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Relationship & Comparison between Post-Stroke Motor Recovery and Functional Recovery – An Observational Study

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ABSTRACT

Aims and Objectives: This study explored relationship between post-stroke motor recovery and functional recovery in Gujarat, India.

Patients, Materials and Methods: This Study involved 67 (48 males and 19 females) individuals diagnosed of stroke by Neuro-physician or General Physician with less than 6 months of post stroke duration. Fugl Meyer Motor Assessment Score was (total of upper extremity and lower extremity sub score) was used to assess their post-stroke motor recovery. Their functional recovery was assessed using the Modified Barthel Index. They were assessed on the same day for Fugl-Meyer Motor Assessment as well as Modified Barthel Index. Data were analyzed using the Pearson's Moment Correlation and Students' paired t-test at $p=0.05$.

Results: Patients' mean age was 57.52 ± 13.1 years ranging between 17 years and 80 years. Their motor recovery had direct positive relationship ($r=0.791$, $p=0.00$) with their functional recovery but there was significant difference ($t=13.16$, $p=0.00$) between motor recovery and functional recovery. Mean score of motor recovery by total of Fugl-Meyer Upper extremity & Lower extremity subscore is 54.79 (54.79%) of total 100 score. Mean score of functional recovery by Modified Barthel Index was 14.06 (70.3%) of total 20 score.

Conclusion: Though Motor recovery has positive impact on the functional recovery in stroke survivors, motor recovery and functional recovery may differ significantly where functional recovery may exceed than motor recovery.

Key Words: Stroke, Stroke rehabilitation, Recovery of function

INTRODUCTION

World Health Organization (WHO) defines stroke as a clinical syndrome characterized by rapidly developing clinical symptoms and/or signs of focal and at times global loss of cerebral function, with symptoms lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin.

Stroke is classified into two types. Ischemic stroke is the most common type affecting about 67-80% of individuals with stroke and results when a clot or block impairs blood flow, depriving the brain of essential oxygen and nutrients, leading to disruption of cellular metabolism, injury

and death of tissues. Hemorrhagic stroke occurs when blood vessels rupture, causing leakage of blood in and around brain. It may occur due to increase in intracranial pressure or restriction of distal blood flow. Central Venous Sinus Thrombosis (CVST) is the presence of acute thrombosis (a blood clot) in the dural venous sinuses, which drain blood from the brain. Symptoms may include headache, abnormal vision, any of the symptoms of stroke such as weakness of the face and limbs on the side of the body and seizures.

Stroke is a global health problem. It is second commonest cause of death and fourth leading cause of disability worldwide. In developed countries, stroke is the first leading cause of disability, second leading cause of death. It makes

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an important concern not only for the physiotherapists but for the entire rehabilitation team.

The incidence of stroke rises rapidly with increasing age. In India, the overall prevalence rate for stroke lies between 84 – 262 per 100,000 in rural area and between 334 – 424 per 100,000 in urban areas.⁶ After the age of 55 years, the risk of stroke doubles every 10 years; two thirds of all strokes occurring in people older than the age of 65 years.⁷ The incidence of stroke is about 1.25 times greater for males than female.⁸

Katherine J. Sullivan et al did a study “Fugl-Meyer Assessment of Sensorimotor Function after Stroke Standardized Training Procedure for Clinical Practice and Clinical Trials” in 2011 to find out reliability of the same score and found that intra-rater reliability for the expert rater was high for the motor and sensory scores (range, 0.95–1.0). Inter-rater agreement (intraclass correlation coefficient, 2, 1) between expert and therapist raters was high for the motor scores (total, 0.98; upper extremity, 0.99; lower extremity, 0.91) and sensory scores (total, 0.93; light touch, 0.87; proprioception, 0.96).

Ohura T et al in 2017, found validity and reliability for Modified Barthel Index in study on stroke patients. ICC for inter-rater reliability for first session was 0.99. For intra rater reliability, mean value of ICC was 0.99 for individual task, inter rate kw coefficients for the first session ranged from 0.77 to 0.94 with intra-rater kw coefficients from 0.85 to 0.96. They concluded with strong criterion related validity against the Barthel Index, with higher reliabilities. Scoring system is convenient tool allowing anyone to assess activity of daily life.¹⁰

Stroke-related physical disability diminishes quality of daily living, place care burden on families, and increase need for long-term institutionalization^{11,12}

Recovery after stroke occurs in two phases: neurological or functional. Neurological recovery occurs as a result of brain repair and reorganization while functional recovery depends on many factors including extent of motor affectation and the quality of rehabilitation¹³. Although neurological recovery may peak within the first three months of stroke; functional recovery continues with improvement in the recoveries of specific functions like mobility and social participation.¹³ Neurological recovery includes motor recovery, sensory recovery and also balance recovery. Functional recovery describes dependency of individual in activity of daily life. Another dimension to be taken into consideration is Quality of life which is individual perception of his/her position in life in the context of the culture and value system in which they live and in relation to their goals, expectations, standards, and concern.¹⁴

Recent studies have shown that Stroke has negative impact on both the functional recovery and quality of life of stroke

survivors. Quality of life of stroke survivors increases with improvement in functional recovery.¹⁴ Stroke has impact on both the motor recovery and functional recovery in individuals who have survived stroke episode but the relationship between motor recovery and functional recovery in stroke has not been clearly explained. However, the relationship between these differential shifts in neurological recovery and functional recovery among stroke survivors has not been well explored. Therefore, this study explored the relationship between post-stroke motor recovery and functional recovery in stroke survivors within first 6 months of post stroke duration.

METHODS

This study was ethically approved by a RK University, Gujarat. This study involved 67 consecutively recruited stroke survivors diagnosed of stroke by Neurophysician or General physician as per selection criteria as follows:

Inclusion criteria:

1. All stroke patients who are willing to participate
2. Both male & female stroke patients
3. Mini mental scale examination score >24¹⁵
4. Duration of stroke varies from discharge from hospital up to 6 months¹⁶

Exclusion criteria:

1. Stroke patients who are not cooperative.
2. Stroke patients who have auditory &/or visual deficits.
3. Stroke patients who do not have proper medical records.
4. Patients having another neurological deficit with stroke.

Oral as well as written consent was taken by patient &/or relative from those who were willing to participate. All subjects were explained about the study and were assessed for different demographic data as well as for motor as well as functional recovery by Fugl-Meyer Motor Assessment Score and Modified Barthel Index Score respectively. Fugl-Meyer Motor Assessment scale was used to assess their post stroke motor recovery. And Modified Barthel Index was used to assess functional recovery of stroke patients. Both of these scales were assessed on the same day for particular patients. They were also interviewed for demographic characteristics (age, gender, body mass index, side of body affected), clinical variables (length of coma, length of hospitalization, hypertension, diabetes and other co-morbidities) and history (addiction history, transient ischemic attack history, family history).

Data was summarized using mean and standard deviation, frequency. Data were analyzed using the Pearson’s correlation for relationship between motor recovery and functional recovery and paired t-test for comparison between motor recovery and functional recovery of participants.

RESULTS

Study included 67 stroke patients. Mean age of the participants was 57.52±13.1 years with majority (92.53%) between 17 and 80 years. Total 19 (28.36%) females and 48 (71.64%) males were included in study. The left side of the body was affected in 35 (52.23%) of the participants while right side of body was affected in 32 (47.76%) patients. Out of the participants who took part in the study, 57 had ischemic stroke (85.07%) while 10 (14.93%) had hemorrhagic stroke. Positive family history of stroke was found in 5 (7.46%) patients. 13 (19.4%) patients themselves had history of transient ischemic attack or stroke in past and had stroke another time. Total 19 (28.36%) patients were diagnosed with hypertension as co-morbidity while 30 (44.75%) patients were diagnosed with diabetes. 29 (43.28%) patients had at least one of the addictions of tobacco, alcohol or smoking.

Table 1: Descriptive statistics

Age	Mean (57.52 years)	Standard Deviation (13.1 years)
Gender	Males (71.64%)	Females (28.36%)
Side of body affected	Right (47.76%)	Left (52.23%)
Type of stroke	Ischemic (85.07%)	Hemorrhagic (14.93%)
Family history	Present (7.46%)	Absent (92.54%)
TIA/Stroke history	Present (19.4%)	Absent (80.6%)
Presence of co-morbidities	Hypertension (44.75%)	Diabetes (43.28%)
Addiction history	Present (43.28%)	

Data was checked for plausibility and cleaned. The kolmogrov-smirnov test was used to analyze normal distribution assumption of outcomes measures and was found normally distributed. Pearson correlation test was applied to find out relation between Fugl-Meyer Motor Assessment Score and Modified Barthel Index Score. By this test, r value found was 0.791 (n=67, p=0.00). Paired student’s t-test was applied to compare Fugl-Meyer Motor Assessment Score and Modified Barthel Index Score. By this test, t value found was 13.161 (n=67, df=66, p=0.00)

Table 2: Pearson correlation test between Fugl-Meyer Motor Assessment Score and Modified Barthel Index Score

Pearson's correlation test		
Correlation Coefficient	N	Sig. (2-tailed)
0.791	67	0

Table 3: Paired T test between Fugl-Meyer Motor Assessment Score and Modified Barthel Index Score

Paired Differences					T	Df	Sig. (2-tailed)
Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
			Lower	Upper			
40.73134	25.33328	3.09495	34.55207	46.91062	13.161	66	.000

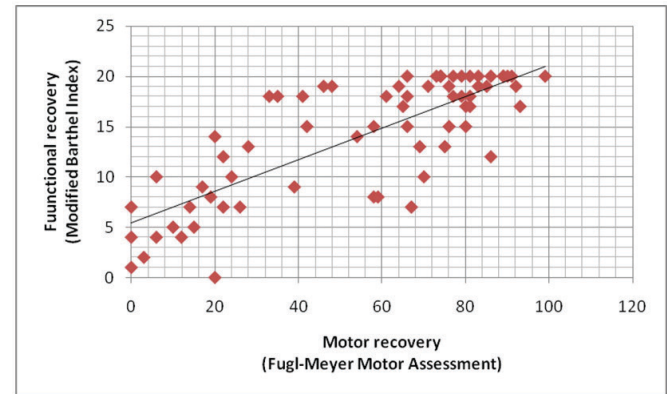


Figure 1: Relationship between motor recovery and functional recovery after stroke.

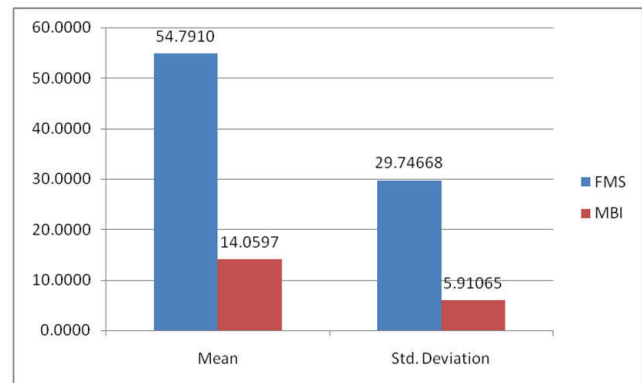


Figure 2: Comparison between motor recovery and functional recovery after stroke.

DISCUSSION

From the results, it is observed that motor recovery has positive impact on functional recovery which suggests that with motor recovery, functional performance also improves of stroke patient as the time passes. It is also found that there is significant difference between motor recovery and functional recovery suggesting that motor recovery and functional recovery may happen at different rate. From mean value, it can be observed that functional recovery exceed than motor recovery. Motor performance accounts recovery of affected side only which is limited to neurological recovery only. Functional performance may also include contribution from normal side also to compensate for completion of task along with affected side of body. By this reason, functional

recovery may exceed than motor recovery. Although, stroke had been shown to have negative impact on both the motor recovery and functional recovery in stroke survivors, the relationship between motor recovery and functional recovery after stroke has not been clearly delineated. The result of this study shows that improved motor recovery results in improved functional recovery in individuals who have had an episode of stroke. This means that if effort is geared towards functional recovery rather than motor activity, there will be remarkable reduction in the dependency in activity of daily living. Even with less motor recovery, by efforts patient can be given advantage of more functional recovery which is more required for patient. This is a wake-up call for clinicians involved in stroke rehabilitation to plan goals that will improve various aspects of life of stroke survivors and tailored those activities that will improve societal integration and reduce activity limitation and participation restriction.¹⁴

Anthea Rhoda et al. (2014) conducted a similar type study. In this study, total of 73 patients from the two separate studies were matched for age at stroke onset, gender, and initial motor functioning. Motor and functional recoveries were assessed at baseline, two and six months post stroke using the Rivermead Motor Assessment Scale and the Barthel Index (BI) respectively. Significant difference between motor and functional recovery was found.¹⁷ Lucca Nannetti et al. (2004) also conducted a study to compare motor and functional recovery on 170 post stroke depression patients. They found post stroke depression does not influence motor and functional recovery suggesting that depression is not affecting recovery.¹⁸

Limitations of this study include small size and only one time assessment was taken. Undiagnosed co-morbidities can also influence findings. Future studies can target on longitudinal follow-up for all stroke patients with more sample size.

CONCLUSION

The findings of this study support the fact that motor recovery had positive impact on functional outcome in stroke survivors. But functional recovery may exceed the motor recovery. Therefore, rehabilitation of stroke patient should not be only focus on the motor recovery but also on functional recovery training equally or even more.

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Conflict of interest

None

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