



# Effectiveness of Combination of Electrical Stimulation, Facial Massage and Mirror Exercises on Patients with Bell's Palsy on Facial Disability.

Saumya Dave<sup>1</sup>, Dr. Ankur Khant (PT, PhD)<sup>2</sup>

1-PhD Scholar, Faculty of Physiotherapy, Marwadi University, Rajkot

2-Associate Professor, Faculty of Physiotherapy, Marwadi University, Rajkot

(Received: 07 January 2024

Revised: 12 February 2024

Accepted: 06 March 2024)

## KEYWORDS

Electrical Stimulation

Facial Exercises

Facial Massage

Sunnybrook facial grading scale

Facial Disability Index

## ABSTRACT:

**Introduction:** Bell's Palsy is characterized by inflammation of the facial nerve canal or facial nerve paralysis associated with swelling and inflammation of the stylomastoid muscle, leading to facial weakness, eyelid ptosis, persistent tearing, and eye pain. The incidence of Bell's palsy is 15-20 per 100,000 people. Various physical therapy treatments are available for improving the recovery in individual with Bell's Palsy including electrical stimulation, facial massage and facial exercises.

**Objectives:** To find the effectiveness of combining electrical stimulation, facial massage and facial exercises on patients with Bell's Palsy on Facial Disability.

**Methods:** Twenty patients (both male and female) having unilateral bell's palsy in the ages between 18-70 and House-Brackmann scores of III-IV were included in the study. The treatment regimen included electrical stimulation, facial massage and facial exercises in front of the mirror. The treatment was given for three weeks. Outcomes were measured by the use of Sunnybrook Facial Grading Scale and Facial Disability Index, both taken before and after 3 weeks of treatment

**Results:** The data was analyzed using the SPSS version 26. The normality was checked before the analysis. The Sunnybrook Facial Grading Scale and Facial Disability Index (Physical Function and Social Function) was analyzed using the paired t-test (p value <0.05). The results indicate a significant improvement from pre-treatment to post-treatment.

**Conclusions:** The study concluded that combination of electrical stimulation, facial massage and facial exercises reduces the functional disability in patients with Bell's Palsy. Therefore, they can be used as a therapeutic treatment for improving the recovery in patients with Bell' Palsy.

## 1. Introduction

Bell's Palsy is a condition where there is a lesion of the facial nerve that results in facial muscle weakness over one side of the face. This unilateral weakness of the facial muscles leads to eyelid drooping, pain, tearing from the eyes continually and hypersensitivity to hearing over the same side. Sometimes the onset could be overnight but usually it is quite sudden.<sup>1</sup> The root cause of Bell's Palsy has not yet been identified and hence it remains idiopathic. Worldwide incidence is 20-30 cases per 1,00,000 individuals annually.<sup>2</sup> It could affect the individuals of any age but middle and young aged have more affection. In majority of cases the paralysis or

weakness remains temporary but those experiencing complete paralysis seems to have a poor rate of recovery where only 60% might return to normal.<sup>1,3</sup>

The diagnosis of Bell's Palsy may be done on the basis of the physical examination and medical history. It can also be diagnosed on electrophysiological basis such as nerve conduction velocity study, electromyography or electroneurography. The electroneurography can analyse in terms of percentage of degeneration of nerve fibers during the early phase of Bell's Palsy. The functions of facial nerve are assessed by House-Brackmann Grading System, Sunnybrook Facial Grading Scale, Facial Disability Index, Yanagihara Grading System and



Sydney Grading Scale.<sup>4</sup> Sunnybrook Facial Grading Scale is a tool evaluating the symmetry of the face at rest, movements of the face occurring voluntarily and synkinesis. The scoring ranges from zero to hundred referring to complete paralysis and normal function respectively. Facial Disability Index has served to be a tool for self-assessment that measures physical and social functioning. VanSwearingen JM had found the reliability and validity of this instrument in the year 1996.<sup>5</sup>

Physical therapy modalities are available that helps in bringing the recovery in individuals with Bell's Palsy. A study performed on efficiency of early physical therapy in severe Bell's Palsy by Maria Nicastri, Patrizia Mancini, Daniele De Seta et al reported that physical therapy has its effectiveness in severe to moderate cases.<sup>6</sup> Various treatment approaches are available for Bell's Palsy that includes electrical stimulation, proprioceptive neuromuscular stimulation, infrared radiation therapy, short wave diathermy, facial massage, facial exercises and more. Electrical stimulation helps in preserving the muscular mass, contractile properties of muscle and also promotes the regeneration of nerve.<sup>7</sup> In this low amplitude electrical current is given transcutaneously which would be activating the weaker muscles. This in turn produces contractions and prevents atrophy of muscles. But its effectiveness remains controversial from various studies.<sup>8</sup> Massage is a soft tissue technique that involves a high order co-ordination and uses a great skill for achieving the integrated movements of body allowing the application at proper speed and depth for achieving its effect maximally. Exercises of the face can be performed in front of the mirror. There are various reviews available which have reported that exercises of the face improve the after effects of Bell's Palsy during the acute phases. But it requires further studies. Therefore, the need of this study was to investigate the combined effect of electrical stimulation, facial massage and facial exercises on the functional disability in individuals having Bell's Palsy. This study would serve as a conventional protocol for the further research.

## 2. Objectives

The study was aimed at finding out the combined effect of electrical stimulation, facial exercises and facial exercises in patients with Bell's Palsy on Facial Disability. Therefore, the study objective was to investigate the effectiveness of combination of electrical stimulation, facial massage and facial exercises in

patients with Bell's Palsy on Facial Disability. This study objective would guide us further to in using this treatment protocol for further research studies conducted on patients having Bell's Palsy.

## 3. Methods

This study was an experimental study wherein the convenience sampling method was used. A total of twenty patients were taken for the study. The patients were treated for three weeks. After taking the ethical approval from the institute, the treatment was given at the Neuro outpatient department of C.U. Shah Physiotherapy Department, Surendranagar. The subjects between 18 to 70 years had been included in the study. Both male and females were taken having the House-Brackmann Score of III-IV. The patients having Recurrent Bell's Palsy, Facial Palsy, History of stroke and undergone a recent surgery of ear were excluded from the study. They were given electrical stimulation, facial massage and facial exercises for 3 weeks. Sunnybrook Facial Grading Scale and Facial Disability Index was taken before and after three weeks of treatment.

Initially twenty-four patients were taken for the study where three patients did not fall under the selection criteria. Also, during the study one patient was not able to come for regular treatment due to long travelling distance. Hence total 20 patients were taken for the study. The physiotherapy protocol comprised of electrical stimulation, facial exercises in front of mirror and facial massage. Faradic stimulation was given to all the affected facial muscles. Motor point stimulation using a pen electrode was given to Frontalis, Corrugator Supercilia, Orbicularis Oculi, Nasalis and Procerus, Buccinator, Orbicularis Oris and Mentalis.<sup>10</sup> The intensity was kept as tolerable to the patient. The contraction was maintained for four seconds with a rest of two seconds. Two sets of 15-20 contractions were given.

Facial massage was given by using fingers or finger pads in the form of effleurage, kneading with the fingertips, wringing and tapping. The direction of effleurage was begun from the midline of the face just below the ear. Stroke was firstly taken under the chin; the second stroke was given by spreading the fingers above and below the mouth. The third stroke was beginning at the nose and the fourth stroke at the midline of the forehead and



curved down. Kneading was started from the midline to the subauricular region. The first line started under the

chin, then the chin to the ear line, then the upper lip to the ear line, and then the nose to the ear line. Wringing was performed with the tip of the finger, which is done using the pads of the index finger and thumb. It started at the corner of the mouth and ran to the ear and then over the chin to the other ear. Tapping was done with the fingertips according to the size and area of the face being treated.<sup>11</sup>

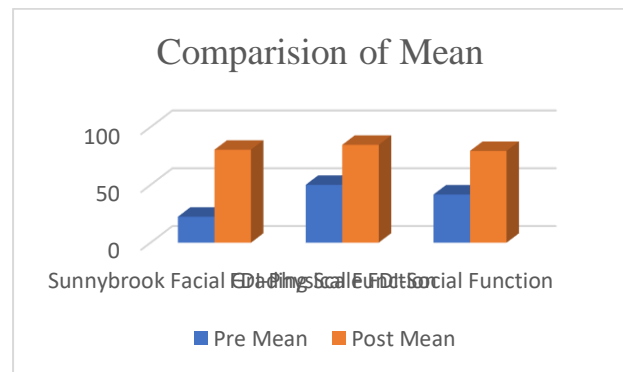
Exercises of the face were performed in front of the mirror. The exercises included movements such as elevating their eyebrows, eye closure, frowning the face, trying to open blow their nostrils, clenching of their teeth, making a smile, performing the expression of pout and trying to blow a balloon. Each exercise was performed for 10-15 repetitions. This treatment was given for three weeks.<sup>12</sup>

**4. Results**

The data analysis was done using the SPSS Version 26. The data was normally distributed which was analyzed using the Shapiro-Wilk Test. Paired t-test was applied for the Sunnybrook Facial Grading Scale by keeping the 95% confidence interval. The two components of FDI were analyzed individually as Physical Function and Social Function by using paired t test. For both the item groups p-value was less than 0.05. There was a statistically significant difference found within the group. Paired t-test for Sunnybrook Facial Grading Scale Revealed a p-value of less than 0.05 indicating a significant effect. Also paired t-test for Physical and Social Function was statistically significant i.e. the p value for both was less than 0.05. The mean age of individuals was 43.85 with a standard deviation of 14.798. The study included 13 males and 7 females.

Outcome Measure	Pre Mean	Pre SD	Post Mean	Post SD	p-value
Sunnybrook Facial Grading Scale	22.45	10.82	80.4	11.15	<0.05
			84.6	9.25	

<b>FDI-Physical Function</b>	50.05	16.43			<0.05
<b>FDI-Social Function</b>	41.65	15.57	79.35	8.41	<0.05



Graph : Showing the Comparison of pre and post Mean and SD.

**5. Discussion**

The results of the study showed that combination of electrical stimulation, facial massage and facial exercises is effective in improving the recovery of patients having Bell’s Palsy. There was a statistically significant improvement in the scores of Sunnybrook as well as on Facial Disability Index. Applying electrical stimulation has shown to improve recovery and functioning of the facial muscles. Electrical stimulation can improve the nerve and muscle functioning, speed up process of healing and reduces the long-term risk of paralysis. Activation of motor nerves by electrical stimulation can produce the contractions of weaker muscles and hence prevents the development of muscular atrophy. A study carried by Tuncay et al evaluating the role of electrical stimulation added to the conventional physical therapy in patients having Bell’s Palsy concluded that electrical stimulation had improvements in the function of movements of face and on electrophysiological outcomes.<sup>13</sup> Various reviews have also been carried out showing the effectiveness of electrical stimulation. A systemic review on effectiveness of electrotherapeutic modalities in treating individuals with Bell’s Palsy was done by Burelo-Peregrino et al which concluded that using electrotherapeutic modalities are helpful in treating patients having Bell’s Palsy but enough evidences are lacking.<sup>14</sup>



The results of the study have shown improvement in the facial disability scores. This improvement could be due to the effect of massage. Facial massage has shown to be having an effect on the nervous system. It has an inhibitory influence on the excitability of the alpha motor neurons thereby inducing a relaxing effect. This would help to induce a sedative effect.<sup>11</sup> Therefore, patients have a relaxing effect reducing the depression and anxiety. Hyong Ju Choi had conducted a research study on the effectiveness of facial muscle exercise program that included massage of the face on patients having facial palsy concluding that this interventional treatment is effective in improving muscle performance of the face and reduces depression in patients. Facial massage was effective as it reduces pain that could be due to inflammation.<sup>15</sup> Also it increases the flow of blood to the muscles, drains the waste metabolites and also improves the lymphatic drainage.

Facial exercises are also helpful in improving facial function, with the use of a mirror as a form of biofeedback to enhance voluntary muscle contraction. Studies have shown that facial exercises have improved the recovery in functions. Also, studies have found that adding biofeedback in the form of mirror would be having a positive effect. This has been supported by an extended systemic review conducted by Amir J.Khan et al in bell's palsy reviewing the evidences available for facial exercises concluding that newer researches have strengthened the earlier results on advantages in bringing early recovery of facial exercises.<sup>16</sup> A systematic review and meta-analysis by LM Pereira et al had concluded that facial exercise therapy is efficacious for facial palsy outcomes.<sup>17</sup> By adding facial massage and facial exercise has a better recovery in individuals having bell's palsy that is supported with a study conducted by Hyoung Ju et al in 2016 found that facial exercises including massage are an effective intervention that improves facial muscle function and decreases depression.<sup>18</sup>

The study concluded that combination of electrical stimulation, facial massage and facial exercises reduces the functional disability in patients having Bell's Palsy. Therefore, they can be used as a therapeutic treatment for improving the recovery in patients with Bell' Palsy

## References

1. Narins, B. (2012). *The Gale encyclopedia of neurological disorders*. 2nd ed. Detroit, Gale.
2. Zhao H, Zhang X, Tang YD, Zhu J, Wang XH, Li ST. Bell's Palsy: Clinical Analysis of 372

- Cases and Review of Related Literature. *Eur Neurol.* 2017;77(3-4):168-172. doi: 10.1159/000455073. Epub 2017 Jan 25. PMID: 28118632.
3. Coulson SE, O'dwyer NJ, Adams RD, Croxson GR. Expression of emotion and quality of life after facial nerve paralysis. *Otol Neurotol.* 2004 Nov;25(6):1014-9. doi: 10.1097/00129492-200411000-00026. PMID: 15547436
4. Ross BG, Fradet G, Nedzelski JM. Development of a sensitive clinical facial grading system. *Otolaryngol Head Neck Surg.* 1996 Mar;114(3):380-6. doi: 10.1016/S0194-59989670206-1. PMID: 8649870.
5. VanSwearingen JM, Brach JS. The Facial Disability Index: reliability and validity of a disability assessment instrument for disorders of the facial neuromuscular system. *Phys Ther.* 1996 Dec;76(12):1288-98; discussion 1298-300. doi: 10.1093/ptj/76.12.1288. PMID: 8959998
6. Nicastrì M, Mancini P, De Seta D, Bertoli G, Prosperini L, Toni D, Inghilleri M, Filippo R. Efficacy of early physical therapy in severe Bell's palsy: a randomized controlled trial. *Neurorehabil Neural Repair.* 2013 Jul-Aug;27(6):542-51. doi: 10.1177/1545968313481280. Epub 2013 Apr 2. PMID: 23549520.
7. Yoo MC, Kim JH, Kim YJ, Jung J, Kim SS, Kim SH, Yeo SG. Effects of Electrical Stimulation on Facial Paralysis Recovery after Facial Nerve Injury: A Review on Preclinical and Clinical Studies. *Journal of Clinical Medicine.* 2023; 12(12):4133. <https://doi.org/10.3390/jcm12124133>
8. Jones S, Man WD, Gao W, Higginson IJ, Wilcock A, Maddocks M. Neuromuscular electrical stimulation for muscle weakness in adults with advanced disease. *Cochrane Database Syst Rev.* 2016 Oct 17;10(10):CD009419. doi: 10.1002/14651858.CD009419.pub3. PMID: 27748503; PMCID: PMC6464134.
9. Teixeira LJ, Valbuza JS, Prado GF. Physical therapy for Bell's palsy (idiopathic facial paralysis). *Cochrane Database of Systematic Reviews* 2011, Issue 12. Art. No.: CD006283. DOI: 10.1002/14651858.CD006283.
10. Kashoo FZ, Alqahtani M, Ahmad M. Neural mobilization in Bell's palsy: A case report.



- Cranio. 2021 May;39(3):266-269. doi: 10.1080/08869634.2019.1610996. Epub 2019 May 1. PMID: 31043132.
11. Hollis, M., & Jones, E., 2<sup>nd</sup> Edition. *Massage for therapists: A guide to soft tissue therapy*. Chichester, U.K: Wiley-Blackwell, 96-100 p
  12. Pereira L, Obara K, Dias J, Menacho M, Lavado E, Cardoso J. Facial exercise therapy for facial palsy: systematic review and meta-analysis. *Clinical Rehabilitation*. 2011;25(7):649-658. doi:10.1177/0269215510395634
  13. Tuncay F, Borman P, Taser B, et al. Role of electrical stimulation added to conventional therapy in patients with idiopathic facial (Bell) palsy. *Am J Phys Med Rehabil* 2015;94:222-8
  14. Burelo-Peregrino EG, Salas-Magaña M, Arias-Vázquez PI, Tovilla-Zarate CA, Bermudez-Ocaña DY, López-Narváez ML, Guzmán-Priego CG, González-Castro TB, Juárez-Rojop IE. Efficacy of electrotherapy in Bell's palsy treatment: A systematic review. *J Back Musculoskelet Rehabil*. 2020;33(5):865-874. doi: 10.3233/BMR-171031. PMID: 32144972.
  15. Choi HJ, Shin SH. [Effects of a Facial Muscle Exercise Program including Facial Massage for Patients with Facial Palsy]. *J Korean Acad Nurs*. 2016 Aug;46(4):542-51. Korean. doi: 10.4040/jkan.2016.46.4.542. PMID: 27615044.
  16. Khan AJ, Szczepura A, Palmer S, Bark C, Neville C, Thomson D, Martin H, Nduka C. Physical therapy for facial nerve paralysis (Bell's palsy): An updated and extended systematic review of the evidence for facial exercise therapy. *Clin Rehabil*. 2022 Nov;36(11):1424-1449. doi: 10.1177/02692155221110727. Epub 2022 Jul 5. PMID: 35787015; PMCID: PMC9510940.
  17. Pereira L, Obara K, Dias J, Menacho M, Lavado E, Cardoso J. Facial exercise therapy for facial palsy: systematic review and meta-analysis. *Clinical Rehabilitation*. 2011;25(7):649-658
  18. Choi HJ, Shin SH. [Effects of a Facial Muscle Exercise Program including Facial Massage for Patients with Facial Palsy]. *J Korean Acad Nurs*. 2016 Aug;46(4):542-51. Korean. doi: 10.4040/jkan.2016.46.4.542. PMID: 27615044.