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# Functionality of Partial Calcanectomies in the Treatment of Calcaneal Osteomyelitis

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## Statement of Purpose

The aim of this study was to assess the end result limb viability that the partial calcanectomy procedure can offer patients with calcaneal osteomyelitis, with success measured by evaluation of their weight bearing status at final follow up.

## Introduction

Partial calcanectomy procedure is a well-established treatment for heel ulcerations with concomitant calcaneal osteomyelitis.[1] Heel ulcerations commonly result from a combination of chronic pressure, neuropathy, and peripheral arterial disease in patients with multiple high-risk comorbidities including diabetes.[1] Ulcerations of the feet precede greater than 80% of Lower Extremity amputations, with diabetic foot infections the leading cause of non-traumatic amputations.[1] The imaging modality of choice for the evaluation of foot and ankle osteomyelitis is MRI, with reported sensitivity of 90% and specificity of 83%.[2]

Below-the-knee amputation (BKA) is a definitive treatment option for patients with calcaneal osteomyelitis, although may be undesirable for patients with a viable midfoot and forefoot.[3] There are many advantages to partial foot amputations over below-the-knee amputations. The patient may ambulate without a prosthesis and may only need a simple orthosis in the shoe, and the patient with only a partial foot amputation expends less energy ambulating than one with a BKA.[2]

Partial calcanectomy procedure is used as a limb salvage surgical technique when the alternative may be an elective BKA. The aim of this study was to evaluate the long-term limb viability as a limb salvage procedure for patients with calcaneal osteomyelitis who underwent partial calcanectomies, and to evaluate their weight bearing status at final follow up.

## Patients and Methods

IRB protocol was obtained. A retrospective chart review of all patients who underwent a Partial Calcanectomy procedure at Saint Francis Hospital from October 2013-December 2017 was performed. Exclusion criteria consisted of patients without a diagnosis of Calcaneal Osteomyelitis.

13 patients, 14 feet (1 bilateral) underwent a Partial Calcanectomy procedure for treatment of Calcaneal osteomyelitis. One patient underwent a re-visional partial calcanectomy procedure to the same foot. Eight of the patients were male and five were female with average age at the time of the procedure 56 years old (Age range of 39-67).

## Results

Ten patients have concurrent Diabetes Mellitus type 2 with peripheral neuropathy and an average Hemoglobin A1c at the time of the procedure of 8.58% (6.7-12.7%). Three patients (23%) have end stage renal disease with treatment of dialysis, and two patients were wheelchair bound before the procedure due to Spina bifida and paraplegia.

X-rays were obtained on all patients to aid in the diagnosis of Calcaneal Osteomyelitis. Advanced MRI imaging was obtained on 78.6% (11/14) of the affected limbs, with 42.8% with and without contrast and 57.1% without contrast. All of the MRI were officially read as positive for Calcaneal Osteomyelitis.

Six out of the 14 affected limbs (42.8%) underwent vascular studies of Ultra Sound ABI/PVR study. The average Ankle Brachial Index (ABI) was found to be 0.75 out of 4 affected limbs (0.58-0.98) as two of the patients had non-compressible arteries and therefore no ABI was able to be calculated. Three of the patients (21.4%) underwent vascular intervention to the affected limb before undergoing the partial calcanectomy procedure, with one patient (7.1%) having intervention after the partial calcanectomy.

Eleven patients were ambulatory before diagnosis of calcaneal osteomyelitis, and 63.6% (7/11) of patients remained ambulatory with some assistive bracing device at the last follow up appointment. Of the other four patients: one patient remained NWB in a wheelchair to heal the surgical site until his death, and three patients (23%) went on to have a below knee amputation due to infected wound to partial calcanectomy site. Two patients were wheelchair bound prior to surgery due to co-morbidities unrelated to calcaneal osteomyelitis.

Two of the three patients who suffered from ESRD as well as peripheral vascular disease resulted in a Below Knee Amputation. All three of the BKA patients had documented peripheral vascular disease.



Image 1: Lateral Left Foot Radiograph Initial Evaluation 6/10/16

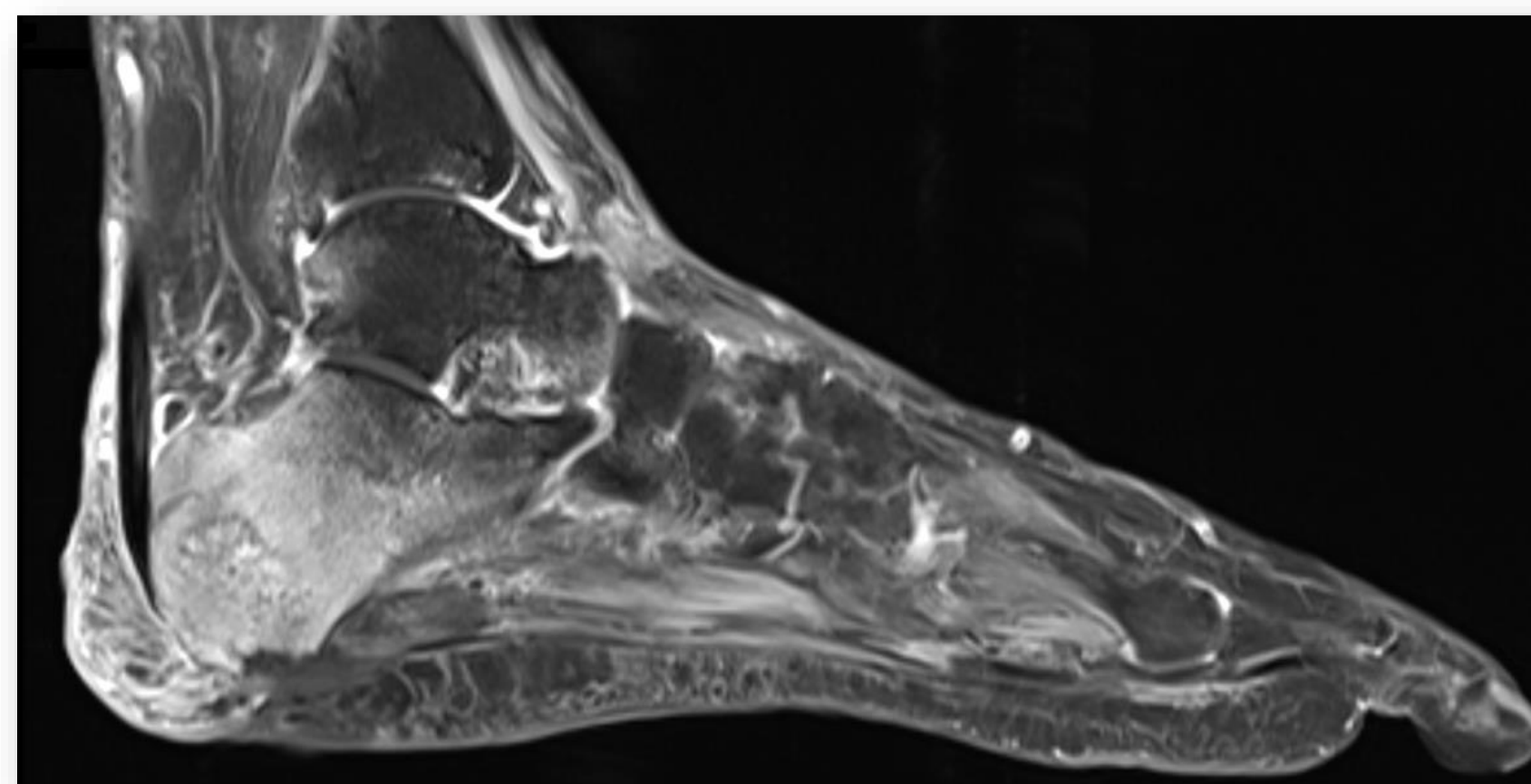


Image 2: Lateral Left Foot MRI Initial Evaluation 6/10/16



Image 3: Lateral Left Foot Radiograph Post Op Partial Calcanectomy 7/27/16

## Discussion

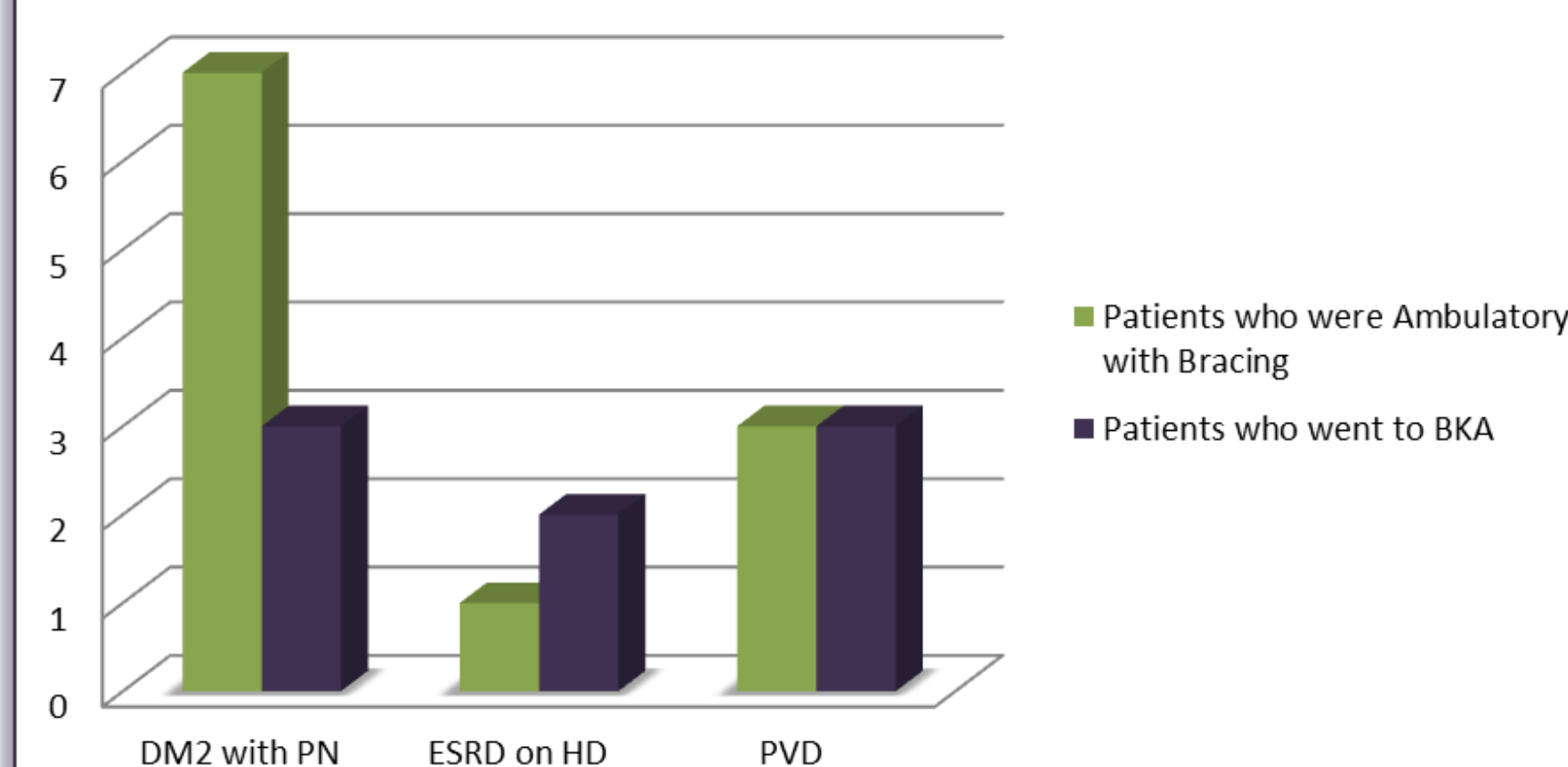
Chronic calcaneal ulcerations commonly lead to calcaneal osteomyelitis, with the most widely accepted treatment a combination of serial debridements and partial calcanectomy.[2] This study was designed to evaluate the long-term limb viability as a limb salvage procedure for patients with calcaneal osteomyelitis who underwent partial calcanectomies, and to evaluate their weight bearing status at final follow up. The results reveal that of the eleven patients whom were ambulatory before the partial calcanectomy procedure, 63.6% returned to ambulation with some assistive bracing. The other four patients resulted in a below-knee-amputation (3 patients) or was in a wheelchair until his death (one patient). This is a comparably low success rate of partial calcanectomies with return to ambulation compared to the current literature, which had results of 85.7% healed and ambulatory and 14.2% with BKA or non-ambulatory.[4] Schade et al [3] found in their study that 85% of patients maintained or improved their ambulatory status post-operatively with only 3% of patients with a decreased ambulatory status post-operatively. Beals et al [5] discussed in their research that balance is impaired with a partial calcanectomy procedure, which may in turn be compensated for with AFO or bracing.

In this study, two of the three patients who suffered from ESRD as well as peripheral vascular disease resulted in a Below Knee Amputation. All three of the BKA patients had documented peripheral vascular disease. Based on these results, a discussion with the patient should be had that they might be better served going to a primary BKA if they also have concurrent ESRD and PVD. Further study could evaluate the effect ESRD has on healing potential for these larger foot amputations.

A limit to this research was the low number of patients in the study. Further research is warranted with a larger study to further assess the long-term limb viability as a limb salvage procedure for patients with calcaneal osteomyelitis who undergo partial calcanectomies.

In conclusion; partial calcanectomy procedure as a limb salvage procedure in the setting of calcaneal osteomyelitis is a viable option for patients with favorable return to ambulation status. Therefore, partial calcanectomy procedure should not be completely bypassed and ignored as a viable option for limb salvage, in favor of a primary below-knee-amputation.

## End Follow Up Ambulatory vs BKA Status



Eleven patients were ambulatory before diagnosis of Calcaneal Osteomyelitis, and seven (63.6%) patients remained ambulatory with various bracing post partial calcanectomy procedure. Therefore, the partial calcanectomy procedure should not be completely bypassed and ignored as a viable option for limb salvage, in favor of a primary below-knee-amputation

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