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FOOTCARE

Plantar fasciitis treatment enters the cold

Heel pain due to plantar fasciitis is one of the most common conditions affecting the adult foot. It is estimated that approximately two million Americans suffer from this condition.[1] The hallmark of fasciitis is pain that occurs when patients first get out of bed in the morning or when they walk after a rest period. After a few minutes of walking, pain may subside, but in some people pain will develop later in the day, especially if they have been on their feet too long.

The plantar fascia is a dense, thick band of tissue that extends from the ball of the foot and attaches to the plantar aspect of the calcaneus. Many conditions can cause plantar fasciitis, including rheumatoid arthritis, osteoarthritis, trauma, and increased body weight, but the most common cause is stretching of the fascia that occurs when the arch lowers as a result of excessive pronation.[2-5] This stretching of the fascia leads to localized inflammation and pain. Pain can occur anywhere in the heel and arch, but one of the most common areas is the medial plantar aspect of the heel, where the strain of the fascia is greatest.

Treatment usually consists of mechanical support such as strapping, arch supports, orthoses, or shoe modification. Reduced activity, ice, corticosteroid injections, nonsteroidal anti-inflammatory drugs,

Figure 1. The cryoneedle with a 1-cm ice ball used in the treatment of plantar fasciitis.

Cryosurgery uses extremely low temperatures to destroy branches of the medial calcaneal nerve that register pain.

and night splints may also be beneficial.[6,7] Recently, extracorporeal shock wave therapy (ESWT) has been advocated.[8,9] All of these modalities may provide relief, but when conservative management is not successful surgery may be indicated. The time frame for performing surgery is variable depending how long it takes to administer conservative treatment.

The most common surgical intervention involves releasing the medial band of the plantar fascia, as either an open or an endoscopic procedure.[10-12] Although usually successful, fascial release can have disadvantages. Releasing the medial band of the fascia to alleviate heel pain also alters the biomechanics of the foot by lowering the arch and can result in eversion of the calcaneus.[13,14] This can cause a strain of the lateral ligaments and joint capsules of the foot resulting in a painful condition known as lateral column pain. This can occur in as many as one third of patients who have had plantar fascial release.[15] In addition, the disability period following heel surgery can be anywhere from several weeks to several months, and the procedure usually requires a hospital stay.

Cryosurgery provides an alternative to conventional heel surgery. Because the fascia is not released, the mechanics of the foot are not altered and the recovery period is very short.

Cryosurgery

Cryosurgery is not a new modality to the medical field. It has been used for years by many medical specialties to treat conditions such as cancer of the prostate, liver, and skin. It is also used to manage painful neuritis of the trigeminal nerve and to control the postoperative pain of thoracotomy.[16-18] I have been using cryosurgery to treat plantar fasciitis for more than two years.

In the treatment of plantar fasciitis this procedure uses very cold temperatures to relieve pain and inflammation. Cryogenic neuroablation involves the application of temperatures of -70° C to peripheral nerves, which results in the destruction of the axons and their myelin sheaths. The temperature is not cold enough to destroy connective tissue. Therefore the epineurium and perineurium are preserved, permitting the regeneration of the axons without formation of amputation neuromas.[19] This differentiates cryosurgery from neurectomy, thermoablation, and injectable neurolytic agents that can permanently destroy the axons.[20,21]

In the cryosurgical management of plantar fasciitis, very low temperatures are used to destroy the divisional branches of the medial calcaneal nerve that innervate the fascia and register pain. Cryosurgery also eliminates the inflammatory cells at the site of pain.

Figure 2. Percutaneous cryosurgery used to treat painful fasciitis on the medial plantar aspect of the heel.

Cryosurgery technology

The cryoprobe consists of an outer tube 2 mm in diameter enclosing a smaller hollow tube. Nitrous oxide gas is forced under high pressure inside the outer tube to a small opening at the tip of the probe. The compressed gas expands as it passes through the opening resulting in a rapid decrease in temperature at the tip of the probe. This is referred to as the Joule-Thompson effect and it results in temperatures as low as -70° C. An ice ball forms at the tip of the cryoprobe; its size can be altered by varying the length of the insulation layer (Figure 1).

Technique

The most important aspect of the procedure is to locate the most painful area of the heel. This is accomplished by palpating the heel and marking the area with a surgical pen. The most painful area is usually the medial plantar aspect of the heel, but can also occur in other locations.

Approximately 4 to 6 cc of local anesthetic are injected into the heel infiltrating the area of pain and the incision site. The foot is then prepped and draped and a 3-mm incision is made on the side of the heel closest to the location of pain. The cryoprobe is inserted, usually from medial to lateral between the plantar fat pad and the inferior surface of the fascia (Figure 2).

Once the tip of the cryo-probe is accurately positioned, a three-minute freeze is initiated, followed by a 30-second defrost and another three-minute freeze. A 1-cm ice ball forms, which is sufficient to destroy the nerves and provide relief to an area approximately 3 cm in diameter. The probe is removed and the wound is irrigated using a long-lasting anesthetic and a small amount of steroid. A mild compressive dressing is applied; sutures are not necessary.

Although the low temperatures destroy the nerves and reduce inflammation, in my clinical experience the integrity of the plantar fascia is not affected and there is no loss of sensation to the skin.

Postoperative care

There is a very short postoperative recovery period following cryosurgery. Patients can wear regular shoes, and the day after the procedure they can remove the dressing and get the foot wet. After showering, they dry the foot and apply a small amount of antibiotic ointment to the incision site, then cover it with a small bandage. Patients are instructed to reduce activity for two to three days.

In my experience, many patients will have minor postoperative discomfort that can last for one to two weeks. During this period most patients will take an NSAID for pain relief. The incision usu-

ally heals in two to three days. The axons regenerate in approximately four to six weeks.

There are very few complications associated with cryosurgery of the heel. As with any surgical procedure, infection is possible but it is rare. Of the 107 patients on whom I have performed cryosurgery for plantar fasciitis, one patient developed a post-operative infection, which was treated with oral antibiotics. Abscess formation at the surgical site occurred in six patients, and is usually the result of excessive patient activity after the procedure.

The most common complication seen is the postoperative development of pain at another location of the heel. This has occurred in seven patients and is probably due to patients walking with an altered gait while the surgical site is healing, resulting in strain on another portion of the fascia. This usually resolves uneventfully but may require a corticosteriod injection or a course of nonsteroidal anti-inflammatory medications and, if the pain is resistant, another cryosurgery. Since cryosurgery uses very cold temperatures it is contraindicated in patients with peripheral vascular disease.

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Of the 107 patients on whom I have performed cryosurgery, all had failed previous conservative treatment with all of the standard treatment modalities. One patient had received ESWT and another had undergone an endoscopic plantar fasciotomy.

Ninety percent of these patients have had complete resolution of their plantar fasciitis or have had such mild discomfort that they have required no further treatment. The follow-up on these patients has been from one to two and a half years.

Conclusion

Cryosurgery is a safe, percutaneous, minimally invasive procedure that produces excellent results. Patient acceptance is very good. The procedure is performed in the office setting instead of the hospital resulting in significant cost savings, and has a very short disability period.

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