Clinical Assessment Of Low Level Laser (GaAlAs) on Gingivectomy Wound Healing

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Abstract

Low-intensity laser therapy aims to suppression of pain, edema reduction and acceleration of wound healing. The main aim of this study is to clinically evaluate the effects of Aluminum Gallium Arsenate laser 670nm in wound healing after gingivoectomy in 11 patients. Surgery was performed in anterior upper and/or lower regions. The right side of the patient (test group) received a laser energy density of 4J/cm², in a 48-hour interval, during one week, totalizing four sessions. The irradiation was punctual in a contact mode in three points. The left side did not receive irradiation (control group). Clinical evaluation was performed by naked eye inspection by five observers, that they do not know the irradiated side, through photography of the treated areas at post-surgical periods of 7, 15, 21,30,60 days. The best healed side was observed. The Sign test was used for statistical analysis with a confidence level of 5% ($P<0.05$). The examiners found a better pattern of healing sometimes in the test and sometimes in the control group until 21 days after surgery. After this period there was no apparent difference between them. There was no statistical difference between the sides ($p>0.05$). These results have shown that low-intensity laser therapy did not accelerate oral mucosa healing after gingivectomy.

Key Words: Laser; Gingivectomy; Wound healing.

التقويم السريري لتأثير ليزر GaAlAr الواطئ القدرة على شفاء جرح قطع اللثة

الخلاصة

يهدف استخدام ليزرات واطئة القدرة إلى إيقاف الشعور بالألم، تقليل استسقاء ما بعد الجراحة، و تسريع التئام الجروح. تهدف هذه الدراسة إلى التقويم ألسريري لتأثير استخدام ليزر كاليوم ألمونيوم أرسنايد الواطئ القدرة ذو الطول ألموجي ٦٧٠ نانومتر في التئام جرح قطع اللثة لأحد عشر مريضا.

أجريت الجراحة على كافة المرضى وفي المناطق اللثوية الأمامية العليا والسفلى وأخذت الجوانب اليمنى لكافة المرضى كمجموعة اختبار ، بينما كانت اليسرى كمجموعة سيطرة. تم استخدام كثافة طاقة بمقدار ٤ جول\سم٢ ، بعد الجراحة والباقي بعد ٤٨ساعة وبواقع أربعة مرات لأسبوع بعد الجراحة. الجهة اليسرى للمرضى لم تعرض لأي تشعيع بالليزر .

أجري التقويم سريريا من قبل أطباء متخصصين بإمراض اللثة وبواسطة تصوير الحالات مابعد كل جلسة تشعيع بالليزر مع عدم علمهم بالجانب المتعرض لليزر، ولفترات معلومة خلال فترة الشفاء وللفترات ٧ ، ١٥، ٢١، ٣٠، و ٦٠ يوما.

حسب الاختبارات الإحصائية التي استخدمت في هذه الدراسة تم اعتماد قيمة التمييز الإحصائي ($P>0.05$). لقد لاحظ المقومون للحالات حالة الشفاء جيدة في مجموعة الفحص وكذلك في مجموعة السيطرة وحتى اليوم الحادي والعشرون بعد الجراحة، وما بعد ذلك لم يجد المقومون أي فرق ملحوظ مابين المجاميع ولا يوجد تمايز إحصائي مابين الجهتين ($P>0.05$). قد أظهرت النتائج أن المعاملة بالليزر واطئ القدرة لا يسرع من عملية شفاء جروح النسيج ألفمي بعد عملية قطع اللثة جراحيا.

Introduction

Laser is a form of light, as its name indicates, Light Amplification by the Stimulated Emission of Radiation. Taking into account that light has been used as a therapeutic tool for centuries, lasers soon became a therapeutic tool within

the health sciences. High intensity lasers use heat for cutting and vaporizing tissues and are known as surgical lasers. In a different way, the low-intensity lasers have the capacity of altering cell behavior without an increase in temperature. These lasers have specific wavelengths that act in a molecular level. The bio-stimulation of cellular behavior is nowadays known by low-level laser therapy (LLLT). The most important effects of this therapy are pain suppression and acceleration of wound healing.

The first researcher to study the effects of low-intensity laser on acceleration of wound healing was Mester in 1985[10] . His studies showed positive effects of LLLT in various biological systems. Experiments in humans resulted in acceleration of healing in non-healing wounds and ulcers after irradiation with low-intensity laser.

There are many papers reporting the use of LLLT for acceleration of wound healing, and the majority of them were performed in animals or *in vitro* [3,7,8,9,10,13]. Some studies in humans can be found, but most are related to extraction of third molars[4,5,6,11]. Therefore, there is a need of more LLLT studies in periodontology.

Rydén, et al.[12] studied the effects of this therapy on reduction of gingival inflammation in patients with gingivitis, and did not find statistically significant differences between irradiated and non-irradiated sites according to the plaque index and gingival bleeding.

Amorim [1] obtained acceleration of gingival healing after gingivectomy in sites irradiated with a low-intensity diode laser. Due to the lack of human studies on the utilization of LLLT for acceleration of wound healing in Periodontology, the aim of this study was to clinically evaluate the effects of low-intensity laser therapy on oral mucosa healing after gingivectomy.

Materials and Methods

Eleven patients presenting inflammatory gingival hyperplasia at superior and/or inferior sextants were selected for this study. Each sextant was considered separately resulting in nineteen areas to be treated by surgery. All patients received oral hygiene instructions, scaling and coronal planning and were put in a rigorous plaque control.

After gingivectomy, the right side (test) received irradiation of Gallium Aluminum Arsenate (GaAlAs) laser, with 670nm wavelength. Just before the study, the power and wavelength were calibrated. The application was in contact mode over the keratinized mucosa corresponding to teeth 11,12,13 or 41, 42, 43. Punctual mode was used in three points of approximately 4mm of diameter each, corresponding to the intraoral point diameter.

The total energy density applied was 4 J/cm² per point. Laser therapy was repeated in a 48-hour interval during one week, totalizing four sessions. The left side, which served as control, did not receive any irradiation. Photographs of the post-surgical periods of 7, 15, 21, 30 and 60 days were taken for clinical evaluation. Each patient accounted for three images: one closed photograph from test side, one for control side and a third involving both areas. Five blind examiners, experts in Periodontology, who received the information that laser was randomly applied at the right or left sides performed the clinical evaluation. The observers marked in a form the side seemingly presenting a more advanced healing process or if both sides were similar. Gingival color, texture and contour were parameters

established for their evaluation. The Sign test was used for statistical analysis at a significance level of 5%. ($P<0.05$).

Results

According to Table 1, most examiners have chosen the control side as presenting the fastest healing at 7 and 21 days and the test side at 15 days after surgery. Both sides were considered similar in the following periods. The Sign test showed no statistically significant difference for this evaluation. ($p>0.05$).

Table 1 Number of patients with the best pattern of healing according to examiners' opinion**.**

	Test	Control	Equal	Z	p
7days[n=19]	7	8	4	0	1 ns
14days[n=17]	8	4	5	0.86	0.38 ns
21days[n=15]	4	7	4	0.6	0.54 ns
30days[n=19]	1	5	13	1.22	0.22 ns
60days[n=19]	1	2	16	0	1 ns

ns: not statistically significant

Discussion

The literature has been showing controversy in the results of researches with low-level laser. The studies of Mester[10] and Kana, et al.[7] have found acceleration on wound healing in rats after LLLT. From the other side, Braverman, et al.[3] did not find significant differences in wound healing in rabbits. *In vitro* studies bring positive results of LLLT in proliferation of human fibroblasts[8,9] and in reduction of prostaglandin E2 production[13]. It is difficult to interpret laboratory studies on the effect of LLLT because of the great variety of animal models and parameters used. Besides, results cannot be expected to be the same in humans. When discussing about *in vitro* studies, one must have in mind that mechanisms involved in wound healing are complex. There is a link between fibroblast activities, extracellular matrix and growth factors produced by inflammatory cells.

In this study, the clinical analysis showed a tendency of choice of one side or sometimes the other until the postsurgical period of 21 days. Both sides were considered equal in the following periods thereafter. This fact suggests that laser influences the first week of the healing process, although the differences between sides were not statistically significant. This study results differ from that found by Amorim[1], whose test group was chosen as best healed within the period of 7 to 35 days after surgery.

The majority of human studies do not show positive effects of laser related to acceleration of wound healing[4,5,6,11,12]. Most of these, as well as the present study, used split mouth design for their research, because this model eliminates variables that can occur from patient to patient. This model is often criticized by some authors, who affirm that laser can have a systemic effect[14,15]. They suggest that LLLT promotes release of growth factors and other substances in the blood stream, which can reach distant sites of the body. This theory loses validity when observing studies that used split mouth design and obtained better results on

lased sites[1,10]. Furthermore, the irradiated areas receive all laser energy density and probably mediators and growth factors released at that sites present local action and are not capable of causing systemic effects.

Another theory discussed in the literature is that laser has a pronounced effect on tissues affected by pathological condition[15]. Tuner and Hode[15] suggest that laser directly affects the immune system, hence healthy organisms do not respond so well as those with immune depression. Some studies confirm this theory showing that LLLT accelerated wound healing[16] and increased production of growth factors [2] in diabetic mice. On the other hand, Amorim[1] obtained better results on the lased side even in healthy patients.

In the present study, the patients were young, healthy and showed an excellent healing process after gingivectomy. All these findings can justify the fact that an evident effect of LLLT on the oral mucosa was not obtained. Moreover, lasers in the red spectrum of light have a superficial action, and the energy density of 4J/cm² can be low for reaching any result.

There is a lack of parameters on the literature for low level laser application, which makes any comparison between studies difficult. Additionally, there are many variables such as type of laser, application mode, punctual or scanning, contact or non-contact, the dose, wavelength and frequency of irradiation, that also impair comparison between different studies.

Scientific documentation about LLLT is still uncompleted. There is the need to establish effective protocols of laser application, allowing this therapy to be used in dental clinics and bring more comfort for the patients.

Conclusion

Within the parameters used in the present study, the results showed that low-intensity laser therapy have no clinical effect of low level laser postoperative exposure, concerning the acceleration of gingival healing of gingivectomy wound with.

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