Custom Talus Replacement for Post-traumatic Total Ankle Arthroplasty Failure

Purpose and Literature Review
Total ankle arthroplasty has been well utilized with the help of newer generations of total ankle implant. The recent trend in past decade shows total ankle arthroplasty utilization increased 671% over the same time period that ankle arthrodesis utilization decreased by 15.6% [1]. However multiple complications are still being reported, such as deep infection, loosening or breakage of implants and post traumatic fractures. Current surgical management of total ankle arthroplasty failure are revision to a new prosthesis, arthrodesis and below knee amputation [2]. The advantage of talar prosthesis replacement includes preservation of joint movement, relative short period of restricted weight bearing, rapid pain relief and preservation of limb length [3]. The purpose of this case study is to present custom talus implant can be a valid alternative treatment option for failed post traumatic total ankle arthroplasty.

Case Study
75 years old male with history of high cholesterol and surgical history of left ankle replacement, heart surgery (sten), cataract-lens implants and prostate surgery and right ankle arthroplasty [02/28/2014](Figure 1) was seen in the office for right ankle pain on July 2014. Patient stated that he sprained his right ankle on the uneven rocky surface. The Xray of the right ankle on the following office visit showed tibial component of the implant was intact, however talus component of the implant showed subsidence with talar bone fragment (Figure 2). The CT image showed the flattening of the talus in sagittal image, subtle lucency at the lateral margin of talar component with lateral displacement of talus and possible osseous fragment. 15mmx11mmx10mm, anterior and plantar displacement of talar component, lateral margin of talus abut with fibula and tibia component shows slight lateral positioned. After extensive discussion with patient and patient’s family, custom talus replacement was choice of treatment. The revision of right total ankle arthroplasty with custom talus surgical procedure was set on June 27th 2015.

Surgical Procedure
A complete collapse of the talar component which located at the dorsal surface of the calcaneous was noted. The shattered talus was sitting medial and lateral ankle gutters. Both talar and tibial components with associated polyethylene were removed from the ankle joint. Lack of bleeding showed clinical signs of avascular necrosis. Partial tectality was performed and left the distal head and neck portion of the talus in order to achieve stabilization of the custom talus. Then custom talus was positioned at the mechanical axis of the tibia. Customized talus template was utilized to create a hole for long talar stem. After placing the custom talus in a desirable position, any gap between the calcaneous and custom talus was packed with combination of autogenous bone graft and cancellous bone chips for stability. Tibial plate with associated polyethylene was positioned in tibia. Adequate ankle joint range of motion with stability was noted. After taking the final xray, 2-0 Vicryl was used for deep fascia and subcutaneous layer and 3-0 Nylon was used for skin close.

Implant Description
The custom talar component has 15mm thick flat base wedge with a long post in order to anchor the implant. The length of the post is 40mm and 10mm diameter. The implant is inclined at 40 degrees posterior and 15 degrees externally. The talar implant is coated with Plasma Spray Titanium on the plantar aspect of the implant.

Post-operative Management
Patient has been NWB with short leg cast with knee crutch for 7 weeks. Then transfer to CAM walker with continued NWB status on knee crutch. Patient also advised to start passive range of motion exercises. At 15th week post operatively, patient started to weight bear with CAM walker and transferred to custom ankle foot orthosis. Physical therapy with full weight bearing status was suggested at 20th week. At 40th week, ankle x ray showed (Figure 3) showed tibial and talus implant in place with good alignment.

Discussion
In Sadoghi et al, they categorized the causes of revision after total ankle joint arthroplasty. The data was collected from the National arthroplasty registers. In Norway and New Zealand between 1993 and 2007. Total of 1113 primary cases and 189 cases of revision surgery was noted. This study found that the most common causes for revision surgery in total ankle arthroplasty were aseptic loosening (38%), technical errors (15%), pain without other causes (12%), septic loosening (8.5%), breakage (5.3%) and periprosthetic fracture (2%). [4,5] Ellington et al reported the one of the primary indication for revision total ankle replacement is talar subsidence. The study describes their classification system based on the position of the talar component in relation to the subtalar joint. Grade 1 represents no subsidence, Grade 2 represents subsidence but not to the level of the subtalar joint and Grade 3 represents subsidence to the level of or inferior to the subtalar joint. Among total of 41 patients, 8 patients fall into Grade 3 group and 7 out of these 8 patients underwent subtalar arthrodesis. 19 patients were required a custom talar component due to the talar subsidence. By comparing preoperative talar subsidence related to the postoperative outcome scores, greater degrees of talar subsidence being associated with poorer outcomes.[2] Previously with extensive bone loss and talar subsidence, arthrodesis may be considered for revision. However, total ankle prosthesis improvement made revision of the total ankle arthroplasty become available for failed primary total ankle arthroplasty.[6] In relation to Ellington’s study, our patient had Grade 3 talar subsidence due to the trauma postoperatively. The post trauma Xray showed significant bone loss in talar body with anterior aspect of the talar component of the prosthesis contacting the body of calcaneous. Custom talar implant is a plausible option for significant bone loss in talus with degenerative subtalar joint.

Reference