



# Alcohol injection TARGETS *intermetatarsal pain*

**M**orton's neuroma (also called intermetatarsal neuroma, interdigital neuroma, and Morton's metatarsalgia) is a frequent finding thought to be caused by an entrapment of the intermetatarsal nerve (the plantar proper digital nerve) under the deep transverse intermetatarsal ligament, or by a mechanical foot imbalance causing repetitive trauma that results in degenerative neuropathy.<sup>1</sup> This condition is frequently found in the third intermetatarsal space, between the third and fourth metatarsals, and is more common in women than in men.<sup>2</sup> Intermetatarsal neuromas are usually found in the excessively pronated foot but have been reported in both the rectus foot and cavus foot as well.<sup>3</sup> I have successfully treated intermetatarsal neuromas with a series of dilute ethyl alcohol injections; the results have been well received by patients and compare favorably to other conservative treatments or surgery for neuromas.

## Symptoms and diagnosis

Most patients present with similar complaints, which range from numbness in the digital web space to intense pain in the ball of the foot or into the toes with activity. When asked to describe these complaints, patients use terms such as pins and needles, burning pain, tingling, or a sense of fullness or cramping in the toes, especially with activity. Additionally, they may describe the pain as moving from the plantar ball of the foot to the toes, or radiating into the arch or up the leg. Walking in dress shoes or running in athletic shoes tends to increase the

severity of symptoms and removing the shoes or resting tends to decrease the severity of symptoms after activity. Many patients report that removing the shoes and massaging the ball of the foot and toes provides immediate relief of symptoms; however, walking barefoot on hard surfaces may also be uncomfortable for patients with more advanced conditions.

The diagnosis of Morton's neuroma is made using several different techniques; however, clinical history and physical examination of the foot are the most reliable. Direct examination usually locates the point of maximum tenderness by reproducing symptoms during a

**Neurolysis caused by dilute alcohol injections can obviate surgery or other invasive treatments for neuroma patients.**



*Figure 1. Diagnostic pinch test for neuroma. Pinching the soft tissues with dorsal and plantar compression of the intermetatarsal space may reproduce nerve-like symptoms in the case of Morton's neuroma.*

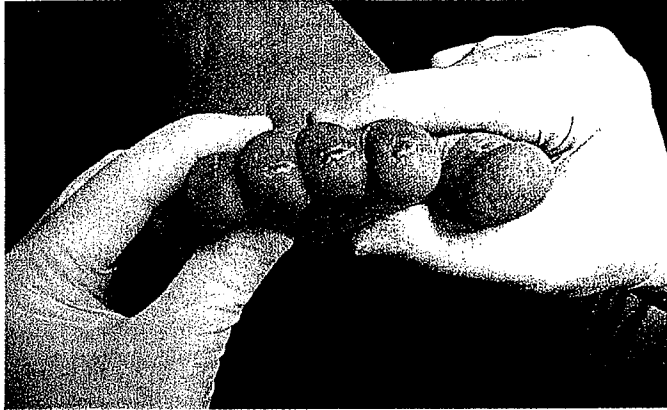


Figure 2. Diagnostic lateral squeeze test for neuroma. Medial and lateral compression of the forefoot area of the foot may reproduce nerve-like symptoms in the case of Morton's neuroma.

pinch test involving dorsal and plantar compression of the intermetatarsal space (Figure 1) or with the lateral squeeze test using medial and lateral compression of the forefoot area (Figure 2). Also, direct pressure at the plantar distal intermetatarsal space may reproduce the patient's symptoms and identify increased thickness or an enlarged nerve (Figure 3). A combination of the lateral squeeze test and the pinch test may reproduce an audible and/or palpable click in the involved intermetatarsal space, often referred to as a positive Mulder's sign.<sup>3</sup>

Additional studies may include a diagnostic anesthetic nerve block injection performed proximal to the suspected neuroma site, weight-bearing x-rays of the involved forefoot area, computed tomography, magnetic resonance imaging, ultrasonography, or sensory nerve conduction testing. These diagnostic studies are not very standard or popular because of cost, operator inexperience, and equipment unavailability. Clinical examination and review of the patient's history of symptoms are still the most common techniques for diagnosis of intermetatarsal neuroma.

Morton's neuroma may be mimicked by several different clinical findings including any condition that causes forefoot pain, numbness, nerve-like pain, metatarsalgia symptoms, or discomfort into the toes. Specific conditions can be found in the list of differential diagnoses (see table, page 60). Most of the conditions listed can be identified by careful history and physical examination, as well as with the more sophisticated diagnostic studies already mentioned.

### Treatment options

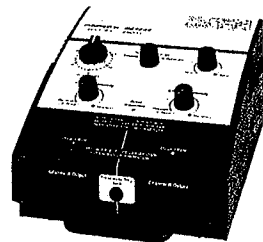
There are numerous treatment options available for Morton's neuroma, ranging from no treatment to conservative methods to surgical care. The conservative alternatives include tape strapping of the foot to provide additional support, application of intermetatarsal pads to help separate the metatarsal heads on weight-bearing, and the use of functional orthotic devices to help stabilize the feet. Most of these approaches are less than successful.<sup>5</sup> Other conservative

## AMREX® Expand your healing touch with Amrex electrotherapy equipment



### SynchroSonic® US/752 Combination Ultrasound/ High Volt DC Stimulator

The US/752 provides high volt pulsed dc stimulation and therapeutic ultrasound which may be combined or applied separately.  
BNR 5.5:1



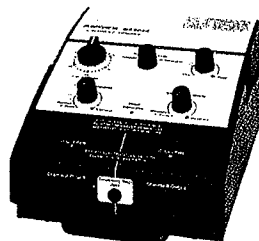
### MS324AB Portable Low Volt AC Muscle Stimulator

The MS324AB is a compact, professional, dual channel, four pad, low voltage muscle stimulator which is ac or battery operable for use in the clinic or the field.



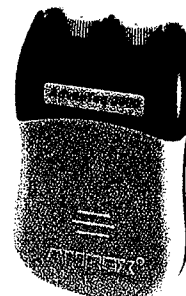
### SynchroSonic® US/54 Combination Ultrasound/ 2 Channel Low Volt AC Stimulator

The US/54 features 4-pad, two-channel low voltage ac stimulation and therapeutic ultrasound which may be combined or applied separately.  
BNR 5.5:1



### MS322 Low Volt AC Muscle Stimulator

The MS322 features a variable frequency range of 1-80 Hz adjustable ramped surge rate, tetanized output and intensity reset circuit.



### AdvanTeq 2000® Portable T.E.N.S.

The AdvanTeq 2000 is a portable, two-channel T.E.N.S. device. Features include burst, modulated, and normal output modes with adjustable pulse width and pulse rate.

A division of Amrex-Zetron, Inc.  
641. East Walnut Street Carson CA 90746 Phone: (800)221-9069 Fax: (310)366-7343  
Web Site: [www.amrex-zetron.com](http://www.amrex-zetron.com) E Mail: [amrex@amrex-zetron.com](mailto:amrex@amrex-zetron.com)

For more information, circle #43

**Finally,  
A Therapeutic Shoe, That  
Looks As Great As It Feels...**

**NEW**



*Women's Velcro*

Available in Lace and Velcro designs for both Men and Women.

**Only \$52 a pair**

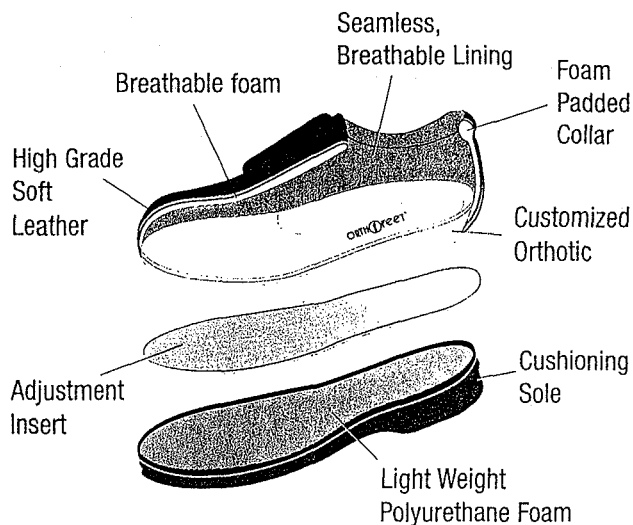
**An Anatomical Last** with extra width across the Midfoot and Toe-Box.

**A Cushioning Sole** with a special heel-recess for heel-pain relief.

**Soft Leather**, padded with open cell foam, and lined with breathable fabric mesh.

**Attractive Styling** along with a shell design of sole, which hides the extra depth.

**Customized Orthotic** (sold separately). Made of advanced materials, which provide permanent support and unsurpassed cushioning. Dynamically shapes to the foot, or can be instantly heat molded.



**ORTHOFEET®**

800-524-2845

For more information, circle #45

**DIFFERENTIAL DIAGNOSES  
OF MORTON'S NEUROMA**

- Bursitis
- Distal neuropathy
- Flexor tendinitis
- Freiberg's disease
- Metatarsal bone tumors
- Metatarsal plantar plate rupture
- Metatarsal stress fractures
- Peripheral neuritis
- Plantar capsulitis
- Rheumatoid arthritis
- Rheumatoid nodules
- Soft tissue tumors
- Synovitis
- Tarsal tunnel syndrome

treatments involve vitamin B<sub>12</sub> injections,<sup>6</sup> corticosteroid injections,<sup>7</sup> and dilute alcohol injections.<sup>8,9</sup>

Among the several surgical options is the most obvious: surgical excision of the involved nerve. Variations include transection of the intermetatarsal ligament with or without neur-

ectomy, external or internal neurolysis, translocation of the involved nerve, endoscopic decompression, and other destructive measures such as laser ablation or cryogenic denervation.<sup>10,13</sup>

The surgical techniques all have the potential for failure and complications. The major problems following surgery include recurrence of the condition, worsening of the pain, creation of traumatic or stump neuromas, excessive deep or superficial scar formation, damage to adjacent soft tissue structures, wound dehiscence, and infection. Less serious complications include numbness in the toes or around the ball of the foot, a feeling of fullness or swelling, and persistent paresthesias.

**Chemical neurolysis of Morton's neuroma**

In an unpublished study performed from 1977 through 1985, I evaluated more than 150 patients who underwent weekly injections of 1/2 ml of a 4% alcohol solution for clinical symptoms of intermetatarsal neuromas. The results showed that more than 80% experienced resolution of their neuroma symptoms after three or more weekly injections. Unfortunately, the collection of data and efforts to control for additional therapeutic measures in each case was flawed. There were so many variables and other treatments provided that the results were not publishable. Many patients had multiple interspace complaints, had undergone previous cortisone

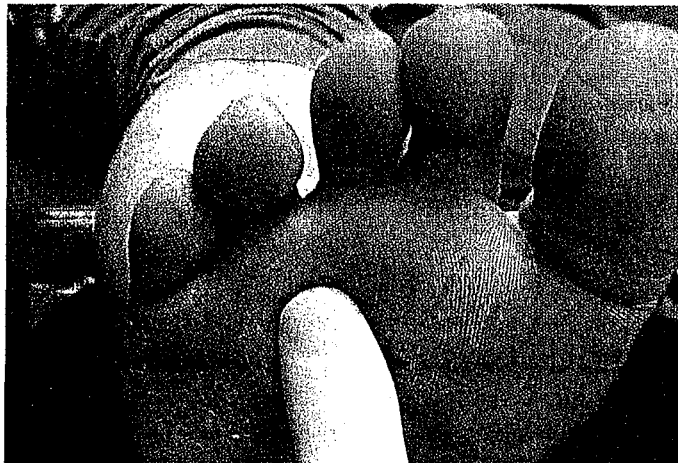


Figure 3. Direct pressure placed at the plantar distal intermetatarsal space. This technique may reveal increased thickness of the tissues and may reproduce the nerve-like symptoms in the case of Morton's neuroma.

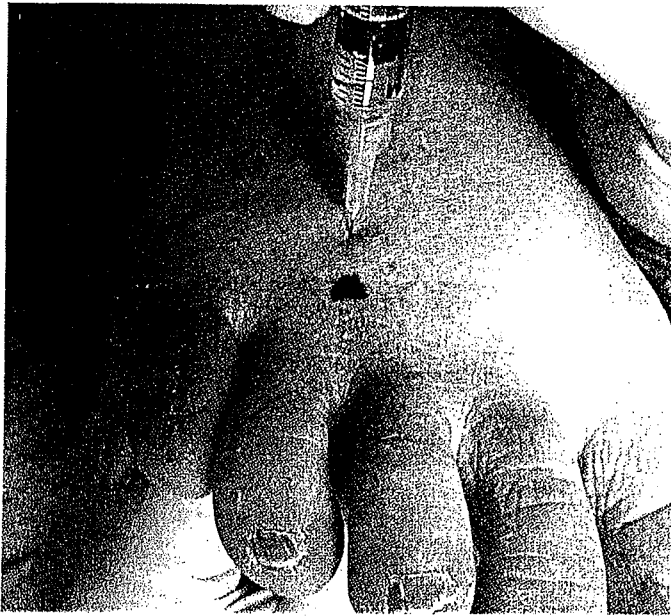


Figure 4. The injection technique. In this case, the area of maximum point of tenderness (MPT) is marked with a small spot for identification. The injection of a small amount (0.5 to 1 ml) of the 4% ethyl alcohol solution is placed proximal to the MPT (deep into the intermetatarsal space below and proximal to the intermetatarsal ligament). It is important on the first few injections to manipulate the needle in the deep tissues until the involved nerve is stimulated before injecting the solution. This allows for close proximity of the injected alcohol solution to the nerve tissue for more rapid absorption.

injections, were wearing functional orthotic devices or had received some other forms of treatment before or during the study time.

In 1986, the technique for mixing the solution and the different clinical conditions responsive to sclerosing injections were published.<sup>8</sup> The mixture was initially composed of 48 ml of 2% lidocaine with epinephrine (1:100,000) and 2 ml of dehydrated ethyl alcohol, which resulted in a 4% dilute solution.<sup>14</sup> However, during this time I began to note that using 0.5% bupivacaine HCl with epinephrine (1:200,000) combined with the dehydrated ethyl alcohol at the same 4% concentration provided more consistent results and longer lasting anesthesia after injection, and this became the mixture of choice. Based on this experience, I then developed further studies to help control many of the problems and variables noted in the earlier study design.

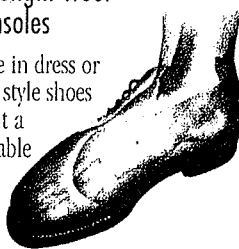
From 1986 through 1996, I performed a detailed prospective study to evaluate the treatment results of a conservative technique involving the chemical neurolysis of isolated intermetatarsal space neuromas. The 100 patients chosen for the study had clinical symptoms of a single intermetatarsal space neuroma on one foot only. None of the patients had undergone previous therapy for the neuromas and all agreed to refrain from receiving additional alternative treatments while in the study program. The patients all had a minimum of three to a maximum of seven weekly 1/2-ml injections of the 4% ethyl alcohol solution proximal to the point of maximal tenderness. The results were published in 1999.<sup>9</sup>

## Common Sense Solutions for Treating Common, Painful Heel Complaints.



### ● Comf-Orthotic® 3/4 Length Wool Felt Insoles

For use in dress or casual style shoes without a removable insole.



Foot pressure without Comf-Orthotic Insole.



Foot with Comf-Orthotic Insole substantially reduces pain & pressure.

### ● Comf-Orthotic® Sports Replacement Insoles



For use in athletic or similar shoes with a removable insole.

### ● Scaphoid Pad

If additional support is desired, add the Scaphoid Pad under the insole. It will add 5/16" lift and is available in S, M, L sizes.



## HAPAD, Inc.

Phone: 800.544.2723

Fax: 800.232.9427

website: [www.hapad.com](http://www.hapad.com)

e-mail: [hapadinc@aol.com](mailto:hapadinc@aol.com)

P.O. Box 6 • 5301 Enterprise Blvd. • Bethel Park, PA 15102

Proven Effective  
Treatment for  
Heel Pain!  
(*Plantar Fasciitis*)

For more information, circle #47

The 4% alcohol solution used for chemical neurolysis in this study and in all subsequent treatment of neuromas in my practice is prepared by mixing 48 ml of 0.5% bupivacaine HCl with epinephrine (1:200,000) with 2 ml (two 1-ml vials) of dehydrated ethyl alcohol for injection, for a total volume of 50 ml. The new mixture is kept in the original bupivacaine bottle, dated and relabeled to identify the solution as 4% sclerosing rather than local anesthetic to prevent inadvertent misuse.

The use of epinephrine appears to aid in the results of neuroma injections, probably because it potentiates the local anesthetic agent, confines the sclerosing solution to a smaller area, prevents the rapid absorption of the solution into the adjacent tissues, and may have some neurolytic action on the nerve tissue itself. However, I also make a bottle of the 4% solution using bupivacaine HCl without epinephrine for use on those patients who have reactions to the epinephrine.

In the prospective study, the injection was made to the dorsal aspect of the foot with a 1 1/4-inch, 27-gauge needle penetrating deep into the intermetatarsal space below and proximal to the intermetatarsal ligament (Figure 4). To position the needle tip close to the nerve tissue proximal to the actual neuroma, the needle was then gently and slowly manipulated within the deep tissue layers until the patient responded with a sensation of tingling, pins and needles, radiating pain into the toes, or burning into the ball of the foot. Once the sensation was felt by the patient, then

the injection was completed. It was my hypothesis that the nerve in this location would be smaller, without surrounding perineural fibrosis or adjacent thickened tissues, making it easier to destroy with the chemical solution at this level than it would be at the actual neuroma site. Additionally, it is not necessary or recommended to perform a local anesthetic nerve block prior to injection of the 4% ethyl alcohol solution since the anesthesia will make it very difficult to locate the involved nerve and could potentially dilute the alcohol solution even further.

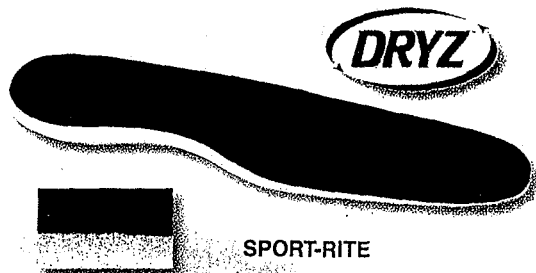
## Results and complications

Of the 100 patients included in the study, the 73 females and 27 males ranged in age from 20 to 75 years (average 51 years). Sixty-two left feet and 38 right feet were involved. Fifty percent of the patients had six or seven injections. The third intermetatarsal space was involved in 81 cases. Follow-up evaluation was performed for each patient at six months to two years (average 13 months) following completion of treatment. Final results showed that 82 patients reported 100% improvement of their symptoms and seven patients reported from 60% to 85% improvement. This resulted in an overall patient satisfaction rate of excellent or good of 89%. Eleven patients had continued pain or other symptoms at the end of the study and elected to proceed with surgical neurectomy. The long-term results of this prospective study appear to be superior to most reported forms of treatment, including surgical care.<sup>15</sup>

# comfortrite<sup>®</sup>

by SEQUOIA

Premolded therapeutic insoles  
available in three distinctive styles:  
*Active Diabetic, Passive Diabetic and Sport-Rite.*

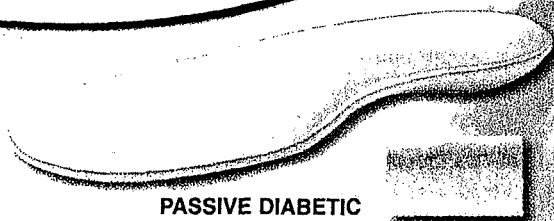


SPORT-RITE

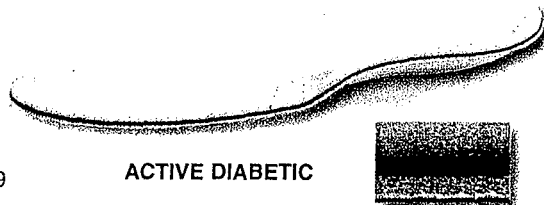


We use state-of-the-art materials:

- *Plastazote<sup>®</sup>* – customizes to plantar surface to reduce shear
- *Medical Poron<sup>®</sup>* – provides for superior shock absorption
- *Microcel Puff<sup>®</sup>* – delivers support and stability
- *DRYZ<sup>®</sup>* – moisture and odor management system



PASSIVE DIABETIC



ACTIVE DIABETIC



Comfort Rite<sup>®</sup> Footwear  
P.O. Box 160, New Holstein, WI 53061  
(920) 898-1919 • 1-800-898-5556  
Fax (920) 898-4605

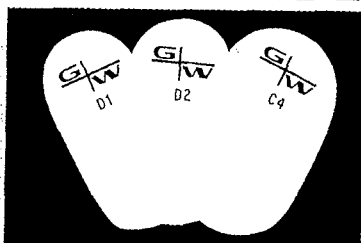
In Canada: Newfosco Ent. Ltd.  
1892 Lawrence Ave., Scarborough,  
Ontario M1R 2Y5  
(416) 759-8779 • Fax (416) 759-1879

E X P E R I E N C E T H E C O M F O R T

For more information, circle #48

**For Your Patients With  
Anatomical Leg Deficiencies**

**GIVE THEM A  
LIFT**



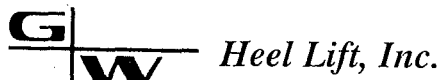
*Research indicates 75% of people suffering from low back pain have leg length inequality of 5mm or more. Heel lifts have been used for decades in reducing low back pain as a result of anatomical leg deficiency.*

**For information, samples & catalog**

**Call: 800-235-4387**

**Fax: 573-885-3202**

**Visit: [www.gwheellift.com](http://www.gwheellift.com)**



*For more information, circle #50*

**Cold therapy.  
Pinpoint pressure.  
PneuGel™ Back Support.**

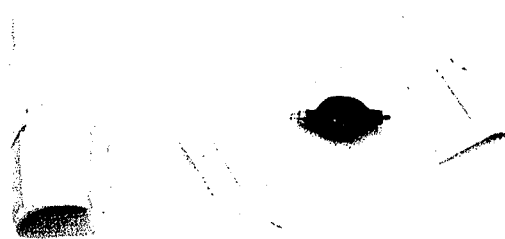
The *Sroufe* PneuGel™ Back Support features a removable bi-component bladder to help relieve lower back pain.

Inflatable air bladder

offers compression and support while a gel section can provide cold therapy for pain relief.

Universal sizing; available in hospital and retail packaging.

Contact us today for information on this or our other PneuGel products, or our full line of orthopaedic softgoods. Visit us at [sroufe.com](http://sroufe.com).



**SROUFE**  
**healthcare**  
**products, inc.**

Since 1975

601 Sroufe Street  
P.O. Box 347  
Ligonier, IN 46767  
260-894-4171  
Fax: 260-894-4092  
Internet: [www.sroufe.com](http://www.sroufe.com)

*For more information, circle #51*

The complications with this injection technique appear to be minimal and include failure to relieve the original symptoms, recurrence of symptoms, increased symptoms after the first and possibly the second injection (postinjection neuritis), and a postinjection lymphatic reaction. The increase in symptoms following the first or second injection appeared to be relatively common and occurred in the first 48 hours after the injection, after which the intensity decreased rapidly. By the subsequent clinical visit all patients reported that the "new" pain had decreased significantly and in most patients had subsided completely. Very few patients had similar increased pain after the third or subsequent injections due to the increasing neurolytic effect of the previous injections.

Although I have never actually seen the perilymphatic irritation, a few podiatric physicians have contacted me to report that the symptoms include increased pain, intense redness with streaking from the injection point proximally up the foot, and blistering in a few cases. The irritation is seen soon after the injection. It is my opinion that in these cases the 4% ethyl alcohol solution was picked up by the dorsal superficial lymphatic system. Deep injections of the solution do not appear to have this secondary effect. This reaction is probably similar to the condition reported following cortisone injections, termed perilymphatic atrophy.<sup>16</sup>

**Discussion**

The active component of the 4% sclerosing solution discussed in this paper is dehydrated alcohol injection, which is also termed absolute alcohol, pure ethyl alcohol for injection, desiccated alcohol, and ethanol. Dehydrated alcohol consists of not less than 98% by volume of ethyl alcohol (ethanol) and is distributed in sterile 1-ml glass vials ready for injection. Ethyl alcohol is a clear, colorless liquid that is miscible with local anesthetic agents. Once the ethanol is diluted to 4% by the method described earlier it produces neuritis and Wallerian nerve degeneration, or chemical neurolysis when absorbed into nerve tissue. Repeated injections of this dilute solution in close proximity to nerve tissue, on a weekly basis, presumably causes selective degeneration or neurolysis until the nerve completely ceases nerve function or is directly destroyed. The volume needed to produce therapeutic neurolysis involves amounts too small to produce systemic side-effects related to ethanol.<sup>17,18</sup>

The dehydrated alcohol may be ordered from a local pharmacist and is also available through a variety of medical supply companies. It is usually purchased in quantities of 10 vials per box. I recommend that the materials be ordered and the solution mixed in the physician's office to maintain quality control and consistency.

For this condition the proper diagnostic codes for nerve conditions should be used, which include, but are not limited to, the following: neuroma 355.6; neuritis, peripheral 355.8; and nerve entrapment 355.9. The correct CPT-2002 code is 64640: Chemical neurolysis by chemical methods. This is not prolotherapy or an experimental injection technique and should not be recoded by the insurance company as such. Foot and ankle physicians are qualified to provide this service and should not allow insurance companies to dictate that this procedure be performed only by anesthesiologists or pain clinics.