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Efficacy of Intraoral and Extraoral Low-Level Laser Therapy (LLLT) in Managing Pain and Swelling After Surgical Removal of Impacted Mandibular Third Molar

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Abstract

Objective: Postoperative edema and pain are common third molar surgery side effects, that normally happens with local anesthesia. The low-level laser (LLLT) method has been universally recognized as a cell bio-modulator that is employed to accomplish optimum beneficial effects. It reduces the pain reaction, stimulates local microcirculation and wound healing, and promotes a fast healing, thus enhancing the patient's quality of life. We intended to ascertain the LLLT efficacy in improving mouth opening following the impacted third molar extraction in this research.

Methods: This randomized clinical trial was carried out on ninety cases who had impacted mandibular third molars in similar positions. Group A was allocated to intra-oral LLLT, Group B to extra-oral LLLT, and Group C to the control group. All participants were evenly divided into these three categories. The outcome that was assessed was the pain degree, alongside the postoperative edema and recovery at the operation site.

Results: Postoperative pain and edema were calculated on 1st and 7th day. All these parameters were lower in LLLT patients ($p>0.05$).

Conclusions: After the impacted mandibular lower wisdom tooth surgical extraction, the LLLT application was effective in mitigating postoperative complications, for instance facial edema and pain.

Keywords: Low Level Laser Therapy (LLLT), Pain, Impacted third molar, Mouth Opening, Laser Dentistry, Facial swelling.

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Introduction

In the oral cavity region, the impacted third molar extraction is a frequently performed process that can result in postsurgical complications, including trismus, edema, and pain. These adverse effects can result in cases experiencing disturbances due to their disruption with chewing and speech [1].

The most intense pain typically occurs within three to five hours of the surgery, when the local anesthesia effects have faded. In contrast, edema typically reaches its maximal size between 20 hours and two days after the procedure, which can have a negative effect on the patient's social life and compromise their aesthetics [2]. The inflammation development is primarily caused by operating trauma, which is linked to the postoperative repercussions [3].

While edema and pain progressively reduce throughout the procedure, it is imperative that the doctor and patient maintain control over these complications. Most surgeons have employed a variety of methods to mitigate the postoperative sequela, including corticosteroids (CS), analgesics, and non-steroidal drugs (NSAIDs).

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However, these medications have adverse effects can be problematic for certain contraindicated cases. Consequently, alternative methods, like low-level laser therapy (LLLT), that is devoid of adverse effects, have emerged [4].

A diode laser energy application that is close to infrared wavelengths is known as LLLT [5]. It has been regarded as having the potential to accelerate the recovery process, and to reduce pain and inflammation. LLLT has been implemented in many dental procedures, including the tooth extraction adverse effects mitigation, due to characteristics [6]. LLLT can also be employed for accelerated and promote bone regeneration by induced extraction cavities quick recovery [7].

On irradiated tissues, LLLT can have both biostimulatory and bio inhibitory effects, each of which has potential therapeutic applications. Biologic response stimulation via energy transfer is a prerequisite for laser therapy [8].

The light energy incorporation with a bio-modulatory function to body cells is the key concept behind the LLLT utilization [9]. The energy of the cell is provided by adenosine diphosphate (ATP), that's the cytochrome c oxidase (CcO) and the Krebs cycle product. This is achieved by CcO absorbing LLLT irradiation and transferring it to mitochondria. A rise in cell activity is induced by the ATP synthesis stimulation [10]. Consequently, the study objective was to ascertain the LLLT efficacy in relieving the discomfort and edema due to the impacted third molars extraction.

Material and Methods

From November 2022 to January 2024, this randomized clinical trial took place on (90) patients, with impacted mandibular third molars in comparable positions (Class II-III and position B, Pell and Gregory's classification) [15]. The cases were comprised of 52 males and 38 females. The study setting was the centre for Dentistry in Iraq's Oral Surgery unit by the Diyala Health Department, and the local institutional ethical committee's approved (KIMSDU/IEC/03/2015 dated December 10, 2015) the protocol. The study's nature was explained to all patients, and they were required to provide written informed consent. The study involved patients aged 18-35 who needed a partially or fully impacted lower third molar surgical extraction. Cases who were in good health and maintained proper dental hygiene were included. Cases with systemic diseases, psychiatric disorders, pericoronitis, neurological or persistent pain, and those who had taken anti-inflammatory drugs or bisphosphonates within 15 days, photosensitivity disorders, asymmetrical third molars, postoperative dry socket, pregnant or breastfeeding women, skipped appointments, and in-place smokers were excluded from the study. The same operating surgeon performed all the surgical procedures.

Utilizing www.random.org all participants were divided into three groups equally regarding to the laser treatment site where cases in group A were allocated to intra-orally LLLT, cases in group B allocated to extra-orally LLLT, cases in group C were allocated to the control group.

Clinical examination

The extraoral examinations consisted of the assessment of the face, eyes, lymph node, and temporomandibular joint for pain, abnormalities, and baseline prior to surgery. Intraorally, the oral hygiene and periodontal status were evaluated for inflammation or irritation.

Radiographic examination

Preoperatively, periapical and panoramic radiographs were obtained for each patient to detect the lower wisdom tooth position, the orientation of its depth in relation to the contiguous tooth, the mandibular foramen, the root

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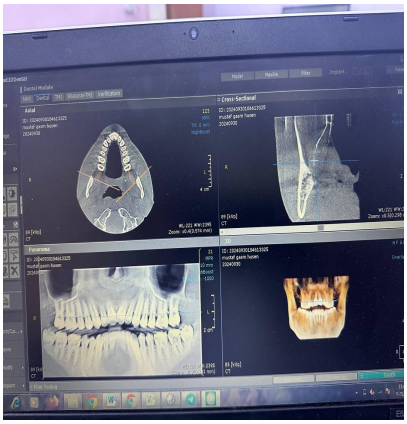
size and shape, and the teeth number (Figure 1).



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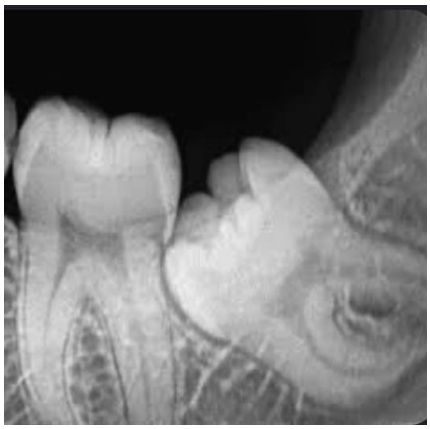


B

Figure 1. Preoperative radiographical assessment (A) O.P.G. image and CPCT showing vertical impaction of the lower wisdom tooth of left and right side, (B) periapical X-ray showing a vertical impaction of lower left third molar.

Anaesthesia

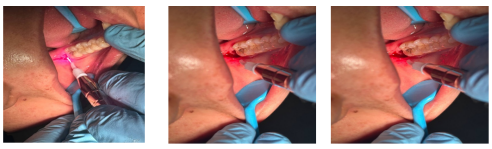
The lidocaine hydrochloride 2% local anaesthetic cartridge and adrenaline 1: 80,000 were utilized to administer local anaesthesia to patients through inferior alveolar block, lingually, and long buccal nerve block injections.

Surgical procedure

Surgical blade number 15 was utilized to make an incision mucoperiostically from the lower seven disto-buccal cusp to the retromolar area midline. The incision was then buccally reached along the 2nd molar crown, and a moon-shaped flap was extended to the muco-buccal fold and increased with a periosteal elevator. All these factors contributed to favourable visibility and excess. The nearby bone is preserved by the application of a straight surgical hand piece fissure or round bur to eliminate the impacted lower third tooth. The tooth is sectioned utilizing a straight handpiece with fissure burs or a turbine handpiece with round or fissure burs, as necessary. The tooth is subsequently extracted utilizing a straight elevator, Coupland's chisel, or Cryer and forceps, with a specific focus on the lower third molar. The wound was inspected for granulation tissue, root fragments, tooth follicles, and bones following the tooth extraction. Using a primary interrupted method, the flap and wound were repositioned, and the edges were sutured.

Laser therapy

Following surgery, patients in the LLLT group were administered low-level laser irradiation intraorally occlusally, lingually buccally or at three sites, and extraorally at three points. 500 mW (0.5 W) of laser energy was administered by employing a diode laser system (QuickLase®, UK) with a constant dual wavelength of (810,980nm) for 120 seconds (0.5 W×120s=48 J). For each site, the control group (n = 30) established standard postoperative care without LLLT, as well as 0.5 cc of normal saline solution in the cavity for 30 seconds (Figure 2).



A B C

Figure 2. Application of low-level laser, Intraorally, (A) at buccal side, (B) Lingual, (C) lingual occlusally at the side of the operation site.

The patient was prescribed amoxicillin capsules 500 mg three times daily following the surgery, while Augmentin tabs 625 mg (Amoxicillin 500 mg, Clavulanic acid 125 mg) were administered twice daily. For a duration of three days, the antibiotic was taken. For individuals who were allergic to penicillin, azithromycin 500 mg was administered every 12 hours. For a duration of three days, either a 500 mg Paracetamol tablet with acetaminophen or a 200 mg Ibuprofen tablet was administered twice daily.

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Pain

The facial dimensions of all patients were evaluated prior to surgery using a flexible measuring tape, which was utilized to determine the distance from the chin tip to the auricular lobe lower part (Figure 3). Pain was evaluated utilizing a visual analog scale (VAS) at two and seven days postoperatively. Patients are instructed to indicate the intensity of their pain by marking points on the VAS [3,12,13].

Swelling

The baseline facial distance was established prior to surgery by calculating the arithmetic mean of face three linear measures. Five points were placed on the face utilizing a centimetre flexible tape, with the patient in an upright position and the mandible in a resting position [1,3,14]. In the postoperative period, edema was assessed in the two planes using a thread and measuring scale. Both preoperatively and postoperatively, the distance between the gonion and the eye external canthus and the distance between the tragus and the lip commissure were measured. The subsequent formula was employed to determine the edema coefficient:

Edema coefficient = (Distance after surgery − distance before surgery)/(distance before surgery) ×100.

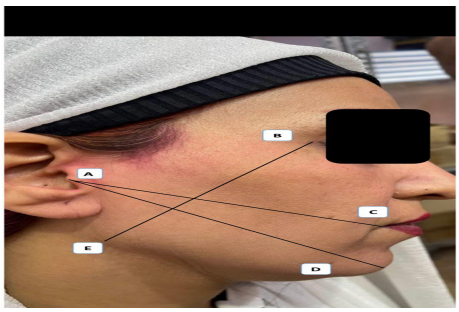

Figure 3. Measuring the distance between (line A and C). distance between the (Line A and D) and distance between (line E and B).

After confirming that the recovery was satisfactory, the suture was removed on the seventh postoperative day. The potential complications linked to the operation were also assessed during the routine follow-up checkup. Cases in both groups were prescribed antibiotics and analgesics for three days following the procedure, involving Amoxicillin or Augmentin for three days or Azithromycin if allergic. Analgesics such as Paracetamol or Ibuprofen were prescribed for a period of three days. Regular follow-up visits, maintaining good oral hygiene, and biting for 60 minutes were among the medical and physical recommendations that were issued postoperatively. Pain and edema were assessed during routine examinations on the third and 7th days.

Statistical analysis

IBM® SPSS® (ver. 26. SPSS Inc., IBM Corporation, Armonk, NY, USA) was employed to conduct the statistical analysis. The Shapiro-Wilk test was employed to investigate the data normality. The mean and standard deviation were utilized to present quantitative data. The paired t-test was employed to compare the means of two groups before and after treatment. The means of two groups were compared utilizing an independent t-test. The association between numerical variables within each group was described using Pearson correlation analysis. A p-value of less than 0.05 was regarded as statistically significant.

Results

In this study, 102 case were assessed for eligibility; 8 patients did not satisfy the criteria, and 2 patients declined to participate. The remaining 90 cases were randomly allocated to three groups, with 30 cases in each cohort. The statistical analysis and follow-up of all allocated patients were conducted (Figure 4).

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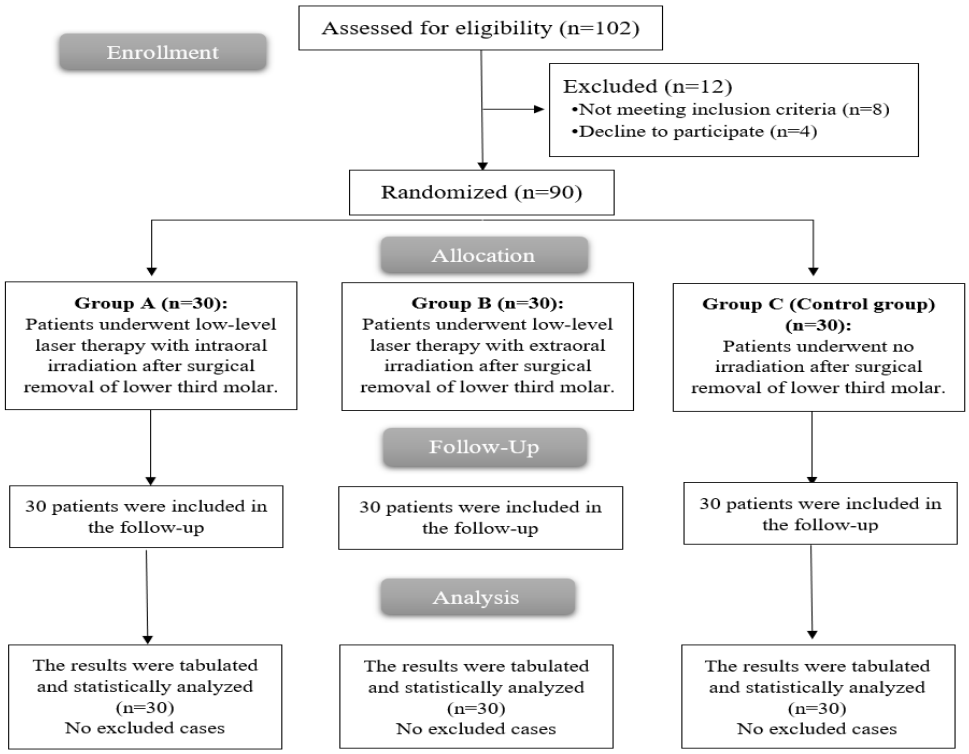

Figure 4. CONSORT flowchart of the studied groups.

Age and gender distributions between the groups were not different (Tables 1 and 2). There was insignificant difference between groups regarding duration of operation (p= 0.178, Table 3). The pain score VAS at days 2, 5, and 7 demonstrated significant differences between study groups ($P < 0.001$, Table 4). The study groups exhibited a significant difference at baseline facial swelling, day 2, and day 7 (P = 0.014, <0.001, and <0.001, respectively). In group A compared to group C at baseline (P = 0.012) facial swelling was significantly reduced. Similarly, compared to groups B and C at days 2 and 7, facial edema was significantly reduced in group A (P < 0.001), with insignificant difference among groups B and C. Facial swelling was significantly reduced in groups B and C at baseline, but it increased at day 2, and subsequently decreased again at day 7 (P < 0.001). Compared to day 2 the facial swelling in group A was significantly reduced at day 7 (P = 0.002). There was insignificant difference between baseline and day 2 or between baseline and day 7 (Table 5).

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Table 1. Age of the study groups samples.

		Group A (n=30)		Group B (n=30)		Group C (n=30)		P-value
		Mean	SD	Mean	SD	Mean	SD	
Age (years)	Mean ± SD	24.8	5.5	25.33	5.34	25.3	4.5	0.903
	Range	18 – 34		18 - 34		18 – 32		

Data are presented as mean ± SD. *: significant as P value <0.05.

Table 2. Gender of the study groups samples.

		Group A (n=30)		**Group B (n=30)**		**Group C (n=30)**		**Total (n=90)**		**P-value**
		N	%	N	%	N	%	N	%	
Gender	Male	21	70%	17	56.67%	14	46.67%	52	57.78	0.185
	Female	9	30%	13	43.33%	16	53.33%	38	42.22 %	

Table 3. Duration of operation among the studied groups.

		Group A (n=30)		**Group B (n=30)**		**Group C (n=30)**		**P-value**
		Mean	SD	Mean	SD	Mean	SD	
Duration of operation	Mean ± SD	33.97	1.59	34.3	1.73	34.7	1.18	0.178
	Range	30 - 36		30 – 36		32 – 36		

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Table 4. Comparison and post hoc of VAS among studied groups.

		Group A (n=30)		Group B (n=30)		Group C (n=30)		P-value
Day 2	Mean ± SD	3.4	0.56	3.73	0.64	7.43	1. 41	<0.001*
	Range	3 – 5		3 – 5		5 – 10		
Day 5	Mean ± SD	1.4	0.5	1.77	0.57	3.83	0.91	<0.001*
	Range	1 – 2		1 – 3		3 – 6		
Day 7	Mean ± SD	0.27	0.45	0.57	0.5	1.03	0.49	<0.001*
	Range	0 – 1		0 – 1		0 – 2		

Table 5. Comparison and post hoc of facial swelling among the studied groups.

		Group A (n=30)		**Group B (n=30)**		**Group C (n=30)**		**P-value**
Baseline	Mean ± SD	327.63	37.91	342.83	25.09	349.6	21.88	0.014*
	Range	288 – 390		300 – 375		306 – 377		
Day 2	Mean ± SD	334.87	35.76	363.7	26.13	377.1	19.88	<0.001*
	Range	290 – 397		320 – 399		337 – 401		
Day 7	Mean ± SD	314.2 ±	30.93	347.47	28.43	361.5	20.82	<0.001*
	Range	280 – 390		300 – 390		320 - 388		

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Discussion

At an oral surgery clinic, the lower third molars surgical removal is one of the most frequently performed methods. It can be followed by trismus, facial swelling, and postoperative pain. These conditions are the result of a combination of intricate factors, but the primary cause is inflammation that is initiated by surgical trauma [15]. Bradykinin (BK) is released from ruptured blood vessels and histamines, serotonins, and potassium are released from injured cells because of the surgical technique, which induces tissue injury. The activation of nociceptors, a change in tissue color, and swelling are the results of this tissue reaction. Nociceptor activation and prostaglandin release are induced by BK. Due to this, symptoms such as pain, trismus, and edema manifest [16]. Side effects, including allergic reactions, systemic bleeding, and gastrointestinal irritation, may result from these types of treatments. In addition, none of these treatments have been found to be satisfactory. [4]. These effects can be mitigated by any combination of NSAIDs, CSs (local or systemic), or both. Nevertheless, these medications may produce different side effects, such as allergic responses, systemic bleeding, and GIT discomfort, and may be dangerous for certain individuals. As a result, there is an increasing interest in the development of alternative, side-effect-free methods [17]. LLLT is widely recognized for its ability to regulate the inflammatory and reduce acute pain in the short term. The LLLT biological effects partial creation is facilitated by the LLLT energy absorption by tissues and the photons interaction with cellular structures. It is anticipated that this interaction will have therapeutic effects. Muscle relaxation, pain relief, wound recovery, and are the altered cell membrane permeability and increased cellular energy outcomes. LLLT prefers the hyperpolarized state, which prevents the painful inputs transmission to the central nervous system, straight over primary nerve terminals [18]. cyclooxygenase 2(COX-2), tumor necrosis factor (TNF), prostaglandin E2 (PGE2), and interleukin 1are among the pain and inflammation mediators that LLLT has significant and rapid effects on [19]. Age differences between the groups were not found to be statistically significant in the present investigation. In this study, the most participants age range was 18 to 34, which constituted approximately 95% of the total sample. In accordance with the observations of Breik and Grubor, Hashemipour et al., and Sasano et al., the most cases in their studies were in their 30s. Prior study has suggested that the primary demographic impacted by symptomatic impaction is individuals aged 20 to 30 [20-22]. The female patient population in this trial was 38 (42.22%), while the male patient population was 52 (57.78%), as established in the current study. In all groups, there was insignificant difference in the proportions of males and females. Many studies have shown a impacted teeth higher prevalence, particularly third molars, in males, which is consistent with our findings [23,24]. Nevertheless, other studies indicated that females had impacted teeth higher incidence [25,26], though certain authors have asserted that in the mandibular third molar impaction incidence there is no sexual predisposition [27-29]. However, this can be explained that males and females may have variable growth rate, that explains females had a greater prevalence. Female jaws growth ceases at the third molar eruption time, while it continues in male jaws, allowing

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for a greater amount of eruption space [30]. After the local anesthetic has diminished, the postoperative pain commences and reaches its peak 6 to 12 hours postoperatively [31], has a duration of two to three days and then regularly diminishes until the 7th postoperative day [13]. The LLLT precise analgesic mechanism has not yet been fully elucidated [15]. It is hypothesized that pain reduction is influenced by changes in the chemicals production, metabolism, and release such as serotonin and acetylcholine, as well as the inflammation local regulation, which affects mediators such as histamine and PGE2 [32,33]. The laser also provokes analgesia by decreasing the BK and type C nerve fibers activity, increasing the endogenous endorphins (β endorphin) production, and reducing the pain threshold [34]. The most severe pain rate was noted in all groups during the initial two days following surgery in the present study. Subsequently, the pain score kept dropping until the 7th day, and there were significant differences between the days in all the groups ($P < 0.001$). VAS was significantly elevated in group C at days 2 and 5, in contrast to groups A and B, with no significant difference between the two groups. However, compared to groups A and B at day 7, VAS was significantly elevated in group C ($P < 0.001$) and significantly elevated ($P = 0.047$) in group B compared to group A. Santos et al. and Landucci et al. conducted a study on 32 female cases, which demonstrated a significant decrease in pain after 48 hours and beyond [35,36]. In a comparable study, Mohajerani et al. demonstrated compared to the control group after three days postoperatively a significant reduction in pain in the laser group is detected. This study involved 80 cases [37]. Petrini et al. and Shenawy et al. demonstrated significant impact. decline in pain following LLLT [38,39]. Das et al. demonstrated a significant decrease in pain following LLLT. In contrast to the control group, nine of our patients experienced only mild pain on the 1st postoperative day. Twelve of the fifteen patients in the study group did not experience any pain after seven days. [40]. Despite this, Hamad et al. demonstrated that it was insignificant over the past four days ($P>0.05$). In the initial three days, the laser group VAS was 4.46 (± 1.45), 4.00, (± 1.36), and 3.35 (± 2.33), respectively. The laser group's VAS score was lower than that of the control group. In the control group, the VAS was 6.58 (± 1.83), 5.82 (± 2.15), and 5.17 (± 1.97), respectively. Throughout the initial three days, the disparity was significant ($p < 0.05$) [41]. The significance of this discovery resulted in stimulates the endogenous endorphins (b-endorphin). Production, biomodulation elevation the pain threshold, and inhibits nerve conduction [42,43]. COX-2 and PGE2 concentrations are reduced, and the cascade of arachidonic acid is inhibited by low-level laser therapy [44]. This study's outcomes are consistent with the findings of Hadad et al., who demonstrated that an intraoral diode laser utilization at 810 nm wavelength, 6 J (100 mW, 60 seconds/point) significantly relieved pain at 24 and 48 hours. [45]. Momeni et al. discovered that pain scores differed insignificantly until the 5th postoperative day. However, on the 6th and 7th days, the laser-treated sides presented significantly minimal pain scores [46]. This study's results are consistent with previous work [14,31,33,47,48]. Kamal et al., Landucci et al., and Clokie et al., administered a LLLT single dose for one- and three-minutes' wavelengths, respectively, instantly following the lower third molar surgical extraction. Postoperatively, they reported

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significant decreases in pain levels ($P < 0.05$) [10,36,49]. Nevertheless, the research conducted by Fernando et al., López-Ramírez et al., Glória et al., Amarillas-Escobar et al., and Farhadi et al. did not demonstrate a positive impact on pain [1,3,12,50,51]. The 940 nm extraoral diode laser was not effective in reducing pain, as demonstrated by Eroglu and Keskin Tunc [52]. In addition, In their study, Ahrari et al. did not observe any significant impact on pain relief from the 660 nm and 810 nm lasers (200 mW, 30 seconds of radiation to the buccal, lingual, and occlusal surfaces of the socket, 6 J/area) [53]. The face edema increases progressively and achieves its peak on the second postoperative day. It is anticipated that the edema will decrease by the fourth day. It has vanished entirely within a week. Consequently, this clinical research assessed edema on the second and 7th postoperative days [40]. Face edema is a three-dimensional condition that is characterized by a convex surface and is visible both internally and externally [54]. The literature employs a variety of methods to evaluate the severity of facial edema, including photographic techniques, mechanical methods (calipers, cephalostats), ultrasound, computed tomography, verbal response scales, magnetic resonance imaging, and the 3dMD face imaging system [55]. Nevertheless, this study refrained from employing these methods due to their complexity, expense, and necessity for specialized tools. Instead, direct face assessment was employed to assess edema, even though it is a two-dimensional technique that is straightforward, easily reproducible, and doesn't necessitate specific equipment. The TNF-α, IL-6, MCP-1, and IL-10 inhibition in the inflammation acute phase may be the inflammatory edema reduction cause by LLLT. This inhibition leads to an increase in the macrophages activation and phagocytic activity, as well as a change in the lymph and blood vessels permeability and channel size and the elevation in the lymphatic vessels number, the microcapillary circulation restoration, thereby reducing swelling [18,56]. Additionally, laser therapy, reduces edema by blood vessels decreasing the permeability, enhance the interstitial fluid absorption, and alters the hydrostatic and intra-capillary pressures and increasing the lymph vessels diameter and number [57]. In the present study, it was determined that in group A than in groups B and C at the baseline facial swelling differed significantly. However, there was no significant difference between groups B and C at days 2. facial swelling was significantly reduced in group A compared to groups B and C at the 7-day mark, while there was insignificant difference between groups B and C. The facial swelling in group A reduced significantly at day 7 compared to day 2, and there was insignificant difference between the baseline and day 2 or the baseline and day 7. At day 2, facial swelling in groups B and C was increasing, but it eventually decreased again by day 7 ($P < 0.001$). These results suggested that facial swelling was extremely significant in all three groups on the second day following the operation. however, there was insignificant difference between the baseline and the seven-day postoperative period for all groups. Hamad et al. reported that the laser group exhibited significantly less swelling than the control group. The difference was statistically significant on the first and third postoperative days ($P < 0.05$). The control group had facial measurements of 113.57 mm (± 4.54mm) on the first postoperative day, while the laser group had measurements of 108.72 mm (± 6.01mm). In the control group, the measurements were 118.43mm (±

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3.48mm) on the third postoperative day, while in the laser group, they were 114.77mm (± 5.63mm) [41]. This study findings are consistent with numerous studies that have stated significant reduction in postoperative swelling following third molar surgery due to the low-density laser's utilization. Singh et al., Bianchi de Moraes et al., and Mohajerani et al. demonstrated the LLLT efficacy in decreasing swelling following the impacted lower mandibular third molars surgical removal [37,58,59]. Ferrante et al., Aras and Güngormüş, and Eshghpour et al. established that LLLT could alleviate facial edema [14-16]. Domah et al. and de Oliveira at al. conducted a systematic review and meta-analysis that revealed that LLLT has a beneficial impact on the postoperative swelling following mandibular third molar operation reduction [60, 61]. On 30 patients in the study and control groups a randomized control trial was carried out by Amarillas-Escobar et al. The study results the indicated a decrease in swelling postoperatively [3]. In an additional study was performed by Batinjan et al., 150 cases were divided into three groups of 50, and photodynamic therapy, LLLT, and a control group were assessed. The study results indicated that both laser-treated groups experienced a significant decrease in postoperative swelling after in comparison to the control group [62]. The mean value of the superior edema coefficient on the first day was higher in the control group (12.63) than in the LLLT group (10.30) in Das' study. Additionally, the superoinferior edema coefficient was 5.91 and 6.67 in the study and control groups, respectively, on the seventh day. The control group exhibited a higher mean anteroposterior edema coefficient (8.83) than the LLLT group (7.54) on the first day. Similarly, the control and study groups exhibited a mean anteroposterior edema coefficient of 4.07 and 2.98 on the seventh day, respectively. The LLLT group exhibited statistically highly significant results for both the superior and inferior anteroposterior edema coefficients [40]. In a study of 60 patients, Raouaa et al. administered steroids to one group and laser therapy to the other. The results indicated that the CS group was more efficient in reduction swelling than the laser group [63]. Nevertheless, both Carrillo et al. and Farhadi et al. stated that in swelling among the LLLT and placebo control groups there was insignificant different [51,64]. Furthermore, Pedreira et al and López-Ramírez et al. have failed to demonstrate that laser therapy has a beneficial impact on swelling [1,65]. Raiesian et al. conducted an additional study in 44 patients, and there was insignificant difference in swelling across the control and study groups [66]. Additionally, Koparal et al and Farhadi et al. conducted research on the laser utilization following third molar surgery. Results indicated that there was insignificant reduction in postoperative swelling [51,67]. The varying irradiation parameters and applications of LLLT may account for the inconsistent results observed in our study and others. Fernando and colleagues performed a study on 64 cases, utilizing the split-mouth technique. One side was subjected to the study, while the other side was administered a placebo. The results indicated that there was insignificant difference in the swelling decrease between the two sites. [12]. Limitations: Larger sample sizes and longer follow-up duration will be necessary for the LLLT efficacy evaluation with different wavelengths and sites, the precise evaluation of edema using 3D imaging techniques, the repair of socket bone using CBCT, and the evaluation of LLLT therapy

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after impacted teeth surgical extraction. Conclusion: LLLT The technique is non-invasive, easy to apply, and has a minimal to injury non-existent risk. This investigation illustrates that LLLT is advantageous in mitigating the severity of facial edema and pain that may follow the impacted third molar surgical extraction.

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