The Northern Ohio Foot and Ankle Journal *Official Publication of the NOFA Foundation*

Calcanectomy for the Treatment of Osteomyelitis in a Patient with a Chronic Calcaneal Fracture: A Case Report

by Authors Joseph Saxon DPM[1], Craig Verdin DPM[2], Nicole Nicolosi DPM[3]

The Northern Ohio Foot and Ankle Journal 1 (1): 1

Abstract: Calcaneal osteomyelitis is a relatively common but devastating complication that places patients at increased risk for limb loss. We present a case of a 55-year-old male with a previous calcaneal fracture resulting in post-traumatic deformity and formation of a plantar heel ulceration. After routine imaging, hematology, and biochemistry was performed, a diagnosis of calcaneal osteomyelitis was made and patient underwent a partial calcanectomy. At the 6-month follow-up, patient is healing without complications and will continued to be monitored.

Key words: Calcanectomy, Osteomyelitis, Calcaneal fracture

Introduction: Osteomyelitis presents as one of the main and most devastating complications of long-term heel ulcerations. Osteomyelitis of the calcaneus represents 7-8% of all osteomyelitis cases, diabetic ulcers being a common cause. Surgical treatment of calcaneal osteomyelitis currently offers only a handful of curative options including partial or total calcanectomy as well as below-knee amputation.

Partial calcanectomy is a limb preserving surgical option where ambulatory status can be maintained in 75% following resection[(3)].

The partial calcanectomy is a relatively simple procedure for chronic heel ulcers with limited calcaneal involvement. The amount of soft tissue compromise may allow for primary closure following partial calcanectomy, or in combination with grafting to allow secondary healing.

Here we present our encounter of using partial calcanectomy and grafting to facilitate wound healing in a patient with heel ulceration and osteomyelitis of the calcaneus in the setting of a chronic calcaneal fracture.

Address correspondence to: jsaxon@mercy.com[1]Podiatric Medicine and Surgical Resident, Mercy Regional Medical Center, verdinc@ccf.edu [2] Podiatric Medicine and Surgical Resident, Cleveland Clinic/ Surgical Hospital of Oklahoma, nicolon@ccf.org[3] Staff Foot and Ankle Surgeon, Orthopaedic & Rheumatologic Institute, Cleveland Clinic

Case Report: Patient is a 55 year old male with past medical history significant for T2DM, HLD, HTN, and CKD presented to the hospital for evaluation of bilateral heel ulcerations. Upon admission, the patient was found to be septic (LDH 252 U/L; CRP 11mg/dL; ESR >140 mm/hr). Podiatric consultation was requested for possible source identification/control. The patient first noticed his left heel ulceration around his most recent admission to an outside facility 3 weeks prior. Patient was then placed on Ertapenem CoPAT for a period of 6 weeks. Patient presented to the emergency department with nausea, fever, and chills. On physical examination, patient had dorsalis pedis palpable bilaterally, posterior tibial pulses faintly palpable bilaterally and protective sensation was absent bilaterally to the level of the mid-tibia. Further, there was noted a well adhered eschar to the plantar left heel with fibrotic rim and surrounding periwound hyperkeratosis (Figure 1). No clear signs of infection noted to left heel including erythema, malodor, drainage, or calor; however, fluctuance to the eschar could be appreciated.

Figure 1: Initial clinical presentation demonstrating stable eschar to plantar calcaneus

Routine X-rays of the left foot obtained during this admission demonstrated revealed chronic calcaneal fracture extending into the subtalar joint with a tongue-type avulsion of the superior aspect of the calcaneus with interfragmental resorption, concerning for osteomyelitis (Figure 2). Vascular studies revealed a left ankle-brachial index of 1.49 and toe brachial index of 0.97. Given the chronicity of the non-healing ulceration, the decision was made to perform a partial calcanectomy of the left foot in an effort to remove any bony prominences and allow for healing of the wound.

Figure 2: Pre-operative plain film radiograph demonstrating calcaneal avulsion fracture and interfragmental resorption

The patient underwent a partial calcanectomy of the left foot while inpatient. Intraoperatively, a 10 blade was made to excise the ulceration full thickness (7.0 x 5.0 x 1.5 cm) to the level of the bone and it was sent to pathology for evaluation. The deep soft tissue overlying the calcaneus revealed purulence. A deep soft tissue culture which encompassed this purulence was excised and sent to micro for evaluation. The posterior plantar calcaneus was noted to be crumbly, soft, and revealed evidence of infection. A sagittal saw blade was used to excise the infected posterior plantar calcaneus (2.0 x2.0 x 1.6 cm) as pre-operatively seen on radiographs as the site of potential osteomyelitis. This excised bone was split in the sagittal direction with half being sent to Microbiology and half being sent to Pathology for evaluation. The wound was then irrigated with 5.0 liters of lactated ringers under standard pressure, resulting in a clean wound, and a negative pressure wound therapy (NPWT) was initiated (Figure 3).

Figure 3: Post-operative result following partial calcanectomy

Postoperative plain film radiographs were obtained and revealed satisfactory resection of posterior aspect of calcaneus and inconsequential distraction of previous avulsion fracture fragment (Figure 4). Subsequent analysis of the microbiology and pathology revealed findings consistent with acute osteomyelitis of the resection portion of the calcaneus, inflammatory necrosis of the resected overlying soft tissue, and growth of Corynebacterium, Pseudomonas, and coagulase negative Staphylococcus species. Clean margins were obtained and did not reveal any growth at the 72 hour mark. After finalization of cultures, the infectious disease service recommended patient be discharged with Doxycycline and Ciprofloxacin in combination with NPWT, and instructions to follow-up with performing surgeon.

Figure 4: Immediate post-operative radiograph revealing satisfactory resection of posterior calcaneus

Post-operative course was uneventful and 2.5 months later, patient has successfully granulated over the resected portion of the calcaneus, allowing for placement of a skin substitute graft. Patient was prepped for placement of a Stravix graft (Osiris Therapeutics, Columbia, MD) to further expedite granulation. Intraoperatively, non-viable tissue was sharply debrided; debridement limited to subcutaneous tissue <20cm2 to create a healthy granular wound bed for graft application. The Stravix 3.0 cm x 6.0 cm graft was thawed by standard technique. The graft was then fenestrated with a 15 blade on the sterile back table and was adhered to the wound using 3-0 prolene. Adaptic was applied followed by a wound vac with black foam under 125 mmHg of pressure.

At the 6-month follow-up, patient was seen and evaluated. Repeat radiographs were taken, showing no changes relative to the most recent plain film radiographs. The wound demonstrated a healthy granular bed. Patient will continue to resume NPWT and will be monitored for changes and eventual epithelization of the wound.

Figure 5: 6-month follow-up

Figure 6: Plain film radiographs at 6-month post-operative follow-up

Discussion:

Osteomyelitis of the calcaneus is a challenging obstacle to manage. Generally, the goal of treatment includes eradication of infected bone, and preservation of function of the foot. Surgical management of chronic osteomyelitis has included local curettage or partial calcanectomy or total calcanectomy. In more severe cases of extensive calcaneal involvement, limited soft tissue coverage creates a challenge for the surgeon to allow for primary closure; Often below knee amputation has been recommended in these cases.

Partial calcanectomy was first described by Gaenslen et al in 1931[1]. It is a relatively simple to perform and allows the surgeon to resect infected bone and soft tissue while preserving ambulatory status with proper post-operative protection.

Partial calcanectomy has been a successfully utilized tool for limb salvage in the treatment of heel ulcerations. Randal et al in 2005 published a literature review of 148 cases where they reported an overall healing rate of 89% [2]. In 2011, Han et al reported a healing rate of 58% and a major amputation rate of 42% in nursing home patients who developed heel ulcers and required partial calcanectomy [3]. In 2012, Shade et all published a systematic review which reported <24% of patients had minor surgical site complications that went on to healing and a major amputation rate of 10% following partial calcanectomy. Additionally, in those who did not require major amputation, they found 8% of patients maintained or improved ambulatory status post-operatively after partial and total calcanectomies with calcaneal osteomyelitis[4].

Although chronic heel ulcers with limited involvement of the calcaneus can be primarily closed following a partial calcanectomy, in cases of large ulceration, it is not possible to approximate the adjacent healthy soft tissue and close primary skin, as was the case in our patient. Split thickness skin grafting in cases of heel ulcerations is not a good choice due to the weight bearing zone being particularly susceptible to shear forces and pressure peaks particularly while ambulating. Employment of a free flap or pedicle is better option but should only be employed for selected patients. Thus, we decided to use NPWT until there was adequate soft tissue coverage and healthy granular wound bed for our graft application. NPWT works though several different mechanisms including fluid removal, moist wound healing, decrease of bacterial burden, increase of blood flow, and by stimulating proliferation of fibroblasts and endothelial cells [7,8]. This was applied after the initial partial resection of the calcaneus for 2.5 months. The patient was then taken back to the OR for wound debridement and Stravix Graft application (Osiris Therapeutics, Columbia, MD) in conjunction with NPWT. At the 6 month mark, the wound was noted to be smaller and demonstrated a healthy granular wound bed.

Interestingly, this patient had sustained a tongue-type calcaneal fracture years prior. Although this did not weigh heavily in terms of surgical planning, it was an unexpected find during initial presentation and made for a more difficult resection of calcaneal bone. Ultimately during the resection, distraction of previous avulsion fracture fragment occurred which was deemed inconsequential.

In conclusion, we can assert that partial calcanectomy was a good alternative to below-knee amputation. Moreover, the combined use of negative pressure wound therapy and skin grafting can be a valid therapeutic approach on the treatment of chronic heel osteomyelitis. In our patient, this combination allowed good coverage of the bone and almost complete wound healing. Further follow-up will hopefully demonstrate continued granulation and epithelization of the heel until complete healing is obtained.

References

1. Gaenslen FJ. Split-heel approach in osteomyelitis of os calcis. J Bone Joint Surg Am 1931; 13(4):759-772
2. Randall DB, Phillips J, Ianiro G. Partial calcanectomy for the treatment of recalcitrant heel ulcerations. J AM Podiatr Med Assoc 2005; 95(4):335-341
3. Han PY, Ezquerro R. Surgical treatment of pressure ulcers of the heel in skilled nursing facilities: a 12 year retrospective study of 57 patients. J Am Podiatr Med Assoc 2011; 101(2):167-175.
4. Shade VL. Partial or total calcanectomy as an alternative to below-the-knee amputation for limb salvage: a systematic review. J AM Podiatr Med Assoc 2012; 102(5):396-405.
5. Van Riet A, Harake R, Stuyck J. Partial calcanectomy: a procedure to cherish or to reject? Foot Ankle Surg 2012; 18(1):25-29.
6. D.C. Norvell, A.P. Turner, R.M. Williams, K.N. Hakimi; J.M. Czerniecki, "Defining successful mobility after lower extremity amputation for complications of peripheral vascular disease and diabetes 2011; vol. 42, no.2, pp. 227-234
7. Fraccalvieri M, Zingarelli E, Ruka E, Antoniotti U, Coda R, Sarno A, Bocchiotti MA, Bruschi S. Negative pressure wound therapy using gauze and foam: histological, immunohistochemical and ultrasonography morphological analysis of the granulation tissue and scar tissue. Preliminary report of a clinical study. Int Wound J 2011;8:355–64.
8. Orgill DP, Bayer LR. Update on negative-pressure wound therapy. Plast Reconstr Surg 2011;127(1 Suppl):105S–15S.