

Research article

Comparison of laser therapy and galvanic stimulation on facial appearance and function in Bell's palsy among south Indian populationTharani G.¹, Kamatchi K.¹, Sharmila S.², Yuvarani G.¹, Vaishnavi G.¹, Pothuraju Pravalika¹¹Faculty of Physiotherapy, Dr. M.G.R Educational and Research Institute, Velapanchavadi, Chennai, Tamil Nadu, India²School of Physiotherapy, Vistas Thalambur, Chennai, Tamil Nadu, India

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Corresponding author: **Tharani G.** Email: tharani.physio@drmgrdu.ac.in**ABSTRACT**

Introduction and Aim: Bell's palsy is an instantaneous lower motor neurons injury of 7th cranial nerve associated with infection and swelling. It produces unexpected unilateral weakness of facial muscles, progresses rapidly and attains peak symptoms within a week. The most common age of incidence is between 20 to 40 years. Although facial paralysis in Bell's palsy is self-limited, only 80% of the patients make a full recovery. There are studies stating that both galvanic electrical stimulation and laser therapy speed up the recovery of facial paralysis, but the extent of complete recovery is unknown. Hence, this study is an attempt to understand and compare how laser therapy and galvanic electrical stimulation affect facial appearance and facial muscle functions in Bell's palsy.

Materials and Methods: This study included thirty subjects with acute onset of Bell's palsy aged between 20-40 years. They were randomly grouped into A and B. Galvanic electrical stimulation and low-level laser therapy were given to group A and group B respectively for 6 weeks (3 sessions/week) along with facial exercises. Facial disability index scale was used to measure facial muscle function and Sunny brook scale was used to measure facial symmetry in pre- and post-treatment periods.

Results: When comparing the pre- and post-mean values of groups A and B on the Sunny Brook facial grading and the facial disability index (physical, social), group B (with low level laser therapy) showed a highly significant difference in mean values at $p \leq 0.001$.

Conclusion: Low-level laser therapy can be used as an adjective in treating the patients with Bell's palsy.

Keywords: Bell's palsy; electrical stimulation; low-level laser therapy; Sunny Brook scale; facial disability index; facial symmetry; synkinesis.

INTRODUCTION

Face is psychologically and cosmetically regarded as the most significant body segment and the greatest source of self-pride (1). When the facial nerve is inflamed and swollen within the facial canal or at the stylomastoid foramen, Bell's palsy occurs, causing an acute LMN (lower motor neurons) paralysis across the single side of the face (2). This facial weakness is characterized by inability to smile, close the eye and corrugate the forehead on the affected side. The exact cause of this condition is unknown but researchers explained that it can occur following common cold, ear infection and eye infection. Additionally, Bell's palsy has been linked to numerous other viral illnesses, including herpes, varicella zoster, HIV, syphilis, the Epstein-Barr virus, and CMV. Single or many attacks may be predisposed by ailments like hypertension, diabetes mellitus, Lyme disease, sarcoidosis, and different malignancies or tumors (3). For every 100,000 people, there are 20 to 30 occurrences of Bell's palsy, which accounts for 60 to 70% of all unilateral peripheral facial palsies in India. People between the ages of 20 and 40 are particularly susceptible to this illness (4). Impaired facial expressions and muscle activity following a

facial nerve lesion makes it harder to communicate face-to-face. It can also make it difficult to eat, drink, and speak, which makes it more difficult to carry out daily tasks. Other social and psychological challenges include low self-esteem, anxiety, sadness, and social isolation. Bell's palsy symptoms might differ from person to person, including inability to wrinkle, frown, and trouble chewing and smelling (5).

In the majority of cases, facial muscles are stimulated by applying galvanic currents. Galvanic currents are used to stimulate local muscles. Galvanic are tiny electrical currents made up of positive and negative ions. The muscle physiology is preserved by the galvanic current. Its main function is to establish facial control and movement in Bell's palsy and to delay muscular atrophy when denervation occurs. When repeated impulses are delivered through electrical stimulation, the healthy motor units of completely (or partially) innervated muscles are activated (6,7). Recent studies have discovered that low intensity laser therapy can also increase the functional activity of injured peripheral nerves by halting the degeneration of the axons(8). It helps to ease facial movement, reduce muscle weakness, and reduce pain. Any sort of patient can benefit from laser

therapy because it is non-invasive and painless (9). The process of nerve regeneration can also be accelerated by the localized and systemic effects of laser application (10).

Numerous researchers have looked into the effects of low-level laser therapy for facial nerve lesions and electrical stimulation independently for Bell's palsy. But, the extensive use of laser therapy for facial nerve lesions is still controversial among the Indian population. Therefore, the objective of this study was to contrast the impact of laser therapy and electrical stimulation on facial symmetry, appearance and muscle performance in people with Bell's palsy.

MATERIALS AND METHODS

After attaining ethical clearance from the Institutional Review Board, this exploratory research was carried out in the Faculty of Physiotherapy at A.C.S. Medical College and Hospital for 6 weeks [IVB-052/PHYSIO/IRB/2017-2018]. The procedures were carried out in accordance with the Helsinki-Declaration of 1964 guidelines (revised-2008).

Thirty subjects clinically diagnosed with acute Bell's palsy, onset between 20-40 years from both the sexes were enrolled for this study after getting their consent for participation. Patients with bilateral facial weakness due to demyelinating neuropathy, metal implants, sensory impairments over the face, ENT impairments, any open wounds and acne on face were excluded from the study. Following initial evaluation, the participants were randomized into groups A and B. The subjects in group-A and group-B received low-level laser treatment and galvanic electrical stimulation, respectively for 6 weeks (3 sessions/week) along with facial exercises.

Dosage for electrical stimulation

Interrupted galvanic current with a pulse duration of 100ms was applied on each motor point of the muscles supplied by the facial nerve at a current

intensity to obtain minimal contraction. Each muscle was stimulated to produce 30 contractions at each session (2).

Dosage for low level laser therapy

Low-level laser therapy was applied using infrared probes with an 830 nanometer wavelength and 100 Mw output power, an average energy density of 10 J/cm², and a duty cycle of 80% for two minutes on each motor point of the muscles supplied by facial nerve (11).

Facial disability index scale was used to measure facial muscle function and Sunnybrook scale was used to measure facial symmetry in pre- and post-treatment period.

Data analysis

Both descriptive and inferential statistics were used to tabulate and analyze the data that had been collected. All the factors were evaluated using SPSS version 24 (Statistical Package for Social Science). The paired t-test and the independent t-test (also known as the Student's t-test) were used to determine the statistical differences between the groups.

RESULTS

The mean values of facial disability index for groups A and B indicate a significant increase after the intervention period, however group B (low level laser therapy; 90.00) has a higher mean value and is more effective than group A (electrical stimulation; 62.83), with a P value of 0.001 (Table 1).

The mean values of post-test of groups A and B on the SunnyBrook facial grading demonstrate a substantial rise, group B (low level laser therapy; 81.33) has a higher mean value and is therefore more effective than group A (electrical stimulation; 60.20), with a P value of 0.001 (Table 2).

Table 1: Comparison of facial disability index between group A and group B in pre- and post-test

FDI	Group A		Group B		t – Test	df	P-value
	Mean	S.D.	Mean	S.D.			
Pre-test	40.04	20.07	43.16	13.41	-.500	28	.621*
Post-test	62.83	26.72	90.00	11.53	-3.61	28	.000***

#Group A: Galvanic Electrical Stimulation, # Group B: Low Level Laser Therapy
 (* P > 0.05) *** P ≤ 0.001

Table 2: Comparison of Sunny Brook facial grading between group A and group B in pre- and post-test

SBFG	Group A		Group B		t - Test	df	P-value
	Mean	S.D.	Mean	S.D.			
Pre-test	31.26	8.47	29.73	10.14	.449	28	.657*
Post-test	60.20	7.10	81.33	12.44	-5.71	28	.000***

#Group A: Galvanic Electrical Stimulation, # Group B: Low Level Laser Therapy
 (* P > 0.05) (***) P ≤ 0.001

The facial disability index and SunnyBrook facial grading reveal a highly significant difference in mean values at P 0.001 while comparing pre-test and post-test among group A and group B (Figs 1 and 2).

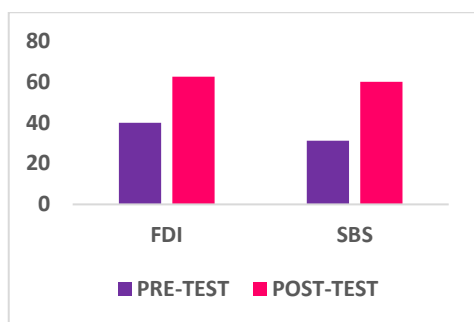


Fig. 1: Difference in facial disability index and SunnyBrook facial grading within group A

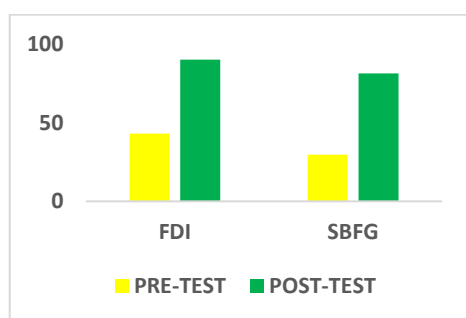


Fig.2: Difference in facial disability index and SunnyBrook facial grading within group B

DISCUSSION

Despite the fact that Bell's palsy is a self-controlled condition, Slavkin *et al.*, found that only 80% of patients fully recover (12). Damages to the geniculate ganglion may lead to an eventual inflammation, edema, and ischemia of the facial nerve and its pathway. Further 20% of patients are among the important pathologies that need to be treated and may cause emotional and social isolation of the patient. Thus, this study was carried out to explore into and evaluate the benefits of Low-Level Laser treatment and galvanic electrical stimulation along with facial exercises in speeding the recovery of Bell's palsy.

The subjects in galvanic electrical stimulation group showed a gradual improvement facial muscle function during feeding and social smiling which was close to the findings of Gitanjali *et al.*, They found that electrical stimulation and active muscle contraction is effective at enhancing facial expressions perhaps as a result of active muscular contraction that enhanced motor learning and facial muscle control (13). Gordon stated that Electrical simulation can help Bell's palsy patients regain muscular tone, build muscle, and boost their ability to endure muscle paralysis by attempting to imitate electrical impulses (6). Shafshak *et al.*, also reported that the electrical simulation applied at low current intensity increases the skin resistance based on the increase in local circulation (14).

The subjects in the laser therapy group experienced better improvement in facial muscle function, symmetry and social interactions as previously found by Bernal. He proved that low-level laser therapy is an excellent form of physical therapy for Bell's palsy recovery and provides a painless therapeutic alternative without side effects that may be used on any type of patient, including those who are unable to take corticosteroids, such as diabetics and people with hypertension (15). Chow *et al.*, also stated that low-level laser therapy significantly improved nerve structures in the people who received it, which may be the cause of the subjects' considerable recovery(16). Moreover, Tam reported that low-level laser treatment radiation considerably widens capillary and arterial muscles, boosts microcirculation, triggers angiogenesis, and lowers inflammation-related oedema while promoting the immune system and neuron regeneration (17).

In the current study, recovery was assessed using the SunnyBrook facial grading system and the facial disability index to compare pre- and post-test results between groups A and B on face symmetry and facial muscle function. Galvanic electrical stimulation and low level laser therapy were both effective in treating patients with Bell's palsy, according to our research. However, treating the patient with Bell's palsy with low-level laser therapy was more successful and produced superior results.

CONCLUSION

According to the results of the current study, low level laser therapy is far more beneficial for persons who acquire full recovery in Bell's palsy than electrical stimulation. Thus, low-level laser therapy can be considered as a choice of physiotherapy treatment for improving both physical and social well-being of Bell's palsy patients.

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CONFLICT OF INTEREST

Authors declare that there is no conflict of interest.

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