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Relationship of Speech and Language Disorders to Lateralization of Functional Impairments After Stroke

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Aim of study is to determine SLD presence in relation to patient age, sex, functional impairment side of the body and the smoking habits.

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I. INTRODUCTION

Reduced, or completely interrupted blood flow to certain parts of the brain, caused by a variety of factors is the most common cause of stroke. There is a reduced or absent ability for speech and language communication, frequently, as a result of a stroke.

Stroke became comprehensive socio-economic and health problem what is obvious from estimation which shows that in the USA there are more than five million people who have survived stroke. From them, 33% have a speech language disorder (SLD). It Prediction for the future is growth of rates in the so-called third age, especially in the developed countries of the world. Ageing will also increase the incidence of stroke, and number of people with damaged speech and language communication. follows that the USA is currently home to more than a million people with aphasia or other SLD (8).

In Italy, approximately 150,000 people suffer from aphasia after stroke. Although most people regain at least some language functions, between 30 and 43% of those affected remain severely aphasic 18 months

after stroke. Among different language functions, difficulty finding words are usually most frequent, pervasive and persistent disorder (4).

In developed countries, the incidence of stroke is declining -mainly due to preventative measures. Day JC. (2001) states that from 1950 to 2006, in the United States of America the population grew from 151 to 299 million people. The fastest growth is in population 75 years and older. Between 2006-2030 the age of 65-74 years will increase by 6-10% of the total population. Population aged 75 and more will grow from 6 % in 2006 to 9% in 2030 and continue Effects on sensory and motor functions of the body to grow to 12% in 2050 year (2).

Nearly three-quarters of all strokes occurs in people older than 65 years. The risk of having a stroke more than doubles each decade after the age of 55. Almost one quarter of stroke occurring in people under age 65 years (14).

Risk factors that can't be control by prevention measures for cerebrovascular diseases are: age, gender, race, ethnicity, genotype, previous myocardial infarction, transient ischemic attack or stroke. Risk factors that may be controlled by preventive measures and treatment are: diabetes, hyperlipidemia, hypertension, atrial fibrillation, coronary and/or peripheral arterial disease, obesity, physical inactivity, stress, alcohol and tobacco abuse (3).

According to research by the American Centers for Disease Control and Prevention and heart attack and stroke, published by the American Heart Association, the risk of ischemic stroke among smokers is doubled compared to non-smokers, regardless other risk factors. Atrial fibrillation is an independent risk factor for stroke, and it increases the risk of stroke by about five times. High blood pressure is the most important risk factor for a stroke (14).

Functional damage will occur in different modalities depending on the localization of brain damage.

Effects on sensory and motor functions of the body are usually expressed through the degree of neurological deficit. Pathological changes in the brain caused by stroke are topographically deployed at different sites of the brain. Concerning functionally impaired side of the body, Savić, G. & Iriskic A. (2011)

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on a sample of 681 patients were found that 46.5% of the sample was from the right-sided, 42.7% of the left-sided and 4.55% with bilateral impairments. For 6.2% of the sample there was no information about lateralization of neurological disorders (10).

On the same sample was found that in the beginning of rehabilitation, 37% of the sample had show significant speech and language impairments. Presence of SLD was for right-sided damaged 67.32%, 22.57% for left-sided and with both sides was 4.57%. Missing data for 5.14% of the sample. Processes and activities of certain brain regions involved in speech communication are rarely present in both hemispheres. Speaking, reading and writing are controlled by the left hemisphere. Less known is the role of the right hemisphere and subcortical areas in these functions. Lexical and grammatical knowledge show hemispheric specialization. Speech and language functions are predominantly a function of the left hemisphere, i.e. the left hemisphere is dominant for language in most people. Right hemisphere has role in the understanding of prosody (the color and tonality of verbal statements). Research shows that the brain lobes have different roles in speech (9).

II. THE AIM OF THE RESEARCH

The aim of the study was to describe some of qualitative and quantitative variables at patients in

period in one year after stroke. The data refer to: - Characteristics of the sample concerning age, sex, comorbidity, and the time onset stroke. -Relationship between speech and language disorders to sex, age, type of stroke, smoking, and lateralization of functional impairment the body after stroke.

III. METHODOLOGY

The research is based on an analysis from anamnesis data taken from medical records of patients involved in rehabilitation and speech therapy after a stroke in the Neurology department IPRM Dr M. Zotović in Banja Luka, in the period 01.03.2011.to 29.02.2012. The sample is 746 patients. After entering the data into a software program SPSS for Windows v.17 results obtained on age, gender, etiology of stroke, functional damage to the body, the presence of smoking, were set up a relationship with the emergence of SLD. From the results we get adequate conclusions.

IV. RESULTS

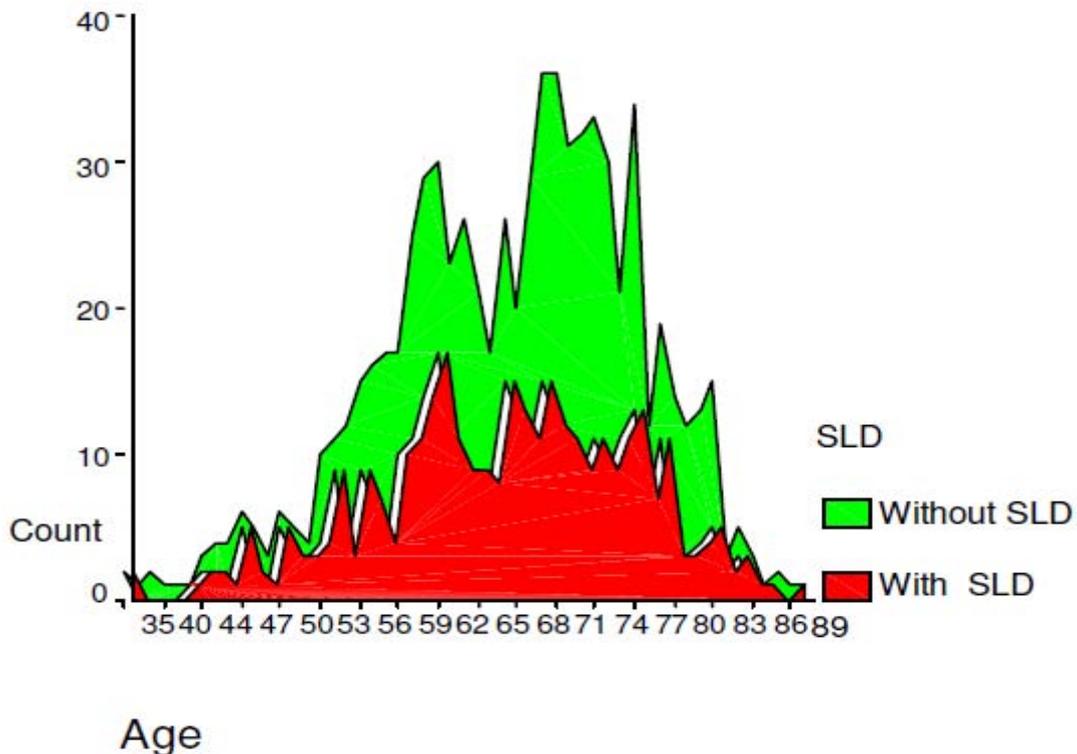


Figure no 1 : Age in relation to the occurrence of speech and language disorders (SLD)

Table no 1 : Time of involvement in the rehabilitation of patients in the sample in relation to onset stroke

| Patients | Day onset stroke ≤ 30 | | Day onset stroke ≤ 60 | | Day onset stroke ≤ 180 | | Total |
|-------------|--------------------------|---------|--------------------------|---------|---------------------------|---------|-------|
| | N | Percent | N | Percent | N | Percent | |
| Without SLD | 204 | 48.2 | 285 | 67.4 | 343 | 81.1 | 423 |
| With SLD | 174 | 54.2 | 274 | 84.8 | 292 | 90.4 | 323 |
| Total | 379 | 50.8 | 559 | 74.9 | 635 | 85.1 | 746 |

Table no 2 : Type of stroke in relation with present SLD

| Typ of stroke | Patients without SLD | | Patients with SLD | | Total | |
|-------------------------|----------------------|---------|-------------------|---------|-------|---------|
| | N | Percent | N | Percent | N | Percent |
| Ischemia | 296 | 39.7 | 241 | 32.3 | 537 | 72.0 |
| Intracranial hemorrhage | 44 | 5.9 | 33 | 4.4 | 77 | 10.3 |
| Ischemia with HIC | 3 | 0.4 | 8 | 1.1 | 11 | 1.5 |
| Subarachnoid hemorrhage | 5 | 0.7 | 2 | 0.2 | 7 | 0.9 |
| Ischemia/atrophia | 4 | 0.6 | 2 | 0.2 | 6 | 0.8 |
| Missing data | 58 | 7.8 | 30 | 4.0 | 88 | 11.8 |
| Other | 13 | 1.7 | 7 | 1.0 | 20 | 2.7 |
| Total | 423 | 56.7 | 323 | 43.3 | 746 | 100.0 |

Table no 3 : Data on comorbidity in the sample taken from medical records

| Comorbidity | Patients without SLD | | Patients with SLD | | Total | |
|------------------------|----------------------|---------|-------------------|---------|-------|---------|
| | N | Percent | N | Percent | N | Percent |
| Hypertension arterials | 103 | 13.8 | 82 | 10.9 | 185 | 24.8 |
| Thrombosis | 0 | 0 | 2 | 0.3 | 2 | 0.3 |
| Tm cerebral | 5 | 0.6 | 4 | 0.5 | 9 | 1.2 |
| Diabetes mell. | 27 | 3.6 | 21 | 2.8 | 48 | 6.4 |
| Heart disease | 49 | 6.5 | 50 | 6.7 | 99 | 13.3 |
| Two and more factors | 155 | 20.7 | 108 | 14.4 | 263 | 35.3 |
| Other | 33 | 4.4 | 19 | 2.5 | 52 | 7.0 |
| Atherosclerosis | 3 | 0.4 | 3 | 0.4 | 6 | 0.8 |
| Unknown | 13 | 1.7 | 18 | 2.4 | 31 | 4.2 |
| No risk factors | 35 | 4.6 | 16 | 2.1 | 51 | 6.8 |
| Total | 423 | 56.7 | 323 | 43.2 | 746 | 100.0 |

Table no 4 : Relation of SLD to smoking habits and age of the patients tested sample

| Smoking | Age | | | SLD | | |
|----------------------|-----|-------|---------|---------------------|------------------------|-------|
| | N | Mean | Percent | N Patients with SLD | N Patients without SLD | Total |
| Smokers | 146 | 62.88 | 19.6 | 80 | 66 | 146 |
| Occasionally smokers | 21 | 67.76 | 2.8 | 9 | 12 | 21 |
| Non smokers | 395 | 68.71 | 52.9 | 168 | 227 | 395 |
| Missing data | 138 | 69.37 | 18.5 | 50 | 88 | 138 |
| Quit smoking | 46 | 66.08 | 6.2 | 16 | 30 | 46 |
| Total | 746 | 67.50 | 100.0 | 323 | 423 | 746 |

Table no 5 : SLD in relation to functional impairment side of the body

| Side of the body | Patients without SLD | | Patients with SLD | | Total | |
|------------------|----------------------|---------|-------------------|---------|-------|---------|
| | N | Percent | N | Percent | N | Percent |
| Right | 98 | 13.1 | 238 | 31.9 | 336 | 45.0 |
| Left | 278 | 37.2 | 65 | 8.7 | 343 | 45.9 |
| Both side | 19 | 2.5 | 10 | 1.3 | 29 | 3.8 |
| Missing data | 1 | 0.1 | 1 | 0.1 | 2 | 0.2 |
| No impairment | 27 | 3.6 | 9 | 1.2 | 36 | 4.8 |
| Total | 423 | 56.7 | 323 | 43.2 | 746 | 100.0 |

V. DISCUSSION

In the rehabilitation has been involved 746 patients with stroke. From the anamnesis data, taken from medical records, during the acute phase of the disease, were registered speech and language problems in 323 patients, or 43.3% of the entire sample.

Due to difficulties in verbal communication to speech therapist evaluation and treatment, 266 were sent or 35.65% of stroke patients. A smaller number of patients, even though had milder SLD, not versed speech therapist. The reason for this is the limited human resources, spatial and temporal capacities of our Institute in this period. The average age of the sample was 67.50 (\pm 9.62) years (Figure no 1). Range of the

sample was 55 years and it was from 35 to 90 years. It is approximately similar to the results of research of other authors in these areas (1, 10, 11, 12).

Under age of 50 was 5.2%; to 60 years, 22.9%; to 70 years 57.4%; to 80 years 92.5% and over 80 years of age was 7.5% of the sample. It is worrisome that the almost quarter of the sample (22.9%) were younger than 60 years, and 40.2% of the sample is younger than 65 years. The data obtained do not agree with the incidence of stroke in the United States, where stroke occurring in people under 65 years of age (14).

Frequency of males is bigger compared to females (54.69%: 45.30%) what is consistent to the results of some research in these geographic areas (10, 11, 12) but not in line with other research which presents

data on the greater representation of females (1, 13, 14, etc.). Differences in the gender structure significantly affect by the cultural, socio-economic, geographic and other factors.

Studies in the USA indicate that the incidence of stroke is higher in females at younger ages, whereas it is vice versa in the older age groups (14). In our study, the incidence in males was higher up to 75 years. After 75 years of age, the incidence was increased in females.

The study of etiology of stroke in Serbia, with a sample of 865 patients with ischemic stroke, aged 15–45 years found the ratio of 486: 379 (56.18%: 43.82%) in favor of males (5).

In the first 10 days of the occurrence of stroke in rehabilitation were included 13 patients or 1.7% of the sample; 30 days after, 50.8%; 60 days 74.9%; to 90 days, 81.1% of the sample. In the first 6 months after stroke in rehabilitation was included 85.1% of the sample. During the first year of the onset of stroke in rehabilitation was included 88.1% of the whole sample and over a year of stroke were included 11.9% of the sample. Big number of patients was at the renewal of treatment (Table no 1).

The most common type of stroke in the sample is ischemic stroke (72%). Intracerebral hemorrhage followed with 10.3%, the combination of ischemia and intracranial hemorrhage with 1.5%, and other types of stroke. Data on the type of stroke in the medical records were not found for 11.8% of the sample (Table no. 2).

Analysis of the age structure in relation to the type of stroke in patients with SLD, we found that at 172 patients with ischemic stroke average age was 67.41 years; 24 patients with HIC were younger, had 59.29 years in average.

In 90.0% of patients from the sample, in medical records were registered some diseases which are risk factor for a stroke. The majority of patients had registered two or more diseases. Mostly, it was a combination of heart disease, diabetes mellitus or arterial hypertension. Sequentially registered are diseases as hypertension, heart disease, diabetes and other diseases as shown in the Table no 3.

Results about relationship of age and the onset of stroke, shows that patients in the category of smokers in average had a stroke with 62.88 years. For non smokers, average occurrence of stroke is six years later, average 68.71 years (Table no 4).

Approximately one third of patients in SLD category were smokers, occasional smokers or former smokers. From the category of patients without SLD 25.05% were smokers, occasional smokers or nonsmokers.

Jovanovic, D. et al (2008) exploring the etiology of stroke in younger patients (15-45 years) found that the most commonly present risk factors were smoking (37%), hypertension (35%) and hyperlipidemia (35%).

These risk factors were also higher because for about a third (32%) of the sample were not specified causes because of incomplete data (5).

In the sample were registered 75 different localizations of brain damage which left various functional effects on patients. The most frequent are the consequences in hemiplegic or hemiparesis modalities. The lesions were located on the left, right or both cerebral hemispheres. For 323 patients with SLD largest number of brain lesions is located: multifocal in 56 patients; as CT or MRI findings described as "a lesion in the area of irrigation left MCA" in 21 patients; parietal lobe left in 19 patients; Parietal temporal lobe left at 16 patients; frontal parietal lobe left at 15 patients; frontal parietal temporal lobe left at 13; temporal lobe left at 13; the basal ganglia bilaterally at 9 patients; supratentorial bilateral at 8 patients; frontal lobe left at 7; the basal ganglia left at 7; para and supraventricular left at 7; that 70.83% of patients with right-sided functional para ventricular bilaterally at 7; in the cerebellum at 6; front temporal lobe left in 5 patients. Beside this, brain lesions at 36 locations were found at other patients with SLD.

Kirshner SH, Jacobs HD. (2009) found that language function lateralizes to the left hemisphere in 96-99% of right-handed people and 60% of left-handed people. Of the remaining left-handed people, about one half have mixed hemisphere language dominance, and about one half has right hemisphere dominance. Left-handed individuals may develop SLD after a lesion of either hemisphere, but the syndromes from left hemisphere injury may be milder or more selective than those seen in right-handed people (6).

Knecht et al. (2000) found that in most people, the left side of the brain contains language centers. The incidence of right hemisphere language dominance was found to increase linearly with the degree of left-handedness, from 4% in strong right-handers to 15% in ambidextrous individuals and 27% in strong left handers (7).

In the sample we found approximately equally represented right-sided and left-sided functional impairments of the body (Table No. 5). Patients with right-sided functional impairments of the body were present in 31.9%, with left-sided 8.7%. We found that 70.83% of patients with right-sided functional impairments body had SLD. This confirms findings of Kirshner SH, Jacobs that language function is lateralized in the left hemisphere in most right-handed and 60% left-handed people (6). Damage to the left hemisphere, had consequences in functional impairment right side of the body, some other functions, as well as some modalities of speech and language. 18.95% of patients form the group with functional impairments of left side of the body had SLD. Damage to the right hemisphere consequently have functional impairments of left side of the body but also speech and language centers in patients with right hemispheric dominance, what is

consistent with studies conducted by Knecht et al. (7). 34.48% of patients with bilateral functional impairments had presented SLD. These patients had damaged both cerebral hemispheres. The patients who had damages located at the sites responsible for speech and language functions had SLD.

VI. CONCLUSION

The occurrence of SLD as a result of stroke depends on localization, extent and size of brain lesions. The incidence of stroke is worrisome in a large working-age population.

Most of the patients had registered, in the medical records, some of the diseases that pose a risk factor for stroke. This leads us to urgent taking measures to prevent the onset and appropriate treatment of these diseases.

The largest part of the sample with a right-sided functional impairments body had SLD, as a consequence of the lesion of centers for speech and language function.

A smaller proportion of patients with functional impairments of left side of the body had present GJP. Patients with bilateral functional impairments had a significant presence of SLD, as a consequence of the lesion of centers for speech and language function.

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