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Effect of Low Power Laser on Postoperative Pain in Endodontic treatment: Literature Review

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***Keywords*— Pain; Low Power Laser; endodontics**

***Abstract*—** *Pain after endodontic treatment is common in cases where treatment is performed, due to factors such as extrusion of debris to the apical region, extravasation of irrigators and intracanal medications, amount of sessions that the element is exposed, complex anatomy that makes it difficult to clean and disinfect the channel system, among others. The use of low-power laser was positive in pain remission, with benefits from its biological effects through biostimulation that has analgesic, anti-inflammatory and healing character. The present study aimed to review the literature on the effect of low-power laser on the control of post-endodontic pain. For this, searches were performed in the following databases: Scielo, Google Scholar, Pubmed, Journal of endodontics and Journal of dental lasers where 24 articles were selected after inclusion and exclusion criteria. The articles included in the research were in the period 2000 and 2021 in three languages (Portuguese, English and Spanish). This study concludes that the literature and experiments related to this theme clearly show the occurrence of a variety of biological stimuli including analgesia in the affected area, stimulation of endorphin release and inhibition of nociceptors in pain control. As limited as studies are limited, further studies on the subject should be researched for a definitive conclusion.*

I. INTRODUCTION

Pain is one of the five signs of inflammation, it can be a real or potential damage of tissues. It differs from person to person, since each one has its own pain threshold, which is diversified in quality and sensory intensity (SOUZA, 2002). Endodontic treatment is performed when the dental pulp suffers, in some way, some trauma or is exposed to bacteria that came due to the progression of caries, these bacteria can invade the root canal system causing pain and other disorders to the patient, which can be solved with a good endodontic treatment. According to Alí *et al.,* (2016) post-endodontic pain "is linked to a secondary periapical inflammatory response and mechanical, chemical and/or microbial injury of periradicular tissues". Studies also show that post-endodontic pain can also be caused by over instrumentation, extrusion of irrigators and medication (GAMA *et al.,* 2008).

Low-power lasers have specific wavelength, and aim to accelerate tissue repair processes, as they act as biomodulators, biostimulators, minimize painful symptomatology, healing, etc. These biomodulatory phenomena promote the therapeutic effects of cell morpho differentiation and proliferation, tissue neoformation, revascularization, edema reduction, increased cell regeneration, increased local microcirculation and vascular permeability (HENRIQUES; CAZAL; CASTRO., 2010).

The laser device produces a beam of light (red in color) that becomes visible when they receive a wavelength energy range of 632.8nm which leave helium-neon particles (He-Ne) excited and produce this particular beam of light. The

laser provides a multitude of benefits to the body such as a better response to inflammation, minimization of painful symptomatology and cellular biostimulation, it is worth mentioning that the therapeutic laser has no curative effect, but acts as an important analgesia agent which makes a better anti-inflammatory response, reduction of edema and pain minimization , which is of paramount importance for the patient to have a better clinical experience, because it will reduce painful symptomatology bringing more comfort to the patient and greater convenience (LINS et al,. 2010).

Pain control when using low-power laser is due to its action of modulation of inflammation, release of endogenous opioids, increases serotonin, excitation and nerve conduction of peripheral neurons, vasodilation, and that it can act in other places because of substances that it releases into the circulation (PELEGRINI; VENANCIO PROVINCE; LIEBANO., 2012).

Therefore, the present study aimed to analyze the effect of low-power laser on postoperative pain in endodontic treatment.

II. METHODOLOGY

A literature review was conducted using the following databases: SciELO, Google Scholar, Pubmed, Journal of endodontics and Journal of dental lasers. Theses and articles published in Portuguese, Spanish and English were included between 2000 and 2021, so these include: literature review, human research, randomized studies, placebo-controlled clinical trial, prospective study and clinical case. Articles that presented duplicity and were not related to the theme were excluded.

Initially, to verify if there was a relationship with the theme of the present study, the articles were previously selected from the reading of the titles and abstracts. After further analysis of the content of the research, publications that were in agreement with the guideline and predefined inclusion and exclusion criteria were inserted in this literature review. Thus, a total of 8925 included in this literature review were generated, published from 2000 to 2021.

Twenty-four articles were selected in the databases using the keywords in the search: pain in endodontics; postoperative pain; low power laser; laser therapy.

III. RESULTS

The crosses of the descriptors allowed the achievement of a total found in the databases, 3685 in PubMed, 132 in SciELO, 50 in the Journal of endodontics, 10 in the Journal of laser in medical Sciences, 03 in the Journal of Biological Medical Sciences and 5000 in Google Scholar.

In the initial screening of PubMed, 3685 articles were found that, first, were evaluated according to the reading of titles and abstracts, and later those that presented duplicity and/or irrelevance were discarded. The final screening was performed through the careful reading of the texts, selecting 10 articles that were on the proposed theme. In the SciELO platform, 132 articles were initially found, but 09 were selected. In the Journal of endodontic platform initially 50 articles were found, however only 02 articles were selected. In the Journal of laser in medical Science platform, 10 articles were initially found, but only 01 articles were selected. In the Journal of Biological Sciences platform, 03 articles were found, however only 01 was selected. In Google Scholar, 5000 studies related to the theme searched were found, however, after passing the same inclusion and exclusion criteria, only 24 were selected.

IV. DISCUSSION

This study reviewed in the literature ways to reduce post-endodontic pain with the use of low-power laser, in which, after inclusion and exclusion criteria, 24 studies were selected that were used among them: literature reviews, human research, randomized studies, placebo-controlled clinical trials, prospective studies and clinical cases. Among the symptoms we feel, pain is one that we remember from early childhood, and ste may be linked to a potential or real damage to the tissues, and can be reported both in terms of these damages and by both characteristics, in which this pain is also considered as a genuinely subjective and personal experience as stated by Souza, et al., (2002). These studies corroborate the studies by Valerio et al., (2019), where he states that pain is recognized as the fifth vital sign since 1996 and that it is a unique, subjective and individual experience, which makes it difficult to include it as the fifth vital sign.

After bacteria invade the dental pulp there is an aggression to the root canal system causing in addition to pain, disorders to the patient. As the goal of endodontic treatment is to relieve the pain of the patient it should not relaps, but for a number of factors this can occur. In the reported studies, it is proven that post-endodontic pain is present when there is existence of this symptom even before the performance of this intervention Ali et al., (2016), these studies agree with the studies of El Mubarak, Abu-Bakr and Ibrahi., (2010) who also state that patients who presented pain before treatment, revealed pain in the post-treatment period, regardless of whether it was performed in one or multiple sessions, where, what determined post-endodontic pain was the presence of pain before endodontic treatment, which also corroborate the literature review of Oliveira and Rocha., (2018) which states that the patient is susceptible to postoperative pain when presenting preoperative pain and

that with the use of medications can relieve symptomatology.

Other causes may influence post-treatment pain, such as the type of intracanal medication used during operative practice. The study reported that patients had significant differences in the use of two types of intracanal medications used Gama et al., (2008), so these studies are correlated with the studies by Singh et al., (2013) who conducted a study using two different intracanal medications proving that one stand out over the other, showing that intracanal medications have differences in pain control.

Also known as soft lasers, low-power lasers are those that have a wavelength ranging from 635 to 950 nm and are used for therapeutic purposes, i.e. they are used to treat diseases because of what their properties cause when they come into contact with cells, as its analgesic, anti-inflammatory and biostimulation effects BARROS et al.,(2008) these studies corroborate the studies by LINS et al., (2010) that also add how the laser effect is present in the scar tissue and affirm that this occurs because the f absorbed ontones are transformed into photochemical, photophysical and/or photobiological effects and the anti-inflammatory effect was due to interacting with cells and tissues at the appropriate dose , certain cellular functions can be stimulated, such as stimulation of lymphocytes, the activation of mast cells, the increase in mitochondrial ATP production and the proliferation of various types of cells, thus promoting anti-inflammatory effects, which also corroborate the studies by ANDRADE, CLARK E FERREIRA et al., (2014) that also add what effects can be achieved through wavelengths between 600 and 1000nm and powers from 1mW to 5W/cm^2. The authors also point out that very low (2.5 W/cm$^{2)}$ ^{or} very high (25 W/cm$^{2)}$potencies may cause inverse effects, which corroborate the studies by BRAMANTE et al., (2015) that state that the anti-inflammatory and analgesic effects of LBP can reduce edema and prevent infections.

The low-power laser is widely introduced in the health area for pain control, which in dentistry has been widely used in the specialty of endodontics to reduce this symptom. The use of laser as a tool for pain control, comparing it with people who did not use it, was significantly higher because of the properties that the laser has Asnaashari, Mohebi and Paymanpour., (2011), these results agree with those of Coelho, Vilas-Boas and Tawil (2019) where the difference was that these authors used unirradicular teeth that resulted in the group that was used the LLLT experienced only mild pain in 24 hours after treatment and that in 72 hours they did not feel any pain. Patients who had exposure to LLLT on the first day had low levels of pain, and also agree with the findings of Morsy et al., (2018) who compared the conventional endodontic treatment with the endodontic treatment using the 980nm diode laser in the intervention of teeth with conical periapic lesions that obtained similar results, demonstrating that the group that used the laser presented considerably lower levels of pain in relation to the group that did not apply it, they also agree with the studies by Doganay and Arslan., (2018) where they observed that the use of laser for pain control in molars with symptomatic apical periodontitis was beneficial in reducing postoperative pain in endodontics and diswinding from the prospective clinical study of Payer et al. , (2005)who state that there was no significant effect on the inflammatory response or healing process in conventional LLLT during endodontic surgery, and also disagree with the studies by Yoshinari et al., (2019) who stated that there were no post-treatment pain so much with the use of LBP and without the use of laser, that is, there was no difference between the groups because of the elements being asymptomatic.

In the randomized clinical study of Guerreiro et al., (2021) the authors state that the properties of laser therapy instill the synthesis of inflammatory processes, decrease the activity of C fibers and exert regenerative effects on injured tissues, having as laser wavelength the main factor for the depth of light penetration of the same, stating that it has the anti-inflammatory and analgesia properties and that everything depends on the dose applied. These studies agree with the studies by Abtahi et al., (2013) where the difference was that he used orthodontic apparatus for an induced separation of dental elements, from which it was observed that the group that was applied the laser pain level was lower than in the placebo group, thus showing its beneficial effects on pain control.

V. CONCLUSION

In view of the above, it was concluded that for the low-power laser to promote a biological effect, it is necessary to absorb its beam of light by the target tissue. The literature pertinent to the theme and the experiments clearly indicate the occurrence of multiple biostimulant effects, including analgesia of the affected region stimulating the release of endorphins, inhibiting nocepceptor signs and controlling pain mediators. This makes its application after a treatment that can occur tissue injury, such as endodontic treatment, a good option for patient comfort and accelerated repair of perirradicular tissue.

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