BRITISH MEDICAL JOURNAL

British Medical Journal

Volume 2, No.6, November 2022

Internet address: http://ejournals.id/index.php/bmj
E-mail: info@ejournals.id
Published by British Medical Journal
Issued Bimonthly
3 knoll drive. London. N14 5LU United Kingdom
+44 7542 987055

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NEUROIMAGING INDICATORS OF SPEECH DISORDERS IN THE PROGNOSIS OF APHASIA REHABILITATION

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Abstract: One of the main factors affecting the recovery of speech is the localization and size of the lesion, which is visualized with multislice computed tomography (MSCT) of the brain. In this work, neuroimaging parameters of speech disorders were studied in the acute period of ischemic hemispheric stroke and compared for the prediction of speech rehabilitation. The study showed that the more extensive the infarcts in the left hemisphere detected by MSCT of the brain, the more severe speech disorders appear in the form of total sensorimotor aphasia. Conversely, small or cortical lesions were found in patients with dynamic aphasia of ischemic stroke.

Keywords: stroke, speech, aphasia, neuroimaging indicators.

Relevance of the problem

Acute cerebrovascular accident (ACV) is one of the most urgent medical and socio-economic problems. According to the National Stroke Registry of 2019, annually more than 60,000 residents of the Republic of Uzbekistan experience acute cerebrovascular accidents. It ranks second in mortality after myocardial infarction, and speech disorders - aphasia occur in 1/3 of patients who have had a stroke. Risk factors (stress, physical inactivity, obesity, smoking, alcohol, etc.) lead to damage to small and large vessels, which are thrombosed or ruptured, and as a result, vascular accidents occur. A stroke disables a person, leading to movement disorders - hemiparesis, loss of speech and other psychological, cognitive disorders reaching dementia and death. Speech pathology in patients with stroke is often combined with a violation of other higher brain functions, which greatly complicates the process of diagnosis and treatment. Due to the decrease in mortality after stroke and the increase in the proportion of stroke survivors in the general population, one can expect an increase in the prevalence of speech disorders, which makes this problem of particular relevance.

Aphasia is an acute speech disorder that occurs mainly with left-hemispheric strokes or traumatic brain injuries. They lead to severe disability, sometimes being the only obstacle to the return of patients to their activities. As a result of speech disorders, patients are transferred to disability groups 1 and 2 without the right to work. With aphasia, speech activity is disturbed in all its manifestations: oral and written speech, understanding of someone else's speech, the ability to name, the grammatical structure of speech, etc. Diagnosis and rehabilitation of post-stroke aphatic speech disorders is extremely difficult, and the time required to restore speech is individual for each patient and takes from several weeks to several years. Many studies pay attention to the relationship between post-stroke speech recovery and rehabilitation prognosis. Are unclear or controversial factors such as [1, 6, 10, 13, 15, 21, 22] the size of the ischemic focus, localization, lateralization and other indicators. This situation is due to

the heterogeneity of the group of patients in the study (the nature and pathogenetic type of stroke, the topography and size of cerebral ischemia, the methods for assessing and interpreting neuroimaging parameters, the severity of the neurological defect from the onset of the disease, the use of different methods in assessing post-stroke disorders (clinical scales, neuroimaging technologies). Despite the variety of types of localization and subsequent functional restructuring of cerebral infarctions, damage to the primary motor cortex in the affected hemisphere is a decisive factor in the recovery process [6]. functional MRI-fMRI, etc. In view of the insufficiently studied problem of speech post-stroke aphatic disorders and the connection with neuroimaging, we decided to study MSCT of patients with speech disorders starting from acute period of hemispheric strokes.

The purpose of the study

The aim of our work was to study the neuroimaging parameters of speech disorders in the acute period of ischemic hemispheric stroke and to compare data for the prognosis of speech rehabilitation.Research material and methods

We examined 60 patients who were hospitalized in the intensive neurology department of the Tashkent Medical Academy for the period from 2021-2022 with a diagnosis of acute cerebrovascular accident of the ischemic type in the basin of the middle cerebral artery with various speech disorders. There were 38 men, 22 women. In all patients, the diagnosis of stroke was verified by computed tomography or multislice tomography of the brain. All patients were conscious at the time of the examination and were available for verbal contact. The study was conducted with the consent of the patients and did not contradict generally accepted ethical standards. The basis for including patients in the study group were the following criteria: the presence of severe speech disorders - (total - sensorimotor, motor or sensory aphasia) in the acute period of stroke; localization of cerebral infarction in the left hemisphere; the absence of pronounced disorders of memory, attention and intelligence before the development of a stroke, which led to the development of aphasia; lack of data on ambidexterity and left-handedness. The state of speech functions was compared with MSCT or CT data of the brain. An important advantage of multispiral computed tomography was the speed of execution and the absence of discomfort during the study.

Clinical and neurological examination was carried out according to generally accepted standards, which included a thorough questioning of the history of the disease, clarification of the causes of concomitant diseases such as hypertension, diabetes mellitus, coronary artery disease and other somatic diseases. Neurological status according to the generally accepted scheme, elucidation of the forms of aphasia in the classification of A.R. Luria. In accordance with it, seven forms of aphasia are distinguished: efferent motor aphasia, afferent motor aphasia, dynamic aphasia, acoustic-gnostic aphasia, acoustic-mnestic aphasia, semantic aphasia, amnestic aphasia.

Group 1 included 28 patients who had motor aphasia; the 2nd group of the study included 12 patients with dynamic aphasia, and the 3rd group of the study consisted of 20 patients with total aphasia (patients had signs of both motor and sensory aphasia). As can be seen from the table, the male sex prevailed among the patients. By age, advanced age prevailed 64.0 +_ 1.3.

In patients of group I (28), ischemic foci in the area of the left middle cerebral artery were detected in 11 (39.3%) patients, signs of discirculatory encephalopathy and atrophy of the brain substance in 13 (46.4%) patients, a combination of lacunar infarction and infarction of the terminal branches was detected in 4(14.3%).

In the II(12) group of patients, ischemic foci in the area of the left middle cerebral artery were detected in 3 (25.0%), in 2 (16.7%) lacunar foci, in 7 (58.3%) - signs of

atrophy and dyscirculatory encephalopathy in the form deepening of the furrows of the cerebral cortex, small foci of ischemia in the periventricular region.

In patients of group III (20), a combination of huge foci of ischemia, foci of destruction in the subcortical areas, signs of discirculatory encephalopathy before the disease were revealed in all 100% of the examined patients.

MSCT	I group (n=28)		II group (n=12)		III group (n=20)		Total	
	Abs.	%	abs.	%	abs.	%	abs.	%
Ischemia in the zone of the middle cerebral artery on the left	11	39,3 ±9,4	3	25,0±13,1	20	100*^	34	56,7±6,5
Signs of discirculatory encephalopathy, atrophy of the substance of the brain	13	46,4 ±9,4	7	58,3±14,9	20	100*^	40	66,6,± 5,9
Lacunar stroke, stroke in the terminal branches	4	14,3 ±4,3	2	16,7±11,2	-	-	5	10,0±3,6

Note: * - I - the difference compared to group I is significant (*-P<0.001)
^ - II - the difference compared to group indicators is significant (^-P<0.001)

In group 1, in 28 patients with motor aphasia, speech recovery after 1 day was observed in 7% of patients, within 3-5 days in 7.1%, within 1 week in 14.3% of patients, by the end of the 1st month in 57% and without the dynamics of recovery of speech disorders in 7.1% of patients.

In group 2, 12 patients with dynamic aphasia were mainly diagnosed with dysarthria, speech recovery during the day was noted in 16.7%, within 3 days in 50%, within 5 days in 8.3%, within 1 week in 16, 7% of patients.

In group 3, in 20 patients with total aphasia, speech recovery was noted only in 1 patient.

The influence of infarct size on the dynamics of speech recovery was considered in 2 directions.

1.As the size of the infarct increased in the basin of the left middle cerebral artery, which is functionally important for speech, speech disorders were more severe, and recovery was very slow.

2.As the size of the infarction increases, many connections between the various branches of the brain that may be involved in compensating for the developed defect are

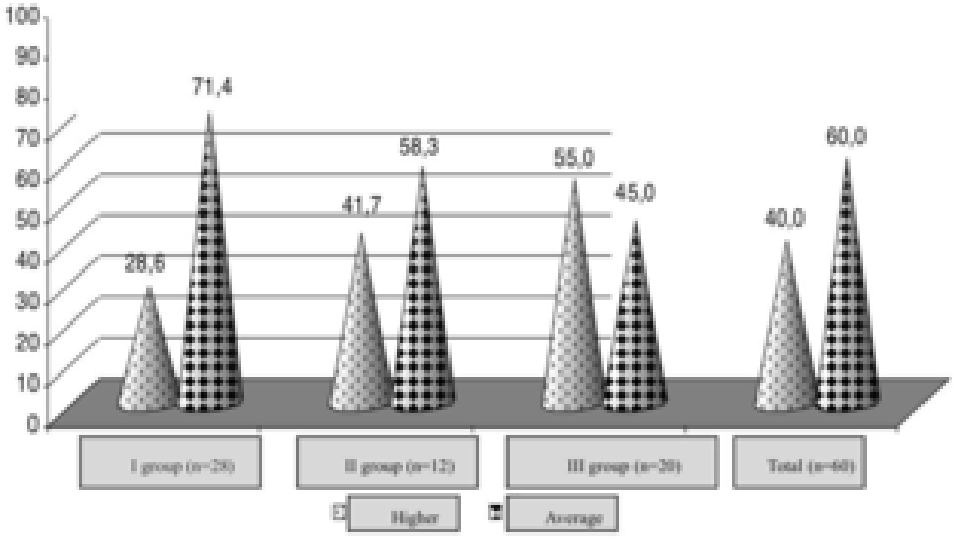
blurred, the number of damaged branches increases, which also reduces the regression of speech disorders.

We analyzed speech recovery in patients with different levels of education and different types (mental and physical) of labor activity. It was assumed that in people whose professional activities writing and reading occupy an important place in life, they have large areas of the brain involved in the implementation of the speech function, and thus their functional speech connections are more developed than in people of physical labor, which could determine their best indicators of speech recovery.

Considering that the education factor is important in the recovery of aphasia, we divided them into 2 groups: patients with secondary education and those with higher education. Patients with higher education accounted for 40%, and with secondary education 60% of patients.

	Education			
	Higher		Average	
	abs	%	abs	%
I group (n=28)	8	28,6	20	71,4
II group (n=12)	5	41,7	7	58,3
III group (n=20)	11	55,0	9	45,0
Total (n=60)	24	40,0	36	60,0

In the 1st group of patients with secondary education was 71.4%, in the 2nd group 58.3% of the patient. Patients with higher education amounted to 55%, in group 3 there were more than in the 2nd - 41%; and in group 1 29%. The following professions were among our patients: entrepreneurs 36.7%, drivers 16.7%, housewives 13.3%, engineers and teachers 6.7% each, farmers, cooks 3.3% each, agronomists, accountants, policeman, dressmaker, electricians and other professions by 1.7%.



The results of the study could not confirm our assumption and only a tendency was revealed towards a slightly better recovery of speech in patients with higher education and engaged in mental work. The worst recovery was noted in group 3, in which total aphasia was observed in the acute period.

In this group of patients, neuroimaging revealed foci of leukomalacia extending to both speech zones. On MSCT or CT of the brain, due to moderate and not extensive lesions in Broca's and Wernicke's areas, gross motor or sensory aphasia occurred in the acute period of stroke. But in the future, since the lesion was larger in the cortical foci, we observed less pronounced motor or sensory disorders due to a significant regression of speech disorders. A greater lesion of the left hemisphere involving two speech areas caused gross total or sensorimotor aphasia in patients of the 3rd group.

Comorbid somatic disease in all examined patients 100% revealed hypertension. The combination of risk factors for hypertension, coronary heart disease and diabetes mellitus was more often observed in patients of the 3rd group - with total aphasia.

Conclusion.

Stroke invalidating the personality, leads to motor and cognitive disorders - loss of speech. The study of neuroimaging parameters of speech disorders in the acute period of stroke is of great importance for differentiating the type and type of stroke, and is necessary for comparing data in predicting speech rehabilitation. One of the main factors affecting the recovery of speech is the localization and size of the lesion, which is visualized with multislice computed tomography (MSCT) of the brain. In this work, we studied the neuroimaging parameters of speech disorders in the acute period of ischemic hemispheric stroke and compared them to predict speech rehabilitation. The study revealed that the more extensive the infarctions in the left hemisphere detected by MSCT of the brain, the more severe speech disorders appear in the form of total sensorimotor aphasia. Conversely, small or cortical lesions were found in patients with dynamic aphasia of ischemic stroke.

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