

Treatment of Plantar Fasciitis by Taping vs. Iontophoresis: A Randomized Clinical Trial

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Abstract

The purpose of the study was to observe the effect of combination of a Taping and Iontophoresis or Taping alone in the treatment of Plantar Fasciitis pain. A total of 30 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 present study show an improvement in the mean values of Visual Analog Scale, and Foot Functional Index scores after treatment in both groups. But it was found that an improvement was statistical significant more in Taping and Iontophoresis group than Taping group alone. It 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, Iontophoresis, Taping, Pain

Introduction

Plantar fasciitis (PF) has been reported across a wide sample of the community that includes both the athletic and non – athletic population (*Schepesis et al., 1991*). Plantar fasciitis represents the fourth most common injury to the lower limb (*Ambrosius and Kondrachi 1992*). In the non- athletic population, it is most frequently seen in weight bearing occupations with unilateral involvement most common in 70% of cases. In the athletic population, 10% of all running athletes involved in basketball, tennis, football, long distance runner and dancers' have all noted high frequency of plantar fasciitis. Obesity and pronated foot posture are associated with chronic plantar heel pain and may be risk factor of the condition. 10% of the population at some point in their lifetime experience plantar

heel pain (*Riddle and Schappert 2004*). In 2000 the foot and ankle special Interest Group of the Orthopedic Section, APTA, surveyed over 500 members and received responses from 117 therapist. Of those responding, 100% indicated that plantar fasciitis was most common foot condition seen their clinic (*Delitto et al., 2008*). There is a little knowledge about the clinical course of the condition and is unknown approximately in 85% of the cases (*Roxas 2005*). The commonly prescribed treatment options are conservative and surgical interventions (*Weil et al., 1994*). Various treatment strategies, including orthoses, stretching, taping, extracorporeal shock wave therapy, laser therapy and drug therapy in the form of systemic medication, and topical application, have been investigated and have shown variable clinical benefit. Studies have shown clinically relevant

improvements in PF symptoms using Iontophoresis of Dexamethasone (Gudeman et al., 1997) and acetic acid (Japour et al., 1999). Non-steroidal anti-inflammatory drugs have been trialed, but did not show clinically significant effects (Osborne and Allison 2006). 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), so it might be expected to play a role in the management of PF. No studies have examined how taping interacts with drug therapy during treatment of PF. The purpose of the present study is to test the combination therapy of Taping & Iontophoresis on pain and disability in plantar fasciitis patients.

Materials & Methods

The 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). Saline water

is made by 0.9% NaCl solution. Then the solution is poured into a water bath. Electrodes are fixed, red positive electrode is placed under the metatarsals heads and the black 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.



Figure 1. Showing Iontophoresis to the Patient

The taping procedure comprised of LAYER1 - 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 2.1

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 2.2

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 2.3). The foot should be in ‘neutral position’ i.e. foot in line with the ankle which is in line with the knee.



Figure 2.1



Figure 2.2



Figure 2.3

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 ± 12.11 years, 43.93 ± 8.86 years, 30.05 Kg/m^2 and 28.36 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
Age(years)	41.33 ± 12.11	43.93 ± 8.86	0.700
BMI(Kg/m ²)	30.05	28.36	0.681

*significant $p < 0.05$

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	
FFI(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 $p < 0.05$

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).

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) 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). It may be more cost - effective for acute cases of plantar fasciitis (Young et al., 2001). 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) & Vicenzino et al., (2000) 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) that showed the reduction in the symptoms of plantar fasciitis patients. Drooga et al., (2004) determines with his study that Iontophoresis benefits with vasodilatation due to attenuated addition of molar concentrations of NaCl to the iontophoresis solutions. Chlorine 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 &

Sjöberga (2003) 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.

References

- Ambrosius H, and Kondracki M.P. 1992. Plantar Fasciitis. *European Journal of Chiropractic* **40**: 29 - 40.
- Delitto Anthony, Dewitt Amanda John, Smith Russell Jr., Torburn Leslie, 2008. Heel Pain—Plantar Fasciitis: Clinical Practice Guidelines Linked to the International Classification of Function, Disability, and Health from the Orthopaedic Section of the American Physical Therapy Association, *J. Orthop Sports Phys. Ther.* **38(4)**:A1-A18.
- Drooga, E.J. and Sjöberga, F. 2003. Nonspecific vasodilatation during transdermal iontophoresis—the effect of voltage over the skin. *Microvascular Research*, **65(3)**:172–178.
- Drooga Erik, J, Henricsona Joakim, Nilssonb Gert, E, Sjöberg, Folke 2004. A protocol for iontophoresis of acetylcholine and sodium nitroprusside that minimises nonspecific vasodilatory effects. *Microvascular Research* 67(2): 197–202.
- Gudeman S.D., Eisele S.A., Heidt R.S. Jr., Colosimo A.J., Stroupe A.L. 1997. Treatment of plantar fasciitis by iontophoresis of 0.4% dexamethasone. A randomized, double-blind, placebo-controlled study *Am. J. Sports Med.*, **25(3)**: 312-6.
- Holmes, C.F., Wilcox, D., Fletcher, J.P. 2002. Effect of a modified, low - dye taping medial longitudinal arch taping procedure on the subtalar joint neutral position before and after light exercise. *J. Orthopaedics and Sports Physical Therapy*, **32**: 194 - 201.
- Japour, C.J., Vohra, R., Vohra, P.K., Garfunkel, L. and Chin, N. 1999. Management of heel pain syndrome with acetic acid Iontophoresis *J American Podiatric Medical Association* **89(5)**: 251-257.
- Osborne, H.R. and Allison, G.T. 2006. Treatment of plantar fasciitis by LowDye taping and iontophoresis: short term results of a double blinded, randomised, placebo controlled clinical trial of dexamethasone and acetic acid: *Br. J. Sports Med.* June; **40(6)**: 545–549.
- Radford, A.J., Landorf, B.K, Buchbinder, R. and Cook, C. 2006. Effectiveness of low - Dye taping for the short - term treatment of

- plantar heel pain: a randomised trial. *B.M.C. Musculoskeletal Disorders* **7**: 64-71.
- Riddle, D.L. and Schappert, S.M. 2004. Volume of ambulatory care visits and patterns of care for patients diagnosed with plantar fasciitis: a national study of medical doctors. *Foot and Ankle International*, **25(5)**: 303 - 310.
- Roxas, M. 2005. Plantar Fasciitis: Diagnosis and Therapeutic considerations. *Alternative Medicine Review*, **10(2)**: 83 - 93.
- Russo, J Sonia and Chipchase, S Lucy. 2001. The effect of low-Dye taping on peak plantar pressures of normal feet during gait *Australian Journal of Physiotherapy* **47**: 214-220.
- Schepisis, A.A.M.D., Leach, R.E.M.D., Gouyca, J.M.D. 1991. Plantar Fasciitis: Etiology, treatment, surgical results and review of the literature. *Clinical Orthopaedics and Related Research*, **266**: 185 - 196.
- Vicenzino, B., Feilding, J., Howard, R., Moore, R., Smith, S. 1997. An investigation of the antipronation effect of two taping methods after application and exercise. *Gait Posture*, **5**: 1 - 5.
- Vicenzino, B., Griffiths, S.R., Griffiths, L.A., Hadley, A. 2000. Effect of antipronation tape and temporary orthotic on vertical navicular height before and after exercise. *J. Orthopaedics and Sports Physical Therapy*, **30**: 333 - 339.
- Weil, L.S., Gowlding, P.B., Nutbrown, N.J. 1994. Heel spur syndrome: a retrospective study of 250 patients undergoing a standardised method of treatment. *The Foot*, **4**: 69 - 74.
- Young, C.C., Rutherford, S.D., Neidfeldt, W.M. 2001. Treatment of Plantar Fasciitis. *Am. Family Physician*, **63**: 467 - 474, 477 - 478.

