

## New evidence of photobiomodulation and ozone therapy combined in the treatment of Bell's palsy

Novas evidências de fotobiomodulação e terapia de ozônio combinadas no tratamento da paralisia de Bell

Nueva evidencia de fotobiomodulación combinada y ozonoterapia en el tratamiento de la parálisis de Bell

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### Abstract

Bell's palsy is the most common cause of unilateral facial palsy reported in the literature. This condition consists of causing rapid onset and unilateral peripheral paresis/paraesthesia of the seventh cranial nerve. Despite being well documented, its etiology is still uncertain, imposing difficulty in immediate treatment. The combination of laser therapy and ozone therapy was proposed as a new treatment method for Bell's palsy, as it combines the efficacy and response of a therapy with the benefits of a minimally invasive approach. In the present study, we describe the first treatment protocol combining laser therapy and ozone therapy in Brazil, as well as details of the technique for the treatment of Bell's palsy. Case Report: A 59-year-old female with paralysis and paresthesia in the right hemiface, diagnosed for Bell's palsy, underwent a combined treatment of laser therapy and ozone therapy (VK OzonTherapy). After the fourth treatment session, a great clinical response was observed, and another session of the VK OzonTherapy protocol was performed. The patient evolved with significant improvement in the sequelae of right hemifacial paralysis, oro-ocular and eye closure, with rapid recovery of muscle tone and correction of asymmetries. Conclusions: This Report shows that the VK OzonTherapy protocol is an adjunct tool for clinical practice capable of improving the aesthetic-functional quality of life in patients with recent unilateral facial palsy.

**Keywords:** Bell's palsy; Facial nerve palsy; Facial nerve paralysis; Laser therapy; Ozone therapy.

### Resumo

A paralisia de Bell é a causa mais comum de paralisia facial unilateral relatada na literatura. Esta condição consiste em causar início rápido e parestesia/paresia periférica unilateral do sétimo nervo craniano. Apesar de bem documentada, sua etiologia ainda é incerta, impondo dificuldade no tratamento imediato. A combinação de laserterapia e ozonioterapia foi proposta como um novo método de tratamento para a paralisia de Bell, pois combina a eficácia e resposta de uma terapia com os benefícios de uma abordagem minimamente invasiva. No presente estudo, descrevemos o primeiro protocolo de tratamento combinando laserterapia e ozonioterapia no Brasil, bem como detalhes da técnica para o tratamento da paralisia de Bell. Relato do Caso: Paciente do sexo feminino, 59 anos, com paralisia e parestesia em hemiface direita, com diagnóstico de paralisia de Bell, submetida a tratamento combinado de laserterapia e ozonioterapia (VK OzonTherapy). Após a quarta sessão de tratamento, observou-se ótima resposta clínica, sendo realizada outra sessão do protocolo VK OzonTherapy. A paciente evoluiu com melhora significativa das sequelas de paralisia hemifacial direita, fechamento oro-ocular e ocular, com rápida recuperação do tônus muscular e correção das assimetrias. Conclusões: Este Relatório mostra que o protocolo VK OzonTherapy é uma ferramenta auxiliar para a prática clínica capaz de melhorar a qualidade de vida estético-funcional em pacientes com paralisia facial unilateral recente.

**Palavras-chave:** Paralisia de Bell; Paralisia do nervo facial; Paralisia do nervo facial; Laserterapia; Ozonoterapia.

## Resumen

La parálisis de Bell es la causa más común de parálisis facial unilateral reportada en la literatura. Esta condición consiste en causar paresia/parestesia periférica unilateral de inicio rápido del séptimo par craneal. A pesar de estar bien documentada, su etiología aún es incierta, lo que impone dificultad en el tratamiento inmediato. La combinación de la terapia con láser y la ozonoterapia se ha propuesto como un nuevo método de tratamiento para la parálisis de Bell, ya que combina la eficacia y la respuesta de una terapia con los beneficios de un enfoque mínimamente invasivo. En el presente estudio, describimos el primer protocolo de tratamiento que combina la terapia con láser y la ozonoterapia en Brasil, así como detalles de la técnica para el tratamiento de la parálisis de Bell. Caso Clínico: Paciente femenina, de 59 años, con parálisis y parestesias en hemifaz derecha, diagnosticada de parálisis de Bell, sometida a tratamiento combinado de láserterapia y ozonoterapia (Ozonoterapia VK). Después de la cuarta sesión de tratamiento se observó una excelente respuesta clínica y se realizó otra sesión del protocolo VK OzonTherapy. El paciente evolucionó con importante mejoría en las secuelas de parálisis hemifacial derecha, cierre oro-ocular y ocular, con rápida recuperación del tono muscular y corrección de asimetrías. Conclusiones: Este Informe demuestra que el protocolo VK OzonTherapy es una herramienta auxiliar para la práctica clínica capaz de mejorar la calidad de vida estético-funcional en pacientes con parálisis facial unilateral reciente.

**Palabras clave:** Parálisis de Bell; Parálisis del nervio facial; Parálisis del nervio facial; Laserterapia; Ozonoterapia.

## 1. Introduction

Bell's palsy (BP) is a condition consisting rapid-onset unilateral paresis/peripheral paresthesia of the seventh cranial nerve (Markus et al., 2021). It is a health problem with negative functional and aesthetic repercussion, which generates a deficit in the patient's quality of life. In spite of BP is well known, its etiology is still uncertain and this imposes difficulty in immediate treatment, promoting devastating long-term consequences (Santos, et al., 2020; Zhang et al., 2020).

This condition affects individuals of all populations, both sexes and various ages, with an annual incidence of 11.5 to 53.3 per 100.000 individuals. (Monini et al., 2010; Rogalska et al., 2016). BP causes partial or complete incapacity of muscle movements on the affected side of the face, and even though it is transient, it can cause severe temporary oral insufficiency and, in some cases, prevent the eyelids from closing, causing permanent eye damage (Prud'hon & Kubis, 2019).

BP is a peripheral disease that results in paralysis of the facial nerve responsible for the expression of facial muscles. The facial nerve has parasympathetic fibers from lacrimal and salivary glands and sensory fibers responsible for flavor to the anterior 2/3 of the tongue (Greco et al., 2012). The most common causes recorded in the literature for the development of BP include viral infections; where the herpes virus appears to be the most likely infecting agente (Hato et al., 2013), vascular, autoimmune reactions, trauma, surgical procedures and neoplasms (Garg et al., 2012).

From this, we decided that this research would focus on the use of combined therapies, for example, laser therapy and ozone therapy in patients with Bell's palsy; because we consider that, it is extremely important to question the existence of clinical evidence in the treatment of this aesthetic-functional condition. Furthermore, it is important to note that art. 1º of resolution nº 166/2015 (Federal Council of Dentistry) (CFO, 2015) and the art. 1º of resolution nº 82/2008 (of the same advice) (CFO, 2008) recognize and regulate the practice of ozone therapy and laser therapy, respectively, as effective integrative practices in dentistry when applied by a qualified dental surgeon.

In that regard, characterize the objective of this work in: to describe the treatment of Bell's palsy in the right hemiface of a female patient through the association of low-frequency laser and ozone therapy, and report the effectiveness of the protocol performed to resolve the case.

## 2. Methodology

This article is a single qualitative and descriptive case report, as classified by Kim et al. (2017). The presente study was approved by the Research Ethics Committee of Hospital Mãe de Deus / Associação Educadora São Carlos – AESC with the number: 4.974.429 and Certificate of Presentation for Ethical Appreciation: 50045421.6.0000.5328.

A 59-year-old female, xanthoderma, reported paralysis and paresthesia in the right hemiface upon waking in the morning (11/18/2020). Searched medical attention (on the same day) and was diagnosed with Bell's palsy and started treatment with systemic corticosteroids (prednisolone 25 mg twice daily, prescribed by attending physician) and physical therapy sessions.

After medical consultation, the patient searched for specialized dental care and was submitted in November 2020 to specific treatment for Bell's palsy by a team of qualified and experienced dentists in these clinical situations.

At first, the patient was instructed to perform hand hygiene with 70% alcohol (weight/weight) and temperature measurement. Posteriorly, a screening questionnaire for COVID-19 was applied to analyze the risks of exposure to the virus. After exclusion of potential infection, anamnesis and evaluation of the patient's general multisystem medical history were performed.

After anamnesis, it was found that the patient had diabetes, hypertension, hypothyroidism and allergic to potassium clavulanate. She was on continuous use of metformin hydrochloride and glimepiride.

Next, we report the planning proposed by the team for the treatment of the case (Table 1).

**Table 1.** Planning the treatment adopted for Bell's palsy\*.

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- **Laser Therapy sessions integrating with Ozone sessions on the right hemiface**
  - **Variation of doses according to the patient's physiological response - therapeutic window**
  - **Botulinum Toxin Application (left hemiface - not affected by BP), for Functional-Therapeutic-Aesthetic balance at specific points: Frontalis muscle, Zygomaticus major and minor muscle, Risorius muscle. Depressor Labii Inferiores muscle - quarterly intervals (as suggested in the literature) (Brito & Barbosa, 2020; Thien et al., 2019; Mendonça et al., 2014).**
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\*Every treatment must be individualized considering the affected region, the physiological response and the intrinsic characteristics of each patient. Source: Authors.

In the first treatment session (11/24/2020), the patient was instructed to wash the face with neutral soap and dry it with disposable paper sheets. Previously facial analysis, face antisepsis was performed with sterile gauze pads and 70% alcohol. During facial analysis, apparent inclination of the right facial side and drooping of the right side of the mouth was observed (Figure 1A-C), the patient was conducted to treatment (VK OzonTherapy protocol): Ozone was administered via systemic auricular 20 mcg (volume 360 mL) and 8J infrared laser for 80 seconds per 1 cm points until coverage of the entire nerve pathway.

**Figure 1.** A 59-year-old woman presenting with right hemifacial Bell's palsy. (A-B) front view of facial muscle tone and asymmetrical smile. (C) View from the left side of the face.



Source: Authors (2022).

In the second (11/25/2020), third (11/26/2020) and fourth sessions (11/27/2020), the same protocol described in the first was used, including an injectable application of 15 mcg of ozone along the innervation pathway. The interval of all sessions (from the 1st to the 4th session) occurred every 24 hours.

Spent a few days after the fourth session (15 days), the patient came to the clinic for evaluation and a significant improvement was observed, as shown in images 2A-C. Despite the improvement, a fifth treatment session (12/14/2020) was conducted following the previous steps (2-3 sessions).

**Figure 2.** Improvement of facial muscle tone and asymmetric smile after 4th session of LaserTherapy associated with Ozone Therapy.



Source: Authors (2022).

In the sixth and final session (12/14/2020), 10 mcg of ozone and 8J infrared laser were applied throughout the nerve – Temporal branches, Zygomatic, Buccal and Marginal mandibular branches as “booster dose” (Figure 2C).

As can be seen in images 2A-C, the patient evolved with significant improvement in the sequelae of right hemifacial palsy, oro-ocular and eye closure and asymmetries. Based on these findings, it was decided not to apply botulinum toxin, since the attempts to improve the asymmetries of the left hemiface (not affected) were no longer needed, since the patient considered the functional and aesthetic return after 20 days of treatment to be satisfactory.

### 3. Results and Discussion

Corticosteroids are widely used for the treatment of BP with evidence of significant benefits in early treatment. More recently, the efficacy of additional treatment with an antiviral agent was investigated. The results of this combination are still imprecise due to the little or no effect on recovery rates compared to corticosteroid therapy alone in people with BP (Gagyor et al., 2019).

In a comparative study on the effectiveness of high and low frequency laser for the treatment of BP in 48 patients, the results revealed that both lasers promoted significant improvements in the recovery of patients with Bell's palsy, with emphasis on the protocol that used the high frequency laser, revealing a slightly better result in terms of efficacy in the treatment of BP with low-frequency laser. Nonetheless, these findings do not cancel each other out, and the low-frequency laser can be a tool of great positive impact for the treatment of this condition (Alayat et al., 2014).

Clinical trials using ozone therapy as a rehabilitative treatment for Bell-type peripheral facial palsy have gained prominence in the field of scientific evidence since the last decade. A study on the effectiveness of ozone (García et al., 2008) in a sample of 134 patients (group 1: 67 patients - ozone rehabilitation treatment / group 2: 67 patients - conventional treatment), revealed that in the first cycle of ozone therapy, 67 patients reported improvement in symptoms (45-67.1%), in the second cycle, 22 patients remained with slight improvement and 15 patients progressed to improvement (63.6%), in the third cycle, 7 patients reported slight improvement and 4 patients reported complete improvement (91.5%). As found in this study, the patient achieved a gradual improvement as they advanced to new ozone cycles. Nonetheless, there is still a large gap in the literature conducted by long-term randomized controlled trials to actually verify the existence of the effectiveness of ozone therapy for the treatment of BP, checking if, in fact, the improvement in the patient's condition was the result of the association of this procedure, or just the effect of laser therapy, since an outcome may naturally lead to an improvement or worsening of the clinical condition. Despite the evidence on ozone therapy and BP is incipient, the results of the literature are close to those achieved in our case report, since in the fourth session of combined treatment, and the patient was already satisfied with the results, with an improvement in the asymmetries of the face and smile.

In a study on the effects of ozone therapy on facial nerve regeneration (Ozbay et al., 2017), it has been suggested that ozone therapy may have beneficial effects on the regeneration of facial nerve injury, confirmed in pathological evaluation, electron microscopy and light microscopy. The authors of this study showed that ozone therapy might be a promising avenue to explore the treatment of acute facial palsy and peripheral nerve regeneration. Although this case report is not a lesion-induced hemifacial paralysis, ozone therapy brought about important improvements in the Bell's palsy condition in question, which suggests that this new therapeutic modality can be included in the clinical practice of dentists to achieve predictable and satisfactory results in a short period.

A retrospective survey compared and determined the incidence and clinical features of individuals with facial paralysis during the COVID-19 outbreak and the same period in 2019 (Codeluppi et al., 2020). The records revealed that 38 patients were treated due to facial paralysis in 2020, and 22 cases in 2019. In detail, in 2020 eight patients (21%) had active symptoms consistent with COVID-19, and only two cases (9%) in 2019. Data compilation showed that the highest occurrence of facial paralysis occurred during the COVID-19 outbreak when compared to the same period in 2019. The 21% of patients with facial paralysis had active or recent symptoms of SARS-CoV-2 infection, suggesting a greater correlation for the risk of developing

facial paralysis during or after COVID-19.

For the reasons mentioned above, it is important for dentists to be more attentive to the development of Bell's palsy in the current pandemic conjecture, since this condition can be a reality of your clinical practice where diagnosis and treatment is of paramount importance to establish the relationship between health and well-being of your patients. Furthermore, there are hypotheses that COVID-19 patients may have Bell's palsy early in the infection in an immune response caused by SARS-Cov-2 (Wan et al., 2020).

#### 4. Conclusion

The infrared laser associated with ozone therapy was an adjuvant approach for the treatment of Bell's palsy where it was possible to observe an improvement in the patient's condition in a short period, enabling the improvement of the patient's quality of life-aesthetic-functional, besides preventing the development of serious sequelae. Nonetheless, from the perspective of evidence-based practice, it is extremely necessary that randomized controlled trials be performed to support ozone therapy for the treatment of Bell's palsy.

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