

Photobiomodulation as a strategy for the treatment of recurrent aphthous stomatitis

- Case Report

Fotobiomodulação como estratégia para o tratamento da estomatite aftosa recorrente – Relato de Caso

Fotobiomodulación como estrategia para el tratamiento de la estomatitis aftosa recorrente – Reporte de Caso

Received: 03/05/2026 | Revised: 03/12/2026 | Accepted: 03/13/2026 | Published: 03/14/2026

Luana Barbieri Trinta

ORCID: <https://orcid.org/0000-0002-5625-3299>
Universidade Federal do Maranhão, Brazil
E-mail: academico.barbieri@gmail.com

Jardel dos Santos Silva

ORCID: <https://orcid.org/0000-0002-5248-1075>
Universidade Federal do Maranhão, Brazil
E-mail: jardel.santos170@gmail.com

Andréa Dias Neves Lago

ORCID: <https://orcid.org/0000-0003-4303-6399>
Universidade Federal do Pará, Brazil
E-mail: andrea.lago@ufma.br

Tabata Resque Beckmann Carvalho

ORCID: <https://orcid.org/0000-0002-7046-5490>
Universidade Federal do Pará, Brazil
E-mail: tabatabeckann@hotmail.com

Sandra Kalil Bussadori

ORCID: <https://orcid.org/0000-0002-9853-1138>
Universidade Nove de Julho, Brazil
E-mail: sandra.skb@gmail.com

Karyzze Milhomem de Oliveira

ORCID: <https://orcid.org/0009-0004-5932-2773>
Universidade Federal do Maranhão, Brazil
E-mail: karyzzeoliveira@gmail.com

Abstract

Recurrent Aphthous Stomatitis (RAS) is characterized as a common pathology in the oral cavity that causes discomfort on patients and that impairs several daily functions. Therefore, this study aimed to analyze 2 clinical cases of RAS submitted to photobiomodulation therapy (PBM) and discuss the benefits that it provides over ulcerations and reactions caused in the tissue. The patients sought the extension project “Laserterapia na Odontologia” in a dental service, in which it was performed the anamnesis and detailed clinical examination, providing attention to their main complaint, at the end it was possible to observe the presence of whitish ulcerative lesions surrounded by a red area and with painful symptoms, which confirms the diagnosis of RAS, then it was decided to use the PBM for a treatment for these lesions, with a protocol for pain and another for acceleration of the wound healing period. It was observed that the immediate reduction of the painful symptomatology in both cases, just as the disappearance of the lesion approximately 3 days after the first irradiation. The PBM was effective in the treatment for RAS in both reported cases and its modulating action of inflammation, analgesic and tissue repair are established, favoring a non-invasive treatment, since it dispensed the use of systemic medications.

Keywords: Aphthous stomatitis; Lasers; Oral medicine; Oral ulcer; Wound healing.

Resumo

A Estomatite Aftosa Recorrente (EAR) é caracterizada como uma patologia comum na cavidade oral que causa desconforto aos pacientes e prejudica diversas funções diárias. Portanto, este estudo teve como objetivo analisar dois casos clínicos de EAR submetidos à terapia de fotobiomodulação (PBM) e discutir os benefícios que ela proporciona sobre as ulcerações e reações causadas no tecido. Os pacientes procuraram o projeto de extensão “Laserterapia na Odontologia” em um serviço odontológico, onde foi realizada a anamnese e o exame clínico detalhado, com atenção à sua principal queixa. Ao final, foi possível observar a presença de lesões ulcerativas esbranquiçadas circundadas por

uma área vermelha e com sintomas dolorosos, o que confirmou o diagnóstico de EAR. Decidiu-se então utilizar a PBM para o tratamento dessas lesões, com um protocolo para alívio da dor e outro para aceleração do período de cicatrização. Observou-se a redução imediata da sintomatologia dolorosa em ambos os casos, bem como o desaparecimento da lesão aproximadamente três dias após a primeira irradiação. A fotobiomodulação (PBM) mostrou-se eficaz no tratamento da estomatite aftosa recorrente (EAR) nos dois casos relatados, e sua ação moduladora da inflamação, analgésica e de reparação tecidual está comprovada, favorecendo um tratamento não invasivo, uma vez que dispensa o uso de medicamentos sistêmicos.

Palavras-chave: Estomatite aftosa; Lasers; Medicina oral; Úlcera oral; Cicatrização de feridas.

Resumen

La estomatitis aftosa recorrente (EAR) se caracteriza por ser una patología común en la cavidad oral que causa molestias a los pacientes y afecta diversas funciones cotidianas. Por lo tanto, este estudio tuvo como objetivo analizar dos casos clínicos de EAR sometidos a terapia de fotobiomodulación (PBM) y analizar sus beneficios sobre las ulceraciones y reacciones tisulares. Los pacientes acudieron al proyecto de extensión "Laserterapia en Odontología" en un servicio odontológico, donde se les realizó una anamnesis y un examen clínico detallado, atendiendo a su queja principal. Al final, se observó la presencia de lesiones ulcerativas blanquecinas rodeadas de una zona roja y con síntomas dolorosos, lo que confirmó el diagnóstico de EAR. Se decidió entonces utilizar la PBM para el tratamiento de estas lesiones, con un protocolo para el dolor y otro para acelerar la cicatrización de la herida. Se observó una reducción inmediata de la sintomatología dolorosa en ambos casos, así como la desaparición de la lesión aproximadamente 3 días después de la primera irradación. El PBM fue eficaz en el tratamiento de la RAS en ambos casos reportados y se establece su acción moduladora de la inflamación, analgésica y reparadora tisular, favoreciendo un tratamiento no invasivo, ya que prescindió del uso de medicamentos sistémicos.

Palabras clave: Estomatitis aftosa; Láseres; Medicina oral; Úlcera oral; Cicatrización de heridas.

1. Introduction

Recurrent Aphthous Stomatitis (RAS) is a common pathology that affects approximately 66% of the population and it can occur anywhere in the oral mucosa (Zeini *et al.*, 2017). The lesions are plain ulcers, with a whitish coloring, fibrinopurulent membrane, an erythematous halo presenting painful symptoms and with diameters ranging from millimeters to a few centimeters, occurring in a simple or a multiple way (Aggarwal *et al.*, 2014; Vale *et al.*, 2015).

The RASs are classified in three types: minor RAS (it is the most common subtype, which usually does not leaves no scar in the oral cavity), greater RAS (usually associated with the presence of a scar). The other variety of EAR is the herpetiform ulcer, characterized by multiple lesions, being a rare condition (Vale *et al.*, 2015; Amorim dos Santos *et al.*, 2020; Brignardello-Petersen, 2017).

The etiology of the disease is still controversial and difficult to reach a consensus, but the proposed causes are mechanical trauma, low immunity, heredity, hormonal factors such as endocrine imbalance (for example menstruation and menopause), lack of vitamins, sleepless nights, stress, recent viral and bacterial infections, among other factors (Nasry *et al.*, 2016; Najeeb *et al.*, 2016).

The diagnosis of RAS is performed through clinical examination of the present ulceration. If necessary, especially on adult patients with sudden outbreaks of the lesions, it is suggested in the literature to request laboratory tests to evaluate the blood count, iron evaluation, vitamin B12 and folic acid (Wang *et al.*, 2022).

The treatment of RAS is symptomatic, where the conventional treatment is the base of several therapeutic agents, such as systemic and topical medications prescribed to treat clinical symptoms, such as pain and the healing process. This treatment has symptomatic and not curative or preventive effect, the current options include topical analgesic, corticosteroids, antibiotics, multivitamins and as a non-invasive treatment, the laser (Najeeb *et al.*, 2016; Wang *et al.*, 2022; Ślebioda *et al.*, 2014).

The use of photobiomodulation therapy (PBM) for the treatment of RAS has been very well accepted and the results are satisfactory. This is a treatment that promotes pain and edema reduction, acceleration of the tissue repair process and inflammatory process modulation, without causing adverse effects (Najeeb *et al.*, 2016; Ślebioda & Dorocka-Bobkowska, 2020; Ahmed *et al.*, 2020).

This study aimed to analyze 2 clinical cases of RAS submitted to photobiomodulation therapy (PBM) and discuss the benefits that it provides over ulcerations and reactions caused in the tissue.

2. Methodology

A descriptive study was conducted, with a qualitative approach (Pereira *et al.*, 2018; Risemberg *et al.*, 2026) and, of the specific type of Multiple Case Report (Bernardes, Nascimento & Ribeiro, 2025; Verztman, 2019; Silva *et al.*, 2013).

The study followed ethical criteria, with patients signing the Informed Consent Forms.

Clinical Case 1

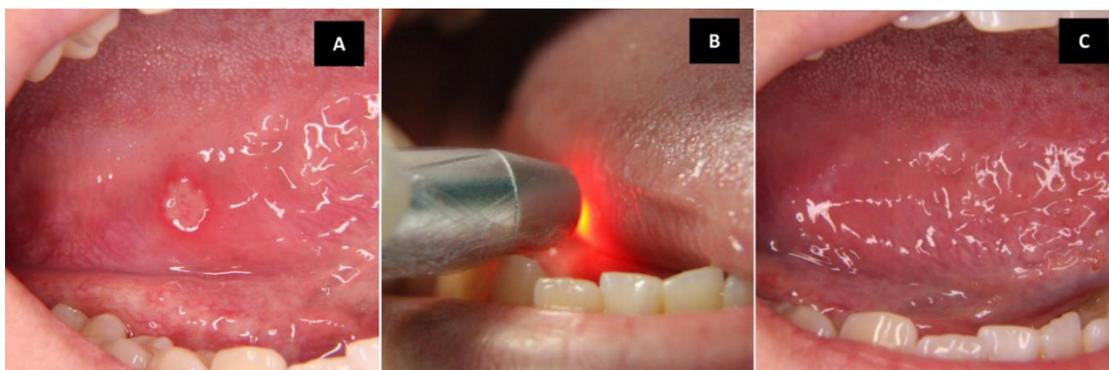
Male patient, 29-years-old, sought dental care reporting of pain and he has deglutition difficulties. During the clinical examination it was verified an whitish ulcerative lesion surrounded by a red area on lateral border of the tongue. The suggestive diagnosis was of recurrent aphthous stomatitis due to clinical characteristics, affected anatomical position and involvement record reported by the patient (Wang *et al.*, 2022). (Figure 1A)

After anamnesis and diagnosis confirmation, it was decided to use the treatment with photobiomodulation therapy using the low-power diode laser (Laser Duo, MMOptics, São Carlos, SP, Brasil). Pain protocol was accomplished according to the following parameters: 808 nm, 100 mW, 3 J of energy per point, for 30 seconds in each point, energy density of 75 J/cm². It was irradiated just 1 point in the center of the lesion (Vale *et al.*, 2015). (Figure 1B) In the pain protocol, it was used the infrared light, to offer comfort and relief of painful symptomatology (Aggarwal *et al.*, 2014; Nasry *et al.*, 2016; Najeeb *et al.*, 2016; Vale *et al.*, 2015; Han *et al.*, 2016; Rocca *et al.*, 2018; Suter *et al.*, 2017).

Subsequently the protocol for tissue repair was performed according to the following parameters: 660 nm, 100 mW, 1 J of energy per point, for 10 seconds in each point, energy density of 25 J/cm². It was irradiated 4 points at the edges of the lesion to accelerate the healing process. In this case it is used the laser on the visible spectrum to therapeutic purposes and tissue repair acceleration (Zeini *et al.*, 2017; Amorim dos Santos *et al.*, 2020; Najeeb *et al.*, 2016; Han *et al.*, 2016; Lalabonova & Daskalov, 2014; Rocca *et al.*, 2018; Suter *et al.*, 2017).

The patient reported a significant improvement of his painful symptomatology right after his first photobiomodulation therapy session. Pain went from grade 7 to 1 based on the Visual Analog Scale (VAS). After 3 days, the affected area for the lesion was totally repaired and the patient had no pain during the healing process, and he did not use systemic or topical medications (Figure 1C).

Figure 1 - A. Initial clinical appearance of the aphthous lesion located on the lateral border of the tongue. B. Laser application for photobiomodulation. C. Clinical appearance after 2-day evaluation.



Source: Research data (2026).

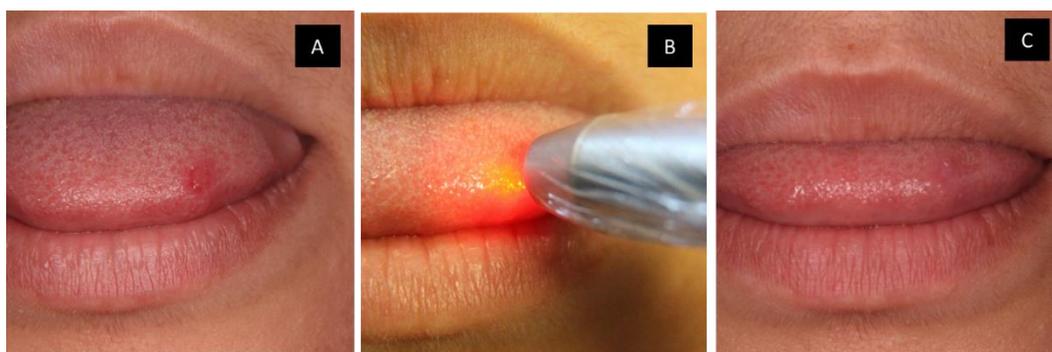
Clinical Case 2

Male patient, 20-years-old, sought dental care, reporting severe pain due to canker sores on his tongue apex region. During the clinical examination it was verified one ulcerative lesions with swollen edges and according to the pain scale (VAS) the patient had grade 8 (Figure 2A).

Therefore, the PBM was initiated (Laser Duo, MMOptics, São Carlos, SP, Brasil) in the same parameters as in clinical case 1; however, the energy density used was (Figure 2B) and the patient reported no immediate pain after the first session in the lesions (Grade zero on VAS). Subsequently, the protocol for tissue repair was performed according to the following parameters: 660 nm, 100 mW, 1 J of energy per point, for 10 seconds in each point, energy density. It was irradiated 4 points for lesion at the edges of the lesion to accelerate the healing process (Zeini *et al.*, 2017; Najeeb *et al.*, 2016; Han *et al.*, 2016; Lalabonova & Daskalov, 2014; Rocca *et al.*, 2018).

The patient reported significant improvement in his painful sensibility and there was almost a complete healing of the ulcerative lesions in three days (Figure 2C).

Figure 2 - A. Initial clinical appearance of the aphthous lesion located at the apex of the tongue. B. Laser application for photobiomodulation. C. Clinical appearance after 3-day evaluation.



Source: Research data (2026).

3. Results and Discussion

The RAS can affect the population of all ages since it is one of the most common pathologies that occur in the jugal mucosa. It affects approximately 20% of the population in general, and most of the patients suffer of different pain grades, which can interfere at the speaking and at the deglutition, affecting the patient's life quality (Brignardello-Petersen, 2017; Hu *et al.*, 2017). Such findings corroborate the findings of this report, since the patients reported an impact on their quality of life.

There are many causes for RAS and one of the known factors that possess direct and indirect relation to their appearance is the psychological factors (Brignardello-Petersen, 2017). The mechanisms by which stress can result in RAS episodes are not well understood. It was suggested that the increase of salivary cortisol levels or oxygen-reactive species (a possible determinant of stress level in the individual) in the saliva, may lead to the lesions appearance. In addition, stress can simply stimulate self-induced trauma, thus initiating an episode of RAS (Ahmed *et al.*, 2020; Ślebioda *et al.*, 2017).

The use of photobiomodulation in the recurrent aphthous stomatitis treatment has shown positive results in relieving pain and reducing the lesions' size (Han *et al.*, 2021; Al-Maweri *et al.*, 2020; Suter *et al.*, 2020). This was observed in the two clinical cases reported. Furthermore, some studies show superior healing performance when using photobiomodulation (Nasry *et al.*, 2016; Lalabonova & Daskalov, 2014; Suter *et al.*, 2017; Akerzoul & Chbicheb, 2018). The low-power diode laser does not produce the possibility of thermal effects in the oral mucosa, such as ablation, coagulation, vaporization, or erythema,

because its interaction with the tissue will promote actions that results in analgesics effects, antiedematous and healing properties. It is described as convenient for use, devoid of adverse effects and it is considered a choice treatment for the management RAS, if the clinician has the equipment and has adequate qualification (Brignardello-Petersen, 2017; Yilmaz *et al.*, 2017).

On both cases of this study it was possible to observe that the photobiomodulation therapy was effective and the patients reported immediate relief of their painful symptomatology, with alterations in the clinical characteristics of the lesions being visible, such as the healing time. The photobiomodulation acts directly in the increase of the production of mitochondrial ATP, because it activates the respiratory chain and the stimulation of the oxidative phosphorylation for a short time, which provokes alterations in the redox state of both the mitochondria and the cytoplasm of the cell (Aggarwal *et al.*, 2014; Vale *et al.*, 2015).

The light molecular absorption allows the photoreceptors stimulation in the mitochondrial respiratory chain, alterations in levels of cellular ATP, collagen synthesis and epithelial proliferation (Ahmed *et al.*, 2020; Yilmaz *et al.*, 2017). The inflammation modulation and erythema process exercised by the photobiomodulation promotes microcirculation acceleration, which results in alterations in the capillary hydrostatic pressure around the lesion, with reduction of the edema and annulment of the intermediate metabolites accumulation, which favorites its effect of inflammatory process modulator (Brignardello-Petersen, 2017; Ślebioda *et al.*, 2014; Lalabonova & Daskalov, 2014; Ślebioda *et al.*, 2017; Yilmaz *et al.*, 2017).

The laser still acts on fibroblasts, with the production of type III collagen fibers, elastin and proteoglycans, essential in the healing process, standing out as a biostimulator for tissue repair (Aggarwal *et al.*, 2014). It has the capacity to stimulate cell proliferation and stagnate the lesion in its initial cycle, which favors the healing process in hypoxia and ischemia regions, it works as cell organizers and it promotes the tissues biomodulation, which accelerates the tissue repair process, it decreases pain, and it improves the anti-inflammatory responses (Zeini *et al.*, 2017; Aggarwal *et al.*, 2014; Amorim dos Santos *et al.*, 2020; Najeeb *et al.*, 2016; Rocca *et al.*, 2018).

The wavelengths used in this study were in the red (660 nm) and infra-red (808 nm) spectrum and they possess different tissue penetration profiles due to the absorption and interaction of each one with the mucosa chromophores (hemoglobin, melanin, and water), approximately identifiable as 4-5 mm for red spectrum and 7-8 mm for infra-red (Han *et al.*, 2016). The protocol used in this study was chosen with the purpose of initially relieve the pain and that's why it was irradiated with the infra-red in the lesion center due to its greater penetration power, since it has a great value once that the healthy cells are located more internally providing the benefit of the photochemical, photobiological and photophysical effects.

Aggarwal *et al.* (2014) accomplished a study through a randomized clinical trial and they indicated that the photobiomodulation therapy was effective in the reduction of pain intensity and full healing time of the aphthous ulcers, with the healing time in the laser-treated group being around 5 days when compared to the healing time in which corticosteroids were used, where full regression occurred in 5-7 days. These findings are similar to those observed in this report in which the maximum healing time of the lesion using the same wavelength was of 3-5 days. Such results are corroborated by the study conducted by Lalabonova and Daskalov (2014), in which promising results were described when using photobiomodulation. The authors observed that pain and inflammation were managed very effectively, in which epithelialization was considerably accelerated.

The photobiomodulation therapy submitted confirmation that its treatment has better results as a treatment for chronic RAS that the conventional pharmacotherapy (Nasry *et al.*, 2016; Suter *et al.*, 2017; Akerzoul & Chbicheb, 2018). Another advantage that the photobiomodulation therapy provides compared to the corticosteroid is the absence of fungal infection (Suter *et al.*, 2017).

4. Conclusion

The results obtained in this study are in accordance to those found in the literature, which reinforces the study positive results that investigate the photobiomodulation therapy effects in the RASs, with a reduction in the pain reception immediately after the irradiation and an accelerated healing. However, it is noticed that there is lack of protocols with well-defined parameters to the two types of existing RASs, that clarify all the measurement values used in dosimetry and information on the equipment used.

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