

Effectiveness of Low Power Laser Therapy and Betamethasone in Minimizing Postoperative Edema and Trismus after Third Molar Surgery: a Clinical Trial

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Abstract: Purpose: In this study the therapeutic low-power laser (LPL) and Betamethasone (as an anti-inflammatory) were compared in terms of their effects on edema and trismus associated with surgical removal of impacted mandibular third molars. **Material and methods:** 20 healthy patients divided into two equal groups were included in the study. Group (I) received LPL irradiation (energy output 6 J/cm² with constant power density of 100 mW, wavelength 980 nm) on the 1st and 3rd postoperative days. Group (II) received a single dose of 4 mg systemic intramuscular Betamethasone Sodium Phosphate (Diprofos) into the gluteal region immediately after suturing of the surgical wound. Both groups received the usual medical and physical postoperative recommendations. **Results:** LPL irradiation (group I) showed remarkable reduction of postoperative edema on the 3rd postoperative day. In addition, no significance difference resulted on comparing this effect between both groups. Postoperative trismus was nearly the same in both groups. No adverse effects of the procedure or medication were observed. **Conclusion:** LPL therapy is effective than systemic Betamethasone in reducing postoperative edema after third molar surgery without statistical significant differences. However both treatment modalities have the same effect on postoperative trismus. [Dalia A. Radwan¹, Nermeen H. Mohammed¹, Ahmed A. Zaky. Effectiveness of Low Power Laser Therapy and Betamethasone in Minimizing Postoperative Edema and Trismus after Third Molar Surgery: a Clinical Trial. Journal of American Science 2010;6(12):986-989]. (ISSN: 1545-1003). <http://www.americanscience.org>.

Key words: edema, trismus, low power laser therapy, Betamethasone.

1-Introduction:

Postoperative trismus and edema are consequences of tissue injury during surgery. The raising of muscular attachments results in reflexive cramp of the masticatory muscles, Jovanovic (1998), and direct trauma to the blood and lymph vessels, Petkovic and Bukurov (1987).

These conditions cause limitation of the mouth opening and fluid accumulation in the interstitial area as a result of its transudation from injured blood vessels and fibrin obstruction of lymph drainage Petkovic and Bukurov (1987). The destruction of the local tissues and severity of surgical intervention are in direct proportion to the presence of these postoperative sequelae, Gonzalez-Santana et al., (2005). These complications reach their maximal at 12–48 h after surgery, but may completely resolve in 5-7 days, Sowray (1986).

Several trials have been used to prevent the occurrence of these complications by means of preoperative and postoperative administration of corticosteroids, as they reduce the leakage of lymph

and thereby the transudation of liquid. Also, non-steroidal anti-inflammatory drugs were administrated postoperatively as well as cold compresses and analgesics, Carrillo et al., (1990); Honmura et al., (1992); Tuner and Hode (1996).

The use of low power lasers (LPLs) had attracted attention. As it induces primary (photochemical, photoelectrical, and photoenergetic) and secondary biostimulation (stimulation of cell metabolism and microcirculation), Berns et al., (1990); Abt (1995); Barabash et al., (1995) and Miserendino et al., (1995). Thus it has a direct effect on lymph and blood vessels, with no adverse effects of irradiation, Lievens (1991).

So the aim of this study was to compare the effectiveness of LPL and intramuscular anti-inflammatory; Betamethasone, in minimizing postoperative edema and trismus after surgical removal of impacted lower third molars under local anesthesia (2% Mepevacaine hydrochloride/1:20,000 Levonordephrine).

2. Material and Methods

2.1. Materials:

2.1.1. Samples:

Twenty patients with the same difficult condition of mandibular third molar teeth composed the sample of this study. They were of both sex, aged 25-30y.

Clinical investigations of the LPL and Betamethasone anti-edematous and anti-trismus effects were conducted at the Oral Surgery Clinic, Faculty of Oral and Dental Medicine, Cairo University, Egypt.

The patients were divided into two equal groups.

2.2. Methods:

2.2.1. Surgery

Surgical odontectomies were performed by only one, experienced surgeon and the duration of surgery was similar in the two investigated groups, being most frequently 30 min on average.

2.2.2. Low-power laser (LPL) treatment

Patients of group (I) received GaAlAs LPL (Quanta system, Italy) sessions on the first and third postoperative days. The laser tip was directed intra-orally from a distance of 1 cm away from the surgical wound, at the buccal, distal and medial surfaces of the extraction sockets. Each surface was stimulated for 3min. The energy output was 6 J/cm², with constant power density of 100 mW, and wavelength of 980 nm.

2.2.3. Systemic intramuscular Betamethasone treatment

Group (II) received a single dose of 4 mg systemic intramuscular Betamethasone Sodium Phosphate (Diprosfos) into the gluteal region immediately after suturing of the surgical wound. Both groups received the usual medical and physical postoperative recommendations.

2.2.4. Measurements:

The size of postoperative edema and trismus were registered in cm on the third and seventh postoperative days (the baseline level was recorded preoperatively).

2.2.4.1. Measurements of edema coefficient (Ec)

The distance between the tip of tragus and the lip commissure at the same side was measured using a graduated tape and the edema coefficient (Ec) calculated using modified formula of Carrillo et al., (1990).

$Ec = \frac{\text{postoperative distance} - \text{preoperative distance}}{\text{preoperative distance}} \times 100$.

2.2.4.2. Measurements of trismus coefficient (Tc)

The trismus was determined by measuring the maximum interincisal mouth-opening ability of the patients by a sliding caliper and the trismus coefficient (Tc) calculated using Carrillo et al., (1990) formulae.

$Tc = \frac{\text{preoperative distance} - \text{postoperative distance}}{\text{preoperative distance}} \times 100$.

2.2.5. Statistical analysis

Statistical analysis of edema and trismus coefficient differences between both groups was performed using the non-parametric Wilcoxon rank test.

3. Results

None of the patients showed any adverse reactions to the applied treatments.

From (Table 1) it was observed that, the average value of edema coefficient in laser stimulated patients on the 3rd postoperative day was noticeably lower than its correspondence in the Betamethasone injected ones, being 1.59 and 10.39 cm respectively. On the 7th postoperative day the average edema coefficients of both groups were almost the same.

Table 1: Comparative survey of postoperative edema coefficients in the investigated groups of patients.

Follow up intervals	Average edema coefficient in Laser group	Average edema coefficient in Betamethasone group	p-value
3 rd postoperative day	1.59	10.39	0.5553
7 th postoperative day	2.68	3.40	0.2538

It was noticed from table (2) that the average postoperative trismus coefficient did not show remarkable difference between both groups on the 3rd and 7th postoperative days.

Statistical analysis of edema and trismus results (Wilcoxon rank test) pointed to a non significant difference between both groups on the 3rd and 7th postoperative days.

Table 2: Comparative survey of postoperative trismus coefficients in the investigated groups of patients

Follow up intervals	Average trismus coefficient in Laser group	Average trismus coefficient in Betamethasone group	p-value
3 rd postoperative day	23.47	26.33	0.7114
7 th postoperative day	13.91	16.78	1.0000

4. Discussion

It is well known among oral surgeons that empirically, postoperative edema and trismus can always be expected after impacted lower third molar surgery. Operative trauma could be presumed to be fairly similar in all the study groups with regard to the need for tooth separation, drilling in bone, and duration of surgery. Both groups received their medical and physical postoperative rescue therapy, it seems reasonable to attribute the favourable results in reduction of postoperative edema or trismus primarily to the effectiveness of the treatment methodology.

Regarding the efficiency of LPL and steroids in reducing postoperative sequelae, many studies proved their anti-edematous and anti-trismus effects on experimental and clinical conditions Goldman(1980); Honmura et al., (1992). LPL is believed to induce an increase in number and diameter of lymph vessels, with a simultaneous decrease of blood vessel permeability Lievens (1988; 1991). The use of steroids, aid in inhibition of phospholipase A2 enzyme, which reduces the release of arachidonic acid in the cells of the inflamed focus. This will consequently decrease prostaglandins and thus reduces these postoperative complications, Huggman (1977). It is believed that single parenteral use of steroids, regardless of the dose, does not exert an undesired effect on the adrenal-pituitary regulation of natural steroid secretion, Montgomery (1990), thus implicating their safe use for this indication. The course of our investigation showed that although Wilcoxon rank test proved insignificant, yet the LPL therapy is more efficient in reducing average postoperative edema on the day of its peak occurrence. But both treatment therapies did not

establish a noticeable anti-trismus effect through the follow up intervals.

The beneficial LPL irradiation effects seem to be dose-dependent. Roynesdal, 1992 verified that lasers with 3 J/cm² energy output or less produce no significant effects after impacted lower third molar surgery, Roynesdal (1992). In our study, we followed his recommendation and used a higher therapeutic dose (6 J/cm², with constant power density of 100 mW, and wavelength 980 nm). It exerted a significant anti-edematous effect on the 3rd postoperative day in comparison to the Betamethasone group.

The LPL therapy appeared to be non-invasive and without any adverse effect on the patients. This clinical finding disagreed with results of Jovanoic et al., (2004) who expected a thermal insult to tissues stimulated with 100mW power density or more Jovanovic (2004), but as we shortened the stimulation time, no adverse thermal effects was encountered. The repeated dose on the 3rd postoperative day proved unnecessary, as its' outcome on the 7th postoperative day was not notable in comparison to the results of the Betamethasone group.

It could be concluded that within the limitation of this study, LPL therapy is effective than systemic Betamethasone in reducing postoperative edema after third molar surgery. However both treatment modalities showed no statistical significant difference and have the same effect on postoperative trismus.

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