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Effectiveness of Low-Level Lasers subsequent to Third Molar Surgery: An Original Research

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ABSTRACT:
Aim: The current study aimed at assessing the effectiveness of low level lasers in reducing the postoperative sequel subsequent to third molar surgery.
Materials and Method: The current study was undertaken on 32 healthy individuals who required surgical removal of bilateral unerupted lower wisdom teeth. Right side of the patient was designated as the test side while the left side of the patient was designated as the control side. Following the surgical intervention, an intraoral Laser diode 940 nm was applied immediately after the placement of sutures on the test side, while on the control side, no application was done following the surgical intervention. In due course, the pain was evaluated with the aid of VAS scale regularly at periodic intervals postoperatively and analyzed.
Results: The results of this study revealed that the mean swelling and trismus in thee immediate postoperative phase and late postoperative phase did not differ significantly between the two sides. However, the results showed that on the sixth and seventh days, the pain was significantly decreased in the intervention side.
Conclusion: The results suggested that pain, swelling, and trismus following surgery were lower on the test side, but only pain mitigation was significant on the test side
Keywords: Low level lasers, wisdom tooth, inflammation

Introduction

Odontectomy of an unerupted wisdom tooth is a classic dental procedure.[1-5] The tissue damage and inflammation as a result of the surgical intervention would result in postoperative

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sequel like pain, swelling and trismus. [6,7] Previous studies have advocated that pain following surgical removal of wisdom tooth increases within the first few hours and later diminishes at the end of the first postoperative week.[4,7] Numerous studies have advocated various drugs and drug deliver systems for the management of postoperative sequel. [8,9] However, their consumption is often associated several side effects.[9] Lasers have been employed in order to minimize these side effects in addition to diminishing the postoperative sequel.[10,11] Low level Laser therapy (LLLT) is employed in numerous clinical scenarios like ulcer healing, aphthous stomatitis, mucositis, neural regeneration, postherpetic neuralgia, synovitis, arthritis, problems of the temporomandibular joint, acute swelling, periapical granuloma, chronic orofacial pain, gingival depigmentation, and bone regeneration.[12,13,14,15] The analgesic effect of LLLT causes neural conduction blockade by stimulating the synthesis of endogenous endorphins (beta-endorphin), reducing inflammatory cytokines and enzymes, altering the pain threshold, inducing changes in morphological neurons, reducing the mitochondrial membrane potential, and blocking rapid axon flow.[16] The anti-inflammatory effect occurs due to the increase in the phagocytic activity, the number and the diameter of lymphatic vessels, diminished permeability of blood vessels and microcapillary blood circulation restoration, normalization of blood vessel permeability along with diminished edema.[16,17] The therapeutic outcome of LLLT following third molar surgery is still controversial. Previous studies have shown therapeutic effects in the management of postoperative pain and swelling when LLLT was used with a wavelength of 870 nm. [9,18] Few studies advocated the use of a laser with a lesser wavelength range at different time intervals for the therapeutic effects.[16,19,20] Hence, the current study aimed at assessing the effectiveness of low level lasers in reducing the postoperative sequel subsequent to third molar surgery.

Materials and method:

The current study comprised of thirty two healthy individuals within the age range of 18 – 30 years who required surgical removal of bilateral unerupted lower wisdom teeth. All the surgical interventions were carried out on moderately difficult impactions. Right side of the patient was designated as the test side while the left side of the patient was designated as the control side. Patients with systemic diseases, acute pericoronitis, neurological or psychiatric disorders, photosensitivity, sensitivity to local anesthesia and patients who used analgesic or anti-inflammatory drugs two weeks before the surgical intervention were excluded from this study. Institutional Ethics Committee Clearance was obtained. Informed consent was taken from every patient. Before the surgery, the demographic data were recorded. Single operator performed all the surgical interventions with a minimum of two-week interval on both sides for individual patients. All patients received anesthesia of alveolar, lingual, and buccal nerve blockades using 2% lidocaine with epinephrine 1:80,000. Modified wards incision was employed in all the patients undergoing the surgical intervention. Following the flap reflection, the buccal and distal bone was removed using carbide round bur 8 and the tooth was sectioned under copious saline irrigation. Finally, the wound was closed using nonabsorbable silk. The operator applied the intraoral laser diode 940 nm (BIOLASE) immediately after the suture on the test side while on the control side only the fiber tip was used without radiation. The fiber tip was placed close to the soft tissue and applied for 30 s at three occlusal, buccal, and lingual points with the total time of 90 s and total energy density of 30 J/3 cm2 10 (J/cm2 at every point). The wattage of the device was 0.5 W and the laser was used as a noncontact and continuous wave. Following thee surgical intervention, amoxicillin 500 mg was prescribed every eight hours for 5 days in addition to diclofenac every 8 hours for 5 days. Pain was assessed with the aid of a VAS based on its

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scores (zero as pain-free to 10 as the worst pain). The extent of mouth opening was evaluated by measuring the interincisal distance before the surgery as well as immediately after and on the second and seventh days post-surgery. The extent of swelling was also evaluated by measuring the distance between the chin and tragus of the ear before the surgery and immediately after plus the second and seventh days post-surgery.
Statistical method: The data obtained was employed into SPSS 24. Descriptive statistics were reported based on central indicators, distribution, frequency, and percentage. Inferential statistics were used through chi-square, Fisher's exact test, independent t-test, and repeated measures ANOVA or their nonparametric equivalents.

Results
This study comprised of 32 patients required surgical removal of bilateral unerupted lower wisdom teeth. Effectiveness of LLLT on the postoperative sequel subsequent to third molar surgery was evaluated. The mean age of the patients was 25.58±2.36 years. Amongst them, 19 (59.38%) were female and 13 (40.62%) were male. The results indicate that the mean swelling in the immediate postoperative day and late postoperative day was relatively same between both the groups as shown in Table 1. The results also indicate that the mean maximal mouth opening in the immediate postoperative day and late postoperative day was relatively same between both the groups as shown in Table 2. The results show that the mean pain did not differ significantly between the immediate postoperative day and late postoperative day was relatively same between both the groups as shown in Table 3.

Table 1: Comparison of swelling on both the sides

Swelling	Test side		Control side		Significance
	SD	Mean	SD	Mean	
Preoperative	9.30	150.65	7.20	151.00	0.474
Intraoperative	8.20	152.90	7.10	152.33	0.770
Second day	9.10	155.08	7.82	158.50	0.180
Seventh day	7.50	150.40	6.05	152.60	0.110

Table 2: Comparing the mean and standard deviation of trismus on both the sides

Mouth opening	Test side		Control side		Significance
	SD	Mean	SD	Mean	
Preoperative	4.30	44.65	5.20	44.04	0.549
Intraoperative	16.20	25.90	15.60	24.33	0.426
Second day	12.10	28.08	9.82	25.50	0.085
Seventh day	10.50	40.40	9.05	36.60	0.053

Table 3: Comparing the mean and standard deviation of pain on both the sides

Pain	Test side		Control side		Significance
	SD	Mean	SD	Mean	
First day	3.12	5.65	2.26	7.04	0.116
Second day	3.12	4.95	2.67	6.33	0.125
Sixth day	1.10	1.08	2.82	2.57	0.012
Seventh day	1.50	0.40	2.05	1.60	0.023

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Discussion

The current study highlighted the effectiveness of one session of low-level lasers in mitigating pain, swelling, and trismus resulting from the surgical operation of the mandibular wisdom tooth. It was observed that the postoperative sequel was less on the test side, but the pain reduction was significant during the late postoperative days. However, literature reveals that LLLT is effective in reducing postoperative pain and swelling.[20,21] Further, several studies emphasized that several sessions are required to reduce pain postoperatively, but they failed to observe any significant difference in pain mitigation on the placebo and laser sides.[4,22] The observations of this current study are in accordance with the findings of a previous study in which laser diode having a wavelength of 810 nm and energy density of 32 J/cm2 was used for pain reduction.[23] Although in the current study, a lower energy density (10 J/cm2) was used, the same reduced pain outcome was obtained on the laser side which was also significant statistically. Even though LLT in this study was employed for only one session, it had a positive effect in reducing trismus, which could be attributed to the minimum thermal effect occurring during laser radiation, and thus diminishing trismus. Further, although during this study, the power density and radiation duration were relatively low, some temperature elevation is always expectable even to a little extent in low-level radiation.[24] LLLT causes antiinflammatory properties by absorption of proteins through activation of macrophages and regulate the intra-capillary pressure via reducing the permeability of vessels.[25] It is well-established that inflammatory response is a typical postoperative process, and performing low-level laser radiation immediately after the surgery and at the beginning of initiation of the inflammatory process and when no swelling has occurred is a typical and effective process in all studies to prevent the development of inflammation. Our study also showed that even with one session radiation with no repetition, the swelling was relatively less on test side compared to the control side. Nevertheless, considering the method through which postoperative swelling was evaluated, the statistical data did not show any significant difference between the two sides. The current study employed low-level lasers intraorally, and possibly the most important reason for its different outcome with a similar study was the different application of laser as extra orally and intraoral in the two studies.[26] Nevertheless, many studies have mentioned better clinical effects of the extra oral application of laser compared to its intraoral usage and placebo.[20] Although the outcomes were reported as desirable, they were not statistically significant. However, the present study achieved the same desired results in one session of radiation and immediately after surgery. For this reason, different studies are recommended to focus on low-level laser radiation in one session, so that by changing the different parameters of laser and medical conditions, better clinical outcomes that are statistically significant can be obtained. Many researchers propose that younger male patients have higher scores of pain.[27,28] In the current study, there was no difference between the male and female patients regarding their pain score, and a slight difference was observed between the pain score reported by the oldest and youngest participants in this study. Since in split-mouth method, the decision on selection of being a placebo or treatment case of the first surgery is based on randomness, pain severity control will be impossible after the second surgery, since the patient's pain threshold will change after the first surgery.[1] The present study had some limitations. First of all, several patients during the study refused to continue and thus were excluded resulting in a small sample size of 32 patients. Further, the usage of one laser

wavelength was the other limitation. Thus, it is suggested that more clinical trials be performed in the future with larger sample sizes and with more diverse low-level laser wavelengths to examine the therapeutic effect of laser on postoperative sequel subsequent to third molar surgery.

Conclusion

In this clinical trial, the effectiveness of LLLT was assessed on postoperative sequel subsequent to third molar surgery. The results revealed that pain, swelling, and trismus diminished postoperatively on the test side, but only pain mitigation on the test side was significant.

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