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Short Communication

Sit to Stand is The Precedent of Balance and Functional Mobility in Stroke

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A B S T R A C T

For functional mobility sit to stand task is a prerequisite index. This study intended to investigate the correlation of sit to stand with balance and functional mobility of post stroke patients. Total 50 participants with informed consent having stroke either infarction or hemorrhagic, age bracket 30-70years, capable to walk under supervision, minimum 3 months had elapsed since the stroke, and able to communicate (score>24on Mini-Mental State Examination) were enrolled. The demographics were recorded and standardized assessment tool included, Berg Balance Scale (BBS), Time Up and Go Test (TUG), Five times Sit to stand test (FSTST), and Mini BES Test. The measurements were obtained after performance of FSTS test. The mean age of the patients was (54.5±9.83), with 40 (80%) male and 10(20%) female patients. Pearson product-moment correlations were computed among the different measures. Bivariate correlation showed strong association of these measures (FSTS, BBS, TUG &Mini BES Test) as the p -value was significant (<0.05). FSTS was correlated with TUG, BBS, and Mini BES Test, (r=.774, r= -.758, r= - .721). The findings of this study highlight that sit to stand is a notable determinant of functional mobility in stroke population.

Introduction

Stroke is one of the high incidence diseases in modern society and is a representative one that causes damage in the central nervous system. It induces motor and sensory disorders accompanied by various symptoms, in which complex functional limitations occur.[1] Lower extremities weakness hampers walking ability which is a notable requirement for the performance of ADLs in stroke population. After stroke patients show limitations in transition from sit to stand and adopt compensatory strategies. Due to less weight bearing on paretic lower limb during STS transfer, stroke individual may have asymmetric patterns.[2] The ability to do STS movement is strongly influenced by the height of the chair seat, use of armrests, physical health and foot position.[3] Biomechanically STS task demands more range of motion and joint torque force with increased lateral deviation of COM and high ground reaction forces. This type of training is a self-directed treatment and minimizes risk of falls.[4] STS is the most frequent practice in routine and needs control of knee extensors, ankle joint dorsiflexors and plantar flexor muscles.[5]STS activity is based on four variant phases including both kinetic and kinematic events, like flexion momentum phase which starts with buttock lifting and seat clearance. Momentum transfer

phase comprises of lifting of buttock with maximal ankle dorsiflexion. Third phase is extension in which hips and trunk are extended with dorsiflexion at ankle joint. Stabilization is the last phase, when all motion associated with STS is completed and patient acquires stability because 3 points based is changed to 2 point base. In STS activity hip extensors work eccentrically in controlled forward flexion of the trunk. As patient goes in standing phase hip and knee work concentrically and CoG moves forward, which helps the patient in lifting off buttocks and elevating trunk. After achieving standing CoP moves forward and plantar flexors activate. At the completion of task again stand to sit requires the eccentric work of hip and knee extensors for controlled descending of the trunk.[6] These all movements need considerable energy of patient and biomechanics. In this way balance can be achieved effectively and fall risk can be minimized.[7]This study intends to determine correlation of sit to stand with balance and functional mobility of stroke patients.

Methodology

The study was analytical correlational survey conducted in the Riphah Rehab and Research Centre Pakistan Railway Hospital from July 2015 -January 2016. Sample size was based on availability of participants in specific time frame. Initially 50 patients were enrolled through inclusion criteria by purposive non-probability sampling technique. Inclusion criteria was either type of stroke, post minimum 03 months, age bracket 30-70years with disability level 2-4 on Modified Rankin scale, the ability to walk with supervision and able to communicate. All participants were instructed to rise up from a 43-cm-high chair 5 times as quickly as possible. An armless, height-adjustable chair was used in this study to ensure subjects' hip was in 90 degrees flexion when seated. The standardized instructions were given. The time started when the subject's back left the back rest and ended when their back touched the back rest on the 5th repetition. The time was recorded by using a digital stop watch. The total duration was recorded in seconds. Afterwards balance assessment was made through BBS, and Mini BESTest, scores of all tools were recorded. SPSS 20 was used to analyze the data. The mean age of the patients was 54.5±9.83, with 40 (80%) male and 10(20%) female patients. In this study 37% patients had MCA and 13% had ACA. When functional components of sit to stand were analyzed on SPSS it was observed that majority of patients' opted incorrect biomechanics during sit to stand as shown in table I below. Pearson product-moment correlation was computed among the different measures (FSTS, BBS, and TUG &Mini BES Test). Bivariate correlation showed strong association of these measures as the p value was significant (<0.05).FSTS was correlated with TUG,BBS, Mini BES Test, (r=.774, r= -.758, r= - .721).The Results of table I shows the biomechanics of sit to stand components which patients adapt post stroke and table II shows mean and standard deviation with correlational analysis.

Table I: Sit to stand Components observed in stroke patients.

Sit to Stand Components	Stroke Population	
	Yes	No
Feet behind knees	18%	32%
Pre-extension	30%	20%
Extension	12%	38%
Lateral trunk deviation	44%	6%
Excessive forward trunk flexion	6%	44%
Knee extension	15%	35%
Hip extension	15%	35%
Smooth descending	17%	33%

Table II: Shows the Mean & SD along with correlation (r '& p' values) of all Outcome Measures

Outcome Variables	Mean±SD	FSTS	TUG	BBS	Mini BESTest	p-value
		r	r	R	r	
FSTS	26.1±13.5	1	0.774	-0.758	-0.721	0.001
TUG	38.3±21.1	0.774	1	-0.697	-0.662	0.001
BBS	40.1±11.3	-0.758	-0.697	1	0.795	0.001
Mini BES Test	13.7±6.1	-0.721	-0.662	0.795	1	0.001

FSTST: Five times sit to stand test **TUGT: Time up & Go test**
BBS: Berg Balance Scale **Mini BESTest: Mini Balance Evaluation Systems Test**
Mean & Standard Deviation **r: correlation coefficient**

Discussion

Sit to stand movement is significantly impaired after stroke. The current study aims to identify the association of STS with functional mobility and balance in stroke. FTSTS test is a valid measure of functional mobility and dynamic balance. The results of present study indicated that most patients showed lateral deviation of trunk towards unaffected side. Greater medio-lateral displacement causes instability and leads to fall. The results showed that extension phase is not complete in 38% of stroke patients, whereas full knee extension was not present in 35% of individuals; this causes asymmetric weight bearing. Similar findings were observed in another study, in which the fall risk was high and needed more time for stabilization most importantly in extension phase.[8]Chair seat heights, use of armrests and foot position have a major impact on the ability to perform STS task as mentioned in literature. The results of present study are in accordance with previous biomechanical studies in which foot placement during sit-to-stand movement significantly affects the total energy expenditure.[9]Imbalanced seat height increases the need of momentum generation and position of the feet.[10]Proper feet position during STS improves static and dynamic postural balance in hemiplegic stroke.[11] For initiation of walk, it is important that trunk must be extended after initial contact and patient should move forward while standing up, 44% of the individuals have trunk deviation towards hemi paretic side which deteriorates the balance.[12]In the present study kinetic data indicated that majority patient's lack complete trunk extension due to which patients had reduced speed and opted compensation strategies for counteracting neuromuscular impairment. This might be one of the reasons why patients cannot start walking fluently from the sitting position. The results showed that majority of the patients had not the smooth descend which further hinders their balance and functional status.[13] In this study stronger associations have been reported between timed STS and balance performance. FTST completion time is significantly associated with TUG and BBS (r=.774, r= -.758, $p \leq 0.01$) and was founded to differentiate individuals with and without balance disorders and fall risks.

The following limitations need consideration, the sample size was small. Strict causation was not stated, because our study was based on correlation analysis. Serious cases were excluded in this study because they were not able to safely perform sit to stand task.

Conclusion

The study concludes that Sit to Stand is a noteworthy predictor in walking fluidity and has strong correlation with functional mobility in stroke population.

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