Section: Neurology

Original Research Article

EFFECTIVENESS OF THE COMBINATION OF ELECTRICAL STIMULATION AND STEROIDS IN PATIENTS WITH BELL'S PALSY

J.Manickavasagam[1], K.Shunmuga Sundaram[2], B.R.Parthasarathy[3]

[1]*Associate Professor, Department of Neurology, Kalaignar Centenary Superspeciality Hospital, Chennai, Tamilnadu, India.*
[2]*Associate Professor, Department of Neurology, Kalaignar Centenary Superspeciality Hospital, Chennai, Tamilnadu, India.*
[3]*Physiotherapist, Department of Neurology, Kalaignar Centenary Superspeciality Hospital, Chennai, Tamilnadu, India.*

Received *: 07/09/2025*
Received in revised form *: 27/10/2025*
Accepted *: 14/11/2025*

Corresponding Author:
Dr. J. Manickavasagam,
Associate Professor, Department of Neurology, Kalaignar Centenary Superspeciality Hospital, Chennai, Tamilnadu, India.
Email: drjmanicks@gmail.com

DOI: 10.70034/ijmedph.2025.4.323

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (4); 1803-1806

ABSTRACT

Background: Bell's palsy is an acute, idiopathic facial nerve paralysis causing asymmetry, eyelid closure difficulty, and deviation of angle of mouth. Corticosteroids improve recovery, but residual weakness is often still present. Electrical stimulation (ES) may enhance rehabilitation by preserving muscle tone and aiding reinnervation. This study evaluated ES combined with steroids versus steroids alone in acute Bell's palsy.

Materials and Methods: This randomised comparative study included 30 patients aged 18–70 years with unilateral Bell's palsy (House–Brackmann grade III-IV) within two weeks of onset. The patients were randomly assigned to the experimental group (n = 15: ES + steroid, antiviral, and facial exercises) and the Control group (n = 15: steroid, antiviral, and facial exercises). The treatment lasted for three weeks. Facial function was measured at baseline and post-intervention using the Sunnybrook Facial Grading Scale.

Results: The mean ages were similar between groups (43.13±13.38 vs. 42.47±14.41 years). The duration of illness, gender, comorbidities, previous history, and initial House-Brackmann grades (III in 60%, IV in 40%) were comparable between groups (P>0.05). The mean pre-intervention score was 64.07±7.34 in the experimental and 58.47 ± 6.63 in the control group (P=0.037). Post-intervention, scores improved to 75.40±7.70 and 61.87±9.12, respectively (P<0.0001). The mean improvement was significantly higher in the experimental group (11.33±3.04) compared to controls (3.40±4.05, P<0.0001),

Conclusion: Electrical stimulation combined with steroids significantly improved facial function and accelerated recovery compared to steroids alone in acute Bell's palsy, supporting ES as an effective adjunct in early rehabilitation.

Keywords: Bell's palsy, corticosteroids, electrical stimulation, facial nerve paralysis, rehabilitation

INTRODUCTION

Bell's palsy presents as a sudden weakness or paralysis of the facial muscles on one side of the face due to temporary dysfunction of the seventh cranial nerve. Clinically, patients often show facial asymmetry, incomplete eye closure, deviation of angle of mouth, and reduced ability to express facial emotions. The estimated annual incidence is about 15–30 per 100,000 people.[1] Although many patients recover spontaneously, a significant minority suffer residual weakness, synkinesis, or cosmetic and functional deficits.[2]

The pathophysiology of Bell's palsy is not fully established, but prevailing theories include viral reactivation (for example, HSV-1), ischaemia, nerve oedema, and compression within the bony facial canal. Inflammatory swelling of the facial nerve can disrupt neural conduction and cause segmental demyelination or axonal injury. In more severe cases,

degeneration beyond the myelin sheath can impair complete recovery and increase the risk of long-term sequelae.[3] Histopathological studies have revealed inflammatory infiltrates, demyelination, and Wallerian degeneration in biopsy specimens of affected nerves.[3,4]

Corticosteroids are the mainstay of early medical management for Bell's palsy. Several randomised controlled trials (RCTs) and meta-analyses have demonstrated that early initiation of steroids significantly progresses the chance of complete recovery and reduces rates of residual deficits.[5,6] Most clinical practice guidelines strongly recommend corticosteroids within onset of 72 hours, often in combination with antiviral therapy, although the evidence for antivirals remains less consistent.[7] Despite optimal medical therapy, patients still experience incomplete recovery or sequelae.[2,8]

Because pharmacotherapy alone has limitations, electrical stimulation (ES) has been explored to enhance recovery by maintaining muscle tone, reducing atrophy, and promoting reinnervation. Experimental models show ES increases regeneration-associated proteins like GAP-43 and neurotrophic factors, aiding nerve regrowth.[9] However, its use in facial paralysis remains debated, with studies showing mixed results, some noting faster recovery and others reporting no benefit or increased synkinesis.[9,10]

In a controlled trial, patients who received selective electrical muscle stimulation in addition to standard therapy achieved maximal recovery earlier (mean 2.5 weeks) compared with those on standard therapy alone (mean 5.2 weeks), while the final facial function outcomes remained comparable between groups.9 Another RCT of neuromuscular ES in chronic Bell's palsy showed benefits in facial symmetry measured by the Sunnybrook scale compared with sham stimulation.[11]

Although combining ES with medical therapy is biologically plausible, the clinical evidence is limited. Few trials have compared ES plus steroids with steroids alone. This study aimed to evaluate the effectiveness of electrical stimulation combined with steroid therapy compared with steroid therapy alone in patients with Bell's palsy.

MATERIALS AND METHODS

This randomized comparative study was carried out on thirty patients in the Department of Physiotherapy, in collaboration with the Department of Neurology, at a tertiary care hospital. Written informed consent was obtained from each participant prior to enrolment.

Inclusion Criteria

Patients between 18 and 70 years of age with a clinical diagnosis of unilateral Bell's palsy, classified as House–Brackmann grade III or IV, who presented within two weeks of symptom onset and consented to participate in regular therapy sessions, were included.

Exclusion Criteria

Patients with recurrent or bilateral facial paralysis, traumatic facial nerve injury, other neurological disorders affecting facial movement, or contraindications to ES (such as implanted cardiac pacemakers or active skin lesions) were excluded.

Methods

Thirty patients were randomly assigned to two groups, each comprising fifteen participants. The experimental group received electrical stimulation in addition to steroid and antiviral therapy, along with facial exercises. The control group received the same treatment protocol without electrical stimulation. All participants were advised to perform simple facial exercises daily throughout the study period under supervised guidance. The treatment continued for three weeks, with regular follow-up and supervision by the same therapist.

Pharmacological management was identical for both groups. Each patient was prescribed oral Prednisolone at a dose of 1 mg/kg/day for ten days, followed by a gradual tapering schedule according to standard protocol, together with oral Acyclovir 400 mg given five times daily for ten days.

Electrical stimulation was administered using a standard low-frequency device delivering intermittent galvanic current applied to the affected facial muscles. The pulse duration was 100 microseconds, with a frequency of 35 pulses per second (35 Hz) and a session duration of 20–30 minutes once daily. The stimulation intensity was progressively adjusted to produce visible muscle contractions without discomfort.

Facial muscle function was assessed at baseline and after three weeks using the Sunnybrook Facial Grading Scale, which evaluates facial symmetry, voluntary movement, and composite recovery.

Statistical Analysis

Data were expressed as mean ± standard deviation for continuous variables and as frequency with percentage for categorical variables. Comparisons were performed using the independent sample t-test for continuous data and Pearson's chi-square test for categorical data. A P value < 0.05 (two-tailed) was considered statistically significant by using IBM SPSS v23.0.

RESULTS

The experimental group had a mean age of 43.13 ± 13.38 years, and the control group had a mean age of 42.47 ± 14.41 years; with no significant difference ($P = 0.896$). The mean duration of illness was 6.13 ± 7.36 days in the experimental group and 4.87 ± 4.24 days in the control group ($P = 0.568$). [Table 1]

Table 1: Comparison of age and duration of illness between groups

Parameter	Group		P value
	Experimental	Control	
Age (Years)	43.13 ± 13.38	42.47 ± 14.41	0.896
Duration (Days)	6.13 ± 7.36	4.87 ± 4.24	0.568

Table footer: Data are presented as mean ± SD. P-values were calculated using independent t-tests; P < 0.05 was considered significant.

The experimental group had 7 (46.7%) females and 8 (53.3%) males, and the control group had 8 (53.3%) females and 7 (46.7%) males. Comorbidities included diabetes in 3 (20%) both group, hypertension in 1 (6.7%) experimental and 2 (13.3%) control patients, and none in 11 (73.3%) experimental and 10 (66.7%) control patients. A previous history was present in 1 (6.7%) and absent in 14 (93.3%) patients both groups. House-Brackmann grade III was observed in 9 (60%) and grade IV in 6 (40%) patients in both groups, with no significant differences across all categories (P > 0.05). [Table 2]

Table 2: Comparison of gender, comorbidities, previous history, and House Brackmann's grade between groups

Category	Subtype / Level	Group		P value
		Experimental	Control	
Gender	Female	7 (46.7%)	8 (53.3%)	0.715
	Male	8 (53.3%)	7 (46.7%)	
Comorbidities	Diabetes mellitus	3 (20%)	3 (20%)	0.79
	Hypertension	1 (6.7%)	2 (13.3%)	
	None	11 (73.3%)	10 (66.7%)	
Previous history	No	14 (93.3%)	14 (93.3%)	1
	Yes	1 (6.7%)	1 (6.7%)	
House Brackmann's grade	III	9 (60%)	9 (60%)	1
	IV	6 (40%)	6 (40%)	

***Table footers:** Values are presented as N (%). P-values were calculated using the chi-square test; P < 0.05 was considered significant.*

The mean pre-intervention score was 64.07 ± 7.34 in the experimental group and 58.47 ± 6.63 in the control group (P = 0.037). Post-intervention, the mean score increased to 75.40 ± 7.70 in the experimental group and 61.87 ± 9.12 in the control group (P < 0.0001). The mean difference between the pre- and post-intervention scores was 11.33 ± 3.04 in the experimental group and 3.40 ± 4.05 in the control group, showing a significant improvement (P < 0.0001). [Table 3]

Table 3: Comparison of pre- and post-intervention Sunnybrook Facial Grading Scale between groups

Sunnybrook Facial Grading Scale	Group		P value
	Experimental	Control	
Pre-intervention	64.07 ± 7.34	58.47 ± 6.63	0.037
Post-intervention	75.40 ± 7.70	61.87 ± 9.12	<0.0001
Difference	11.33 ± 3.04	3.40 ± 4.05	<0.0001

***Table footers:** Data are presented as the mean ± SD. P-values were calculated using independent t-tests; P < 0.05 was considered significant.*

DISCUSSION

In our study, both groups were comparable in terms of age and duration of illness, ensuring minimal confounding effects on the outcomes. Similarly, Inagaki et al. included patients with Bell's palsy aged 40.0 ± 4.4 years in the ITST group and 48.2 ± 3.6 years in the control group, showing a similar age range between groups.[12] Likewise, Shi et al. conducted a network meta-analysis of 3,609 patients from 26 studies across 12 countries and reported no significant association of age, sex, follow-up time, publication year, or country with baseline variables affecting treatment comparisons (P > 0.05).[13]

Also, Badshah et al. included 58 patients in the experimental group and 55 in the control group, with ages ranging from 20 to 60 years and 50% between 30–40 years, showing comparable age distribution between groups.[14] Similarly, Pietro et al. included 38 participants (control: 18, selective electric stimulation: 20) with mean ages of 36.8 ± 15.6 years in the control group and 39.2 ± 16.8 years in the stimulation group, and similar days since onset of paralysis (control: 9.2 ± 8.2, stimulation: 6.9 ± 3.8).[9] These findings indicate that both our study and previous research included well-matched groups in terms of age and illness duration, minimising potential confounding.

In our study, both groups were similar in terms of baseline characteristics. The sex distribution was similar, and comorbidities such as diabetes and hypertension were evenly distributed. Most patients had no comorbidities, and a previous history was uncommon. Baseline disease severity, as assessed by the House-Brackmann grades, was also similar. These results demonstrate that the two groups were well matched at baseline, minimizing the chances of confounding effects. Inagaki et al. also observed comparable group characteristics, reporting five men and three women in the ITST group and eight men and thirteen women in the control group, with no significant difference in the initial House–Brackmann grades between them (mean difference 0.06, P = 0.67).[12]

Shi et al. found that sex and other baseline characteristics did not significantly influence

treatment outcomes (P = 0.45 for sex).[13] In addition, Badshah et al. reported that in the experimental group, 40% of patients had Grade IV dysfunction, 24% had Grade V, and 5% had complete paralysis at baseline, with a similar grading distribution in the control group, by align with ours.[14] Pietro et al. reported 55% females in the control group and 35% in the stimulation group, with median House–Brackmann scores of 4 and 3.5, respectively. These findings support comparable baseline characteristics across studies, indicating that outcome differences were likely treatment related.[9]

In the present study, both groups showed improvement after intervention, with better gains in the experimental group, suggesting superior treatment efficacy. Inagaki et al. similarly reported faster and more complete recovery in the ITST group, with a mean House–Brackmann grade of 1.13 ± 0.13 compared to 1.71 ± 0.16 in controls (P = 0.035), and 88% versus 43% of patients achieving grade I recovery (P = 0.044). Patients with complete degeneration showed 83% recovery in the ITST group vs 18% in the control group (P = 0.035).[12]

Likewise, Shi et al. reported that combination therapies, particularly steroids plus antivirals or steroids plus antivirals plus physiotherapy/ES, were the most effective for facial function recovery (for example, OR 15.441, 95% CI 1.561–189.621 for steroid + antiviral + Kabat vs placebo), while treatments with only antivirals were less effective; adverse events were low for steroid plus antiviral combinations.[13]

In contrast, Ray et al. reported significant within-group improvement in physical function, assessed by the Facial Disability Index, over 12 weeks (P < 0.001), but no significant difference between the ES and control groups (P > 0.05), indicating limited inter-group effect.15 In contrast, Badshah et al. found that combined therapy with steroids, facial exercises, and ES produced better gains in House–Brackmann grades and symptom relief than steroids alone, with 50% of experimental patients achieving full recovery compared to 22% in controls, and significant improvement in drooling, ocular symptoms, and taste disturbance (P < 0.05 for all).[14] Overall, while most reports suggest that ES enhances recovery, some studies, such as that by Ray et al., have shown inconsistent inter-group results, reflecting variability in treatment response.[15]

Limitations

This study was conducted at a single centre, which may limit the generalisability of the results. The short follow-up duration restricted assessment of long-term recovery and recurrence. Reliance on patient-reported adherence to facial exercises may have introduced reporting bias.

CONCLUSION

The combination of ES and steroid therapy resulted in better improvement in facial function than steroid therapy alone among patients with Bell's palsy. The experimental group showed more improvements in Sunnybrook scores and faster recovery, suggesting that adjunctive ES is an effective strategy for enhancing early rehabilitation and functional outcomes in acute Bell's palsy patients. Future studies with larger, multi-centre cohorts and longer follow-up are needed to confirm these findings and assess long-term recovery, recurrence, and prevention of synkinesis.

REFERENCES

1. Greco A, Gallo A, Fusconi M, Marinelli C, Macri GF, de Vincentiis M. Bell's palsy and autoimmunity. Autoimmun Rev 2012; 12:323–8. https://doi.org/10.1016/j.autrev.2012.05.008.
2. Fujiwara T, Hato N, Gyo K, Yanagihara N. Prognostic factors of Bell's palsy: prospective patient-collected observational study. Eur Arch Otorhinolaryngol 2014; 271:1891–5. https://doi.org/10.1007/s00405-013-2676-9.
3. Wang A, Xie W, Zhang J. The synergistic role of viral infection and immune response in the pathogenesis of facial palsy. J Neurovirol 2025; 31:208–18. https://doi.org/10.1007/s13365-025-01258-7.
4. Liston SL, Kleid MS. Histopathology of Bell's palsy. Laryngoscope 1989; 99:23–6. https://doi.org/10.1288/00005537-198901000-00006.
5. Gupta KK, Balai E, Tang HT, Ahmed AA, Doshi JR. Comparing the use of high-dose to standard-dose corticosteroids for the treatment of Bell's palsy in adults-A systematic review and meta-analysis. Otol Neurotol 2023; 44:310–6. https://doi.org/10.1097/MAO.0000000000003823.
6. Engström M, Berg T, Stjernquist-Desatnik A, Axelsson S, Pitkäranta A, Hultcrantz M, et al. Prednisolone and valaciclovir in Bell's palsy: a randomised, double-blind, placebo-controlled, multi-centre trial. Lancet Neurol 2008; 7:993–1000. https://doi.org/10.1016/S1474-4422(08)70221-7.
7. Gagyor I, Madhok VB, Daly F, Sullivan F. Antiviral treatment for Bell's palsy (idiopathic facial paralysis). Cochrane Database Syst Rev 2019;9:CD001869. https://doi.org/10.1002/14651858.CD001869.pub9.
8. Goo B, Kim J-H, Park J, Baek Y-H, Nam S-S. Recovery rate and prognostic factors of peripheral facial palsy treated with integrative medicine treatment: a retrospective study. Front Neurol 2025; 16:1525794. https://doi.org/10.3389/fneur.2025.1525794.
9. Di Pietro A, Cameron M, Campana V, Leyes L, Zalazar Cinat JAI, Lochala C, et al. Efficacy of adding selective electrical muscle stimulation to usual physical therapy for Bell's palsy: immediate and six-month outcomes. Eur J Transl Myol 2023;33. https://doi.org/10.4081/ejtm.2023.11630.
10. Yoo MC, Kim JH, Kim YJ, Jung J, Kim SS, Kim SH, et al. Effects of electrical stimulation on facial paralysis recovery after facial nerve injury: A review on preclinical and clinical studies. J Clin Med 2023; 12:4133. https://doi.org/10.3390/jcm12124133.
11. Marotta N, Demeco A, Inzitari MT, Caruso MG, Ammendolia A. Neuromuscular electrical stimulation and shortwave diathermy in unrecovered Bell palsy: A randomized controlled study. Medicine (Baltimore) 2020;99:e19152. https://doi.org/10.1097/MD.0000000000019152.
12. Inagaki A, Katsumi S, Sekiya S, Murakami S. Intratympanic steroid therapy for Bell's palsy with poor prognostic results. Sci Rep 2021; 11:8058. https://doi.org/10.1038/s41598-021-87551-x.
13. Shi J, Lu D, Chen H, Shu M, Xu Y, Qian J, et al. Efficacy and safety of pharmacological and physical therapies for Bell's palsy: A Bayesian network meta-analysis. Front Neurol 2022; 13:868121. https://doi.org/10.3389/fneur.2022.868121.
14. Badshah M, Umar M, Naeem A, Marryam M. A randomised control trial to review the effectiveness of combination therapy versus steroids alone, for the treatment of Bell's palsy. Ann Pak Inst Med Sci 2013;9(3):118–21. https://apims.net/apims_old/Volumes/Vol9-3/4.
15. Ray T, Kundu T, Mukherjee U, Pramanik R. A comparative study to assess the effects of electrical stimulation in recent onset Bell's palsy. Indian J Phys Med Rehabil 2025; 35:220–4. https://doi.org/10.4103/ijpmr.ijpmr_20_25.