

Limb Salvage of The Foot Through Creation of A Calcaneal Cortical Window to Treat Osteomyelitis Following Injection

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Statement of Purpose

Calcaneal osteomyelitis is a complicated limb-threatening clinical scenario, which often times is difficult to treat. Most cases of calcaneal osteomyelitis that we treat are seen secondary to direct or contiguous infection from a wound. Less often, it is due to hematogenous spread, or even more infrequently from a needle injection. A few case reports have been published in the literature of calcaneal osteomyelitis following steroid injection [1,2], however, they were treated with a partial calcanectomy. To our knowledge, there have been no cases reported in the literature of creating a lateral calcaneal cortical window to treat calcaneal osteomyelitis in a severely immunocompromised adult. The purpose of this case report is to present our surgical limb salvage protocol for the treatment of calcaneal osteomyelitis that was minimally disruptive to the patient's quality of life and maintained his baseline function.

Literature Review

Currently, traditional methods to treat calcaneal osteomyelitis include partial calcanectomy, total calcanectomy, or amputation [3,4,5]. Functional outcomes and patient satisfaction from a partial or total calcanectomy have been studied and currently appears to be satisfactory [6,7,8]. Unfortunately, a partial or total calcanectomy is typically associated with long hospital stays or rehabilitation, and typically, the need for further procedures to obtain complete healing. Gait is also impaired and shoe modifications are required. Of note, however, a calcanectomy, in comparison to amputation, has led to a notable decrease in morbidity and mortality [9]. Currently, an even less invasive percutaneous antibiotic delivery system has been described [10,11]. The common variable in all of these procedures, however, is the presence of a heel ulcer, which was not present in our patient, thus rendering these treatment options suboptimal. After searching the literature, two case reports were found of pediatric patients that were treated with cortical windows, debridement, and antibiotic impregnated beads. The first case report involved a 9 year old who presented with fever, an inability to bear weight and edema to the left foot and ankle. A lateral calcaneal window was created to treat hematogenous methicillin resistant *Staphylococcus aureus* (MRSA) osteomyelitis [12]. The second case report also involved a 9 year old who had a 9 month history of worsening pain and swelling to her left foot. She was treated with curettage through an oval cortical window of her first metatarsal [13]. A search of general orthopedic literature was also performed, and revealed the use of cortical windows for the treatment of osteomyelitis involving the femur, tibia, and humerus [13,14,15].

Case Study

A case is presented of a severely immunocompromised 70-year-old male, former smoker, on oxygen with chronic obstructive pulmonary disease, idiopathic pulmonary fibrosis, rheumatoid arthritis, coronary artery disease, hyperlipidemia, benign prostatic hypertrophy and atrial fibrillation, who presented with progressively worsening right rear foot swelling, pain, and a draining sinus along the lateral foot below the right ankle. Two weeks prior to presentation, he was treated by his podiatrist with an injection into the lateral aspect of his foot after an MRI was performed at an outside facility. The history here is not clear, and attempts to obtain notes and previous imaging were not successful. About one week after receiving the injection, he noticed drainage from the injection site, and what the patient related as pus. He was subsequently placed on oral antibiotics by his doctor, however, when the drainage did not resolve, he presented to the Emergency Department. The patient was admitted under internal medicine, and various services were consulted, including podiatry and infectious disease (ID). On admission, vital signs were within normal limits, with the exception of pulse oximetry, which was 90%. A complete blood count (CBC) with differential was normal, erythrocyte sedimentation rate (ESR) was 28 and c-reactive protein (CRP) was 5.35. He was placed on Vancomycin and Zosyn due to concerns of an underlying abscess and/or bone infection. Initial radiographs were unremarkable without evidence of osteomyelitis (Figure 1). An MRI of the right ankle with and without contrast was performed. Post contrast images demonstrated a tract from an area of phlegmonous change in the region of the lateral malleolus to the lateral wall of the calcaneus where there was a focal cortical breakthrough. The area of cortical breakthrough communicated with a geographic region of signal abnormality within the calcaneal tuberosity, measuring approximately 4.6 x 2.0 x 2.3 cm. A large area of osteonecrosis was also noted to involve the distal tibia along with a smaller focus involving the posterior aspect of the talar dome without subchondral collapse (Figure 2 A, 2B).

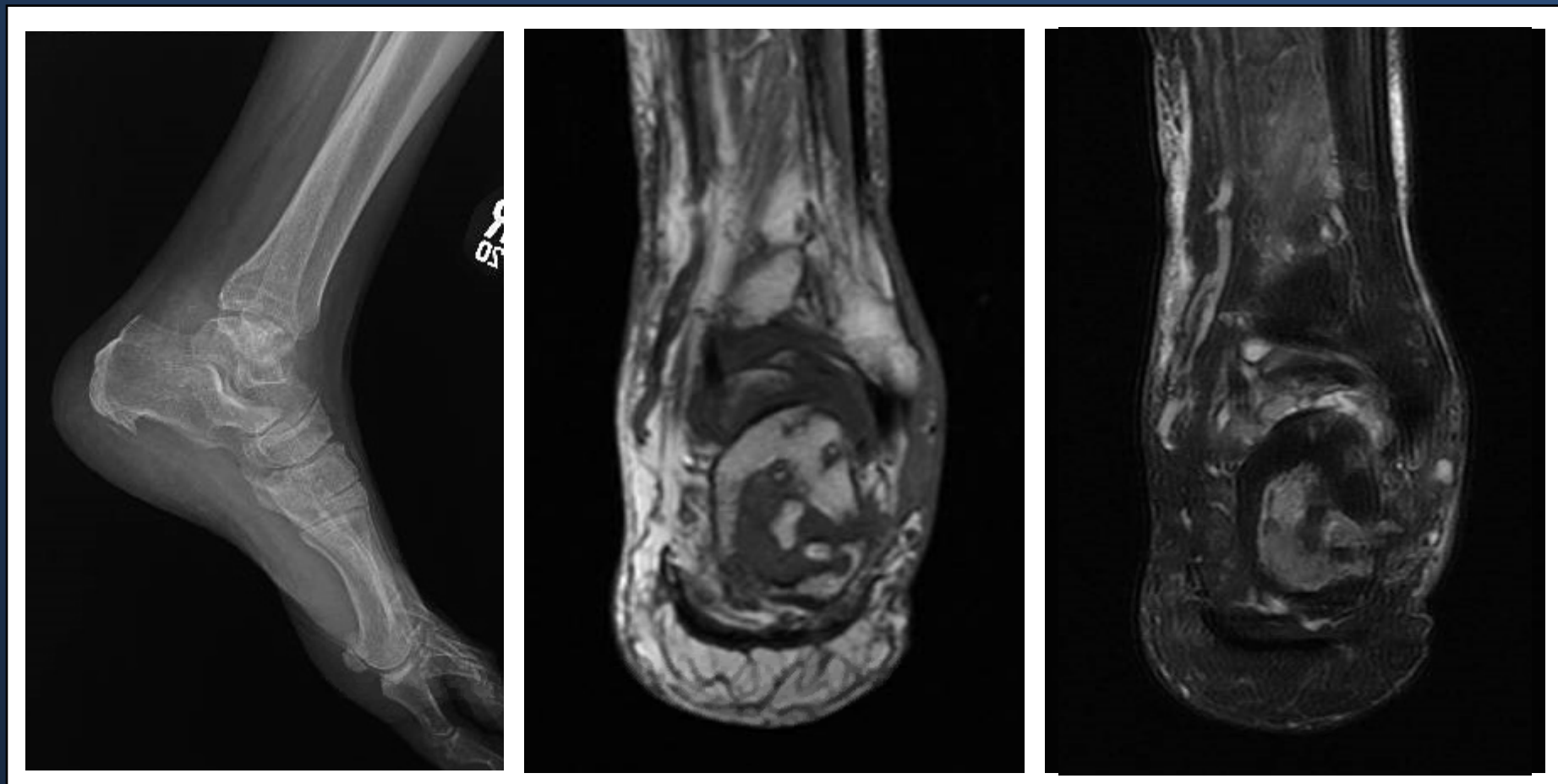


Figure 1: Pre-op x-ray Figure 2A, 2B: Initial T1 and STIR images

Case Study continued

After discussing with internal medicine and ID, the plan was to take the patient to the OR for drainage/debridement of the calcaneus and placement of antibiotic impregnated beads through a calcaneal window. Postoperatively, the white blood cell count remained elevated and a repeat MRI with contrast was ordered that showed moderate peripheral enhancement and edema within the calcaneal defect; consistent with residual infection versus post surgical change. On return to the operating room, the same surgical approach was taken.

Surgical Procedure

With the patient in the supine position, and a bump under the ipsilateral hip, the right heel was approached through a modified curvilinear lateral extensile incision that incorporated the draining sinus tract. The dissection plane was taken down to periosteum, and a full-thickness subperiosteal flap off of the calcaneus was created. The peroneal tendons and the sural nerve were maintained superior to the incision. After completion of the soft tissue dissection, the planned cortical window was marked with 4 safe-stop drill holes. The window was then cut using a sagittal saw and removed, while maintaining a slightly wider exterior cortex in relation to interior cortex. At this point, a mixture of purulence, dead bone, and debris was expressed. A wound culture of this material was obtained. The bone was then curetted and the bone was irrigated with a pulsed lavage containing normal sterile saline. Prior to irrigation, a deep surgical swab of the bone was obtained along with a sample of cancellous bone. Samples were sent for acid fast, fungal, aerobic, and anaerobic cultures. A sample of bone was also sent to pathology. The wound was packed with absorbable Vancomycin impregnated beads made of calcium phosphate cement impregnated with 1 gram of Vancomycin. The sinus track was excised and the flap was re-approximated with Nylon suture in an interrupted pattern. The incision was dressed with a dry sterile dressing and placed in a modified Jones compression dressing and a posterior splint constructed out of 3" fiberglass.

The patient was taken back to the operating room 12 days later, at which point an ankle aspiration was performed to rule out a septic joint per ID's request. The cortical window was then opened through the same incision using the original approach. The bone was debrided once again and irrigated with a pulse irrigation system containing normal sterile saline. This time the Gentamycin impregnated beads were added to address the most recent culture results. The cortical window was then closed and the subcutaneous tissue and skin were again re-approximated using Nylon suture in an interrupted pattern. The patient was placed in a modified Jones compression and posterior splint and discharged home with a peripherally inserted central catheter for continued antibiotic therapy.

Analysis & Discussion

The initial bone pathology came back as acute osteomyelitis and the wound culture was significant for a polymicrobial infection consisting of MRSA, *Pseudomonas aeruginosa*, and *Pseudomonas putida*. Blood cultures, fungal culture, and acid fast culture were negative. Tissue culture from the second procedure did not grow anything. The ankle fluid culture was also negative. Ankle fluid cytology revealed macrophages in the background of blood and proteinaceous debris.



Figure 3. Lateral x-ray Three months post operative, patient full weight bearing

ID placed the patient on 1250 mg of intravenous Vancomycin BID in combination with 3.375 grams of Zosyn every 8 hours for 6 weeks administered through a peripherally inserted central catheter. The patient was non-weight bearing for five weeks, then transitioned to protected toe touch weight bearing in an off loading shoe with a walker for assistance because the CAM boot was too heavy for him to wear. By 3 months postop, he was full weight bearing in a sneaker. At 25 months post operatively, the patient had no recurrences and no complications. When addressing cases of calcaneal osteomyelitis without the presence of ulceration, eradication of infection in conjunction with limb salvage should be the primary focus. We presented a case of a 70 year old male, with severe co-morbidities who was successfully treated while maintaining normal foot biomechanics and quality of life. Though our approach was not entirely novel, it was unique in that it is not the typical approach to surgical treatment of calcaneal osteomyelitis. It facilitated relatively quick discharge to home, as opposed to a prolonged hospital course, which would have likely rendered this patient bed ridden given his significant pulmonary history.

References

- [1] Gidumal R, Evanski P. Calcaneal osteomyelitis following steroid injection: a case report. *Foot Ankle*. 1985;6(1):44-6.
 - [2] Wronka KS1, Sinha A. Calcaneal osteomyelitis following steroid injection for plantar fasciitis: a case report. *Foot Ankle Spec*. 2012;5(4):253-5.
 - [3] Babak I, Pedrizz P, Kulig M, Janowicz J, Walsky P. Comparison of bone preserving and radical surgical treatment in 32 Cases of calcaneal osteomyelitis. *J Bone Joint Infect*. 2016;5(1):10-16.
 - [4] Walsh TP, Yates BJ. Calcanectomy: Avoiding major amputation in the presence of calcaneal osteomyelitis- A case series. *The Foot* 2013;23:130-135.
 - [5] Boffell TJ, Collier RC. Near total calcanectomy with rotational flap closure of large decubitus heel ulcerations complicated by calcaneal osteomyelitis. *JFAA*. 2013;52(1):107-112.
 - [6] Oliver NG, Steinberg JS, Powers K, Evans KK, Kim PJ, Attinger CE. Lower Extremity Function Following Partial Calcanectomy in High-Risk Limb Salvage Patients. *Journal of Diabetes Research* Volume. 2015;Article ID 432164, 7 pages.
 - [7] Smith D, Stuck R, Ketner L, Sage R, Pinzur M. Partial calcanectomy for the treatment of large ulcerations of the heel and calcaneal osteomyelitis. An amputation of the back of the foot. *J Bone Joint Surg Am* 1992;74:571-5.
 - [8] Baunhauer J, Fraga C, Gould J, Johnson J. Total calcanectomy for the treatment of chronic calcaneal osteomyelitis. *Foot Ankle Int* 1998;19:849-55.
 - [9] Perez M, Wagner S, Yun J. Subtotal calcanectomy for chronic heel ulceration. *J Foot Ankle Surg*. 1994;33:572-9.
 - [10] Drampalos E, Mohammad HR, Kosmidis C, Balal M, Wong J, Pilali A. Single stage treatment of diabetic calcaneal osteomyelitis with an absorbable gentamicin-loaded calcium sulphate/hydroxyapatite biocomposite: The Silo technique. *Foot (Edinb)*. 2017 Nov 23; 34:40-44.
 - [11] Karr JC. An Overview of the Percutaneous Antibiotic Delivery Technique for Osteomyelitis Treatment and a Case Study of Calcaneal Osteomyelitis. *J Am Podiatr Med Assoc*. 2017 Nov; 107(6):511-515.
 - [12] Chen K, Balloch R. Management of Calcaneal Osteomyelitis. *Clinics in Podiatric Medicine and Surgery*. 2010; 27(3):417-429.
 - [13] Chiu CK, Singh VA. Chronic recurrent multifocal osteomyelitis of the first metatarsal bone: a case report. *J Orthop Surg (Hong Kong)*. 2009;17(1):119-22.
 - [14] Chang W, Colangeli M, Colangeli S, Di Bella C, Gozzi E, Donati D. Adult Osteomyelitis: Debridement versus debridement plus Osteoset T pellets. *Acta Orthop Belg*. 2007;73:238-244.
 - [15] Gitelis S, Brebach GT. The Treatment of Chronic Osteomyelitis with a Biodegradable Antibiotic-impregnated Implant. *Journal of Orthopedic Surgery*. 2002;10(1):53-60.
 - [16] Ilyas AM, Mudgal CS. Management of medullary osteomyelitis of the humerus. *Tech Hand Up Extrem Surg*. 2008;12(3):144-9.
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