

# Trunk performance correlates with functional outcome in stroke patients – a cross sectional study

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## Abstract

Background: Rehabilitation of the stroke subjects demands much from the therapist, since it impairs not only limbs but also trunk. A good trunk control may enhance the functional independence. Objective:-To assess the trunk performance in subjects with stroke using TCT (Trunk Control Test) and PASS (Postural Assessment Scale for Stroke patients) and correlating it with their functional performance using FIM (Functional Independence Measure). Design:-Cross sectional study Setting:-Father Muller Medical College Hospital Subjects:-26 subjects clinically diagnosed with unihemispheric stroke Main Measures:-Trunk performance measured with TCT and PASS and functional performance measured with FIM. Results:-Mean age of the patients was 62.9 years of which 9 were females and 17 males .16 of them were in the 2<sup>nd</sup> stage of recovery of Chedoke , 9 and 14 were in the 3<sup>rd</sup> and 4<sup>th</sup> stage of recovery respectively. TCT had a significant correlation with FIM ( $r=0.5$ ) and PASS had a high correlation of ( $r=0.81$ ) with FIM.TCT and PASS also exhibited a moderate correlation of  $r=0.42$ . Conclusion:-Trunk performance is correlated with the functional outcome of stroke patients which is significant both clinically and statistically.

**Keywords:-**Trunk performance, trunk control, functional outcome, stroke.

## Introduction

CVA (Cerebrovascular accident) may be defined as the sudden onset of neurological signs and symptoms resulting from disturbance of blood supply to the brain<sup>1</sup>. The individual affected with CVA may exhibit deficits in fundamental motor skills like bed mobility, sit to stand transitions, ability to maintain balance in sitting or standing or standing posture which are indispensable or achieving autonomy in ADL(activity of daily living).

These daily activities require maximal and efficient trunk control. Studies regarding upper and lower limb are innumerable but the trunk which is the central key point of the body is an area of neglect<sup>2</sup>. Trunk provides a proximal stability for required distal limb movements which are related to functional activity<sup>3</sup>. Thus the trunk is responsible for isolated movements in

the limbs which make trunk performance a very important predictor for ADL after stroke.

The performance of the trunk and ADL has been evaluated in many ways. Outcome measures being one of the most sensitive tools which identify accurate changes in patients performance inability them to identify the prognostic status of an individual with a disability<sup>4</sup>. TCT and PASS are commonly used for trunk recovery in which TCT captures the basic motor skills that predict recovery of complex trunk control. Along with these complex skills, postural performance is used to assess the ability to maintain and ensure equilibrium in changing positions. Both these scales showed high internal consistency and high inter rater reliability<sup>5,6</sup>.

Functional status is measured using FIM which is a widely accepted measure in stroke rehabilitation research and estimates the recovery of functional milestones post stroke and showed a high internal consistency<sup>7</sup>. Thus trunk control in rehabilitation forms a pre-requisite for balance, transfers, gait and is related to an independent functional living. Various studies regarding the correlation between trunk performance and functional outcomes have been done either with

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TCT or PASS with FIM on an average of 6 months.

This study focused at measuring trunk performance using TCT which evaluates the trunk at the disability level and PASS which measures the postural performance and correlating it with functional status using FIM highlighting the importance of trunk control and shifting attention from the upper and lower extremity rehabilitation to focus on trunk control rehabilitation in the plan of care of an individual affected with stroke. The findings of this study enabled us to understand the importance of trunk control in functional recovery following stroke.

### Materials and Methods

The study was done with 26 subjects which included patients admitted in FMMCH(Father Muller Medical College and Hospital)and community dwelling stroke between the months of January 2008 to May 2008. 26 subjects diagnosed clinically as unihemispheric stroke, between the age group of 50-70 years in the 2-4 Chedoke stages of motor recovery with a history of single stroke and a stable cognitive status were included in this study. Ethical clearance was obtained from the institutional review board . Subjects who were hemodynamically unstable, diabetics with visual defects or any musculoskeletal deformities were excluded. A written informed consent was obtained before the commencement of the study from the subjects. Demographic data including name, age, gender, side of weakness was documented. The cognitive status of the subject was evaluated using the Mini Mental Status Examination. The stage of recovery was assessed using postural stages of recovery. The trunk performance was measured using TCT and PASS. No verbal encouragement or feedback was provided throughout the procedure but the subjects were assured regarding the prevention of fall.



**Figure 1. Turning from supine to affected side lateral**

Firstly simple bed mobility tasks were evaluated using the Trunk Control Test. The test consists of four items which are assessed on a 3 point ordinal scale. This instrument assessed the gross motor functions. The subject was asked to roll to their weak side and the ability to complete this task was documented. The scoring was based on whether the subject was unable to do the task independently or non-muscular help in the form of pulling on the bed clothing, side rails of the bed. The other activities included rolling to the strong side, sitting up from lying position, balancing in sitting position with feet off the ground for 30 seconds. The total score ranges from 0 to 100.



**Figure 2. Turning from supine to unaffected side lateral**

Secondly the postural control was assessed using the Postural Assessment for Stroke Patients. This instrument was divided into two categories in which the first category was about the maintenance of posture followed by change in posture. In the category of maintenance of posture the subject was asked to sit on bed with feet touching the floor and their ability to sit with or without support was recorded. Standing with or without support and standing followed this on paretic and non-paretic limb. The second category included similar items of TCT i.e. from supine to weak and strong side alternatively and supine to sitting on the edge of the bed. These components were not rechecked as they were computed earlier. The additional items assessed were sitting to supine, sitting to stand transitions, standing and picking up a pencil from the floor. These were evaluated depending upon the ability

to perform the activity on their own, or with little or no help required by the subjects. According to the individual's capacity of performing the task a score of 0 which indicated that the activity could not be performed to a maximum score of 3 which indicates that the activity could be performed without help.



Figure 3: Standing unsupported



Figure 4: Supine to Sit



Figure 5. Sitting to standing transition

Lastly their independence in ADL was recorded using FIM. FIM evaluates the level of assistance an individual needs to grade the functional status from total assistance to complete independence. It measures what the individual does, not what the person could do under certain circumstances. The instrument contains 6 categories. The first section is about self-care activities. Here the subject was checked for the ability to eat, bath, dress the upper and lower body and toileting activities. The next section includes sphincter control in which they are questioned about their ability to control their bowel and bladder followed by a section of transfer, which comprises of whether they were able to transfer to bed, wheelchair and toilet. In the locomotion category their ability to walk or use the wheelchair was assessed and the last section, which contained the category of communication and social cognition, was evaluated. The entire assessment was taken on a single occasion.

#### Scales used

##### Trunk control test

The trunk control test evaluates motor performance of the trunk. The test consists of four items, which are assessed on a 3-point ordinal scale. The items are rolling from supine to the weak side, rolling from supine to strong side, sitting up from lying down and maintaining balance in the sitting position on the side of the bed. The total score ranges from minimum 0 to maximum 100 points. A higher score indicating a better performance.

##### Postural assessment scale for stroke patients

This involves being mounted on the edge of a 50 cm high examination table with feet touching the floor, standing with support and lastly standing on the nonparetic leg with no other constraints. Other tests are rolling from supine to affected side lateral, supine to non affected side lateral, supine to sitting up on the edge of the table, sitting on the edge of the table to supine, sitting to standing up, standing up to sitting down and standing and picking a pencil from the floor. Total score ranges from 0 which indicates activity cannot be performed to a maximum score of 3 which evaluates that the activity can be performed without help.

### Functional independence measure

Functional Independence Measure uses levels of assistance an individual needs to grade functional status from total independence to total assistance. The instrument lists 6 self care activities like feeding, grooming, bathing, upper body dressing, lower body dressing and toileting. The functional mobility is tested through 3 items on transfer activities. Under locomotion, walking using a wheelchair and stairs is assessed. 2 and 3 items evaluate communication and social cognition respectively.

### Data analysis

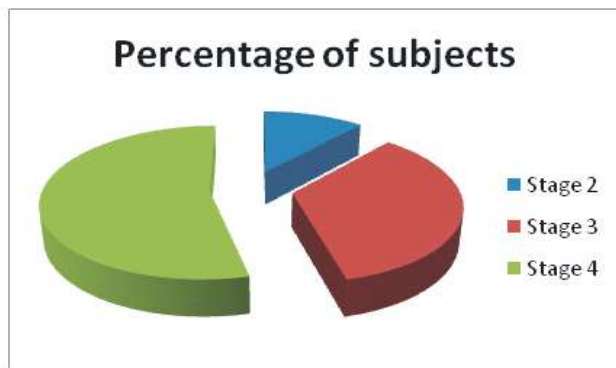
Collected data was expressed in terms of mean and standard deviation and has been analyzed using SPSS software. Karl Pearson's Correlation Coefficient was used to find the correlation between TCT, PASS and FIM.

### Results

Side of Stroke	No: of subjects	Percentage
Left	10	38.5
Right	16	61.5
Total	26	100

### Distribution of subjects according to side of stroke

The table shows that 16 subjects were right sided stroke and 10 subjects were left sided stroke among the 26 subjects included in the study.



### Distribution of subjects according to Chedoke stage of recovery

Model	Un standardized Coefficients		Standardized Coefficients	T	p
	B	Std. Error	Beta		
1 (Constant)	30.064	21.365	0.597	1.407	0.172
TCT	0.834	0.229		3.642	0.001

Karl Pearson correlation coefficient  $r = 0.597$ ,  $r^2 = 0.356$   
a. Dependant Variable: FIM

### Correlation between TCT and FIM

Model	Un standardized Coefficients		Standardized Coefficients	t	p
	B	Std. Error	Beta		
1 Constant	40.653	9.942	0.813	4.089	0
PASS	2.576	0.377		6.833	0

Karl Pearson correlation coefficient  $r = 0.813$ ,  $r^2 = 0.661$   
a. Dependant Variable: FIM

### Correlation between PASS and FIM

The table shows that there is a high correlation of PASS with FIM where  $r=0.813$ . Trunk control has 66.1% affect on the functional outcome.

### Discussion

This study showed that trunk impairment directly affects the functional improvement in stroke patients; a better trunk control had a better functional status. Since the trunk muscles have bilateral innervation, in unihemispheric stroke the impairment of the trunk may be less when compared to the limb weakness. Some of the authors pointed out that the weakness of trunk musculature could be attributed to the insufficient recruitment of high threshold motor units, disuse, immobilization, balance, stability and functional disability.<sup>8</sup> Several outcome measures have been validated to measure the trunk performance.

Clinical scales have the advantage of being applied to all patients. A study done by Franchignoni<sup>7</sup> stated that TCT had a significant correlation with FIM and it is also supported by the study done by Duarte and co-workers<sup>9</sup>. Their study includes acute stage of stroke and the trunk performance was measured on admission and discharge while as in our study it was a single

occasion measurement. Trunk performance of patients soon after stroke has found to be closely associated with long-term functional importance. Both measures of TCT and PASS are similar in context but PASS uses a 4 point ordinal scale whereas TCT uses a 3 Point ordinal scale. The PASS shows a less pronounced ceiling effect than TCT.<sup>5,10</sup> PASS was well supported at early and later stages after stroke because the PASS contains required items which are easy and quick to use and is of practical value.

Compared to other scales, PASS was used because it includes fundamental activities to perform ADL tasks. The inter and intrarater reliability of PASS have been shown to be very high.<sup>5,10</sup> A good correlation is observed between PASS and FIM. FIM evaluates the physical and neuropsychological aspects of functional independence in stroke and has become the predominant tool for measuring multiple disabilities.

The predictors of post stroke function are age, previous stroke, bowel and bladder incontinence, visuospatial deficits, motor status, balance, severity of stroke, cognition, size and site of lesion. In this study the age, gender, side of lesion and stage of recovery has been taken into account & this study shows no correlation with the age and scales. FIM doesn't evaluate bed mobility in severely impaired stroke patients.

Unlike other studies this study did not find any correlation between the gender and the scales probably due to unequal distribution of males and females. Spinazzola and colleagues<sup>11</sup> demonstrated that patients with right hemisphere lesions suffer from postural deficits when compared to left hemisphere lesions. But in this study no correlation is found was found between the side of lesion and the scales. Patients with stroke duration of 2-5 years have scored maximum on TCT which is similar to the patients with a duration ranging from several days to several months. The possible reason for this could be the location and severity of lesion.

The positive correlation between the Trunk performance and FIM shown in this study includes importance of trunk muscle retraining in effective stroke rehabilitation. Further interventional studies are needed to find the

efficacy of trunk muscle retraining in functional recovery following stroke.

## Conclusion

This study showed that trunk control has a good correlation with functional independence. PASS is an effective tool measure trunk control when compared to TCT and it is also easy to administer.

## References

1. Bertoti DB. Functional rehabilitation through life span. 1<sup>st</sup> edition. Philadelphia. F.A Davis, 2004.
2. Verheyden G, Nieuwboer A Van de Winckle A and DeWeerd W. Clinical tools measure trunk performance after stroke: A systematic review of the Literature Clinical rehabilitation, 2007; 21:387-394.
3. Verheyden G, Nieuwboer A, Wit LD, Feys H , Schuback B. Trunk performance after stroke an eye catching predictor of functional outcome. J Neurol Neurosurg Psychiatry, 2007; 78: 694-698.
4. Hobart J.C. , Lamping DL, Freeman JA ,Langdon DW,D.L. Mclellan DL, .Greenwood RJ, Thompson AJ. Evidence -based measurement. Neurology, 2001; 57:639-644.
5. Charles B, Perrennou, DA, Villy J, Rouseaux, M, Pelissier JY. Validation of a Standardized Assessment of Postural Control in Stoke Patients: The Postural Assessment Scale for Stroke Patients (PASS). Stroke, 1999; 30: 1862-1868.
6. Fujiwara T, Liu M, Tsuji T, Sonoda S, Mizuno K, Akaboshi K, Hase K, Masakado Y, Chino N . Development of a New Measure to Assess Trunk Impairment after Stroke. Its Psychometric Properties. Am J Phys Med Rehabil, 2004; 83:681-688.
7. Franchignoni F.P, Tesio, Ricupero, Martino. Trunk Control Test as an early predictor of Stroke Rehabilitation Outcome. Stroke, 1997; 28(7): 1382-1385.
8. M Karatas, N Cetin, M Bayramoglu, A Dilek. Trunk muscle strength in relation to balance and functional disability in unihemispheric stroke patient's Am J Phys Med Rehabil, 2004; 83:81-87.
9. Duarte E; Macro E; Muniesa JM ; Belmonte R ;Diaz P; Tejero M ; Escalad F. Trunk control test as a functional predictor in stroke patient. Journal of rehabilitation medicine, 2002; 34:267-272.
10. Wang CH, Hsueh IP, Sheu CF, Hsieh CL. Discriminative, predictive, And evaluative properties of a trunk control measure in patients with stroke. Phys Ther, 2005; 85:887- 894.
11. Spinazzola L, Cubelli R, Della Sala S. Impairments of trunk movements following left or right hemisphere lesions: dissociation between apraxic errors and postural instability. Brain, 2003; 126: 2656-2666.