

A Comparative Study on the Swiss Ball Training and Conventional Balance Training Versus Proprioceptive Neuromuscular Facilitation Pattern for Improving Trunk and Balance Control in Sub-Acute Stroke

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ABSTRACT

Background and purpose: Stroke is a common neurological disorder, representing a major cause of disability. It is considered as a significant health problem, which needs an unremitting and wide-ranging rehabilitation. In stroke, trunk control is impaired in 80 % of patients. The patients are unable to maintain the balance in sitting, standing or moving in weight bearing position. The purpose of the study is to compare the effect of the Swiss ball training and conventional balance training versus proprioceptive neuromuscular facilitation pattern for improving trunk and balance control in sub-acute stroke.

Method: 30 subjects who underwent inclusion criteria were selected and randomly divided into 15 subjects in each two groups. Group A [Swiss ball training and conventional balance training] and Group B [proprioceptive neuromuscular facilitation pattern]. The Berg balance scale and Trunk impairment scale can be used as the primary outcome of the study.

Results: Analysis using Independent 't' test found that there was no statistically significant difference ($p < 0.05$) between the Swiss ball training and conventional training versus proprioceptive neuromuscular facilitation pattern for improving trunk and balance control in sub-acute stroke.

Conclusion: Based on the results, this study concluded that Swiss ball training and conventional training was more effective than proprioceptive neuromuscular facilitation pattern for improving trunk and balance control in sub-acute stroke.

KEYWORDS: Stroke, Swiss ball training, Berg balance scale and Trunk impairment scale, Proprioceptive neuromuscular facilitation.

INTRODUCTION

Stroke is a common neurological complaint, which is a major cause of disability.^[1] It is considered as a significant health problem, which needs an unremitting and wide-ranging rehabilitation. Stroke is also known as "cerebral vascular accident brain attack" or "apoplexy".^[2] According to WHO Stroke

is defined as "acute onset of neurological dysfunction due to abnormality in cerebral circulation with resultant signs and symptoms that corresponds to involvement of focal area of brain lasting more than 24 hours"^[3]

In stroke, trunk control is impaired in 80 % of cases. Therefore cases are unable to

maintain the balance in sitting, standing or move in weight bearing position. They demonstrate asymmetry with most of the weight in sitting or standing shifted toward the stroke side. They also demonstrate increased postural sway in due to impairment in trunk control. Balance is also disturbed in stroke with impairment in steadiness, symmetry and dynamic stability.^[4]

The Indian Council of Medical Research estimates that among the non-communicable disease, Stroke contributes for 41% of deaths and 72% of disability is adjusted during life years.^[5] In stroke, there is palsy or weakness of one side of the body includes upper limb, trunk and lower limb leading to the disturbances in the trunk muscles. The sensory and motor impairments of upperlimb, lower limb and trunk interfere with the functional performance after Stroke. Trunk performance has been identified as an important early predictor of functional outgrowth after Stroke.^[6]

Trunk control is related to measure balance, gait and functional activity in patient with stroke. Counter rotation between the upper and lower trunk is the mobility over stability task which is essential for all the functional movements.^[7] The rotation of trunk muscle activity is not unilateral, but require static holding of contra-lateral muscle to stabilize central Apo neurosis, so allowing antagonist shorten and draws one side of pelvis or thorax forwards. Trunk training exercises was given to improve their trunk stability and balance.^[8]

Another method is by giving the Swiss ball exercises, there will be improved proximal trunk control which is prerequisite for distal limb movement and therefore prominent gait changes can be seen.^[9] Trunk training exercises are effective to improve sitting balance and effective loading and activation of muscles of paretic limb.^[10] Core stability exercises are effective in achieving effective balance in a multi-system and multidirectional task approach Swiss ball are commonly used in stroke rehabilitation as it provides greater challenge to control

and dynamic balance and there are evidences that Swiss ball training is superior to ground based exercises in their ability to recruit trunk muscles by increasing their demand and trunk balance on athletes.^[11] Exercises performed on Swiss ball led to better trunk muscle activity in patients with stroke. Specific pelvic patterns of Proprioceptive Neuromuscular Facilitation (PNF), which are mentioned in the literature not only exercise the pelvis motion and stability but also facilitate trunk motion and stability.^[12] In addition, these patterns help to improve functional trunk activities and treat the upper trunk & cervical areas indirectly through irradiation.

METHODOLOGY

The study was conducted at the Bharat Neuro Rehabilitation Centre, under the supervision of concerned authority. A total number of 30 subjects were selected by random sampling method after due consideration of inclusion criteria are Age: 40-60 year. Both male and female are included, First onset of unilateral lesion associated with ischemic or hemorrhagic stroke, duration of stroke less than or equal to 6 months, Both right and left hemiplegic, Spasticity on Modified Ashworth scale should be 1,1+,2, Brunnstrom grading 2,2+ and Exclusion criteria are Head injury, Brain tumor, Neurological disease affecting balance other than strike such as cerebellar disease, Parkinson's disease, Medically unstable, Musculoskeletal disorder of trunk and lower limb affecting motor performance, Seizures they all were divided into Group A [Swiss ball training and conventional balance training] and Group B [Proprioceptive neuromuscular facilitation pattern] with 15 subjects in each group. A total duration of 5 session in a week for 12 weeks. The parameter used for this study was Berg Balance Scale and Trunk Impairment Scale.

PROCEDURE

The total number of 30 subjects who were diagnosed as overweight and obesity are

suitable for inclusion criteria were included for the study.

After the informed consent obtained from them, the subjects divided into twogroups.

Group A and Group B with 15 subjects in each group.

The Group A will engage in the Swiss ball training and conventional training The Group B will engage in the Proprioceptive neuromuscular facilitation pattern.

Group A patients received Swiss ball training and conventional training for 45 minutes, once in a day, 5 days per week for 5 months

Swiss ball training

- ❖ Active sitting
- ❖ Rock back and forth
- ❖ Rock side to side
- ❖ Circles
- ❖ Upper trunk rotation
- ❖ Lower trunk rotation
- ❖ Seated march
- ❖ Crab exercise

1. Active sitting: The subjects were asked to sit on a Swiss ball with erect spine then they were asked to balance themselves keeping their foot flat on the floor. After that they bounce on the Swiss ball with balance.
2. Rock back and forth: The subject was asked to sit on Swiss ball with erect spine. they were asked to do pelvic tilting slowly to both anterior and posterior with balance.
3. Rock side to side: The subject was asked to sit on Swiss ball with erect spine. they were asked to do pelvic tilting slowly to both sides with balance
4. Circles: The subject was asked to sit on Swiss ball with erect spine. They were asked to start rolling the hips slowly, both in clockwise and anticlockwise.
5. Upper trunk rotation: was performed by moving each shoulder forwards and backwards.
6. Lower trunk rotation: was performed by placing the both the patient's legs on Swiss ball and asked to move the ball to

both the left and right by rotating the pelvis. Initially ball was placed beneath the knees and the advanced towards the ankles.

7. Seated march: The subject was asked to sit on Swiss ball with erect spine. They were asked to begin slow march lifting, alternately foot off the ground, progressing with comfortable speed with balance.
8. Multidirectional reach outs: forward reach: was performed by asking the patient to reach a fixed point at shoulder height by forward flexing the trunk at the hips.

Conventional balance training

- Weight transfer (anterior, posterior, lateral tilt)
- Side rotation of the trunk
- Elongation of trunk (lateral bending)
- Reaching the objects (upward, downward, sideways, back ward)
- Sit to stand
- Erect sitting with / without support

Group B (PNF PATTERN)

Group B received PNF pattern for trunk and pelvic for 45 minutes, once in a day, 5 days per week for 25 weeks.

Upper trunk in supine position

- Flexion with rotation to left (chopping)
- Extension with rotation to the left (lifting)
- Extension with rotation to the right

Lower trunk in supine position

- Flexion with rotation to the right

The pelvic patterns

- Anterior elevation
- Posterior depression

RESULTS AND TABLE

Table – 1 Comparison of BERGBALANCE SCALE Between Group - A And Group – B

The comparative mean values, mean difference, standard deviation and unpaired

't' value between Group A and Group B on stroke berg balance scale in trunk control in post

Berg balance scale	Mean	Mean Difference	Standard Deviation	Un Paired 't' Value
Group-A	40.87	3.47	2.75	2.782
Group-B	37.40			

The unpaired 't' value of 2.782 was greater than tabulated 't' value of 2.05, which showed that there was statistically difference at 0.05 level thus there is a significant improvement regarding trunk balance, participants in response to treatment in Group-A when compared to Group -B.

Table -2: Comparison of TRUNK IMPAIRMENT SCALE Between Group -A And Group - B

The comparative mean values, mean difference, standard deviation and unpaired 't' value between Group A and Group B on Trunk impairment scale in trunk control in post stroke

Trunk impairment scale	Mean	Mean Difference	Standard Deviation	Un paired 't' Value
Group -A	17.80	2.20	2.60	2.3008
Group -B	15.60			

The unpaired 't' value of 2.003 was greater than tabulated 't' value of 2.05, which showed that there was statistically difference at 0.05 level thus there is a significant improvement regarding trunk balance, participants in response to treatment in Group-A when compared to Group-B

DISCUSSION

Exercises performed on Swiss Ball increases kinesthetic awareness because of the unstable nature of the ball, the user is forced to be intrinsically aware of the positioning of their body in space.^[13] The unstable nature of the ball forces the user to make constant weight shifts while on the ball, to find their balance points, various stabilizer muscle groups are also challenged while exercising.^[14]

Joy YM wee et. al., (1999) conducted a study on 128 hemiplegic patients to examine the utility of the Berg Balance Scale in predicting the length of stay and discharge destination. The result of the study concluded that the measuring the Berg Balance Scale scores of patients with hemiplegic admitted in acute stroke rehabilitation unit may help in approximating length of stay and predicting discharge destination and also documented that Berg Balance Scale was a better tool for assessing balance in hemiplegia.^[15]

Based on the above study results, the present study was include by Berg Balance Scale as parameter, conventional training & Swiss ball exercise as intervention procedure.

In the PNF Group, result shows improvement in terms of static and dynamic sitting balance and coordination, there was also improvement in maintaining and changing posture.^[16] There was more improvement in post treatment trunk impairment scale, suggesting better trunk muscle activity. The probable mechanism by which PNF could have worked is by facilitating the neuromuscular mechanism, by stimulating the proprioceptors.^[17]

IN THE ANALYSIS AND THE INTERPRETATION IN THE BBS OF GROUP A AND GROUP B

The unpaired 't' value of 2.785 was greater than tabulated 't' value of 2.05, which showed that there was statistically difference at 0.05 level thus there is a significant improvement in Group-A when compared to Group-B.

Therefore, the study was rejecting the null hypothesis and accepting the alternative hypothesis.

IN THE ANALYSIS AND THE INTERPRETATION IN THE TIS OF GROUP A AND GROUP B

The unpaired 't' value of 2.3008 was greater than tabulated 't' value of 2.05, which showed that there was statistically difference at 0.05 level thus there is a significant improvement in Group-A when compared to Group-B

Therefore, the study was rejecting the null hypothesis and accepting the alternative hypothesis.

CONCLUSION

This study concluded that the Swiss ball training and conventional balance training will be more beneficial for both trunk and balance control in sub-acute stroke than PNF training.

Declaration by Authors

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