



P-ISSN: 2394-1685
E-ISSN: 2394-1693
Impact Factor (ISRA): 4.69
IJPESH 2016; 3(1): 261-264
© 2016 IJPESH
www.kheljournal.com
Received: 26-11-2015
Accepted: 28-12-2015

Swethankh KS

Authors Affiliated to ALL India
Institute of Speech and Hearing,
Manasa Gangothri, Mysore,
570006, India.

Deepak Thazhakkattu Vasu

Authors Affiliated University
Tunku Abdul Rahman. Kuala
Lumpur, Malaysia

Jimshad T U

Authors Affiliated to Dayananda
Sagar College of Physiotherapy
Shavige Malleswara hills, K-S
lay out Bangalore 560078 India.

Correspondence

Swethankh KS

Authors Affiliated to ALL India
Institute of Speech and Hearing,
Manasa Gangothri, Mysore,
570006, India.

Effect of Acupuncture- Like Tens on Hand Function in Sub-Acute Stroke – A Comparative Study

Swethankh KS, Deepak Thazhakkattu Vasu, Jimshad T U

Abstract

Background: Stroke is also a leading cause of functional impairments, with 20% of survivors requiring institutional care after 3 months and 15% - 30% being permanently disabled⁴. Stroke is a life-changing event that affects not only the person who may be disabled, but their family and caregivers⁵. This study is to investigate whether acupuncture like TENS decreases spasticity and increases muscle strength more effectively than conventional rehabilitation and stimulatory techniques. Objectives of the study was to evaluate the effectiveness of acupuncture like TENS in improvement of hand function, to assess the improvement of motor recovery of upper limb in sub-acute stroke patients using acupuncture like TENS. Methods and Material: A Total of 30 subjects who fulfilled the inclusion and exclusion criteria were included in the study, they were randomly divided into two groups by convenience sampling. Group A (n=15) received Group A received a conventional physical therapy treatment along with acupuncture like TENS for wrist extensors and triceps, and Group B (n=15) received conventional physical therapeutic exercises and techniques only. Results: shows there was an improvement in Pre to Post scores of ARA and FM for both the groups, but when comparing both the groups, there was a drastic improvement in scores of ARA and FM in group A when compared to group B with p- value <0.0001. Conclusions: The result of the study indicates that combination of conventional Physical Therapy along with Acupuncture like TENS can be safely and effectively administered in improving hand function of sub-acute stroke patients.

Keywords: stroke, acupuncture- like tens, hand function.

Introduction

Stroke is one of the leading causes of mortality and morbidity worldwide^[1]. Approximately 20 million people each year will suffer from stroke and of these 5 million will not survive^[2]. Developing countries account for 85% of global deaths from stroke^[3]. Stroke is also a leading cause of functional impairments, with 20% of survivors requiring institutional care after 3 months and 15% - 30% being permanently disabled⁴. Stroke is a life-changing event that affects not only the person who may be disabled, but their family and caregivers^[5].

The WHO defines stroke as “rapidly developing clinical signs of focal (at times global) disturbance of cerebral function, lasting more than 24 hours or leading to death with no apparent cause other than that of vascular origin”^[6]. The risk of recurrent stroke within five years of a first stroke is between 30% and 43%^[7]. The effects of a stroke depend on which part of the brain is injured and how severely it is affected and very severe stroke can cause sudden death^[8]. Symptoms of stroke include numbness, weakness or paralysis, slurred speech, blurred vision, confusion and severe headache. Apart from all the impairments that result from stroke, perhaps the most serious, and most challenging problem in the field of upper limb rehabilitation. But there are only limited attention has been given to upper extremity rehabilitation following stroke, functional recovery of the arm are limited compared with that for the lower extremities^[10].

Although it is often thought that the upper extremity does not recover as well as the lower extremity following stroke, the actual degree of neurological recovery of the upper and lower extremities may be similar^[9]. The lower extremity, however, can function with less motor control than the upper extremity. Thus, partial motor recovery in the lower extremity may permit many patients with stroke to ambulate independently. Partial recovery of upper-extremity function does not usually translate into functional use. Approximately 60% of stroke

Survivors experience upper extremity dysfunction limiting participation in functional activities [10]. Stroke in young poses a major health problem. Stroke in the younger age group adds to the social burden, and as such these patients merit special attention in diagnostic, therapeutic, and preventive care. It leaves the patients with residual disabilities like physical dependence, cognitive decline, depression, and seizures. The peak age of stroke occurrence is 55–65 years, but events occurring at a younger age assume importance in being occurring in a productive age group. Survivors of stroke regard improvement of upper extremity function are to be important for their increase in quality of life. During daily activities, non-use of the paretic upper extremity with compensation from the less affected side was common [11]. Effective screening, evaluation, and management strategies for stroke are well established worldwide [12]. Conventional methods of physical therapy rehabilitation to regain motor control consist of stretching and strengthening, attempting to retrain weak muscles through re-education. Use of sensory feedback is often stressed to facilitate muscle activation, e.g., stroking the overlying skin, sudden stretching of the muscle, and vibration of the muscle or its tendon. Training in pre ambulation, functional mobility exercises and weight transfer also included in lower limb physical therapy rehabilitation. Task oriented exercises, stretching/weight-bearing by the affected arm, and teaching of activities of daily living are also implemented. The pattern of weakness varied amongst patients, the most affected groups were distal, such as finger and wrist flexors and muscles involved in hand grip, while the least affected were the proximal groups, such as shoulder abductors and adductors. [13]

Electrical stimulation has been used for many years by physical therapists to maintain or improve muscular strength in immobilized muscle. Luigi Galvani in 1791 provided the first scientific evidence that current can activate muscle. During the 19th and 20th century researchers studied and documented the exact electrical properties that generate muscle movement. It was discovered that the body functions induced by electrical stimulation caused long-term changes in the muscles in the 1960's, NMES is applied in athletes in the former Soviet Union and found strength improvements of 30-40%. [14]

Neuromuscular electrical stimulation has been used to treat patients after stroke in the last few decades. This included transcutaneous electrical nerve stimulation on the peripheral nerve or acupuncture points, and functional electrical stimulation on the motor points. Electrical neuromuscular stimulation enhances motor recovery after stroke, with claims that it can reduce spasticity, strengthen muscles, and increase the range of movement of joints with prevention or correction of contractures. Electrical stimulation at the wrist in combination with other rehabilitation strategies can result in increased grip strength and improved motor function. [15]

Experimental studies have demonstrated that acupuncture and electro acupuncture have circulatory and biochemical effects in common with physical exercise on the release of transmitters and peptides in brain and spinal cord. These areas may be modified by training and experience. Reorganization occurs not only in cortical areas but also in sub cortical regions and the spinal cord [16]

AL-TENS should be defined as the induction of forceful but non-painful phasic muscle contraction at myotomes. Electro physiologically, both acupuncture and electro acupuncture stimulates skin and muscle afferents. In former studies conducted in acupuncture like TENS in lower limb proved

decreased ankle plantar flexor spasticity, and increased dorsiflexor strengthening in stroke patients. By using AL-TENS not yet conducted any study on upper limb improvement; this is because of complexity of functions of hand muscles. This study is found out whether AL-TENS can be used in the rehabilitation of upper limb. [17]

Rehabilitation of lower limb is quiet easier as compared to upper limb rehabilitation. Studies states that upper limb recovery is lesser than that of lower limb. Many studies have been conducted on lower limb of stroke patient using acupuncture like TENS, but further more studies are recommended on upper limb. More explorations have to be done in the upper limb rehabilitation field. Introduction of stimulation (NMES & FES) made a remarkable leap in the field of rehabilitation, but further more studies yet to be conducted with acupuncture like TENS. This study is to investigate whether acupuncture like TENS decreases spasticity and increases muscle strength more effectively than conventional rehabilitation and stimulatory techniques objectives of the study was to evaluate the effectiveness of acupuncture like TENS in improvement of hand function, to assess the improvement of motor recovery of upper limb in sub-acute stroke patients using acupuncture like TENS. [18]

2. Materials and Methods

Study was conducted in clinics and rehabilitation centres in Calicut. The Ethical clearance has been obtained from the Ethical committee as per ethical guidelines research from biomedical research on human subjects, 2001, ICMR, New Delhi. The study design was experimental with pre-post-test design. A Total of 30 subjects were taken. Inclusion criteria of Patients with first time stroke, Sub acute patients (3-6 months), Medically stable patients, Patient able to sit, Patient with MCA stroke, Patients between age of 50-70 and Exclusion criteria of Patient intolerant to acupuncture like TENS, Patient with altered sensory impairments, Any Contra indications for TENS, Other neurological & orthopaedic conditions affecting upper limb, Patient with subluxed shoulder, Patient with shoulder hand syndrome. Patient with cognitive Subjects selected for the study were randomly allocated into two groups by Convenience sampling, for this purpose randomization is done by allocating subjects with odd number to control group and even number to experimental group. Group A (n=15) received Group A received a conventional physical therapy treatment along with acupuncture like TENS for wrist extensors and triceps, and Group B (n=15) received conventional physical therapeutic exercises and techniques only. Procedure includes Group A received a conventional physical therapy treatment along with acupuncture like TENS for wrist extensors and triceps, whole treatment period consist of 3 weeks and 5 sessions in a week. Each session consist of a 40 minutes conventional treatment of stroke rehabilitation including stretching of concerned muscles, sensory stimulation, functional activity exercises, postural correction and also tone reducing techniques like icing, along with gait training. In addition with these techniques acupuncture like TENS is also implemented for 20 minutes for above mentioned muscle groups. Group B is the control group, as they received a conventional physical therapeutic exercises and techniques. Their treatment session consisted of above mentioned techniques of conventional therapy for 40 minutes a day of 5 sessions a week for 3 weeks. Action research arm test and Fugl Meyer assessment of physical performance were conducted to know the existing functional level of upper limb in both groups before starting of the whole treatment session.

Action research arm test and Fugl Meyer assessment of physical performance were conducted once again and the functional improvements are noted.

Data analysis was performed using SPSS software (version 17). Alpha value was set at 0.05. Descriptive statistics was used to find out mean and standard deviation (SD) for demographic and outcome variables., Paired –T test was used to find out homogeneity for base line and demographic and outcome variable, Unpaired –T test was used to find out homogeneity for base line and demographic and outcome variable, Wilcoxon test was used to find out homogeneity for base line and demographic and outcome variable, Mann-Whitney test was used to find out the homogeneity for base line and demographic and outcome variable.

3. Results & Discussion

3.1 Results: The result of the study shows that there is significant improvement in hand function based on action research arm test and Fugl-Meyer assessment of physical performance scores of both groups after the treatment. Patients of group A treated with conventional Physical Therapy along with Acupuncture like TENS showed significant improvement in both Action research arm test scores ($p=0.014$) and Fugl-Meyer assessment of physical performance scores ($p=0.02$) than patients of group B treated with conventional Physical Therapy .

Table 1: Mean pre-test scores of ARA and FM of Group A and Group B

| | |
|----------------|-------|
| Group A ARA | 32.53 |
| Group B ARA | 34.93 |
| Group A FM | 7.4 |
| Group B FM | 7.53 |

Table 2: Mean Post test scores of ARA and FM of Group A and Group B

| | |
|----------------|-------|
| Group A ARA | 44.2 |
| Group B ARA | 38.93 |
| Group A FM | 10.07 |
| Group B FM | 7.93 |

Table 3: Mean Pre and Post test scores of ARA Group A and Group B

| | |
|---------------------|-------|
| Group A Pre ARA | 32.53 |
| Group A Post ARA | 44.2 |
| Group B Pre ARA | 7.4 |
| Group B Post ARA | 10.07 |

Table 4: Mean Pre and Post test scores of FM Group A and Group B

| | |
|--------------------|-------|
| Group A Pre FM | 7.4 |
| Group A Post FM | 10.07 |
| Group B Pre FM | 7.53 |
| Group B Post FM | 7.93 |

3.2 Discussion

The study is an experimental comparative study to find out the effect of acupuncture- like TENS on hand function in sub-acute stroke patients. The group A and B were given conventional Physical Therapy; along with that group A received an additional treatment of Acupuncture like TENS. Total number of patients were included in the study is 30 and the duration of the study is 3 weeks

On statistical analysis using student's t test there was a significant difference between the groups in improving the functional outcome of hand. Group A showed a significant improvement than group B in both Action research arm test and Fugl-Meyer assessment of physical performance scores.

The result of this study indicates that a combined treatment of conventional Physical Therapy with Acupuncture like TENS is more effective in improving hand function in sub-acute stroke patients.

The improvement in the hand function is due to the reduction in the tone of spastic flexor muscle group, since the spastic muscle group compromise the normal hand function. In addition an improvement in strength and motor function of extensor muscle groups will also aid in better functional outcome of hand when stimulation is applied to an antagonist muscle, the large diameter Ia muscle spindle afferent fibers originating the muscle are excited. The action potentials generated in these fibers are transmitted to the spinal cord and excite spinal interneuron which in turn inhibit the activity in the motor neurons to the spastic muscle. [19]

Acupuncture like TENS selectively activate small diameter fibers ($A\alpha$) arising from muscles (ergo receptors) by the induction of phasic muscle twitches. Thus, TENS is delivered over motor points to activate AA efferent to generate a phasic muscle twitch resulting in ergo receptor activity.

A reduction in spasticity is because of an enhancement of presynaptic inhibition of the hyperactive stretch reflexes in spastic muscles, disinhibition of descending voluntary commands to the motor neurons of the paretic muscles, and decrease in co-contraction of the spastic antagonist.

It is found that acupuncture like TENS slowed the development of resistance to passive stretch of the wrist flexors and increased voluntary wrist dorsiflexion with a decrease in antagonist co-contraction. Former studies found that electrically stimulated sensory inputs could enhance brain plasticity. The result of the study is consistent with the findings of Tiebin Yan et al and Barbro B Johansson *et al* who also used the similar technique and found reduction in muscle spasticity. [20]

After the treatment programme patients were able to open the hand and fingers which results them in performing functional task with more ease. The functional scales used in this study included questions of functional task, that need opening of the hand. So the outcome measures used in this study is very much apt for the method adopted for the treatment. Unlike the other neuromuscular stimulation modalities Acupuncture like TENS is more patient friendly and less irritant and very much convenient for the Physiotherapist to use. There are however limitations to this study. The study was done on a small sample size and it was conducted for a short duration i.e., only three weeks. Thus the result only shows the short term effects of the interventions. All measurements were taken manually and this may introduce human error which could threat the reliability of the study. The study didn't include long term follow up or recurrence rates and thus results cannot tell us about the effectiveness of the interventions in long term. The study was limited to the hand functions only and other muscle

groups which can contribute to the upper limb function were not included. The study included MCA stroke patients only and they were in the sub-acute stage. So the effectiveness of this intervention in other stages and other arterial involvement could not be studied. The type of stroke- whether hemorrhagic or ischemic was not identified. This study didn't consider the hand dominance of patients and the side affected. [21]

Future studies should establish the efficacy of the treatment in a large sample size with a long term follow up. Further study can be done to check the effects of these techniques on other muscle groups of upper limb. Effects of these techniques on other form and stages of stroke can be studied means. A more advanced and functional task oriented method to evaluate the outcome measure can be adopted. Further studies can be conducted using Acupuncture like TENS in other neurological conditions are recommended.

4. Conclusion

The purpose of the study was to compare the effect of acupuncture like TENS in hand function. The group treated with Acupuncture like TENS and conventional Physical Therapy treatment techniques had a significant improvement in hand function than the group treated with conventional Physical Therapy treatment techniques alone. The result of the study indicates that combination of conventional Physical Therapy along with Acupuncture like TENS can be safely and effectively administered in improving hand function of sub-acute stroke patients.

5. References

1. PM Dalal. Burden of Stroke-Indian Perspective. Japi, 2004, 5 2.
2. Carl Counsell MD, Martin Dennis FRCP, Michael McDowall MSc, Charles Warlow FRCP. Predicting outcome after acute and sub-acute stroke. Development and validation of new prognostic models. American Heart Association 2002; 33:1041-1047.
3. Johanna H, vander Lee, Heleen Beckerman, Gustaaf J, Lankhorst, Lex M. Bouter. Effectiveness of the action research arm test and the Fugl-meyer assessment scale in chronic stroke patients. Journal of rehabilitation medicine. 2001; 33:110-113.
4. Julie Moreland, Mary Ann Thomson. Efficacy of electromyographic biofeedback compared with conventional physical Therapy for upper extremity function in patients following stroke. A research overview and meta-analysis. Presented at the Canadian Physiotherapy Association Congress, 1994, 74.
5. Tiebin Yan MD PhD, Christina WY, Hui Chan PhD. Transcutaneous electrical stimulation on acupuncture points improves muscle function in subjects after acute stroke. A randomized controlled trial. Journal of rehabilitation medicine. 2009; 41:312-316.
6. Barbro B. Johansson MD PhD, Eva Haker PhD, Magnus von Arbin MD PhD, Mona Britton MD PhD, Göran Långström PhD, Andreas Terént MD PhD, Dag Ursing MD, Kjell Asplund MD PhD. Acupuncture and Transcutaneous Nerve Stimulation in Stroke Rehabilitation-A Randomized Controlled Trial. American Heart Association 2001; 32:707-713.
7. Mark Johnson. Transcutaneous electrical nerve stimulation (TENS). Low-frequency currents. 259-286.
8. Johanna H. van der Lee, Heleen Beckerman, Gustaaf J. Lankhorst and Lex M. Bouter. The responsiveness of the action research arm test and the Fugl-meyer assessment

- scale in chronic stroke patients. J Rehab Med 2001; 33: 110-113.
9. John W. Krakauer. Arm Function after Stroke: From Physiology to Recovery. Seminars in Neurology 2005; 25(4):384-395.
10. Juha M. Hijmans PhD, Leigh A. Hale PhD, Jessica A. Satherley BSc, Nicole J. McMillan B Phty, Marcus J. King BE . Bilateral upper-limb rehabilitation after stroke using a movement-based game controller .Journal of Rehabilitation Research & Development 2011; 48(8):1005-1014.
11. Donald Easton, Jeffrey Saver L, Gregory Albers W, Mark Alberts J, Seemant Chaturvedi, Edward Feldmann. et all. . Definition and Evaluation of Transient Ischemic Attack - A Scientific Statement for Healthcare Professionals from the American Heart Association Stroke, 2009; 40:2276-2293.
12. Abraham J, PSS Rao, SG Inbaraj, G Shetty, CJ. Jose. An Epidemiological Study of Hemiplegia due to Stroke in South India. 1970; 2:477-481.
13. Julie Moreland, Mary Ann Thomson. Efficacy of Electromyographic Biofeedback Compared with Conventional Physical Therapy for Upper-Extremity Function in Patients Following Stroke: A Research Overview and Meta-analysis. Physical Therapy 1994; 74:534-543.
14. Joanna Powell, a David Pandyan, Malcolm Granat, Margaret Cameron and David J. Stott. Electrical Stimulation of Wrist Extensors in Poststroke Hemiplegia. Stroke 1999; 30:1384-1389.
15. Tapas Kumar Banerjee Md Frcp (London), Shyamal Kumar DAS DM (Neurology). Epidemiology of stroke in India. Neurology Asia 2006; 11:1-4.
16. De Kroon JR, Ijzerman MJ, Chae J, Lankhorst GJ, Zilvold G. Relation between stimulation characteristics and clinical outcome in studies using electrical stimulation to improve motor control of the upper extremity in stroke. Journal of Rehabilitation Medicine. 2005; 37:65-74.
17. Bolton DAE, Cauraugh JH, Hausenblas HA. Electromyogram triggered neuromuscular stimulation and stroke motor recovery of arm/hand functions: A meta-analysis Journal Neurological Science 2004; 223:121-127.
18. De Kroon JR, van der Lee JH, Ijzerman MJ, Lankhorst GJ. Therapeutical electrical stimulation to improve motor control and functional abilities of the upper extremity after stroke: A systematic review. Clinical Rehabilitation 2004; 16: 350-360.
19. Glanz M, Klawansky S, Stason W, BerkeyC .Functional electro stimulation in post stroke rehabilitation: A meta-analysis of the randomized controlled trials. Archives of Physical Medicine and Rehabilitation 1996; 77:549-553.
20. Ijzerman MJ, de Kroon JR, Jannink-Nijlant JJM, Renzenbrink GJ, Severens JL. Preliminary economic evaluation of electrical stimulation treatment of the upper extremity in post-stroke hemiplegia .7th International Workshop on Functional Electrical Stimulation. Vienna, Austria. 2001; 12-15.
21. Popovic MB, Popovic DB, Sinkjaer T, Stefanovic A, Schwirtlich L. Clinical evaluation of functional electrical therapy in acute hemiplegic subjects. Journal of Rehabilitation 2003; 40:443-454.