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RESEARCH ARTICLE

COMPARISON OF TRUNK TRAINING EXERCISES ON UNSTABLE SURFACE V/S PELVIC PNF TECHNIQUE IN CHRONIC STROKE PATIENTS

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ABSTRACT

Objectives: comparison of trunk training exercise versus pelvic PNF to improve trunk control and gait in chronic stroke patient. **Method:** A sample of 20 patients was recruited from the Physiotherapy Department of shree B.G. Patel College of physiotherapy and Iris Hospital anand through convenient sampling technique. Ten patients were placed to each TTE and PNF groups. TTE group was treated with trunk and L/E exercises on unstable surface and PNF group was treated with PNF patterns of Pelvic for four consecutive weeks. Pre and post treatment measurements were determined by Trunk impairment score (TIS) and Time up and go test (TUG). **Results:** Both group showed improvement after training, but the Trunk training exercise (TTE) group demonstrated better scores relating to PNF group in the Trunk control and balance (TIS= 0.0083 & TUG= <0.001) at the end of the protocol. **Conclusion:** The study revealed that there is significant improvement in trunk control in both group but more significant improvement in trunk control and balance in TTE group compared to PNF.

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INTRODUCTION

Stroke is a global health problem and is a leading cause of adult disability (Ashrafian, 2010). Brunnstrom noted from observing a large number of hemiplegic patients that an almost stereotyped sequence of events takes place during recovery following a cerebrovascular accident (Sridharan, 2009). The trunk being the central key point of the body, proximal trunk control is a pre requisite for distal limb movement control, balance and functional activities (Fujiwara, 2001). However, stroke patients are less capable of balance and postural control due to trunk muscle weakness and damaged proprioception. The sensory and motor impairments of upper limb and lower limb and trunk interfere with the functional performance after stroke. These patients have an increased risk of falling toward the paretic side and limited functional abilities (Batchelor, Mackintosh, Said and Hill, 2012; Eng, Pang and Ashe, 2008). Ability to distribute body weight evenly (postural symmetry) and to shift weight according to the task requirements, is essential to normal balance (Goldie, Bach and Evans, 1989; Nichols, Miller, Colby and Pease, 1996).

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This ability is commonly disturbed in individuals with stroke. They frequently show an increased posture sway, a decreased dynamic stability, and impaired weight-shifting ability onto the paretic lower limb both when sitting and standing (Dickstein, 1996). As a consequence, all these effects can bring to difficulties in leading an independent life (Shumway-Cook *et al.,* 2007). Sitting balance is a predictor of functional recovery, and the role of the trunk muscles in maintaining balance is important because the center of mass becomes lower than that in the standing position[5] Sitting involves the ability to reach for a variety of objects located both within and beyond arm's length as personal daily tasks; it also entails activities such as showering, toileting and dressing. Self-triggered arm movements were associated with anticipatory postural adjustments in muscles of the trunk and lower limbs, indicating that postural adjustments always precede active movement (Developing_a_Clinical_Tool_to_Measure_Sitting_Balance_after_Stroke_A_reliability_study? 1995; Sackley, 1990). Most literature concerning rehabilitation after stroke focuses on the hemiplegic upper and lower limbs while the trunk receives little attention. Many hemiplegics shift their center of gravity to unaffected side when maintaining quiet stance and show left right asymmetry and decreased balance ability. In addition to limb and trunk impairments hemiplegic stroke patients

frequently present with balance abnormalities and are associated with poor balance and falls. According to Tsuji, Liu M et al, the trunk muscles are impaired on both sides of the body following a unilateral stroke as evaluated by motor evoked potential studies. Various approaches are used for the rehabilitation of the trunk in stroke Patients, Which are

- Stretching and strengthening of trunk muscles
- brunnstrom Approach
- Neurodevelopmental Approach
- Trunk stabilization Exercise

But here we are **investigate the effect of the trunk training exercise on unstable surface and pelvic PNF technique:** Many studies conducted trunk exercise on a stable support surface with stroke patients and reported that the functions of their trunks improved but exercising on an unstable surface increases postural sway, further promoting trunk muscle activation. Balancing exercise on unstable surface sensitize muscle spindle through gamma motor neurons, thereby motor output which influences the stability of joints (Park, 2014). In studies that conducted trunk stabilization exercises on an unstable surface, with stroke patients as subjects, the thickness of the trunk muscle increased, and the balancing ability improved[19]; however, there was no significant difference in trunk muscle activation between groups in a study that conducted trunk stabilization exercises using a sling (Park, 2014). Shumway Cook et al. noted that an unstable support surface stimulated the sensory system and the motor system more than a stable support surface, effectively changing postural orientation ability and aiding postural strategies. Training on Swiss ball as a change in the stability may influence trunk muscle activity due to different biomechanical demands of the exercises and also influence the anticipatory postural adjustment which may improve trunk performance (Kothalanka Viswaja, 2015).

Pelvis is a part of trunk that supports extremity motions. Hence, the pelvic motion comes from trunk muscles. The range of motion in the pelvic patterns depends on the amount of motion in the lower spine. Biomechanically it is impossible to move the pelvis without motion in the spine as it is connected with the spine (Susan, 2008). The diagonal mass movement patterns in PNF resemble normal motor activity. A reduction in truncal tone can be promoted by PNF trunk pattern that emphasize rotation movement of trunk. PNF programs may be appropriate for improving trunk muscle endurance, strength and trunk mobility (Paneri, 2014). Wang reported that studies on the effectiveness of PNF-based treatment have been both supportive and conflicting and that very few studies on pelvic facilitation for gait improvement existed (Akosile, 2011). Specific pelvic patterns of Proprioceptive Neuromuscular Facilitation (PNF) exercise improve the pelvis motion and stability but also facilitate trunk motion and stability. In addition, these patterns help to improve functional trunk activities (Susan, 2008). Many researches are there on trunk training programme of unstable surface and on PNF on pelvic to improve trunk control, balance and gait. Both approaches are effective individually but comparison of these two approaches are not found anywhere so, Aim of study is to compare trunk training exercise on unstable surface and pelvic PNF technique for improving sitting balance, postural control and gait on chronic stroke patients And shows that which is more beneficial.

MATERIALS AND METHODOS

Study design

- Comparative experimental study

Study Setting

- Department of Physiotherapy, SHREE B.G.PATEL, COLLEGE OF PHYSIOTHERAPY, ANAND
- IRIS Hospital, Anand

Sample Size

- 20 Patients

Inclusion Criteria

- Subjects who were diagnosed with the first onset of unilateral hemispheric stroke,
- Had no neglect of paretic limbs,
- Could sit independently for 30 s on a stable surface,
- Were medically stable,
- Had no peripheral neuritis,
- Had no musculoskeletal problems such as low back pain or arthritis affecting motor performance,
- And could understand and follow simple verbal instructions

Exclusion Criteria

- Had aphasia,
- Not medically stable,
- Uncontrolled hypertension,
- Spinal deformity,
- Pelvis fracture less than 6 months,
- Impaired cognitive function

Materials used in study: Plinth, chairs, pillows & towels etc.

Apparatus used in study

Physioball, Balance board, Balance pad, Camera

Outcome Measures

- Trunk impairment scale
- Time up and go test

Intervention Procedure

- Sample of 20 had taken by convenience sampling from the population fulfilling the inclusion criteria. A written consent were obtained from all the subjects. 20 subjects were divided into two groups each consisting. TIS score and TUG score of both the control group and the experimental score was noted.

Protocol for Trunk Training Group: With using Physioball, balance board & balance pad.

- Weight shifting – forward /backwards Side to side
- Reaching overarm – shoulder flexion / abduction

Table No. 1

Gender		Side of hemiplegia		Cause of stroke	
Male	Female	Right	Left	Ischemic	Hemorrhagic
16	4	8	12	17	3

Table 2. Comparison of Pre and Post Value in Trunk Training Exercise Group And PNF group

PARAMETER	Group	Pre Test	Post Test	t Value	P value
		Mean ± SD			
TIS	TTE	9.6 ± 1.11	17.7 ± 1.9	18.23	0.0083
	PNF	9.4 ±1.9	15.1 ± 2.34	9.33	0.0191
TUG	TTE	48.28 ± 13.99	32.77 ± 10.27	9.64	<0.0001*
	PNF	49.19 ± 14.63	40.2 ± 11.75	6.94	<0.0001*

(P value significant<0.05)

Table 3. Comparison of Post Value in Trunk Training Exercise Group and PNF group

PARAMETER	Group	Post Test Mean ± SD	T value	P value
TIS	TTE	17.7 ± 1.9	2.586	0.0187
	PNF	15.1 ± 2.34		
TUG	TTE	32.77 ± 10.27	1.426	0.1709
	PNF	40.2 ± 11.75		

(P value significant<0.05)

- E.g. reaching for glass or bottle
- Lower limb exercise – hip flexion / abduction

Duration: 30 minutes

Protocol for Pelvic PNF group

- Positioning
- Manual contact, stretch & resistance
- Pelvic Patterns – rhythmic stabilization & initiation

Duration: 20 to 30 minutes

Data Analysis: One way paired t- test was used to compare Trunk impairment scale and Time up and go test for intergroup and unpaired t-test was used to compare between groups of Trunk Training Exercise on unstable surface and PNF.
Each calculated P value was compared with table value to test hypothesis at 0.05(5%) level of significance.

RESULTS

All the descriptive characteristics of the subjects and their variables are analysed. Total 20 patients were taken so according each variables distribution and differences is seen. We have taken 20 patients (10 in each group) they had selected by convenient sampling as per inclusion criteria after the study of 4 week we come to know that the both groups shows improvement in parameters (TIS & TUG) but TTE shows significantly higher improvement then PNF group

DISCUSSION

The Randomized Clinical Trial was conducted to compare the effect of the trunk training exercise on unstable surface and pelvic PNF technique on postural control gait, and balance in chronic stroke patients. The study showed significant improvement in post-intervention score of the trunk training exercise on unstable surface and Pelvic PNF when evaluated by TIS. However between the groups the score was statistically significant and trunk training exercise showed better improvement compared to Pelvic PNF.

Trunk training apparently improved the balance of the lumbo-pelvic-hip complex, corrected postural alignments, therefore it could have led to a gradual improvement in Sitting balance in the TIS. Trunk stability exercises lead to stabilization of the trunk by strengthening the lumbar musculature and improving trunk control which resulted in correction of the shift of COG from the unaffected side back to the center (Effects of trunk exercises performed on an unstable surface on trunk muscle activation, 2015). In a study conducted to investigate the effects of trunk exercises performed on an unstable surface on trunk muscle activation, postural control, and gait speed in stroke patients a significant a significant improvement in sitting balance was noted on trunk performance (Khanal, 2013). As stated in the literature, Pelvic PNF not only improvise the pelvis motion and stability but also facilitates trunk motion and stability. PNF might have improved the flexibility, muscle strength, neural control, and proprioception contributing to a better postural control and dynamic stability (Susan, 2008).

The study showed significant improvement in post-intervention score of the trunk training exercise on unstable surface and Pelvic PNF also in the TUG score. Kabat reported that a greater motor response can be attained when facilitating techniques are employed in addition to resistance which could have led to an improved motor recovery in our study (Susan, 2008). The PNF techniques used were Repeated Stretch technique which helps to strengthen trunk muscles. Reversal of Antagonist technique trains coordination and can prevent or reduce fatigue of the working muscles and Rhythmic Stabilization technique applied to lower trunk and pelvic stability which might have helped in improving the control of the pelvis. As pelvic motion and stability is required for proper function of the trunk and lower extremities during different activities (Susan, 2008). Trunk training exercises on unstable surface improves sitting balance and ability to maintain a static posture after dynamic posture by activation of trunk musculature especially transverse abdominis 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 enhanced quality of gait.

Four weeks and there was improvement in sitting balance which in turn enhanced quality of gait (Khanal *et al.,* 2013). Core strengthening improved posterior pelvic tilt and centre of gravity transfer during swing phase. It has been proven that transverse abdominis is involved in preparation of body during contralateral weight shifting (Yu, 2013). It is also believed that such feed-forward recruitment pattern of core musculature provides a more stable neuromuscular foundation for muscular movement and can contribute to more precise limb control during locomotion (Shinkle *et al.,* 2012). Improvements in balance and gait occurred because both the trunk training exercise on unstable surface consist of the use of lower limb muscles which account in change of balance and gait. Gait improved just not because of selective flexion and extension movements but also because of rotation exercises of upper and lower trunk. Gait and balance also improved because the motor control proceeds from proximal to distal, the improved level of proximal trunk control leads to improvement in distal lower limb control which helped in attaining better balance and gait (Kothalanka Viswaja, 2015). Because of all these reasons we have confirmed that unstable surface would be a better medium to train hemiplegic subjects in recruiting trunk muscles thus affecting the outcomes of the study.

Conclusion

The study showed significant improvement in pre and post-intervention score of the trunk training exercise on unstable surface and Pelvic PNF. However trunk training exercise on unstable surface was statistically significant and trunk training exercise showed better improvement in sitting balance and gait compared to Pelvic PNF.

Limitation of the study

- The sample size was too small.
- Long term follow was not there to check the consistency & long term effect of the treatment

Future Research

- Multicenter trials with long-term follow-up can be carried out to check the carry over effect.
- Outcome measure to evaluate quality of life can be considered.

REFERENCES

Ashrafian H. Familial stroke 2700 years ago. Stroke; a journal of cerebral circulation. 2010.

Sridharan SE, Unnikrishnan JP, Sukumaran S, Sylaja PN, Nayak SD, Sarma PS, et al. Incidence, types, risk factors, and outcome of stroke in a developing country: The Trivandrum Stroke Registry. Stroke; a journal of cerebral circulation. 2009

Fujiwara t, Liu m. The relationship between trunk function and the findings of transcranial magnetic stimulation among the patients with stroke. J rehab med. 2001

Dickstein, Nissan, Pillar and Scheer, 1984; Hacmon, Krasovsky, Lamontagne and Levin, 2012; Mizrahi, Solzi, Ring and Nisell, 1989; Nichols, 1997; Nicholsetal.,1996

van de Port IG, Kwakkel G, Schepers VP, et al.: Predicting mobility outcome one year after stroke: a prospective cohort study. J Rehabil Med, 2006

Developing_a_Clinical_Tool_to_Measure_Sitting_Balance_after_Stroke_A_reliability_study?et al 1995; Sackley, 1990

effects of trunk stabilization exercises on different support surfaces on the crosssectional area of the trunk muscles and balance ability. J Phys Ther Sci, 2013

Park JH, Hwangbo G: The effect of trunk stabilization exercises using a sling on the balance of patients with hemiplegia. J Phys Ther Sci, 2014

Kothalanka Viswaja, Kiran Prakash Pappala, Pilladi R Sri Tulasi and Patchava Apparao. (2015). EFFECTIVENESS OF TRUNK TRAINING EXERCISES VERSUS SWISS BALL EXERCISES FOR IMPROVING SITTING BALANCE AND GAIT PARAMETERS IN ACUTE STROKE SUBJECTS. International Journal of Physiotherapy

Susan S. Adler, Dominiek Beckers and Math Buck, PNF in practice, an illustrated guide (Third edition. Germany: Springer Publication; 2008).

Paneri N. A comparative study on to find the effectiveness of proprioceptive neuromuscular facilitation technique versus conventional trunk exercises to improve trunk control in recovery stage of hemiplegic patients. Int J Physiother 2014

Akosile C, Azikiwe N, Adegoke B, Johnson O, Awolowo O. Effects of Proprioceptive Neuromuscular Facilitation Technique on the Functional Ambulation of Stroke Survivors. Journal of the Nigeria Society of Physiotherapy 2011

Effects of trunk exercises performed on an unstable surface on trunk muscle activation, postural control, and gait speed in stroke patientsKyoung-Sim Jung, PhD, PT1), Hwi-young CHo, PhD, PT2)*, Tae-Sung in, PhD, PT3)(Oct. 29, 2015)

Khanal D, Singaravelan R.M., Khatri S M. (2013), Effectiveness of Pelvic Proprioceptive Neuromuscular Facilitation Technique On Facilitation Of Trunk Movement In Hemiparetic Stroke Patients. IOSR Journal of Dental and Medical Sciences.

Yu SH, Park SD. The effects of core stability strength exercise on muscle activity and trunk impairment scale in stroke patients. J Exerc Rehabil 2013

Shinkle J, Nesser TW, Demchak TJ, McMannus DM. Effect of core strength on the measure of power in the extremities. J Strength Cond Res 2012

Kothalanka Viswaja, Kiran Prakash Pappala, Pilladi R Sri Tulasi and Patchava Apparao. (2015). effectiveness of trunk training exercises versus swiss ball exercises for improving sitting balance and gait parameters in acute stroke subjects. International Journal of Physiotherapy

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