



ADDING HIGH INTENSITY LASER THERAPY TO INTERFERENTIAL CURRENT ON PATIENTS WITH SCIATIC PAIN

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Article History: Received: 05.05.2023

Revised: 10.06.2023

Accepted: 14.06.2023

ABSTRACT

Background: Degenerative disc disease in the spine can cause the pain known as lumbosacral sciatica. Frequently, lumbar discomfort radiates down the leg, limiting a person's range of motion and impairing their ability to function normally. Sciatica is a common medical condition that can cause severe discomfort and even disability.

Objective: The current study set out to do just that by looking at how well high intensity laser therapy complements interferential current therapy in relieving sciatica pain.

Patients and methods: Forty patients, 20 males and 20 females, aged 30 to 50 who had been referred for treatment of sciatica pain, were split evenly between two groups. For a total of 12 sessions over the course of 4 weeks, 3 sessions per week, each session lasting for 60 minutes, the study group received high intensity laser therapy in addition to a selected physical therapy programme (interferential current, stretching and strengthening exercises for the lumbar and hip muscles), while the control group received only a selected physical therapy programme. The Straight Leg Raising (SLR) Test, the Visual Analog Scale, the Modified Oswestry Disability Index, and a digital inclinometer were used to assess all patients. Benha University's physical therapy clinics served as the study's sites for outpatient research. **Results:** The results showed a statistically significant difference between the treatment and control groups ($p < 0.001$), with the treatment group experiencing greater relief from sciatica pain.

Conclusion: High intensity laser therapy for four weeks in conjunction with the chosen physical therapy programme was found to be an effective treatment for individuals with sciatica pain, according to the study.

Keywords: sciatica pain, high power laser therapy, Interferential current therapy, visual analogue scale, straight leg raise and Oswestry Disability Index.

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INTRODUCTION

The clinical manifestation of sciatica, which is more of a symptom than a diagnosis in and of itself, is pain that radiates into one or more dermatomes of the lumbar spine or sacrum. A herniated disc that presses on a nerve root is responsible for 90% of instances of sciatica. Consequently, it causes discomfort in a dermatomal or myotomal pattern. Herniated discs are rather common, with estimates ranging from 1 to 3 percent for those with symptoms. People in their 30s to 50s tend to be the most at risk for LDH.⁽¹⁾

One of the most common reasons people see the doctor is because they are experiencing musculoskeletal pain, and low back pain (LBP) is the leading cause of years of disability globally. Sixty percent of those who seek primary care for LBP also complain of leg discomfort. Referred leg pain does not involve a nerve root, however some individuals will have symptoms of nerve root entrapment (often

referred to as sciatica). When compared to LBP alone, the combined presentation is associated with worse results.⁽²⁾

Research on the effects of Interferential Current (IFC) application on caused pain and in connection with various disorders has been conducted. However, research is lacking and its effects are unclear in regards to its use for low back pain.⁽³⁾

There is some controversy around the analgesic benefits of laser on musculoskeletal disorders, however a number of potential pathways have been proposed for laser therapy of pain and function in the lower back.⁽⁴⁾

High intensity laser treatment (HILT) has a significant impact on pain control due to its capacity to increase cellular vascular permeability, metabolism, and blood circulation when applied to deeper structures and tissues.⁽⁵⁾

Therefore, the aim of the study was to determine the therapeutic effect of high intensity laser therapy in addition to the interferential current therapy on sciatica pain.

PATIENTS AND METHODS

Pre and post experimental design study was conducted between May 2022 and February 2023. A total of 40 Egyptian sciatica male and female cases participated in the study. They were diagnosed following a thorough clinical and radiological examination, were assigned into 2 equal groups study group and control group. **Study group** received High intensity laser therapy in addition to selected physical therapy program **and control group** received selected physical therapy program only (interferential current, stretching and strengthening exercises for the lumbar and hip muscles). and sent to the outpatient clinic of faculty of physical therapy, Benha University.

Inclusive criteria were clinically and radiologically diagnosed sciatic patients, both genders, ages ranged from 30 to 50 years old, medically, psychologically stable and ambulant independently patients, at least 3 months with sciatica, positive straight leg test, sensory changes in dermatome distribution of sciatic nerve and approved to sign a consent form before starting the interventions.

Exclusive criteria were range of motion restriction, lumbar myelopathy, fracture, instability, acute trauma, recent lumbar injection, psychiatric disorders, cognitive deficits, medically unstable and uncooperative patients, acute onset of pain less than 3 months, any other disease of the nervous system, musculoskeletal system disorders, disturbances in vital signs and autonomic functions.

Measurement instrument:

- **Straight leg raising test** is a diagnostic procedure for disc disease and nerve root inflammation. Its value in identifying disc herniation and neurological compression is also noteworthy. Due to its ability to identify cases of abnormal nerve root tension or compression, this procedure can also be categorised as a neurodynamic assessment test.⁽⁶⁾

-**Digital inclinometer for range of motion** is an inclinometer or tilt meter is an instrument for measuring angles of slope

-**Visual analogue scale:** is frequently employed in studies of pain and other forms of subjective experience⁽¹⁾.

-**Modified Oswestry Disability Index:** Treatment success for low back pain is often evaluated using patient-reported disability scales. The Oswestry

Impairment Questionnaire (ODQ) for Modified Oswestry Low Back Pain is a widely used condition-specific outcome measure for quantifying disability in individuals with lumbar syndromes. Ten pieces, ranging from 0 to 5, make up the modified ODQ.⁽⁷⁾

Procedures: for assessment

-All patients were prepared through brief explanation about assessment protocol, reading and signing the consent form before study conduction and writing down a detailed general evaluation sheet for each patient. Each patient was asked to indicate intensity of their radiating pain by marking a 100-mm-long horizontal line that is labeled “no pain” at one end and “worst pain possible” at the other end.

-Range of motion of hip flexion during straight leg raising test was measured using the digital inclinometer.

- Low back pain was assessed using Modified Oswestry Disability Index (ODI)

- For treatment

Study group received a combination of high-intensity laser treatment and a customised physical therapy programme (including interferential current, lumbar and hip stretching and strengthening exercises). Laser radiation at 808 nm and 905 nm was provided by a single laser probe operating at a power density of 1 W/cm² and a duty cycle of 1:1 to the. Manually, the device was programmed to provide 32 J/cm² of radiation in pulsed mode to the sorest spots for 43 seconds at a time. Three sessions twice weekly for four weeks (12 sessions).

Control group received only a selected physical therapy program (interferential current, stretching and strengthening exercises for the lumbar and hip muscles), for 12 sessions every other day for 4 weeks, 3 sessions/week, each session for 60 minutes.

ETHICAL APPROVAL

The study was approved by the Physical Therapy Research Ethical Committee at Cairo University in Egypt (P.T. REC/012/003795).

STATISTICAL ANALYSIS

Unpaired t-tests were used to compare subject characteristics between treatment groups. The Chi-square test was used to compare the sex ratios of the two sets of participants. The data were checked for normality using the Shapiro-Wilk test. Levene's test for homogeneity of variances was utilised to check for group homogeneity. Treatment effects on VAS, ODI, and SLR were analysed using a mixed-model repeated-measures ANOVA. Post-hoc testing using the Bonferroni correction for multiple comparisons were also conducted. A p-value less than 0.05 was used as the threshold for statistical

significance in all analyses. All statistical tests were performed in SPSS for Windows (version 25). Chicago, Illinois, United States (IBM SPSS).

Group I and II subjects' data were summarised in Table 1. No statistically significant differences were seen in the distribution of age, weight, height, body mass index, or sex across groups. (p > 0.05).

- RESULTS

- Subject characteristics:

Table 1. Comparison of subject characteristics between group I and II:

Variable	Group I	Group II	MD	t- value	p-value
	Mean ±SD	Mean ±SD			
Age (years)	39.05 ± 1.66	38.1 ± 2.12	0.95	1.57	0.12
Weight (kg)	77.5 ± 5.86	79.85 ± 5.92	-2.35	-1.26	0.21
Height (cm)	165.1 ± 5.53	166.2 ± 6.82	-1.1	-0.56	0.57
BMI (kg/m ²)	28.42 ± 1.29	28.89 ± 1.02	-0.47	-1.31	0.19
Sex, N (%)					
Females	12 (60%)	13 (65%)		(χ ² = 0.11)	0.74
Males	8 (40%)	7 (35%)			

SD, standard deviation; MD, mean difference; χ², chi squared value; p value, probability value

Effect of treatment VAS, ODI and SLR:

A significant interaction effect between treatment and time was found using mixed model ANOVA (F = 5.06, p = 0.001). The main impact of time was statistically significant (F = 151.43, p 0.001). As expected, therapy had a substantial main impact (F = 6.03, p = 0.002).

Within group comparison

Posttreatment VAS and ODI scores were lower than pretreatment scores in both groups (p 0.001). The VAS and ODI scores dropped by 55.37 and 65.12 percent in Group I, and 43.2 and 35.55 percent in Group II, respectively.

Both groups' SLR improved significantly after therapy compared to before it (p 0.001). SLR improved by 88.8 and 59.65 percent in groups I and II, respectively.(Table 2).

Between group comparison

Prior to therapy, there was no statistically significant difference between the groups. After therapy, the VAS and ODI scores of Group I were significantly lower than those of Group II (p 0.01). Group I's SLR improved significantly after therapy compared to group II's (p 0.01). (Table 2-3).

Table 2. Mean VAS, WOMAC index and active knee extension pre and post treatment of group A and B:

Variable	Pre treatment	Post treatment	MD	% of change	p value
	Mean ±SD	Mean ±SD			
VAS					
Group I	6.05 ± 1.23	2.7 ± 0.92	3.35	55.37	0.001
Group II	6.25 ± 1.25	3.55 ± 0.88	2.7	43.2	0.001
MD	-0.2	-0.85			
	<i>p = 0.61</i>	<i>p = 0.005</i>			
ODI (%)					
Group I	42 ± 11.14	14.65 ± 7.86	27.35	65.12	0.001
Group II	44.45 ± 9.34	28.65 ± 5.17	15.8	35.55	0.001
MD	-2.45	-14			
	<i>p = 0.45</i>	<i>p = 0.001</i>			
SLR (degrees)					
Group I	43.3 ± 7.16	81.75 ± 9.07	-38.45	88.80	0.001
Group II	45.1 ± 6.42	72 ± 10.89	-26.9	59.65	0.001
MD	-1.8	9.75			
	<i>p = 0.41</i>	<i>p = 0.004</i>			

SD, standard deviation; MD, mean difference; p value, probability value

DISCUSSION

Pain in the legs caused by sciatica is radicular and is felt just at the dermatome of the damaged nerve root. decreased productivity and high medical costs can have a major impact on the economy.⁽⁹⁾.

This study showed that the addition of the high intensity laser therapy to the interferential current and the selected physical therapy program was more effective for improving sciatic pain in the study group than using the interferential current and the selected physical therapy program only in the control group.

This study's findings corroborate the effectiveness of HPLT in pain management, which may be attributed to a number of factors including the release of endogenous opioids such as the endorphins in the CNS, which are increased by HPLT therapy and may dampen central pain feelings. Substance P release through peripheral receptors is decreased by laser therapy.⁽¹⁰⁾.

The results of the current study agreed with a previous study that reported high power Laser therapy is a useful approach for the treatment of lumbosacral sciatic pain, and it can promote flexibility⁽¹¹⁾.

Also, Angelova and Ilieva⁽¹²⁾ reported a significant pain decrease in patients with osteoarthritis after seven days of using high power laser.

The result of the current study was supported also by Fiore et al⁽¹³⁾ who proved the analgesic effect of high-intensity laser in patients with low back pain. The results obtained in both groups of patients showed a significantly greater pain decrease in patients treated with a high-intensity laser.

In addition, the data of the conducted study was agreed with Gocevaska et al⁽¹⁴⁾ who concluded that patients with chronic low back pain treated with a high-intensity laser have significantly reduced low back pain, reduced disability and improved range of motion.

Addition of the high intensity laser therapy to the interferential current and the selected physical therapy program was more effective for improving sciatic pain and decreasing disability scores^{(15), (16)}.

Consistent with these findings, previous research has shown that HILT is an effective therapy for chronic lumbar radiculopathy, reducing VAS and Oswestry Disability Index ratings while increasing patients' mobility and general function.^{(5), (16), (17), (18), (19), (20), (21), (22)}.

In agreement with IFC, the result of the current study was agreed with Rampazo et al⁽²²⁾ who stated that interferential current (IFC) therapy shows significant analgesic effects in patients with neck pain, low back

pain, knee osteoarthritis and post-operative knee pain.

On the other hand, some studies were not on the same line with results of our study and there are contradictions. There were no significant differences between HPLT and conventional physiotherapy program in a variety of musculoskeletal disorders^{(24), (25), (26)}.

Conclusion

Reduced discomfort and functional impairment, as well as improved nerve root physiological function and a greater degree of straight leg lift, are all positive outcomes of high-power laser therapy. Furthermore, leg and spinal exercise treatment is scientifically competent to lessen pain, increase ROM, and enhance function. Stressing the relevance of an exercise programme in rehabilitation focused at functional recovery is feasible, safe, and cost-effective. Accordingly, clinics providing physical therapy should highlight HILT in conjunction with a chosen physical therapy programme as a viable rehabilitation option because it is an efficient, trustworthy, and noninvasive technique.

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