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RESEARCH ARTICLE

EFFECT OF ADDITIONAL SENSORIMOTOR STIMULATION ON THE MOTOR AND FUNCTIONAL RECOVERY OF HEMIPLEGIC ARM IN ACUTE STROKE

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ABSTRACT

Objectives: To evaluate the effect of additional sensorimotor stimulation on the motor and functional recovery of hemiplegic arm in acute stroke.
Design: Experimental design, randomized controlled design
Settings: The study was conducted at St. Thomas Hospital K.P Hospital.
Procedure: 30 Subjects diagnosed with acute stroke having recovery hemiplegic arm were taken into the study and divided into two groups, one group is controlled where as other was an experimental group.
Results: The significant difference between the pre-test and post-test control group and experimental group in Fugl Meyer was $P<0.05$. The significant difference between the Post-test of both the control and experimental group of Fugl Meyer was $P<0.05$. The significant difference between the pre-test and post-test control as well as in Action Research Arm Test was $P<0.05$.
Conclusion: The study concludes that there was significant improvement of motor activity in both groups between pre and post sessions. The results of the subjects who participated in experimental group have shown good motor recovery than control groups.

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INTRODUCTION

The Traditional definition of stroke devised by W.H.O in 1970's is "A neurological deficit of cerebrovascular cause that persists beyond 24 hours or is interrupted by death within 24 hours". The impact of stroke is considerable world wide. It is estimated that there are 4.5 million deaths a year from stroke and over 9 million are stroke survivors. It comprises the major cause of adult disability and second cause of mortality worldwide (W.H.O, 2008). In India the average annual incidence rate is 123.57 per 100,000 persons among them women were more affected than men. Age specific stroke incidence rate increases from fourth decade to seventh decade in both sexes (Daniel, 2008). The commonest risk factor identified was hypertension followed by diabetes (Arif Herekar, 2008). In CVA the frequency of MCA stroke is reported to be more than 80 cases per 100,000 people (Marry, 2008), this is attributed to the anatomy of MCA.

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As a consequence the upper limb is affected in large number of patients. Studies suggest that motor recovery occur at different rate in upper and lower extremity, with that of upper extremity recovery occurring later. Some of the factors that decrease the probability of return of upper limb function are lack of spontaneous stimulation during functional activities. Each transfer and each attempt to stand or walk requires bilateral activities in leg. In performing the upper limb activity the patient uses non affected side exclusively. Several studies of treatment modality especially directed at improving upper limb function such as biofeedback (Inglie, 1984), stimulation etc, show positive results but they were applied to chronic stroke patients. There is a need for further studies in early period when a surviving brain tissue has greatest plasticity. The rehabilitation of upper limb has become a challenge. Lord JP *et al* has proved that the choice of therapeutic technique is a contributing factor in stroke (Lord, 1986). The therapeutic technique used should be such that it has patient's complete involvement. Sunderland A, *et al* (1992) has proved that enhanced therapy regime will lead to better intrinsic recovery from hemiplegia (Stephen Bagg, 2002), so adding a specific intervention to routine treatment procedures after stroke would

be effective. Studies show that stroke patients can achieve and maintain functional improvements especially by combining electrical stimulation techniques with voluntary effort (Kraft, 1992). The present study investigates the effectiveness of pneumatic splint and rocking chair along with electrical stimulation for upper limb recovery in acute phase of stroke.
Rocking chair was part of colonial life. It was an American phenomenon which was initially used as garden chair, then as a cradling device for mother and child. Later in 1900's rocking chair therapy was emerging as treatment for various ailments such as dementia etc (David, 2002 and Charles, 2000). Rocking regularly has the ability to gently exercise even the weakest of muscle (Nancy, 1988). This phenomenon turned to fact when modern research accounts began to surface throughout varying health care disciplines.

Aim of the Study

To evaluate effect of additional sensorimotor stimulation on motor recovery of hemiplegic arm in acute post stroke patients.

MATERIALS AND METHODS

Research Design : Randomized controlled design.
Study Type : Experimental Study.
Sample Method : Convenient Sampling.
Sampling Technique : Total of 30 stroke patients are selected based on Selection criteria and were randomly allocated to either experimental or control Group.
SAMPLE SIZE : 30
Control Group – 15
Experiment Group – 15
STUDY SETTING: St. Thomas Hospital K.P Hospital
STUDY DURATION : Six weeks. [15]
INCLUSION CRITERIA: AGE GROUP : 40 – 60 [5] [9]
GENDER: Both male and Female.
Side of Involvement: Both Right side paresis and left side paresis.
Arterial Involvement: Middle Cerebral Artery.
Duration of Post Stroke: 2 to 5 weeks after the onset of stroke.
Motor Function: Fugl Meyer score between 11 and 45.

Subjects must be able to sit independently or with minimum support.
Ability to perform experimental treatment Independently.

Exclusion Criteria

- A previously completed stroke on same side or prestroke disability affecting the arm function [4].
- Subjects with any fracture of Upper limb.
- Subjects with cardiac pacemaker.
- Subjects prone for epilepsy.
- Subjects who are aphasic.

Materials Required

- Pneumatic splint
- Paper
- Wooden Block of 10cm,7.5cm,5cm,2.5cm size
- Tube 2.25 cm
- Tube 1x16 cm
- Bolt
- Washer
- Ball Bearing
- Marble
- Goniometer
- Pencil
- Knee Hammer
- Ball
- Glasses
- Stimulator
- Rocking Chair

Procedure

After complete Assessment, the selected subjects are explained about the mode of Treatment to be given.

Group A(GROUP A (Control Group): Subjects are treated with electrical stimulation.

ELECTRICAL STIMULATION PARAMETERS [19]
Pulse Duration:100 – 300 μs
No of Contractions per session:10 – 20 Contractions
Amplitude:Maximum tolerable Intensity.
Frequency of sessions:5 days per week.
Electrode type : Carbon rubber electrodes

Muscles Stimulated

In Shoulder supraspinatus or teresminor, and deltoid or pectorals are stimulated. If the arm is internally rotated one electrode is placed over posterior deltoid and other over teresminor, if there is no internal rotation middle deltoid and supraspinatus are stimulated. At the Scapula level Lower Trapezius and Rhomboid for scapula stabilization. In Elbow Triceps is stimulated with one electrode over motor point and other over its tendon. If Biceps is weak, Triceps contraction is alternated with biceps. Wrist, finger extension is achieved by stimulating Radial Nerve. [11]

GROUP B (Experimental Group)

The subjects are positioned in a rocking chair. An inflatable splint was used to support the affected arm. The Shoulder was positioned in 80^0 flexion and slight abduction. The elbow is in extension and wrist is held in dorsiflexion is firmly against wall with two straps. The Patients were asked to perform rocking movements for 30 minutes, pushing with the heels or the hemiplegic arm. During rocking movements, the patients fell slightly forward and had to actively push backward. Patients were encouraged to do this with their hemiplegic arm. Initially, the therapist guided the movements, once the patient could control the movements he/she performed them independently. **[16]**

Evaluation Parameters

Fugl Meyer scores for upper limb. – Is a disease specific performance based measure of motor recovery following stroke, with a maximum score of 66 for upper limb. [25](Refer Appendix I)

Action research arm test – is a measurement of arm motor function, contains four domains grasping, griping, pinching and gross movements. Performance of each item is rated on a four point scale. [15] (Refer Appendix II)

RESULTS

The comparison of pre and post- test control values of Fugl meyer score with mean pre value of 22.33 increased to post

value of 43.73, given t- value of -6.826, thus giving a significant result with p<0.05. Comparison of pre-test and post-test values shows ,pre experimental value 19.33 and post experimental value increased to 51.53, given t- value – 25.881, thus giving a significant result with p<0.05. The study shows improvement in brunnstrom fugl Meyer scores in the control and experimental groups. The control group improved from 22.3 to 43.73. In comparison the experimental group improved from 19.33 to 51.53.this implies a difference in improvement of 7.8 points in favour of experimental group with t- value of -3.34. Thus giving a statistically significant result of P<0.05. Comparison of pre and post test control values of action research arm test with mean pre value of 8.20 increased to post value of16.07, given t- value of -5.476, thus giving a significant result with p<0.05. Comparison of pre and post test experimental values ofaction research arm test ,pre experimental value 7.67 and post experimental value increased to 28.40, given t- value – 15.119, thus giving a significant result with p<0.05. The results for action research arm test. The results showed similar pattern. The control group improved from 8.20 to 16.07. The experimental group improved from 7.67 to 28.40 with a difference of 12.33 in improvement, with t-value of -6.826.thus giving a statistically significant result of P<0.05.

Conclusion

This study compares the post-test value of Brunnstrom Fugl Meyer score and action research arm test between experimental and control groups. Based on statistical analysis there was significant improvement of motor activity in both groups between pre and post sessions. The results concluded that the subjects who participated in experimental group have shown good motor recovery than control groups. Hence it provides evidence that adding a specific intervention to the routine treatment procedures in acute phase after stroke provoked to be effective. It is crucial to apply this type of intervention as soon as possible to prevent learned non use of hemiplegic arm.

Limitations and Recommendations

Limitations

- Lack of skillful and goal directed movements.
- Possibility of secondary damage to shoulder joint such as subluxation, soft tissue lesion, shoulder hand syndrome, shoulder pain due to possible overloading of the shoulder joint.
- Small sample size.
- The exact mechanism for motor recovery is not clear.

Recommendations

- A similar study can be done on other conditions such as paraplegia, etc.
- Applying the therapy to hemiplegic arm with subluxed shoulder requires careful positioning and support. Study is needed to determine how this should be done.
- This technique is said to relieve back pain, this requires an evidence based study.
- The exact neuronal process underlying in this technique, should be made clear.

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