

To Evaluate the Effects of Plantar Fascia and Tendo Achilles Stretch in Chronic Plantar Fasciitis

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Abstract

Objectives: Plantar fasciitis (PF) is a degenerative syndrome of the plantar fascia resulting from repeated trauma at its origin on the calcaneus.⁵ PF is reported to be the most common cause of inferior heel pain in adults.⁶ Overload causes micro-tears at the fascia-bone interface of the calcaneus or within the substance of the plantar fascia alone. The central band of the plantar fascia is primarily affected where a hyper cellular, inflammatory response occurs within the fibres of the fascia, leading to degenerative changes. The site of abnormality is typically near the site of origin of the plantar fascia at the medial tuberosity of the calcaneus. The objective of this study is to evaluate the effectiveness of plantar fascia and Tendo Achilles stretch in chronic plantar fasciitis patients. **Methods :** A sample of 30 subjects, age between 25-35 years, both male and females, as per inclusion and exclusion criteria, from SSSMC and Dr. K.K.B.M. Subharti Hospital, Dehradun and OPD of Physiotherapy, School of Medical and Allied Sciences, Greater Noida were included in the study. The subjects were randomly divided into two groups. The subjects were assessed and their Pre VAS and S.D. was recorded (during first few steps in morning) and then Group - A was treated with plantar fascia stretching and the calf massage and Group- B was treated with Tendo Achilles stretching and the calf massage. After 8 weeks Post VAS and S.D. was again recorded and compared. **Results:** The data of Pre VAS Score, Post VAS Score and S.D. for both Group (A and B), was recorded on the base of pain on first walking in the morning on day 1st and after 8th week. The detailed statistical analysis shows the improvement in both the Groups A and B. The overall more improvement was found in the Group- A in which planter fascia stretching with calf muscle massage was delivered to the patients. Which shows the significant improvement in chronic plantar fasciitis subjects. The mean scores of Pre VAS and S.D. and Post VAS and S.D. of Group - A, was 5.46 ± 1.02 and 0.93 ± 0.57 and the mean scores of Pre VAS and S.D. and Post VAS and S.D. of Group - B, was 5.27 ± 0.99 and 1.86 ± 0.71 on day 1st and after at 8th week respectively. The paired "t" test was applied to test the significant difference between day 1st and after at 8th week. A significant P - Value of $<.001^*$ was found in both the Groups A and B when the comparison was done with the mean score of pre VAS and S.D. and post VAS and S.D. on after at 8th week. Which shows the significant improvement in pain in both the groups but improvement in pain was more in Group-A than the Group-B to whom the tissue specific stretching of Planter fascia was given with the calf massage in Chronic Planter Fasciitis subjects. **Conclusions:** The results of this study indicates that there is significant improvement in the VAS score of the Group -A and B. But the results of the Group A was more effective than the group B to whom the tissue specific stretching of planter fascia was given with the calf massage.

Keywords: Plantar fascia; Plantar fasciitis; Tendo Achilles stretch; Plantar Fascia stretch; Plantar Fascia Massage; VAS; Windlass mechanism.

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Introduction

Underlying the skin of the sole there is a thick layer of deep fascia known as plantar aponeurosis (commonly called as plantar fascia) which originates from the medial calcaneal tuberosity. It consist of central, medial, and lateral parts. The medial and lateral parts are relatively thin, and

the central part is thickest and strongest. Traced distally the aponeurosis broadens and divided into five processes, one for each digit.¹

The plantar fascia is one of the major stabilizing structures of the longitudinal arch of human foot, especially during midstance of the gait cycle.² The foot has a visible medial longitudinal arch (MLA) that aids in distributing the force attributed to weight bearing. The MLA connected at their base by the plantar fascia. When force is applied to the apex of the MLA, the arch depresses, and tension is distributed throughout the plantar fascia.^{3,4} The plantar fascia contributes to support of arch of the foot by acting as a tie-rod, where it undergoes tension when the foot bears weight. (Fig. 1)

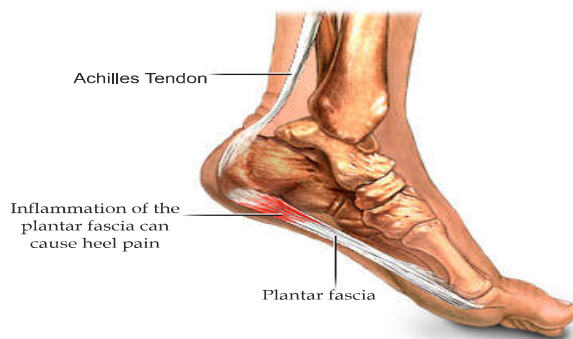


Fig. 1: Plantar fasciitis:

It was found the plantar fascia continuously elongated during the contact phase of gait. It went through rapid elongation before and immediately after mid-stance, reaching a maximum of 9% to 12% elongation between mid-stance and toe-off. During this phase the plantar fascia behaves like a spring, which may assist in conserving energy. In addition, the plantar fascia has a critical role in normal mechanical function of the foot, contributing to the “windlass mechanism”. When the toes are dorsiflexed in the propulsive phase of gait, the plantar fascia becomes tense, resulting in elevation of the longitudinal arch and shortening of the foot.

Plantar fasciitis is irritation of the plantar fascia. Plantar fasciitis (PF) is a degenerative syndrome of the plantar fascia resulting from repeated trauma at its origin on the calcaneus⁵ PF is reported to be the most common cause of inferior heel pain in adults.⁶ Overload causes micro-tears at the fascia-bone interface of the calcaneus or within the substance of the plantar fascia alone. The central band of the plantar fascia is primarily affected where a hypercellular, inflammatory response occurs within the fibres of the fascia, leading to degenerative changes. The site of abnormality is typically near

the site of origin of the plantar fascia at the medial tuberosity of the calcaneus.⁷ Suggested risk factors include overweight, prolonged standing, and having a reduced range of motion in the ankle and 1st metatarsophalangeal joint.⁸ (Fig. 2)

On examination, the patient exhibits point tenderness over the bottom of the heel as well as pain with dorsiflexion of the foot. Radiographs often are normal.⁹

Physical therapy is widely used to treat Plantar Fasciitis. It can include passive modalities and active therapy. Treatment consists of stretching of calf muscle and tissue-specific plantar fascia-stretching. Long-term benefits of the stretch include a marked decrease in pain and functional limitations and a high rate of satisfaction. This approach can provide the health-care practitioner with an effective, inexpensive, and straightforward treatment protocol.¹⁰

With this study we compare the effect of tissue specific plantar fascia stretch over Tendo Achilles on the pain relief and symptoms in chronic plantar fasciitis. (Fig. 3)

Objectives of the Study

Statement of study : Is the plantar fascia stretching with calf massage and Tendo Achilles stretching with calf massage to relieve the pain in chronic plantar fasciitis?

Hypothesis

Alternate Hypothesis: There will be a significant difference in VAS score of with plantar fascia stretching with calf massage and Tendo Achilles stretching with calf massage in chronic plantar fasciitis subjects.

Null Hypothesis: There will not be a significant difference in VAS score of with plantar fascia stretching with calf massage and Tendo Achilles stretching with calf massage in chronic plantar fasciitis subjects.

Operational Definitions

a. *Plantar fasciitis*: Plantar fasciitis (PF) is an overuse injury resulting from repetitive

microtears of the plantar fascia at its origin at the tuberosity of the os calcis deep to the distal medial heel pad.⁵

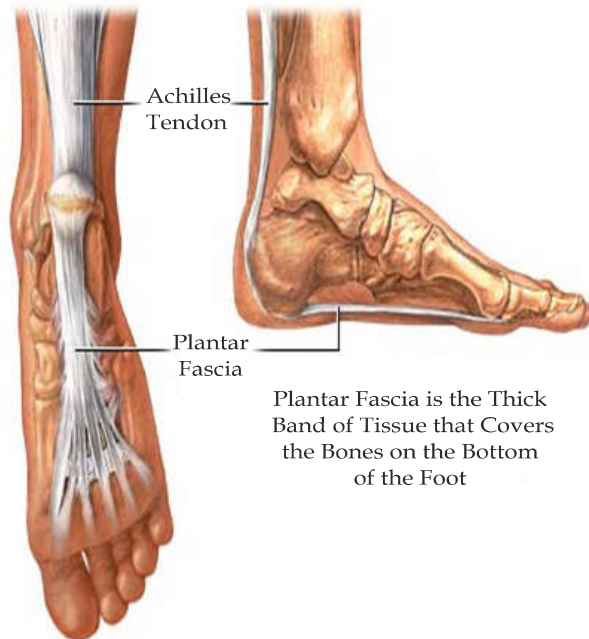


Fig. 2 : Plantar Fascia is the Thick Band of Tissue that Covers the Bones on the Bottom of the Foot

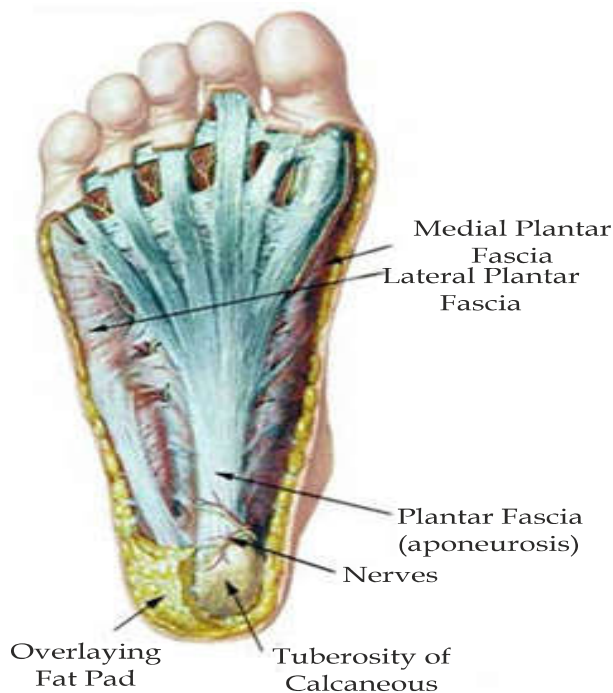


Fig. 3: The plantar fascia is a thick band of connective tissue that supports the foot's plantar

The condition presents with tenderness over the midportion of the plantar fascia as opposed to insertional plantar fascia; dorsiflexion of the toe almost always exacerbates the patient's symptoms.⁷

- b. *Stretching*: Any movement that require moving a body part to the joint at which there is an increase in the movement of a joint can be called a stretching exercise. Stretching can be done either actively or passively.^{10,11}
- c. *Massage or Soft Tissue Manipulation*: The scientific manipulation of the body tissue is referred as massage. Any technique, be it manual or mechanical, which imparts mechanical energy to the soft tissue of the body through the skin without producing any change in the position of the joint, in order to elicit certain physiological or psychological effect which can be utilized for therapeutic, restoration or preventive purpose either on sick or a healthy individual can be define as massage.³
- d. *Visual Analog Scale (VAS)*: The Visual Analog Scale, more commonly referred to as the VAS was used to track progress. The VAS is a scale used as a subjective measurement of pain experienced on a level between zero and 10 with zero being no pain and 10 being the worst. The VAS is a well-studied method for measuring both acute and chronic pain (Scott, 1976), and its usefulness has been validated by several investigators (Katz, 1999 and Carlson, 1983). The patient is asked to bisect the line at a point representing self-assessed position on the scale. The patient score is thus obtained by measuring from zero to mark bisecting the line.

Materials and Methods

30 patients (both males and females) of age between 25-35 years (mean age of 29.60) presenting with signs and symptoms of plantar fasciitis from duration of 8 weeks or more and willing to participate, were evaluated in this study. The inclusion criteria of selection was age (25-35 years), symptoms of plantar fasciitis (first few step are painful in morning, pain on medial aspect of heel) with normal MMT of dorsi-flexors and plantar-flexors. The subjects who were on medication for pain relief or having other associated joint and heel pathology were excluded from the study.

30 subjects were randomly divided in two groups Group A and Group B (15 subjects each). Group A was instructed to do plantar fascia stretching twice a day and calf muscle massage was given once for 6 days/week for 8 weeks. Group B was instructed to do Tendo Achilles stretching twice a day and calf muscle massage was given once for 6 days/week for 8 weeks. All the subjects were instructed to do

stretching once just prior to get off the bed before the first step in the morning and again during their treatment in OPD. Massage was given in OPD after the stretching.

The outcome measures of the study was VAS according to the patient's relief in pain and symptoms. The subjects were evaluated prior to the commencement of the treatment at day 1 and after every week till 8 weeks by using VAS as the outcome measure. The VAS of day 1 and VAS after 8 weeks of giving treatment were compared.



Photo 1: Patient Performing Plantar Fascia Stretching



Photo 2: Patient Performing Plantar Fascia Stretching



Photo 3: Patient Performing Tendo Achilles Stretching (Starting Position)



Photo 4: Patient Performing Tendo Achilles Stretching (Stretched Position)



Photo 5: Patient Performing Tendo Achilles Stretching (Starting Position)



Photo 6: Patient Performing Tendo Achilles Stretching (Stretched Position)

All the analysis was obtained using SPSS Version 13.0 (for window vista). Demographic data of the patients including age and gender were summarized. The dependent variable for the statistical analysis was VAS (for pain). A base line data was taken at the beginning of the study (pre test values) and after the completion of the treatment (post test values) to analyze the difference between the two treatment groups, independent t - test was

used. A level of 0.05 was used to determine the statistical significance.

Design : This study is a comparative study design which intends to find out if there is any significant improvement in the pain during first few steps in the morning in both the Groups-A and B, having physiotherapy treatment protocol, Group-A receive plantar fascia stretching with calf massage while Group-B receive Tendo Achilles stretching with calf massage within the sample.

Sample : A sample of 30 subjects, age between 25-35 years, both male and females, were included in the study from SSSMC, Dr. K.K.B.M. Subharti Hospital, Dehradun and OPD of Physiotherapy, School of Medical and Allied Sciences, Greater Noida. All the subjects were assessed for inclusion and exclusion criteria of the study.

Sample Selection : Sample selection was done as per availability of Chronic Planter Fasciitis patient who were able to continue treatment regularly.

A baseline assessment of clinical and functional status was assessed before the subjects were assigned to do the task as per protocol.

Inclusion Criteria

- Age 25-35 years.
- Symptoms of plantar fasciitis are present.
- Normal muscle power.
- Normal blood pressure.
- Pain on medial aspect of heel.
- Willingness to participate.

Exclusion Criteria

- Age below 25 or above 35 years.
- Any joint and heel pathology.
- Medication for pain.
- Any foot injury in previous one year or any foot deformity.
- Professional athlete.
- Inability to understand instruction or to provide informed.

Instrumentation

1. Patient couch
2. Stationary: (pen, paper, graph paper, marker)
3. Universal Goniometer (halfcircle)
4. Golf ball
5. Towel
6. Chair
7. Oil or talcum powder: Friction reducing agent or lubricating agent.
8. VAS Scale



Fig. 4: Universal Goniometer (half circle)



Fig. 5: Golf Ball

Protocol and Procedure

This study was done on 30 subjects with the signs and symptoms of Chronic Plantar Fasciitis from duration of 2 months or more. All subjects between 25-35 years of age were randomly selected. The subjects who were on medication for pain relief

were excluded from the study. All subjects were randomly divided in two groups Group A and amp; Group B (15 subjects each). Group A was instructed to do Plantar Fascia stretchings twice a day and calf muscle massage was given once for 6 days/week for 8 weeks. Group B was instructed to do Tendo Achilles stretchings twice a day and calf muscle massage was given once for 6 days/week for 8 weeks. All the subjects were instructed to do stretching once just prior to get off the bed before the first step in the morning and again during their treatment in OPD. Massage was given in OPD after the stretching. The subjects were evaluated prior to the commencement of the treatment and after every week till 8 weeks by using VAS as the outcome measure.

Duration : The treatment of stretching was given twice a day and the calf massage was given once a day for 8th week under the supervision of a Physiotherapist. Both the Groups have given same few techniques.

Data Analysis : The data of Pre and Post VAS Score for both Group (A and B), was recorded on the base of pain on first walking in the morning on day 1st and after 8th week. The detailed statistical analysis shows the improvement in both the Groups A and B. The overall more improvement was found in the Group- A in which planter fascia stretching with calf muscle massage was delivered to the patients. Which shows the significant improvement in Chronic Planter Fasciitis subjects. The mean scores of Pre VAS and S.D. and Post VAS and S.D. of Group-A, was 5.46 ± 1.02 and 0.93 ± 0.57 and the mean scores of Pre VAS (Table 2 and Graph 2) and S.D. and Post VAS and S.D. of Group-B, was 5.27 ± 0.99 and 1.86 ± 0.71 on day 1st and after at 8th week.(Table 4 and Graph 4) The paired “t” test was applied to test the significant difference between day 1st and after at 8th week. A significant P - Value of $<.001^*$ was found in both the Groups A and B when the comparison was done with the mean score of pre VAS and S.D. and post VAS and S.D. on after at 8th week. Which shows the significant improvement in pain in both the groups but improvement in pain was more in Group-A than the Group-B to whom the tissue specific stretching of Planter fascia was given with the calf massage in Chronic Planter Fasciitis subjects.

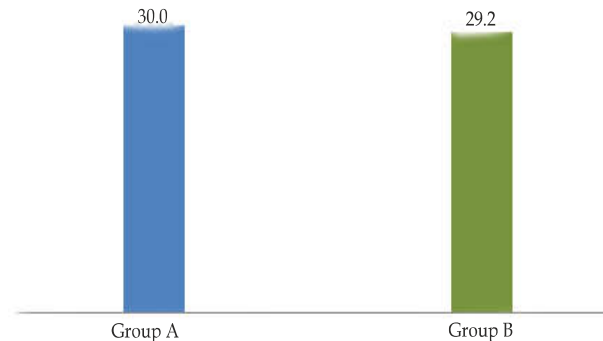
Results

The results of this study shows that the mean scores of Pre VAS and S.D. and Post VAS and S.D. of Group-A, was 5.46 ± 1.02 and 0.93 ± 0.57 and the

mean scores of Pre VAS and S.D. and Post VAS and S.D. of Group-B, was 5.27 ± 0.99 and 1.86 ± 0.71 on day 1st and after at 8th week respectively. The paired “t” test was applied to test the significant difference between day 1st and after at 8th week. A significant P - Value of $<.001^*$ was found in both the Groups A and B when the comparison was done with the mean score of pre VAS and S.D. and post VAS and S.D. on after at 8th week. Which shows the significant improvement in pain in both the groups but improvement in pain was more in Group-A than the Group-B to whom the tissue specific stretching of Planter fascia was given with the calf massage in Chronic Planter Fasciitis subjects. (Table 3 and Graph 3)

Table 1: Mean Age of Group A and Group B

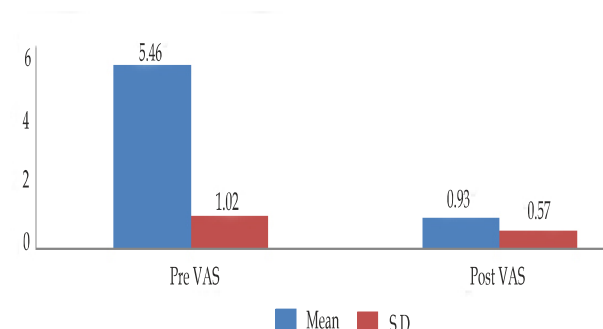
Variable	Mean	SD	SEM	t-value	p-value
Group A	30.0	3.54	0.646	0.984	0.329
Group B	29.2	2.7	0.492		



Graph 1: Mean Age of Group A and B

Table 2: Comparison of Effect of Planter Fascia Stretch between Pre and Post VAS of Group A (Planter Fascia stretch)

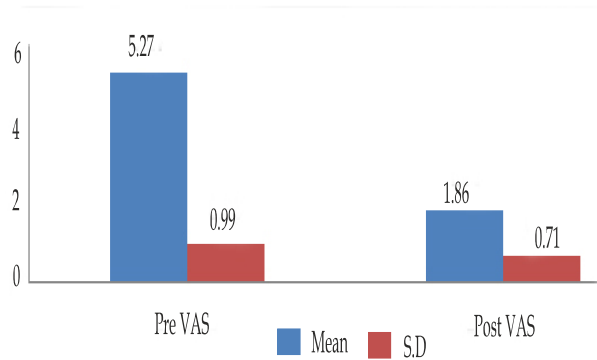
Relative Improvement	MEAN	S.D	S.E.M	t-value	p-value
Pre VAS	5.46	1.02	0.186	21.23	$<.001$
Post VAS	0.93	0.57	0.104		



Graph 2: Comparison of Effect of Planter Fascia Stretch between Pre and Post VAS of Group A (planter fascia stretch)

Table 3: Comparison of Pre and Post VAS of Group B (T A Stretch)

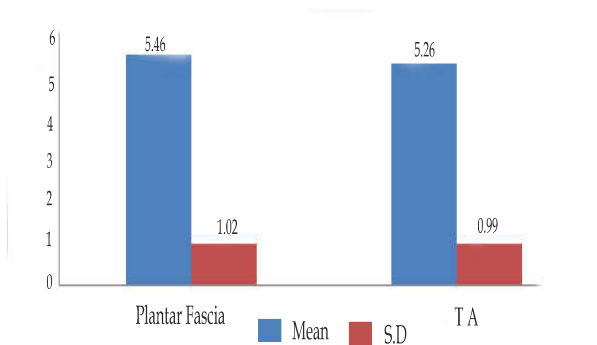
Relative Improvement	MEAN	S.D	S.E.M	t-value	p-value
Pre VAS	5.27	0.99	0.180	15.33	<0.001
Post VAS	1.86	0.71	0.129		



Graph 3: Comparison of Pre and Post VAS of Group B (TA stretch)

Table 4: Comparison of Effect of Planter Fascia Stretch and TA Stretch.

Difference	MEAN	S.D	S.E.M	t-value	p-value
Plantar Fascia	5.46	1.02	0.186	0.771	0.444
TA	5.26	0.99	0.181		



Graph 4: Comparison of effect Plantar Fascia Stretch and TA Stretch.

Discussion

In this study 30 subjects with a age group of 30-55 years were selected. For better comparative analysis of the treatment technique the subjects were divided into two groups, Group A and B, 15 in each. As an outcome measure the subject of both the groups were monitored for Pre Vas score on the base of pain on first walking in the morning.

For Group-A subjects, the treatment protocol includes the plantar fascia stretching with calf

massage and for Group - B subjects, the treatment protocol includes Tendo Achilles stretching with calf massage. t - Test has been performed to analyze the comparative study of the treatment of Chronic Planter Fasiitis.

The results supported the randomized controlled trial and research of Di Giovanni et al compared the efficacy of plantar fascia stretching versus Achilles tendon stretching with the other technique of physiotherapy treatment to cure the problem. But it is now cleared from the comparative study done with the help of the plantar fascia stretching with calf massage the prognosis rate is more than that with Tendo Achilles stretching with calf massage in Chronic Planter Fasciitis subjects.

Future Research

It would be more challenging if the study will be done for longer duration and the number of subjects will be more than the better conclusion can be made regarding the effectiveness of treatment protocol.

For better results advance regime of Protocol can be included in the study.

Study could be done in early and late age groups depending on the environmental and habitual facts.

Conclusions

The results of this study indicates that there was a significant improvement in the Pre VAS Score values in both the Groups-A and B. Group-A receive plantar fascia stretching with calf massage while Group-B receive Tendo Achilles stretching with calf massage. But the prognosis rate is more in plantar fascia stretching with calf massage than the Tendo Achilles stretching with calf massage in Chronic Planter Fasciitis subjects.

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