

Efficacy of Swiss Ball Therapy in Balance Rehabilitation of Hemiplegic Stroke Participants

Parthiban Alagappan¹, Manivel Arumugam², Ramamoorthy Veyilmuthu³

¹Senior Physiotherapist - Grade II, Department of Physical Medicine & Rehabilitation, PSG Hospitals, Coimbatore.

²Senior Physiotherapist, Department of Pulmonology, PSG Hospitals, Coimbatore.

³Professor & HOD, Department of Physical Medicine & Rehabilitation, PSG Hospitals, Coimbatore.

Corresponding Author: Parthiban Alagappan

ABSTRACT

Background: Impaired balance is one of the most common problems in post stroke patients. Thus the subject may unable to maintain balance in sitting and standing or to move in weight bearing posture without loss of balance. Treatment focusing on balance impairment is important to achieve functional independence at the earliest following stroke.

Methodology: Quasi experimental design - pretest and posttest designs with two groups at Department of Physical Medicine & Rehabilitation, PSG Hospitals, Coimbatore, Tamil Nadu, India. A total of 30 stroke patients in the age group of 45 to 60 years who satisfied the selection criteria were randomly assigned into two groups. Group A received conventional therapy along with balance training using Swiss ball for 60 minutes/session and Group B received conventional therapy along with balance training on mat and stool for 60 minutes/session. Outcomes were measured with Berg balance scale.

Results: All participants in Group A and Group B showed significant improvement in Berg balance scale with a mean difference of 13.6 and 8.7 respectively, calculated 't' value using the paired test for group A and B were 39.3 and 15.9 (P<0.05) respectively. When comparing between the groups using independent 't' test, the Berg balance scale scores showed mean difference of 4.6 and 't' value of 5.4 (P<0.05)

Conclusion: This study revealed that there was a significant improvement in balance following balance training on Swiss ball than on bed and stool among hemiparetic patients.

Key Words: Swiss ball, Static balance, Dynamic balance, Berg Balance Scale

INTRODUCTION

Stroke is a rapidly developing clinical signs of focal cerebral dysfunction; lasting more than 24 hours or leading to death with no apparent cause other than the vascular origin. [1]

Balance is frequently disturbed following stroke with impairments in steadiness, symmetry and dynamic stability. [2] The automatic adjustment of muscle tension that occurs normally in preparation for and during a movement task, termed

automatic postural tone is impaired in stroke patients. Thus the patient may lack ability to stabilize the proximal joints and trunk appropriately resulting in postural malalignment, impaired balance and risk of falling. Commonly problems may exist when reacting to a destabilizing external force or during self initiated movement. [3]

Patients with stroke typically demonstrate asymmetry with most of weight in sitting or standing shifted to non-paretic side. Hemiplegic subjects typically fall in

side of weakness. [4] They also have increase postural sway in standing. Balance problem during dressing activities increases the likelihood of stroke survivors having a fall.

In preface of stroke balance training is considered vital because it helps in achieving optimal posture, gait and thus can hasten the patients progression to near normal functional activities.

A cordial therapeutic intervention along with a good patient co-operation has led to early balance improvisation in patients. [5] Swiss ball therapy along with other physical therapy intervention will help in early regaining of balance when compared to conventional therapy interventions. [6,7]

In this study we aimed at improving the balance through Swiss ball exercises along with other conventional balance training. So with the improvement of balance it's able to achieve a good and independent functional mobility, gait and ADL activities. The Berg Balance Scale is a used as an assessment tool to identify balance impairment. [8] Functional activities such as reaching, bending, transferring, and standing are evaluated on the test to evaluate balance.

METHODOLOGY

STUDY DESIGN

Pretest and posttest design with a comparison group – a quasi experimental study.

STUDY SETTING

Physiotherapy division, Department of Physical Medicine and Rehabilitation, PSG Hospitals

NUMBER OF SUBJECTS

A total of 30 hemiplegic participants who met inclusion criteria were randomly assigned into Experimental group (Group A – 15 subjects) and Control group (Group B – 15 subjects).

INCLUSION CRITERIA

Age: 45-60 years; Gender: male; Ischemic stroke for the first time; Functional balance grade – fair

EXCLUSION CRITERIA

Cognitive deficit; Bilateral cerebellar stroke; Sensory disorders; Cardiovascular system instability; Tumors and infections; Orthopedic conditions.

INSRTUMRNATION USED

Swiss Ball; Mattress; Couch; Stool; Bolsters; Balance board; Measuring tape.

OUTCOME MEASURES

Berg Balance Scale.

PROCEDURE

The purpose of the study was explained to the subjects, verbal description of all procedures and test was given to them and a written consent was obtained from the patients who fulfilled the inclusion and exclusion criteria and randomly assigned to two groups. An assessor who was blinded to the group allocation took the outcome measurements using Berg Balance Scale. Initial assessment was taken on the first day before therapy. Intervention was given to each group separately for a total of 10 sessions (5 sessions / week). Post assessment was taken after 10 sessions of physiotherapy treatment using the same outcome measure. Comparison of pretest and posttest values within the group and between the groups was done finally.

INTERVENTION

The subjects in the experimental group (Group A) received conventional therapy along with balance training using Swiss ball for 60 minutes per session, the subjects in control group (Group - B) received conventional therapy and balance training activities on mat and stool. Exercises performed by both the groups are given in figure 1.

DATA ANALYSES

Paired 't' test was used to find the difference within the group between pre and post intervention scores in the outcome measure. Independent 't' test was used to find the difference between the groups in the outcome measure. The statistical significance for this study was set as $p < 0.05$.

Figure 1: Illustrates treatment protocol

CONVENTIONAL PHYSICAL THERAPY
Normalization of muscle tone: Slow sustained stretching for biceps and wrist flexors, hamstrings and calf muscles; Weight bearing activities in forearm supported prone lying, prone kneeling, half kneeling, sitting and standing. Range of Motion exercises: Passive and active assisted exercises for the affected upper and lower limb - 15 repetitions each exercises.
GROUP A (Balance training using swiss ball)
Supine lying position: Pelvic bridging bilateral and unilateral; lower trunk rotation; lower limb flexion and extension. Sitting position: Static sitting balance training - patients should sit on the ball and have both feet touch the floor with hips, knees and ankles at 90-90-90 degree position and can work on achievement of an upright erect posture; Trunk forward and lateral reach; Upper and lower trunk flexion-extension and lateral flexion activities; Marching activities; Trunk rotation and PNF chopping and lifting activities. 15 repetitions each activities.
GROUP B (Balance training using mat and stool):
Supine lying position: Pelvic bridging bilateral and unilateral; lower trunk rotation; lower limb flexion and extension. Sitting position: Static sitting balance training - patients should sit on the stool and have both feet touch the floor with hips, knees and ankles at 90-90-90 degree position and can work on achievement of an upright erect posture; Trunk forward and lateral reach; Upper and lower trunk flexion-extension and lateral flexion activities; Marching activities; Trunk rotation and PNF chopping and lifting activities. 15 repetitions each activities.

RESULTS

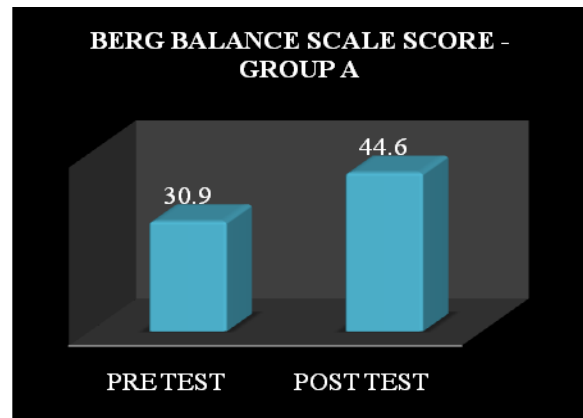
The aim of the study is to find out whether balance training using Swiss ball when given along with conventional balance training improves balance in all day activities among post stroke patients. As shown in Table 1, all participants in group A&B, showed significant improvement in Berg balance scale score with a mean difference of 13.6 and 8.7 respectively. The calculated 't' value by using the Paired 't' test for group A&B were 39.3 and 15.9 respectively which was greater than the table 't' value of 2.14; $p < 0.05$. This shows that there is a significant improvement in balance in both the groups. As shown in Table 2, when comparing the groups using Independent 't' test, Berg balance scale score showed mean difference of 4.7 and the 't' value of 7.5; $P < 0.05$, which was greater than the table 't' value of 2.04. This results shows that there is a statistically significant improvement in group A which underwent balance training using Swiss ball along with conventional balance training.

Table 1: Mean, mean difference and Paired 't' test values for Berg balance scale of groups A&B.

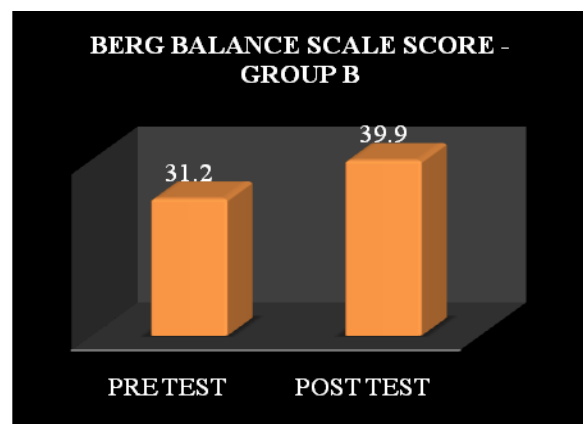
Groups	Means	Mean difference	't' value	'p' value
Group A				
Pre test	30.9	13.6	39.3	$p < 0.05$
Post test	44.6			
Group B				
Pre test	31.2	8.7	15.9	$p < 0.05$
Post test	39.9			

Table 2: Mean difference and Independent "t" Test values for Berg balance scale of groups A&B.

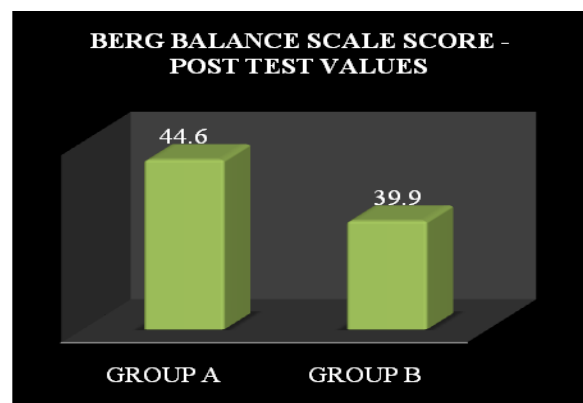
Outcome measure	Mean difference	't' value	'p' value
Berg balance scale	4.6	5.4	$p < 0.05$



Graph 1: Pre test and post test mean values of Berg balance scale score for group - A.



Graph 2: Pre test and post test mean values of Berg balance scale score for group - B.



Graph 3: Post test mean values of Berg balance scale score for groups - A & B.

DISCUSSION

In stroke patients who can able to walk, the majority of falls were reported only during walking, an activity that requires dynamic and reactive balance for example turning, transferring, and stair climbing because of reduced balance.

Conventional physical therapy uses only traditional balance training protocols on a stable surface that is less demanding for the post stroke patients to improve balance, but the stroke participants need more of balance to prevent the fall related complications.

The Swiss ball, as a movable surface, provides the patient with some uncertainty in terms of stability. A sudden movement of the ball requires the patient to be able to make a quick, unanticipated postural response, to realign the centre of gravity in relation the base of support. Swiss ball stimulates body's natural motor reflex and encourages body to react as a whole integrated unit by increasing the muscle recruitment, thereby increasing the efficiency of the muscles for effective postural mechanism.

A significant improvement in balance the experimental group (balance training using Swiss ball) is due to the postural perturbation provided by the movement of the Swiss ball to which the trunk muscles responded reactively in order to maintain the desired postural stability.

Duncan et. al., (2009) in his study has stated that activity of the trunk muscle was greater when exercises are performed on a Swiss ball than in exercises performed on stable surface in healthy adults. [6] Karthik Babu et. al., (2011) in their study found that there was a significant improvement in lateral flexion of trunk when trained with Swiss ball than in plinth. The results were similar to our findings that balance improvement in Swiss ball training is much significant than conventional balance training. [9]

In Berg balance scale the components such as trunk rotation, turning and placing alternate step on stool scores

improved much in Swiss ball training group than the conventional balance training group. This is due to the fact that with Swiss ball therapy coordination improved much more because of perturbations on unstable surface resulted in greater muscle recruitment.

CONCLUSION

The intent of this study was to find out the effect of Swiss ball therapy in balance rehabilitation of hemiplegic stroke participants. From the results of this study we can state that Swiss ball when administered along with conventional physical therapy will be more effective in improving balance.

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