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# **ORIGINAL ARTICLE**

EFFECT OF SHOCKWAVE THERAPY OVER LASER THERAPY ALONG WITH STRETCHING EXERCISES ON FOOT FUNCTION AMONG PLANTAR FASCIITIS PATIENTS

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#### ABSTRACT

Background of the study: Plantar fasciitis is a disorder of connective tissue which support the arch of foot. It results in heel pain and bottom of the foot is usually most severe with first step of the day. Pain is exaggerated by bending the foot and toes upward the skin. The aim of the study was to compare the effect of shockwave therapy and laser therapy in plantar fasciitis patients along with stretching exercises. Methodology: It is a Comparative study with Pre and Post type. This study conducted at ACS Medical College and Hospital, Physiotherapy OPD, Velappanchavadi, Chennai. Male and female patients of 30 samples of Age group between 20-60 with plantar fasciitis were selected for this study. They were divided in to Group A with 15 samples and Group B with 15 samples. They were given treatment of Shockwave therapy along with stretching exercises (Group A), Laser therapy along with stretching exercises (Group B) for 3days per week for 4weeks. The patients were with Stabbing pain in bottom of foot, severe pain in bottom of the foot in morning and Limited up motion of ankle. Pain and Function assessed with Visual analogue scale (VAS) and Foot function Index (FFI). Result: The study concluded that Group A is more effective than Group B with mean difference of 4.137 and 39.20 respectively in VAS and FFI. Conclusion: The study showed beneficial results in both groups, the results reflected that the shockwave therapy along with stretching exercises had better improvement on reducing pain and improving the foot function among the plantar fasciitis patients.

Keywords: Plantar fasciitis; Stretching exercise; Shockwave therapy; Laser therapy; Foot function index; Visual analogue scale.

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### INTRODUCTION

Plantar fasciitis is a prevalent foot disorder characterized by pain originating from the insertion of the plantar fascia near the medial tubercle of the calcaneus, with the most intense discomfort typically experienced during the first step in the morning<sup>1</sup>. It affects about 10% of the general population and can be attributed to injury at the origin of the plantar fascia or biomechanical abnormalities of the foot <sup>2</sup>.

The condition is believed to develop from overuse or repetitive microtrauma of the plantar fascia tissue. Because the exact cause is not always clear, diagnosis often relies on clinical signs, including plantar heel pain upon weight-bearing after a period of non-weightbearing, pain that initially improves with activity but worsens as the day goes on, and tenderness upon palpation<sup>3</sup>.

Conservative treatments are typically the initial approach and involve strategies such as rest, nonsteroidal anti-inflammatory drugs (NSAIDs), and the use of foot orthotics. Surgery is usually considered only when conservative treatments are ineffective, with the majority of patients (about 85% to 90%) finding relief without surgical intervention. Additionally, approximately 80% of patients do not experience a recurrence of pain following conservative treatments. Several minimally invasive treatments have gained popularity for plantar fasciitis, addressing including extracorporeal shockwave therapy (ESWT), corticosteroid injections, platelet-rich plasma (PRP) injections, botulinum toxin (BTX) injections, acupuncture, dry needling, and prolotherapy <sup>4</sup>.

ESWT, in particular, has become a widely accepted and safe alternative treatment option. It has demonstrated clinical effectiveness in managing tendon injuries, with potential mechanisms including the destruction of calcifications, pain relief, initiation of tissue regeneration, and remodelling of the affected tendon<sup>5</sup>.

Low-level laser therapy (LLLT) has also shown promise in the treatment of plantar fasciitis. LLLT has been used successfully to alleviate pain associated with various conditions, and more recently, it has been applied to manage plantar fasciitis-related pain<sup>6</sup>.

Stretching exercises are frequently employed as a conservative treatment for plantar heel pain. Manual active stretching or passive stretching of the plantar fascia and Achilles tendon have proven effective for patients with plantar fasciitis. Numerous studies have explored the efficacy of these stretching techniques, with many yielding positive results. Some research has also assessed the effectiveness of combined treatments, which may include ultrasound or radial shockwave therapy in conjunction with stretching exercises<sup>7</sup>.

An experimental study was conducted to compare the effects of shockwave therapy versus laser therapy, both in combination with stretching exercises, among patients with plantar fasciitis. This study aimed to provide valuable insights into the optimal treatment approach for individuals suffering from this condition<sup>8-12</sup>.

# METHODOLOGY

This is a pre and post comparative study type. The comparison was made before and after giving the treatment to plantar fasciitis patients. The study conducted at ACS Medical College and Hospital, Physiotherapy OPD, Velappanchavadi, Chennai-77. In this study totally 30 samples were collected. The participants were divided into groups by sampling method. The total study duration was about 3 Months

**Inclusion Criteria:** Both Male and female Samples with Age of 20-60, patients with stabbing pain in bottom of foot, Patients with Severe pain in bottom of the foot in morning and Limited up motion of ankle were included in the study.

**Exclusion Criteria:** Patients with Recent injury, Recent fracture, Previous surgery of foot, Ankle joint disorder and Diabetics were excluded from the study.

Materials Used in the study were Shockwave therapy machine, Laser therapy machine, Visual analogue scale (VAS) and Foot function index (FFI). Measurement Tools Visual analogue scale (VAS) used to measure Pain and Function was measured by Foot Function Index (FFI)

**Intervention:** Shockwave therapy along with stretching exercises (Group A), Laser therapy along with stretching exercises (Group B). Shockwave therapy given for 2400 shocks and Laser therapy gave for 3 mins and Stretching exercises was given for10mins.

Procedure: Patients from outpatient physiotherapy Department ACS medical college with plantar fasciitis with the duration of past one month are screened by inclusion and exclusion criteria to participate in the study. The purpose of the study was explained to the patient. After obtaining informed consent, demographic information of the standardized history includes age, gender, duration of symptoms and occupation. The participants were asked to mark their intensity of pain on 10cm visual analogue scale in the data collection sheet with number 0 to 10 where 0 symbolizes no pain 10 symbolizes severe pain. The outcome measures were recorded using measuring tools VAS (Visual Analogue scale) and FFI (Foot Function Index) before and after treatment as pre and post test score.

Pre-test measurements were recorded using VAS for the pain subjectively before the initiation of 1st session of treatment protocol and post test values were recorded at the end of the 12th session for both groups respectively. Foot function index was measured before the initiation of 1st session of treatment protocol for pretest values and post-test values were measured at the end of 12th session for both the groups respectively.

The participants were divided into two groups Group A were treated with shockwave therapy along with stretching exercises. Group B were treated with laser therapy along with stretching exercises.

**Shockwave Therapy:** Group (A) received 3 sessions of shockwave therapy 3 days per week for four weeks for total 12 sessions. The patient was positioned supine on the bed. Ultrasound gel was put over the heel and the focus of shockwave treatment area was localized with

the help of ultrasound (Figure). Each patient received 2500-3000 impulses. Energy level was between 11-15 N/sq.m. It was applied on circular motion on the insertion of the site of plantar fascia and along the fascia.



Figure 2: Shockwave therapy

**LASER THERAPY:** Group (B) received 3 sessions of laser therapy 3 days per week for four weeks for total of 12 session at Intensity of 6 J/cm2 in scanning method.



Figure 3: Laser therapy

**Stretching Exercises:** Both Group A and Group B were given stretching exercises for 10mins

The stretching exercises are Calf muscle stretch, Plantar fascia Stretch (ball roller), Towel stretch and Towel curls

**Calf Muscle Stretch:** Ask the patient to Lean the hands against a wall. Straighten the knee of the affected leg and bend the other knee in front and keep both feet flat on the ground. Hold the stretch for 15seconds.



Figure 4: Calf muscle stretch

**Plantar Fascia Stretch:** Place a ball under the patient's foot and ask them to roll it back and forward which stretches plantar fascia and loosens and the foot muscles. Patient was made to stretch for 10 times



Figure 5: Plantar fascia stretch

**Towel Stretch:** The patient was asked to sit on the bed or floor with the leg stretched out a towel was wrapped around the ball of foot just below the toes and patient was asked to pull the towel gently, allow the foot to bend up towards the knee until they feel stretch in the back of lower leg. The knee is straight during exercises. The stretch was hold for 12-15 seconds. And patient was made to stretch



Figure 6: Towel stretch

**Towel Curls:** Patient was asked to stand on their feet flat on floor and a towel was placed down in front the patient so that the short end of the towel is near the patient's feet. Patient was asked to place the toes of one foot on the end of the towel and scrunch the toes and asked to pull the towel toward him/her. This stretch was repeated for 10 times.



Figure 7: Towel curls

**Data Analysis:** Descriptive data analysis was used for demographic data. Paired t-test to analyze the difference of plantar fasciitis with shockwave therapy with stretching exercises and laser therapy with stretching exercises

**Descriptive Data Analysis:** In this comparative study 30 plantar fasciitis patients were selected randomly for Group A -15 participation and Group B -15 participation. Selected peoples were between 20-60 years of age and both male and female were taken for this study. The participants in Group A were given shockwave therapy and stretching exercises and Group B were given laser therapy with stretching exercises for 3 days per week for weeks respectively.

Group A		Mean	Number of Pairs	Mean Diff.	SD, SEM	DF	т	P value	<b>Sig. Diff.</b> (P<0. 05)
VAS	Pre Tost	6.800	15	4.13	0.756	14	24.49	P<0001	****
	Test								
	Post	2 667			0.195				
	Test	2.007							
	Pre	75 20							
FFI	Test	75.20	15	39.20	6.014	14	25.24	P<0001	****
	Post	36.67			1.553				
	Test								

Group A (Shockwave Therapy and Stretching Exercises)

**Table 1:** Paired t test on VAS and FFI within Group A

The above table 1 shows significant difference in VAS and FFI within Group A with P value >0.0001



Paired T test Within Group A Graph 1: Presentation of VAS and FFI within the Group A

Group	В	(LASER	THERAPY	AND	STRETCHING	<b>SEXERCISES</b> )
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Group B		Mean	Number of Pairs	Mean Diff.	SD, SEM	DF	t	P value	<b>Sig.Diff.</b> (P<0.05)
	Pre Test	6.933	15	4.00	0.7432	14	21.54	P<0001	***
VAS	Post Test	2.933			0.1919				
FFI	Pre Test	76.33	15	20 52	6.664	1.4	22.20	D 40001	****
	Post Test	37.13	15	38.53	1.721	14	22.39	P<0001	

Table 2: Paired t test on eyesight on VAS and FFI within Group B

The above table 2 shows significant difference on VAS and FFI within Group B with P value > 0001



Graph 2: Presentation of VAS and FFI within the Group

#### Comparative Study between Group A and B on VAS and FFI

Out come Measures	Exercise	Test	Mean	Mean Diff.	R Square	F	P value	Sig. diff. (P < 0.05)
	Group A Group B	Pre	6.800		0.718	47.57	<0.0001	***
		test		4.13				
VAS		Post Test	2.667					
		Pre test	6.933	4.00				
		Post Test	2.933	4.00				
FFI	Group A Group B	Pre test	76.33	39.20	0.894	157.5	<0.0001	***
		Post Test	37.13					
		Pre test	76.33	20 52				
		Post Test	37.13	50.55				

Table 3: ANOVA to compare VAS and FFI between Group A and B

The above table 3 shows significant difference on VAS and FFI between Group A and B with P value <0.0001.



#### RESULT

Total 30 samples were selected for this study, later divided equally into 15 samples in each Group A (Shockwave therapy and Stretching exercises) and Group (laser therapy with stretching exercises) B with age group between 20 to 60 years were included in the study.

In Group A (Shockwave therapy and Stretching exercises) VAS and FFI improved significantly with mean difference of 4.137 and 39.20 respectively with P value>0.0001

In Group B (Laser therapy and Stretching exercises) VAS and FFI improved significantly with mean difference of 4.00 and 38.53 respectively with P value>0.0001

Comparative study between Group A and Group B showed significant difference in VAS and FFI with F value 47.57 and 157.5 with P value>0.0001.

The study concluded that Group A (shockwave therapy and stretching exercises) is more effective than Group B (laser therapy with stretching exercise) with mean difference of 4.137 and 39.20 respectively in VAS and FFI.

#### DISCUSSION

Plantar fasciitis is a non-inflammatory degenerative syndrome of the plantar fascia resulting from repeated trauma at its origin on the calcaneus. To date, there is evidence that this condition may not be characterized by inflammation but, rather by non-inflammatory degenerative changes in the plantar fascia.

Plantar fasciitis is the most common cause of heel pain. It has estimated that it affects as much as 10% of the general population over the course of a lifetime. The condition is bilateral in up to one-third of cases. Incidence reportedly peaks in people between the age of 40 to 60 years in general population. The condition is thought to be multi-factorial in origin with factors such as obesity, decreased ankle joint range of motion, prolonged weight bearing and increase in age are suggested to be commonly involved <sup>13-17</sup>.

In this study 30 subjects between 20-60 years who diagnosed with plantar fasciitis are included in this study. All this subjects in this group showed improvement in their foot function all the participants in this study reported that there was a notable improvement in their foot function.

On comparing the pre and post test values of Group A who are treated with shockwave therapy and stretching exercises shows significant improvement in the foot function among plantar fasciitis patients.

ESWT is a new non-invasive therapeutic modality with effectiveness, convenience, and safety. ESWT has the potential of replacing surgery in many orthopedic disorders without the surgical risks. The complication rates are low and negligible. The exact mechanism of shockwave therapy remains unknown <sup>18-22</sup>

The results reveal significant beneficial effects of ESWT in patients with chronic plantar fasciitis. The only significant side effect appears to be an increase in local pain levels during administration of the shots which subside within 30 minutes <sup>23-25)</sup>

Because of better results with endoscopic release versus the benefits of no complication, no immobilisation, and early resumption of full activities ESWT, we concluded that ESWT is a reasonable earlier line of treatment of chronic plantar fasciitis before EPF  $^{\rm (26,27)}$ 

The extracorporeal shock wave is an effective method of plantar fasciitis treatment in the studied group of patients. The performed treatments allowed achieving a lasting therapeutic effect and reduced the intensity and frequency of pain, which allowed reducing the use of painkillers and for a return to full physical activity <sup>28, 29</sup>

In all the literature reviewed, plantar fasciaspecific stretching had the best statistically significant long-term results <sup>30</sup>. There were too few studies to assess whether stretching is effective compared to control or other interventions, for either pain or function. However, there is some evidence that plantar fascia stretching may be more effective than Achilles tendon stretching alone in the shortterm <sup>31</sup>.

Comparing the Group A (shockwave therapy with stretching exercises) with Group B (laser therapy with stretching exercises) alternate hypothesis is justified.

Data analysis expose that the treatment value score of VAS, FFI Group A shows significant at the end of 8 weeks of treatment. Compared to mean value score of Group B. Correlated the result obtained from two groups, result shows that shockwave therapy with stretching exercises is significant than the laser therapy with stretching exercises.

**Ethical Clearance:** Ethical clearance has obtained from Faculty of Physiotherapy, Dr. MGR. Educational and Research Institute, Chennai, Tamil Nadu, Reference number: No: F-04/PHYSIO/IRB/2021-2022, Dated: 29/01/2022.

**Conflict of interest:** There was no conflict of interest to conduct and publish this study.

Fund for the study: It was a self-financed study.

# CONCLUSION

The present study concludes that there was showing improvement in both the groups Group A (shockwave therapy and stretching exercises) and Group B (laser therapy and stretching exercises) on reducing the pain and improves the foot function among the plantar fasciitis patients.

On comparing both the groups, Group A (shockwave therapy and stretching exercises) and Group B (laser therapy and stretching exercises), Group A showed better improvement than Group B in improvising the foot function ability and reducing the pain on the subjects with plantar fasciitis. Group A showed a beneficial improvement in post test values when compared when compared with post test values of group B

With reference to the statistical analysis done from the data collected using VAS, FFI. It is concluded that there is a significant difference in pain, muscle strength and functional performance following shockwave therapy with stretching exercises and laser therapy with stretching exercises. Shockwave therapy with stretching exercises is the best treatment for decreasing pain and increasing muscle strength and foot function in plantar fasciitis patients.

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