

EFFECTIVENESS OF HIGH INTENSITY HILTHERA 4.0 LASER TREATMENT ON PATIENTS WITH PLANTAR FASCIITIS

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Abstract

Plantar fasciitis is one of the most common causes of heel pain. Conservative lines of treatment include non-steroidal anti-inflammatory drugs, corticosteroid injections, Physiotherapy, stretching exercises and using heel pads or orthotics. The purpose of the study is to investigate the effects of high intensity Hilthera 4.0 laser treatment on pain and functional capacity in patients with acute plantar fasciitis. Total 30 participants were randomly recruited and were evaluated before the first treatment session and after 8 sessions of treatment with Hilthera 4.0 Laser. Treatment Parameters are frequency (Hz) 25, one shot emission (MJ) 500, and a total energy 3000W for 15 minutes each session. Outcome measures are VAS score for measuring Pain and Foot Function Index score for measuring Foot Function. IBM SPSS version 16.0 software was used for statistical analysis. Paired sample t-tests are used to measure the pre and post test results. Results shows that there is a significant difference in VAS Score and Foot Function Score pre and post treatment with 'p' value < 0.05 when Hilthera 4.0 laser is used for pain and Foot function in patients with Plantar Fasciitis. In conclusion Hilthera 4.0 Laser Therapy is effective in treating pain and Functional limitation in patients with Plantar Fasciitis.

Key Words

Plantar Fasciitis, Hilthera 4.0 Laser Therapy, VAS Score, Foot Function Index Score

Introduction

Plantar fasciitis is one of the most common causes of heel pain¹. It involves inflammation of a thick band of tissue that runs across the bottom of your foot and connects your heel bone to your toes

Plantar fasciitis (PF) is most common among patients aged 40 to 60 years² and the ratio of men to women is approximately 2:1². Patients with Plantar fasciitis usually experience plantar heel pain on ambulation, especially during the initial first few steps in the morning which improves with weight bearing³. Unaccustomed athletic activity, sudden weight gain, unsuitable footwear and even standing long hours may cause plantar fasciitis. Biomechanical abnormalities including reductions in the strength of calf muscles, tightness of the Achilles tendon (AT) and plantar fascia, isolated gastrocnemius tightness and abnormal foot alignment⁴ can lead to abnormal loading on the plantar fasciia resulting in its inflammation. Unfortunately, the time taken for resolution is often 6–18 months, which can lead to frustration for patients and physicians^{5,6}.

Conservative lines of treatment include non-steroidal anti-inflammatory drugs, corticosteroid injections, Physiotherapy, stretching exercises and using heel pads or orthotics⁷

Laser treatment is regarded as a non-invasive and painless method that can be easily administered in therapy units for several musculoskeletal disorders, including muscle strains, epicondylitis, rheumatoid arthritis, osteoarthritis, and carpal tunnel syndrome⁸. Both Low-level laser therapy (LLLT) and high-intensity laser therapy (HILT) are being used in treating plantar fasciitis (PF) although both treatments improved the pain levels, function, and quality of life in patients with PF, HILT had a more significant effect than LLLT⁹. Ferit Akkurt in his study reported that High intensity Laser Therapy reduces inflammation and pain¹⁰

Several studies reported the effects of high intensity laser therapy on plantar fasciitis but studies on the effects of high intensity Laser (HILTHERA 4.0) on plantar fasciitis are very less. Hilthera 4.0 Laser using optical fiber with oscillation wavelength of 1064nm provides the optimal therapeutic option to treat acute and chronic pain by safely reaching deep tissues without causing thermal injury or damage to the patient. It delivers the most specific non-invasive therapeutic laser wave penetration for the treatment of painful joint pathologies, deep muscle injuries, tendon

injuries and bone related ailments

The main characteristics of this laser is High Emission Power (up to 8000W), Highly Effective at Maximum Depths, Rapid Analgesic Effects, Pulsed Technology Ensures High Safety Profile, Controlled & Programmable Release of Energy, Observes Thermal Relaxation Periods of Tissues. Through its Photo-biostimulation, Photo-biomodulation and Photo-thermal effects, Hilthera 4.0 Laser helps in speeding up metabolism by facilitating re-adjustment of physiological concentrations of Na + and K + at the cellular level, supplies thermal energy in tissue, promotes blood circulation in damaged tissue, increases nutrient supply, quickly reduces swelling.

The purpose of this study is to investigate the effects of high intensity Hilthera 4.0 laser treatment on pain and functional capacity in patients with acute plantar fasciitis

Hypothesis:

Null Hypothesis (H₀)

There is no significant difference in Pain and functional capacity in patients with acute plantar fasciitis by treating with Hilthera 4.0 laser

Alternate Hypothesis (H₁)

There will be significant difference in Pain and functional capacity in patients with acute plantar fasciitis by treating with Hilthera 4.0 laser

Purpose of the Study:

To investigate the effects of high intensity Hilthera 4.0 laser treatment on pain and functional capacity in patients with acute plantar fasciitis

Objective of the Study:

To evaluate the effectiveness of Hilthera 4.0 laser in plantar fasciitis.

Materials and Methodology

Subject Recruitment:

All the participants of the study are collected from the out-patients attending Physiotherapy at Menara group of clinics, Physio at work – Menara Telekom, Physio at Work – Bukit jelutong, Malaysia and Rev-Med International

Selection Criteria:

A total number of 30 subjects were randomly selected and recruited for the study

Research Design:

Experimental design, Randomized control trial

Material:

Hilthera 4.0 laser, Patient's consent form and Pillows

Methodology:

Patients diagnosed with acute plantar fasciitis and referred for physiotherapy by a primary physician are carefully assessed and upon fulfilling the inclusion criteria are randomly recruited into the study

Inclusion Criteria:

- i. Subjects diagnosed with Unilateral or bilateral Plantar Fasciitis, ii. Both Male and Female, iii. Age group from 20 – 70 years and iv. Having acute plantar Fasciitis

Exclusion Criteria:

- i. Recent Ankle and Knee Injuries, ii. Any Foot Deformities, iii. Uncontrolled Diabetes Mellitus

Orientation of Subjects:

The purpose of the study has been explained to all the subjects before the commencement of the study and informed consent has been taken from all of them. Subjects were instructed to come to physiotherapy department regularly; Subjects were clearly explained about the interventions before starting the treatment

Evaluation Procedure:

Evaluation was carried out for all the subjects; pain was measured using visual analogue scale and functional status of the patient was measured using Foot Function Index questionnaire. Two tools have been used for evaluation: i. Visual analogue scale ii. Foot Function Index questionnaire

Visual analogue scale: Pain was quantitatively measured by visual analogue scale, here the subject was shown a 10 cm line where one end is marked “0” and the other end is marked “10”. They were explained that “0” represents no pain and “10” represents maximum pain and they were instructed to mark their level of pain over that 10 cm line scale

0-----10

Foot Function index (FFI): It is a self administered instrument that measures pain and disability associated with Foot. It gives information as to how your foot pain has affected your ability to manage in everyday life. It consists of 17 items divided into 2 subscales, pain (5 items) and disability (12 items). The questions are asked, patient mark the responses where 0 = No pain and 10 = worst pain imaginable for 5 pain items. For disability 0 = No difficulty and 10 = so difficult that he/she requires help. FFI is the result of total of two subscales (pain and disability subscales) divided by 170 and multiplied by 100 as its percentage

Treatment Protocol:

Hilthera 4.0 Laser therapy – one shot emission (MJ) 500, frequency (Hz) 25, Total energy 3000W for duration of 15 minutes per session

Procedure:

All the subjects were evaluated for their pain and Foot Function before initial treatment session. They received 8 sessions of Hilthera 4.0 Laser treatment. Each session is for 15 minutes and 2 sessions a week for 4 weeks, after 8 sessions of treatment the subjects were re-evaluated for pain and foot function

Results and Discussion:

IBM SPSS version 16.0 software was used for statistical analysis. Descriptive statistical results are shown as mean \pm standard deviation, frequencies and percentages. Before and after treatment results were evaluated through paired sample t-tests. Statistical significance and confidence intervals were determined as $p < 0.05$ and 95%, respectively

A total of 30 subjects were selected randomly for the study but only 22 participants (n=22) successfully completed the study. 8 subjects were dropped in the middle due to various reasons.

As shown in **Table -1** the mean age and standard deviation of the participants is 45.4091 ± 12.8198 . Male and female ration of 1; 1 (Male-11 and Female-11)

From **Table-2**, the Mean VAS score of participants (n=22) prior to treatment is 6.591, standard deviation is 1.436 and Mean VAS score of participants (n=22) after treatment is 3.000, and standard deviation is 0.976. The Mean FFI score of participants (n=22) prior to treatment is 46.176, standard deviation is 16.787 and mean VAS score of participants (n=22) after treatment is 26.674, and standard deviation is 7.734. The 't' value of VAS score pre and post treatment is 15.339 and 'p' value < 0.01 . The 't' value of FFI score pre and post treatment is 6.327 and 'p' value < 0.01 which is highly significant

Graph 1 show the significant difference in VAS Score and FFI Score pre and post treatments. The results of the study shows that there is a significant difference in VAS Score (Pain) and FFI score pre and post treatment with 'p' value < 0.05 when Hilthera 4.0 laser is used for pain and Foot function in patients with Plantar Fasciitis.

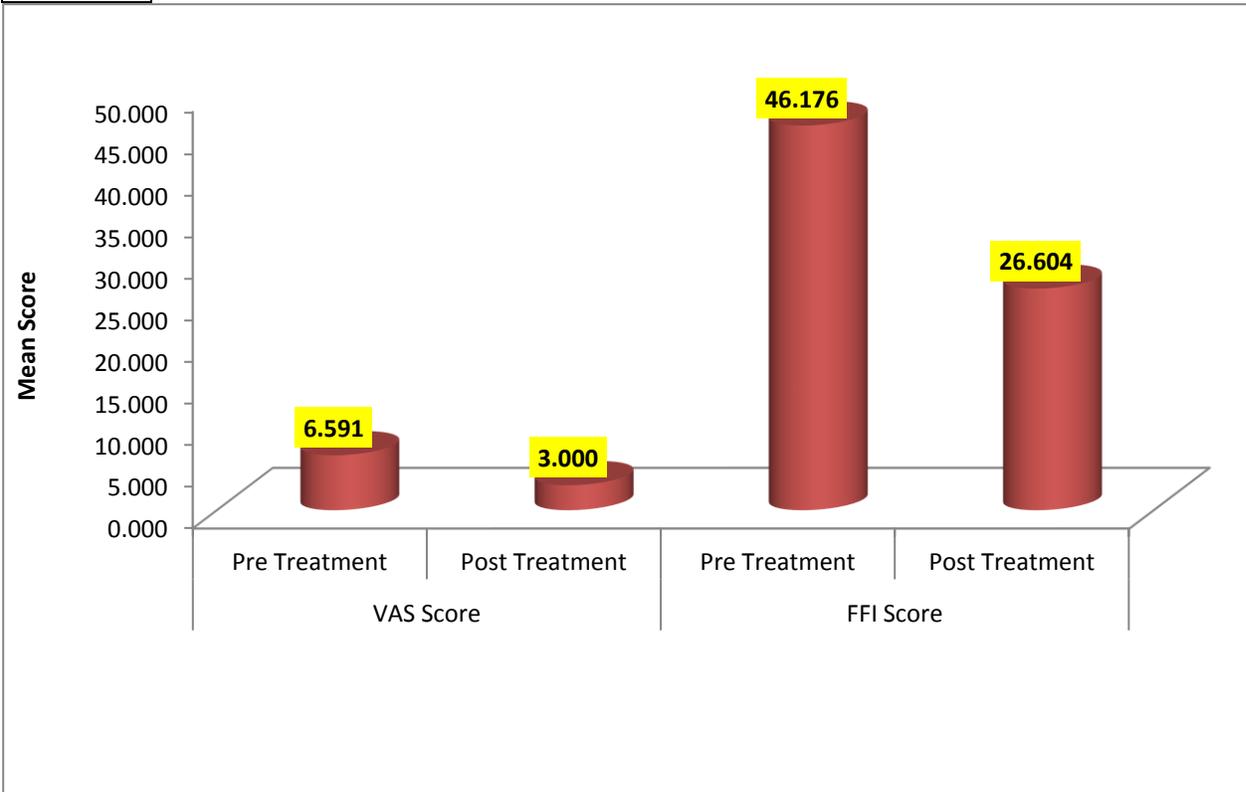
TABLE 1

Demography Characteristics		Mean ± SD /NO (%)
AGE (Years)		45.4091 ± 12.8198
SEX	Male	11 (50%)
	Female	11 (50%)

TABLE 2

		N	Mean	Std. Deviation	" t " Value	P Value
VAS Score	Pre Treatment	22	6.591	1.436	15.339	0.000 < 0.001
	Post Treatment	22	3.000	0.976		
FFI Score	Pre Treatment	22	46.176	16.787	6.327	0.000 < 0.001
	Post Treatment	22	26.604	7.734		

GRAPH 1



Very few studies are done on the effects of Hilthera 4.0 Laser on Plantar Fasciitis. Present study evaluates the effectiveness of High intensity Hilthera 4.0 laser treatment on patients with plantar fasciitis.

This study was conducted on 30 plantar fasciitis patients, randomly recruited and evaluated before the first treatment session and after 8 sessions of treatment with Hilthera 4.0 Laser. Pain was assessed by Visual Analog Scale (VAS), pain and disability associated with foot was assessed by Foot Functional Index (FFI). The Visual Analog Scale showed reduction in pain from pre to post-treatment, there is significant reduction in the pain with 'P' value 0.01. These results are consistent with the findings of previous studies, It is suggested that frequency range from 1 to 100 Hz is suitable for pain reduction and neuralgia treatment despite the general recommendation to use continuous mode.¹¹ Study done by Ordahan et al.⁹ stated that both high-intensity and low-level laser treatments improved the pain levels, but High Intensity Laser Therapy had a more significant effect than Low Level laser therapy. Foot Functional index (FFI) showed improvement in disability associated with foot from pre to post-treatment. There is significant improvement in FFI score with 'P' value 0.01.

In summary, our findings revealed that Hilthera 4.0 training is effective in reducing the pain and disability of plantar fasciitis. Further, with the limitations outlined in mind, researchers can cautiously use these minimal important differences to assist in prospective sample size calculations for clinical trials.

Limitations of the study:

Small sample size may affect the external validity of the results, thus care should be taken in generalizing these results to a wider population. A larger multi centered randomized clinical trials would be recommended to improve external validity of the results. Further Studies can be done on chronic plantar fasciitis cases alone and with different treatment parameters.

Conclusion:

This study shows that Hilthera 4.0 laser treatment is very effective in reducing pain and improving foot function related to Plantar Fasciitis

References:

1. J.D. Rompe . Plantar fasciopathy. *Sports Med Arthrosc*; 17;2009: 100-104
 2. Buchbinder, R. Clinical practice: plantar fasciitis. *N Engl J Med*. 2004; 350 (21):2159-2166.
 3. Thompson, JV, Saini, SS, Reb, CW. Diagnosis and management of plantar fasciitis. *J Am Osteopath Assoc*. 2014;114(12):900-906.
 4. Nakale, N. T. et al. Association between Plantar Fasciitis and Isolated Gastrocnemius Tightness. *Foot Ankle Int*. 39(3), 271–277 (2018)
 5. A.T. Lim, C.H. How, B. Tan. Management of plantar fasciitis in the outpatient setting *Singapore Med J*, 57 (2016), pp. 168-170
 6. M. Mardani-Kivi, M. Karimi Mobarakeh, Z. Hassanzadeh, A. Mirbolook, K. Asadi, H. Ettehad, et al. Treatment outcomes of corticosteroid injection and extracorporeal shock wave therapy as two primary therapeutic methods for acute plantar fasciitis: a prospective randomized clinical trial. *J Foot Ankle Surg*, 54 (2015), pp. 1047-1052
 7. Thomas JL, Christensen JC, Kravitz SR, et al; American College of Foot and Ankle Surgeons heel pain committee. The diagnosis and treatment of heel pain: a clinical practice guideline-revision 2010. *J Foot Ankle Surg*. 2010; 49(Suppl 3):S1–S19.
 8. Brown AW, Weber DC Physical agent modalities (2000) In: Braddom RL (ed) *Physical medicine and rehabilitation*. WB Saunders, Harcourt Health Sciences Company, London; pp 440-458
 9. Banu Ordahan, Ali Yavuz Karahan, RecanKaydok. The effect of high-intensity versus low-level laser therapy in the management of plantar fasciitis: a randomized clinical trial. *Lasers Med Sci* 2018 Aug; 33(6):1363-1369.
 10. Ferit Akkurt, Halil Ekrem Akkurt, Halim Yılmaz, Yücel Olgun and Zafer Sen. Efficacy of High-Intensity Laser Therapy and Silicone Insole in Plantar Fasciitis. *Int J Phys Med Rehabil* 2018; 6:5). DOI: 10.4172/2329-9096.1000484
 11. Salvioli S, Guidi M and Marcotulli G. The effectiveness of conservative, non-pharmacological treatment, of plantar heel pain: a systematic review with meta-analysis. *Foot* 2017; 33: 57–67.
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