TO MEASURE THE POSTURAL SWAY IN STROKE INDIVIDUAL USING SWAY METER

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ABSTRACT

Background & Objectives: Stroke is caused by an interruption of the blood supply to the brain. Stroke survivors present with deficits in different systems, including sensory, musculoskeletal, perceptual, and cognitive, which decrease postural stability or postural instability. Lord’s sway meter is very sophisticated and complex like force platforms are available to measure postural sway as a component of postural control. But postural sway in these patients using sway meter is not addressed adequately. Therefore the objective of the study is to evaluate efficacy of sway meter for detecting postural sway in stroke patients.

Methods: The study included a total of 30 age matched subjects within 45-65 years, Screening of neuropathy patients was done using MMSE score. Postural sway was measured using Lord’s Sway meter during eyes open and eyes closed condition. A total of six trials were given with a rest interval of 5-10 seconds in between the trials but subjects were not allowed to move their feet from foot markings. Mean of the sways in anteroposterior and mediolateral directions were calculated.

Results: The mean sway for stroke patients during eyes open was .467cm and .009cm whereas during eyes closed was .687cm and .428cm in anteroposterior and mediolateral direction respectively which was highly significant. Pearson correlation coefficients were positively correlated. Discussion & Conclusion: The sway meter can be used as a reliable tool
for measuring postural sway in stroke patients. There was a significant correlation between eyes close and eyes open in both direction (anteroposterior & mediolateral direction)

**Key Words:** stroke, postural sway, sway meter

**Literature Survey:**

Stroke is defined as loss of neurological function caused by an interruption of the blood supply to the brain (Barclay-Goddard RE, Stevenson TJ & Poluha W et al, 2004). Stroke affects men and women equally and causes major social and economic burdens to society. The lifetime risk of stroke is estimated at one in four by age 80 years, and the lifetime risk of silent or covert stroke is likely closer to 100 (Tapuwa D, Musuka Stephen B. Wilton MD, Mouhieddin Donnan G, 2003). Ischemic stroke due to brain vessels occlusion and blockage includes 80% (Marx J, Hockberger R, Walls R & Rosen's, 2006; Tintinalli JE, Kelen GD & Stapczynski JS, 2004). Symptoms include focal or non-focal symptoms, negative or positive symptoms and sudden or gradual onset result in primary segregation of stroke. Symptoms depend upon the affected region of brain, which in turn is defined by the arterial anatomy involved. Common symptoms of stroke are aphasia, hemianopia, hemispatial neglect, hemiparesis and hemianopia. The majority (90%) of strokes are supratentorial and act upon stroke using the acronym FAST, for facial droop, arm drop, speech disturbance and time. Posterior circulation or infratentorial stroke has a multitude of additional symptoms, including diplopia, bulbar palsies, dysphagia, unilateral dysmetria and incoordination, as well as reduced levels of consciousness (Tapuwa D et al, 2009). Stroke survivors present with deficits in different systems, including sensory, musculoskeletal, perceptual, and cognitive, which decrease postural stability (Horak FB, 1991; Duncan PW, 1994; Wade D, Collen F, Robb G & Warlow C, 1992). Impaired postural stability probably has the greatest impact on gait and independency in activities of daily living (ADL). Indeed, to achieve improvement in walking capacity or ADL, improvement

Postural stability or balance is to maintain body’s centre of mass over the limited base of support and is achieved by synkinesis of the limbs and body trunk based on information from postural adjustment function. Anne Shumway-cook & Marjorie H. had showed that no one stands absolutely still during a stance postural control; infect there are small amounts of body sways, mostly in forward and backward directions. Hence small amounts of spontaneous postural sway characterize quiet stance. Postural control is achieved from complex interactions between various sensory inputs such as ocular, vestibular and proprioceptive and motor outputs. These sensory inputs integrate to inform the central nervous system regarding the body’s position relative to the environment and interact along with musculoskeletal and neuromuscular system to ensure postural stability. An irregularity in the postural sway is usual whenever there is a disturbance in any of sensory input and/or of the motor output is present (Anne Shumway-cook & Marjorie H. Wollacott). During a bipedal stance body sway could be measured using a sway meter, which was proposed by Lord et al in 1991 (Lord SR, Clark RD & Webster IW). Later in 1996 Lord et al measured the variables of sway as maximum balance range using sway meter and concluded its test-retest reliability. Therefore Sway meter used by Lord is a reliable tool in evaluating and analyzing posture without the use of expensive equipment such as force platform and motion laboratories. Balance control also involves a general neural process in central nervous system to resolve the sensory conflicts from different sensory modalities and also synthesizing information.
from disparate sensory inputs and combining efferent and afferent information for sensorimotor integration to avoid fall. Post stroke patients are known to exhibit excessive reliance on visual input for balance and walking and are unable to use somatosensory and vestibular input correctly (Nashner et al, 1982).

**Sources of Collection Of Data:**

Observational data manually collected from ward-based sources by a research assistant. · Rotary physiotherapy center rohtak Apex hospital rohtak

Sample Size: 30

Study Design: Correlation study

Inclusion Criteria: · Age - 45-65 · Gender - both male and female. · Independently mobile who are able to walk minimally for 20 m without a walking aid

Exclusion Criteria: ·

- Patients using medications which can affect the postural stability by affecting central or peripheral nervous system
- Patients enable to withhold themselves from alcohol on the day of assessment.
- Patients taking medications for drug or alcohol dependency.
- Any history of surgical procedures, fractures, severe osteoarthritis or any other.
- Musculoskeletal problems likely to affect lower-extremity function and posture.
- Patients with lower extremity amputation or prosthesis.
- History of any other neurological impairment (such as multiple sclerosis, cerebral palsy, poliomyelitis, etc.).
- Subjects with respiratory dysfunction and cardiac condition.
History of any symptoms like dizziness, vertigo leading to balance impairment.

Sampling Method: Simple random sampling

Independent Variable: sway meter 18

Dependent Variables: Balance

Statistical Analysis: Pearson correlation

Procedure: Patient will be selected according to inclusion or exclusion criteria. Subjects were explained about the aim and procedure of the study and inform consent was taken from each subject. All the participants who fulfill the inclusion criteria were included in the study. Sway measurement were measured using sway meter. To remove any visual inputs sway meter was placed behind the subject. Foot prints were drawn on a sheet of paper and subjects were asked to remove their footwear and stand on it. The foot imprints used was constant for all individuals. It was measured such that distance between the heel was 15 cm and angle of toe out was 250 between the second metatarsals. They were instructed to keep their hands by their sides and stand as still as possible. A total of six trials were done including, first three trials with eyes open and next three trails with eyes closed. The subject were given a 5 to 10 second rest period after each trail but they were not be allowed to move the feet away from the foot markings. Maximum duration recorded for all trials was 5-6 minutes. The sway measurement included anteroposterior (AP) and mediolateral (ML) displacements which were maximum peak-to-peak displacement in the respective direction. The sway was recorded and its value was manually determined as count of millimetre traversed by the pen. Comments from the subjects were taken at the end of the procedure regarding the application and limitations in using the sway meter.

Statistical analyses were performed using statistical package for social sciences (SPSS version 18.0 for Window) and pearson correlation was used to find out the relation between the outcome variables with statistical significance at p≤0.05. Means and SD were calculated for age, gender, MMSE and Analysis of sway measurements during eyes open and eyes closed in both directions.
**Result and Discussion:**

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<th>Correlation between anteroposterior and mediolateral sway</th>
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<td>EO(AP)cm</td>
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This study concerned with evaluation of influence of stroke on postural sway using sway meter. The chief finding of this study is that stroke patients have significantly larger sway compared to healthy individuals during quiet standing. Postural instability in stroke can be due to lack of appropriate proprioceptive feedback from lower extremity, slowness in peripheral sensory and motor pathways, reduced lower-extremity strength, central nervous system dysfunction and visual deficits (Massion J, 1992). There was a significant difference in sway measurements during eyes closed condition compared to eyes open among all patients. This shows an increase in sway during eyes closed condition. But sway in patients with stroke was more even during eyes open compared to healthy people standing with their eyes close. As there was an overall increase in the sway during eyes closed condition but These changes could be supported by stating that subjects were becoming more sensitive of their sway during eyes closed and making an effort to control it (Sivakumar Ramachandran & Roopa Yegnaswamy, 2011). In our study anteroposterior and mediolateral sway were measured and it was found that sway in anteroposterior direction was more as compared to the mediolateral direction during eyes open and eyes closed condition.
among all groups. Helene Corriveau et al., in 2000 found more of AP displacement than ML displacements. Lafond et al., in 2004 found the similar results in their study and stated that these measures could be due to activation of ankle strategy which involves slight intermittent contraction of ankle plantar flexors and dorsiflexors. Therefore during quite standing the sway is along the axis of rotation of the ankle joints. To maintain balance during quiet standing, both the size and position of the base of support are important. In our study foot prints were constantly same for all subjects during the sway measurements. Feet were at a distance of 15 cm and an angle of 250 toe out position which was considered to be most stable among the other foot positions given by R. Kirby et al., in their study. They tested for the various foot positions which would significantly affect the standing balance(Kirby RL, Prince NA, MacLeod DA;1987) No subjects in our study reported instability while standing on foot imprints. Rather they find it stable during standing. Comments were obtained from the subjects about discomfort regarding the application of sway meter. None of the subjects reported any discomfort with the application of sway meter on their waist.

LIMITATION OF THE STUDY:

The sample size was small. • The study was limited to age group (45-65 years) • Method of collection of sample was convenient rather than randomized. • Population was limited to a specific area which limits the demographic details

SCOPE FOR FUTURE RESEARCH:

Elderly population more than 65 years of age can also be studied. • Other variable such as Total sway, coordinated stability and voluntary sway can also be studied using sway meter in stroke patients. • Sway measurement with different head positions such as head turn to left and right or head straight and head back to check effect of vestibular system in postural
sway. In the lights of the results of the study we conclude that there is significantly larger postural sway in stroke patients using sway meter. Therefore Sway meter can be used as a reliable tool for determining the effect of balance on postural sway.

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