Original Research Article

Effectiveness of Motor Imaginary Technique for Improving of Upper Limb Function in Post Stroke Patients

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Abstract

Objectives: This study was to compared the conventional exercises and conventional exercises with motor imaginary technique for improvement of hand function in post stroke patients.
Methods: 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 6 weeks as 5 days per week, one session per day.
Results: When compared the mean ± standard deviations of pre-test and post- test value of control group patients. P-value was found to be 0.003. it was statistically significant. While, when we compared the mean ± standard deviations of pre-test and post- test value of experimental group patients. P-value was found to be less than 0.0001. it was highly statistically significant differences.
Conclusions: Conventional physiotherapy exercises with motor imaginary technique is the most effective for improving of upper limb function as compared with only conventional physiotherapy exercises in post stroke patients. Hence, this form of technique can be use in post stroke patients for improvement of activity of daily livings.
Keywords: Post stroke patients, Conventional exercises, Motor Imaginary technique

Introduction

Stroke remains one of the greatest challenges in health care, as it is a common cause of acquired long-term disability in adults, and the second leading cause of death worldwide [1, 2]. Moreover, it will continue to be an important topic, given that demographic trends with an aging population are expected to result in a significant increase in stroke patients in the

future [3]. In Germany, for example, approximately 196,000 first time strokes occur annually, in addition to approximately 66,000 recurrent strokes [4]. On average, 25% of all patients after stroke or transient ischemic attack are discharged to an inpatient neurological rehabilitation facility immediately after acute treatment [4,5]. Affected individuals often face dramatic changes in their daily lives, making self-reported measures of individual health status valuable for assessing long-term recovery from stroke [1]. However, these measures are rarely collected, and when they are, it is in very different ways and usually not through repeated measurements, making it difficult to draw conclusions about their progression [6].

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 counter balancing this effect. The recovery from stroke takes place in initial 3-6 months after the attack. (UMPHERD, 1990) 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 [7]. Objectives of our study was to compared the conventional physiotherapy and conventional physiotherapy with imaginary technique for improvement of hand function in post stroke patients.

Materials & Methods

This present study was conducted in Department of Physiotherapy, School of Paramedical and Allied Health Sciences, Al-Karim university, Katihar during a period from May 2021 to November 2021.

Methodology

Sample 30 subjects who fulfilled inclusion and exclusion criteria were selected for the study.

Inclusion criteria: Ability to walk indoor without a stick indicating no major balance problem, Hemi paretic patient within the involvement of middle cerebral artery, above one-month post-stroke and within one year. (Brunnstorm stage 2), Ischemic type of stroke, Age groups between 40- > 65 years, both gender and both sides of involvement.

Exclusion criteria: Serious sensory or cognitive and aphasic deficit, Other type of stroke (hemorrhagic, lacunars), Comatosed patients, Bilateral involvement, Balanced disorder, Medical instability, Any recent fracture or surgery, Recent myocardial infarction, Auditory impairment, perceptual defects, reflex sympathetic dystrophy and mental retardation.

All the 30 subjects with middle cerebral artery stroke were assigned in to control group and experimental group. Each group had 15 patients.

Procedures:

Table, pillows, ice, chair, towel, couch, peg board, Needle, thread and audio tape were used as material tools in this study.

Control group: 15 post stroke patients were treated with conventional physiotherapy exercises.

Experimental group: 15 post stroke patients were treated with conventional physiotherapy exercises and motor imaginary technique.

Parameters: Motor performance for Fugl-Meyer assessment scale (Upper limb only).

Treatment Technique:

Control Group:

In sitting: Sitting on a firm flat surface, hands rests over bed, feet flat on floor, while therapist place one hand over elbow and other over wrist. (i) Weight shifting to both sides. (ii) Clasping both hands forward, turning to sound side. While lifting the affected leg and crossing it over the sound side. (iii)Clasping both hands forward, turning to affected side. While lifting the sound leg and crossing it over the affected side. (iv) Sitting with crossed legs. The affected leg over the sound one. While both hand clasps and places over knee. (v) Flexion and extension of knee. Therapist places one hand over foot other hand over knee.

From sitting to standing: (i) Clasping both hands forward. Affected foot parallel with sound one. Therapist place one hand over sacrum and other hand over knee. (ii) Patient stands up weight bearing over affected leg.

Stage 1: Therapists assists in holding patient and help them to raise up.

Stage 2: Assist by clasping hands forward and without therapist support.

Stage 3: With one hand support.

Stage 4: Without hand support.

In standing: (i) Clasping both hands forward. Turning to both sides. (i) Sitting and standing up.

For movements of arm: (i) Elevation of arms with clasped hands. (ii) Moving clasped hands to face, while therapists hand prevents retraction of shoulder. (iii)Moving clasped hands above head, while therapists hand prevents retraction of shoulder. (iv) Mobilizing shoulder girdle with extended arm. (v) Bilateral shoulder flexion exercises. (vi) Sitting push-ups to full elbow extension.

Ice Therapy: Placing the patient's hand in a bucket of melting ice for a few seconds brings intense awareness of the part, reduces spasticity and often improves movement. STRETCHING all spastic muscles especially biceps brachii, wrist and finger flexors.

Lower Limb Exercise:

Mobilising the leg and toes, bridging exercise, activities on mat, weight bearing exercise, activites on tilt board.

Treatment duration and Repetition: 60 minutes and 20 repetition per exercise.

Home Exercise: needle and thread activity, button activity, peg board activities.

Experimental group: Conventional Physiotherapy exercises given as same as control and motor imaginary technique given.

Ask the patient to contract and relax his muscles (progressive relaxation). The patient was asked first to tighten the muscles of feet and then relax them, the same procedure followed in his legs, arms, and hand. this portion of audio tape is followed by 5-7 mins of suggestions for internal, cognitive visual images related to using affected arm in functional tasks (maintain interest ,3 scripts were provided during 6 weeks interventions, one during first 2 weeks, second during second 2 weeks, third during third 2 weeks). Internal, cognitive images were used in which patient received audio tape command imagine himself from third person perspective executing the tasks specified on mental practice audio tape. The intervention was intended to target and improved functional use the patient's affected wrist and fingers as well as to secondary improve his ability to move out of synergy with affected arm.

During first 2 weeks, the audio taped functional task was reaching for grasping a cup, during the second 2 weeks, functional tasks practiced was turning pages in large book. during third 2 weeks task practiced was reaching for and grasping a item on a high self and bringing an item to himself, for each of this task the patient was urged to use all of his senses (eg. Feel your fingers grasp around the edge of the cup) The duration of treatment is 20 minutes per session two session per week.

Measurement: 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 6 weeks as 5 days per week, one session per day.

Statistical Analysis

Data was analysed with the help of latest version of SPSS software. Mean ± standard deviations were observed. T- test was applied. P-value was taken less than or equal to 0.05 for significant differences.

Observations

A total of 30 post stroke with upper limb dysfunction patients of age group 40 to > 65 years were enrolled in this study. Most of the patients 21(70%) were in age group of 50 to 60 years. All the patients were assigned into two group (Control and experimental group). Each group had 15 patients.

Table.1. Comparisons of Fugl Mayer score in between the pre -test and post-test value of control group patients.

Pre-test	Post test	t-value	p-value
Mean ± Standard deviation	Mean ± Standard deviation		
27.34 ± 2.45	30.67 ± 3.12	3.251	0.003

When we compared the mean ± standard deviations of pre-test and post- test value of control group patients. P-value was found to be 0.003. it was statistically significant. While, when we compared the mean ± standard deviations of pre-test and post- test value of experimental group patients. P-value was found to be less than 0.0001. it was highly statistically significant differences.

Table.2. Comparison of Fugl Mayer score in between the pre -test and post-test value of experimental group patients.

Pre-test	Post test	t-value	p-value
Mean ± Standard deviation	Mean ± Standard deviation		
25.34 ± 3.14	35.12 ± 4.24	7.179	< 0.0001

Discussions

Stroke is the third most common cause of death and the main cause of acquired adult disability in high-income countries (Warlow 2008) [8]. This affects from 112 to 223 per 100,000 people in high income countries, and from 73 to 165 per 100,000 in low-income countries (Feigin 2009) [9]. The annual incidence of stroke is 795,000 people in the USA (Go 2013) [10], more than 110,000 in England (NHS

Choices) and around 15,000 in Scotland (Stroke in Scotland 2010) [11]. Motor impairment, typically affecting movement of the face, arm and leg of one side of the body, affects about 80% of stroke survivors (Langhorne 2009) [12]. Upper limb (i.e. arm, hand and/or finger) motor impairments are often persistent and disabling (Lai 2002) [13]; only half of all stroke survivors with an initial plegic (paralysed) upper limb regain some

useful upper limb function after six months (Kwakkel 2003) [14], and, of those with initial arm impairment, 50% have problems with arm function four years post stroke (Broeks 1999) [15]. Activities of daily living (ADLs) largely depend on arm function (Sveen 1999) [16], particularly for personal activities such as feeding, dressing and grooming. One year after stroke, arm motor impairment is associated with anxiety (Morris 2013) [17] and poorer perception of health-related quality of life (Franceschini 2010) [18] and subjective well-being (Wyller 1997) [19]. Therefore, improving upper limb function is a core element of rehabilitation after stroke to maximise recovery (Langhorne 2003) [20].

In this present study, we were enrolled 30 post middle cerebral artery stroke patients with age group of 40 to > 65 years. Most of the patients 21(70%) were in age group of 50 to 60 years. All the patients were divided into two groups (Control and experimental group). Each group had 15 patients. Control group patients were treated with conventional physiotherapy. And experimental group patients were treated with treated with conventional physiotherapy and motor imaginary technique.

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 pre-test 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 (BRUNNSTORM 2007) [21].

In this study, highly significant improvement was seen in experimental group patients ($p<0.0001$) as compared to control group patients ($p=0.003$). Thus, motor imaginary technique may provide a valuable tool to access the motor network and improve motor outcome after stroke.

Conclusions:

This present study concluded that the conventional physiotherapy exercises with motor imaginary technique is the most effective for improving the upper limb function as compared with only conventional physiotherapy exercises in post stroke patients. Hence, this form of technique can be use in post stroke patients for improving the activity of daily livings.

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