

Total Ankle Replacement on a Preexisting Tibiototalcalcaneal Arthrodesis with Femoral Head Allograft: A Case Report

Stephanie Mita, DPM¹ and Danny J. Choung, DPM²

Kaiser Permanente
Research

¹Resident, Kaiser Permanente North Bay Consortium, CA; ²Attending, Chief of Podiatry and Orthopedics at Kaiser Permanente San Rafael, CA

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Statement of Purpose

We present a patient who underwent conversion of tibiototalcalcaneal (TTC) arthrodesis with femoral head allograft—originally performed to address significant talar bone deficit after failed subtalar joint bone-block arthrodesis—to total ankle replacement (TAR), with 3-year follow-up. To the authors' knowledge, this has not yet been described in the literature.

Literature Review

TTC arthrodesis is an established limb salvage option for severe end-stage deformity correction or ankle and hindfoot arthritis, to eliminate pain and create a plantigrade foot for ambulation. A common complication is superficial wound infection, which ranges from 5.3-33.3%¹⁻⁵. The incidence of nonunion after TTC fusion is high, ranging from 11.1-26.7%¹⁻⁸, which increases to 50.0-52.0%⁹⁻¹⁰ with use of femoral head allograft.

Revision after TTC fusion is complicated, with conversion to TAR reserved as a technically challenging salvage option for patients with adequate bone stock. Small case series studies show good clinical outcomes, with complications including delayed wound healing and migration of ankle components. In a 2015 study by Pellegrini, 23 ankle fusions (11 TTC fusions) were converted to TAR. Pain and function scores improved, and 3 (13%) showed talar subsidence necessitating revision¹¹. In a 2017 study by Preis, 18 painful ankle fusions (1 TTC fusion) were converted to TAR due to nonunion or malunion. Three had delayed wound healing (16.7%). Four had incomplete osseointegration at the posterior bone-prosthesis interface on the tibial side (22.2%); no loosening was observed¹². In a 2017 study by Preis, 6 painful TTC fusions were converted to TAR using a cementless 3-component prosthesis. One patient had delayed wound healing. All had improved pain and function, and there was no subsidence nor loosening¹³.

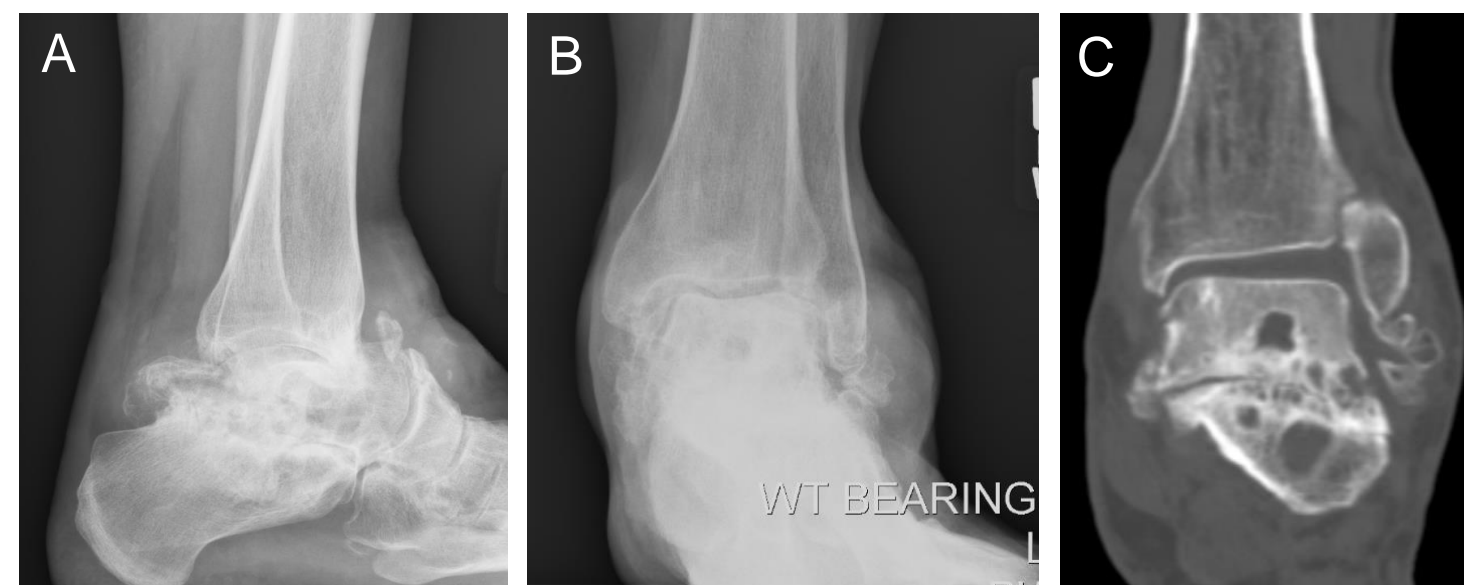


Figure 1. Initial x-rays (A, B) and coronal CT (C) of left ankle, showing cystic changes in the talus and calcaneus, varus tilt with reduced height of the talar body, and a preserved ankle joint.

Case Study

A 62-year-old healthy female was treated by the principal investigator from 2011 through 2018. The patient reported left ankle injury at least 40 years prior, with 10 years of increasing pain necessitating ankle braces and daily ibuprofen to continue being active. On exam, her ankle had lateral bony prominence, with tenderness at the sinus tarsi. Her heel was in neutral alignment. Radiographs showed subsidence of the talus into the calcaneus, with a dorsiflexed talus causing anterior ankle impingement (Figure 1A and B). CT scan showed vast degenerative changes in the talus and calcaneus, a varus tilt with reduced height of the talar body, and a preserved ankle joint (Figure 1C).

In June 2012, the patient's index procedure was a subtalar joint bone-block distraction fusion with cortical cancellous graft from a distal femoral metaphysis allograft. The patient maintained good subtalar joint alignment until 1 year post-operatively, when she was noted to have mild ankle varus deformity. CT demonstrated collapse of the talar body with cyst formation, and degeneration to the ankle joint (Figure 2).

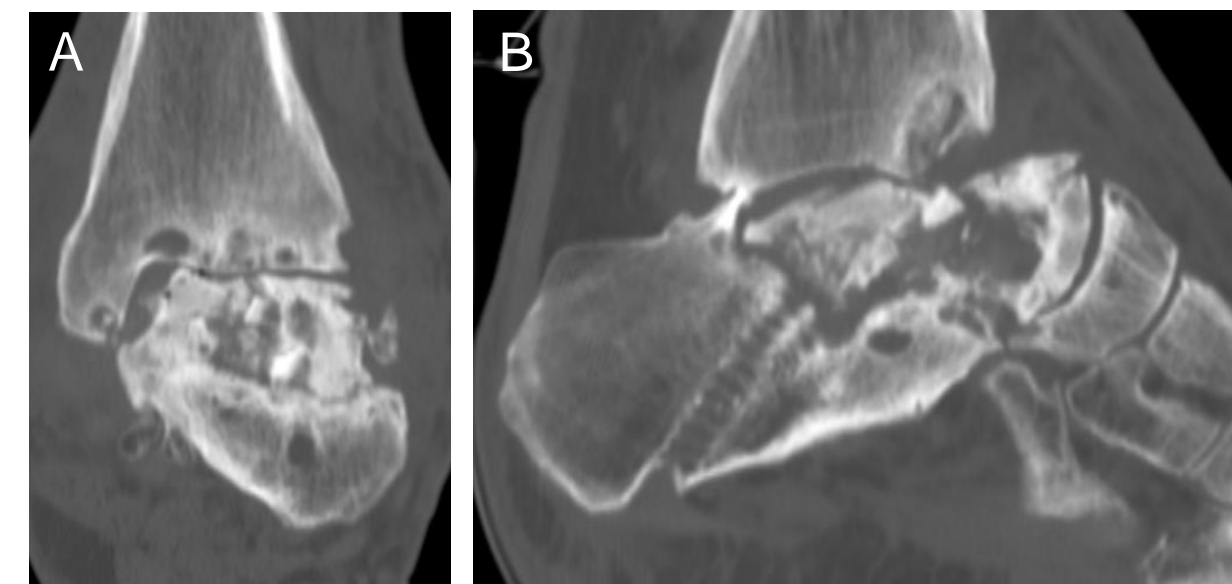


Figure 2. CT scan (A, B) after failed subtalar joint bone-block arthrodesis, demonstrating collapse of the talar body with cyst formation, and degeneration to the ankle joint.

In December 2013, the patient underwent TTC fusion with femoral head allograft. Fibular osteotomy was performed. The talus demonstrated necrotic, fragmented bone. The femoral head allograft was decorticated, contoured, and placed with tight press fit. The fusion site was fixated with two 6.5 mm cannulated cancellous screws. An Ilizarov ring fixator was in place for 3.5 months. At 5 months, radiographs demonstrated consolidation of the allograft, with a forefoot adductus deformity; at 8 months, a rigid varus deformity was noted (Figure 3). At 8.5 months, the patient developed a lateral ankle wound requiring debridement and removal of the fibula hardware. All labs, cultures, and imaging of the 1x5 mm lateral ulcer ruled out infection. Due to pain and significant disability to the left foot, the decision was made to convert the fusion to TAR.

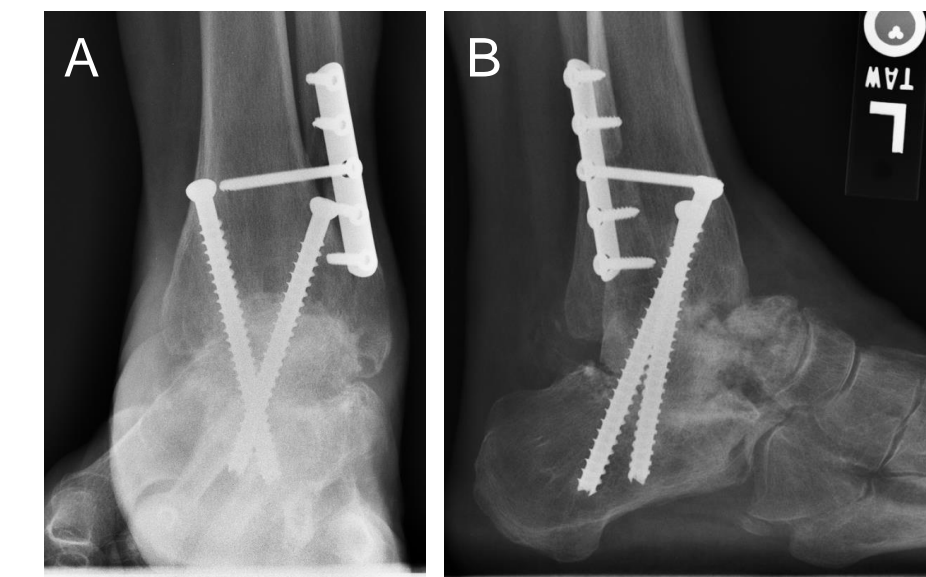


Figure 3. Weight bearing radiographs (A, B) 8 months after TTC fusion with femoral head allograft, with varus deformity.

In July 2015, the patient underwent TAR using the Wright Infinity® implant, with posterior tibial lengthening and anterior tibial transfer to peroneus tertius. The ulcer was excised, and sterile preparation and draping were repeated. An extensile anterior longitudinal incision was made across the ankle joint. A custom tibial-talar cutting guide was used. The talar resection was performed using two distal pins angled for 14 degrees of varus correction. A size 2 tibial tray trial and a size 1 talar dome trial were verified, and the final components were implanted with cement. An 8 mm poly was attached to the inferior surface of the tibial component. A 2.4 mm Steinmann pin was inserted across the iatrogenic lateral malleolus fracture site (Figure 4). The patient began touch down weightbearing in a cast at 2 weeks and was weight bearing as tolerated at 6 weeks. She required local wound care for 9 months, after which the wound remained healed.

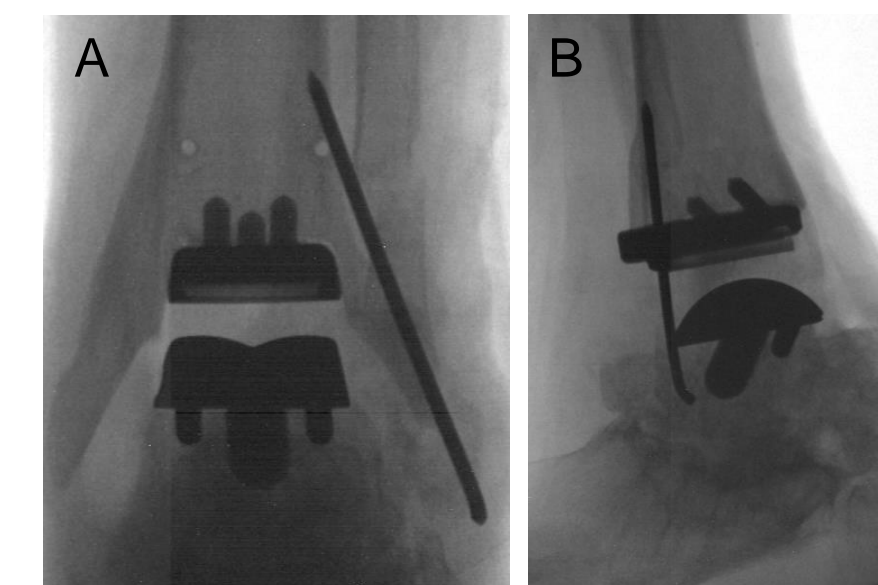


Figure 4. Intra-operative fluoroscopy (A, B) of TAR, with Steinmann pin in fibula.

In July 2018, 3 years after TAR on malunited TTC arthrodesis with femoral head allograft, this patient was actively walking and hiking, with limited but pain-free ankle joint range of motion, neutral resting calcaneal stance position, and mild tolerable arthritic pain to the midfoot. Final x-rays demonstrated good alignment of the ankle prosthetic components (Figure 5).

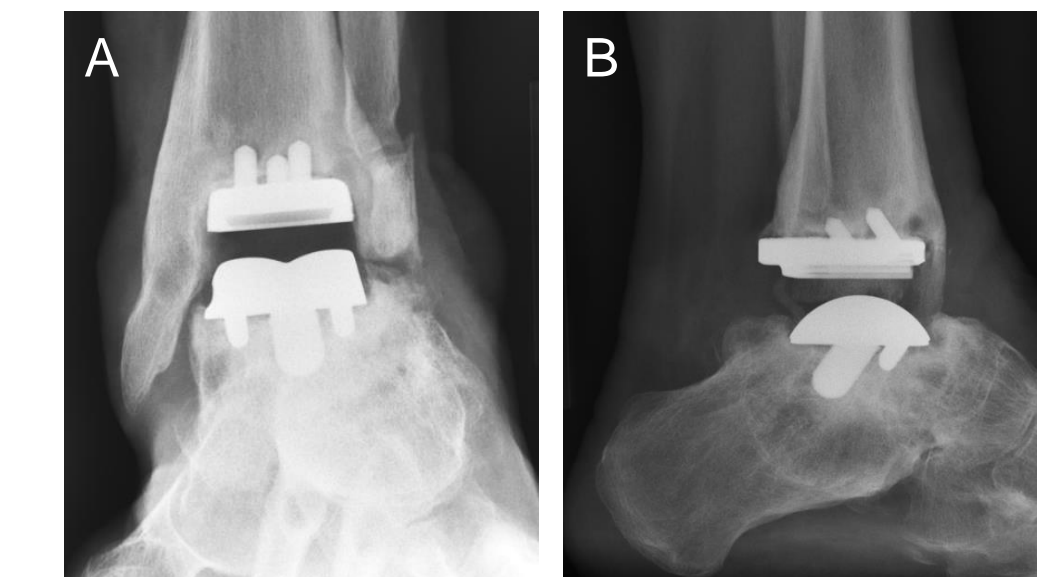


Figure 5. Final weight-bearing x-rays (A, B), at 3 years after TAR.

Analysis & Discussion

After TTC arthrodesis with femoral head allograft, the patient had delayed wound healing, which has been noted in prior case series studies. In the setting of high risk of nonunion with femoral head allograft, this patient demonstrated complete consolidation; however, she fused in severe varus deformity. Subsequent successful revision to TAR after TTC fusion with bulk allograft has not yet been described. Our findings suggest that good radiographical and clinical results can be achieved with conversion to TAR after TTC arthrodesis with femoral head allograft that fused in severe varus deformity.

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