Original Research Article

Compare the Effectiveness of Mime Therapy on Facial Synkinesis in Idiopathic and Traumatic Lower Motor Neuron Facial Palsy

Vamakshi Vijay [1], Manish Kumar Jha *[2], Lovneesh Kumar [3], Muskan Jain [4].

[1] MPT, Neurology, Department of Physiotherapy, SRHU, Dehradun, Swami Rama Himalayan University, Dehradun, Uttarakhand, India.

*[2] Faculty, Neurology, Department of Physiotherapy, SRHU, Dehradun, Swami Rama Himalayan University, Dehradun, Uttarakhand, India.

[3] Professor, Department of ENT, SRHU, Dehradun, Swami Rama Himalayan University, Dehradun, Uttarakhand, India.

[4] MPT, Neurology, Department of Physiotherapy, SRHU, Dehradun, Swami Rama Himalayan University, Dehradun, Uttarakhand, India.

ABSTRACT

Background: The seventh cranial nerve has a core function of regulating emotional displays and speech. Facial paralysis, characterized by the loss of voluntary motor control on one or both sides, is commonly attributed to Bell's palsy which accounts for 50-75% of cases and trauma responsible for 10-23% of cases. Various rehabilitation methods, including Mime Therapy, are employed to enhance facial muscle function.

Objective: This study aims to compare Mime Therapy's impact to reduce the synkinesis of a face in individuals with idiopathic and traumatic lower motor neuron facial nerve palsy.

Study Design: Experimental, Comparative Study

Study Setting: Physiotherapy OPD, Neurology ward, and ENT ward of Himalayan Hospital, Dehradun

Participant: This study involved 30 patients, with 20 in Group A (Idiopathic) and 10 in Group B (Traumatic), all of whom had House-Brackmann Scores of 3-5. The patient's ages ranged from 20 to 70.

Outcome Measure: Two outcome measures were used: House Brackmann Score and Sunnybrook Facial Grading System.

Result: A noticeable difference in both outcome measures was observed. In the House Brackmann Score for group A (p-value <0.001) and B (p-value=0.016), In Sunnybrook Facial Grading System for group A (p-value<0.001) and B (p-value=0.002). However, when comparing the post-intervention results of both groups, no distinct variation was found in the outcome variables (p-value>0.05).

Conclusion: The study provides evidence demonstrating that Mime Therapy has been successful in effectively reducing Facial Synkinesis in patients with both idiopathic and traumatic LMN Facial Palsy. The results indicate a significant improvement in the condition, suggesting that Mime therapy can be an efficacious treatment approach for this type of facial paralysis.

KEYWORDS: Mime Therapy, Facial Synkinesis, Idiopathic LMN Facial palsy, Traumatic LMN facial palsy, Bell's palsy.

Address for correspondence: Dr. Manish Kumar Jha, Faculty, Neurology, Department of Physiotherapy, Swami Rama Himalayan University, Dehradun, Uttarakhand, India-248016. Phone no.- 8130785861 **E-Mail:** mkjha@srhu.edu.in

INTRODUCTION

Facial nerve palsy can be a devastating condition, which without proper medical intervention and rehabilitation, may lead to permanent disfigurement. The facial nerve can be injured at any point along its pathway, resulting in a sensorimotor deficiency. Its various causes range from complications during delivery (such as the use of forceps) to neoplasia. Idiopathic LMN facial palsy is the frequently diagnosed condition for this ailment [1].

The seventh cranial nerve, comprising sensorimotor fibers, originates with its UMN fibers in the pyramidal system (corticobulbar tracts). The fibers traverse the Capsula interna to reach the brainstem in the pontine region, where they connect with the facial nerve nucleus before decussate to the opposite side. This anatomical pathway explains why the forehead is unaffected in stroke patients, as it receives input from both cerebral hemispheres. Conversely, a lower motor neurons lesion impacts half side of the face ipsilaterally.

There is a wide range of factors that can contribute to facial nerve palsy, including idiopathic, infectious, traumatic, iatrogenic and neoplastic causes [2]. Idiopathic LMN facial palsy is a condition characterized by abrupt muscle weakness, without any apparent cause [3]. Trauma comprises fractures of temporal bone which accounts for twenty-two percent of all fractures of cranial bone. The main cause of these fractures is road traffic accidents, which can result in facial nerve injury in 31% of cases [4].

Lower motor neuron facial palsy is a condition with a total palsy of muscles of the face, unilaterally [5]. This can result in reduced motions of the face unilaterally, ranging from paresis to complete palsy. [6,7].

The clinical features of this condition include drooping of the eyelids on the same side, incomplete closing of eyes, dryness of the eye from incomplete closure, lacrimation, deviation of oral angle, altered gustatory perception on the same side, pooling of food on the involved side due to reduced muscle strength, salivary drooling, changes in the sensation on the involved side, discomfort in or around the ear and auditory hypersensitivity may occur if stapedial muscle gets impacted.[8]

Various physiotherapy intervention, such as conventional therapy like electrical stimulation, taping, and the application of heat modalities. Exercise therapy, which involves receiving massage and biofeedback is also utilize to reeducate and rehabilitate the facial muscles [9].

"Mime Therapy" is a type of facial rehabilitation that uses exaggerated facial expressions to retrain and strengthen facial muscles. The goal is to enhance facial balance and function in individuals with synkinesis (A condition where facial muscles move involuntarily during voluntary movements.) these techniques help individuals to better understand the underlying mechanisms of their facial muscles and develop more effective training strategies [10].

"Mime Therapy" consists of mirror feedback, muscle relaxation and neuromuscular re- education. These techniques are used to improve the physical and mental wellbeing of an individual. Mirror feedback involves using a mirror to help individual see and correct their movements. Muscle relaxation aims to decrease tension and stress in muscles. Neuromuscular re-education is a technique used to help individual regain and improve their muscle function and control [11].

This study aims to compare the impact of Mime Therapy on reducing facial synkinesis in individual with idiopathic and traumatic LMN facial nerve palsy. Limited research exists on the impact of mime therapy on traumatic facial palsy, this study seeks to determine its efficacy in such cases.

METHODOLOGY

Research design: Experimental, Comparative study

Sample size: 30 participants (20 idiopathic: 10 traumatic)

Target population: Patients who have unilateral lower motor facial palsy

Research setup: Physiotherapy OPD, Neurology ward, and ENT ward of Himalayan Hospital, Dehradun

Inclusion criteria:

· Age- 20-70

· Gender- both male and female

· Case of lower motor neuron facial weakness

· MMSE Score more than 24

· House-Brackmann Score between 3-5 including both traumatic and idiopathic facial palsy.

Exclusion criteria:

· B/L facial paralysis

· Permanent nerve damage/ flaccid paralysis of facial muscle

· Upper limb weakness

Outcome measures:

· House-Brackmann Score [12]

· Sunnybrook Facial Grading System [13]

Procedure: Ethical clearance was obtained from the institutional ethics committee. Patients will be chosen according to selection criteria and then split into two groups based on the cause of their facial palsy: Group A, patients with Idiopathic facial palsy (no known cause), and Group B, traumatic facial palsy (due to trauma or iatrogenic injury). Subjects will receive a comprehensive explanation of a study procedure and written consent will be obtained from them. A pre-assessment was conducted for all patients to determine the initial degree of dysfunction and extent of synkinesis using HBS and SFGS. Both groups will receive Mime Therapy sessions lasting 40 minutes, for 5 days. For outpatients, Mime therapy was taught to the patients and their caregivers on the same day. For reference, the video of the whole procedure was given to the patient then via video calling daily Tele-rehab guidance was given. Therapeutic sessions should be held three times per day: one session by the therapist and the remaining two sessions by the patient with the aid of instructional videos. After that, a post-assessment evaluation was conducted to measure the extent of reduction in the reduction of the degree of facial nerve dysfunction and facial synkinesis using outcome measures. The result was compared to the baseline measurement to determine the efficacy of Mime Therapy.

MIME THERAPY [14]

It involves the following seven components:

1. Patient information and history about treatment and prognosis

2. Massage: By the technique of effleurage and kneading, patients were guided to self-massage their face and neck.

3. Breathing and Relaxation: It involved teaching patients to distinguish between strain and relaxation in the muscles of face. Exhalation and deep breathing were employed to facilitate relaxation.

4. Facial Exercises: Instructed to perform exercises such as forehead crease, eye closure, smiling, snarling and lip puckering, varying the amplitude and speed while using mirror feedback.

5. Eye and lip closure (Synkinesis): Instructed to engage in activities like inflating their cheeks with varying amounts of air and water and performing gentle movements while eating or drinking with eyes open.

6. Pronunciation: Instructed the positioning of the lips using vowels like A, E,I,O and U, as well as consonants like P,F and B

7. Expression: Patient were asked to mimic different expressions such as surprise, disgust, anger and sadness.

Data Analysis: Analytical analysis was conducted with SPSS software version 20. Normality was evaluated by using the Shapiro-Wilk test. The Wilcoxon signed rank test was employed to assess the mean difference within the group. The Mann- Whitney test was employed to differentiate between Group A and Group B mean. A Significant level of 0.05 was used for data analysis.

RESULTS

This chapter presents the results of reviewing data from two outcome measures: the HBS and the SFGS. The analysis included comparisons between and within the group. The data was scrutinized to examine the comparative effectiveness of Mime Therapy for treating

Facial synkinesis in the case of Idiopathic and Traumatic LMN Facial palsy.

Analysis Through House Brackmann Score:
Analyzing HBS (MEAN±SD) revealed a substantial difference in group A Post-treatment (2.40±0.50) in contrast to pre-treatment (3.80±0.41).

Analyzing HBS (MEAN±SD) revealed a Noticeable change in group B Post-treatment (3.10±1.10) in contrast to pre-treatment (3.90±0.73).

Analyzing HBS in both groups there was a notable change in each group, yet group A displays a slightly significant difference than group B.

Analysis Through Sunnybrook Facial Grading System:
Reviewing the SFGS (MEAN±SD) revealed a substantial difference in group A Post-treatment (55.15±7.44) in contrast to pretreatment (17.65±6.42)

Reviewing the SFGS (MEAN±SD) revealed a noticeable change in group B Post-treatment (43.60±18.79) in contrast to pretreatment (18.80±13.02)

Reviewing SFGS in groups A and B, there was a notable change in each group, yet group A showed a slightly significant difference from group A

INTERGROUP COMPARISON

On examining the post-intervention (Mean± SD) of the HBS of Group A (2.40±0.50) and Group B (3.10±1.10), it does not show any significant difference as its p-value exceeds 0.05, Examining the post-intervention (Mean± SD) of the SFGS of Group A (55.15±7.44) and Group B (43.60±18.79), It also does not show any significant difference as its p-value exceeds 0.05, indicating equal effectiveness of Mime Therapy in reducing Facial Synkinesis in both groups.

After analyzing data from both groups, Group A exhibits slightly greater improvement, while each group displays noticeable differences. Therefore, the results suggest that after 5 days of Mime Therapy will help reduce Facial Synkinesis in Traumatic Lower Motor Neuron Facial Paralysis.

Table 1: Comparison of outcome measure HBS (Mean ± SD).

GROUP	PRE(MEAN±SD)	POST(MEAN±SD)	P value
A(IDIOPATHIC)	3.80±0.41	2.40±0.50	0
B(TRAUMATIC)	3.90±0.73	3.10±1.10	0.016

Table 2: Comparison of outcome measure SFGS (Mean ± SD)

GROUP	PRE(MEAN±SD)	POST(MEAN±SD)	P value
A(IDIOPATHIC)	17.65±6.42	55.15±7.44	0
B(TRAUMATIC)	18.80±13.02	43.60±18.79	0.002

Table 3: Intergroup comparison of outcome measures (Mean ± SD).

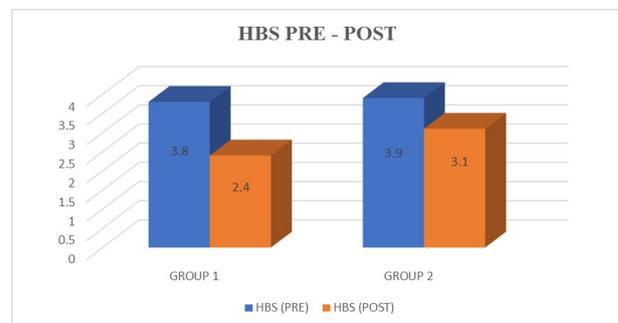| OUTCOME MEASURE	GROUP A POST (MEAN±SD)	GROUP B POST (MEAN±SD)	P - VALUE
HBS	2.40±0.50	3.10±1.10	0.085
SFGS	55.15±7.44	43.60±18.79	0.091

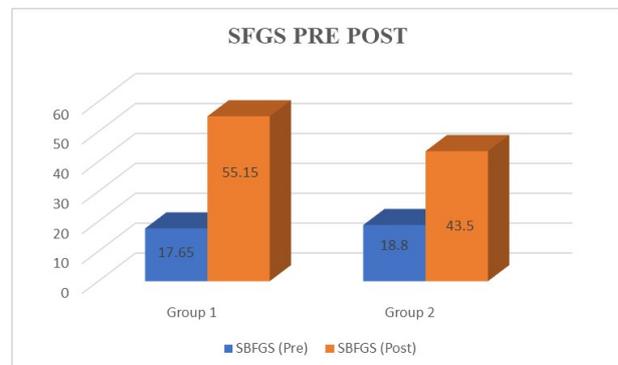**Fig 1:** Pre-Post House Brackmann Score Mean Comparison.

Fig 2: Pre-Post Sunnybrook Facial Grading System Mean Comparison.

Fig. 3: Pre-Post improvement in Traumatic LMN Facial Palsy

The patient initially presented with a House-Brackmann score of 4, indicating an inability to fully close their eyes and notable synkinesis in the face. However, after five days of Mime Therapy, the patient's condition improved to a House-Brackmann score of 2. At this stage, they were able to fully close their eyes and showed a significant reduction in synkinesis movements.

Fig. 4: Pre-post improvement in Idiopathic LMN Facial Palsy

On initial presentation, the patient exhibited a House-Brackmann score of 4, indicating an inability to fully close their eyes and little synkinesis movement present in the face. However, after five days of Mime Therapy, the patient's condition improved to a House-Brackmann score of 2. At this stage, they were able to fully close their eyes with minimal effort, and synkinesis was barely noticeable

Note – The above figure shows only the improvement in the eyes and mouth since the patient did not permit to show the full face.
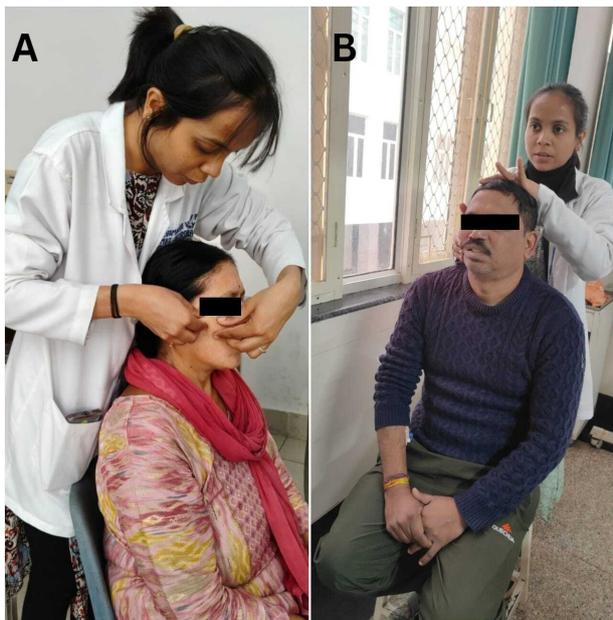

Fig. 5: Demonstration of the Mime Therapy to the patients

A: Demonstrate Facial Massage using Kneading
B: Demonstrate facial exercise focused on the mouth to improve smile.

DISCUSSION

Facial palsy occurs due to impairment of the facial nerve. It can result from trauma, congenital conditions (such as Moebius syndrome), or Ramsey Hunt syndrome. Facial muscle weakness can lead to difficulties in expressing emotions and performing functions such as eating, drinking, and speaking, which can significantly impact an individual's quality of life [15].

Otolaryngologists and primary care doctors commonly treat patients with facial nerve palsy. Idiopathic LMN facial palsy is the predominant cause, with a rate of 23 to 35 cases per 100,000. Trauma is responsible for 10-23% of the facial nerve palsies [16].

Facial rehabilitation addresses both the psychological and physical effect of facial palsy and aims to restore an individual's self-esteem.

Di Stadio et al. in their study investigated the impact of facial taping with Kabat rehabilitation on 20 outpatients with Bell's palsy. The finding suggested that this combination contributed to faster recovery and improved outcomes for the patients [17].

Another study by D'Souza and Rebello concluded that Mime Therapy and PNF are equally effective in individuals with idiopathic LMN facial palsy [18].

Prajapati and Patel found that combining electrical situation with Mime Therapy improved motor skills for Bell's Palsy patients [19].

Our research findings are backed by both Prajapati and Patel's as well as D'Souza and Rebello's studies, affirming the efficacy of mime therapy in alleviating facial synkinesis and symptoms associated with LMN Facial Palsy.

Mime Therapy aids in facial rehabilitation by demonstrating neural plasticity in the facial neuromotor system. It helps reduce abnormal movement patterns and reestablish symmetrical muscle control for intended facial actions. Studies have shown that MIME therapy can decrease facial asymmetry both at rest and during voluntary movements, thereby reducing synkinesis. Additionally, Mime exercises are

linked to emotional control through the activation of the thalamus, globus pallidus, and reticular system. These exercises activate the reticular system, enhancing muscle control and reducing synkinesis. Performing these facial exercises consistently increases muscle tension followed by bilateral relaxation, improving facial circulation and coordination between both halves of the face. This enables symmetrical facial movements and emotional expression [20].

As far as I am aware, no studies have been conducted on the effectiveness of Mime Therapy for traumatic LMN facial palsy. Therefore, it's important to assess the efficacy of Mime Therapy for traumatic LMN facial palsy and to compare the prognosis between idiopathic and traumatic facial palsy when treated with Mime therapy. The study included 30 subjects, with 20 patients in Group A (idiopathic facial palsy) and 10 patients in Group B (traumatic facial palsy). The age group considered for the study was 20-70 years.

Two outcome measures used were HBS and SFGS. The first outcome measure i.e. HBS, is commonly used to assess the severity of facial palsy, using a scale from I (normal) to VI (complete paralysis). The reliability of this scale is r =0.783[21,22]. The other outcome measure used was SFGS. It is a scale that evaluates the severity of damage related to peripheral facial palsy. This scale assesses movement, symmetry, and synkinesis, and generates score ranging from 0 to 100, with 100 indicating normal function [23].

On analyzing both outcome measure statistically, both groups display improved results but group A showed slightly more significant improvement when compared the pre-post data. However, based on the post-data, it was evident that both groups responded well to Mime Therapy, and no substantial difference was observed in both groups.

In this study, first noticeable effects of Mime Therapy were observed in the regions of the eyes and forehead. Patients reported and clinical observations confirmed that improvements in these areas were evident after just 5 days of treatment. This early response was characterized by a reduction in involuntary muscle contractions and improved voluntary movement control. In contrast, the improvements in the mouth and nasolabial fold regions were less pronounced during the initial phase. Significant changes in these areas were typically observed after a more extended period of therapy.

This study's findings support Mime Therapy's effectiveness in improving Facial Synkinesis in both idiopathic and traumatic lower motor neuron facial palsy. The result suggest that Mime Therapy may be more effective treatment option for idiopathic facial palsy compared to traumatic facial palsy. The study highlights the importance of considering the underlying cause of facial palsy when selecting a treatment approach.

There are a few potential limitations of the study to consider. Firstly, adherence to the therapy regime could impact the outcomes. Additionally, the study had a small sample size.

Future studies should investigate the prolonged impact of Mime Therapy on Facial Synkinesis in Traumatic LMN Facial palsy. The potential benefits of combining Mime Therapy with other therapeutic modalities such as botulinum toxin injections or surgical interventions.

CONCLUSION

Mime Therapy is a promising rehabilitation approach for managing Synkinesis in patients with LMN Facial palsy. Mime Therapy is effective for both idiopathic and traumatic cases. By customizing therapy programs to the specific symptoms clinicians can enhance treatment outcome and improve the QoL for individuals impacted by this challenging condition.

ABBREVIATIONS

LMN- Lower Motor Neuron
UMN - Upper Motor Neuron
HBS - House Brackmann Score
SFGS - Sunnybrook Facial Grading System
MMSE - Mini-Mental State Examination
OPD - Out Patient Department
ENT - Ear Nose Throat
SD - Standard Deviation
PNF – Proprioceptive Neuromuscular Facilitation
QoL - Quality of Life

AUTHORS CONTRIBUTION

Vamakshi Vijay is responsible for conceptualizing and designing the research, conducting experiments, data collection, and writing the manuscript**.**

Manish Kumar Jha- served as a guide and provided significant help in research writing, methodology development and data interpretation.

Lovneesh Kumar - was instrumental in providing patients for data collection and regularly checking and reviewing the work to ensure accuracy and integrity throughout the research process.

Muskan Jain – played a crucial role in data collection and provided technical support during the experiments. She also assisted with the preparation of figures and tables. Their contributions ensured the accuracy and reliability of the data presented in this thesis.

Conflicts of interest: **None**

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