

A Comparative Study to Analyse the Effect of Motor Imagery and Mirror Book Therapy Versus Mime Therapy for the Recovery in Patients with Acute Bell's Palsy

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Abstract: ***Background and Objectives:** Bell's palsy is an acute-onset peripheral facial palsy and is the commonest cause for lower motor nerve fiber palsy. Facial resting symmetry and expressions are determining factors of facial attractiveness & being a marker of good health. The objective of study is to compare the effect of motor imagery and mirror book therapy versus mime therapy. There is dearth of evidence that proposes the effectiveness of motor imagery and mirror book therapy; mime therapy in improving the facial symmetry in acute Bell's palsy. Hence the need arises to evaluate the effectiveness of the motor imagery and mirror book therapy as compared to mime therapy on the recovery in Bell's palsy patients. **Aim:** To study the effect of motor imagery and mirror book therapy versus mime therapy for recovery in patients with acute Bell's palsy. **Methodology:** Convenient sampling was done for the selection of participants. Thirty participants who met the inclusion criteria were recruited from various hospitals of Vadodara. The participants were divided into three groups; Group A-Conventional electrotherapy along with Motor Imagery and Mirror book therapy; Group B-Mime therapy with conventional electrotherapy; Group C- Conventional electrotherapy with mirror bio-feedback exercises at home. Baseline data were collected with the use of SFGS and FDI. After 4 weeks, the participants were evaluated again. **Result and conclusion:** The data were analysed using the ANOVA test and there was a statistically greater improvement in Group A and Group B than the Group C with SFGS score. With FDI score the FDIS domain showed greater improvement in Group A than Group B and Group C. The SPSS version 23 used for data analysis and the p-value is 0.05. The present study concluded that Motor Imagery and Mirror Book Therapy, Mime therapy showed greater improvement in Facial Function and Facial Symmetry in patients with acute Bell's palsy. Motor Imagery and Mirror Book Therapy obtained better results regarding the quality of life and psychosocial functions than mime therapy and conventional electrotherapy.*

Keywords: Acute Bell's Palsy, Motor Imagery, Mirror Book Therapy, Mime therapy, Conventional Electrotherapy, FDI, SFGS

1. Introduction

Bell's Palsy is named after the Scottish anatomist, Sir Charles Bell (1774-1842), who was the first to describe it. Bell's Palsy is the most common acute idiopathic disorder that is associated with peripheral nerve palsy affecting the facial nerve, which supplies all the muscles of facial expression. The annual incidence of Bell's palsy is 15 to 30 per 100,000 persons, equally affecting both genders. Bell's palsy has been described in patients of all ages, with peak incidence noted in the 40s.¹The incidence is lowest in children under 10 years old, increases from the ages of 10 to 29, remains stable at the ages of 30 to 69, and is highest in people over the age of 70. It occurs more commonly in patients with diabetes, hypertension and an increased incidence in women during the third trimester of pregnancy.^{2,3}The etiology of Bell's palsy remains obscure and there are no clinical or laboratory tests that can diagnose the disease.⁴

Difficulty in closing the affected side-eyes, facial deviation to the unaffected side, difficulty in drinking, eating, and speaking are the common problems associated with acute

phase of bell's palsy.⁵ Psychological problems associated with facial appearance is the main factor that affects the individual personally in any phase of bell's palsy.⁶ Thus, it causes functional deficits, affects facial expressions, and impacts the individual's quality of life.⁷ The proper assessment and treatment are imperative for accomplishing the most ideal recuperation of facial nerve function. Bell's palsy patients may be benefitted by the specific physiotherapy interventions that will improve the physical functions as well as the psychosocial well-being.⁸ Bell's palsy is frequently treated with patient education and various physical therapy interventions which includes kinesiotherapy, massage therapy, cryotherapy, and electrotherapy.⁹

Since 1980, mime therapy, a combination of mime and physiotherapy, has been offered in patients with sequelae of facial paralysis. The aim of mime therapy is to improve symmetry of the face both at rest and during movement, simultaneously controlling synkinesis; in the process, patients will look and feel better and have less problems with eating, speaking, drinking and social integration.¹⁰ Mime therapy includes auto-massage, relaxation exercises, co-ordination

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exercises, inhibition of synkinesis and emotional expression exercises. There is scarcity of evidence that suggesting the effectiveness of mime therapy in improving facial symmetry during the acute phase management in Bell's palsy.¹¹

Motor Imagery technique is been described as the mental representation of movement without anybody movement. Literature shows the positive effects of motor imagery on motor learning and improvement of performance in athletes, healthy individuals, and individuals with neurological conditions.¹² Motor imagery allows the patient to attentively perceive a movement, without absolute reconstructing link between the perception and movement. Types of Imagery came to be classified as external (visual) and internal (kinesthetic).¹³ External imagery can be of the person or the environment, or both. Mahoney and Avenier distinguished between external (visual) and internal (kinesthetic) imagery as follow: "In external imagery, a person views himself from the perspective of an external observer; internal imagery, on the other hand, requires an approximation of the real-life phenomenology specified the person actually imagines being inside his/her body and experiencing those sensations that might be expected within the actual situation."¹⁴

In current psychological and clinical studies, the definition of visual imagery involves the self-visualization of action, whereas kinesthetic imagery implies somaesthetic sensations elicited by action.¹⁵ A somewhat different distinction between kinesthetic and visual imagery relates MI to kinesthetic imagery of one's own movements, whereas visual imagery is related to spatial coordinates of a movement within the environment. Thus, visual imagery applies mainly to the imagery of moving objects or to the movement of another person in the imagined environment, although imaging one's own movement is additionally possible.¹⁶

Using new imaging techniques, research within the past few years has shown that the activation sequences in the motor cortex during mental imagery of a movement are almost like those occurring during the performance of that movement.¹⁷ The application of Motor Imagery, which is always applied as rehabilitative protocols with Mirror Therapy before rehabilitative exercises. Mirror Therapy is a safe and simple-to-use intervention for the recovery of stroke patients and phantom limb pain, also that can be an acceptable method to other neurological conditions.¹⁸ In one study, mirror book therapy was used as a bifold mirror to twice reflect the unaffected half of a patient's face, such that the patient sees a full, unaffected face, this is an adaptation from the mirror box originally created by Ramachandran to manage phantom limb pain and paralysis.^{19,20}

Paolucci Teresa et al. suggested that the mirror therapy, and its association with motor imagery inspired the patient to imagine the movement before executing it, and allows to perceive the improved movement in the facial paresis over visual feedback by viewing the reflection of the intact face in place of the facial palsy sensory feedback, in which the face moved symmetrically.^{18,21,22}

There is ample of evidence that proposes the effectiveness of motor imagery and mirror book therapy; mime therapy in improving the facial symmetry in acute Bell's palsy. Hence

the need arises to evaluate the effectiveness of the motor imagery and mirror book therapy as compared to mime therapy on the recovery in Bell's palsy patients.

2. Methodology

Inclusion Criteria:

- 1) Patient diagnosed with unilateral Bell's palsy and referred for physiotherapy within one week of onset.³⁹
- 2) Patient having sufficient, physical, and mental ability to understand instructions and co-operate throughout the session.³⁹
- 3) Age group between 18-60 years.⁶

Exclusion Criteria:³⁹

- 1) Patient with previous history of peripheral facial paralysis.
- 2) Patient with facial palsy (supranuclear lesion or any known cause of infection).
- 3) Patient with history of trauma / fracture of skull bone.
- 4) Patient undergone recent facial surgery.
- 5) Patient with skin allergy problem, especially on face.
- 6) Pharmacological and psychological treatment for psychiatric disorders.
- 7) Central nervous system tumour.

Sample Size: The sample size was calculated using G-Power software version 3.1.9.4. The calculated size of sample was 30(10 in each group).¹⁰ In this study Convenient Sampling (non probability) method used. Study duration was 12 months. Study design was an interventional comparative study.

Material Used:

- Electrical stimulator
- Mirror
- Pen, Paper, and Powder
- Mirrorbook
- Stool

Procedure:

This study was conducted after taking ethical approval from Institutional Ethical Committee. All patients diagnosed as unilateral Bell's palsy referred by ENT/ Physician/ Neurosurgeons for the study were screened as per inclusion criteria. Participants willing to participate were informed about the procedure of the study and their written consent for participation in the study would be obtained. Outcome assessment was performed for each group before the intervention and at the end of 4 weeks of intervention.

Outcome Measures:

Sunnybrook Facial Grading System (SFGS):²⁴

The SFGS focuses on facial asymmetries and the presence or absence of synkinesis. Facial symmetry is evaluated, comparing the paretic half of the face with the nonparetic side during rest and during voluntary movements, generating a single composite score from 0 to 100. SFGS is reliable with interclass correlation coefficient of 0.890.

Facial disability index (FDI):²³

It measures physical impairment and psychosocial factors related to facial neuromuscular function. It consists of two sub scales as FDI physical function subscale and FDI social/ wellbeing function sub scale. The total score is 200,100 of each subscale. FDI has high reliability and construct validity.

Intervention:

Patients were divided into 3 groups:

Group A: Motor imagery & Mirror book therapy along with conventional electrotherapy

Group B: Mime therapy along with conventional electrotherapy

Group C: Conventional electrotherapy along with traditional mirror feedback exercises Conventional electrotherapy was given in all 3 groups.

Conventional Electrotherapy: It included infrared radiations (up to 7 days from the date of onset) to affected side followed by electrical stimulation (Interrupted Galvanic current) of affected muscles with 3 sets of 30 contraction.^{6,10}

Group A: were received conventional electrotherapy along with motor imagery and mirror book therapy. During the session, the participants were first performed the motor imagery technique. The instructions for the participants to perform the motor imagery techniques are as follows:²¹

- Relax the face and close the eyes and concentrate.
- Imagine doing sufficient complete and symmetrical movements of face. Activate lightly and selectively to each different muscle region.
- Exercises to be imagined: 1. Lift the eyebrows 2. Frown the eyebrows 3. Close the eyes- open eyes 4. Wrinkle your nostrils, smile with closed mouth 5. Give a kiss 6. Stretch the lower lip downwards.
- Repeat 5 times each with a 5 second pause between to each visualization.

Mirror book therapy session:¹⁹ Following the motor imagery technique, the patients were performed the mirror book exercises. The patient was sat upright, maintaining good and proper posture. The mirror had kept at the patient's eye level. The mirror should be opened to a right angle with the nose touching the outer edge of mirror. The participant looked into the mirror with both eyes open and only the unaffected half of the face reflecting back. The participant should see the unaffected side of the face twice reflecting, giving the appearance of full-face reflection. After that the patients were requested to perform the following therapist commands:²¹

- 1) Think about something surprising and rise gently the eyebrows. Release.
- 2) Think about something frustrating and gently frown the eyebrows. Release.
- 3) Think about something disgusting and wrinkle your

nose gently and briefly. Release.

- 4) Think about something Funny and smile with closed mouth. Release.
- 5) Think about something funny and smile with open mouth. Release.
- 6) Think about someone you love and send him/her a kiss. Release.
- 7) Think about something disgusting and make a gentle inverted smile. Release.
- 8) Close and open the eyes very slowly while feeling progressively the opening and closing one eyelid.

Each exercise done in random order from session to session. Repetitions: 5 times each

Contraction/ Rest time: Hold contraction for 3 seconds, rest for 3 to 5 seconds.

Intervention protocol was given for 4 weeks and 3 days per week that will last for 45 to 60min.

Group B: were received conventional electrotherapies along with mime therapy. Mime therapy is as follows:^{6,11,22}

- 1) Auto massage- effleurage and kneading for 10 to 15 minutes on both the sides of the face and neck.
- 2) Breathing and relaxation exercises.
- 3) Specific low intensity exercises to co-ordinate both the halves of the face will teach. Basic exercises (forehead wrinkle, eye closure, smile, snarl, lip pucker) with variations in amplitude and speed, exercises for one side of the face to control separate movements, relaxation of the lower jaw, exercises of mouth (smiling, pouting) and eye with simultaneous inhibition of synkinesis will be included. A mirror is used for the biofeedback.
- 4) Eye and lip closure exercises will teach.
- 5) Exercise was performed to increase the patient's awareness of lip movements and the position of mouth for various sounds. Vowels as a, e, i, and o and consonants such as p and b will be used for position of the lips. Lastly, emotional expression exercises will teach. Mime therapy protocol for 3 days per week.²⁵

Group C: were received conventional electrotherapy and traditional facial feedback expression exercise program in front of the mirror, 5-6 times in a day and home advices.^{14,21} Intervention was given for total 4 weeks.

Statistical Analysis: Data was entered in Microsoft excel worksheet (2007), data was cross check for any data entry error. Analytical statistics: quantitative data, one-way ANOVA test was applied to find which intervention was better, ANOVA test was applied to find statistical difference of outcome variable (SBFGS and FDI) between three groups. Paired t-test was applied to find statistical difference between 'pre' and 'post' reading of outcome variable (SBFGS & FDI) by using SPSS version 23 software. 'p' value of <0.05 consider statistically significant(p*). ANOVA test was used to compare the SBFGS and FDI score between 3 groups by using SPSS version 23.

3. Results

Table 1: Distribution of sample by age group

Group	Group A		Group B		Group C	
	Mean	SD	Mean	SD	Mean	SD
Age(years)	42.3	15.83	32	13.58	35.7	15.30

Table 2: Distribution of sample by gender

Group	Group A		Group B		Group C	
	Male	Female	Male	Female	Male	Female
Frequency	8	2	6	4	7	3
Percentage	38.09%	22.22%	28.57%	44.44%	33.33%	33.33%

Table 3: Distribution of sample by Medical History

Medical History	No.
DM	7
HTN	3
DM+HTN	3
No. Medical history	17

Table 4: Comparison of Pre and Post Intervention measurement of Group A with respect to total SFGS and its dimensions scores by paired t-test

Group A	Components	Pre-Intervention		Post Intervention		t- value	p-value
		Mean	SD	Mean	SD		
SFGS	Resting Symmetry	19.5	1.58	14	3.16	6.12	0.0002**
	Voluntary movement	33.6	5.71	45.2	9.43	7.12	<0.0001**
	Synkinesis	0.5	1.58	0.3	0.94	1.00	0.343
	Composite score	13.6	6.86	30.9	11.51	8.39	<0.0001**

Note: *p value<0.05 significant, p value>0.05 not significant

Table 5: Comparison of Pre and Post Intervention measurement of Group A with respect to total FDI and its dimensions scores by paired t-test

Group A	Components	Pre-Intervention		Post Intervention		t- value	p-value
		Mean	SD	Mean	SD		
FDI	Physical function	38.5	9.44	77	12.29	8.48	0.0001*
	Social function	40.8	4.13	78.8	13.07	9.80	0.0001*
	Total	79.3	12.01	155.8	21.87	11.33	0.0001*

Note: *p value<0.05 significant, p value>0.05 not significant

Table 6: Comparison of Pre and Post Intervention measurement of Group B with respect to total SFGS and its dimensions scores by paired t-test

Group B	Components	Pre-Intervention		Post Intervention		t- value	p-value
		Mean	SD	Mean	SD		
SFGS	Resting symmetry	19	2.108	13.5	2.415	6.128	0.0002*
	Voluntary movement	34.4	11.027	43.6	10.574	6.273	<0.0001*
	Synkinesis	0.9	1.911	0.5	1.080	1.500	0.167
	Composite score	14	10.121	29.6	9.453	14.77	<0.0001*

Note: *p value<0.05 significant, p value>0.05 not significant

Table 7: Comparison of Pre and Post Intervention measurement of Group B with respect to total FDI and its dimensions scores by paired t-test

Group B	Components	Pre-Intervention		Post Intervention		t- value	p-value
		Mean	SD	Mean	SD		
FDI	Physical function	38.5	9.44	72	11.59	7.59	0.0001*
	Social function	41.69	4.69	68	11.62	8.65	0.0001*
	Total	80.1	11.96	140	15.86	10.62	0.0001*

Note: *p value<0.05 significant, p value>0.05 not significant

Table 8: Comparison of Pre and Post Intervention measurement of Group C with respect to total SFGS and its dimensions scores by paired t-test

Group C	Components	Pre-Intervention		Post Intervention		t- value	p-value
		Mean	SD	Mean	SD		
SFGS	Resting symmetry	18.5	2.415	15.5	2.838	3.674	0.005*
	Voluntary movement	32.8	5.266	34.8	5.977	3.000	0.015*
	Synkinesis	0.7	1.494	0.6	1.349	1.000	0.343
	Composite score	13.6	6.963	18.7	7.008	5.075	0.0007*

Note: *p value<0.05 significant, p value>0.05 not significant

Table 9: Comparison of Pre and Post Intervention measurement of Group C with respect to total FDI and its dimensions scores by paired t-test

Group C	Components	Pre-Intervention		Post Intervention		t- value	p-value
		Mean	SD	Mean	SD		
FDI	Physical function	39	4.59	66.5	5.29	20.42	0.0001*
	Social function	39.6	3.50	70.9	9.03	11.47	0.0001*
	Total	78.6	6.43	137.4	12.29	18.42	0.0001*

Note: *p value<0.05 significant, p value>0.05 not significant

Table 10: Comparison of all three groups with respect to total SFGS and its dimensions scores by one-way ANOVA

Groups	Resting symmetry		Voluntary movement		Synkinesis		Composite score	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Group A	14	3.162	45.2	9.437	0.3	0.948	30.9	11.512
Group B	13.5	2.415	43.6	10.574	0.5	1.080	29.6	9.453
Group C	15.5	2.838	34.8	5.977	0.6	1.349	18.7	7.008
F- value	1.360		3.976		0.180		4.969	
p-value	0.274		0.031*		0.836		0.015*	
Pairwise comparison of groups by Tukeys multiple post hoc procedures								
Group A vs Group B	0.917		0.915		0.919		0.950	
Group A vs Group C	0.470		0.037		0.827		0.021*	
Group B vs Group C	0.269		0.087		0.979		0.042*	

Note: *p value<0.05 significant, p value>0.05 not significant

Table 11: Comparison of all three groups with respect to total FDI and its dimensions scores by one-way ANOVA

Groups	Physical function		Social function		Total score	
	Mean	SD	Mean	SD	Mean	SD
Group A	77	12.292	78.8	13.070	155.8	21.872
Group B	72	11.595	68	11.623	140	15.867
Group C	66.5	5.296	70.9	9.036	137.4	12.294
F- value	2.639		2.418		3.375	
p-value	0.090		0.108		0.049*	
Pair wise comparison of groups by Tukeys multiple post hoc procedures						
Group A vs Group B	0.526		0.104		0.117	
Group A vs Group C	0.073		0.283		0.059	
Group B vs Group C	0.462		0.837		0.939	

Note: *p value<0.05 significant, p value>0.05 not significant

4. Discussion

The purpose of the study was to determine the effect of motor imagery and mirror book therapy versus mime therapy for recovery in patients with acute Bell's palsy. Bell's palsy is a rapid unilateral facial nerve paresis or paralysis. The condition leads to partial or complete inability to voluntarily move facial muscles on the affected side of face.¹ Bell's palsy mostly affects patients' facial symmetry and quality of life.^{26,27,28}

Total 30 acute Bell's palsy patients diagnosed by ENT/Physician/Neurosurgeon were included in the study. The patients were divided into three groups, Group A (Motor Imagery and Mirror Book Therapy), Group B (Mime therapy) and Group C (Conventional Electrotherapy). To assess the severity of facial nerve paresis the SFGS was used. SFGS includes three components: resting symmetry, voluntary movements and synkinesis. The quality of life was assessed by FDI score that includes two components: physical function and social function. The evaluation was done before and after intervention protocol.

As shown in table 1, the mean age was 36.66±14.80. The mean age of patients in Group A was 42.3±15.83 years, the mean age of patients in Group B was 32±13.58 years and the mean age of patients in Group C was 35.7±15.30 years. As

per the literature, the incidence of Bell's palsy onset differs with age, having a lower incidence in younger age group & higher incidence in adults.²¹ to 40 years is the most common age group affected with Bell's palsy. However, the median age of onset in Bell's palsy patients is at 40 years.^{1,3,29,30,31}

As the shown in table 2, Out of 30 patients 21 were males and 9 were females. Group A consisted of 8 (38.09%) male and 2 (22.22%) female. Group B consisted of 6 (28.57%) and 4 (44.44%) female. Group consisted of 7(33.33%) male and 3 (33.33%) female. The present study demonstrates predominance of Bell's palsy in males. However, the literature suggests that Bell's palsy equally affects both the genders.^{4,5,6}

As shown in table 3, (Group A) 2 patients, (Group B) 2 patients, and (Group C) 3 patients, had a medical history of diabetes mellitus. Kedar k et al. concluded that diabetes mellitus is more common among patients with Bell's palsy than among those who have never had this disease. Conversely, the risk of Bell's palsy is increased in diabetes.³² Previous study suggested that in diabetics the Schwann cell and myelin sheath of nerve are much more prone to damage than in nondiabetics and the risk of severe nerve degeneration, with its sequelae of contracture and synkinesis, is increased in diabetes.^{33,34,35}

Table 4 compares the mean value for SFGS score of Group A. The mean value of the SFGS score for pre-intervention was 13.6 ± 6.86 , and the mean value of post intervention was 30.9 ± 11.51 . Thus, the present study concluded the SFGS score was improved after 4 weeks of intervention, suggesting that motor imagery and mirror book therapy with conventional electrotherapy showed the significant improvement in facial symmetry. Motor imagery technique encourages the patient to imagine the normal movement before executing it. Motor imagery needs the aware activation of brain regions that are concerned with movement preparation and execution, accompanied by a voluntary inhibition.²⁵ Group A patients perceived the improvement in the movements over the visual feedback, all they were viewing the reflection of intact face instead of the facial palsy sensory feedback. This allowed the patient to perceive that the face movements are occurring symmetrically. In mirror book therapy by seeing the unaffected face perform the exercises in normal manner for the affected side will lead to an increased activity of motor command pathways from the unaffected region which is utilized to supplement the damaged region. As per the literature with the use of Mirror book therapy the patients are allowed to visually appreciate the return of muscle activity.¹⁹

Table 5 compares the mean value for FDI score of Group A. The mean value of FDI score for pre intervention was 79.3 ± 12.01 and the mean value of post intervention was 155.8 ± 21.87 . As results shows, Group A had a significant increase in FDIS scores as compared to the SFGS and FDI scores. The FDIS is a subjective measure of patient's social rehabilitation. It measures whether or not patient feels "calm", "peaceful" and other more psychosocial goals such as whether one feels comfortable going outside in public.¹⁹

The mirror book therapy had a greater benefit for psychological reinforcement in psychosocial domain. For the patients, as the intervention involves repeatedly seeing oneself with a normal face through mirror.³⁵ Motor Imagery is a cognitive process in which a subject imagines that he/she performs a movement without actually performing the movement and without even tensing the muscles. It is a dynamic state during which the representation of specific motor action is internally activated without any motor output.^{18,21} The Motor Imagery and Mirror book therapy have showed improvement in both facial symmetry and quality of life.

As shown in table 6, Group B pre intervention mean score of SFGS was 14 ± 10.12 and post intervention mean score was 29.6 ± 9.45 . As per the results, study concluded that the SFGS score mean value was improved after 4 weeks of intervention, implying that mime therapy combined with conventional electrotherapy showed significant improvement in facial symmetry. Mime therapy includes stretching, relaxation exercises, massage, mirror exercise, vowel exercises. The improvement may be because massage improves circulation and maintains muscle properties and the visual feedback has shown to control muscle activities in facial muscles. Mime therapy had shown to create new growth and production of collagen and connective tissue in facial muscles and restore muscle activation.³⁶ According to

Gopi et al, mime therapy improves facial symmetry and functions more than conventional therapy and home exercises in people with acute Bell's palsy. That showed greater improvement in strength and motor function of facial muscles.^{6,36} There are few studies conducted with the usage of mime therapy reporting the reduction in facial asymmetry both at rest and during voluntary movements, reducing synkinesis.

As shown in table 7, Group B pre intervention mean score of FDI was 80.1 ± 11.96 and post intervention mean score was 140 ± 15.86 . The results concluded that the FDI score mean value was improved after 4 weeks of intervention that suggests mime therapy combined with conventional electrotherapy showed significant improvement in quality of life.

As shown in table 8, Group C pre intervention mean score of SFGS was 13.6 ± 6.96 and post intervention mean score was 18.7 ± 7.00 . The results suggested that conventional electrotherapy with mirror feedback exercises showed significant improvement in facial symmetry. Facial mirror feedback exercises like smiling, frowning etc. are the passive facilitatory type of exercises that helps in regaining and restoring lost muscle function by performing all facial activities of daily living. Voluntary activation of facial muscles with passive facilitation when performed in front of mirror improves facial function by principle of feedback knowledge.³⁷

As shown in table 9, pre intervention mean score of FDI was 78.6 ± 6.43 and post intervention mean score was 137.4 ± 12.29 . The results showed, conventional electrotherapy with mirror feedback exercises had a significant improvement in quality of life. The literature shown that the physical therapy in facial nerve paralysis, physiotherapy in form of electrotherapy and facial exercises has an effective role in the primary management of peripheral facial paralysis.³⁸

As per shown in table 10, post intervention mean score of SFGS, Group A was 30.9 ± 11.51 , Group B 29.6 ± 9.45 and Group C was 18.7 ± 7.00 . That shown all three groups had a significant improvement in facial symmetry but Group A and Group B shows slightly more improvement than group C. For Motor Imagery and Mirror Book Therapy (Group A), whenever the patients attempt to move paralyzed face, he/she receives sensory feedback, in which the face moved symmetrically.^{18,19} Group B of mime therapy included facial muscles exercises which are adopted to diminish abnormal movement patterns and re-establish symmetrical muscle activity control for intended facial actions.^{36,37} In Group C, literature suggest that the mirror feedback exercises performed by the patients, will recruit exaggerated movement over the affected side that can lead to synkinesis or other discomfort to facial symmetry.³⁸

As per shown in Table 11, mean score for FDI of Group A 155.8 ± 21.87 , Group B 140 ± 15.86 and 137.4 ± 12.29 . All three groups showed good efficacy with the intervention over time and patients experienced greater recovery of facial paralysis and a better quality of life. Group A showed slightly more improvement in psychosocial domain of the

FDI score. In motor imagery and mirror book therapy the patient will not initiate excessive contraction of muscles on affected side that prevents synkinesis and dyskinesia. Both techniques gave positive impact on patient's mind. That was less stressful and technique relieves the patient's psychological stress. In motor imagery and mirror book therapy the patient feels that the face is normal, calm, comfortable, confident, peaceful. In mirror book therapy with the use of bifold mirror patient can see the unaffected side face, so they feel that the whole face is normal and with motor imagery the patients imagine their normal face and different expression exercises of the face. The motor imagery is used as potential tool to examine action representation, because it can provide insights into the processes of action planning and perception. In mirror book therapy the mirror neuron circuit activates, the interpretation of mirror reflex by brain as an image that corresponds to the paretic side, activating injured motor circuits.^{18,19,21,22}

So, the result suggested that the improvement was found in the SFGS score in both Group A and Group B, which shows the facial symmetry improves almost the same in both groups than in Group C. A significant improvement was found after intervention in Motor Imagery and Mirror book therapy group in FDIS domain of the FDI score than in mime therapy group and conventional electrotherapy group.

5. Limitations

The first limitation of this study is small sample size. A small sample size of 30 subjects cannot cover the whole population of acute bell's palsy. Therefore, the results should be interpreted with caution.

Another limitation is that we did not have the possibility to control all patients in motor imagery technique, appropriate way during the rehabilitation. The imaging capacity and concentration level vary subject to subject. The long-term follow-up of the patients was not taken.

6. Future Scope of the Study

The present study acknowledges that future studies are required to enable better understanding of the effects of the mime therapy, motor imagery and mirror book therapy in acute bell's palsy patients. Large sample size can be taken for future studies. A long follow-up may be included to find out long efficacy of the intervention protocol. Homogenous sample with age and gender distribution can be taken for future studies.

Clinical Implication

By implicating motor imagery and mirror book therapy exercises in clinical practice, that is an inexpensive method and shows significant improvement in facial symmetry and quality of life in patients with acute Bell's palsy. Implicating mime therapy that shows improvement of facial function and reduces synkinesis in acute Bell's palsy patients. In summary, mime therapy, motor imagery and mirror book therapy target facial symmetry, physical function, and social function of the patients. The motor imagery and mirror book therapy may provide a useful and cost-effective treatment in

the management of acute Bell's palsy patients and merits future study.

7. Conclusion

We aimed in this present study to evaluate the effect of motor imagery and mirror book therapy versus mime therapy for the recovery in patients with acute Bell's palsy. Total 30 patients diagnosed as unilateral Bell's palsy were screened as per inclusion criteria and divided into three groups. The SFGS score and FDI score were used for each group before the intervention and at the end of 4 weeks intervention. The data were analyzed and the result was obtained that Group A and Group B both showed nearly equal effects on SFGS score. Group A showed greater improvement on the FDIS domain of FDI score. The study concluded that the integrated use of Motor Imagery and Mirror book Therapy; Mime therapy are effective in the rehabilitation to improve facial function and facial symmetry in the acute Bell's palsy patients than conventional electrotherapy. Moreover, Motor Imagery and Mirror Book Therapy obtained better results with regards to quality of life and psychosocial functions.

List of Abbreviations

- ANOVA: Analysis Of Variance
- BP: Bell's Palsy
- ENT: Ear, Nose and Throat
- FDI: Facial Disability Index
- FDIP: Facial Disability Index Physical
- FDIS: Facial Disability Index Social
- FGS: Facial Grading System
- MP: Mental Practice
- MBT: Mirror Book Therapy
- MEPP: Mirror Effect Plus Protocol
- MI: Motor Imagery
- MT: Mirror Therapy
- MVF: Mirror Visual Feedback
- PNF: Proprioceptive Neuromuscular Facilitation
- QOL: Quality Of Life
- SFGS: Sunnybrook Facial Grading System
- SD: Standard Deviation
- SD Curve: Strength Duration Curve
- SPSS: Statistical Package for the Social Sciences

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