

Management of a Giant Cell Tumor of the Calcaneus with High Speed Burring, Curettage, and Bone Cement Application: A Case Report

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STATEMENT OF PURPOSE

Giant cell tumors (GCT) of bone are locally aggressive benign tumors with a high recurrence rate after surgical resection.¹ The prevalence of GCT at atypical locations like the feet are seen in approximately 1% of cases.² This case report aims to assess the effect of high-speed burring, curettage, and polymethylmethacrylate (PMMA) bone cement application for the treatment of GCT of the calcaneus.

LITERATURE REVIEW

GCT is composed of mononuclear stromal cells and characteristic multinucleated giant cells that exhibit osteoclastic activity.³ A typical GCT is a lytic lesion with well-defined margins, with or without a sclerotic border. It is eccentric in location and frequently occurring at the meta-epiphyseal region of long bones (75%-90%).¹ The prevalence of GCT peaks during the third decade of life with only 13% of cases occurring in patients over the age of 50 years.³ Radio-graphs and contrast-enhanced magnetic resonance imaging (MRI) are imaging modalities of choice for diagnosis. Enneking and Campanacci classifications are helpful in planning surgical intervention.^{4,5}

The mainstay treatment for GCT stages 1 and 2 is intralesional surgery consisting of curettage and PMMA or allograft placement, with local recurrence rates reported as high as 52.6% for the foot and ankle bones.⁶ The estimated prevalence of pulmonary metastasis associated with GCT is approximately 2%-3%.⁷ To reduce the chance of GCT recurrence, various local adjuvants such as use of high velocity burr, alcohol, phenol, cryoablation with liquid nitrogen, and hydrogen peroxide can be utilized.^{2,7,8}



Fig. 1. Radiographs revealed expansile, lytic lesions within the calcaneus measuring approximately 4.9 x 3.3 x 3.7 cm.

CASE STUDY

A 61-year-old female presented with gradually worsening right foot and ankle pain for several years, and over the past two months she was unable to hike or jog. She described the pain as aching, sharp, and constant throughout the day. The pain was worse with activity and improved with rest, anti-inflammatory medications, and an ankle sleeve.

On physical exam, the patient had moderate swelling of the right ankle and lateral right foot and mild pain with direct compression of the right heel. Right foot radiographs demonstrated an expansile, septated lytic lesion with sclerotic margins in the right calcaneus (Fig. 1), and chest radiographs were negative for pulmonary metastasis. MRI showed an expansile solid lesion with cortical thinning and focal areas of extra-osseous extension (Fig. 2). Clinical exam and imaging were highly suggestive of giant cell tumor classified as Campanacci Grade 2.

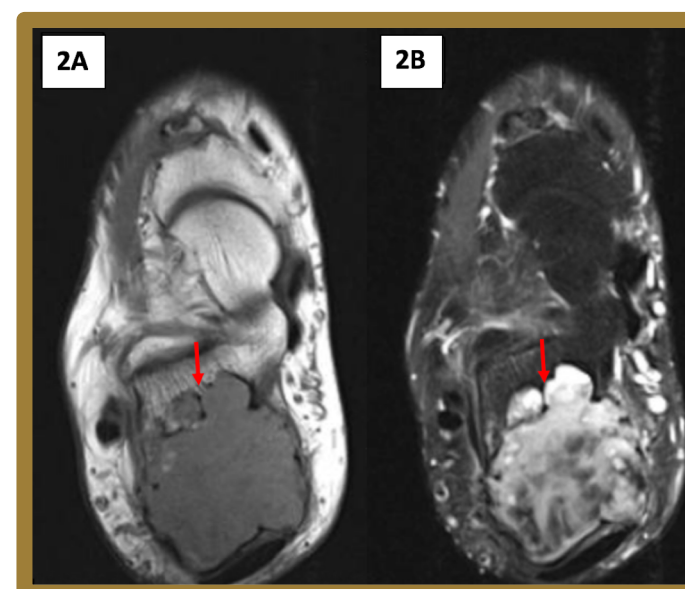


Fig. 2. MRI coronal images (A) T1 sequence-intermediate signal and (B) T2 sequence-predominant heterogeneous hyperintensity.

The GCT was extracted via curettage, and a 5-mm high velocity burr was used to remove bone septations until normal bone was visualized. Once the tumor was removed, the cavity was treated with phenol alternating with alcohol using a kittner. This was repeated three times, and then the defect was irrigated. Next, contrast dye was placed into the defect, and fluoroscopy verified complete resection of the tumor. Lastly, the PMMA was injected into the cavernous defect which then hardened.

Intraoperatively, the lesion was tan-brown and soft. Two pathology specimens, frozen and permanent, were sent for gross and histologic examination which confirmed the diagnosis of GCT of the calcaneus (Fig. 3).

CASE STUDY (CONTINUED)

Post-operatively, the patient was non-weightbearing for 3 weeks and progressed to full weightbearing at 6 weeks. She had foot and chest radiographs at 6 weeks, 3 months, and 12 months. At 12-month follow-up, clinical assessment and radiographs showed no evidence of local recurrence or pulmonary metastasis

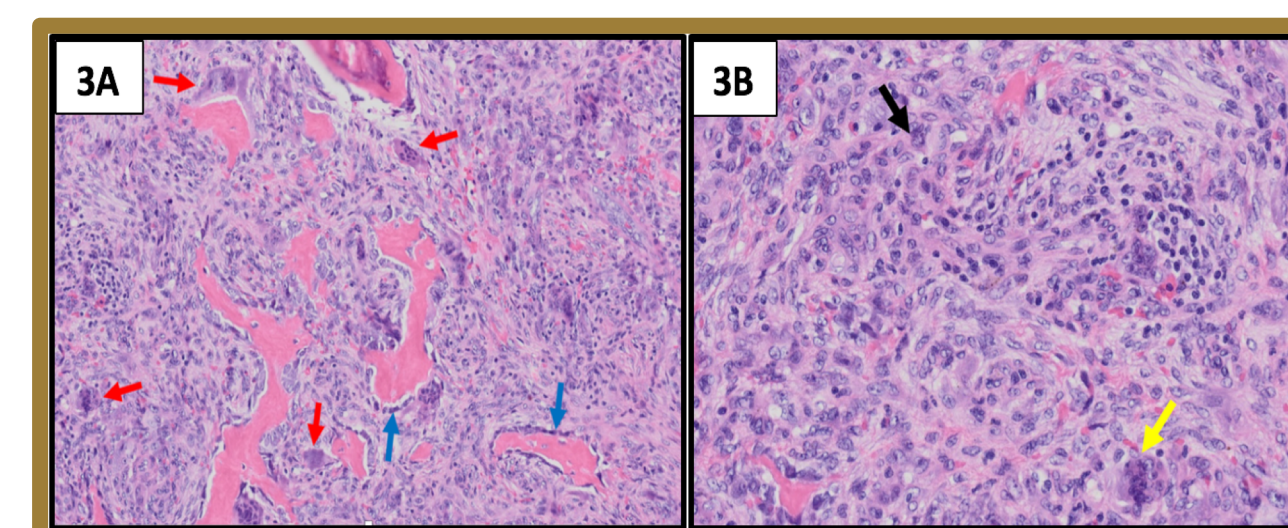


Fig. 3. Microscopic examination on (A) low power demonstrated evenly dispersed multinucleated giant cells (red arrows) and benign bone with surrounding reparative osteoblast collar (blue arrows). (B) High power is composed of osteoclast-like giant cells (yellow arrows) and mononuclear cells (black arrows).

ANALYSIS & DISCUSSION

Studies have shown GCT treated with curettage and bone cement has a lower recurrence rate than those treated only with curettage. In a multicentric study by Kivioja et al involving 294 patients, the recurrence rate was 20% for intralesional surgery with cement and 56% without cement.⁹ The lower recurrence rate for the cohort treated with cement may be due to its exothermic reaction during the setting process resulting in tumor necrosis 10-mm beyond the bone/cement interface.¹⁰

To further reduce the risk of GCT recurrence, local chemical adjuvants such as phenol and alcohol with high-speed burring can be employed in conjunction with curettage and cement placement.⁹ Phenol, alcohol, and high speed burring induces tumor necrosis resulting in removal of peritumoral bone. In a retrospective study for the treatment of GCT primarily of the long bones in the upper and lower extremities, Errani et al reported 12.5% recurrence in 64 patients treated with phenol, alcohol, curettage, burring, and bone cement or graft application, compared to 16% recurrence in 200 patients not treated with chemical adjuvants.¹¹

ANALYSIS & DISCUSSION (CONTINUED)

There is a low incidence of GCT of the calcaneus, and it is diagnosed with the use of imaging and histopathology examination. GCT surgical intervention is determined by its Enneking and Campanacci classification, as well as patients' goals. Intervening during early stages with curettage, high velocity burr, chemical adjuvant, and bone cement application has shown to reduce local recurrence. This case report demonstrates that this method of treatment is applicable for the treatment of GCT in the calcaneus.

Special Recognition

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