

Evaluation of Analgesic Effect of Laser Therapy in Patients with Oral Ulcers with Inflammatory Origin and Knowledge of Patients about their Lesions

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Uriel de Amorim Nascimento¹, Karin Berria Tomazelli², Liliane Janete Grando³ and Sarah Freygang Mendes Pilati^{4*}

¹Graduate in School of Dentistry, University of Vale do Itajaí, Itajaí, SC, Brazil

²Postgraduate student, MD in Postgraduate Program in Dentistry, Federal University of Santa Catarina (UFSC), Florianópolis, SC, Brazil

³Professor, PhD in Department of Pathology, Federal University of Santa Catarina (UFSC), Florianópolis, SC, Brazil

⁴Professor, PhD in School of Dentistry, University of Vale do Itajaí, Itajaí, SC, Brazil

Abstract

The purpose of this study was to evaluate the immediate analgesic effect of low-level laser therapy applied on ulcerated oral lesions with an inflammatory origin. Also, it was to evaluate the knowledge of patients about the appearance of these oral lesions and their treatment.

The trial was composed of 48 patients who presented ulcerated and painful oral lesions, with an inflammatory character. Visual Pain Scale (VAS) was used immediately before and after biostimulation with laser therapy, in order to evaluate the pain reduction on the lesions with the application of this technique. The participants also answered a questionnaire about sociodemographic characteristics and knowledge about the lesion.

Based on the data obtained with visual pain scale application, 85.41% of the patients reported moderate to high levels of pain (6 to 10 on the VAS scale) before the laser therapy session, and right after this percentage dropped to 3.4%. Reduced results in laser efficiency were also observed in smoking patients. Related to the patient's knowledge only 25% of them were aware of laser therapy treatment.

Laser therapy proved to be an important tool in pain relief of the studied lesions contributing to the improvement in the quality of life of patients.

Keywords: Pain relief, Laser therapy, Oral ulcers

Introduction

Low-level laser therapy (LLLT), also known as photobiomodulation, is a non-pharmacological and non-invasive clinical application its effect is related to tissue biomodulation which results in analgesic effect, improves wound healing procedure, reduce edema, and accelerate the inflammation process [1-3].

LLLT has been widely used for more than 50 years [4]. However, it emerged for use in health areas after 1960, becoming a generalized treatment modality with a variety of clinical applications [5].

Laser is an abbreviation word for "light amplification by stimulated emission of radiation", is a highly concentrated non-ionizing electromagnetic radiation that spreads through wave movements [6]. LLLT is a minor invasive method, used in low intensity, not producing heat and being able to penetrate tissue and produce bacterial death through electromagnetic waves, causing cellular photoreceptors to absorb this energy, inducing a cellular response [7].

Like any other radiation laser light has a frequency, wavelength, and propagation speed. Wavelengths most commonly used in LLLT are red between 630 to 700nm and infrared between 700 to 904nm. By penetrating less, but interacting with biological tissue, the red laser is indicated for superficial lesions, such as wound repair. Being the infrared laser the most penetrating, has been the wavelength of choice for bone, neural repairs and to promote immediate and temporary analgesia, by altering the potential of these cell membranes [8].

In this way, LLLT is used for pain relief and to accelerate the repair processes of the hard and soft tissue due to the biomodulatory effects on cells [9,10]. Specifically, the therapeutic effects of laser on tissue lesions are biochemical, bioelectric, and

*Corresponding Author: Sarah Freygang Mendes Pilati, University of Vale do Itajaí, Uruguai St., 458 – Centro, Itajaí – SC, Brazil

bioenergetic, resulting in stimulation of microcirculation, cellular tropism, analgesic action (releases chemotactic substances, which stimulate the release of endorphins), anti-inflammatory (interferes with the synthesis of prostaglandins), antiedema (facilitates the venous return of the lymphatic due to vasodilator action of capillaries) and healing resulting in an improvement in tissue repair and pain relief more quickly and effectively [4,11,12].

Many studies have shown its use in faster and less painful tissue repair, in stomatitis aphthous recurrent, traumatic ulcers, herpes lesions, lichen planus (mainly in its atrophic and erosive forms), pericoronitis, gingivitis, angular cheilitis, pericementitis, oral burning syndrome, alveolitis, temporomandibular dysfunction (TMD), and mucositis [7,13-16]. In addition to having wide and varied use, the incorporation of LLLT meets the minimally invasive approach in dentistry.

The patient's perception of the disease represents a factor of great relevance for the search and treatment. Laser therapy has been widely used, although some patients are unaware of the effects of this tool on their oral health, especially the benefits generated from its use in clinical conditions [17].

The purpose of this study was to evaluate the immediate analgesic effect of LLLT using the Visual Pain Scale (VAS) scale, applied on ulcerated oral lesions with an inflammatory origin. Also, it was to evaluate the knowledge of patients about the factors that could influence the appearance of these oral lesions and the relation between the lesion and its response to laser therapy with risk habits.

Methods

This research project was carried out in accordance with the criteria of the Helsinki Declaration. It was approved by the Institution's human research ethics committee of UNIVALI, under number 3.006.319.

This is a prospective analytic experimental study. The population of this study involved patients in regular dental care (restorative, prosthetic, among others) in the Dental Clinic of UNIVALI and in the Center of Dental Specialties (CEO) of the city of Itajaí- Brazil, and who presented ulcerated and painful oral lesions, with an inflammatory character, clinically diagnosed as aphthous ulcers of inflammatory origin. The diagnosis of the lesions was clinical, based on clinical characteristics and symptoms, since none of them were biopsied. The study included adult patients, older than 18 years old, willing to participate in the study, and who signed the Informed Consent Form.

Initially, patient data as age and gender were collected, and a questionnaire with ordinal scales was filled in by the patients concerning their harmful habits such as alcoholism, smoking, chronic mouth/tongue bite, high consumption of acid, and hot beverages. Also, another questionnaire was applied in order to obtain information about the knowledge about their own injuries and treatment.

On the same day, physical and oral examinations were performed first with an emphasis on establishing a clinical diagnosis of ulcers, and also, to evaluate the physical conditions and to grade the pain of the lesion. With this purpose, the participants were also requested to grade the pain of their ulcer on VAS (Visual Analog Pain Scale) [16,18] with a scale of 0= no pain to 10= severe pain, before therapy.

In the sequence, a LLLT session was performed according to the specific case of each patient, with an individualized protocol. Therapy was always performed with the same equipment ®(Therapy XT DMC, Brazil), with a wavelength infrared of 904 nm, continuous mode, a spot of 0.28 cm, applied by the point-to-point technique in the central region of the lesion, with 100 mW power, 4 Joules per cm² per point, 10s, with the points apart 1cm from each other. The number of spots used depending on the size of the lesion.

Soon after the session, VAS scale was again performed to collect data on pain levels and description of the lesion to compare with before LLLT. The patient clinical care was performed once a week continuously for 3 weeks.

Data collected were tabulated in Excel 2013 program and analyzed using the software SPSS Statistics Version 25.0. We performed a descriptive analysis considering epidemiological features and clinical characteristics of the inflammatory lesions, and outcomes obtained through LLLT.

Results

The sample consisted of 48 participants, 62.5% of which were women, and 66,6% of all of them were over 50 years old (Table 1). Os homens, em geral, foram os que mais apresentavam hábitos disfuncionais, como alcoolismo (70%), mordiscar bochecha e língua (77,7%), consume de bebidas ácidas (94,4%) e quentes (88,8%). Users who had synchronous bad habits (more than one) increased the frequency of injuries and increased the number of sessions required for improvement (two or more sessions, reaching four sessions). This includes participants who ingested acidic beverages and/or very hot beverages, who realized that soon after the lesions disappeared, they already had new ulcers due to the habit, also understanding the parafunctional habits in which the incidence of injuries and healing difficulty is perceived due to the lack of cooperation of the patient. Worsening pain response was observed in patients who had synergistic use of alcohol, and smoking. It was noticed that males are related to the higher frequency of smoking and alcohol consumption habits (Table 1).

In a deeper analysis of the correlation habits/pain level, it is observed that patients with parafunctional habits, smoking and alcoholism obtained pain scores mainly above 5 (88.3%) (Table 2), complementing the frequency of more recurrent lesions.

As for pain reported by patients and measured with the aid of the VAS Scale, before and after laser therapy, Table 2 shows the results obtained. A total of 85.4% of patients reported mean/high initial pain (values 6 to 10 on the VAS scale) before laser therapy sessions; the values reported after treatment decreased, reaching only 3.4% of the cases (Table 2). No reports of discomfort were manifested during laser application and patients showed significant improvement after each laser therapy session.

A total of 14.5% reported absent or endurable pain (values from 0 to 5 on the VAS scale) before the sessions, and after the sessions, it was verified that this index increased to 95.8%. This reduction was considered significant in the chi-square test for $p < 0,001$ (Table 2).

The results regarding the level of knowledge of patients regarding injury and laser therapy treatment show that 75%

Table 1 Distribution of the relative frequency of participants who have the habits mentioned according to gender.

	Female	Male	n	Porcentagem
Age				
- 50	10 (33,3%)	6 (33,3%)	16	33,4%
+50	20 (66,7%)	12 (66,6%)	32	66,6%
Habbits				
Alcoholism	20 (66,6%)	13 (70%)	33	66,6%
Smoker	18 (60%)	10 (55,5%)	28	58,3%
Biting mouth/tongue	15 (50%)	14 (77,7%)	29	60,4%
Acidic beverages	25 (83,3%)	17 (94,4%)	42	87,5%
Hot beverages	23 (76,6%)	16 (88,8%)	39	81,2%
Total	30 (62,5%)	18 (37,5%)	48	100%

Table 2 Distribution of the relative frequency of pain level as a function of the times of the laser application process according to the VAS scale.

VISUAL ANALOG SCALE (VAS)	BEFORE APPLICATION	AFTER APPLICATION	LLLT (infrared spectrum) 100 mW, 40 s, 4 J/cm ²
6 – 10 *	85,4%	3,4%	1-2 point each 0.28 cm
0 – 5 **	14,5%	95,8%	1-2 point each 0.28 cm

Moderate to high pain

** Non-pain to tolerable

Table 3: Distribution of the relative frequency of participants in relation to knowledge on the subject.

Knowledge of the injury	Percentage of patients
Have never had the injury before	56,2%
Knowledge about the origin of the lesion	68,7%
Knowledge about treatment with low-level laser therapy	25%

of the participants only knew about this treatment alternative due to the recommendation of the professional, where most had never had laser therapy previously. Only 25% of the patients had knowledge about the laser treatment (Table 3). The study shows that a large part of the patients 68.7% were aware of the origin and cause of their injury and that 56.2% reported having never had the lesion (Table 3).

Discussion

According to Genovese [19], the biological effects that low-level laser causes in tissues consist of light energy, which is deposited on them and is transformed into vital energy, producing primary (direct), secondary (indirect), and therapeutic effects, which promote actions of an analgesic, anti-inflammatory, and curative nature. Some studies have observed improvement in pain, cure, and edema in aphthous ulcers and wounds, following our study, in which reduction of pain was verified after laser application on the injury [20-23].

Inflammation is a protective response that aims to rid the body of the initial cause of cellular damage, so LLLT aims to control the inflammatory process, accelerating the recovery of the patient [24]. Pain is also a protective mechanism, it limits movement and, consequently, impairs the functional capacity of the patient [16,25].

Authors such as Bensadoun [26] and Genovese [19] attributed excellent wound healing and the potential to reduce pain, and also, microscopic and molecular findings, such as increased cell division and changes in nerve conduction through the release of endorphins and encephalins, respectively. Therefore, pain control

is essential during treatment of lesions, agreeing with our work where participants reported fast returning to the routine without pain in the spot where the laser was applied, ensuring a better quality of life and that they are able to have a routine without any stress caused by difficulty chewing, opening mouth or pain.

It is noted that the effects of laser irradiation have been investigated in malignant cells. This is an important line of research, particularly when considering the safety and efficacy of low-level laser therapy in cancer patients. It should be noted that, in the present study, laser treatment was not performed in lesions suspected of malignancy or premalignant lesions [27].

As noted in the study, the use of LLLT in clinical practice offers an additional option of non-medication and can be an excellent adjunct in the treatment of patients who report pain, especially those who do not have habits, such as smoking. It was observed that smoking patients had the benefits of laser application reduced due to their habit compared to those who not smoke. Nicotine at low concentrations can stimulate neutrophil chemiotaxis, but at high concentrations, it can damage phagocytosis. There are also reports that in smokers there is a decrease in salivary antibody (IgA) and serum (IgG) levels, in addition to having a reduction in lymphocytes [28]. Thus, there is an impairment in immune response, establishing or aggravating diseases in the oral cavity, these processes are coordinated by pro-inflammatory cytokines [12]. The negative effect of smoking on the tissue repair process has been addressed in several health areas. LLLT is used with satisfactory results to assist in the relief of pain in oral lesions in both smokers and nonsmokers, but studies have shown that levels of improvement after treatment, in some clinical parameters, are lower in smokers [29].

Smoking and alcohol are the factors with the greatest potential for the appearance of lesions, besides being carcinogenic, despite the multifactorial aspect of the disease [30]. In the present study, it was not possible to perform a correlation between patients without alcohol, and smoking, as most patients smoked and drank. Studies show that smoking, alcohol and parafunctional habits, besides being associated with the appearance of oral lesions, are also associated with loss of the patient's quality of life. And that alcohol consumption is an important risk factor to encourage smoking [30,31].

The gender of patients investigated remained statistically associated with smoking and consumption habits, and the frequency of both habits was higher among males. A similar result was identified in the Brazilian drug report [32].

In addition to the clinical benefits already mentioned, laser therapy promotes optimization between dentist and medical alternatives, as it is a noninvasive and low-cost method that reduces pain, stimulates tissue healing, and eliminates the use of some medications such as analgesics and expenses associated with side effects [33].

Thus, it is necessary that the patient has knowledge about his lesion, about the possibility of recurrence and even more, about this form of treatment, which brings much fewer side effects. The lack of knowledge of the population about LLLT corroborates with other studies, identifying a need to disseminate information about this treatment [17].

Conclusion

LLLT was effective as it demonstrated a pain relief rate of oral ulcers with an inflammatory origin. It is evident that smoking and consumption habits were or remained present in the life of a significant portion of the individuals investigated who developed oral lesions. A lower analgesic effect was observed in pain reduction in patients who were tobacco users. These results reinforce the need for further research to clarify the cause-effect relationship between the existence of habits and the risk of injuries, laser efficiency, and protocol standardization.

In general, population has knowledge about his injury and many have even had the lesion before, so it is necessary to inform the population about treatment with LLLT of inflammatory lesions, which are common in the population and bring minimal side effects.

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