International Journal of Health Sciences and Research
www.ijhsr.org ISSN: 2249-9571

Case Report

A New Therapeutic Proposal for Hand Dysfunction Secondary to Cardiac Arrest - A Case Report

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Received: 25/09/2016 *Revised: 17/10/2016* *Accepted: 25/10/2016*

ABSTRACT

A new intervention (TASTT) for hand rehabilitation was proposed in this report which was based on the principle of somatosensory input, mirror neurons, learned non use phenomenon and neuroplasticity. An intervention of 45 days (1 hour per day, 5 days per week for 9 weeks) was given to the patient & prognosis was observed on various outcome variables like CAHAI, ABHILHAND, Brunnstrom stage of hand recovery and Sollerman Hand Function test before & after the intervention. It was concluded that a combination of sensiromotor with task specific training may be a successful strategy for the treatment of paretic hand.

Keywords: TASTT, Task oriented approach, Paretic Hand, Neuroplasticity

INTRODUCTION

Cardiac arrest may be thought of as causing both "metabolic" and "structural" damage to the central nervous system. Patients with brief episodes of systemic circulatory arrest who suffer milder degrees of cerebral anoxia-ischemia demonstrate the clinical features of a reversible "metabolic encephalopathy". [1]

Global cerebral ischemia during cardiac arrest results in heterogeneous injury to the brain and most common cause of morbidity and mortality. The unique vulnerability of the brain is attributed to its limited tolerance of ischemia and its unique response to reperfusion. [2]

Patients with more severe systemic anoxia-ischemia suffer structural damage to specific areas of the brain as if they had had a stroke. Large projection neurons of the cerebral cortex, cerebellar Purkinje cells, and the CA-1 area of the hippocampus are the most vulnerable areas. The subcortical areas, such as the brainstem, thalamus, and hypothalamus, are more resistant to injury than the cortex. If the thalamocortical complex or extensive bilateral cortical regions are injured, dysfunction in arousal and consciousness may result. [1,2]

Hand movements normally play central role in human existence and much attention in rehabilitation research has been focusing on restoring hand motor function after a stroke. A recurring theme is that interventions emphasizing intense, active repetitive movements are of high value in this regard. These increase strength, accuracy and functional use when applied to subjects with paretic hand. [3]

Various therapies have been developed to improve functional recovery in patients with a paretic hand due to stroke or acquired brain injury, including the facilitation technique with proprioceptive neuromuscular facilitation, the Brunnstrom approach, the Bobath approach,

electromyography (EMG) - initiated electrical stimulation, increased intensity of physiotherapy, constraint - induced movement therapy, computerized arm training, early and repetitive sensorimotor stimulation of the arm, transcranial magnetic stimulation (TMS) and thermal intervention for the hemiplegic upper limb to facilitate sensory and motor recovery. But it's rarely been seen that all these techniques been summed up to an extent patient can perform, in order to gain better recovery of function. [4]

A new approach (Therapist assisted sensiromotor training {TASTT}) based on the principles of neurolplasticity, learned non use phenomenon and somatosensory input is invented through this case study which signifies patterned neural activity in regeneration and recovery of function.

The primary novelty of this case report is the demonstration of substantial gain of functional independence in daily living in context of hand functions secondary to cardiac arrest. This case report aims to evaluate the effectiveness of TASTT to improve hand function secondary to cardiac arrest.

Description of TASTT-

This approach was designed by integrating the principles of learned non-use phenomenon, mirror neurons, neuroplasticity and somatosensory input.

Material used- Micropore tape and Glove

Procedure-

The therapist fastening his hand including finger and thumb with patient hand with the help of micropore (for e.g. if patient have left side effected tie your right hand so that therapist ventral aspect of hand faced dorsal aspect of patient hand). After tieing the micropore with all fingers and thumb at the DIP and PIP joint, the therapist assist and direct all the movements of finger and thumb including the flexion and extension at PIP, DIP and MCP joint, abduction and adduction at MCP joint, opposition and wrist flexion, extension and radial and ulnar deviation. These will give visual feedback to the patient as he/she is moving his own independently. This is helpful in preventing associated movements and directing and learning each movement of hand separately. (Therapist can also wear a glove to hidden his support in doing movement. Glove should be of large sized so that both therapist and patient hand will be enclosed in it.). This approach is beneficial in flaccid stage.

Task oriented exercises can be incorporated in the progression of this approach. For e.g. reaching activities, Sensory discrimination activities like- Identification of Different objects (different coins, Matching Shape-circle, square, rectangle).

CASE REPORT

A 52 year female presented with complaint of incapable in using left hand for carrying out her daily activities since one year. A patient was admitted in Amar hospital, Patiala after she had an attack of cardiac arrest, one year ago. She was unconscious for two days after an attack and on ventilator. When she gains the conscious level, her left arm was unmovable and doctor advised her to take physiotherapy treatment. Since, then she was taking a physiotherapy treatment but does not find any signs of improvement in left hand. But now she was capable of moving left shoulder and elbow joint without any difficulty. MRI reports reveal ischemic changes in the right frontal region and global changes of cerebral atrophy.

She was housewife, living with her husband and participated in various social activities like kitties parties without any trouble. Her husband was very cooperative and equally participates during rehabilitation process. Her hobbies are cooking, writing stories and articles in newspaper.

Patient reported activity limitations and required assistance for tasks such as grooming, cutting vegetables, making chapattis, carrying objects with left hand, applying hair pins and wearing ear rings. A signed consent for carrying out this study was obtained from the patient.

On observation, built was mesomorphic and walk with normal base of support independently. The left shoulder was internally rotated, adducted and slightly flexed, elbow is extended and forearm supinated. The left wrist was flexed and fingers were slightly flexed at PIP and DIP joints and thumb assumed a flexed and adducted position. The non-pitting oedema was seen over thenar and hypothenar area of ventral aspect of left hand.

On cognitive examination, patient was found alert, oriented and cooperative with the higher mental functions as assessed by Mini Mental Status Examination (MMSE) was scored 30/30. The facial expression and conversation with patient shows her apprehensive behaviour due to inability to do simple task with left hand.

On sensory examination, the superficial, deep & cortical sensations are found to be intact (checked at dermatomal level). On Motor Examination, muscle tone as per Modified Ashworth Scale (MAS) is grade 1 in group muscle of shoulder and elbow joint. The hand musculature was flaccid and obtains stage III grading in Brunnstorm stages of Hand recovery.

Functional motor evaluation of hand was assessed by ABILHAND Questionnaire, Chedoke Arm and Hand Activity Inventory: CAHAI-9 Version and sollerman hand function test. The following baseline score was obtained by the patient-

Measure	Score (baseline Evaluation)
ABILHAND	11/46
CAHAI-9	25/63
sollerman hand function	18/80
Brunnstrom stage of hand recovery	Stage III

On the basis of history, investigation reports & examination, a clinical diagnosis of Hand dysfunction secondary to cardiac arrest was made. Treatment was incorporated with the aim of correcting the attitude of hand, preventing the deformities, maintaining the strength, gaining gross motor functions, fine motor skills and independence in ADLs.

The treatment protocol according to problem list & goals are described in following table-

Table 1- TASTT was incorporated with Task oriented exercises

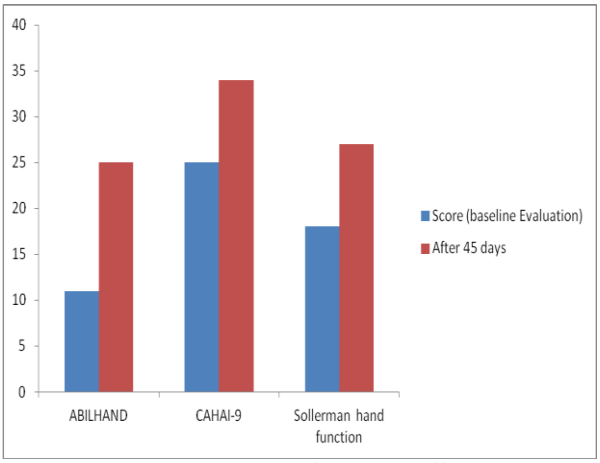
To stimulate palmar abduction and rotation of thumb(opposition)	• Hold forearm in mid position and wrist in extension, while patient attempts to grasp and release cylindrical object.
To stimulate opposition of radial and ulnar sides of hand (cupping of the hand)	• Forearm in supination, patient practices opposing thumb and the other fingers, particularly 4th and 5th finger.
Train control over the manipulation of objects	• Practice picking up various small objects between thumb and each fingers like marbles. • Picking marbles out of a bowl and releasing them into another bowl. • Practice picking up polystyrene cup around the rim without deforming it. • Practice picking up a piece of paper from his opposite shoulder • Put fingers around a refrigerator door handle or around a drawer handle. Open and close the door or drawer. • Using touch screen mobile phone for playing games (fruit ninja, snowball). • Cut the paper into small pieces with the help of scissor • Stapler or puch the bunch of papers. • Click the pen up and down.

Prognosis

After giving above mentioned physiotherapy treatment for 45 days (5 days per week), patient was reassessed. Subjectively, 40-50% improvement in doing daily activities, now patient was able to hold the glass fill of water with left hand, pick up the object with index finger and thumb, able to apply the hair pin and wear ear rings independently.

Table 2- Outcome measurements to evaluate the prognosis before and after the treatment

Measure	Score (baseline Evaluation)	After 45 days
ABILHAND	11/46	25/46
CAHAI-9	25/63	34/63
Sollerman hand function	18/80	27/80
Brunnstrom stage of hand recovery	Stage III	Stage IV



Graph 1: shows the comparison of scores on different outcome variables before and after the administration of an intervention.

DISCUSSION AND CONCLUSION

The components of this program comprise sensory discrimination skills, an inhibition of abnormal movements by using visual feedback. The results suggest that a combination of sensiromotor with task specific training may be a successful strategy for the treatment of paretic hand. Tailored task-specific training may allow normal cortical segregation to be re-established and normal fine motor control to be restored.

The primary goal for physiotherapy treatment is to make patient functionally independent and to utilize the available capabilities for achieving better quality of life. Regular exercising is required to maintain strength, improve function, and enhance quality of life in individuals with paretic hand. The exercise prescription used in the case report mainly emphasize on

gaining the functional independence.

REFERENCES

1. Caronna and Finklestein, Neurological Syndromes after Cardiac Arrest. *Stroke.*1978. 9(5); 517-520.
2. Geocadin *et al.*, Management of Brain Injury After Resuscitation From Cardiac Arrest. *Neurol Clin.* 2008. 26(2): 487-ix. doi:10.1016/j.ncl.2008.03.015.
3. Ausenda *et al.*, A New Idea for Stroke Rehabilitation: Bilateral Transfer Analysis from Health Hand to the Paretic One with a Randomized and Controlled Trial. *Int J Phys Med Rehabil.* 2014. S3:008.
4. Kawahira *et al.*, Effects of intensive repetition of a new facilitation technique on motor functional recovery of the hemiplegic upper limb and hand. Brain Injury. 2010. 24(10); 1202-13.

How to cite this article: Gambhir S, Arumugam N. A new therapeutic proposal for hand dysfunction secondary to cardiac arrest - a case report. Int J Health Sci Res. 2016; 6(11):330-334.

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