Case report

Photobiomodulation Therapy in Bell´s palsy: a case report

ABSTRACT

Aims: The primary concern for patients with Bell's palsy is the impact on their ability to express facial emotions, which significantly affects well-being and self-esteem. Facial expressions are essential for social connections, and the growing use of online work tools and social networks amplifies their importance.
Study design: Case Report
Methodology: Red PBM (660 nm ± 10 nm) was applied to the temporal, zygomatic, mandibular, and cervical regions (2 J per point, 2 points per region), while infrared PBM (808 nm ± 10 nm) was administered to the temporal, supra-auricular, submandibular, and posterior cervical ganglia regions (2 J per point, 2 points per region). A total of 10 points were treated with red PBM and 8 with infrared PBM.
Results: This case report describes the successful use of a four-sessions photobiomodulation (PBM) protocol with red and infrared lasers on facial regions affected by Bell's palsy, leading to notable improvements in smile symmetry, eyebrow movement, and eye closure. Since the first session, patient presented visible improvements in smile, eyebrow arching and eye closure.
Conclusion: These results suggest that PBM may be an effective tool for managing facial paralysis, offering patients a non-invasive treatment option with minimal adverse effects. Further clinical trials are recommended to explore its broader therapeutic potential.

Keywords: Photobiomodulation; Bell's palsy; Facial expressions; Case report; Facial paralysis

1. INTRODUCTION

Bell's facial paralysis or peripheral facial paralysis (PFP) is defined as an idiopathic peripheral paralysis of one of the seventh facial nerves, with a sudden onset. Approximately 40,000 people in United States are affected by PFP annually (1), and its prevalence is slightly higher in women (2). Various etiological factors are associated to the PFP, including trauma, infection, metabolic alterations, tumors, toxins, congenital factors, and both acute or chronic otitis media (3).

The PFP involves a lesion of the facial nerve (4) resulting in paralysis and loss of facial expression, either partially or fully. This condition compromises aesthetics and significantly impacts the patient's psychosocial well-being (5). There is a notable association between facial paralysis and significant disruptions in social activities, public behavior, professional performance, and interpersonal communication (6,7). While most patients experience natural recovery within a few weeks to months, some individuals may suffer long-lasting effects, underscoring the need for effective treatments.

The primary treatment options for Bell's palsy focus on reducing inflammation, promoting nerve recovery, and minimizing complications. These approaches include the use of corticosteroids and antiviral medications (4), facial exercises and physical therapy(8), and botulinum toxin injections (9).Other treatment options have also been proposed, such as osteopathic treatment (5,10).

Photobiomodulation (PBM) may be considered an adjunct therapy for the treatment of PFP due to its regenerative capacity. PBM can induce the metabolism of injured nerve tissue, enhancing nerve function (11,12). PBM has shown analgesic, anti-inflammatory, and healing effects through cellular biostimulation(13,14).

By acting therapeutically on biological systems, PBM promotes temporary analgesia, regulates the inflammatory process, and biomodulates cellular responses. With the application of appropriate parameters, PBM can stimulate cellular metabolism, increase local microcirculation, and accelerate the healing process, thereby restoring the physiological balance (12). This case report illustrates the use of PBM in the treatment of PFP.

2. PRESENTATION OF THE CASE

This case report was written based upon the Case Reports Guideline (CARE) (15,16). The patient D. L. F., 27 years old, presented to the clinic with left-sided facial paralysis and pain in the left posterior cervical area. The patient reported an onset of symptoms with loss of sensation in the tongue and severe pain in the left cervical region, following a period of intense stress. The patient had difficulty chewing and closing his eye, and felt anxious and uncomfortable due to his aesthetic conditions.

To determine the severity of the paralysis, patient performed facial expressions, such as smiling and blinking, which were documented though photographs. The patient presented with grade IV on the House-Brackmann (HB) facial nerve classification(17), indicating a moderately severe injury with obvious asymmetry, no forehead movement, and weakness with possible disfiguring synkinesis - Table 1. This scale, though initially created to classify the recovery of the facial nerve recovery post-surgery, is the most cited in literature for analyzing mimic muscles moviments.The Committee on Facial Nerve Disorders recommends this system for evaluating and reporting all facial nerve recovery results. The HB classification can also serve as a prognostic tool for PFP; a grade higher than II three months after symptom onset signals possible recovery with potential sequelae. The likelihood of recovery to HB I decreases as the severity of paralysis increases (17).

Table 1: House-Brackmann Grading Scale (17).

Grade	Description	Characteristics
I	Normal	Normal Facial Function
II	Mild Disfunction	Slight weakness on close inspection; normal tone and symmetry at rest
III	Moderate Disfunction	Obvious weakness +/- asymmetry, but not disfiguring; synkinesis, contracture or hemifacial spasm; complete eye closure with effort
IV	Moderately Severe Disfunction	Obvious weakness or disfiguring asymmetry; normal symmetry and tone at rest; incomplete

		eye closure
V	Severe Disfunction	Barely perceptible motion; asymmetry at rest
VI	Total paralysis	No movement

PBM therapy was initiated 7 days after the patient began pharmacological treatment prescribed by the physician (Prednisolone 40mg, Acyclovir 400mg, Alginac® 1000mg – a combination of Cyanocobalamin, Diclofenac sodium, Pyridoxine andThiamine). The PBM was applied using red (660 nm ± 10 nm) and infrared (808 nm ± 10 nm) lasers, each with a power output of 100 mW ± 20% (Elite, DCM, São Carlos, Brazil). Red PBM was applied to 2 points per region, targeting the temporal, greater and lesser zygomatic, marginal mandibular, and cervical regions, delivering 2 J per point. Infrared PBM was similarly applied to 2 points per region, targeting the temporal, supra-auricular, submandibular, and posterior cervical ganglia regions, also delivering 2 J per point. In total, 10 points were treated with red PBM and 8 with infrared PBM. The PBM sessions were repeated at 72-hour intervals, following the same protocol, for four additional sessions.

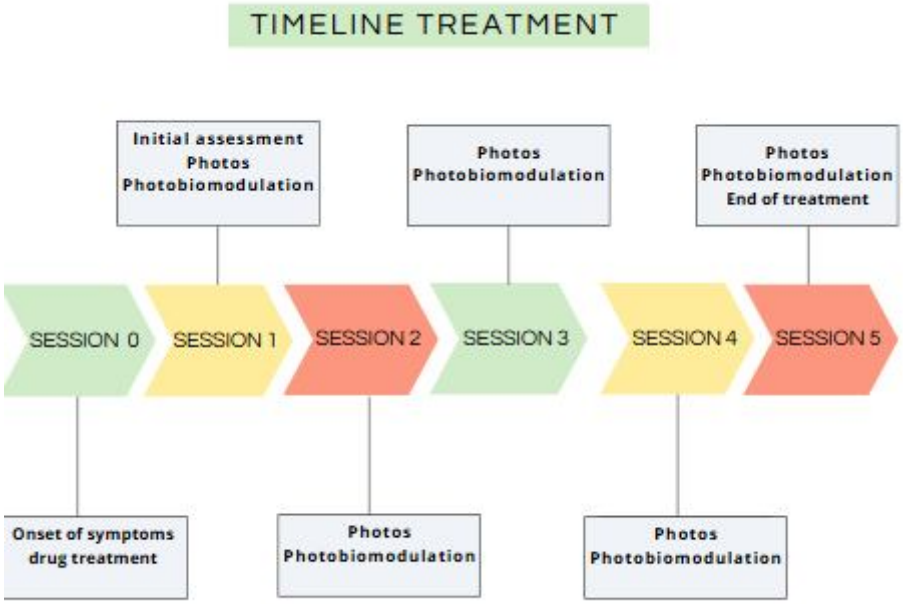

Fig.1. Timeline of the treatment. The sessions were performed with 72hour interval.

The initial facial analysis showed significant asymmetry. In the upper third, the left eyebrow was immobile when patient attempted to raise it, while the right eyebrow moved. The left eye exhibited minimal movement and was widely open. Analysis of the middle and lower thirds of the face revealed lip incompetence, with the left lip lower and the incisor teeth barely visible when smiling (Figure 1). After the first session, the patient's cervical pain subsided, and visible improvements were noted in his smile, eyebrow arching, and eye closure. Also, photographs were taken and the patient reported a reduction in discomfort.

By the time of subsequent sessions, even more significant improvements were observed (figures 2 and 3). The patient reported improved chewing function and noticeable positive progress in his psychosocial condition. Upon returning 72 hours after the last session, the

patient showed significant improvement in his smile, eyebrow arching, blinking and self-esteem. He reported being able to work again, sleeping better, eating well, and experiencing high satisfaction with the treatment results. The patient tolerated the procedures without any discomfort or adverse effects.

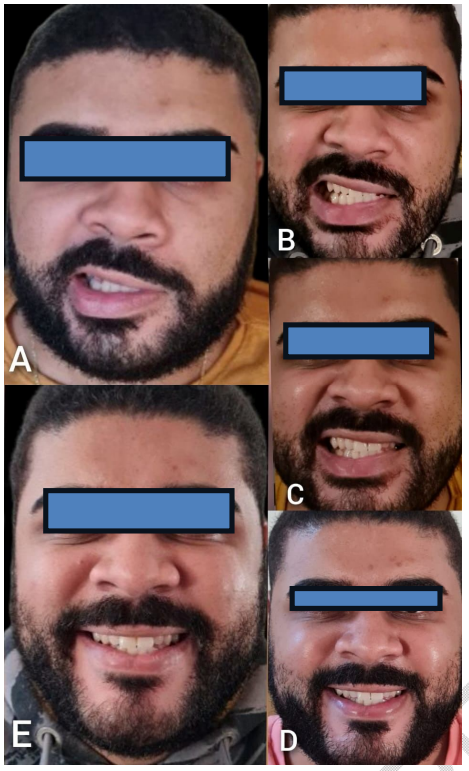

Fig. 2. Evolution of the smile after 4 PBM sessions. A) Before treatment; B) After 1 session; C) After 2 sessions; D) After 3 sessions; E) After 4 sessions - Final treatment.

Fig. 3. Visible improvements in eyebrow arching. A) Before treatment; B) after 1 session; C) After 2 sessions; D) After 3 sessions.

3. RESULTS AND DISCUSSION

Photobiomodulation promotes tissue repair by stimulating cellular metabolism, increasing local microcirculation, and restoring physiological balance. When the facial nerve is damaged, muscle functions are compromised, altering functional performance and significantly impacting the individual's social life.

In this case report, infrared PBM was applied to the ganglia to enhance regenerative capacity of certain nerve structures, promoting stimulated nerve function. PBM may favor reinnervation and induce damaged nerve tissue to endogenously produce proteins associated with nerve growth. The red PBM, applied to the facial nerve pathway, is known have anti-inflammatory effects, reducing the levels of pro-inflammatory cytokines and modulate the inflammatory process(2). Early intervention in cases of Bell's palsy is crucial for preventing long-term sequelae. The combination of pharmacological treatment with early PBM can significantly enhance recovery outcomes. Studies have shown that early treatment with corticosteroids and antiviral agents can reduce nerve inflammation and viral load (18). However, integrating PBM to traditional treatment has potential synergistic effects.

The selection of appropriate PBM parameters, such as wavelength, dosage, and treatment frequency, is critical for maximizing therapeutic outcomes. Research by Hamblin indicates that specific wavelengths, particularly in the red and near-infrared spectrum, can penetrate tissues effectively and stimulate cellular repair mechanisms (19). Our use of dual wavelengths aimed to leverage these findings, providing a comprehensive treatment protocol. The light parameters were chosen based on literature suggesting that PBM's anti-inflammatory and stimulatory effects are found at 1-5 J range. Parameters ca vary significantly between studies, and no standard dosage or application technique has been consolidated. In this study, a low dosage of 2 J per point was used for both the red and infrared lasers. This approach aligns with previous studies who indicated that low energy doses of up to 8J are effective for stimulatory PBM, aiming to increase ATP production, and enhance metabolism and cell proliferation. Recently, 4J per point was used and found

effective results after seven sessions (20). In contrast, this study achieved resolution of facial paralysis with a lower radiant energy (2J) in just five sessions. These finding suggest that PBM is a promising adjuvant therapy for the treatment of PFP, particularly in cases where traditional treatments have not been satisfactory.

The strengths of the study include the resolution of the case with few PBM sessions and the absence of side effects. The primary weakness is the small sample size, indicating the need of randomized controlled trials to validate these findings.

Silva et al. (7) emphasized that the face reveals features and expressions that are essential for communication and socialization, reflecting individual emotions. This case underscores the importance of addressing issued that affect the social life and dignity of individuals. Also, the success of PBM in treating PFP suggests broader applications for other neurological conditions involving nerve damage and inflammation. Studies have shown promising results of PBM in treating neurodegenerative diseases and traumatic brain injuries, indicating that the principles applied in this case could be extended to other areas of neurological rehabilitation (21).

The patient was very pleased with the treatment results, especially the resolution of facial asymmetry. He was able to return to work, socialize, eat properly, and experienced a significant improvement in self-esteem. This study highlights the importance of early treatment for Bell's facial paralysis to prompt a quick response. PBM was effective in reversing the paralysis and improving the patient's self-esteem and social.

4. CONCLUSION

It was reported the effective treatment of Bell's facial palsy with PBM protocol adjuvant to the pharmacological therapy. The authors emphasize the importance of the early treatment for reversing the condition. Further research on this subject is suggested, especially robust and low bias randomized controlled trials, focusing on the PBM treatment efficacy and the clinical implications of the biopsychosocial approach to Bell's Facial Palsy.

CONSENT (WHEREEVER APPLICABLE)

The patient has given informed consent for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal.

ETHICAL APPROVAL (WHEREEVER APPLICABLE)

All authors hereby declare that all experiments have been examined and approved by the the Research Ethics Committee of UniversidadeNove de Julho (UNINOVE) and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.This case report was approved by the number 7.088.804.

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