

# **EFFECTIVENESS OF HIGH INTENSITY HILTHERA 4.0 LASER TREATMENT ON PATIENTS WITH TENNIS ELBOW**

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## **Abstract**

Tennis elbow also called as Lateral epicondylitis is a condition that presents with pain and tenderness around the common extensor origin of the elbow. Conservative lines of treatment include non-steroidal anti-inflammatory drugs, corticosteroid injections, Physiotherapy, stretching exercises and orthotics like lateral counterforce bracing. The purpose of this study is to investigate the effects of high intensity Hilthera 4.0 laser treatment on pain, grip strength and functional capacity in patients with acute Lateral Epicondylitis. 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, hand dynamometry for grip strength and Patient- Rated Tennis Elbow Evaluation (PR-TEE) for functional evaluation. 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, grip strength and patient rated Tennis elbow evaluation Score pre and post treatment with 'p' value < 0.05 when Hilthera 4.0 laser is used. In conclusion Hilthera 4.0 Laser Therapy is effective in improving pain, grip strength and Functional limitation in patients with Tennis Elbow.

**Key Words:** Tennis Elbow, Lateral Epicondylitis, Visual Analogue Scale, Grip Strength, Hand Dynamometer, Patient- Rated Tennis Elbow Evaluation questionnaire

## **Introduction**

Tennis elbow is a common condition that presents with pain and tenderness around the common extensor origin of the elbow. Tennis elbow is estimated to affect 1-2% of the adult population each year and is more common in the dominant arm<sup>1</sup>. Tennis elbow affects men and women equally<sup>2</sup>, it is generally regarded as an overuse injury involving repeated wrist extension against resistance, although it can occur as an acute injury (trauma to the lateral elbow). Tennis elbow is seen in laborers who utilize heavy tools or engage in repetitive gripping or lifting task. LE is also associated with computer use of more than 20 hours per week, a risk that increases in line with years of use<sup>3</sup>. LE produces a heavy socioeconomic burden resulting from lost workdays and may cause an inability to work for several weeks in some patients<sup>4</sup>. Conservative lines of treatment include non-steroidal anti-inflammatory drugs, corticosteroid injections, Physiotherapy, stretching exercises and using orthotics such as lateral counterforce bracing<sup>5,6</sup>

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 syndrome<sup>7</sup>. Several studies reported the effects of high intensity laser therapy on tennis elbow, but studies on the effects of high intensity Laser (HILTHERA 4.0) on tennis elbow 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<sup>+</sup> and K<sup>+</sup> 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, grip strength and functional capacity in patients with acute tennis elbow.

## **Hypothesis**

### **Null Hypothesis (H<sub>0</sub>)**

There is no significant difference in Pain, grip strength and functional capacity in patients with acute Tennis elbow by treating with Hilthera 4.0 laser

### **Alternate Hypothesis (H<sub>1</sub>)**

There will be significant difference in Pain, grip strength and functional capacity in patients with acute Tennis elbow 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, grip strength and functional capacity in patients with acute Tennis elbow

## **Objective Of The Study**

To evaluate the effectiveness of Hilthera 4.0 laser in Tennis elbow.

## **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, Pillows

## **Methodology**

Patients diagnosed with acute Tennis elbow 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. Unilateral and bilateral tennis elbow, ii. Both Male and Female, iii. Age group from 25 – 60 years, iv. having Acute Tennis elbow

## **Exclusion Criteria**

i. Recent traumatic injuries around elbow, ii. Nerve entrapments around elbow, iii. Cervical radiculopathies, iv. Cervical myelopathies, and v. Uncontrolled Diabetes Mellitus

## **Orientation of Subjects**

An ethical clearance was obtained from ethical committee and informed consent was taken from all the subjects. Individuals who fulfilled inclusion criteria regardless of their gender were taken into the study. The purpose of the study was explained to all the subjects; they 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, grip strength was measured using Hand held Dynamometer and functional status of the patient was measured using Patient rated Tennis Elbow evaluation questionnaire.

Three tools have been used for evaluation: i. Visual analogue scale ii. Dynamometry and iii. Patient Rated Tennis Elbow Evaluation

**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

**Dynamometry:** A hand held dynamometer (Baseline Hydraulic Hand Dynamometer) is a practical tool to measure the grip strength of the hand. Dynamometry has been used for assessment of muscle strength for being a non-invasive, easy-to-apply and low-cost method in addition to providing reliable muscle strength parameters. The arm positions for grip strength evaluation are shoulder in adduction, elbow at an angle of 90<sup>0</sup> flexion and wrist in neutral position. The participants were instructed to squeeze as hard as possible on the device. Next, with the subjects in the upright position, 3 tests for grip strength were performed using the affected hand. The mean values of the 3 grip strength measurements (kilogram-force) were calculated and recorded.

**Patient Rated Tennis Elbow Evaluation:** It is a self administered instrument that measures pain and functional disability associated with Tennis Elbow. The Patient rated Tennis Elbow Evaluation is a 15-item questionnaire with two sub scales Pain (5 items) and functional disability (Specific activities - 6 and usual activities - 4). The questions are asked, patient mark the responses where 0 = No pain and 10 = worst pain imaginable for the past week for the 5 pain items. For Functional disability 0 = No difficulty and 10 = so difficult that he/she requires help. Functional disability sub scale is the sum of two subscales (Specific activities and usual activities) divided by 2. Patient Rated Tennis Elbow Evaluation score is the result of two sub scales (pain and functional disability)

**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, grip strength and functional disability 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

### 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 20 participants (n=20) successfully completed the study. 10 subjects were dropped in the middle due to various reasons.

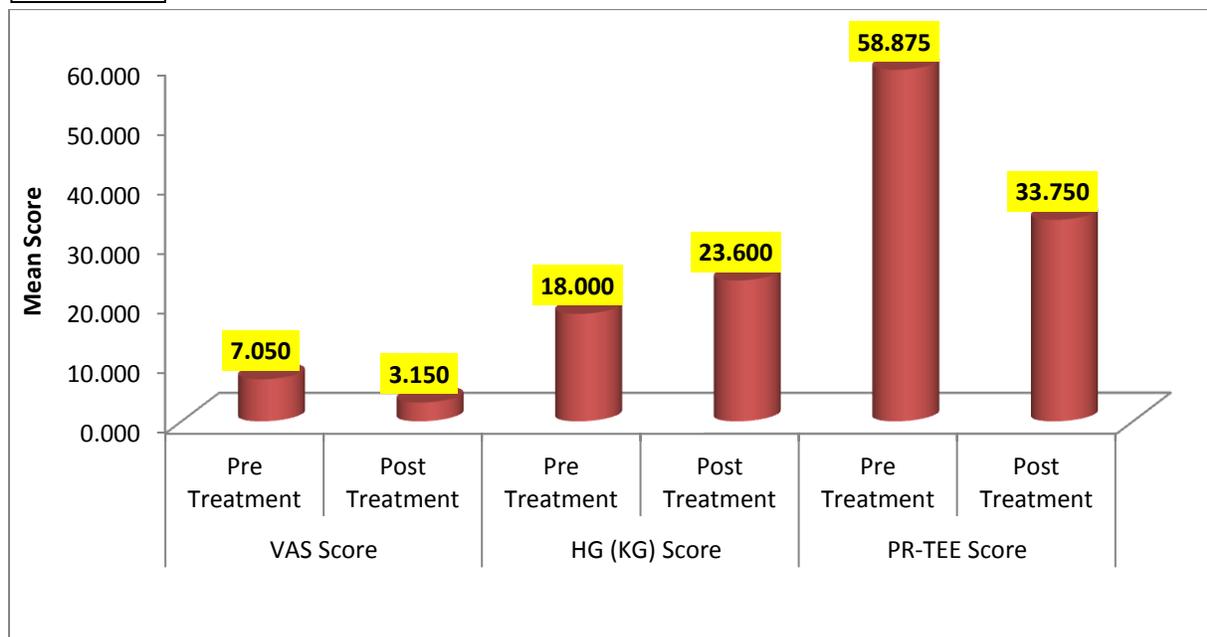
As shown in **Table -1** the mean age and standard deviation of the participants is  $42.950 \pm 7.857$ . Male and female ration of 1; 1 (Male-10 and Female-10)

Demography Characteristics		Mean $\pm$ SD /NO (%)
AGE (Years)		42.950 $\pm$ 7.857
SEX	Male	10 (50%)
	Female	10 (50%)

TABLE 2

		N	Mean	Std. Deviation	" t " Value	P Value
VAS Score	Pre Treatment	20	7.050	1.146	22.132	<b>0.000 &lt; 0.001</b>
	Post Treatment	20	3.150	0.745		
HG (KG) Score	Pre Treatment	20	18.000	5.130	-11.095	<b>0.000 &lt; 0.001</b>
	Post Treatment	20	23.600	5.462		
PR-TEE Score	Pre Treatment	20	58.875	17.074	7.876	<b>0.000 &lt; 0.001</b>
	Post Treatment	20	33.750	7.984		

GRAPH 1



From **Table-2**, the Mean VAS score of participants (n=20) prior to treatment is 7.050, standard deviation is 1.146 and Mean VAS score of participants (n=20) after treatment is 3.150, and standard deviation is 0.745. The Mean Hand Grip (HG) Dynamometry score of participants (n=20) prior to treatment in kilograms is 18.000, standard deviation is 5.130 and Mean Hand Grip (HG) Dynamometry score of participants (n=20) after treatment is 23.600, and standard deviation is 5.462. The Mean Patient Rated Tennis elbow evaluation score (PR-TEE) of participants (n=20) prior to treatment is 58.875, standard deviation is 17.074 and mean Patient Rated Tennis elbow evaluation score (PR-TEE) of participants (n=20) after treatment is 33.750, and standard deviation is 7.984.

The 't' value of VAS score pre and post treatment is 22.132 and 'p' value <0.01. The 't' value of Hand Grip (HG) Dynamometry score pre and post treatment is -11.095 and 'p' value < 0.01 which is highly significant. The 't' value of Patient Rated Tennis Elbow Evaluation score (PR-TEE) pre and post treatment is 7.984 and 'p' value < 0.01 which is highly significant

**Graph 1** show the significant difference in VAS Score, Hand grip Dynamometry score and Patient Rated Tennis Elbow Evaluation score (PR-TEE) pre and post treatments. The results of the study shows that there is a significant difference in VAS Score (Pain), HG Score and PR-TEE score pre and post treatment with 'p' value < 0.05 when Hilthera 4.0 laser is used for pain, grip strength and hand function capacity in patients with Tennis elbow.

The present study evaluates the effectiveness of High intensity Hilthera 4.0 laser treatment on patients with tennis elbow. The principal aim of rehabilitation is to restore the function and reduce the pain. This study was conducted on 30 Tennis elbow patients, randomly recruited and evaluated before the first treatment session and after 8 sessions of treatment with Hilthera 4.0 laser.

The Visual Analog Scale showed reduction in pain from pre to post-treatment. Post-treatment values showed significant improvement with 'P' value of 0.001 compared to pre-treatment. 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.

Dynamometry showed improvement in disability associated with arm from pre to post-treatment, but post-treatment showed significant improvement with 'P' value of 0.001 compared to pre-treatment. According to Shu-Chun Lee et. al, grip-force performance can be affected by aging, and hand-grip weakness is associated with functional limitations of daily living. However, using an appreciate digital hand-held dynamometer with continuous hand-grip force control may provide more valuable information for clinical diagnoses rather than merely recording instantaneous maximal hand-grip force in frail elderly adults or people with a disability<sup>8</sup>.

Patient Rated Tennis Elbow Evaluation showed improvement in functional capacity of arm from pre to post-treatment, but post-treatment showed significant improvement with 'P' value of 0.001 compared to pre-treatment. The tool was developed by Mac Dermid and published with reliability statistics in 1999, updated wording in 2005. According to Angelo Cacchio et al, the PRTEE questionnaire, which provides a very quick, easy and standardized quantitative description of pain and functional disability in patients with LET (Lateral Elbow Tendinopathy), was recently validated as a reliable means of assessing LET<sup>9</sup>.

### **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 tennis elbow cases alone, with different treatment parameters and with larger samples

### **Conclusion**

This study shows that Hilthera 4.0 laser treatment is very effective in reducing pain and improving the function of hand

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