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Effect of High Power Laser on Post Operative Pain and Quality of Life after Cesarean Section

Mohamed H. Aboelmakarem[1] , Nermeen K. Bleedy[2], Eman A. Elhosary [3,] Shereef Lotfy[4] , Hassan Abdelnour[5], Fayiz, F. Elshamy [3]

[1] Physical Therapy Department , Kafr Al-Sheikh General Hospital , Egypt
[2]Physical therapy for women health, Physical therapy Department. Collage of Applied Health Science. Jerash University. Jerash. Jordan.
[3]Department Of Physical Therapy For Women ' s Health , Faculty Of Physical Therapy , Kafr Al-Sheikh University , Kafr Al-Sheikh , Egypt.
[4] Gynecology And Obestetrics Department , Faculty Of Medicine , Tanta University , Tanta , Egypt
[5]Physiotherapy Department. School of Health Sciences. Ahfad University. Omdurman. Sudan, Physical Therapy Department , College Of Allied Health Sciences , Jerash University , Jerash, Jordan

Abstract

Background: Cesarean section (CS) is considered one of the most prevalent surgical procedures. This work was done to evaluate the impact of high-power laser on postoperative pain as well as quality of life after CS.

Methods: This current study was carried out on 40 patient's females aged from 20 to 35 years old, body mass index < 32 kg/m^2, primiparous, full-term pregnancy schooled for elective CS. Patients were distributed into two equivalent group: Group A: was given high power laser (HPLT) after 24 hours post CS in addition to ketoprofen injection and group B: was given ketoprofen injection.

Results: The result of the study showed significant improvement in visual analogue scale (VAS) after 4h, 8h, 12h, 16h, 24h, Mobility, self-care, usual activity, pain \ discomfort and anxiety\ depression (quality of life) (QOL) in both group post treatment .Comparison between both group revealed that there was statistical significant difference between both group favor to group (A).

Conclusions: The HPLT holds promise as an effective modality for managing postoperative pain and enhancing overall quality of life among women undergoing CS.

Keywords: Cesarean Section, High-Power Laser, Ketoprofen Injection, Visual Analogue Scale

1. Introduction:

Cesarean section (CS) is considered one of the most prevalent surgical procedures, particularly in our country although its prevalence differs across the world. The average number of CS done every hour is around one [1, 2]. One of the primary issues for pregnant women considering a cesarean section is the possibility of postoperative pain. Pain has a negative effect on patients' spirits along with making them afraid to consent to surgery [3]. The mother's capacity to supply food and care for the infant is impacted by the pain that follows a CS. Although chronic pain is a well-known consequence of CS, studies have demonstrated that 12.3% of patients still report pain six months following the procedure. Acute pain, particularly in the first twenty-four hours following a CS, can lead to chronic pain and postpartum depression that lasts for eight weeks following delivery [3]. There are already a number of options for post-C-section pain relief. Opiate usage is associated with respiratory depression, nausea, vomiting, urine retention, as well as constipation, among other adverse effects [4].

One therapy utilized to avoid and decrease post-operative pain in the current century is laser irradiation onto the area of surgery. In 2002, the Food and Drug Administration (FDA) authorized the use of high-power laser therapy (HPLT) to alleviate pain. As a form of treatment, laser therapy makes use of light with an intense light spectrum spanning 1000 to 1500 nm [5].

The laser's light is utilized for pain relief as well as wound healing without producing any heat. The photochemical processes that cause a modification in cell membrane permeability, a rise in mRNA production, and an enhancement in cell proliferation are what give this approach its therapeutic benefits [6].

A number of medical conditions have shown promising results when treated with laser therapy, including orthopedic problems, degenerative diseases, sports injuries, musculoskeletal disorders, postoperative pain following tibial fracture surgery, surgical breast augmentation, keloid scar elimination, in addition to oral mucositis prevention following cancer treatment [4]. One possible mechanism through which laser irradiation provides analgesia is by reducing spasm in muscle arterioles, and this is critical for tissue oxygen supply; another is through enhancing ATP 3 formation, which eventually normalizes the metabolic rate of the tissues with decreased energy levels; and a third may be associated with its influence on endorphin levels as well as gale control of pain. Through all of these channels, it has the potential to break the pain cycle [7].

This work was done to evaluate the impact of HPLT on postoperative pain and quality of life after CS.

2. Methodology:

2.1. Subjects

This prospective randomized controlled study was done on 40 patient's females aged from 20 to 35 years old, body mass index (BMI) < 32 kg/m^2, primiparous, full-term pregnancy schooled for elective CS. The Ethical Committee Kafr El-Sheikh University (approval code: P.T/WH/2/2023/39) approved the study before starting study procedures. The patients gave their informed written consent.

Exclusion criteria were patients with history of abdominal operations, history of any radiotherapy or chemotherapy, history of diabetes, sensitivity to light like lupus, infection of the skin or soft tissue around the incision and pre-eclampsia.

Randomization:

In order to prevent selection bias, two wrapped cards that represented the two-therapy group were chosen at random by the patients using a single random method. These cards are the follows; Group A was given high power laser after 24 hours after cesarean section in addition to ketoprofen injection. Group B: was given ketoprofen injection.

All patients had complete history taking and assessing of pain localization, positions and movements that worsen the pain.

Fifty- three patients were enrolled in our study, 13 of them were excluded (8 didn't fulfil our inclusion criteria and 5 refused to join the study), The remaining 40 patients who were randomized into our two equal groups.

Figure 1

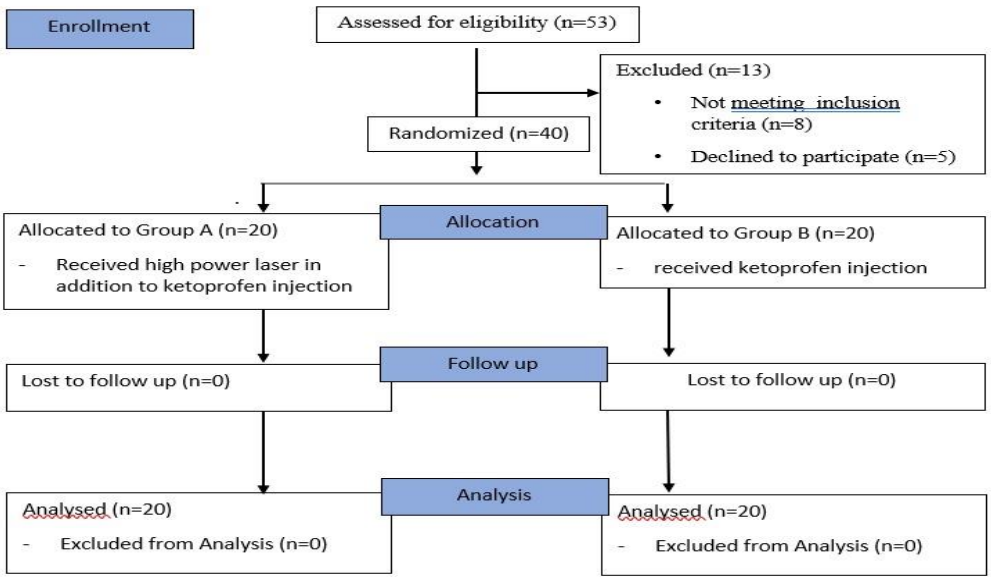

Figure 1: Flowchart of enrolled patients

2.2. Assessment tool :

Visual analog scale (VAS)

It is composed of two ends, one of which stands for "no pain" while the other for "pain as severe as it may be." The patient's present level of pain should be indicated by marking a point on the line. The measurement is taken from a pain-free point to the patient's point on the line. The patient's level of pain is indicated by the distance measured [6].

Quality of Life (QoL) Questionnaire

The EuroQol VAS (EQ VAS) as well as the EuroQol-5 Dimensions-3 Levels (EQ-5D-3L) were used to measure the QOL. Anxiety, depression, pain, mobility, as well as daily activities are some of the dimensions. No problems, moderate problems, as well as extreme problems are the three levels of each dimension. The EQ VAS records the respondent's self-rate health, on a vertical VAS with a range of ratings from 0 (the poorest possible health status) to 100 (the most ideal health condition). The Euro Qol committee certified a valid Arabic version of the EQ-5D scale for evaluating quality of life. Nothing, slight/moderate problems as well as severe/extreme problems make up each dimension [8, 9].

2.3 . Treatment tool

High laser power utilizing a double diode laser device (LUMIX® 2 device, Fisioline, Italy) emitting at 904 nm: frequency 6 KHz duty cycle 100% source PW300 91nm.

2.4. Treatment method

Group (A): received high power laser in addition to ketoprofen

Patient position: crock lying position with bare skin on the area of treatment. Patients were subjected to high laser power using a double diode laser device emitting at 904 nm frequency 6 kHz duty cycle 100% source PW300 91 nm. It was applied on the surgical suture as each point exposed to 10 second 3 times per day every 8 hours after cesarean section after 24 hour for 7 days, an experienced physical therapist conducted the technique. A spot laser was placed perpendicular onto the skin along the line of the CS, and the application technique was punctual as well as non-contact. With a 1 cm gap between each point, the number of points administered was proportional to the length of the surgical wound., the laser source tip was sterilized between each irradiation sessions. started after 24 hour postpartum. The patient and therapist wear safety goggles, in addition to ketoprofen. (ketofan 100mg\2ml) injection twice daily

Group (B): received ketoprofen injection (ketofan 100mg\2ml) injection twice daily.

1.1. Statistical analysis

We used IBM SPSS software package version 20.0 to analyze the data that was input into the computer. (New York: IBM Corp., Armonk) Quantitative data was represented by percentages and numbers. To ensure distribution normality, the Kolmogorov-Smirnov test was employed. Range (including minimum and maximum), mean, standard deviation, median, as well as interquartile range (IQR) were used to represent quantitative data. We used a 5% threshold of significance for judging the data.

2. Results:

Demographic and clinical characteristics were insignificantly different among the two groups. **Table 1**

Table 1: Demographic and clinical characteristics of subjects in both groups

	Group A (n=20)	**Group B (n=20)**	**Test of sig.**	**P**
Age (Years)	32.25 ± 5.63	32.4 ± 4.64	t= 0.092	0.927
BMI (Kg/m^2)	29.64 ± 4.11	30.42 ± 3.5	t=0.65	0.52

Data are presented as mean ± SD or frequency (%). BMI: Body mass index, ASA: American Society of anesthesiologists, CS: Cesarean Section.

Within group comparison showed a significant difference in VAS posttreatment as compared with pretreatment P. value of <0.001 in all hours.
Between group before treatment, there is no significant difference between both groups in VAS after 1h, 4 h, 8h, 12 h, 16h and 24h with P. value of (1, 0.199, 0.508, 0.86, 0.71 and 0.715) respectively, while after treatment, there is a significant difference between both groups VAS after 1h, 4h, 8h, 12h, 16h and 24 hours with P. value of (0.002, 0.006, <0.001, <0.001, 0.023 and 0.014) respectively favor to group A . **Table 2**

Table 2: Pre vs Post treatment Comparison between studied cases according to VAS score

	Mean ± SD.		U. value	p
	Group A (n=20)	Group B (n=20)		
1 H				
Pre treatment	9±0	9±0	200	1
Post treatment	3,8±1,881	6,2±2,285	86	0.002*
Z. value	-3.932	-3.53		
P. value	<0.001*	<0.001*		
4 H				
Pre treatment	8,1±1.055	7,9±1,071	248	0.199
Post treatment	4,6±1,729	6,2±1,508	100.5	0.006*
Z. value	7.728	-4.008		
P. value	<0.001*	<0.001*		
8 H				
Pre treatment	7,7±1.4	7,55±1,356	225	0.508
Post treatment	3,2±1,735	5,85±1,872	63	<0.001*
Z. value	9.03	-3.993		
P. value	<0.001*	<0.001*		
12 H				
Pre treatment	6,6±1.21	6,55±1,356	207	0.86
Post treatment	1,95±1,791	4,6±1,314	52	<0.001*
Z. value	9.621	-4.379		
P. value	<0.001*	<0.001*		
16 H				
Pre treatment	4,8±1.1	4,85±1,089	214	0.71
Post treatment	2,25±1,832	3,65±1,694	117	0.023*
Z. value	5.337	-3.619		
P. value	<0.001*	<0.001*		
24 H				
Pre treatment	4,65±1.15	4,7±1,129	215	0.715
Post treatment	2,05±1,82	3,55±1,605	110	0.014*
Z. value	5.4	-3.758		
P. value	<0.001*	<0.001*		

Data are presented as mean ± SD. * Significant p value <0.05, VAS: visual analogue scale.
Both groups showed a significant difference in all Qol variables posttreatment as compared with pretreatment P. value of <0.05. Table 3

Between group comparison before treatment, there is no significant difference between both groups in Mobility, Self-care, Usual activity, Pain\discomfort and Anxiety/Depression with P. value of (1, 0.84, 0.88, 0.92 and 0.9) respectively, while after treatment, there is a significant difference between both groups in Mobility, Self-care, Usual activity, Pain\discomfort and Anxiety/Depression with P. value of (<0.001, 0.042, 0.024, <0.001, 0.015 and 0.03) respectively favour in group A .

Table 3: Pretreatment and post treatment comparison between studied cases according to Quality of life (EQ-5D-3L)

			Group A (n=20)	Group B (n=20)	P. value
Mobility	Pre treatment	1	6 (30%)	6 (30%)	1
		2	6 (30%)	6 (30%)	
		3	8 (40%)	8 (40%)	
	Post treatment	1	20 (100%)	10 (50%)	<0.001
		2	0	10 (50%)	
		3	0	0	
Z. value			0	0	
P. value			<0.001	<0.001	
Self care	Pre treatment	1	5 (25%)	4 (20%)	0.84
		2	10 (50%)	10 (50%)	
		3	5 (25%)	6 (30%)	
	Post treatment	1	10 (50%)	12 (60%)	0.042
		2	5 (25%)	4 (20%)	
		3	5 (25%)	4 (20%)	
Z. value			-1.945	-2.532	
P. value			0.052	0.011	
Usual activity	Pre treatment	1	6 (30%)	7 (35%)	0.88
		2	8 (40%)	7 (35%)	
		3	6 (30%)	6 (30%)	
	Post treatment	1	12 (60%)	10 (50%)	0.024
		2	5 (25%)	7 (35%)	
		3	3 (15%)	3 (15%)	
Z. value			-2.131	-2.482	
P. value			0.033	0.013	
Pain\ discomfort	Pre treatment	1	4 (20%)	5 (25%)	0.92
		2	12 (60%)	10 (50%)	
		3	4 (20%)	5 (25%)	
	Post treatment	1	11 (55%)	9 (45%)	0.015
		2	6 (30%)	7 (35%)	
		3	3 (15%)	4 (20%)	
Z. value			-2.460	-2.636	
P. value			0.014	0.008	
Anxiety Depression	Pre treatment	1	6 (30%)	7 (35%)	0.9
		2	10 (50%)	9 (45%)	
		3	4 (20%)	4 (20%)	
	Post treatment	1	11 (55%)	14 (70%)	0.03
		2	5 (25%)	3 (15%)	
		3	4 (20%)	3 (15%)	
Z. value			-2.103	-2.412	
P. value			0.038	0.016	

Data are presented as frequency (%). * Significant p value <0.05.

3. Discussion

Effective pain management after CS is essential for physical recovery and enabling new mothers to care for their newborns [10]. In order to alleviate pain, facilitate wound healing, and encourage higher-quality tissue regeneration, laser treatment is a professionally recognised rehabilitation method that has been utilised to restore functioning in a variety of clinical circumstances [11]. Reduced E2 prostaglandin, which stimulates chemicals to delay the onset of pain and regulates the inflammatory process, is linked to pain alleviation induced by lasers [12]. HPLT has been used to a variety of ailments recently. Applications for HPLT include treating wounds (such as diabetic foot ulcers), relieving the symptoms of knee arthritis, shoulder pain, and persistent ankle pain [13, 14].

Our result revealed that before treatment, there is no significant difference between both groups in VAS after 1h, 4 h, 8h, 12 h, 16h and 24h, while after treatment, there is a significant difference between both groups VAS after 1h, 4h, 8h, 12h, 16h and 24 hours favor in group A . Within group comparison showed a significant difference in VAS posttreatment as compared with pretreatment P. value of <0.001 in all hours.

According to Kim et al. [15], HPLT significantly reduced pain at 3 and 8 weeks, which is consistent with our findings. Additionally, Dundar et al. [16] discovered that the HPLT group outperformed the sham group in terms of pain score improvement.

In a similar vein, Alayat et al. [17] shown that HPLT in conjunction with exercise reduces pain and functional disability more effectively and for a longer period of time than either sham laser and exercise or laser alone, with benefits lasting up to three months. The results can explained as B-endorphin and other endogenous opioids are secreted in greater amounts after laser therapy.[16] Although non-opioid analgesics are now mandated in the post-CS analgesia program due to the possibility of adverse effects. The research showed that, prior to treatment, there was no significant difference between the two groups in terms of mobility, self-care, usual activity, pain/discomfort, and anxiety/depression; however, following treatment, there was a significant difference between the two groups in these areas. Both groups showed a significant difference in all QOL variables posttreatment as compared with pretreatment. This suggests that while the combination of laser therapy and ketoprofen is effective in managing specific symptoms like pain, its overall impact on broader functional and psychological aspects of recovery might be limited in the short term.

Therefore, in general conclusions of studies around HPLT, a reduction in pain perception has a major impact on the patient's improved QOL. An established conclusion is supported by a case report by Hussain et al. [21], who demonstrated a considerable decrease in pain from 7.8 to 1.6 on the VAS scale following three days of GaAlAs diode laser treatment of the CS incisional wound without any negative side effects.

After 12 weeks, Ebid et al. [20] revealed that the active laser group's QoL outcomes significantly improved compared to the placebo laser group. In their evaluation of the long-term effects of HILT treatment on quality of life (QoL) in patients with post-mastectomy pain syndrome, Ebid and El-Sodany [21] found that QoL increased, pain decreased, and range of motion improved. Inflammation reduction, microcirculation improvement, immunological process stimulation, nerve regeneration improvement, and endorphin release are all potential causes of pain reduction following laser treatment. By enhancing blood flow, vascular permeability, and cell metabolism through particular waveforms with regular peaks of higher amplitudes and time intervals between them to decrease heat accumulation phenomena, laser treatment can quickly produce photochemical and photothermic effects in the deep tissue [22].

Additionally, it increases the quantity of myofibroblasts needed for wound healing, which can restrict the wound and speed up the reepithelization process, as well as collagen production and tensile strength [23].

This study was conducted at a single center and has some limitations, including a small sample size. Therefore, we suggested more research with a bigger sample size to look at longer-term results and evaluate how these treatments can improve full recovery following CS.

Conclusions:

The findings suggest that HPLT holds promise as a non-invasive and effective modality for managing postoperative pain and enhancing overall quality of life among women undergoing cesarean section.

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Conflict of Interest: Nil

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