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Нарушения социальных когнитивных функций у пациентов в остром периоде ишемического инсульта

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АННОТАЦИЯ

Обоснование. Нарушение когнитивных функций широко распространено после инсульта. Однако состояние социальных когнитивных функций, в частности модели психического состояния, у данной категории пациентов изучено недостаточно.

Цель. Изучить частоту и предикторы развития нарушений социальных когнитивных функций по модели психического состояния у пациентов в остром периоде ишемического инсульта.

Материал и методы. Нарушения модели психического состояния оценивали однократно с помощью теста чтения психологического состояния по взгляду в остром периоде ишемического инсульта. Выраженность неврологического дефицита определяли по шкале Национального института здоровья, степень инвалидизации — по модифицированной шкале Рэнкина, симптомы делирия — по шкале оценки тяжести делирия, выраженность агрессивного поведения — по шкале агрессивности Buss Perry. Когнитивный дефицит определяли с помощью Монреальской шкалы когнитивной оценки, степень корковой атрофии — по результатам компьютерной томографии головного мозга. В исследовании были включены 86 пациентов — 53 мужчины и 33 женщины. Средний возраст составил 64 года. Статистическая обработка проведена с помощью пакета программ IBM SPSS Statistics 21. В анализе использовали методы непараметрической статистики. Бинарные данные сравнивали с помощью параметра χ^2, категориальные данные — посредством теста Манна–Уитни.

Результаты. У 70% пациентов отмечены нарушения социальных когнитивных функций. Независимыми предикторами нарушения модели психического состояния по данным линейного регрессионного анализа были нарушения когнитивных функций по Монреальской шкале когнитивной оценки (p=0,0001) и выраженность корковой атрофии по данным компьютерной томографии головного мозга (p=0,001).

Вывод. Нарушения социальных когнитивных функций встречаются у значительной части пациентов в остром периоде инсульта, к числу их клинических предикторов можно отнести наличие когнитивных расстройств и корковой атрофии.

Ключевые слова: *социальные когнитивные функции, инсульт, модель психического состояния, деменция*.

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Impairment of social cognitive functions in the patients with acute ischemic stroke

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ABSTRACT

BACKGROUND. Cognitive impairment is common after a stroke. However, the condition of social cognitive functions, in particular theory of mind, in this group of patients has been studied insufficiently.

AIM. To study the frequency and predictors of the development of the social cognitive disorders based on theory of mind impairment in patients with acute ischemic stroke.

MATERIAL AND METHODS. Theory of mind impairment was assessed using "Reading the Mind in the Eyes" test in the acute period of ischemic stroke. National Institutes of Health Stroke scale was used to assess the severity of neurological deficit, modified Rankin scale — the degree of disability, Delirium Severity Rating Scale — the symptoms of delirium, Buss Perry aggressiveness scale — severity of aggressive behavior, Montreal Cognitive Assessment Scale — cognitive deficit. The severity of cortical atrophy was evaluated by computed tomography of the brain. The study included 86 patients, 53 males and 33 females. The average age of patients was 64 years. Statistical analysis was performed using the IBM SPSS Statistics 21 software package. Nonparametric statistics methods were used. Binary data were compared using the chi-square parameter, categorical data were compared using the Mann–Whitney test.

RESULTS. Seventy percent of patients suffered from the impairment of social cognitive functions. Independent predictors of the impairment of theory of mind according to linear regression analysis were cognitive dysfunction according to the Montreal Cognitive Assessment Scale (p=0.0001) and the severity of cortical atrophy on computed tomography of the brain (p=0.001).

CONCLUSION. Social cognitive impairment is registered in a substantial number of patients in acute period of stroke; its predictors include general cognitive impairment and cortical atrophy of the brain.

Keywords: *social cognitive functions, stroke, theory of mind, dementia*.

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BACKGROUND

Stroke is a global medical and socioeconomic problem. Cognitive and affective disorders, along with classical neurological disorders, are widespread after a stroke. Among the latter, social cognitive functions (SCF), which represent the ability to perceive, process, and analyze information critical for understanding the processes underlying social interactions, remain understudied.

SCF impairment significantly affects the patient's mental state, quality of life, and ability to interact adequately with their surroundings. In everyday life, compromised SCF are manifested by an inability to maintain social contact, understand the feelings of others, violate social distance, and having difficulty communicating. There are several aspects of SCF, which are the mental state model (MSM), also known as the "theory of mind," affective empathy, social perception, and social behavior [1].

From the standpoint of neuroanatomy, impaired SCF is associated with damage to specific regions, mainly the frontal and temporal lobes of the brain, as well as neuronal connections between them. The dorsomedial prefrontal cortex integrates social information, which is subsequently used to form an idea of the character of other people; the temporoparietal junction is responsible for the ability to consider the situation from the standpoint of another person and for some aspects of moral reasoning [2].

MSM is one of the most critical components of social interaction. Because of MSM, people can interpret the behavior of others, analyze the feelings and emotional state, and the motivational component of others. This complex neuropsychological phenomenon involves several mental mechanisms, namely the ability to interpret gaze, facial expressions, emotions, and speech. MSM depends on the coordinated interaction of several brain systems and is also determined by the social environment, upbringing, and behavior [3].

For patients after stroke, for the full recovery, it is essential to adapt to the surrounding world, perceive other people adequately, and evaluate their attitude toward themselves. In this process, SCF, in particular MSM, is of crucial importance. In this regard, MSM impairment in patients after a stroke is an serious problem requiring a comprehensive study.

This study analyzes the frequency and predictors of SCF disorder development based on the state of MSM in patients in the acute period of ischemic stroke.

MATERIALS AND METHODS

The patients were enrolled in 2021 in the Department of Neurology for patients with acute stroke at the multidisciplinary hospital in Ufa. The study included patients with ischemic stroke admitted to the hospital on day 1 after the onset of the first symptoms. The exclusion criteria were transient ischemic attacks, impaired consciousness to the level of coma, and a history of severe chronic mental disorders. The stroke diagnosis was established by the criteria of the World Health Organization [4].

The severity of neurological deficit was assessed on admission according to the National Institute of Health Stroke Scale (NIHSS), the degree of disability was evaluated according to the modified Rankin scale [5, 6], delirium symptoms were assessed according to the Delirium Rating Scale (DRS) [7, 8], and the severity of aggressive behavior was evaluated according to the Buss Perry aggressiveness scale (physical aggression, anger, hostility) [13]. Cognitive deficits were identified using the Montreal Cognitive Assessment (MoCA) scale [9], MSM disorders were identified using the Reading the Mind in the Eyes Test (RMET), and depression symptom severity was evaluated according to the Montgomery–Asberg scale [12] on day 10 (±1 day) after acute stroke onset.

The RMET score of 22 points or less was considered an impairment of the MSM. Normative indices for this test are 22–30 points. A value higher than 30 points implies a good understanding of MSM, and a value lower than 22 points indicates a decreased ability to understand MSM [10, 11].

The severity of atrophy of the cerebral cortex was assessed on a 2-point scale according to computed tomography (CT) of the brain (0—no signs of atrophy, 1—mild to moderate atrophy, 2—severe atrophy).

Statistical analysis was performed using the IBM SPSS Statistics 21 software package. Due to the use of short scales in the work and the non-normal distribution of data for the most parameters, we used nonparametric statistical methods in the analysis. Binary data were compared using the χ^2 parameter, and categorical data were compared using the Mann–Whitney test. To identify independent predictors of MSM impairment severity, multiple linear regression was performed with simultaneous inclusion of all variables. The dependent variable was the RMET score. Independent variables were selected from those values that were significantly different in patients with different outcomes, according to the results of univariate comparative analysis. If necessary, the

Table 1. Key demographic and clinical characteristics of patients included in the study

Parameters	Indicators (n = 86)
Gender (male/female)	53/33
Age, years	64 (56,25–70,75)
Stroke severity, according to NIHSS, points	3 (2–6)
Functionality, according to the modified Rankin scale, points	4 (3–4)
Pathogenetic subtypes of ischemic stroke*	12/7/5/1/61
Localization of the ischemic focus in the vascular system**	30/28/28

Note: *atherothrombotic/cardioembolic/lacunar/other established etiology/cryptogenic; **left carotid territory/right carotid territory/vertebrobasilar system.

Table 2. Results of linear regression analysis

Variables	Coefficient beta	Standard error	p
Age	0,01	0,061	0,865
Cognitive impairment, according to MoCA	**0,434**	**0,099**	**0,0001**
Delirium severity, according to DRS	–0,052	0,158	0,173
Cortical atrophy, according to brain CT	**–1,875**	**0,754**	**0,014**
The severity of neurological deficit, according to NIHSS	–0,217	0,158	0,173
Constant	13,340	4,629	0,005

Note: the Nadelkerkes index determines the part of the variance explained by logistic regression, $R^2 = 0.41$ (41%).

data were normalized. In cases of a strong correlation (collinearity) between two parameters, only one parameter was included in the model at the discretion of the researcher. The difference was considered significant at $p < 0.05$.

The work was approved by the local ethics committee of Bashkir State Medical University.

RESULTS

The study included 86 patients in the acute period of stroke. Their main characteristics are presented in Table 1.

MSM disorders were registered in 60 (70%) of 86 patients. The results of a comparative analysis showed that patients with MSM disorders had a higher score on the NIHSS ($p = 0.041$) and MoCA ($p = 0.0001$) scales, with greater severity of cerebral cortical atrophy according to CT data ($p = 0.001$).

Correlation analysis showed that the severity of MSM impairment according to RMET data was significantly associated with the following:

-patient's age ($r = 0.4$; $p = 0.0001$);

-the severity of neurological deficit according to the NIHSS scale ($r = 0.3$; $p = 0.009$);

-the severity of delirium symptoms according to the delirium assessment scale with its general indicator ($r = 0.3$; $p = 0.002$), indicators for subscales of visuospatial orientation ($r = 0.5$; $p = 0.0001$), long-term memory ($r = 0.4$; $p = 0.0001$), formal thinking ($r = 0.4$; $p = 0.0001$), hyperkinesis ($r = 0.2$; $p = 0.05$), motor retardation ($r = 0.2$; $p = 0.05$), and attention ($r = 0.2$; $p = 0.029$);

-the severity of cognitive impairment on the MoCA scale as a whole ($r = 0.6$; $p = 0.0001$) and subscales of visual-constructive and executive skills ($r = 0.6$; $p = 0.0001$), naming ($r = 0.4$; $p = 0.0001$), attention ($r = 0.5$; $p = 0.0001$), speech ($r = 0.5$; $p = 0.0001$), abstract thinking ($r = 0.4$; $p = 0.0001$), and delayed recall ($r = 0.5$; $p = 0.0001$);

-degree of cortical atrophy according to a CT scan of the brain ($r = 0.5$; $p = 0.0001$).

Multiple linear regression analysis included age, the severity of neurological deficit according to NIHSS, the severity of delirium according to DRS, cognitive impairment according to MoCA, and the severity of cortical atrophy according to brain CT. The last two indicators were significant predictors of the severity of MSM disorders. This regression model explained about 41% of the variability in the severity of MSM disorders after stroke (Table 2).

DISCUSSION

In this work, the data of 86 patients were analyzed. The results indicated a high incidence of SCF disorders after stroke (70%).

MSM impairment was significantly associated with the severity of cognitive deficit according to the MoCA scale and atrophic changes in the cerebral cortex according to brain CT. These associations indicate that the risk of MSM disorders is especially high in patients with a neurodegenerative process preceding stroke. A stroke can become a factor leading to the clinical manifestation of a cerebral atrophic process. The association with the MoCA cognitive impairment score indicates that SCF impairment develops more often as part of post-stroke cognitive impairment.

As a result of MSM impairment, situations can be underestimated, leading to a misunderstanding in communication, resentment, a manifestation of anger, or, conversely, ignoring other's comments. It is difficult for the patients with MSM disorders to determine the feelings and emotional states of the people around them. Impairment of MSM can be considered as one of the reasons leading to difficulties in caring for patients and their participation in the rehabilitation process. The issues surrounding correcting MSM impairments are currently insufficiently developed.

Thus, SCF disorders, in particular MSM, are common after stroke. Patients with cognitive impairment according to the MoCA scale, as well as people with severe atrophic changes of the cortex are at risk of the development of SCF disorder. Considering the data we obtained, it is advisable to include tests for assessing MSM impairments in the neuropsychological exam of patients with cognitive impairment after stroke. Methods aimed at improving MSM should be included when planning rehabilitation measures. Future research should identify the most effective approaches to correcting MSM disorders, including pharmacological and nonpharmacological methods.

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