (proximal femur with pathological fracture), CT defined the fracture configuration and confirmed the absence of intra-articular involvement, which influenced the choice of intralesional rather than resective surgery.

The differential diagnosis at unusual sites includes aneurysmal bone cyst, chondroblastoma, clear cell chondrosarcoma, tenosynovial giant cell tumour, and critically, giant cell-rich osteosarcoma. The last of these can be histologically deceptive, and its exclusion requires careful pathological assessment. At the clavicle in particular, the majority of primary bone tumours are malignant; the index of suspicion for malignancy is therefore higher and open biopsy prior to definitive surgery is strongly advisable, as was done in Case 7.[1,4,7]

### GCT of the Talus

GCT of the foot and ankle comprises less than 4% of all GCTs, with the talus being the most commonly affected tarsal bone. Its unique anatomy; the majority of its surface is covered by articular cartilage and it bears the full body weight without muscular insertion makes both adequate tumour excision and reconstruction demanding. Cases 1 and 2 in this series reflect the grade-dependent approach. The Grade II lesion with intact cortex in Case 1 was amenable to aggressive curettage and bone grafting, consistent with the principle that intralesional surgery provides adequate control for contained lesions. The Grade III lesion with cortical breach in Case 2 presented a different problem: curettage through a breached cortex in a weight-bearing bone carries a high risk of residual disease and structural failure. Talectomy with tibiocalcaneal arthrodesis sacrifices ankle motion but offers reliable oncological control and a stable, plantigrade foot for weight-bearing, an outcome that was confirmed in this case.

### GCT of the Metacarpal

Metacarpal GCTs are rare, comprising roughly 1-4% of all GCTs, and are among the most surgically challenging owing to the thin cortical shell, limited space for curettage, and the functional importance of hand anatomy. They tend to present at a more advanced stage than long-bone GCTs, frequently with cortical destruction already present. As documented by Averill et al. and later by Saikia et al., simple curettage in the hand carries a recurrence rate approaching 90% in some series far exceeding the 20-30% seen in long bones. Management options reported in the literature include wide excision with fibular strut reconstruction, metatarsal osteoarticular transfer, and ray amputation. Ray amputation, while the most functionally sacrificial approach, provides the most reliable oncological margin and patients particularly when the second or fifth ray remains intact adapt well functionally. In Case 3, the Grade III nature of the fourth metacarpal lesion with extensive cortical destruction made this the appropriate choice, and the outcome confirms the published experience.[9-11]

### GCT of the Distal Tibia

The distal tibia is a less common GCT location than the proximal tibia, but its periarticular position

means that management decisions must account carefully for the ankle joint. When the subchondral bone and articular surface remain intact as in Case 4, aggressive curettage with bone grafting can achieve effective local control while preserving ankle function, even in Grade III lesions. This is consistent with the broader principle that Campanacci grading, while important, should not be applied in isolation: MRI assessment of articular integrity is an equally critical determinant of whether joint-preserving surgery is feasible.

**GCT with Pathological Fracture**

Pathological fracture occurs in approximately one in five patients presenting with GCT, and its management is one of the more contested areas in the field. Van der Heijden et al. studied 48 fracture cases from a series of 422 GCT patients treated over nearly three decades and reported a local recurrence rate of 30% after curettage with adjuvants compared to 0% after en bloc resection, while noting that the complication rate was substantially lower in the curettage group (4% versus 16%). Their analysis concluded that curettage with adjuvants remains a reasonable option for pathological fractures without soft tissue extension, and that resection should be reserved for cases with soft tissue involvement, fracture through a recurrent lesion, or inability to restore structural integrity.

Case 5 in this series illustrates this approach. The pathological fracture through the proximal femoral GCT occurred without extensive soft tissue involvement and without intra-articular extension. Extended curettage with phenolisation, PMMA cement filling, and dynamic hip screw fixation achieved both tumour clearance and fracture stabilisation. The fracture united satisfactorily and hip function was preserved. None of the other cases in this series presented with a pathological fracture, though the risk is always present in periarticular GCTs where the subchondral bone may be significantly compromised prior to diagnosis.[12]

**Pulmonary Metastasis in GCT**

Although GCT is classified as a benign tumour, pulmonary metastasis is a well-recognised phenomenon, reported in 1-6% of cases. These benign pulmonary implants arise from haematogenous seeding, most often after surgical manipulation of the primary tumour, and are histologically indistinguishable from the primary bone lesion. They contain the same mononuclear stromal cells and multinucleated giant cells without features of malignant transformation. Most follow an indolent clinical course and do not necessarily require immediate intervention. Where lesions are resectable, surgical excision is generally recommended; non-resectable lesions can often be monitored with interval imaging, as they may remain stable or even regress spontaneously. Denosumab, the RANK-L inhibitor that has demonstrated efficacy in the primary tumour setting, has also been used in the management of progressive pulmonary GCT metastases.[13]

Case 6 in this series demonstrates the discovery of pulmonary metastases on PET-CT performed at the time of recurrence, four years after initial treatment. Channappa et al. described a comparable scenario; a recurrent tibial GCT that underwent malignant transformation over six years, with concurrent non-transformed pulmonary metastases ultimately necessitating above-knee amputation. Their report underscores the importance of long-term surveillance for all GCT patients, particularly those with recurrent disease or repeated surgical intervention. In Case 6, the pulmonary nodules were detected concurrently with the recurrent local disease, and the overall disease burden ultimately necessitated above-knee amputation.[13]

**GCT of the Clavicle**

The clavicle is a rare site for any primary bone tumour, with an overall incidence of 0.45–1.01% of all bone tumours. Crucially, the oncological pattern of the clavicle resembles that of flat bones rather than long bones: the majority of primary clavicular bone tumours are malignant, and benign lesions are uncommon. Fewer than 20 cases of clavicular GCT have been reported in the world literature over the past four decades, making it one of the rarest presentations of an already uncommon tumour. This rarity, combined with the predominance of malignant tumours at this site, means that the diagnostic threshold for biopsy prior to definitive surgery must be low. The radiological appearances, i.e, lytic change with ballooning of the cortex may be indistinguishable from a low-grade malignancy, and PET-CT or bone scintigraphy, while useful for staging, does not reliably differentiate GCT from malignant lesions at this site.[5,6]

Case 7 illustrates the diagnostic and surgical challenges. The MRI findings were consistent with GCT, but the predominance of malignant tumours at the clavicle mandated histopathological confirmation via fine needle aspiration cytology before any definitive procedure. Once the diagnosis was confirmed, the clavicle was treated as an expendable bone. En bloc excision of the lateral end with approximately 3 cm of healthy bone margin, without reconstruction, was performed. Nagano et al. reported a similar strategy and noted full maintenance of shoulder range of motion without disproportion following partial claviculectomy. The rationale for preferring resection over curettage in this location is twofold: first, the proximity of the subclavian vessels makes re-operation after curettage and potential recurrence technically hazardous; and second, curettage margins in a ballooned, thin-cortex bone are inherently less reliable. The functional outcome in our case supports this approach.[5,6]

**Individualised Management**

Across all seven cases, the consistent theme is the inadequacy of a single surgical algorithm. The same tumour type at the same site behaved differently

depending on grade (Cases 1 and 2, both talar GCTs), and the same grade at different sites required entirely different operations (Cases 3, 4, 5, and 7, all Grade III lesions). Surgical decision-making must integrate Campanacci grade, site-specific anatomy, cortical integrity, articular surface status, proximity to neurovascular structures, functional consequence of each option, and the individual patient's age and functional demands. Adjuvant therapies including denosumab are increasingly relevant in the neoadjuvant and adjuvant setting, particularly for unresectable, recurrent, or metastatic disease, though none of the cases in this series required systemic treatment.

## CONCLUSION

Giant cell tumour of bone arising at uncommon anatomical locations represents a clinically and surgically heterogeneous group of lesions. Our series of seven cases highlights the importance of individualised management based not only on Campanacci grade, but also on anatomical constraints, cortical integrity, articular involvement, functional demands, and the potential consequences of recurrence.

The cases demonstrate that similar radiological grades may require markedly different surgical strategies depending on the site involved. While contained lesions could be managed successfully with extended curettage and reconstruction, more aggressive disease in anatomically constrained locations such as the talus, metacarpal, and clavicle often required definitive procedures to achieve durable local control. Uncommon clinical presentations, including pathological fracture and benign pulmonary metastasis, further emphasise the need for treatment strategies tailored to tumour behaviour rather than a uniform surgical algorithm.

Careful imaging evaluation, histopathological confirmation, and site-specific surgical planning remain central to achieving disease control while preserving function. Although limited by its retrospective design and small sample size, this series adds to the existing literature on rare presentations of GCT and underscores the importance of long-term surveillance given the risks of local recurrence, pulmonary metastasis, and, rarely, malignant transformation.

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