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Role of CIMT in treatment of upper limb hemiplegia in cerebrovascular accident patient

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ABSTRACT

Cerebrovascular accident is the medical term for a stroke. A stroke is when blood flow to a part of brain is stopped either by a blockage or the rupture of a blood vessel. Stroke is the third leading cause of death and the most common cause of disability in the developed and developing countries. Stroke is a major cause of disability, mainly caused by motor disorders. Although most patients show significant improvement in motor function soon after stroke, 75% of patients remain deficient in the upper limbs after 3-6 months. Constraint-induced movement therapy is a neurorehabilitation approach developed, characterized by the retention of the less affected upper limb and the forced use of the affected arm. The aim of the study is to compare the effect of Conventional therapy and Constraint-induced movement therapy on upper extremity function among stroke patient. A total of 30 Stroke patient were recruited into this study and randomly assigned into two groups, the control group and trained group. Data were collected before training and 3 months after completing the training program. The study is Quasi Experimental study design. The study was conducted at outpatient Department, Physiotherapy. Group A – Receives Conventional therapy (Experimental group - I) Group B – Receives Constraint-induced movement therapy (Experimental group - II). The Inclusion criteria and Exclusion criteria are considered in this research. The result is that CIMT is proved to be more statistically significant and clinically effective intervention in comparison to motor relearning programme among the patients aged between 35-60 years. Constraint induced movement therapy is significantly effective in improving upper limb function than conventional therapy on cerebrovascular accident patient.

Key Words: Cerebrovascular accident, Stroke, Constraint-induced movement therapy, upper limb Hemiplegia.

INTRODUCTION

Cerebrovascular accident (CVA) is the medical term for a stroke. A stroke is when blood flow to a part of brain is stopped either by a blockage or the rupture of a blood vessel. Stroke is the third leading cause of death and the most common cause of disability in the developed and developing countries.(Batool S, et al., 2015) Burden of stroke is escalating in Asia and incidence ranges from 182 to 342 per 10,000 populations.(Khealani BA, 2008) Upper extremity motor impairment is the most disabling consequence of stroke that limits independent living.(Singh P., et al 2013) About 85% of stroke population exhibits an initial weakness in arm that persists in 55% to 75% of patients even after three to six months.However, full recovery of hemiplegic arm occurs in only 5 to 20% of patients. Hemiplegic arm reduces the ability to actively perform functional arm movements such as reaching, grasping and manipulating an object that result in difficulties in activities of daily livings (Singh P., et al 2013).

Worldwide, 16.9 million people suffer a first stroke each year, resulting in about 33 million stroke survivors and 5.9 million stroke-related death making stroke the second or third most common cause of death(Feigin V et al., 2013) and one of the main causes of acquired adult disability(Kwakkel Gert., 2016). Approximately 80% of these survivors have motor impairments of the upper limb(Langhorne P, et al., 2013) that gravely affect their ability to perform activities of daily living (ADL), as well as social participation. Previously we showed that the severity of upper limb paresis is an independent determinant of the outcome of basic activities of daily living (ADL) post stroke. (Veerbeek J, et al., 2011)

Stroke is a major cause of disability, mainly caused by motor disorders (Dobkin, 2005; Towfighi and Saver, 2011; Corbetta et al., 2015). Although most patients show significant improvement in motor function soon after stroke, 75% of patients remain deficient in the upper limbs after 3-6 months (Pang et al., 2006; Ng et al., 2007; Chen et al., 2017).

Constraint-induced movement therapy (CIMT) is a neurorehabilitation approach developed by Taub et al. (1993), characterized by the retention of the less affected upper limb and the forced use of the affected arm. This is usually achieved by placing the least affected hand in a soft glove and then intensely targeting the affected hand for up to 90% of daily waking hours, 2 weeks per month (14 days total) (Taub and Wolf, 1997; Kwakkel et al. al., 2015). However, daily intensive occupational therapy for 6 hours results in low adherence rates. To overcome this difficulty, a modified CIMT (mCIMT) has been developed in recent decades (Page et al., 2001, 2002; Wang et al., 2011; Taub et al., 2013; Souza et al., 2015; Zhu et al., al., 2016). MCIMT differs from conventional CIMT in that it has a reduced training intensity.

A growing body of research shows that CIMT after stroke, especially in the chronic phase (> 6 months), is more effective than standard rehabilitation measures (van der Lee et al. 1999; Wolf et al. 2006; Sterr et al. ., 2014; Park et al., 2015; Takebayashi et al., 2015; Ballester et al., 2016). The fundamental issue is still whether CIMT is superior to conventional rehabilitation for acute or subacute stroke. Numerous studies have demonstrated that CIMT is ineffective for the acute stroke patient's rehabilitation. Initiated in the first several days and weeks following the stroke, a high-intensity CIMT can exacerbate the decline in limb function (Dromerick et al., 2009).

The aim of the study is to compare the effect of Conventional therapy and Constraint-induced movement therapy on upper extremity function among stroke patient.

METHODOLOGY

A total of 30 Stroke patient were recruited into this study and randomly assigned into two groups, the control group and trained group. Data were collected before training and 3 months after completing the training program. The study is Quasi Experimental study design. The study was conducted at outpatient Department, Physiotherapy. A total number of 30 subjects were selected and assigned into experimental group 1 and experimental group 2 of 15 each. Non probability convenient sampling was used for selecting the sample from the population.

Group A – Receives Conventional therapy (Experimental group - I) Group B – Receives Constraint-induced movement therapy (Experimental group -II). The Inclusion criteria are 45-60 years of age, 1-3 months post stroke patients, Motor Assessment Scale sitting score of 3, and Brunnstorm recovery stage score 4, Both males and females, No visual deficits And No sensory deficits

The Exclusion criteria are Any cognitive deficits, any other neurological deficits as multiple sclerosis, Parkinson’s disease, Any musculoskeletal disorder like osteoarthritis, ligament injury, Patient undergoing any other balance training protocol simultaneously, Non-cooperative patients.

Both groups received standard conventional physiotherapy treatment for 30 minutes. Group B receives Conventional therapy whereas Group B receives Conventional therapy along with Constraint induced movement therapy for 45 minutes. Pre and post treatment measurements were determined by upper arm section of Motor Assessment Scale (MAS) and Self Care item of Functional Independence Measure (FIM) Scale.

DATA ANALYSIS

The collected data were analyzed using paired “t” test and independent “t” test.

EXPERIMENTAL GROUP – A

Table 1 : Conventional therapy

Variable	“t” cal. value	“t” table value
Upper limb function	20.125*	2.273

“t” calculated value > “t” table valueSignificant at 5% level.

EXPERIMENTAL GROUP – II

Table 2: Constraint induced movement therapy

Variable	"t" cal. value	"t" table value
Upper limb function	20.125*	2.273

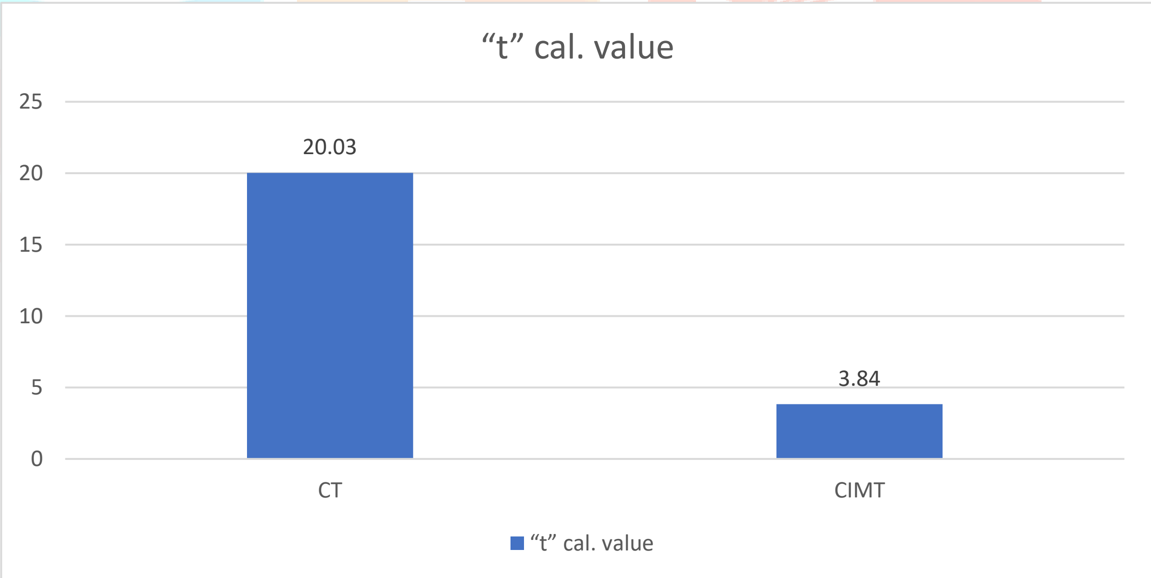
"t" calculated value > "t" table valueSignificant at 5% level.

Independent "t" test

Table 3: Constraint induced movement therapy

Variable	"t" cal. Value	"t" table value
Upper limb function	3.766*	2.112

"t" calculated value > "t" table valueSignificant at 5% level.



RESULTS AND DISCUSSION

The data was subjected to statistical analysis and the following results were obtained.

Conventional therapy is significantly effective in improving upper limb function on cerebrovascular accident patient.

Constraint induced movement therapy is significantly effective in improving upper limb function on cerebrovascular accident patient. Similar results were achieved by Batool S, et al., 2015 where they found that CIMT group showed more significant improvement in motor function and self-care performance of hemiplegic upper extremity as compared to MRP group in patients with sub-acute stroke assessed by the MAS and FIM scales. Thus, CIMT is proved to be more statistically significant and clinically effective intervention in comparison to motor relearning programme among the patients aged between 35-60 years.

Constraint induced movement therapy is significantly effective in improving upper limb function on cerebrovascular accident patient.

Constraint induced movement therapy is significantly effective in improving upper limb function than conventional therapy on cerebrovascular accident patient.

DISCUSSION

Conventional therapy is significantly effective in improving upper limb function on cerebrovascular accident patient. The improving upper limb function following conventional therapy

may be due Increases the efficiency and strength of synaptic connection. Enhances both parallel and hierarchical processing with in CNS, which induced increases stored areas of the brain and it results in enhancing effective motor recovery. Prolonging the action potential through changes in potassium conductance. This allow increased excitatory post synaptic potentials.

Reactivation of the cortex was due to increased responsiveness of weak inputs from neighboring areas. Take over of existing descending pathway from premotor and supplementary motor cortex that have direct projection to brains-team area involved in motor control.

Constraint induced movement therapy is significantly effective in improving upper limb function on cerebrovascular accident patient.

The improving upper limb function following constraint induced movement therapy may be due induces long term structural changes in the organization and number of connection among neurons. Parallel and hierarchical processing With in CNS markedly increased which results in peak amplitude and size of cortical output to the muscles were significantly larger and shorter reaction time. Practice (CIMT) makes the maps of cortical output to the muscles continued to enlarge until the subject explicit knowledge of the sequence. Repeated practice of motor skill results in improved synaptic efficiency between the sensory and motor cortex, increases the efficiency of the thalamocortical pathway that are co activated during learning process.

Recovery of arm function was associated with ventral extension of upper limb areas of the cortex (functionally related area). Strengthen of the shift in the hierarchical organization of the cortex, with supplementary motor cortex, premotor cortex descending pathways taking over for the primary corticomotor pathways.

Constraint induced movement therapy is significantly effective in improving upper limb function than conventional therapy on cerebrovascular accident patient.

This might have occurred due to Increased alternation of motor cortex by hard prospected training programme. Co-Activation of many muscles simultaneously present at initial level, of with continuous, hard practice those less efficient contractions are eliminated and only the necessary muscles contact. Extension of upper limb presentation in cortex and pre motor supplementary motor cortex descending pathways taking over the primary corticomotor pathway.

Increasing of central mapping changes persists for large periods on intense practice and continues to enlarge until the subjects explicit knowledge of the sequence. Peak amplitude and size of cortical output to the muscle were significantly higher and reaction fine becomes shorter. Increase short term and long term structural changes in organization and number of connection in neurons.

The study results conclude with, Nilsson L., et.al., (1998) showed that, constraint induced movement is significantly effective in improving the upper limb function than conventional therapy on cerebrovascular accident patient.

Ann Charistin Eliasson.et.al (2004) concluded that the constraint include movement therapy shows greater improvement in upper limb function than the conventional therapy on cerebrovascular accident patient.

The results of this study make us conclude that constraint include movement therapy is significantly effective in improving upper limb function than conventional therapy on cerebrovascular accident patient. Further studies are needed to evaluate CIMT effects in acute and chronic post stroke population.

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