



Giant Cell Tumors of the Foot and Ankle Bones: High Recurrence Rates After Surgical Treatment



Rajiv Rajani, MD¹, Lindsay Schaefer, MD², Mark T. Scarborough, MD³, C. Parker Gibbs, MD³

¹ Assistant Professor, Department of Orthopaedics, University of Texas Health Sciences Center San Antonio, San Antonio, TX

² Resident, Department of Orthopaedics, University of Texas Health Sciences Center San Antonio, San Antonio, TX

³ Professor, Department of Orthopaedics and Rehabilitation, University of Florida, Gainesville, FL

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ABSTRACT

Giant cell tumor (GCT) of the bone is a benign primary bone tumor most often treated with intralesional surgery. Most cases occur around the knee; however, rarely, GCT of bone can occur in the foot and ankle. Limited data exist about the outcomes after treatment of GCT in this location. We retrospectively reviewed an orthopedic oncology database from 1970 to 2010 for cases of GCT of the bone, specifically within the foot and ankle bones. After exclusionary criteria were applied, a total of 19 disease sites in 18 patients were included for analysis. Of the 19 disease sites, 10 recurred. Patients, on average, required 1.7 operations per disease site. Of the 18 patients, 10 required ≥ 2 operations, 3 required ≥ 3 operations, and 1 required 4 operations. A total of 4 amputations were performed, including 2 below the knee amputations. Of the 10 patients with recurrence, 2 also had evidence of metastatic disease. The recurrence rates of GCT in the foot and ankle bones appear to be greatest after intralesional curettage without the use of cement. Although the recurrence rates are high, intralesional operations with multiple adjuvant therapy can eventually result in cure.

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Giant cell tumor (GCT) of the bone is a benign, primary bone tumor often occurring in skeletally mature individuals in the distal femur, proximal tibia, and distal radius (1). In these locations, depending on the disease severity, various treatments can be used. In most cases, intralesional procedures are performed, such as curettage through a large cortical window with the use of adjuvant therapy. Augmentation with bone graft or cement is also commonly performed to fill the subsequent bone void. The various adjuvant treatments used include high-speed burr, pulse lavage irrigation, phenol, polymethylmethacrylate, hydrogen peroxide, and argon gas laser (2–5). It has also been suggested that the use of multiple adjuvant treatments can lower the recurrence rate (6).

Primary bone tumors are rare in the foot and ankle, and GCT of the bone accounts for 20% of all bone tumors surgically treated in this area (7,8). Previous reports have combined both hand and foot GCT for analysis (9,10). In these analyses, the data have been conflicting about whether the risk of local recurrence in the foot and ankle is equal to or greater than that at other disease sites (10,11). The distal tibia and foot bones have a complicated anatomy that could make thorough curettage

of the tumor difficult while also preventing the local effect of an adjuvant treatment. It has been suggested that ray resection and amputations could be necessary for these areas; however, the data are unclear (11).

The purpose of our retrospective study was to determine the recurrence rate of GCTs of bone in the distal tibia and foot and identify potential prognostic factors that might be associated with an increased rate of recurrence.

Patients and Methods

From 1970 to 2010, 37 patients were identified who fit the criteria of having a GCT of the bone in the distal tibia or any foot bone. After institutional review board approval, a retrospective medical record review was performed to identify the details pertaining to the 37 patients. Of the 37 patients, 19 were excluded for a variety of reasons. Eight had incomplete records, including a lack of the specific adjuvant used, partial treatment at an outside facility, or an unclear pathologic diagnosis. Eleven were excluded because they had < 2 years of follow-up data available. After the exclusionary criteria were applied, 18 patients with foot and ankle GCTs and ≥ 2 years of follow-up data remained. Each medical record was reviewed for the operative records, follow-up radiographic and clinical examinations, and pathology records. Specifically, each patient's medical records were reviewed to assess for any signs of recurrence by clinical examination, radiographic examination, or pathologic diagnosis. The diagnoses

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Address correspondence to: Rajiv Rajani, MD, Department of Orthopaedics, University of Texas Health Sciences Center San Antonio, 8300 Floyd Curl Drive, 8th Floor, San Antonio, TX 78229.

E-mail address: Rajani@uthscsa.edu (R. Rajani).

were categorized from the pathology records, and the Enneking stage of disease was assessed using plain radiographic examinations. All pathologic findings were reviewed by a musculoskeletal-trained pathologist, with specific attention to discerning between GCT of the bone and giant cell reparative granuloma. Any case in which the pathologic findings were in doubt was excluded.

The data for the anatomic location, sex, age at diagnosis, interval to recurrence, type of surgery performed, adjuvant treatments used during surgery, disease stage, evidence of metastasis, and surgical margins were analyzed.

Results

During the course of nearly 40 years, 18 patients, with a total of 19 disease sites were identified to fit our selection criteria. Of the 18 patients, 11 were female and 7 were male. The average age at diagnosis was 26.1 years. A total of 33 operations was performed or 1.73 operations per disease site. Two patients underwent amputation as their primary treatment (below the knee amputation, ray resection). These 2 patients did not develop recurrence. Of the remaining 17 disease sites, all were initially treated with an intralesional procedure. Ten of these sites developed recurrence.

Of the 18 patients who underwent surgery, 10 required ≥ 2 operations, 3 required ≥ 3 , and 1 patient required 4 operations. All 18 patients were clear of local recurrence at 2 years after their most recent operation. Additional data are listed in Tables 1–5.

Operation Performed

Of the 33 operations performed on 18 patients, 11 were curettage and bone grafting, 12 were curettage and cementation with or

Table 1
First surgery details

Patient No.	First Surgery	First Margin	Adjuvant Therapy	Interval to Recurrence (y)
1	Curettage, bone graft	Intralesional	Irrigation	5.32
2	Fourth ray resection	Wide	None	—
3	Curettage, iliac crest bone graft	Intralesional	None	1.04
4	Curettage, bone graft	Intralesional	None	0.32
5	Curettage, cementation	Intralesional	Burr, irrigation	—
6	Curettage, cementation	Intralesional	Burr, irrigation	—
7	Curettage, bone graft	Intralesional	Burr, irrigation	—
8	Curettage, iliac crest bone graft	Intralesional	None	1.08
9	Curettage, cancellous bone graft	Intralesional	Irrigation, phenol	—
10	Curettage, bone graft	Intralesional	Burr, electrocautery, irrigation, phenol	—
11	Curettage, bone graft, cementation	Intralesional	Burr, irrigation	—
12	Curettage, bone graft, cementation	Intralesional	Argon, burr, irrigation	—
13	Curettage, bone graft	Intralesional	Irrigation	2.16
14	Curettage, bone graft	Intralesional	Burr, electrocautery, irrigation	0.72
15	Curettage, iliac crest bone graft	Intralesional	None	—
16	Right below the knee amputation	Wide	None	—
17	Curettage, excision of tibia, osteoarticular allograft	Intralesional	Burr, irrigation, phenol	1.16
18	Curettage, bone graft, cementation	Intralesional	Burr, irrigation	1
19	Curettage, cementation	Intralesional	Argon, burr, phenol	2.88

Table 2
Second surgery details

Patient No.	Second Surgery	Second Margin	Adjuvant Therapy	Interval to Recurrence (y)
1	Wide excision, ankle arthrodesis, resection of talus	Wide	None	—
2	—	—	—	—
3	En bloc wide excision, intercalary fibula autograft	Wide	None	—
4	Excision of tibia, ankle arthrodesis, iliac crest bone graft, vascular graft	Marginal	None	—
5	—	—	—	—
6	—	—	—	—
7	—	—	—	—
8	Resection of second metatarsal	Wide	Irrigation	0.64
9	—	—	—	—
10	—	—	—	—
11	—	—	—	—
12	Curettage, cementation	Intralesional	Argon, burr, irrigation	—
13	Right below the knee amputation	Wide	None	—
14	Resection distal tibia, fibula and talus, ankle arthrodesis	Marginal	Irrigation	3.24
15	—	—	—	—
16	Curettage, cementation	Intralesional	Burr, phenol	—
17	Curettage, cementation	Intralesional	Burr, irrigation	1
18	Curettage, cementation	Intralesional	Argon, burr, phenol	—

without bone grafting, 2 were below the knee amputations, and 8 were wide or marginal excisions of the masses.

Of the original 19 disease sites, 1 was treated with a below the knee amputation as the primary treatment and 1 was treated with a ray resection. All other primary operations were intralesional. Of the 17 patients who had undergone intralesional procedures, 10 developed a recurrence.

For the second procedure, 6 of the procedures were wide or marginal resections and only 4 were intralesional curettage. Of the 6 treated with wide or marginal second procedures, 2 recurred. Only 1 of the 4 intralesional cases recurred. Of the 10 treated with marginal

Table 3
Third surgery details

Patient No.	Third Surgery	Third Margin	Adjuvant Therapy	Interval to Recurrence (y)
1	—	—	—	—
2	—	—	—	—
3	—	—	—	—
4	—	—	—	—
5	—	—	—	—
6	—	—	—	—
7	—	—	—	—
8	Resection of second toe	Wide	None	—
9	—	—	—	—
10	—	—	—	—
11	—	—	—	—
12	—	—	—	—
13	—	—	—	—
14	Excision of soft tissue mass	Marginal	Irrigation	—
15	—	—	—	—
16	—	—	—	—
17	Curettage, bone graft, cementation	Intralesional	Burr, irrigation	1.72
18	—	—	—	—

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