Indian Journal of Orthopaedics Surgery 2024;10(3):289–293

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Indian Journal of Orthopaedics Surgery

Journal homepage: https://www.ijos.co.in/

Case Report

Giant cell tumor of distal femur with pathological fracture: A case report

Harsh Kapil Jogi[1]*, Vikas Anandrao Atram[1], Himanshu Pradeep Ganwir[1], Abhishek Chandrashekhar Golhar[1], Saurabh Satyanarayan Kunwar[1], Meet Ajay Mehta[1]

[1]*Dept. of Orthopaedics, Indira Gandhi Government Medical College & Hospital, Nagpur, Maharashtra, India*

ARTICLE INFO

Article history:
Received 23-04-2024
Accepted 30-04-2024
Available online 04-09-2024

Keywords:
Giant cell tumor
Pathological fracture
Distal femur
Bone grafting

ABSTRACT

Giant cell tumors (GCT) are benign tumors with potential for aggressive behaviour and capacity to metastasize. Although rarely lethal, benign bone tumors may be associated with a substantial disturbance of the local bony architecture that can be particularly troublesome in peri-articular locations. It is characterized by a proliferation of mononuclear stromal cells and the presence of many multi- nucleated giant cells with homogenous distribution.

There is no widely held consensus regarding the ideal treatment method selection. There are advocates of varying surgical techniques ranging from intra-lesional curettage to wide resection. Although GCT is classified as a benign lesion, few patients develop progressive lung metastases with poor outcomes. Treatment is mainly surgical. Options of chemotherapy and radiotherapy are reserved for selected cases.

A case of giant cell tumor of distal femur with pathological fracture is reported here. A 39 yr old male with h/o trivial trauma presented with swelling and tenderness over Left thigh and knee. A detailed work up was done and a GCT of distal femur (causing pathological fracture) was confirmed. Patient was managed with surgery in which Tumor excision, curettage and bone grafting was done, and the fracture fixed with locking compression plate. After 6 months of follow up, fracture was well united with no radiological sign of recurrence of tumor.

1. Introduction

The giant cell tumor of bone (GCTB), also known as an osteoclastoma or a myeloid sarcoma, is a benign local aggressive osteolytic neoplasm that primarily affects skeletally mature young adults. These usually arise in the metaphysis and extend into the epiphysis of long bones. While most GCTB are benign, they rarely metastasize to the lungs. Clinically their behaviour can be unpredictable. A histopathological examination is needed to confirm the diagnosis. Imaging of the primary site with plain X Ray films, CT scan and MRI is the recommended diagnostic approach. A chest CT or chest X-ray is also recommended to evaluate for metastases to the lungs. Treatment is usually curettage with wide resection, which has a good prognosis. Only curettage was the mainstay of treatment for GCT, particularly for grades 1 and 2, but it was associated with a high recurrence rate (35-40%).[1–4] To reduce recurrence, adjuvants such as bone cement, phenol, hydrogen peroxide (H2O2), cryosurgery, and argon beam are used. To reduce the risk of local recurrence, systemic treatments such as bisphosphonates, interferon alpha (IFN-a), and denosumab can be used.[4]

Grade 3 patients are primarily treated with en bloc resection and reconstruction. Other reconstruction methods, such as CC screws and steinmann pins, are available, but

* *Corresponding author*.
E-mail address: harshjogi10@gmail.com (H. K. Jogi).

https://doi.org/10.18231/j.ijos.2024.046

plating provides greater stability and stiffness.

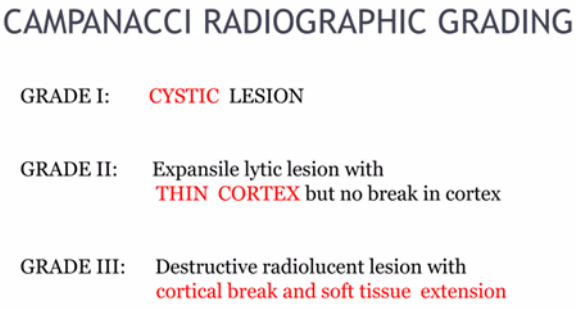

Figure 1: Campanacci radiographic grading (Image Sources)[5]

Rarely GCT can undergo malignant transformation. These may be primary or secondary. Malignant GCT has a poor prognosis.

A giant cell tumor of bone is a relatively rare neoplasm, accounting for approximately 3 to 5% of all primary bone tumors. It generally affects young adults, with peak incidences in the 2^{nd} and 3^{rd} decade, mildly more prominent in females. Risk factors are not fully understood, but there are increased incidents in patients with Paget disease, typically developing in the pelvic or skull bones. These patients will have abnormal laboratory values that manifest as elevated alkaline phosphatase levels. GCTB usually occur as a single lesion that most commonly affects the distal femur and proximal tibia (50 to 65%), followed by the distal radius, sacrum, and vertebral body.

The pathophysiology is not entirely understood but is thought to be caused by the RANK/RANKL signalling pathway overexpression by osteoblast-like mononuclear stromal cells. This overexpression results in the transformation of monocytic pre-osteoclast cells to osteoclast cells. These osteoclasts start absorbing the bone resulting in osteolysis seen with these tumours.[6]

2. Case Presentation

A 39 yr old male presented with history of trivial trauma due to fall at home that caused pain over his Left knee. Patient had progressively increasing swelling over his left knee since 2 months, that was not associated with pain or tenderness. But after the fall, the patient presented with massive increase in swelling and tenderness, with Range of motion being painful and severely restricted.

On clinical examination, patient has tenderness, swelling over the anterolateral aspect of the distal femur and knee. Swelling was well-defined, smooth, firm and uniform in consistency with dimensions of 6*5*5cm, and associated with crepitus. Knee movements were restricted. Normal capillary circulation was present. Paraesthesia was not noted. There was no local rise of temperature, overlying skin condition was good. No lymphadenopathy seen and the rest of the general examination was within normal limits.

2.1. Radiological examination

Initially we had done x-ray of the left thigh and knee-anteroposterior and lateral views that showed fracture of the distal femur and an eccentric osteolytic lesion that passed through the fracture site (anterolateral part of distal femur). MRI of the left knee was done that showed a well defined juxta articular eccentric osteolytic altered signal intensity lesion with narrow zone of transition in distal epiphysio-metaphyseal region of femur suggestive of neoplastic etiology- possible GCT. CT scan was also done to check for intra articular extension of the fracture, and the fracture was not found to invade the joint.

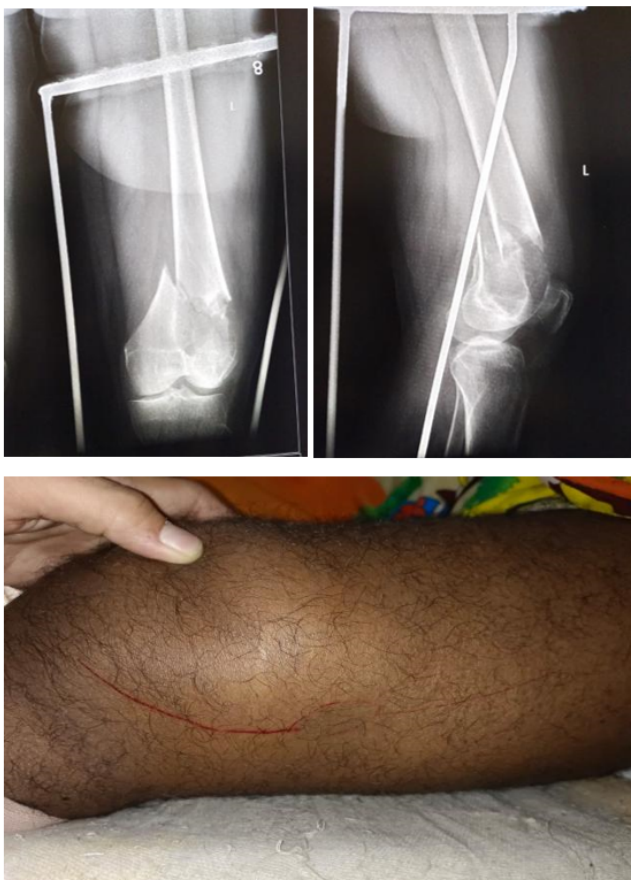

Figure 2: Pre op x-rays and pre op clinical images

2.2. Patient workup

This patient had h/o CVA 1 year ago and was a k/c/o Hypertension since 1 year and was on medications for the same.

His routine blood investigations were within normal limits. Clopidogrel was stopped 7 days prior to surgery.

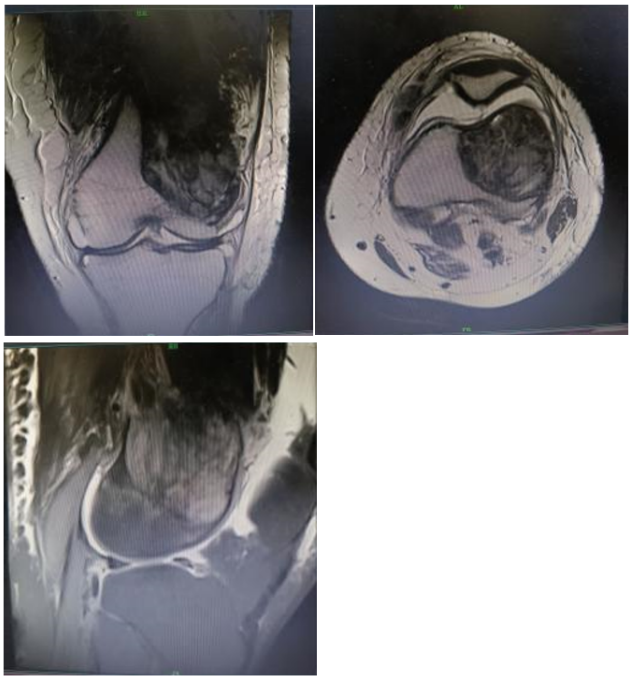

Figure 3: MRI images of left knee

CECT A+P+T was done which showed no evidence of any secondary tumour or metastasis.

On FNAC of the lesion, it showed giant multinuclear cells, pointing towards GCT.

After fitness was done, patient was posted for surgery in which excision of the tumour was done, the gap filled with bone graft and hydroxyapatite granules and the fracture reduced and fixed with distal femur locking compression plate.

A curvilinear incision was taken starting from lateral femoral epicondyle and extending proximally about 20cm along the femoral shaft. Deep fascia of the thigh incised in line with its fibres. Vastus lateralis muscle identified under fascia lata and the muscle followed posteriorly till the lateral intermuscular septum. Muscle anteriorly reflected and dissection done between the muscle and the septum, till the linea aspera of the femur reached. Tumour identified and excised enmass, curettage done and the gap filled with iliac bone graft and hydroxyapatite granules. Knee joint line evaluated and amount of comminution identified. Fracture fragments reduced and provisionally fixed with k wires. Distal femur locking compression plate of 9 holes placed over lateral surface of distal femur and fixed with screws of appropriate size. Fracture fixation confirmed under C arm. Closure done in layers. Skin closed with stapler and sterile dressing given.

The tumour excised was collected and sent for histopathology and CBNAAT. CBNAAT came out to be negative whereas histopathology confirmed the presence of giant cell tumour.

Figure 4: Intra operative images

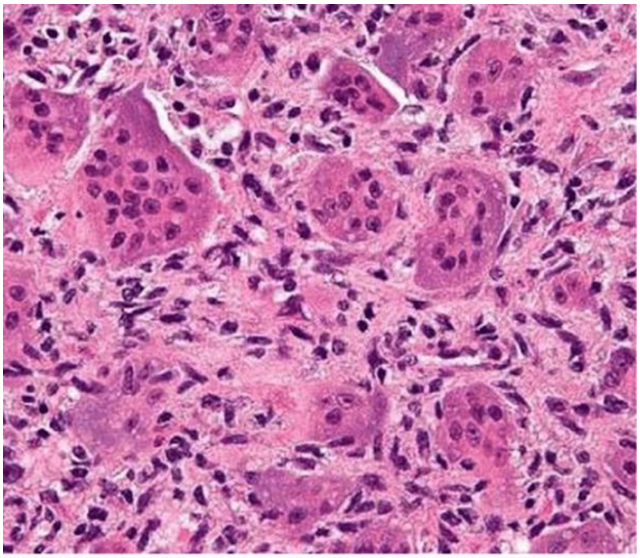

Figure 5: Histopathology

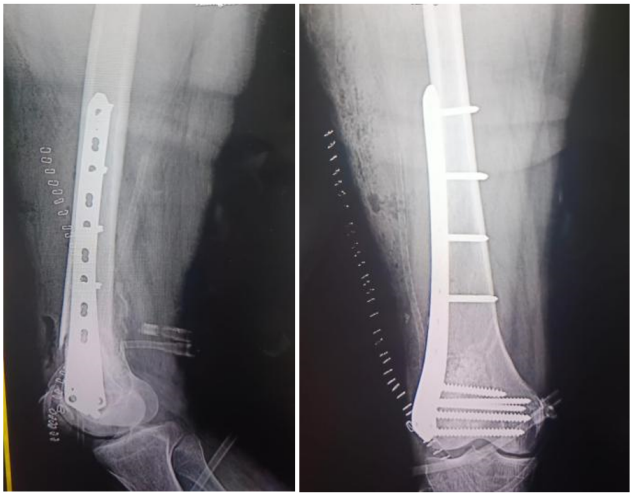

Figure 6: Immediate post op x-rays

Patient was given i.v. antibiotics for 3 days and check dressing was done on post op day 3 and patient was discharged on post op day 5 on oral antibiotics.

Sutures were healthy and were removed on post op day 14. Patient was followed up on 1 month, 3 months and 6 months post op, and evaluated clinically and radiologically with serial x-ray.

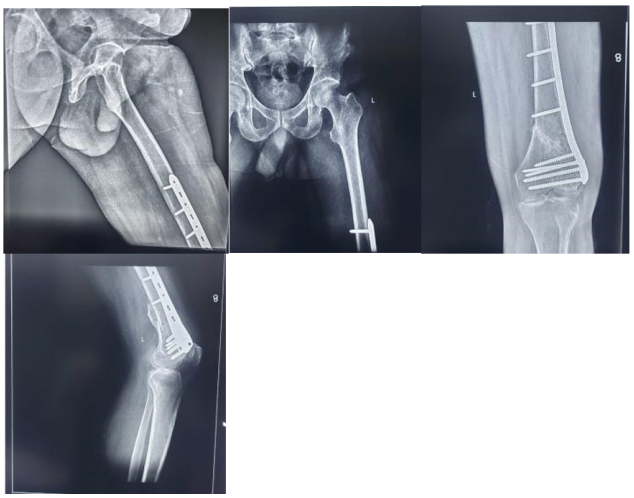

Figure 7: Follow up x-rays- 3 months

3. Discussion

The case presented to the hospital with pathological fracture of distal femur. A detailed work up was done and GCT of distal femur was diagnosed. Patient was managed with surgery in which tumor excision, curettage, and bone grafting was done and the fracture was fixed with locking compression plate in the same sitting.

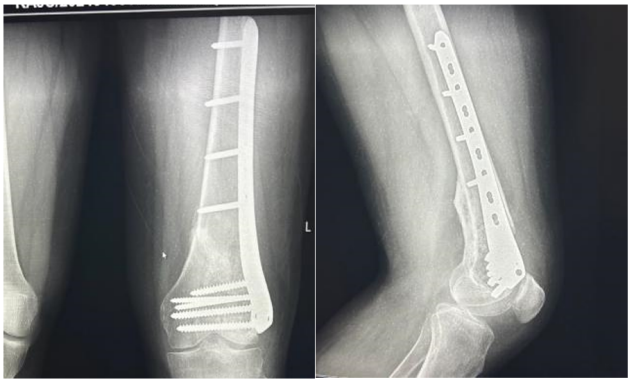

Figure 8: Follow up x-rays- 6 months

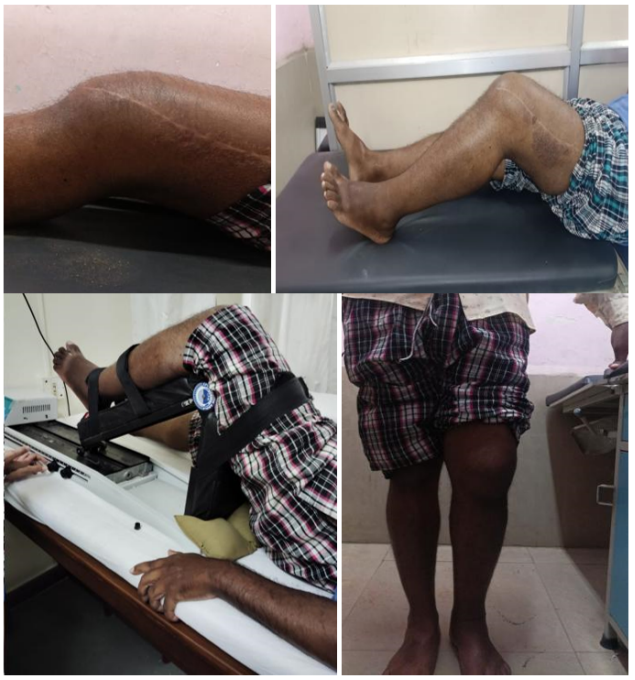

Figure 9: Follow up clinical images

In 2019 retrospective cohort by Obada Hasan et al., he highlighted the factors that caused recurrence in GCT of bone, in which higher grades of tumor and extra-compartmental extension of tumor were few of the factors.[7]

In 2023 case report by Shubham Prakashrao Vaidya et al., he highlighted the importance of iatrogenic fracture and the need of pre operative planning. In a patient of GCT of distal femur, who was taken for excision and curettage surgery, iatrogenic fracture of distal femur occurred intra operatively while handling the limb, which was fixed with distal femur plate in second sitting due to unavailability of implant during the initial surgery.[8]

Our patient was followed up at 1 month, 3 months and 6 months post-operatively. Clinically and radiologically there were no signs of recurrence of the tumor at 6 months. The

patient has been started knee ROM on CPM machine to increase his knee flexion. The patient is able to carry out his routines.

4. Conclusion

Giant cell tumor of bone is a relatively benign tumor with potential to recur and metastasize. This patient had a pathological distal femur fracture (due to GCT) for which excision, curettage, bone grafting and plate fixation was done. The patient was followed up for 6 months post surgery, and evaluated. There was no sign of recurrence of tumor clinically or radiologically. The fracture united well which is evident on the follow up x-ray. The patient is able to flex his knee upto 50 degrees actively and passively with CPM machine upto 100 degrees. Also, the patient is able to bear weight and is able to carry out his daily activities.

5. Sources of Funding

None.

6. Conflict of Interest

None.

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Author biography

Harsh Kapil Jogi, Junior Resident https://orcid.org/0009-0000-7902-7684

Vikas Anandrao Atram, Associate Professor

Himanshu Pradeep Ganwir, Assistant Professor

Abhishek Chandrashekhar Golhar, Senior Resident

Saurabh Satyanarayan Kunwar, Junior Resident

Meet Ajay Mehta, Junior Resident

Cite this article: Jogi HK, Atram VA, Ganwir HP, Golhar AC, Kunwar SS, Mehta MA. Giant cell tumor of distal femur with pathological fracture: A case report. *Indian J Orthop Surg* 2024;10(3):289-293.