

Original Research Article

A study on effect of strain-counterstrain in plantar fasciitis

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ABSTRACT

Background: Bipedal locomotion is a unique feature of human beings and has the advantage of upright mobility. Hence, foot becomes the most important weight loading structure and gets the maximum pressure per unit area. Plantar fasciitis is a painful inflammatory process of the plantar fascia, the connective tissue on the sole of the foot. Thus a study was conducted to determine the effect of strain-counterstrain in plantar fasciitis.

Methods: 30 individuals aged between 18-35 years both male and female with plantar fasciitis were recruited for the study. The patients were treated for a period of 7 days using the technique of strain-counterstrain. Pre-intervention and post-intervention scores of Plantar Fasciitis Pain and Disability scale were assessed and were analysed using unpaired t-test and repeated ANOVA.

Results: There was equal distribution of occurrence of plantar fasciitis among both the genders out of the population of study. A significant difference was noted between the pre and post interventional measure of a type of manual therapy called strain-counterstrain ($p < 0.0001$). The difference between pre intervention and after third day intervention did not show much of a difference. However after fifth day a considerable difference was noted ($p < 0.0001$). It was noted that limited dorsiflexion improved after one week of interventional measure of strain-counterstrain ($p < 0.0001$).

Conclusions: The technique of strain-counterstrain which is a type of manual therapy is effective in patients affected by plantar fasciitis. It also showed an improvement in the limited ankle dorsiflexion range.

Keywords: Disability scale, Plantar fasciitis, Plantar fasciitis pain, Strain-counterstrain

INTRODUCTION

Plantar fasciitis (PF) is considered to be an overuse syndrome as it develops over time and is a result of repeated stress that exceeds body's inherent capacity to repair and adapt which eventually leads to the failure of the ligaments, bones and muscles. PF is a degenerative syndrome of the plantar fascia resulting from repeated trauma at its origin on the calcaneus.^{1,2} Pain is generally caused by collagen degeneration at the origin of the plantar fascia at the medial tubercle of the calcaneus.³⁻⁸ It

affects upto 10% of general population.⁵⁻⁷ Functional risk factors include tightness in Gastrocnemius, soleus and weakness of intrinsic foot muscles because limited dorsiflexion due to tight Achilles tendon strains the plantar fascia.^{3,4,9}

Plantar fasciitis is the most common cause of inferior heel pain. The word 'fasciitis' assumes inflammation which is an inherent component of this condition. It is typically precipitated by biomechanical stress. Plantar fascia is plantar aponeurosis, lies superficial to the

muscles of plantar surface of the foot. Plantar fascia has a thick central part which covers the central muscle of the first layer, flexor digitorum brevis and is immediately deep to the superficial fascia of the plantar surface. It acts as a truss. Maintaining the medial longitudinal arch of the foot, and assists during the gait cycle and facilitates shock absorption during weight bearing activities. Plantar fasciitis has been reported across a wide sample of the community.

In the non athletic population, it is most frequently seen in weight bearing occupation. 65% of non-sports demographics are overweight, with unilateral involvement most common in 70% of cases. Second major distribution of plantar fasciitis is in the athletic population, 10% of all running athletes. Basket ball, tennis, football, long distance runner and dance have all noted high frequency of plantar fasciitis.¹⁰

Within manual therapy, strain-counterstrain is a type of "passive positional release" created in the early 1960s by Lawrence Jones, D.O. It is a hands-on treatment that attempts to alleviate muscle and connective tissue tightness by the use of very specific treatment positions held for 90 seconds. During the procedure, the involved tissue is "slackened" causing a relaxation of the "spasm" which, in turn, allows local areas of inflammation, trapped within the painful tissue to dissipate. Following this "release" there is an immediate reduction of pain and tension in the involved tissue. This relaxation aims to restore normal joint mobility and release other structures in the region that may have been compressed.

Urse listed the Heinking counterstrain method for treatment of tender points. For Wynne et al, counterstrain treatments were applied to tender points in the foot, ankle and leg. Brief mechanical pressure was applied on each tender point with one finger tip to determine tenderness and tissue tension. The appropriate joint was then moved into various positions of ease until 70% to 80% of relief was achieved when the same pressure was introduced. The position was maintained for 90 seconds, the joint was then slowly returned to neutral position and the tender points re-examined.¹¹ This study includes an intervention that lasts for a period of one week which is lesser as compared to the conventional treatment. It also aids patients in achieving their functional independence at its earliest. Thus the aim of the study was to ease the discomfort in shorter duration with minimal intervention to minimize the suffering time among patients.

METHODS

Randomised clinical trial was done with simple random sampling. 30 subjects were studied in this study. Consent form, PFPS scale, Assessment sheet, goniometer were used in the study.

Outcome measures: Plantar fasciitis pain and disability scale.

Inclusion criteria

- Age 18-35 years both male and female.
- Clinically diagnosed cases of plantar fasciitis.
- Those willing to participate in the study.

Exclusion criteria

- Presence of other musculoskeletal disorders in the lower limb.
- Surgery for plantar fasciitis and any corticosteroid injection.

The study was approved from the Institutional Ethical Committee of Tilak Maharashtra Vidyapeeth, Pune, India. 30 patients were included as per inclusion criteria. Purpose of the study and intervention procedure was explained to the participants and a written consent was taken.

With patient in supine position, ipsilateral knee flexed, the practitioner places one thumb on the tender point at the plantar fascia insertion. While monitoring the tender point with the thumb, the toes and ankle are plantar flexed, curving around the tender point until symptomatic relief of the tenderness is felt by the monitoring thumb. If required, supination or pronation of the foot can be added. The position of ease is held for approximately 90 seconds or until there is softening of the tissues below the monitoring thumb. The foot is then returned to neutral position without moving the thumb and the tender point re-assessed.

RESULTS

Number of males and females affected by plantar fasciitis within the sample size. There was equal distribution of occurrence of plantar fasciitis among both the genders out of the population of study. Males and females are equally affected by the condition (Table 1).

Table 1: Number of males and females affected by plantar fasciitis within the sample size.

Males	15
Females	15
Total(n)	30

Table 2: Mean scores of pre intervention and post intervention.

	Pre	Post
Mean	46.167	28.435
SD	±9.271	±6.399

The mean of pre and post intervention. The PFP scale was used to evaluate the score of patients prior to intervention to evaluate pain and the activities limited due

to pain (Table 2). A similar score was obtained post intervention.

The two obtained scores were evaluated using unpaired t test and the results obtained were highly significant with $p < 0.0001$.

Table 3: Interpretation obtained during the intervention period.

	Pre	After 3rd	After 5th	Post
Mean	44.167	39.687	33.314	28.435
SD	±9.271	±8.029	±7.765	±6.399

Table 4: Pre and post intervention ankle dorsiflexion range of motion.

	Pre	Post
Mean	19.96	25.4
SD	±4.131	±3.756

There is a significant difference between the pre and post interventional measure of a type of manual therapy called strain-counterstrain.

The PFPS was used to evaluate scores after third and fifth day intervention of a type of manual therapy called strain-counterstrain (Table 3). The above result was statistically proved significant using repeated ANOVA ($p < 0.0001$).

The difference between pre intervention and after third day intervention did not show much of a difference. However after fifth day intervention a considerable difference was noted. Table 4 shows pre and post intervention ankle dorsiflexion range of motion. The result was analysed using unpaired t test and the result was statistically significant with $p < 0.0001$.

It was noted that limited dorsiflexion improved after one week of interventional measure of strain-counterstrain.

DISCUSSION

Results showed that both genders were equally affected by plantar fasciitis and that neither of the gender was biased. Between 4% to 7% of people have heel pain at any given time and about 80% of these cases are due to plantar fasciitis.^{12,13} Approximately 10% of people have the disorder at some point during their life.¹⁴ It becomes more common with age. It is unclear whether one sex is more affected than the other.¹⁵

Identified risk factors for plantar fasciitis includes excessive running, standing on hard surfaces for prolonged periods of time, high arches of the feet, the presence of a leg length inequality and flat feet. The tendency of flat feet to excessively roll inward during walking or running makes them more susceptible to

plantar fasciitis.¹⁶⁻¹⁸ Obesity is seen in 70% of individuals who present with plantar fasciitis and is an independent risk factor.¹⁹ Studies have suggested a strong association exists between an increased body mass index and the development of plantar fasciitis in the non-athletic population; this association between weight and plantar fasciitis has not been observed in the athletic population.²⁰

Current studies support the need for a pain scale that can uniquely assess pain exclusive to PF for diagnosis and assessment.²¹⁻²⁶ Landorf and Radford question the statistical significance in changes with the VAS because of the multiple confounding variables associated with that test. They determined that a “minimally important difference” was based not on statistical values alone but changes in “the effect a disorder has on the patient’s life in general”.²¹

Bennett et al developed a questionnaire to measure overall foot health.²⁷ Their questionnaire examined four different domains of questions (with 107 participants). The “domains” (or categories) of questions were pain, function, footwear, and general foot health. One functional question was “How much does your foot health limit you in walking” which is ideal in measuring the overall foot health but is not symptom specific to PF.

Rose et al suggest using nerve conduction to evaluate changes in PF but few podiatrists may have nerve conduction equipment in their office.²⁸ The PFPS can be administered in almost any setting. The existing pain scales are effective in gauging overall pain but they lack the specific inclusion of symptomatic questions that will allow specific, objective, analytical measurement of change in symptoms unique to PF.^{21,23,26, 27,29, 30} The PFPS effectively showed the difference between PF patients vs. patients with other pathologies causing heel pain.

The PFPS will allow clinician’s more descriptive, exclusive analysis of PF pain for evaluation of treatment than the 100-point VAS scale. For example a young woman’s score VAS and PFPS drops from 70 to 60 which would be “statistically significant” but, it may not show “minimally important difference”. However a comparison the current vs. previous PFPS tests of this patient, shows a changed Q#14 because she no longer prefers toe walking, and Q#15 which shows reduced pain from “walking in the morning” and reduced pain from “standing after watching a movie.” This would display a “minimally important difference” and answer the need for a pain scale that can uniquely assess pain exclusive to PF for diagnosis and evaluation.²¹⁻²⁶

In this study the PFPS has effectively discriminated pain unique to PF patients vs. heel pain caused by other foot pathologies. Hence PFPS was chosen as the outcome measure. The PFP scale was used to evaluate the score of patients prior to intervention to evaluate pain and the activities limited due to pain. A similar score was

obtained post intervention. The two obtained scores were evaluated using unpaired t test and the results obtained were highly significant with $p < 0.0001$.

The plantar fascia functions as both a supporter and stabilizer of the medial longitudinal arch during gait and weight bearing by acting as a windlass mechanism. The plantar fascia resists the combined downward compressive force of the body weight and the corresponding upward ground reaction force by virtue of its osseous connection. The plantar fascia undergoes a stretch tension from these forces, preventing flattening of the medial longitudinal arch, thus elevating the arch. During the propulsive phase of gait, dorsiflexion of the toes wind the plantar fascia around the head of the metatarsal.³¹ This winding shortens the plantar fascia and elevates the medial longitudinal arch while creating a varus position of the calcaneus that locks the talonavicular and calcaneocuboid joints into stabilizing the midfoot.^{31,32} Strain-counterstrain is a technique wherein a stretch is applied to the plantar fascia which aids the above mentioned mechanism. Plantar fascia specific stretch was cited to have the most effect in reducing morning pain.³³

The PFPS was also used to evaluate scores after third and fifth day intervention. The resultant outcome was analysed using repeated ANOVA and the result was statistically significant with $p < 0.0001$. The difference between pre intervention and after third day intervention did not show much of a difference. However after fifth day intervention a considerable difference was noted.

The improvement in score maybe attributed to the improvement in joint play in mobilization and to improved flexibility due to the technique used as it elevated the biomechanical stress on pain sensitive structure. Mobilization helped to improve the mobility.³⁴ Hence in this study the design was to target the dysfunctional status of joints and inflammation of soft tissues we could achieve effective handling by appropriate therapy. One study suggested that manual physical therapy and exercise is a superior method of management of plantar heel pain at short and long term follow ups.³⁵

Limited ankle dorsiflexion was noted in subjects with plantar fasciitis. Hence a pre intervention and post intervention ankle dorsiflexion range of motion was taken into account. The result showed an improved functional range of motion of the talocrural joint. This was analysed using unpaired t test and the result was statistically significant with $p < 0.0001$.

CONCLUSION

The technique of strain-counterstrain which is a type of manual therapy is effective in patients affected by plantar fasciitis. It also showed an improvement in the limited ankle dorsiflexion range.

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