Int J Pharm Bio Sci 2015 July; 6(3): (B) 486 - 497

Research Article **Physiotherapy**

International Journal of Pharma and Bio Sciences **ISSN 0975-6299**

COMPARATIVE STUDY OF KINESIOTAPING VERSUS INTRINSIC MUSCLE STRENGTHENING AND CRYOTHERAPY IN THE TREATMENT OF CHRONIC PLANTAR FASCITIS

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ABSTRACT

Plantar fascitis is a common chronic overuse injury of the plantar fascia worldwide. A Comparative study was conducted with a total of 30 subjects where subjects were divided equally into two groups by lottery method. Patients in Group B received intrinsic muscle strengthening exercises and cryotherapy and the Group A received only Kinesiotaping. Each patient was assessed on day 1st i.e.pre-treatment and on day 7th i.e.post-treatment with Plantar fascitis pain scale (PFPS), Foot function index (FFI) and the changes in the Ultrasonography (USG). Group A and Group B were compared using Chi-square test and ~~the~~ Student t test. In relation to USG, PFPS and FFI, Group A shows lesser pain with the decreased plantar fascial thickness than Group B on Day 7, with the P value <0.001. Thus, this study concludes that, Group A shows significant improvement in all parameters than Group B.

KEYWORDS: **Kinesiotaping, Plantar fascitis, Cryotherapy, Ultrasonography**

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INTRODUCTION

Plantar fascitis is a common chronic overuse injury of the plantar fascia. The initial symptom is heel pain at the moment of the first step on the floor when getting out of bed in the morning. The symptom may be released gradually after walking. However, the pain may recur later on if the stepping force is increased or the continuous weight bearing period is prolonged. Repetitive minor trauma may cause persistent chronic pain. [1, 2]Therapeutic interventions include systemic medication, ultrasound therapy, deep friction massage, strengthening of toe flexors, foot arch support, heel cushion, traditional nonelastic taping, night splinting, and local steroid injection. The plantar fascia is the main stabilizer of the medial longitudinal arch of the foot against ground reactive forces, and is instrumental in reconfiguring the foot into a rigid platform before toe-off. Plantar fascitis affects about 10% of the population at least in one moment in life, being obese women at menopause age most affected,[3] In the 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 fascitis is in the athletic population, 10% of all running athletes. Basket ball, tennis, football, long distance runner and dance have all noted high frequency of plantar fascitis. [4, 5]Plantar fascitis has been reported across a wide sample of the community. The etiology of plantar fascitis is unclear; diagnosis is usually based on clinical signs, including: plantar heel pain when weight-bearing after a period on non-weight-bearing, pain that eases within but then increases with further use as the day progresses, and pain on palpation. [6, 7] Plantar fasciitis can be a frustrating disorder to treat successfully; most successfully when treatment is started within six weeks after the onset of symptoms. [8][9]

MATERIALS AND METHODS

A Comparative study was done on Patients with chronic unilateral plantar fascitis with sample size of 30. Random sampling was done by using the lottery method, where chit – A represents the Group A and chit – B represents the Group B. Data was collected from Dr. D. Y. Patil College of Physiotherapy, Pimpri, Pune, with chronic unilateral plantar fascitis fulfilling the inclusion and exclusion criteria. Materials used in Group A were kinesio tape and scissors. Materials used in Group B were cold pack and towel. Outcome measure was recorded by Ultrasonography, Plantar fascitis pain scale and Foot function index. Subjects with chronic unilateral plantar fascitis diagnosed by Orthopaedician, subjects between ages20-40 years age of both sex, were included in the study. Exclusion criteria were subjects withPrevious surgical history for plantar fascia, History of recent fractures around ankle/foot, History of autoimmune or systemic inflammatory disorders (Rheumatoid arthritis) impaired circulation to lower extremities, Subjects with impaired circulation to lower extremities, peripheral neuropathies, Subjects with neurological disorders leading to impaired balance and co-ordination, Soft tissue abnormalities like fat pad syndrome, plantar fascia rupture, heel bruise, calcaneum spur.

Procedure

Subjects were thoroughly explained about the procedure and were required to sign the written informed consent document approved by the ethical committee at Dr. D. Y. Patil College of Physiotherapy, Pimpri,Pune. A total of 30 subjects were divided equally into two groups by lottery method. Patients in the Group B were received a traditional physical therapy exercises i.e. intrinsic muscle strengthening exercises and cryotherapy and those in the Group A were received Kinesiotaping.Each patient was assessed on day 1st i.e.pre-treatment and on day 7th i.e.post-treatment and was treated for 7 days. The assessments included the subjective pain intensity and the changes in the ultrasonography (measuring plantar fascial thickness)

Testing Procedure for Group A

Subjects were treated with kinesiotaping. The tape [Kinesio Tex, Kinesio Taping, US] used for this study was waterproof, porous, and adhesive. The tape with a width of 5 cm and a thickness of 0.5 mm was selected for this study.

Taping On the Plantar Fascia

The original site for taping was marked with the marker on the posterior margin of the calcaneal bone. The four end sites of taping were marked on the metatarsal joints of the first to fifth toes, except the third. During the taping, the patient was in a prone position with the knee joints at 90◦ of flexion and the ankle joints at a neutral position. The tape was cut longitudinally into four slices of equal width extended up to about two-thirds of the whole length of the tape to be used. The base of the tape was firmly adhered to the marked original site over the calcaneal bone and then stretched distally to stick the four ends of the sliced tape on the marked sites of forefoot.

Procedure for Group B

Commercial cold pack was given for 10-15 minutes each day for the period of 7 days. Intrinsic Muscle Strengthening Exercises**:** Towel curls up for 10 repetitions, 2 sets for the period of 7 days.

PHOTOGRAPHS

Photo 1
Materials Required For Group A

Kinesio tape

Scissor

Photo – 2
Materials Required For Group B

Cold Pack

Towel

Photo 3
Application of kinesio tape

Photo 4
Cryotherapy

Photo 5
Intrinsic muscle strengthening exercises

HYPOTHESIS

Alternative Hypothesis

At the end of the study, it may be seen that kinesiotaping is more effective in the treatment of pain in plantar fascitis.

Null Hypothesis

At the end of the study, it may be seen that kinesiotaping is not effective in the treatment of pain in plantar fascitis.

RESULTS

Table 1
Age distribution of patients studied

Age in years	Group A		Group B	
	No	%	No	%
21-30	9	60.0	3	20.0
31-40	6	40.0	12	80.0
Total	15	100.0	15	100.0
Mean ± SD	29.53±8.02		34.33±6.03	

Samples are age matched with P=0.100

Graph 1

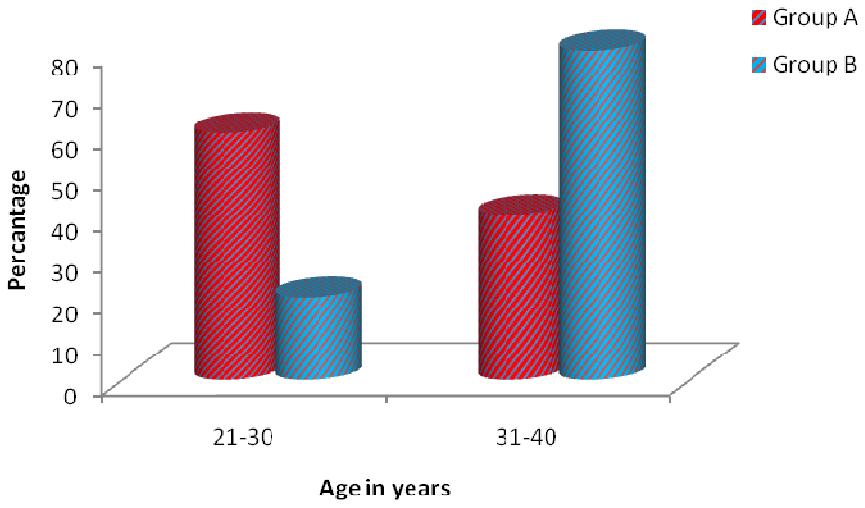


Table 2
Gender distribution of patients studied

Gender	Group A		Group B	
	No	%	No	%
Female	12	80.0	9	60.0
Male	3	20.0	6	40.0
Total	15	100.0	15	100.0

Samples are gender matched with P=0.427

Graph 2

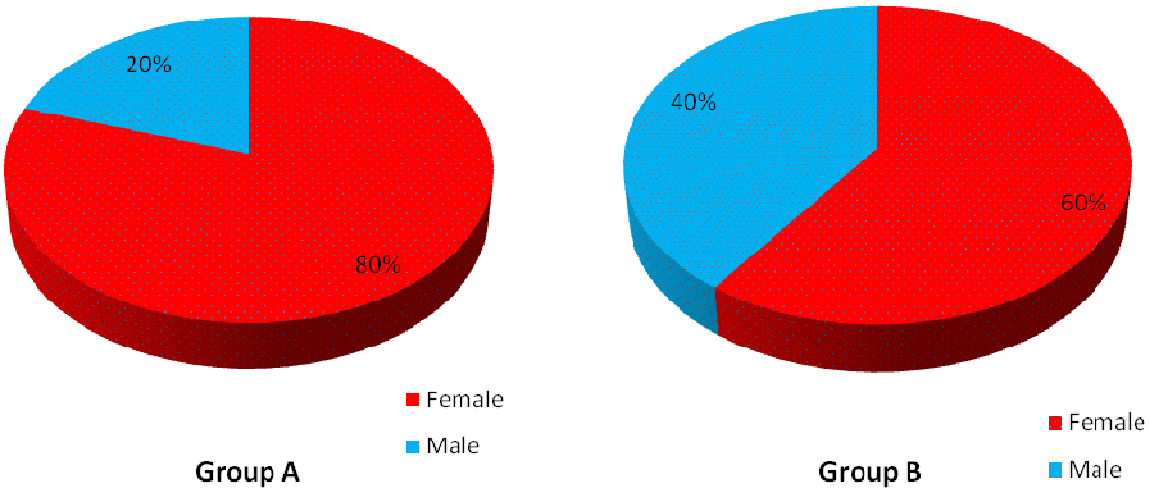
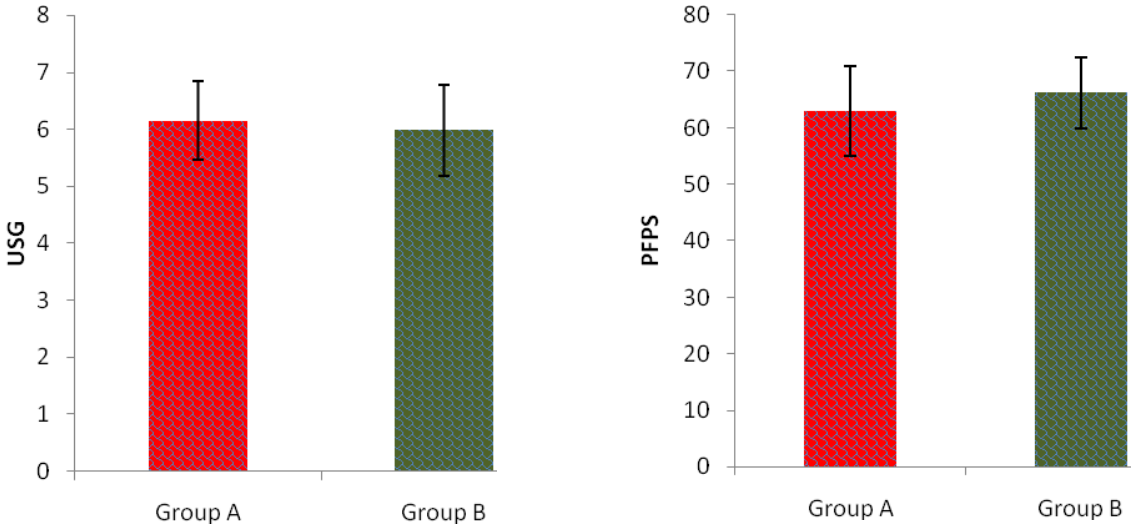


Table 3
Comparison of study variables on pre-op day1 in two groups studied

Pre-op day1	Group A	Group B	P value
USG	6.15±0.69	5.98±0.80	0.547
PFPS	63.00±7.88	66.20±6.35	0.231
FFI	180.47±11.79	189.93±10.05	0.025*

Graph 3



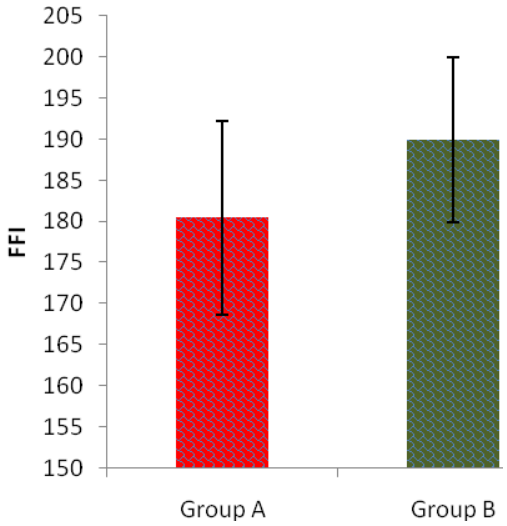


Table 4

USG: A Comparative Evaluation in two groups of patients studied

USG	Pre day 1	Post day 7	difference	t value	P value
Group A	6.15±0.69	5.21±0.61	0.933	7.364	<0.001**
Group B	5.98±0.80	5.89±0.93	0.087	0.444	0.664
P value	0.547	0.025*	-	-	-

Graph 4

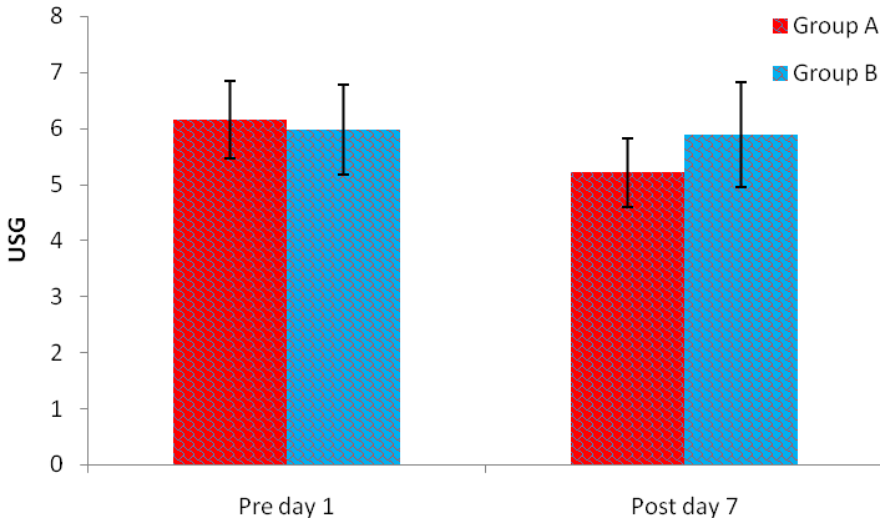


Table 5

PFPS: A Comparative Evaluation in two groups of patients studied

PFPS	Pre day 1	Post day 7	difference	t value	P value
Group A	63.00±7.88	29.40±6.31	33.600	17.928	<0.001**
Group B	66.20±6.35	61.60±6.13	4.600	4.742	<0.001**
P value	0.231	<0.001**	-	-	-

Graph 5

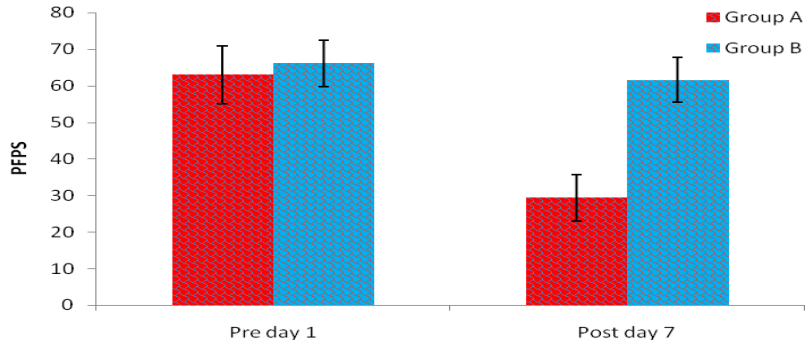
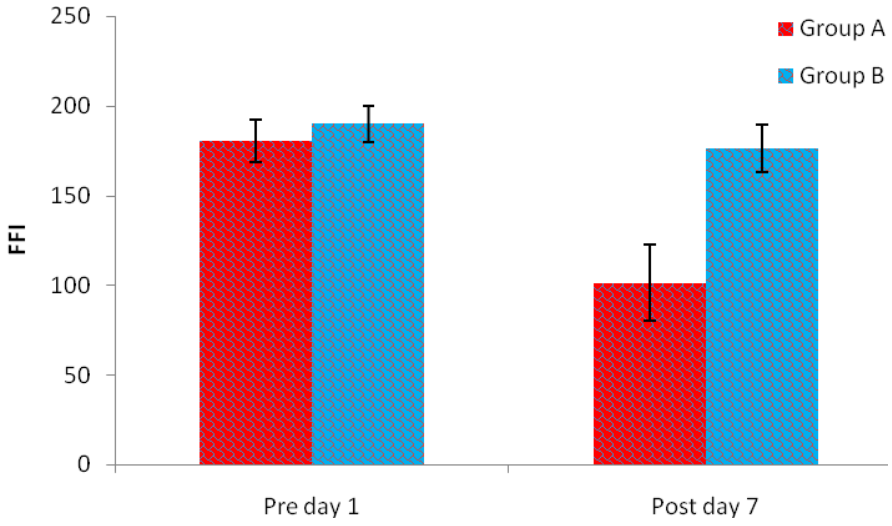


Table 6

FFI: A Comparative Evaluation in two groups of patients studied

FFI	Pre day 1	Post day 7	Difference	t value	P value
Group A	180.47±11.79	101.40±21.02	79.067	12.074	<0.001**
Group B	189.93±10.05	176.27±13.00	13.667	6.421	<0.001**
P value	0.025*	<0.001**	-	-	-

Graph 6



Statistical Methods

Chi-Square Test

- $\chi^2 = \frac{\sum (Oi - Ei)^2}{Ei}$, Where Oi is Observed frequency and Ei is Expected frequency

Fisher Exact Test

	Class1	Class2	Total
Sample1	**A**	B	a+b
Sample2	C	D	c+d
Total	a+c	b+d	n

Fisher Exact Test statistic= $\sum p = \frac{(a+b)!(c+d)!(a+c)!(b+d)!}{n!} \frac{1}{\sum a!b!c!d!}$

- ***Student t test (Two tailed, independent)***

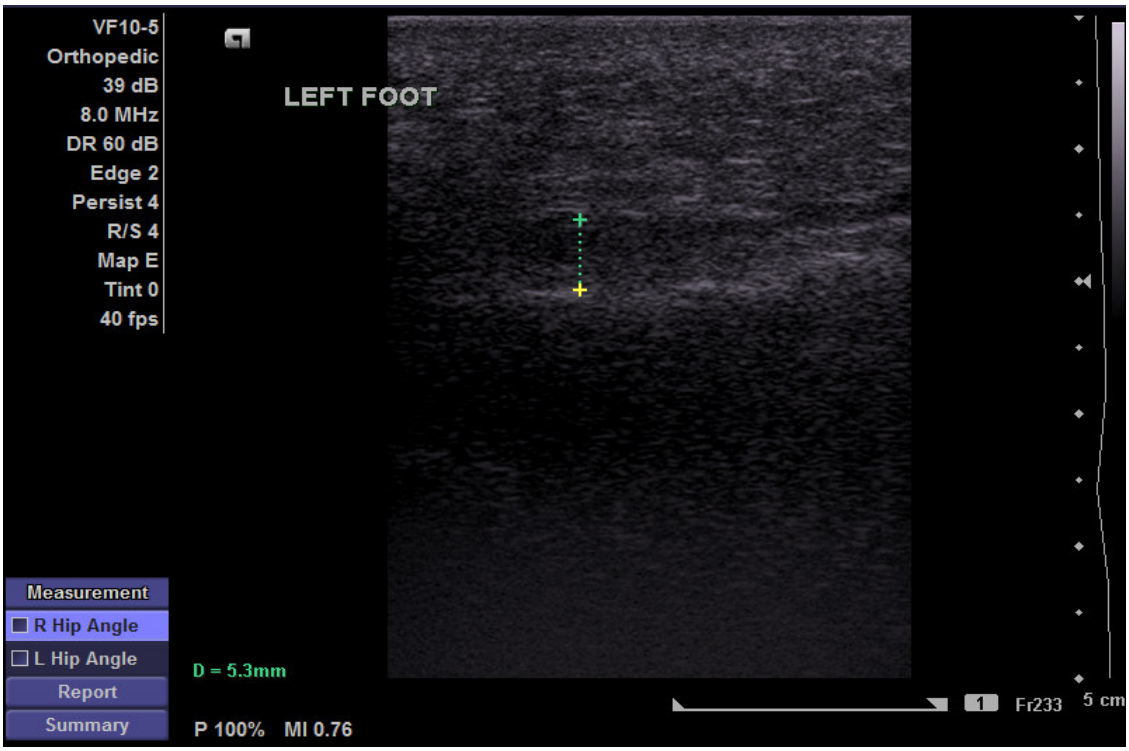
$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{s^2(1/n1 + 1/n2)}}$$

Where $s^2 = \frac{(n1-1)\sum_{i=1}^{n1}(x1 - \bar{x}1)^2 + (n2-1)\sum_{i-1}^{n2}(x2 - \bar{x}2)^2}{n1 + n2 - 2}$

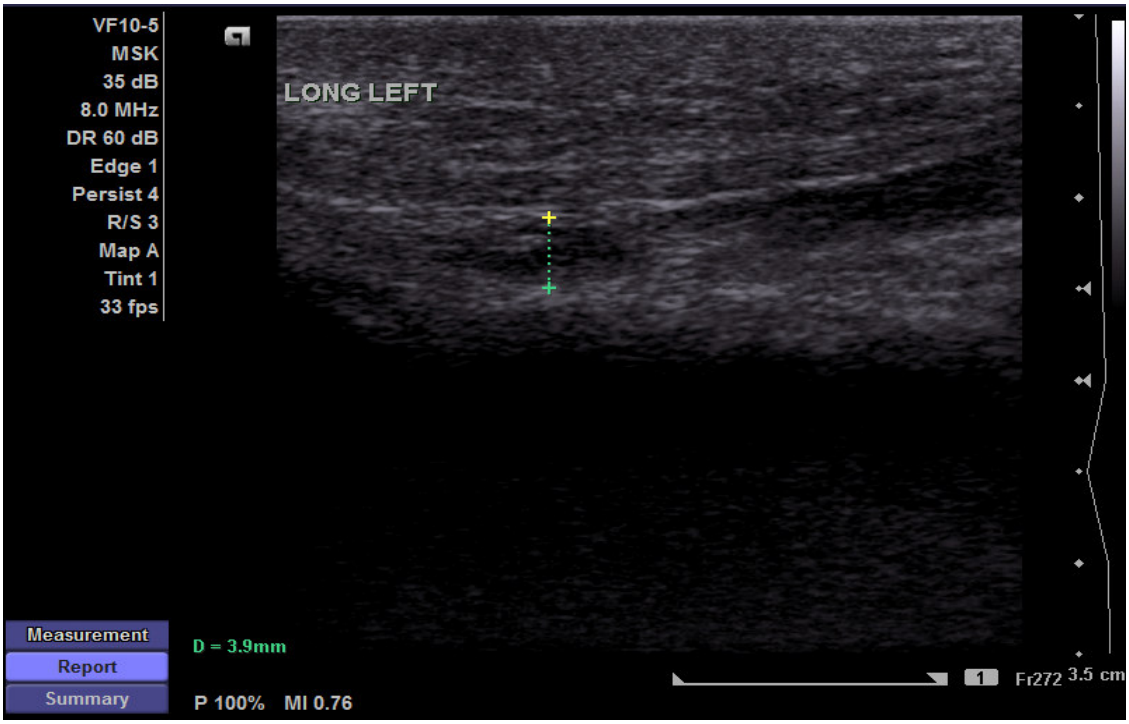
Significant figures

+ Suggestive significance (P value: 0.05<P<0.10)
* Moderately significant (P value: 0.01<P ≤ 0.05)
** Strongly significant (P value: P≤0.01)

Stastical software:The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc9.0.1 ,System 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc**.** In these two groups the basic characteristics of Age was not influencing the study result. (Table 1 and Graph 1) In Group A male subjects were 20% and female subjects were 80%. In males were 40% and females were 60%. (Table 2 and Graph 2) The efficacy of the study was based on USG, PFPS and FFI on Day 1 and Day 7. Table 3 and Graph 3, shows the comparison of study variables on pre-op day1 in Group A and Group B. USG score in Group A, was 6.15 and in Group B, 5.98, with P value 0.547. PFPS score in Group A, was 63 and in Group B, 66.20, with P value 0.231. FFI score in Group A was 180.47 and in Group B 189.93, with P value 0.025. In relation to USG, Group A shows decrease in plantar fascial thickness on Day 7, with the difference of 0.933 and with the P value <0.001, which signifies notable decrease in the plantar fascial thickness in Group A than Group B. (Table 4 and Graph 4) In relation to PFPS - pain score, Group A subjects have lesser pain score than Group B subjects on Day 7, with the difference of 33.600 and with the P value <0.001, which signifies there is remarkable decline in the PFPS pain score in Group A than Group B. (Table 5 and Graph 5) In relation to FFI – pain score, Group A subjects have lesser pain score than Group B subjects on Day 7, with the difference of 79.067 and with the P value <0.001, which Signifies there is remarkable decline in the FFI pain score in Group A than Group B. (Table 6 and Graph 6)



Increased thickness of plantar fascia on USG Pre application of kinesiotaping



Normal Plantar Fascial Thickness on USG post application of Kinesiotaping

DISCUSSION

Possible Mechanism of Kinesiotaping in Treating Plantar Fasciitis

The technique of kinesiotaping, including selection of taping site, pulling direction, and pulling force, is critical in treating soft tissue lesions. It should follow the principle of motion analysis and biomechanics. [10] In general, the original site is usually selected at the origin of the desired pulling force and the insertion site is determined by the desired strength of the pulling force. The direction of the force is usually parallel to the direction of muscle fibers. It may also allow the tape to cover the skin area to be stimulated [tactile stimulation]. The strength of the force depends on the desired intensity of tactile stimulation and the desired limitation of the range of stretch to the muscle fibers, tendons, or ligaments, or the range of motion for the joint. Usually, kinesiotaping can control the pulling force to a certain tendon or ligament in order to avoid further injury so that the tissue repair can be facilitated. By applying kinesiotaping on the plantar fascia, the pulling force of the plantar fascia can be reduced. Therefore, repetitive injury to the plantar fascia can be avoided and the tissue repair can be facilitated.

Changes in Subjective Pain after Kinesiotaping

In our study, the decreases in pain scores with the help of Plantar fascitis pain scale and Foot function index were significant more in the Group A (Kinesiotaping) than in the Group B (Cryotherapy and Intrinsic muscle strengthening exercises). The reduction in pain intensity was probably because of the reduced pulling force to the plantar fascia [negative tension from taping]. The improvement in focal circulation might also be an important factor for pain relief. It is unclear whether the direct mechanical stimulation [from the shearing force of taping] to the nociceptors and/or mechanoceptors plays any role in pain relief. This mechanism could be similar to hyperstimulation in the case of acupuncture or trigger point injection. [11, 12, 13]In this study significant improvement is seen in the Group A treated with the kinesiotaping and shows better improvement in all the parameters i.e. PFPS,

FFI and USG than Group B after 7 days of treatment. By applying kinesiotaping on the plantar fascia, the pulling force of the plantar fascia can be reduced. Therefore, repetitive injury to the plantar fascia can be avoided and the tissue repair can be facilitated. After kinesiotaping, the thickness at the insertion site was significantly reduced as compared to the Group B. It appears that kinesiotaping can effectively reduce the inflammatory reaction in a certain region [the insertion site] of the plantar fascia.

CONCLUSION

In this study, Group A who were treated with Kinesiotaping experienced, effective percentage change in pain and plantar fascial thickness than Group B who were treated with Cryotherapy and intrinsic muscle strengthening exercises. Hence, the study can be concluded stating that Kinesiotaping gives better improvement than Cryotherapy and intrinsic muscle strengthening exercises in the treatment of plantar fascitis.

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