DUAL TASK COGNITIVE PERFORMANCE ALONG WITH CONVENTIONAL PHYSIOTHERAPY TREATMENT ON GAIT PARAMETERS IN PATIENTS WITH ISCHEMIC STROKE: A CASE REPORT

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ABSTRACT

Various motor and sensory deficits prevail in stroke patients which have significant effect on their walking ability, which further affects overall independence of the patient in daily activities. Cognitive task performance along with the conventional physiotherapy treatment may cause profound effect on various gait parameters in stroke. The main purpose of the study is to evaluate the effects of dual task training along with conventional physiotherapy on gait parameters in patients with ischemic stroke. Assessment and treatment was given at baseline and after 6 weeks. Before and after intervention spasticity was measured by Modified Ashworth Scale (MAS), Functional performance by Dynamic Gait Index (DGI) and Gait Parameters. The finding of the study showed that there was improvement in functional performance but not in spasticity.

KEY WORDS: Sub acute ischemic stroke, Dual task cognitive training, Gait parameters, Dynamic Gait Index (DGI).

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INTRODUCTION

Stroke is defined as a focal neurological deficit attributed to injury of central nervous system (CNS) by a vascular cause including cerebral infarction, intracerebral hemorrhage (ICH) and subarachnoid hemorrhage. It is a major cause of disability and death World Wide [1].

The common deficits associated with stroke are motor impairment including limb spasticity, sensory impairment, language impairment aphasia and/or dysarthria), dysphagia, cognitive impairment, visual impairment, and post stroke depression. The motor impairment typically affects the control of movement of the face, arm and leg of one side of the body and affects 80% of patients to varying degrees [2].

70% of Stroke patient who are going for inpatient rehabilitation are unable to walk independently and is dependent for mobility. Walking is the major factor that helps the patient to return the previous level of activity because independent ambulation is important for the reintegration and social participation [3].

As it has noticed that patients with functional ambulation shows different gait patterns compared with able bodied person and this increases the chances of their falling and this shows the marked variation in gait patterns of

stroke patients. It is seen that there is decrease in cadence, short step length and asymmetric steps, when there is instantaneous adaptation in speed and load changes [4-6].

Balance is most often trained under single task and dual task training. Dual task training requires participants to perform multiple tasks simultaneously and use to investigate the effect of cognitive task on postural control and vice versa. It is noticed that the postural stability is reduced when stroke patients performed 2 or more task concurrently and this shows increased risk of falls [7].

After stroke, performance of cognitive task results in profound reduction in gait speed, leading to corresponding effect on stride duration, stride length; double limb support time and cadence (referred to as Dual task interference or cognitive motor interference). Dual task training improve the Dual task walking in people with stroke [8].

CASE DESCRIPTION

A 45 year old male having right sided hemiplegia with grade 3 spasticity in upper limb and lower limb. He was able to walk independently but there is difficulty in stair climbing. For the overhead or reaching activities there is difficulty of opening of hand, and radiological investigation revealed that there was a moderate sized infracts of left MCA territory. He was medically stable and completed the neurological investigation. He was co-operative during the treatment procedure and signed the consent from prior the intervention.

Baseline Measurements: Patient completed the following baseline investigation prior to intervention.

Modified Asworth Scale (MAS): The objective measurement of spasticity of upper limb includes elbow flexor, wrist flexor and lower limb includes knee extensor, plantar flexor. The patient was examined on a couch in relaxed position in supine lying. The affected extremity was moved passively and resistance encountered by the therapist to passive movement of elbow, wrist, knee and ankle was then recorded by MAS [9,10].

Gait Parameters: Gait parameters were measured on a 10meter walkway with a plane sheet of paper on the surface. Patient was instructed to step on an inkpad and asked to walk on a paper sheet or chart from one end of walkway to the other end. The foot print from the sole of the foot was taken on the paper as produced by the walk of the patient and the measurement of the gait parameters was done [11]. (Fig. 1)

Dynamic Gait Index (DGI): The Dynamic Gait Index (DGI) was developed by Shumway-Cook and Woollacott to evaluate functional stability during gait activities in older people and to evaluate their risk of falling. The DGI is an 8-item tool with which the examiner rates an individual's gait performance on an ordinal scale that ranges from 0 to 3. It takes approximately 10 minutes or less to complete and score the DGI. Reliability and validity of DGI for people with stroke has been established. Test was performed on distance of 20 foot. The patients were instructed to walk on marked surface with different task [12].(Fig. 2)

INTERVENTION METHOD

The patient received 45 minute training session, 3 times a week for 6 weeks, it includes dual task training and conventional physiotherapy treatment. Dual task cognitive training includes: semitandem, eye open, arm alteration with Spell word forward, semi-tandem, eye closed, arm alteration with Spell word backward, Draw a letter with right foot and name any word start with letter A-K, Draw a letter with left foot and Name any word start with letter A-K, Perturbed standing holding a ball and remember prices e.g. bills. Perturbed standing holding a ball and Remember prices e.g. groceries, Walk narrow base of support and Count backward by 3, Walk narrow base of support Count backward by 3, Walk narrow base of support, step sideways, backwards avoiding the obstacles and Remember words Walk and kick a ball and tell the opposite of words, walk and reach and trunk twisting and Visual imaginary task (imagine ant situation) [13]. (Fig. 3 and 4)

Conventional physiotherapy includes mat activities (stretching and strengthening) of lower limb muscles. Sitting on a Swiss ball with eyes open and eyes closed. Sitting position and reach outs. Standing and reach out [14].

Fig. 1:   **Fig. 2:**   **Fig. 3:**   **Fig. 4:**

Fig. 1: Gait parameters taken by ink footprint method.
Fig. 2: Patient performed one of the component of DGI.
Fig. 3: Perturbed standing holding a ball and remember prices e.g. bills.
Fig. 4: Semi-tandem, eye closed, arm alteration with Spell word forward.

OUTCOME MEASUREMENTS AND RESULT

Table 1: Outcome measurement and result

Outcome		Baseline Measurement	3 week	Post intervention Scores
(MAS)		3	2⁺	3
DGI		17	18	21
Gait parameters	Cadence	23 steps/sec	23 steps/sec	27steps/sec
	Step length	12.5 inches	14 inches	16 inches
	Stride length	27.8 inches (left) or 27 inches(right)	28.5 inches(left) or 28 inches (right)	30 inches (left) or 29.5 inches(right)
	Gait velocity m/sec	1.33m/sec	1.33 m/sec	2.8 m/sec

MAS (Modified Ashworth Scale), DGI (Dynamic Gait Index)

Measurements were assessed following Baseline intervention score, 3 and 6 weeks. The spasticity score in MAS was decreased at week 2 and 6 from the baseline measurement. Spasticity again increased and it was 3 at week 4. The score in DGI was also improved from baseline and it was 21 of 24 at week 6.

DISCUSSION

The result of the study shows that dual task cognitive training was effective to improve the gait parameters and relative improvement in functional abilities.

In present study, it was found that spasticity remain same throughout the treatment because functional training is given and there are variables changes in between the treatment but at the end there is no change in spasticity grading at week 3 and 6.

In present study the functional abilities was also improved up to the 6 weeks after intervention. The studied by AN et al [15] stated that the effect of various dual task training methods with gait on the balance and gait of patients with chronic stroke and concluded cognitive dual task gait training was more effective in improving the balance and gait abilities of chronic stroke patients than either the motor dual task gait training or the cognitive dual task gait training along performed for 30 minutes per day, three times a week, for eight weeks.

Kim et al [16] studied effect of dual-task training with cognitive tasks on cognitive and motor function after stroke and they concluded that Dual task training improves cognitive and walking abilities of patients with stroke performed for 4 weeks, 3 days a week.

CONCLUSION

In conclusion the present case study reveals that dual task cognitive performance training can be used as an adjunctive tool for other rehabilitation. The clinical improvement was observed after 6 week intervention. Therefore dual task cognitive training is effective in improving gait speed under dual-task contexts in persons with impaired balance under dual-task conditions. The instructional set was an important contributing factor for improvement in dual-task performance.

This study found that it was feasible to implement individualized dual-task training, combining a traditional intervention with a variety of cognitive tasks, in community-dwelling adults with balance impairment and successfully allocated their attention to the task in which they were instructed and functional improvement in subjects after stroke. However the above results of present study shows improvement which cannot be generalized in stroke population because it is a study of single subject.

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Conflicts of interest: None

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