

A Case Study of Photobiomodulation as the Solution for Bell's Palsy

Dr. Aishwarya Rai¹, Dr. Jasmine Anandabai², Vishakha Choudhary³

¹Assistant Professor, JRPSCPT

²Dean and Principal, JRPSCPT

³Student (BPT Intern), JRPSCPT

ABSTRACT

Often affecting one side, Bell's palsy, also known as "acute facial palsy of unknown cause," is a common cranial neuropathy that results in abrupt, complete paralysis or face muscle paresis. Over the period of 48 hours, the condition may get worse. It is brought on by damage or inflammation to the 7th cranial nerve, the face nerve, or any of its branches along its course, primarily in the bony canal. This results in dysfunction of the facial nerve. It is equally prevalent in both sexes and has no age restriction, however as people age, so does the incidence. A increased risk is associated with diabetes, hypertension, obesity, pregnancy, and upper respiratory tract infections. It is mainly believed to be idiopathic and is diagnosed by ruling out other potential causes. Bell's palsy sufferers and their family may experience severe consequences, including psychological and physical problems. Therefore, a timely cause determination and early diagnosis are essential to efficient treatment. However, the exact etiology of Bell's palsy remains unknown, which affects the course of treatment. To adopt a customized therapy strategy, however, a comprehensive examination and a comprehensive history are necessary to determine the likely cause and risk factors. Most patients heal on their own in less than three weeks, even without treatment. Still, there's always a chance of lingering paresis after therapy or recovery.

Keywords: Bell's Palsy, Photobiomodulation, Kabat Exercises

INTRODUCTION

Bell's palsy (idiopathic facial paralysis) is caused by the acute onset of the lower motor neuron weakness of the facial nerve with no detectable cause.¹ The face is considered psychologically the most important part of the body and an important component of self-concept.² Facial nerve paralysis is a common problem that affects appearance and involves paralysis of any structure innervated by the facial nerve. Lesions of the facial nerve can result in partial or full paralysis of 1 side of the face with impaired facial movement and diminished facial expression, which interfere with interactions with others and face-to-face communications.² Patients who suffer from unilateral or bilateral facial paralysis also struggle with speaking, eating, and drinking, which makes it harder for them to carry out daily tasks and causes social and psychological problems like depression, anxiety, social isolation, and low self-esteem. Facial paralysis can result from congenital, idiopathic, neoplastic, iatrogenic, infectious, traumatic, viral (herpes zoster), malignant, diabetic, polyneuropathic, or inflammatory causes⁴.

A frequent cranial neuropathy known as Bell's palsy results in sudden unilateral lower motor neuron facial paralysis. Bell's palsy, also known as lower motor neuron type facial paralysis, is characterized by

a quick and abrupt onset that often affects one side of the face unilaterally. It can be brought on by any infection or mechanism and is idiopathic in origin. The clinical presentation can be explained by crocodile tears, dry eyes, hyperacusis, dysgeusia, drooping of the corner of the mouth, and loss of taste in the anterior two thirds of the tongue. It affects both genders equally, and in India, the incidence ranges from 20 to 30 cases per 100,000. Disabilities arise within 42 to 72 hours. Although it can occur at any age, the average onset is 40 years old.

The most frequent cause of facial paralysis is Bell's palsy, and despite much research, no clear explanation has been identified. When a patient first sees the doctor, one side of their face is completely or partially incapable of moving their facial muscles. The symptoms typically appear out of the blue; the patient or their support system observes the asymmetry in their face, and they complain of difficulty swallowing, difficulty closing their eyes, difficulty whistling, and possible eye injury. Bell's palsy was described as a vasculopathy in the facial nerve's vasa nervorum by some writers, while others attempted to prove that the condition was caused by a virus but were unable to produce any solid proof. It was linked to exposure to the cold. It is still possible to diagnose idiopathic facial palsy by exclusion.

There are several different causes of Bell's palsy, however the exact cause is still unknown. Bell's palsy is more common in patients with a history of diabetes, hypertension, or pregnancy.

Simple, individualized care that considers all aspects of the patient's illness should be the norm for treatment. Phases or suitable actions should be followed before to starting a treatment, and the treatment itself should be administered accordingly. We can ascertain the extent of the patient's illness by doing a comprehensive evaluation of the patient prior to initiating treatment.

House-Brackmann Facial Grading System

GRADE	DESCRIPTION	CHARACTERISTICS
1	Normal	Normal facial function in all areas
2	Mild dysfunction	Slight weakness noticeable on close inspection; may have very slight synkinesis
3	Moderate dysfunction	Obvious, but not disfiguring, difference between two sides; noticeable, but not severe, synkinesis, contracture, or hemifacial spasm; complete eye closure with effort
4	Moderately severe dysfunction	Obvious weakness or disfiguring asymmetry; normal symmetry and tone at rest; incomplete eye closure
5	Severe dysfunction	Only barely perceptible motion; asymmetry at rest
6	Total paralysis	No movement

Manual Muscle Testing For Facial Muscles

GRADE	MOVEMENT
5	Normal contraction of the muscle, no asymmetry compared to healthy side
4	Nearly normal contraction, little asymmetry compared to healthy side
3	Contraction of the muscle in one half compared to healthy side
2	Contraction of the muscle in one quarter compared to healthy side
1	Trace of muscle contraction can be seen/palpated
0	The muscle demonstrates no palpable muscle contraction

CASE REPORT

A 28-year-old married woman presented to the JRPSCPT OPD with complain of pain by the side of right ear and weakness of right side of the face. Three months ago (September 2023) she had woken up in the morning and was to go about her daily routine when she noticed the asymmetry in her face just before she was about to brush her teeth. Her disability progressed by the end of night when she couldn't even close her eyes or eat solids properly. She went to visit her physician who prescribed her medications and referred her for physiotherapy. The patient is a housewife. She has not recently travelled to any region that has a chilly climate. She mostly stays indoors. The patient did not have any episode of dizziness, altered sensation in the face, neck or any pain that would radiate. Her complain included pain behind the right ear (NPRS- 6/10), there was drooping around the corner of her mouth, she was unable to lift her eyebrow and she was unable to close her eyes completely. The patient came from a well to do family and had a bachelors degree in arts. The patient has a history of gestational diabetes that had resolved post pregnancy. She has two children, of which the older daughter has suffered from bell's palsy as well at the age of 3 that left no residual deformity. Her maternal grandmother also has a prior history of bell's palsy. The patient has undergone physiotherapy in the past however, her condition had not improved at all according to her. Presently, her observation was: right muscles of facial expression didn't participate upon smiled. No swelling present over right eye and closed partially and eyelids lagged with flattening of the nasal labial fold on the right side. Patient experienced no pain before onset of the symptoms, however, presently she has moderate pain in the mastoid region. Her superficial sensations are intact and her score on House Brackmann Facial Grading was 3.

INTERVENTION:

Photobiomodulation: Oxidative stress (OS), which can be present in Bell's palsy, Ramsay Hunt syndrome, Lyme disease, and other conditions, is implicated in the pathophysiology of facial paralysis and inhibits peripheral nerve regeneration. This condition is known as peripheral facial paralysis (PFP). There is no agreement on the best practices for standard care today. Therefore, in patients who do not respond to conventional care therapy, photobiomodulation (PBM), an antioxidant immunomodulator, can be used to maximize therapeutic outcomes.

For three weeks in a row, the first treatment frequency was two times per week. After that, it was tapered down to once every week for the next three weeks. There were seven total irradiation areas in each session.

Neuromuscular electrical stimulation (NMES): It is the process of applying an electrical current to motor nerves to produce contractions in the muscles they innervate. NMES is frequently utilized in physical medicine and rehabilitation settings to enhance the growth of muscle strength, prevent or

reduce the fibrosis and atrophy of the muscles, and enhance the reeducation of the muscles, including their sensory awareness and volitional control. Denervated muscles contract due to the steadily increasing current. When treating denervated muscle, the shortest impulse used lasts 100 milliseconds (ms).

To stimulate denervated muscles, interrupted galvanic (D.C.) current—a continuous, unidirectional flow of charged particles—is used. Its length is more than 10 ms, and its frequency is 30 per mint.

Electrode Placement: An inactive electrode was placed in the supine laying position. a pen electrode (active electrode) was used to stimulate the muscles in the face and at the nape of the neck. To generate alternating muscle contraction and relaxation, current intensity is progressively increased until a good contraction is attained at the maximum point of each surge. This process is then repeated.

Impulse: The shortest impulses are rectangular ones, lasting 100 milliseconds, and they need a frequency of about 30 milliseconds. They have a sudden rise and fall in power. Its benefit is in its ability to produce a denervated muscle contraction with minimal sensory stimuli, hence removing unwanted contractures of innervated muscles. One physiological effect of intermittent D.C. current is that denervated muscle can contract in response to a steadily rising current. To cause a fast relaxation after a brick muscle twitch, the shocks are applied repeatedly. At motor locations, electrical stimulation results in the greatest contraction with the least amount of electricity.

Massage therapy: Helps by improving circulation and prevents contracture and improves facial asymmetry. Techniques used were: stroking, effleurage, thumb kneading and hacking.

Neuromuscular re-education: based on an understanding of the physiological pattern of muscle actions. Kabat exercises were employed in the exercise program that consisted of 5 to 10 repetitions of 3 to 5 exercises that were done thrice daily.

DISCUSSION

These case reports detail the clinical features and physiotherapy care provided to patients with Bell's palsy. These studies discovered that the features of individuals with Bell's Palsy improved in their initial symptoms following treatment with NMES, facial massage, and facial movement exercises (with visual feedback from a mirror) to improve asymmetry and synkinesis as suggested by clinical practice and scientific literature. Patients with facial paralysis have historically received physical therapy in the form of basic facial exercises or electrical stimulation. However, there are just a few randomized controlled trials on the efficacy of physical therapy.⁵

The literature only has seven case reports that use PBM to treat facial paralysis.⁶⁻¹⁰ According to a case study by Bernal Rodriguez et al., 2020, a facial paralysis that had been unresponsive for eight years may be effectively treated using a dual-wavelength (660 nm and 808 nm) photobiomodulation procedure that involved twenty-four consecutive PBM therapy sessions. Three distinct cases of severe, chronic facial palsy were treated in a study by Zarkovic et al., and facial paralysis recovery was achieved by using 34 PBM sessions spaced five months apart, targeting deep-seated tissue with 1064 nm near infrared (NIR). On the other hand, three sessions of 700 nm (NIR) PBM (100 mW output power, 100 J/cm² of energy density, and 28 s per point) were successful in the full regression of paralysis, the complete recovery and absence of muscular pain, and the improvement of speech and chewing in a 13-year-old girl, as reported by Poloni et al. in 2018. An additional case study involving a 71-year-old patient treated with 808 nm

(NIR) photobiomodulation demonstrated its efficacy and emphasised the importance of initiating therapeutic measures as soon as possible to enhance prognosis.

CONCLUSION

The purpose of the study was to determine whether photobiomodulation benefits Bell's palsy patients. NMES and exercise are still used in the treatment of those afflicted with the illness. Nevertheless, the patient was already receiving no advantages from standard techniques; including facial PNF exercises with Photobiomodulation showed to be more beneficial. To sum up, we would like to see further research done in order to precisely quantify the efficacy of photobiomodulation.

ACKNOWLEDGEMENT

We would like to thank our patient who does not want her name to be disclosed for entrusting her faith in us.

AUTHORSHIP STATEMENT

Aishwarya Rai and Jasmine Anandabai designed the treatment protocol. Vishakha Choudhary counselled the patient and recruited her for the treatment. She also helped in the treatment sessions by being a valuable member of the team. Aishwarya Rai and Vishakha Choudhary prepared the manuscript for publication. No research funding was applied for the study. The manuscript was revised by all authors and approved for the final document.

REFERENCES

1. Cirpaci D, Goanta CM, Cirpaci MD. Recurrences of Bell's palsy. *J Med Life*. 2014;7 Spec No. 3(Spec Iss 3):68-77.
2. Frederick DA, Kelly MC, Latner JD, et al. Body image and face image in Asian American and white women: examining associations with surveillance, construal of self, perfectionism, and sociocultural pressures. *Body Image* 2016;16:113–25.
3. Coulson SE, O'Dwyer NJ, Adams RD, et al. Expression of emotion and quality of life after facial nerve paralysis. *Otol Neurotol* 2004;25:1014–9.
4. Kim JH, Park YC, Seo BK, Baek YH, Goo B, Nam SS. The efficacy of laser therapy in patients with facial palsy: A protocol for systematic review and meta-analysis. *Medicine (Baltimore)*. 2020 Aug 21;99(34):e21665.
5. Cardoso JR, Teixeira EC, Moreira MD, Fávero FM, Fontes SV, Bulle de Oliveira AS. Effects of exercises on Bell's palsy: systematic review of randomized controlled trials. *Otology & neurotology: official publication of the American Otological Society, American Neurotology Society [and] European Academy of Otology and Neurotology*, 2008; 29(4): 557–560.
6. Bernal Rodriguez, C.G.; Berlingieri Polho, I.; Azevedo, L.H.; de Paula Eduardo, C. Photobiomodulation Therapy to Treat Facial Paralysis of 8 Years: Case Report. *Photobiomodul. Photomed. Laser Surg.* **2020**, *38*, 477–480.
7. Tanganeli, J.P.C.; de Oliveira, S.S.I.; da Silva, T.; Fernandes, K.P.S.; Motta, L.J.; Bussadori, S.K. Complete and Fast Recovery from Idiopathic Facial Paralysis Using Laser-Photobiomodulation. *Case Rep. Dent.* **2020**, *2020*, 9867693.

8. Poloni, M.M.; Marques, N.P.; Ribeiro Junior, N.V.; Sperandio, F.F.; Hanemann, J.A.C.; de Carli, M.L. Bell's palsy treated with photobiomodulation in an adolescent: Rare case report and review of the published literature. *Int. J. Paediatr. Dent.* **2018**, *28*, 658–662.
9. Panhóca, V.H.; Nogueira, M.S.; Bagnato, V.S. Treatment of facial nerve palsies with laser and endermotherapy: A report of two cases. *Laser Phys. Lett.* **2020**, *18*, 015601.
10. Zarkovic Gjurin, S.; Pang, J.; Vrčković, M.; Hanna, R. Efficacy of 1064 nm Photobiomodulation Dosimetry Delivered with a Collimated Flat-Top Handpiece in the Management of Peripheral Facial Paralysis in Patients Unresponsive to Standard Treatment Care: A Case Series. *J. Clin. Med.* **2023**, *12*, 6294.