

Recurrent Giant Cell Tumor of the Distal Femur (Campanacci Grade III) Managed with Extended Curettage, Autologous Iliac Bone Graft, and Cementation: A Case Report and Review of Literature

R. K. Ambulgekar¹, Muzammil Quadri², Prabuddha B. Husale³

¹Professor and HOD, Department of Orthopaedics, Dr. SCGMC, Nanded

²Lecturer, Department of Orthopaedics, Dr. SCGMC, Nanded

³Junior Resident, Department of Orthopaedics, Dr. SCGMC, Nanded

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Corresponding Author: Dr. Prabuddha B. Husale

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Abstract:

Background: Giant cell tumor (GCT) of bone is benign but locally aggressive, with potential for recurrence, especially after prior surgery. Campanacci grade III lesions with cortical breach and soft tissue extension present challenges for joint preservation. Extended intralesional curettage combined with structural support using autologous bone graft and PMMA cement offers a limb-sparing alternative in select patients.

Case Presentation: We report a 36-year-old female with right knee pain and swelling following a trivial fall, with a history of prior curettage for distal femoral GCT two years earlier. Imaging revealed a recurrent Campanacci grade III lesion with cortical destruction and limited soft tissue extension. She underwent extended intralesional curettage, placement of autologous cancellous bone graft harvested from the contralateral iliac wing beneath the subchondral plate, and reconstruction with PMMA cement. At 12 months follow-up, she was pain-free, ambulating independently, had full functional range of motion, and radiographs demonstrated graft incorporation, stable cement, and no evidence of recurrence.

Conclusion: Recurrent Campanacci grade III distal femoral GCTs can be successfully managed with extended curettage, autologous bone grafting, and PMMA cementation. This approach preserves joint function, provides structural support, and allows early detection of recurrence, making it a viable limb-sparing option. Long-term follow-up is crucial due to the high recurrence potential.

Keywords: Recurrent giant cell tumor, distal femur, Campanacci grade III, extended curettage, autologous iliac bone graft, PMMA cement, joint preservation, musculoskeletal oncology.

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Introduction

Giant cell tumor of bone (GCTB) is a primary, benign but locally aggressive bone tumor accounting for 5–8% of all primary bone tumors and nearly 20% of benign tumors [1]. It most frequently affects skeletally mature adults aged 20–40 years and shows a slight female predominance [2]. Approximately 70% of lesions involve the distal femur, proximal tibia, or distal radius [3].

Histologically, GCT consists of multinucleated osteoclast-like giant cells dispersed within a mononuclear stromal cell background, which drives its local aggressiveness and propensity for recurrence [4]. While benign, recurrence rates following standard curettage range from 10% to 25%, and risk increases with incomplete excision, cortical breach, or previous surgery [5].

Treatment goals include local tumor control while preserving joint function. Standard approaches include intralesional curettage with or without

adjuvants, wide resection with endoprosthetic replacement, and, more recently, systemic therapy with denosumab for unresectable or recurrent cases [6,7]. Recurrent or Campanacci grade III lesions are traditionally considered for wide resection; however, extended curettage with structural augmentation is increasingly reported as a safe, joint-preserving alternative in selected patients [4,6].

We present a case of recurrent Campanacci grade III distal femoral GCT, following prior curettage, managed successfully with extended curettage, autologous iliac bone grafting, and PMMA cementation, with excellent functional outcome at 12 months.

Case Presentation

Clinical Findings: A 36-year-old female presented with insidious right knee pain and swelling

following a trivial fall at home. She had a history of prior curettage for distal femoral GCT at another hospital two years prior. Pain was dull, localized, activity-related, and partially relieved by rest. She denied fever, systemic illness, or weight loss.

On examination, a firm, tender swelling ($\sim 7 \times 6$ cm) was palpable over the anterolateral distal femur. Overlying skin was normal with mild local warmth. Knee flexion was restricted to 100° with discomfort at extremes. Ligamentous and neurovascular exams

were unremarkable. No signs of infection were noted.

Radiological Findings: Plain radiographs revealed an eccentric, expansile lytic lesion with cortical breach and irregularities consistent with prior surgery, extending into the subchondral region but sparing the articular surface (Figures 1a, 1b).

MRI demonstrated heterogeneous signal intensity with cortical disruption, minimal soft tissue extension, and largely preserved cartilage, consistent with Campanacci grade III recurrence.



Figure 1a: Preoperative AP radiograph showing recurrent lytic lesion with cortical breach and previous curettage changes



Figure 1b : Lateral radiograph confirming subchondral extension and extraosseous involvement.

Histopathology : Core needle biopsy confirmed recurrent GCT, showing numerous multinucleated giant cells evenly dispersed in a mononuclear stromal background, consistent with prior diagnosis.

Surgical Management : The patient underwent extended intralesional curettage under tourniquet control. A cortical window was created, and aggressive curettage with a high-speed burr was performed to remove tumor and scar tissue from the

previous surgery. The cavity was irrigated with hydrogen peroxide and treated with phenol as a local chemical adjuvant.

Autologous Iliac Bone Graft: Cancellous bone was harvested from the contralateral iliac wing and

placed beneath the subchondral plate to provide mechanical support and prevent articular collapse.

PMMA Cement Reconstruction: The remaining cavity was filled with polymethylmethacrylate cement to provide immediate structural stability and facilitate radiographic surveillance for recurrence.

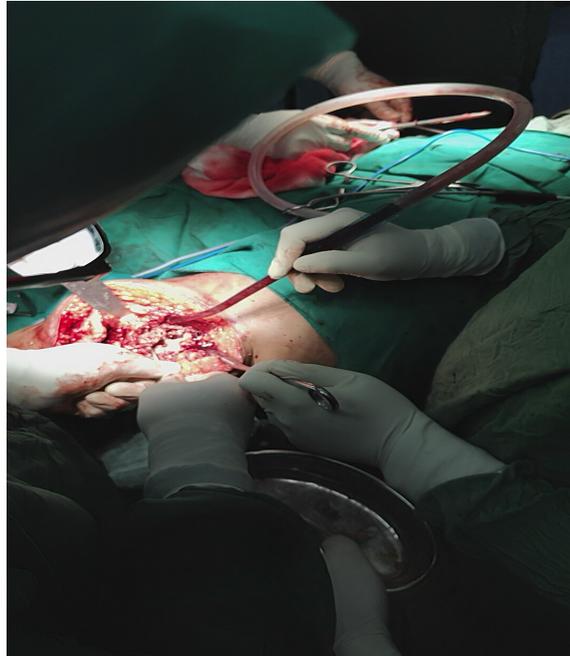


Figure 2a: Intraoperative image showing cortical window in distal femur.



Figure 2b ; Immediate postoperative AP radiograph showing defect following curettage of recurrent distal femoral GCT filled with PMMA bone cement and autologous cancellous bone graft.



Figure 2c : Immediate postoperative Lateral radiograph showing defect following curettage of recurrent distal femoral GCT filled with PMMA bone cement and autologous cancellous bone graft

Postoperative Care and Rehabilitation

- Early passive and active knee mobilization started on postoperative day 2.
- Quadriceps strengthening exercises were initiated immediately.
- Partial weight-bearing was allowed at 6 weeks, progressing to full weight-bearing at 10–12 weeks.
- Serial radiographs were obtained at 6 weeks, 3 months, 6 months, and 12 months to monitor

graft incorporation, cement stability, and recurrence.

Outcome

At 12 months, the patient:

- Was pain-free and ambulating independently.
- Achieved knee ROM of 0–110°.
- MSTS functional score: 27/30.

Table 1: Preoperative and Postoperative Outcome Summary

Parameter	Preoperative	Postoperative (12 months)
Knee ROM	0–100°	0–110°
Pain (VAS 0–10)	6	0
Swelling	Present	Absent
MSTS Score	18/30	27/30
Radiographic findings	Cortical breach, expansile lytic lesion	Graft incorporated, cement stable, no recurrence

Discussion

Campanacci grade III GCTs with prior surgery and recurrence present unique challenges due to altered anatomy, scar tissue, and high recurrence potential [1–3]. Traditional management often involves wide resection with endoprosthesis reconstruction, which sacrifices the native joint [2].

Extended Curettage and Joint Preservation:

- Aggressive curettage with high-speed burr and chemical adjuvants is effective in removing residual tumor cells, even in previously operated bones [4–6].

- Autologous cancellous iliac graft provides subchondral support, reducing risk of articular collapse and maintaining joint function [2,4].
- PMMA cement restores structural stability and enables radiographic monitoring for early recurrence [5].

Selection Criteria for Limb-Sparing Surgery in Recurrent Grade III Lesions:

- Limited soft tissue extension
- Preserved cartilage and ligamentous integrity
- No neurovascular involvement
- Patient preference for joint preservation [4,7]

Literature Evidence:

- O'Donnell et al. reported recurrence rates of ~25% after curettage and cementation [5].
- Klenke et al. identified inadequate curettage and lack of adjuvants as independent risk factors for recurrence [6].
- Balke et al. demonstrated that joint-preserving curettage with adjuvants achieves durable local control and excellent functional outcomes [4].

Our case highlights that meticulous extended curettage, subchondral grafting, and cementation can preserve joint function and maintain structural integrity even in recurrent grade III lesions. Long-term surveillance is critical due to persistent recurrence risk.

Conclusion

Recurrent Campanacci grade III distal femoral GCTs can be successfully managed with extended curettage, autologous iliac bone grafting, and PMMA cementation, achieving:

- Joint preservation
- Structural support
- Early detection of recurrence

Patient selection, meticulous surgical technique, and long-term follow-up are essential to optimize functional and oncological outcomes.

References

1. Jaffe HL, Lichtenstein L, Portis RB. Giant cell tumor of bone: Its pathologic appearance,

grading, supposed variants and treatment. *Arch Pathol.* 1940;30:993–1031.

2. Campanacci M, Baldini N, Boriani S, Sudanese A. Giant-cell tumor of bone. *J Bone Joint Surg Am.* 1987;69(1):106–14.
3. Turcotte RE. Giant cell tumor of bone. *Orthop Clin North Am.* 2006;37(1):35–51.
4. Balke M, Schremper L, Gebert C, Ahrens H, Streitbürger A, Köhler G, et al. Giant cell tumor of bone: Treatment and outcome of 214 cases. *J Cancer Res Clin Oncol.* 2008;134(9):969–78.
5. O'Donnell RJ, Springfield DS, Motwani HK, Ready JE, Gebhardt MC, Mankin HJ. Recurrence of giant-cell tumors of the long bones after curettage and packing with cement. *J Bone Joint Surg Am.* 1994;76(12):1827–33.
6. Klenke FM, Wenger DE, Inwards CY, Rose PS, Sim FH. Giant cell tumor of bone: Risk factors for recurrence. *Clin Orthop Relat Res.* 2011;469(2):591–9.
7. Saiz P, Virkus W, Piasecki P, Templeton A, Shott S, Gitelis S. Results of giant cell tumor of bone treated with intralesional excision. *Clin Orthop Relat Res.* 2004;(424):221–6.
8. Blackley HR, Wunder JS, Davis AM, White LM, Kandel R, Bell RS. Treatment of giant-cell tumors of long bones with curettage and bone-grafting. *J Bone Joint Surg Am.* 1999;81(6):811–20.
9. Algawahmed H, Turcotte R, Farrokhyar F, Ghert M. Adjuvant treatments for giant cell tumor of bone: Current status and future perspectives. *Curr Oncol Rep.* 2010;12(5):410–6.