

Comparative Effectiveness of Kinesiotaping and Low Dye Taping In Improving Pain and Disability in Subjects with Plantar Fasciitis

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ABSTRACT

Background: PF also known as the painful heel syndrome occurs in both males and females is primarily an overuse injury involving the inflammation of the fascia on the plantar surface of the foot and micro-tears of the plantar fascia at its insertion on the calcaneus. Conservative treatment involving the use of strapping or structural correction is a first line intervention for PF treatment. The knowledge gained on the effectiveness of Kinesio taping versus Low-Dye taping, and which is the superior form of strapping for PF, may assist the practitioner in achieving a better and comprehensive treatment plan of PF.

Objective: To find out the comparative effectiveness of kinesiotaping in conjunction with conventional treatment and low dye taping in conjunction with conventional treatment for improving heel pain and disability in subjects with Plantar fasciitis.

Study design: Randomized control trial

Setting: Participants were enrolled from Safdarjung Hospital-Sports Injury Centre, Pandit Deendayal Upadhyaya National Institute for Persons with Physical Disabilities, ISIC Institute of Rehabilitation Sciences

Patients: 45 subjects who were diagnosed with plantar fasciitis were included in the study

Intervention: All the three groups received home exercises and supervised conventional exercise programme. The two experimental groups received Kinesiotaping and Low Dye Taping respectively.

Measurements: Outcome measures included Numeric Pain Rating Scale (NPRS 11), Revised Foot Function Index (RFFI), Visual Analogue Scale (VAS).

Results: There was significant improvement in Numeric Pain Rating Scale (NPRS 11), Revised Foot Function Index (RFFI), Visual Analogue Scale (VAS) within the groups at 1 week post intervention. Between groups analysis showed significant improvement in Visual Analogue Scale (VAS).

Limitations: Small sample size (n=45).no follow ups done.

Conclusion: Addition of Kinesiotaping to the conventional group brought significant difference from conventional therapy group alone in improving first step pain (VAS) after one week of intervention but there was significant improvement in each group after one week post intervention.

Keywords: Plantar fasciitis, Plantar heel pain, Kinesiotaping, Low Dye Taping, Phonophoresis.

INTRODUCTION

Plantar fasciitis (PF) is the most common foot condition treated by healthcare professionals accounting for 15% of foot disorders with more than 10% of the population affected by it over their lifetime.^[1-4] It accounts for 7-14% of all sporting injuries^[5] and is especially prevalent in

sports requiring a posterior depression of the pelvis.^[6]

Current literature suggests that plantar fasciitis is caused by the collagen degeneration at the origin of plantar fascia at the medial calcaneal tubercle so, PF is termed fasciosis because of the chronicity of

the disease and the evidence of degeneration rather than inflammation. [9,10]

The most common presenting symptom of PF is a sharp pain of insidious onset with maximal tenderness at the anterior medial border of the calcaneus. [3,4,6,7] The pain is worst on the first few steps in the morning [3,4] and with initial steps after prolonged sitting or inactivity. [4]

Predominantly, PF is treated conservatively. Conservative management employs many different techniques including: rest, [6] cryotherapy, [11] therapeutic ultrasound, [12] stretching and strengthening, [13] manipulation, [14] orthotics, [13] strapping [15] and night splints [6] all of which have been shown to be beneficial along with operative treatment.

There are different ways of strapping available -Low dye taping and Elastic taping. Several authors agree that Low-Dye taping of the foot is effective in the treatment of PF. [14-18] Immobilisation by Low-Dye taping shortens the distance between origin and insertion of the plantar musculature and fascia relieving the strain and tensile forces on weight bearing. In this way the strapping aims to allow healing to occur naturally. [8,15]

Kinesio tape is a thin elastic tape invented by Kase in the 1970s. It is widely used to prevent injuries in athletes and it has a number of proposed beneficial properties. Studies in 2010 showed that taping with Kinesio tape, in addition to traditional therapy, was more effective in the treatment of PF than traditional therapy alone as it corrects muscle function by strengthening weakened muscles, improves circulation of blood and lymph by eliminating tissue fluid (oedema) and bleeding beneath the skin therefore decreasing swelling, decreases pain through neurological suppression, repositions subluxed joints by relieving abnormal muscle tension, helping to return the function of fascia and muscle.

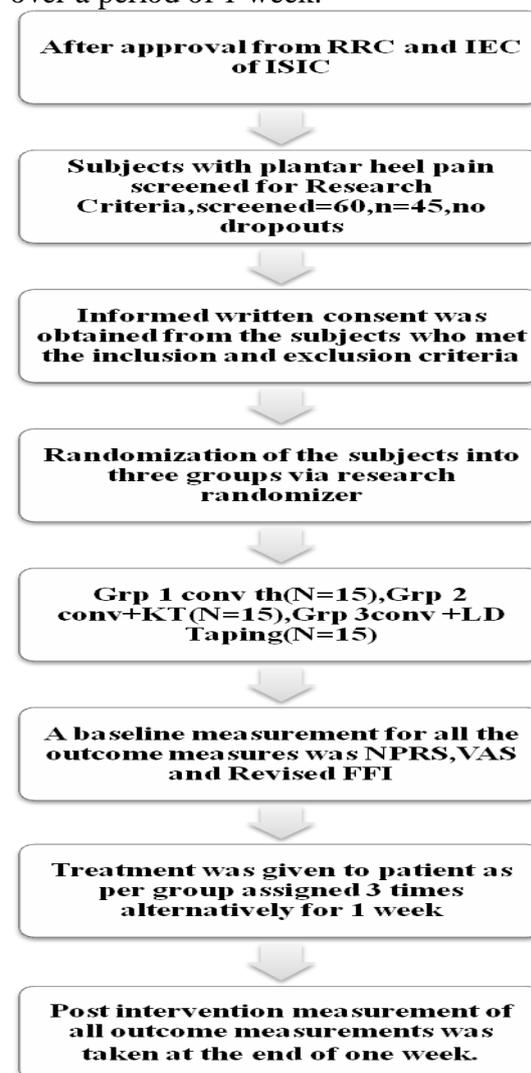
MATERIALS AND METHODS

The study was approved by RRC and IEC from Indian spinal injuries centre New Delhi. We recruited 45 subjects from

Safdarjung hospital New Delhi, Pt Deendayal Upadhyaya National Institute for physically handicapped New Delhi and Indian spinal injuries centre New Delhi. Subjects diagnosed with plantar fasciitis were included in this study.

Criteria for inclusion were both male and female subjects of age 25 to 50 years, positive windlass test, negative tarsal tunnel test complaining of unilateral involvement of plantar fasciitis from 6 weeks to 3 months. [19]

Prior to the treatment, the patients were educated about the protocol and after the treatment the subjects were assessed for any increase in pain. If no adverse reaction, open wound/skin allergy in area to be taped was reported further sessions were carried out. 3 sessions of conventional treatment over a period of 1 week.



Group A- Conventional therapy Phonophoresis: Therapeutic ultrasound with Fastum gel on continuous mode; intensity of $1\text{W}/\text{CM}^2$, frequency of 1 Mhz for 5 minutes, will be given three times (alternate day in a week). [19]



Figure1- Ultrasound machine (Enraf Nonius Sonopuls 490)



Figure 2-Ultrasound gel

Towel curl up-For this, subjects sat with foot flat on the end of the surface and small weight was kept at the end of towel keeping the heel on the floor and the towel was pulled towards the body by curling the towel with toes for 10 minutes. [19]



Figure 3 -Towel curling exercise

Stretching exercises-

Active Tendo Achilles stretching in standing by leaning against the wall, holding each stretch for 1 minute and repeating 5 times each.



Figure 4- Plantar fascia stretching

Plantar fascia stretching with tennis ball-Subject sat on the chair rolling foot on a ball for 5 minutes. [19]



Figure 5- Plantar fascia stretching

Group B received kinesiotaping along with conventional treatment (as mentioned in Group A).Patient was positioned in prone with feet off the end of the table and gastrocnemius, plantar fascia were taped using Y and Palm taping technique respectively. [20]

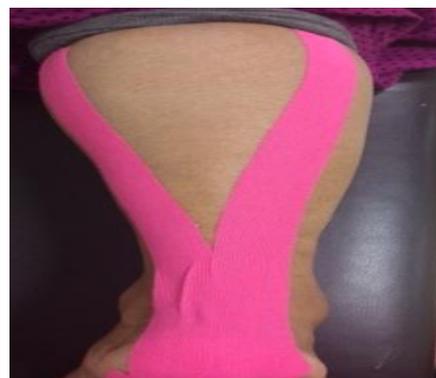


Figure 6- Taping on gastrocnemius muscle



Figure 7-Taping on Plantar fascia

Group C received low dye taping along with conventional treatment (as mentioned in Group A). Patient was positioned in prone with feet off the end of the table and foot was taped using Low dye taping technique. [21]



Figure 8- Low Dye Taping



Figure 9- Low Dye Taping

Statistical Analysis

The statistical package of social sciences for windows, version 21.0 was used to analyse the data. Analysis was done for 45 subjects who completed the study on all the outcome measures that are VAS,RFFI,NPRS.

Normality was tested using Shapiro Wilk test. One way ANOVA was done for between group analysis of all the outcome variables. In case of significance, post hoc testing was done using Tukey-Kramer test for pair wise comparisons. With-in group pre post scores was done using paired t-test. A probability level of 0.05 was selected as the criterion for significance in all tests.

RESULTS

Subject demographics and baseline values (pre-treatment) showed no significant difference in heel pain intensity score (NPRS), first step pain(VAS) and foot disability (RFFI).

One-way ANOVA for between group comparison was done for three groups of which VAS for first step pain showed significant difference ($p=0.03$).

Significant difference was found between pre and post treatment ($p=0.00$) for NPRS,RFFI and VAS in within group analysis for Group 1,2 and 3.

DISCUSSION

Within group analysis, significant improvement was found in all the outcome variables, NPRS,VAS,RFFI for each group($p=0.00$).One-way ANOVA for between group comparison was done for three groups of which VAS for first step pain showed significant difference($F=3.8$, $p=0.031$).

The statistical analysis of the VAS showed that there was a significant time effect for both groups ($p < 0.001$) which means that both treatment groups were effective at reducing the mean VAS over the course of the study period. There was a statistically significant treatment effect showing that the Kinesio group improved better than the Low-Dye group. The Kinesio group showed a faster rate of decrease than the Low-Dye group.

First step pain is the most characteristic pain of PF, worst on the first few steps in the morning. [13] It is the result of stretching the contracted and damaged plantar fascia causing pain. The pain improves with further ambulation.

The Kinesio tape group decreased morning pain overall .This may be as a result of the tape being worn for up to three days over which time the tape could act on correcting intrinsic muscle imbalances in the foot, aiding the correct functioning of the fascia itself, reducing oedema and inflammation by stimulating blood circulation and neurologically stimulating

the proprioceptive nerve fibres and reducing pain.

The Kinesio group may have been able to more effectively reduce the VAS of participants due to its stimulating effect on proprioceptive A-beta fibres which decrease the effect of nociceptive C fibres, proven by studies done by Illes in 2009. The Low-Dye tape also reduced mean VAS readings in participants, although less effectively although less effectively. This may have been accomplished by shortening the distance between origin and insertion of the plantar musculature and fascia which relieved the strain and tensile forces on weight bearing. In this way the strapping allowed healing to occur naturally with the

healing of the plantar fascia also being less painful. [8]

There was a significant time effect ($p < 0.001$) indicating that both groups decreased the total FFI score over time within groups.

Table 1-Subject demographics of study sample (N=45), BMI-Body Mass Index

Characteristics	Group 1	Group 2	Group 3
No. of subjects	15	15	15
Age (years) Mean±SD Range	44.3±6.1 (30-50)	34.7±6.4 (25-45)	38.1±8.1 (25-50)
Gender	Males	7	9
	Female	8	6
Height in cm Mean±SD Range	164±4.5 (158-171)	162.8±3.2 (158-171)	163.5±4.6 (158-174)
Weight in Kg Mean±SD Range	64.5±6.5 (50-75)	60.9±8.1 (47-80)	59.6±7.3 (45-72)
BMI (kg/m ²) Mean±SD Range	23.9±1.9 (18.9- 25.9)	22.9±2.8 (18.7- 29.5)	22.3±2.8 (17.2- 27.6)

Table-2 Comparison of outcomes between Group A, Group B and Group C,*Significance at 00.5 level

Outcomes	Group A	Group B	Group C	F value	p-value
NPRS	3.1±1.2	3.8±1.1	4.0±0.9	3.08	0.56
VAS	30.6±11.9	42.2±9.1	37.1±13.3	3.77	0.03*
RFFI	37.3±19.7	37.1±13.3	45.4±11.2	1.74	0.18

Table 3- Post hoc analysis for VAS between groups,

GROUPS	MEAN DIFFERENCE	P-VALUE
Conventional vs Kinesiotaping	11.60*	0.02*
Kinesiotaping Vs Low Dye	5.06	4.23
Low Dye vs Conventional	6.53	4.23

* Significance at 00.5 level

These findings suggest that both treatments may be effective in reducing the total FFI score because neither one was statistically superior to the other. The overall decrease in FFI Total score for the Kinesio tape group may be a result of the reduction in oedema and inflammation due to the tape lifting the skin. The tape may have also aided the correct functioning of the plantar fascia and intrinsic foot muscles and neurologically suppressed the pain of the PF.

The statistical analysis of the Low-Dye group showed there was also a significant improvement in the participants FFI Total score. The reason for this improvement may have been due to the Low- Dye tape immobilizing the plantar fascia and allowing healing.

The Kinesio tape group decreased morning pain overall. This may be as a

result of the tape being worn for up to three days over which time the tape could act on correcting intrinsic muscle imbalances in the foot, aiding the correct functioning of the fascia itself, reducing oedema and inflammation by stimulating blood circulation and neurologically stimulating the proprioceptive nerve fibres and reducing pain.

In this study all the three groups received phonophoresis as a part of conventional treatment for plantar fasciitis. A study by Cagnie concluded that phonophoresis given as treatment for plantar fasciitis helps in reduction of pain.

We also included both weight bearing Achilles tendon stretching and plantar fascia specific stretching in conventional physiotherapy regimen which was received by the subjects. This could have brought this significant result in all the groups. [19]

Study Limitations

1. One limitation of this study is that we concluded only short-term effects thus missing an opportunity to look at the

long-term effects on healing and prevention of recurrence which can occur with the performance of daily activities by the subjects.

2. The sample size used was smaller.
3. The absence of a true no treatment control group makes it difficult to differentiate between the treatment effect and the natural course of the disorder.
4. Foot Posture Index was not considered in this study.

Future Researches

1. Studies with long follow up and more sample size should be conducted.
2. The risk factors of plantar fasciitis shall be considered while designing new studies in plantar fasciitis.
3. More studies shall be done for analysing the efficacy of Kinesiotaping and Low dye taping in subjects with plantar fasciitis as we could find only anecdotal evidences for the same.
4. Further studies should be done for the efficacy of different techniques of kinesiotaping and low dye taping on fascia itself as we could not find and published articles on the same.

CONCLUSION

In conclusion, addition of Kinesiotaping to the conventional group brought significant difference from conventional therapy group alone in improving first step pain (VAS) after one week of intervention. However important point to remember is that both the taping techniques are operator dependent procedure and results could vary from therapist to therapist.

Kinesiotaping and Low Dye Taping in conjunction with conventional physiotherapeutic treatment are efficacious tools for short term treatment of plantar fasciitis as both groups showed improvement in all outcome variables after one week of intervention.

More randomized control trails are needed to explore the effectiveness of

Kinesiotaping and Low Dye Taping technique in managing plantar fasciitis.

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