

A Cross Sectional Study on Trunk Impairment, Static and Dynamic Balance among the Patients with Chronic Stroke at Tertiary Care Hospital

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Abstract: ***Background:** Stroke is one of the leading causes of death and disability in India and also one of the leading causes of functional impairment. Stroke affects the Trunk Performance, Static and Dynamic Balance and also the level of independence in Activities of Daily Living. **Objectives:** To find a correlation between Trunk Impairment, Static and Dynamic Balance and its effect on Activities of Daily Living. **Method:** This study included 72 patients of chronic stroke according to inclusion and exclusion criteria. Then Trunk performance was evaluated by Trunk Impairment Scale (TIS), Static Balance, Dynamic Balance and Activities of Daily Living were evaluated by Frailty and Injuries Cooperative Studies of Intervention Techniques-4 (FICSIT-4), Timed Up and Go test (TUG) and Barthel Index (BI) respectively. Statistical analysis was done by using SPSS software (version 20). Spearman's Rank correlation test was applied. **Result:** Spearman's Rank correlation showed highly significant correlation between TIS, FICSIT-4, TUG and BI scores as their p-values were <0.01. **Conclusion:** The study reveals that the Trunk Impairment, Static and Dynamic Balance as well as Activities of Daily Livings are strongly correlated with each other.*

Keywords: Trunk impairment, Static balance, Dynamic balance, Activities of daily living, Chronic stroke

1. Introduction

Stroke or Cerebrovascular Accident (CVA) is the sudden loss of neurological function caused by an interruption in the blood flow to the brain.^[1] A stroke is a brain attack of vascular origin, typically characterized by a sensory-motor impairment of the contralesional side of the body.

Stroke is one of the leading causes of death and disability in India. The age standardized stroke prevalence in this study was 4.87/100 persons.^[2]

Stroke is also a leading cause of functional impairment, with 20% of survivors requiring institutional care after 3 months and 15-30% are permanently disabled.^[3]

Motor deficits are characterized by either hemiplegia or hemiparesis and affected trunk control with affected shoulder girdle and lower limb strength. The trunk being the central key point of the body, proximal trunk control is pre requisite for distal limb movement control, balance and functional mobility. Trunk stability is the ability of the trunk muscles to allow the body to remain upright, adjust weight shift and perform selective movement of the trunk that maintains the center of mass within the base of support during static and dynamic postural adjustments.^[4]

The trunk plays an important role in functional independence as well as basic motor control in activity of daily living. However, the recovery or rehabilitation of the trunk is a more neglected area in stroke rehabilitation research or intervention compared to limb rehabilitation.

Postural disturbance in patients with hemiplegia are common and limit the recovery of gait and functional independence.^[5] In general, postural control can be

classified according to static and dynamic postural control.^[6] Therefore, evaluation of postural control should be considered for both aspects static and dynamic postural control.^[7] Both static and dynamic balance are crucial to maintaining postural stability.^[8] Loss of Static and Dynamic stability results in reduction of functional abilities. Balance problems have been implicated in the poor recovery of Activities of Daily Living and mobility and increased risk of falls.^[9]

2. Significance of the Study

Balance is found to be a highly challenging area after stroke and it is required for functional independence. It is estimated that nearly 60% of the patients with stroke are significantly disabled following the occurrence of stroke. Trunk performance and balance are the major determinants of functional independence. Static and Dynamic balance need to be differentiated and their individual association with trunk performance should be studied as both impairments call for different line of treatment. Hence it is important to determine the relationship between Trunk Impairments, Static & Dynamic Balance and its effect on Activities of Daily Living in patients with Chronic Stroke.

3. Methodology

Study design : Cross-sectional study

Study population : Patients with Chronic Stroke (duration more than 6 months)

Study setting : Physiotherapy OPD, New Civil Hospital, Surat

Study duration : 5 months after Ethical Approval

Sample size : Sample size was calculated by using OpenEpi, Version 3 software at 95% confidence level with 4.87% prevalence. Calculated sample size was 72.

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Sampling method : Purposive Sampling

Inclusion criteria

- Diagnosis of stroke
- Duration of stroke ≥ 6 months
- Patients who can easily understand and follow verbal commands (Mini Mental Score Examination ≥ 24)
- Patients who are able to stand independently and walk with or without assistive device
- Brunnstrom recovery stage 3 or more
- Modified Ashworth Scale not more than 1+

Exclusion criteria

- Any orthopedic condition of lower limb
- Neurological condition other than stroke
- Unstable vitals
- Patient not willing to be a part of the study

Outcome measures:

To find a correlation between Trunk Impairment, Static and Dynamic Balance and its effect on Activities of Daily Living these scales were used respectively : Trunk Impairment Scale (TIS), Frailty and Injuries Cooperatives studies of Intervention Technique – 4 (FICSIT-4), Timed Up & Go test (TUG), Barthel Index (BI).

TIS assess static and dynamic sitting balance and trunk coordination. TIS consist of 3 subscales with a total score of 23, including Static sitting balance (TIS-S), Dynamic sitting balance (TIS-D) and Coordination (TIS-C). TIS-S consists of 3 questions with a total score of 7. TIS-D consists of 10 questions with a total score of 10.^[10] TIS-C consists of 4 questions with a total score of 6. The TIS has a high reliability ($r=0.98$) and validity ($r=0.99$).^[11]

FICSIT-4 is used to assess static balance. FICSIT used tests requiring subjects to maintain three different stance tests without assistive devices. Total score of FICSIT is 28. FICSIT-4 has good to excellent reliability and good construct validity.^[12]

TUG test is used to assess dynamic balance. The “Timed Up and Go” test measures, in seconds, the time taken by an individual to stand up from a standard arm chair, walk a distance of 3 meters, turn, walk back to the chair and sit down. The subject wears their regular footwear and uses their customary walking aid (none, cane, walker). No physical assistance is given. If a patient took 14 seconds or longer he or she was classified as high-risk for falling.^[13] TUG has excellent inter-rater reliability and test-retest reliability.^[14]

The Barthel Index (BI) has been selected as being the best of the Activities of Daily Living (ADL) scales. The Barthel Index measures the individual’s performance on 10 ADL functions, such as feeding, transfer, personal care, toilet use, bathing, walking, climbing stairs, dressing and bowel & bladder control. The items are summed to give a score ranging from 0 to 100. A total BI score of 0-20 suggests total dependence, 21-60 severe dependence, 61-90 moderate dependence and 91-99 slight dependence.^[15] BI is a useful

instrument with high inter-rater reliability, internal consistency, convergent and predictive validity.^[16]

4. Procedure

After being issued clearance by Human Research Ethics Committee of Government Medical College Surat, the present study is a “Cross Sectional Study On Trunk Impairment, Static and Dynamic Balance among the Patients with Chronic Stroke” was initiated. Participants who met inclusion criteria were included in this study. First explain the patients about purpose & importance of the study and then had taken written consent from them before entering in the study. After then all test were performed in sequence : TIS, FICSIT-4, TUG and BI.

Statistical Analysis

As every variable was not following normal distribution, non-parametric statistics test (Spearman’s Rank correlation) was used. SPSS version 20 was used.

5. Result

Correlation between TIS, FICSIT, TUG and BI

		TIS-T
FICSIT	R	0.3948**
	p-value	0.0006
TUG	R	-0.5874**
	p-value	0.0000
BI	R	0.5323**
	p-value	0.0000

6. Discussion

The aim of the study was to find the Relationship between Trunk Impairment, Static and Dynamic Balance and its Effects on Activities of Daily Living (ADL) in Patients with Chronic Stroke.

Mean age of subjects was 47.89 ± 15.9 years. Table shows the relation of Trunk Impairment with Static Balance, Dynamic Balance, and level of independence in ADL. For this purpose TIS was correlated with FICSIT, TUG and BI. The TIS-T was strongly positively correlated with FICSIT and BI, with correlation coefficient 0.3948 with FICSIT and 0.5323 with BI. It shows that Static Balance and level of independence in ADL in Stroke patients were significantly affected by Trunk Impairment. TIS-T was negatively correlated TUG with correlation coefficient -0.5874, which shows relation between Trunk Impairment and Dynamic Balance. The negative correlation interpreted that as the score of Trunk Impairment increases, the time to be taken to complete the task of Dynamic Balance in TUG was reduced, which conclude that the patient who had good trunk control shows good Dynamic Balance.

Findings of present study: TIS score was 13.45 ± 2.8 suggest that almost all person have good Trunk Performance after long duration of stroke. FICSIT score was 16.44 ± 4.38 . Score of TUG was 20.33 ± 7.51 suggest that patients have chances of fall. Score of BI was 80.62 ± 13.47 suggest that patients have moderate

independence so they can do most of the activities by themselves with minimal help.

G. Jijimol et al conducted a study on Correlation of Trunk Impairment with Balance in Patients with Chronic Stroke. They concluded that Trunk performance and Balance in the chronic patients were positively correlated with each other.^[17] Wim saeys et al conducted randomized controlled trial of truncal exercises early after stroke to improve balance and mobility. They concluded that in addition to the conventional therapy, truncal exercises have a beneficial effect on truncal function, standing balance and mobility after stroke.^[5]

7. Limitations

- Samples were selected purposively in this study.
- Only patients with Chronic Stroke were taken into the study.
- Coordination has effect on balance, but it was not consider in the study.

8. Clinical Implication

This study will help in detail assessment of specific component of the Balance. Thus, help in goal setting and management of the Stroke patients.

9. Conclusion

The results of the study satisfy the alternative hypothesis that there is a Relationship between Trunk Impairment, Static and Dynamic Balance and Activities of Daily Living among the Patients with Chronic Stroke.

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