Plantar Fasciitis: Current Diagnostic Modalities and Treatments

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KEYWORDS

• Plantar fasciitis • Foot • Heel pain

Plantar fasciitis is one of the most common causes of heel pain seen by foot and ankle surgeons. Approximately 10% to 16% of the population suffer from plantar fasciitis.[1] This is usually an overuse injury at the origin of the plantar fascia caused by excessive stress to the foot or biomechanical abnormalities of the foot such as excessive pronation. This condition may cause inflammatory or degenerative changes of the fascia and periostitis of the medial calcaneal tubercle.

Bilateral plantar fasciitis may be caused by arthridides such as rheumatoid arthritis, Reiter disease, ankylosing spondylitis, systemic lupus erythematosus, and gout.

ANATOMY

The plantar fascia, or plantar aponeurosis, is predominantly composed of longitudinal collagen fibers that start at the anterior aspect of the calcaneal tubercle, extend distally into 5 digital bands at the metatarsophalangeal joints, and terminate at the dorsal aspect of the proximal phalanges. The fibers blend into the dermis, flexor tendon sheaths, deep transverse metatarsal ligaments, and other ligament structures. The plantar fascia consists of 3 bands: medial, central, and lateral. Each band is separated by an intermuscular septum that splits the intrinsic plantar muscle into their different compartments.

The lateral band is superficial to the abductor digiti quinti minimi muscle. It is also attached to the lateral process of the calcaneus and the base of the fifth metatarsal. The medial band of the plantar fascia is superficial to the abductor hallucis muscle. This band is connected to the flexor retinaculum. The flexor digitorum brevis muscle arises from the central band of the plantar fascia.

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The plantar fascial bands are supplied by the medial and lateral plantar nerves. The thickness of a normal plantar fascia is approximately 3 mm. In patients with plantar fasciitis, the maximum thickness is significantly increased to 7 mm.[2]

DEFINITION

Plantar fasciitis is described as a painful inflammatory process, generally at the origin of the plantar fascia on the calcaneus. It can also be central in the plantar arch, or, less commonly, distal.[3] Lemont and colleagues[4] state that the disorder is better classified as a fasciosis rather than a fasciitis, with chronic degeneration of the plantar fascia rather than a true itis or inflammatory condition.

RISK FACTORS

Plantar fasciitis is often seen in patients between the ages of 40 and 60 years. It is more common in women. Occupations that require people to walk a lot or stand on hard surfaces for long periods of time can also damage the plantar fascia. The condition is common in athletes, nurses, letter carriers, warehouse workers, and auto mechanics.[1] Poor footwear, such as those that are thin soled, loose, or lack an arch support, can also contribute to plantar fasciitis.

Patients who are overweight or obese carry a larger force per unit area on their feet. This causes increased strain on the fascia, leading to chronic stretching with degeneration, and thus pain. Plantar fasciitis is also seen in pregnancy, with the weight gain over a short period of time causing increased stress on the ligamentous structures of the foot.

Decrease in ankle dorsiflexion is another risk factor for plantar fasciitis.[1] Normal gait requires a minimum 10° of dorsiflexion at the ankle joint to clear the ground. If the patient has less than 10° of dorsiflexion, the foot will compensate by pronating and increasing the tensile load on the plantar fascia.

SYMPTOMS

Pain is usually localized to the medial calcaneal tubercle, but can be distal and along the entire length of the fascia. In the acute phase of plantar fasciitis, pain is sharp and worse with the first step of the day after a period of non–weight bearing. This is known as poststatic dyskinesia. Pain initially improves after a few steps or minutes, but then worsens with additional weight bearing. In the chronic stages, pain is dull and constant. The fascia has been inflamed, healed, and then stressed again with continuous weight bearing. This process leads to chronic degenerative changes to the fasica. Histologically, collagen necrosis, giofibroplastic hyperplasia, chondroid metaplasia, and matrix calcification are seen.[4]

PATHOMECHANICS

During stance, the medial longitudinal arch functions similarly to a truss, with tension along the plantar fascia, in connection with 2 compressive elements.[5] Stretching or spreading of the arch in weight bearing is prevented by tension of the plantar fascia, muscles, and ligaments, with compression of the bone structures of the arch. Thus the stiffness of the arch is in proportion to the stresses, or loads, applied. Hicks[6] proposed that low arches seen in pes planus resulted in increased tension within the fascia. Salathe[7] stated that the greatest tension occurred within the fascia at heel-off.

Hicks[6] compared the plantar fascia working with the digits with a windlass. As the toes dorsiflex, the plantar fascia tightens as it courses around the metatarsal heads,

causing shortening of the fascia and increased tension. Activation of the windlass mechanism causes increase in stability of the arch and prepares the foot for the propulsive phase of gait.

In patients with shortening or tightening of the Achilles tendon (equinus), stress becomes greater in the plantar fascia as the heel elevates. Because many of these patients also present with digital contractures, loads are further increased within the plantar fascia as the toes are dorsiflexed. Carpenter and colleagues[8] stated that there can be a 6-mm change in length of the plantar fascia during gait, indicating the effect of ground forces on load within the fascia.

Plantar fasciitis can be associated with pes planus and pes cavus. In a study of 82 patients, Prichasuk[9] suggested that pes planus was an important factor in patients with plantar fasciitis. Fascial thickening in the pes cavus patient is correlated with sagittal arch mechanics and can influence the severity of symptoms. Because the fascia is tighter and thicker, shock is less dissipated in stance and gait, causing increased tension at the origin on the calcaneus.

DIFFERENTIAL DIAGNOSES

The following are included in any patient presenting with plantar calcaneal pain.

Rheumatoid Arthritis

Generally, rheumatoid arthritis attacks diarthrodial joints. Other sites of involvement include tendons, tendon sheaths, subchondral bone, bursae, and periarticular subcutaneous tissue. The rheumatoid patient may present with heel pain, also with poststatic dyskinesia.

The basis for this pain is an inflammatory reaction in the epiphyseal portion of the calcaneus. Epiphyseal bone is similar histologically to synovial tissue, with the inflammatory process causing osteitis and irregular osteolysis of cortical bone. Radiographs of the foot may show periostitis, osteolysis, and loss of radiopacity of the soft tissues surrounding the calcaneus.

In juvenile rheumatoid arthritis, the epiphyseal plate may be invaded by the ostetitis, causing cystic destruction of the epiphyseal plate. This can cause retardation of growth. Because local manifestations of rheumatoid arthritis in the foot respond well to nonsteroidal antiinflammatory drugs (NSAIDs) and corticosteroid injection, a good medical history is mandatory. This history should include other areas of joint pain, morning stiffness, and edema to periarticular tissues. In addition to radiographs, laboratory studies should be performed, including rheumatoid arthritis latex, and a complete blood count along with erythrocyte sedimentation rate.

Rheumatoid nodules are chronic inflammatory lesions that occur in the subcutaneous tissue, particularly in areas of mechanical pressure. Plantar and medial to the calcaneal tuberosity is a common area for presentation in the foot. There is palpable swelling and sensation of a mass in the early stages, and magnetic resonance imaging (MRI) may be required for diagnosis.

Reiter Syndrome

Reiter syndrome is a triad consisting of nongonococcal urethritis, arthritis, and conjunctivitis. Articular involvement usually involves weight-bearing joints, but can include the toes and plantar calcaneal tuberosity area. Presentation may vary. There may be mild inflammation, or significant signs including rubor, calor, and severe pain. Synovitis may be migratory but can be followed by a more severe and persistent inflammation. Diagnostic studies include radiographs of the foot and the lymphocyte

antigen HLA-B27. Periostitis of the plantar surface of the calcaneus is estimated to occur in 20% of patients with Reiter syndrome.

Ankylosing Spondylitis

Ankylosing spondylitis is an inflammatory arthritis involving the axial skeleton and, in the later stages, diarthrodial joints. The primary tissue involved in the disease process is cartilage, especially fibrocartilage. Often there is osteitis of subchondral bone. Synovitis, with inflammation of the enthesis and periosteum, is a feature of the disease process. Five percent of patients with ankylosing spondylitis present with heel pain due to periositis and osteitis of the plantar calcaneus. Diagnostic studies should include lymphocyte antigen HLA-B27 and pedal radiographs.[10]

Osteomyelitis

The calcaneus is a frequent site for hematogenous osteomyelitis in the foot, especially in the pediatric patient. Presentation includes calor, edema, and pain with standing and walking. Fever and leukocytosis may accompany this presentation. Direct extension osteomyelitis is more common in the podiatric practice, especially in the diabetic patient. It is accompanied by an open lesion or ulceration and may include drainage, cellulitis, and systemic signs.

Radiographs of the foot show periostitis, erosion, and bony destruction. MRI may be performed in the early stages and may show osteomyelitis before any plain-film changes. Culture and sensitivity of purulence or drainage with subsequent bone culture are performed to confirm the diagnosis and plan treatment. Treatment plans may include intravenous antibiotics, irrigation and debridement, and subsequent planning for skin coverage.

Calcaneal Stress Fracture

Calcaneal stress fracture must be included in the differential diagnosis of heel pain. Patients present with diffuse swelling and ecchymosis, often after prolonged or significant activity. Lateral compression of the heel helps with the diagnosis. The calcaneus is prone to stress fracture because of its anatomy, with a thin cortical shell surrounding primarily cancellous bone. Patients involved in athletic activities or prolonged walking may feel a sharp pain with limited ability to continue. Initial radiographs may be negative, and bone-scan or MRI studies may be required for diagnosis. After 3 to 4 weeks, a thin sclerotic line may be visible on plain radiographs. Treatment includes immobilization, ice, NSAIDs, and non–weight bearing.

Plantar Fascial Tear

Plantar fascial tear is rare because the plantar fascia is thick, tough, and resilient to pressure and trauma. Patients present with a history of trauma, a feeling of sharp pain, often accompanied by a pop or a tearing sensation in the plantar heel or arch area. There is a correlation between previous multiple corticosteroid injections and plantar fascial tear. Presentation includes swelling and often ecchymosis. A palpable defect in the fascia may be present. Confirmation by MRI may be necessary, although plantar fascial tear is often a clinical diagnosis. Treatment includes immobilization, rest, ice, NSAIDs, and non–weight bearing with crutches, often for a period of 4 to 6 weeks.[11]

Tarsal Tunnel Syndrome

Tarsal tunnel presents with a history of paresthesia, and pain to the heel. The posterior tibial nerve passes under the laciniate ligament accompanied by the posterior tibial artery and veins. It branches into the medial plantar nerve, lateral plantar nerve, and

the medial calcaneal nerve. Compression occurs due to trauma, varicosities of the vena comicantes, or hypertrophy of the ligament. Presentation may include pain in the area of the port-au-pedis or directly inferior to the plantar calcaneal tuberosity. The Tinel test is performed by percussing the tarsal tunnel and eliciting pain or tingling sensation distally. The Veilleux test is performed by percussing the tarsal tunnel and eliciting the pain and tingling sensation proximally and distally. Nerve conduction velocity test and distal latency studies are necessary to establish the diagnosis. Treatment includes injection therapy, oral medication, or nerve decompression through surgery.

Medial Calcaneal Nerve Entrapment

The medial calcaneal nerve arises off the posterior tibial nerve, usually distal to the laciniate ligament. In some cases, branching may occur more proximally. The nerve courses plantarly beneath the heel and serves the medial, plantar, and lateral aspects of the heel. Entrapment may occur as a result of pressure because the nerve passes underneath the calcaneal tuberosity. Symptoms are more neurologic and include paresthesia, tingling, and burning. Treatment includes reducing pressure on the nerve through surgical decompression and injection therapy to reduce fibrosis.

Plantar Calcaneal Bursitis

The plantar calcaneal bursa may become inflamed with weight bearing or prolonged trauma. Symptoms may mimic those of plantar fasciitis, with pain on direct compression of the plantar calcaneal tuberosity. There may be mild edema but no ecchymosis. Radiographs will be negative and this condition usually responds well to off-loading and injection therapy.

Bone Contusion

A bone contusion occurs with trauma to the calcaneus. Often the patient presents after a minor injury, such as slipping on a stair and jamming the heel into the floor. Radiographs are negative and there may be no ecchymosis or edema. There is pain to compression of the plantar heel, with no history of poststatic dyskinesia. Treatment is usually symptomatic with ice, NSAIDs, and off-loading.

DIAGNOSTIC TESTING

Generally the diagnosis of plantar fasciitis is clinical, based on the history of pain, poststatic dyskinesia, absence of trauma, and edema along with the physical examination.

Radiographs

Radiographs are the most common diagnostic test performed for heel pain and plantar fasciitis. Because plantar fasciitis and heel spur syndrome are closely related, lateral, medial oblique, and lateral oblique radiographs of the foot can confirm the presence of a plantar calcaneal spur (**Fig. 1**). A heel spur may be present, but these have also been reported to be present in 27% of people without any symptoms. Radiographs can also confirm later-stage stress fracture, bone tumors, bone cysts, periostitis, and erosions due to infection or rheumatologic causes.

Diagnostic Ultrasound

Normal plantar fascia is hyperechoic and isoechoic with adjacent fat. On the sagittal plane, the fascia is recognized by its striated appearance secondary to the orientation of the fibers.[12] In patients with clinical symptoms of plantar fasciitis, the proximal end of

Fig. 1. (*A, B*) Heel spur noted plantarly.

the fascia is hypoechoic, which can be seen clearly when compared with the surrounding soft tissue. Plantar fascia is also significantly thicker in patients with plantar fasciitis. Symptomatic patients were seen to have fascia measuring 4 mm or more in thickness, whereas those of asymptomatic patients measured 4 mm or less.[2,12]

MRI

MRI is not usually used to diagnose plantar fasciitis. However, it is a useful tool to differentiate between the various causes of heel pain. Most commonly seen is perifascial edema, which appears as poorly circumscribed areas of high signal intensity on the short-tau inversion recovery (STIR) images in the soft tissues superficial or deep to the plantar fascia.[13] The second most common finding is bone marrow edema of the calcaneus at the insertion of the plantar fascia. The area of the edema is small. This may also be seen when trauma has occurred to the heel. The third most common findings is high signal intensity within the plantar fascia on T2 and STIR images that

may show some degree of fascial tear. On T1-weighted spin-echo MRI, intermediate signal intensity within the plantar fascia can be seen as well as aponeurotic thickening greater than 5 mm on T1 sequences.

Computerized Tomography Scan

Computerized tomography (CT) scan be performed if calcaneal stress fracture is suspected. Generally, MRI or CT would be considered only in those cases recalcitrant to treatment and for those patients with a high index of suspicion for the other causes of heel pain.

Technetium 99 Bone Scan

A bone scan is often positive with chronic heel pain and plantar fasciitis due to chronic periostitis and inflammation, with increased activity in the periosteum. A technetium 99 bone scan can also diagnose fatigue or a stress fracture. There will be diffuse, intense increased activity with a stress fracture, whereas plantar fasciitis will show focal uptake in the area of the medial calcaneal tuberosity.

Nerve Conduction Velocity and Electromyography Test

Distal latencies are performed if tarsal tunnel is suspected. Normal distal latencies are 4.1 and 4.7 milliseconds for the medial and lateral plantar nerves, respectively. Patients with tarsal tunnel syndrome show delays in the distal latency studies. However, in some cases of tarsal tunnel these studies may be normal.

CONSERVATIVE TREATMENT OPTIONS

Low Dye Strapping

Low dye strapping is often an effective treatment modality in mild to moderate cases. The strapping uses adhesive tape to immobilize the foot and decreases the distance between the origin and insertion of the plantar fascia, thus relieving plantar strain. Tape will loosen in time, often quickly, and may prove less effective in severe cases. Relief with plantar support via strapping often gives a good indication of the efficacy of orthotics in a particular patient.[14]

Footwear

The American Academy of Podiatric Sports Medicine advocates a minimum 2.5-cm (1-inch) heel height with a strong stable midfoot shank and relatively uninhibited forefoot flexibility for treatment of plantar fasciitis. Going barefoot and wearing sandals are not recommended.

Stretching of the Achilles Tendon and Plantar Fascia

Porter and colleagues[15] studied 94 patients with plantar fasciitis on a program of stretching of the Achilles tendon. The patients were separated into 2 groups. Group 1 stretched 3 times per day for 3 minutes each session. Group 2 stretched twice each day for five 20-second periods each session. Each groups stretched for a period of 4 months. The investigators noted improvement in foot and ankle function for both groups, with no significant differences between group 1 and group 2. Most physicians today incorporate a vigorous program of stretching in patients with plantar fasciitis.[16]

DiGiovanni and colleagues[17] compared protocols of Achilles tendon stretching versus specific stretching of the plantar fascia. With the plantar fascia stretch, the affected side is placed on the contralateral knee, the ankle is held dorsiflexed, and the toes are moved into dorsiflexion by hand. This exercise causes stretch and tension

in the plantar fascia. Improvement was found at 8 weeks in 52% of patients, compared with 22% in the Achilles tendon–only stretching program.

Night Splints

Night splints are worn to keep the ankle in neutral to slightly dorsiflexed position. This technique prevents contracture of the plantar fascia while resting at night and promotes stretching of the Achilles tendon. Batt and colleagues[18] evaluated 33 patients with plantar fasciitis for the effectiveness of ankle dorsiflexion night splints. Seventeen patients were in the treatment group, and 16 were controls. All 17 patients in this study experienced substantial relief, with an average time to resolution of 12.5 weeks. Patients often complain that the splints are uncomfortable for the first few nights, but the discomfort generally becomes less in time.

Physical Therapy

Physical therapy treatments have been one of the cornerstones of plantar fasciitis, although studies show pain relief in patients after 2 weeks but no statistically significant relief after 1 month.[19] Ice is prescribed each night to decrease edema and inflammation. Other modalities, such as whirlpool and ultrasound treatments, are performed 3 times per week for 3 to 4 weeks as part of the physical therapy regimen.[20] They are combined with passive stretching of the tendoachilles and plantar fascia.

Antiinflammatory Agents/Oral Corticosteroids

Antiinflammatory agents have been widely used in the treatment of plantar fasciitis, whether they are given orally, topically, or via injection. NSAIDs are given to decrease inflammation but care must be taken in patients with gastritis or ulcer disease, renal disease, or reflux esophagitis. They are best used as short-term therapy. New topical antiinflammatory agents, such as diclofenac sodium gel, can be used, but studies on efficacy have been limited. The gel is applied directly to intact skin around the location of the pain.

Injection of Corticosteroid

Care must be taken with injections so that atrophy of the soft tissue does not occur. Gill[21] advises injecting deep to the plantar fascia, between the fascia and the calcaneus, to avoid atrophy and necrosis of the calcaneal fat pad. Generally, corticosteroid injections are given in a series of 3, spaced a few weeks apart.

Crawford and colleagues[22] concluded that pain scores were reduced after corticosteroid injection, and remained so after 1 month, with maximum benefit for 6 to 8 weeks. However, at the 3- and 6-month marks, no significant differences were noted.

Complications of injections include rupture of plantar fascia. Acevedo and Beskin[23] reported that, in a group of 765 patients with a clinical diagnosis of plantar fasciitis, 51 were diagnosed with a plantar fascial rupture. Of these ruptures, 44 (86%) were associated with prior corticosteroid injection.[23] Balasubramanian and Prathap[24] believed that local steroid injections cause focal necrosis of collagenous tissue and can predispose ruptures of tendon or fascia.

Orthoses

Scherer[25] stated that the most important part of orthotic success was to mechanically control the midtarsal joint. Lynch and colleagues[26] carried out a prospective study comparing the success of orthoses with NSAIDs and steroid injections. Orthotics had an 80% success rate, compared with 33% and 30% success rates with NSAIDs and steroid injections respectively.

Extracorporeal Shock-Wave Therapy

In 2000, the Food and Drug Administration approved the use of extracorporeal shock-wave (ESWT) therapy to treat plantar fasciitis. Sound waves are propagated to damaged tissues to induce microtrauma. This microtrauma stimulates healing by attracting blood vessels and nutrients to the plantar fascia. ESWT comes in low waves and high waves. Waves are considered low energy if the flux density ranges from 0.05 to 0.10 mL/mm^2 making local anesthetics unnecessary. Side effects consist of redness at the area of therapy, pain, and swelling.

Through an acoustic lens, the focus of the shock-wave source, or heel spur, is centered with the c-arm. This focus should cover an area of 50 mm in the axis of the shock wave and a diameter of 7.0 mm perpendicular to the shock-wave axis. The shock-wave unit is placed on the foot along the medial aspect of the heel over a layer of ultrasound gel.

Rompe and colleagues[27] studied 112 patients who received 3 treatments of 1000 impulses weekly or 3 treatments of 10 impulses weekly. These patients were evaluated on the visual analog scale to assess pain on palpation, ambulation, and pain at rest/night after 6 months of treatment and 5 years after treatment. Patients were instructed to stop all therapy for 6 weeks before the extracorporeal shock-wave therapy. After 6 months and 5 years, the group who received the treatments of 1000 impulses showed significantly less pain on palpation, ambulation, and after rest or at night compared with the group who only received 10 impulses for 3 weeks.

In another double-blind randomized study, Haake and colleagues[28] compared ESWT with a placebo in 272 patients. All patients had suffered from chronic plantar fasciitis for more than 6 months. The ESWT group received 4000 impulses of positive energy flux density (0.08 mJ/mm^2) under local anesthesia every 2 weeks for 12 weeks. The placebo group received therapy consisting of a polyethylene foil filled with air, also under local anesthesia. Final results between the 2 groups revealed no significant difference in pain level, ambulation, or need for additional therapy at the end of the 12 weeks and after 1-year follow-up. A similar study by Buchbinder and colleagues[29] confirmed no statistically significant difference between the ESWT group and placebo.

SURGICAL TREATMENT OPTIONS

When conservative management fails, which occurs in approximately 10% of patients, surgical options should be considered. Symptoms should be present for more than 6 months before surgery should be discussed.

Open Plantar Fasciotomy

Open plantar fasciotomy allows for release of the tight plantar fascial bands. An incision is made along the anterior medial aspect of the heel distal to the insertion of the plantar fascia. Once the soft tissue is freed from the fascia, the medial bands are transected. If a heel spur is present, a rasp may be used to smooth down the prominence. Some surgeons will free the abductor hallucis muscle to prevent nerve entrapment from occurring. Open surgery has risks; approximately 25% of patients will still experience heel pain after the surgery.[30] Over-release of the plantar fascia may lead to flatfoot complications. Nerve entrapments can occur, as well as pain along the scar.

Contompasis[31] performed a 3-year retrospective study of 126 surgeries for plantar fasciitis. Plantar fascial release provided 36% satisfactory relief.[31] A combination of fascial release and spur resection allowed 44.3% to have complete resolution of pain and 45.2% to have improvement in pain, whereas 10.5% had no relief.

Endoscopic Plantar Fasciotomy

Endoscopic plantar fasciotomy (EPF) has become more popular because of its minimally invasive nature and visualization of the fascia. It minimizes complications and recovery time compared with open procedures. EPF is performed by creating a small incision along the medial aspect of the heel at the anteriomedial border of the calcaneus. Blunt dissection separates the subcutaneous fat from the fascia inferiorly and superiorly. A cannula with a trochar is then passed from medial to lateral. Some surgeons choose to make a second incision along the lateral aspect of the heel at the tip of the trochar. Others choose to use only 1 portal for the entire procedure. At this point the endoscope and the cutting device are inserted. The superficial and deep layers of the medial band of the plantar fascia are then transected to the point where the medial band ends, which is approximately halfway across the fascia.[32] Satisfaction ranged from 60% to 80% with this procedure in relief of heel pain. Complications after endoscopic plantar fasciotomies include heel pain, calcaneal stress fractures, lateral column pain, incisional pain, nerve entrapment, and postoperative infection.

Cryosurgery

Percutaneous cryosurgery uses subfreezing temperatures to produce analgesic effects. The areas of maximum tenderness are marked on the foot. A stab incision is made along the anterior medial aspect of the heel. A probe is used to bluntly dissect the subcutaneous tissue from the plantar fascia. The cryostar plantar fascial probe is then inserted inferior to the plantar fascia up to the point marked on the foot. A nerve sensor in the probe determines the course of the nerves in the fascia. Three minutes of cryosurgery are performed, followed by 30 seconds of thawing. Another course of 3 minutes of cryosurgery is then performed. It is important to explain to the patient that numbness will occur to the plantar heel for many months after the procedure. In a study by Cavazos and colleagues,[33] out of 137 feet, 77.4% of the patients were considered to be successes after cryosurgery. This procedure is still being studied for the effects on nerve and soft tissue after the freeze-thaw cycles.

Radiofrequency Nerve Ablation

Radiofrequency ablation is another minimally invasive procedure that ablates the nerve by generating a 5-mm sphere of heat around the tip of the electrode. The point of maximum tenderness is marked on the foot. A 22-gauge insulated needle is inserted into the marked location and an electrode is inserted to stimulate the nerves. If fasciculation is noted, the motor nerve is being stimulated and the needle needs to be pulled back until a purely sensory nerve is being stimulated. At this point, the generator is increased to 90°C for 90 seconds. Patients are allowed to bear weight immediately after the procedure. Liden and colleagues[34] performed a retrospective study on 31 feet that received radiofrequency ablation therapy to the heel. The mean visual analog pain score was 8.12 before treatment, and 2.07 at 6 months. Complications include hematoma at the site of entry from the cannula.

Coblation Therapy

Coblation therapy with Topaz is a form of bipolar radiofrequency. It causes microscopic damage to the fascia, which increases the blood supply to the fascia, bringing healing factors, and breaks up the nocioceptors. It requires a small stab incision at the medial aspect of the heel to allow for insertion of the cannula and obturator. The Topaz wand should be connected to a saline solution and placed on the surface of the fascia.

It allows for 0.5 seconds of pressure, creating perforations at 5-mm intervals with 1-, 3-, and 5-mm depths. The patient is immobilized for 3 weeks and then returned to ambulatory status.

SUMMARY

Plantar fasciitis is a common cause of heel pain. Once clinically diagnosed, the rehabilitation time through conservative or surgical management may last for many months.

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