CHAPTER 11

TREATMENT OF RECALCITRANT NERVE ENTRAPMENTS

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Nerve entrapments within the foot and ankle may differ in a number of ways from other anatomic areas. The foot is a weight-bearing structure, subject to direct pressures, as well as a variety of potential stretching movements on the soft tissues. In addition, there tends to be far less subcutaneous tissue than in other areas of the body. Every surgeon has encountered patients with problematic nerve entrapments, and often achieving improvement in symptoms with additional surgery can be frustrating. However, the author has developed a simple protocol that may be useful in assessing which procedures may be most efficacious in the surgical management of this type of problem. This approach is not all inclusive, but is a basis for surgical planning and discussion.

GENERAL SURGICAL OPTIONS

Neurolysis

Historically, neurolysis has been described as a primary means of addressing nerve entrapment. The potential benefits of this approach include the maintenance of nerve function postoperatively. However, in the foot and ankle there are a number of circumstances that would tend to limit the effectiveness of neurolysis. In many instances, the entrapment is associated with surrounding scar tissue secondary to previous surgery or trauma. As such, as the body heals there will be an even greater degree of scarring that develops. Once the nerve has become entrapped, the simple normal motions associated with walking may be sufficient to place traction on the nerve. Therefore, it has been the author's experience that simple neurolysis alone has not been effective in most patients with this type of entrapment.

Nerve Relocation

In order to avoid some of the pitfalls associated with surgical scarring, surgeons have relocated or redirected a nerve from an area of primary entrapment to another area where there is a greater degree of soft tissue protection or subcutaneous coverage. Once again, in theory this may work well for some areas where there is a greater amount of subcutaneous tissue. However, in the foot and ankle this is not a luxury that is afforded in most patients. The issues relative to scarring may largely be the same as that with simple neurolysis

Nerve Excision

Logically, it would appear that simple removal of a nerve would be adequate to alleviate symptoms associated with entrapment. However, there are patients who have persistent pain even after the nerve has been removed. In some instances, this can be secondary to a painful stump formation, nerve adhesion to adjacent structures, or other forms of scarring which results in traction of the nerve. Measures can be undertaken to enhance the effectiveness of nerve excision, although the patient is still left with some loss of sensitivity and/or motor function as a result.

ANATOMIC BASIS FOR NERVE ENTRAPMENT SURGERY

There are specific anatomic considerations that may make a difference relative to the selection of the surgical approach for patients with recalcitrant nerve problems. Different thoughts and concerns will be discussed relative to nerve surgery based upon the location of the entrapment.

Dorsal Foot/Anterior Ankle

Dorsal nerve entrapments can be found following previous surgery, lacerations, or blunt trauma to the area. Unfortunately, for patients simple nerve excision of the entrapment does not prove helpful. There may be a number of reasons for this. First, the dorsal aspect of the foot is subjected to distinct compressive forces secondary to shoes. If a nerve stump is subjected to this type of pressure, it can often serve as a source of pain and irritation, even without significant entrapment of the nerve.

However, once a nerve is cut, axons will attempt to regenerate, and in doing so these regenerate structures tend to adhere to the skin. Therefore, in addition to the direct pressure on these newer nerve fibers, there is constant traction that may be placed across the soft tissue structures dorsally, as the foot undergoes dorsiflexion and plantarflexion during the normal gait cycle. Any degree of scarring around a nerve will tend to limit the mobility of the nerve relative to the surrounding tissues, applying traction, and in many patients eliciting pain or dysesthesias. Plantarflexion appears to be the primary culprit relative to generating symptoms, and many patients may find that sleeping is very difficult unless the foot is supported by the foot board of a bed or some other means to alleviate tension on the nerve. Neurolysis or nerve relocation may tend to have a less favorable outcome in this anatomic area due to the relatively thin subcutaneous layer. Postoperative scarring may limit mobility of the nerve, and therefore, result in additional symptoms.

Simple nerve excision would still be a reasonable approach for a patient who has a primary nerve entrapment as an initial step. Other than the deep peroneal nerve, the branches that cross the ankle are purely sensory, and excision does not create any significant functional loss. However, it has been the author's experience in patients who are experiencing recalcitrant nerve problems that a more simplistic approach to this problem may not be successful. First, studies have demonstrated that when nerve is excised, the only way that one can modify the normal regeneration of the axons is by implanting the nerve into muscle. Within the dorsal foot there is limited muscular tissue, and even if adequate muscle was available, there would still be traction that might be applied to the nerve with ankle motion. Therefore, when a nerve is excised from the dorsal aspect of the foot in a patient with recalcitrant entrapment, it would be preferable to not only implant the nerve into muscle, but to remove the nerve into an area where traction forces and direct compression would not be problematic. This will require that the nerve be removed proximal to the ankle. As such, for these types of problems the author will tend to remove the entire nerve segment and implant this residual stump into muscle within the anterior leg.

Lateral Ankle/Foot

The same approach is used for patients who have developed problems associated with sural nerve entrapment. Alternatively, bone has been demonstrated in some studies to be an adequate recipient for the nerve stump. Depending upon the level at which the sural nerve is resected, it may be easier to implant the stump into the fibula as opposed to muscle.

Medial Heel

Entrapment of the medial calcaneal nerve branches can be encountered following heel surgery, and the anatomic location of this entrapment is one that is theoretically more difficult to address because there is a lack of sufficient muscle for implantation. Furthermore, shoes will tend to create compressive forces over the medial heel area. Accordingly, the author has performed simple nerve excision, attempting to trace the nerve as proximal as is possible without involving the posterior tibial nerve. More than likely, success with this technique is derived from the fact that there is a greater degree of subcutaneous tissue at this level for some patients, and the fact that there is no direct weight-bearing pressure subjected against the nerve stump. Provided this can be removed sufficiently proximal, there may be an elimination of direct shoe pressure as well.

Plantar Foot

Nerve entrapment in the plantar foot is most often seen following removal of Morton's neuroma or lacerations. Because of the proximity and bulk of the plantar intrinsic musculature, this is one area within the foot where a more local excision of nerve can be performed and the nerve stump can be implanted into muscle. The author has found that the easiest way to accomplish this procedure is to begin the dissection proximal to the area of entrapment and scar. Dissection is carried directly to the level of the plantar fascia, and the fascia is incised in line with the course of the nerve. Following the separation of the fascia from the underlying muscle, one should readily visualize the nerve and simply follow this distally to the area of entrapment.

The key is to ensure that the nerve is implanted into deep muscle so that the stump is

not superficial. Generally this will involve creating a track or path from the deeper segment of muscle to the more superficial portion with a hemostat. The nerve can then be guided through this from superficial to deep, then anchored into the muscle with an epineural suture for stability and to prevent retraction. In addition, one needs to ensure that there is no tension on the nerve branch when the foot is dorsiflexed. At times, one must perform more proximal dissection to provide this additional measure of relaxation on the nerve stump. In some patients this may mean that a branch to an adjacent interspace may need to be sacrificed.