



Effect of Functional Electrical Stimulation on Foot Drop for Patients with Cerebro Vascular Accident

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ABSTRACT

Need of Study- *This study is to determine whether Therapeutic exercise and Functional Electrical Stimulation application on Dorsiflexors for a foot drop post stroke (cerebrovascular accident) subject could improve their functional ability and prevent foot drop.*

Sample size- *30 all the subjects were taken from TRA General, Hospital, Kolkata.*

Study Design – Random Sampling, *This study includes 30 numbers of subjects in two Groups ,Group A 15 subject and Group B 15 subject in both genders in randomly selected Age – 40-60yrs. Subject were taken after Six month post stroke without tendoachilis contracture.*

Outcome measures – POMA (Tinneti scale), ROM (Range of motion of Planter flexion).

Results- *shows that significant positive value in group A & B both depict that effect of treatment is significant. In group A, p value is (.000) and t value (-8.103), so it is statistically significant. In group B, p value is (.000) and t value is (-7.519) that mean it is also statistically significant. So, both the effect therapeutic exercise experimented on group A and the effect of Functional Electrical stimulation experimented on group B to increase dorsiflexion and also planter flexion for post stroke subjects is found significant.*

Conclusion:- *The present study found more significant positive effect in case of good life and Walking Patterns by (POMA & ROM) by using Functional Electrical Stimulation (FES). There is also positive result in case of Therapeutic Neuromuscular Electrical Stimulation (Faradic Stimulation).*

Key Words- *Foot drop, 6 Month Post Stroke Subjects, POMA,ROM, FES,NMES, Therapeutic exercise.*

INTRODUCTION

Foot Drop or Drop foot is the one of the most common mobility problem followed by Stroke. Foot Drop is the inability to lift the foot and toes. Foot drop caused by Cerebro Vascular Accident and also by SCI or by weakness of the Anterior Group of leg muscles as paralysis of Tibialis Anterior Muscles.¹

There are gradations of weakness that can be seen with Foot Drop as-

1 Complete paralysis. 2 Flicker of contraction. 3 Contraction of muscles with gravity eliminated alone. 4 Contraction of muscles against gravity. 5 Against gravity with small resistance. 6 Muscles contraction against gravity with normal resistance.³

Stroke or Cerebro Vascular accidents (CVA) can result in impairment of the sensory motor systems with an initial loss of motor functions.⁴ A stroke is caused by the Interruption of blood supply to the brain, because a blood vessels burst or is blocked by a clot. This cuts off supply of oxygen and nutrients causing damage to the brain tissue.^{6,7}

Functional Electrical Stimulation is the application of electrical stimulation to the nerve in order to produce muscles contraction. It is used to treat the effect of Upper Motor Neuron Lesion resulting from condition such as stroke.⁸

For correction of Foot drop two electrode functional electrical stimulation must be used in treatment plan for about 1 month over the more than six month post Stroke patients with age 41 to 60 yrs.^{8,17}

David G Embrey PhD et.al in American Physiotherapy Report volume 91, 2010 May.

Stated that ‘‘Functional Electrical Stimulation system that stimulates both dorsiflexors and Planter Flexors muscles similar to the timing of typical adult gait combined with daily walking can improve walking ability’’. This clinical trial documents improved walking ability in patients with chronic hemiplegic by applying a Functional Electrical Stimulation system that stimulates both the dorsiflexor and plantar flexor muscles during gait.

Othmar Schuhfried, MD, PhD, et al stated that patients with spinal cord injuries or stroke, electrical upper limb neuro-prostheses are applied to enhance upper limb and hand function, and electrical lower limb neuro-prostheses are applied for restoration of standing and walking. For example, a dropped foot stimulator is used to trigger ankle dorsi flexion to restore gait function.

The use of electrical stimulation for restoring strength and endurance in this area, neuromuscular electrical stimulation has been used to increase strength and endurance in partially and fully paralyzed muscle. It has been used for peroneal nerve stimulation.

METHODOLOGY

SAMPLE SIZE

No. of subjects – Minimum 30

SOURCE OF SUBJECTS

All the subjects were taken from the TRA General, Hospital, Kolkata.

STUDY DESIGNS

Random Sampling method.

STUDY POPULATION

This study includes 30 numbers of subjects in two Groups. Group A 15 subjects and Group B 15 subjects in both gender randomly selected Age – 40-60yrs. Subject should be taken after Six month post stroke without tendoachilis contracture.

INCLUSION CRITERIA OF STUDY

- Patient with post stroke foot drop.
- Age-40-60yrs.
- Sex both Male and Female.
- Patient is able to stand and walk minimum 10min without any support.
- Patient is willing for treatment procedure.
- Minimum 5⁰ of planter flexion present.
- Six month post stroke patients.

EXCLUSION CRITERIA OF STUDY

- Cognitive deficit.
- Aphasia disorder.
- Refuse to co-operate.
- Cardiovascular anomalies.
- Pregnant patient.
- Psychiatric patient.
- Contracture of Tendoachilis muscles.
- Peripheral Nerve Lesion (LMN).

TOOLS USED IN STUDY

Functional Electrical Stimulation machines', Rest tool, Armless chair, Goniometer, Faradic Stimulation machines', Coductive gel, Surface Electrode.

OUT COME MEASURES

POMA (for balance)

Tinetti assessment tool

ROM (range of motion of Planter flexion).

PROCEDURE

A total of 30 subjects were recruited for this study, all subjects met with the inclusion and exclusion criteria of this study. After addressing a detailed explanation of search and purpose of the study to each subject, a consent form was obtained. Later the subjects were asked to fill two scales i.e. POMA and ROM and one scale i.e. POMA was filled by their stages followed by subject's demographic data was also noted. All this data was later used for statistical analysis. ROM of planter flexion was measured by goniometer and subjects with minimum 5⁰ planter flexion were taken.

In this study 30 subjects were randomly selected in to two Groups. Group A and Group B of age 40-60yrs.Total 30 subjects (Six month Post stroke foot drop patients) will be divided in to two groups by simple random sampling following a complete assessment.

Group A includes 15 Subjects will be treated with FES and therapeutic exercise recommended for Post Stroke Foot drop. Functional Electrical Stimulation used with an Amplitude - 100ms, Pulse - 30Hz, Duration - 40m/sec, Voltage - 60v. For 6-8 hrs per day 5 days a week for minimum one month and the intensity automatically fixed. Which activated automatically during walking for

20 to 40 second at first then gradually increase in each session with subjects tolerance capacity.³²

DATA ANALYSIS

- Data was analyzed by using SPSS version 16.0 software.
- Data Analyzed by the help of POMA Measurement scale³⁰ & Goniometer.³¹
- In case of POMA in this study total score mainly based on Gait + Balance =28
- < 19 high fall risk
- 19-24 medium fall risk
- 25-28 low fall risk
- Subjects with minimum 5⁰ planter flexion were taken.
- The Normal ROM of planter flexion is 45⁰.
- In this study Statistics for each analysis are based on the cases with no missing or out-of-range data for any variable in the analysis.
- Comparisons are significant only if p value is less than 0.05

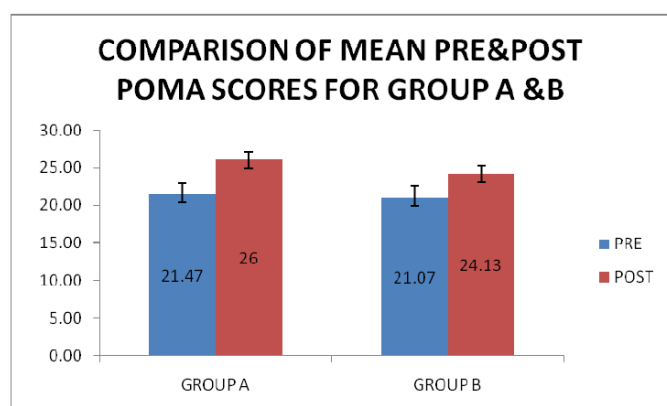


Fig 1-Comparison of mean Pre and Post POMA score for group A and B

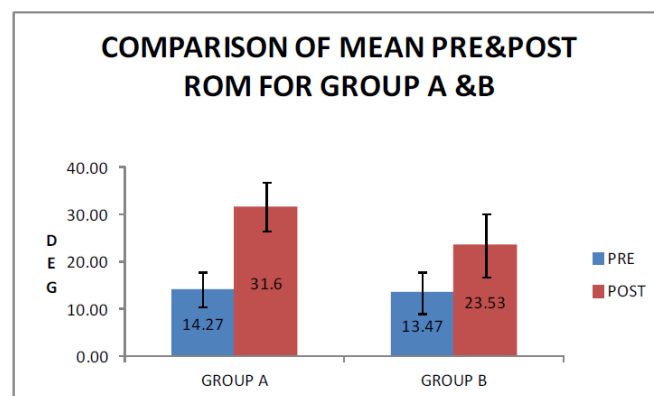


Fig 2-Comparison of mean Pre and Post ROM for group A and B

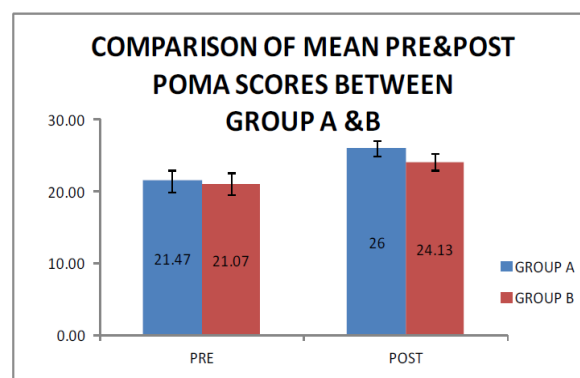


Fig 3- Comparison of Pre and Post POMA score between group A and B

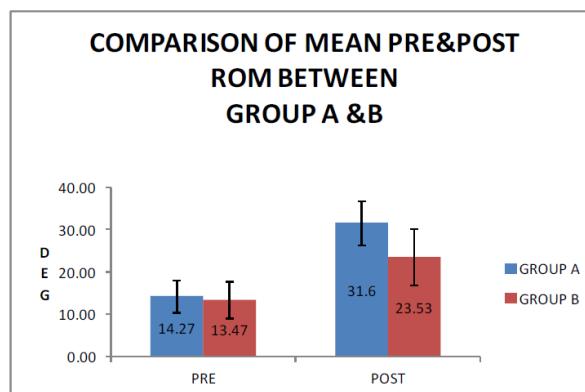


Fig 4- Comparison of mean Pre and Post ROM between group A and B

DISCUSSION

In this present Study Faradic Stimulation used because it is an alternating short duration low frequency current and produces voluntary muscles

contraction. Used Pulse - 0.01 to 3millisecond, Used Frequency - 50 to 100 Hz.¹⁷

Statistical t test and F test were carried out for understanding the effect of the treatment. Where t value is increased, and p value (.000) that is <0.05 that means factor is statistically significant.

Here t value is statistically significant and positive output (-15.48) and p value also significant (.000) in group A and t value is (-13.73) and p value is (.000) in group B so it is also statistically significant.

So, both the effect therapeutic exercise experimented on group A and the effect of Functional Electrical stimulation experimented on group B to in subjects are found significant for increasing range of motion and increase angle of Foot drop in post stroke subjects and also it is help full for correction in Gait.

In this study, fig.3 highlights comparison between Pre & Post POMA Scores between group A & B which depict that the effect of treatment is not significant but Post POMA is significant which is statistically significant as t value (.732) and p value is (.000). That means Pre POMA is statistically insignificant and Post POMA is statistically significant for both groups A & B. So, after the treatment of therapeutic exercise experimented in group A subjects and treatment of Functional Electrical stimulation experimented in group B subjects, it is found that there is significant difference in increasing range of motion and increase angle of Foot drop and also increase dorsi flexion and also planter flexion in post stroke subjects between Group A and Group B. So it can be inferred that Functional Electrical

stimulation has effective in increasing range of motion and increase angle of Foot drop and also increase dorsiflexion and also planter flexion in post stroke subjects.

LIMITATION OF THE STUDY

- The study involved only a small sample size. Increased number of samples would have further strengthened the results.
- Gait Patterns' was not considered in this study.
- This study was blinded.
- Use only two scales.
- Age group was fixed.
- Stage of Patients was fixed.

FUTURE RESEARCH

- This study can be done with different age groups.
- This study can be done on gender basis.
- To identify the correlations between types of stroke of different lobe involvement with other factors like cognition behavior, fatigue, slurring of speech and medication effects.
- To identify the effects of stroke on quality of life.
- Without Intervention based study can be done to identify the effect of physical exercises and Effect of Functional electrical Stimulation for correction of Foot Drop in aspect of patient's quality of life, depression, cognition, slurring of Speech.

CONCLUSION

The present study found significant positive effect in case of good life and Walking Patterns by (POMA & ROM) by using Functional Electrical Stimulation (FES). Also found a positive result in case where use Therapeutic Electrical Stimulation

(Faradic Stimulation). Disease was found not to be associated with life in Post stroke subjects. On comparison of correlations we found that Functional Electrical Stimulation is more effective than Therapeutic Electrical Stimulation (Faradic Stimulation) assessed by using POMA & ROM. All statistically significant collected data showed that FES gives more significant and effective result for correction of Post stroke Foot Drop after Six month. It can be inferred that Functional Electrical stimulation has effectively for increasing range of motion in the subjects and also increase angle of Foot drop in post stroke subjects and also it is helpful for correction in Gait.

CLINICAL SIGNIFICANCE

The results of the present study will add on to the literature about the Prevention of foot drop of post stroke subjects. It will help the physical therapist to choose a much appropriate protocol for prevention of foot drop and increase functional ability and activities in daily life in patient with post stroke Foot Drop by using Functional Electrical Stimulation then Therapeutic Electrical Stimulation (Faradic Stimulation) assessed by using POMA & ROM.

In this present study statistical data showed that application of FES (Functional Electrical Stimulation) effective rather than Faradic Stimulation in Post stroke subjects for correction of Foot drop.

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