Tibiotalocalcaneal Arthrodesis with Fresh Frozen Femoral Head Allograft for Large Osseous Defects

Charles A. Sisovsky DPM AACFAS[1], James M. Cottom, DPM FACFAS[2], Colin T. Graney, DPM AACFAS[3]
[1]Fellow, Florida Orthopedic Foot and Ankle Center, Sarasota, FL, [2]Fellowship Director, Florida Orthopedic Foot and Ankle Center, Sarasota, FL, [3]Private Practice, Madison Advanced Foot and Ankle, Madison, WI


Figure 1: Lateral approach for tibiotalocalcaneal arthrodesis


Figure 2: Acetabular reamer used to create space for femoral head allograft

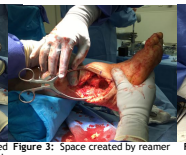
Figure 3: Space created by reamer


Figure 4: Reamers are being used to create press-fit allograft out of femoral head


Figure 5: The press-fit femoral head graft is created.


Figure 6: Failed TTC fusion with non-union of ankle and subtalar joint. Revision resulted in loss of bone requiring grafting.

Figure 7: The patient underwent revision TTC fusion with IM nail and femoral head grafting.

Purpose

Large osseous voids can be encountered in a variety of pathologies including talar AVN, Charcot neuroarthropathy, failed total ankle replacement, and severe longstanding deformity. This large defect presents a challenge to the surgeon, particularly when attempting to salvage a functional limb. The authors present a series of patients treated with tibiotalocalcaneal arthrodesis combined with use of a fresh frozen femoral head allograft, using a technique that utilizes acetabular reamers. The purpose of the present to study was to determine any significance in correlation between complications and successful outcomes.

Surgical Technique

Tibiotalocalcaneal (TTC) fusion was performed as a salvage procedure in all patients for various conditions (see Table 1). The hindfoot and ankle were approached with either a lateral extensile (Fig 1), anterior, or combined medial and lateral approach, depending on the particular pathology. The ankle and subtalar joints were prepped with a combination of power and hand instrumentation. To address a large osseous defect, acetabular reamers, typically used in hip resurfacing procedures, are used to create a press-fit graft out of the femoral head allograft. (See Figures 1-7) The TTC fusion is then fixated using either retrograde intramedullary nail fixation or locking plates and screws. Additional procedures are carried out according to concomitant pathology. Layered closure is performed, and patients are placed into a well-padded posterior splint with Jones compression dressing.

Results

Eighteen patients were retrospectively reviewed. Mean follow up was 15.2 months. The fusion rate was 83.3% at a mean time of 11.4 weeks. There were 3 non-unions, 2 of which were asymptomatic. Of the complications to note, 4 (22.2%) patients had delayed wound healing, 4 (22.2%) had deep infection requiring I&D, 3 (16.7%) patients had cellulitis resolved with antibiotics, and 1 (5.6%) patient ended up with a below-knee amputation due to deep infection. Results are summarized in Table 2.

Table 1: Demographics

# of patients (n)	18
Age (years)	64.1 +/- 8.7
Sex	33.3% Male; 66.7% Female
BMI (kg/m2)	28.7 +/- 5.3
Presence of Diabetes	55.6%
Tobacco Use	16.7%
ESRD/ Hemodialysis	11.1%
Coronary Artery Disease	55.6%
Indications	8 Charcot Neuroarthropathy (44.4%) 4 Osteoarthritis (22.2%) 3 Talar AVN (16.7%) 2 Failed Total Ankle Replacement (11.1%) 1 Dropfoot w/ hindfoot arthritis (5.6%)

Table 2: Results

Time to Fusion (weeks)	11.4 ±1.8
Successful Fusions	15 (83.3%)
Non-unions	3 (16.7%); 2 asymptomatic (11.1%)
Follow up (months)	15.2 ± 3.9
Complications	4 delayed wound healing (22.2%) 4 dehiscence/deep soft tissue infection requiring I&D (22.2%) 3 cellulitis resolved with PO antibiotics (16.7%) 1 Below knee amputation (5.6%)

Analysis & Discussion

Bone grafting techniques are often used in foot and ankle surgery. When large defects are present during ankle and hindfoot arthrodesis, a large stock allograft is often necessary to fill the void[1]. The technique described using acetabular reamers to shape a press-fit graft for osseous defects has not previously been described in the literature[2]. Numerous authors have described the used of fresh frozen femoral head bone grafts to fill osseous defects of the hindfoot and ankle during arthrodesis, however, they have not focused on the technique as we have in this study. In a recent study by Wukich et al, they found that those patients requiring a femoral head allograft, 67.7% experienced a complication[3]. This matches our data which was a complication rate of 66.7%. We hope that this information adds to the growing volume of literature regarding hindfoot and ankle arthrodesis and the use of bone grafts in this setting.

References

1. Jeng CL, Campbell JT, Tang EY, Cerrato RA, Myerson MS. Tibiotalocalcaneal arthrodesis with bulk femoral head allograft for salvage of large defects in the ankle. Foot Ankle Int. 2013 Sep;34(9):1256–66.

2. Bussewitz B, DeVries JG, Dujela M, McAlister JE, Hyer CF, Berlet GC. Retrograde Intramedullary Nail With Femoral Head Allograft for Large Deficit Tibiotalocalcaneal Arthrodesis. Foot Ankle Int. 2014 Jul;35(7):706–11.

3. Wukich DK, Mallory BR, Suder NC, Rosario BL. Tibiotalocalcaneal Arthrodesis Using Retrograde Intramedullary Nail Fixation: Comparison of Patients With and Without Diabetes Mellitus. J Foot Ankle Surg. 2015 Oct;54(5):876–82.