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

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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 was 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 (<0.001) 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 unrelenting 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 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.

Group A:

- Conventional therapy for 30mins per day
- Manual standing with the support of two therapists for 15mins
- 45mins for 3weeks

Group B:

- Conventional therapy for 15mins
- Supported standing on tilt table for 30mins per day
- 45mins for 3weeks

Outcome measure: Functional balance grading scale

Aim of the study:

- To assess the effects of early standing on a tilt table
- To compare the improvement in standing balance
- To prepare for gait training

Methodology:

- Sample size: 30 patients
- Inclusion criteria: Sub-acute stroke patients
- Exclusion criteria: Severe hemiparesis, severe cognitive impairment, and contraindications for tilt table therapy

Statistical analysis:

- Paired t-test
- Unpaired t-test

Significance level: p < 0.05

Results:

- Statistically significant difference in standing balance between Pre and Post test
- Group B showed faster recovery compared to Group A

Conclusion:

- Early standing on a tilt table is an effective method to improve standing balance
- It helps in gait training and recovery of upper limb functionality
- Further research is needed to evaluate long-term effects and patient satisfaction.
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 week), 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. physicosomatic 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 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


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.

<table>
<thead>
<tr>
<th>Group- A</th>
<th>Mean Value</th>
<th>Standard Deviation</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>0.87</td>
<td>0.64</td>
<td>5.1717</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Post-test</td>
<td>1.93</td>
<td>0.59</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table: 2 Group- B 30 minutes of Tilt table standing with conventional therapy for 15minutes.
<table>
<thead>
<tr>
<th>Group- B</th>
<th>Mean Value</th>
<th>Standard Deviation</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>0.93</td>
<td>0.70</td>
<td>11.3089</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Post-test</td>
<td>2.67</td>
<td>0.49</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Post Test Values</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group- A</td>
<td>Group- B</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>Functional Balance Grading scale</td>
<td>1.9300</td>
<td>0.5900</td>
</tr>
<tr>
<td>t-test</td>
<td>3.7369</td>
<td>0.0008</td>
</tr>
</tbody>
</table>

Table: 3 Post Test Value of 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  Increase decreased circulation in upright position.

Therapeutic benefits Reinintroduce patient to vertical position. Promote and maintain bone density in L/E. Faciliteate 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

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[15] Peter Langhorne, Olivia Wu, Helen Rodgers, Ann Ashburn and Julie Bernhardt on behalf of the AVERT trialists’ (2017) collaboration Efficacy and safety of very early mobilization within 24 h of stroke onset (AVERT): a randomized controlled trial.