The Utility of Nuclear Medicine Imaging in the Management of Chronic Heel Pain

Molly Judge, DPM, FACFAS, Gina Hild, PGY III, Cleveland Clinic Foundation/Kaiser Permanente Residency Program, Cleveland, OH and Sean McMillin, DPM

Abstract

A prospective study was conducted to evaluate the utility of nuclear medicine imaging (NMI) via triphasic bone scan imaging to identify a diagnosis of heel pain syndrome and additionally identify those patients that would be likely to benefit from a corticosteroid injection. In patients with localized heel pathology, suspicious for enthesitis or bursitis that was confirmed by NMI, 73.47% had focal uptake and 20.41% had diffuse uptake in the region of the infracalcaneal tuber of the affected heel. Uptake medially or laterally was also obtained on bone scan results through multiple orthogonal images. As a result, more definitive and accurate placement of injection therapy could be obtained.

This method provided 80.73% improvement in 45 patients (50 feet). Outcomes were determined by the visual analog scoring (VAS) system. Perhaps more importantly, this method of therapeutic planning allowed for patients with alternate diagnoses to be identified allowing for more appropriate, and safe therapy. It is particularly important in differentiating cases of plantar fasciitis from bone contusion, stress fracture or pathology of the midfoot. Injections could be extremely detrimental if given in any of the above scenarios.

Introduction

It is the authors contention that practitioners can utilize nuclear medicine imaging, specifically the triphasic bone scan, to discern the true etiology of chronic heel pain. This can be done by evaluating the pattern of hyperemia that manifests on NMI. Once the pattern of pathologic hyperemia is observed, it is possible to determine which patients may benefit from an isolated injection of corticosteroid. The anatomic mapping provided by the bone scan further optimizes treatment, as it identifies a specific region for injection. This study was performed as a modification of that reported by Frater, C et al: (1.) The senior author of the current project contends that this study had 2 primary flaws. The first is that plantar fasciitis is a mechanical problem that does not resolve with isolated injection therapy and is best managed by rehabilitation methods to improve the fascia's response to stretch and strain. Second, the planes of imaging obtained in this study were less than optimal to evaluate infracalcaneal pathology as it relied on the dorsal-plantar projection. This projection is known to be compromised by considerable bone overlap given the influence of isotope uptake within the distal tibia, talus, calcaneus and midfoot bones. It is intuitive that local processes such as enthesitis and infracalcaneal bursitis would benefit from localized injection therapy. These areas are best identified using alternate projections in nuclear medicine imaging such as the lateral and oblique views. These are the same images we use to evaluate with plain film imaging. Differentiating bursitis and enthesitis from the alternate diagnoses that cause plantar heel pain will allow detection of those patients that will best benefit from injection therapy and also identify those diagnoses that warrant alternate treatments.

Clinical Evaluation

Clinical evaluation of infracalcaneal heel pain may represent a number of etiologies. Perhaps most commonly seen are the findings of plantar fascial enthesitis and infracalcaneal bursitis. In the case of enthesitis or infracalcaneal bursitis the target of tenderness is often located in the region of the plantar medial calcaneal tubercle. In these cases a well placed trigger point injection can be successful in reducing, if not eliminating, chronic pain. Injection therapy is not appropriate for all inferior heel pain pathology and so it is integral to be certain of the diagnosis prior to delivering any form of steroid injection. Target tenderness at plantar medial tubercle with the ankle and 1st MTPJ in dorsiflexion can differentiate plantar fasciitis from bursitis. Calcaneal stress fracture, calcaneal contusion and chronic tendonopathy are all differentials of heel pain in which a steroid injection may actually prove detrimental. FHL tendonopathy is a condition that can present with a target of tenderness a few centimeters distal to the infracalcaneal tubercle. Steroid injection given in this scenario could result in tendon rupture and chronic disability for the patient.

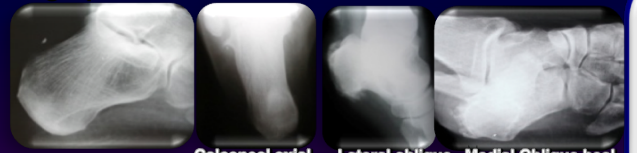
Fig 1. The sharp contour of the medial border of the plantar fascia is easy to appreciate as depicted by the series of downward arrows just 1.0cm distal to the infracalcaneal tubercle (as indicated by the gold star).

In contrast the case of flexor hallucis longus tendonopathy may manifest with the target of tenderness distinctly further from the tubercle. Target tenderness is predictably located distal to the tubercle and in Fig. 2 is indicated by the gold star while the tubercle is indicated by the "x".

Materials & Methods

A prospective case series of patients presenting with infracalcaneal heel pain was performed over a 2-year period (2007 to 2009). All patients in this series had weight bearing radiographic examination, were clinically evaluated and vital statistics were recorded including the heel affected (right or left), age, sex, height, weight and body mass index. A subjective grading scale was also performed using the visual analog scoring system before and after injection therapy. All patients included in this series had triphasic nuclear medicine bone scan imaging to determine the precise location and extent of pathology. Clinical evaluation and bone scans were evaluated by the senior author. If focal or diffuse uptake was seen *localized in the infracalcaneal tubercle*, a trigger point injection was deemed valuable and 2 cc 0.5% Marcaine plain in 20mg of triamcinolone acetonide was administered to the target area of tenderness. Each patient subjectively evaluated the effect of their injection 1 week or more after therapy and then again at final follow up using the VAS system. Excluded from the study were patients with diabetes, peripheral neuropathy, heel ulcerations, history of calcaneal osteomyelitis, Charcot foot, neuritic pain or peripheral vascular disease evidenced by diminished pulses peripherally.

Radiographic Evaluation: Special plain film views of the heel are suggested



Nuclear Medicine Imaging

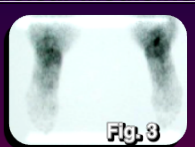


Fig .3 Dorsalplantar view is of little value for identifying enthesiopathy due to overlap of tibia, talus and calcaneus

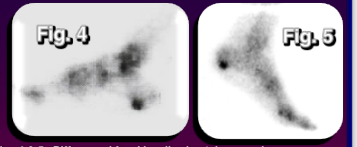


Fig. 4 & 5 Diffuse and focal localized uptake seen due to enthesiopathy and infracalcaneal bursitis

Alternate patterns of isotope uptake identified diagnoses that would not benefit from isolated injection therapy such as calcaneal stress fx (Fig. 6), navicular stress fx (Fig. 7), Lisfranc's arthrosis (Fig. 8), subtalar stress fx (Fig. 9), and partial tear of the plantar fascia (Fig. 10).

Results

Between January 2007 and December 2009, seventy-three patients (80 feet) were evaluated for infracalcaneal heel pain that interfered with activities of daily living. Excluded from the study were 28 patients (30 feet). Seven patients were not offered injection due to alternate diagnoses deemed inappropriate for injection. Others excluded: five with peripheral neuropathy, 4 had no follow up, 9 received injection but had no follow up, and 3 had scans missing. Ultimately, 45 patients (50 feet with 5 bilateral cases) were included in the study. These patients were followed through until December 31, 2010. Twenty-five female and 20 male patients, with 27 right feet and 23 left feet, were included in the study.

Average age 52.39 (range: 31 – 79)

Average BMI 34.13 (range: 22.40 – 57.20)

Avg. injection follow up 34.43 weeks (range 1.0 -186.00)

VAS scores: (1 is no pain and 10 is severe pain)

pre injection average 7.49 (range 2.0 – 10.00)

post injection average 1.56 (range 0.00 – 6.50)

average change 5.93 (range 2.00 – 10.00)

average improvement 80.73% (range 22.22% - 100%)

Conclusion

In an attempt to determine candidates appropriate for inferior heel injection therapy, this prospective study found that NMI could discriminate specific diagnoses such as enthesitis and infracalcaneal bursitis differentiating them from other conditions unlikely to benefit from injection therapy such as stress fracture, tendon pathology, plantar fascial tears and contusion of bone. Using NMI 73.47% of patients had focal uptake and 20.41% had diffuse uptake in the region of the infracalcaneal tuber of the affected heel. Discrimination of strictly medial or lateral pathology was possible by obtaining multiple orthogonal views which ultimately aided in a more ideal injection placement. This method provided 80.73% improvement in 45 patients and 50 feet using the visual analog scoring (VAS) system for evaluation of outcome. Perhaps more importantly, this method of therapeutic planning allowed for the identification of alternative pathology that may be worsened by the administration of injection therapy. Injection therapy is a successful strategy for symptomatic relief of certain heel pain syndromes however this is no replacement for addressing the associated biomechanical influences responsible for the pathology.

1. Frater, C et al: Bone scintography predicts outcome in plantar fasciitis. J. Nuclear Medicine 2006, 47:1577-1580.