A Randomized Double Blind Clinical Study on the Efficacy of Low Level Laser Therapy in Reducing Pain After Simple Third Molar Extraction

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Abstract

Aim. The aim of this clinical study was to test the efficacy of Low level laser therapy (LLLT) in controlling post-operative pain after simple third molar extraction in a double blind, randomized placebo control study.

Material and Methods. Sixty healthy adults undergoing simple third molar extraction under local anesthesia (2% lidocaine with epinephrine 1:80,000) were selected in the study. 30 patients received a soft laser with an 870 nm wave length applied intra-orally from a distance of 1 cm for 10 minutes after extraction procedure. The energy output was 4 J/cm², with constant power density of 50 mW. Laser treatment was simulated in the other 30 patients. Patients were instructed to evaluate their postoperative pain through out 7 days after extraction using a visual analogue scale (VAS).

Results. Results showed that the pain level in the laser group was lower than in the placebo group throughout the 7 day follow up period. The differences were significant starting from second postoperative day and continue all through the 7 day follow up period (Mann-Whitney U – test, p<0.05).

Conclusion. We suggest that the use of low power laser irradiation is a promising therapy in reducing the post-operative pain after third molars extraction.

Introduction

Postoperative pain control is an essential part of routine oral surgical procedures performed with local anesthesia and can have a crucial influence on the subjective impression of the patient concerning the performed surgical procedure [1]. Postoperative pain may be referred to surgical trauma and the release of pain mediators [2]. After surgical extraction of impacted lower third molars, the pain is most intense 3-5 hours following extraction, just after the cessation of local anesthesia [3].

In that sense, the use of low-power laser offers promising possibilities [4, 5]. It is assumed that the analgesic effect of low-power laser is based on the stabilization of nerve cell membrane, probably due to the more stable conformation of the lipid bilayers that is induced, and the associated integral proteins of the nerve cell membrane, which have been observed [6]. The enhanced redox systems of the cell and an increase in adenosine triphosphate (ATP) production have also been shown leading to restoration of neuronal membranes and decreasing pain transmission [7].
The aim of this clinical study was to test the efficacy of low level laser therapy (LLLT) in controlling post-operative pain after simple third molar extraction in a double blind, randomized placebo control study.

Patients and Methods

Sixty healthy adults of both sexes (37 males and 23 females), their demographic data was illustrated in Table 1 presenting in the outpatient oral surgery clinic-National Research Center. Informed consent was obtained from participating patients. The study was approved by the local ethical committee.

Laser treatment

The participants were randomly assigned (randomization is done using sealed envelopes) into an active and a placebo group among patients undergoing simple extraction of third molars under local anesthesia (2% lidocaine with epinephrine 1:80,000). 30 received a postoperative low-power laser irradiation, using a soft laser SL-202 (PETROLASER, Pr. Stachen, Saint-Petersburg, 198097, Russia) with an 870 nm wave length applied intra-orally from a distance of 1 cm for 10 minutes after extraction procedure. The energy output was 4 J/cm², with constant power density of 50 mW. Laser treatment was performed once. In the other 30 patients laser treatment was simulated. The handpiece was inserted into the patient’s mouth, with the laser not activated. Laser treatment was performed by a third person. The operator, the assistant and the patient wore protective glasses.

Pain assessment

Patients were instructed to quantify their post-operative pain level in the morning of 7 postoperative days by means of a visual analogue scale (VAS) (Fig. 1) prior to taking any pain medication. Patients were allowed to use one tablet of diclofenac sodium 100 mg on need.

Statistics

Data was analyzed using professional statistics package (SPSS for windows, Release 7.5, SPSS Inc., Chicago, IL, USA). Descriptive data represented as mean ± SD for numeric data and compared using independent t-test. Results of VAS [8, 9] were analyzed using non-parametric statistic analysis. They were presented using the box-plot design. The pain level for each post-operative day was presented for the active and placebo group. Differences on the respective days were analyzed using Mann-Whitney rank sum test - asymp. sig. (2-tailed). Values of \( p<0.05 \) was considered significant.

Results

The general characteristics and operative characteristics of the two groups were presented in Table 1.
and 2. There was no significant difference between the two groups regarding their mean age, sex distribution, mean duration of surgery, the distribution of the duration of surgery and the incidence of tooth separation (Independent t-test (P>0.05)).

The pain level in both groups decreased from the first to the seventh postoperative day (Fig. 2) as shown in the medians (black line across the box). However, the pain level in the active laser group was lower throughout the 7 day follow up period. Differences were statistically significant starting from the 2nd day throughout the 7 day follow up period (Mann-Whitney U test). Wound healing was estimated to be within normal limits in both groups with no complications reported.

Discussion

Third molar extraction is the most commonly performed procedure in the practice of oral and maxillofacial surgery [10]. The pain and morbidity associated with third molar extraction is well-known, and surgical removal of impacted third molars even has been used extensively as a model in the evaluation of analgesics, steroids, antibiotics, general anesthetics and sedatives over the years [11].

The use of laser as a complementary medical treatment modality for pain reduction has increased over the last few years especially its use for pain reduction in dentistry [12]. Lasers have a useful place in the periodontal and oral surgical techniques. Although not all researches proved that laser is a significantly effective in the reduction of postoperative pain and swelling in patients undergoing third molar teeth extraction [13, 14], some recent ones reached another opinion. Amarillas-Escobar et al. [15] found that the use of therapeutic laser in the postoperative management of patients having surgical removal of impacted third molars markedly reduced pain. Markovic and Todorovic [16] reported the effect of laser in decreasing postoperative pain and trismus and minimizing edema after third molar surgery. Tortamano et al. [17] indicated that using laser controlled pain caused by the first archwire.

The results of this study indicated that postoperative use of low-power laser irradiation after simple extraction of third molars significantly reduces postoperative pain. The pain level in both groups (active and placebo) decreased from the first to the seventh postoperative day. However it was not significant in first day it seems that this may be due to the intensive nerve block applied for both groups during the extraction process.

Low level laser therapy (LLLT) uses light energy, in the form of adenosine triphosphate (ATP), to elicit biological responses in the body. The increased cellular energy and changes in the cell membrane permeability result in pain relief, wound healing, muscle relaxation, immune system modulation, and nerve regeneration [18]. The unique pain reduction abilities of LLLT have been extensively researched and documented in numerous clinical studies and medical papers [19-22]. Suggested processes include increase in beta-Endorphins, blocked depolarization of C-fiber afferent nerves [23], increased nitric oxide production and decreased Bradykinin levels, increased nerve cell action potential or increased release of acetylcholine [24].

Some in vitro research studies investigated effect of excess laser doses, they had a warning to clinicians that “more” is not necessarily “better” [25]. The laser dose we used in this study (4 J/cm², with constant power density of 50 mW, with an 870 nm wave length applied intra-orally from a distance of 1 cm for 10 minutes) was optimum and effective with no side effects, in agreement with that of Markovic and Todorovic [20] who used the same energy output and power density but with different wave length (637 nm – visible red light).
As it is mandatory for the dental profession to improve health outcomes and quality of life, he must seek new effective tools. So, we suggest that the use of low power laser irradiation is a promising type of therapy in reducing the post-operative pain after third molars extraction provided it is given in the proper dose.

References