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COMPARE THE EFFECT OF CIMT VERSUS MIRROR THERAPY ON HAND FUNCTION IN SUBACUTE AND CHRONIC STROKE

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ABSTRACT

BACKGROUND: To compare the CIMT versus Mirror therapy has proven effective in increasing functional use of affected hand in patients with subacute and chronic stroke. **OBJECTIVE:** To evaluate the effectiveness of the constraint induced movement therapy (CIMT) and combined mirror therapy for patient's rehabilitation of the patients with subacute and chronic stroke patients. **METHODS:** Twenty patients with subacute and chronic stroke were enrolled and divided into two groups CIMT group, CIMT with Mirror therapy group. CIMT group 6 hours a day for 4 days per week for 4 weeks ,and CIMT with Mirror therapy group 30 minutes of mirror with CIMT for 4 days per week for 4 weeks . The fugl-meyer motor function assessment (FMS) and Brunnstrom Voluntary control grading were evaluated 4weeks after the treatment. **RESULTS:** The score of the Brunnstrom Voluntary control grading p value (P value 0.0001) and Fugl-meyer scale P value (0.0001). **CONCLUSION:** In our group of subacute and chronic stroke patients, hand functioning improved both groups, mirror therapy combined with CIMT showed more improvement than the CIMT after 4 weeks of treatment.

KEY WORDS: Hemiplegic upper extremity, Mirror therapy, constraint induced movement therapy, Subacute and chronic stroke.

INTRODUCTION

Stroke is a global epidemic and an important cause of morbidity and mortality. As defined by WHO stroke is rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than of vascular origin. Stroke remains the leading cause of disability and the third leading cause of death among adults in the United States of America and In India, stroke is perhaps the second commonest cause of death and probably the most common cause of disability, According to W.H.O (16 Nov. 2011) in India incidence of stroke was 130/100000 individuals every year.[1]

Rehabilitation is an active participatory process to minimize the neurological impairment resulting from stroke. The main goal of the rehabilitation is to return the patient to home and maximize recovery by providing safe, progressive regimen suited to the individual patient.[2]Proper rehabilitation of stroke patients includes early physical, occupational and speech therapy. A study conducted among stroke patients found that proper rehabilitation therapy results in better motor recovery. Physical therapy helps to reverse the disabilities caused by stroke. Current research suggests that stroke patients recover the lost function in three ways, overcoming learned non use, learning to use existing redundant neural pathways that don't include damaged brain tissue and the development of neural pathways through brain plasticity.[2]

The neural mechanisms underlying the efficacy of mirror therapy are not clear, but the resulting improvement in motor function is an instantiation of use dependent neural plasticity, which has been demonstrated in the form of expansion of topographic maps in a variety of situations. The mirror provides patients with visual input. The mirror reflection of the moving good hand looks like the affected hand moving correctly and perhaps substitutes for the often decreased or absent proprioceptive input. Use of the mirror may also help recruit the premotor cortex to help with motor rehabilitation. The premotor cortex has a number of features suggesting it might possibly be a link from the visual image in the mirror to motor rehabilitation following stroke. Premotor cortex has significant contributions to the descending corticospinal tracts, more bilateral control of movement than the motor cortex itself and intimate connections with visual input. On a number of neurological and psychological levels, mirror therapy may help to reverse elements of learned disuse of the

affected limb. Mirror neurons are bimodal visuomotor neurons that are active during action observation, mental stimulation (imagery), and action execution. For example, it has been shown that passive observation of an action facilitates M1 excitability of the muscles used in that specific action. Mirror neurons are now generally understood to be the system underlying the learning of new skills by visual inspection of the skill.[1]

NEED OF STUDY

Stroke is one of the most common devastating disorders. It causes nearly 5 million deaths each year in the world. According to World Health Organization 15 million peoples suffer stroke worldwide each year, of these, 5 millions are permanently disabled. Stroke is the 3rd largest killer in India. Incidence of stroke in India is around 130 per 10, 0000 people every year.

Hand function disability following stroke poses as one of the greatest obstacles to independent living, thus leading to the need of incorporating newer techniques and approaches conventional rehabilitation that are invested in improving functional recovery of motor skills after stroke. Mirror Therapy is a newer technique which is thought to affect neuroplasticity and is simple and convenient to apply.

Mirror Therapy works on hand cortical reorganisation and learned non-use.

The purpose of this study was to compare the effect of the CIMT versus mirror therapy in stroke patients

AIM AND OBJECTIVES

AIM

To compare the effect of CIMT Versus Mirror therapy with CIMT on hand functioning in patients with stroke.

OBJECTIVES

To study the CIMT versus Mirror therapy with CIMT for improving the hand functioning in stroke.

To evaluate the effect of Mirror therapy with CIMT versus CIMT on upper limb functions among patients with stroke.

HYPOTHESIS

Null hypothesis

There was no significant effect of Mirror therapy with CIMT versus CIMT so does not improve hand functioning in stroke.

Alternate hypothesis

There was significant effect of Mirror therapy with CIMT versus CIMT improve hand functioning in stroke.

MATERIAL AND METHEDOLOGY

Study Design: Experimental design.
Sample size: 20.
Sample method: Random Sampling.
Study setup: Hospital in and around pune.

INCLUSION CRITERIA

Both male and female Patients aged between 40 to 60 years.
Stroke with affecting upper extremity.
Patient with voluntary control grading from 2-4 for affected hand.
A score of 24 or more mini mental status examination.

EXCLUSION CRITERIA

Any musculoskeletal problem in upper limb eg: dislocation, reflex sympathetic disorder
Neurological disorder that do not support with CIMT and mirror therapy.
Contracture in upper limb.

PROCEDURE

This study was an experimental design randomized control included 20 patients with stoke. This study was conducted in and around pune All the patients of stroke with hemiparesis were examined and screened according to the inclusion and exclusion criteria. 20 patients who fulfilled the criteria were enrolled in the study after taking an informed consent. Patients were randomly allotted to study in experimental and control group, one Study group was given mirror therapy with constraint induced movement therapy which include ADLS activities, and another group was given constraint induced movement therapy.

During the Mirror therapy program for 30 min 4 days of week for 4weeks. Patient were seated close to a table on a mirror was placed vertically and in mid saggital plane, the paretic hand of the patient was placed back of the mirror and the nonparetic upper extremity was placed in front of mirror. The patient asks to do some functional task; reaching, grasping, lifting, placing objects and counting with fingers, each of the above tasks was perform for 5 repetitions. They were instructed to watch the image of their unaffected upper limb in the mirror this seeing the reflection of nonparetic upper extremity movements projected over the paretic upper extremity. The imagery component will reinforce by then instructing the individual to imagine that the reflected limb is in fact your limb moving about physically in space. And another group CIMT is a multifaceted intervention designed to promote increased use of the more paretic upper extremity, the patient is engaged in intense task oriented practice of the more paretic upper extremity for up to 6 hours a day, 4 days of week for 4weeks, and the patient nonparetic arm restrained from use by having the patient wear a safety mitt up to 90% of waking hours.

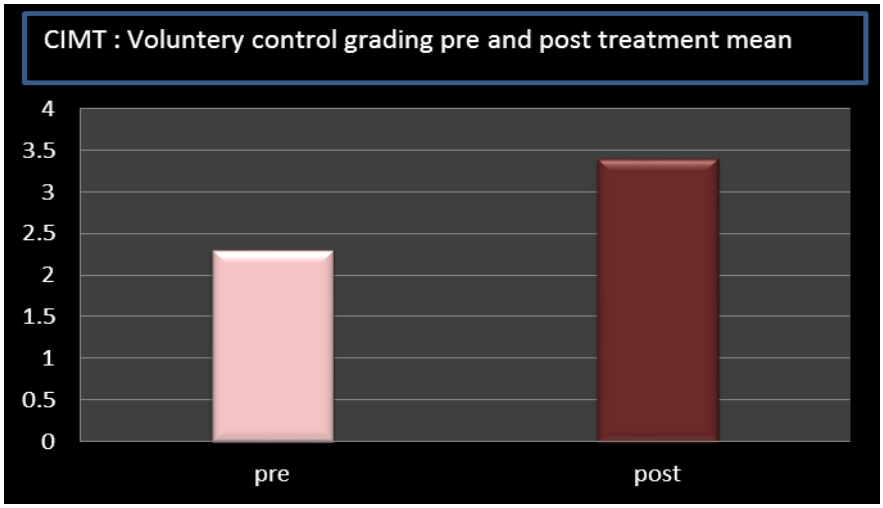
OUTCOME MEASURES

Fugl-mayer upper limb assessment of physical performance.
Brunstroms Voluntary control grading.

RESULTS

Table: 1 Comparing the mean value of CIMT group voluntary control grading pre and post treatment

Vcg	Mean	Standard deviation	P value
Pre	2.3	0.48	<0.0001
Post	3.4	0.51	

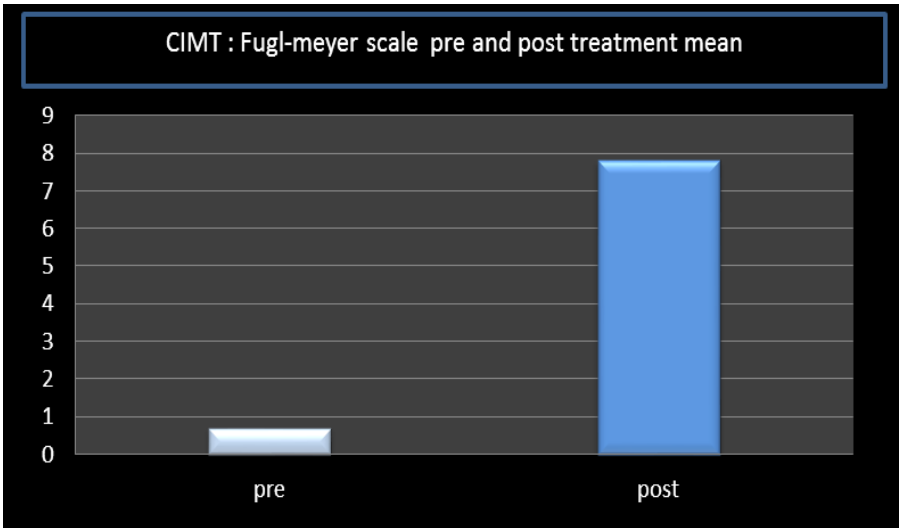


Graph: 1 Comparing the mean value of CIMT group voluntary control grading pre and post treatment

INTERPRETATION: GRAPH:1 shows graphical presentation of CIMT group comparing the voluntary control grading pre-treatment mean and SD 2.3 ±0.48 and post treatment and SD 3.4±0.51, P value shows statically significant

Table: 2 Comparing the mean value of CIMT group fugl-meyer scale pre-treatment and post treatment

Fms	Mean	Standard deviation	P value
Pre	0.7	0.82	<0.0001
Post	7.8	0.63	

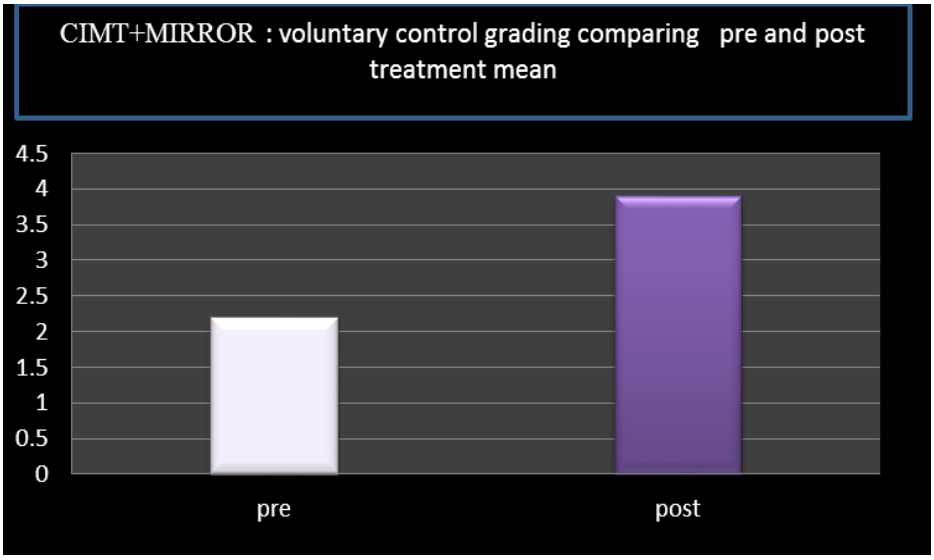


Graph: 2 Comparing the mean value of CIMT group fugl-meyer scale pre-treatment and post treatment

INTERPRETATION:GRAPH2**:** CIMT group comparing the fugl-meyer scale pre mean and SD 2.3± 0.48 and post treatment mean and SD 3.4 ±0.51 and Pvalue<0.0001 results shows statically significant.

Table 3: Comparing the mean value of mirror+ CIMT versus CIMT group voluntary control grading pre and post treatment

Vcg	Mean	Standard deviation	P value
Pre	2.2	0.42	<0.0001
Post	3.9	0.73	

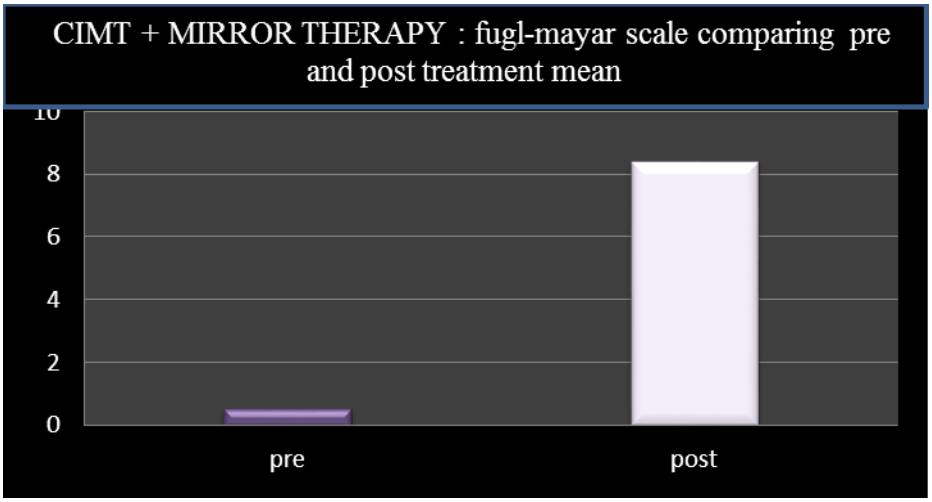


Graph: 3 Comparing the mean value of mirror+ CIMT versus CIMT group voluntary control grading pre and post treatment

INTERPRETATION:CIMT+MIRROR voluntary control grading comparing pre mean and SD 2.2±0.42 and post treatment mean and SD 3.9± 0.73 and P value<0.0001 results shows statically significant.

Table: 4Comparing the mean value of mirror+ CIMT versus CIMT group fugl-meyar scale pre and post treatment

Fms	Mean	standard deviation	p value
Pre	0.5	0.52	<0.0001
Post	8.4	0.51	



Graph: 4Comparingthe mean value of mirror+ CIMT versus CIMT group fugl-meyar scale pre and post treatment

INTERPRETATION: GRAPH: 4CIMT+MIRROR voluntary control grading comparing pre mean and SD 0.5 ±0.52 and post treatment mean and SD 8.4 ±0.51 and Pvalue<0.0001 results shows statically significant.

DISCUSSION

The stroke is one of the major cause of the disability and impairment, the impaired muscle strength after a stroke poses a therapeutic challenge for the patients, guardians, and specialists in rehabilitation therapy, In particular, the learned nonuse phenomenon of the affected upper extremity is characterized by the tendency to use the less affected upper extremity for the purpose of habitually performing the functional tasks [3]. As described, if hemiplegic patients use the unaffected upper extremity, they would lose the functional independence. This leads to the speculation that the patients would increasingly use the hemiplegic upper extremity and eventually would achieve a functional recovery, if they concomitantly receive short-term intensive rehabilitation treatments, such as CIMT and mirror therapy, following the onset of

symptoms[4]. These intensive rehabilitation treatments for the upper extremity training may be based on the structural plasticity that the gray and white matter undergo following the onset of stroke[5,6].

In the association with structural alterations in the gray matter following the short-term intensive rehabilitation treatments, such as the CIMT, it has been shown that the size of contrast-enhanced bilateral sensorimotor cortex was increased on the voxel-based morphometry on T1-weighted magnetic resonance imaging scans. In addition, the previous studies have also shown that there is a significant proportional correlation between the size of contrast-enhanced bilateral sensorimotor cortex and the degree of the functional recovery of the hemiplegic upper extremity[7]. To explain the mechanisms of the mirror therapy, the transcranial magnetic stimulation was performed during the mirror illusion in normal healthy individuals. It was shown that there was an increase in the activity of the primary motor cortex (M1) corresponding to the contralateral hand on the mirror [8].

In our study all the patients with sub-acute and chronic stroke with involvement of upper extremity, we divided into two groups one group was given mirror therapy + CIMT and another group was CIMT, The MT group received beside this program 30 min of mirror therapy + CIMT. After 4 weeks of treatment, patients of MT+ CIMT showed ($p < 0.0001$), in CIMT group ($p<0.0001$) both group shows significant result but more improvement showed in mirror+ CIMT as compare to CIMT group. Differences in upper-extremity function after intervention in the mirror + CIMT group were compared with those in the CIMT group. The experimental group showed significantly greater differences compared to the control group, with improvements in paretic upper-extremity functions ($p < 0.0001$). Similar results were reported by Yavuzer et al. he studied Mirror therapy improves hand function in subacute stroke: a randomized controlled trial. [9] indicating that visual illusions that make patients feel as if their two hands are symmetrically moving simultaneously activate both the left and right cerebral hemispheres and increase the excitability of the paretic limb.

Based on the present result, the experimental showed a significant improvement in upper extremity and to perform activities of daily living compared to the control group. The bilateral upper-limb training in mirror therapy using visual feedback improved paretic upper-extremity function, which, in turn, enhanced the performance of activities of daily living. The area of self-care showed statistically significant differences when the subitems of the abilities to perform activities of daily living in the mirror group were compared with those of the control group. This finding is attributed to the recovery of upper-extremity function. Improvement in self-care is one of the most important aspects in performing activities of daily living [9].

Our treatment program was comparable to other studies in terms of how many weeks and how many days per week and duration 30min mirror and CIMT group 6hours, 4days per week for 4 days Based on the data in the literature and on previous experience, we have appreciated that half an hour rehabilitation sessions suffice, avoiding excessive stress on the patient—mental effort that was required during the MT training was very tiring for the patients, as some of them stated that "I feel less tired when I'm walking for 1 h" or "I feel that something it's happening in my brain, I feel that it works and it is tired." The therapist had the task to ensure the full collaboration of the patient. As we have stated before, attention and complexity of the task are important characteristics that are crucial for the ability of a procedure to induce long-term neuroplasticity [10]

CONCLUSION

This study shows that mirror therapy combined with CIMT showed more improvement than the CIMT.

LIMITATIONS

There were no consistent criteria for the location or size of lesions prior to the current study.

A limitation of this study is that the patients met specific selection criteria; hence, the findings cannot be generalized to all stroke patients.

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