Novel Approach towards Bilateral Training in Stroke Patient: An Interesting Case Report

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Abstract

Cerebrovascular cause accident is the leading of disability worldwide. Ischemic stroke is caused by a sudden decrease in blood flow to the areas of the brain that leads to severe impairment if left untreated. Various imaging techniques are used to know the areas of affection in the brain that help in the diagnosis of the type of stroke and the extent of impairment. In this case, we reported a 45 years old factory owner with a history of hypertension who came with complaints of sudden onset of weakness on the left side of the body for 11 days. Investigations revealed a large block in the right Middle Cerebral Artery (MCA). Due to the infarct, the patient had left hemiplegia with more involvement of the left upper extremity. Physiotherapy was started on the 10th day of the episode on hospital admission. Tailor-made protocol focused on 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 early rehabilitation of hand function post hemiplegia.

Keywords: Stroke; Hemiplegia; Physiotherapy; Bilateral upper limb training; Strengthening; Case report

Introduction

Stroke is defined by WHO as rapidly developing clinical evidence of focal (or global) cerebral dysfunction, with symptoms lasting 24 hours or more or leading to death, with no evident cause other than the vascular origin". Stroke leads to hemiplegia or paresis on the contralateral side of the body. There is enough evidence that suggests there is considerable weakness on the ipsilateral side of involvement. This is because only 75-90% of fibers cross to the opposite side in the medulla [1].

The remaining is the cause of ipsilateral weakness on the less affected side in hemiplegia [2]. In the present case, there is an infarct in the right middle cerebral artery which suggests clinical findings in the opposite *i.e.*, the left hemiplegia. One of the major complications faced by an individual with stroke due to the middle cerebral artery is a reduction in mobility due to damage to the premotor cortex as the premotor cortex (Broadman 6) plays a function in the organization of motor actions and contributes to proximal upper and lower limb power. Studies suggest training the less affected side along with the hemi paretic side help in the early gain of functional ability [3]. Bilateral arm training paired with simultaneous auditory stimuli improves the concerned extremity's motor and functional performance. Strengthening in stroke is a newly emerging concept in Neurophysiotherapy [4]. Strengthening is only started when the patient crosses Stage 5 of the brainstorm stage of recovery on the affected side [5]. Studies suggest that strength training for the less affected side helps to perform bimanual activities in a better way as compared to training with only focus on the hemi paretic side [6]. Considering training the unaffected side while rehabilitation prevents the deconditioning effects on the unaffected side [7].

Case Presentation

Patient information

A 45 years old factory worker was apparently alright 3 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.

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Since then, he was diagnosed case of hypertension and is under regular medication. Later on, he had a similar episode after 3 months on a fine evening; he fainted out and was carried by caregivers to the local hospital. This time there was weakness on the left side of the body, with more involvement of the upper limb. After 10 days of preliminary management, he was referred to our hospital on 7th March 2022 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. As the patient was vitally unstable (Hypertension), he was in neuro ICU for 7 days. Physiotherapy was started on the 10th day of the episode on hospital admission.

Clinical findings

The patient was conscious, and well oriented to time, place, and person assessed by MMSE on the day of assessment. His speech was affected. On observation, the patient was supine lying, with the left upper limb held in extension, along with external rotation and lower limb also in extension, external rotation and pronation with the knee in semi flexion and the ankle in plantar flexion. 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. Sensory examination 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 (Table 1).



Clinical diagnosis

Regular blood investigations along with CT scans and MRIs were done. The scans revealed a right middle cerebral artery infarct.

Physiotherapy intervention

As the patient became hemodynamic ally stable, vigorous neuron-physiotherapy was started. A tailor-made combination of approaches was planned and provided after the initial assessment. The involvement of the patient in the therapy session was also monitored as it helps in early recovery. Special emphasis was given to hand rehabilitation and strength training for the less affected side. Multiplan movement along with task-oriented training was performed. The focus was given to the brunnstrom stage of recovery during the intervention and the patient was kept motivated with thorough counseling. Strengthening of the less affected side was also focused on as it is also of great importance to regain functional ability in stroke patients. Hand rehabilitation along with pretension training was given to the patient. Treatment was provided for 1 hour per day, 5 days per week for 1 month. The details of physiotherapy rehabilitation are provided in Table 2 and Figure 1.

Table 2: Bilateral training in stroke patient.							
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 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, physioball
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



Figure 1: 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.

Follow up and outcomes

The outcome measures were taken on the day of assessment, on the 15^{th} day, and the day of discharge (28^{th} day). Modified Ashworth Scale, Brunnstrom recovery stages, Berg balance scale, and gait parameters were the outcome measures used. The patient is under regular follow-up *via* telerehabilitation post-discharge. The outcome measures are depicted in Table 3 and Figure 2.

Table 3: Bilateral training in stroke patient.						
Outcome measure	On the day of the assessment	On 15 th Day	On the day of discharge			
MAS (Upper limb)	Grade 1+	Grade 1	Normal tone			
MAS (Lower limb)	Grade 1	Normal tone	Normal tone			
Brainstorm stage of recovery (upper limb)	Stage 2 going to 3	Stage 2 going to 3	Stage 4			
Brainstorm stage of recovery (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			



Figure 2: Outcome measures.

Discussion

Strength training is a relatively new concept. Through incidence of stroke is increasing day by day, similar is the improvement in management strategies. Early detection and early rehabilitation lead to better recovery [8]. In this case report, the tailor-made approach for the patient was used that finds relevance with the previously published studies. Strength training was found to be beneficial in a metaanalysis; they suggested that in hemiplegia, strength training plays a crucial role to prevent deconditioning of the less affected side [9]. Most patients post-stroke work for the hemiplegic side. This novel approach also focuses on the non-paretic side [10]. There was a reduction in the spasticity along with improvement in the Brunnstrom stage of recovery with the tone reduction strategies used while managing the patient [11]. The Berg balance score also improved which is a reliable tool to measure static and dynamic patients with stroke.

Conclusion

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.

Conflict of Interest

All Authors declare no competing interest.

Informed Consent

Oral as well as written consent obtained from the patient.

Author's Contribution

PH wrote and designed the manuscript. VGS helped in patient care. RKK and MIQ read and approved the manuscript.

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