Ankle arthrodesis with IM rod and 3-D printed titanium truss cage following failed ankle arthroplasty

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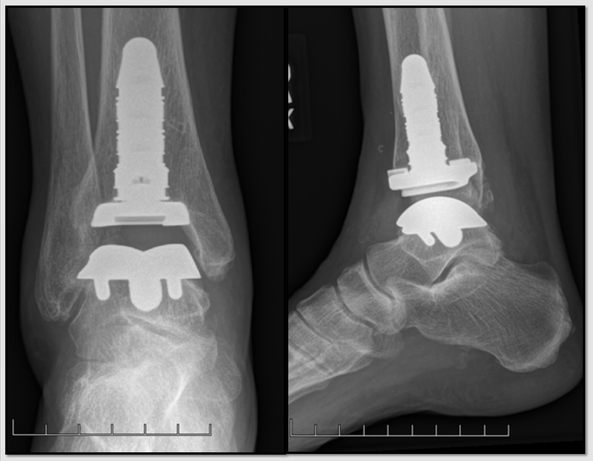
Introduction and Aim

Early attempts at total ankle replacements (TARs) were fraught with clinical failure and were reduced to near extinction. The resurgence of TARs can be credited to inventive physicians and the ability to alter perceptions to produce a more biomechanically sound implant. Recent changes to newer generations of TARs include modifications to the components and design of the implant, improved surgical instrumentation and technique, and the use of a two- or three-component design. While the discussion between revisional TAR versus fusion following failed TAR is beyond the scope of this case study, management of large structural defects of the ankle and hindfoot is challenging with modest outcomes in the literature. In this case study we present the use of a patient-specific 3-demensional printed titanium truss cage with tibiotalocalcaneal arthrodesis for a failed total ankle arthroplasty. This case serves as a proof of principle that requires future research to determine its long-term clinical value, cost-effectiveness, and difficulties.

Implant	Study	Years	Survivorship
Agility	Knecht et al. (2004)	9	10.6%
Buechel-Pappas	Buechel et al. (2004)*	20	74.2%
Multiple	Haddad et al (2007)	10	77%
STAR	Wood et al (2008)	10	80.3%
STAR	Mann et al. (2011)	10	90%
STAR	Brunner et al. (2012)	14	45.6%
Multiple	Zaidi et al. (2013)	10	89%
STAR	Jastifer et al. (2015)	10	94.4%
Multiple	Bartel et al. (2015)	10	81%

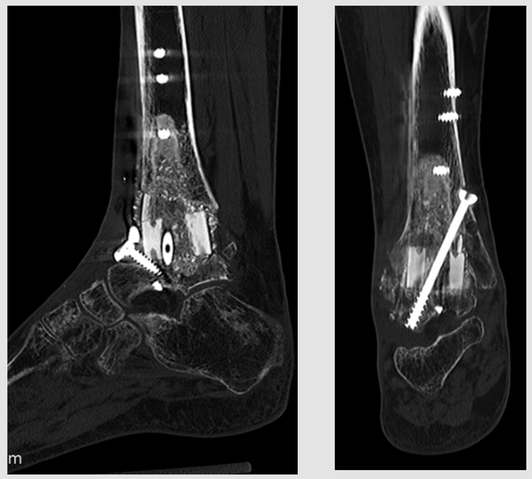
Survivorship: Studies showing multiple TARs with multiple implants. Studies are organized by years followed by survivorship post-insertional of implant



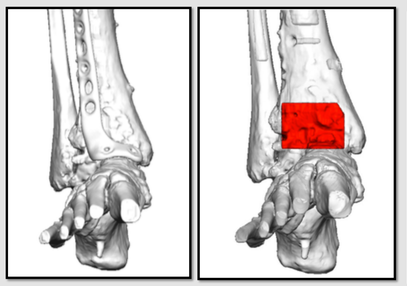
Patient had an Inbone™ TAR in 2013
Due to lateral incision dehiscence and positive cultures
Infectious Disease consultation recommended complete implant removal

Methods

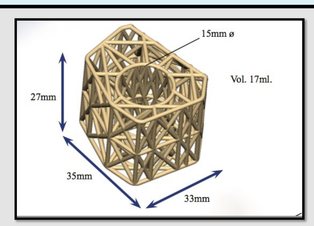
Patient underwent a total ankle replacement (TAR) in 2013. Following the surgery she fell in the shower and had persistent weakness laterally. Patient had a lateral ankle stabilization procedure that dehisced with green drainage, which resulted in an Infectious disease consult , who recommended complete implant removal with antibiotic spacer.
The patient underwent removal of ankle implant, insertion of antibiotic spacer, and Ex-Fix application.
Subsequently, the patient was taken back to the operating room to fuse the ankle with an Allograft osteo wedge, MAP 3, Augment, and a Wright Medical anterior ankle plate and screw fixation.



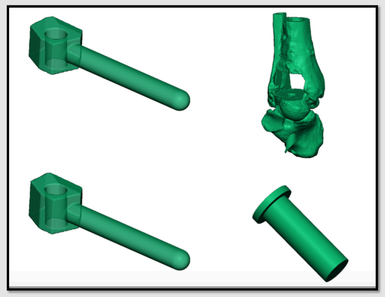
CT (8/10/16)
There is no significant healing identified involving the bone graft involving the distal tibia. No evidence for bone formation noted around the surgical site identified to indicate healing.



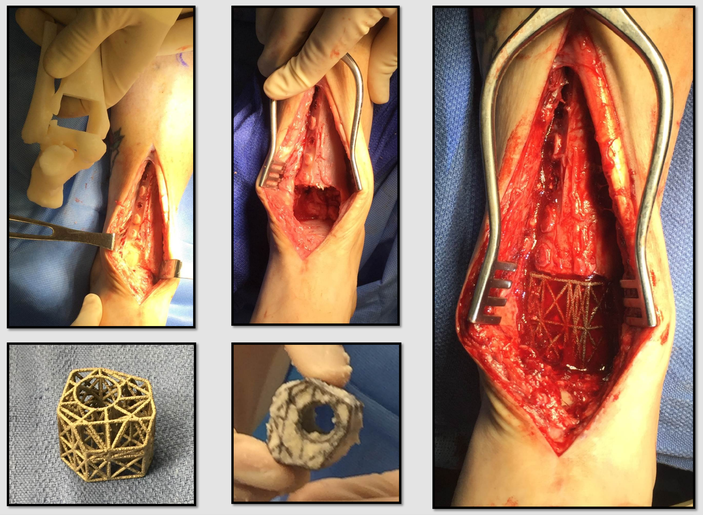
From left to right: AP CT Pt RLE, AP CT boney deficit, AP CT implant with IM rod, Lat. CT Pt RLE, Lat. CT boney deficit, Lat. CT implant with IM rod,



CT guided truss cage dimensions



Trials, CT model of Pt RLE, Sizer for IM rod



Top left: CT model & Pt RLE. Top middle: Pts RLE. Bottom left: Truss cage. Bottom middle: Truss cage with graft. Left: Pts RLE with truss cage and IM rod.

Methods (continued)

Following the non-union the patient underwent ankle arthrodesis with IM rod, 3D printed titanium truss cage, Wright medical Augment, and Allomatrix

Lateral ankle view: status post ankle arthrodesis with IM rod and 3D printed titanium truss cage

Conclusions

At six months the incision had completely healed and the patient was able to full weight bear and ambulate without assistance.
CT report (7/11/17) stated, osseous union of the distal tibia and talus, no evidence of hardware failure.
The recent revival of interest in total ankle replacement has shown promise in terms of intermediate-term survivorship. However, these rates vary significantly with surgeon experience, patient selection, and individual implant design.
Total ankle replacement failure demands surgical intervention, namely either revisional TAR or arthrodesis of the ankle joint.
The future of patient-specific 3D printed implants in foot and ankle surgery is uncertain, with numerous potential benefits and limitations.
While the cost, resources, and surgical time required can be extensive, there are potential limb-saving scenarios like the case presented here.

References

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