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Exploring Muscle Energy Technique as A Physiotherapeutic Intervention for Peripheral Facial Palsy: A Pilot Report

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Abstract

Background: Peripheral facial palsy results from damage to the peripheral branches of the facial nerve, often presenting as a sudden weakness in the muscles on one side of the face. Research on the application of muscle energy technique (MET) for treating this condition is scarce. Therefore, the aim of this study was to assess the effectiveness of MET in the treatment of peripheral facial palsy. Methods: 15 patients suffering from peripheral facial palsy attending Physical Medicine and Rehabilitation Department for physiotherapy were included in the study to assess their collective impact. The study spanned a duration of 2 weeks, utilizing a combination of muscle energy technique and electrical muscle stimulation as interventions. Treatment duration of one session were approximately 30 minutes. Three measuring tools were taken namely Sunnybrook Facial grading scale((SFGS), House Brackmann Scale (HBS) and Facial Disability Index (FDI). The data collection for the study is conducted on the 1st ,7th and 14th day. Results: There are statistically significant differences between the 1st, 7th, and 14th sessions for FDI-physical function sub-scale, HBS, and SFGS scores, with all mean differences being negative (1st < 7th < 14th), and p-values of 0.000, supported by the 95% confidence intervals. However, for FDI-Social function sub-scale, there are no significant differences, as all p-values (0.255, 0.499, 0.290) exceed 0.05, and the confidence intervals include zero. Overall, MET is effective for improving physical and nerve function, though its impact on social functioning may require longer-term evaluation. Conclusions: MET demonstrated a noticeable beneficial impact on the patients. MET effectively enhances physical and nerve function, but its effect on social functioning may need extended evaluation. The results confirm that the treatment is effective for peripheral facial palsy, especially in the early stages of recovery.

Keywords: Peripheral facial palsy, muscle energy technique, sunny brook facial grading scale, facial disability index, house brackmann scale

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INTRODUCTION

Peripheral facial palsy typically involves muscle weakness on one side of the face, with Bell's palsy being the most common form [1]. In India, the incidence of Bell's palsy ranges from 20 to 30 cases per 100,000 people, representing nearly 70% of all instances of unilateral peripheral facial palsy.[2] Peripheral facial palsy may have various other causes, including Ramsay Hunt syndrome and traumatic injury. Peripheral facial palsy results from damage to the peripheral branches of the facial nerve, leading to weakness or paralysis of muscles on one side of the face. The clinical symptoms of this condition vary based on the site of the lesion along the facial nerve. Those affected typically display facial asymmetry, trouble closing the eye or

mouth, and sagging of the eyebrow or mouth corner. These issues can interfere with everyday tasks, making activities such as seeing, speaking, and eating challenging.

A range of physiological and physical tests are used to assess the severity of facial nerve paralysis or involvement of cranial nerve VII, informed by patient history and clinical examination. Treatment options include medical and surgical interventions designed to gradually alleviate symptoms [2].

Physical therapy plays a crucial role in managing and treating peripheral facial palsy. Current treatment methods include soft tissue mobilization, electrical muscle stimulation, neural mobilization, proprioceptive neuromuscular facilitation, neuromuscular re-education, mirror therapy, facial motor imagery, kinesiotherapy, facial expression exercises, and muscle energy technique [3].

Relaxing the sternocleidomastoid muscle helps reduce stimulation of the stellate ganglion, which can alleviate sympathetic nervous system overactivity and improve blood flow to the face. Addressing the upper trapezius and sternocleidomastoid muscles can aid in restoring proper cervical alignment and influence the activation of the spinal nucleus of the trigeminal nerve, extending to the C2 spinal cord level.[3] Muscle energy technique (MET) applied to the upper trapezius, sternocleidomastoid, levator scapulae, and scalene muscles proved effective in treating peripheral facial palsy [4].

Muscle energy technique (MET) was initially created by osteopathic physicians Fred Mitchell, Sr. and Fred Mitchell, Jr. to address soft tissue issues, mobilize joints, stretch tight muscles and fascia, alleviate pain, and enhance circulation and lymphatic flow [5,6]. MET involves a patient-generated contraction of skeletal muscles against a controlled resistance applied by the practitioner in a precise direction and position. This method relies on active muscle relaxation, harnessing the muscle's own energy to stretch and release tight muscles.

Since the 1950s, electrical muscle stimulation has been utilized to enhance facial function and reduce sequelae. Transcutaneous electrical stimulation stimulates motor nerves that innervate weakened muscles, causing contractions and helping to prevent muscle atrophy [7].

Numerous studies provide comparative and experimental analyses of various physiotherapeutic techniques; however, research on the use of MET remains limited. This study focuses on the effectiveness of MET, emphasizing its potential to facilitate a quicker recovery response. Hence, this study aims to evaluate the effectiveness of MET in managing peripheral facial palsy.

METHODOLOGY

As the study included human subjects, ethical clearance was obtained from the Institutional Ethical Committee, Jorhat Medical College and Hospital, Jorhat, as per the ethical guidelines for Biomedical Research and Human Subjects ,2000, ICMR, New Delhi. Patients were thoroughly informed about the study, and consent forms were signed following screening based on inclusion and exclusion criteria. 15 patients (9 male and 6 female) suffering from peripheral facial palsy attending Physical Medicine and Rehabilitation (PM&R) Department for physiotherapy were included in the study. All consecutive cases of peripheral facial palsy were taken.

The inclusion criteria were:

- Subjects medically diagnosed with unilateral peripheral facial palsy
- Subjects within ages of 15-60 years
- Acute onset within one month
- Patients with moderate to severe facial nerve paralysis as per House Brackmann scale: IV, V, VI

The exclusion criteria were:

- Post surgical cases of neck, upper limb and face.
- Subjects having existing severe neurological disorder, skin allergies or skin lesion
- Patients with a pacemaker or deep brain stimulator

The study spanned a duration of 2 weeks, allowing for comprehensive analysis of the treatment's effectiveness within the timeframe. The study utilized a combination of MET and Electrical muscle stimulation (EMS) as interventions to assess their collective impact. Treatment duration of one session is approximately 30 minutes. The study utilizes three assessment tools: the Sunnybrook Facial Grading Scale to evaluate resting symmetry, voluntary movement of facial muscles, and the presence of synkinesis; the House-Brackmann Scale to determine the level of functional impairment; and the Facial Disability Index to assess the severity of disability. The data collection for the study is conducted on the 1st ,7th and 14th day to track the progress and any changes observed throughout the duration of the intervention.

Muscle Energy Technique

1. *Upper trapezius muscle*: The patient lay supine with the treated arm beside the trunk and head side-bent away from the restriction. The practitioner stabilized the shoulder and cupped the ipsilateral ear. The patient resisted bringing the shoulder and ear closer for 7-10 seconds while holding their breath. Afterward, the muscle was stretched during exhalation for 30 seconds. This was repeated three times.
2. *Sternocleidomastoid muscle*: The patient lay supine with a 10–15-degree neck extension, the contralateral hand on the sternum, and the head fully rotated. The patient lifted the head slightly while holding their breath for 7-10 seconds, then slowly released. The practitioner applied an oblique stretch with one hand on the sternum and the other on the mastoid, holding for 30 seconds. This was repeated three times.
3. *Levator scapulae muscle*: The patient lay supine with the head in flexion, fully side-flexed, and rotated away from the treated side. The patient pushed the head backward and slightly to the side against the practitioner's resistance while also performing a resisted shoulder shrug. After 7-10 seconds of isometric contraction and breath holding, a stretch was applied to the contact points and held for 30 seconds as the patient exhaled. This process was repeated three times.
4. *Scalene muscles*: The patient lay supine with a cushion under the upper thoracic area, the head rotated 45 degrees away from the treated side. They lifted the forehead slightly and attempted to turn the head toward the affected side against resistance for 7-10 seconds while holding their breath. A mild stretch was then applied with slight neck extension as the patient exhaled, held for 30 seconds, and repeated three times.

Electrical muscle Stimulation

Electrical Muscle Stimulation (EMS) included galvanic current to stimulate the facial muscles. The treatment involved using a 100-millisecond intermittent galvanic current at the motor points, applied for 30 cycles in three rounds per point, with the current intensity adjusted to achieve minimal muscle contraction. 8

RESULTS

An interventional study performed on 15 patients with 9 male and 6 female subjects were included in the study. Statistical analysis was performed using SPSS software for Windows, with a significance level set at 0.05 Paired t-test was conducted as Facial Disability Index, House Brackmann Scale, and Sunnybrook Facial Grading Scale have varying ranges and levels of variability and follows normal distribution. So further for comparison purpose paired-t-test was performed. Microsoft excel and word was used to generate graphs and tables. Table 1 represents 1st and 7th day variables; Table 2 represents 1st and 14th day variables and Table 3 represents 7th and 14th day variables. Figure 1 represents gender distribution with 40% male and 60% female subjects; Figure 2, 3,4 and 5 represents scores of 1st and 14th day of FDI-physical function subscale, FDI-social function subscale, House Brackmann scale and Sunnybrook facial grading scale respectively.

A statistically significant difference was observed in the Facial Disability Index-Physical Function Subscale (FDI-PFSS) between the 1st, 7th, and 14th assessments. In each case, the mean difference is negative, with FDI-PFSS 1st being lower than both the 7th and 14th, and FDI-PFSS 7th being lower

than the 14th. All p-values are 0.000, and the 95% confidence intervals support these differences. Hence, FDI-PFSS scores indicate significant improvement in physical function from the 1st to the 7th and 14th sessions.

No statistically significant difference was found in the Facial Disability Index-Social Function Subscale (FDI-SFSS) between the 1st, 7th, and 14th assessments, with p-values of 0.255, 0.499, and 0.290, all greater than 0.05. The 95% confidence intervals also include zero, indicating no significant changes in social functioning.

On the other hand, a statistically significant difference was found in the House-Brackmann Scale (HBS) between the first, seventh, and fourteenth assessments. The mean differences were negative, with HBS 1st showing lower scores compared to both the 7th and 14th assessments, and the 7th score being lower than the 14th. All p-values were 0.000, and the 95% confidence intervals confirmed these significant improvements in facial nerve function over the course of the sessions.

A statistically significant difference was also observed in the Sunnybrook Facial Grading Scale (SFGS) between the first, seventh, and fourteenth assessments. The mean differences are negative, with SFGS 1st being lower than both the 7th and 14th, and SBGS 7th being lower than the 14th. All p-values are 0.000, and the 95% confidence intervals support these differences. Hence, SFGS Scores indicate marked improvement in facial nerve function over time.

Overall, MET is effective for improving physical and nerve function, though its impact on social functioning may require longer-term evaluation.

Table 1. 1st and 7th variable Table.

Variables	Mean	Std. deviation	t-value	p-value
FDI-PFSS	-29.0000	11.4018	-9.851	0.000
FDI-SFSS	3.467	11.300	1.188	0.255
HBS	-1.733	1.033	-6.500	0.000
SFGS	-18.000	8.742	-7.974	0.000

Table 2. 1st and 14th variable Table.

Variables	Mean	Std. deviation	t-value	p value
FDI-PFSS	-44.5667	11.0935	-15.559	0.000
FDI-SFSS	2.133	11.892	0.695	0.499
HBS	-4.067	1.223	-12.880	0.000
SFGS	-43.800	11.194	-15.154	0.000

Table 3. 7th and 14th variable Table.

Variables	Mean	Std. deviation	t value	p value
FDI-PFSS	-15.5667	8.8919	-6.780	0.000
FDI-SFSS	-1.333	4.701	-1.099	0.290
HBS	-2.333	0.724	-12.486	0.000
SFGS	-25.800	7.321	-13.648	0.000

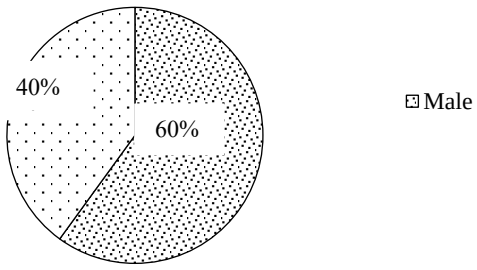

Figure 1. No. of subjects in gender distribution.

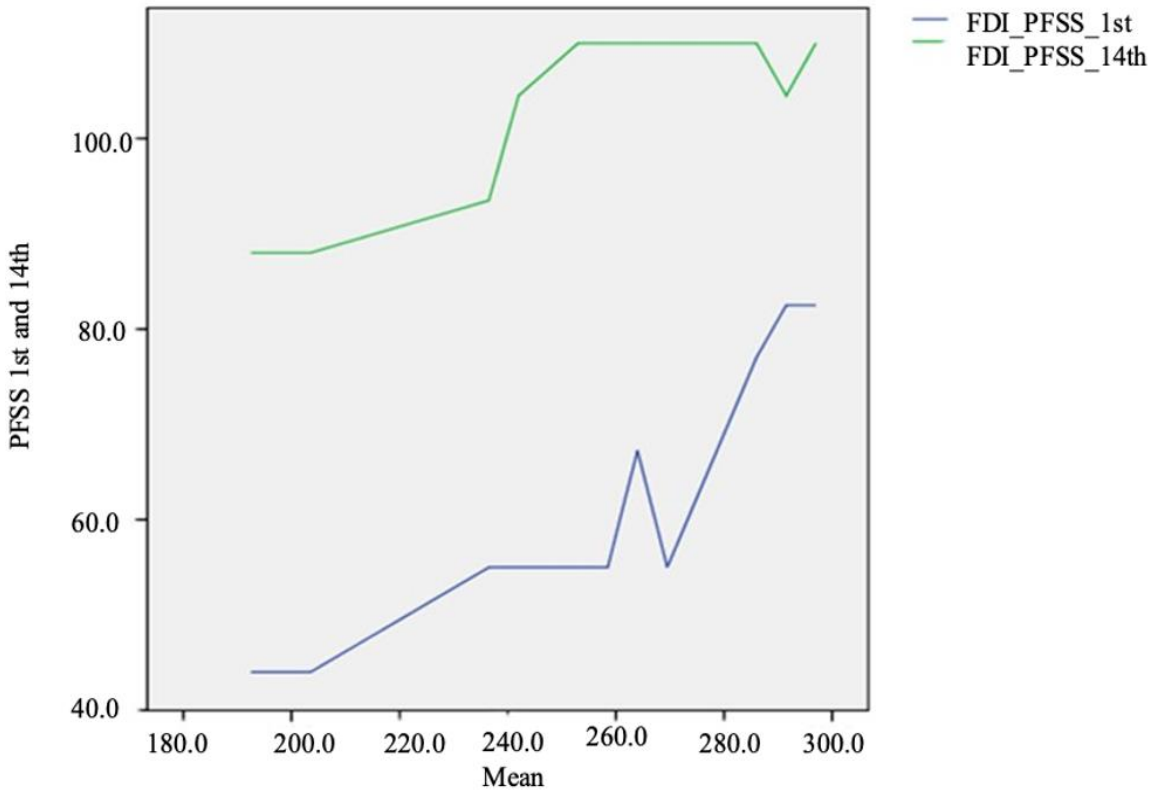

Figure 2. Graph representing FDI-PFSS scores of 1st and 14th day.

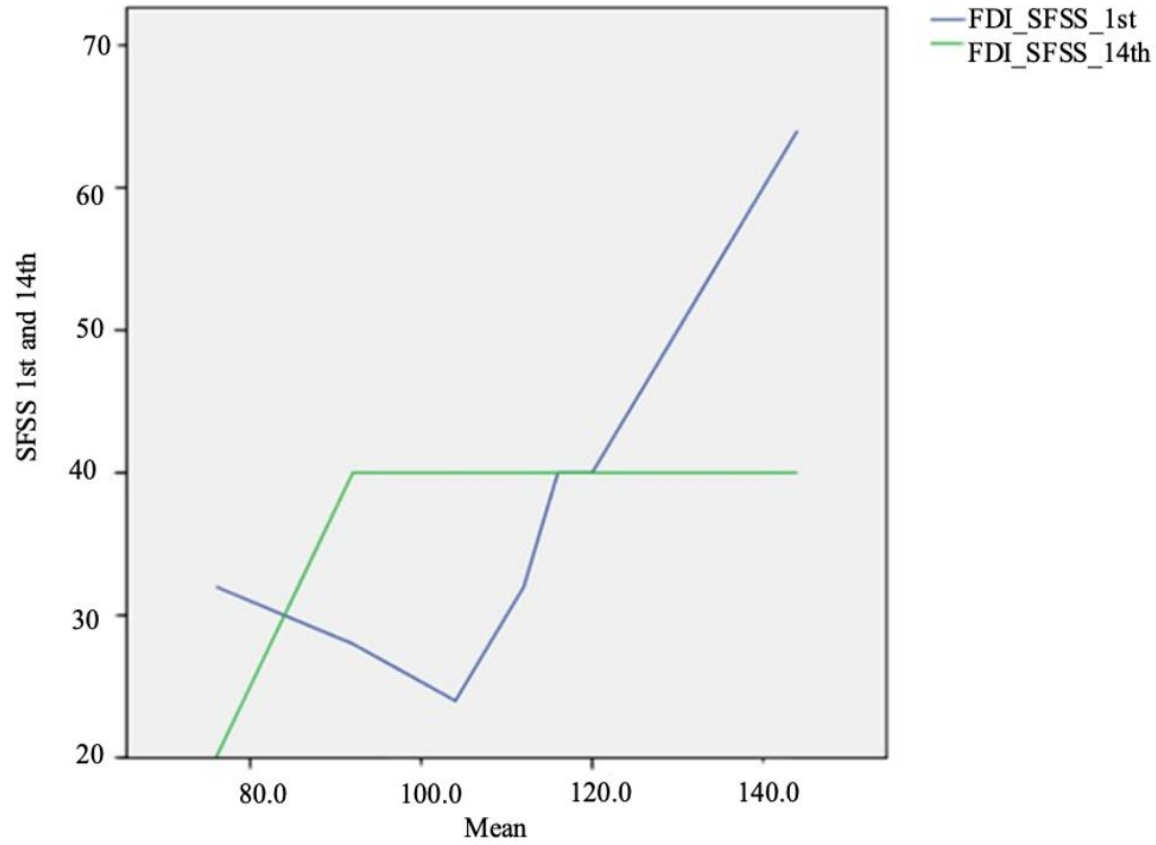

Figure 3. Graph representing FDI-SFSS scores of 1st and 14th day.

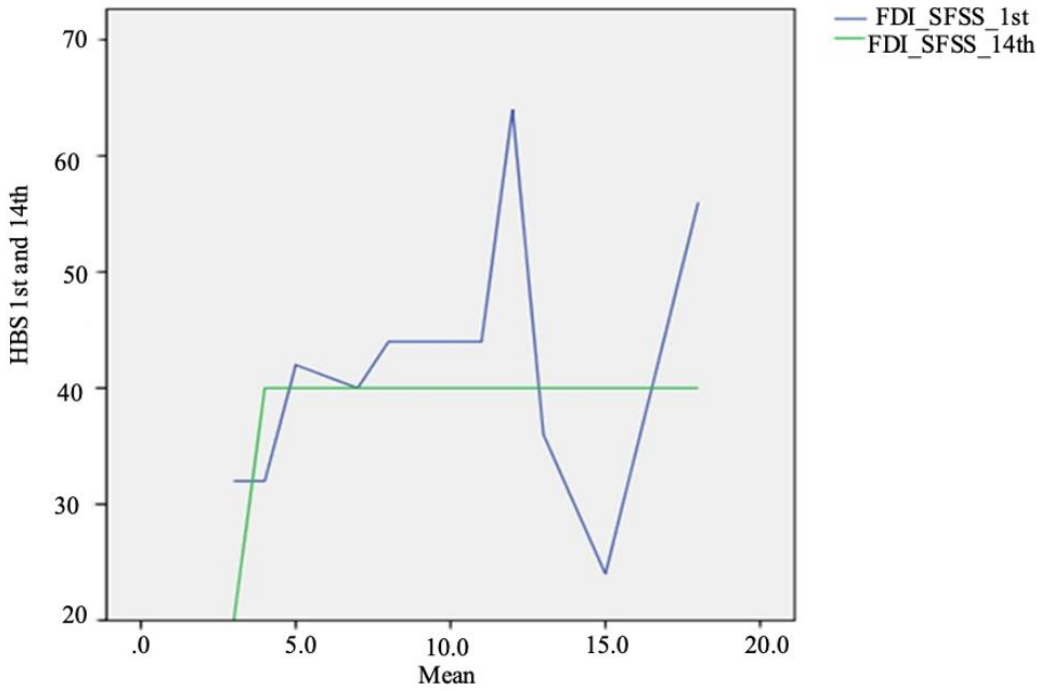

Figure 4. Graph representing HBS scores of 1st and 14th day.

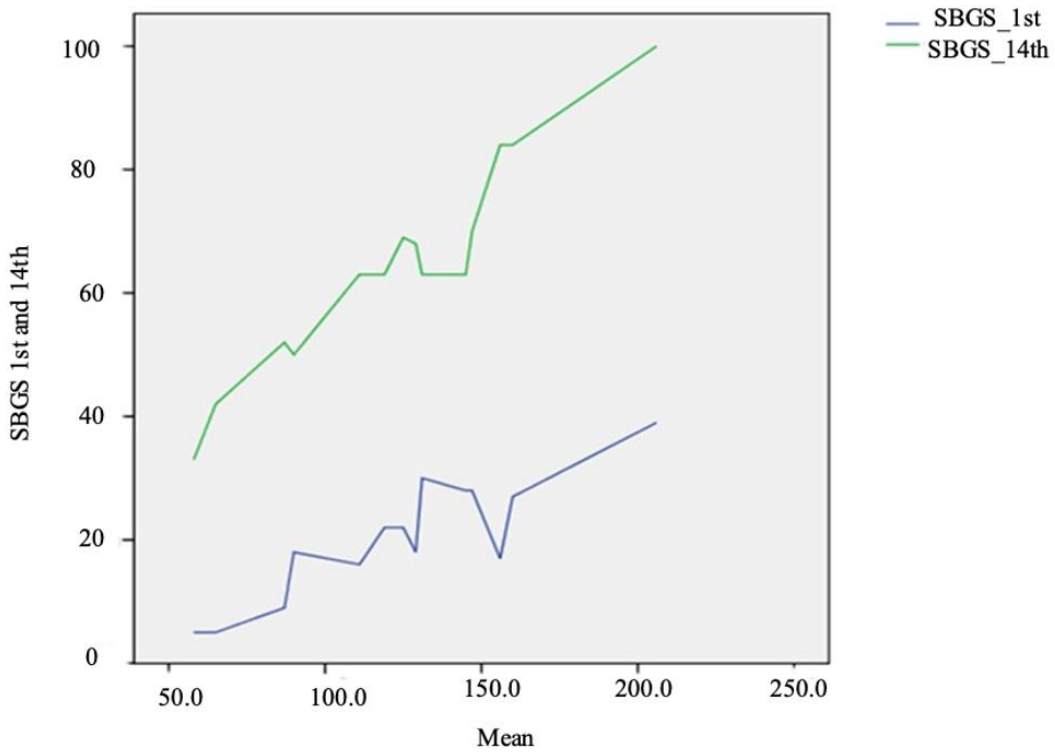

Figure 5. Graph representing SFGS scores of 1sts and 14th day.

DISCUSSION

Peripheral facial palsy is a common problem among facial nerve damage people with higher incidence of weakness and pain of the face seen, involving different impairment of muscle control. Hence this pilot study is aimed to see the effects of Muscle Energy Technique as an intervention on peripheral facial palsy individuals [8,9].

15 subjects are included where 9 subjects are male and 6 are female. Demographic data where baseline variables as subjects medically diagnosed with unilateral peripheral facial palsy within ages of 15-60 years and acute onset within one month, as well as measurement tools including Sunnybrook Facial grading scale, House Brackmann Scale and Facial Disability Index were used and muscle control of upper trapezius, sternocleidomastoid, levator scapulae and scalene are recorded. The Muscle Energy Technique showed a noticeable positive effect on patients. The findings support the treatment's effectiveness in managing peripheral facial palsy, especially during the early recovery phase.

The sternocleidomastoid muscle is anatomically located near the stellate ganglion. This ganglion is found in about 80% of individuals and is formed by the fusion of the inferior cervical and first thoracic sympathetic ganglions, typically at the level of the C7 transverse process.[9] The effectiveness in managing symptoms of these conditions is due to its ability to block the sympathetic nervous system (SNS) and enhance peripheral blood flow to the face.

Muscle Energy Techniques have demonstrated potential in relaxing the sternocleidomastoid muscle and relieving neck pain. This technique involves active muscle contractions followed by stretching, which promotes flexibility and reduces muscle tension through post-isometric relaxation. MET helps to relax and lengthen the muscle. This is supported by a systematic review done by Edwan Thomas in 2019, which have shown that MET can significantly reduce muscle tension in various conditions. MET can be applied to increase range of motion of a joint when functional limitation is present [10].

Targeting the upper trapezius and sternocleidomastoid muscles can aid in restoring proper cervical alignment and potentially influence the activation of the spinal nucleus of the trigeminal nerve, extending to the C2 level of the spinal cord. This concept is supported by a 2017 study by Jong-Hyeon Park, which examined the effectiveness of muscle energy techniques on the upper trapezius and sternocleidomastoid muscles in the treatment of Bell's palsy [3,11-12].

Na Young Jo conducted a study to assess the clinical effects of Muscle Energy Technique (MET) on peripheral facial paralysis. The study involved applying MET to the upper trapezius, sternocleidomastoid, levator scapulae, and scalene muscles. A total of sixty patients were divided into two groups: Group A (n=30), which received standard Korean medicine, and Group B (n=30), which received both MET and standard Korean medicine. The findings indicated that MET was effective in alleviating the symptoms of peripheral facial paralysis. Muscle imbalances often create a chain reaction of tension among related muscle groups, where tightness in one area causes compensatory tension in others. By engaging each muscle with isometric contractions followed by controlled stretching, MET encourages post-isometric relaxation and helps relax the entire muscle group.

The primary goal of electrical stimulation is to promote nerve regeneration and preserve muscle mass and contractility. Myung Chul Yoo et al. (2023) reviewed preclinical and clinical studies examining the effectiveness of electrical stimulation therapy in aiding recovery from peripheral facial nerve injury. However, due to inconsistencies in study results and the low quality of evidence, electrical stimulation therapy is not yet considered a primary treatment for facial paralysis in patients [13]. Depending on the nerve injury and latencies deficiency in nerve conduction, patients with facial paralysis will be considered for a prolonged electrostimulation combined with exercise programs and drug treatment, in order to increase the success of the intervention [14]. Electrical stimulation alone may require a longer time to restore facial function in cases of facial palsy compared to when it is combined with other treatments. Thus, relying solely on electrical stimulation may not be adequate.

Electrical stimulation for facial palsy often produces inconsistent results and is not typically regarded as a primary treatment option. Furthermore, it may necessitate a longer recovery period. Furthermore, there are anecdotal potential negative effects of electrical stimulation in terms of increased aberrant reinnervation and synkinesis [15]. In contrast, Muscle Energy Technique can promote faster improvements in muscle function and overall recovery. This approach focuses on enhancing muscle performance and may offer more immediate benefits for patients.

The observed improvements in House-Brackmann scores, the Sunnybrook Facial Grading Scale, and the physical subscale of the Facial Disability Index may be attributed to enhanced blood flow, reduced muscle tension, and improved communication between nerves and muscles. Notably, in the social subscale of the Facial Disability Index, most patients demonstrated better scores by day 7, indicating that a significant portion of participants had already reached higher levels of social functioning early in the study. This ceiling effect can hinder the detection of further statistical improvements. When participants begin with high scores, there is less opportunity for measurable change, which may result in insignificant outcomes in subsequent assessments. Moreover, anxiety or depression was not associated with facial palsy severity [16]. The perceived severity of facial nerve paralysis is shaped by internal and external factors specific to each patient, rather than solely by the objective severity of the condition. Quality of Life (QOL) scores may not adequately reflect levels of impairment, as they are influenced by aspects beyond the physical impairment itself.

CONCLUSION

After analyzing the data, Muscle Energy Technique had a clear positive effect on patients. The improvements were especially notable in physical function subscale (FDI-PFSS) and House Brackmann scale (HBS) and Sunnybrook Facial Grading Scale (SFGS), with steady progress through the treatment period. Its impact on social functioning (FDI-SFSS) may require a longer assessment period. These results confirm that the treatment is effective for peripheral facial palsy, especially in the early stages of recovery. Thereby the alternative hypothesis is accepted which proves that Muscle Energy Technique is effective in peripheral facial palsy.

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Self

CONFLICTS OF INTEREST

There are no conflicts of interest.

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