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Exploring Approaches in the Contemporary Management of Plantar Fasciitis: A Review

Bharat Rathi[1]

Author's Affiliations:

1. Resident, Department of Musculoskeletal Physiotherapy, Ravi Nair Physiotherapy, College, Datta Meghe Institute of Higher Education and Research, Sawangi(M), Wardha, India.

Corresponding Author:

Bharat Rathi

Resident, Department of Musculoskeletal Physiotherapy, Ravi Nair Physiotherapy, College, Datta Meghe Institute of Higher Education and Research, Sawangi(M), Wardha, India.

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Abstract:

Plantar Fasciitis is a degenerative condition irritating the fascia along the course of the fascia and mainly at the origin of the fascia. The disorder's etiology is unclear, but it includes repetitive microtrauma, excessive wear and tear of the fascia and prolonged standing, improper use of footwear, obesity, etc. Both males and females are affected between the ages of 40-60. The standard clinical features of the condition include irritation of the plantar fascia and pain, which is worse in the morning and improves as the day passes. Diagnosis can be made by specific physical tests, including triple compression test, dorsi flexion test, and radiographic investigation t (MRI, X-ray), which rule out other complications like calcaneal spur and stress fracture of the calcaneum. The management of the condition varies based on the severity of the condition; in acute cases, medications are proven to be effective; in sub-acute cases, physical therapy modalities such as dry needling and matrix rhythm therapy are proven to be more effective in alleviating the pain and discomfort, and in chronic cases, the surgical approach is used. However, physical therapy and pharmacological treatment approaches have proved more effective in reducing pain and improving ADL in individuals with Plantar fasciitis.

Keywords: Plantar fasciitis, Medication, Conservative management, Physical therapy, Surgical management, pain relief.

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Introduction:

Plantar fasciitis is a common disorder affecting adults and young individuals with less physically active lives and poor footwear [1]. The inflammation of the plantar fascia due to excessive wear and tear in populations such as military personnel, runners, and obese individuals due to extreme overload is common in certain professions that require long hours of standing jobs [2,3]. Plantar fascia is more common in individuals with foot deformity and muscular imbalance in the intrinsic foot muscles. Planter fascia is a ligamentous sheath originating from the medial end of the calcaneus and inserts distal to the base of the metatarsal, forming three bands, i.e., medial, lateral, and central. The central band of the plantar fascia is also known as planter aponeurosis, which helps and maintains the planter arches by forming a truss. The planter fascia enhances the gait by following the **Windlass Mechanism. This** mechanism provides stability to the foot during the heel-off phase and helps the body to propel In the anterior direction [4]**.**

In previous years, it was assumed that plantar fasciitis is an inflammatory condition caused by micro-tears in the planter fascia strain, causing inflammation in the plantar fascia. However, current literature has provided evidence that the condition is degenerative and not inflammatory, as the main culprit is due to loss of the tensile strength in the fascia. As mentioned in the literature, the plantar fascia has two parts (sheath and core) which have two different roles: the mechanical loading causing changes in the sheath, and the catabolic response from the core part causing an inflammatory reaction which plays a significant role in the development of plantar fasciitis [5].

History and Evaluation:

A detailed history of the pain must be taken, such as onset, duration, location, intensity, and course of the pain is assessed. The pain is dull, aching over the heel, which is more in the morning and during initial steps and subsides gradually with walking and ADLs. A detailed history regarding the type of work, footwear assessment, long-standing for how much time, and basal metabolic rate of the patient is taken. All other conditions, such as peripheral neuropathy and disc compression, are ruled out. Physical Examination of the patient includes palpation of the heel and assessing the tenderness; the pain is usually sharp and localized pain over the heel. Tightness of surrounding muscles such as gastrocnemius, soleus, and tibialis anterior and posterior is assessed. Strength assessment is performed using Manual muscle testing for the

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muscles. Once done with physical evaluation, the findings are correlated with radiographic findings.

Differential Diagnosis:

Sometimes, it isn't easy to diagnose plantar fasciitis. There are various other conditions with similar presentation. Certain degenerative conditions such as Osteoarthritis, Ankylosing spondylitis, and Reiter's syndrome can be suspected when the patient complains of unilateral heel pain. In cases of bilateral heel pain, one might suspect he or she might be suffering from Rheumatoid arthritis, which is common in females. An abscess in the soft tissue in diabetic patients is also one of the standard clinical presentations. Other symptoms and the classical presentation, such as weight loss, night pain, and infection, suggest neoplasia, but this condition is not very common. Other conditions include entrapment of the S1 nerve or compression of the tibial nerve in the tarsal tunnel.[6].

Diagnostic Findings:

Various physical examination special tests also have good reliability for confirming the diagnosis. The particular test is the triple compression test, which is used to assess the entrapment of the tibial nerve in the tarsal tunnel. In this, the ankle is in plantar flexion, and the heel is taken into maximum inversion, which causes posterior tibial nerve compression. Dorsiflexion and eversion test is done by passively dorsiflexing and everting the ankle to the end range. Hold the position for 10 seconds, and look for the symptoms. Ht symptoms arise, it is because of compression of the tibial nerve [7].

Diagnosis of plantar fasciitis is usually made by physical evaluation. In contrast, some radiographic findings, such as plain X-rays, confirm the presence of calcaneal spur, which causes thickening of the plantar flexors. This basic X–ray is used to assess the normal orientation of the bone in the ankle and foot complex. Magnetic Resonance Imagining determines the thickness of the plantar fascia and soft tissue around the ankle joint. MRI is the most efficient way to rule out other conditions, such as a hairline fracture or stress fracture of the calcaneum. Another

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diagnostic method is Ultrasonography to assess the thickness of calcaneal spur, tendinopathy, and sub-calcaneal bone erosion. It is one of the most cost-effective diagnostic tests for plantar fasciitis [8].

The systemic presentation and heel pain require various other investigations, such as blood urea levels in young patients with bilateral heel pain and white cell levels. Electromyography assesses the neurologic origin of the heel pain caused by affection plantar nerve, posterior tibial nerve involvement, and its branches..[9].

Management Strategies for Plantar Fasciitis:

Plantar Fasciitis is usually a self-remitting condition, with 90% of individuals achieving symptomatic relief within three to six months after the onset of the condition by following proper rest, footwear modification, lifestyle modification, weight reduction protocol, and application of medication along with physical therapy and another conservative approach.

Pharmacotherapy:

Includes Nonsteroidal anti-inflammatory drugs play an essential role in reducing pain. They are either taken orally in the form of a tablet or applied topically over the plantar fascia for pain relief by inhibiting the cyclooxygenase pathway by inhibiting the activation of the inflammatory pathway [10]. Local application of corticosteroid injection over the plantar fascia has proved to significantly reduce pain and improve the patient's overall well-being [11].

Osteopathic Manual Therapy:

It is a joint manipulation technique that works with strain and counter strain mechanisms, proving immediate improvement in the condition, and **data on long-term followup is not available.** The method is applied by positioning the foot in a position that imposes minimal resistance with passive flexion of the knee, ankle, toes, and fascia. This position is maintained for at least 90 seconds, and tender points are released. The common site of the tender point in the fascia is at the base of the medial calcaneum.[12].

Extracorporeal Shockwave Therapy:

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ESWT is a noninvasive treatment modality for various inflammatory conditions; ESWT promotes healing and recovery time. The mechanism of action of ESWT needs to be clarified to date. Some studies state that it stimulates neovascularization and collagen synthesis in degenerative tissue. Current literature compares the effect of ESWT with conventional therapy. The group that received ESWT showed significant improvement in the functional level and pain.[13].

Physical Therapy:

Physical Therapy has proven to improve the condition and the pain in individuals suffering from planter fasciitis; the interventions included in Physical Therapy are

- **Stretching Exercises:** Gentle Stretching exercises are given to the patient for plantar fascia, gastrocnemius, and soleus. The stretch Is given three times and held for 90 sec**.**
- **Strengthening Exercises:** strength training is given to the intrinsic muscle of the foot, which supports the arches of the foot, strengthening of plantar flexors and dorsi flexors, which maintain normal foot position[14–16].

Orthotic Devices:

Splinting of the foot plays a vital role in improving the patient's overall condition. This splinting is helpful in preventing contracture of the fascia; nocturnal application of the splints prevents shortening of the fascia. Heel pads are prescribed for the footwear, which helps in the effective redistribution of weight and avoids excessive pressure on the calcaneal spur in terms of relieving symptoms. [17].

Percussive massage and Myofacial Release technique:

Theragun is an effective tool for breaking adhesion; the treatment consists of applying the theragun over the calf muscles, which causes relaxation of the plantar fascia to increase the flexibility of the fascia and reduce pain[18]. The frequency for treating plantar fasciitis is fifty-three hearts per week for 5 minutes over the calf muscles. The myofascial release technique is a conventional soft tissue manipulation technique involving the resolution of the adhesions and

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tender points. Pressure is applied over the tender point. After identification of the trigger point, the pressure is maintained for 90 seconds and then released. This causes an influx of fresh blood, causing relaxation of the symptoms. [19].

Botulinum Toxin:

It plays a significant role by inhibiting the release of neurotransmitters at the neuromuscular junction, inducing skeletal muscle paralysis. Botox is injected into the plantar fascia, gastrocnemius, and soleus to reduce muscle tension and produce an analgesic effect without the risk of perifascial atrophy or rupture leading to the lengthening procedure. The efficacy of the botox alone is unclear as the patient received adjuvant therapy and botox [20,21].

Platelet rich plasma:

PRP has gained popularity in promoting soft tissue healing in orthopedic conditions. This therapy consists of extracts of endogenous growth factors, which are thought to stimulate intrinsic cell growth mechanism, which helps in the recovery of the condition. A meta-analysis concluded that the PRP is effective in long-term pain relief and is a safe management option [22,23].

Therapeutic Ultrasound

Therapeutic ultrasound is considered a commonly used deep heating modality for pain relief in plantar fasciitis. In this method, the ultrasound head is placed over the heel of the patient, and the device is turned on for the mode used for the treatment is pulsed for the duration of the treatment is 8 minutes, and 1 MHz frequency is used for the treatment of the patient, and intensity used is 1.8 W/cm2[24]. The evidence regarding the effect of therapeutic ultrasound is varied less. More studies are required to assess the impact of the US[25]. High-energy ultrasound creates thermal zones inside the tissue, stimulating tissue repair cascade and promoting collagen generation [26].

Matrix Rhythm Therapy (MRT):

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MRT is indicated in cases of inflammations, tightness, spasticity, or conditions where the oscillation of the cell is hampered due to adhesions that restrict the flow of oxygen. Matrix rhythm therapy uses oscillation, which ranges from 8 to 12 Hz. These oscillations synchronize with the body, increasing the oxygen supply by improving microcirculation, thereby increasing energy production and inducing muscle and fascia relaxation. One study was conducted to assess the effect of MRT on plantar fasciitis. A single session of MRT proved to be very effective in improving pain, skin temperature, and functional activities in individuals with plantar fasciitis [27].

Dry Needling:

It is a minimal or less invasive technique to release the trigger point. Dry needling alters the biochemical environment by reducing the spontaneous electrical activity with the trigger point in the fascia [28]. It is one of the most effective methods to relieve pain. The parameters of the needles used for release the length used were 30-50 mm, and the diameter was 0.6mm. The duration of the treatment was 30 minutes. The individual is lying. The needle is inserted in the muscle belly of the calf muscle, and the needle is manipulated in the belly of the muscle near the trigger point within the pain limits [29].

Surgical Management Strategies:

Surgical interventions are required in less than 50% of cases where the fascia is sectioned; secondary risk factors are the collapse of the longitudinal arch and lateral side foot pain. Excision of the calcaneal spur is ineffective as the layer of the calcaneal spur is different, and the fascia layer is separate, proving the excision surgery is of no significant use [30,31].

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Conclusion:

Planter fasciitis is an inflammatory condition of planter fascia causing pain and discomfort like other musculoskeletal disorders. The conditions are commonly seen in individuals with long-standing working hours and poor footwear use. Various treatment approaches are available for the treatment.

The commonly used treatment approach is a conservative approach. In rare cases, surgical intervention is required for the correction of the condition. On the other hand, newer conservative treatment approaches are available for the management of the conditions, such as ESWT, which is proven to be effective at the functional level with such a significant result in the pain intensity. In comparison, Matrix rhythm therapy has reduced the pain significantly and improved the local skin temperature in individuals with plantar fasciitis, whereas no evidence was found on the effect of MRT on functional level in plantar fasciitis.

Although dry needling proved to reduce the pain significantly in cases of long-standing heel pain, there was not much significant improvement in the range of motion.

We conclude that Dry needling, ESWT, MRT, Electrotherapy(US), and foot pads help alleviate pain. At the same time, for improving ROM stretching, Botulinum Toxin Platelet-rich plasma helps increase the fascia's flexibility, leading to an improved range of motion. Osteopathic manual therapy(OMT) effectively improves conditions in the short term, but no evidence is available on the long-term effect of the OMT.

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All authors contribute equally for the manuscript

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