CHAPTER **51**

RECURRENT GIANT-CELL TUMOR OF THE FIRST METATARSAL

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A 41-year-old black female presented to the author's office with complaints of pain, swelling and progressive enlargement of the left foot. The patient had recently relocated from Buffalo to the New York City area, and related walking more than she was generally accustomed to. The pain was at times severe, making it difficult to walk. Cold and rainy weather exacerbated pain in her foot. She remembered having her left foot caught in bicycle spokes at age seven, but sought no professional treatment.

The patient worked as a bank examiner, and denied any significant medical illness. She had a previous tonsillectomy, appendectomy, and total abdominal hysterectomy. She did not take any medication, and there was a family history of arthritis.

On physical examination, the left foot was noted to be abnormally shaped especially over the medial aspect of the first metatarsal and first metatarsal-cuneiform joint area. The left foot was warm to touch and there was +1 edema. There was discomfort to palpation over the first metatarsal bone. The patient was able to stand and walk, however, with considerable discomfort and a limp. Range of motion at the first metatarsophalangeal joint was full and unrestricted without any crepitus or joint pain. Similar findings were noted at the first metatarsal-cuneiform joint.

Initial x-rays revealed an expansile lesion within the first metatarsal which lay at the proximal metaphysis and diaphysis of the bone (Figs. 1A, 1B). The patient was referred for a three-phase technetium bone scan. Diffuse increased activity was noted in the knees, which was consistent with arthritis. There was focal increased activity involving the first metatarsal of the left foot, as well as the first tarsal-metatarsal joint. A CT scan was also performed, which again revealed an expansile lesion of the first metatarsal with possibly bony erosion of the inner table, and questionable thinning of the cortex with soft tissue swelling. Due to the patient's age and the CT scan appearance of the lesion, a biopsy was suggested. Frozen section as well as bone biopsy was consistent with giant-cell tumor of bone, apparently benign, and primarily in bone.

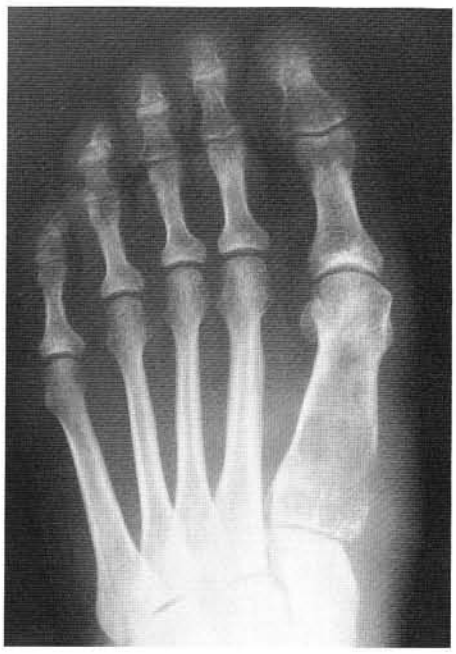

Figure 1A. Dorsoplantar radiograph demonstrating expansile lesion within the body of the first metatarsal bone, with associated soft tissue edema. Surgical biopsy has been obtained from the medial cortex.

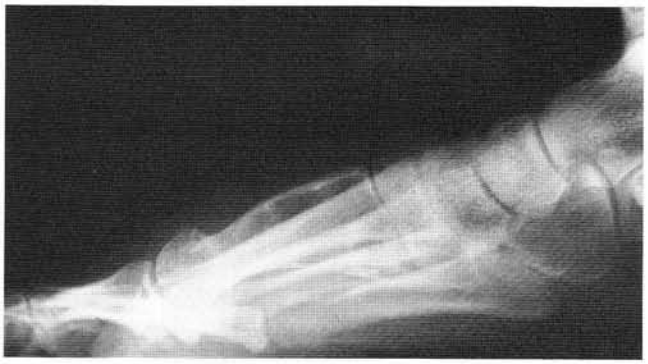

Figure 1B. Lateral radiograph of the first metatarsal bone showing an expansile lesion with questionable erosion of the plantar cortex.

The patient was then taken back to surgery at which time the tumor was approached through a separate dorsal linear incision. At the previous biopsy site, there appeared to be extensive vascular proliferation, and the possibility of tumor extravasation was entertained. The dorsal incision was then deepened to the level of the periosteum which was gently freed laterally. The underlying cortex was

expansile, however, intact. Joint spaces were visualized at the metatarsophalangeal and metatarsal-cuneiform joint, and there was no evidence of joint space expansion. The cortical bone was thin and there was a loss of dorsal cortex noted at the proximal aspect of the metatarsal, with the tumor appearing through the osseous window.

A rectangular osseous window was then created medially utilizing an oscillating saw (Fig. 2). Three sides of the window were opened, and the plantar aspect of the rectangle was forced open

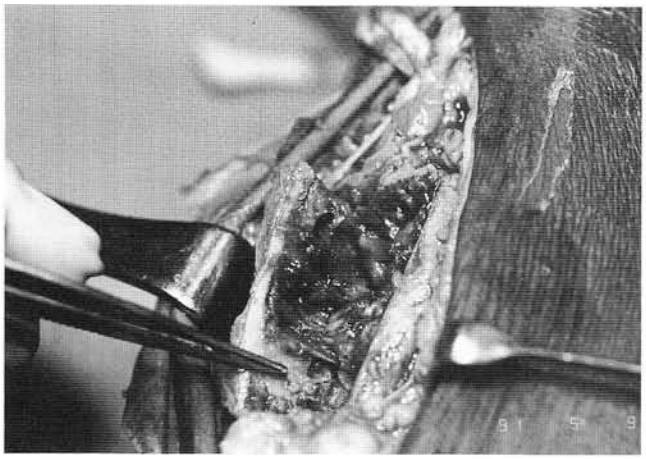

Figure 2. Creation of the cortical window exposing the underlying tumor. The giant cell tumor is soft, pliable, and brownish in color.

with a Freer elevator, and a Greenstick fracture was created. The periosteum remained attached plantarly at the Greenstick fracture site. Extensive giant-cell tumor proliferation was noted throughout the entire proximal aspect of the first metatarsal and through the diaphysis and distal metaphyseal region, to the surgical neck of the first metatarsal. The giant-cell tumor was removed with a curette, and the internal cortex of bone was aggressively curetted. A small exostosis was removed from the dorsal aspect of the first metatarsal head. This was sent for separate histologic study which was negative for tumor invasion. All areas were then irrigated with normal saline.

The previous biopsy site was again examined and the proximal portion of the metatarsal appeared fragmented and invaded by tumor. This was removed by en bloc resection, as well as resection of the adjacent soft tissues where the tumor appeared clinically to have invaded.

Bone graft taken from the ipsilateral hip was then placed throughout the first metatarsal. Cancellous bone, as well as cortical struts, were utilized. A piece of cortical-cancellous bone graft was fashioned to form the proximal and medial cortical wall of the first metatarsal. This distal osseous window was then replaced over the grafted area and held in place with sutures through periosteal reconstruction. Remaining closure was performed throughout the subcutaneous tissue and dermis. The patient was placed in a short-leg cast.

Histologic study revealed the following:

— Curettage from tumor of the left first metatarsal was consistent with giant-cell tumor.
— Dorsal exostosis from the first metatarsal head was consistent with osteocartilaginous exostosis. No tumor was seen.
— Excision of the cortical wall in the area of the previous biopsy, along with the soft tissue, revealed giant-cell tumor with invasion of cortex and extension into the adjacent fibro-fatty tissue.

During the patient's initial postoperative course, she did quite well and remained non-weight bearing for approximately three months. X-rays at one month revealed the bone graft in place. There was a small medial defect noted which was secondary to resection of the medial cortex (Figs. 3A-3C).

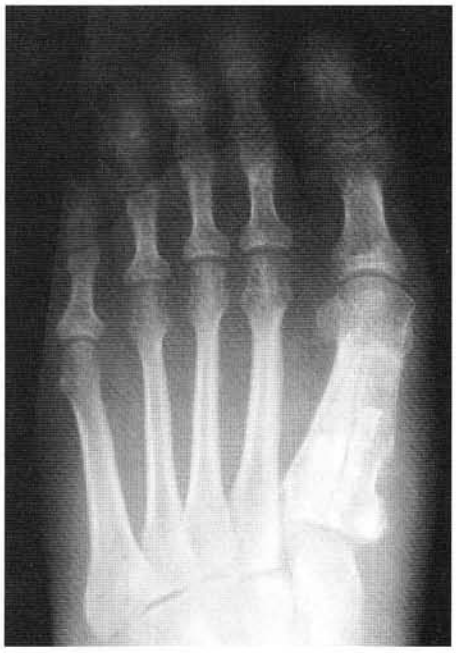

Figure 3A. Bone graft apparent within the body of the first metatarsal. Small medial defect is secondary to previous resection of bone.

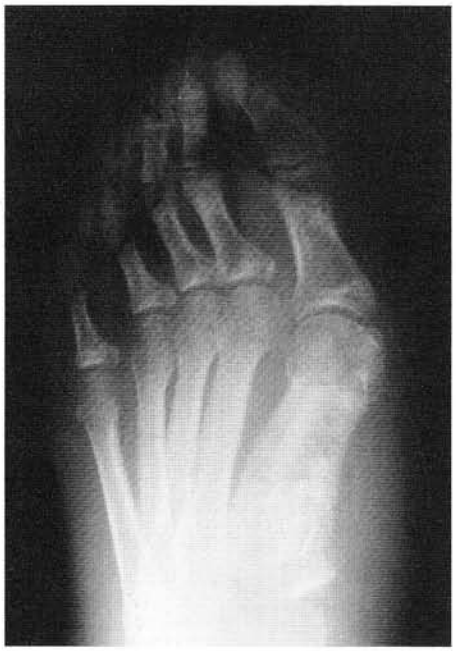

Figure 3B. Lateral oblique radiograph demonstrating bone graft in place and good cortical margins.

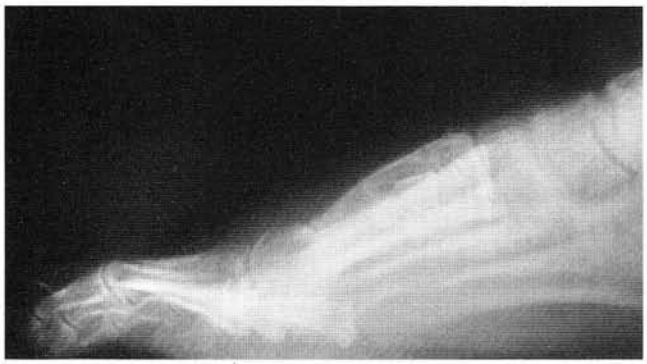

Figure 3C. Lateral radiograph again revealing bone graft in place. No cortical disruption is noted.

X-rays were repeated on a monthly basis which continued to show graft incorporation. At three months, the graft appeared to be incorporated and the patient began to partially bear weight. She had no complaints of pain.

The patient was again seen at 4 1/2 months postoperatively, and she was walking without pain in a wooden shoe. She was back to work full time, and there were no subjective complaints. Clinically, the left foot had a palpable soft tissue mass beneath the first ray from the metatarsal neck to the base. The mass extended plantarly and medially. The mass was clearly visible and palpable, however, not painful. There was no pain over the first metatarsal bone to deep palpation. Normal osseous contours were noted clinically. The first metatarsal was stable and motion at the first metatarsophalangeal joint was full and unrestricted, as well as the metatarsal-cuneiform joint.

X-rays were taken again and reviewed. At the proximal, medial, and inferior aspects of the first metatarsal, there appeared to be recurrence of the tumor with an osteolytic lesion present. Again, this was associated with the soft tissue tumor (Figs. 4A-4D).

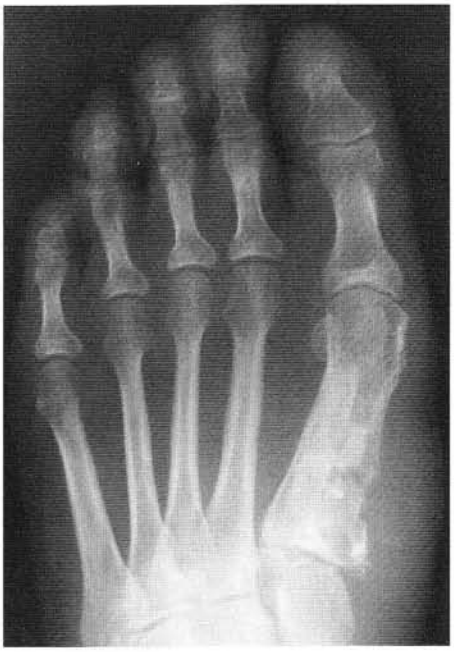

Figure 4A. Dorsoplantar radiograph revealing incorporation of bone graft and normal cortical appearance. Soft tissue enlargement is noted.

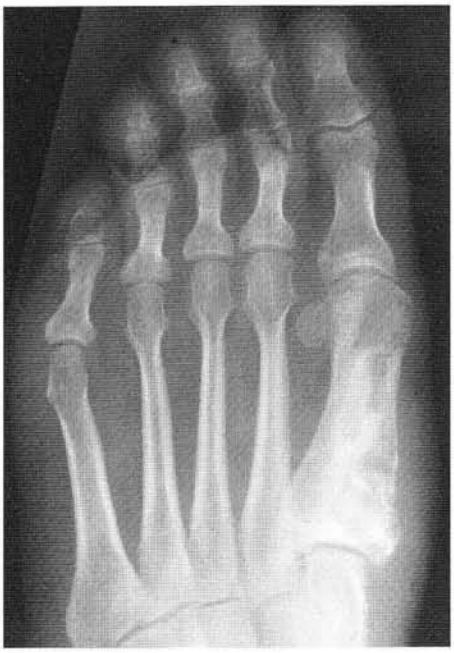

Figure 4B. Normal medial-oblique radiograph. Bone graft is well incorporated. Soft tissue edema is present.

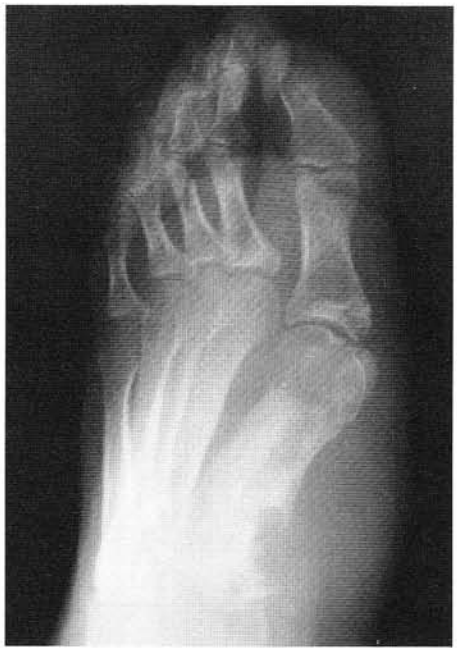

Figure 4C. Erosive lesion of bone at the plantar medial aspect of the first metatarsal with apparent soft tissue extension.

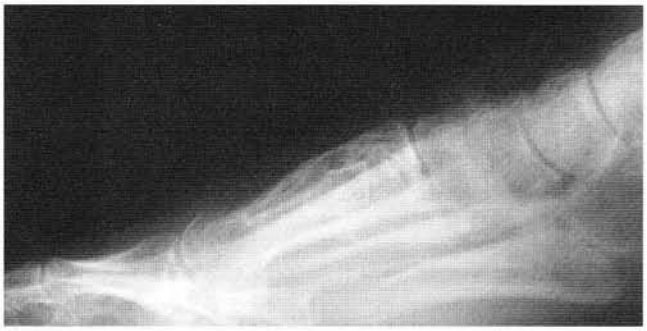

Figure 4D. Lateral radiograph of the foot at 4 1/2 months postoperative.

An MRI was immediately scheduled, which revealed recurrence of the giant-cell tumor with soft tissue extension. The patient was referred to an orthopedic oncologist at the Hospital for Joint Diseases in New York City.

The patient subsequently underwent resection of the first metatarsal with cortical allogenic bone graft and fusion at the first metatarsal-cuneiform and metatarsophalangeal joints. Wide excision of the surrounding soft tissues were performed and the patient remained in a cast for approximately four months.

The patient was evaluated by the author eight months postoperatively, and was walking with minimal discomfort in the left foot. She had a limp, but was pleased with her level of activity. The hallux was fixed at approximately 30 to 40 degrees of dorsiflexion. A well-healed linear scar, approximately 8 cm long, was noted over the area of soft tissue resection.

X-rays taken at this time revealed delayed union at the metatarsophalangeal joint. No recurrence of the giant-cell tumor was seen. The patient continues to do well to this date (Figs. 5A, 5B).

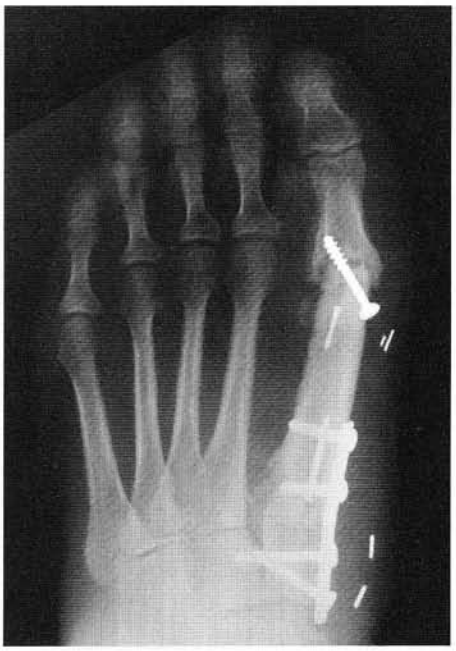

Figure 5A. Dorsoplantar radiograph revealing allogenic bone graft in place, utilizing plate and screws, as well as attempted arthrodesis of the first MPJ.

Figure 5B Lateral radiograph revealing good functional position of the first ray, again with delayed union noted at the first MPJ. The bone graft appears to be incorporated proximally.

DISCUSSION / SUMMARY

The conventional giant-cell tumor (GCT) is a solitary lesion characterized by benign-appearing osteoclast-like giant cells and stromal cells that originate within the epiphysis of adults.

Numerous bone tumors have giant cells that must be distinguished from conventional giant-cell tumors. These range from benign lesions such as non-ossifying fibroma, to locally aggressive lesions such as the aneurysmal bone cyst and high-grade sarcoma.

Giant-cell tumor of hyperparathyroidism is histologically indistinguishable from giant-cell tumor of the epiphysis. The former lesion most frequently is centered within the diaphysis or metaphysis of bone, and is associated with elevated serum calcium and depressed serum phosphorus levels.

The initial management of giant-cell tumors should include a complete history and physical examination, serum calcium and phosphorous studies, a Technetium-99 bone scan to exclude multi-centricity, CT scan to determine the extent of the lesion, open surgical biopsy, avoidance of extensive wound contamination by vertically placed incisions, and meticulous hemostasis during surgery.

DEMOGRAPHICS AND TUMOR CHARACTERISTICS

In some cases, following surgery or after pathologic fracture, recurrence had been known to occur into joints, soft tissues, or subcutaneous structures. Distant metastasis to the lungs is also possible. Rare lung metastasis occurs approximately 1% of the time. About 5% of primary bone tumors are giant-cell tumors, however, the tumor rarely occurs in the foot. They are most frequently identified in epiphyseal regions of long bones (75%), as well as the pelvis and sacrum. 70% of the patients are between the ages of 20 and 40. Rarely is the tumor seen in patients with open growth plates.

The most common clinical features include pain, swelling, and occasional pathologic fracture. Characteristically, the giant-cell tumor is radiographically centered in the epiphysis (99%) and has pure lysis with or without a trabeculated appearance.

Gross pathology typically reveals a soft, brown tumor, usually modified by areas of hemorrhage and fibrosis. The histolopathologic findings reveal many osteoclast-like giant cells mixed with short spindly stromal cells containing nuclei similar to those within giant cells. All cells that make up this neoplasm do not display objective anaplasia.

DISEASE COURSE AND TREATMENT

Although not a sarcoma, its high local recurrence rate and intense bone destruction often force surgical measures similar to those used for low-grade malignancies. Treatment is generally rendered by curettage with or without the use of Phenol or cryosurgery. Cure rates are reported to be approximately 50% with curettage alone. Cure rates are improved by utilizing Phenol (75%), and are stated to be better with the use of cryosurgery (95%). Bone grafting is often employed following curettage, Phenolization or cryosurgery. Should recurrence occur, then eventual control is obtained either by repeat cryosurgery or more extensive procedures such as an en bloc resection.

CONCLUSION

Giant-cell tumor of bone is a distinctive neoplasm which has a variable behavior. It must be distinguished from other pathologic entities on the basis of histologic study. Giant-cell tumors are currently no longer graded as to the degree of malignancy, because their biologic behavior is difficult to predict on histologic grounds. Along these lines, as a guide to therapy and with a view to forecasting prognosis within certain limits, it is suggested that giant-cell tumors be graded according to whether they show insignificant, moderate, or pronounced atypia or abnormal mitoses of their stomal cells. Otherwise, they are considered tumors of uncertain malignant potential, and are simply designated giant-cell tumors.

There are no firm radiographic findings of giant-cell tumors. These tumors again are generally seen in the epiphyseal regions of long bones and are very infrequently found in the foot. They represent expansile lesions with thinning of the cortical margins. They may involve soft tissue as well.

After histologic confirmation of the lesion, surgical resection is performed. Cryotherapy or Phenolization can be performed to lower recurrence rates. Recurrence should be considered preoperatively as a possible complication.