

## Reconstruction of the distal fibula with nanocrystalline hydroxyapatite (NanoBone® Bone Graft) following giant cell tumor resection

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### Preoperative

The patient is a twenty-three-year-old male who presented with complaints of pain and swelling in the lateral aspect of the right ankle currently managed by oxycontin-acetaminophen. Symptoms began three months prior following a work-related inversion injury to the right ankle. Symptoms include loss of range of motion, pain, stiffness, swelling, and weakness. Patient reports no previous surgeries to the leg or ankle. Preliminary diagnosis is acute ankle fracture of the distal fibula.

Radiographs and MRI show an expansile, aggressive bone lesion of the right distal fibula with indistinct borders and abnormal periosteal reaction laterally. The lesion extends approximately 4cm from the distal tip of the lateral malleolus. There are no other bone or soft tissue anomalies, and the ankle mortise is intact. There is also no clear evidence of a pathological fracture.



Fig. 1. Preoperative images demonstrating expansile, aggressive giant cell bone lesion

### Surgical Procedure

A percutaneous biopsy of the bone lesion was done, and pathology confirmed a giant cell tumor without evidence of malignancy. Three months following the initial visit, the patient was taken to surgery. A direct lateral surgical approach was employed. Soft tissue flaps were elevated off the bone. The expansile bone lesion was identified with evidence of cortical thinning and breakthrough. A large bone window was removed laterally. Curettes and burrs were used to resect the tumor, followed by argon beam laser for margin expansion serially and fluoroscopy to ensure the adequacy of curettage. The remaining bone was very thin and tenuous.

12.5ml of NanoBone SBX Putty was used to fill the defect. The distal fibula was prophylactically stabilized with a distal fibula locking plate contoured to fit the bone. It was secured proximal to the bone defect with three bicortical non-locking screws and one bicortical locking screw. Additionally, four locking screws were placed in the distal portion of the plate interdigitating with the NanoBone bone graft under fluoroscopic guidance. The site was copiously irrigated and a layered closure was completed. A posterior splint was applied.

## Bone Graft Substitute Clinical Case Series

### Postoperative Course

One-month post-surgery, the patient is recovering well and is non-weight bearing. There is decreased range-of-motion of the right ankle with minor flexion and extension weakness. The ankle is tender to palpation and a skin rash is present. The splint was removed and physical therapy initiated. The patient is still in significant pain, so ice and anti-inflammatories were prescribed in addition to continuing the narcotic pain medication. Radiographs show normal bone mineralization is progressing. The plate and bone graft are in good position and there is no evidence of fracture or recurrence of the tumor. There is no evidence of migration of the bone graft material.



Fig. 2. Postoperative image of distal fibula locking plate with screws demonstrating progression of bone mineralization

Three weeks later, range of motion and strength have improved. The skin rash and tenderness have also improved. Pain is reduced. Radiographs show progression of fracture repair and a stable construct. Progressive weight-bearing will be permitted despite physical therapy not being initiated as requested.

### Three Month Follow-up Visit

Three months postoperative, patient has made continued improvement in range of motion, skin rash, and tenderness. Weakness is stable at 4/5. Patient is making slow but steady progress. Patient is weight-bearing with pain likely due to lack of rehabilitation. He is to continue light duty activities at his place of employment.

Radiographs show increased bone graft incorporation compared to his last visit. New bone appears to be forming around the four distal locking screws that were placed into the bone graft. There is no evidence of tumor recurrence. The ankle mortise is intact. His next visit will be at six months postoperative.



Fig. 3. X-rays demonstrating bone formation around locking screws 3-months after NanoBone application