

Original Research Article

A Randomized Clinical Trial to Study the Effectiveness of Mirror Therapy in Improving Hand Function of Stroke Patients

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ABSTRACT

Introduction: Mirror Therapy is patient directed treatment that improves the upper extremity function. It is a form of imagery in which mirror is used to convey visual stimuli to brain through observation of one's unaffected body part as I carries out set of movements.

Method: 30 patients with sub acute and chronic stroke with impaired hand function were randomly allocated into 2 groups with 15 patients in each group. Group A received Mirror Therapy and Conventional Physiotherapy and Group B received only Conventional Physiotherapy. Both groups received treatment for 5 days a week for 4 weeks duration. Hand functions were measured using Wolf Motor Function Test (WMFT) and Jebsen Handfunction Test (JHFT).

Results: There was statistically significant improvement in hand function of stroke patients in Group A as compared to Group B.

Conclusion: It is concluded that the Mirror Therapy with Conventional Physiotherapy significantly found effective than Conventional Physiotherapy alone in improving hand function of stroke patients.

Keywords: Stroke, Mirror Therapy, Conventional Physiotherapy, Hand function, Wolf Motor Function Test & Jebsen Hand Function Test.

INTRODUCTION

Stroke or brain attack is the sudden loss of neurological function caused by an interruption of the blood flow to the brain. ⁽¹⁾ Stroke patient's incidence rate ranges from 0.2 to 2.5 per 1000 populations per year in India. Upto 85% stroke survivors experience hemiparesis resulting in impairment of an upper extremity immediately after stroke. ⁽²⁾ One direct consequence of stroke is the loss of upper limb (UL) function. Whereas upto 83% of stroke survivors learn to walk again, it is estimated that only 5 to 20 % of stroke

survivors attain complete functional recovery of their affected upper limb. ⁽⁴⁾

Common forms of treatment for this condition include exercise training of the paretic limb, functional electrical stimulation, and constraint-induced movement therapy. Therapeutic approaches e.g. Bobath or motor relearning approach. ⁽⁴⁾

One of the newest therapies is Mirror Therapy in Stroke Rehabilitation. This involves the use of a mirror box being placed in front of the patient with the mirror image showing the unaffected limb. Movements are then introduced with the

unaffected limb, with the affected limb out of view while the patient watches the mirror. The patient perceives that they are watching the affected limb move in the mirror. ⁽⁵⁾

Conventional Physiotherapy involve Upper Extremity shoulder exercises, Passive ROM exercises, elbow and wrist weight bearing exercises, dumbbell exercises and hand exercises. Lower Extremity exercises involve Passive ROM exercises; sit to stand exercises, partial squatting, toe rises. ⁽⁶⁾

Various studies have been done to evaluate the study of Mirror Therapy in stroke patients but still the result is controversial. ^(4,7,8)

Thus the aims and objectives of the study is to examine the effects of Mirror Therapy as an intervention for hemiparesis of the hand and to study the effect of Mirror Therapy combined with conventional therapy when compared with conventional therapy alone in motor recovery of hand.

MATERIALS AND METHODS

The study design was a randomized clinical trial. Patients suffering from stroke diagnosed from Department of Neurosurgery, Guru Gobind Singh Medical College and Hospital, Faridkot and Department of Medicine, Guru Gobind Singh Medical College and Hospital and referred to physiotherapy OPD of University College of Physiotherapy, Faridkot. Randomization was done by using Random number tables, with allocation concealment by opaque sequentially numbered sealed envelopes.

Inclusion criteria:

- 1) Age between 45-65 year.
- 2) Both male and female subjects were taken.
- 3) Patient with sub-acute and chronic stroke > 3 months post stroke were taken.
- 4) Patient who were able to understand and follow simple verbal

instructions and has normal hand function before the stroke.

- 5) Patient willing to participate in the study.

Exclusion criteria:

- 1) Non co-operative patients.
- 2) Inability to understand and follow simple verbal instructions.
- 3) Patients with poor vision.
- 4) Patients having difficulty in attending therapy session on daily basis.

The study was approved by Research and Ethical Committee of University College of Physiotherapy, Faridkot. Patients were equally divided into two groups based on randomization, Group A (n=15) and Group B (n=15). Duration of treatment was 5 days a week for 4weeks duration.

Wolf Motor Function Test (WMFT) and Jebsen Hand Function Test(JHFT) were used to assess the patient's hand function. Data was collected at baseline of study (0 week) and at the end of treatment (4 weeks).

PROCEDURE:

Group A (Experimental): All the patients in experimental group received Mirror Therapy and Conventional Therapy.

Mirror Therapy: During mirror practice patient was seated on a chair close to the table on which a mirror is placed vertically and advised to place both the hands on the table. The involved hand was placed behind the mirror and noninvolved hand in front of the mirror. The patient was advised not to look on the affected hand and focus on the mirror. The practice consisted of non paretic side wrist flexion-extension, finger flexion-extension, thumb opposition while patient looked into the mirror, watching the image of their noninvolved hand. During the session, patient was asked to do the same movements in the paretic hand, each activity 10 repetitions per session for one session per day 5 days a week for 4 weeks. ⁽²⁾

**Conventional physiotherapy:
Upper Extremity-**

Shoulder exercises:

(A) Theraband Exercises

(B) Range of motion, Weight bearing activities and elbow / wrist exercises:

- Passive or self assisted range of motion for joints with no or minimal active movements.
- Upper extremity weighing activities e.g. placing down on physio ball and pushing ups on the armrest of chair.
- Dumbbell/wrist cuff weight exercises Elbow/wrist flexion and extension.(progressed by increasing the weight and increasing repetitions from 2 sets of 10 to 3 sets of 15).

(C) Hand activities exercises and functional training:

- Hand muscle strengthening: Exercises using putty, grippers (movements: pinch, grip, finger extension) (progressed by increasing the resistance of the putty and grippers and increasing repetitions from 2 sets of 10 and 3 sets of 15).
- Functional activities: playing cards, picking up objects of various sizes and shapes, reaching tasks, fine motor tasks

Lower Extremity-

(A) Cardiorespiratory fitness and mobility

- Brisk walking.
- Sit to stand: progressed by reducing the height of chair.
- Alternate stepping onto low risers: progressed by increasing the height of the steppers and by reducing the arm support.

(B) Mobility and balance

- Walking in different directions.
- Tandem walking.
- Walking through an obstacle course.
- Sudden stops and turns during walking.
- Walking on different surfaces (carpet, foam).
- Standing on wobble board.

- Standing with 1 foot in front of the other.
 - Kicking ball with either foot.
- (C) Lower extremity muscle strength:
- Partial squats, progressed by increasing movement magnitude.
 - Toe rises, progressed from bilateral rise to unilateral rises on either leg and progressed by increasing no. of repetitions from 2 sets of 10 to 3 sets of 15.



FIGURE 1: Mirror Therapy (Wrist Flexion)
Legend: Patient performing wrist flexion exercise with unaffected hand in Mirror-box Therapy



FIGURE 2: Conventional Therapy (Passive range of motion for shoulder joint)
Legend: Passive range of motion of the affected upper limb for shoulder joint in conventional therapy

Group B (Control): All patients in Control Group received Conventional Physiotherapy program for 1 hour per day for 5 days a week for 4 weeks duration. Patients were

given Conventional Physiotherapy in the same way as Group A.

RESULTS

Result was analysed using SPSS; t-test was to compare the results between the two groups. The result was considered significant with $p < 0.05$.

Paired t-test was done between pre-test and post-test values between Group A and Group B for examining the effect of upper limb motor performance and there was significant improvement in hemiparetic hand function.

Unpaired t-test was done to compare Group A and Group B to examine changes within both the groups. Group A shows significant improvement than Group B in Jebsen Hand Function Test.

TABLE 1: Inter group comparison in Group A and Group B Wolf Motor Function Test

	WMFT			
	PRE (0 WEEK)		POST (4 WEEKS)	
	GROUP A	GROUP B	GROUP A	GROUP B
MEAN	1.25	1.12	3.37	1.65
MEAN DIFFERENCE	0.134		1.71	
NUMBER	15	15	15	15
S.D	1.04	0.59	1.25	0.87
T VALUE	.431		4.34	
P VALUE	.670*		.000*	
Df	28		28	
S.E.M	.270	.152	.324	.228*
TABLE VALUE AT 0.05 df	2.06		2.06	

(*) is the significant p value

TABLE 2: Inter group comparison in Group A and Group B Jebsen Hand Function Test

	JHFT			
	PRE (0 WEEK)		POST (4 WEEKS)	
	GROUP A	GROUP B	GROUP A	GROUP B
MEAN	44.93	43.73	49.60	45.20
MEAN DIFFERENCE	1.19		1.30	
NUMBER	15	15	15	15
S.D	2.37	2.40	4.62	2.00
T VALUE	1.374		3.379	
P VALUE	.180*		.002*	
dF	28		28	
S.E.M	.613	.620	1.19	0.518
TABLE VALUE AT 0.05 df 14	2.05		2.05	

(*) is the significant p value

TABLE 3: Intra group comparison between Group A and Group B Wolf Motor Function Test

	WMFT			
	GROUP A		GROUP B	
	PRE (0 WEEK)	POST (4 WEEKS)	PRE (0 WEEK)	POST (4 WEEKS)
MEAN	1.25	3.37	1.12	1.65
MEAN DIFFERENCE	2.11		0.53	
NUMBER	15	15	15	15
S.D	1.04	1.25	0.59	0.87
T VALUE	3.70		1.87	
P VALUE	0.002*		0.088*	
dF	14	14	14	14
TABLE VALUE AT 0.05	2.15	2.15	2.15	2.15

(*) is the significant p value

TABLE 4: Intra group comparison between Group A and Group B Jebsen Hand Function Test

	JHFT			
	GROUP A		GROUP B	
	PRE (0 WEEK)	POST (4 WEEKS)	PRE (0 WEEKS)	POST (4 WEEKS)
MEAN	38.83	45.93	44.33	45.20
MEAN DIFFERENCE	7.09		0.866	
NUMBER	15	15	15	15
S.D	7.45	7.62	1.87	2.0
T VALUE	8.66		3.166	
P VALUE	0.000*		0.007*	
dF	14	14	14	14
TABLE VALUE AT 0.05	2.15	2.15	2.15	2.15

(*) is the significant p value.

DISCUSSION

The study concluded that Mirror Therapy combined with Conventional Physiotherapy is effective in improving motor recovery of hand. Improvement occurred in the motor recovery of hand of the patients who received Mirror Therapy and Conventional Physiotherapy as compared to Conventional Physiotherapy only.

A study by Christian ⁽⁹⁾ supports present study. He studied the effect of a therapy that includes mirror to simulate the affected upper extremity with the unaffected upper extremity early after stroke. It was demonstrated that the application of Mirror Therapy in the early phase after stroke resulted in functionally relevant improvements in motor, sensory, and attentional domains.

The results of a study by Gunes ⁽¹⁰⁾ were also similar to present study. It was to evaluate the effects of Mirror Therapy on upper extremity motor recovery, spasticity, and hand related functioning of inpatients with sub acute stroke. This study showed that Mirror Therapy in addition to conventional rehabilitation program was more beneficial in terms of motor recovery and hand related functioning.

The study of Femy ⁽²⁾ also supports this study. The purpose is to study the effectiveness of Mirror Therapy as a home program in rehabilitation of hand function in sub acute stroke. It was concluded that the Mirror Therapy as a home program with conventional exercises significantly found effective than sham therapy in improving hand functions in sub acute stroke.

A study by Deepti ⁽¹¹⁾ also supports present study. The purpose is to synthesize the relevant literature about Mirror Therapy in order to facilitate its integration into Physical Therapist Practice. It suggests that the encouraging effects of Mirror Therapy improves the functional outcomes after stroke by facilitating plastic re-organization of the cortex in the brain in response to visual feedback. Thus, Mirror may provide a valuable tool to access the motor network and improve outcome after stroke.

CONCLUSION

The study concluded that Mirror Therapy is found to be effective in improving motor recovery of hand. Improvement in motor recovery of hand occurred after the treatment of four weeks in patients who received Mirror Therapy and conventional physiotherapy as compared to patients who received conventional therapy alone.

Limitations:

Sample size for the study was small. The

long term effects of Mirror Therapy were not investigated.

Future scope:

Large sample size should be taken. Long term follow up studies should be done to examine the appropriate effect of Mirror Therapy.

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