

# REFINEMENTS IN THE TREATMENT OF MORTON'S INTERMETATARSAL NEUROMA

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Morton's neuroma, also known as intermetatarsal neuroma, is a common cause of foot pain. A thorough and recent review of this malady reiterates the concept that this condition represents an entrapment neuropathy affecting the common digital branch of the plantar nerve situated in the intermetatarsal space.<sup>1</sup> Primary entrapment of the common and proper digital branches of the plantar nerves at the level of the deep transverse intermetatarsal ligament, typically respond well to accurate dissection and sharp excision. Excision of the neuroma, however, is not always curative and a symptomatic stump neuroma occurring at the level of, and proximal to, the deep transverse intermetatarsal ligament (DTIL) may develop secondary to nerve stump incarceration and/or tethering.<sup>1,3</sup> The purpose of this paper is to review the standard procedure for surgical management of resistant Morton's neuroma, Refinements in operational technique that are directed at decreasing the rate of recurrent symptomatology will also be discussed.

## **CLINICAL FINDINGS**

Symptoms associated with plantar intermetatarsal neuroma or distal plantar nerve entrapment may be similar to those encountered with tarsal tunnel syndrome or lumbosacral radiculopathy. The cutaneous distribution over the sole of the foot, however, is localized to the digits, web spaces and digital sulcus, and the plantar metatarsal ball region.

Complaints of sharp or burning pain, numbness, and paresthesia, along with plantar sensory deficit are common. Focal tenderness and Tinel's sign are frequent findings. However, in the

author's experience, deep palpation does not usually cause proximal radiation of pain. Intrinsic muscle weakness and digital contracture may be present due to biomechanical dysfunction and, in most cases of plantar forefoot neuroma, this plays a role in the development of plantar nerve entrapment in the intermetatarsal spaces.

## **BASIC CONSERVATIVE THERAPY**

Conservative treatment can be very gratifying, especially when abnormal subtalar joint pronation plays a primary causative role. The use of a soft insole pad, a flexible sole, and a low-heeled shoe can be helpful. A Meyer-type metatarsal projection pad placed just proximal to the weight-bearing level of the metatarsal heads can be curative, especially in cases where the condition is diagnosed and treated at an early stage. Orthoses combined with NSAIDs and, when indicated, local infiltration of glucocorticosteroid at the point of entrapment, often effect significant symptomatic relief.

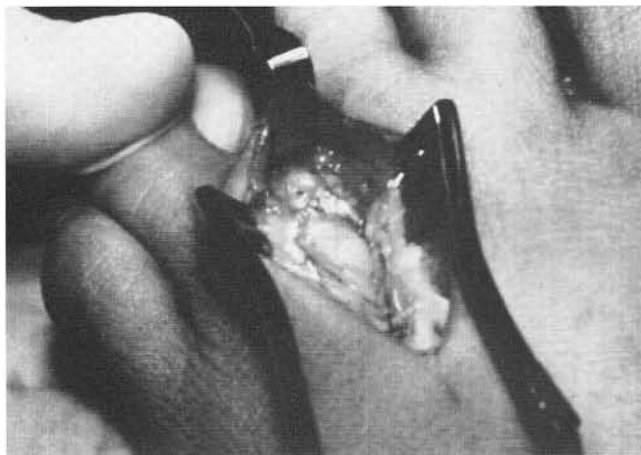
Symptoms will typically recur if mechanical support is not rendered in conjunction with anti-inflammatory therapy. Physical measures such as calf and arch stretching, and strengthening exercises have also proven to be useful.

## **SURGICAL MANAGEMENT AND TECHNICAL REFINEMENTS**

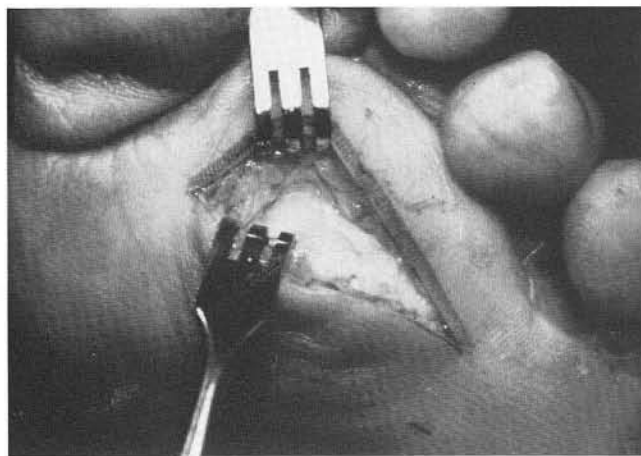
Recalcitrant cases of intermetatarsal neuroma require operative neurolysis and, traditionally, surgical excision. The use of local anesthesia with intravenous sedation works well for this procedure, however it may be inadequate in cases involving revisional surgery.

Patient positioning in either the supine or prone position varies with the surgeon's preference and the patient's requirements. The procedure is expedited with the proper use of a pneumatic tourniquet, but can be performed without this aid to hemostasis.

A dorsal or plantar approach can be used according to the surgeon's preference. (Figures 1, 2) However, several factors should be considered when selecting the incisional approach. An original dissection into a virgin interspace is readily performed through a dorsal longitudinal exposure, and this typically requires transection of the DTIL. Preservation of the DTIL may be beneficial with respect to maintaining digital and metatarsal function,<sup>5</sup> and is most readily achieved with the use of a transverse, curvilinear or zig-zag plantar approach.



**Figure 1.** Dorsal approach to intermetatarsal ligament.



**Figure 2.** Plantar transverse approach used to access adjacent intermetatarsal spaces.

The transverse incision is particularly useful in those less common cases where adjacent interspaces are involved. In cases involving recurrent intermetatarsal neuroma following previous surgical intervention, the plantar approach (Figure 3) is extremely useful and allows dissection proximally into the interspace without the need for heavy-handed retraction (which would be difficult to avoid using a dorsal exposure for access to the proximal reaches of the intermetatarsal space).



**Figure 3.** Plantar approach to recurrent intermetatarsal neuroma.

Following dissection of the intermetatarsal space and identification of the common digital branch of the plantar nerve, external neurolysis is carried out to the level immediately proximal to the DTIL. Similarly, isolation of the proper digital branches to the contiguous surfaces of the adjacent toes is performed. Although external neurolysis alone has been noted to be useful for the treatment of Morton's neuroma<sup>6</sup> it should be noted that the traditional and time-honored technique of neurectomy at a level proximal to the proximal margin of the DTIL remains the standard treatment for this common condition. Current efforts are being made to assess the potential benefits of repositioning the common plantar nerve so that it courses dorsal to the DTIL.<sup>7</sup> The use of epineural suture with and without concomitant application of tissue adhesive is also being evaluated.<sup>8</sup>

The primary goal of these extra measures is to diminish the size and number of budding neurites (axon sprouts) that escape the epineural sheath at the open end of the transected nerve trunk. This, in turn, should decrease the likelihood of establishing a symptomatic stump neuroma following surgical neurectomy. These tech-

niques are performed via a plantar approach with the aid of surgical loupe magnification. It has been shown that fibrin adhesive is readily available, effective, and safe to use, particularly when the patient donates his/her own plasma prior to the procedure.<sup>9-12</sup> The adhesive is made using a combination of autologous fibrinogen, thrombin, and calcium chloride.

Following transection of the nerve trunk proximal to the DTIL, the epineural sheath is microsurgically peeled proximally to expose the fasciculi, which are subsequently transected more proximally. The epineural sheath is then distracted distally beyond the distal margin of the freshly sectioned intraneural elements. A single drop of fibrin tissue glue is then applied to the distal margin of the fasciculi, by positioning a needle inside the elongated epineural sheath. The epineural sheath is then closed over the glued fasciculi using interrupted stitches of 8-0 nylon (Figure 4), followed by excision of any redundant epineural sheath. A final drop of fibrin glue is then applied to the sutured end of the nerve trunk. The nerve end is then allowed to retract into the plantar vault where it remains well protected amidst intact intrinsic musculature.

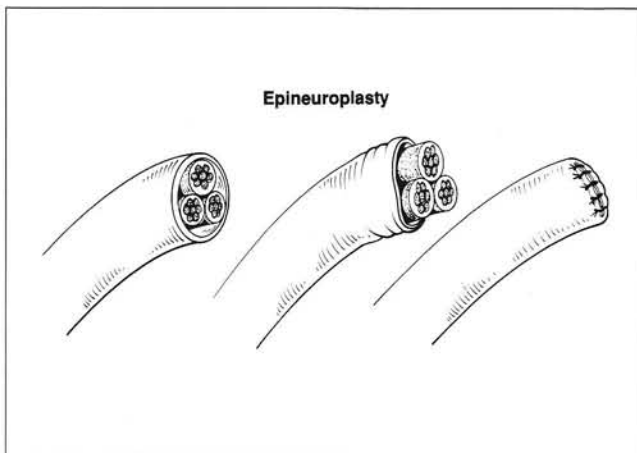


Figure 4. Schematic representation of epineural suture closure.

Postoperative management involves early (day of surgery) metatarsophalangeal and ankle dorsiflexion-plantarflexion range of motion exercises. Non-weight bearing on the foot is maintained for three weeks while the wound heals.

To date, the author's surgical experience with the use of these technical refinements has not yet yielded a subject population large enough to allow statistical analysis. These refinements in

the technique of intermetatarsal neurectomy are founded upon established neurosurgical principles, and it is anticipated that the regular use of these added measures should decrease the incidence of symptomatic recurrent intermetatarsal neuroma.

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