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Relato de Caso

Photobiomodulation with 808nm laser associated with vitamin B12 as a strategy in the treatment of paresthesia of the inferior alveolar and lingual nerve arising from lower third molar extraction: a case report

Fotobiomodulação com laser de 808nm associado a vitamina B12 como uma estratégia de tratamento para parestesia dos nervos alveolar inferior e lingual decorrente de extração de terceiro molar inferior: relato de caso

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ABSTRACT

Introduction: Paresthesia is a neurosensitive disorder caused by an injury of the neural tissue. The advised treatment approaches for paresthesia are microsurgery, drug treatment, acupuncture, nerve decompression and photobiomodulation (PBM). Studies have shown the influence of PBM on cellular metabolism, in order to exert a positive action at molecular levels, relieving pain, reducing nerve damage and accelerating neural tissue repair processes. **Objective:** To report a clinical case of a patient diagnosed with paresthesia submitted to PBM treatment and medication consisting of vitamin B12. **Case Report:** The patient reported sensory loss of the tongue, lips, lower alveolar ridge on the right side and hypogeusia in the immediate post operative care period. The patient was diagnosed with paresthesia of the inferior alveolar and lingual nerves and submitted to PBM treatment during a period of 6 months. **Conclusion:** PBM in the innervation pathway affected by paresthesia demonstrates effectiveness for sensory improvement. This work illustrates treatment options that can be used in similar clinical manifestations.

Key-words: Mandibular Nerve; Lingual Nerve; Paresthesia; Low-Level Light Therapy; Vitamin B 12.

RESUMO

Introdução: A parestesia é um distúrbio neurossensorial causado por uma lesão do tecido neural. As abordagens de tratamento recomendadas para a parestesia são microcirurgia, tratamento com medicamentos, acupuntura, descompressão nervosa e fotobiomodulação (PBM). Estudos têm demonstrado a influência da PBM no metabolismo celular, a fim de exercer uma ação positiva em nível molecular, aliviando a dor, reduzindo os danos aos nervos e acelerando os processos de reparo do tecido neural. **Objetivo:** Relatar a evolução clínica de uma paciente com parestesia tratada com PBM e medicação composta por vitamina B12. **Caso Clínico:** Paciente foi submetida à cirurgia de extração de terceiro molar inferior retido e no pós-operatório imediato referia perda sensorial de língua, lábios, rebordo alveolar inferior lado direito e hipogeusia. A paciente foi diagnosticada com parestesia de nervos alveolar inferior e lingual e foi submetida a tratamento com PBM por um período de 6 meses. **Conclusão:** A PBM demonstrou eficácia para a melhora sensorial na via de inervação afetada pela parestesia. Este trabalho ilustra importantes opções de tratamento que podem ser utilizadas em manifestações clínicas semelhantes.

Palavras-chave: Nervo Mandibular; Nervo Lingual; Parestesia; Terapia com Luz de Baixa Intensidade; Vitamina B 12.

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INTRODUCTION

Inferior alveolar nerve (IAN) paresthesia is a sensory deficit, when this is injured. Altered sensitivity to cold and/or hot, pain, numbness sensation, "pinching", tingling and itching are its main symptoms. Lingual nerve (LN) and Inferior alveolar nerve (IAN) paresthesia may cause a sensation of burning on the tongue, altered taste perception, changes in sensitivity of the lips and tongue with consequently lesions due to bite trauma and/or burns of the lips with hot food. The anatomical knowledge of the IAN, an appropriate radiographic examination, the position of the mandibular canal and the third molar roots, as well as the understanding of adequate techniques and surgical strategies are relevant factors to prevent the occurrence of paresthesia.[1]

Over the last years authors have proposed the use of the term Photobiomodulation (PBM) to specify the treatment that uses or red/near- infrared (NIR) light or light emitting diodes (LEDs) to heal,[2] restore, and stimulate multiple physiological processes and to repair damage caused by injury or disease.

Researches on low intensity laser irradiation in the path of the affected innervation demonstrates that this is a promising treatment for sensory improvement in NAI and NL. In cases of paresthesia, it is advantageous to the patient as not being neither painful nor traumatic.[1,3,4]

PBM with laser has been cited in the literature to offer neurosensory impairment, the laser promotes axon growth in injured nerves.[5-7] Laser application protocols in paraesthesia are still widely discussed, but studies have shown better results with the use of infrared irradiation, with a 48-hour interval in the following extra-oral areas: lower lip, chin and mental foramen and intra-orally, on the buccal region, mental foramen and first molar apices, and on the lingual region in the mandibular foramen. Studies have shown differences to the wavelengths, irradiation, and dosimetry parameters used, making it difficult to obtain objective information to facilitate clinical application by professionals in dentistry studies have shown differences with respect to the wavelengths, irradiation, and dosimetry parameters used, making it difficult to obtain clear and objective information to facilitate clinical application by professionals in dentistry.[3,4]

Administration of vitamin B complex could be associated with laser therapy for better results. The prognosis for recovery as a result of these treatments varies depending on the extent of the nervous tissue injuries and the suggested treatment.[4]

Therefore, the objective of the present study is to report the clinical case of a young patient submitted to PBM for the treatment of paresthesia of the inferior alveolar nerve and lingual nerve after third molar extraction.

CASE REPORT

This work was approved by the Ethics Committee of the Federal University of Juiz de Fora (UFJF), n: 2,631,579.

In this study, a 23-year-old female Brazilian patient, who underwent extraction surgery of an impacted lower third molar in September 2017, and in the immediate post operative care period, reported sensory loss on tongue, lips and lower right side and hypogeusia.

Clinical parameters were used to diagnose and monitor the nerve damaged. A neurosensitive clinical test is used to identify the degree of sensory disturbance, which is determined by the patient's responses to specific sensitive diagnostic tests for the affected area.

These tests are divided in two categories: mechanoceptive and nociceptive. Among the mechanoceptives, there are the two-point discrimination tests and the touch by needles with varying strength test, used in this case. The nociceptive test is performed by using sharp instruments and thermal sensitivity.[1]

For the diagnosis of the patient, a neurosensitivity test was performed with the use of a short sterile needle, positioned:

1. Perpendicular to the LN path without needle penetration into the tongue (simple touch, mild painful stimulus) (figure 1a);
2. Parallel to the LN path, juxtaposed to the mesiodistalaxis of the tongue (stimulus of touch sensation) (figure 1b);
3. Perpendicular to the path of the LN with penetration of the needle in the tongue (deeper stimulus of pain) (figure 1c).

The first neurosensitivity test, performed in November 2017 revealed loss of total sensitivity of the alveolar ridge at touch and pain level. On a scale of 0 to 5, with 5 being the sensitivity of the side not affected by paresthesia (control), and 0 null or minimal sensation of pain, the patient indicated 0 to sensitivity to pain after stimuli was made, both with the perforation of the alveolar ridge with the needle as with a Molt surgical curette on the affected side. The sense of touch was also non-existent.

In a portion of the posterior third of the tongue from the affected side there was a small painful sensation to the stimulus with the needle, classified as 1 according to the sensitivity scale.

In the anterior portion, at the apex of the tongue, the sensation of pain was present, defined as 3; while in the lateral, anterior portion present in scale 1. In the other regions the touch and pain were indicated as 0. The sensation of pressure with the tip of the needle was reported only in the anterior portion of the tongue in scale 1.

Sensation of altered taste, hypogeusia, in a scale of 0 to 5, rated as 0 related to the unaffected side

Figure 1: Neurosensitivity test with needle.

and it was also reported lip numbness. The neurosensitive test was repeated once a month for 6 months.

The patient was submitted to PBM using the laser Duo MMO (MMOptics, SP-BR) in a 808nm infrared wavelength, for 60 seconds, 200J/cm², 6J, continuous wave, punctual use (6mm point) and intimate contact with the patient's mucosa / skin.

The frequency of application was 3 times a week, with the first application ten days after the surgery resulting in paresthesia. The total number of PBM was 52, three times a week for a period of 6 months of monitoring. Between 12/14/2017 and 02/16/2017, no laser therapy sessions were performed, only the periodic recording of any changes felt. In this way, the laser therapy sessions was divided into 40 laser therapy sessions during the period between September to December, a break period without medication or laser therapy between December and February and 12 more sessions in February and March. The PBM parameters and dosimetry are shown in table 1.

The points of application of the PBM for inferior alveolar nerve injury were: extra-buccally points – lower lip, chin and mental foramen (figure 2); intra-bucally points – mental foramen and apices of first molar on buccal side (figure 3) and mandibular foramen on the lingual side. The points of application of the PBM for lingual nerve were shown in figure 4.

Table 1: Dosimetric parameters PBM infrared.

Parameters	PBM infrared
Wevelenght.nm	808
Spectral bandwidth (FWHM), nm	20
Operating Mode	Continuous wave
Polarization	Random
Aperture diameter per LED, mm	10
Irradiance at aperture per LED, nW/cm²	6,4
Beam profile	Multimode
Beam spot size at target, cm²	0,785
Exposure duration, s	60
Radiant exposure per LED, J/cm²	200
Total radiant energy per point, J	6
Aplication technique	Contact
Total number of treatment sessions	52
Frequence of treatment sessions	3/week

Figure 2: Extra-buccalypoints. Lower lip (point 1), chin (point 2) and mental foramen (point 3).

Figure 3: Intra-bucally points. Mental Foramen (point 4) and apices of first molar (point 5).

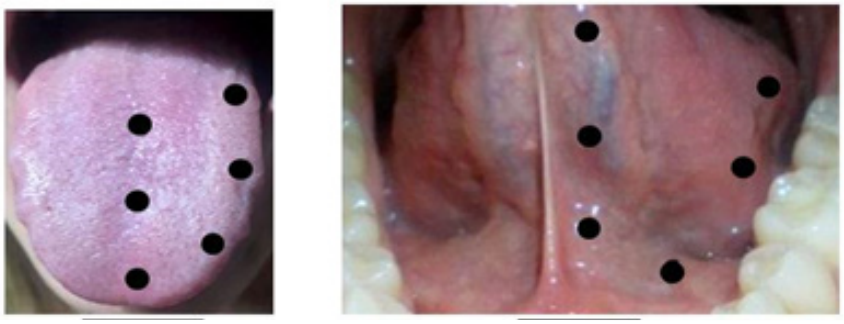

Figure 4: Irradiation points of the lingual nerve. Figure 4a: Irradiation points of the dorsal face os the tongue. Figure 4b: Irradiation points of the ventral face of the tongue.

The laser was applied for 60 seconds at each of the indicated points (18 irradiated points totally). In the peripheral path of the nerve and in the mental foramen was applied in a punctiform way. The surface application method, also applied to adjacent tissues, was performed to stimulate blood circulation.

The neurosensitivity test previously described was performed monthly for 6 months, to assess the progression of the patient´s treatment. Results are presented in table 2.

The patient also used Etna® (Laboratório Gross S.A., Rio de Janeiro, Brazil.) capsules, oral administration, 3 times a day, for 2 months. Each capsule contains Cytidine phosphate disodium, 2.5 mg, uridine triphosphate disodium 1.5 mg and hydroxocobalamin acetate 1.0 mg. Etna® is a medicine cited in the literature as an aid for the repair process of sensorineural damage. It consists of the pyrimidine ribonucleotides,cytidine monophosphate (CMP) and uridine triphosphate (UTP), extracted from RNA degraded by a pancreatic ribonuclease and bound to sodium radicals. Its pharmacological role consists in its integration into the metabolic pathways of myelin sheath synthesis and neuronal cellular membranes as transfer molecules, asprecursors of neuronal RNA and as agonists of neuronal P2Y receptors (a family of G protein-coupled receptors), especially in situations of enhanced biochemical synthesis, during regenerative processes. The agonist action on neuronal P2Y receptors leads to a synthesis of neuronal cell membrane phosphatidylcholine increase. The nucleotides administered orally are degraded in nucleosides and nitrogenous bases before they are assimilated in the intestinal epithelium.[1-5] The patient only used the medication during the

Table 2: Evolution of sensitivity through tests of paresthesia of the lingual and alveolar inferior nerves, on a scale of 0 to 5.

1st Assessment (September 2017)	**Horizontal touch with needle**	**Tip of the needle**	**Perforation / lower pain**
ANATOMICAL REGIONS			
Lip	0	0	0
Alveolar ridge	0	0	0
Anterior portion of tongue	0	1	1
Lateral aspect of tongue	0	0	1
Medium portion of tongue	0	0	0
Posterior portion of tongue	0	0	1
2nd Assessment (October 2017)	**Horizontal touch with needle**	**Tip of the needle**	**Perforation / lower pain**
ANATOMICAL REGIONS			
Lip	3	2	5
Alveolar ridge	0	0	1
Anterior portion of tongue	1	1	4
Lateral aspect of tongue	1	2	2
Medium portion of tongue	0	0	0
Posterior portion of tongue	0	0	1
3rd Assessment (November 2017)	**Horizontal touch with needle**	**Tip of the needle**	**Perforation / lower pain**
ANATOMICAL REGIONS			
Lip	5	5	5
Alveolar ridge	1	5	5
Anterior portion of tongue	5	5	5
Lateral aspect of tongue	5	5	5
Medium portion of tongue	0	0	2
Posterior portion of tongue	0	0	4
4th Assessment (December 2017)	**Horizontal touch with needle**	**Tip of the needle**	**Perforation / lower pain**
ANATOMICAL REGIONS			
Lip	5	5	5
Alveolar ridge	5	5	5
Anterior portion of tongue	5	5	5
Lateral aspect of tongue	5	5	5
Medium portion of tongue	1	5	3
Posterior portion of tongue	1	1	5
5th Assessment (January 2018)	**Horizontal touch with needle**	**Tip of the needle**	**Perforation / lower pain**
ANATOMICAL REGIONS			
Lip	5	5	5
Alveolar ridge	5	5	5
Anterior portion of tongue	5	5	5
Lateral aspect of tongue	5	5	5
Medium portion of tongue	2	5	4
Posterior portion of tongue	1	4	5

6th Assessment (February 2018)	Horizontal touch with needle	Tip of the needle	Perforation / lower pain
ANATOMICAL REGIONS			
Lip	5	5	5
Alveolar ridge	5	5	5
Anterior portion of tongue	5	5	5
Lateral aspect of tongue	5	5	5
Medium portion of tongue	2	5	4
Posterior portion of tongue	1	4	5
7th Assessment (March 2018)	**Horizontal touch with needle**	**Tip of the needle**	**Perforation /lower pain**
ANATOMICAL REGIONS			
Lip	5	5	5
Alveolar ridge	5	5	5
Anterior portion of tongue	5	5	5
Lateral aspect of tongue	5	5	5
Medium portion of tongue	3	5	5
Posterior portion of tongue	3	5	5

first two months of treatment, as indicated by the manufacturer.

In the time period from December 2017 until February 2018 only the periodic annotations of any alterations felt by the patient were made, without the laser therapy sessions. The sensation of taste from December to January 2018 had a slight improvement, evolving from 1 to 2. In the central region of the tongue, the pain stimulus increased from 3 to 4 on January and was maintained on February. There were no significant changes between January and February, but in the from December to January, the lateral and central touch was more strongly perceived (table 2).

The laser sessions were resumed on February 2018 and after seven sessions, the pain sensitivity in the central region of the tongue was evaluated as equal to the control side. The sensation of taste, however, did not show significant improvement, remaining at 2, although it was used a comparative perception scale according to the evaluation of the patient together with the examiner, who does not evaluate small variations accurately.

The sensation of touch was also improved with the resumption of the PBM, in the middle and posterior portions of the tongue. The horizontal touch with the needle, although still reduced in relation to the control side, showed a good reactivity in the test performed in March 2018 (7th assessment on Table 2). The sensation of taste had a slight improvement, but still distant from that perceived on the control side. An extended treatment is needed to obtain better results on this regard.

DISCUSSION

In the studies developed by Nakajima et al[3] and Ozen et al[6] the testing was performed at the beginning and the end of the treatment. Yet, Nakajima et al[3] also adopted the testing criteria during control sessions, in order to observe in which period the neurosensitivity improvement was greater, and also to have the opportunity to report to the patient the periodical improvements during the treatment, since the professional is often inquired into this regard. This case report assessed the patient in each laser therapy session, performing neurosensitivity tests once a month throughout the treatment.

The use of photobiomodulation for the treatment of nerves that provide innervation of teeth injured, even if with good results, is poorly reported in the literature, as demonstrated in studies by Nakajima et al[3], Ozenet al[6,] Khullar et al[7], Buysse Temprano et al[8], Kadra et al[9].

There are studies which use photobiomodulation in mandibular nerve paresthesia, showing an increase in time and magnitude of neurosensory recovery.[6,7] Khullar et al[7] investigated the effects of photobiomodulation on sensory perception in 15 patients after a long-standing postsurgical IAN injury. The results demonstrated a significant improvement in mechanosensory perception after photobiomodulation in comparison to the placebo group. Buysse Temprano et al[8] performed at least 10 laser therapy sessions with an 808-nm diode laser at 48-72h intervals. This time interval (48-72 h) was also used in this study. They irradiated the IAN path on the skin surface as well as the buccal region in at least 25 points. Their findings indicated that the extent of improvement in tactile sensations was more rapid in the laser group than in the placebo group, but the difference between the two groups was not significant.

In this study, satisfactory results were obtained

combining the laser therapy with the medication Etna®. The "numb lip" sensation, described by the patient, improved after the second laser session. At the fourth session, the patient reported feeling a tongue tingling immediately after irradiation of the infrared light (table 2).

The sensation of small "shocks" was reported during the laser therapy sessions, especially in the posterior region of the tongue, near the palatal aspect of the second lower molar in the eighth session. After these "shocks" reports, the sensation of pain when stimulated by the examiner, increased significantly, improving the symptomatology of the patient, outcome comparable to Nakajima et al[3] (improvement in the 10th session).

The return of lip sensitivity and improvement of the tongue sensory neural and alveolar ridge tests, as described in table 2, shows the efficacy on the use of laser therapy in combination with the drug Etna® in the developed treatment.

In the third neurosensitivity test (November 2017) after 26 laser sessions, the posterior part of the tongue reacted positively to pain stimulus, going from "1" to "4"; while the middle part previously unreactive to pain, responded slightly to tests scoring 2, which was the same progression assessed on the taste perception. These results were similar to Khadra et al[9] and Almeida et al[4] that in their case reports demonstrated improvement after about 20 laser therapy sessions of the symptomatologic patterns of paresthesia and inferior alveolar nerve dysesthesia in the patients examined.

Regarding the sense of touch, there was progressive improvement between the first test (reactivity 0 in all the anatomical regions) and the last which was scored 5. Between the first and third tests, there was an important evolution, demonstrated as an evident sensory return in the lower lip and anterior and lateral portions of the tongue.

After 40 laser therapy sessions, the sense of touch improved in all anatomical regions evaluated in comparison to the first test demonstrating a favourable prognosis for the patient, who started the treatment ten days after the paresthesia diagnosis (table 2). The early beginning of the treatment may have contributed to patient positive response to laser therapy, according to Almeida et al[4] who claims that the earlier the laser treatment initiates after the trauma, the better is the prognosis for recovering from paresthesia.

In correspondence with the pause period from photobiomodulation therapy (PBMT) between January and February, there were no significant changes in the improvement of neurosensitive stimulation perception, which may indicate a correlation between the acceleration of the recovery from paresthesia and the laser therapy use.

The sense of touch had an improvement with the resumption of laser therapy, in the middle and posterior part of the tongue. The horizontal touch with needle, although still reduced in relation to the control side, showed a good reaction in the test performed in March 2018.

Even though the sense of taste has returned, it improved on a smaller scale in relation to the other senses, indicating the need of continued treatment or re-evaluation of another specific protocol for this condition.

CONCLUSION

The association of laser therapy with and without the drug Etna® obtained a good result in this clinical case, regarding the response to injured tissues. New studies and protocols in order to create new guidelines of treatment for these cases are encouraged, in favour of improving the quality of life of the patient and practicing a minimally traumatic dentistry.

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