

A Comparative Study on Effectiveness of Motor Imaginary Technique on Improving Upper Limb Function in Middle Cerebral Artery Stroke

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ABSTRACT

Study objective: The effectiveness of motor imaginary technique in middle cerebral artery stroke.

Participants: 30 subjects age of 40-55 years with middle cerebral artery stroke patients were selected under purposive sampling technique and assigned in 2 groups with 15 subjects each one group received conventional physiotherapy and other group received conventional physiotherapy with motor imaginary technique for a period of 4 weeks.

Outcomes: Fugl-meyer scale is to measure functional outcome before and after treatment.

Procedure: The subjects of both control group and experimental group were involved for pre test assessment by fugl- meyer assessment scale (hand component).

The subjects of control group were given conventional physiotherapy and experimental group were given conventional physiotherapy and motorimaginary technique. The treatment was given for 1 hour for a period of 4 weeks as 5 days per week, one session per day.

Aim: To find out the effectiveness of motor imaginary technique on Improving upper limb function in middle cerebral artery stroke.

Results: Patients in experimental group shows significantly better performance than control group.

Conclusion: It can be concluded that motor imaginary technique is a promising intervention for improving functional activity of affected upper limb in middle cerebral artery patients.

Key words: fugl- Meyer assessment scale, conventional physiotherapy, motor imaginary Technique.

Introduction:

Brain is the major organ of the central nervous system that has control center for all the body's voluntary and involuntary activities. The brain has high energy requirement and little metabolic reserves. Interruption of blood flow only few minutes sets in motion a series of pathological events and damage to brain tissue. Stroke (or) cerebro vascular accident is defined as a rapidly developing clinical sign of focal (or) global disturbance of cerebral function lasting more than 2 hours (or) leading to death with no apparent cause other than the vascular origin (WHO 1991) (Susan B.O Sullivan 2009). A stroke is a brain attack. It is a third leading cause of death. It occurs when blood clot or ruptured vessel prevent oxygen from reaching the brain resulting in destruction of brain cells.

The disturbance of cerebral function is caused by 3 morphological abnormalities, i.e. stenosis, occlusion or

rupture of the arteries. Dysfunction of the brain (neurological deficit) manifests itself by various neurological signs and symptoms that are related to the extent and site of the area involved and to the underlying causes. Warning signs of stroke can be numbness, weakness or paralysis of face, arm, and leg especially on one side of the body sudden severe head ache, loss of balance and many factor contribute to delay in seeking medical treatment for stroke.

It has been noted that stroke incidence may vary considerably from country to country. The prevalence of stroke in India was estimated as 203 per 100,000 population above 20 years, amounting to a total of about 1 million cases (Sethi .K). 78 per cent of strokes in 40 - 65 age group (M.Dinesh Verma). In south India it was reported to be 56.9 per 100,000 as compared to 150 to 100,00 for USA and EUROPE. The major modifiable risk factor for stroke are transient ischemic attacks especially in presence of 70-99% carotid artery stenosis, hypertension, arterial fibrillation or other source of cardiac emboli, left ventricular hypertrophy, congestive heart failure, cigarette smoking, alcohol consumption, cocaine use, obesity, diabetes mellitus, high serum cholesterol and non-modifiable risk factor are age, race, gender and family history of stroke. Middle cerebral artery occlusion is more common site of occlusion in ischemic stroke. Post stroke hemi paralysis in middle cerebral artery syndrome leads to impairment of upper extremity functions more than the lower extremity. Early activation and forced use of involved upper extremity is effective in counterbalancing this effect.

The recovery from stroke takes place in initial 3-6 months after the attack. (UMPHRED, 1998) however, research has shown there can be recovery of useful motor function year's later

Physiotherapeutic measure on Stroke has been revolutionized in the last decade through a combination of new techniques looking at brain recovery. Advances in basic sciences and clinical research are beginning to merge and show that the human brain is capable of significant recovery after stroke, provided that the appropriate treatments and stimuli are applied in adequate amounts and at the right time. To improve functional activity there is a challenge to implement newer techniques, in that motor imaginary technique shows an important role.

Naturally the challenge in managing middle cerebral artery is to improve functional activity. Physiotherapy with its recent literatures are designing a newer or comprehensive techniques to improve the functional activity of middle cerebral artery stroke. In that way, one or more recent advancing research on motor imaginary plays vital role on improving Upper limb function of middle cerebral artery stroke which also need more research work. This study may be useful for physiotherapist who is treating these subjects and future reference for practicing physiotherapy.

Stroke

“Rapidly developed clinical sign of focal (or) global disturbance of cerebral function lasting more than 24 hours or leading to death with apparent cause other than vascular origin”

-WHO (1996)

Hemiplegia

Motor defects are characterized by paralysis (hemiplegic) or weakness (hemi paresis) typically on one side of the body opposite to side of lesion.

- Susan B.Sullivan(1996)

Fugl-Meyer scale

It is an impairment based test with items organized by sequential recovery stage. A three point ordinal scale is used to measure Impairments of volitional movement with grades from 0 to 2 with sub test for upper extremity function, lower extremity function, balance, sensation, pain and range of motion.

- Brunnstorm (1987)

Motor imaginary technique

Motor imaginary refers to the active process by which humans experience sensations with or without external stimuli. It is an active process during which a specific action is reproduced with in working memory without any real movements

-jeannerod (2006)

Need for the study:

Cerebrovascular accident is among the most frequent of all neurological disorder. The major goal of stroke rehabilitation is functional enhancement by maximizing the independence, life style, and dignity of the patient. The mortality due to stroke is very severe. Owing to high incidence of middle cerebral artery stroke, upper limb is severely affected than lower limb. About 20% of individual paralyzed by stroke fail to regain the functional use of affected limb, Physiotherapy techniques and approaches improves functional activity following stroke traditionally. In recent advances shows that motor imaginary technique will play a role on improving upper limb function in stroke.

There has been very few research which supports on motor imaginary technique and its role on upper limb function in stroke. In stroke especially in middle cerebral artery involvement attacks the upper limb function

mostly. So there is need to do further study on motor imaginary technique on improving functional activity of upper extremity in middle cerebral artery stroke.

Aim of a study:

The aim of the study is to find out the effectiveness of motor imaginary technique on improving upper limb function in middle cerebral artery stroke.

Objective of a study:

To compare the effectiveness of conventional physiotherapy and conventional physiotherapy with Motor imaginary technique on improving upper limb function in middle cerebral artery.

Hypothesis and Null hypothesis: There is no significant difference between conventional physiotherapy and conventional physiotherapy with motor imaginary technique on improving upper limb function in middle cerebral artery stroke.

Alternative hypothesis: There is significant difference between conventional physiotherapy and conventional physiotherapy with motor imaginary technique on improving upper limb function in middle cerebral artery stroke.

Material and Methods: Table, Pillows, Ice, Chair, Towel, Couch, Peg, board, Needle, thread, Audio tape
Study Design: Pre-test, post-test two groups, Experimental study design Sampling design: Purposive sampling technique.

Sample size: consist of 30 subjects with middle cerebral artery stroke were selected assigned in to control group and experimental group. Control group: consist of 15 middle cerebral artery stroke subjects treated with conventional physiotherapy .

Experimental group: consist of 15 middle cerebral artery stroke subjects treated with conventional physiotherapy and motor imaginary physiotherapy technique

Study method:

Subjects were divided into control group and Experimental group . 15 subjects were treated with conventional physiotherapy and 15 subjects were treated with conventional physiotherapy and motor imaginary technique. Variable and independent variable:

Study setting: ASHWIN MULTI-SPECIALITY HOSPITAL, VIVEKANANDHA INSTITUTE OF MEDICAL SCIENCES, THIRUCHENCODE, OUT PATIENT DEPARTMENT PPG COMMUNITY CENTRE.

Study duration: Study was conducted for a period of 6 months.

Procedure: The subjects of both control group and experimental group were involved for pre-test assessment by Fugl- meyer assessment scale (hand component). The subjects of control group were given conventional physiotherapy and experimental group were given conventional physiotherapy and motor imaginary technique. The treatment was given for 1 hour for a period of 4 weeks as 5 days per week, one session per day.

Data presentation: Table 1 Pre test and Post test values of control group using Fugl meyer scale

TABLE I: Pre test and Post test values of control group using Fugl meyer scale

Control group		
S.NO	PRE-TEST	POST-TEST
1	28	30
2	19	21
3	22	24
4	26	29
5	24	27
6	24	26
7	20	22
8	32	34
9	38	40
10	28	31
11	27	31
12	30	34
13	25	28
14	27	31
15	29	32

TABLE II: Pre test and Post test values of Experimental group using Fugl Meyer scale

Experimental group		
S.NO	PRE-TEST	POST-TEST
1	19	24
2	26	31`
3	25	30
4	32	36
5	28	37
6	28	35
7	27	34
8	25	32
9	24	29
10	27	34
11	37	39
12	20	29
13	24	31
14	22	30
15	28	34

ANALYSIS OF PRE-TEST DATA OF CONTROL GROUP AND EXPERIMENTAL GROUP

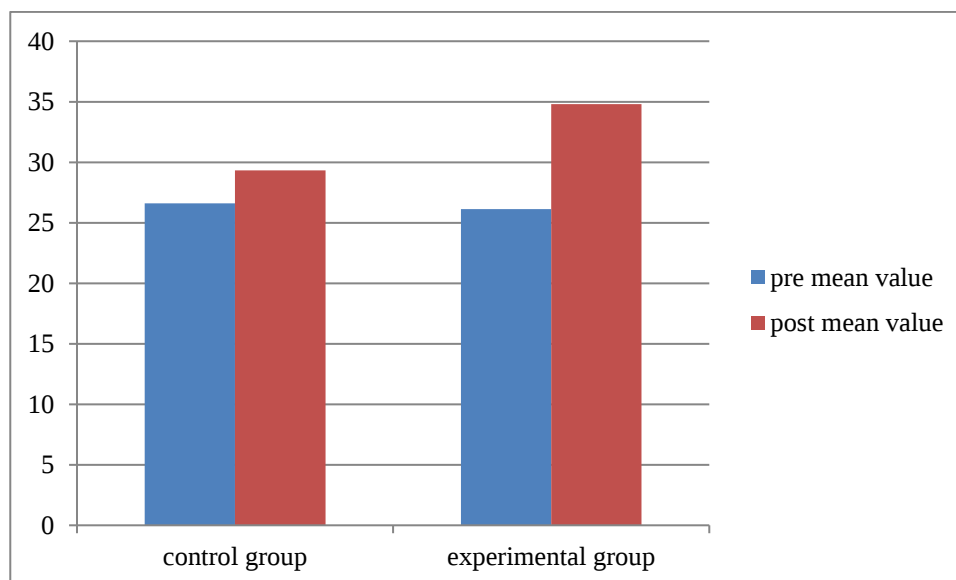
TESTS	CONVENTIONALPHYSIOTHERAPY AND CONVENTIONAL PHYSIOTHERAPY WITH MOTOR IMAGINARY TECHNIQUE	
Pre test mean value	Control Group	Experimental Group
	26.6	26.13
Independent T- test	0.24	
P value and its Significance	P value > 0.05 is insignificant	

For 28 degrees of freedom at 5% level of significance, the calculated pre test „t“ value between control group and Experimental group was 0.24 and the critical value was 1.701, which states that there is no significant difference between two groups.

ANALYSIS OF POST TEST DATA OF CONTROL GROUP ANDEXPERIMENTAL GROUP

TESTS	CONVENTIONAL PHYSIOTHERAPY AND CONVENTIONAL PHYSIOTHERAPY WITHMOTOR IMAGINARY TECHNIQUE	
Post test mean value	control Group	Experimental Group
	29.33	34.8
Independent „t“ test	2.88	
P value and its significance	P value < 0.05 is significant	

For 14 degrees of freedom at 5% level of significance, the calculated post test „t“ value between control group and Experimental group was 2.88and the critical value was 1.701 which states that there exists a significant difference between two groups



ANALYSIS OF PRE-TEST AND POST-TEST DATA OF CONTROLGROUP

GROUPS	CONVENTIONAL THERAPY	
Control group	Pre-test mean value	Post-test mean value
	26.6	29.3
Paired „t“ test	13.72	
P value and its significance	P value < 0.05 is significant	

For 14 degrees of freedom at 5% level of significance, the student „t“ test value for control group

(CONVENTIONAL PHYSIOTHERAPY) was 13.72 and the critical value was 1.761, which states that there exists significant difference between the pretest and post-test values of control group

TABLE VI: ANALYSIS OF PRE TEST AND POST TEST DATA OF EXPERIMENTAL GROUP

GROUPS	CONVENTIONAL PHYSIOTHERAPY AND MOTOR IMAGINARY TECHNIQUE	
	Pre-test mean value	Post-test mean value
Experimental Group	26.13	34.8
Paired „t“ test	17.95	
P value and its significance	P value < 0.05 is significant	

For 14 degrees of freedom at 5% level of significance, the student „t“ test value for Experimental group II (conventional physiotherapy and motor imaginary technique) was 17.95 and critical value was 1.761, which states that there exists significant difference between the pre-test and post-test values of Experimental group

VI. RESULTS

Effectiveness of control Group (conventional physiotherapy) is elicited by comparing the pre-test and post-test values of experimental group using paired „t“ test; the calculated value is 13.72, whereas the critical value is 1.761. Since the calculated value is greater than the critical value, there exists a significant difference between the pretest and post test values of control group .

Effectiveness of Experimental group (conventional physiotherapy with motorimaginary technique) is elicited by comparing the pretest and post test values of Experimental group using paired „t“ test, the calculated value is 17.95, whereas the critical value is 1.761. Since the calculated value is greater than the critical value, there exists a significant difference between the pretest and post test values of Experimental group

While comparing the post test values of control group and Experimental group using independent „t“ test, the calculated value is, 2.88 whereas the critical value is 1.761, which shows that there exists a significant difference between the post test values of two groups.

When comparing the mean values of both, the post test mean value of control group 29.33 is lesser than the post test mean value of Experimental group 34.8 which confirms that Experimental group shows a significant improvement than control group .

Rehabilitation of stroke patients is a complex and difficult procedure. Various physiotherapy strategies evolved over the years for the rehabilitation of stroke patients.

Motor imaginary technique is the therapeutic programme which aims at the optimization of function by training patients in various tasks related to the daily activities.

This study is to find out the efficiency of Motor imaginary technique in improving upper limb function as evidenced by the outcome measure Fugl Meyer assessment scale (upper limb component). Motor imaginary technique in hemiparetic patients with middle cerebral artery involvement.

Result obtained from statistical analysis between pretest and post test values of experimental group and control group at 5% level of significance showed significant improvement in Fugl Meyer Assessment Scale by Motor imaginary technique following 4 weeks of exercise programme.

Analysis of results shows that there is an increase of 24% in outcome measure of Fugl Meyer Assessment scale.

VII DISCUSSION

Rehabilitation of the hemiplegic patients is essential for improving functional activities. stroke affects patient's normal activities of daily living and make them dependent to others. The purpose of this study is to synthesize the relevant literature about motorimaginary technique in order to facilitate its integration in to physical therapist practice.

SUSAN B.O" SULLIVAN described occlusion of the proximal middle cerebral artery produces extensive neurological damage with significant cerebral oedema .increased intracranial pressure typically lead to loss of consciousness, brain herniation and possibly death.

The most common characteristics of middle cerebral artery syndrome or contralateral spastic hemiparesis and sensory loss of face, upper extremity and lower extremity, with the face and upper extremity more involved than the lower extremity .

MAGILL suggested that mental practice is effective because it augments existing motor schema .at the level pretest the patient had limited ability to use the affected wrist and fingers but a greater ability to perform gross movements with the affected arm, as indicated by his scores on items on fugl-meyer scale.

After participating in mental practice intervention targeting grasping, reaching and gripping behaviours the

patient maintained his gross motor score while improving on the fine motor components of Fugl-Meyer scale, at the post test the specificity of the changes in the areas targeting suggests enhancement of the existing motor plan as a possible mechanism.

Frequent practice of skill causes improved motor performance, motor imaginary technique, when combined with physical practice has been shown to be even more effective in improving motor performance than physical practice alone. One viable hypothesis is that during mental practice concurrent activity occurs in musculature and in the appropriate neuro motor pathways. This correlative neuro motor activity is similar to the activity that we hypothesize occurs with repetitive physical practice and is responsible for motor performance improvements that individuals exhibit after mental practice.

We believed that the patient improvements between the pretest and the post test occurred because the patient, through mental practice, was provided with additional practice of functional tasks using the affected arm.

On a physiological level we believed that this practice caused priming of the motor cortex and appropriate activation of the neuro motor pathways, which resulted in the patient's improvements. We believed that correlating changes in motor behaviour with changes in cortical organization using functional magnetic resonance imaging might substantiate this claim.

Mental image of movement can be generated independent of behavioural output of paretic limb as patients motor function began to improve daily activities using the affected limb were implemented. Outcome measures were grip strength shoulder flexibility and time to complete common daily activities such as dressing and inserting a key in lock with greater precision and ease of movement.

The functional activities of stroke patients is measured by Fugl-Meyer scale. It is an impairment based scale test items organized by sequential recovery stage (BRUNNSTROM 2007) Thus, motor imaginary technique may provide a valuable tool to access the motor network and improve outcome after stroke.

Hence, it thought this form of technique can prove useful in stroke patients who have lost movements. Therefore when combining motor imaginary technique with conventional physiotherapy it improves upper limb function which is revealed in this present research work.

VIII. SUMMARY AND CONCLUSION

This study finds out the efficacy of Motor imaginary technique in improving upper limb function in middle cerebral artery stroke.

In 30 patients the upper limb function was measured by Fugl Meyer assessment.

The control group subjects were given conventional physiotherapy and experimental group were given conventional physiotherapy and motor imaginary technique. For both groups various exercise through peg board, pronation-supination board, threading board.

The subjects were strictly instructed not to sleep during the treatment. Initially patient feel difficult in imagine and also feels bore. Samples were given conventional physiotherapy for lower extremity.

The duration of the treatment program was 4 weeks treatment motor performance was done through Fugl Meyer assessment scale.

My study concluded that the calculated value was above the significant value, strictly proves that the motor imaginary technique was very effective in improving upper limb function in middle cerebral artery stroke

LIMITATIONS AND SUGGESTION

- This study was very short term and therefore to make it more valid long term is necessary.
- Since the study has been done with smaller number of subjects further studies should be conducted with large group of population.
- Motor imaginary technique is not well applicable for stroke patients who are having cognitive and sensory defect
- Though the Fugl Meyer Assessment and were administered objectively bias is possible, further study can be done other reliable assessment tools.
- Variation in calamity, drugs, diet, personal habit, side of involvement, gender, age could not be controlled.

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