

Effect of Mirror Therapy on Hand Functions in Leprosy Patients

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ABSTRACT

Background: Leprosy is a chronic infection which is caused by bacillus *Mycobacterium leprae*. It primarily affects superficial tissues, skin and peripheral nerves. Hand function disability and sensory loss following leprosy poses as one of the greatest obstacles to independent living.

Aim: To study the effect of mirror therapy on hand functioning in leprosy patients.

Objective: To evaluate the effectiveness of the sensory re-education combined with mirror therapy in patients with leprosy.

Methods: Thirty patients with leprosy were enrolled and divided into two groups Participants were divided in two groups, Experimental group and control group using convenient sampling. Subject in control group was treated with only sensory re-education, and subjects in experimental was treated with sensory re-education along with mirror therapy .The Sensory re-education program was for 30 min 4 days of week for 4weeks.Experimental group 30 minutes of mirror with sensory re-education for 4 days per week for 4 weeks . Fugl- Meyer (FM) Assessment Of Physical Performance. Michigan Hand Outcome Questionnaire (MHQ), and Disability of Arm Shoulder and Hand (DASH) scale were evaluated before treatment and 4weeks after the treatment.

Results: Post treatment experimental group shows significant improvement in hand functioning with leprosy patients with P value 0.001

Conclusion: In our group of control and experimental of leprosy patients, hand functioning improved both groups, mirror therapy combined with sensory re-education showed more improvement than the only sensory re-education after 4 weeks of treatment.

Keywords: Leprosy upper extremity, Mirror therapy, sensory re-education therapy.

INTRODUCTION

Leprosy is a chronic infection which is caused by the acid-fast, rod-shaped bacillus *Mycobacterium leprae*. Leprosy primarily affects superficial tissues, skin and peripheral nerves. Leprosy affects social and psychologically as well as its highly visible disability and its complication have resulted in a social stigma in leprosy. [6]

The major signs and symptoms of leprosy are Numbness, Loss of temperature sensation, Touch sensation reduced, Pins

and needles sensations, Pain, Deep pressure sensations, Nerve injury, Loss of digits. [9]

Sensory Rehabilitation is an active participatory process to minimize the neurological impairment resulting from leprosy. To return the patient to home and maximize recovery by providing safe, progressive regimen suited to the individual patient is the main goal of the rehabilitation. Proper rehabilitation of Leprosy patients includes early physical, occupational therapy. A study conducted among leprosy

patients found that proper rehabilitation therapy results in better sensory improvement than motor recovery. [1,3]

Mirror therapy works on principle of cortical re-organisation. In this there is use of a mirror to create a reflective illusion of an affected limb in order to stimulate the brain to think movement has occurred without pain. [2,11]

NEED FOR STUDY

To independent living, hand function disability and sensory loss following leprosy poses as one of the greatest obstacles, thus leading to the need of including newer techniques and approaches to commonplace rehabilitation that are improving functional recovery of motor skills after leprosy. Mirror Therapy is the newer techniques which is thought to affect neuroplasticity and is simple and convenient to apply hence need of study.

Aim:

- To study the effect of mirror therapy on hand functioning in leprosy patients

Objectives:

- To study the effect of Mirror therapy in improving hand function in leprosy using Michigan Hand Outcome Questionnaire (MHQ)
- To study the effect of Mirror therapy in improving hand function using Fugyl Meyer (FM) Assessment Of Physical Performance
- To study the effect of Mirror therapy on Disability using Disability of Arm Shoulder , and Hand (DASH) scale

MATERIAL AND METHEDOLOGY

- **Study Design:** Randomised control trial
- **Sample size:** 30
- **Sample method:** Random Sampling.
- **Study setup:** Hospital in and around Pune.
- **Target population:** Leprosy patients

INCLUSION CRITERIA

- Aged between 35-60 years.
- Both male and female Patients
- Leprosy with affecting upper extremity.

- Leprosy since 1 years

EXCLUSION CRITERIA

- Any musculoskeletal problem which affects the upper limb
- Recent injuries
- Cognitive impairment
- Contracture in upper limb.

Procedure

Permission was taken from institutional ethical committee of Tilak Maharashtra Vidyapeeth, department of physiotherapy. Participants were selected on the basis of inclusion and exclusion criteria. Random allocation using envelope method. The aim and method of the study was explained to the selected participants and written consent was taken. Participants were divided in two groups, Experimental group and control group using convenient sampling. Subject in control group was treated with only sensory re-education, and subjects in experimental was treated with both sensory re-education along with mirror therapy.

Sensory re-education

Begin by using a moving touch stimulus, such as eraser or pencil, and stroke over the area. The patient first watches, then closes his / her eyes, and tries to identify where the touch occurred. Progress from stroking to using constant touch. When the patient is able to localize constant touch. Progress to identification of familiar objects of various shapes, size, textures like keys eating utensils, toothbrush etc.

The Sensory re-education program was for 30 min 4 days of week for 4weeks.

Mirror therapy

The Mirror therapy program was for 30 min 4 days of week for 4weeks. Patient will be seated close to a table and the mirror will be placed vertically and in mid sagittal plane, the affected hand of the patient will be placed back of the mirror and the non affected upper extremity will 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 will be perform for 5 repetitions. They were instructed to watch the image of their unaffected upper limb in

the mirror this seeing the reflection of non-affected upper extremity movements projected over the affected 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. [2,11]

- Fugl- Meyer (FM) Assessment Of Physical Performance [4]
- Michigan Hand Outcome Questionnaire (MHQ) [7,8]
- Disability of Arm ,Shoulder and Hand (DASH) scale [5]

OUTCOME MEASURES

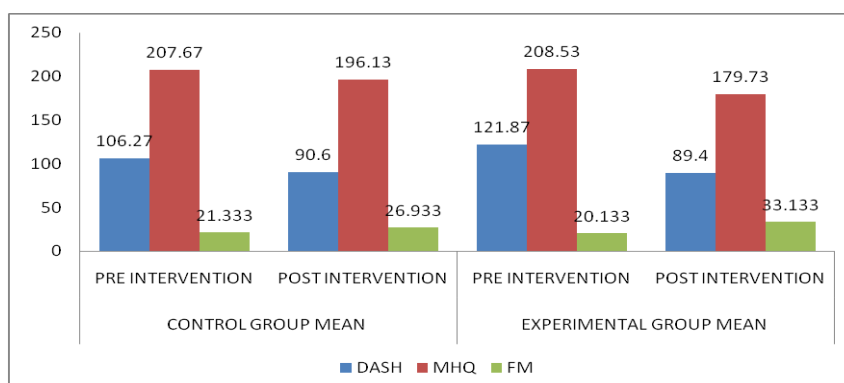
RESULT

Table 1

GROUP	GENDER	AGE(YRS)(MEAN±SD)	DURATION OF LEPROSY
CONTROL GROUP	M=9(60%)	58.77±6.397	3±1.69
	F=6 (40%)		
EXPERIMENTAL GROUP	M=10(66.66%)	57.33±6.397	3.6±1.50
	F=6 (33.33%)		

Table : 2

	CONTROL GROUP			EXPERIMENTAL GROUP		
	PRE INTERVENTION MEAN AND SD	POST INTERVENTION MEAN AND SD	P value	PRE INTERVENTION MEAN AND SD	POST INTERVENTION MEAN AND SD	P Value
DASH	106.27±23.720	90.600±20.677	0.0640	121.87±23.415	89.4±19.115	≤0.001
MHQ	207.67±27.466	196.13±14.486	0.0874	208.53±17.631	179.73±19.021	≤0.001
FM	21.333±5.864	26.933±6.158	0.0165	20.133±6.243	33.133±5.423	0.001



Result shows presentation of leprosy group comparing the Pre-experimental and Pre control group using the mean values of DASH, MHQ and FM scales. Mean and SD of DASH pre intervention experimental is 121.87±23.415 and pre intervention control is 106.27±23.720. Mean and SD of MHQ pre intervention experimental is 208.53±17.631 and pre intervention control is 207.67±27.466. Mean and SD of Fugl-Meyer Assessment Of Physical Performance pre intervention experimental is 20.133±6.243 and pre intervention control is 21.333±5.864. P value considered as not significant

Result shows presentation of leprosy group comparing the Pre- intervention

control and Post intervention control group using the mean values of DASH, MHQ and FM scales. Mean and SD of DASH pre intervention control is 106.27±23.720 and post intervention control is 90.600±20.677. Mean and SD of MHQ pre intervention control is 208.53±17.631 and post intervention control is 196.13± 14.486. Mean and SD of Fugl- Meyer Assessment Of Physical Performance post intervention control is 20.133±6.243 and pre intervention control is 26.933±6.158. P value 0.001 considered significant

Result shows presentation of leprosy group comparing the Pre- intervention experimental and Post intervention experimental group using the mean values

of DASH, MHQ and FM scales. Mean and SD of DASH pre experimental is 121.87 ± 23.415 and Post experimental is 89.4 ± 19.115 . Mean and SD of MHQ pre intervention experimental is 208.53 ± 17.631 and Post intervention experimental is 179.73 ± 19.021 . Mean and SD of Fugl-Meyer Assessment Of Physical Performance pre intervention experimental is 20.133 ± 6.243 and Post experimental is 33.133 ± 5.423 . P value 0.001 shows statically significant

Result shows presentation of leprosy group comparing the Post intervention control group and Post intervention experimental group using the mean values of DASH, MHQ and FM scales. Mean and SD of DASH Post intervention control Group is 90.6 ± 20.67 and Post intervention Experimental group is 89.4 ± 19.115 . Mean and SD of MHQ Post intervention control Group is 196.13 ± 14.48 and Post intervention Experimental is 179.73 ± 19.021 . Mean and SD of Fugl-Meyer Assessment Of Physical Performance Post intervention control Group is 26.933 ± 6.15 and Post Intervention Experimental is 33.133 ± 5.423 . P value 0.001 showing statically significant.

DISCUSSION

In this study we included the leprosy patients with affected motor and sensory sensation. The purpose of this thesis was to study the combine effect of mirror therapy and sensory re-education in leprosy patients. In this study, leprosy patients were taken in and around Pune. Total 40 samples were taken according to the inclusion and exclusion criteria. 5 gets dropped and 5 not kept follow up. 15 subjects were in Experimental group and 15 subjects were in Control group. Subject in control group was treated with only sensory re-education, and subjects in experimental was treated with both sensory re-education and mirror therapy.

Tanja Oud et al Mirror Neurons accounts for about 20% of all the neurons present in a human brain. These mirror

neurons are responsible for laterality reconstruction i.e., ability to differentiate between the left and the right side. When using the Mirror box, these mirror neurons gets activated and helps in the recovery of affected parts. ^[10]

Cortical reorganization that results from nerve injury patient loses functional sensibility, In a normal, hand, a stimulus elicits a profile of neural impulses which reach the sensory cortex. These impulses are associated with previous memories or experiences, and turn into a conscious perception. After nerve injury the same stimulus will elicit an reduced or altered profile of neural impulses, and when these impulses reach the somatosensory cortex they may find no match or alter match in the association cortex. In such cases the sensation is reduced or experienced as new, cannot be identified, and may even pass unnoticed. Cortical connections and cortical maps can be re-modulated by experience. Experiments have shown that activity, behaviour and the accession of skills are factors that can influence the cortical patterns. This plasticity of the brain, to respond to changes by peripheral nerve influence, can be used in the function rehabilitation of the hand in patients with a peripheral nerve injury of hand. This type of treatment is called sensory re-education. Sensory re-education is aimed at refining cortical receptive fields with a higher sensory resolution, improving tendency towards reversal and normalization of the distorted hand map, and improving processing in the sensory network at a higher order cortical level, facilitating interpretation of the distorted hand map. ^[10]

This system is thought to use the observation of movement to stimulate the motor processes that would be involved in that movement. Similarities have been drawn with motor imagery where by the individual will mentally imagine movements rather than observing the reflection of a movement in a mirror. It is thought that the brains natural inclination to

prioritise visual feedback over all others would make

CONCLUSION

- Study concluded that there is significant effect of mirror therapy on hand functions in leprosy patients.

Limitation:

- Limited area of sample collection
- Less study duration
- Not used advance equipment

Future Scope

- Used advance equipment like Electromyography (EMG) and Nerve Conduction Velocity (NCV)
- Using biofeedback
- Can be compare with Constraint induced movement therapy (CIMT) technique

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