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Comparing the effectiveness of strain-counter strain and taping on plantar fasciitis

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Abstract
Background: Plantar Fasciitis is an inflammatory process classified as an overuse syndrome resulting in micro tears of plantar fascia at its origin. The two most common underlying causes of the plantar heel pain are degenerative and mechanical due to overuse or trauma. Excessive pronation and the biomechanics of adducted talus and everted calcaneus results in increased tension causing the arch to collapse and creating excessive stress on the plantar fascia. Strain and counter-strain is a soft tissue mobilization technique is passive positional technique aimed at relieving musculoskeletal pain and dysfunction through manual manipulation**.** Plantar fascia taping stabilizes and offloads the stress on plantar fascia ligament. Techniques like strain counter strain and tapping provide relief from the symptoms and it may act as a precursor to long term management.so in order to find out better treatment tool, study was conducted to compare the effectiveness of strain-counter strain and taping on plantar fasciitis.
Method: 40 participants aged between 25-65 years both male and female with plantar fasciitis were included in the study. The participants were treated for a period of 7 days using the technique of strain counterstain and conventional physiotherapy treatment to group A (n=20) whereas group B (n=20) received Taping technique and conventional physiotherapy treatment. Pretreatment and post treatment assessment were done by using PFPS Plantar Fasciitis pain and disability scale. The scores were analyzed using paired and unpaired 't' test.
Result: Statistical analysis: Statistical analysis was done by the instat3. Paired 't' test was used to compare the difference of PFPS score on 1st day and on 7th day for taping. Which was statistically significant $p<0.005$. Paired 't' test was used to compare the difference of PFPS score on 1st day and on 7th day for strain and counter-strain, which was statistically significant $p<0.005$.Unpaired 't' test was used to compare the difference of PFPS score on 7th day of strain counter-strain and on 7th day of taping. The result were statistically not significant with $p > 0.05$.
Conclusion: Strain and counter-strain and taping both techniques are effective therapeutic option in the treatment of plantar fasciitis. But while comparing both the groups there was no statistical difference in the effectiveness of strain and counter-strain and taping on plantar fasciitis.

Keywords: plantar fasciitis, strain and counter-strain, Taping, (PFPS) Pain and disability scale

Introduction

Plantar fasciitis is one of the most common cause of inferior heel pain. It is typically precipitated by biomechanical stress [1]. Individuals most prone to plantar heel pain are middle-aged women, obese individuals, athletes and male runners. Plantar fasciitis has been reported across a wide sample of the community. In non-athletic population, it is most frequently seen in weight bearing occupations. 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. Basketball, tennis, football, long distance runner and dance have all noted high frequency of plantar fasciitis [1].

This inflammatory response has been classified as an overuse syndrome resulting in micro tears of plantar fascia at its origin. The two most common underlying causes of the plantar heel pain are degenerative and mechanical due to overuse or trauma [2]. Excessive pronation is a commonly risk factor due to plantar flexion and adduction of a talus during weight bearing, causing the calcaneus to Evert. The biomechanics of adducted talus and everted calcaneus results in increased tension in the structures of the plantar surface of the foot, causing the arch to collapse and creating excessive stress on the plantar fascia [3].

Plantar fascia is plantar aponeurosis, lies superficial to the muscles of the 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 plantar surface. It maintains the medial longitudinal arch of the foot and assist during gait cycle and facilitates shock absorption during weight bearing activities [4].

The classic presentation of plantar fascia is the pain on the sole of the foot at the inferior region of the heel. patient complains the pain to be particularly bad with the first step taken on rising in the morning or after prolonged rest or pain comes after weight bearing activity [5]. After few steps and through the course of the day, heel pain diminishes, but returns if intense or prolonged weight bearing activity is undertaken. Pain is usually located on medial tuberosity of calcaneus. Generally, pain is more significant when weight bearing activities are involved [1].

Various physiotherapy treatment protocols have been advocated in the past such as rest, taping, orthosis-night splint, silicon heel cups, stretching and myofascial release. Electrotherapy modalities in the form of ultrasound, phonophoresis, laser, microwave diathermy, iontophoresis,

cryotherapy, contrast bath [6].

Strain and counter-strain is a soft tissue mobilization technique [7]. and is one of the physical therapy treatments given in the chronic conditions that causes tightness and restriction in the soft tissues. Strain and counter strain is fourth most commonly used osteopathic manipulative technique (Jones and kurtz; 2003) which is passive positional technique aimed at relieving musculoskeletal pain and dysfunction through manual manipulation (D. Amborgio and Roth, 1997). Lawrence Jones, defined it as "a mild over-stretching applied in a direction to the false and continuing message of strain, which the body is suffering. This is accomplished by shortening the muscle containing the false stretch message so much that it stops reporting the strain [7]. Accurate palpation of diagnostic tender point (TP) is central to strain and counter strain. Thus, it can be described as tender point of ligaments or facial fibers. When muscles and soft tissues are injured a strain is produced at the site of injury. A sore; tender point can be felt at the location of injury while palpating the tender point if the patient's body is positioned so that the pain is relieved this new position reproduces the position of injury and paradoxically relaxes the tissue (counter strain) [2, 8, 9].

Plantar fascia taping is a common way to help relieve the symptoms of plantar fasciitis. Plantar fascia taping is widely used to add support, reduce stress on the plantar fascia ligament as both a way to relieve pain from plantar fasciitis as well as preventive measure against that and other heel pain ailments. Plantar fascia taping is a good way to stabilize the fascia ligament. It is often used to offload stress on the plantar fascialigament. When the foot is taped properly, the fascia's movement becomes limited. By limiting the fascia's movement, it becomes a way to keep the ligament from moving abnormally or stretching excessively and thus preventing tears from developing in the tissue [5].

Hence these techniques are proposed to resolve plantar fasciitis.

The present study was undertaken with the intention to find out the effectiveness of strain and counter-strain in plantar fasciitis, in conjunction with conventional treatment and to compare the effectiveness of taping with conventional treatment by using Plantar fasciitis pain and disability scale (PFPS) [10].

PFPS gives u more detailed, analytical analysis of patients. PFPS scale is effective in measuring pain that is unique to plantar fasciitis through questions of mobility/function and activities of daily living. Lesser the score good is the outcome. Domains of the PFPS scale are pain description, mobility/function and activities of daily living [10].

Need of the Study

Plantar fasciitis is a commonly faced problem, which affects many individuals. This pain related to the plantar fascia affects patient both physically and psychologically hampering functional outcome. Various treatment protocols are available but it is necessary that treatments relieve pain and increases patient's functional capacity that should be used as a first priority. Techniques like strain counter strain and tapping provide relief from the symptoms that frequently keep patients from attending work and participating in their functional activities. It may act as a precursor to long term management. Is a relatively simple method used to help ease pain associated with the condition and creates immediate symptom relief. But there are very few studies suggesting which of the two techniques are better. So there was a need to see and compare the effectiveness of tapping and strain and counter strain on plantar fasciitis.

Aims and Objectives

Aim: to compare the effectiveness of taping and Strain counter- strain in patients with plantar fasciitis.

Objectives

- To find effectiveness of taping on pain and functional outcome in plantar fasciitis patients.
- To find effectiveness of strain and counter strain on pain and functional outcome in plantar fasciitis patients.
- To compare effectiveness of taping and Strain counter strain on pain and on functional outcome in plantar fasciitis.

Research Design and Methodology

- Study design: Randomised controlled trail
- Study setting: This study was conducted in the college of physiotherapy, PIMS Loni and Seth G.S.M college and K.E.M Hospital, Mumbai.
- Duration of the study: The total duration of study was 4 months after the date of ethical clearance.
- Sample selection: Sample size: 40 plantar fasciitis patients
- Sampling method: convenient sampling.

Inclusion Criteria

Subjects were selected for the study if they fulfilled the following criteria:

- Clinically diagnosed cases of plantar fasciitis not less than 6 weeks
- Age between 25 to 65 years both male and female
- Pain with the first steps upon waking
- Pain located at the heel or plantar surface of midfoot consistent with plantar fasciitis (defined as pain immediately upon awakening and pain with walking or jogging) [1, 2, 8].

Exclusion Criteria

- Previous surgery or treatment for plantar fasciitis including surgery and anti-inflammatory drugs.
- History of ankle and foot fracture
- Congenital deformity of the foot or ankle
- Spasticity throughout the lower extremity
- Use of an assistive device for ambulation
- Arthritis

Outcome Measures

- Functional outcome assessed by Plantar fasciitis pain and disability scale score. (PFPS)[10]

Material Used

- Patient's record file.
- PFPS form
- Pen
- Rigid tape (1,1.5,2 inches wide)
- Scissor

Procedure

Ethical clearance was obtained followed by all the

participant with clinical diagnosis of plantar fasciitis were screened for the study. As per the suitable inclusion and exclusion criteria, participants were randomly allocated to any one group and informed written consent was obtained from them. Total 40 individuals 20 in each group divided randomly into two groups. Then pain and functional assessment was carried out by using PFPS scale.

Group A

Participants were treated with

1. Ultrasound with an output of 1W/cm^2 for 5 minutes using a pulsed mode with frequency of 1 MHz for 3 sittings (alternate days) for 1 week [1].
2. Contrast bath was given for 20 minutes 1:2 ratio; hot: cold for 3 sittings (alternate day) for 1 week [11].
3. Exercise for intrinsic muscles:
1. Towel curl up for towel curl ups participants sat with foot flat on the end of towel placed on a smooth surface small weight is kept at the other end of towel. Keeping the heel on the floor, the towel was pulled towards the body by curling the towel with the toes, for 10 minutes [12].
2. Active ankle exercises:

Dorsiflexion, Plantarflexion, inversion, eversion in supine lying 10 repetition [12].

3. TA stretching: self-stretching of Achilles tendon with towel, hold for 30 seconds and 3 repetitions [12].
4. Plantar fascia stretching with tennis ball. Participant sitting on the chair rolling foot on the ball for 5 minutes [13, 14].

The conventional physiotherapy was followed by strain and counter-strain manipulation.

Strain and counter-strain technique

Lateral calcaneus is palpated with middle finger applying medial directed force to the lateral calcaneal tubercle. With patient side lying on ipsilateral leg and practitioner grasping the plantar heel, the position of comfort is obtained by leaning on to the calcaneus to create rearfoot eversion while the distal hand holds the anterior talus causing rotation around subtalar joint axis. Hold the position of comfort for 90 seconds and repeated [2].

Group B

Participants received conventional treatment as group along with taping

The conventional physiotherapy management will be given. Taping for Plantar fasciitis is a relatively simple method used to help ease pain associated with the condition. Tape can be applied in the morning do reduce strain throughout the day, or just prior to exercise to keep the fascia from moving too much during physical activity. To help the tape stick, the feet should be cleaned with a non-moisturizing spray. In addition, feet should also be kept dry [5].

Taping plantar fascia:

1. Start by taping around the ball of the foot (metatarsal) area. Next, wrap another piece of tape around the heel and attach it to the tape around the ball of the foot.
2. Place a strip around the metatarsal region and then cross the mid-foot diagonally before wrapping it around the heel and crossing the mid foot again. This makes an X shape across the mid- foot and it is responsible for giving support to the plantar fascia. Repeat this wrap three times to ensure that it will hold up and create a strong support.
3. Finish the taping by applying tape horizontally across the foot to cover the previous strips. When this is finished, the bottom (plantar) surface of the foot should be almost entirely covered from the metatarsal region to the heel. This will add the support necessary to allow the fascia ligament to rest [5].

All the participants were advised to use soft heal foot wear, not to stand for long time and not to walk bare foot. Participants were instructed not to do any stretching exercises at home [1, 5].

Outcome was assessed, at the end of one week, based on PFPS [10]

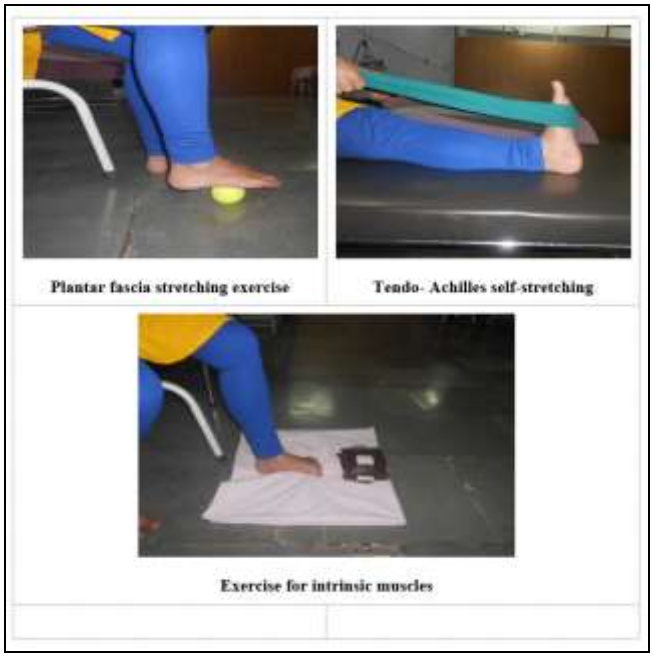


Fig 1

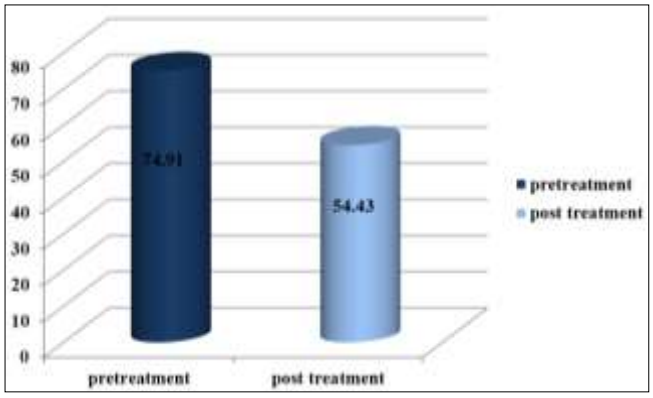
Fig 2: Strain and counter-strain manipulation for plantar fasciitis

Fig 3: Taping technique for Plantar fasciitis

Data Presentation and Interpretation

Table 1: Table showing effect of strain and counter strain on plantar fasciitis

	Mean± SD	Mean± SD	"t" value	"p" value	Result
Strain and counter-strain	74.91± 1.029	54.43±1.607	48.744	<0.005	Significant

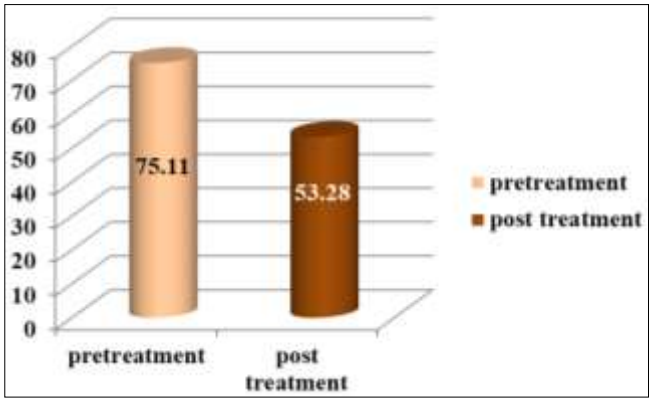


Graph 1: PFPS Score of strain and counter strain

Result
There is significant difference in mean score on PFPS for strain and counter-strain pretreatment it was 74.91 and post treatment it was 54.43

Table 2: Table showing effect of taping on plantar fasciitis

	Mean± SD	Mean± SD	"t" value	"p" value	Result
Taping	75.11±0.8322	53.28±1.883	58.507	<0.005	Significant



Graph 2: PFPS Score of taping

Result
There is significant difference between mean score on PFPS, for taping pretreatment it was 75.11 and post treatment it was 53.28

Table 3: Table showing comparison of taping and strain and counter strain on plantar fasciitis

	Mean± SD	Mean± SD	"t" value	"p" value	Result
Taping v/s Strain and counter-strain	21.83	20.48	2.403	>0.05	Not significant

Graph 3: PFPS Score of strain and counter strain and taping

Result
There is no significant difference between PFPS mean score

of taping which was 21.83 and for strain and counter-strain it was 20.403

Statistical analysis: Statistical analysis was done by the instat3 software and also manually which was done to cross check the outcomes.

Paired 't' test was used to compare the difference of PFPS score on 1st day and on 7th day for taping. Which was statistically significant $p<0.005$?

Paired 't' test was used to compare the difference of PFPS scoreon 1st day and on 7th day for strain and counter-strain. Which was statistically significant $p<0.005$?

Unpaired 't' test was used to compare the difference of PFPS score on 7th day of strain counter-strain and on 7th day of taping. The result were statistically not significant with $p > 0.05$.

Discussion

Plantar fasciitis is one of the conditions which can be treated by a wide variety of physiotherapy methods. The present study was undertaken with the intention to find out the effectiveness of strain and counter-strain in plantar fasciitis, in conjunction with conventional treatment and to compare the effectiveness of taping with conventional treatment by using (PFPS) [10]

Strain counter strain is passive positional technique aimed at relieving musculoskeletal pain and dysfunction through manual manipulation (D.Amborgio and Roth, 1997). Strain and counter strain: Lawrence Jones, defined "a mild over-stretching applied in a direction to the false and continuing message of strain, which the body is suffering. This is accomplished by shortening the muscle containing the false stretch message so much that it stops reporting the strain [7].

Accurate palpation of diagnostic tender point (TP) is central to strain and counter strain. Thus, it can be described as tender point of ligaments or facial fibers. When muscles and soft tissues are injured a strain is produced at the site of injury. A sore; tender point can be felt at the location of injury while palpating the tender point if the patient's body is positioned so that the pain is relieved this new position reproduces the position of injury and paradoxically relaxes the tissue (counter strain) [2, 8, 9].

Plantar fascia taping is used to add support, reduce stress on the plantar fascia ligament as both a way to relieve pain from plantar fasciitis as well as preventive measure against that and other heel pain ailments. Plantar fascia taping is a good way to stabilize the fascia ligament. It offloads the stress on the plantar fascia ligament. By limiting the fascia's movement, it becomes a way to keep the ligament from moving abnormally or stretching excessively and thus preventing tears from developing in the tissue [5].

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Conclusion

On the basis of present study, it can be concluded that conservative treatment approach like physiotherapy in the treatment of plantar fasciitis, is beneficial. Although both the conventional treatment and strain and counter-strain and taping have found to be effective in alleviation of symptoms and associated disability in plantar fasciitis. Both the groups showed benefits in terms of reduction of pain and increase in functional ability in terms of PFPS. But while comparing both the groups there was no difference in the effectiveness of strain and counter-strain and taping on plantar fasciitis. Hence it can be concluded that strain and counter-strain and taping both are effective therapeutic option in the treatment of plantar fasciitis.

Limitation of Study

- Small sample size.
- Result cannot be generalized to large population

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