Original Article

Effectiveness of balance training and balance training with obstacle ambulation on dynamic balance in ambulant stroke subjects – A comparative study

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Abstract

Objective: The effectiveness of balance training and of balance training with obstacle ambulation on dynamic balance in ambulant stroke subjects. **Materials and Methodology:** After getting the ethical clearance for this 30 ambulant stroke patients with age group of 40 to 65 were selected for the study and screened through inclusion and exclusion criteria The patients consent for this study was taken and documented. Procedure: Group A and Group B subjects were given with Balance training and Balance training with obstacle ambulation respectively. The dosimetry of these exercises was 60–70 minutes a day, 5 times a week, for 4 weeks. Data collected for statistical analysis included the patients were assessed with dynamic gait index and Timed up and go test in pre and post treatment. **Result:** Data collected were statistically analyzed using the SPSS 11 version for t-test. Mean pre-treatment dynamic gait index score of control and experimental group are 16.33 and 17.06 respectively. Mean pre-treatment timed up and go test score of control and experimental group are 27.93 and 27.53 respectively. Mean post treatment dynamic gait index score of control and experimental group are 22.33 and 23.33 respectively. Mean Post treatment timed up and go test score of control and experimental group are 17.66 and 19.33 respectively. The mean difference of experimental group was 6.2 which greater then mean difference of control group 6. The t-value is 16.80 which were greater than p value 0.0001.These values suggest there was significant effect in giving balance training with obstacle ambulation training than balance training alone. **Conclusion:** To conclude, though both Balance training and Balance training with obstacle ambulation exercises are beneficial in Stroke patients, Balance training with Obstacle ambulation proved to be better than the Balance training alone in improving the Functional balance. This study proves this statement statistically with significance.

Key Words: Cerebro Vascular Accident [CVA], Balance training, Obstacle ambulation exercises, Functional balance.

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INTRODUCTION

A stroke is caused by the interruption of the blood supply to the brain, usually because a blood vessel bursts or is blocked by a clot. This cuts off the supply of oxygen and nutrients, causing damage to the brain tissue [WHO]. According to the World Health Organization, 15 million people suffer stroke worldwide each year. Of these, 5 million die and another 5 million are permanently disabled. Prevalence of stroke was 2.7% in 2006 and 2.6% in 2010. Among racial/ethnic groups, age-adjusted prevalence was highest among American Indians/Alaska Natives and lowest among Asians/NHOPIs. Age-adjusted prevalence was higher among adults with a lower level of education compared with those with a higher level of

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education. Annual incidence of stroke: 13 per 100 000 in 1969 and 145 per 100 000 per year during 2003-05 and 2005-06.[1] A stroke happens when blood flow to a part of the brain stops. A stroke is sometimes called a "brain attack."If blood flow is stopped for longer than a few seconds, the brain cannot get blood and oxygen. Brain cells can die, causing permanent damage. There are two major types of stroke: ischemic stroke and hemorrhagic stroke. Ischemic stroke occurs when a blood vessel that supplies blood to the brain is blocked by a blood clot. This may happen in two ways: Ischemic strokes may be caused by clogged arteries. Fat, cholesterol, and other substances collect on the artery walls, forming a sticky substance called plaque. A hemorrhagic stroke occurs when a blood vessel in part of the brain becomes weak and bursts open, causing blood to leak into the brain. Some people have defects in the blood vessels of the brain that make this more likely. These defects may include Aneurysm, Arterio venous malformation (AVM).[2] Balance impairment is important to consider after stroke since a total of 160 000 people died from falls in India in 2005. This included more than 100 000 people aged over 60 years and nearly 20 000 people aged 0–14 years. Mortality rates increased progressively after the age of 14 years and were highest among people aged 70 years or older.[3] To maintain balance in activities of daily living (ADL), posture control is essential, while motor, sensory and higher brain cognitive faculties all contribute to postural control.[4,5,6,7] Following stroke, patients lose functions of the motor, sensory and higher brain cognitive faculties to various degrees which leads to diminished balance. People who have suffered a stroke are at an even higher risk of falling than people among the general population.[8] Falls are the number one medical complication after acute stroke.[9] Furthermore, the high fall risk for individuals with stroke is not only present in the acute phase, but it remains a considerable health concern throughout the post stroke life span. In stroke rehabilitation, walking function is critical to maintaining functional independence and improving daily activity levels, and is strongly associated with the quality of life post-stroke. Ambulation includes various outdoor activities such as visiting convenience stores, shopping malls, banks, and parks, as well is enjoying leisure activities. Decreased walking function may be the main source of frustration to patients with functional impairments as this can prevent them from being able to cross a road in a limited time or walk around with people for a long time. I-Chun Chen *et al* performed Dynamic balance function of patients in the visual feedback training group, it showed that dynamic balance in visual feedback training group had significant improvements when compared with the control group. Activities of daily living (ADL) function in self-care also had significant improvements at 6 months of follow up in the trained group. The results showed that balance training was beneficial for patients after hemiplegic stroke.[10] Patima Silsupadol *et al* stated that Dual-task training is effective in improving gait speed under dual-task contexts in elderly persons with impaired balance, and single-task training may not generalize to balance performance under dual-task conditions, in his study Effects of Single-Task Versus Dual-Task Training on Balance Performance in Older Adults.[11] David L. Jaffe *et al* in his study 'Stepping over obstacles to improve walking in individuals with post stroke Hemiplegia' concluded that training individuals with post stroke hemiplegia to step over obstacles produced improvements in their gait parameters, the ability to step over objects, and walking endurance.[12] The ability for persons to adjust their gait pattern in response to environmental demands is a prerequisite for safe walking in everyday life. In studies investigating such complex walking skills, obstacle avoidance paradigms have been used most frequently. Said and coworkers conducted an experiment in which individuals with stroke walked on a walkway and had to step over a stationary obstacle.[13] They suggested that individuals with stroke used a more cautious strategy to step over the obstacle with higher toe clearance of the lead limb, smaller post obstacle distances, and greater step times than nondisabled subjects.[13] It has been documented that hemiplegic or hemiparetic stroke patients presented with more posture sway, asymmetric weight distribution, impaired weight-shifting ability and decreased stability capability.[10] Exercise interventions, in the form of task-oriented exercise programs, are now recognized as a new strategy to improve the functional status of chronic stroke individuals (Dean *et al*., 2000; Eng *et al*., 2003; Salbach*et al*., 2004).[14,15,16] A circuit training program using obstacles is an intervention method that improves walking ability and enhances the balance of patients with stroke. (Ki-Tae Park and Hyun-Joo Kim 2016).[17] Furthermore, they may not be able to participate in a variety of social activities and tend to avoid walking in crowded places. This can result in social isolation that exacerbates their feeling of disability and contributes to a decreased quality of life and psychosocial status.[18] Obstacles training helps to improve the gait parameters, the ability to step over objects, and walking endurance.[12] Need for the study: Ability to step over obstacles while walking/ambulation is limited in many of the stroke patients. Inability to cross obstacles may result in lack of confidence, fear of fall which can result in a reduction of activity. The benefit of obstacle ambulation along with routine balance exercises in further enhancing the dynamic balance function has not been investigated.

MATERIAL AND METHODOLOGY

30 ambulant stroke patients with age group of 40 to 65 were selected for the study and screened through inclusion and exclusion criteria. The patients were briefed about the study and consent taken. The patients were divided into two groups, control group and experimental group. Inclusion Criteria were Stroke, single episode of unilateral stroke, Age group 40 to 65 years, both male and females and Berg Balance Score of 41 – 52 were included in the study. Exclusion criteria were patients with any associated neurological conditions, Blind or experience severe visual field deficit affecting balance and gait, musculoskeletal ailments of lower extremity leading to instability and pain, Presence of uncontrolled hypertension and diabetes, Recent cardiac diseases (less than 2 months), Unilateral neglect.

RESULT

A total of 30 patients between age group between 40-60 years were included in the study. The study consists of two groups; experimental group and control group. Each consists of 15 patients. Experimental group given with balance training and obstacle ambulation and control group given with balance training only. The result shows that there were significant differences between the two groups. Mean pre-treatment dynamic gait index score of control and experimental group are 16.33 and 17.06 respectively. Mean pre-treatment timed up and go test score of control and experimental group are 27.93 and 27.53 respectively. Mean post treatment dynamic gait index score of control and experimental group are 22.33 and 23.33 respectively. Mean Post treatment timed up and go test score of control and experimental group are 17.66 and 19.33 respectively. Mean difference in pre treatment and post treatment dynamic gait index score of control and experimental group are 6 and 6.2 respectively. The mean difference of experimental group was 6.2 which greater then mean difference of control group 6. The t-value is 16.80 which is greater than p value 0.0001. These values suggest there was significant effect in giving balance training with obstacle ambulation training than balance training alone.

Table 1: Comparison of the outcome measures of control group

	Pre test mean	Post test mean	Mean difference	T-value	P value
Dynamic gait index	16.33	22.33	6	19.4	1.5
Timed up and go test	27.93	17.66	10.26	23	9.8

Table 2: Comparison of the outcome measures of Experimental group

	Pre test mean	Post test mean	Mean difference	T-value	P value
Dynamic gait index	17.06	23.33	6.2	16.8	1.05
Timed up and go test	27.53	19.33	8.2	27	1.25

DISCUSSION

In stroke rehabilitation, walking function is critical to maintaining functional independence and improving daily activity levels, and is strongly associated with the quality of life post-stroke. Decreased walking function may be the main source of frustration to patients with functional impairments as this can prevent them from being able to cross a road in a limited time or walk around with people for a long time. Furthermore, they may not be able to participate in a variety of social activities and tend to avoid walking in crowded places. This can result in social isolation that exacerbates their feeling of disability and contributes to a decreased quality of life and psychosocial status.[18] David L. Jaffe et.al showed that training individuals with post-stroke hemiplegia to step over obstacles produced improvements in their gait parameters, the ability to step over objects, and walking endurance.[12] A total of 30 patients between age group between 40-60 years were included in the study. The study consists of two groups; experimental group and control group. Each consists of 15 patients. Experimental group given with balance training with obstacle ambulation and control group given with balance training only. The result shows that there were significant differences between the two groups. Mean pre-treatment dynamic gait index score of control and experimental group are 16.33 and 17.06 respectively. Mean pre-treatment timed up and go test score of control and experimental group are 27.93 and 27.53 respectively. Mean post treatment dynamic gait index score of control and experimental group are 22.33 and 23.33 respectively. Mean Post treatment timed up and go test score of control and experimental group are 17.66 and 19.33 respectively. Mean difference in pre treatment and post treatment dynamic gait index score of control and experimental group are 6 and 6.2. The mean difference of experimental group was 6.2 which greater then mean difference of control group 6. The t-value is 16.80 which were greater than p value 0.0001.These values suggest there was significant effect in giving balance training with obstacle ambulation training than balance training alone.

CONCLUSION

The study concludes that there is a significant effect in giving balance training with obstacle ambulation training than the balance training alone on functional balance in stroke patients.

Limitation of Study

In term of study limitations the sample size used in this study was small so that result is not generalized. In this study there is no follow up after 4 weeks, so it may be another limitation of the study. Other gait variables like step length, stride length and temporal symmetry index was not considered.

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