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### Evaluate the effect of combination of a taping and iontophoresis or taping alone in the treatment of plantar fasciitis pain

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#### Abstract

The Aim of the study was to evaluate the effect of combination of a Taping and Iontophoresis or Taping alone in the treatment of Plantar Fasciitis pain. Thirty patients (male =16; female=14) were selected as subjects and they were further divided into two groups. Each group comprising of 15 subjects (male=8; female=7). The results of the our study show an improvement in the mean values of Foot Functional Index scores and Visual Analog Scale after treatment in both groups. But our study was found that an improvement was statistically significant more in Taping and Iontophoresis group than Taping group alone. In the study was concluded that if the patients of plantar fasciitis were treated with combination therapy (Taping & Iontophoresis) then there was noticed significant recovery from pain and disability in them.

**Keywords:** Plantar fasciitis, taping, iontophoresis

#### Introduction

Plantar Fasciitis (PF) is an inflammatory and painful condition occurring at the site where the medial part of the plantar fascia attaches to the calcaneum. This is one of the most common causes of plantar heel pain and responsible for most of the foot pain, which is due to the biomechanical imbalance that occurs as a result of excessive strain in the fascia. Generally, the case may be accompanied by calcaneal epin, which may also be clinically asymptomatic. Plantar fasciitis-related heel pain occurs in a slowly increasing pattern, most notably in the morning when standing up or after long periods of inactivity (Goff JD *et al.*, 2011) <sup>[1]</sup>.

Studies have shown clinically relevant improvements in PF symptoms using Iontophoresis of Dexamethasone (Gudeman *et al.*, 1997) <sup>[6]</sup> and acetic acid (Japour *et al.*, 1999) <sup>[8]</sup>. Non-steroidal anti-inflammatory drugs have been trialed, but did not show clinically significant effects (Osborne and Allison 2006) <sup>[9]</sup>. Low Dye taping supports the longitudinal arch of the foot. It has been shown to significantly reduce peak plantar pressures of normal feet during gait, especially the peak plantar pressure in the medial midfoot, Low-Dye taping is applied below the ankle and is hypothesized to generate a supinating force that controls the amount of pronation occurring at the subtalar joint (Russo & Chipchase, 2001) <sup>[13]</sup>, so it might be expected to play a role in the management of PF. The purpose of the our study is to test the combination therapy of Taping & Iontophoresis on pain and disability in plantar fasciitis patients.

#### Materials & Methods

30 patients of plantar fasciitis both males & females in the age range of 24 to 58 years were selected as subjects after obtaining their consent based on inclusion and exclusion criteria of the study. The subjects were further divided into two groups: Group- A (n=15) and Group-B. (n=15)

#### Treatment protocol

The subjects of Group - A underwent the taping and Iontophoresis. The Iontophoresis comprises of an electric impulses from a low-voltage galvanic current stimulation unit to drive ions (0.9% NaCl) into soft tissue structures. (Figure 1)

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**Fig 1:** Showing Iontophoresis to the Patient

Saline water is made by 0.9% NaCl solution. Then the solution is poured into a water bath. Electrodes are fixed, positive electrode is placed under the metatarsals heads and negative electrode is placed under the calcaneal bone. Current is applied using Uniphy Guidance -C machine. A current up to 4 mA for 10 minutes and a total dose of 40mA is delivered over a period of time determined by the patient's sensitivity.

**The taping procedure comprised of Layer 1:** Patient lie in the prone position, (1 or 2 sports/cloth tape spray with tape adhesive prior to taping) Starting behind small toe, coursing around back of heel and adhere to inside of arch right behind great toe. Before adhering to great toe, slightly push down on joint behind great toe to increase bowing of arch as shown in figure 2.



**Fig 2:** Layer 1

**Layer 2:** Apply 2 sport tape (cloth) to bottom of foot with pressure up into the arch. Tape should adhere to 1st layer of tape on both sides of the foot. Can leave heel open if choose. Repeat this 3-4 times with each layer offset from the previous about 1/2 the width of the tape until arch is covered as shown in figure 3.



**Fig 3:** Layer 2

**Layer 3:** Apply another strip of tape as you did in the first layer (One strip only). This will cover the ends of the 2 tape of the second layer on each side of foot to prevent peeling up (Figure 4).



**Fig 4:** Layer 3

The foot should be in neutral position' i.e. foot in line with the ankle which is in line with the knee. The training frequency of the treatment session for both the groups and for each treatment if for 1 week for one time in a day. The Group B underwent the taping treatment alone. The scores of VAS (Visual Analog Scale) and stiffness (Foot Functional Index) of each subject of Group- A and Group- B were recorded before and after 1-week.

#### Statistics

The data was analyzed using statistical computer software SPSS 13 software package (version 13, SPSS Inc. Chicago, USA). The paired t – test and unpaired t – test was used. The level of significance was  $p < 0.05$ .

#### Results

The mean age and BMI of the subjects of Group -A and Group-B was  $41.33 \pm 12.11$  years,  $43.93 \pm 8.860$  years,  $30.05 \text{ Kg/m}^2$  and  $28.36 \text{ Kg/m}^2$  respectively. It was found that the difference in the mean values of age and BMI between Group -A and Group-B was not statistical significant (Table 1).

**Table 1:** Comparison of Age & BMI

	GROUP A	GROUP B	t-value
BMI (Kg/m <sup>2</sup> )	30.05	28.36	0.681
Age (yr)	41.33±12.11	43.93±8.86	0.70

\*significant  $p < 0.05$

Table 2 shows the comparison of scores of Visual Analog Scale (VAS) and FFI between Group- A and Group- B before and after one week. It was found that before the start of one week treatment programme to the subjects of Group- A and Group- B there was no statistical difference in the scores of VAS and FFI. After one week there was statistical significant difference in the scores of VAS and FFI in both the groups but a greater improvement was observed in Group- A as compared to Group- B (Table 2).

**Table 2:** Comparison of Scores (Unpaired t - test) of VAS & FFI between two groups

		GROUP A	GROUP B	t-value
VAS (Mean±SD)	Before	6.27±0.799	6.40±0.737	2.05*
	After 1 week	3.87±0.834	4.93±0.884	
VAS(Mean±SD)	Before	41.91±3.85	41.91±1.94	2.05*
	After 1 week	23.44±3.63	32.70±2.20	

\*significant  $p < 0.05$

Further, it was found that in Group-A there was a statistical significant improvement in the scores of VAS & FFI after one week (Table 3).

**Table 3:** Paired t-test of VAS & FFI of Group A

	Before	After one week	t-value
VAS(Mean±SD)	6.27±0.79	3.87±0.83	2.14*
FFI(Mean±SD)	41.92±3.85	23.45±3.63	2.14*

\*significant  $p < 0.05$

Similarly, it was found that in Group-B there was a statistical significant improvement in the scores of VAS & FFI after one week (Table 4).

**Table 4:** Paired t-test of VAS & FFI of Group B

	Before	After one week	t-value
VAS(Mean±SD)	6.53±0.64	4.93±0.88	2.14*
FFI(Mean±SD)	41.92±1.94	32.70±2.20	2.14*

\*Significant  $p < 0.05$

## Discussion

The result of present study shows that subjects in both the groups had significant decrease in pain and improvement in FFI. However, out of the two groups, the Group-A receiving Iontophoresis along with Taping had a higher percentage of change in both pain and stiffness as compared to Taping alone. Therefore the null hypothesis is rejected and thus alternate hypothesis is accepted. As Plantar Fasciitis is one of the conditions which can be treated by a wide variety of physiotherapy methods, it is still difficult to formulate all proof guidelines for the management of Plantar Fasciitis. Various methods of treatment exist with own claims of success without any attempts of comparing the maximal effective methods. Both the groups in present study had equal number of subjects and there was no significant difference found with respect to their gender distribution, age and body mass index. Radford *et al.*, (2006) <sup>[10]</sup> found a short term effectiveness of low - dye taping compared to sham ultrasound (placebo) at reducing pain. The benefits of taping

found in this study are consistent with research with mechanical adaptations. And this change in mechanics reduces the strain on plantar fascia by supportive tape during standing and ambulation. So the use of taping provides the mechanical stability and support for the strained plantar fascia. In the clinical setting taping results in almost immediate changes in symptoms. It is proposed that, during this short term alleviation of symptoms, the adjunct management options have time to reach therapeutic thresholds. Taping can be applied in either the acute or chronic condition (Vicenzino *et al.*, 1997) <sup>[15]</sup>. It may be more cost - effective for acute cases of plantar fasciitis (Young *et al.*, 2001) <sup>[18]</sup>. Both taping strategies (Low - dye taping and calcaneal taping) were associated with a reduction in pain for 1 week after plantar fasciitis. Holmes *et al.*, (2002) <sup>[7]</sup> & Vicenzino *et al.*, (2000) <sup>[16]</sup> demonstrated the effectiveness of low - dye taping in reducing pain in plantar heel pain patients. The result of the present study is bolstered by the study of Osborne and Allison (2006) <sup>[9]</sup> that showed the reduction in the symptoms of plantar fasciitis patients. Drooga *et al.*, 2004) <sup>[4]</sup> determines with his study that Iontophoresis benefits with vasodilatation due to attenuated addition of molar concentrations of NaCl to the iontophoresis solutions. Chorine is applied as NaCl solution and has a sclerolytic effect that reduces redundant scar tissue, which increases extensibility of scar tissue and connective tissue and used in contracture indications. Drooga & Sjoberga (2003) <sup>[5]</sup> study the effect of ionic strength of the vehicle on the nonspecific vasodilatation during iontophoresis of sodium chloride and deionized water. They found that anodal and cathodal iontophoresis induced a voltage over the skin that was dependent on the ionic strength of the test solution. The nonspecific vasodilatation during anodal iontophoresis was less pronounced than during cathodal iontophoresis, and was independent of the voltage over the skin. The nonspecific vasodilatation in cathodal iontophoresis was related to the voltage over the skin, and was possibly mediated by depolarization of local sensory nerves. The result of the NaCl Iontophoresis along with Taping group shows significantly greater improvements in morning pain where as such results could not be found out when seen in taping alone. So this study adds that drug delivered (NaCl) when delivered via Iontophoresis in combination with Low Dye taping, give good short term relief. The benefits of taping are reduced when it is stopped, however when it is combined with Iontophoresis, treatment effects are maintained. Future research is needed using a control group to evaluate the treatment approach used in the study and also the long term benefits of the intervention used.

## Conclusion

It was concluded that if the patients is given Iontophoresis along with the Taping, a better management is seen for pain and stiffness to those patients treated with Taping alone.

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