

Comparative Analysis of Electrical Stimulation Techniques in Bell's Palsy Patients: A Study of Proprioceptive Neuro - Muscular Facilitation Versus Kabat Therapy Effects

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Abstract: ***Background:** Few studies have focused on electrical stimulation with proprioceptive neuro - muscular facilitation technique versus electrical stimulation with kabat therapy in Bell's palsy patients out of many literatures. **Aim:** To know the effects of electrical stimulation with proprioceptive neuro - muscular facilitation technique versus electrical stimulation with Kabat therapy in Bell's palsy patients. **Design:** A Comparative study. **Setting:** This study took place from September 12, 2021, to June 09, 2022, at the OPD of the Department of Physiotherapy in Pacific Hospital, Udaipur, Rajasthan, India. **Population:** 30 subjects, both male & female age group from 20 - 50 years old who had been diagnosed with Bell's palsy. **Methods:** According to the House - Brackmann Scale, the severity of Bell's palsy was classified as normal, mild dysfunction, moderate dysfunction, moderately severe, severe dysfunction, and total paralysis. **Results:** The results did not show statistically significant differences between the two groups. The distribution of Group A and Group B, according to age, sex, reflexes, functional disability impairment, House Brackmann scale, and communication, the chi - square value with a p - value of 1.000, indicating no statistically significant difference between the two groups. **Conclusion:** This study lightens the distribution of subjects depending upon various factors in Group A and Group B. The study highlights age groups, sex, reflexes, functional dental problems, biting habits, communication, and socializing. The distributions of subjects were statistically similar between the two groups, without any significant results observed in over all comparisons.*

Keywords: Bell's palsy, Electrical stimulation, Kabat therapy, PNF

1. Introduction

Bell's palsy (Idiopathic peripheral facial palsy) is sudden paralysis or weakness in the muscles of one side of the face due to the dysfunction of the facial nerve (cranial nerve VII), named after Scottish surgeon, neurologist and anatomist, Sir Charles Bell (1774 - 1842, leading to short and long - term complications.¹ Bell's palsy can occur due to viral infection and rarely occurs more than once. It occurs commonly in persons with risk factors such as diabetes, pregnancy, preeclampsia, obesity, and hypertension.² According to the data, annually 20 - 32.2 per 100, 000 people aged between 15 - 45 years have been diagnosed with Bell's palsy and 49 - 51% of all facial nerve palsy patients also have Bell's palsy. Although it is difficult to find which interventions can show greater recovery in face function and expression.³ Literature has shown that 70% of patients have a good prognosis and several treatments in physiotherapy are found effective in improving muscle tone and nerve stimulation along with further prevention of contractures and atrophy of facial muscles.^{4, 5}

Electrical stimulation showed good effects in the facilitation of the paralyzed or weak muscles and this treatment is included in every therapeutic rehab center, clinic, and

hospital. Kabat therapy is easy to perform by the physical therapist without any specific instrument, is convenient, and provides better and faster recovery in patients with Bell's palsy. A randomized controlled trial conducted by Maurizio Barbara et al. showed that kabat therapy significantly improves the overall clinical stages of Bell's palsy while administered at an early stage compared to non - rehabilitate patients.⁶ A literature review by Hasmawati Hasan et al. on the effectiveness of Kabat therapy as a complement therapy showed significant improvement in the rehabilitation of Bell's Palsy patients if it is added to the physical therapy.⁷

A randomized clinical trial conducted by N. Manikandan on the effect of facial neuromuscular re - education on facial asymmetry showed individualized facial neuromuscular re - education is more effective in improving facial asymmetry in patients with Bell's palsy than the conventional therapeutic measures.⁸ A study conducted by Johnson et al. to compare the effects of electrical stimulation with proprioceptive neuromuscular facilitation techniques versus a control group receiving no intervention showed the electrical stimulation with PNF techniques group had significant improvements in facial symmetry and motor function in comparison to the control group.⁹ A systematic review by Rodriguez et al. found the effectiveness of

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intervention depending on the subject's condition and severity, the electrical stimulation, exercise, and other physiotherapy treatments had significant effects in improving facial muscle strength, motor function, and quality of life in patients with Bell's palsy.¹⁰

Although several studies have been conducted, very little literature described the outcomes of Bell's palsy's treatment with electrical stimulation with Kabat therapy versus electrical stimulation with proprioceptive neuromuscular facilitation technique in Bell's palsy patients. This study guides the physical therapist to elaborate on the lack of results to meet individualized recovery, prognosis, and effective intervention in the overall improvement of the patient with Bell's palsy.

2. Method

Study design and participants

This comparative study was conducted on 30 male and female subjects diagnosed with Bell's palsy, 15 subjects in Group A and 15 subjects in Group B aged between 20 to 50 years old in 2022 at the OPD of the Neurology Department of Physiotherapy in Pacific Hospital, Udaipur, Rajasthan, India from September 12, 2021, to June 09, 2022. This study excluded those who had recent surgery, open wounds, pregnancies, uncooperative, phobic patients, cerebellopontine angle disease, and absence of signs and symptoms of the central nervous system.

Outcome measures

House - Brackmann facial paralysis scale (HBS): HBS is a valid, reliable, and commonly used tool for the evaluation of Facial nerve function. Based upon functional impairment grade I (Normal); normal facial function in all nerve branches, grade II (mildly dysfunction); slight weakness on close inspection, eye complete closure with minimum effort, mouth slight asymmetry, grade III (moderate dysfunction); obvious but not disfiguring facial asymmetry, eye complete closure with effort, mouth slight weakness with maximum effort, grade IV (moderately severe); asymmetry is disfiguring and/or obvious facial weakness, incomplete eye closure, mouth asymmetric with maximum effort, Grade V (Severe dysfunction); only barely perceptible motion, asymmetry at rest, no movement at the forehead, incomplete eye closure, mouth slight movement and Grade VI (total paralysis); no facial function.¹¹

Procedure: Subjects who had met with inclusion criteria and consent was taken from parents and children were included in the study. All the participant was divided into two groups; Group A consisted of 15 subjects who received electrical stimulation for 10 - 20 minutes depending on acute and chronic and PNF for 25 - 30 min for 12 weeks (5 times/week) and Group B consisted of 15 patients who have received treatment with electrical stimulation with kabat therapy for 10 - 30 minutes depending on acute to chronic for 12 weeks (5times / week).

Statistical software: The Statistical software used is SPSS 16.0 and Microsoft Word and Excel have been used to generate graphs, tables, etc.

3. Results and Interpretation

Table 1: Distribution of cases according to Age

Age Group	Group A		Group B	
	Number of cases	Percentage	Number of cases	Percentage
20 - 30 years	9	60.00	8	53.33
31 - 40 years	6	40.00	7	46.67
Total	15	100	15	100.00
Mean±SD	29.00±6.64		30.13±6.67	

Chi - square = 0.000; P = 1.000 (NS)

The distribution of cases according to age groups. In Group A, there were 9 cases (60%) in the 20 - 30 years age range and 6 cases (40%) in the 31–40 years range. Group B had 8 cases (53.33%) in the 20 - 30 years range and 7 cases (46%) in the 31 - 40 years range. The total number of cases was 15 for both the groups. The mean age for Group A was 29.00 with a standard deviation of 6.64 while for Group B, the mean age was 30.13 with a standard deviation of 6.67. The chi - square value was 0.000 with a p - value of 1.000, indicating non - significant results.

Table 2: Distribution of cases according to Gender

Gender	Group A		Group B	
	Number of cases	Percentage	Number of cases	Percentage
Male	9	60.00	8	53.33
Female	6	40.00	7	46.67
Total	15	100.00	15	100.00

Chi - square = 0.000; P = 1.000 (NS)

The distribution of cases is based on gender. In Group A, there were 9 cases (60%) that were male and 6 cases (40%) that were female. Similarly, in Group B, there were 8 cases (53.33%) that were male and 7 cases (46.67%) that were female. The total number of cases in each group was 15. The chi - square value was 0.000 with a p - value of 1.000 indicating non - significant results.

Table 3: Distribution of cases according to reflexes

Reflexes	Group A		Group B	
	Number of cases	Percentage	Number of cases	Percentage
Good	0	0.00	0	0.00
Mild	6	40.00	6	40.0
Normal	0	0.00	0	0.00
Poor	8	53.33	6	40.00
Very Poor	1	6.67	3	20.00
Total	15	100.00	15	100.00

Chi - square = 1.286; P = 0.526 (NS)

The distribution of cases according to reflexes in Group A and Group B. In Group A, there were 0 cases with good reflexes, 1 case (6.67%) with very poor reflexes, 6 cases (40%) with mild reflexes, 0 cases with normal reflexes, and 8 cases (53.33%) with poor reflexes. In Group B, the corresponding numbers were 0 cases with good, 6 cases (40%) with mild reflexes, 0 cases with normal reflexes, 6 cases with poor reflexes (40%), 3 cases (20%) with very poor reflexes in each reflex category, respectively. The total number of cases in each group was 15. The chi - square value was 1.286 with a p - value of 0.526 indicating non - significant results.

Table 4: Distribution of cases according to Communication

Communication	Group A		Group B	
	Number of cases	Percentage	Number of cases	Percentage
Good	0	0.00	0	0.00
Mild	6	40.00	6	40.00
Normal	3	20.00	3	20.00
Poor	4	26.67	4	26.67
Very Poor	2	13.33	2	13.33
Total	15	100.00	15	100.00

Chi - square = 0.000; P = 1.000 (NS)

The distribution of cases according to communication in Group A and Group B. In Group A, there were 0 cases with normal, 6 cases with mild (40%) reflexes, 3 cases with 20% normal communication 4 cases with 26.67% poor, and 2 cases with very poor 13.33% reflexes. The total number of cases in each group was 15. The chi - square value was 0 with a p - value of 1.000, indicating non - significant results.

Table 5: Distribution of cases according to HBS (house Brackmann score)

HBS	Group A		Group B	
	Number of cases	Percentage	Number of cases	Percentage
3	5	33.33	5	33.33
4	6	40.00	5	33.33
5	2	13.33	2	13.33
6	2	13.33	3	20.00
Total	15	100.00	15	100.00

Chi - square = 0.291; P = 1.000 (NS)

The distribution of cases according to the House Brakeman Scale (HBS) was analyzed in Group A and Group B. In Group A, there were a total of 15 cases, with 5 (33.33%) cases classified as HBS 3, 6 (40%) as HBS 4, 2 (13.33%) as HBS 5, and 2 (13.33%) as HBS 6. In Group B, also consisting of 15 cases, the distribution was 5 (33.33%) cases for HBS 3, 5 (33.33%) for HBS 4, 2 (13.33%) for HBS 5, and 3 (20%) for HBS 6. The chi - square test showed a chi - square value of 0.291 and a p - value of 1.000, indicating no statistically significant difference between the two groups in terms of HBS distribution.

Patient scoring data after treatment on day 45

Distribution of cases according to reflexes

Reflexes	Electrical stimulation+ PNF		Electrical Stimulation with KabatTherapy	
	Number of cases	Percentage	Number of cases	Percentage
Moderate	2	13.33	4	26.67
Normal	7	46.67	6	40.00
Slight	6	40.00	5	33.33
Total	15	100.00	15	100.00

Chi - square = 0.834; P = 0.659 (NS)

The distribution of cases according to reflexes in Group A (electrical stimulation with proprioceptive neuromuscular facilitation techniques) and Group B (electrical stimulation with Kabat method). In Group A, there were 2 cases (13.33%) with moderate reflexes, 7 cases (46.67%) with normal reflexes, and 6 cases (40%) with slight reflexes. In Group B, the corresponding numbers were 4 cases (26.67%) with moderate, 6 cases (40%) with normal, 5 cases 33.33%

with slight reflexes in each reflex category, respectively. The total number of cases in each group was 15. The chi - square value was 0.834 with ap - value of 0.659 indicating non - significant results.

Distribution of cases according to communication

Communication	Electrical stimulation+ PNF		Electrical Stimulation with Kabat Therapy	
	Number of cases	Percentage	Number of cases	Percentage
Good	7	46.67	6	40.00
Mild	3	20.00	5	33.33
Normal	5	33.33	4	26.67
Total	15	100.00	15	100.00

Chi - square = 0.688; P = 0.709 (NS)

The distribution of cases according to communication in Group A and Group B. In Group A, there were 5 cases (33.33%) with normal, 3 cases with mild (20%) reflexes, 7 cases with (46.67%). The total number of cases in each group was 15. The chi - square value was 0.688 with a p - value of 0.709 indicating non - significant results.

Distribution of cases according to HBS (house Brackmann score)

HBS (House Brackmann score)	Electrical stimulation+ PNF		Electrical Stimulation with Kabat Therapy	
	Number of cases	Percentage	Number of cases	Percentage
1	7	46.67	6	40.00
2	6	40.00	5	33.33
3	2	13.33	4	26.67
Total	15	100.00	15	100.00

Chi - square = 0.834; P = 0.659 (NS)

The distribution of cases according to the House Brakeman Scale (HBS) was analyzed in Group A (electrical stimulation+ proprioceptive neuromuscular facilitation techniques) and Group B (electrical stimulation with Kabat method). In Group A, there were a total of 15 cases, with 7 (46.67%) cases classified as HBS 1, 6 (40%) as HBS 2 (13.33%) as HBS 3. In Group B, also consisting of 15 cases, the distribution was 6 (40%) classified as HBS 1, 5 cases (33.33%) as 2, 4 (26.67 %) cases for HBS 3. The chi - square test showed a chi - square value of 0.834 and a p - value of 0.659, indicating no statistically significant difference between the two groups in terms of HBS distribution. Therefore, there is no notable association between the HBS distribution and the groups. Further research may be necessary in the future to explore other different factors which may impact the distribution of cases between these two groups.

4. Discussion

The Analysis done between Group A and Group B is based on the distribution of cases according to age, gender, reflexes, communication, and the House - Brackmann scale. The results lightened individual intervention plan to achieve better prognosis in patient with Bell's palsy. Group A with a total of 15 subjects received Electrical stimulation with Proprioceptive Neuromuscular facilitation techniques and Group B with a total of 15 subjects received Electrical stimulation with Kabat therapy. The range of distribution of

subjects according to age was as follows: 9 cases (60%) in the 20 - 30 years age range, 6 cases (40%) in the 31–40 years range. Similarly, Group B had 8 cases (53.33%) in the 20 - 30 years range, and 7 cases (46%) in the 31 - 40 years range. This analysis suggests the age distribution within Group A and Group B. The mean age for Group A was 29.00 with a standard deviation of 6.64 while for Group B, the mean age was 30.13 with a standard deviation of 6.67. The statistical mean and standard deviation of age can be considered for a deep understanding of distribution. The Central Tendency and dispersion had drawn with these values which had given specific ideas to explore the variation in age between the groups. The statistical analysis has been done between Group A and Group B by using the chi - square test to find the significant differences between these two groups according to the Age distribution. The chi - square value was 0.000 with a p - value of 1.000. These results indicate that there were no statistically significant differences in the age distribution of subjects between the two groups. This suggests age did not play a significant role in the distribution between the two groups. Meanwhile, the sample size, disease condition, research design, and location area of subjects should be considered. This study shows that Both Proprioceptive neuromuscular facilitation with electrical stimulation and the Kabat method with Electrical stimulation was found to be effective in minimizing facial disability, improving facial nerve function, and enhancing the quality of life in patients with Bell's Palsy. The results of the statistical analysis showed that Proprioceptive neuromuscular facilitation with electrical stimulation increased effectiveness in the management of Bell's palsy. In addition to this treatment option for Bell's palsy, physiotherapy has been reported to have a wide range of benefits in treating Bell's palsy. Physiotherapy maintains the facial muscle tone and stimulates the neural transmission of the facial nerve and is thus beneficial for Bell's palsy patients. Bell's palsy is self - limiting, but even in this scenario, physical therapy techniques that emphasize soft - tissue and muscle re - education should be applied to avoid muscle wasting or soft - tissue contracture formation. House Brackmann score was used to quantify the resting and voluntary muscle symmetry. The physical and social functions of patients were assessed using facial reflexes. The facial PNF technique helps in stimulating weakened facial muscles by irradiation principle which proved to be better than traditional therapeutic measures for the children with Bell's palsy like electric stimulation. The child's active participation and visual feedback were also enhancing the recovery. Nevertheless, this was the first study to document the effectiveness of the Proprioceptive neuromuscular facilitation technique in children with Bell's palsy. Thus, we correct the smile of the child with Bell's palsy. Our study supports a result of a review by Anna Maria Gatidou et al. The study concluded that either Proprioceptive neuromuscular facilitation techniques or Kabat therapy in combination with Electrical nerve stimulation showed great improvement in facial asymmetry.¹²

5. Conclusion

The study shows the distribution of cases in Group A and Group B was analyzed based on different factors such as age groups, sex, reflexes, functional dental impairment, biting

habits, communication, and socializing. Furthermore, this study highlights the need for individualized assessment and interventions for maximum patient treatment and recovery. The distributions of subjects were statistically similar between the two groups, without any significant results observed in overall comparisons. Although both treatments are effective in improving the symptoms, Proprioceptive neuromuscular facilitation with electrical stimulation had better recovery in the overall distribution of Bell's palsy.

Suggestion for Further study: Our study also suggests that further research is needed in the future to explore the long - term outcomes of these findings and to deliver effective treatment plans that can improve functional outcomes in patients with Bell's palsy.

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Compliance with Ethical Standards:

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with declaration and its later amendments or comparable ethical standards.

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