

Effects of Conventional Ultrasound V/S Low Level Laser Treatment in Chronic Plantar Fasciitis

Dr. Shilpa Khatri¹, Dr. Ujwal Yeole², Miss Priyanka Gupta³

¹Assistant Professor, Tilak Maharashtra Vidyapeeth, Pune.

²Associate Professor and Principal, Tilak Maharashtra Vidyapeeth, Pune.

³Intern, Tilak Maharashtra Vidyapeeth, Pune.

Corresponding Author: Dr. Shilpa Khatri

ABSTRACT

Background: Plantar fasciitis is one of the common soft-tissue disorders of the foot, yet little is known about its aetiology. The purpose of the present study was to see the effects of the conventional ultrasound and low level laser treatment on plantar fasciitis.

Aim and objective: To study the effects of conventional ultrasound versus low level laser treatment on pain disability in chronic plantar fasciitis.

Methods: 52 participants were selected according to the inclusion and exclusion criteria and consent was taken. Participants were divided into Group A, Group B. Group A were given therapeutic conventional ultrasound along with stretching exercises and Group B were given LLLT along with stretching exercises. Participants were assessed for plantar fasciitis using Foot Function Index and Maryland foot score. Assessment was done on pre and post intervention on Day 1, 7, 14, 21, 28 i.e. study duration was four weeks.

Results: The P value of Group A is <0.0001 and Group B is <0.0001. The comparative p value of two group is <0.05.

Conclusion: In this study we conclude that, LLLT is more effective on pain disability in chronic plantar fasciitis than Conventional ultrasound.

Key Words: Therapeutic conventional ultrasound, LLLT, Plantar fasciitis, Foot Function Index, Maryland Foot Score, Stretching Exercises

INTRODUCTION

Plantar fasciitis is the most common foot condition treated by healthcare

providers. Plantar Apo neurosis or fascia consists of 3 bands; lateral, medial and central. The central band is the only one attaching the calcaneus to the proximal toes with wrapping on the heads of metatarsals. This arrangement results in “windlass effect” (functional shortening) on plantar fascia when the toes are extended, during the latter part of stance phase. The most common site of heel pain diagnosed as plantar fasciitis is near the origin or entheses of the central band at the medial plantar tubercle of the calcaneus. [1] Reduced ankle dorsiflexion, obesity (BMI \geq 30kg/m²), and work-related weight-bearing appear to be independent risk factors for plantar fasciitis. [2] Conservative treatment based on physical therapy (stretching exercises) and analgesic agents is usually enough, although recovery is slow (up to 18 months). Hence, it is incorporated with electro-therapeutic modalities. [3] In physiotherapy, there is wide use of conventional ultrasound for the management of the plantar fasciitis. Therapeutic conventional ultrasound, described as a high-frequency mechanical wave, transmits energy through vibration. Conventional ultrasonic generators are able to deliver energy in two modalities: continuous or pulsed. [4] Another modality that is now again widely used in physiotherapy clinics is low-intensity LASER treatment. It has gained popularity over the last 30 years as a safe, conservative, and effective way to treat a variety of soft tissue injuries and painful conditions. [5] Low level LASER treatment

is helpful in producing analgesic effect in various types of chronic pain. [6] Hence this study was planned to assess and compare the post-intervention analgesic efficacy of Conventional ultrasound compared with LLLT in patients with chronic plantar fasciitis.

METHODOLOGY

Ethical Clearance Committee procedures were done before starting the study. Participants were selected on the basis of inclusion and exclusion criteria. In inclusion criteria patients who do not regularly practice any physical activity, [3] duration of pain should be more than 6 months, [3] Pain on the planter aspect of heels, patients diagnosed with plantar fasciitis. And in exclusion criteria patient with neurological disorders; local infection, tumour, coagulation disorders, stress fracture, sensitivity deficit, pregnancy, presence of fluffy calcaneal spur on radiograph, generalise joint pain, non-specific urethritis, the use of NSAIDs, use of any orthotic appliances in shoes, diagnosis of a seropositive or seronegative arthropathy. [3] 52 patients from OPDs of physiotherapy clinics were approached out of which 36 patients were selected for the study according to inclusion and exclusion criteria. The OPD set up was having the conventional ultrasound machine and LLLT which were calibrated. The aim and method of the study was explained to the selected participants and their written consent was taken. Participants were divided in two groups, Group A and Group B using chit method. Group A: Therapeutic conventional ultrasound + stretching exercises; Group B: Low level LASER treatment + Stretching exercises. Treatment was performed in a standard manner with the subjects washing their symptomatic foot/feet in soap and water. Continuous Therapeutic conventional ultrasound was applied with the following parameters: continuous mode, base frequency of 1MHz, power 2 W/cm² for 8 minutes on the painful area. [3,4] Both the therapist and the subject

wore protective goggles during LLLT treatment and the foot was "irradiated" with 30mW over the painful area of the plantar surface of foot. Treatment was given for 8 minutes in correspondence with 10cm² area of treatment. [5] Both the groups were given stretching exercises for posterior leg musculature and plantar fascia. Patients were instructed to hold the assigned stretch for ten seconds and to repeat it ten times repeating three times per day every day. [11] The total time each patient was given was approximately 20 min.

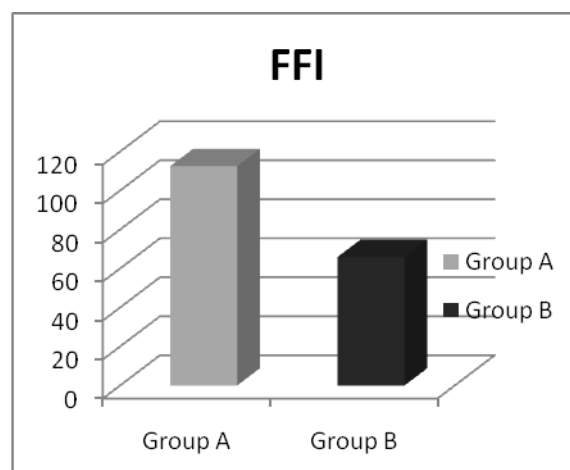
The data (Function Foot Index [9] and Maryland Foot Score [10]) was collected on pre and post intervention, thrice a week for 4 weeks. Intervention was being given thrice per week. The treatment was given according to the respective groups. The results were compared statistically. Group A, B were assessed with Foot Function Index and Maryland Foot Score on pre and post intervention Day 1, 7, 14, 21 and 28.

Data Analysis

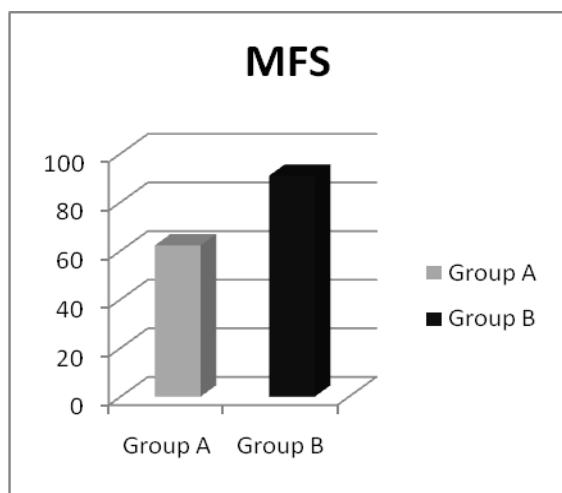
Statistical results were obtained using INSTAT software.

Table 1: The columns depict within the group comparisons whereas the rows depict inter group comparisons.

Outcome Measures	Group A	Group B	P value
Age	27.6±6.33	26.2±8.29	0.893
BMI	26.1±6.48	24.58±6.0	0.446
FFI Pre	148.35±42.56	123.85±57.34	0.133
FFI Post	112.55±36.01	65.95±38.44	0.0003
P value	<0.0001	<0.0001	
MFS Pre	49±8.303	63.6±17.05	0.14
MFS Post	62.25±8.162	90.9±5.73	<0.0001
P value	<0.0001	<0.0001	



Graph 1: Showing comparison between Group A and Group B



Graph 2: Showing comparison between Group A and Group B

DISCUSSION

The purpose of this study was to compare the effects of Conventional ultrasound and LLLT on plantar fasciitis using Foot Function Index and Maryland Foot Score. The results of the present study show that Group A i.e. Conventional ultrasound group and Group B i.e. LLLT group shows statistically significant within the group improvement in both FFI scores and MFI score. The chronic nature of the painful heels in the trial accurately represents the population seeking treatment from The London Foot Hospital, a tertiary referral centre. Plantar fasciitis is the most common diagnosis given to pain on the plantar aspect of the heel. This term oversimplifies the painful heel, which may have one of several aetiologies, explanations of which are outside the remit of this paper. The aetiology of plantar heel pain is believed to be associated with lower limb biomechanics that is, pronation producing tension on the soft tissues of the plantar surface-or part of a systemic inflammatory condition. Patients who presented with likely signs of systemic inflammatory disease related heel pain were excluded from the trial in an effort to assess the conventional ultrasound treatment with minimal variables. [8] Therapeutic conventional ultrasound has been used extensively to treat variety of conditions because of its documented thermal effect. It has repeatedly been shown to increase tissue

temperature at depths up to 5cm with only minimal increase in skin temperature. Stretching of the plantar fascia and Achilles tendon is considered to be effective in the management of plantar fasciitis. [7] The goal of a stretching program is to relieve the stress put on the plantar fascia by either the plantar fascia itself being tight or the fascia being tightened by a tight Achilles tendon, as both the plantar fascia and Achilles tendon insert. [14]

In Text book of Electrotherapy, second edition by Jag Mohan Singh, it is stated that therapeutic conventional ultrasound produces some thermal effects which raises the local temperature resulting in accelerated tissue healing. The extensibility of collagen also increases that gives reduction in pain. It is also stated that Therapeutic conventional ultrasound also gives placebo effect which results in significant psychological effects. [12] One study evaluating the use of conventional ultrasound in the treatment of plantar fasciitis stated the optimum intensity to be 2-3 w/cm² but, in common with physiotherapy texts, offered no justifying explanation of the rationale behind this choice of intensity. There is a need for therapists to prove the efficacy of different dosages of conventional ultrasound across the therapeutic range, considering different parameters such as pulsing versus continuous beam, intensity, frequency, and probe movement. These different dose parameters each need to be evaluated with statistically appropriate and controlled populations of patients, in order to substantiate results. [8] One study evaluating the use of continues conventional ultrasound on chronic plantar fasciitis stated that using us as an intervention mean on, Crawford did not achieve significant results. Although we also could not show higher treatment effectiveness, the characteristics of each study were totally different. Crawford used low intensity (0.5 W/cm²) and pulsed mode of application, while we used high-power (2.0 W/cm²) and continuous mode, this being especially indicated to chronic

processes treatment. [3] In the inter group comparison, Group B i.e. LLLT group showed statistically significant improvement in patients in terms of FFI. This is supported by a study done by Michael Coughlin et al. [13] On Low Level LLLT on plantar fasciitis which states that LLLT stimulate healing and reduce pain by accelerating the speed, quality and strength of tissue repair and the reduction of inflammation. [13] The stretching exercises are proved to be effective in plantar fasciitis. This is supported by a study done by Kent Stuberon Conservative treatment in plantar fasciitis, which states that stretching relieves the stress put on the plantar fascia by either the plantar fasciitis self being tight or the fascia being tightened by a tight Achilles tendon, hence providing pain relief. [14] One study demonstrated that stretching was statistically significantly more effective in reducing pain, [15] Stretching exercises, although central to most treatment protocols, have rarely been evaluated in isolation or for their long-term benefits. In evaluating the data from the current study, as well as our phase-one clinical trial, we noted an overall positive response to the plantar fascia stretch. [16] Also, unlike Therapeutic conventional ultrasound, the LLLT beam doesn't attenuate due to change of medium and this may be other reason for better results than conventional ultrasound. Hence, LLLT in conjunction with stretching exercises proves to be more effective than conventional ultrasound in management of plantar fasciitis. Another study states that obesity is also a factor that cannot be neglected though and is an independent risk factor for plantar fasciitis. [17] Working on obesity can be a future scope for the present study.

CONCLUSION

This study concludes that Low level LLLT is more effective in managing plantar fasciitis than conventional ultrasound.

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