Effectiveness of Combination of Facial Proprioceptive Neuromuscular Facilitation and Muscle Energy Technique for Neck Muscles in Patients with Bell's Palsy

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Abstract :

BACKGROUND: Bell's palsy changes facial expressions and lead to functional problems in facial movement and negative psychological effects on patients. There are many physiotherapy interventions used in treatment of Bell's palsy, among them includes electrical stimulation, proprioceptive neuromuscular facilitation (PNF) technique, Muscle Energy Technique (MET) etc. Thus, this study intends to know the combined effects of facial PNF and MET for neck muscles in patients with Bell's palsy.

METHODOLOGY: 20 patients with Bell's palsy were selected and divided into two groups based on selection criteria. Group A received Muscle Energy Technique along with Facial PNF and Group B received Facial PNF. Sunnybrook facial grading scale was used as an outcome measure for pre and post assessment.

RESULT: On comparing pre to post intervention values in group A and group B, there was no significant difference in terms of facial movements and symmetry statistically, in both the groups.

CONCLUSION: The present study concluded that both the groups showed average improvement in terms of facial movements and symmetry, but no significant statistical difference was seen between the groups.

keywords: **Bell's palsy, Facial Proprioceptive Neuromuscular Facilitation, Muscle Energy Technique.**

I. INTRODUCTION

Bell's palsy is a condition caused by dysfunction of cranial nerve VII, "The facial nerve" which is characterized by an acute, unilateral, partial or complete paralysis of face or acute weakness, with a prevalence of 11-40 cases per 100,000 persons [1] and highest incidence in the age group of 15 to 45 years[2].

Bell's palsy can impair ability to communicate by facial expression and articulation, it may also lead to severe temporary oral insufficiency like drinking and eating [3, 4.] Bell's palsy is characterized by loss of forehead wrinkles, an inability to close one's eyes due to discomfort, lip distortion to the opposite side, and epiphora[1].

There are many approaches used for the rehabilitation of Bell's palsy which includes electrical stimulation, facial massage, mime therapy etc. One of the approach among them is Proprioceptive Neuromuscular Facilitation (PNF) devised by Kabat, Knott and Voss[5], it is a manual resistance technique that works by simulating fundamental pattern of movement, and also the Muscle Energy Technique (MET), a different strategy, is based on active muscle relaxation and works to loosen and lengthen stiff muscles by utilizing their inherent energy[1]. The patient can actively participate in the therapy process with MET, which has a larger range of uses for treating the neurological and musculoskeletal systems. MET's effectiveness has been demonstrated in both experimental and clinical settings[6]. Most studies done on Bell's palsy focuses to treat weak facial muscles to restore the voluntary facial movements. Even though, few studies focused on treating the neck muscles in Bell's palsy, there are hardly any studies done on understanding the combination effectiveness of treating the facial and neck muscles in Bell's palsy.

II. MATERIALS AND METHODS
STUDY DESIGN: Experimental.
CRITERIA FOR SAMPLE SELECTION
INCLUSION CRITERIA:

- AGE: - 20-40 years.
- GENDER: - Male and Female.
- ONSET OF SYMPTOMS: - 2-4 weeks.
- Patients diagnosed with unilateral 7th cranial nerve LMN lesion.

EXCLUSION CRITERIA:

- Contracture of facial muscles
- Sensory deficit over face
- Dysarthria

- ENT surgeries/ disorders
- Bell's palsy due to viral infection

SAMPLE SIZE: 20 participants

SAMPLING METHOD: Convenience sampling

The patients were assigned into 2 groups, Group A and Group B, in which,

Group A received Muscle Energy Technique for neck muscles and Facial Proprioceptive Neuromuscular Facilitation and Electrical Stimulation and patient specific exercises.

Group B received Facial Proprioceptive Neuromuscular Facilitation and Electrical Stimulation and patient specific exercises.

TREATMENT DURATION: 30-40 minutes, 10 sessions

III. PROCEDURE AND TREATMENT:

The Group A and Group B patients were assessed with Sunny Brook Grading Scale followed by administration of the treatment techniques, and were reassessed with same outcome measure after 10 sessions of treatment.

GROUP A received Muscle energy technique along with Facial Proprioceptive Neuromuscular Facilitation, Electrical Stimulation and patient specific exercises.

ELECTRICAL STIMULATION: 30 stimulations of 3 sets to the motor points of Frontalis, Orbicularis Oculi, Levator Palpebrae Superioris, Procerus, Risorius and Zygomaticus Major, Orbicularis Oris, Mentalis for 10 sessions were given.

MUSCLE ENERGY TECHNIQUE:

MET for Upper trapezius

STEP 1: - The patients were asked to be in a supine position, the therapist supported the back of patient's head with contact hand and placed her stabilizing hand on patient's clavicle.

STEP 2: - The patient's neck was positioned in contralateral side flexion. The therapist instructed the patient "Bring your ear towards the shoulder and shrug your shoulder simultaneously" then applied resistance to this action to achieve an isometric contraction for 7 seconds, while the patient held the breath.

STEP 3: - Then the patients were asked to breathe out and relax and the muscle was stretched for 30 seconds while the patient was in relaxed state.

The procedure was repeated for 2 times.

Figure 1: Starting and ending position of MET Upper trapezius
(Demonstrated on model)

MET for Sternocleidomastoid

STEP 1: The patients were asked to be in supine position with a cushion/ folded towel under the scapular region to keep the head slightly bent backwards onto the bed. The therapist placed the contact hand on the ipsilateral mastoid process and the stabilizing hand reinforced the patient's contralateral hand which was placed over the sternum.

STEP 2: The patients were asked to hold the breath while rotating the head to contralateral side and then to lift the head off the bed, so that gravity offered the resistance and they held this position for 7 seconds.

STEP 3: The patients were asked to breathe out and relax and the stabilizing hand was diagonally pushed towards the foot on the same side to stretch the muscle for 30 seconds while the patient was in a relaxed state.

The procedure was repeated for 2 times.

Figure 2: Starting and ending position of MET Sternocleidomastoid (Demonstrated on model)

FACIAL PNF:

Before each step the therapist demonstrated the patient which facial movement is expected to be performed.

STEP 1: The therapist instructed the patient "lift your eyebrows up" while applying resistance to the forehead, pushing caudally and medially.

STEP 2: The therapist instructed the patient "close your eyes" while applying gentle diagonal resistance to eyelids.

STEP 3: The therapist instructed the patient "open your eyes" and while applying resistance to the upper eyelids.

STEP 4: The therapist instructed the patient "wrinkle your nose" while applying resistance next to the nose diagonally down and out.

STEP 5: The therapist instructed the patient "smile" while applying resistance to the corner of the mouth medially and slightly downward.

STEP 6: The therapist instructed the patient "purse your lips" while applying resistance laterally and upward to the upper lip, laterally and downward to the lower lip.

STEP 7: The therapist instructed the patient "wrinkle your chin" while applying resistance down and out at the chin.

Figure 3: Facial PNF steps (Demonstrated on model)

Each step was repeated for 15 times on the unaffected side before proceeding on to the next step.

GROUP B received Facial PNF (same procedure as stated for patients in GROUP A), Electrical stimulation and patient specific exercises.

DATA ANALYSIS AND RESULTS

Statistical analysis of the data was performed using SPSS 20.0.The continuous variables were presented as mean± SD. Categorical variables were presented in frequency and percentage. Pre post comparison in Sunny brook facial grading score was done by paired t test. A p value<0.05 was considered statistically significant.

Table 1: Pre post comparison of Sunnybrook Facial Grading Scale in Group A

Group A		Mean	Std. Deviation	Average improvement	t value	P value
Group A	Pre	24.2	11.311	28.2	9.663	P<0.001
	Post	52.4	15.664			

The above table depicts that average pre Sunny brook facial grading score in group A was 24.2±11.31, before the treatment and after 10 sessions of treatment, it was 52.4±15.664. The average improvement was 28.2 with p<0.001.

Graph 1: Pre post comparison of Sunnybrook Facial Grading Scale in Group A
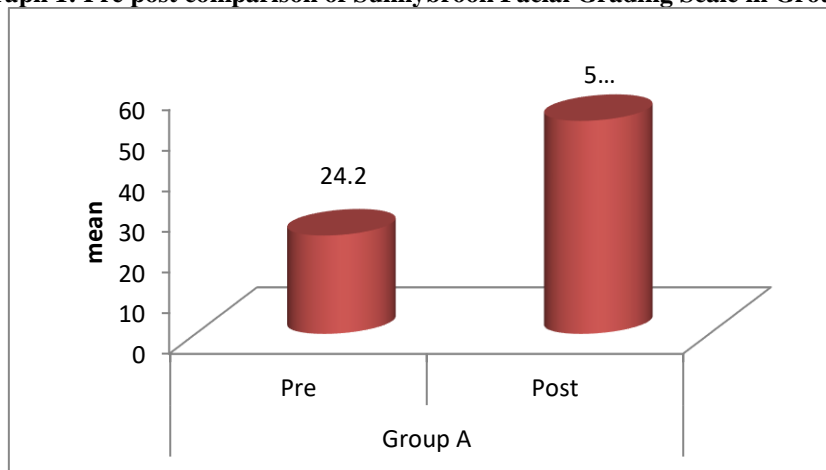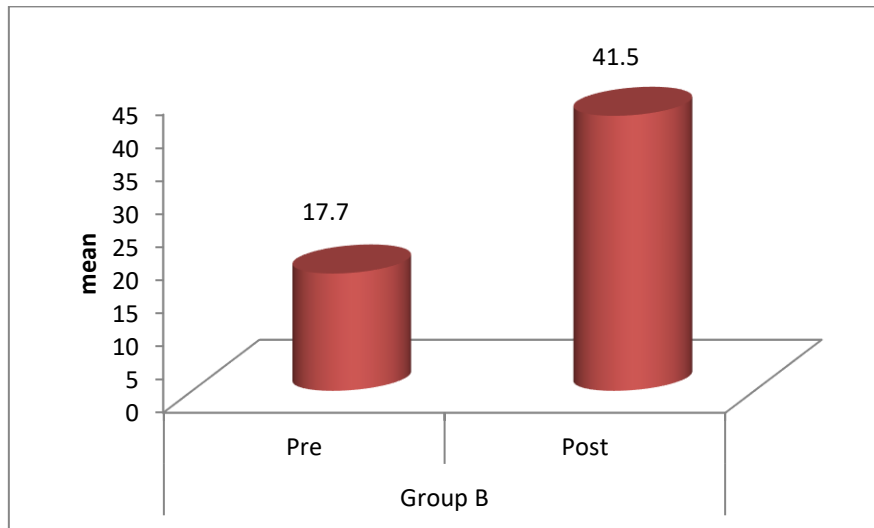

Table 2: Pre post comparison of Sunnybrook Facial Grading Scale in Group B

Group B	Mean	Std. Deviation	Average improvement	t value	P value
Pre	17.7	11.185	23.8	7.201	P<0.001
Post	41.5	16.972			

The average pre Sunny brook facial grading score in group B was 17.7±11.185, before the treatment and after 10 sessions of treatment, it was to 41.5±16.972. The average improvement was 23.8 with p<0.001.

Graph 2: Pre post comparison of Sunnybrook Facial Grading scale in Group B


The Pre post comparison in group A and group B showed statically significant improvement in Sunny brook facial grading score.

Table 3: Comparison of Sunny brook facial grading score between group A and group B.

		Average improvement	Std. Deviation	t value	P value
	Group A	28.2	9.330	1.037	0.131
	Group B	23.8	9.635		

The analysis of comparison between group A and group B in Sunny brook facial grading score showed average improvement in group A with 28.2±9.33 and in group B with 23.8±9.635 at $p>0.05$, indicating no statistically significant difference between group A and group B.

Graph 3: Comparison of Sunny brook facial grading score between group A & group B.
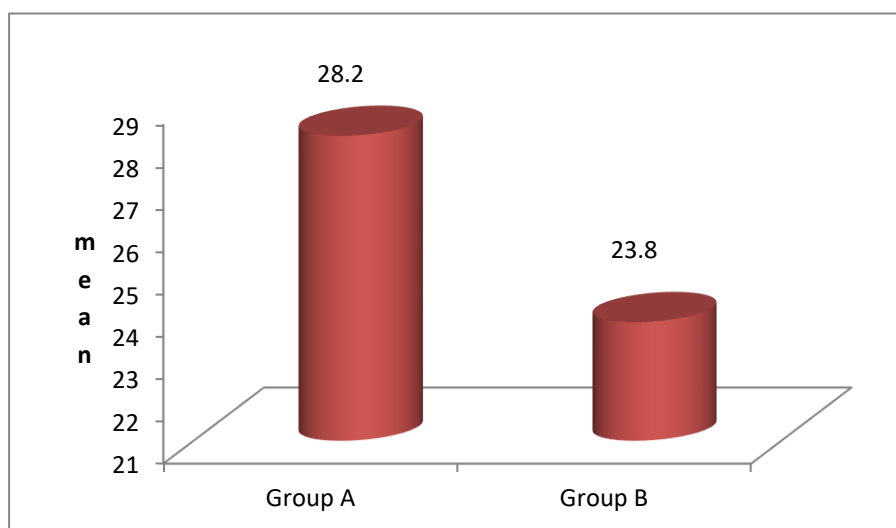
DISCUSSION

On comparing GROUP A and GROUP B, analysis of comparison between these two groups showed average improvement in group A 28.2± 9.33 and in group B was 23.8± 9.635 with $p> 0.005$ indicating no statistical difference between group A and group B. The possible physiology of improved facial symmetry may be due to the following reasons, in proprioceptive neuromuscular

facilitation technique, it is the resistance to the motion or the intact muscle that produces irradiation, and the spread of muscular activity will occur in specific patterns, i.e. to weaker or paralysed muscles which in turn induces the muscle contraction. Sternocleidomastoid is closely related to stellate ganglion, which is the central ganglion through which sympathetic nerves that travel to head, neck and chest pass and carotid arteries and the SCM muscles are ventrally distributed. Since Bell's palsy is known to develop as a result of reduced microcirculation in the facial nerves, a stellate ganglion block may treat Bell's palsy by improving blood flow in common carotid artery. Relaxing the SCM muscle by giving MET reduces stimulation of the stellate ganglion, alleviates hyper activation of the sympathetic nervous system, and increases peripheral blood flow in the face, representing an effective method for treating Bell's palsy. The upper fibers of trapezius muscle are controlled by the same accessory nerve that control the SCM muscle. The effects produced by MET to upper trapezius could influence the recovery of Bell's palsy symptoms with its close association with SCM.

CONCLUSION
There was no significant difference in terms of facial movements and symmetry among the patients who received facial PNF along with MET for neck muscles and patients who received facial PNF alone.

RECOMMENDATIONS
This study evaluated facial movements, its symmetry and synkinesis as outcome measures, in future studies addressing the pain parameter as outcome measures can also be done.

LIST OF ABBREVIATIONS
MET: Muscle Energy Technique
PNF: Proprioceptive Neuromuscular Facilitation
UT: Upper Trapezius
SCM: Sternocleidomastoid
LMN: Lower Motor Neuron
QoL: Quality of Life
FaCE/FDI: Facial Clinometric Evaluation Scale and Facial Disability Index

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