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ORIGINAL ARTICLE

EFFECT OF TRIGGER POINT THERAPY VS STRETCHING ON INTENSITY OF PAIN AND ANKLE ROM IN PATIENTS WITH PLANTAR FASCITIS

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ABSTRACT

Background of the study: Plantar Fasciitis is an inflammation caused by excessive stretching of the plantar fascia[1]. The plantar fascia is a broad band of fibrous tissue which runs along the bottom surface of the foot, attaching at the bottom of the heel bone and extending to the forefoot[2]. Plantar heel pain is a common problem in adults**.** Objective of the study is to compare the effectiveness of trigger point therapy technique Vs sustained stretching to triceps suare given as an adjunct to conventional physiotherapy. **Methodology:** Total 30 patients satisfying the criteria were divided into two groups, of which 15 were females and 12 were males and age range between 35 to 45 years. By using non-probability convenient sampling method patients were divided into two groups, Group- A and Group – B the patients were selected based on inclusion and exclusion criteria. Group A treated with Sustained Manual Stretching and Group B with Trigger point therapy. **Result:** In comparison of outcome between two groups, shows a significant difference in improvement on ROM with P value of <0.0.001, VAS with P value of 0.0.012 and Foot Pronation Ankle with P value of 0.001. **Conclusion:** The study provides trigger point therapy as an effective treatment for chronic plantar fasciitis by improving flexibility of ankle dorsiflexion range of motion and pain reduction. In this context trigger point therapy is to be considered as an essential component of treatment for chronic plantar fasciitis. This technique is cost effective and can easily be applied in clinical set up.

Keywords: Trigger Point Therapy, Stretching, Plantar Fasciitis, triceps suare

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INTRODUCTION

Plantar Fasciitis is an inflammation caused by excessive stretching of the plantar fascia[1]. The plantar fascia is a broad band of fibrous tissue which runs along the bottom surface of the foot, attaching at the bottom of the heel bone and extending to the forefoot[2]. Plantar heel pain is a common problem in adults[1]. Most common cause of heel pain is inflammation to dense connective tissue extending from the calcaneus to the metatarsal region, thus the descriptive term plantar fasciitis[3]. The cause for plantar fasciitis are stress, tension and pulling on the plantar fascia, inflexible calf muscle and tight achilles tendon which places more tension on the plantar fascia, over pronation, high arches and rigid feet, incorrect or worn off shoes and over training[4].

The common over use injury is characterized by heel pain that is worse in the morning with the first few steps. Since it is difficult to rest the foot, this problem gradually worsens with progression; pain may start interfering with activities of daily living. The patients frequently relate that the pain is localised to an area that the examiner identifies as the medial calcaneal tubercle[5-7]. Stanley Salmons states that (1995) the central part of the plantar aponeurosis is the thickest and strongest.

Plantar fasciitis was first described by Wood in 1812 and he attributed it to tuberculosis, since then, plantar fasciitis is known by many pseudonyms; including Joggers Heel, Heel Spur Syndrome, Plantar Fascia Insertitis, Calcaneal enthesopathy, Sub calcaneal pain, Stone bruise, Calcaneal periostitis, and calcaneodynia.

Plantar fascia is the major structure that supports and maintains the arched alignment of the foot. This aponeurosis is made of strong yet flexible connective tissue that functions as a 'bowstring' to hold up the medial longitudinal arch[8-10].

Objectives of the study is to compare the effectiveness of trigger point therapy technique Vs sustained stretching to triceps suare given as an adjunct to conventional physiotherapy. Also to study the effectiveness of sustained stretching to triceps surae given as an adjunct to conventional physiotherapy methods in the management of chronic plantar fasciitis and to study the effectiveness of trigger point therapy technique to triceps surae given as an adjunct to conventional physiotherapy methods in the management of chronic plantar fasciitis.

METHODOLOGY

Source of Data: The research approach used in this study was an experimental approach. Place of study: Department of Physiotherapy, Recoup Neuro-musculoskeletal Rehabilitation Centre, Bangalore. Population of the study was chronic plantar fasciitis patients from Karnataka State. The total period of study was 6 months.

Method of collection of data: Total 30 patients satisfying the criteria were divided into two groups, of which 15 were females and 12 were males and age range between 35 to 45 years. By using non-probability convenient sampling method patients were divided into two groups, Group-A and Group-B the patients were selected based on inclusion and exclusion criteria.

Inclusion criteria: Unilateral involvement of plantar fasciitis, Active ankle dorsiflexion less than 10 degree, Chronic plantar fasciitis having duration between 6 months to one year, Age

between 35 to 45 years, Sex; both male and female patients, Foot pronation more than 8 degrees, At least three trigger points in gastro-soleus muscles ,

Tools and Materials Used: Therapeutic Ultrasound machine ; A portable therapeutic ultrasound manufactured by Electrocare systems, Chennai, having a frequency of 1 MHz and an output of 3.5 watt/cm^2 and 2.5 cm^2 size treatment head. Recording material; Ultra sound machine, full circle goniometer, recording sheets, consent form, data collection sheet, skin markers, and Vaseline for trigger point therapy [11-14].

Outcome measures used for the study:

a. Visual Analog Scale (VAS)

A Visual Analog Scale was used to measure pain. Patient was asked to mark a point on a 10-cm scale where zero represents no pain and 10 represent severe pain.

Craig Liebenson (1996) – Huskission 1974 devised the Visual Analog Scale with mm markings in a 100-mm scale.

Bijur. P. E. et al 2001 in the study of reliability of VAS, for measurement of pain, it is aid that 90% of pain ratings were reproducible within 90mm. This data suggests that the VAS is efficiently reliable be used to assess pain.

Michelle H Cameron (1999) - A simple Visual Analog Scale may be sufficient to provide information regarding a progressive decrease in pain.

b. Half circle goniometer was used to assess ROM

Half circle goniometer (180 degrees) used to measure ankle active dorsiflexion range of motion and foot pronation angle[57].

The inter tester and intra tester reliability for goniometer measurement of plantar flexion, dorsi flexion and foot pronation of ankle were assessed. The intra and inter tester reliability for measurements observed by visual estimation was 0.83 for plantar flexion and 0.82 for dorsi flexion. Results suggest that clinician should use a goniometer to take repeated range of motion measurements of patients to minimise the error associated with theses measurements[15-18].

Data Collection Procedure: Referred patients with a diagnosis of chronic plantar fasciitis were included in the study. They were divided in to two groups, Group-A and Group-B using non-probability convenient sampling method. The subjects were informed of the purpose of proposed research study and consent was obtained from patients who were being included. Assessment of Dorsiflexion active range of motion, VAS and foot pronation angle were taken pre-treatment value on the day one before the treatment and post-treatment value on day 15th next day finishing the 6th session of the treatment.

Heel Pain Assessment: - A VAS scale was used to measure pain at the plantar aspect of foot. Patients were given a strip of paper with a 10 cm line. At one end was written ‘no pain’ and at the other ‘the worst pain I ever felt’ and the patient was asked to mark the line at the point corresponding to the intensity of pain at that very moment when patient weight bears in the morning first few steps. The measurements were taken pre-treatment value on the day one before the treatment and post-treatment value on day 15th next day finishing the treatment[19].

Ankle Mobility: - Active dorsiflexion will be limited due to tightness and pain so it should

be measured using goniometer. Patient in prone ankle dorsiflexion was measured by placing the semicircular edge of goniometer at the contour of the heel, while the arms were aligned with the long axis of the fibula and the fifth metatarsal[20,21].

Fig 1: Active dorsiflexion of ankle measured using goniometer

The zero position of dorsiflexion is defined as 90^0 angle between long axis of fibula and lateral border of foot. The foot was dorsiflexed actively and measurements were recorded. Investigator should hold the subtalar joint in neutral position. Dorsiflexion was measured both with knee extended and knee flexed to 90^0.

Foot pronation angle in weight bearing: Placed the subject in prone with hip and extended position. Positioned the foot over the edge of the supporting surface. Centred the fulcrum of the goniometer over the posterior aspect of the ankle midway between the malleoli. Aligned the proximal arm with the posterior midline of the lower leg and align the distal arm with the posterior midline of the calcaneum. Then measured the foot pronation angle in non-weight bearing first. After that, measured the foot pronation in the weight bearing position on a table edge[22].

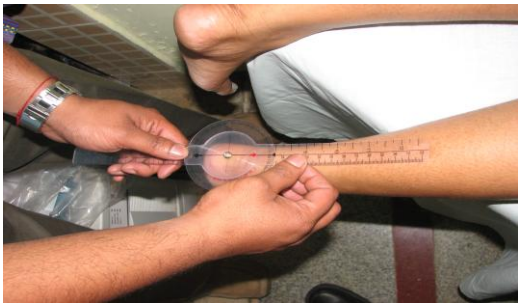

Fig 2: Foot Pronation in Non Weight Bearing

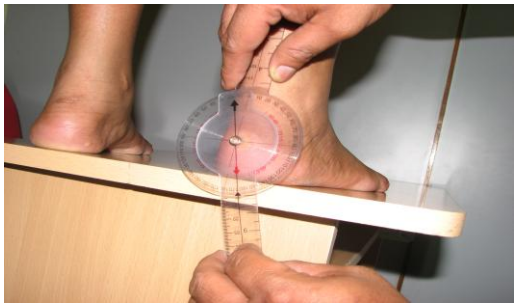

Fig 3: Foot Pronation in Weight Bearing

Treatment Procedure:

Group – A

Sustained Manual Stretching[3]**:** The patient was in supine and as relaxed as possible during passive stretching. The therapist stabilized around the malleoli with the top hand. Cup the

patient's heel with the bottom hand and place the fore arm along the bottom of foot. Then pull the calcaneus distal ward with the thumb and fingers while pushing upward with the forearm. The stretch force is applied for at least 40 seconds followed by 20 seconds rest and repeated 5 times in exercise session. The stretching treatment duration was 5 minutes.

Fig 4: Initial Position: Sustained Manual Stretching of triceps surae

Fig 5: Final Position: Sustained Manual Stretching of triceps surae

1. Ultrasound therapy

With the patient prone, and foot outside the plinth, continuous mode ultrasound of 1.5 watt/cm^2 for 5 minutes was applied around medial calcaneal tuberosity.

Group – B

1. Trigger point therapy[15]

a. Trigger point pressure release

Fig 6: Hand position for trigger point pressure release

The therapist lengthened the muscle to the point of increasing resistance within the comfort zone and then applied gentle, gradually increasing pressure on the trigger point until the finger encountered a definite increase in tissue resistance. At that point the patient may felt a degree of discomfort but should not experience pain. This pressure is

maintained until the therapist felt a relief of tension under palpated finger. Also, during this period clinician changed the direction of pressure to achieve better result. Duration of trigger point pressure release was 2 minutes[25].

b. **Deep stroking massage:** The patient was positioned comfortably so that the muscle to be treated is completely relaxed and lengthens out pain. The skin lubricated if the subcutaneous tissues are tense and immobile. The thumbs or a finger of both hands were placed so that they trap a taut band between them just beyond the bands trigger points. As the digits encounter the nodularity of the trigger point that is caused by its contraction knots, pressure is exerted to engage the restrictive barrier. The purpose of this pressure directed along the length of the taught band was to elongate the maximally shortened (contractured) sarcomeres of the contraction knots to release their tension. The total duration of deep stroking massage was 2 minutes[26].

Fig 7: Hand positioning for Deep stroking massage

c. **Myofascial release**

Positioned the patient comfortably in prone lying; and the treatment part should be well exposed. The researcher standed on the side of the prone patient at the leg level. The cephalad hand was placed on gastrocnemius region fingers facing cauded.

Cauded hand was placed fingers facing cephalad, so that heels of hand were few centimeter apart.

Fig 8: Myofascial release

Arms will be crossed; light compression is applied on the tissue to remove the slack by separation of hand until each individually reaches the elastic barrier of the tissue being contracted.

Barrier was held for not less than 90 second and commonly between 2 to 3 minutes for 5 times until a sense of separation of the tissue is noticed.

The tissues were followed to their new barrier and the light sustained separation force is maintained until a further release is noted.

Total myofascial release treatment time s 1 minute.

1. Ultrasound therapy

With the patient prone, and foot outside the plinth, continuous mode ultrasound of 1.5 watt/cm2 for 5 minutes was applied around medial calcaneal tuberosity.

Frequency of treatment was alternate days with a total of 3 sessions per week. The total duration of intervention was 2 weeks.

RESULT

Study Design: A Comparative study consisting of 30 plantar fascitis patients is undertaken to compare the effect between Group A and Group B. The Group-A has received Sustained Manual Stretching to the posterior compartment of leg in addition to the ultrasound therapy, while the Group-B received combined treatment protocol consisted of Trigger Point Therapy and ultrasound therapy.

Group A: Stretching group

Group B: Trigger Point Therapy group

Table 1: Basic characteristics of two groups

Basic characteristics	***Group A***	***Group B***	***P value***
Age in years; Mean ± SD	39.40±2.89	39.93±2.92	**0.619**
Sex; Male: Female	10:5	11:4	**0.690**

By analyzing basic characteristics of two groups, the group A shows a mean of 39.40 and the group B shows a mean of 39.93 in age with a P value 0.619. In the Male: Female ratio of two groups, the group A shows a ratio of 10:5 and the group B shows a ratio of 11:4 with a P value 0.619.

Table 2: Comparison of ROM between two groups

ROM	Group A	Group B	P value
Pre-Assessment	9.93±1.10 (8-12)	9.93±1.10 (8-12)	**0.838**(Z=0.242)
Post-Assessment	14.13±1.19 (12-16)	17.00±1.36 (15-20)	**<0.001****(Z=4.222)
% Change	42.3%	71.2%	-
P value	0.001** (Z=3.430)	0.001** (Z=3.420)	-

In comparison of ROM between two groups, Pre-Assessment shows a P value of 0.838 and Post-Assessment shows a P value of <0.001.

Table 3: Comparison of VAS between two groups Results are presented in Mean ± SD (Min-max)

VAS	Group A	Group B	P value
Pre-Assessment	6.33±0.72 (5-7)	6.13±1.06 (5-8)	**0.432** (t=0.603))
Post-Assessment	3.53±0.74 (2-5)	2.00±0.66 (1-3)	**<0.001**** (t=5.996)
% Change	44.2%	67.4%	-
P value	0.001**(t=9.459)	0.001**(t=11.808)	-

In comparison of VAS between two groups, Pre-Assessment shows a P value of 0.438 and Post-Assessment shows a P value of <0.001.

Table 4: Comparison of Foot Pronation angle between two groups

Foot Pronation angle	Group A	Group B	P value
Pre-Assessment	10.87±1.06 (9-12)	11.00±0.85 (9-12)	**0.728**(t=0.381)
Post-Assessment	6.93±0.96 (5-8)	5.13±1.06 (4-7)	**<0.001****(t=4.872)
% Change	36.2%	53.4%	-
P value	0.001**(t=10.597)	0.001**(t=21.433)	-

In comparison of Foot Pronation Angle between two groups, Pre-Assessment shows a P value of 0.728 and Post-Assessment shows a P value of <0.001.

Table 5: Comparison of outcome between two groups

Outcome	Group A	Group B	P value	Effect size
ROM	4.20±1.57	7.07±1.83	**<0.001****	1.64 (VL)
VAS	2.80±1.15	4.13±1.36	**0.012****	1.03 (L)
Foot Pronation Angle	3.93±1.44	5.87±1.06	**0.001****	1.49 (VL)

L: Large effect; VL: Very Large Effect

In comparison of outcome between two groups, shows a significant difference in improvement on ROM with P value of <0.0.001, VAS with P value of 0.0.012 and Foot Pronation Ankle with P value of 0.001.

DISCUSSION

The Study is an experimental comparative trial to find out the effectiveness of Trigger Point Therapy and Sustained Manual Stretching to the posterior compartment of leg (triceps surae region) along with conventional treatments in the treatment of chronic plantar fasciitis. The duration and age are almost similar in both groups. The outcome was measured using Visual Analogue Scale for pain

and Ankle Dorsiflexion Range on Motion and Foot Pronation angle with a Goniometer.

The Group-A has received Sustained Manual Stretching to the posterior compartment of leg in addition to the ultrasound therapy while the Group-B received combined treatment protocol consisted of Trigger Point Therapy and ultrasound therapy.

A two-week treatment program administered to the groups in adjunct to conventional physical therapy improved the active dorsiflexion ROM, reduced foot pronation in weight bearing and reduction in pain.

From the analysis it was demonstrated that pain, active dorsiflexion range of motion and decreased foot pronation angle showed improvement in group–A. Statistical analysis between groups showed significant difference in active dorsiflexion range of motion and pain in group-B over the control group this permits rejection of Null hypothesis.

The application of ultrasound therapy has a major effect in reducing pain in the plantar region, ultrasound results in

Stimulation of cutaneous thermal receptors increased soft tissue extensibility changes in nerve conduction due to increased tissue temperature. Modulation of inflammation due to the non-thermal effect[15, 22] .

Trigger point therapy needs to release the contractured sarcomeres of the contraction knots in the trigger point. The trigger point therapy is likely to rupture contraction knots, destroying the corresponding motor and plates as functional structures and increasing the painfulness of the procedure. Then it will rupture the sarcolemmal membrane at the contraction knots, the muscle fibre would spill myoglobin. In addition to the effect of stretch, this rupture process may be one reason for the effectiveness of trigger point therapy[15 & 22].

When stressful forces (therapeutic) are gradually applied to fascia, there is at first an elastic reaction in which a degree of slack is allowed to be taken up, followed if the force persists, by what is colloquially referred to as 'creep' (a variable degree of resistance) occurs. This gradual change in shape results from viscoelastic property of tissue. This finally results in reduction of tightness of triceps surae and thus improves range of motion[23].

There may also happened 'hysterisis', which describes the process of energy loss due to friction and to minute structural damage, which occurs when tissues are loaded and unloaded. During treatment, hysterisis induction reduces stiffness and improves the way the tissue will respond to subsequent demands.

There may also be occurring the neuro-reflexive changes with the application of manual force on the musculoskeletal system. Hands on application of force to the musculoskeletal system results in afferent stimulation through mechanoreceptors that require central processing of the spinal cord, brain and cortical levels. Afferent stimulation frequently results in efferent inhibition[24].

Release occurs by applying carefully directed forces against barriers i.e. tightness, which may be due to general myo-tactically controlled mechanoreceptor responses[25].

Thus improving flexibility of triceps sure muscle group may reduce over pronation during gait and assist foot to supinate progressively locks the midtarsal joint and promotes stability throughout the foot creating rigid lever propulsion[26].

Analysis of result between groups showed improvement in active dorsiflexion range of motion, which indicate reduction in the triceps surae tightness and which may leading to the reduction of over pronation of subtalar joint. Thus the strain in the plantar fascia is getting reduced and thus reduction of plantar fascial pain.

Discussion may be concluded as effect of trigger point therapy in chronic plantar fasciitis gives the results that there is significant increase in active range of motion in Group – B, there is significant reduction in pain in both groups but the group – B shows more percentage of reduction when comparing the post treatment values.

CONCLUSION

The purpose of this investigation was to compare the effectiveness of trigger point therapy and sustained manual stretching in the management of chronic plantar fasciitis. Most significant aspect of this study was the quantification of changes in dorsiflexion ROM, foot pronation angle and pain in chronic plantar fasciitis while giving trigger point therapy and sustained manual stretching.

The study provides trigger point therapy as an effective treatment for chronic plantar fasciitis

by improving flexibility of ankle dorsiflexion range of motion and pain reduction. In this context trigger point therapy is to be considered as an essential component of treatment for chronic plantar fasciitis. This technique is cost effective and can easily be applied in clinical set up.

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