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Case Report

Physiotherapy Section

Novelty in Exercise Regimen towards Bilateral Training in a Patient after a Cerebrovascular Event

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ABSTRACT

Ischaemic stroke is caused by a sudden decrease in blood flow to the areas of the brain that leads to severe impairment if left untreated. The impairments include contralateral loss of motor and sensory functions, along with affection on the ipsilateral side. There is a reduction in strength on the unaffected side of stroke, due to the fact that only 75-90% of corticospinal fibres cross from the medulla to the contralateral side. A 45-year-old male, factory owner came with a chief complaint of sudden onset of weakness on the left side of the body for 11 days with a history of hypertension. Investigations revealed a large block in the right Middle Cerebral Artery (MCA). Medical management was provided with thrombolytics, anticoagulants, and antihypertensives. Thereafter, the patient was referred for physiotherapy. Physiotherapy assessment revealed left hemiplegia with more affection of upper extremity, spasticity grade 1+. He also had reduced gripping and grasping. A tailor-made protocol was formulated which focused on task and approach-oriented training with bimanual activities along with consideration of the less affected side was provided to the patient helped in early recovery and made him go back to his occupation. There are many studies on hand rehabilitation, but this is one in its kind that will add to the available literature on the positive effects of strength training on the unaffected side to be considered in rehabilitation.

Keywords: Bilateral upper limb training, Hemiplegia, Physiotherapy, Strengthening, Stroke

CASE REPORT

A 45-year-old male, factory worker came with complaints of difficulty using the left upper and lower extremities for 11 days. One evening, he had sudden onset of weakness on the left side of the body along with difficulty in breathing. Then he fainted and was taken to a local hospital. As he gained consciousness after an hour, he complained of weakness on the left side of the body, with more involvement of the upper limb. He had a similar episode three months back, while he was attending a marriage ceremony at his place, he had sudden onset of weakness on the left side of the body along with difficulty in breathing. The symptoms settled with medical management in the available local hospital. Since then, he was diagnosed with hypertension and was under regular medication.

After 10 days of preliminary management with thrombolytics, anticoagulants, and antihypertensives, he was referred to a higher centre for further management. Investigations revealed a large block in the right middle cerebral artery. Due to the infarct, the patient had left hemiplegia with more involvement of the left upper limb. He was thus referred for physiotherapy.

The patient was conscious, and well oriented to time, place, and person assessed by Mini Mental Status Examination [1] on the day of assessment. The patient was supine. The left upper limb held in extension, with external rotation at shoulder and pronation, lower limb also in extension, external rotation at the hip with the knee in semi flexion and the ankle held in plantar flexion. On motor examination, he had developed muscle tone in the left upper and lower limbs. According to Modified Ashworth Scale, the grade was 1+ on the left upper limb and 1 on the lower limb [2].

On sensory examination, the superficial sensations were intact with impaired along with the deep and cortical sensation. Reflex examination revealed exaggerated reflexes on the left side of the body. The hand functions are shown in [Table/Fig-1].

Hand function	Results
Grasp	
Spherical	Impaired
Cylindrical	Impaired
Hook	Unable to perform
Grip	
Pulp to pulp	Absent
Tip to tip	Absent
Lateral prehension	Absent

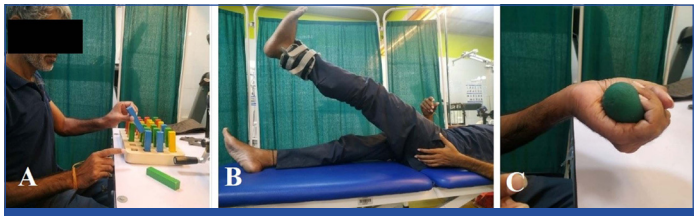
[Table/Fig-1]: Shows the hand function of the patient (prerehabilitation).

Physiotherapeutic interventions: As the patient became haemodynamically stable, immediate neurophysiotherapy was started. A tailor-made combination of approaches was planned and provided after the initial assessment. Special emphasis was given to hand rehabilitation and strength training for the less affected side. Multiplanar movement along with task-oriented training was performed. The focus was given to the Brunnstrom stage of recovery [3] during the intervention and the patient was motivated with thorough counselling. Strengthening of the less affected side, i.e., the right side was also focused on as it is also of great importance to regain functional ability in stroke patients. Hand rehabilitation along with prehension training was given to the patient. Treatment was provided for one hour sessions every day, five days per week for one month. The details of physiotherapy rehabilitation are provided in [Table/Fig-2,3].

Follow-up and outcomes: The outcome measures were taken on the day of assessment, on the 15th day, and the day of discharge (28th day). Modified Ashworth Scale, Brunnstrom recovery stages, Berg balance scale, and gait parameters were the outcome measures used. The patient gained normal muscle tone postrehabilitation along with improvement in the Brunnstrom stage of recovery. The patient is under regular follow-up via telerehabilitation postdischarge. The outcome measures are depicted in [Table/Fig-4,5].

Problem Identified	Cause of the problem	Goal framed	Treatment strategy	Equipment used
Hypertonia in the right upper and lower limb muscles.	Injury to the brain as a consequence of Cerebral Vascular Event (CVE) and prolonged hospital stay	To reduce the tonal abnormality	Rood's inhibitory techniques and controlled movements on the affected side.	Direct Handling
Decreased bed mobility		To enhance bed mobility	Facilitatory techniques	Direct Handling
Difficulty in sit-to-stand activity		Promote sit-to-stand activity	Strengthening muscles of the lower limb with focus to G. max, quadriceps, and tibialis anterior.	Weight cuffs
Reduced sitting balance		To improve sitting balance	Balance training, both static and dynamic	Direct handling, physio-ball
Reduced strength on the less affected side		To regain the strength	Strengthening on the less affected side	Weight cuffs
Difficulty to perform gripping and prehension activities		Regain lost grip and prehension	Training gripping and prehension along with guided movements	PEG-Board, gel ball, and grip strengthener
Decreased activities of daily living		Advice patient to be as active as possible	Guiding the normal movement and ad encouraging to involve in activities of daily living	Active participation by the patient

[Table/Fig-2]: Physiotherapy interventions in detail.



[Table/Fig-3]: a) Depicts hand rehabilitation with Peg Board; b) Strengthening of the lower limb with a 1 kg weight cuff on the less affected side; c) Gel ball exercise for spherical grasping.

Outcome measure	On the day of the assessment	On 15th day	On the day of discharge
Motor assessment scale			
Upper limb	Grade 1+	Grade 1	Normal tone
Lower limb	Grade1	Normal tone	Normal tone
Brunnstrom stage of recovery			
Upper limb	Stage 2 going to 3	Stage 2 going to 3	Stage 4
Lower limb	Stage 3 going to 4	Stage 3 going to 4	Stage 4 going to 5
Berg balance score	9	36	48
Stride length	Not able to test	38 cm	64 cm
Cadence	Not able to test	23 steps	60 steps
Gait velocity	Not able to test	0.07 m/sec	0.32 m/sec

[Table/Fig-4]: Outcome measures on 1st day of assessment, on the 15th day and on the day of discharge.

Hand function	Results
Grasp	
Spherical	Improved
Cylindrical	Improved
Hook	Improved
Grip	
Pulp to pulp	Able to perform
Tip to tip	Able to perform
Lateral prehension	Able to perform

[Table/Fig-5]: Shows the hand function of the patient (postrehabilitation).

DISCUSSION

In most patients, the hemiplegic side of stroke is focused, but the unaffected side is left unused and its functions reduce with time. In this patient, a novel rehabilitation approach was used in which the task-oriented approach was used and strength training was used on the unaffected side [4,5]. Strength training is a relatively new concept. Though incidence of stroke is increasing day by day, similar is the improvement in management strategies. Early detection and early rehabilitation lead to better recovery [6]. Strength training was found to be beneficial in a meta-analysis by Wist S et al., they suggested that in hemiplegia, strength training plays a crucial role to prevent deconditioning of the less affected side [7]. High resistance training and integrated functional task practice have been shown to enhance upper extremity function in poststroke patients, according to a study by Patten C et al., [8]. In an randomised clinical trial conducted by Jeon HJ and Hwang BY, to see how bilateral training has an impact on balance and walking in stroke patients and found that bilateral training group achieved dramatically better Functional Reach Test (FRT) and Berg Balance Score (BBS) scores relative to unilateral training group [4]. A systemic review of the similar type of studies done on the upper limb by Wu J et al., stated the effect of bilateral arm training may be more effective than unilateral one in accelerating recovery of upper limb function following a stroke [9]. This novel approach to train both sides, also focuses on the non-paretic side [10]. There was a reduction in the spasticity on the left side along with improvement in the Brunnstrom stage of recovery [11]. The Berg balance score also improved which is a reliable tool to measure static and dynamic patients with stroke [12].

Early physiotherapy measures were started in this case to hasten the patient's recovery and allow him to return to his regular activities and occupation. Beginning physiotherapeutic rehabilitation early improves outcomes by accelerating the prognosis [13]. While performing different exercises, breathing exercises help the patient feel less anxious. As a result, the patient cooperates more readily and recovers more quickly. Along with passive and active movements, bed mobility activities, functional re-education training, trunk balancing exercises, balancing exercises, and therapy to improve cognition, proprioceptive neuromuscular facilitation and strength training were added to the exercise prescription. As a result, the patient's outcomes were ultimately improved by achieving and increasing postural control, motor function, and the patient's self-perception of the risks of falling. Following this exercise program every day also gradually improves the usual hemiplegic gait. The patient's quality of life was improved by task-oriented motor and cognitive activities [14].

This case report implicates the benefits of strength training on the less affected side and how that improves the functional abilities of such patients. There is very little literature that suggests the same thought. This case report will be an add-on to the available literature on strength training in stroke as after 28 days of rehabilitation, the patient was able to walk without assistance and able to perform bimanual tasks with minimum support.

CONCLUSION(S)

This case report implicates the benefits of strength training on the less affected side and how that improves the functional abilities of such patients. There is very little literature that suggests the same thought. This case report will be an add-on to the available literature on strength training in stroke as after 28 days of rehabilitation, the patient was able to walk without assistance and able to perform bimanual tasks with minimum support.

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