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EFFECT OF LOW POWER LASER ON POSTOPERATIVE TRISMUS

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Summary. *Postoperative trismus frequently associates the oral surgical interventions performed in the ramus and angle of the mandible. There is no ideal therapy for postoperative trismus. Since the low power laser induces distinguishing primary and secondary biostimulative effects, the aim of the investigation was to determine its effect on the reduction of postoperative trismus.*
The investigation was performed in 48 patients who had undergone surgical removal of the impacted lower third molar. In 24 examinees, apart from the medical and physical therapy, laser irradiation of surgical wounds and extraoral biostimulative points was applied. In the remaining 24 patients, only the standard postoperative medicinal and physical therapy was applied. Measurement of the mouth opening diameter was taken immediately prior to surgery and on the third postoperative day.
Results show that laser therapy was most favorable in the elimination of postoperative trismus.
In conclusion it can be emphasized that LPL represents a completely safe additional means of treatment in the postoperative course due to its efficiency in the control of postoperative trismus.

Key words: *Postoperative trismus, therapy, low power laser*

Introduction

Trismus represents a limitation of the mouth opening. This is so due to a reflexive cramp of the masticatory muscles leading to a completely or incompletely limited mouth opening in a patient. Trismus occurs as a consequence of infection due to a breakthrough of bacterial toxins in the muscle fibers or the injury of a muscle on induction of the mandibular anesthesia.

Postoperative trismus frequently associates the oral surgical interventions performed in the region of the ramus and the mandibular angle. In addition, the severity of the intervention, and the massiveness of tissue and bone destruction are in direct proportion to the presence of trismus. It seems that the very position of the lower third molars, especially those impacted, complicated removals as well as the circulation features in the region make the trismus presence more frequent after the removal of these teeth than after other oral surgical interventions (1). It is considered that strong and long manipulation of the mucoperiosteal flap with a retracter during the impacted third molar surgery contributes to the more severe trismus. In such cases, trismus is usually associated with massive edema, and the whole condition is additionally complicated by long-lasting and strong pain (2,3).

The duration of trismus depends on the destruction of local tissue and severity of surgical intervention. Usually, it disappears in 5-7 days. The therapy is primarily intended to reduce the swelling as soon as possible, which is in such cases, as already pointed out, closely associated with trismus. This includes preoperative and postoperative administration of corticosteroids (prednisolon, methylprednisolon, dexamethasone) which reduce the leakage of lymph and blood vessels and thereby the transudation of liquid. Also, nonsteroid antiinflammatory drugs are administrated postoperatively (ibuprophen, nimesulide) as well as the cold compresses and analgesics.

Low power laser (LPL) induces primary (photochemical, photoelectrical, and photoenergetic) and secondary (stimulation of cell metabolism and microcirculation) biostimulation potential and reduces pain and edema after surgery (4,5,6,7). As there is no ideal means of prevention the postoperative trismus yet, it appears that the application of LPL in certain postoperative period could contribute to the more successful and faster recovery of a patient, especially considering that there are no adverse effects of irradiation.

The aim of the study was to establish the effect of LPL on the eradication of postoperative trismus.

Material and method

Semiconducting laser GaAlAs "MILS 94" (output power 10 mW, wavelength 670 nm, working in continuous regime, probe of 2 mm in diameter) was used in the research. The investigation included 48 patients of both sexes, aged 16-47 with removed impacted lower third molar. In all cases, impacted lower third molar

removal was performed in a quiet stage. In all surgical dental removals 4 ml lidocaine combined with adrenaline 1 : 8000 (ICN Yugoslavia) were applied as a local anesthetic by a technique of direct mandibular intraoral anesthesia. Immediately prior to surgery, all subjects were taken measures of mouth opening diameter, that is, mouth opening between cutting edges of upper and lower central incisors was registered in millimeter. After surgery, the usual postoperative medical and physical therapy was applied (corticosteroids and cold compresses externally). Patients were divided in two groups.

First group - 24 patients underwent LPL irradiation in the region of surgical wounds and extraoral biostimulative points (EBSP) immediately after the surgery and next three days. They represented the experimental group.

Operative wounds and surrounding areas were stimulated with energy of 1J for 100 s (15 points of 2 mm diameter X 1J + 15 J).

EBSP were stimulated with energy 1.5 J for 150 s (4 points of 2 mm in diameter X 1.5 J = 6 J. EBSP are: mandibular angle (a point projects at the juncture of lines extending from the rare edge of ramus and lower edge of the mandible at approx. 1 cm), region of foramen mentale (a point is positioned in the region below and between the root apicis of the first and second lower premolar), preauricular (projected 1 cm in front of the ear tragus), and nasolabial point (located in the nasolabial sulcus elevated up to the middle of nasal ala about 0.5 cm distally).

The second group - 24 patients with surgically removed lower third molar received no laser irradiation. They composed the control group.

The degree of mouth opening was established on the third postoperative day by calculating the postoperative trismus coefficient (T_c) (2). The distance between cutting edges of upper and lower medial incisors was again registered in millimeter.

Calculation was done using the following formulae:

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

Results

Gender – specific incidence is shown in table 1. It can be observed that impacted lower third molars were predominately present in females (60.4%)

Table 1. Male/female Ratio

Total patients' gender	n	%
Men	19	39.6%
Women	29	60.4%
Total No. of patients	48	100.0%

Age – specific incidence is shown in table 2. The most interventions were performed in patients 21-30 (64.6%) years of age.

Postoperative trismus in patients treated with laser is less expressed than in those who did not undergo irradiation as shown in table 3. It can be observed that the mean value of coefficient of trismus in laser stimulated patients (33.23) is noticeably lower than in wounds spontaneously healed (50.90), what is statistically significant ($p<0.001$).

Table 2. Age – specific incidence

Total patients' age	n	%
< 20	8	16.6%
21-30	31	64.6%
31-40	7	14.6%
41-50	2	4.2%
Total No. of patients	48	100.0%

Table 3. Postoperative coefficient of trismus

Group	Postoperative coefficient of trismus	p
Unstimulated patients (n=24)	50.90 ± 15.50	<0.001
Stimulated patients (n=24)	33.23 ± 16.71	

Discussion

A fundamental feature of LPL is the biostimulation of cell activity and microcirculation (8). LPL accelerates the process of wound healing and elimination of inflammatory infiltrate, and thereby edema too, what positively correlates with the reduction of postoperative trismus (1). In the course of this investigation LPL presented high antitrismus effect without adverse effects.

Carrillo (2), in his research points to expressive antitrismus effect of LPL, while Roynesdal (3) doesn't find some significant effect. The important fact is that during the investigation, not only surgical wounds were irradiated, but also EBSP. The points represent reflexive therapeutic areas acting as biostimulative microsystems of the head region where stimulation with lower stimuli may lead to optimal results (9). In addition, the patients received the usual postoperative medicinal and physical therapy. The application of LPL combined with medicinal and physical treatment reflected beneficially in elimination of postoperative trismus. As postoperative trismus was much more severe in patients who didn't undergo LPL, but received only medical and physical therapy, it seems reasonable to attribute the favorable results in reduction of postoperative trismus primarily to the effectiveness of LPL.

GaAlAs laser used in the research was 10 mW of output power. The best effects were achieved by emission of energy in the region of a wound and around the wound itself with total irradiation dose of 10-15 J per treatment. It took 35 minutes what appears to be quite long. Because of that, the application of laser devices of greater output power (30 mW), would be acceptable therapeutically. That would shorten the time of treatment (10 min), and still, the tissue would receive the adequate amount of energy. There would be no adverse thermal effects, since they can be expected only with the application of lasers of greater output power (above 100 mW).

Conclusion

Based on the above, it can be concluded that LPL represents a completely safe complementary means of treatment in the postoperative course as it can be very efficient in reduction of postoperative trismus in certain conditions.

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EFEKAT LASERA MALE SNAGE NA POSTOPERATIVNI TRIZMUS

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Kratak sadržaj: *Postoperativni trizmus je čest pratilac oralnohirurških zahvata sprovedenih u ramusu i angulusu mandibule. Idealna terapija za postoperativni trizmus ne postoji. Kako laser male snage poseduje izrazite primarne i sekundarne biostimulativne efekte u istraživanju je postavljen cijl da se ustanovi njegovo dejstvo za suzbijanje postoperativnog trizmusa.*

Ispirivanje je obavljeno na 48 ispitanika kod kojih je izvršena hirurška ekstrakcija impaktiranog donjeg umnjaka. Kod 24 ispitanika je, osim medikamentne i fizikalne postoperativne terapije, vršeno lasersko zračene hirurških rana i ekstraoralnih biostimulativnih tačaka. U ostalih 24 ispitanika primenjena je samo standardna postoperativna medikamentna i fizikalna terapija. Merenje promera otvaranja usta je izvršeno neposredno pred oralnohirurški zahvat i trećeg dana nakon operacije.

Rezultati pokazuju da se laseroterapija vrlo povoljno odrazila na eliminaciju postoperativnog trizmusa. U zaključku se može istaći da laser male snage predstavlja potpuno bezopasno dopunsko sredstvo za primenu u postoperacionom toku jer može uspešno da deluje na suzbijanje postoperativnog trizmusa.

Ključne reči: *Postoperativni trizmus, terapija, laser male snage*