Radical Sub-total Calcanectomy for Osteomyelitis with Staged Custom Titanium Cage Implant: A Case Study

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Purpose:
The purpose of this case report was to provide a novel surgical approach as a limb salvage option for an ambulatory patient with calcaneal osteomyelitis (OM).

Limb salvage procedures following wide resection of the calcaneus are limited and infrequently described. Amputation is often indicated or an end result. Potential alternatives include pedicle bony allograft, autograft, or a custom implant. Overall, treatment options for extensive calcaneal OM are somewhat limited and many of these procedures are technically challenging. The primary end treatment goal is to eradicate the OM and provide the patient with a pain-free functional limb for ambulation.

Case Report:
Following a spinal surgery, a 41 year old autistic male developed a chronic ulcer to his left heel, and subsequently calcaneal OM. Cultures were positive for Enterobacter and MRSA, which required multiple courses of intravenous and oral antibiotics. The wound eventually healed with local wound care and negative pressure vac therapy. Months later, the patient presented to the emergency room febrile with persistent left limb swelling and redness.

MRI demonstrated erosion of the posterior medial aspect of the left calcaneus involving 75% of the calcaneus, compatible with worsening OM. There was a pathologic fracture of the posterosuperior calcaneus due to the underlying OM and multiple abscesses in the soft tissues.

A staged surgical treatment approach was planned. The patient first underwent a radical sub-total calcaneotomy, Achilles detachment, and insertion of a gentamycin/tobramycin antibiotic bone cement spacer. The resected portion measured 4.0 x 3.0 x 4.5 cm. Pathology reports confirmed active chronic OM.

Exactly seven months later, the patient returned to the operating room. A custom titanium implant cage was fabricated from CT imaging. The patient-specific implant included two screws for fixation to the remaining anterior calcaneal fragment, as well as portion to reach the Achilles.

The patient received a nerve catheter block preoperatively, was placed in a prone position, and thigh tourniquet placed. Bone marrow aspirate (BMA) was harvested from the proximal lateral tibia. A standard Baumann gastrocnemius lengthening was performed. An “S” shaped incision directed proximal medial to distal lateral was made over the insertion of the Achilles tendon and calcaneus. The antibiotic cement spacer was explanted. The posterior portion of the remaining calcaneus was then debrided to healthy bleeding bone and subchondral drilling was performed. On the back table, cryopreserved cancellous bone combined with demineralized cortical bone matrix was mixed with the BMA – this was then packed within the custom implant. The implant was anatomically placed and secured with two 5.0 mm partially-threaded cannulated screws. #2 FiberWire was passed through the Achilles tendon in a Krakow fashion and the tendon was then re-anchored into the posterior superior implant.

Results:
Postoperatively, the patient was non-weightbearing in a gravity plantarfexion splint. This was transitioned to a fiberglass cast at the first follow-up and he remained non-weightbearing for ten weeks total.

The clinical results for this patient has been promising. Follow-up plain films have demonstrated excellent implant alignment at six months. The patient demonstrates sufficient ankle motion and the Achilles tendon functions normally. He currently is working well with physical therapy and partial weightbearing in an Arizona brace for stability. Some plantar fat pad atrophy has been observed, but remains a non-issue at this point.

Analysis and Discussion:
This case study demonstrates a successful alternative for surgical treatment of calcaneal OM. Advances in technology to allow custom titanium implants from CT imaging offers an innovative approach to limb salvage that could potentially be less morbid than an amputation in the right patient. Patient selection is critical. The patient’s prior functional status, comorbidities, bone quality, vascular status, and soft tissue coverage should all be carefully considered in the preoperative phase. Other considerations include cost of implant, surgical competency, and patient’s ability to be compliant. A limitation to this study is the length of follow-up. Additional studies with larger populations and long-term results are needed to further draw comparative conclusions to other surgical options in treating calcaneal OM.

References:

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