

Sit-And-Reach Test to Predict Mobility in Patients Recovering from Acute Stroke

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Abstract

Early accurate and reliable prediction of outcome in stroke victim is important. Regaining mobility is a primary goal of patient with stroke during rehabilitation. Sitting balance has been reported to correlate with mobility and functional outcomes after stroke. Sit and Reach Test would be a useful measure of sitting balance. Thus the study is an attempt to find the efficacy of Sit and Reach Test to predict mobility in patients recovering from acute stroke. **Methods:** A longitudinal study was carried in 30 patients with first ever stroke. The study consist of measuring performance of Sit and Reach Test, the day patient was able to sit unsupported for 1 minute post stroke and measuring mobility using Functional Independence Measure (transfer and locomotion activity items) at 3 months post stroke. **Results:** Pearson correlation coefficient yielded that Sit and Reach Test correlated with the Functional Independence Measure Mobility scores ($r=0.958$, $p=0.000$). Linear regression analysis showed that Sit and Reach Test could predict Functional Independence Measure Mobility scores and accounted for 13.55% of the variation. **Conclusion:** This study reveals that Sit and Reach test, age and time can predict mobility of patients recovering from acute stroke. Of these three, Sit and Reach test was found to be the most powerful predictor.

Keywords: Sitting balance, Sit and Reach Test, Mobility, Functional Independence Measure.

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INTRODUCTION

World Health Organization defines the clinical syndrome of stroke as rapidly developing clinical signs of focal (or global) disturbances of cerebral function with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than vascular origin.¹ Worldwide about 20 million people suffer from stroke each year, 5 million will die as a consequence and 15 million will survive, of those, who survive, 5 million will be disabled by their stroke. Therefore the global burden of stroke needs to be defined for developed and developing nations.² Community surveys from many regions of India show crude prevalence rates for stroke in the range of 90-222 per 100,000 persons. India will soon have to bear an enormous socioeconomic burden due to cost of rehabilitation of stroke.³ With the rising cost of stroke management early accurate and reliable prediction

of outcome in stroke victim is important to: Set realistic and attainable therapeutic goals, Facilitate proper discharge planning and Anticipate the need for home adjustments and community support for functional independence. Regaining mobility (i.e ability to independently and safely move oneself from one place to other.) is a primary goal of patient with stroke during rehabilitation since it is a key factor in becoming independent in daily functioning.⁴ Sitting is a prerequisite for most functional activities, such as dressing, transferring and eating in a seated position.^{5,6} It is the first upright posture to be restored after stroke.^{7,8} 93% of patient in the stroke population can achieve 1 min independent sitting balance within 6 days of stroke onset.⁸ Sitting balance has been reported to correlate with mobility and functional outcomes after stroke.^{5,6,9-17} Morgan¹⁸ showed a correlation ($r=49$) between ability to maintain 15 second static sitting within the first three days of stroke onset and gait outcomes at six weeks in post stroke patients. Nitz and Gage¹⁹ reported a significant relationship between independent sitting balance within the first ten days of stroke onset and independent ambulation on discharge. Feigin²⁰ showed a co relation ($r=0.675$) in patient with stroke between sitting equilibrium and gait at 6 months, correlation between sitting equilibrium and gait at 12 months were smaller and less meaningful. Despite its association with

mobility and functional outcomes, sitting balance has not been reported as a sole predictor for mobility and function in patient with stroke.^{5,6,9-17} Other reported predictors of functional outcome and mobility are age, stroke severity, motor impairment, urinary incontinence, consciousness at onset, co-morbidity, admission activity of daily living score, time between stroke onset and management.¹¹⁻¹⁷ Black²¹ reported that combination of age, initial admission Glasgow Coma Scale, rehabilitation admission strength, standing balance, and sitting balance accounted for 29% variance in the discharge Functional Independence Measure total score in Traumatic Brain Injury patients. Among these, sitting balance was second most powerful predictor of both selected element of discharge Functional Independence Measure motor and discharge Functional Independence Measure total score. Sitting balance predictive capacity was exceeded in power only by age. Tyson²² found that recovery of Activities of Daily Living at three months was independently predicted by balance disability, weakness, age and premorbid disability whereas recovery of mobility and disability was predicted by balance and age alone in stroke patients. Hama¹⁷ reported that 10 min sitting balance correlated with depressive mood and apathy and was predictive of post stroke Activities of Daily Living outcomes along with age. To use sitting balance as an outcome predictor, a precise measurement of sitting balance during the acute phase of stroke is essential. However, there is no widely accepted or standardized measurement of sitting balance. Measurement techniques include the assessment of trunk movement, perturbation and Center Of Pressure displacement measurements.^{5,6,11,18,20,23-25}

MATERIALS AND METHODS

A longitudinal hospital based study was carried out at 950 bedded tertiary care teaching hospital in 35 patients with first ever stroke, consisting of measuring performance of Sit and Reach Test, the day patient was able to sit unsupported for 1 minute (i.e 5 to 10 days) post stroke^{8,31} and measuring mobility using Functional Independence Measure (transfer and locomotion activity items) at 3 months post stroke⁴⁴⁻⁴⁶ for prospective analysis. Purposive sampling technique was used to select 35 patients with a diagnosis of first ever ischemic stroke. The Inclusion criteria were recent hemiparesis secondary to stroke, medically stable for rehabilitation (all vitals within normal limits), preserved cognitive ability and ability to sit unsupported for 1 min to allow the performance of Sit and Reach Test. The Exclusion criteria were confirmed or suspected subarchnoid or intercerebral hemorrhage which could receive different medical management, any preexisting neurological disorder such as parkinsons disease, which could lead to motor deficits

in addition to those resulting from recent stroke, vestibular or orthopedic disorders which could affect sitting balance or a stroke rehabilitation program and nonparetic upper limb with shoulder flexion less than 110° which could affect performance of Sit and Reach Test. Out of 35 patients 5 patients were excluded after there initial assessment as 2 of them were unavailable for follow up assessment and 2 of them had recurrent stroke and 1 met with intertrochantric fracture.

Demographic characteristics of patients (n = 30)

	Mean ± S D	Range
Age (years)	56.30 ± 8.03	48 - 80
Duration of stroke onset and initial assessment (days)	7.56 ± 1.56	5 - 10
Gender		
• Male	18	
• Female	12	
Side involved		
• Right	18	
• Left	12	

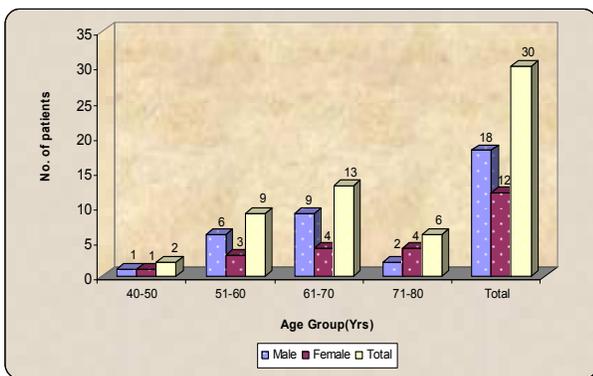
PROCEDURE

The synopsis of the study was submitted to the Institutional Ethical Committee (IEC) for approval. After obtaining the approval patients were included for the study based on the inclusion and exclusion criteria. The purpose of the study was explained to the patients and they were informed about their right to opt out of the study anytime during the course of the study without giving reasons for doing so. A signed informed consent (Vernacular language) was obtained from all the patients who willingly volunteered for the study. Initially the patients were managed in medical wards and in inpatient Neuro rehabilitation unit. After discharge from the medical wards the patients were treated in the outpatient department of Neuro rehabilitation unit and later were put on routine home exercise program for stroke. The treatment approach was designed to meet the individual needs of the patients, incorporating strategies aimed at increasing patient’s functional independence. All these patients were asked to follow up with the treating therapist regularly every 15 days till their discharge from the Neuro rehabilitation unit. The assessment tools used in our study included Sit and Reach Test (performance base), Functional Independence Measure – Transfer and Locomotion activity items (Interview in person). Both of these are well established and reliable measures.^{10,47} The study included an initial assessment and a follow up assessment. During initial assessment (t 0), the day patient was able to sit unsupported for 1 minute i.e 5 – 10 days post stroke, score on Sit and Reach Test was recorded and during follow up assessment (t1) i.e 3 months post stroke the patients were interviewed in person about their performance on Functional

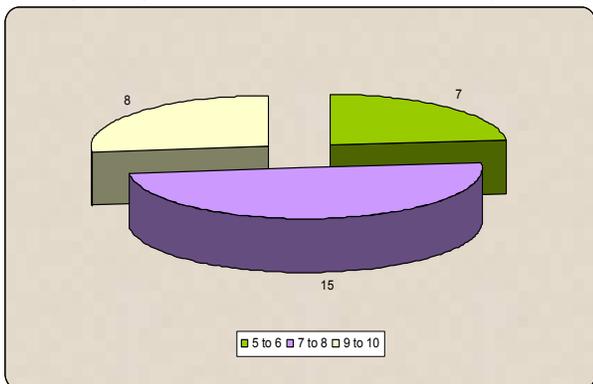
Independence Measure – Transfer and Locomotion activity items, which was recorded as mobility outcome. Before starting the study a pilot study was carried out to test the intrarater test - retest reliability of Sit and Reach Test in acute stroke patients with a sample size of 30 and the intrarater test - retest reliability was found to be good.

RESULTS

Data from all the patients were entered into a computer database and analyzed with SPSS statistical package (version 14.0). Pearson correlation test was used to find the correlation between Sit and Reach Test, Age and Time (days required for achieving 1 minute sitting balance) and Functional Independence Measure mobility score at 3 months post stroke respectively. Liner regression analysis was used to predict Functional Independence Measure mobility score at 3 months post stroke



Graph 1: Age wise and sex wise distribution of patients



Graph 2: Distribution of patients according to time (days required for achieving 1 minute sitting balance)

Table 1: Pearson’s correlation coefficient of age, duration, Sit and Reach Test with Functional Independence Measure (Mobility)

Parameters	Mean ± SD	Correlation ‘r’	p-value
FIM(Mobility)	24.66 ± 11.68	-	-
SRT	12.43 ± 4.04	0.958	0.000
Age	56.30 ± 8.03	-0.742	0.000
Duration	7.56 ± 1.59	-0.556	0.001

S, p<0.05

Table 2: Linear Regression equation predicting Functional Independence Measure mobility at 3 months post stroke

Equations	SEE	CV	SD	R	P-value
Three Month Post stroke mobility= - 9.70 + 2.76* SRT	0.60	13.55%	3.34	0.958	0.000
Three Month Post stroke mobility= 93.82– 1.07* Age	1.42	31.76%	7.83	0.742	0.000
Three Month Post stroke mobility= 55.53 – 4.07* Time	1.77	39.27%	9.71	0.556	0.001

S,p<0.05

The linear regression analysis showed that Sit and Reach Test, age and time (days required for achieving 1 minute sitting balance) could predict Functional Independence Measure Mobility scores at 3 months post stroke. Sit and Reach Test performance accounted for 13.55% of the variation, age accounted for 31.76% of the variation and time accounted for 39.27% of the variation of Functional Independence Measure Mobility scores at 3 months post stroke. The slandered error of the estimate for predictive model of Sit and Reach Test performance , age and time is 0.60, 1.42 and 1.77 respectively, which is small.

DISCUSSION

The results of the present study indicate that Sit and Reach test can predict mobility of patients recovering from acute stroke thereby supporting the hypothesis. The result of our study are in agreement with those of Martin C S et al⁹ who reported that 35% of variability in change in discharge mobility post stroke could be explained by admission score for walking, sitting balance, age and time post stroke. Ingrid G L et al¹¹ who studied outcome of mobility one year after stroke and inferred that mobility one year after stroke can be predicted validly by including functional status, sitting balance, time between stroke onset and measurement (i.e time between stroke onset and admission to rehabilitation), age. Port et al¹² who concluded that mobility at one year post stroke can be predicted by functional status, sitting balance, time between stroke onset and measurement and age. However it is difficult to compare our results with the predictive power of these studies, because of the difference in sample size, demographic characteristic of patient, inclusion and exclusion criteria outcome measures and measurement intervals. Nevertheless it is possible to compare our results with those of Tsang Y L et al¹⁰ who found that Sit and Reach test can predict mobility of patients recovering from acute stroke at discharge and the distance reached on the Sit and Reach test accounted for 32.7% of the variance in the Functional Independence

Measure Mobility score at discharge. Where as in our study distance reached on the Sit and Reach Test accounted for 13.55% of the variance in the Functional Independence Measure Mobility score at 3 months post stroke. This can be explained by the difference in sample size, demographic characteristics, measurement timing and interval in both the studies. Our study included an initial assessment and a follow-up assessment. The initial assessment included the measurement of sitting balance using Sit and Reach Test. Literature reports that stroke population can achieve one minute independent sitting balance within 11 days of stroke onset,⁸ so to overcome the variability in the day of assessment of Sit and Reach Test, we decided to assess Sit and Reach Test the day patient was able to sit unsupported for one minute. The follow up assessment included of measuring mobility using Functional Independence Measure mobility score at 3 months post stroke. The three months post stroke was chosen as a cutoff point for follow-up assessment as it is reported that maximum recovery post stroke occurs within first 3 months of stroke onset.⁴⁴⁻⁴⁶ So to overcome the variability in the follow-up assessment three months post stroke was set as a cut off point for follow-up assessment. The results that Sit and Reach test (dynamic sitting balance) can predict mobility of patients recovering from acute stroke is suggesting that, balance control is highly specific to control of mobility. This can be explained by the fact that, to reach in sitting, involves not only movement of the arm but also the movement of the trunk or upper body at the hips to extend the reach together with active use of the leg to aid in balancing by making an 'active' base of support in much the same way as in standing.⁴⁸

CONCLUSION

In the present study we found that Sit and Reach test can predict mobility of patients recovering from acute stroke. On further analysis we found that age as well as time (days required for achieving 1 minute sitting balance), can also predict mobility of patients recovering from acute stroke. Of these three, Sit and Reach test was found to be the most powerful predictor, Age was found to be the second most powerful predictor and Time (days required for achieving 1 minute sitting balance) was found to be the weakest predictor for mobility of post stroke hemiplegic patients.

Clinical implications: By determining so we have provided more evidences for clinicians in choosing variables for predicting mobility outcomes in patients with stroke. With this information more appropriate treatment interventions can be tailored to meet different needs of the stroke patients. Further from research perspective the results, predicts outcome based on objective testing. These predicted outcomes can be

compared with actual outcome of patients treated with a new regime to evaluate the efficacy of a new treatment protocol.

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