

Comparison of Swiss Ball Exercises versus Conventional Therapy on Improving Trunk Control in Patients with Acute and Subacute Stroke

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ABSTRACT

Background and objectives: Stroke is the sudden loss of neurological function caused by an interruption of blood flow to the brain. Common problem after stroke are impaired motor functions including balance and gait disturbances. The trunk being central key point of body, proximal trunk control is a pre requisite for distal limb movement control, balance and functional activities. So the purpose of study was to Compare effectiveness of Swiss ball exercises versus conventional therapy on improving trunk control in patients with acute and sub -acute stroke.

Methods: 18 Subjects with acute and sub-acute stroke based on inclusion and exclusion criteria were conveniently allocated to Group A and Group B. Group A patients received Swiss ball exercises and Group B received conventional therapy. Using TIS and PASS pre and post treatment assessment was recorded. The results of the study shows that trunk exercises performed on either Swiss ball or on bed can improve trunk control. But statistically Swiss ball training gives more significant improvement in trunk control than conventional therapy.

Keywords – Trunk control, TIS, PASS, Swiss ball exercises, conventional therapy.

INTRODUCTION

Stroke is the sudden loss of neurological function caused by an interruption of blood flow to the brain. There are two types of stroke: 1. Ischemic stroke: - it results when a clot blocks or impairs blood flows, deprives the brain of essential oxygen and nutrients. It is the most common type, affecting about 80% of

individuals with stroke.2. Hemorrhagic stroke: - occurs when blood vessels rupture, causing leakage of blood in or around the brain. ⁽¹⁾ Developing countries like India are facing a double burden of communicable and non-communicable diseases. Stroke is one of the leading causes of death and disability in India. According to World Heart Federation every year 15 million people worldwide suffer from stroke, nearly 6 million die and 5 million left disabled. It is the major health problem in India and is the third leading cause of disability and the second leading cause of death. About 1.2% of death in India is due to stroke, the incidence is 105 per 1 lakh population in urban community and 262 per lakh in rural community. Among the non-communicable diseases stroke contributes for 41% of deaths and 72% of disability as estimated by Indian council of medical research. ⁽²⁾

Duration of acute stroke according to WHO is 2 week and sub-acute stroke is from 2 week to one year. Hemiparesis refers to weakness of one side of body; weakness includes muscles of upper and lower limb, trunk and face. Common problem after stroke are impaired motor functions including balance and gait disturbances. The trunk being central key point of body, proximal trunk control is a pre requisite for distal limb movement control, balance and functional activities. The sensory and motor impairment of upper and lower limb and trunk interfere with functional performance after stroke many hemiplegic shift their center of gravity to unaffected side when maintaining quite stance and show left right

asymmetry and decreased balance ability. ⁽³⁾

In addition to limb and trunk impairments hemiplegic stroke patients frequently present with balance abnormalities and are associated with poor balance and falls. Effective trunk control is the ability of trunk muscles to allow the body to remain upright, adjust weight shifts and perform selective trunk movements against gravity and maintain base of support during static and dynamic postural adjustments in sitting, standing and stepping. ⁽⁴⁾

Trunk control is related to measure of 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. The rotation of trunk muscle activity is not unilateral, but require static holding of contralateral muscle to stabilize central Apo neurosis, so allowing antagonist shorten and draws one side of pelvis or thorax forwards. ⁽⁵⁾

Trunk training exercises are given to improve their trunk stability and balance. 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. Trunk training exercises are effective to improve sitting balance and effective loading and activation of muscles of paretic leg. Core stability exercises are effective in achieving effective balance in a multi-system and multi-directional 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. Exercises performed on Swiss ball lead to better trunk muscle activity in patients with stroke. When the exercises are performed on the Swiss ball the trunk musculature gets

activated, since the movement of a ball beneath the participants provides a postural perturbation to which muscles respond in order to main posture and therefore improves balance. ^[4]

MATERIAL AND METHODOLOGY

The study was conducted in Physiotherapy department of MVPS college Participants were included considering the inclusion and exclusion criteria.

Inclusion Criteria:-

1. Acute and sub-acute stroke patients with age between 40-60 years.
2. Mini mental score should be 24 or above.
3. Patient should be able to understand and follow simple verbal instruction.
4. Berg balance score should be more than 21.

Exclusion Criteria:

1. Neurological disease affecting balance other than stroke.
2. Visual problem which would interfere with reaching to pick up objects.
3. Musculoskeletal disorder of trunk or lower extremity affecting motor performance.
4. Cardiovascular conditions like myocardial infarction.
5. Cognitive impairment.

Procedure was explained to the participants and participants were then asked to sign the consent form. Assessment of all the included participants was done as per the assessment form. Participants were randomly divided into two groups Group A and Group B. Group A received trunk exercises on Swiss ball. Group B received conventional therapy Outcome measures were taken using Trunk Impairment scale and postural assessment scale.

Group A has received Swiss ball therapy

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 were 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.

Group B has received - Conventional Therapy

1. Pelvic bridging: in supine lying both the patient's legs are placed on the bed and asked to lift the pelvis off the bed.
2. Upper trunk rotation: the patient, while sitting in the upright position, move each shoulder forwards and backwards.
3. Lower trunk rotation: was performed in crook lying position by rotating the pelvis to both sides.
4. Forward reach: forward reach: was performed by asking the patient to reach

a fixed point at shoulder height by forward flexing the trunk at the hips.

5. Weight shift :Patient is asked to shift weight

RESULT

- As p value < 0.0001 in group A for **TIS**, result is extremely statistically significant i.e. Swiss ball exercises are effective in TIS for improving trunk control in patients with acute and sub-acute stroke.
- As p value < 0.0001 in group A for **PASS**, result is extremely statistically significant i.e. Swiss ball exercises are effective in improving trunk control in patients with acute and sub-acute stroke.
- As p value = 0.0012 in group B for **TIS**, result is very statistically significant i.e. Conventional therapy showed improvement in TIS for improving trunk control in patients with acute and sub-acute stroke.
- As p value = 0.0012 in group B for **PASS**, result is very statistically significant i.e. Conventional therapy showed improvement in PASS for improving trunk control in patients with acute and sub-acute stroke.

Table No.1: Comparison Of Pre And Post Values Of Tis (Group A):

TIS	PRE Rx	POST Rx
MEAN	13.38	20.13
S.D.	1.19	0.83
T VALUE	16.38	
P VALUE	<0.0001	

Table No.2: Comparison Of Pre And Post Values Of Pass (Group A):

PASS	PRE Rx	POST Rx
MEAN	23.75	31
S.D	2.82	1.60
TVALUE	13.78	
PVALUE	<0.0001	

Table No.3: Comparison Of Pre And Post Values Of Tis (Group B):

TIS	PRE Rx	POST Rx
MEAN	13.63	16.25
S.D	1.41	1.28
T VALUE	7.22	
P VALUE	0.0012	

Table No.4: Comparison Of Pre And Post Values Of Pass (Group B)

PASS	PRE Rx	POST Rx
MEAN	23.75	26.38
S.D	3.49	2.83
T VALUE	5.27	
P VALUE	0.0012	

Table No.5:Comparing Tis Of Group A And Group B :

TIS	GROUP A	GROUP B
MEAN	6.75	2.63
S.D.	1.16	1.41
T VALUE	6.3847	
P VALUE	<0.0001	
Significance	Extremely Statistically Significant	

Table No. 6: Comparing Pass Of Group A And Group B :

PASS	GROUP A	GROUP B
MEAN	7.25	2.63
S.D.	1.49	1.41
T VALUE	6.3858	
P VALUE	<0.0001	
Significance	Extremely Statistically Significant	

DISCUSSION

The purpose of study was to compare the effect of Swiss ball exercises and conventional therapy on improving trunk control in patients with acute and sub-acute stroke.

In this study 18 patients were conveniently assigned 9 were in group A which received Swiss ball exercises and 9 were group B which received conventional therapy. Two patients were drop out due to some reason. The outcome was measured by using TIS and PASS.

The result of this study revealed that Swiss ball exercises are more effective than conventional therapy on improving trunk control in patients with acute and sub-acute stroke.

Trunk control has been a key factor for balance and it is an early predictor of functional outcome after stroke. Lack of trunk control is attributed to muscle weakness, motor incoordination and multisensory disintegration in subjects affected with stroke.

Gregory J Lehman et al ⁽⁸⁾ studied about the effect of Swiss ball training in muscle activity. They selected 11 college students of average weight 85.4 kg and height 179 cm and age 27.6 with greater than 6 months of weight training and no back pain. They trained them with Swiss

ball and recorded the muscle activity with EMG. They concluded that the Swiss ball exercises influence the trunk muscle activity in rectus abdominus and external oblique.

Study published “efficacy of trunk exercises on Swiss ball versus bed in improving trunk control in hemi paretic patients”. - S. Felix Renald. ⁽³⁾ This study revealed that there was significant improvement in trunk control following trunk exercises on Swiss ball than on bed among hemi paretic patients. The possible reason for better trunk control improvement in Swiss ball group may be as the movement of Swiss ball under the patients provided a postural perturbation to which trunk muscle respond reactively in order to maintain the desired postural stability.

Another study, “effectiveness of trunk training exercises versus Swiss ball exercises for improving sitting balance and gait parameter in acute stroke subjects.” Kothalanka Viswaja et al ⁽⁴⁾ concluded that both group noted significant differences. But when comparing between these two groups there is no statistical significance noted. So this study concluded that there is no significant difference between trunk training exercises and Swiss ball exercises on sitting balance and gait parameters in subjects with stroke.

Raikan Büyükavc, Füsün Şahin, ⁽⁶⁾ the impact of additional trunk balance exercises on balance, functional condition and ambulation in early stroke patients. The study revealed that In early stroke patients either conventional exercises or conventional exercises plus trunk balance exercises can provide significant improvement in balance, functional condition and ambulation. However, the level of the improvement is better for the group which was applied trunk balance exercises to conventional exercises. Trunk balance exercises that are easily applicable with simple mechanisms by the patients themselves can be added to the rehabilitation.

The possible reason for better trunk control improvement in Swiss ball group

may be as the movement of Swiss ball under the patients provided a postural perturbation to which the trunk muscle responds reactively in order to maintain the desired postural stability. Trunk stabilization training on unstable surfaces activated the postural muscle around the abdomen and pelvis, more than that on a stable surfaces. (3)

In biomechanical aspect the weight is shifted in any plane, the trunk responds with a movement to counteract the change in the center of gravity training on Swiss ball as change in the surface stability may influence trunk muscle activity and also influences anticipatory postural adjustment and trunk performance. (4)

Improved weight shifting ability through rotations also can enhance trunk muscle stability and balance. Improved lower trunk control effectively stabilizes the pelvis, which can lead to improved mobility and gait in the Swiss ball group.

The bouncing and rocking movement on Swiss ball increases alertness by connecting the vestibular system with reticular formation. The exercises on Swiss ball restore the function of movement and equilibrium and it encourages the patient's participation and also makes the use of affected muscle easy. The uneven surface of Swiss ball reduces the chances of repetitive stress on muscles. This could be a possible reason for better improvements found in the Swiss ball group. (7)

The positive findings in conventional therapy may be because of effective load bearing through affected limb which is carried over to standing up. Trunk stabilization exercises to strengthen the muscles of the abdomen help to maintain dynamic stability of the body; these exercises using functional movements are important. Core stability exercises improve sitting balance and ability to maintain a static posture after dynamic posture by activation of trunk musculature especially transverse abdominals and multifidus which

are deep seated muscles and they help in spinal stabilization, these muscles were trained for 4 weeks and there was improvement in sitting balance which in turn enriched the quality of gait. (4)

CONCLUSION

The results of the study show that trunk exercises performed on either Swiss ball or on bed can improve trunk control. But statistically Swiss ball training gives more significant improvement in trunk control than conventional therapy.

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