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Research Article

EFFECTIVENESS OF TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION ON ACUPUNCTURE POINTS AND ELECTRICAL STIMULATION ON MOTOR POINTS TO IMPROVE DORSIFLEXOR MUSCLE FUNCTION IN SUB ACUTE STROKE SURVIVORS – A COMPARATIVE STUDY

Bright Alwin Victor P*

Madha Colleg of Physiotherapy

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ABSTRACT

Background: Transcutaneous electrical nerve stimulation has been used to treat hemiplegia since the last decade. Results have shown that TENS applying to the common peroneal nerve can improve motor function in patients with stroke. **Aim of the Study:** The aim of the study is to find the effectiveness of TENS in Acupuncture points & Electrical Stimulation in Motor Points to improve dorsiflexor muscle function in sub acute stroke survivors. **Need for the Study:** This study is to find which stimulation can be used for the sub acute stroke survivors to improve the locomotion and spasticity by promoting dorsiflexor muscle function, and also to the functional activity. **Methodology:** Study Design is Quasi Experimental, Comparative type with Simple Random Sampling of 22 Subjects in home based study for 4 weeks. **Inclusion Criteria**: Adults (above 18 years) with a clinical diagnosis of Sub Acute Stroke (6-10 months),Gender both male & female with Brunnstorm stage (3,4) **Exclusion Criteria**: History of psychosis, History of foot deformity, Un co-operative patients, Hypersensitivity, Lower motor neuron lesion, Skin infections, Cognitive impairment, Changes in bone joint structures. **Results:** Both Transcutaneous electrical nerve stimulation on acupuncture points and electrical stimulation on motor points improved the dorsiflexors muscle function in sub acute stroke survivors.

INTRODUCTION

Oxygen and nutrients are supplied to the brain via several major blood vessels. These vessels may become blocked, or less commonly bleeds, which results in an area of damaged brain tissue is referred to as a stroke. Stroke is the third most common cause of death in the western world and the most common cause of long term adult disability[1]. It is recognized that the negative motor impairments following stroke, e.g., loss of strength and dexterity, contribute most to disability[2].

Regaining the ability to walk is the goal most frequently stated by patients with hemiparesis in stroke rehabilitation. The expected level of walking determines to a great extent the expected level of activities of daily living (ADL) and possible discharge to home. However, home and community mobility present additional challenges to walking ability as independence require safety of mobility. Independent gait is considered a primary goal in stroke rehabilitation.

Transcutaneous electrical nerve stimulation has been used to treat hemiplegia since the last decade.

Corresponding author:* **Bright Alwin Victor P
Madha Colleg of Physiotherapy

Results have shown that TENS applying to the common peroneal nerve can improve motor function in patients with stroke. Levin and Hui-Chan found that 30 minutes of TENS, applied 5 times a week for 3 weeks, significantly decreased ankle plantar flexor spasticity and hyperactive stretch reflex and markedly increased maximal voluntary contraction of the ankle dorsi flexors in chronic spastic hemiparetic subjects. Other studies further reported that repetitive TENS decreased hyperactive stretch reflexes in plantar flexor muscles and passive resistive plantar flexor torque and improved the performance of daily activities measured by Barthel Index in stroke survivors[1-3].

Use of electrical stimulation to achieve overall functional improvement for the patient. Studies of subject after stroke has shown that TES has a positive orthotic effect on walking ability. Increase activity of the tibialis anterior muscle during TES aided walking increased afferent input to the central nervous system and there by influenced plasticity in healthy subject. Repetitive electrical stimulation of the common peroneal nerve leads to long-standing sensorimotor cortical reorganization in healthy subject. It is possible that more benefit could be gained by applying neuromuscular electrical stimulation (NEMS) early after stroke.

Cutaneous electrical stimulation of the affected limb after stroke resulted in the reduction of undesired muscle tone, facilitation of voluntary movements and reduction of neglectance.[13–15] A glove or sock electrode stimulates Cutaneous and muscle afferents of a large area and motor fibers of intrinsic muscles and may facilitate cortical synaptic reorganization and increase the contribution of the remaining motor structures in the restoration of voluntary activity. Cortical reorganization may have a role in the improvement of the motor and sensory functions of the stimulated limb.

METHODOLOGY

Study Design is Quasi Experimental, Comparative type with Simple Random Sampling of 22 Subjects in home based study for 4 weeks.

Inclusion Criteria: Adults (above 18 years) with a clinical diagnosis of Sub Acute Stroke (6-10 months), Gender both male & female with Brunnstorm stage (3,4)

Exclusion Criteria: History of psychosis, History of foot deformity, Un co-operative patients, Hypersensitivity, Lower motor neuron lesion, Skin infections, Cognitive impairment, Changes in bone joint structures

Procedure

Group – A

The TENS group received 30 minutes of TENS (100 Hz, 0.2-ms square pulses), Electrodes were placed over 4 acupuncture points of the affected leg, namely ST 36 (Zusanli), LV 3 (Taichong), GB 34 (Yanglinquan), and BI 60 (Kunlun)

Group– B

Electrical stimulation on motor points of lower limb dorsiflexors, Pulse width of 300 ms, frequency of 20 Hz, amplitude set at minimum level required to produce full dorsi flexion, The intervention was given in 30 minute sessions, 3 times a day for 4 weeks

Motor points: Peroneus longus, Extensor digitorum longus, Tibialis anterior, Peroneus brevis, Extensor hallucis longus, Extensor digitorum brevis

Group- A & B

Both groups received conventional therapy for 4 weeks, 4 days per week, 30 minutes per session. This includes, Passive range of motion exercises, Passive stretching exercises, Weight bearing on paretic limb, Trunk stability exercises, Walking training.

Data analysis and Interpretation

Observation and Analysis

The collected data were tabulated and analyzed using descriptive and inferential statistics.

To assess all the parameters, mean and standard deviation were used.

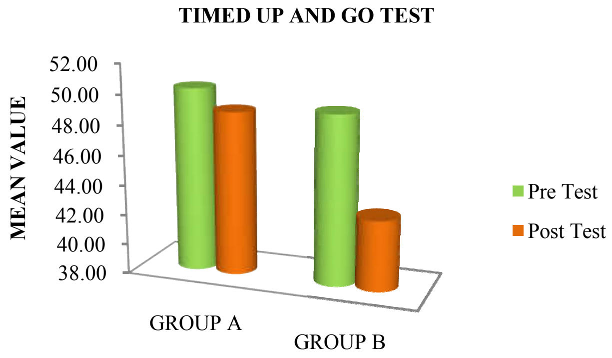
To find out the changes in Timed Up and Go test, Gait speed from pre test to post test, paired't' test was adopted.

Independent't' test was used to compare the mean values of all parameters.

Table 1 Pre And Post Test Values of Tug In Group A and group B

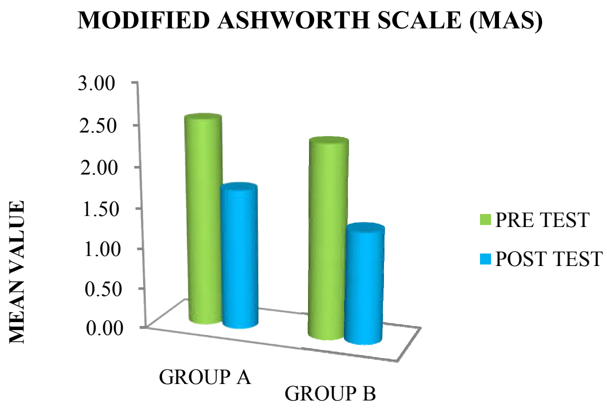
Group	Test	Mean	Std. Deviation	Paired t value	Significance Level
GROUP A TUG	Pre Test	50.2827	11.80359	10.561	0.0001 ***
	Post Test	48.9009	11.77779		
GROUP A MAS	Pre Test	2.5455	0.52223	6.708	0.0001 ***
	Post Test	1.7273	0.64667		
GROUP B TUG	Pre Test	49.2336	9.29185	4.601	0.001 **
	Post Test	42.6882	12.61777		
GROUP B MAS	Pre Test	2.3636	0.50452	10.000	0.0001 ***
	Post Test	1.3636	0.50452		

*** Very Highly significance, ** Highly significant
There is statistically significant difference between pre and post test of TUG and MAS in group A & B at P <0.05



Graph 1 A

Graphical Representation of Pre and Post Test Mean Values of Timed Up and Go (Tug) Test for Group A and Group B



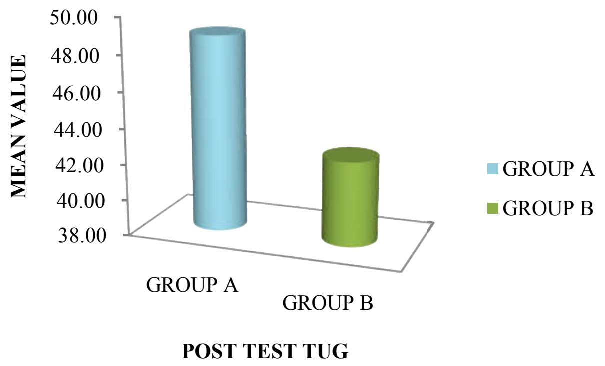
Graph 1 B

Graphical Representation of Pre and Post Test Mean Values of Modified Ashworth Scale for Group A and Group B

Table 2 Comparision Between Group A & Group B POST Test Timed Up and go (Tug) Test Score

Post Test	Mean	Std. Deviation	Un paired t value	Significance level
Group A	48.9009	11.77779	1.194	0.247 NS
Group B	42.6882	12.61777		

There is no statistically significant difference between post test TUG scores in group A & B P >0.05

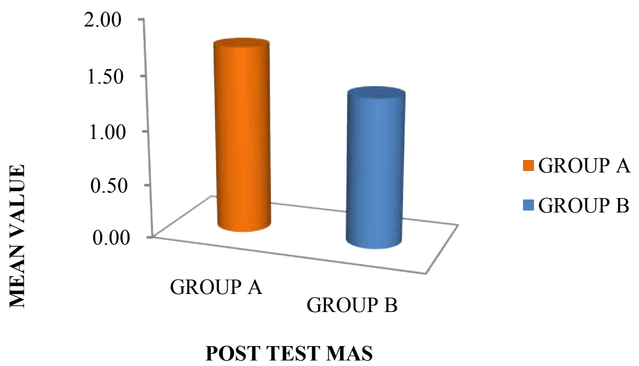


Graph 2 Graphical Representation of Post Test Timed Up and Go (Tug) Test Score between Group A & Group B

Table 3 Comparision between Group A & Group B Post Test Modified Ashworth Scale (MAS) Score

Post Test	N	Mean	Std. Deviation	Un pair t value	Significance level
GROUP A	11	1.7273	0.64667	1.470	0.157 NS
GROUP B	11	1.3636	0.50452		

There is no statistically significant different between post test MAS score in group A & B P >0.05



Graph 3

Graphical Representation of Post Test Modified Ashworth Scale (Mas) Score between Group A and Group B

RESULTS

According to table-1 the pre test mean value of Timed Up and Go test (Group -A) was 50.2827 and post test mean value was 48.9009. There is statistically significant difference in Group A between pre test and post test of Timed Up and Go test at P<0.05.

According to table-1 the pre test mean value of Modified Ashworth Scale (Group -A) was 2.5455 and post test mean value was 1.7273. There is statistically significant difference in Group A between pre test and post test of Modified Ashworth Scale at P<0.05.

According to table-1 the pre test mean value of Timed Up and Go test (Group -B) was 49.2336 and post test mean value was 42.6882. There is statistically significant difference in Group B between pre test and post test of Timed Up and Go test at P<0.05.

According to table-1 the pre test mean value of Modified Ashworth Scale (Group -B) was 2.3636 and post test mean value was 1.3636. There is statistically significant difference in Group B between pre test and post test of Modified Ashworth Scale at P<0.05.

According to table-2 the post test mean value of Timed Up and Go test in Group A was 48.9009 and in Group B were 42.6882. There is no statistically significant difference in Group A and Group B at P>0.05.

According to table-3 the pre test mean value of Modified Ashworth Scale in Group A was 1.7273 and in Group B was 1.3636. There is no statistically significant difference in Group A and Group B at P>0.05.

DISCUSSION

Stroke is one of the life threatening neurological disease observed most frequently. They occupy third place after heart disease and cancer as a cause of death and first place as a cause of morbidity.

The incidence of this illness is gradually increasing along with the extension of the average life expectancy of patients who suffer from CVA, 10% recovery spontaneously within the first month. There is no response to treatment in another 10% and 80% of patients are candidates for rehabilitation.

Few studies suggested that electrical stimulation on motor points shows benefit on improvement on dorsiflexion action while some other studies suggested that TENS on acupuncture points shows benefit on improvement on dorsiflexion action.

It is interesting to compare the electrical stimulation on motor points with TENS on acupuncture points. Hence the study had been done.

The samples for this study were taken based upon the discharge list collected from St.Thomas multispecialty hospital, 45 stroke cases, who considered for the study, were called over through telephone for appointments. On examination, 32 subjects met the inclusion criteria, among them only 26 subjects consented. These 28 subjects were randomly allocated into two groups using simple random sampling. Post test measures are taken for 22 subjects with 2 subjects dropped out from each group during the course of intervention. The mean age of subjects in group A was 50.3 and group B was 55.4.

Tiebin yon *et al* (2009) in his previous findings showed that electrical stimulation applied to the peripheral nerves had decreased spasticity and enhanced dorsiflexion. Similarly in this study TENS in acupuncture point produced a significant increased in percentage of normal tones compared with control group indicating that the treatment protocol also normalized muscle tone and applied to the acupuncture point with the subject during the acute stage.

TUG test scores and the first day when subjects were able to walk did not show significant differences among groups. This could be due to the relatively small sample size. Because there were always new additional subjects who were able to walk at subsequent assessment session, it made direct data comparisons among groups difficult or invalid.

Shamay S.M & Christina (2007) in their study showed that TENS to acupoints decreased plantar flexor spasticity and enhanced dorsiflexor force production in patients with chronic stroke. Possible mechanisms underlying the improvements could be attributable to an enhancement of presynaptic inhibition of the hyperactive stretch reflexes in spastic muscles, decrease in the co contraction of spastic antagonists, and disinhibition of descending voluntary commands to the motoneurons of paretic muscles as suggested. It should be noted that TENS electrodes were applied to the acupuncture points located on the anterolateral aspect of the affected lower limb, which are subcutaneous and close to the nerves (i.e., peroneal nerve) and blood vessels. The areas covered by the TENS electrodes were much bigger than those of acupuncture points and probably excited the areas innervated by the peroneal nerve.

In our study the electrical stimulation on motor points was compared with TENS on acupuncture point on subjects with sub acute stroke subjects. There is no significant different in between the two groups.

The collected data were tabulated and analyzed using descriptive and inferential statistics. To assess all the parameters, mean and standard deviation were used.

To find out the changes within the groups A and B in MAS, Timed Up and Go test, Gait speed from pre test to post test, paired 't' test was adopted and shows statistical significant difference.

Comparing the pre and post test values of TUG shows a highly statistical significant difference in group A with mean value of 50.28 and 48.9 with t value of 10.56.P<0.05. Comparing the pre and post test values of MAS shows a highly statistical significant difference in group A with mean value of 2.54 and 1.72 with t value of 6.70.P<0.05. Comparing the pre and post test values of TUG shows a highly statistical significant difference in group B with mean value of 49.23 and 42.68 with t value of 4.6.P<0.05.

Comparing the pre and post test values of MAS shows a highly statistical significant difference in group A with mean value of 2.36 and 1.36 with t value of 10.00.P<0.05. Independent't' test was used to compare the mean values of all parameters in between the groups shows no statistical significance**.**

The post test values TUG shows a non statistical significant difference in between the groups A and B mean value of 48.9 and 42.6 with t value of 1.19. The post test values MAS shows a non statistical significant difference in between the groups A and B mean value of 1.72 and 1.36 with t value of 1.47 P>0.05.

The Transcutaneous electrical nerve stimulation on acupuncture point and electrical stimulation on motor point improved the dorsiflexors muscle function in sub acute stroke survivors.

CONCLUSION

Both Transcutaneous electrical nerve stimulation on acupuncture points and electrical stimulation on motor points improved the dorsiflexors muscle function in sub acute stroke survivors.

Limitations: The sample size was small, The variables studied were only sub acute stroke, This study was done only for Brunnstorm motor recovery stages 3 and 4 groups, There was no Sham group.

Recommendations: Future studies can be done on large samples, Future studies can be done for longer duration**,** To add a Sham Group and compare the effectiveness.

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