

[ORIGINAL ARTICLE]**Relationship Between Duration of Stroke and Hand Function Recovery in Patient with Stroke****Ms. Pranoti Rajgopal Zawar¹, Dr. Maheshwari Harishchandre (PT)², Dr. Suvarna Ganvir(PT)³**¹Under Graduate Student, ²Associate Professor, ³Professor & HOD, Department of Neurophysiotherapy, D.V.V.P.F's College of Physiotherapy, Ahmednagar.**ABSTRACT :**

Background : Stroke is sudden loss of neurological function caused by an interruption of the blood flow to the brain. The fine motor activities are also affected which leads to difficulty in writing, prehension and precision are also affected so patient is also not able to hold any object in the hand which required to performed in daily activities.

Methods -This is an Observational study with a study duration was of 1 year. A total of 30 participants were recruited using the purposive sampling method from the Department of neuroscience, Vikhe Patil Memorial Hospital, Ahmednagar; Puntamba stroke center, Puntamba and Rahuri stroke center.

Result - The study shows in Jebsen Taylor Hand Function Test, the most affected component is writing which requires more time followed by moving heavy objects and stimulated feeding, in addition requires less time for card turning, followed by small common object and checkers stacking and the least time required for performing moving light object in stroke patients.

Conclusion- The study concludes that there is no relationship between duration of stroke and hand function recovery in patients with stroke. The JebsonTaylor Hand Function test shows that the most time required is for small dexterity movement like writing, stimulated feeding. The patients find difficulty in moving heavy objects. The less difficulty task is card turning, checkers stacking, moving light objects, which requires use of all the fingers.

Key words: stroke, Jebsen Taylor Hand Function Test, Brunnstorm recovery stages, stroke duration.

Introduction:

Stroke is sudden loss of neurological function caused by an interruption of the blood flow to the brain⁽¹⁾. Stroke is a clinical syndrome consisting of rapidly developing clinical signs of focal disturbance of cerebral function lasting more than 24 hours of leading to death with no apparent cause other than vascular origin. According to WHO, 15 million of people suffer from stroke worldwide each year. Out of which 5 million died & 5 million are permanently disable. The estimated prevalence of stroke range, 84-262/1,00,000 in rural & 334-424/1,00,000 in urban area in India⁽²⁾. Prevalence of stroke in men (46.78/1,00,000) was higher than women (41.52/1,00,000). It was similar in urban & rural area in Maharashtra⁽³⁾. The incidence of stroke

decreases by 42% in high income countries & greater than 100% increases in low to middle income countries. The incidence rate 119-145/1,00,000 on recent population-based studies in India⁽²⁾.

Functional impairments are commonly complemented with weakness on one side of body, problems with vision & emotional challenges⁽⁴⁾. Additionally, due to apraxia, stroke survivor faces difficulty with performing task or movements when asked. Due to weakness, there is difficulty in eating, swallowing, closing of eyes, taste sensation is affected. There is shoulder pain or restricted ROM due to shoulder pathology leads to difficulty in dressing, grooming activities, etc.

There is a great affection to the distal part than proximal part. The hands are more affected than

*Corresponding author

Ms. Pranoti Rajgopal Zawar

Email : zpranoti2016@gmail.com

D.V.V.P.F's College of Physiotherapy, Ahmednagar.

Copyright 2021, VIMS Journal of Physical Therapy. This is an Open Access article which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.



other parts of upper limb. Grasp & manipulation are strategies of movement precision, muscle fatigue & impaired ability to grasp objects, having a great impact on daily living⁽⁴⁾.

Brunnstorm approach or movement is given by physical therapist Siegfried Brunnstorm in year 1997. This approach is specially used for CVA and stroke patients. There are six stages of motor recovery given by the Brunnstorm. They are: Stage one is flaccidity, there is complete lack of voluntary movement. Stage 2 is appearance of spasticity here basic limb synergies redeveloped. In stage three, there is peak in spasticity of muscles. Stage four, there is decrease in spasticity & in stage five complex movement & combination of muscle developed. In stage six, spasticity disappears & there is individual joint movement⁽⁵⁾.

The Jebsen-Taylor Hand Function Test is designed to provide a short objective test of hand functions commonly used in activities of daily living. It consists of seven items that include the activities of fine motor, weight & non-weight hand functions movement which are timed⁽⁶⁾. It has widely used in clinical setups and research setting as well as in conditions like brain injury, stroke recovery, multiple sclerosis, rheumatoid arthritis.

Need For Study

There are theories that during stage three of stroke recovery, spasticity begins to develop according to Brunnstorm approach. But it has not been seen practically in patients with stroke. It is important to study the recovery of hand functions during recovery stages of stroke.

Material And Methodology

This is an Observational study with a study duration of 1 year. A total of 30 participants were recruited using the purposive sampling method from the Department of neuroscience, Vikhe Patil Memorial Hospital, Ahmednagar; Puntambastroke center, Puntamba and Rahuri stroke center. The Jebsen Taylor Hand Function Test is taken with duration between 517-660 days and Brunnstorm recovery stages of stroke. Inclusion criteria were, or first episode of stroke patient, >3 grade hand recovery stage (Brunnstorm stages), Both genders.

Exclusion criteria included patients with compromised mental status, Patient with hand deformity patients e.g.- claw hand, wrist drop, etc.

Sensory deficit patient, Un co-operative patients, Uneducated patients.

Procedure

We have taken the ethical approval from the institutional ethical committee, we had screened 70 stroke patients and we had included 30 of them in study as per selection criteria like first of stroke patient stroke patients, >3 grade hand recovery stages, both genders. Prior to test we have given detailed information about project & details about the procedure was explained to patient who had participated for the project. Informed Consent is taken from the patients who had participated.

The duration of stroke was noted of stroke patients along with other demographic information & Brunnstorm hand recovery stage was seen, spasticity grade had been taken on affected side by modified asthworth scale of shoulder, elbow & wrist muscles and we had assessed for the jebsen-taylor hand function test with the dominant affected side hand. Because the writing subtest required dominant hand to give the correct result. With the participants in a seated position in front of an adjustable table, the test was administered according to the standardized procedures of the JTHFT. The sub test was explained to the patients first is writing a 24 sentence, card turning was demonstrated, next sub test was small common object, the next was stimulated feeding, next was checkers stacking, next was moving light objects, next was moving heavy object. The subtests were then performed in the same sequence, starting with the nondominant hand and followed by the dominant hand. Measurement of outcome included duration of time (in sec) required to complete each subtest; the maximum time allocated per subtest was 120 sec. The total duration was computed for all the seven subtests and we had added them to get total final score. Lower scores indicated greater levels of hand function.

Outcome Measures: 1) Jebsen-taylor hand function test, is short objective test for hand function which is used for providing the activities of daily living. The test consists of 7 subtest & we will score each subtest. It is performed at both affected & non-affected hands. It consists of seven items that include a range of fine motor, weight & non-weight hand functions activities which are timed. Lower the score, greater is the function. The maximum score for each subtest is 120 sec. The total score of 7 subtest will be 840 sec. The jebsen taylor hand function test has moderate to

high test-retest reliability and excellent intrarater reliability $r=0.84$ and 0.85 , $p<0.057$.

2) Brunnstorm approach:

There are 7 stages of hand recovery given by brunnstorm for the stroke patients. Flaccidity of the involved limb, neither reflex nor voluntary movements are present, Spasticity begins, minimal voluntary movement, little or no finger flexion, Mass grasp, use of hook grasp but no release; no voluntary finger extension, Lateral prehension, release by thumb movement; semi-voluntary figure extension, Palmar prehension; possibly cylindrical & spherical grasp; voluntary mass extension of the digit, All prehensile types under control; skill improving; full range voluntary extension of digits; individual finger movements are present, less accurate than opposite side

Result:

Statistical analysis was done by GraphPad InStat software. The data was entered into an excel spread sheet, tabulated and subjected to statistical analysis. Various statistical measures such as mean, standard deviation (SD) and pearson’s correlation test were utilized to analyses the data.

Demographics: A total 70 participants with hemiparesis were screened for the study from August 2019 to March 2020 considering the inclusion and exclusion criteria. Out of these 30 were eligible for the study and they agreed for participation. The mean age of participants was 51.4 years. The gender ratio was 14:16 (14 males and 16 females). The percentage of the right-side involvement was 67% and left side was 33%. The mean duration of stroke was 517.066 days.

Table 1: Showing demographic profile of patients

	MEAN±SD
Age	51.4±15.758
Gender (M/F)	14(46.6%)/16(53.3%)
Side of hemiplegic Rt/Lt	20(66.6%)/10(33.3%)
Duration of stroke (days)	517.066±660.88

Table 2: Shows Gender wise distribution

Gender	% (No of patients)
Male	46.6%(14)
Female	53.3%(16)

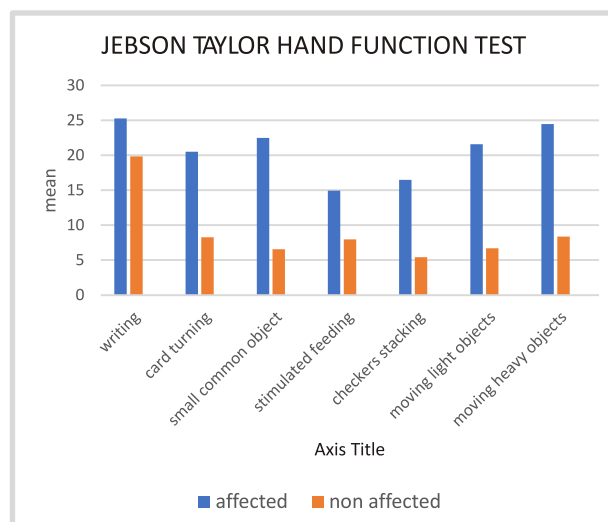
Table 3: Shows Duration of stroke

Duration of stroke	No of patients
Less than one month	3
1-5 months	5
6-12 months	10
More than one year	12

Table no 3: shows that most of patients has more than one year of duration followed by 6-12 months of duration then 1-5 months of duration and less than one month of duration.

Table 4: Shows comparison between affected & non affected side hand function by Jebsen Taylor Hand Function Test (JTHFT)

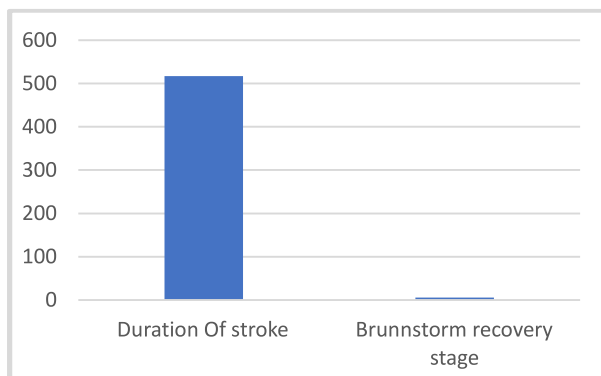
Components (JTHFT)	Affected side	Non affected side
	Mean± SD	Mean± SD
Writing a 24 - letter sentence	25.28±26.40	19.84±11.49
Card turning	20.52±15.16	8.26±3.18
Small common object	22.49±24.58	6.55±1.1.91
Stimulated feeding	14.93±12.76	7.96±3.12
Checkers stacking	16.47±14.49	5.14±1.79
Moving light objects	21.57±20.28	6.7±1.88
Moving heavy objects	24.48±19.99	8.37±2.88



Graph 1: Shows Jebsen Taylor Hand Function Test mean, of affected side and non-affected side

Table 5: Shows duration of stroke in days and hand function recovery by Brunnstorm stage

Duration of stroke	Mean±SD	r value	P value	Significance
	517.059±660.88	-0.07603	-0.6897	Not significance
Brunnstrom recovery stage	5.468±0.802			



Graph 2: Shows duration of stroke in days and hand function recovery by Brunnstorm stage

Discussion:

The study describes the relationship between duration and hand function recovery using Jebsen Taylor test in patients with stroke. Hand function is evaluated by the Jebsen Taylor test to measure the disability or limitation in activities of daily living. This is used to assess the both hands separately. The time performance could be used to measure the differently Upper Limb motor functions in patients with stroke. This study aimed for relationship between hand function recovery and duration of stroke.

KathrinAllgöwer conducted study in (2017) on ‘Fine motor skill predict performance in the Jebsen Taylor hand function test after stroke’ They conclude that there is a structure behind fine motor impairments following stroke and showed that it explains JTHFT results to a large extend⁸. Mak MK, et.al conducted study in (2015) on ‘Use of Jebsen Taylor Hand Function Test in evaluating the hand dexterity in people with Parkinson's disease’. They conclude that PD patients require more time to perform JTT which suggest that there is deficit in gross and fine functional dexterity⁽⁷⁾.

The study reveals that, in jebsen taylor hand function test the most time required is for writing a sentence in patients with stroke. Then it is followed

by moving heavy objects and stimulated feeding. In addition, the patient required a little less time for card turning. This is followed by small common object and checkers stacking in which the time required is less and easy to performed and the least time required for moving light object followed by stroke.

In my study, according to duration of stroke it is found that most of the patient are at chronic stage i.e. >6 months with 53.3%. This is followed by sub-acute stage i.e.<6 months with 36.6% and acute stage i.e. 1-20 days is lowest with only 10% of patients.

The comparison between mean of affected and non-affected side in each sub test show different relation like writing a 24 letter sentence the mean difference is of 5 and stimulated feeding also show difference of 7 so this indicates patients find difficulty in performing from both hands, then card turning, small common object, checkers stacking, moving light object and moving heavy object the difference is 13, 16, 12, 15 and 17 this shows that the non-affected side of hand requires much less time than the affected hand. The patients find this subtest easier to perform.

The study shows more time is required to write a sentence due to spasticity in fingers and difficulty in two jaw chuck as patients are not able to hold the pen or complete the sentence. Secondly affected sub-test is moving heavy objects that is due to pain or weakness. Then stimulated feeding requires to hold the spoon as there is spasticity in fingers the patients have difficulty in performing this sub-test. The patients take little less time for card turning, small common objects and checkers stacking as this requires the whole hand and the spasticity of hands help to perform this sub-test. The less time taken by the patients is in moving light objects as patients is able to perform even if spasticity is present.

As the study shows no or negative relationship between duration of stroke and hand function recovery in patients with stroke is maybe due to different type of stroke attack. Some patients may have mild affected area in the brain than the others patients. The second factor is age group because the younger age group patients show good recovery rate than older age group patients. Most of the patients in the study shows duration of stroke attack more than 6 months as this stage shows spasticity in hand and recovery of hands maybe affected so this relation shows negative value. According to the Modified Ashworth Scale, thepatients differ with Brunnstorm recovery stage or spasticity grade and also in both

gender the recovery maybe different so this can also affect the results of duration of stroke and hand function recovery in patients with stroke.

The study says that there is nosignificant relationship between duration of stroke and hand function recovery. There is negative relationship between duration of stroke and hand function recovery in patients with stroke.

Conclusion:

The study concludes there is no relationship between duration of stroke and hand function recovery in patients with stroke. The jebsen-taylor hand function test shows that the most time required is for small dexterity movement like writing, stimulated feeding. Also, the patients find difficulty in moving heavy objects. The less difficulty task is card turning, checkers stacking, moving light objects, which requires use of all the fingers. So, there is need to focus on small dexterity movements activities on patients with stroke.

Funding sources- None.

Conflict of Interest- None

References:

- 1) O'Sullivan. s, Schmitz. T, Fulk. G. Physical rehabilitation. 6th end, F.A. Davis company, Philadelphia, 2014.
- 2) jeyaray Durai Pandian and Paulin Sudhan. Stroke epidemiology and stroke care services in Indian: journal of stroke.2013; vol.15.. (3):128-134.
- 3) Sureshkumar KamalakannaN, Aashrai S.V. Gudlavalleti and Hannah Kuper. Incidence & prevalence of stroke India: A systematic review: The Indian Journal of Medical Research.2017;vol.146..(2):175-185.
- 4) Pablo Aqueveque, Paulina Ortega, Esteban Pino and Francisco Saavedra. After Stroke Movement Impairments: A Review of Current Technologies for Rehabilitation: Physical Disabilities.2017;95-116.
- 5) Suvarna Ganvir. S and Ganvir. S. Manual Therapy Approaches in Neurophysiotherapy, Jaypee Brothers Medical Publishers, New Delhi, 2016.
- 6) Gudrun M Johansson, Charlotte K Häger. A modified standardized nine hole peg test for valid and reliable kinematic assessment of dexterity post-stroke: journal of NeuroEngineering and Rehabilitation.2019; vol.16..(8):1-11.
- 7) Mary K.N Takla, Enas A.K Mahmoud. Jebsen Taylor Hand Function test: Gender, dominance, and age differences in healthy Egyptian population: Bulletin of Faculty of Physical Therapy.2018;vol.23..(2):85-93.
- 8) KathrinAllgöwer and JoachimHermsdörfer. Fine motor skill predict performance in the Jebsen Taylor hand function test after stroke: journal of the international Federation of clinical Neurophysiology. 2017; vol.128..(10):1858-1871
- 9) 4. Mariana Cunha Artilheiro,, Francis Meire Fávero, et.la. Reliability, validity and description of timed performance of the Jebsen–Taylor Test in patients with muscular dystrophies: Brazilian journal pf Physical Therapy. 2018;vol.22..(3):190-197
- 10) Mak MK, Tam VW, Woo CW, et.al. Use of Jebsen Taylor Hand Function Test in evaluating the hand dexterity in people with Parkinson's disease: journal of Hand Therapy. 2015;vol.28..(4):389-395.
- 11) Chen HM, Chen CC, et.al. Test-retest reproducibility and smallest real difference of 5 hand function tests in patients with stroke: Neurorehabilitation and Neural Repair. 2009;vol23..(5):435-440.
- 12) Welmer AK, Holmqvist LW, Sommerfeld. Limited fine hand use after stroke and its association with other disabilities: journal of Rehabilitation Medicine. 2008; vol.40..(8).
- 13) Cecilia W.P.Li-Tsang and Sam C.C.Chan et.al. The Hong Kong Chinese Version of the Jebsen Hand Function Test: Inter-rater and Test-retest Reliabilities: HKJOT. 2004; vol.14:12-20.
- 14) Siraj Sharma, H. Ralph Schumacher and A. Thomas McLellan. Evaluation of the Jebson Hand Function Test for Use in Patients with Rheumatoid Arthritis: Wiley online Library. 1994; vol.7..(1):893-7524.