

# THE PATTERN OF NEUROLOGICAL DAMAGE IN PATIENTS WITH ISCHEMIC STROKE AND THEIR EARLY RECOVERY – STUDY REPORT –

CĂTĂLIN COSMIN MUTU<sup>1</sup>, CLAUDIA ȘTEFANIA SPÎNU<sup>2</sup>

<sup>1</sup>“Lucian Blaga” University Sibiu, Clinical County Emergency Hospital of Sibiu, CVASIC Research Centre, Sibiu

<sup>2</sup>Clinical County Emergency Hospital of Sibiu

**Keywords:** ischemic stroke, neurological impairment pattern, early recovery, NIHS scale

**Abstract:** NIHS scale is the largest worldwide tool used by doctors in order to objectively quantify the severity of neurological impairment in acute stroke, in the initial stage as well as in the subsequent stages. The aim of this paper is to present the results of an observational, prospective, analytical study on a number of 85 patients with acute ischemic stroke, hospitalized within two months in the Neurology Clinic of Sibiu. NIHS scale has been evaluated at all patients on the first day of the admission and at the discharge date. The objective was to determine the pattern of neurological damage in patients and to achieve correlations between the extent of neurological damage and their early recovery potential consistent with TOAST subtypes of stroke. **Conclusions:** The pattern of neurological impairment is specific for each subtype of ischemic stroke. Early recovery of motor deficits is subtype dependent. Recovery of cognitive deficits and language is not subtype dependent. The degree of early recovery was 45,12% (average 9.9 days stay in hospital care) with a maximum of 51.54% for UE stroke subtype and a minimum of 38.98% for LAA stroke subtype.

## INTRODUCTION

Stroke represents one of the leading causes of morbidity and mortality worldwide. Ischemic stroke is a heterogeneous disease with distinct subtypes, each of them presenting specific etiological, pathogenesis and clinical aspects.(1)

As a clinician-reported measure of global disability, modified Rankin Scale (mRS) and National Institute of Health Stroke Scale (NIHS scale) are the tools used by doctors in order to objectively quantify the severity of neurological impairment in acute ischemic stroke, in the initial stage as well as in the subsequent stages.(1,2,3)

As patient-reported measure, there are proposed new scales for measure the primary outcome in clinical stroke trials such as: the Patient-Reported Outcome Measure Information System (PROMIS) and Quality of Life in Neurological Disorders (NeuroQoL) scales.(4,5)

## AIM

The aim of this study was the assessment of the neurological impairment, as well as the assessment of the short-term evolution of inpatients in the Neurology Clinic of Sibiu, by analyzing the dynamics of all 11 items of the NIHS scale in the two key moments of hospitalization (admission and discharge).

## MATERIALS AND METHODS

We conducted an observational, prospective, analytical study on a number of 85 patients with acute ischemic stroke, hospitalized within two months in the Neurology Clinic of Sibiu. NIHS scale has been evaluated at all patients on the first day of the admission and at the discharge date.

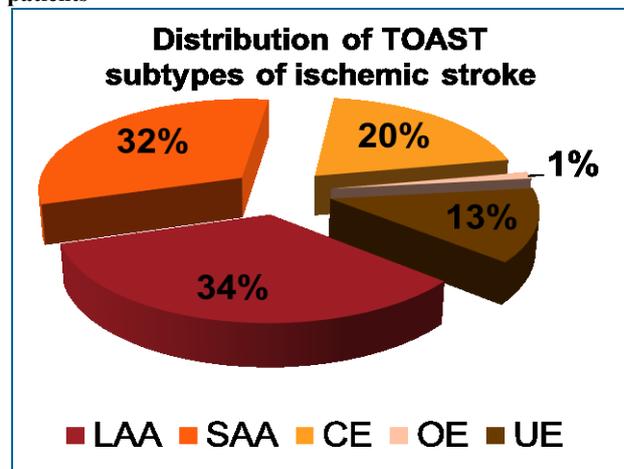
The primary objective was to establish correlations between the degree of recovery of patients and TOAST subtypes of stroke. The secondary objective was to determine the pattern

of neurological damage in patients included in study and to achieve correlations between the extent of neurological damage and the recovery of patients and TOAST subtypes of stroke.

## RESULTS

The 85 patients with acute ischemic stroke (average age 71,42 years) that were included in the current study, were divided according to TOAST classification criteria, as follows: 29 (34,11%) LAA subtype - stroke due to large artery atherosclerosis, 17 (20%) CE subtype - stroke due to cardioembolism, 27 (31,76%) SAA subtype stroke due to small vessel occlusion, 1 (1,17%) OE subtype - stroke of other determined etiology and 11 (12,94%) EU subtype - stroke of undetermined etiology.

Figure no. 1. TOAST subtypes of ischemic stroke in studied patients



<sup>1</sup>Corresponding author: Cătălin Cosmin Mutu, Str. Pompeiu Onofreiu, No. 2-4, Sibiu, România, E-mail: cosminmutu@yahoo.com, Phone: +40742 931011

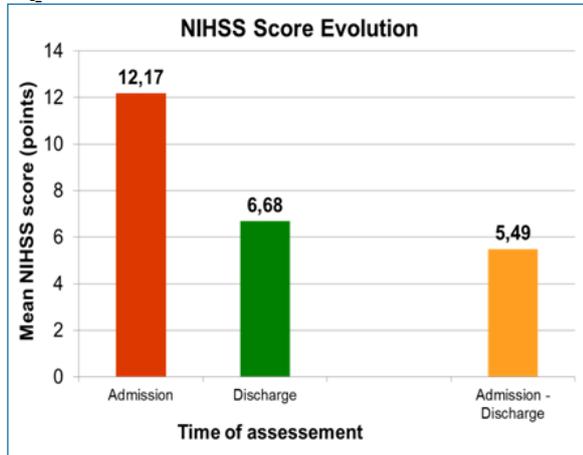
Article received on 20.07.2019 and accepted for publication on 28.08.2019  
ACTA MEDICA TRANSILVANICA September;24(3):63-65

## CLINICAL ASPECTS

In our clinic, the average hospitalization period of the patients involved in this study was 9,9 days.

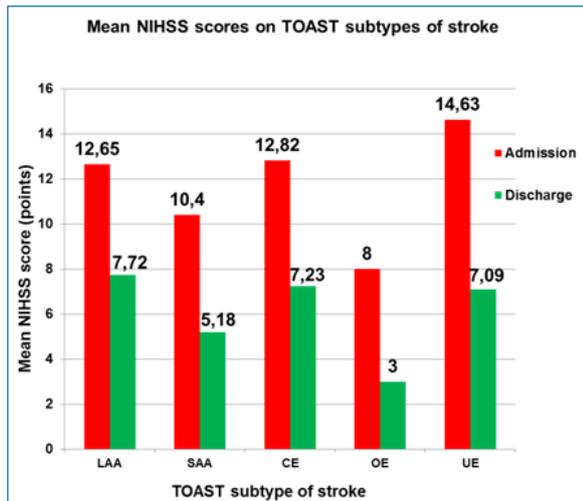
For the whole study group, the mean value of NIHSS score at admission was 12,17 points and at discharge it was 6,68 points. From a global, comprehensive perspective, during the hospitalization in our clinic, the degree of early recovery of neurological deficits was 45,12%.

**Figure no. 2. Evolution of NIHSS Score from global perspective**



The mean value of NIHSS scale at admission and at discharge (A/D) has varied as follows: 12,65/7,72 points for the LAA subtype, 10,4/5,18 points for SAA subtype, 12,82/7,23 points for CE subtype, 8/3 points for OE subtype and 14,63/7,09 points for EU subtype of stroke.

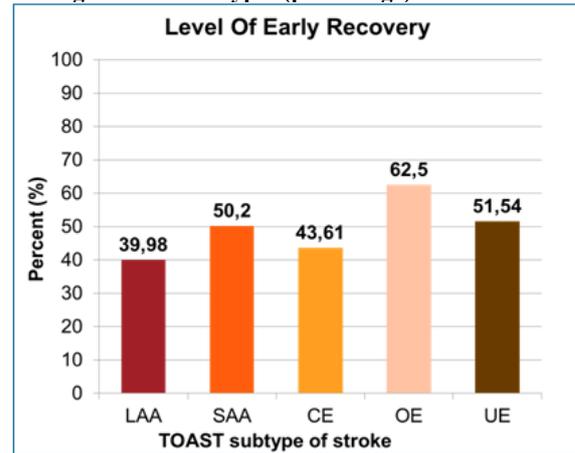
**Figure no. 3. Mean NIHSS scores and its variations from admission to discharge according to different subtypes of stroke**



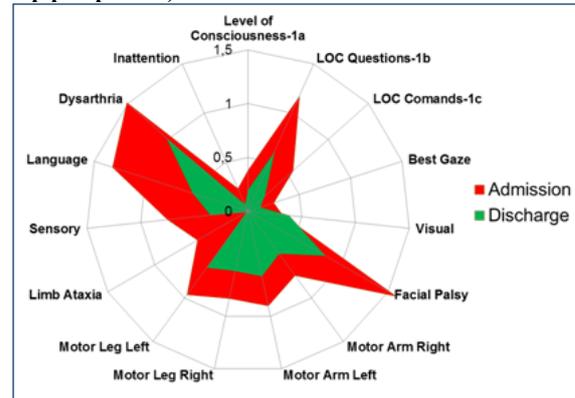
The highest grade of early recovery was observed at patients with other determined etiology of stroke subtype (OE – 62,5%), followed by patients with stroke due to small artery occlusion (SAA – 50,2%) and by patients with cardioembolic stroke (CE – 43,61%). The lowest grade of early recovery was observed at patients with stroke due to large artery atherosclerosis (LAA – 39,98%).

The data from our study revealed that facial palsy and language functions were more affected (maximal scores) compared with cognitive and sensory functions (minimal scores), independently of the subtypes of stroke, as it can be seen in next suggestive radar type charts

**Figure no. 4. Level of overall neurological improvement according to stroke subtypes (percentage)**

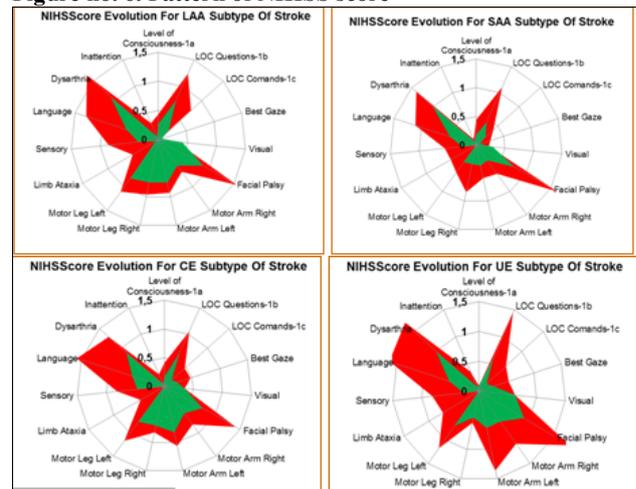


**Figure no. 5. Mean scores for each item of NIHSS scale (whole group perspective)**



Studying the pattern of neurological damage in the first and in the last day of hospitalization in each patient from this study group, correlated with the own subtype of ischemic stroke, let us to observe specific patterns of recovery. Recovery of the upper limbs motor deficit was significantly greater in patients with SAA and EU stroke subtypes compared with the recovery of patients with LAA and CE subtypes. Recovery of cognitive and language deficits has not varied depending on the stroke subtypes (see next radar type charts).

**Figure no. 6. Pattern of NIHSS score**



## CLINICAL ASPECTS

### DISCUSSIONS

According to TOAST classification, the incidence of stroke subtypes we found, overlaps with the values described in the literature, except for the stroke of undetermined etiology which has a higher incidence in our country, probably due to low diagnostic efficiency specific to our region.(6,7,8)

The mean value of NIHSS scale at admission and at discharge (A/D) has varied as follows: 12,65/7,72 points for the LAA subtype, 10,4/5,18 points for SAA subtype, 12,82/7,23 points for CE subtype, 8/3 points for OE subtype, 14,63/7,09 points for EU subtype of stroke and 12,17/6,02 points for the whole study group.

At the admission in hospital, the highest mean value of NIHSS score was encountered at the patients with stroke due to undetermined etiology (14,63 points) followed by the patients with cardioembolic stroke (12,82 points) and by those with stroke due to large artery atherosclerosis (12,65 points).(8,9)

At discharge, the patients with stroke due to large artery atherosclerosis were most affected in terms of NIHSS score (mean 7,72 points).

According to our study, facial palsy and language functions were more impaired compared with cognitive and sensory functions, independently of the stroke subtypes. Motor functions were moderately impaired, and mild recovery was observed in the entire study group.(10,11)

Recovery of the upper limbs motor deficit was significantly greater in patients with SAA and EU stroke subtypes compared with the recovery of patients with LAA and CE subtypes. Recovery of cognitive and language deficits has not varied depending on the stroke subtypes. The visual deficit had zero recovery during hospitalization.

### CONCLUSIONS

The pattern of neurological impairment is specific for each subtype of ischemic stroke.

Early recovery of motor deficits is dependent on the subtype of stroke.

Recovery of cognitive deficits and language is independent on the subtype of stroke.

During hospitalization in our clinic the degree of early recovery for the whole study group was 45,12%.

The degree of early recovery has been maximum (51,54%) for patients with stroke from undetermined cause and minimum (38,98%) for the stroke due to large artery atherosclerotic disease.

There is needed for better therapeutical strategies to be implemented in our clinic regarding medical management of the patients with stroke (thrombolytic therapy with IV tPA, mechanical thrombectomy in acute ischemic stroke) to improve the quality of recovery and as well the quality of our patient's life after stroke.

### REFERENCES

1. Adams HP Jr, Davis PH, Leira EC, Chang KC, Bendixen BH, Clarke WR, et al. Baseline NIH Stroke Scale Score Strongly Predicts Outcome after Stroke: A report of the Trial of Org 10172 in Acute Stroke Treatment (TOAST). *Neurology*. 1999;53(1):126-31.
2. Lyden P. Using the National Institutes of Health Stroke Scale: a cautionary tale. *Stroke*. 2017;48:513-519.
3. Harrison JK, McArthur KS, Quinn TJ. Assessment scales in stroke: Clinimetric and clinical considerations. *Clin Interv Aging*. 2013;8:201-211.
4. Muir, K. W., Weir, C. J., Murray, G. D., Povey, C., & Lees, K. R. Comparison of neurological scales and scoring systems for acute stroke prognosis. *Stroke*. 1996;27(10):1817-1820.
5. Katzan IL, Thompson N, Uchino K. Innovations in stroke: the use of promis and neuroqol scales in clinical stroke trials. *Stroke*. 2016;47:e27-e30.
6. Coleman, ER, Moudgal, R, Lang, K. Early rehabilitation after stroke: a narrative review. *Curr Atheroscler Rep*. 2017;19(12):59.
7. Rondina JM, Park CH, Ward NS. Brain regions important for recovery after severe post-stroke upper limb paresis. *J Neurol Neurosurg Psychiatry*. 2017;88:737-743.
8. Kwah LK, Harvey LA, Diong J, Herbert RD. Models containing age and NIHSS predict recovery of ambulation and upper limb function six months after stroke: an observational study. *Journal of physiotherapy*. 2013;59(3):189-197.
9. Fonarow GC, Saver JL, Smith EE, Broderick JP, Kleindorfer DO, Sacco RL, et al. Relationship of National Institutes of Health Stroke Scale to 30-day Mortality in Medicare Beneficiaries with Acute Ischemic Stroke. *In: J Am Heart Assoc*. 2012;1(1):42-50.
10. Lee KB, Lim SH, Kim KH, Kim KJ, Kim YR, Chang WN, et al. Six-month functional recovery of stroke patients: a multi-time-point study. *Int J Rehabil Res*. 2015;38(2):173-180.
11. Stinear C. Prediction of recovery of motor function after stroke. *The Lancet Neurology*. 2010;9(12):1228-1232.