

## Effectiveness of Proprioceptive Neuromuscular Facilitation V/S Massage in Patients with Bell's Palsy.

**Received:** 26 October 2022, **Revised:** 29 November 2022, **Accepted:** 31 December 2022

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### Keywords

Bell's palsy, PNF, Massage

### Abstract

Bell's palsy has a set of treatment protocol including traditional techniques e.g. massage, MMT, PNF, etc. as well as advanced modalities such as electrical stimulation. As we know massage and PNF both are traditional therapeutic techniques to treat Bell's palsy and used worldwide. The techniques are mainly focused on the qualitative recovery of the facial muscles as the primary recovery is achieved by electrical stimulation. Due to lack of time and resources the therapists tend to use only one of them. Thus this study will be done to find out which one of them is more effective and will ensure more qualitative recovery in minimum amount of time. Unilateral Bell's palsy patients were taken and filtered according to inclusion and exclusion criteria. Total 30 patients were included and divided into 2 groups (Group A and Group B). Every patient was assessed according to Sunnybrook Facial Grading Scale and the readings were recorded. Treatment protocol for group A was PNF along-with stimulation and for group B massage along-with stimulation. After 2 weeks of standard treatment protocol again assessment was taken using Sunnybrook Facial Grading Scale and the readings were recorded. With the pre and post-treatment readings difference was calculated for both groups and statistical analysis was done. PNF is considered slightly significant as a result of comparing the readings of Sunnybrook Facial Grading System between both the groups immediately after the intervention. It can be concluded that the PNF is significantly effective than massage. But, massage also has remarkable recovery. Therefore it is advisable to use both of them for good recovery.

## 1. Introduction

The face is representative part of body. The main activity of facial muscles is to perform expressions which show the physical as well as the mental state of the person. Bell's palsy is known as the paralysis of facial muscles caused by pathology of facial nerve. It is a lower motor neuron (LMN) type of lesion considering the injury is distal to the geniculate ganglion. It temporarily weakens or paralyzes facial muscles. With Bell's palsy, your face droops on one side. These patients experience difficulty in closing

eyelid. Bell's palsy affects men and women equally. It typically occurs in people between ages of 15-60. Patients who are having family history of Bell's palsy, diabetes, auto-immune disease, hypertension are more prone. The most common of the abrupt onset of unilateral facial weakness are stroke and Bell's palsy.

There are total 18 facial muscles performing different type of actions as well as helping to perform facial expressions. Occipitofrontalis is the only muscle of scalp. Below that Orbicularis oculi,

Corugetorsupercili and Levatorpalpebraesuperioris are the muscle around the orbit. Procerus, Compressor naris, Dilator naris, Depressor septi are the muscles of nose. At last Depressor angulioris muscle, Risorius, Zygomaticus major muscle, Zygomaticus minor muscle, Levatorlabiisuperioris, Levatorlabiisuperioris alaeque nasi muscle, Depressor labii inferioris muscle, Levatorangulioris, Buccinator muscle, Mentalis, Orbicularis oris are the muscles around the mouth and chin. There is one neck muscle named Platysma which has some of its part in face.

All the intrinsic muscles of face are supplied by facial nerve. The facial nerve originates from ponto-medullary junction. Throughout its course the nerve forms 11 branches in which 5 are terminal branches supplying the facial muscles. After originating the muscle gives 3 branches in the facial canal those are greater petrosal nerve, nerve to stapedius muscle and the chorda tympani. Just after exiting from stylo-mastoid foramen there are 3 branches posterior auricular, digastric and stylohyoid. The nerve passes through a narrow corridor of bone on its way to face. At last the nerve gives 5 terminal branches Temporal, Zygomatic, Buccal, Marginal mandibular and Cervical. In Bell's palsy the nerve becomes inflamed and swollen usually related to viral infection (rhino virus - most common, herpes - less common). The nerve even supplies the test buds in anterior 1/3 of tongue and a muscle in ear which is responsible for controlling the amplitude of volume reaching the eardrum (Stapedius muscle). But these functions are intact in Bell's palsy as the nerve gets injured distally

after supplying the tongue and the Stapedius.

Electrical stimulation is one of the traditional approaches for rehabilitation of facial palsy. It produces a generalised effect on the muscles which implies quantity but lacks in quality of muscle contraction. As facial expressions are important part of communication, generalised effect will not be enough to complete the rehabilitation. Thus an associated technique will help to complete it and provide the qualitative improvement as well.

The techniques of proprioceptive neuromuscular facilitation rely mainly on stimulation of proprioceptors for increasing the demand made on neuromuscular mechanism to obtain and facilitate its response. It works by stimulating fundamental patterns of movements, it either facilitates or inhibits the movement. Unlike other skeletal muscles facial muscles lack fascial enclosure and tendons. Which eventually allows them to move freely compared to other skeletal muscles and so there is lack of proprioception. Due to this particular phenomenon the muscles are unable to move properly without biofeedback (e.g. a mirror or EMG). PNF procedures consist of facilitating the voluntary response of a paralysed muscle and provides accuracy of facial movement patterns of isolated muscle control with the help of resistance and it avoids movements that promote contraction of muscles related to more than one facial expression.<sup>11</sup> PNF primarily improves the initiation of a particular muscle action.

Massage is a general term referring practices of manipulating soft tissue for therapeutic purposes. It incorporates manual touch to improve circulation, relax muscles, improve range of motion, etc. Effleurage, kneading, wringing, tapping are massage components used on the face. Bell's palsy treatment protocols often include massage along with electrical stimulation, exercises, and biofeedback. There is no large scale or specifically massage-targeted studies have yet been published. It is believed that as the facial sensations are intact with Bell's palsy, massage within pain tolerance is not only safe, but it may be an important intervention to keep flaccid muscles elasticity and well nourishment.<sup>12</sup>

The Sunnybrook Facial Grading System is consist of three components which are face at rest, voluntary motion, synkinesis, three facial regions at rest, and five facial regions in voluntary motion with or without synkinesis. Within each component and facial region there are three to five levels. It gives a composite score that describes the overall static and dynamic condition of the face. The Sunnybrook Facial Grading System is intuitively easy to use, and is clinically relevant. It has the sensitivity, reliability, and precision required for serious facial nerve research.<sup>13</sup> It is commonly used to measure the qualitative recovery after facial nerve surgery.

There are many traditional approaches used for rehabilitation of Bell's palsy which includes electrical stimulation. Studies have states that patients treated with electrical stimulation produce mass action. It is generalised contraction of all facial muscles with attempted facial expressions. Facial

muscles should improve in order to maintain symmetry and expressions so it is the need to focus on specific muscles or we can say a specific functional activity.

Massage is an independent and proven technique but to calculate its effect in improving Bell's palsy it is better to compare it with something. To find out significance of any technique involving Bell's palsy it is easy to compare it with proprioceptive neuromuscular facilitation as it has great significance in qualitative recovery of facial muscles (E.g. a study concludes that kinesio-taping with facial exercises is more effective than facial PNF in treating patients with unilateral Bell's palsy<sup>4</sup>). Thus, the objective of the study is to compare the effectiveness of massage and PNF as well as to calculate the effectiveness of massage.

## 2. Methodology

An ethical clearance was taken from the institutional ethical committee. Patients diagnosed with unilateral Bell's palsy by physician were included in the study. Some of the patients were excluded for additional illnesses, bilateral symptoms, facial palsy, Bell's palsy as a complication of surgical procedure, patients with ear infections, chronic Bell's palsy as these conditions can interfere with symptoms causing errors in the results. Inclusion criteria patients with classical unilateral Bell's palsy symptoms, patients who can follow the sessions without fail, A written consent form was taken from each participants included in this study. After applying the inclusion exclusion criteria total 30 patients were selected. Majority patients were residents of Karad,

Maharashtra. Purpose of the study and roll of patient was clearly explained to the patients before starting the actual study.

Subjects were divided into 2 groups equally. Both of them were assessed by Sunnybrook facial grading scale for synkinesis, symmetry of voluntary movements and resting symmetry. Here after group A and group B received different interventional protocols (i.e. PNF for group A and Massage for group B). Both groups contained 15 patients each, total it was 30 patients. The common intervention for both groups was electrical stimulation as the standard protocol was chosen i.e. galvanic stimulation for facial muscles 3 sets of 30 repetitions and 3 sets of 3 repetitions of faradic current for 3 trunks of facial nerve. Protocol included minimum 5 sessions per week; maximum 1 session per day.

Subjects in group A received facial proprioceptive neuromuscular facilitation. Session begun with electrical stimulation as specified above. Then 15 repetitions for 3 sets of proprioceptive neuromuscular facilitation within 30 minutes ended the session. Exercises for this group included elevation and depression of eyebrows, opening and closing of the eyelids, retraction of angle of mouth upward, protrusion of lips. Protocol included minimum 5 sessions per week; maximum 1 session per day.

Subjects in group B undergone massage as intervention along with electrical stimulation. Session started with electrical

stimulation as mentioned above, and then facial massage was given. Protocol included minimum 5 sessions per week; maximum 1 session per day. Massage included:

1. Effleurage
2. Kneading
3. Wringing
4. Tapping and
5. Manual lymphatic drainage (in case of oedema)

Patients were treated for 2 weeks which is the standard treatment time for Bell's palsy. At the end of 2 weeks patients were assessed by Sunnybrook facial grading scale. Readings were recorded and basic statistical procedures up to standard deviation were done using Microsoft word. Further statistics was done using the application Instat.

Statistical analysis was done with the help of Microsoft Excel for initial process (to calculate Mean, SD). For further calculations, statistics software INSTAT was used. The analysis was done using assumption test carried out by the Kolmogorov and Smirnov method. The data was following Gaussian Distribution. To compare the pre and post values of Sunnybrook facial grading system from within the group the paired t test was used, whereas to compare the values between both the groups (pre-pre and post-post) unpaired t test was used.

### 3. Results

**Table No. 1 (Proprioceptive Neuromuscular Facilitation)**

<b>GROUP-A</b>	<b>Pre-assessment</b>	<b>Post-assessment</b>
<b>Mean</b>	27.067	89.067
<b>SD</b>	5.7	3.807
<b>Median</b>	26	90
<b>Minimum</b>	17	82
<b>Maximum</b>	36	95

### Interpretation

The two-tailed P value is <0.0001, considered extremely significant.

t = 38.035 with 14 degrees of freedom.

**Table No. 2 (Massage)**

<b>GROUP-B</b>	<b>Pre-assessment</b>	<b>Post-assessment</b>
<b>Mean</b>	30.93	78.93
<b>SD</b>	5.522	6.250
<b>Median</b>	32	78
<b>Minimum</b>	21	70
<b>Maximum</b>	40	92

### Interpretation

The two-tailed P value is <0.0001, considered extremely significant.

t = 43.993 with 14 degrees of freedom.

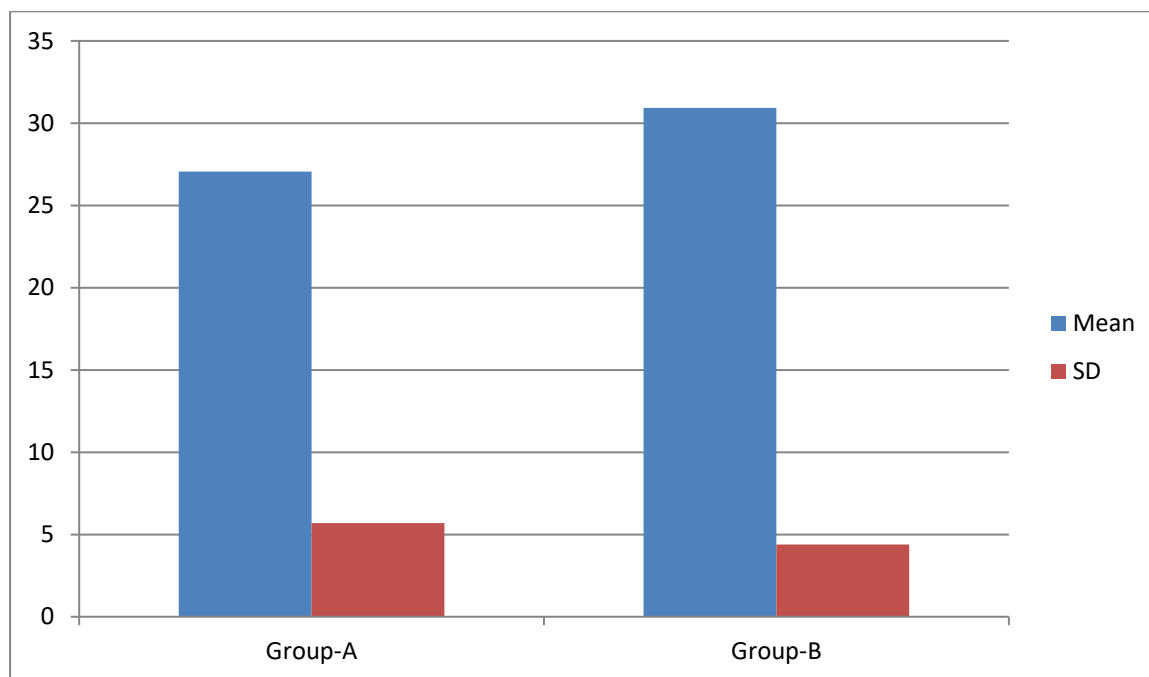
**Table No. 3 Pre-assessment**

<b>Pre-assessment</b>	<b>Group A (PNF)</b>	<b>Group B (Massage)</b>
<b>Mean</b>	27.066	30.933
<b>SD</b>	5.7	5.522
<b>Median</b>	26	32
<b>Minimum</b>	17	21
<b>Maximum</b>	36	40

### Interpretation

The two-tailed P value is <0.0700, considered not quite significant.

Welch's approximate t = 1.887 with 27 degrees of freedom.



**Graph no. 1**

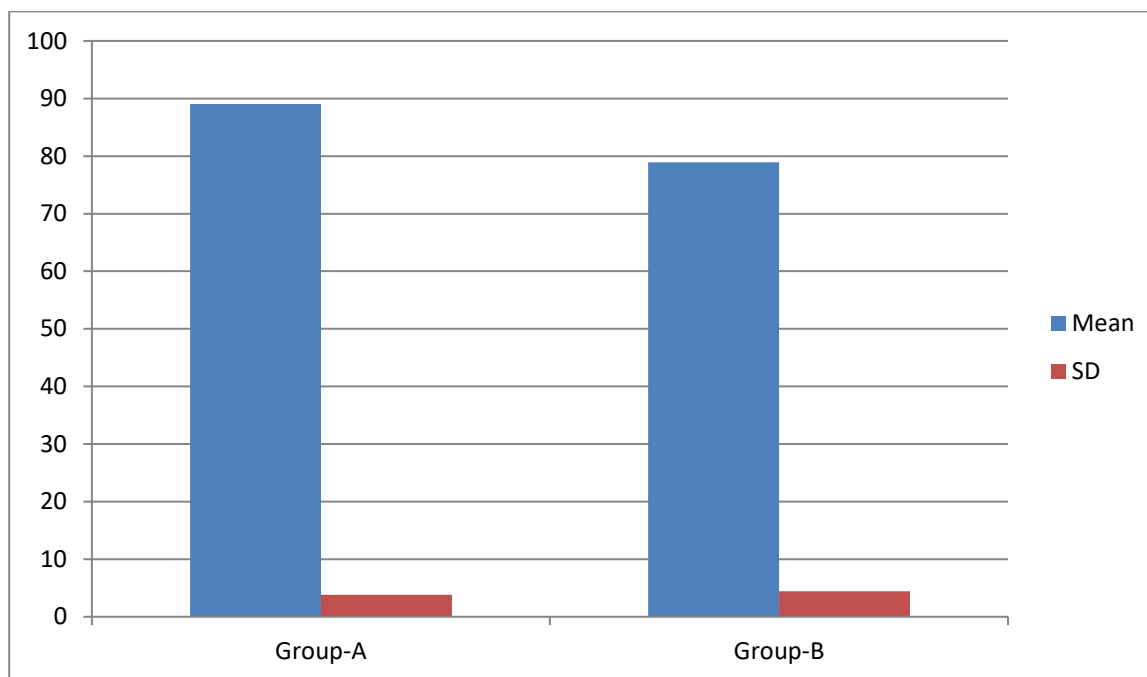
**Table No. 4 Post-assessment**

Post-assessment	Group A (PNF)	Group B (Massage)
Mean	89.067	78.933
SD	3.807	6.250
Median	90	78
Minimum	82	70
Maximum	95	92

### Interpretation

The two-tailed P value is  $<0.0001$ , considered slightly significant.

Welch's approximate  $t = 5.363$  with 23 degrees of freedom.



**Graph no. 2**

#### 4. Discussion

Face is the most characteristic part of body. The Bell's palsy adversely affects it. It mainly causes deviation of face towards one side due to paralysis of half of the face, further it causes difficulty in closing eyes, smiling, closing mouth properly and drooling of saliva. Facial paralysis has detrimental effects on physical, corneal, mental health, social welfare and quality of life. Impairments in face or lack of facial expressions also affect ones communication. Sometimes it affects the mouth so bad that the patient is totally unable to speak which again includes the speech therapy in rehabilitation.<sup>14</sup>Physiotherapy has been widely practised for rehabilitation of patients with Bell's palsy since 1927. Although there are medications (e.g. steroids) but they are secondary to physiotherapeutic interventions. Electrical stimulation, PNF, Massage and facial

exercises are primary physiotherapeutic interventions. It takes nearly 1 to 2 weeks get complete recovery.

PNF is compared more frequently with other interventions. Individualized facial neuromuscular re-education is more effective in improving facial symmetry in patients with Bell's palsy than conventional therapeutic measures.<sup>8</sup>PNF is significantly more effective than neuromuscular re-education to reduce facial disability.<sup>9</sup>As it includes the proprioception which Important factor while treating any type of facial paralysis. A study showed, exercise and bio-feedback accompanied with massage in Bell's palsy had significant decrease in function of face and increasing quality of life score.<sup>10</sup>

The comparison of readings of Sunnybrook Facial Grading System in post-assessment is

slightly significant there is no big difference in the effectiveness of PNF and massage. But, it also concludes that the PNF is slightly more significant than massage.

Facial paralysis is the condition involving or one can say affecting muscle as well as proprioception. The PNF exactly works on these two. It was quite predictable that PNF is more effective than massage but the difference was quite significant. PNF works on the actual cause whereas massage has quite generalised effect. Even the therapeutic effects of PNF are recovery of facial expressions, improve muscle contraction, etc. which are the exact requirements for the recovery of Bell's palsy.

Massage might not have that significant effect as PNF. But subjects treated with it showed quite significant effects. Massage has a different set of physiological and therapeutic effects than other interventions used to treat Bell's palsy. Some of therapeutic effects of massage are reduction of stress, relaxation, reduce pain, improve circulation, etc. Edema or swelling near parotid gland is commonly seen in Bell's palsy as it is the exact site on facial nerve where infection is present. It is a proper indication for massage and massage is the only treatment for that.

After studying the protocol for Bell's palsy it is clear that there should be an additional treatment intervention with electrical stimulation to improve the quality of muscle contraction. It can be PNF or massage. But it is preferable to use both of them as they don't have any side effect still shows promising effects. If the condition requires

only one of them it is not possible to imply both of them, PNF will be the choice of treatment. In spite that PNF has a significant recovering ability, effect of massage is significant too.

## 5. Conclusion

At last it is clear that the PNF is significantly more effective than the massage to improve quality of contraction in Bell's palsy and can be used as secondary treatment intervention with electrical stimulation. But the study also shows that the massage is also quite effective. In conditions where PNF cannot be used massage is a good choice of treatment. Further it is advisable to give both massage and PNF with electrical stimulation as a complete protocol.

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