

Effect of Various Conventional Treatments on Plantar Fasciitis: A Brief Review

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DOI: <https://doi.org/10.52403/ijshr.20230338>

ABSTRACT

Plantar fasciitis is a painful ailment caused by inflammation of the plantar fascia characterised by heel pain. Plantar fasciitis is a degenerative syndrome of the plantar fascia caused by recurrent trauma to the calcaneus. The plantar fascia is a thick, multilayered fibrous connective tissue on the sole of the foot that aids in the creation of the longitudinal arch of the foot. It dynamically stabilises the medial longitudinal arch, restores the arch and helps in reconfiguration of the foot for efficient toe-off. Also, it provides static support to the longitudinal arch as well as dynamic shock absorption. The characteristic PF discomfort is localised around the medial tubercle of the calcaneus and arises after the first few steps in the morning or after a lengthy period of non-weight bearing activities. Standing or walking causes pain and tenderness on the sole of the foot, particularly under the heel.

Key words: plantar fasciitis, heel pain, Muscle stretching exercises, gluteal muscle strengthening

INTRODUCTION

Plantar fasciitis (PF) is a prevalent condition that causes heel discomfort. It is one of the painful conditions caused by plantar fascia irritation. It is believed that it affects up to 10% of the general population during the

course of their lives.¹ PF is a bothersome and painful ailment that impairs function. Standing or walking causes pain and tenderness on the sole of the foot, particularly under the heel. It affects people of all ages and is seen in both sedentary and athletic people.² Plantar fasciitis is a degenerative syndrome of the plantar fascia caused by recurrent trauma to the calcaneus.³

The plantar fascia is a thick, multilayered fibrous connective tissue on the sole of the foot that aids in the creation of the longitudinal arch of the foot. It dynamically stabilises the medial longitudinal arch, restores the arch and helps in reconfiguration of the foot for efficient toe-off. Also, it provides static support to the longitudinal arch as well as dynamic shock absorption.² As the weight is centred on the medial longitudinal arch while standing, the strain from the extension of the plantar fascia works as a tie-rod of the medial longitudinal arch, minimising the arch's descent. The intrinsic and extrinsic muscles of the foot are tightened to supplement the passive supports, resulting in a complete foot arch.⁵

The PF discomfort is localised around the medial tubercle of the calcaneus and arises

after the first few steps in the morning or after a lengthy period of non-weight bearing activities. Standing or walking causes pain and tenderness on the sole of the foot, particularly under the heel.⁶ Pain can be minimized by taking more steps or engaging in minor exercises, but it returns with extended weight-bearing activities.⁷

It is believed that multiple variables including obesity, a reduction in ankle joint range of motion, prolonged weight bearing and an increase in age, contribute to the disorder. As ankle dorsiflexion range narrows, plantar fasciitis worsens. The ratio for plantar fasciitis is at least 2:1 in people with less than 10° of ankle dorsiflexion and the ratio sharply rises as dorsiflexion range shrunk.¹ Additionally, researchers have found a link between poor biomechanics and plantar fasciitis in people with higher arched feet. The flexibility required to help absorb ground response forces is lacking in a foot with a higher arched foot. As a result, the load placed on the plantar fascia rises, similar to a stretch on a bowstring, as a result of its inability to dissipate the forces from heel impact to midstance.² Extraordinary pronation and increased stress at the plantar fascia's insertion and the development of PF are both caused by overcompensation at the first metatarsal phalangeal joint.⁸

There are many different types of treatments available, such as rest, strengthening

exercises, arch supports, stretching, switching shoes, anti-inflammatory drugs, orthotics, night splints, chiropractic therapy, electric modalities, patient education, soft tissue therapy, massage, acupuncture, taping, and surgery. Although NSAIDs and injections provide pain relief, their effects are frequently only momentary.⁶

METHOD

Studies were searched from the following search engine PubMed, Google scholar and Research gate to review the literature. We included randomized controlled trials that investigated the effect of various interventions on foot function, pain intensity, temporospatial gait parameters, muscle strength and balance in plantar fasciitis patients. Key words used to search studies were plantar fasciitis, heel pain, Muscle stretching exercises, gluteal muscle strengthening.

RESULT

A total of 14 articles were assessed in the review. Four articles were rejected as they do not fit the required criteria. Nine of the ten studies were randomized control trial (RCT) and the remaining one was a case report. As a result, there is no protocol that is used for long term in patients with plantar fasciitis, instead of that all the studies fulfilled the protocol for a short duration of time.

Author/ Journal/year	Study design	Age group	Intervention	Sample size	Outcomes	Authors conclusion
Kamonseki DH. et al. j.math. (2015)9	RCT	20 to 60 years	Three groups Foot Exercise Group (FEG – extrinsic and intrinsic foot muscles), Foot and Hip (abductor and lateral rotator muscles) Exercise Group (FHEG) and Stretching Exercise Group (SEG).	83 Subjects	Visual analog scale, Foot and Ankle Outcome Score, Star Excursion scale	All three exercise protocols analyzed led to improvements at eight-week follow-up in pain, function and dynamic lower limb stability in patients with plantar fasciitis
Ratna ST et al. Int J Physiother. August (2015)10	RCT	20-55 years	group I received ultrasound and exercise therapy while group II received kinesio tape in addition to ultrasound and exercise therapy	60 Subjects	Visual Analogue scale (vas) Plantar fasciitis pain/disability scale (pfps), Ultrasonography	greater improvement was found in subjects who received kinesio taping along with conventional therapy.
Santos BD et al. J. Chiropr. Med. (2016)11	Case report	44-year-old	10 sessions of hip strengthening and MT over a period of 3 months MT consisted of passive joint manipulation of the ankle and foot (using both the Maitland	1 subject	Numeric Pain Rating Scale, Pressure-pain threshold (algometry), Perceived exertion (OMNI Resistance Exercise Scale).	The combination of hip strengthening and MT improved foot pain in a patient with a clinical diagnosis of plantar fasciitis

			mobilization techniques and Mulligan mobilization techniques); myofascial maneuvers of the gastrocnemius, soleus muscles, and plantar fascia			
			neural mobilization of the tibial nerve; and stretching of the plantar fascia and triceps surae			
Banik A. et al. Int. j. med. sci. diag. res. (2019) ⁶	RCT	20 to 60 years	Group A (case) treated with NSAID + ultrasound therapy and Group B (Control) treated with NSAID only.	70 subjects	Pain Score (0-4) , Pain frequency score (1-5), Visual analog scale (VAS), 50 feet walking time, seconds	It may be concluded that from this study, ultrasound therapy is beneficial for plantar fasciitis.
Hemlata et al. Physiotherapy and Occupational Therapy Journal. (2019) ²	RCT	20-50 Years	Group A - received MFR therapy and exercises for plantar fascia. 10 second MFR technique applied by knuckle on sole. The intervention was followed for 2 times /week for 4 weeks. And Group B - Subject received static stretching and exercises of the plantar fascia, hold for 30 seconds with 5 repetitions. This intervention was followed 3 sets for 30 seconds per session and 1 session per week i.e., 4 sessions 4 weeks.	30 subjects	Foot Function Index, Visual Analogue Scale.	concluded that Myofascial release (MFR) is better than Stretching exercises in 4 weeks intervention patients with plantar fasciitis
Thong-On S. et al. Ann Rehabil Med (2019) ⁷	RCT	20-80 years	All patients received physical therapy interventions two times per week in the first 4 weeks and performed daily strengthening or stretching exercises three times per day.	84 subjects	Pain visual analogue scale (VAS), Temporospacial gait parameters	Both strengthening and stretching exercise programs significantly reduced pain and improved gait in patients with PF
Boonchum H. et al. J Musculoskeletal Neuronal Interact (2020) ⁸	RCT	40-65 years	Home-based stretching exercise for calf and plantar fascia that allowed the patients to perform by themselves and was progressed by week, The programs consisted of the gastrocnemius, soleus, and plantar fascia stretching exercise. Duration for each stretching exercise was 20-30 sec, resting between exercises for 10 sec, and stretching each exercise for 10 sets. They spent a total time for the exercise around 20 minutes per day, 5 days per week over the duration of 3 weeks.	20 subjects	clinical outcomes which included the plantar fascia pain/disability scale (PFPS) (score), muscle length (degree) of gastrocnemius and soleus, and muscle strength (kg) of ankle dorsiflexors, plantar flexors, invertors, evertors, great toe flexors, and lesser toe flexors	A home-based stretching exercise was an effective program for reducing pain, enhancing muscle strength for both extrinsic and intrinsic foot muscles in patients with PF
Johan J. et al. International Journal of Medical and Exercise Science (2020) ¹²	RCT		Group A (control group) undergoes conventional therapy which include four daily stretching exercises with 2 sessions/week for a period of eight weeks (three 30-s sets) Group B (experimental group) undergoes conventional therapy with Gluteal muscles Strengthening	30 Subjects	Numeric pain rating scale is used to measured pain intensity and lower limb function measured using start excursion balance test	Concluded that gluteal muscles strength helps in improving lower limb function and reducing pain in patients with plantar fasciitis
Hooda K. et al. J. Physiother Res. (2021) ¹³	RCT	18-60 years	Participants will be allocated to Group A (Manual Therapy) and Group B (Hip Abductor Strengthening) A total of 16 sessions, four times a week on alternate days for four weeks, will be given to each patient.	30 Subjects	pain associated with foot function (Foot Function Index), arch height (navicular droptest), Foot Pressure Distribution	The patients who receive Hip Abductor Strengthening intervention may have positive results compared to the MT intervention among patients with PF. This will be the first study to

						compare the effect of hip abductors strengthening and manual therapy
Arif MA. et al. Cureus (2022) ⁴	RCT	30-70 years	Group A, the gastrocnemius-soleus stretching program was applied, whereas in group B, the tendoachilles stretching exercises were adopted.	60 Subjects	Visual Analog Scale	Gastrocnemius-soleus stretching exercises are more effective for reducing the symptoms of plantar fasciitis in the adult population.

DISCUSSION

Plantar fasciitis is a painful condition that produces pain on the bottom of the foot, especially while taking the first few steps in the morning. Most therapeutic approaches are accessible, with varying degrees of efficacy. Conservative therapy methods include rest, avoiding vigorous or strenuous activity, strengthening and stretching exercises, night splinting, and orthotics.³ Stretching exercises are a distinctive feature of conservative therapy. These workouts relax the plantar fascia and the stiff Achilles tendon.⁴ Previous research has found that stretching can help with PF therapy. The best frequency and duration of stretching exercises, however, are uncertain. The stretching exercise techniques used in the trials that demonstrated therapeutic benefits were varied.⁹

The gluteus medius and gluteus minimus are the major hip abductors. Gluteus maximus weakness leads to decreased hip extension and lateral rotation strength. In the event of weak hip extensors, the hamstring muscle compensates, resulting in hamstring tightness and increased knee flexion. All of these factors may contribute to prolonged forefoot loading, making the plantar fascia more vulnerable to injury. It results in plantar heel pain as well as functional impairment.¹² Several studies have found that stiffness of the posterior muscles of the lower limb may be involved in the aetiology of PF, and that stretching programmes can help.¹⁴

As a result, people with plantar fasciitis who have gluteal muscle weakness and increased heel discomfort require strengthening. So, in the current investigation, patients with plantar fasciitis were given intervention protocols that included gluteal muscle strengthening activities as well as traditional stretching treatments.

CONCLUSION

A large number of studies on conventional therapy treatment for plantar fasciitis have been conducted, including therapeutic modalities, plantar fascia stretching, and joint mobilisation, and are considered to be effective and clinically relevant because these studies help in improving lower limb function and reducing pain in patients with plantar fasciitis.

Apart from the favourable effects, but for a short period of time, these studies had other drawbacks, including a small sample size, short period of intervention, the absence of a control group in several studies, and the lack of long-term follow-up.

Furthermore, there have been few researches to determine the effect of posterior muscle stretching and strengthening. It has also been demonstrated that plantar fasciitis is linked to gluteal muscular weakness. As a result, the current study aims to determine the efficacy of hip muscle strengthening in relieving pain, foot function, and dynamic balance in individuals with plantar fasciitis.

Declaration by Authors

Ethical Approval: Not Required

Acknowledgement: None

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

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How to cite this article: Manju, Meetu, Pradyumna Krishna M, Sameer. Effect of various conventional treatments on plantar fasciitis: a brief review. *International Journal of Science & Healthcare Research*. 2023; 8(3): 276-280. DOI: <https://doi.org/10.52403/ijshr.20230338>
