CHAPTER **13**

# FRESH TALAR ALLOGRAFT FOR A LARGE POSTERIOR MEDIAL TALAR DOME LESION: A Case Study

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## INTRODUCTION

Osteochondral defects of the talus are relatively rare occurring in approximately 1% of all talar fractures.[1] Osteochondral fractures have been reported to occur in approximately 2-6% of ankle sprains.[2] The classic Berndt and Harty article of 1959 reported 43% of the lesions were on the lateral side and 57% were on the medial side.[3] Although the majority of talar dome lesions respond favorably to conservative care, more severe or chronic lesions often require surgical management. Various surgical techniques have been described for the treatment of the more severe, posterior medial, Berndt-Harty grade 3-4 lesions. These techniques have traditionally included debridement, subchondral drilling, arthroscopic abrasion, microfracture, and curettage. Recently new therapeutic methods that restore the hyaline cartilage sheath have been developed. These techniques include osteochondral autogenous grafting, autologous chondrocyte transplantation, and osteochondral allografts.

The following case study follows one such patient who underwent surgical resection of a large posterior medial talar osteochondral lesion with fresh allograft osteochondral grafting. In selected patients this procedure can provide very acceptable functional results.

## CASE REPORT

A 32-year-old female was referred for evaluation and treatment of a large posterior medial osteochondral defect of her left talus. The patient had sustained a severe ankle sprain 15 months before when she stepped off a stair. She was treated conservatively at the time, radiographs were negative. The patient appropriately rehabilitated the injury, but at 8 months post-injury she developed progressively worse left ankle joint pain. Pain was described as deep, aching, and affecting the entire ankle joint both medially and laterally. This was aggravated with activity and less symptomatic when she intentionally walked with an intoed gait. Stairs also became more difficult for the patient. She took acetaminophen and over the counter nonsteroidal antiinflammatory drugs with minimal relief.

The patient's past medical history was unremarkable. Past surgical history included a tonsillectomy and adenoidectomy at age 12. No medications, and no known drug allergies. Social history revealed a 12 pack-year smoking history. The patient was married with two children.

Physical exam revealed a slightly antalgic gait on the left. Ankle joint dorsiflexion was limited to 5 degrees when compared with the contralateral extremity which was normal. There was a subtle positive anterior drawer sign present. Passive inversion of the left ankle and subtalar joint complex produced medial ankle joint line pain. Radiographs showed an intact ankle joint mortise with uniform joint space and no osteophytes. However the lateral oblique view demonstrated a suspicious large, nondisplaced osteochondral lesion affecting the medial shoulder of the talus.

A subsequent MRI demonstrated a large 1.5 cm osteochondral defect medially with a large amount of underlying marrow edema. The fragment was sclerotic and adherent to the underlying bone by synovial and granulation tissue. Two medium sized subchondral cysts were identified in the medial talus and there was an increased signal to the deltoid ligament suggestive of previous injury and scarring of the tibiofibular interosseous ligament.

Treatment options were discussed with the patient. It was recommended that the patient stop smoking at least 3 months before the surgery. The patient elected to undergo transplantation of a fresh osteochondral medial talar shoulder. The graft size was matched up by patient x-rays, which were originally submitted. Several fresh talar allografts became available over the next six months. The patient was finally able to undertake the challenges associated with this type of surgery and agreed to surgery 10 months after the initial evaluation.

The surgery was performed under general anesthesia. A thigh tourniquet was applied but not inflated. An 8 centimeter incision was made vertically over the medial malleolus with care to avoid the tibialis posterior tendon. An oblique medial malleolar osteotomy was made to

expose the medial talus after holes were predrilled for the subsequent screw fixation. An area of 25 x 6 x 8 mm of delaminated, fragmented osteochondral tissue held in place by granulation tissue was identified. Using a combination of a pneumatic sagittal saw and straight osteotomes a cresent shaped area of the posterior medial talar dome was squarely resected to bleeding cancellous bone using drill holes as a guide.

The allograft was harvested 10 days before the surgery and stored at plus 4 degrees in Ringer's lactate. The donor was no older than 30 years old and all criteria by the American Association of tissue banks were met. The complete ankle was harvested with the capsule intact. The corresponding talar allograft was carefully prepared on the back table using precise measurements to fit the deficit. The prepared replacement allograft measured 28 x 8 x 10 mm. The anterior leading edge of the graft was made at a 90 degree angle. The posterior margin was tapered flush with the contour of the posterior talus. The interface between the graft and the host bed was lightly planed to make a tight fit. The graft was made proud 1-2 mm throughout the length of the graft. The size and position of the allograft was checked by fluoroscopy. The allograft was fixated with three chondral darts made by Arthrex driven from medial to lateral. The ankle joint was put through a smooth range of motion. The medial malleolar osteotomy was fixated by two partially threaded cancellous screws. The wound was closed in layers. A Jones compression cast was applied.

Postoperatively the patient was maintained non-weightbearing with crutches. She was placed into a standard below-knee cast on postoperative day 4 for a period of 4 weeks. At 4 weeks the patient was placed in a removable cam walker with continued nonweightbearing. This allowed the patient to perform range of motion excercises. Radiographs were obtained at 4, 8, and 12 weeks postoperative. Radiographic healing of the malleolar osteotomy occurred by the eighth week and the graft appeared sufficiency revascularized at 12 weeks sufficient for early partial, controlled weightbearing. The patient developed transient mild tarsal tunnel symptoms after the first cast was removed due to swelling over the tarsal tunnel. All nerve symptoms resolved over the next four weeks as the swelling diminished. At 12 weeks the patient was 3 degrees shy of a normal ankle joint dorsiflexion when compared with the opposite limb.

At 5 months the patient returned to full weight-bearing with unlimited activities with the exception of running or jogging, which was not recommended until 12 months postoperative.

Figure 1. Oblique ankle x-ray showing posterior medial talar dome lesion.

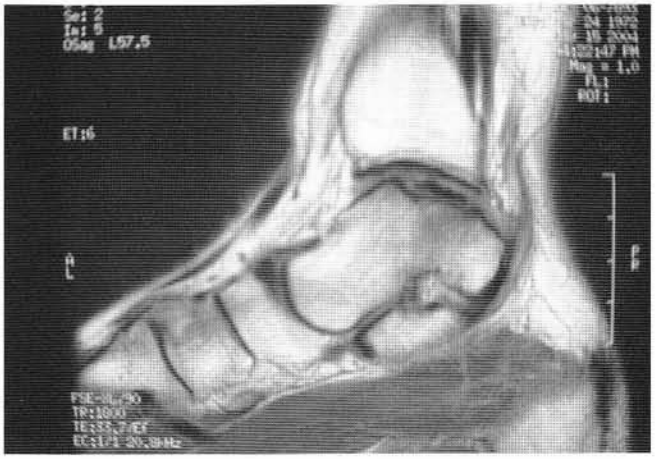

Figure 2. T-1 image showing large osteochondral defect medially.

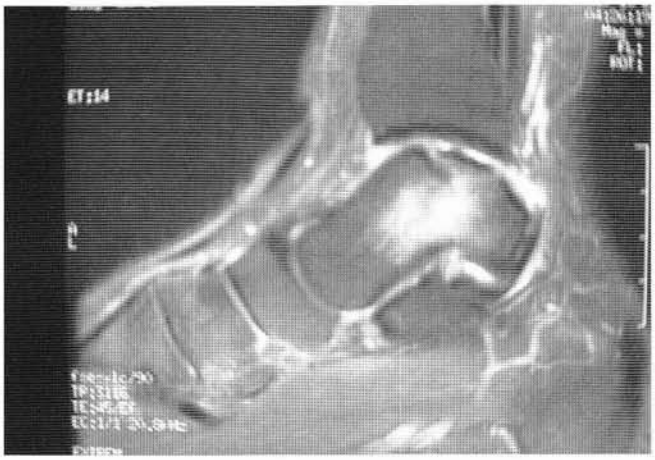

Figure 3. MRI demonstrates detached osteochondral fracture fragment with underlying marrow edema.

Figure 4. MRI reveals a large subchondral cyst.

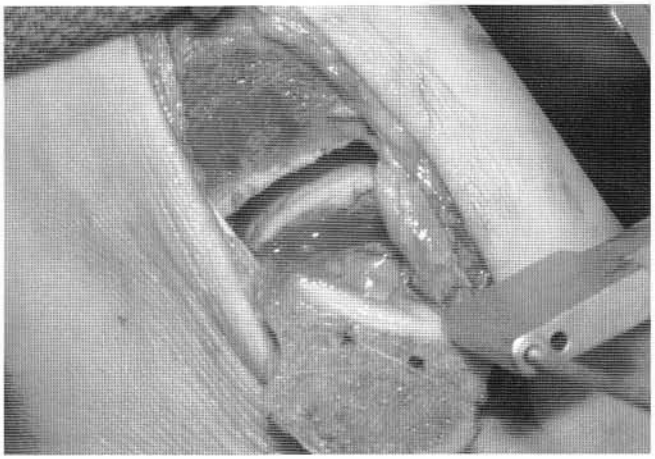

Figure 5. A medial malleolar osteotomy with distraction allows exposure for block resection of the damaged medial talar shoulder.

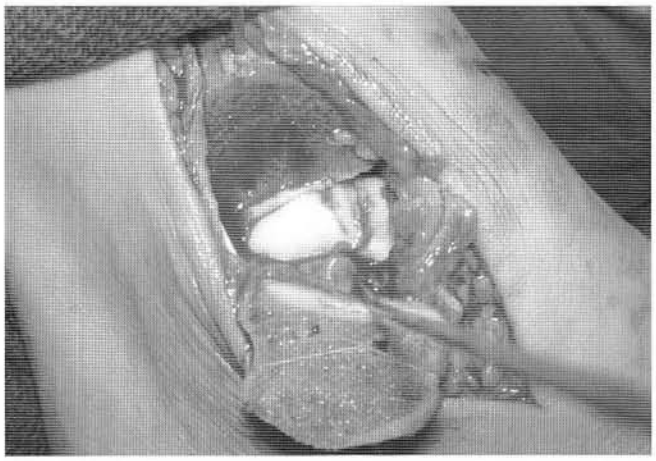

Figure 6. The allograft is contoured to exactly fit the resected deficit.

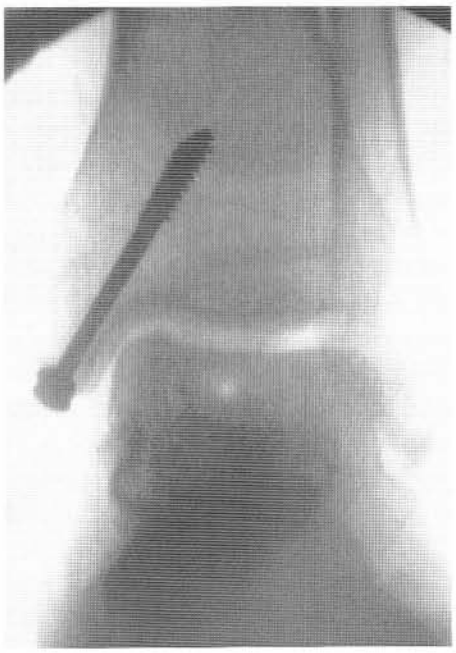

Figure 7. Intraoperative x-ray showing allograft and fixation intact.

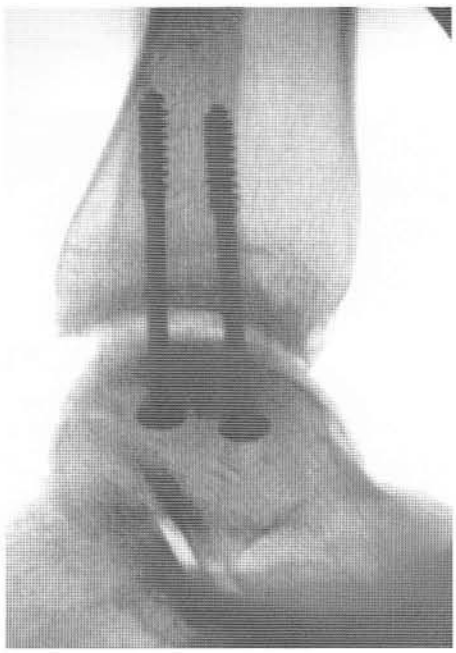

Figure 8. Lateral x-ray demonstrates uniform joint space.

Figure 9. Postoperative week 6 showing partial consolidation of the allograft and early healing of the malleolar osteotomy.

Figure 10. Lateral view at 6 weeks showing relative sclerosis of the allograft with an intact tibiotalar joint space.

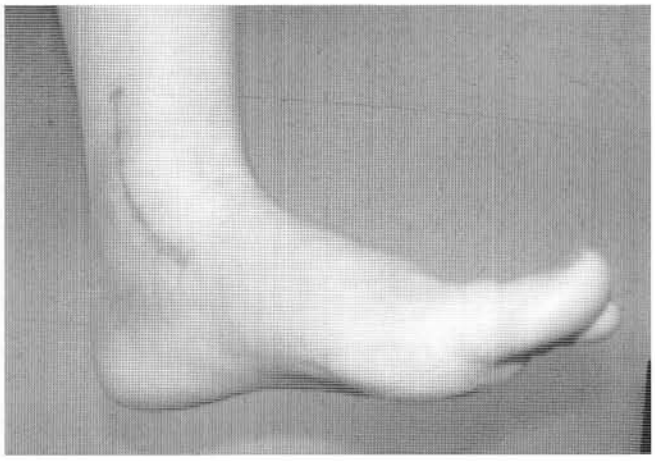

Figure 11. Patient demonstrates active ankle dorsiflexion at 8 weeks.

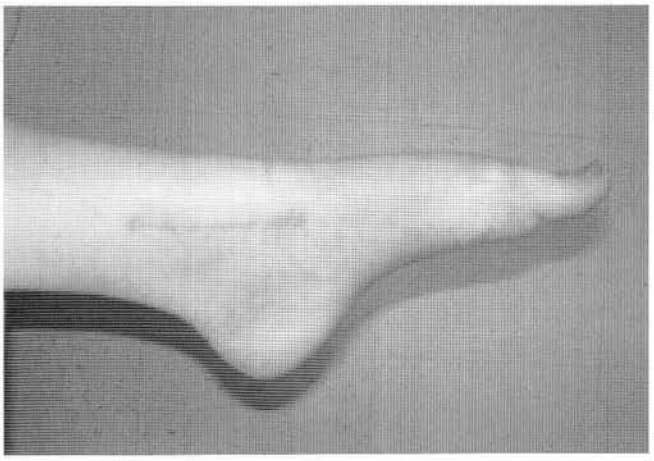

Figure 12. Patient has better than average plantar flexion at 8 weeks postoperative.

## DISCUSSION

In 1959, Berndt and Harty proposed a mechanism and classification system of talar osteochondral fractures. Stage 1 was defined as a small area of compression of subchondral bone; stage 2 a partially detached osteochondral fragment; stage 3 a completely detached, nondisplaced osteochondral fragment; stage 4 a displaced osteochondral fragment. Later Loomer[4] added a stage 5 to the Berndt and Harty classification to accommodate the presence of a subchondral cyst. In 1999, Hepple[5] devised a classification system based on MRI that considered both the subchondral cyst formation and the grade of bony edema surrounding the cartilage injury.

Surgical treatment of the large posterior medial talar dome lesion has evolved considerably. The choice of treatment must take into account the patient's age, activity level, health, and level of pain. In addition, the size, location, stage of the lesion as well as the viability of the cartilage and surrounding subchondral bone need to be assessed.

In very large lesions fresh or frozen allografts can be considered because of the advantages in restoring a

natural articular surface. This includes restoration of the natural posterior medial shoulder of the talus, an area where round autologous osteochondral plugs cannot possibly fulfill this task. An allograft also eliminates the risk of donor site morbidity. The use of a single graft instead of multiple grafts also minimizes fibrocartilage ingrowth between plugs, a disadvantage of the mosaicplasty technique.

Meehan et al[6] described total ankle joint resurfacing in 11 patients using fresh osteochondral transplantation. Bipolar allograft replacement was performed in nine patients and unipolar allografts were used in 2. Joint surfaces were resected using the Agility ankle arthroplasty jigs and the allografts were secured with anteriorly placed screw fixation. Six of the 11 ankles had successful grafting procedures. The authors concluded poor results occurred in ankle with a graft-host size mismatch or graft thickness less than 7mm.

Fresh allograft is superior to frozen allograft in maintaining chondrocyte viability. However, frozen allografts have a decrease in the immunological response. Chondrocyte viability decreases proportional to the immune response. Reports of long term success range from 67% to 100%.[7,8] Tissue matching between the host and donor grafts is not required because the matrix that surrounds the chondrocytes protects them from the immunocompetent host cells. Current research investigating histocompatibility, the use of immunosuppressive medications and tissue antigen matching is underway to refine current allografting techniques. Allograft should be considered for the younger than 50 year old patient with a large lesion. In older patients or with more generalized arthritic findings an arthrodesis or total ankle replacement should be considered. Failure of osteochondral grafting may necessitate a similar fate, namely ankle joint arthrodesis versus total joint replacement.

## REFERENCES


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