Blocked Vision Treadmill Training on Balance and Gait Speed of Patient with Thalamic Stroke- A Case Report

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ABSTRACT

Thalamic bleed is rarely encountered clinical conditions among neurorehabilitation areas. Undiagnosed hypertension (HTN) and other comorbidities is thought to be the primary cause behind this clinical entity. We here report a 48-year-old female with history of thalamic bleed secondary to undiagnosed HTN, suffering with moderate to severe sharp shooting pain in the lower extremities and impaired balance while executing a Basic as well as Instrumental Activities of Daily Living (BADLS/IADL). The precise mechanism in thalamic pain is resulted due to compromised mechanism between somatosensory cortex and thalamus. The afferent pathways emerging from thalamus projecting to cortex is no longer functional which leads to false interpretations by thalamus.

Keywords: Thalamic Bleed, Hemiparesis, Blind folded, Backward treadmill training, Physiotherapy Management, Gait Training.

INTRODUCTION

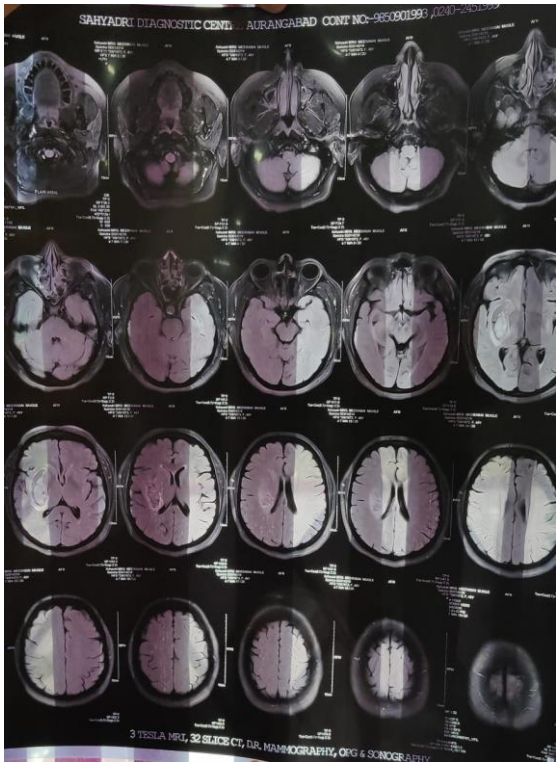
The thalamic stroke is an independent variant of lacunar stroke. It indicates the lesions located in the deeper areas of CNS. A thalamus is a relatively smaller part of CNS but very important which mainly concerned with major crucial body functioning, such as postural control, motivation drives, communication, memory, tactile sensations and pain.[1]

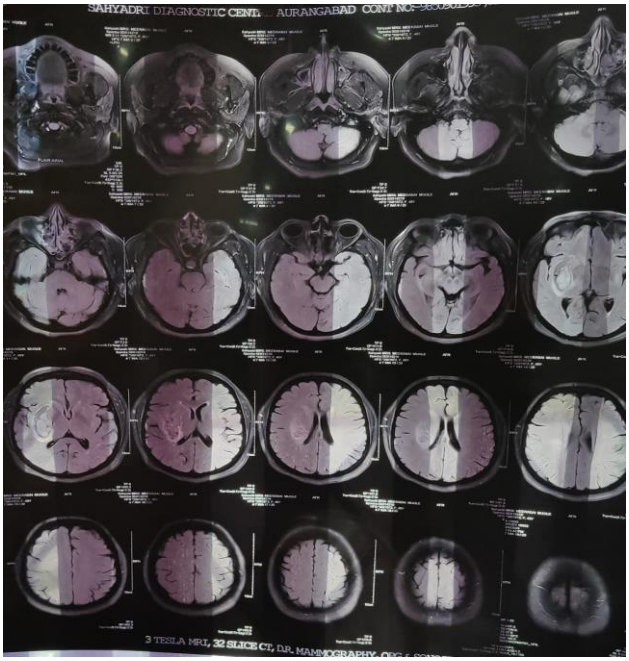
Poststroke movement disorders are manifest rarely after stroke which mainly affects the structures of the brain which lie deeper, like the basal ganglia (44%) and thalamus (37%). [3-6] It has been reported in thalamic stroke that there are movement disorders in the region of polar arteries supplying paramedian thalamus. [7]. Balance impairment is one of the major causes of limited functioning in stroke patients. Factors contributing to impaired balance are mainly, reduced strength of muscles, reduced range of motion, tone abnormality, postural abnormalities and sensorimotor deficits. The mentioned impairments may result in increase in the risk of falling, impaired movements and reduced performance of activities of daily living. [8] Reduced central integration of the sensory cues which include visual, vestibular and somatic-sensory input causes sensory impairments, specifically, balance disorders in stroke patients. As a result, in thalamic stroke, there is regular occurrence of abnormal involuntary movements. Backward walking causes a lesser amount of mechanical strain production on knee joint, engagement of damaged cerebral pathways activation of cerebrum and increase in cortical processing of primary motor cortex. During backward walking, visual cues though present, may not provide information about the mark to be touched, nor the resources to anticipate ground conditions. As a result of this, there is variation in optic flow which leads to alteration in pelvic and spinal stability which is required for maintenance of dynamic balance. Thus, Backward walking training may be superior to forward walking training for improving gait and dynamic balance and reduction in fall risk in post stroke patients, as it requires greater postural demands. [9] Zanetti and Schieppati reported in their study that treadmill training with blocked vision was more effective at improving gait abilities by improving postural control obtained by **enhancement of proprioceptive and vestibular sensations during blocked visual feedback.[10]**

CASE

A 48-year-old female patient came to outpatient Neurophysiotherapy department with complains and history of balance difficulties in standing, stair-climbing, community walking. She also experienced pain in her left side of whole body. She also reports difficulties while executing IADL's such as preferring escalators, public transport for commute purpose etc., her physical examination revels, atypical facial expressions, difficulty in lifting her left hand against pull of gravitational force, her head and upper trunk is tilted to left side. As she walks on command of physiotherapist (PT) she doesn't look up but fixes her eyes on the floor, she takes small steps and more weight shifts in sideways than forward, which confirms that she has difficulty in stabilizing and balancing while attempting the standing and walking. Her left foot doesn't remain in contact with the floor until her weight is on her right foot, she is unable to shift her weight on left side. While listening to her the PT noted slurring, difficulty in word articulations and chewing the food particles. Furthermore, her sensory examinations revels impaired sensations on left side when examined bilaterally.

Diagnosis- Diagnosis was done on the basis of subjective and objective evaluation. Patient's MRI findings revelling that thalamic bleed.





INTERVENTIONS

a) Backward Treadmill Training Interventions:

The patient received, the backward treadmill training interventions (BTT) i.e., with eyes closed, 3 times/week for 2 weeks. The BTT session were administrated for 15 minutes. The patient was allowed to take rest for a minute or more if they are feeling exhausted/fatigue. Prior to BTT sessions, patients were encouraged to walk on the treadmill with blocked vision for 2 minutes to determine maximum walking speed and to get familiarized with the intervention modality and study participant were allowed to grasp treadmill handrails if required. Additionally, a verbal cues and tactile cues were provided to achieve better gait pattern.

b) Conventional Physiotherapy Interventions:

These interventions include primarily, slow and sustained stretching, strengthening, proprioceptive training, facilitation and gait training. Stretching were mainly administered to hamstring muscles as it is a primary muscle involved in backward walking.

The static stretching were given with the 10 repetitions with 30 sec hold. The study participant also receives the proprioceptive training in various weight bearing positions to improve joint proprioceptive sense.

The participant was assessed at a pre and post interventional level for assesing his balance and mobility components prior to the intervention.

OUTCOME MEASURES

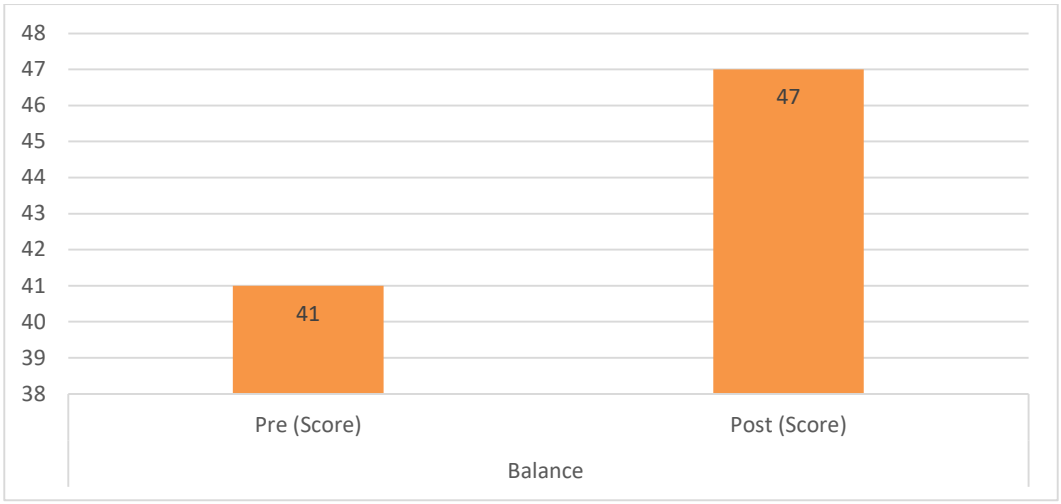
1. **Berg Balance Scale** (**BBS):** To determine the balance, the Berg Balance Scale (BBS) was used. The BBS is 14 items, 5 points ordinal scale, aimed to analyze the balance in subacute stroke population and other neurological conditions. It barely takes only 15-20 min. There is no need for any specialized training to administrate in the participants. The maximum score for BBS is 56. [11, 12]

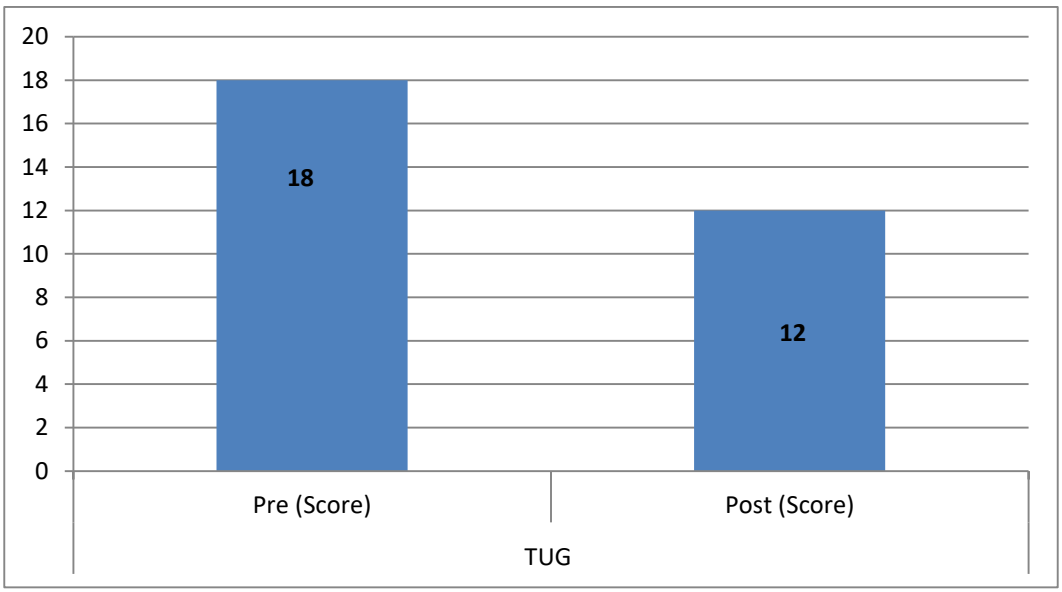
2. **Timed Up & Go Test (TUG):** It is the test to estimate gait speed and to distinguish the individuals with a risk of fall. It is the time performance of getting up from chair, walking 3m, turning around and walking back to sit down again. The participants who take more than 12sec to complete the TUG test is considered to be at a higher risk of fall. This TUG test is highly recommended by American Geriatrics Society, British Geriatrics society for screening the fall risk. [13, 14]

RESULTS

Balance	Pre (Score)	41
	Post (Score)	47

TUG	Pre (Score)	18
	Post (Score)	12





DISCUSSION

The PT interventions in thalamic bleed patients, requires a holistic approach to deal with mobility, balance and proprioceptive impairments. The conventional PT interventions has very limited therapeutic choices to deal with the gait and balance impairments in the thalamic bleed clients. The backward treadmill training with blocked vision has been introduced as main line of intervention for the gait and balance impairments seen in various neurological diseases and its wide scope has been proven in various published articles at the dosage of 3 days/week.[6] Our client has also been treated with backward treadmill training with blocked vision which resulted in resolution of her balance and gait impairments. In many instances of the thalamic bleed conditions the screening of balance and gait impairments has been neglected. Early detection and interventions for the balance and gait impairments associated with the cases of thalamic bleed need to be addressed by the PT which is thought to be a first contact healthcare professional. This case reports highlights the role of backward treadmill training with blocked vision as a effectual intervention in management of gait and balance impairments seen in thalamic bleed.

Following 4 weeks of backward treadmill training with blocked vision, her balance and gait impairments has been effectively reduced in terms of enhanced standing balance, weight shifting abilities, independent stair climbing and walking abilities etc. On evaluation using disease specific scales patient has shown significant improvement in the pre and post scores. Prior consent from the patient and ethical clearance was obtained from the institution for the publication of this case.

CONCLUSION

Appropriate diagnosis of impaired balance and gait in the thalamic bleed should be considered as an important step. The early detection and timely PT management by the backward treadmill training would be a gamechanger to prevent poor balance and gait impairments and thereby aids in dropping the assistance required from the caretakers.

Informed Consent

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Conflict of Interest: - The authors declare that there are no conflicts of interests. Data and materials availability All data associated with this study are present in the paper.

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