

# Use of Titanium Mesh Cage in Reconstruction after Traumatic Talar Extrusion Injury: Case Report

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## STATEMENT OF PURPOSE

Complete extrusion of the talus following high-energy trauma is a rare and complex injury.<sup>1</sup> Talar extrusion is associated with a multitude of limb threatening complications such as avascular necrosis, infection, nonunion and significant limb length discrepancy. Currently described treatment options include primary tibio-calcaneal fusion, fusion with use of bone grafting including autograft as well as non-vascularized and vascularized autograft, fusion with the use of titanium mesh cage or re-implantation of the talus<sup>4,7</sup>.

The goals were to regain anatomical alignment, avoid subsequent limb length discrepancy, and obtain a plantigrade foot, using a one-stage procedure. A femoral head allograft for primary fusion was ultimately decided against, as morselized autograft has higher incorporation and union rates into bone and was thus considered as a more viable option.<sup>8,9</sup> Titanium mesh cages have been shown to provide structural support and maintain bone defect height thereby increasing limb stability.<sup>9</sup> The mesh cage construct combined with the use of tibiototalcalcaneal intramedullary nail, fibular autograft and allograft with both osteoinductive and osteoconductive properties, was determined to be a superior method of treatment.

## LITERATURE REVIEW

Titanium mesh cages (TMC's) were first used in spine surgery by Dr. Jürgen Harms in 1986.<sup>7,10</sup> TMC's have since been used with continued success in many other reconstructive manners.<sup>11</sup> They are continuing to be described in literature for successful use in reconstruction of segmental bone defects in the extremities.<sup>2,11-14</sup> Cobos et al were the first to record the successful use of TMC's for large segmental defects in the extremities. They presented two cases of Gustilo Grade IIIB open fractures of the tibia that were treated with TMC, IMN and cancellous bone autograft and allograft. In both cases, bony union was observed with no need for revisional procedures.<sup>2</sup>

Clements et al presented described a 53 year-old patient with avascular necrosis of the talus who underwent reconstruction with use of IMN, TMC, iliac crest autograft, bone graft substitute, and application of internal bone stimulator. The patient subsequently underwent a below knee amputation 6 months later due to traumatic injury which lead to hardware failure. Post-amputation dissection was performed on the limb and samples of material taken from inside the cage and surrounding areas and sent to the lab. All surrounding bone samples appeared to display mature lamellar bone.<sup>7</sup> This finding reiterates the use of mesh cage grafts for reconstruction in the ankle joint.

## CASE STUDY

In the present case we describe treatment of a 20-year-old patient who was involved in high speed motor vehicle crash. The patient was traveling at high speed as a restrained driver when she lost control of the vehicle and hit a tree. Her past medical history (PMH) was essentially negative.

Patient sustained multiple fractures including right open talar extrusion. (FIG A and B) On admission, the patient underwent multiple surgical procedures by an orthopedic trauma surgeon. Debridement of the right open talar fracture was performed and both significant bone loss and overall joint contamination was noted at time of surgery. An antibiotic spacer was used in place of the talus to preserve limb length and allow soft tissue healing, until definitive surgery could be performed.

A multitude of treatment options including below knee amputation was discussed. Ultimately the decision was made by the surgeon, patient, and patient's family to attempt tibio-calcaneal arthrodesis with titanium mesh cage and IMN placement. Patient was placed on IV vancomycin and Zosyn throughout her in-patient stay secondary to multiple open fractures which was monitored by infectious disease.



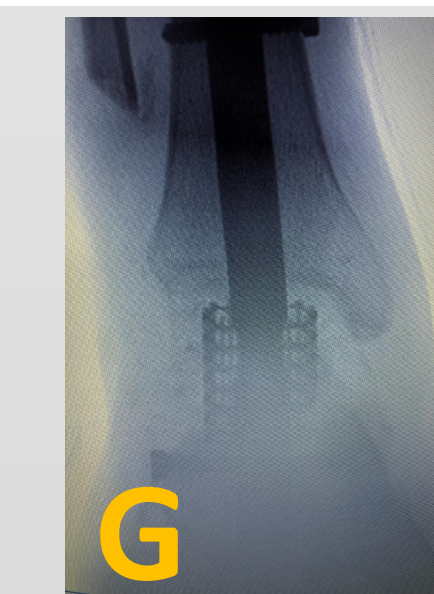
The patient returned to the operating room 11 days after initial debridement was performed. A 12cm incision was made over the lateral aspect of the right lower leg and ankle.

Resection of the distal portion of the fibula was performed, and morselized in a bone mill for later implantation. The antibiotic spacer was removed. Cartilage was resected from the superior aspect of the calcaneus (FIG C) and inferior aspect of the distal tibia. The bone void was measured at approximately 30mm after cartilage resection. A 24 x 30mm titanium mesh cage was then sized for the talar void. (FIG D) The posterior aspect of the cage was cut to match the slope of the posterior calcaneus and was placed in the central aspect of void. A 12 x 150mm IM nail was then placed through the mesh cage into the central aspect of the tibia.

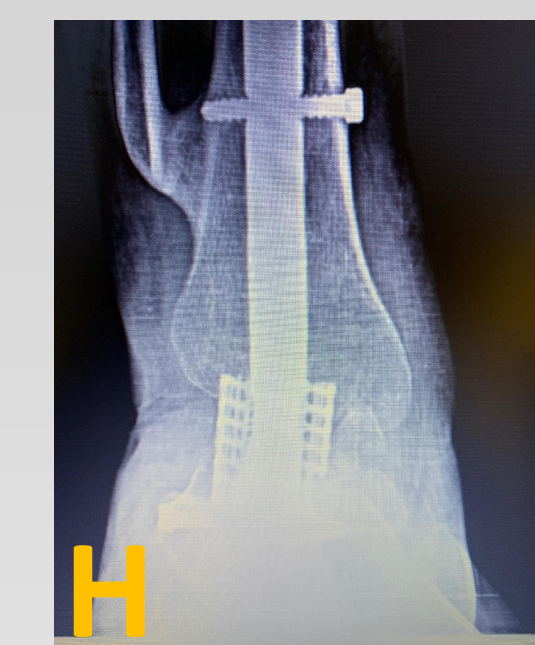
## CASE STUDY CONT.



The central aspect of the mesh cage was aligned where the talar body would normally sit. (FIG E-G) After locking screws into the tibia and calcaneus, the void of the cage was filled with previously harvested fibula autograft with orthobiologics including DBM in addition to a connective tissue matrix.



Patient was placed in a posterior splint with compression dressing for 7 days. A small central wound dehiscence was noted measuring approximately 0.3 x 0.5 x 0.3cm at the convergence of the incision and original laceration site. The patient was then referred to an out-patient wound care physician, in addition to continued follow up with infectious disease. The patient returned for a four week follow up, post reconstruction, the non – healing wound was cultured, and was positive at that time for Enterobacter cloacae, which was treated with 6 weeks of IV aztreonam. The wound healed 3 months after surgery.



The patient was kept strict non-weight bearing to the right lower extremity in a splint for 2 weeks and controlled ankle movement boot for 10 total weeks. The patient was then allowed weight bearing as tolerated in a CAM boot at post-op week 12. The patient was placed in a custom AFO at post op week 12.

The patient, to date (FIG H-J), has proceeded to return to a full course load of college classes, is ambulating with AFO on the right lower extremity without restriction or pain.

## ANALYSIS AND DISCUSSION

Due to successful application of titanium mesh grafts in the lower extremity with minimal complications, we anticipate their use in foot and ankle reconstruction with increasing frequency.<sup>9,15</sup> Complications may remain however, due to superior stability of the construct, ability to regain anatomic length, currently described up to 150 mm in the lower extremity,<sup>17</sup> as well as greater incorporation of autograft in conjunction with the cage, this method holds significant advantages over the other methods listed in reconstruction of the ankle. In conclusion, we believe titanium mesh cages are a viable option as an adjunct to the reconstruction of large segmental defects of the lower extremity.

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