



EFFECT OF MECHANICAL AND PHYSICAL THERAPY ON PLANTAR FASCIITIS

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ABSTRACT

Background and Purpose: Commonly, plantar fasciitis creates stabbing pain that typically comes with the first morning step. Normally, the discomfort reduces when the body rises and begins to move, although it may increase after lengthy periods of standing or while rising from a seated position. The purpose of this research is to examine the effectiveness of manual therapy and ultrasound therapy in the treatment of plantar fasciitis.

Materials & Methods: A total number of 60 patients was divided into 2 groups out of which group A (30 subjects) was provided by manual therapy only and another group i.e., group B (30 subjects) was provided with ultrasound therapy and exercise, and the result was comparing the efficacy of manual therapy in treatment of PF. **GROUP-A (Manual Therapy):** Stretching with Passive Movements. 4 days a week till 4 weeks. **Group B (Ultrasound Therapy):** 3MHz for the duration of 5 mins with Stretching with Passive Movements. 4 days a week till 4 weeks. Assessments was done using Goniometer for Rang of Motion and VAS for Pain

Results: The results of the study shows that the pre score of Group A VAS was 7.80 ± 0.54 and Post score was 6.78 ± 0.786 . Group B VAS pre was 7.23 ± 0.65 and Post was 2.98 ± 1.03 . The Range of motion of Group A pre was 8.62 ± 2.738 for Dorsiflexion and 21.72 ± 3.72 for Plantarflexion which changed to 10.82 ± 2.82 and 28.72 ± 1.23 respectively. The Range of motion of Group B pre was 9.72 ± 2.810 for Dorsiflexion and 20.72 ± 2.78 for Plantarflexion which changed to 18.92 ± 1.929 and 37.83 ± 1.83 respectively. There was significant difference seen in both the Groups Range of Motion and Higher effects were in Therapeutic Ultrasound subjects. There was no significant difference in the VAS scores if Group A.

Conclusion: According to the findings of the research, we are able to draw the conclusion that both interventions had a substantial impact; however, there was more effects seen in the Therapeutic Ultrasound with Stretching and Compared with Only stretching. No effects can be seen on pain with stretching as ultrasound has significant effects on pain of the subjects.

INTRODUCTION

'Plantar fasciitis,' a term used to describe inflammation of the plantar fascia, the connective tissue that helps support the arch of the foot. Heel and foot pain are particularly noticeable when a person takes their first steps or has been resting for a long time. If you bend your foot and toes towards your shin, you may feel discomfort in your lower leg. Approximately one-third of those with plantar fasciitis have pain in both feet at the same time(1).

What causes plantar fasciitis remains a mystery. In addition to weight, increased exercise and overuse are other risk factors for developing osteoarthritis. Sedentary lifestyle, inward rolling of the foot and tight Achilles tendon are also associated to this condition(2). Though plantar fasciitis is often accompanied with heel spurs, it is not known whether they play a role in its development. When the ligament's connection to the bone breaks down, it may develop plantar fasciitis. New terminology for plantar fasciosis has been proposed as inflammation has little or no functional role. In cases where the patient's symptoms are not enough to make a diagnosis, ultrasound may be useful. All of the following conditions have comparable symptoms: Osteoarthritis, ankylosing spondylitis, heel pad syndrome, and reactive arthritis(3).

Plantar fasciitis normally goes away on its own with rest and non-invasive therapies. Those who have been affected by an injury are often told to take it easy for the first few weeks, change their activities, take pain medicine, and do a lot of stretching. If none of these options work, then steroid injections, physiotherapy, orthotics, and splinting may be employed. If these treatments aren't working, you may want to consider surgery or extracorporeal shockwaves(4).

About 4 to 7 percent of people have plantar fasciitis, which accounts for more than 80 percent of heel pain complaints. Around 10% of the population is affected at some point in their life. It becomes more common as we become older. It's unclear whether males or women are more severely affected by this condition(5).

Intense, lingering pain in the sole of one foot is typical of plantar fasciitis (70 percent of cases)(6). Put weight on your heel after a long period of rest, and you'll notice an increase in pain in your heel. A common complaint among those who have plantar fasciitis is that the pain is worst in the morning or after sitting for an extended period of time. By continuing to walk, symptoms are typically relieved. These symptoms include tingling or numbness, as well as swollen or radiating discomfort. In this case, fevers and nocturnal sweats are rare(7).

In people with plantar fasciitis, the plantar fascia may rupture as a consequence of overuse. A torn plantar fascia is often accompanied by a popping or cracking noise, significant edema in the affected area, and excruciating pain in the arch of the foot(8).

Jogging, prolonged standing on hard surfaces, and high arches of the foot have been linked to plantar fasciitis. When walking or running, flat feet are more prone to develop plantar fasciitis because of their predisposition to roll inward excessively. People with plantar fasciitis are 70 percent more likely to be fat than the general population. Plantar fasciitis is often the result of excessive tension on the plantar fascia(9).

Studies have shown that non-athletes who are obese are more prone to get plantar fasciitis. For athletes, this relationship between weight and plantar fasciitis is not seen. Risk factors such as Achilles tendonitis and wearing the wrong shoes have also been found. Plantar fasciitis has a complex aetiology that is difficult to pin down and may be caused by a variety of factors. As a band of connective tissue, the plantar fascia connects the medial tubercle with the anterior side of the heel bone. Fascia, which runs the length of your foot from heel to toe, acts as a support for your arch and keeps your feet stable(10).

Plantar fasciitis is a non-inflammatory ailment of the plantar fascia. Plantar fasciitis has been linked to a non-inflammatory structural breakdown of the plantar fascia rather than an inflammatory process in studies conducted over the last decade(11).

Academics in the area have dubbed plantar fasciosis in light of these new findings. Repeated microtrauma to the plantar fascia is assumed to be the cause of this structural degeneration (small rips). Myxomatous degeneration, calcium deposits in connective tissue, and disorganised collagen fibres are typical findings in plantar fascia microscopic examination(12).

It has been shown in study that plantar fasciitis may be caused by a malfunctioning Windlass mechanism in the plantar fascia during standing and walking. Plantar fasciitis may also be caused by an injured flexor digitorum brevis muscle, which sits directly underneath the plantar fascia.

We'll use the term "therapeutic ultrasonography" for now to refer to any method that uses ultrasound to treat a patient's health condition. Physiotherapeutic ultrasound was already in use when lithotripsy was initially introduced in the 1980s. There are a number of additional technologies at various stages

of transition from research to clinical use, including HIFU, ultrasound hemostasis, cancer therapy, and ultrasound-aided thrombolysis. In certain cases, it may utilise focused ultrasound (FUS)(13).

In the above-mentioned applications, ultrasonography is the principal source of the observed biological effect (the oscillation of abrasive dental tools at ultrasonic frequencies therefore do not belong to this class). Ultrasound is made up of sound waves with a frequency of 800,000 to 20,000,000 Hz, which cannot be heard by the human ear(14).

Ultrasound may have three different outcomes. First and foremost, more blood is flowing through the body. It's also worth noting that when edoema and edoema are decreased, pain is reduced as well. A mild touch may be used to massage muscles and/or ligaments in the treated area once scar tissue has softened. These three benefits are the consequence of two fundamental impacts of therapeutic ultrasonography. There are two types of effects: thermal and non-thermal. Absorption of sound waves results in thermal consequences. These effects are caused by cavitation, microstreaming, and acoustic streaming, none of which are thermal in nature(15).

The cavitation effects of tissue vibrations directly activate cell membranes via the creation of tiny bubbles. There seems to be an increase in the inflammatory response as a result of this physical stress(16).

According to Hayes et al., an ultrasonic transducer with a penetration depth of up to 5 centimetres may have a therapeutic impact. 3 MHz is the best option for tissues less than 2.5 cm deep. Despite its size, the plantar fascia is just a thin layer of connective tissue that is not capable of contracting(17). In order to treat this condition effectively, 3 MHz may be applied to the palpable plantar fascia. Clinicians may use a wide variety of ultrasound intensities because of their differing opinions on how the ultrasound parameters they chose affect the tissue they are treating.

STATEMENT QUESTION

Is there any Effect of manual therapy in treatment of plantar fasciitis?

AIMS AND OBJECTIVES OF THE STUDY

- To find out the Effect of manual therapy in treatment of plantar fasciitis
- To find out Effect of ultrasound therapy in treatment of plantar fasciitis.
- To compare the Effect of manual therapy and ultrasound therapy in treatment of plantar fasciitis.

HYPOTHESIS

NULL HYPOTHESIS:

There is no significance effect of ultrasound.

RESEARCH HYPOTHESIS:

There is a significance effect of manual Therapy.

METHODOLOGY

- STUDY DESIGN: Experimental study
- Research setting- The study will be performed on females and males in India.
- STUDY LOCATION: People living in the Delhi NCR, India.
- Duration - duration of study will be 4 weeks.
- Consent and Ethical Consideration-Ethical approval will be taken from the institute to conduct the research and informed consent will be taken from each participant going to be include into the study
- Population- 60 subject. Reframe SAMPLE SIZE: 60 individuals taken by random sampling.
- Sampling method- Random sampling will be done on the basis of inclusion and exclusion criteria.
- Sample side -60 subject was including on the basis of inclusion and exclusion criteria.

Inclusion Criteria:

- Patients between 22-34 years of age
- patients with plantar heel pain

Exclusion Criteria:

- Osteoporosis,
- overweight
- diabetes.

DATA COLLECTION: A total of 60 subjects with plantar heel pain was included in the study. The subjects were screened according to the Inclusion or Exclusion criteria. Before the study, written consent form was taken from all subjects through that sufficient explanation of the procedure, purpose and risks/benefits was provided to all subjects.

VARIABLE:

DEPENDENT VARIABLE- Age, weight, height

INDEPENDENT VARIABLE- VAS, RANGE OF MOTION

MATERIAL REQUIRED:

- Couch / Plinth
- Foam mattress
- Universal full circle metal goniometer
- Stop watch
- Consent form
- Assessment form
- Pen & paper

PROCEDURE

A total number of 60 patients was divided into 2 groups out of which group A (30 subjects) was provided by manual therapy only and another group i.e., group B (30 subjects) was provided with ultrasound therapy and exercise, and the result was comparing the efficacy of manual therapy in treatment of PF.

GROUP-A (Manual Therapy): Stretching with Passive Movements. 4 days a week till 4 weeks

Group B (Ultrasound Therapy): 3MHz for the duration of 5 mins with Stretching with Passive Movements. 4 days a week till 4 weeks

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DATA ANALYSIS

The data analysis was carried out using the Social Science Packaging Software (SPSS) 26.0 edition of the software. Readings were analyzed using an independent T-test and a paired t-test. This is a graphical depiction created using Microsoft Word 2021.

RESULTS

The results of the study shows that the pre score of Group A VAS was 7.80 ± 0.54 and Post score was 6.78 ± 0.786 . Group B VAS pre was 7.23 ± 0.65 and Post was 2.98 ± 1.03 . The Range of motion of Group A pre was 8.62 ± 2.738 for Dorsiflexion and 21.72 ± 3.72 for Plantarflexion which changed to 10.82 ± 2.82 and 28.72 ± 1.23 respectively. The Range of motion of Group B pre was 9.72 ± 2.810 for Dorsiflexion and 20.72 ± 2.78 for Plantarflexion which changed to 18.92 ± 1.929 and 37.83 ± 1.83 respectively. There was significant difference seen in both the Groups Range of Motion and Higher effects were in Therapeutic Ultrasound subjects. There was no significant difference in the VAS scores if Group A.

TABLE NO 1: Demographic Descriptive Statistics.

	AGE	HEIGHT	WEIGHT

Mean	29.54	5.42	61.98
N	60	60	60
Std. Deviation	1.942	.3701	2.752

TABLE NO 2- Gender Ratio

	MALE	FEMAE
GROUP A	15	15
GROUP B	15	15

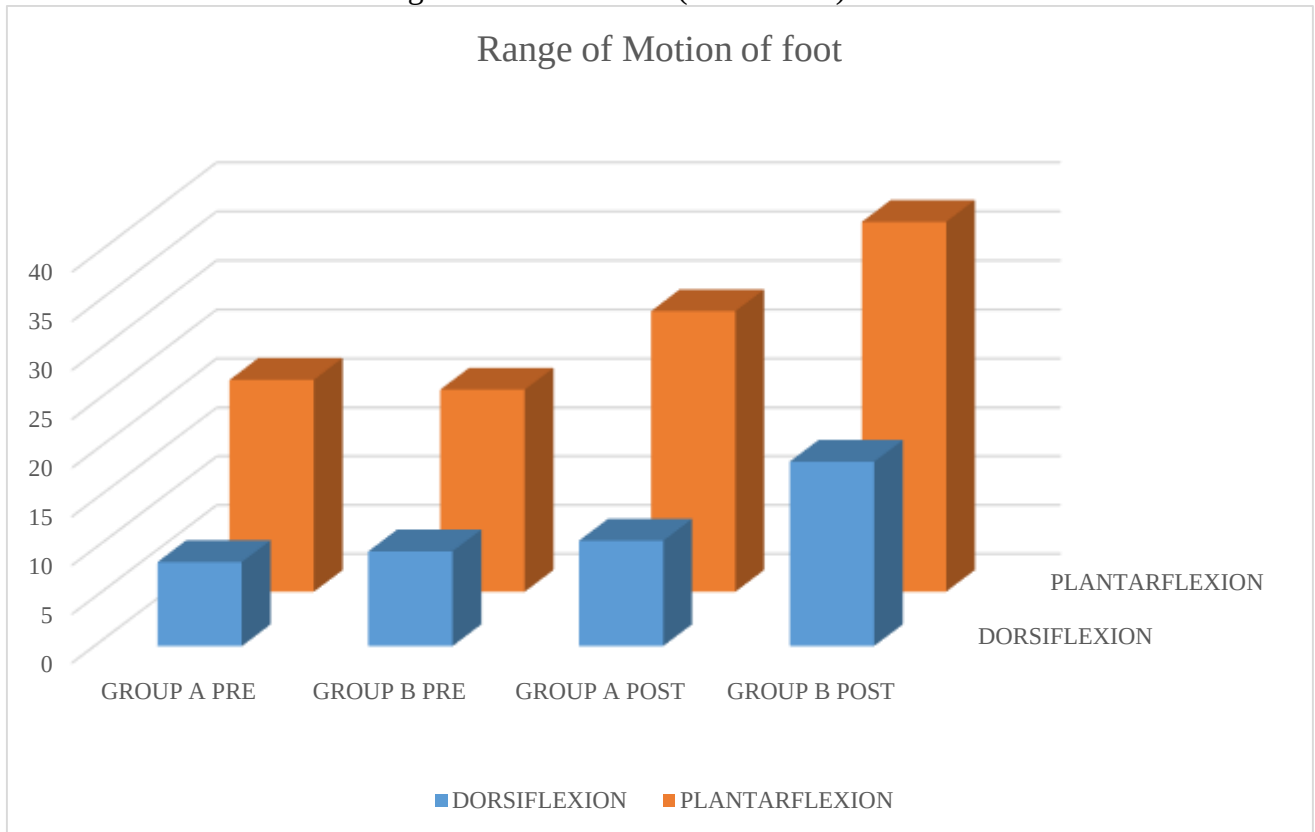
TABLE NO 3. Range of Motion of foot (PRE-POST) Active Movements

	PRE		POST		P VALU E
GROU P A	DORSIFLEXI ON 8.62±2.738	PLANTARFLEXI ON 21.72±3.72	DORSIFLEXI ON 10.82±2.82	PLANTARFLEXI ON 28.72±1.23	P<0.05
GROU P B	DORSIFLEXI ON 9.72±2.810	PLANTARFLEXI ON 20.72±2.78	DORSIFLEXI ON 18.92±1.929	PLANTARFLEXI ON 37.83±1.83	P<0.05

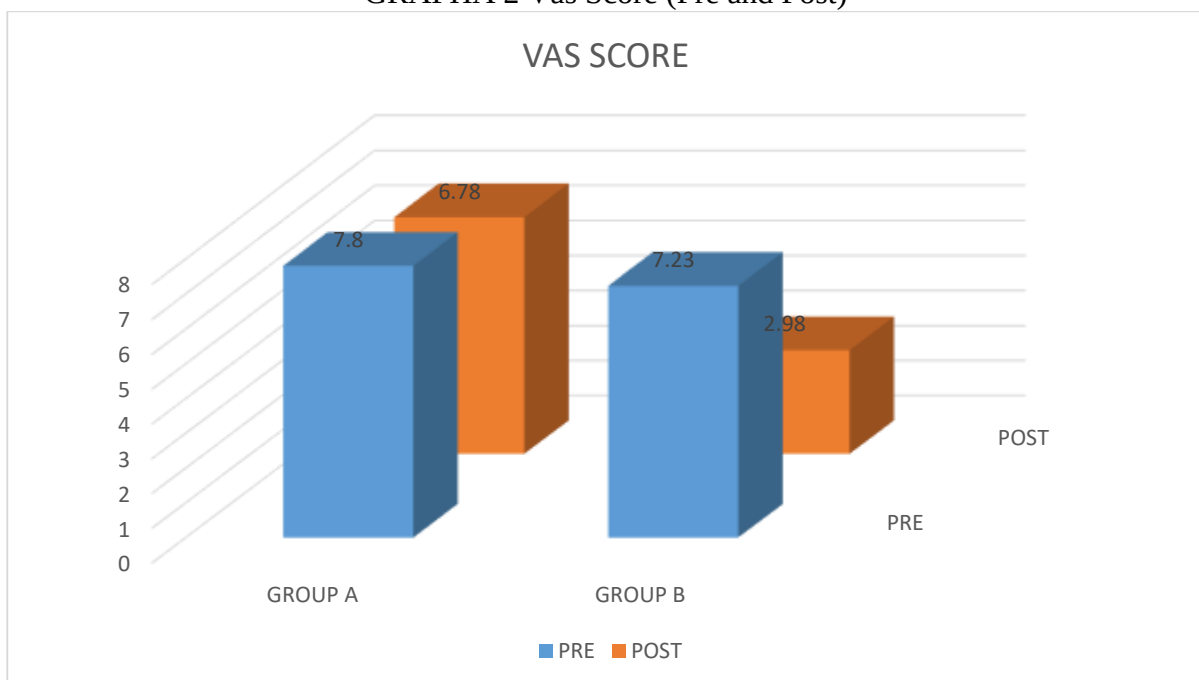
TABLE NO 4. Vas Score Paired t test (pre-post)

	PRE	POST	P VALUE
GROUP A	7.80±0.54	6.78±0.786	P>0.05
GROUP B	7.23±0.65	2.98±1.03	P<0.05

GRAPH 1- Range of Motion of foot (PRE-POST) Active Movements



GRAPH 2 Vas Score (Pre and Post)



DISCUSSION

The study was conducted to find out the Effect of manual therapy in treatment of plantar fasciitis. To find out Effect of ultrasound therapy in treatment of plantar fasciitis. To compare the Effect of manual therapy and ultrasound therapy in treatment of plantar fasciitis. The results of the study shows that the pre score of Group A VAS was 7.80 ± 0.54 and Post score was 6.78 ± 0.786 . Group B VAS pre was 7.23 ± 0.65 and Post was 2.98 ± 1.03 . The Range of motion of Group A pre was 8.62 ± 2.738 for Dorsiflexion and 21.72 ± 3.72 for Plantarflexion which changed to 10.82 ± 2.82 and 28.72 ± 1.23 respectively. The Range of motion of Group B pre was 9.72 ± 2.810 for Dorsiflexion and 20.72 ± 2.78 for Plantarflexion which changed to 18.92 ± 1.929 and 37.83 ± 1.83 respectively. There was significant difference seen in both the Groups Range of Motion and Higher effects were in Therapeutic Ultrasound subjects. There was no significant difference in the VAS scores if Group A. Some study says Scott C Wearing et al 2015 An precise diagnosis of plantar fasciitis can only be made by examining local stress and structural parameters in relation to plantar fascial thickness. To determine if there are any possible links between regional foot stress during locomotion and structural factors such as plantar fascia thickness, arch shape, and discomfort in the heel, researchers studied people with and without unilateral plantar fasciitis. The symptoms of plantar fasciitis were present in 10 of the subjects, however none of the other participants experienced them. When a person weighed down on their foot, an analogue visual scale was utilised to measure their heel pain. A lateral foot roentgenogram and a bilateral sagittal sonogram were used to evaluate the thickness of the face and the static arch angle of the foot. A pressure plate was used to gauge the regional plantar loadings. As a consequence of these studies, it has been shown that plantar fasciitis might be linked to the thickness of the fascia and the arch's static structure. Ana P. Ribeiro et al 2015 - Plantar fasciitis has been connected to the medial longitudinal arch, the rearfoot alignment, and calcaneal stress. Runners with unilateral PF had their MLA, rearfoot alignment, and dynamic plantar stress tested, despite the absence of a correlation. Some 120 people were included; 20 had PF in the acute period and 15 had previously had chronic PF. The index and rearfoot alignments of the MLA were determined using digital imaging. Using Pedar X insoles and travelling at 12 kph, researchers measured the area of the foot that was in direct contact with the ground. Forefoot and rearfoot plantar strains were accurately predicted by the PF runners' MLA index and rearfoot alignment. Valgus measurements were shown to be a reliable predictor of loading rates in the front and medial areas in clinical investigations

Future scope of study

- More study can be done with higher sample size in the study.

Conflict of interest: -None

CONCLUSION

According to the findings of the research, we are able to draw the conclusion that both interventions had a substantial impact; however, there was more effects seen in the Therapeutic Ultrasound with Stretching and Compared with Only stretching. No effects can be seen on pain with stretching as ultrasound has significant effects on pain of the subjects.

REFERENCES

1. Roxas M. Plantar Fasciitis Plantar Fasciitis: Diagnosis and Therapeutic Considerations.
2. Luffy L, Grosel J, Thomas R, So E. Plantar fasciitis. J Am Acad Physician Assist. 2018 Jan 1;31(1):20–4.
3. Hossain M, Makwana N. “Not Plantar Fasciitis”: The differential diagnosis and management of heel pain syndrome. Orthopaedics and Trauma. 2011 Jun;25(3):198–206.
4. Monto RR. Platelet-rich Plasma and Plantar Fasciitis [Internet]. 2013. Available from: www.sportsmedarthro.com
5. Tufikifa N, Bsc N. THE ASSOCIATION BETWEEN PLANTAR FASCIITIS AND ISOLATED GASTROCNEMIUS TIGHTNESS. 2018.
6. Gamba C, Serrano-Chinchilla P, Ares-Vidal J, Solano-Lopez A, Gonzalez-Lucena G, Ginés-Cespedosa A. Proximal Medial Gastrocnemius Release Versus Open Plantar Fasciotomy for the

- Surgical Treatment in Recalcitrant Plantar Fasciitis. *Foot and Ankle International*. 2020 Mar 1;41(3):267–74.
7. Pearce CJ, Seow D, Lau BP. Correlation Between Gastrocnemius Tightness and Heel Pain Severity in Plantar Fasciitis. *Foot and Ankle International*. 2021 Jan 1;42(1):76–82.
 8. Wang CJ, Chen HS, Huang TW. Shockwave therapy for patients with plantar fasciitis: A one-year follow-up study. *Foot and Ankle International*. 2002;23(3):204–7.
 9. Logan LR, Klamar K, Leon J, Fedoriw W. Autologous blood injection and botulinum toxin for resistant plantar fasciitis accompanied by spasticity. *American Journal of Physical Medicine and Rehabilitation*. 2006 Aug;85(8):699–703.
 10. Drake M, Bittenbender C, Boyles RE. The short-term effects of treating plantar fasciitis with a temporary custom foot orthosis and stretching. *Journal of Orthopaedic and Sports Physical Therapy*. 2011;41(4):221–31.
 11. Sallam RAE, el Ghawet AI. The effectiveness of combined prescription of ankle–foot orthosis and stretching program for the treatment of recalcitrant plantar fasciitis. *Egyptian Rheumatology and Rehabilitation*. 2016 Oct;43(4):172–7.
 12. Zhou JP, Yu JF, Feng YN, Liu CL, Su P, Shen SH, et al. Modulation in the elastic properties of gastrocnemius muscle heads in individuals with plantar fasciitis and its relationship with pain. *Scientific Reports*. 2020 Dec 1;10(1).
 13. Griffin XL, Parsons N, Costa ML, Metcalfe D. Ultrasound and shockwave therapy for acute fractures in adults. Vol. 2014, *Cochrane Database of Systematic Reviews*. John Wiley and Sons Ltd; 2014.
 14. Mayr E, Frankel V. O R I G I N A L A R T I C L E Ultrasound – an alternative healing method for nonunions ? 2000;1–8.
 15. Santamato A, Solfrizzi V, Panza F, Tondi G, Frisardi V, Leggin BG, et al. Short-term Effects of High-Intensity Laser Therapy Versus Ultrasound Therapy in the Treatment of People With Subacromial Impingement Syndrome: A Randomized Clinical Trial [Internet]. 2009. Available from: www.ptjournal.org
 16. Siva Kumar MS, Couto ', Bs PGD, Hm PGD, Dpmr MBBS. THE EFFECT OF ULTRASOUND VERSUS NERVE AND TENDON GLIDING EXERCISE ON PAIN AND FUNCTIONS IN PATIENTS WITH CARPAL TUNNEL SYNDROME-A COMPARATIVE STUDY CERTIFICATE PROJECT GUIDE PRINCIPAL.
 17. Hayes BT, Merrick MA, Sandrey MA, Cordova ML. by the National Athletic Trainers. *Journal of Athletic Training* [Internet]. 2004 [cited 2022 Jun 30];39(3):230–4. Available from: www.journalofathletictraining.org
 18. Martínez-Jiménez EM, Becerro-de-Bengoa-Vallejo R, Losa-Iglesias ME, Rodríguez-Sanz D, Díaz-Velázquez JI, Casado-Hernández I, et al. Acute effects of myofascial induction technique in plantar fascia complex in patients with myofascial pain syndrome on postural sway and plantar pressures: A quasi-experimental study. *Physical Therapy in Sport*. 2020 May 1;43:70–6.
 19. Gon Kim T, Hyun Bae S, yeop Kim G, yoon Kim K. The effects of extracorporeal shock wave therapy on stroke patients with plantar fasciitis.
 20. ge W, leson C, VukoViC C. Dry cupping for plantar fasciitis: a randomized controlled trial.
 21. Michael B. Pohl. Biomechanical and Anatomic Factors Associated with a History of Plantar Fasciitis in Female Runners [Internet]. Available from: www.cjsportmed.com
 22. Tsai CT, Chang WD, Lee JP. Effects of short-term treatment with kinesiotaping for plantar fasciitis. *Journal of Musculoskeletal Pain*. 2010;18(1):71–80.
 23. Jeffrey R. Basford. A randomized controlled evaluation of low-intensity laser therapy: Plantar fasciitis Cite this paper. 1998.
 24. Ribeiro AP, Trombini-Souza F, Tessutti V, Lima FR, Sacco I de CN, João SMA. Rearfoot alignment and medial longitudinal arch configurations of runners with symptoms and histories of plantar fasciitis. *Clinics*. 2011;66(6):1027–33.
 25. D'Andréa Greve JM, Grecco MV, Santos-Silva PR. Comparison of radial shockwaves and conventional physiotherapy for treating plantar fasciitis. *Clinics*. 2009;64(2):97–103.

26. Ribeiro AP, Sacco ICN, Dinato RC, João SMA. Relationships between static foot alignment and dynamic plantar loads in runners with acute and chronic stages of plantar fasciitis: A cross-sectional study. *Brazilian Journal of Physical Therapy*. 2016 Jan 1;20(1):87–95.
27. Hammer WI. The effect of mechanical load on degenerated soft tissue. *Journal of Bodywork and Movement Therapies*. 2008 Jul;12(3):246–56.
28. Mark W. Cornwall. Plantar Fasciitis: Etiology and Treatment [Internet]. 1999. Available from: www.jospt.org
29. LCDR Rachel H. Allen, Gross MT. Toe Flexors Strength and Passive Extension Range of Motion of the First Metatarsophalangeal Joint in Individuals With Plantar Fasciitis [Internet]. 2003. Available from: www.jospt.org
30. Hyland MR, Webber-Gaffney A, Cohen L, Lichtman SW. Randomized controlled trial of calcaneal taping, sham taping, and plantar fascia stretching for the short-term management of plantar heel pain. *Journal of Orthopaedic and Sports Physical Therapy*. 2006;36(6):364–71.
31. Drake M, Bittenbender C, Boyles RE. The short-term effects of treating plantar fasciitis with a temporary custom foot orthosis and stretching. *Journal of Orthopaedic and Sports Physical Therapy*. 2011;41(4):221–31.
32. D. MATT LYNCH. 16.
33. Abd El Salam MS, Abd Elhafz YN. Low-Dye Taping Versus Medial Arch Support in Managing Pain and Pain-Related Disability in Patients With Plantar Fasciitis. *Foot & Ankle Specialist*. 2011;4(2):86–91.
34. Markus Walther MD, Kratschmer B, Verschl J, Volkering C, Altenberger S, Kriegelstein S, et al. Effect of different orthotic concepts as first line treatment of plantar fasciitis. *Foot and Ankle Surgery*. 2013;19(2):103–7.
35. Yusuf A, Roos E, Engström M, Söderberg B, Lund CPO. FOOT & ANKLE INTERNATIONAL Foot Orthoses for the Treatment of Plantar Fasciitis Foot Orthoses for the Treatment of Plantar Fasciitis. 2006.
36. Tsai WC, Wang CL, Tang FT, Hsu TC, Hsu KH, Wong MK. Treatment of proximal plantar fasciitis with ultrasound-guided steroid injection. *Archives of Physical Medicine and Rehabilitation*. 2000;81(10):1416–21.
37. Wearing SC, Smeathers JE, Sullivan PM, Yates B, Urry SR, Dubois P. Plantar fasciitis: Are pain and fascial thickness associated with arch shape and loading? *Physical Therapy*. 2007 Aug;87(8):1002–8.