

Heel Neuroma: A Case Study

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This article reviews the diagnosis, pathology, and treatment of plantar heel neuroma, an entity that has previously been described and recognized, yet one that we feel warrants further review because of the prevalence of plantar heel pain that does not respond to the usual array of treatments. We feel that neuroma of the medial calcaneal nerve often goes undiagnosed, and may progress to a severely painful condition that requires surgical intervention. In this article, we describe another case of heel neuroma in an otherwise healthy patient with a history of chronic plantar heel pain that was unresponsive to a wide array of nonsurgical treatments. Level of Clinical Evidence: 4 (The Journal of Foot & Ankle Surgery 48(3):376–379, 2009)

Key Words: calcaneus, fasciitis, nerve, neuritis, pain, tarsal tunnel

In present day foot surgical practice, an extremely common chief complaint is that of “heel pain.” A wide range of potential etiologies of heel pain are generally well appreciated, including plantar fasciitis, gout, stress fracture, ankylosing spondylitis, foreign body, tarsal tunnel syndrome, heel spur, and a number of other metabolic conditions. One etiology that is not so commonly considered, in our opinion, is neuroma formation involving the medial calcaneal nerve. In 1977, after failure to alleviate chronic plantar heel pain with the use of local corticosteroid infiltration for suspected bursitis, Davidson (1) described a neuroma of the medial calcaneal branch of the lateral plantar nerve that was identified after surgical excision of a rubbery nodule localized to the plantar fat pad of the heel. In that case, the palpable plantar nodule was initially thought to be a “heel bursa,” however pathological inspection of the excised soft tissue mass revealed microscopic findings consistent with perineural fibrosis. Although significantly overlooked and ignored in present day podiatric practice, this finding provided an alternative etiology for heel pain and aides us in the treatment of our patients.

The medial calcaneal nerve arises from the posterior tibial nerve, or the lateral plantar nerve, or both of these nerve trunks (2, 3). The most common description of the origin of the medial calcaneal nerve branches indicates that they arise from the posterior tibial nerve as it runs deep to the flexor retinaculum (4). The branches actually pierce the retinaculum and provide sensation to approximately one third of the plantar aspect of the heel (5). Neuroma formation involving

any of these nerve branches may be caused by direct trauma, or chronic microtrauma associated with either obesity or repetitive biomechanical overload. Since the plantar fat pad of the heel serves as a natural shock absorber for the body, it is not difficult to conceptualize that repetitive trauma to this area can result in extraneural, as well as intraneural, fibrosis involving the medial calcaneal nerve branches.

Clinically speaking, the patient with a heel neuroma may present with an “electrical”-type pain and/or paresthesia that radiates across the heel or, on occasion, proximally toward the tarsal tunnel. If the neuroma is large enough, the clinical examination may reveal a palpable mass that Davidson referred to as the “lamp cord sign” (1). Pain on palpation of a heel neuroma is usually localized to the central aspect of the plantar heel, rather than distally near the proximal attachment of the plantar fascia (6, 7). Tenderness may also be appreciated plantar-medially along the course of the calcaneal nerve as it branches from the tibial nerve. Patients may also complain of pain increasing in the area as the day goes on, which is in contrast to the typical poststatic dyskinesia that is often associated with initial weight bearing in patients with plantar fasciitis (8). Diagnostic ultrasound may also be helpful in identifying a heel neuroma, or other soft tissue mass or foreign body, localized to the fat pad of the heel. If present, a neuroma appears as a hypoechoic mass. As a part of the evaluation of a suspected plantar heel neuroma, radiographic, as well as hematological studies, can be used to rule out calcaneal spur formation, osseous neoplasm, fracture, foreign body, or systemic pathologies that may cause the presenting symptoms (9). A magnetic resonance image can also be used to aid in making the diagnosis. Obviously, as with all mass formations, biopsy and pathologic examination remains the gold standard for definitive diagnosis.

Case Report

A 46-year-old white male with a past medical history of hyperlipidemia presented with right heel pain, which had

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Financial Disclosure: None reported.

Conflict of Interest: None reported.

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doi:10.1053/j.jfas.2009.01.013

insidiously started 4 months before presentation. The pain had progressively worsened over time, and entailed paresthesia radiating across the heel from proximal and medial to distal and lateral; and these symptoms were aggravated by weight bearing contact or pressure. On examination, the patient did not display Tinel's sign upon percussion of the posterior tibial nerve and its branches from the tarsal tunnel to the plantar aspect of the heel. There was, however, reproducible pain with moderate-to-deep palpation of the midplantar aspect of the heel, near the junction of the plantar and posterior surfaces. He displayed no pain to direct, deep palpation of the proximal portion of the plantar fascia, and there was no pain in the mid-arch or upon activation of the plantar fascia windlass mechanism, while simultaneously palpating the deep plantar fascia. Furthermore, he denied any history of pain in his low back or buttock, and the straight leg raise and deep tendon reflexes, as well as manual muscle strength testing, were all normal. There was no evidence of cutaneous discoloration, localized increase in skin temperature, or visible pedal deformity associated with his painful heel. Standard radiographic images were obtained, and revealed no evidence of osseous pathology; specifically, there was no roentgenographic sign of plantar calcaneal spur formation or stress fracture. Diagnostic ultrasound of the plantar heel revealed a normal-appearing plantar fascia, as well as a hypoechoic mass suggestive of neuroma formation (Figure 1). Based on these findings, a diagnosis of medial calcaneal neuroma was made, and a regimen of 4% alcohol injections was implemented in an effort to sclerose the nerve. The sclerosing injections were performed every 10 to 14 days, until a total of 8 injections were given. Adjunct therapy in the form of a shock-absorbing heel cup for all weight-bearing activities was also employed. Overall, after approximately 4 months of therapy, the patient related a 70% reduction in pain, in comparison with the pain at the time of his initial visit. However, the residual pain gradually worsened and, after discussion of the potential risks and benefits of surgical intervention, as well as a description of the anticipated post-operative course, the decision was made to pursue operative inspection and, most likely, excision of the neuroma. Specific potential complications that were noted included recurrent symptomatology, permanent nerve pain, and the loss of plantar cutaneous sensation with associated problems, such as cutaneous ulceration.

At approximately 6 months following his initial presentation, the patient was brought to the operating room and placed on the operating table in the supine position. Following administration of intravenous sedative, the plantar aspect of the heel was infiltrated with 10 mL of a 50:50 mixture of local anesthetic consisting of 0.5% bupivacaine and 1% lidocaine without epinephrine. A well-padded pneumatic tourniquet was placed around the patient's right ankle and, after completion of the sterile preparation, a curvilinear incision was made over the plantar aspect of the heel. The incision was deepened

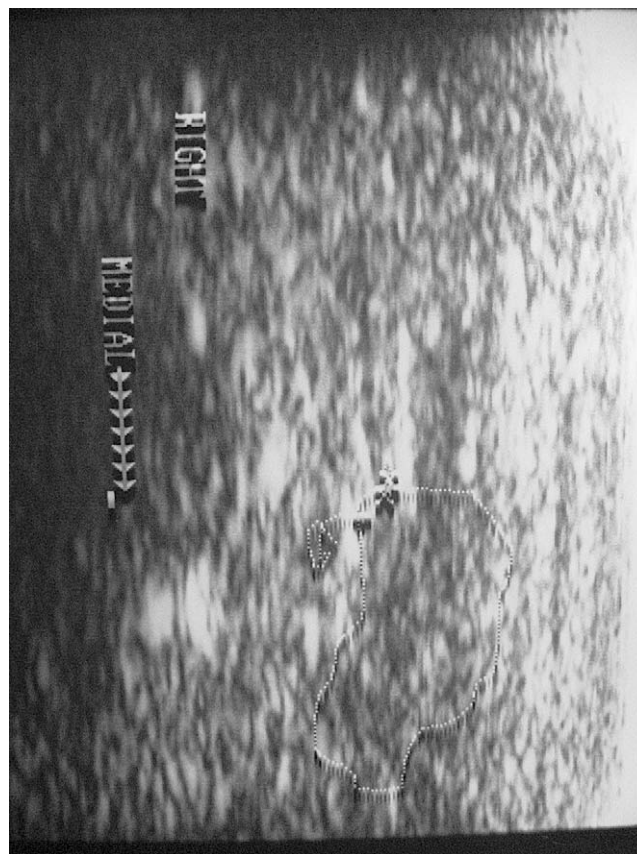


FIGURE 1 Diagnostic ultrasound image of the plantar soft tissue mass localized to the fat pad of the heel. Note the hypoechoic mass (outlined), consistent with neuroma formation.

using mainly blunt dissection and a neurofibrous mass was almost immediately identified in the subcutaneous fat pad of the heel. The lesion was fusiform and displayed a white coloration and a rubbery texture; and adipose tissue was intimately adhered to the mass (Figure 2). The mass was freed from surrounding subcutaneous tissues and the deep fascia over the calcaneus, and excised completely from the plantar aspect of the heel (Figure 3). Sharp excision with a fresh scalpel was used to section the suspected neuroma from the remaining medial plantar calcaneal nerve trunk, which was neither sutured nor transposed after sectioning near the posterior and medial aspects of the heel, proximal to the plantar surface. Distally, the nerve trunk formed several small strands that appeared to fade out in the fat pad, without distinct evidence of an organized nerve trunk. The excised neurofibrous mass was submitted for pathological examination, after which the tourniquet was deflated, hemostasis assured, the wound was thoroughly irrigated and the incision was closed in layers. After confirming that the vascular status was intact, a sterile compressive dressing was applied and the patient was given a negative heel surgical shoe for partial weight bearing on the forefoot. The pathology report revealed a mass that grossly measured $5.0 \times 4.0 \times 1.1$ cm; and the microscopic

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