

## TERAPIA A LASER DE BAIXA INTENSIDADE PARA RECUPERAÇÃO SENSORIAL DO NERVO MENTUAL: RELATO DE CASO

### LOW-LEVEL LASER THERAPY FOR MENTAL NERVE SENSORY RECOVERY: CASE REPORT

### TERAPIA LÁSER DE BAJA INTENSIDAD PARA RECUPERACIÓN SENSORIAL DEL NERVIO MENTONIANO: REPORTE DE CASO

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**RESUMO:** A terapia a laser de baixa intensidade (LLLT) é uma modalidade terapêutica promissora para o tratamento da parestesia após cirurgias orais. Este relato de caso apresenta a aplicação da LLLT em um paciente com parestesia do nervo mental após cirurgia ortognática. O paciente foi submetido a três sessões semanais ao longo de três meses, utilizando um laser infravermelho (comprimento de onda: 780 nm). Durante o primeiro mês, foi aplicada uma densidade de energia de 157,5 J/cm<sup>2</sup>, seguida de 105 J/cm<sup>2</sup> nas sessões subsequentes. Avaliações funcionais e sensoriais foram realizadas mensalmente para monitorar a evolução clínica. O tratamento resultou em melhora progressiva e significativa da função neurosensorial. A LLLT contribuiu para a recuperação da sensibilidade na região afetada, promovendo o bem-estar do paciente e melhorando sua qualidade de vida geral. Este caso reforça o potencial da LLLT como uma abordagem terapêutica segura, não invasiva e eficaz no manejo da parestesia pós-operatória, especialmente quando iniciada prontamente após a cirurgia. Estudos clínicos adicionais são incentivados para padronizar protocolos de tratamento e confirmar a eficácia em longo prazo.

**Palavras-chave:** Cirurgia ortognática. Parestesia. Terapia a laser de baixa intensidade. Infravermelho. Reparo nervoso.

**ABSTRACT:** Low-level laser therapy (LLLT) is a promising treatment modality for paresthesia following oral surgery. This case report presents the application of LLLT in a patient with mental nerve paresthesia after orthognathic surgery. The patient underwent three weekly sessions over a period of three months using an infrared laser (wavelength: 780 nm). During the first month, an energy density of 157.5 J/cm<sup>2</sup> was applied, followed by 105 J/cm<sup>2</sup> for the remaining sessions. Functional and sensory evaluations were conducted monthly to monitor clinical progress. The treatment resulted in a progressive and significant improvement in neurosensory function. LLLT contributed to the recovery of sensitivity in the affected region, enhancing the patient's well-being and overall quality of life. This case supports the potential of LLLT as a safe, non-invasive, and effective therapeutic approach for managing postoperative paresthesia, particularly when initiated promptly after surgery. Further clinical studies are encouraged to standardize treatment protocols and confirm long-term efficacy.

**Keywords:** Orthognathic surgery. Paresthesia. Low-level laser therapy. Infrared. Nerve repair.

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**RESUMEN:** La terapia con láser de baja intensidad (LLLT) es una modalidad de tratamiento prometedora para la parestesia posterior a cirugías orales. Este reporte de caso presenta la aplicación de LLLT en una paciente con parestesia del nervio mentoniano después de una cirugía ortognática. La paciente fue sometida a tres sesiones semanales durante un período de tres meses, utilizando un láser infrarrojo (longitud de onda: 780 nm). Durante el primer mes, se aplicó una densidad de energía de 157,5 J/cm<sup>2</sup>, seguida de 105 J/cm<sup>2</sup> en las sesiones restantes. Se realizaron evaluaciones funcionales y sensoriales mensualmente para monitorear el progreso clínico. El tratamiento resultó en una mejora progresiva y significativa de la función neurosensorial. La LLLT contribuyó a la recuperación de la sensibilidad en la región afectada, mejorando el bienestar y la calidad de vida de la paciente. Este caso respalda el potencial de la LLLT como un enfoque terapéutico seguro, no invasivo y eficaz para el manejo de la parestesia posoperatoria, especialmente cuando se inicia de forma temprana. Se alientan estudios clínicos adicionales para estandarizar los protocolos de tratamiento y confirmar su eficacia a largo plazo.

**Palabras clave:** Cirugía ortognática. Parestesia. Terapia láser de baja intensidad. Infrarrojos. Reparación nerviosa.

## INTRODUCTION

Orthognathic surgery is an invasive procedure that may lead to complications such as facial paresthesia, which can be temporary or permanent depending on the extent and location of the nerve injury, as well as the individual's capacity for neural recovery (Buysse Temprano *et al.*, 2017; Doh; Shin; You, 2018; Fernandes-Neto *et al.*, 2020). Paresthesia is defined as an altered skin sensation that may present as numbness, partial loss of sensation, burning, or tingling (Buysse Temprano *et al.*, 2017; Doh; Shin; You, 2018; Fernandes-Neto *et al.*, 2020). The most affected nerves by paresthesia are the inferior alveolar, mental and lingual, which are ramifications of the mandibular division of the trigeminal nerve and are responsible for the sensitivity of the lower lip, lower teeth, chin, gums and tongue (Buysse Temprano *et al.*, 2017; Doh; Shin; You, 2018; Fernandes-Neto *et al.*, 2020).

The patient follow-up is important and critical because, depending on the severity of the injury, the peripheral lesions of the nerves mentioned above can range from mild (neuropraxia) to complete nerve section (neurotmesis) and impair the patient's well-being with simple activities such as chewing or talking. Different modalities of treatment have been employed to accelerate neurosensory recovery in cases of paresthesia, including systemic medications, specific physiotherapy, electrical stimulation, cryotherapy, homeopathy, acupuncture, low-level laser therapy (LLLT), and, in more severe cases, surgical nerve repair (Barbosa *et al.*, 2021; Bittencourt; Paranhos; Martins-Filho, 2017).

Currently, the repair of injured nerves represents a great obstacle for the surgical procedures in Dentistry (Antony *et al.*, 2017; Buysse Temprano *et al.*, 2017; Fernandes-Neto *et al.*, 2020). Among the options to avoid this unwanted effect, LLLT has shown promising results due to its biomodulatory effects, which include accelerated tissue regeneration, reduction of postoperative pain, and facilitation of nerve function recovery (Antony *et al.*, 2017; Barbosa *et al.*, 2021; Guarini *et al.*, 2018; Mirzaei *et al.*, 2019). In a systematic review, Bittencourt *et al.* (2017) (Bittencourt; Paranhos; Martins-Filho, 2017) demonstrated that, despite differences in treatment protocols, LLLT reduced patient discomfort and improved paresthesia outcomes following orthognathic surgery.

Therefore, the aim of this study was to present a case report of postoperative paresthesia and evaluate the effectiveness of low-level laser therapy in a patient with lower lip paresthesia following orthognathic surgery.

## CASE REPORT

A 39-year-old woman (G.R.M.) presented to the Department of Restorative Dentistry at the School of Dentistry, São Paulo State University – UNESP (Araraquara, Brazil) with a chief complaint of sensorineural impairment in the mental region following orthognathic surgery. The patient had undergone the procedure six months earlier, based on a diagnosis of Class II dentofacial deformity and short face, confirmed by anamnesis and complementary examinations. Postoperatively, she was prescribed medications including an antibiotic (Cephalexin), a non-steroidal anti-inflammatory drug (Nimesulide), an analgesic (Dipyrrone), and later Pregabalin for the management of persistent chronic pain. Despite this pharmacological approach, the patient continued to experience altered sensation in the mental region.

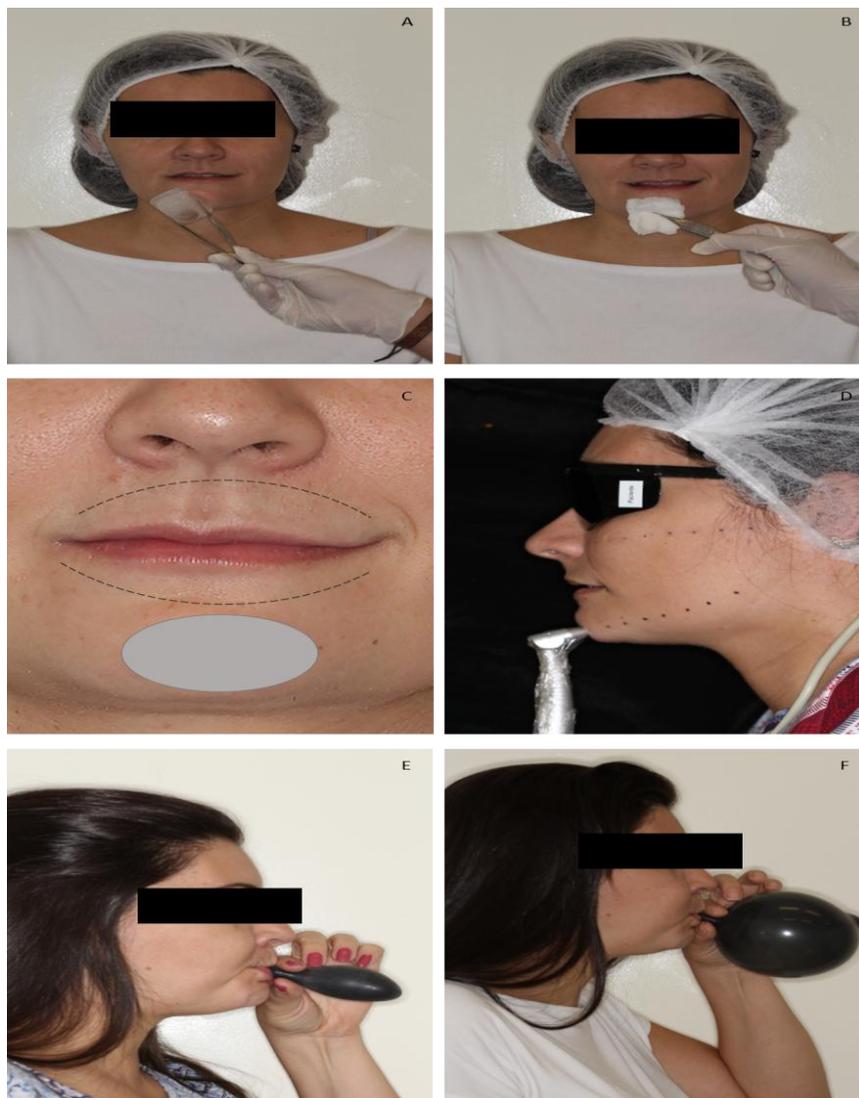
Considering the clinical condition, a treatment plan involving low-level laser therapy (LLLT) was proposed. Prior to initiating the therapy, the patient signed a free and informed consent form. Subsequently, functional and sensory tests were performed (Figure 1A, 1B, 1E), and responses were recorded based on the patient's subjective evaluation.

During the treatment period, the patient attended weekly sessions and underwent a total of three applications per week over a period of three months, totaling 36 laser therapy sessions. A low-level laser device (Twin Flex Evolution, MMOptics, São Carlos, São Paulo,

Brazil) was used, emitting an infrared wavelength of 780 nm. In the first month, the energy density was set at 157.5 J/cm<sup>2</sup>, applied for 1 minute and 30 seconds per point.

The laser tip was applied in contact mode to extraoral areas as illustrated in Figure 1D. After the first month, the energy density was reduced to 105 J/cm<sup>2</sup> and the irradiation time to 1 minute per point, maintained until the end of the treatment. Application zones included the region from the ala of the nose to the tragus, from the mental region to the ascending mandibular ramus, and around both upper and lower lips (Figure 1C-D). The laser beam was positioned perpendicularly to the tissue, with approximately 1 cm spacing between each application point.

At the end of each month, the patient underwent new evaluations using functional and sensory tests to monitor clinical progress (Figure 2).



**Figure 1.** A) Hot test; B) Cold test; C) Demarcation of areas with paresthesia; D) Extraoral application points; E) Initial blowout test; F) Final blowout test

FUNCIONAL AND SENSORIAL TEST	YES	NO
Heat: Heated gauze - 1min water in the microwave		
Cold: Ice cube		
Eyebrow lift (front) “Surprise”		
Adduction of the eyebrows (corrugate eyelashes) "Disapproval"		
Eyelid closure (orbicularis eye) “Close tightly”		
Closure of the lips (orbicularis oris) “Whistle”		
Cheek compression (buccinator) “Blowing” - Bladder filling		
Elevation of the angle of the mouth (Greater Zygomatic) “Smile”		
Elevation of upper lip - Show gums and teeth		
Rinse - water		
Pronounce lip and dentolabial consonants (B, P, M and V) - pumped, Peruíbe, Mississippi and vegetarianism		

Figure 2. Functional and sensory tests performed in this study.

## RESULTS

During the three-month period of low-level laser therapy, the patient showed progressive clinical improvement, as verified by comparison between the initial and final blowout tests (Figure 1E-F). In the first month, sensory and functional assessments revealed predominantly negative responses in most of the tests performed. However, by the final evaluation, a marked improvement was observed. As shown in Figure 3, the patient achieved a 91% positive response rate in basic sensitivity and functional tests, indicating a significant recovery of neurosensory function.

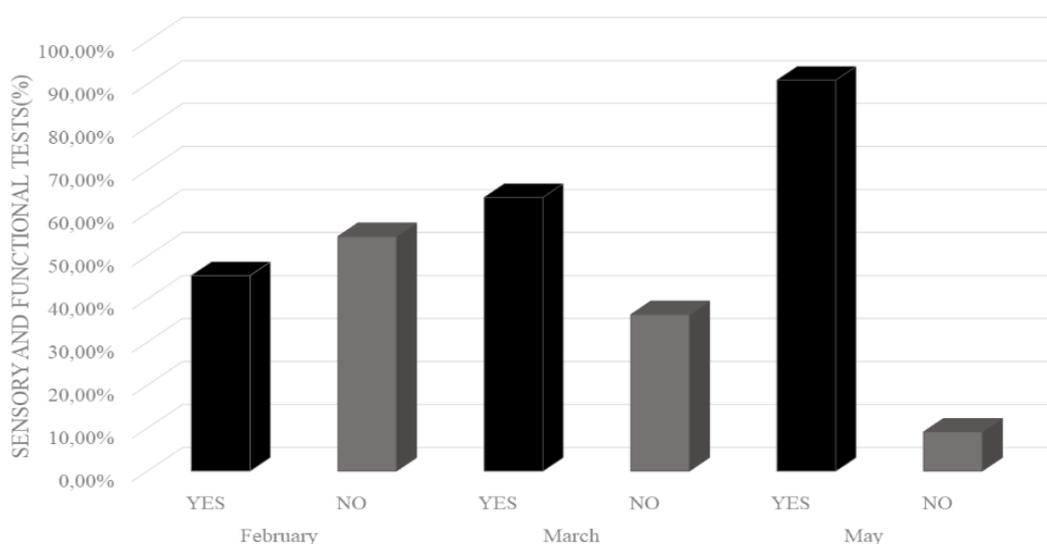


Figure 3. Response to sensory and functional tests in the mental region affected by paresthesia.

## DISCUSSION

This paper presented a case report of follow-up of post-surgical paresthesia with low-level laser therapy. Our results showed that the protocol used with Twin Flex Evolution low-level laser achieved considerable improvements in view of the condition that the patient was previously showed. It is interesting to mention that there is still no standardized dosimetry or irradiation protocol for the treatment of post-surgical paresthesia (Barbosa *et al.*, 2021; Bittencourt; Paranhos; Martins-Filho, 2017; Mirzaei *et al.*, 2019; Olszewska *et al.*, 2025).

Sensory disturbances such as paresthesia are common postoperative complications following orthognathic surgery. The nerves most frequently affected include the inferior alveolar, mental, and lingual nerves (Bittencourt *et al.*, 2017). Nerve injuries during surgery may result from mechanical trauma, such as stretching, compression, or transection. These injuries are typically classified into three categories: neuropraxia, axonotmesis, and neurotmesis.

Neuropraxia is characterized by a temporary block in nerve conduction without structural damage to the nerve fiber. This condition generally has a good prognosis and does not require surgical intervention. Axonotmesis involves partial disruption of axonal continuity, and depending on the severity, recovery may occur spontaneously or may require therapeutic support. Neurotmesis is the most severe type of injury, involving complete disruption of the nerve, and spontaneous recovery is rare without surgical repair. Damage to these nerves can significantly impair basic functions such as chewing, speaking, and swallowing (Buysse Temprano *et al.*, 2017; Rezende *et al.*, 2018).

The use of low-level laser therapy becomes as an interesting possibility not only for the healing and inflammation reducer (Antony *et al.*, 2017; Buysse Temprano *et al.*, 2017; Guarini *et al.*, 2018; Rezende; Silva; Frigo, 2018), assist to the improvement of the oral opening during the surgery postoperative (Mirzaei *et al.*, 2019; Rezende; Silva; Frigo, 2018), but also to recover the sensitivity. The response to this treatment is related to factors related to the laser parameters and also directly related to neurosensory damage level (Barbosa *et al.*, 2021; Olszewska *et al.*, 2025). In addition, the time resulting from the perception of paresthesia and the beginning of laser therapy is important in obtaining the results. The shorter time, the better results. In the present study, although treatment with low-level laser started 6 months after orthognathic surgery, the results were considered satisfactory.

There is no consensus in the literature regarding the low-level laser therapy protocols for the treatment of paresthesia. However, a minimum of ten sessions with 48 hours break between them is recommended (Barbosa *et al.*, 2021; Bittencourt; Paranhos; Martins-Filho, 2017). In the present case report, two different power densities were used. Initially, the delivered dose was according to the manufacturer's instructions (157.5 J/cm<sup>2</sup>). After the impact of the initial dose and predictability of a prolonged treatment, as the patient showed visible improvements in sensory and functional evaluation, the delivered dose was reduced to 105 J/cm<sup>2</sup> and maintained until the end of treatment. During the irradiation no thermal sensation has been reported by the patient.

The tests used in this study to evaluate the gain on mechanical and thermal sensitivity were achieved to be accurate and efficient, both useful for clinical application. The low-level laser under the parameters used in this case report showed beneficial effects on the sensorineural restoration and presents itself as a promising therapeutic option.

The mechanism of the low-level laser therapy can be explained by the penetration of the light into the tissue. The energy released into photons is absorbed by the tissue and can stimulate or inhibit enzymatic activities and produce photochemical reactions that induce biological effects in the cells and tissue. The light into the tissue can determine the stimulation of the reinnervation and repair of impaired nerve fibers, restoring the sensitivity of the tissue (Barbosa *et al.*, 2021; Bittencourt; Paranhos; Martins-Filho, 2017; Mirzaei *et al.*, 2019).

Also, this technique shows some advantages, such as the absence of contraindication, easy to handle, absence of adverse effects that characterize a noninvasive procedure and the absence of surgical intervention, which is very interesting for the patient (Barbosa *et al.*, 2021; Bittencourt; Paranhos; Martins-Filho, 2017). Therefore, more objective protocols should be investigated to ensure greater reliability in cases of follow-up similar to that presented in the present study.

## CONCLUSION

Based on this case report, it was possible to conclude that LLLT may represent a viable treatment option for patients experiencing paresthesia after orthognathic surgery, as the protocol used resulted in significant neurosensory recovery. Moreover, this non-invasive approach has the potential to enhance patients' quality of life. However, further clinical studies are necessary to establish standardized treatment protocols.

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