

Osteomyelitis of the Calcaneus: Margin of Resection Required to Affect a Cure.

Case Illustration and Report of Preliminary Findings.

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BACKGROUND

Osteomyelitis of the calcaneus has been attributed to many causes including chronic heel ulceration, puncture wounds, open fracture, and hematogenous spread.^{1,11} Calcaneal osteomyelitis is a serious problem that may lead to significant complications including amputation and death.^{1,4,12-15} Because chronic osteomyelitis can lead to further spread of infection, cellulitis, sepsis, and death, amputation of the extremity has often been cited as the only definitive therapy.^{12,15,16-19}

However, lower extremity amputation carries increased mortality, substantial limitations in mobility, and decreased quality of life.^{20,23} As an alternative, partial and total calcaneotomy have both been advocated as a means to reduce the bacterial load, clear the infection and maintain a functional extremity.^{5,8,16,17,19,24-31} Partial calcaneotomy has been reported to fail due to inadequate resection of the osteomyelitis on occasion, subsequently requiring additional surgeries and amputation.^{1,6,8,26,29}

It has been reported that in cortical bone a resected clear margin of 5mm can successfully cure osteomyelitis.³² While this investigation provided clear guidelines regarding the issue of infection in cortical bone, it did not address infection in trabecular bone.

To date, no published investigation has delineated the extent of resection necessary to affect a cure of osteomyelitis in trabecular bone such as the calcaneus. The present investigation is designed to determine the margin of resection necessary to clear bacterial infection from a calcaneus in clinically suspected cases of osteomyelitis.

RESULTS

- The first patient was enrolled and the findings are presented here.
- Areas of macroscopically identifiable discoloration and cortical and trabecular softening correlated to plain films in terms of cortical erosions and focal osteopenia.
- Histologic evaluation identified areas of macrophage infiltration suggesting infection.
- Mapped areas of macroscopic and histologic infection as well as demarcation between infected and non-infected bone precisely correlated with areas of decreased signal intensity on T-1 weighted MRI.
- T-2 weighted images did not correlate well to histologically identified areas of infected bone and appeared to be markedly over-sensitive with areas of increased signal intensity extending far beyond the macroscopic and microscopic areas of infected bone.

CONCLUSIONS

- T-1 weighted images in this case precisely correlated with areas of infected calcaneal bone.
- Plain X-ray did not provide sufficient indication of the extent of infection in this case.
- T-2 weighted images in this case appeared to poorly correlate with areas of infected calcaneus and indicated inflammation extending far beyond histologically identifiable areas of infection.
- Our preliminary findings suggest that T-1 weighted images may prove to be a reliable predictor of infected trabecular bone. These images may be helpful in determining the extent of resection necessary to clear the infection in cases of calcaneal osteomyelitis. Further investigation is warranted and subjects will continue to be enrolled in this study.

MATERIALS AND METHODS

- Institutional Review Board Approval to conduct this investigation was obtained. The subject provided written consent.
- Inclusion criteria consisted of a calcaneal pathologic specimen obtained from a patient who had clinical and radiographic evidence of osteomyelitis of the calcaneus.
- Exclusion criteria will include a history of trauma to the affected calcaneus which occurred after the clinical diagnosis of osteomyelitis and which demonstrates radiographically identifiable disruption of the cortex attributable to traumatic fracture.
- The entire calcaneus was dissected free of the limb immediately following below-the-knee amputation.
- The calcaneus was rinsed with sterile normal saline and then placed in formalin.
- The preserved calcaneus was sectioned into slices of 5mm thickness. Bone cuts were oriented in a fashion consistent with a partial calcaneotomy intended to resect the clinically infected portion of bone.
- Samples were taken from each of the slices for bone biopsy.
- Microscopic analysis was conducted in order to identify histological evidence of osteomyelitis.
- Specimens were also evaluated to determine whether or not there was a demarcation of inflammation suggesting a change from infected to non-infected bone.
- These bone biopsy results were mapped and compared to preoperative MRI and plain X-Ray to determine whether or not sections at a given distance from the clinically suspected locus of infection yield histological evidence of osteomyelitis.

CALCANEAL OSTEOMYELITIS IMAGING



Figure 1 Calcaneal pathologic specimen



Figure 2 Lateral X-ray of the affected limb



Figure 3 T1 weighted MRI of the affected limb

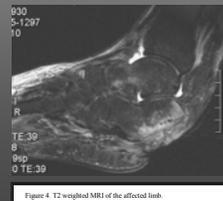


Figure 4 T2 weighted MRI of the affected limb

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