

Functional Recovery And Quality Of Life After The Stroke

Amela Čičkušić,¹ Renata Hodžić,² Adnan Čičkušić,³

¹Department of Physical Medicine and Rehabilitation

²Department of Neurology

³Department of Neurosurgery

University Clinical Center Tuzla, Bosnia and Herzegovina

Corresponding author

Amela Čičkušić

¹Departement of Physical Medicine and Rehabilitation
University Clinical Center Tuzla, Bosnia and Herzegovina
Trnovac bb, 75000 Tuzla
Bosnia and Herzegovina
Phone: +38761895510
Email: cic-amela@hotmail.com

ABSTRACT:

Introduction: The main goal in rehabilitating persons affected by stroke is the establishment of maximum functional capacities in activities of every day living, their personal and social identity.

Objective: To determine the degree of improvement of functional recovery and quality of life of patients after first ischemic stroke with the anterior circulation syndrome; with the posterior circulation syndrome and with the lacunar syndrome in the acute and post-acute phase of physical therapy and rehabilitation.

Material and methods: The study was prospective; consecutively included 90 patients with first ischemic stroke. The first group consisted of 30 patients with the syndrome of complete anterior circulation; the second group of 30 patients with the posterior circulation syndrome and the third group of 30 patients with lacunar syndrome. After their discharge from the Clinic for Neurology, they conducted a rehabilitation treatment at the infirmary at the Clinic for Physical Medicine and Rehabilitation for up to 8 weeks. Retesting of the patients was performed 6 months after the stroke at their regular checkup. In order to monitor motor and functional recovery, the Scale of motor assessment was used- "Motor Assessment Scale" (MAS). Within the MAS, six months after the stroke, motor recovery of the hand in particular, was analyzed in all the groups, as well as overall functioning. To assess the quality of life after the stroke, "Stroke Specific Quality of Life Scale" SS-QOL was used. Patients were tested after a rehabilitation treatment and 6 months after the stroke.

Results: The functional recovery of patients is statistically significant for all three groups of patients after the physical treatment and six months after the initial testing ($p < 0.0001$). Functional recovery after conducting physical treatment and six months after the stroke is significantly better in the group of patients with lacunar syndrome ($p = 0.001$) and group with the stroke in the posterior circulation ($p = 0.01$) than in the group of patients with the anterior

circulation. Functional recovery was statistically significant in the group of patients with lacunar syndrome than in patients with posterior circulation: after physical therapy $p = 0.01$; six months after the stroke $p = 0.01$; $p = 0.02$ for the motor recovery of the hand $p = 0.05$ and for overall functioning. The quality of life was significantly better ($p = 0.001$) six months after the stroke compared to the test done after the rehabilitation treatment in all three examined groups. Among the examined groups, there was no statistically significant difference in the quality of life after the stroke.

Conclusion: The functional recovery of patients after first ischemic stroke is significant in acute and post-acute phase of physical therapy and rehabilitation. Total activating and motor recovery of the hand was significantly better in the group of patients with lacunar syndrome than in the group of patients with the anterior and posterior circulation syndrome. Localization and size of the stroke affect and determine the degree of functional recovery of patients, time needed for rehabilitation and outcome of rehabilitation. It has been shown that the quality of life six months after stroke is significantly better for the patients in all three analyzed groups but without significant differences between the groups.

Keywords—Ischemic stroke, functional recovery, quality of life

INTRODUCTION:

The main goal in the rehabilitation of stroke patients is establishing the maximum functional capacity in activities of daily living, as well as personal and social identity. Stroke is the most common cause of functional disability, but also the most common reason for rehabilitation of persons older than 60 years. According to some research about 10-20% of patients with ischemic stroke die shortly after onset. Still about 10% of patients spontaneously recover to

the extent that they do not require rehabilitation. A third of patients is incapacitated due to the size of ischemic damage or parallel presence of other diseases (heart disease, diabetes), and can not handle the rehabilitation program. The group that remains needs, depending on the severity of their defect, some other form of rehabilitation. About 30% of patients are candidates for some program of intensive rehabilitation [1]. However, after surviving the stroke every person has a clear potential for recovery. The question is whether they will fulfill it and to what extent.

Measuring quality of life is very important for a better understanding of the patient's subjective experience of the disease, for development of new and improvement of existing therapeutic procedures, and for monitoring the success of health care as a whole. Patients with stroke often have a significantly lower quality of life compared to controlled subjects of similar age, even in the cases with very mild effects [2]. Today's approach to life quality research has been characterized by the focus on a particular person as an individual, and quality of life can only be understood from the perspective of an individual. At the level of the person, the quality of life can be observed as a result of a complex process of interactions between personal characteristics, treatment outcome, behavior, support of the society as a whole, and quality of healthcare provided [2]. Some studies speak of the marked correlation between physical disability, dependency in the conduct of daily life activities and the quality of life itself. The dependency regarding the ability to carry out daily life activities is clearly linked to the areas of physical functioning and overall health in the quality of life but has no predictive role in the psychological and socioeconomic aspect of quality of life [3].

PARTICIPANTS AND METHODS:

This was prospective and was conducted at the Department of Neurology and the Department of Physical Medicine and Rehabilitation, during a two-year period (starting from February 2013 to February 2015). The study included a total of 90 consecutive patients who suffered ischemic stroke. Group I consisted of 30 patients with anterior circulation syndrome; group II of 30 patients with the posterior circulation syndrome and group III of 30 patients with lacunar syndrome. Patients who have been in a coma for more than 48 hours, as well as hemodynamically unstable patients were not included in the study. Other exclusion factors were hemorrhagic stroke, recurrent strokes, patients who have been treated with thrombolytic therapy, and patients with aphasic disorders. In addition to medical history and clinical examination, diagnosis of stroke was confirmed by the results of computer tomography CT and /or nuclear magnetic resonance NMR imaging of the brain. Patients were included in early rehabilitation treatment immediately after stabilization of their vital functions with continuous monitoring of blood pressure, pulse and respiration. After the patients were discharged

from the Department of Neurology, they were transferred to the Department of Physical Medicine and Rehabilitation where stationary rehabilitative treatment was conducted for up to 8 weeks. Re-testing of the patients was performed 6 months after the stroke. All the patients, during the rehabilitation treatment received individual exercise program, with appropriate introductory electrotherapy and thermo procedures. Patients also received somatopedical treatment with training of motor and cognitive functions, as well as self-care activities.

In order to monitor the motor and functional recovery, we used **Motor Assessment Scale (MAS)** [4] Initial testing was carried out at the Department of Neurology, upon completion of the rehabilitation treatment at the Department of Physical Medicine and Rehabilitation, and 6 months after the stroke. This scale contains eight hierarchical areas. Graded was: turning of the patient in the prone position on the healthy side, moving of the patient from a lying to a sitting position with his/her feet over the edge of the bed, the balance in the sitting position, the transition from sitting to standing, walking, function of the upper arm, hand movements, fine motor skills of the hand muscle tonus. Each area was individually numerically measured with a score of 0-6. The total maximum score was 48 points and it represented the maximum recovery. Within MAS six months after the stroke, in particular was analyzed motor skill recovery of the hand (maximum recovery- score 18) and total activation (maximum recovery - score 30). To assess the quality of life after the stroke, "**Stroke Specific Quality of Life Scale**" was used - **SS-QOL** [5]. Subjects were tested after a rehabilitation treatment and 6 months after the stroke. The scale contains 12 areas that analyze their energy, their role in their family, speech, mobility, mood, personality, independence, social role, thinking, hand function, vision, work/effectiveness. Each examined area was evaluated on a scale from 1 to 5. Rating 5 included these offered answers (no need for help / no difficulty / I strongly disagree). Score 4 (need a little help / have small difficulties / I moderately disagree). Score 3 (some sort of help / some difficulty / I neither agree nor disagree). Score 2 (need a lot of help / a lot of difficulty / I moderately agree). Score 1 (fully need help / cannot do it / I totally agree). The total score was obtained by adding individual scores and it resulted in the maximum of 60.

RESULTS:

As it can be seen in Table 1., 6 months after the stroke, significant motor recovery occurred in all three groups compared to the initial testing ($p < 0.0001$ for all three groups of patients).

Table 1. Scale of motor assessment 6 months after the stroke

Group of participants	MAS Initial testing	MAS 6 months after the stroke	p
Anterior circulation syndrome	10.16 ± 4.81	31.06 ± 9.77	<0.0001
Posterior circulation syndrome	14.73 ± 6.35	33.06 ± 7.21	<0.0001
Lacunar syndrome	16.66 ± 6.23	37.46 ± 6.55	<0.0001

MAS=Motor Assessment Scale; p=statistical significance

Table 2. Motor recovery score for patients with anterior and posterior circulation syndrome

Group of participants	MAS Initial Testing	MAS After Physical tr.	MAS After 6 months	MAS Hand Re-test	MAS Activation
Anterior circulation syndrome	10.16 ±4.81	26.56 ± 9.35	31.06 ± 9.77	8.96±5.95	22.06±4.44
Posterior circulation syndrome	14.73 ±6.35	28.53 ± 6.48	33.06 ± 7.21	11.7±4.77	21.33±4.30
p	0.0027	0.34	0.37	0.05	0.51

MAS=Motor Assessment Scale; p=statistical significance

When comparing the score of motor assessment between groups of patients with anterior circulation syndrome and patients with posterior circulation syndrome, a statistically significant difference was found, between the groups during the initial testing and after the evaluation of hand recovery. Score of the motor recovery was significantly better in the group of patients with the posterior circulation syndrome (p = 0.0027 during the initial test, p = 0.05 for motor recovery of the hand of those patients with posterior circulation syndrome).

Table 3. Motor recovery score of patients with posterior circulation syndrome and lacunar syndrome

Group of participants	MAS Initial Testing	MAS After Physical tr.	MAS After 6 months	MAS Hand Re-test	MAS Activation
Posterior circulation syndrome	14.73 ±6.35	28.53 ± 6.48	33.06 ± 7.21	11.7±4.77	21.33±4.30
Lacunar syndrome	16.66 ±6.23	32.43 ± 5.61	37.46 ± 6.55	14.0±2.91	23.43±4.04
p	0.23	0.01	0.01	0.02	0.05

MAS=Motor Assessment Scale; p=statistical significance

When comparing the score of motor assessment between groups of patients with posterior circulation syndrome and patients with lacunar syndrome, there can be seen a statistically significant difference between the groups after the physical treatment, six months after the stroke, during the re-testing of motor recovery of hands when evaluating activation during re-testing. Score of the motor recovery was significantly better in the group of patients with lacunar syndrome than in patients with posterior circulation syndrome (p = 0.01 after the physical treatment; p = 0.01 six months after the stroke; p = 0.02 for motor recovery of the hand; p = 0.05 for activation of patients with lacunar syndrome).

Table 4. Stroke Specific Quality of Life Scale after physical treatment and 6 months after stroke

Group of participants	SS-QOL after physical treatment	SS-QOL 6 months after stroke	p
Anterior circulation syndrome	27.83±3.88	40.50±6.16	<0.001
Posterior circulation syndrome	27.46±2.67	41.43± 4.44	<0.001
Lacunar syndrome	28.00±5.21	42.96±5.72	<0.001

SS-QOL=Stroke Specific Quality of Life Scale; p= statistical significance

The quality of life after the stroke was significantly better (p = 0.001) six months after the stroke compared to testing done after the rehabilitation treatment in all three groups (patients with lacunary, anterior and posterior circulation syndrome). There was no statistically significant difference in the quality of life after the stroke among the examined groups.

DISCUSSION

The results of our study show that total motor recovery of the hand, six months after the stroke was significantly better in the group of patients with lacunar syndrome than in the group of patients with the anterior and posterior circulation syndrome.

For all lacunar strokes it has been thought to have a better prognosis than cortical strokes. Samuelson et al. published in 1996 the results of a three-year follow-up of 81 patients with a first stroke, clinically and radiological confirmed as lacunar stroke. In this group 6% of patients died, while 21% had a recurrent stroke. The majority of patients had established a rapid recovery in the first few weeks of the illness, while three years later; only a quarter of the survivors was dependent on another person in performing activities of daily living.

Poorer functional recovery was noticed in people with white matter changes (leukoaraiosis). In a similar study, 145 patients with lacunar strokes were followed over a period of several years, with a survival rate of 86% five years after the onset of the illness, while in 63% of patients with recurrent strokes, the strokes in question were again lacunar strokes. [6]

There are some interesting data from the studies which also deal with the recovery of patients with lacunar syndrome relating to solely motor lacunar stroke. 92 patients with lacunar stroke were followed, where the authors determined the progressive nature of the motor deficit in 27% of patients, who had more frequent diabetes than the others, with poorer functional recovery at the end of treatment. The outcome of pure motor stroke, especially if hemiparesis is in question, not hemiplegia, is probably better in comparison to hemiplegia / hemiparesis incurred as a result of a heart attack in the cortex, with complete or almost complete recovery in 60% of patients, 3 weeks after the stroke. [7]

In our study, in all groups we analyzed the specific motor recovery of the hand in relation to the total activation. The function of the hand is a very important recovery parameter, especially for the patients who are often discouraged by the fact that, in spite of physical therapy and rehabilitation with the team, the hand remains dysfunctional. In doing so, the second hand often takes on the compensatory role or it takes a long time to restore natural (base) functions. In our study we observed significant motor recovery of the hand in the group of patients with lacunar syndrome, then in the group of patients with the posterior circulation syndrome compared to the patients with the anterior circulation syndrome. This might be explained with the localization, the size of the stroke as well as severe motor deficit of the hand, or hands and feet, which more frequently occurred in the group of patients with the syndrome of anterior circulation.

Research done by Thompson and associates compared the effectiveness of three scales measuring the improvement of hand function after rehabilitation.

The used tests were the Fugl-Meyer motor subscale estimates of upper extremities (FM), Wolf motor function test (WMFT) and Motor Assessment Scale (MAS). Patients were categorized as low, moderate or high loss of motor functions. Results of mutual sensitivity comparisons indicate that no single test is sensitive enough to measure the improvement of whole upper extremity function and that the evaluation of the test selection should be based on the residual function of the hand. [8]

In the study by English and associates, the outcome of rehabilitation was analyzed after the first stroke by a speed walk test, Berg balance scale and MAS scale. Speed walk and Berg scale have shown great sensitivity to changes in relation to the initial testing. MAS has also shown positive changes, especially in the group of patients with lower functionality. However, MAS for motor recovery of the hand has shown a lower values while most patients did not have statistically significant recovery from the initial testing. By analyzing the study, MAS measurement of the hand function results gave confirmation that the recovery required more time in relation to the initial testing. [9]

A prospective study by Congo and Lee from 2013 analyzes the recovery time and predictors of rehabilitated patients hand recovery in the first year after the stroke. They monitored a hundred patients with a first stroke, and the evaluation of skills, strength and hand function were measured using the Motor Assessment Scale (MAS), the Upper Extremities Motor Index (UEMI) and modified Barthel index (MBI). In this study, 31.6% of patients experienced a recovery of hand function 12 months after stroke. Although the recovery came late, in a few patients, this finding was important given the significant impact of hand skills in self-care functions. It was also concluded that the motor index for the upper extremities makes the most significant correlation with the recovery of the patient through re-testing at 3, 6 and 12 months after the stroke. [10] It was concluded in our study that after six months significantly better motor recovery of the hand was recorded in the group with lacunar and posterior circulation syndrome compared to patients with anterior circulation. It was also confirmed that we should insist on continuous education of patients about the importance of daily training and exercises at home, their monitoring and recording of the results.

The results of our study show that the quality of life six months after stroke is significantly better for the patients in all three analyzed groups, but without significant differences between the groups.

Aspects of quality of life after the stroke and methods of measuring it are subjects of growing interest for the researchers. The study by Krančiukaite and Rastenyte [11] talks about the methods of objectification and measuring the quality of life after stroke. Measurements are focused on the physical, psychological, social and functional aspects of life and

are generally based on the patient's subjective vision of his / her general health and well-being. The biggest problem in this field of research is how the definition of this term should be conceptualized. It is important to distinguish between health issues and non-health issues regarding the quality of life.

SSQOL is the newest among the specific stroke scales and was used in our study. It was created based on the interviews with patients and in consultation with psychiatrists, neurologists, and patients. The authors suggest that the complexity of using this scale is a particular problem. There are three options of answers, and items within the same item use different answers to the questions asked. In the outcome, this can lead to a misinterpretation of the answer. It has been suggested to change the format of the form in order to improve the transparency of the test, and at the same time, authors believe that some deficiencies will be eliminated through clinical practice. In order to assess consistency, sensitivity and reliability, a larger sample of patients is required than before. In the analysis and possible corrections of other QOL scales, it is emphasized the need for the patient to remain at the center of the examination and to be involved in each phase of the test, and that the clinicians carefully choose the type of test to be used [12].

In a study by Huang et al. [13] changes in SSQOL following the use of Constraint-induced therapy were tested (applying the paretic arm with a simultaneous functional blockade of a healthy arm) in patients after stroke. It was established that other defects, time passed since the stroke, the value of daily activity and the age were the determining factors in improving the quality of life after rehabilitation.

In the study by Chen et al. [14], the validity, reliability and acceptability of the shortened version of SSQOL in patients with mild to moderate dysfunction of the upper extremities before and after rehabilitation were examined. It concluded that the scale has acceptable good measuring properties and requires a shorter time period for testing. The use of the sub-scale and overall results depend on the type of research. However, to check the reliability, it is necessary to include patients with a wide range of dysfunction in the studies and to use a larger sample.

The study of Vrdoljak and Rumbolt [15] analyzes the quality of life after the stroke of patients in Croatia. In order to evaluate microsocial factors that affect the quality of life, patients and relevant members of their families were examined. The overall values of SSQOL did not differ significantly between patients and family members. However, family members evaluated a somewhat larger role of the patient in the family, mobility and social role than the patients themselves. According to the results, estimates of general functioning and global quality of life can be accepted with confidence.

The study of Lapidlo and associates [16] analyzes the quality of life in the older population. The results

support the hypothesis that older subjects have a relatively high level of QOL, regardless of the degree of cognitive functioning. Their perception of QOL is better than their guardians see it. QOL is more associated with depressive symptoms of the level of dementia when measured by independent statements. The results state that depressive symptoms and cognitive functioning may be important indicators of QOL. Interventions that deal with depression and increased cognitive abilities can help maintain and improve the overall QOL of older people.

CONCLUSION: Results of this study show that the functional recovery of patients after first ischemic stroke is statistically significant in the acute and post-acute phase of physical therapy and rehabilitation. Total and motor recovery of the hand six months after the stroke was significantly better in the group of patients with lacunar syndrome than in the group of patients with the anterior and posterior circulation syndrome. Patients with posterior circulation syndrome had a better overall and motor recovery of the hand compared to patients with the anterior circulation syndrome. Localization and size of the stroke affect and determine the degree of functional recovery of patients, time needed for rehabilitation and outcome of rehabilitation. It has been shown that the quality of life six months after stroke is significantly better for the patients in all three analyzed groups but without significant differences between the groups.

REFERENCE:

1. McDowell F. Stroke rehabilitation. In: Welch KMA, Caplan LR, Reis DJ, Siesjo BK, Weir B (eds) Primer on Cerebrovascular Diseases. San Diego, Academic Press. 1997; 740-744.
2. Lušić I, Lušić V. Kvaliteta života nakon moždanog udara. U: Nemotorni simptomi nakon moždanog udara. Zagreb, Medicinska naklada. 2015; 257-262.
3. Anderson C, Laubscher S, Burns R. Validation of the short form 36 (SF-36) health survey questionnaire among stroke patients. 1996; Stroke 27: 1812-1816.
4. Carr JH, Shepherd RB, Nordholm L, Lynne D. Investigation of a new motor assessment scale for stroke patients. Phys Ther. 1985; 65: 175-180.
5. Williams LS, Weinberger M, Harris LE, Clark DO, Biller J. Development of a stroke-specific quality of life scale. Stroke. 1999; 30: 1362-1369.
6. Salgado AV, Ferro JM, Gouveia-Oliveira A. Long term prognosis of first-ever lacunar strokes. A hospital-based study. Stroke. 1996; 27:661.
7. Hommel M, Besson G. Clinical features of lacunar and small deep infarcts at specific anatomical sites. Adv Neurol. 1993; 62: 161.

8. Thompson PD. Rigidity and spasticity. In: Jankovic J, Tolosa E (eds) Parkinson's diseases and movement disorders. Baltimore, Williams and Wilkins. 1998; 755-762.
9. English CK, Hillier SL, Stiller K, Warden A. The sensitivity of three commonly used outcome measures to detect change amongst patients receiving inpatient rehabilitation
10. Kong KH, Lee J. Temporal recovery and predictors of upper limb dexterity in the first year of stroke: a prospective study of patients admitted to a rehabilitation centre. *NeuroRehabilitation*. 2013; 32: 345-50.
11. Krančiukaite D, Rastenyte D. Measurement of quality of life in stroke patients. *Medicina*. 2006; 42: 709.
12. Williams LS, Weinberger M, Harris LE, Clark DO, Biller J. Development of a stroke-specific quality of life scale. *Stroke*. 1999; 30: 1362-1369.
13. Huang Y, Wu Ch, Lin K, Hsieh Y, Snow W, Wang T. Determinants of Change in Stroke-Specific Quality of Life After Distributed Constraint-Induced Therapy. *Am J Occup Ther* 67. 2013; 54–63.
14. Chen H, Wu Ch, Lin K, Li M, Yu H. Validity, Reliability and Responsiveness of a Short Version of the Stroke-Specific Quality of Life Scale In Patients Receiving Rehabilitation. *J Rehabil Med*. 2012; 44: 629–636.
15. Vrdoljak D, Rumboldt M. Quality of life after stroke in Croatian patients. *Coll Antropol*. 2008; 32: 355-359.
16. Lapid M, Rummans T, Boeve B, McCormick J, Pankratz Sh, Cha R, Smith G, Ivnik R, Tangalos E, Petersen R. What is the quality of life in the oldest old? *Int Psychogeriatr*. 2011; 23: 1003–1010.