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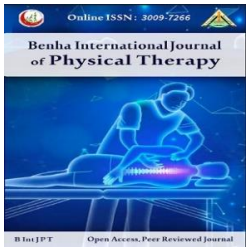

Original research

Effect of High Level Laser Therapy on Postoperative Cesarean Section Incisional Pain

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Abstract

Background: Postoperative pain is a significant concern for pregnant women undergoing a cesarean section. This pain not only instills fear in patients when considering consent for the surgery but also negatively affects their emotional well-being. **Purpose:** This study was carried out to investigate the impact of high-level laser on incisional pain after postoperative cesarean section. **Methods:** Fifty post-operative lower segment cesarean section women participated. They were selected randomly from the El Shatby University Hospital in Alexandria. They were aged from 20 to 40 years. Their BMI was less than 30 kg/m². All participants were distributed into two equivalent groups; the control group was treated by medical treatment (non-steroidal anti-inflammatory drugs as well as antibiotics) only, and the study group was treated by the same medical treatment given to the control group in addition to a high-level laser for 5 minutes on days 2nd, 3rd, and 4th after the cesarean section (3 sessions). VAS and cortisol level were used to assess the severity of incisional pain for each woman in both groups pre- and post-treatment. **Results:** The results showed that in both groups' VAS and cortisol levels decreased significantly after treatment. In terms of VAS and cortisol levels, there was no statistically significant difference between both groups pre-treatment. Significant differences in VAS and cortisol levels were seen between both groups after treatment, favoring the study group. **Conclusion:** It can be concluded that high-level laser therapy is safe and effective in reducing postoperative incisional pain through decreasing pain intensity and cortisol level.

Key words: Cesarean section,Cortisol level,High level laser therapy,Incisional pain.

Introduction

Cesarean section (CS) is the most common obstetric operation around the world [1]. The surgeom must go through every layer to separate it from the fetus in order to perform a cesarean section [2].

Postoperative pain often results from injuries in organs or tissues that produce stimuli that are felt to be painful [3].

Pain like this can result in a number of unfavorable side effects as it can result in difficult coughing or deep breathing, mother can't hold the

baby and can lead to chronic pain which can results in depression [4-5].

Pain management following cesarean delivery is crucial. In addition to enhancing mobility, effective pain management can lower the risk of complication [6]. There a number of ways to ease post-C-section pain. Administering analgesics post-surgery through opioids in addition to non-steroidal anti-inflammatory drugs is the most popular method[7].

Non-opioid analgesics are recommended for the treatment of pain following cesarean sections. However, the use of non-pharmacological interventions is important because of non-opioid analgesics side effects. These interventions might make it possible to prevent negative pharmacological agent effects. Transcutaneous electrical nerve stimulation (TENS), massage, and acupuncture are examples of non-pharmacological interventions that can be used for these goals [8,9].

In the twenty-first century, laser irradiation is a technique to help avoid and lessen post-operative pain following surgeries [10,11].

There are two types of photobiomodulation, low level laser and high intensity level laser. In recent years, high-intensity laser therapy (HILT) has been utilized into physiotherapy treatment plans. When compared to low-power laser treatment, HILT is superior because it uses more intense beams to penetrate deeper, rapidly delivering the targeted high quantity of multi-directional energy into the deeper tissues [12-14].

It was reported that HILT show effect in pain reduction on muscloskeletal problems as in chronic low back pain and patellofemoral pain syndrome [15, 16]. Also show effect of wound healing and post-surgical pain [17-21], but there is limited study of high level laser on incisional pain postoperative cesarean section.

patients and Methods

Subjects:

Fifty post-operative lower segment cesarean section women participated. They were selected randomly from the El Shatby University Hospital in Alexandria. They were aged from 20-40 years. Their BMI was less than 30 Kg\m^2. All women have lower segment cesarean section**.** Women with upper segment cesarean section, diabetic patient and infection of the skin were excluded from the study.

Ethical committee:

The Faculty of Physical Therapy at Cairo University's ethical review board gave its approval to this research (No: P.T.REC/012/005570).

Design of study:

The research is design as randomized controlled study pre and post experimental design.

They were randomized into two equivalent groups A and B:

Group A (Control group):

It involved twenty-five postoperative cesarean section women. They were treated by medical treatment (Non-steroidal anti-inflammatory drugs as well as antibiotics) only.

Group B (Study group):

It was involved twenty-five postoperative cesarean section women. They were treated by medical treatment (Non-steroidal anti-inflammatory drugs as well as antibiotics) in addition to High level laser for 5 minutes on days 2nd, 3rd and 4th, after cesarean section (3 sessions)**.**

Outcome measures:

1- Standard weight height scale:

The BMI for groups A and B was determined by measuring each patient's height and weight using the weight-height scale (healthy scale 160 kg) both before and after therapy.

$$BMI = \frac{\text{Weight (Kg)}}{\text{Height (m}^2\text{)}}$$

2- Visual analogue scale (VAS):

It was used to assess severity of postoperative cesarean section incisional pain for each woman in both before and after treatment for groups A and B.

VAS is typically shown as a 100 mm horizontal line with word descriptions anchored at either end, one of which indicates no pain while the other end the greatest amount of pain. The patient point to on the line the spot that, in their opinion, best captures how they currently feel about themselves. The VAS score is expressed as a millimeter measurement from the line's left end to the patient's designated point. When using the

Arabic version, the patient's indicated point was measured from the right side [22].

3- Blood analysis:

Blood sample was collected at 8:00 am to determine the cortisol levels for each participant in groups A and B both pre and post treatment.

Treatment procedures:

High level laser therapy:

HLLT is cutting-edge technology for successful intervention in physical therapy which made in Italy. It consisting of an 808 nm diode of 1600 mW and a 915 nm diode of another 1600 mW, Which used to obtain high powers adequate to therapeutic needs, in which in a short time a particularly significant energy density is irradiated and such as to reach the most therapeutically effective energy in a short time, and to involve the various cellular layers involved from time to time by the pathology taken into consideration.

It was be used for treatment of all patient in group B only, three sessions in days 2nd, 3rd and 4th post-operative.

Parameter:

The incision was treated by HLLT. The treatment was performed by using of scanner HLLT model HPL 3.2 (1 Diode 808+ 1 Diode 915mn) at power of 70% and density of 5.0 J/Cm^2 and time of 5 minutes for 3 consecutive days.

Patient was supine lying, incision was exposed and scanner was covering the all area for five minutes.

Statistical analysis:

The results are shown as the mean ± the standard deviation. The Kolmogorov-Smirnova test was used to check the normality of the data collected before treatment. Since the data followed a normal distribution, an independent t-test was used to compare the two groups' parameters. The two groups' pre-treatment values were compared using the analysis of covariance (ANCOVA) test, and the post-treatment values were compared simultaneously in order to control for the impact of the pre-treatment values. A dependent t test was used to compare the same group's data prior to and post treatment. For this study, we used the Windows version of the Statistical Package for the Social Sciences (SPSS) software to analyze the data. A significant result was defined as a P value < 0.05.

Results

1- General characteristics of the two studied groups:

There was no statistical significant difference between both groups A and B in age and BMI (Table 1).

Table (1): Comparison between mean age and BMI values of the two studied groups.

	Group A	Group B	t value	p value
Age (yrs.)	29.08 ± 2.75	29.04 ± 2.37	0.055	0.956 (NS)
BMI (kg/m^2)	24.30 ± 2.93	24.38 ± 3.10	-0.920	0.927 (NS)

Data are expressed as mean ± SD. NS= p> 0.05= not significant.

2- Visual Analogue Scale:

There was a significant decline in VAS scores in both groups after treatment.

Prior to treatment, there was no statistically significant difference in VAS scores among groups A and B. After treatment, groups A and B differed significantly on the VAS, with group B showing a greater decrease **(Table 2; Fig. 2).**

Table (2): Inter- and intra-groups comparison between values of VAS in the two studied groups measured at pre- and post-treatment.

	Group A	Group B	F value	P value
Pre-treatment	8.61 ± 0.66	8.66 ± 0.62	0.071	0.791 (NS)
Post-treatment	5.89 ± 0.82	2.36 ± 0.70	527.081	0.001 (S)
Mean difference	2.72	6.30		
% change	31.59 ↓↓	72.75 ↓↓		
t# value	34.247	46.563		
p value	0.001 (S)	0.001 (S)		

Data are expressed as mean ± SD. F value= ANCOVA test. t value= unpaired t test; t# value= paired t test. NS= p> 0.05= not significant; S= p≤ 0.05= significant.

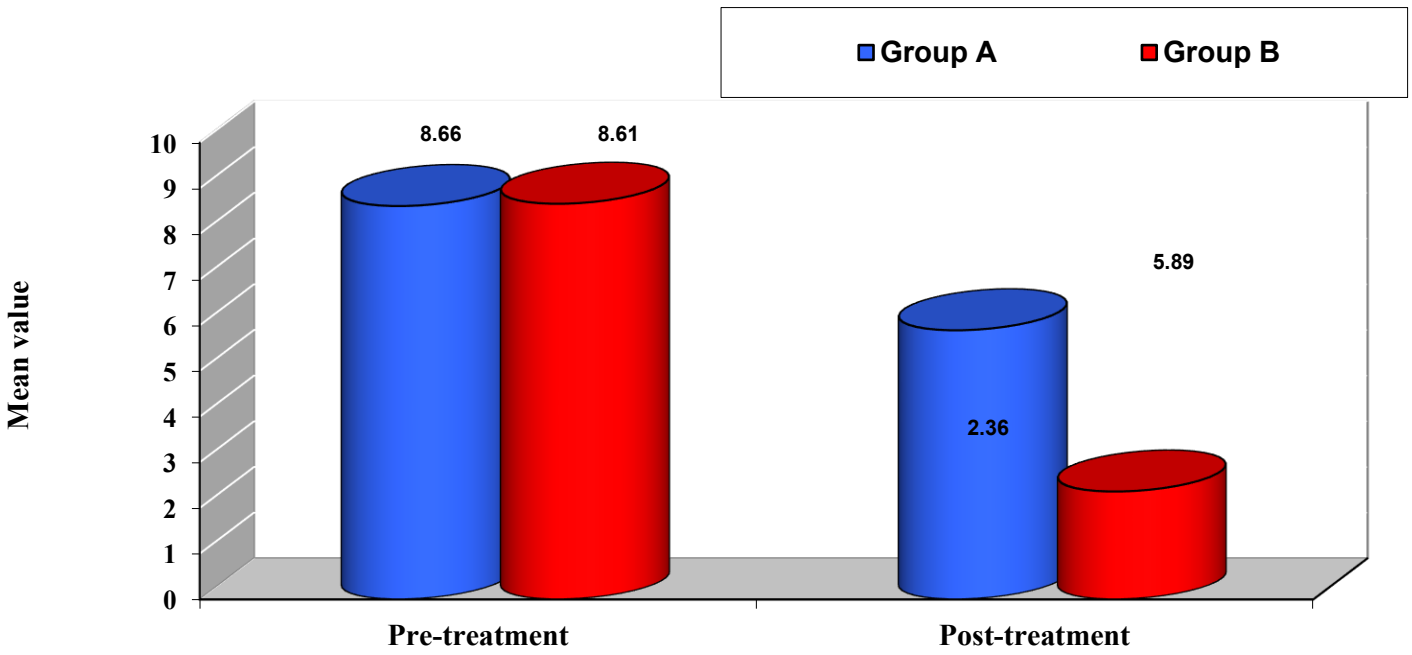

Fig. 1: Mean values of VAS in the two studied groups measured pre- and post-treatment.

3- Serum cortisol:

A significant decline was noted in cortisol levels in both groups after treatment.

The levels of cortisol in groups A and B were not significantly different before treatment. There was a statistically significant difference in the levels of cortisol between groups A and B after treatment, with group B showing a greater decline **(Table 3; Fig. 3).**

Table 3: Inter- and intra-groups comparison between values of serum cortisol in the two studied groups measured at pre- and post-treatment.

	Group A	Group B	F value	P value
Pre-treatment	26.79 ± 2.00	26.77 ± 3.21	0.001	0.987 (NS)
Post-treatment	23.61 ± 2.31	15.33 ± 2.44	902.737	0.001 (S)
Mean difference	3.18	11.44		
% change	11.87 ↓↓	42.73 ↓↓		
t value	14.517	53.000		
p value	0.001 (S)	0.001 (S)		

Data are expressed as mean ± SD. F value= ANCOVA test; t value= paired t test. NS= p> 0.05= not significant; S= p≤ 0.05= significant.

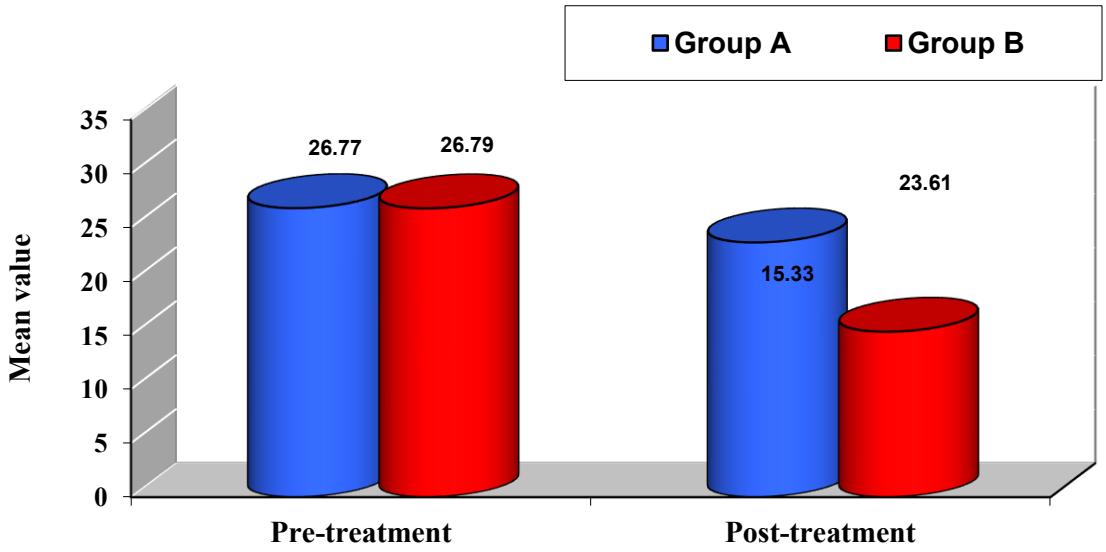

Fig. 2: Mean values of serum cortisol in the two studied groups measured pre- and post-treatment.

Discussion

The cesarean section (CS) is the most commonly performed obstetric surgery, both in Ethiopia and globally [23]. Post-cesarean pain is a prevalent issue that poses considerable health and economic consequences for both the individual patient and society as a whole [24].

When postoperative pain is not managed effectively, it can greatly increase the morbidity of surgical patients, leading to prolonged recovery times and a delayed return to normal functional activities [25]. Using of HLLT in soft tissue surgery frequently results in reduced surgical durations, diminished pain levels, and a lower incidence of postoperative complications [26].

The aim of this study was to investigate the impact of high level laser on incisional pain postoperative cesarean

section. Fifty post-operative lower segment cesarean section women participated. They were selected randomly from the El Shatby University Hospital in Alexandria. They were aged from 20-40 years. Their BMI was less than 30 Kg\m^2. The Faculty of Physical Therapy at Cairo University's ethical review board gave its approval to this research (No: P.T.REC/012/005570).

The research is designed as randomized controlled study pre and post experimental design. All women were randomized into two equivalent groups A and B: Group A (Control group): It included twenty-five postoperative cesarean section women. They were treated by medical treatment (Non-steroidal anti-inflammatory drugs and antibiotics) only. Group B (Study group): It included twenty-five postoperative cesarean section women. They were treated by the same medical treatment given to group A in addition to High level laser for 5 minutes on days 2nd, 3rd and 4th , after cesarean section (3 sessions) .

VAS and cortisol level were used to assess severity incisional pain for each woman in both group A and B before and after treatment.

Results of this study revealed that; within groups; there was significant decrease in VAS and cortisol level in both groups post-treatment. Prior to treatment, there was no statistically significant difference in VAS or cortisol levels among groups A and B. After treatment, groups A and B differed significantly in VAS cortisol levels, with group B showing a greater decline.

The potential mechanisms that contribute to the analgesic effect of HILT stem from this method's capability to inhibit the transmission of pain signals and to enhance the synthesis of substances that mimic morphine in the body, while also promoting blood circulation, improving vascular permeability, and boosting cellular metabolism [27,28]. Furthermore, HILT might exert a direct influence on nerve structures, potentially accelerating the recovery from conduction block or obstructing the transmission of Aδ- and C-fibers [29].

Peplow et al., (2010)[30] stated that the agreement among the studies included in his analysis showed significant reduce pain and inflammation, increase blood flow, tissue regeneration and improve wound healing when use laser therapy.

The effectiveness of HILT, according to Angelova and Ilieva, (2016)[31] is based on the unique and distinctive high peak power of the laser pulse, which transmits a lot of energy in a short period of time as opposed to the lengthy time required to deliver the same amount of energy by low level laser treatment (LLLT), which increases the risk of tissue damage and heating.

Findings of this study came in agreement with Bjordal et al., (2006)[32] who detected that laser therapy has great effect on relive acute pain and decreasing inflammation.

The results also agreed with Saber et al., (2012)[33] who stated that laser therapy has great effect in decreasing post-operative pain which caused by incision.

Also, the results agreed with Zeng et al., (2018)[34] who stated that laser therapy has significant effect when used to decrease incisional pain.

Also, the results of the current study is agreed with Thabet et al., (2018)[35] who carried out his research involving forty diabetic women aged between 28 and 38 years who were experiencing delayed healing of caesarean wound and stated high

level laser therapy is significantly decrease the inflammation of post-operative caesarian section incision and show difference in size and appearance of incision.

The findings of this study also agreed with results of Hussain et al., (2022)[23] who stated that high power level laser when used to decrease the incisional pain in postoperative caesarian section has significant effect in decreasing pain when applied it on thirty-five years female with power output of 10 watts and an energy level of 10 joules per square centimeter were applied for a duration of 2.5 minutes. This treatment was administered over a period of three consecutive days.

The findings of this study are confirmed with the study of Zhao et al., (2025)[36] who divided the patients into two groups: first group received medication only and second group received HLLT and he discovered that HILT significantly reduced pain and improved functional level of patients in the second group when he evaluated its impact on surgical pain using the VAS and the Oswestry Disability Index (ODI).

Furthermore, the findings of current study are confirmed with Ebid et al., (2015)[19] who showed great effected of high power laser therapy in decreasing pain and increasing functional level of patient when applied HLLT to post mastectomy patients. In addition, the findings of current study are supported by Giovannacci et al., (2014)[37] who assessed acute post-operative pain using the VAS, numeric rating scale, and verbal rating scale-6 on the day of surgery, as well as on the first, third, and seventh days following the procedure and stated that laser therapy is very effective in decreasing post-operative pain and improve the discomfort sensation after surgery.

Also, Pereira et al., (2020)[18] described how a high-power diode laser was used to treat a severe knee injury brought on by border ischemia from long-term usage of autostatic retractors instead of Low-power laser. The injury occurred following surgery for a complete prosthesis, and he stated that uses of high power level laser therapy in post-operative surgical pain can reduce the uses of analgesic which has adverse effect on patient.

The findings of this study are also confirmed by Hopkins et al., (2004)[38] who stated that laser therapy is very useful when used for treating surgical wound which promoting healing of wound and decreasing of pain when asses by visual analog scale (VAS).

Also, Mikami et al., (2020)[20] agreed with the results of this study by investigating the following clinical question (CQ) is the focus of the systematic review and meta-analysis: Does using lasers in addition to traditional therapy reduce the pain that comes with treating periodontal disease?. Ten RCTs were included in the database, which was for randomized controlled trials (RCTs) carried out prior to June 2020 following an independent assessment of 165 original records. The remaining ones concentrated on non-surgical periodontal pocket management, while six of them addressed surgical methods. RCTs, used the HLLT, PBMT, in addition to the addition of HLLT to PBMT procedures, and stated that high level laser is more effective on reducing post-surgical pain than conventional therapy.

The results of this study are also supported by White et al., (2017)[39] who stated that use of HILT devices can used as alternative analgesic therapies into treatment protocols for acute or chronic pain because it is a safe device that does not

have any negative effects and may be used to decrease reliance on oral opioid-containing drugs in the post-discharge period following surgery.

Moreover, the findings of this study agreed with Eshghpour et al., (2016)[40] who stated that using of laser therapy on postoperative wound not only decreasing the incisional pain but also reduce swelling at first week of surgery following the extraction of impacted third molar and it may be advised to help relieve patients' symptoms post-surgery.

The findings of this study came in accordance with Zhao et al., (2021)[41] who stated that photobiomodulation (PBM) reduced pain and analgesic intake in the early post-surgery period.

Conclusion:

It can be concluded that high level laser therapy is safe and effective in reducing postoperative incisional pain through decreasing pain intensity and cortisol level.

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