

Case Report

Limb salvage with wide resection and endoprosthetic reconstruction for giant cell tumour of proximal tibia: a case report

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ABSTRACT

Giant Cell Tumour of Bone (GCT) is a locally aggressive benign bone tumour commonly affecting the epiphyseal region of long bones in skeletally mature individuals. The proximal tibia is among the most frequently involved sites. Surgical management becomes challenging when the tumour extends into surrounding soft tissues and requires wide excision with reconstruction. A 41-year-old female presented with pain, swelling around the left knee joint, and difficulty in weight bearing for three months without a history of trauma. Clinical examination revealed swelling over the proximal tibia, tenderness, and painful restriction of terminal knee movements. Radiographs demonstrated a lytic lesion involving the proximal tibia, and MRI revealed a giant cell tumour with posterior extension. The patient underwent wide resection of the proximal tibia with limb salvage reconstruction using a proximal tibial endoprosthesis. Histopathological examination confirmed the diagnosis of giant cell tumour. Postoperative recovery was uneventful. Limb salvage with endoprosthetic reconstruction provided stable knee joint function and adequate oncological clearance. Wide excision with endoprosthetic reconstruction is an effective treatment option for giant cell tumours of the proximal tibia with extraosseous extension, providing both tumour control and functional limb preservation.

Keywords: Giant cell tumour, Proximal tibia, Limb salvage surgery, Endoprosthesis, Knee reconstruction

INTRODUCTION

Giant cell tumour of bone (GCT) of bone is a benign but locally aggressive primary bone tumour that commonly affects skeletally mature individuals, typically in the third to fourth decade of life, with a predilection for the epiphyseo-metaphyseal region of long bones around the knee.¹ The proximal tibia is one of the most frequently involved sites and presents unique challenges due to its subarticular location, thin soft tissue coverage, and critical role in weight-bearing across the knee joint.² Although histologically benign, GCT exhibits aggressive biological behaviour characterized by cortical destruction, local invasion, and a significant risk of recurrence.³ Various

surgical modalities have been described for the management of GCT, with the primary goal being complete tumour removal while preserving joint function.⁴ Extended intralesional curettage with the use of high-speed burrs and adjuvant agents such as phenol, hydrogen peroxide, and polymethylmethacrylate (PMMA) cement remains the standard treatment for most Campanacci grade I and II lesions.⁵ Reconstruction following curettage using techniques such as the sandwich technique, bone grafting beneath the subchondral bone, and cement augmentation with internal fixation has shown good functional outcomes in proximal tibial lesions.⁶ Despite advances in intralesional surgery, recurrence remains a significant concern, particularly in tumours

around the knee joint.⁷ Factors such as cortical breach, soft tissue extension, and inadequate curettage contribute to higher recurrence rates.⁸ In cases with extensive bone loss, recurrent disease, or pathological fractures, more radical procedures such as wide resection and limb salvage reconstruction using custom or modular mega-prostheses may be required.⁹ Adjuncts in the management of GCT have also evolved, with denosumab emerging as a useful option in selected cases, particularly in advanced, recurrent, or unresectable tumours, by reducing tumour burden and facilitating surgical management.¹⁰ Although GCT most commonly involves long bones, rare presentations in locations such as the spine have also been reported, where diagnosis and management become more complex due to anatomical constraints and potential neurological involvement.¹¹ Overall, management of proximal tibial GCT requires an individualized, multidisciplinary approach to achieve optimal oncological control and functional outcomes.¹²

CASE REPORT

A 41-year-old female presented to the orthopaedic outpatient department with complaints of pain and swelling around the left knee joint associated with difficulty in weight bearing for three months. There was no history of trauma, fever, or systemic illness. On clinical examination, swelling was noted over the proximal aspect of the left tibia. There was no local rise in temperature. Tenderness was present over the proximal tibia. The range of motion of the left knee joint was painful and terminally restricted.



Figure 1: Clinical swelling photo.

Plain radiographs of the left knee revealed a lytic lesion involving the proximal tibia suggestive of an aggressive bone lesion. MRI of the left knee demonstrated features consistent with a giant cell tumour of the proximal tibia with posterior extension into adjacent soft tissues. Considering the extent of the lesion, the patient was planned for wide excision of the tumour with limb salvage reconstruction.



Figure 2: Pre-op X-ray AP.



Figure 3: Pre-op X-ray lateral.

Surgical procedure

A longitudinal midline incision extending approximately 4-5 cm above and 4-5 cm below the knee joint was made. Careful dissection was carried out to expose the tumour. The posterior vascular pedicle was carefully dissected and preserved.

After separation of the giant cell tumour from surrounding soft tissue attachments, the tibia was osteotomized approximately 5 cm distal to the inferior margin of the tumour. The tumour-bearing segment of the proximal tibia was excised en bloc and sent for histopathological examination. Reconstruction was performed using a proximal tibial endoprosthesis. The tibial canal was reamed up to size 11. The distal femur was prepared with a box cut and freshening of the bone surface. Trial components were placed to assess alignment and stability.

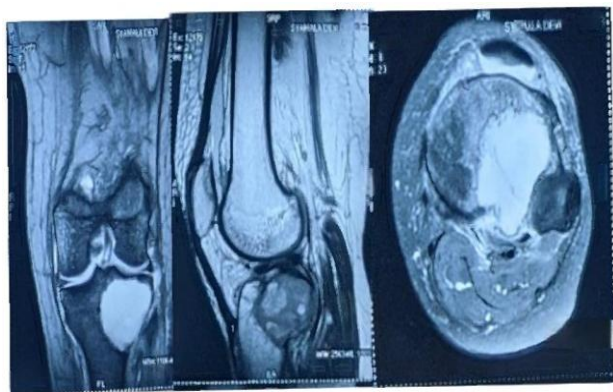


Figure 4: MRI scan.

The final prosthetic components consisted of femoral component size 11 with ring, proximal tibial component size 11 10×110 mm collar stem cemented into the tibia using bone cement the patellar tendon was sutured to the tibial component to restore extensor mechanism function. The wound was closed in layers after adequate histopathology.



Figure 5: Intra-op tumour exposure.



Figure 6: Excised specimen.

Histopathological examination of the excised specimen confirmed the diagnosis of giant cell tumour of bone,

characterized by numerous multinucleated giant cells dispersed among mononuclear stromal cells.



Figure 7: Prosthesis insertion.



Figure 8 (A and B): post-op X-ray.

DISCUSSION

Giant cell tumour (GCT) of bone is a benign but locally aggressive primary bone tumour characterized by proliferation of mononuclear stromal cells and osteoclast-like multinucleated giant cells.¹¹ It typically affects skeletally mature individuals in the third to fifth decades of life with a slight female predominance.² The tumour most commonly arises in the epiphyseal region of long bones, with a strong predilection for the distal femur and proximal tibia around the knee joint.³

Clinically, patients usually present with insidious onset of pain, swelling, and restriction of joint movements.⁴ In advanced disease, cortical destruction with soft-tissue extension may lead to joint instability, functional impairment, and difficulty in weight-bearing.⁵ Radiologically, GCT appears as an eccentric, expansile, lytic lesion involving the epiphysis with cortical thinning and absence of mineralized matrix.⁶ MRI plays a key role in delineating intraosseous extent, soft-tissue involvement, and articular cartilage status, thereby guiding surgical planning.⁷

The primary goal of management is complete tumour removal while preserving joint function whenever feasible.⁸

Extended intralesional curettage with the use of high-speed burrs and local adjuvants such as phenol, hydrogen peroxide, and polymethylmethacrylate (PMMA) cement is the standard treatment for most Campanacci grade I and II lesions.⁹ Reconstruction following curettage using techniques such as the sandwich technique, subchondral bone grafting, and cement augmentation with internal fixation has shown good functional outcomes, particularly in proximal tibial lesions.¹⁰

Despite advances in intralesional surgery, recurrence remains a significant concern, with reported rates ranging from 10% to 25%.¹¹ Recurrence is more common in lesions with cortical breach, soft-tissue extension, or inadequate initial curettage.¹² In such aggressive or recurrent cases, wide excision may be required to achieve adequate oncological control.¹³

Wide resection, however, results in substantial bone loss and necessitates reconstruction for limb salvage.¹⁴ Endoprosthetic reconstruction has emerged as an effective option following resection of aggressive periarticular GCTs, particularly around the knee joint, as it allows immediate stability and early mobilization.¹⁵ Reconstruction of the proximal tibia requires special attention to restoration of the extensor mechanism, which is critical for achieving satisfactory functional outcomes.¹

Adjunctive therapies have expanded treatment options in recent years, with denosumab showing effectiveness in reducing tumour size and facilitating surgery in selected advanced cases.² However, surgical excision remains the definitive treatment in most cases.³ In the present case, the patient presented with an aggressive proximal tibial GCT with posterior soft-tissue extension. Considering the extent of disease, wide excision followed by proximal tibial endoprosthetic reconstruction was performed, allowing adequate oncological clearance and functional limb preservation. Postoperatively, the patient achieved stable knee reconstruction with satisfactory early functional recovery. Overall, management of aggressive proximal tibial GCT requires individualized planning, balancing oncological safety with functional preservation. Wide resection with endoprosthetic reconstruction remains a reliable limb salvage option in selected cases with extensive local disease.⁴⁻⁶

CONCLUSION

Giant cell tumor of the proximal tibia can be effectively managed with wide excision and limb salvage reconstruction when there is extensive bone destruction or soft tissue extension. Endoprosthetic reconstruction offers a reliable method for restoring knee function and enabling early rehabilitation while achieving adequate tumor clearance.

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