

ORIGINAL RESEARCH

IJPHY

THE EFFECTS OF INTERFERENTIAL THERAPY FOR INDUSTRIAL WORKERS IN CASE OF PLANTAR FASCIITIS

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ABSTRACT

Background: In the recent industrial set up, plantar fasciitis is one of the commonest problems faced by workers. It occurs mainly in the prolonged standing workers. There are some studies where some authors mentioned about interferential therapy as a treatment modality in plantar fasciitis but there is no such evidence supporting the use of IFT. Here comes the need of the study to find out the effects of the interferential therapy and also to find out whether the conventional therapy and interferential therapy are effective in plantar fasciitis for industrial workers. The aim of the study is to find out the benefit of the interferential therapy with the conventional therapy and also use conventional therapy alone for industrial worker in case of planter fasciitis.

Methods: A sample of 30 subjects were distributing randomly in two groups. These subjects were referred by the consultant physician and orthopedic surgeon. All the subjects were signed a consent form prior to participation in the study. Before receiving any intervention, on day zero outcome measures assessment were carried out for both groups subjects by VAS (Visual analog scale) for pain measurement, FFI (Foot Function index) scale for activity limitation scores and goniometric measurement of active dorsi-flexion of ankle joint. Range of Motion (ROM) measurement for both group A and B were taken usual in slandered goniometry according Martin and White. On day 15th, all outcome measures re-assessment will be carried out for the result.

Results: In comparison of both interventions group B (IFT with conventional therapy) is more effective in decreasing pain ($p = 0.00$) improving functional ability ($p = 0.00$) than group A (only conventional therapy). For ROM, $t = -0.642$ the difference is not significant ($p = 0.526$). It has been inferred that conventional therapy and IFT with conventional therapy are equally effective for improving ROM.

Conclusion: In conclusion, this study indicating that there is a significant difference in the effectiveness of Interferential therapy over conventional therapy in plantar fasciitis for industrial workers. Even though improvement in range of motion is not differing in both group, pain and functional improvement is more in the group treated with IFT.

Keywords: plantar fasciitis, interferential therapy, industrial workers

Received 19th August 2015, revised 11th September 2015, accepted 27th September 2015



www.ijphy.org

DOI: 10.15621/ijphy/2015/v2i5/78233

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INTRODUCTION

Plantar fasciitis is one of the most common occupational or sport related strain injuries of the foot.¹ It is an inflammatory reaction from chronic irritation of the plantar fascia at its origin at the calcaneus.² This is mainly characterized by pain and tenderness under the heel on weight bearing, which limits the physical activity. Although this condition affects 10% of the population at least one moment in life and the symptoms are bilateral in more than 10% of cases.³

The classic sign of plantar fasciitis is the worst pain occurs with the first few steps in the early morning. Typically the patient reports a gradual onset of pain at the beginning of activity or weight-bearing after a period of non-bearing activity. After few steps or as they warm up, the heel pain decreases or diminishes, but returns with intense or prolonged weight bearing activity which is sometimes accompanied by stiffness.⁴ Initially the reports of the heel pain may be diffuse or migratory; with time it usually focuses around the area of the medial calcaneal tuberosity. Generally this pain is most significant when weight bearing activities are involved. The term 'plantar fasciitis' refers to the clinical syndrome of heel pain with tenderness on the under surface of the heel at the point of insertion of the plantar fascia into the calcaneal (heel bone) tuberosity (Fuery, 1975). Plantar fasciitis was first described by Wood in 1812.

Plantar fasciitis has many etiological factors, but the most common cause is mechanical, involving compressive forces making the foot's longitudinal arch flat. Inflammation mainly occurs due to over use or repetitive micro-trauma at the origin of the plantar fascia.⁵ As the etiology is unclear, diagnosis is mainly based on the clinical signs & symptoms.⁶ It has been estimated to affect patients between the ages of 8 and 80. It has been shown to cause heel pain in active as well as sedentary persons of all ages. It is seen in both men and women.

Pathology involves micro-tears of the plantar fascia from repetitive trauma leading to degeneration of collagen. Although often thought of as an inflammatory process, the fascia degeneration and necrosis found in plantar fasciitis is more similar to a tendinitis than a tendinitis. Extrinsic factors of plantar fasciitis include training errors, improper foot wear, and unyielding surfaces. Intrinsic factors include pes-cavus or pes-planus, decreased plantar flexion strength, and reduced flexibility of the plantar flexor muscles, excess pronation, and torsional mal-alignment. Tissue damage produces inflammation with pain and tenderness at the

medial process. The causes of plantar fasciitis are always anatomic, biomechanical, and environmental factors. The most commonly implicated factor, as a cause of plantar fasciitis is excessive pronation of the foot which is mainly biomechanical factor.^{7,8}

Implementation of a conservative treatment and preventive protocol has been shown to be effective in resolving or reducing the symptoms associated with plantar fasciitis. For plantar fasciitis treatment, there will be use of conservative treatment, shock-wave therapy, injections and medications; surgical interventions. Conservative treatment in physiotherapy includes electrical modalities, patient education, soft tissue therapy / massage, stretching, ice, heat, strengthening exercises, orthotics etc.⁹

There are some studies where some authors mentioned about interferential therapy as a treatment modality in plantar fasciitis but there is no such evidence supporting the use of IFT. Here comes the need of the study to find out the effects of the interferential therapy and also to find out whether the conventional therapy and interferential therapy are effective in plantar fasciitis for industrial workers.

METHODOLOGY

Industrial workers having pain at first step in the morning at least minimum 2 to 5 on VAS scale score with a work nature of prolong standing are included. All the participants were aged between 40-60 years and both genders are acceptable for study. Subjects with any skin lesion on the plantar fascia subjects with including heel, anomaly of the foot and ankle, who diagnosed with seronegative arthropathies (rheumatoid arthritis, ankylosing spondylitis. etc) and gout were excluded from the study. Subjects who are having metallic implants in the ankle joint, subjects with sensory problem, diagnosed with diabetes neuropathy were also excluded from the study.

A sample of 30 subjects were distributed randomly in two groups. These subjects were referred by the consultant physician and orthopedic surgeon. All the subjects were signed a consent form prior to participation in the study. Before receiving any intervention, on day zero outcome measures assessment were carried out for both groups subjects by VAS (Visual analog scale) for pain measurement, FFI (Foot Function index) scale for activity limitation scores and goniometric measurement of active dorsi-flexion of ankle joint. Range of Motion (ROM) measurement for both group A and B were taken usual in slandered goniometry according Martin and White.¹⁰ On day

15th, all outcome measures re-assessment will be carried out for the result.

Procedure

Group A: In this group, the participants are treated with conventional therapy as follows;

- a. Ultrasound for 5 minutes using continuous mode with frequency 1MHz is given three times once a week for 15 days. [fig 1]
- b. Contrast bath was given for 20 minutes for 15 days. [fig 2]
- c. Stretching exercises including plantar fascia stretching with tennis ball. For this subject was sitting on the chair rolling foot on the ball for 5 minutes. TA (pendo-achillis) stretching, done in standing by leaning against the wall, holding each stretch for 1 minute and repeating 5 times each session. Advice towel stretch to be done in home at least before getting out of bed. [fig 3,4,5]
- d. Strengthening exercises for intrinsic muscles was done mainly towel curl up. For towel curl ups subject sat with foot flat on the end of towel which placed on a smooth surface. Keeping the heel of the floor, the towel was pulled towards the body by curling the towel with the toes, for 10 minutes. [fig 6]



Fig 1: Applying ultrasound over medial side of calcaneus



Fig 2: Contrast bath method



Fig 3: Plantar fascia stretching with Tennis ball exercise



Fig 4: Calf muscle stretching using Towel over bed.



Fig 5: Against wall calf stretches



Fig 6: Intrinsic muscles strengthening

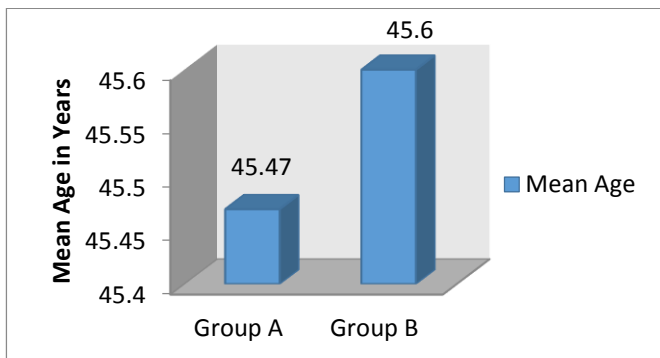
Group B: In this group subjects received conventional treatment as group A, but added with interferential therapy. Interferential electrical stimulation was performed for 15 minutes, with four electrodes placed surrounding the plantar fascia and distally, two proximally at the calcaneus posteriorly [fig 7]. Subjects were treated 3 times per week for 15 days. Outcome measures were assessed, at the end of 15 days of intervention, based on VAS for pain, Foot Function Index and ROM of ankle dorsi-flexion.



Fig 7: Four Electrodes placement of IFT. Overplantar fascia.

Data Analysis: All analysis was carried out in SPSS Windows Version 20.0. Demographic data of patients include age is descriptively summarized. An alpha level of 0.05 was used to determine

statistical significance. Statistical technique used for analysis the study was paired t-test and independent sample t-test. Paired t-test was performed to find out the effectiveness of interferential therapy and conventional therapy in plantar fasciitis for industrial workers. In other hand, independent sample t test was carried out to compare the both groups i.e. between control group and experimental group.



Graph 1: Mean age of subjects of Group A and Group B

	VAS	Mean + SD	N	t	Df	p
Group A	Before Treatment	3.46 + 0.83	15	7.246	14	0.00
	After Treatment	2.46 + 0.5164	15			
Group B	Before Treatment	3.46 + 0.74	15	11.297	14	0.00
	After Treatment	1.60 + 0.50	15			

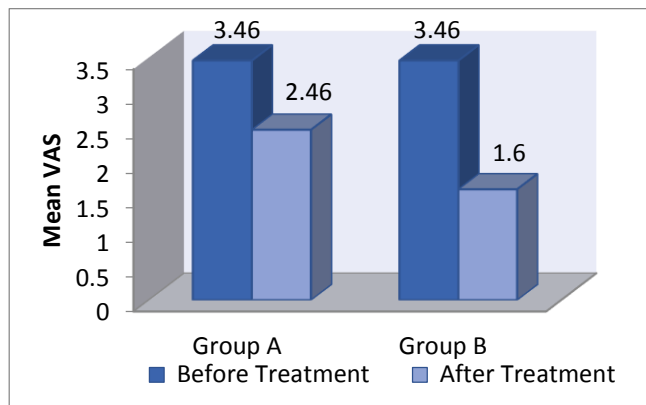
Table 1: within group analysis of Group A and Group B of VAS

	FFI	Mean ± SD	N	t	df	P
Group A	Before Treatment	42.61 ± 2.22	15	13.74	14	0.00
	After Treatment	26.96 ± 3.97	15			
Group B	Before Treatment	43.68 ± 2.56	15	21.13	14	0.00
	After Treatment	20.81 ± 3.17	15			

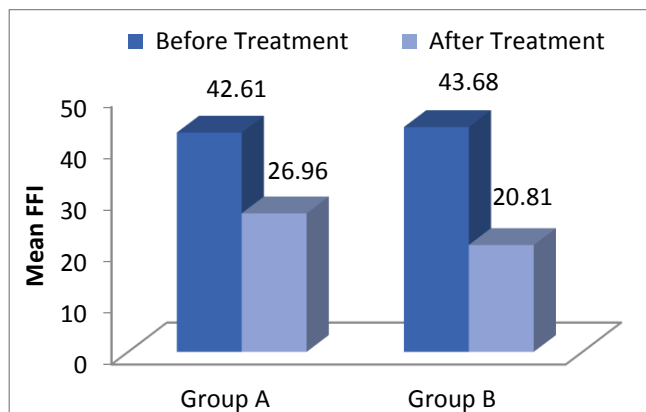
Table 2: within group analysis of Group A and Group B of FFI

	ROM	Mean ± SD	N	t	df	p
Group A	Before Treatment	15.80 ± 2.85	15	-3.910	14	0.00
	After Treatment	17.86 ± 1.64	15			
Group B	Before Treatment	15.53 ± 2.66	15	-4.316	14	0.00
	After Treatment	18.33 ± 2.28	15			

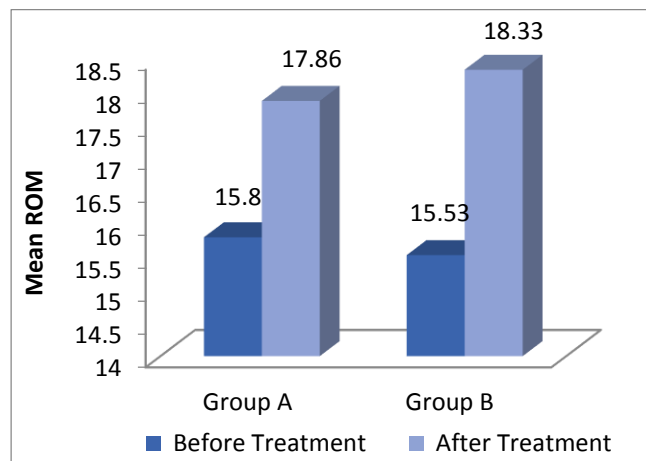
Table 3: within group analysis of Group A and Group B of ROM



Graph 2: Mean VAS of Group A and Group B



Graph 3: Mean FFI of Group A and Group B



Graph 4: Mean ROM of Group A and Group B

	Treatment	N	Mean ± SD	t	df	p
VAS	Group A	15	2.46 ± 0.51	4.638	28	0.00
	Group B	15	1.60 ± 0.51			
FFI	Group A	15	29.96 ± 3.97	4.68	28	0.00
	Group B	15	20.81 ± 3.17			
ROM	Group A	15	17.86 ± 1.64	-0.642	28	0.526
	Group B	15	18.33 ± 2.28			

Table 4: To compare the effectiveness of interventions of A & B group for industrial workers in plantar fasciitis.

For ROM, $t = -0.642$ which is not significant ($p = 0.526$). It has been inferred that conventional therapy and IFT with conventional therapy are equally effective for difference in ROM.

Although the result of the study demonstrated that interferential therapy and conventional therapy both are effective for industrial workers in plantar fasciitis. But, when the subjects were treated with Interferential therapy, showed an additional benefit in terms of reduction of pain on VAS, functional ability in terms of FFI and significantly increase ROM in ankle dorsi-flexion.

RESULTS

Statistical interpretation shows results that pain decrease in both groups but group B shows better result than group A. It was found that in group A, $t = 7.246$ which is significant ($p = 0.00$). On other way, in group B, $t = 11.297$ which is also highly significant ($p = 0.00$). In comparison of both interventions group B (IFT with conventional therapy) is more effective in decreasing pain ($p = 0.00$) than group A (only conventional therapy). In case of FFI, there will be increase functional ability with t value = 13.74 in group A and $t = 21.13$ in group B where both are highly significant $p = 0.00$. However, the results concluded that more improvement of functional ability ($p = 0.00$) in group B than group A. For ROM, $t = -0.642$ the difference is not significant ($p = 0.526$). It has been inferred that conventional therapy and IFT with conventional therapy are equally effective for improving ROM.

DISCUSSION

Plantar fasciitis is a diseased condition which can be treated with wide variety of physiotherapeutic methods alone or sometimes along with some medical interventions. Various methods of physiotherapy exists with own claims success without any attempts of comparing the maximal effective methods.

The aim of the study is to determine the effectiveness of interferential therapy for industrial workers in case of plantar fasciitis. For this study, 2 groups were given interventions, where group A treated with only conventional therapy and group B treated with IFT combined with conventional therapy. For comparison, the effects of the interventions were measured by outcome measures VAS scale, FFI scale and objective measure ROM of ankle dorsi-flexion. Both groups showed significant improvement. But in case of group B, the amount of improvement was higher with decrease in pain, increasing functional ability when compared to group A and increasing ankle dorsi-flexion range is equal in both groups.

James Kofoworola Borlarin, mentioned about the inferential therapy which is a form of electrical stimulation commonly used to treat pain.

According to him, it might use in treating planter fasciitis as it has some similar effects like low frequencies which generally used to activate the mechanism, again providing a degree of pain relief. But he also reported that there will be no such evidence to support the use of effectiveness of interferential therapy for treating planter fasciitis.¹¹

Sergio Jorge et.al, studied about the effectiveness of interferential therapy in reducing inflammatory pain and oedema. In their study they applied inferential therapy (4000Hz carrier frequency, 140-HZ amplitude modulated beat frequency, pulse duration 125 milliseconds, current intensity 5 mA) for 1 hour on the formation induce nociceptive response and edema and on carrageenan-induced mechanical hyperalgesia and edema was evaluated. In results they suggested that, interferential is effective in reducing inflammatory pain and should be considered as primary use in the control of acute inflammatory pain.¹² Absorption of exudates is accelerated by a frequency of 1-10 Hz(rhythmic), as a rhythmical pumping action is produced which assists the normal absorption of exudates.¹³

Kelly A Long studied about the clinical decision making process related to choosing different interventions options with cost consideration for two patients with a diagnosis of planter fasciitis. Both received conservative physical therapy treatments 3 times per week for 3 weeks. Patient A's treatment plan included iontophoresis with dexamethasone and on the other hand patient B's treatment plan included interferential electrical stimulation. In the results, patient A had improved range of motion, strength, and decrease pain as compared with initial evaluation. On the other hand patient B did have some improvements in strength and pain levels but not range of motion.

Mark I Johnson et.al investigated the analgesic effects on interferential currents and Transcutaneous Electrical Nerve Stimulation on experimentally induced ischemic pain in otherwise pain-free volunteers. In the result they get that there were no difference in the magnitude of analgesia between IFT and TENS. Interferential currents reduced pain intensity to a great extent than shape electro-therapy. Whatever the proposed mechanism IFT is effective in relieving pain in plantar fasciitis patients. Further studies need to evaluate the mechanisms for therapeutic effects of IFT in treating plantar fasciitis.

CONCLUSION

In conclusion, this study indicating that there is a significant difference in the effectiveness of Interferential therapy over conventional therapy

in plantar fasciitis for industrial workers. Even though improvement in range of motion is not differing in both group, pain and functional improvement is more in the group treated with IFT.

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Citation

Himashree Das, & Abhijit Dutta. (2015). THE EFFECTS OF INTERFERENTIAL THERAPY FOR INDUSTRIAL WORKERS IN CASE OF PLANTAR FASCIITIS. *International Journal of Physiotherapy*, 2(5), 772-777.