



RESEARCH ARTICLE

IONTOPHORESIS VERSUS ULTRASOUND IN PATIENTS WITH PLANTAR FASCIITIS

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ABSTRACT

Introduction: Plantar Fasciitis occurs because of micro trauma to the plantar fascia due to abnormal loading. Plantar fasciitis is considered as a self limiting condition. However the typical resolution time is anywhere from 6-18 months or sometimes longer. Conservative management is reportedly very successful. Therapeutic ultrasound with or without phonophoresis, electrical stimulation and administration of NSAIDS through iontophoresis are said to be effective.

Methods: 30 patients were taken from OPD of Department of Orthopaedics, Guru Gobind Singh Medical College and Hospital; Faridkot based upon inclusion and exclusion criteria. The subjects were divided into two groups of 15 in each by simple random sampling. Group A was treated with Ultrasound for 3 weeks, Group B was treated with Iontophoresis for 3 weeks. Total treatment duration was 3 weeks. Both groups were assessed for Pain (visual analogue scale) and disability (Foot Function Index).

Results: There was no significant difference between the two groups in VAS and FFI before the treatment had started at 0th week as p value was (0.851), (0.522). While there was a significant difference between the two groups after 3rd week of treatment as p value was (0.115), (0.000). The score of visual analogue scale (VAS) and foot functioning index (FFI) improved in both groups, though the decrease of intensity of pain and functional disability was more in Group B (p<0.01).

Conclusion: This study concluded that both Ultrasound and Iontophoresis are effective in decreasing pain and functional disability. However, it is concluded that Iontophoresis is more effective than Ultrasound in Plantar Fasciitis.

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INTRODUCTION

Plantar fasciitis (also referred to as plantar heel pain syndrome, heel spur syndrome, or painful heel syndrome) is, by definition, an inflammation of the plantar fascia (Dimou *et al.*, 2004). The injury itself is an enthesopathy (an abnormality or injury at the site of attachment of a ligament or tendon to bone) of the origin of the plantar fascia at the medial tubercle of the calcaneal due to excess traction often characterize by pain on the first step in the morning. Plantar fasciitis is generally believed to be due to repetitive partial tearing at this enthesis with associated chronic inflammation (DiGiovanni, 2003; Batt *et al.*, 1996). Etiologically, plantar fasciitis is classified as an overuse or repetitive strain injury (Goulet, 1984). When the fascia is over stretched micro – ruptures develop along the bone – fascial interface (periosteum), resulting in acute inflammatory response (Gudeman *et al.*, 1997).

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Over time, as the condition becomes chronic, the initial inflammatory reaction progresses to micro – hemorrhages, collagen degeneration, and fibrosis of the plantar fascia (Campbell and Giovaniello, 1997). Fibrosis (scarring) causes the plantar fascia to thicken and contract resulting in pain when the tissue is put under a weight bearing load (Quaschink, 1996). In addition, relative heel cord contracture often develops which worsens at night and during periods of prolonged non weight – bearing, since the foot is held in plantar flexion when at rest (Ryan, 1995). Plantar fasciitis is the most common cause of heel pain with a lifetime prevalence of ten percent, accounting for eleven to fifteen percent of all foot symptoms, and affecting two million people in the United States alone (Martin *et al.*, 2001; Landorf *et al.*, 2004). The incidence of plantar fasciitis peaks in people between the ages of 40 to 60 years with no bias towards either sex (Crawford and Snaith, 1996). Plantar fasciitis is usually seen as an overuse injury in athletes, runners in particular (accounting for nearly 10% of running injuries), but is also seen in the general population (Dimou *et al.*, 2004; DiGiovanni, 2003; Batt *et al.*, 1996; Lynch, 1998; Martin *et al.*, 2001; Buchbinder, 2004; Winemiller, 2003). Many treatment options have been applied

for the management of plantar fasciitis which includes rest, physiotherapy, shoe modification, anti inflammatory agents and surgery (Pfeffer *et al.*, 1999). In physical therapy. Interventions such as iontophoresis, ultrasound, mobilization/ manipulation, soft tissue release techniques and therapeutic exercise are commonly used to manage patients with plantar fasciitis; however, these have varying levels of evidences in regard to their effectiveness (Gudeman *et al.*, 1997; McPoil *et al.*, 2008). Ultrasound has been used in the treatment of musculoskeletal condition for many years. Therapeutic ultrasound is used routinely by podiatrists and physiotherapists, and is prescribed by physicians in their treatment of plantar fasciitis and plantar heel pain (Whiting, 1975; Clark and Stenner, 1976; Bruno and Hefland, 1976).

Iontophoresis is an electrotherapy technique in which medically useful ions are driven through the patient's skin into the tissues. The basic principle is to place the ions under an electrode with the same charge. A constant galvanic current is then applied and the ion is electrically propelled into the patient. A stretching and strengthening regime is a key element in the rehabilitation of this disorder (Gudeman *et al.*, 1997). The purpose of current study was to compare efficacy of iontophoresis versus ultrasound in patients with plantar fasciitis.

MATERIALS AND METHODS

Design

A Randomized clinical design was used for the purposes of the current study. 30 patients of unilateral plantar fasciitis were taken from the Out Patient Department (OPD) of University College of Physiotherapy, Faridkot, Punjab. Patients were randomly divided into two groups, Group A (Ultrasound group) and Group B (Iontophoresis group) based on randomization. Randomization was done by simple random sampling. After initial assessment, participants drew one of 30 pre-printed cards in opaque sealed envelopes from a box (15 labeled 'Group A' and 15 labeled 'Group B') and were placed in the Ultrasound group and Iontophoresis Group in accordance with the card drawn.

Eligibility Criteria

Inclusion criteria

Pain provoked by taking first few steps in the morning, by standing after prolonged sitting, and/or by prolonged standing. Both males and females, Age group 40-60 years., Experienced symptoms for at least 4 weeks or more, Patient with unilateral plantar fasciitis. Previously diagnosed patient. (a) On physical examination, patients may walk with their affected foot in an equine position to avoid placing pressure on the painful heel, (b) Passive ankle/first toe dorsiflexion can cause discomfort in the proximal plantar fascia (c) Plain radiography, Ultrasonography, MRI, Participants had a diagnosis of PF based on the following symptoms: (a) Maximal pain (induced by digital pressure) located at the antero-medial aspect of the plantar surface of the calcaneus (b) Pain that is worse on the first few steps in the morning (c) Aggravation of pain by

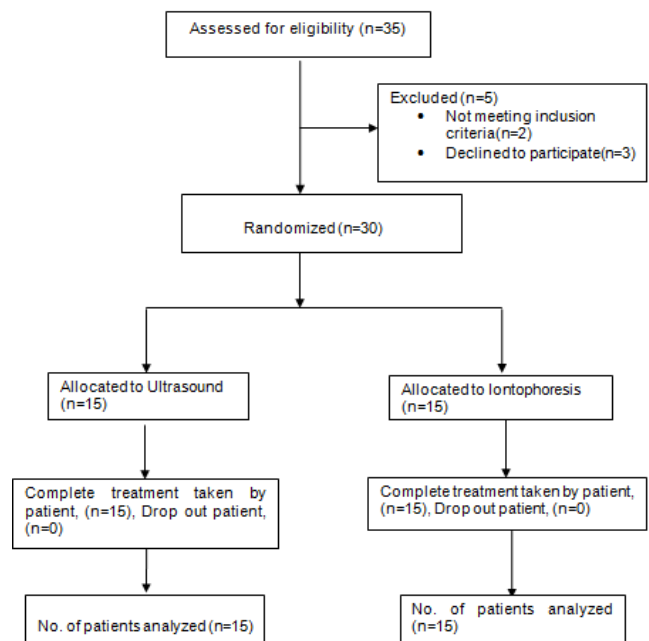
passive dorsiflexion of the big toe (d) Aggravation of pain when standing or walking on toes.

Exclusion criteria

Radiological evidence showing calcaneal spur, Red flags (i.e. tumour, fracture, osteoporosis etc), Prior surgery to distal tibia, fibula, ankle joint (Arthrodesis), Sensitivity deficit, Participants suffering from systemic disease causing foot pain were excluded from the study, Foot pathology plantar fasciitis including tendonitis, bursitis, or calcaneus fracture.

Intervention

Patients in Group A received Ultrasound with an output of 1.5 w/cm² for 7 Minutes using a continuous mode with a Frequency of 3MHz, (Shashwat *et al.*, 2014). Treatment was given for 5 times a week for 3 weeks (Model-JUS-1) along with stretching of calf muscle and plantar fascia with strengthening exercises of the intrinsic muscles towel curls and picking up marbles. Patients in Group B received Iontophoresis of sodium diclofenac treatment were given for 20 minutes daily for 5 days/week for three weeks (Meditek electronics MS-10) (Nesrin and Demirtas, 1998) along with Stretching exercises and strengthening exercises were performed same as in group A. The subjects were thoroughly explained about the procedure prior to participation in the study and the informed consent was taken. Assessment of all patients in both the groups was taken through VAS (scores from 0-10) and FFI (scores from 0-230) at 0th week and 3rd week of the treatment.



Statistical Analysis and Results

The changes in pain and functional disability measured through VAS and FFI from 0-3 week after treatment were revealed by using the Independent t-test in each group. Data was analyzed using SPSS version 20 software.

The results of this study showed that, score of VAS and FFI improved in Group B after treatment as shown in figure 1 and 2. In group A (15 patients), 7 males (47%) and 8 were females (53%) with the mean age of 50.0 and S.D is 5.4703 where as in Group B (15 patients), 8 were male (53%) and 7 were females (47%) with mean age of 49.1 and S.D is 5.7924.

VAS: There was no significant difference between the two groups in VAS before the treatment at 0th week as p value was (0.815). While there was a significant difference between the two groups after 3rd week of treatment as p value was (.015). Comparison between both the groups was conducted by using Independent t-test. At 0th week and after the treatment at 3rd week group B showed statistically significant improvement with a decrease in mean value that is 7.20, 2.26 respectively than group A having mean values 7.13, 3.20 at 0th week and after treatment at 3rd week respectively (Fig1).

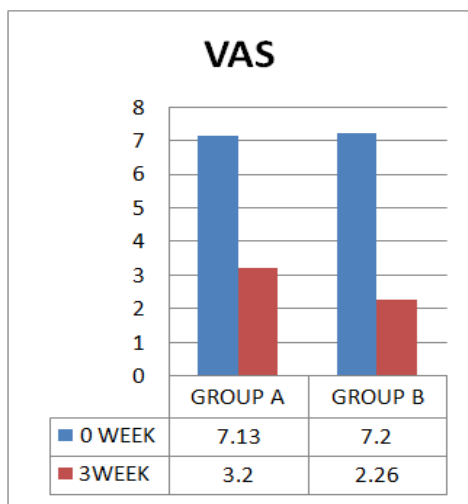


Fig. 1. Comparison at 0th week and after 3rd week VAS of Group A and Group B

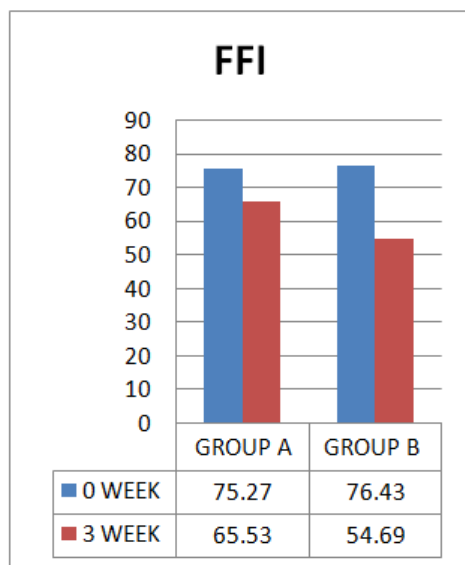


Fig. 2. Comparison at 0th week and after 3rd week scores of FFI of Group A and Group B

FFI: There was no significant difference between the two groups in FFI before the treatment at 0th week as p value was (0.522). While there was a significant difference between the two groups after 3rd week of treatment as p value was (.000).

Comparison between both the groups was conducted by using Independent t-test. At 0th week and after the treatment at 3rd week group B showed statistically significant improvement with a decrease in mean value that is 76.43, 54.69 respectively than group A having mean values 75.27, 65.53 at 0th week and after treatment at 3rd week respectively (Fig2).

DISCUSSION

Results of the present study concluded that both ultrasound and iontophoresis were effective in reducing pain and improving functional abilities in patients with plantar fasciitis. However, statistically it was concluded that iontophoresis is better than ultrasound. There was statistically significant decrease in pain and functional disability for Group B that was treated by iontophoresis with sodium diclofenac as compared to those who received ultrasound for Group A.

The better outcome with iontophoresis could be due to strong vasodilatation in blood vessel of the skin lead to less effective diffusion to the deeper tissues on the basis that increased local flow served to dilute the sub epidermal deposit. Goyal M (2013) studied the comparison of Taping and Iontophoresis in subjects with plantar fasciitis and concluded that the iontophoresis (0.9% NaCl) along with taping is more effective than taping. More improvement was seen in VAS and FFI in iontophoresis group than taping group. The result of this study is relevant to the present study which showed significant decrease in pain and improvement in functional activities with use of iontophoresis increased local flow served to dilute the sub epidermal deposit. Gudeman *et al.* (2006) carried out a randomized, double-blind study on treatment of plantar fasciitis by Iontophoresis of 0.4% dexamethasone for forty affected feet were randomly assigned to one of two groups. Group I feet were treated with traditional modalities and placebo Iontophoresis. Group II feet received the traditional modalities plus Iontophoresis of dexamethasone. Both groups were treated six times over 2 weeks. The subjects' clinical course was assessed using the Maryland Foot Score. These results suggest that although traditional modalities alone are ultimately effective but Iontophoresis in conjunction with traditional modalities provides more significant results.

R Nesrin Demirtas, Cengiz Oner (1998) studied treatment of lateral epicondylitis by iontophoresis of sodium salicylate and sodium diclofenac and concluded that treating the lateral epicondylitis by iontophoresis of sodium diclofenac was more effective than that of sodium salicylate. This study is relevant for the use of Sodium diclofenac in subjects with lateral epicondylitis for reducing pain.

Conclusion

We conclude, from our results, that Ultrasound and Iontophoresis are effective in decreasing pain and functional disability. In addition, it is statistically proved that functional

disability were decreased and pain reduced after 3rd weeks of treatment with statistical significance of $p < 0.001$.

Iontophoresis in plantar fasciitis patients leads to faster pain reduction and decreasing functional disability as compared to the ultrasound.

Implications for practice: No major side effects were associated with US and Iontophoresis.

Limitations of study: The sample size for the study was small, the period of study carried out was less, and there was no follow up taken after completing the study.

Future scope: Study can be done on large sample size, further study can be done by different outcome measures, and further studies should include long term follow up more than 2 month, use of different salts.

Abbreviations: Plantar Fasciitis, US: Ultrasound, VAS: Visual Analog Scale, FFI: Foot Function Index, S.D: Standard Deviation.

Consent: All authors declare that written informed consent was obtained from the patient before starting the study for publication of this study report.

Ethical approval: This study was approved by Research and Ethical committee of University College of physiotherapy, Baba Farid University of Health Sciences, Faridkot, Punjab, India

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Competing interests: Authors declare that no competing interests exist.

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