

EFFECTS OF EARLY STANDING ON TILT TABLE IMPROVING STANDING BALANCE IN SUBACUTE STROKE PATIENT

¹Dr. Kishoremoy Das, ²Dr.A.Kumaresan

¹M.P.T.(Neurology) 2nd year, ²Assistant professor
Department of Neuro Physiotherapy

Saveetha College of Physiotherapy, Saveetha University, Chennai, India.

Abstract: Standing on a tilt table helps in recovery of the ability to maintain standing balance and sustain load on the affected limb which is crucial to gait training and recovery of upper limb functionality. Supported standing on tilt table or standing frame is an adjunctive therapeutic practice commonly adopted in subjects with several central nervous diseases who are unable to stand actively. Aim of the study is to find out the effects of early standing on a tilt table improving balance to prepare for standing and gait training. Based on the inclusion and exclusion criteria the samples were collected from Physiotherapy OPD at Saveetha medical college and hospital. Patients were divided into two groups A and B in Group-A 15 patients were received conventional therapies includes passive range of motion exercises, pelvic bridging, bilateral, pelvic rolling and bilateral symmetrical approach, for 30mins and manual standing with the support of two therapist for 15mins routinely for 45mins per day for 3weeks. In Group B 15 patients were received 15mins of conventional therapy along with standing in tilt table for 30mins per day 45mins for 3weeks. Outcome measure functional balance grading scale was used to assess the standing balance and was documented for both the groups before and after the interventions with duration period of 3weeks. **Result:** The paired t-test showed extremely statistically significant difference (<0.0001) between the Pre and Post test of group A and Group B for functional balance grading scale. The unpaired t-test analysis showed extremely statistically significant difference ($p=0.0008$). Therefore the study shows statistically significant in standing balance in Group-B treated with tilt table. **Conclusion:** In this study standing in tilt table has an excellent effects in improving standing balance in sub acute stroke patient and was more convenient to the patients, as both the group has shown improvement of standing balance but the recovery in Group-B was found to be faster than the Group-A.

Keywords: Sub acute stroke, Early standing, Tilt Table, Functional Balance Grading.

I. INTRODUCTION

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 (Susan B O Sullivan, 2007). Stroke is also known as “cerebral vascular accident”, “brain attack” or “apoplexy”(Susan S Adler 2008). 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”(Davis PM 1990). 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. The estimated adjusted prevalence rate of stroke range, 84-262/100,000 in rural and 334-424/100,000 in urban areas. The incidence rate is 119-145/100,000 based on the recent population based studies. Therefore activities of daily living are limited by the disability in sensory, motor, and cognitive and emotional control functions seen following a stroke. Due to muscular stiffness and weakness, stroke patients have difficulties in supporting their weight on the lower extremity on the affected side, thereby causing disabilities in balance control while standing, which affects quality of life negatively. In addition, significant reductions in the function of the upper extremity on the affected side are experienced by stroke, resulting in significant difficulties in independent movements and performing the activities of daily living .To acknowledge the effects of early standing on a tilt table for the stroke patient as early standing can prevent general and neurological complications reduces spasticity prevent muscle contracture and let the patient to bear weight which helps to improve its joint proprioception. The purpose of the study benefits such as prevention of hip and knee flexors contractures, circulatory training, autonomic nervous system stimulation, and sensory activation Moreover, recovery of the ability to stand up and sustain load on the affected limb is crucial to gait training and recovery of upper limb functionality. Supported standing on tilt table or standing frame is an adjunctive therapeutic practice commonly adopted in subjects with several central nervous diseases who are unable to stand actively. Its helps to improve antigravity muscles strength and head and trunk postural control, maintain standing ability, and prepare for gait training.

II. NEED OF THE STUDY:

The effects of early standing on a tilt table for the sub-acute stroke patient as early standing can prevent general and neurological complications reduces spasticity prevent muscle contracture and let the patient to bear weight which helps to improve its joint proprioception the study also benefits such as prevention of hip and knee flexors contractures, circulatory training, autonomic nervous system stimulation, and sensory activation Moreover, recovery of the ability to stand up and sustain load on the affected limb is crucial to gait training and recovery of upper limb functionality. Supported standing on tilt table is an adjunctive therapeutic practice commonly adopted in subjects with several central nervous diseases who are unable to stand actively, which helps to improve antigravity muscles strength and head and trunk postural control, maintain standing ability, and prepare for gait training

III. METHODOLOGY

Thirty subjects were recruited from In-patient Department of Saveetha Medical College and Hospital, Saveetha University, Thandalam Chennai. The subjects were randomized into two groups By lottery method into Group A and Group B. the lot box contained 15A and 15B those who have picked A were placed in group A and those who picked B were placed in group B. for all the subjects signed an informed consent form before participation. The subjects were included in the study if they fulfill the following criteria

2.1 Inclusion criteria with Onset sub-acute stage (48h to 1 weeks), Both male & female age 50-75 years. New (first) clinical diagnosis of stroke, cerebral hemorrhage or infarct confirmed by consultant or CT scan leading to admission to the SMCH, Graded as mRS 4 or 5 (severe or very severe stroke and unable to stand without support/mechanical aid and assistance of two people), Conscious and responsive to verbal commands

2.2 Exclusion criteria with Systolic blood pressure above 140mmhg and below 100mmhg and diastolic above 90mmhg and below 50mmhg at rest lying or sitting will be excluded. Resting heart rate above 110 and below 50 beats per minute (e.g. cardiovascular instability) Temperature ≥ 38.5 degrees centigrade or ≤ 35 degrees centigrade, Orthopedic impairments which prevent full weight bearing in standing, Additional neurological deficits unrelated to the current or past stroke (e.g. psychosomatic disorder, peripheral neuropathy or Multiple Sclerosis), because these impairments are not related to the condition of interest

2.3 Procedure: all 30 subjects after baseline assessment, were randomly allotted into to two groups by lottery method namely Group- A and Group-B, 15 patients in each group. From Saveetha hospital In patient department. Among the selected population, based on inclusion and exclusion criteria patients with stroke were included in the study. Detailed procedure was explained in their informed consent form prior to the treatment. For all the 30 patients Pre and post test measurements was done by using Functional balance grading scale. Before and after the intervention with Treatment duration: 1 session per day; 5 days per week for 3 weeks.

2.4 Treatment protocol

2.4.1 Group A received conventional therapies includes passive range of motion exercises, pelvic bridging, pelvic rolling bilateral symmetrical approach, for 30mins and manual standing with the support of two therapist for 10mins routinely for 45mins one session in a day for 5 days for 3weeks.

2.4.2 Group B received 15mins of conventional therapy along with standing in tilt table for 30mins for 45minutes one session in a day for 5 days for 3weeks

2.5 Outcome measures: Functional Balance Grade (FBG) O'Sullivan, S.B. and Schmitz T.J. 6th Edition

IV. STATISTICAL ANALYSIS:

The Data was calculated and tabulated. Paired t-test was used to analyze the result within the group and unpaired t-test was used as to analyze the result between the groups.

V. RESULTS:

The statistical analysis revealed high statistically significant difference ($p < 0.0001$) between the Pre and Post test of Group-A and Group-B for functional balance grading scale.

The pre test value for Group-A was 0.87(SD=0.64) whereas, the post test value was 1.93(0.59) and the pre test value for Group-B was 0.93 (SD=0.70) whereas, the post value was 2.67(SD=0.49).

The unpaired t-test analysis for post test between Group-A and Group-B showed and extremely statistically significant difference at $p = 0.0008$

Table: 1 Group- A 30 minutes of conventional therapy with manual standing for 15 minutes.

Group- A	Mean Value	Standard Deviation	t-value	p-value
Pre-test	0.87	0.64	5.1717	<0.0001
Post-test	1.93	0.59		

Table: 2 Group- B 30 minutes of Tilt table standing with conventional therapy for 15minutes.

Group- B	Mean Value	Standard Deviation	t-value	p-value
Pre-test	0.93	0.70	11.3089	<0.0001
Post-test	2.67	0.49		

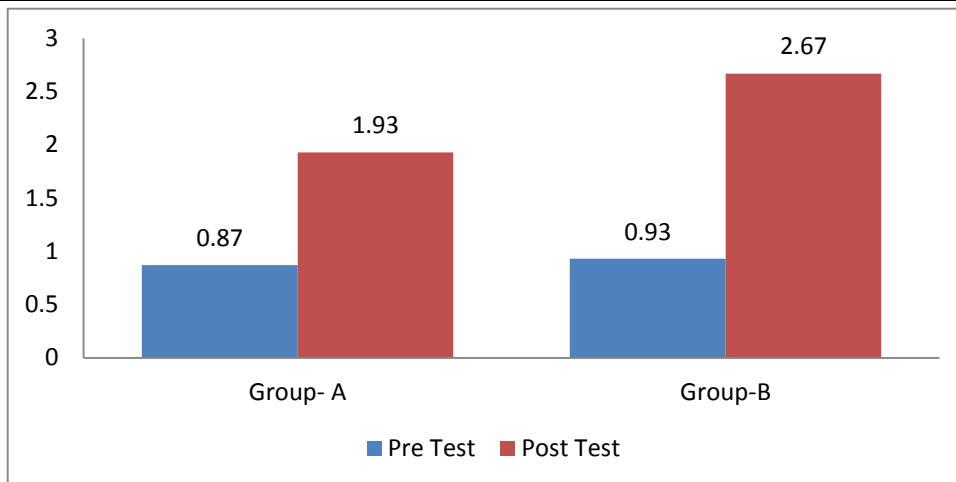


Figure:1 Comparison of the Pre Test and Post Test of Group-A and Group-B.

Table: 3 Post Test Value of Group- A and Group- B.

Parameter	Post Test Values				t-test	Significance
	Group- A		Group- B			
	Mean	Standard Deviation	Mean	Standard Deviation		
Functional Balance Grading scale	1.9300	0.5900	2.6700	0.4900	3.7369	0.0008

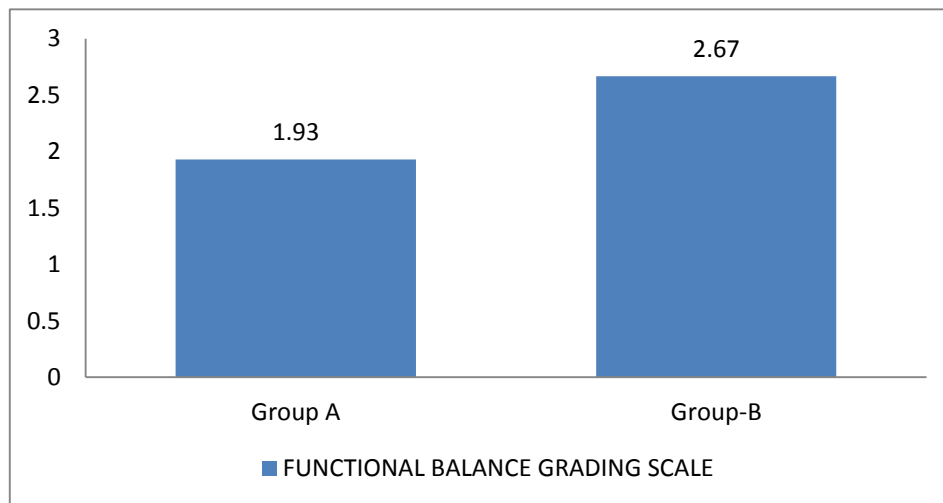


Figure:2 Post Test Comparison for Group-A and Group-B.

VI. DISCUSSION:

The current analysis indicated extremely significant improvements using tilt table standing along with conventional therapy ($p < 0.0001$). As there was no study done using functional balance grading for assessing the standing balance in subacute stage of stroke. This study revealed that early standing in tilt table along with conventional therapy can benefit the patients for joint proprioception and able to sustain balance while standing. Ginny Paleg and Roslyn Livingstone (2015) et al, states that Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [23] statement was used to structure this review that there is a strong evidence from a high quality randomized study, and other lower quality studies, also support the benefit of supported standing on activity outcomes such as standing symmetry and ability to maintain a stable standing position for the sub-acute and chronic stroke population was very effective for improvement in gait, functional activity and muscle strength in the sub-acute stroke population. Rhoda Allison Stroke Unit and Rachel Dennett Physiotherapy Department (2007) witnessed that along with the conventional therapy addition of standing with the support of tilt table has a significant improvement in balancing and increase of motor recovery in lower extremity found high score in berg balance scale and Gross Functional Tool Section of the Rivermead Motor assessment scale.

According to Peter t. katzmarzyk (2014) et al, indicate that greater time spent standing is associated with a lower risk of mortality. The observed association is consistent in men and women; however, it seems to be limited to those who are physically inactive. Several epidemiological studies have documented high levels of sitting and sedentary behavior internationally. Given preliminary evidence that breaks in sedentary behavior are associated with a more favorable cardiometabolic risk profile and the emerging evidence of associations between excessive sitting and the development of several chronic diseases and premature mortality, standing may represent a healthier alternative to sedentary behaviors.

Generally in hospital setup conventional physiotherapy is commonly being used where the therapist mostly concern with facilitatory techniques in activation of the muscles rather than bringing the patient out of bed, many times the patients complaints of fear of fall to come out of beside providing walker and two therapist support, and sometimes the patients ends up with shoulder and knee pain after mobilization which makes patient tired and fatigue, where fatigueness can be the biggest barrier in rehabilitation. Tilt table standing enhance the patient to stand vertical and ensure the safetiness for the patients, where the load for the therapist and risk of fall is reduced.

It provide many positive advantages the physiological effects can be Tilt at 60 degree onwards can gives Pt. the physiological effect and sensation of upright standing. — Respiratory: increased ventilation, gravity drains bronchioles. — Neurologic: Sensory receptors of the soles of the feet, Joint proprioceptors, muscle spindles, semicircular canals get stimulated. — Musculoskeletal: muscle tone increases in antigravity muscle, Increased bones density. — Increased urinary drainage — Increased circulation in upright position.

Therapeutic benefits Reintroduce patient to vertical position. Promote and maintain bone density in L/E. Facilitate early weight bearing. Prevent muscle contracture. Improve lower limb strength. Cardiovascular conditioning. Allow to become acclimated to an upright position without rapid changes in BP. Decrease spasticity. Postural improvement Enhance bowel and bladder function. Provide early weight bearing experiences for patients who are too weak to stand on their own. Decreases prolonged bed rest complications. Improve psychological outlook and also motivates Patients to participate in ambulation program.

In our study we did not perform a long term follow up assessment, hence future studies are required to evaluate long term effects. Further studies including a larger patient cohort will be needed to fully verify the results. The current results show that there is effective result in early standing for 30minutes in tilt table along with 15 minutes of conventional therapy than compared to standing manually for 15mins with 30 minutes of conventional therapy. In current study, we aimed to emphasize the importance of supportive standing to sustain standing balance which can be more reliable in preparing for gait training among subacute stage of stroke recovery in a daily rehabilitation setting.

VII. CONCLUSION

From this study it is concluded that early standing in tilt table along with conventional therapy can be an adjunctive therapy which is highly effective to maintain standing balance and to sustain full weight bearing to prepare for the gait training therefore application of tilt table along with conventional therapy should be considered when designing a rehabilitation program to prepare for the standing and gait training.

REFERENCE

- [1] Susan B O Sullivan & Thomas J Schmitz, Physical Rehabilitation (6th edition).
- [2] Ginny Paleg and Roslyn Livingstone Systematic review and clinical recommendations for dosage of supported home-based standing programs for adults with stroke, spinal cord injury and other neurological conditions
- [3] Rehani dhara rakesh1, mahesh hegde2, purusotham chippala3effect of supported standing on functional ability in patients with acute stroke: a single-blinded randomized controlled trial
- [4] Lee M, Wong M, Tang F. Clinical evaluation of new biofeedback standing balance training device. J Med Eng, February 27, 2013.
- [5] Wong A, Lee M. the development and clinical evaluation of a standing biofeedback trainer
- [6] Kim C-Y, Lee J-S, Kim H-D, Kim J-S. the effect of progressive task oriented training on a supplementary tilt table on lower extremity muscle strength and gait recovery in patients with hemiplegic stroke posture. 2015, j.gaitpost.2014.
- [7] Kim C-Y, Lee J-S, Kim H-D, Kim J, Lee I-H. Lower extremity muscle activation and function in progressive task-oriented training on the supplementary tilt table during stepping-like movements in patients with acute stroke hemiparesis 2015, J Electromyography Kinesiol
- [8] Edwards LC, Layne CS. Effect of dynamic weight bearing on neuromuscular activation after spinal cord injury. Am J Phys Med Rehabil.2007;86(6):499–506.
- [9] Pollack A, Baer G, Pomeroy V, Langhorne P. Physiotherapy treatment approaches for the recovery of postural control and lower limb function following stroke (Cochrane Review). In *The Cochrane Library*, Issue 1. John Wiley and Sons, 2004
- [10] Ashburn A. A review of current physiotherapy in the management of stroke. In Harrison M. Physiotherapy in stroke management. Churchill Livingstone, 1995: 3–23.
- [11] Ferrarello F, Deluca G, Pizzi A, Baldini C, Iori F, Marchionni N and Di Bari M. Passive standing as an adjunct rehabilitation intervention after stroke: a randomized controlled trial. Archives of Physiotherapy 2015; 5: 2. DOI 10.1186/s40945-015 0002-0.
- [12] Meredith Newman, Karen Barker. Systematic review on the effect of supported standing in upper motor neuron disorders. Clin Rehabil 2012; 26: 1059-1077.
- [13] Glickman LB. A systematic review of supported standing programs. J Pediatr Rehabil Med. 2010; 3:197-213.
- [14] Allison R and Dennett R. Pilot randomized controlled trial to assess the impact of additional supported standing practice on functional ability post stroke. Clin Rehabil 2007; 21: 614–619.
- [15] Peter Langhorne, Olivia Wu, Helen Rodgers, Ann Ashburn and Julie Bernhardt on behalf of the AVERT triallists' (2017) collaboration Efficacy and safety of very early mobilization within 24 h of stroke onset (AVERT): a randomized controlled trial.