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Mild cognitive impairments in patients in the acute period of cardioembolic stroke

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Abstract

Aim – to study the features of moderate cognitive disorders in patients with acute ischemic stroke of the cardioembolic subtype during comprehensive neuropsychological testing in comparison with data on structural changes in brain tissue identified using visual semi-quantitative scales during magnetic resonance imaging of the brain.

Material and methods. The prospective observational study involved 60 patients (22 women and 38 men) diagnosed with cardioembolic stroke. The study participants were divided into two groups: patients with non-amnesic (neurodynamic) multifunctional type of moderate cognitive disorders (40 patients: 70% men, 30% women, mean age 64.3 years) and patients with amnestic multifunctional type (20 patients: 50% men, 50% women, mean age 76.1 years). All patients underwent a comprehensive neuropsychological examination and magnetic resonance imaging of the brain using standard magnetic resonance scales.

Results. Patients with non-amnestic multifunctional type of moderate cognitive disorders accounted for 67% of the examined patients (40 people), and 33% (20 people) were patients with amnestic multifunctional type. During the examination, neuropsychological features were identified in each group. 22% of patients (13 people) had infarctions in the "strategic" zones, and 45% of patients (27 people) had multiple focal ischemic strokes. In 90% of patients (54 people), there was a pronounced lesion of the white matter in the form of a hyper-intense signal from the periventricular and subcortical areas and a moderate widening of the cerebral sulci against the background of slight atrophy of the gyri.

Conclusion. The comprehensive diagnostic approach, including neuropsychological testing and assessment of structural changes in the brain using visual semi-quantitative magnetic resonance scales, allows for the detection of cognitive impairments at the pre-dementia stage and the initiation of therapy aimed at preventing the progression of these impairments.

Keywords: mild cognitive impairment, cardioembolic stroke, MRI scales, neurodegeneration, neuropsychological assessment, dysregulatory disorders.
Conflict of interest: nothing to disclose.

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Умеренные когнитивные нарушения у пациентов в остром периоде кардиоэмболического инсульта

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Аннотация

Цель – изучить характеристики умеренных когнитивных расстройств у пациентов в остром периоде ишемического инсульта кардиоэмболического подтипа в ходе комплексного нейропсихологического тестирования в сопоставлении с данными структурных изменений вещества головного мозга, выявляемых с помощью визуальных полуколичественных шкал при магнитно-резонансной томографии головного мозга.

Материал и методы. Проведено проспективное обсервационное исследование с включением 60 пациентов (22 женщины и 38 мужчин) с диагнозом «кардиоэмболический инсульт». Исследуемые разделены на две группы: пациенты с неамнестическим (нейродинамическим) мультифункциональным типом умеренных когнитивных расстройств (40 пациентов: 70% мужчин, 30% женщин, средний возраст составил 64,3 года) и больные с амнестическим мультифункциональным типом (20 пациентов: 50% мужчин, 50% женщин, средний возраст составил 76,1 года). Всем пациентам проведены комплексное нейропсихологическое обследование и магнитно-резонансная томография головного мозга с применением стандартных магнитно-резонансных шкал.

Результаты. Пациенты с неамнестическим мультифункциональным типом умеренных когнитивных расстройств составили 67% обследуемых (40 человек), а 33% (20 человек) – пациенты с амнестическим мультифункциональным типом. В ходе обследования были выявлены нейровизуализационные особенности в каждой группе. У 22% пациентов (13 человек) определялись инфаркты в области «стратегических» зон», у 45% пациентов (27 человек) был обнаружен многоочаговый ишемический инсульт. У 90% пациентов (54 человек) отмечалось выраженное поражение белого вещества в виде гиперинтенсивности сигнала от перивентрикулярных и субкортикальных областей и умеренное расширение борозд головного мозга на фоне незначительной атрофии извилин.

Выводы. Комплексный диагностический подход в виде нейропсихологического тестирования и оценки структурных изменений вещества головного мозга с применением визуальных полуколичественных магнитно-резонансных шкал позволяет выявить когнитивные нарушения на додементной стадии и инициировать терапию, направленную на профилактику прогрессирования данных нарушений.

Ключевые слова: умеренные когнитивные нарушения, кардиоэмболический инсульт, МР-шкалы, нейродегенерация, нейропсихологическое обследование, дизрегуляторные расстройства.
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Список сокращений
МРТ – магнитно-резонансная томография; УКР – умеренное когнитивное расстройство; нУКР – неамнестический (нейродинамический) мультифункциональный тип УКР; аУКР – амнестический мультифункциональный тип; FCSRT – тест ассоциированного селективного распознавания; MMSE – краткая шкала оценки психического статуса; MoCA – Монреальская шкала оценки когнитивных функций; FAB – батарея тестов лобной дисфункции; ШДМ – шкала деменции Маттиса; MTA – шкала атрофии медиальных отделов височной доли; GCA – шкала глобальной кортикальной атрофии; NIHSS – The National Institutes of Health Stroke Scale.

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INTRODUCTION

Cardioembolic stroke is one of the most prevalent subtypes of ischemic stroke. In its acute phase, some syndromes may develop that preclude effective rehabilitation. These include cognitive impairments that have a significant adverse effect on the quality of life and reduce the possibilities of social and household adaptation. At the same time, the clinical patterns of the higher cortical functions have not been fully identified to this day. In the diagnostic algorithm of acute cerebrovascular accidents (ACVA), magnetic resonance imaging (MRI) has an important role. Semi-quantitative visual scales were developed to improve quality of assessment of findings of structural MRI and objectification of the obtained data. However, comparison of results of changes of the brain matter identified using such scales with the developing cognitive disorders has not been carried out in to a sufficient extent. Identification of some correlations of these indicators would facilitate a better understanding of impairments of the higher cortical functions from the perspective of the theory on their dynamic localization, and would improve the quality of prediction of their condition in remote periods of ACVA.

The term “mild cognitive impairment” was first used by the American neurologist R.C. Petersen in 1997 to characterize an interim stage between the normal aging and dementia [1]. A mild cognitive impairment (MCI) is a clinically significant deterioration of cognitive functions (attention, memory, speech, perception, praxis, executive functions) that has not reached the degree of dementia [2]. At this level of impairment of higher cortical functions, complete maladaptation of patients and loss of independence in daily life are not observed. Prevalence of MCI among people aged 60 and above varies from 5.0 to 36.7% [3]. The rate of MCI progression to dementia is approx. 8-15% per year [4]. The following are identified as the major diagnostic criteria of MCI: deterioration of the higher cortical functions vs. individual baseline level, complaints of impairment of memory, attention and other cognitive functions that come both from the patient and from the informants (relative or a person close to the patient), or from the consulting physician. The functional impairment is confirmed by neuropsychological tests or other clinical measurement. The impairment may involve one or more cognitive spheres. Some independence in the daily life may remain but theme may be minor difficulties in the performance of complex tasks, however, the level of alterations observed is below the level of dementia. Besides, these impairments manifest on the background of a clear mind, lack of delirium and other psychic disorders [5–7].

In 2014, R.C. Petersen identified 4 types of MCI: amnestic mono-functional; amnestic multifunctional; non-amnestic (neuro-dynamic) mono-functional; non-amnestic multifunctional [8]. Prof. O.S. Levin, in his turn, suggested the amnestic type with memorizing impairment, neuro-dynamic-dysregulatory type with the development of a fronto-subcortical syndrome; the type predominated by visuospatial impairments; the type predominated by language impairments; and the combined type of observed MCI [9, 10].

According to the Russian studies, the most prevalent type of MCI is the non-amnestic multifunctional type [11]. It also follows from literature that 68% of MCIs stem from dyscirculatory encephalopathy or earlier ACVA [12]. It is to be noted that neuropsychological examination of cognitive functions that allows assessment of their different components, is the gold standard of determining the MCI type [13].

AIM

To study the features of moderate cognitive impairments in patients with acute ischemic stroke of the cardioembolic subtype during comprehensive neuropsychological testing in comparison with data on structural changes in brain tissue identified using visual semi-quantitative scales during magnetic resonance imaging of the brain.

MATERIAL AND METHODS

The prospective observation study conducted at the Almazov National Medical Research Centre included 60 patients (22 women and 38 men). Inclusion criteria: acute period of cardioembolic subtype ischemic stroke (diagnosed as per criteria established in the 2024 clinical recommendations); mild cognitive impairments as per diagnostic criteria of the National Institute of Aging and Alzheimer’s Association, ICD-11 criteria, DSM-5; normal consciousness; general stable condition, including compensated chronic diseases; informed consent to participate in the study. Exclusion criteria: known earlier diagnosis that could have been a possible cause of cognitive disorders (Alzheimer’s disease, dementia with Lewy bodies, Pick disease, frontotemporal dementia, Parkinson’s disease, Huntington’s disease, Wilson-Konovalov’s disease and other diseases); speech impairments including aphasia of varying severity; manifested dysarthria; presence of traumatic brain injury; history of alcoholism; surgery within one year prior to inclusion in the study (except emergency endovascular thrombectomy and thromboaspiration on admission); clinically manifested depression or anxiety.

To exclude the functional causes of cognitive disorders, a screening for anxiety and depression was performed using the Hamilton's scale. The finding of this test in the study group did not reach threshold values and matched the normal emotional background.

The study was performed on day 10-14 from the onset of stroke. The patients were divided in two groups. Group I: patients with non-anamnestic (neuro-dynamic) multifunctional MCI. Group II: patients with amnestic multifunctional type or multifunctional type with hippocampal-type memory impairments.

The division of patients into groups was performed based on complaints of memory impairments, particularly, disorders in memorizing new information, and on results of tests focusing on differential diagnostics of MCI types (the 5 word test, free and cued selective reminding test (FCSRT), verbal fluency test (phonetic and semantic associations), trail-making test.

All patients underwent the following assessments: collection of cognitive complaints, medical and life history; neurological examination; evaluation using clinical scales commonly applied in neurological practice to assess stroke severity, functional limitations, and post-stroke disability (National Institutes of Health Stroke Scale, Barthel Index, Modified Rankin Scale, Rivermead Mobility Index, Glasgow Outcome Scale); comprehensive neuropsychological testing; brain MRI with application of MR scales for assessing brain tissue condition.

The neuropsychological testing included a mini-mental scale examination (MMSE) Montreal cognitive assessment, frontal assessment battery test (FAB), clock drawing test, 5 word test, verbal fluency test (phonetic and semantic associations), Mattis dementia rating scale, digit span test, Hamilton anxiety and depression rating scales, symbol digit modalities test, Schulte table test, free and cued selective reminding test (FCSRT) [21–33].

The brain MRI identified the following: localization and volume of the focus of the ischemic stroke, lesion of the areas strategically important for the higher cortical functions, multi-focal lesion of the brain. To assess white matter changes, the Fazekas, Scheltens and Wahlund scales were used. The presence of selective cerebral atrophy or gray matter pathology was evaluated using the following scales: the medial temporal lobe atrophy (MTA) scale, the Koedam parietal atrophy scale and the global cortical atrophy (GCA) scale [34, 40].

Statistical processing of the data was performed in the RStudio integrated development environment. To describe the data, the following descriptive statistics methods were used: for the data with normal or near-normal distribution, mean value and standard deviation were calculated; for the data with distribution significantly different from normal, mean value and standard deviation were augmented with median and values of first and third quartiles (with bootstrapping). Distribution was assessed by constructing histograms. Histograms are presented for data with distributions significantly deviating from normality. For comparing values between MCI types, the two-sample Mann–Whitney U test with Holm's correction for multiple comparisons was applied. Boxplots were constructed for measures showing significant differences between types.

RESULTS

Clinical and neuropsychological characteristics

According to the patient history data, arterial hypertension and atrial fibrillation was found in all patients of the study sample. 28 patients (42%) had chronic heart failure, and 14 patients (21%) had type II diabetes mellitus. According to the lipid profile, 59 patients (89%) had dyslipidemia. According to the medical documents, 42 patients (64%) had been diagnosed with 'dyscirculatory encephalopathy' of various severity prior to the development of the stroke. The evaluation of the neurological status revealed the following: motor impairments, hemiparesis in 60 (91%) patients, sensory impairments in 29 (44%) patients, speech impairments such as dysarthria or volume disorders in 24 (36%) patients, dysfunction of cerebral nerves such as oculomotor disorders, asymmetry and sensory impairments of the face, dysphagia in 33 (50%) patients. The Doppler ultrasonic examination of the brachycephalic arteries and vessels of the head identified atherosclerotic lesion of the brachycephalic vessels (common and internal carotid arteries) in 66 patients (100%). At the same time, hemodynamically significant stenosis over 50% were not identified in the study sample.

The neurological examination found that the average score on the NIHSS scale matched that of mildly severe ischemic stroke. In the vast majority of cases, motor, sensory and coordination disorders were found. In the evaluation of mobility, degree of activity impairment and disability it was found that the patients were able to move about the hospital department without any aids, had mild to moderate activity impairments and were capable of taking care of themselves without assistance. The average score on the Hachinski scale shows that clinical signs of vascular cognitive disorders prevailed in the patients included in the study. Some individual cases demonstrated possible presence of a neurodegenerative component. In the evaluation of the patient mobility by the Rivermead index it was found, that mild impairment of mobility was prevalent in the studies cohort. The study of functional activity using the Barthel scale demonstrated mild to moderate dependence degrees. On the whole, these data matched the results of Rankin scale examination (mild to moderate activity impairments). The testing on the Glasgow outcome scale also correlated with these findings. The general values follow **in Table 1**.

In the evaluation of the neuropsychological status, 100% patients (n=60) came up with cognitive complaints. These included lowered attention focus, quick fatigue when performing cognitive tasks, easy distraction, abstraction, longer time needed to perform a specific action, forgetfulness, lowered thinking rate. The neurological tests identified the following cognitive disorders most often: lowered attention focus, some instability and exhaustion of attention, reduced verbal fluency, deterioration of constructive and dynamic praxis, lower quality of regulatory functions, executive skills, lowered psychomotor rate without impairment of thinking structure, deterioration of short-term memory,

Parameter	M±SD	Median (Q1–Q3)
Age	68,23 ± 11,24	-
NIHSS	3,33 ± 2,57	2,50 (2,00–4,00)
Rivermead	10,10 ± 3,85	11,00 (7,00–14,00)
Rankin	2,83 ± 0,81	-
Barthel	78,50 ± 23,87	90,00 (65,00–95,00)
Hachinski	9,83 ± 1,24	-
Glasgow outcome scale	4,20 ± 0,58	-

Notes: NIHSS – The National Institutes of Health Stroke Scale
Примечания: NIHSS – The National Institutes of Health Stroke Scale.

Table 1. *Clinical and neurological characteristics of patients with MCI in the acute period of cardioembolic stroke on days 10-14 (in points, M±SD, median (Q1–Q3))*

Таблица 1. *Клинико-неврологическая характеристика пациентов с УКР в остром периоде кардиоэмболического инсульта на 10–14 сутки (в баллах, M±SD, медиана (Q1–Q3))*

mild disorders of the visuospatial gnosis. The cumulative data of the results of neuropsychological examination follow **in Table 2**.

Based on the analysis of complaints, analysis of life and disease history, and data of complex neurological assessment, the patients were divided into two groups. The patients with non-amnestic (neuro-dynamic) multifunctional MCI (nMCI) comprised 67% of the patients (n=40); while 33% (20 patients) had amnestic multifunctional MCI (aMCI) or multifunctional MCI with hippocampal-type memory impairments. The data follow in **Table 3**.

Patients with amnestic multifunctional MCI performed worse in neuropsychological tests that assessed memory and memory-associated activities. The group comparison showed the following specifics: in patients with aMCI there were disorders in the information memorizing process, which manifested in difficulties in delayed recall of words. Cues were of little assistance. This group also showed deterioration of visuospatial functions, which manifested in disorders in the clock drawing test and methods involving copying of material. In patients with nMCI, the differences in the immediate and delayed recall of words were less

Test	M±SD	Median (Q1–Q3)
Mattis dementia rating scale (MDRS), total	121,72 ± 6,29	25,00 (25,00–26,25)
MDRS, initiation – perseveration	29,40 ± 3,60	-
MDRS, attention	31,22 ± 2,50	-
MDRS, constructive praxis	5,00 ± 0,71	-
MDRS, conceptualization	34,55 ± 1,78	-
MDRS, memory	21,47 ± 2,27	-
MMSE	25,52 ± 1,08	-
FAB	14,65 ± 1,78	-
Clock drawing test	9,48 ± 0,85	10,00 (9,00–10,00)
Digit span test	25,37 ± 8,84	-
MoCA	23,90 ± 1,87	24,00 (23,00–25,00)
Schulte table No.1	65,17 ± 10,22	-
Schulte table No.2	65,75 ± 10,37	-
Schulte table No.3	65,85 ± 11,14	-
Schulte table No.4	65,77 ± 10,83	-
Schulte table No.5	66,58 ± 10,64	-
Direct numbers	4,82 ± 0,39	5,00 (5,00–5,00)
Reverse numbers	3,80 ± 0,40	4,00 (4,00–4,00)
FCSRT (free reminding)	18,08 ± 3,72	-
FCSRT (cued reminding)	13,33 ± 3,94	-

Notes: MDRS – Mattis dementia rating scale, MMSE – mini-mental status evaluation, MoCA – Montreal scale of cognitive assessment, FAB – frontal dysfunction battery of tests.

Примечания: ШДМ – шкала деменции Маттиса, MMSE – краткая шкала оценки психического статуса, MoCA – Монреальская шкала оценки когнитивных функций, FAB – батарея тестов лобной дисфункции.

Table 2. *Results of neuropsychological examination of patients with MCI in the acute period of cardioembolic stroke (in points, M±SD, median (Q1–Q3))*

Таблица 2. *Результаты нейропсихологического обследования пациентов с УКР в остром периоде кардиоэмболического инсульта (в баллах, M±SD, медиана (Q1–Q3))*

manifested, and the semantic cue usually helped recall the stimulus material. The charts of value distribution in the study samples are shown in **Fig. 1**.

Test	Dysregulatory type		Amnestic type	
	M±SD	Median	M±SD	Median
5 word test (immediate recall)	(Q1–Q3)	4,50 (4,00–5,00)	(Q1–Q3)	4,00 (3,00–4,00)
5 word test (cued immediate recall)	4,70 ± 0,52	5,00 (4,00–5,00)	4,40 ± 0,68	4,50 (4,00–5,00)
5 word test (delayed recall)	3,17 ± 0,75***	3,00 (3.00–4,00)	1,85 ± 0,99	2,00 (1,75–2,25)
5 word test (cued delayed recall)	3,92 ± 0,76*	4,00 (3,00–4,00)	3,20 ± 0,95	3,00 (2,75–4,00)
Trail-making test, part A	64,42 ± 10,30	66,00 (59,50–69,75)	71,70 ± 10,31	70,50 (65,75–77,25)
Trail-making test, part B	65,90 ± 10,81	68,00 (61,00–72,00)	72,00 ± 10,50	72,00 (65,75–77,25)
Phonetic association test	9,57 ± 1,81*	10,00 (8,00–11,00)	8,00 ± 1,95	7,50 (7,00–9,00)
Semantic association test	12,62 ± 2,22*	12,50 (11,00–15,00)	10,45 ± 2,46	10,00 (9,00–12,00)
FCSRT (free reminding)	19,75 ± 2,73	20,00 (17,75–22,00)	14,75 ± 3,18	15,00 (11,75–17,25)
FCSRT (cued reminding)	15,05 ± 3,57	16,00 (13,00–18,00)	9,90 ± 1,86	10,00 (8,00–12,00)
FCSRT, total score	34,80 ± 4,16***	35,00 (31,75–38,00)	24,65 ± 3,18	25,00 (22,75–27,00)

*Notes: * – p<0.05, ** – p<0.01, *** – p<0.001, FCSRT – free and cued selective reminding test.*
*Примечания: * – p<0,05, ** – p<0,01, *** – p<0,001, FCSRT – тест ассоциированного селективного распознавания.*

Table 3. *Comparative analysis of neuropsychological test data in two groups (in points, M±SD, median (Q1–Q3))*

Таблица 3. *Сравнительный анализ данных нейропсихологического тестирования в двух группах (в баллах, M±SD, медиана (Q1–Q3))*

In 22% of patients (n=13) with mild cognitive impairments, infarctions were detected in some areas of the 'strategic' zones such as thalamus, striatum, hippocampus, prefrontal cortex, left temporo-parieto-occipital junction; in 45% of patients (n=27), multifocal brain lesions in the form of ischemic stroke were detected. This patient group is characterized by fairly pronounced white matter lesions appearing as hyperintensities in the periventricular and subcortical regions. These lesions are represented by numerous foci of varying diameters, typically distributed across all cerebral lobes, sometimes showing a tendency to coalesce. This group also exhibits moderate sulcal widening with mild gyral atrophy. When using the Fazekas scale, it was determined that 90% of patients (n=54) exhibited moderate white matter lesions, corresponding to a score of 3 or 4 points. This group was characterized by the presence of leukoaraiosis foci along the cerebral ventricles, as well as diffusely distributed gliosis areas appearing as hyperintense signals. These changes generally matched the data obtained in the analysis of MRI scans using the Wahlund scale, where the local alteration foci prevail sometimes showing a tendency to coalesce. The vast majority of these changes was localized in the frontal lobes, and, to a lesser degree, in the parietal and temporal lobes. At the same time, the use of the Scheltens scale demonstrated a more pronounced degree of white matter lesion, which reflects the specifics of interpretation of results on this scale and the emphasis on the quantitative assessment of foci. The analysis of results of parietal lobe lesions on the Koedam scale generally revealed moderate atrophy of the gyri of the lobes, accompanied with some widening of the sulci (1 point). In some cases, not changes were found. In individual cases, severe atrophy was identified that came up to 2 points. The analysis of alterations in the medial section of the temporal lobe using the MTA scale identified no pronounced alterations in any of the cases. In individual examinations, no significant atrophy was found. For the majority of patients, the characteristic features were the mild dilatation of the chorioidal fissure (1 point) or a minor reduction in the height of the hippocampus accompanied by slight enlargement of the temporal horns of the lateral ventricles (2 points). The assessment using the GCA scale revealed that for the majority of the examined patients a minor atrophy of the cerebral matter (10 points or less) was characteristic. The atrophies were represented with some widening of the sulci and ventricles and some loss of volume of the gyri. A small number of patients demonstrated moderate atrophic changes, ranging from 11 to 20 points on the applied scale. These changes primarily affected the frontal regions, to a lesser extent the temporal areas and the parieto-occipital regions. The overall data from the brain assessment using MR scales are presented in **Table 4**.

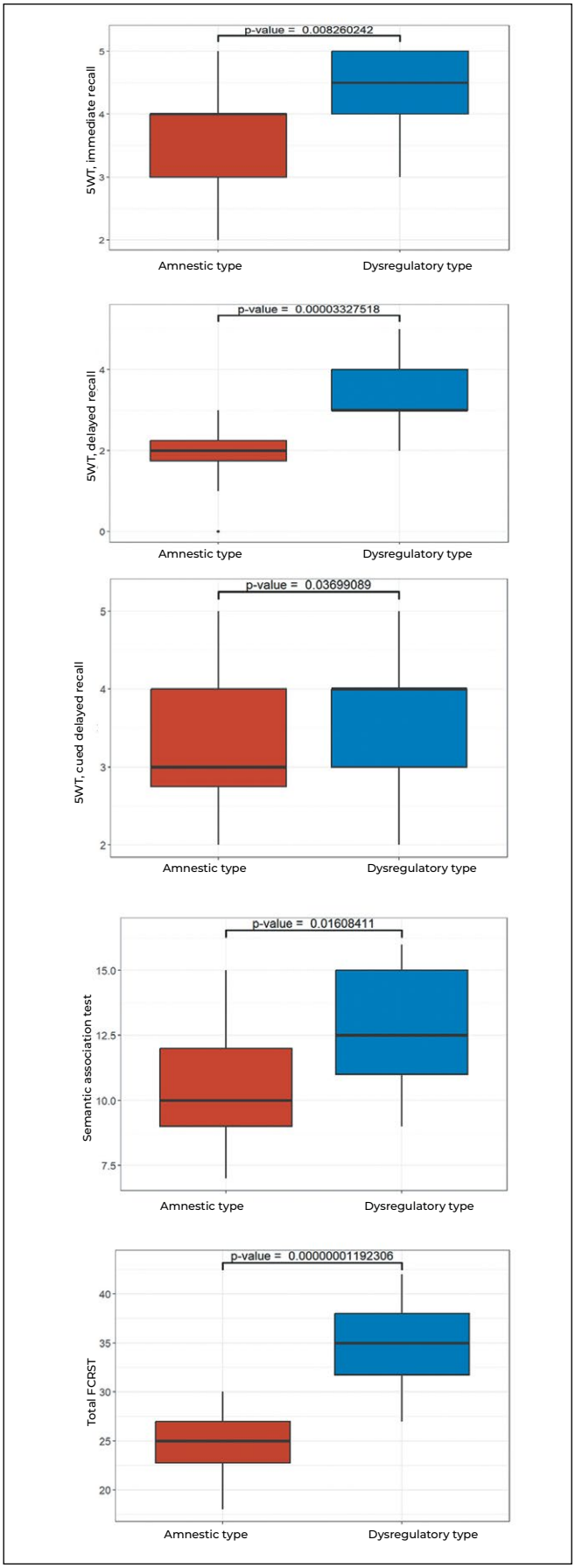

Figure 1. *Boxplots comparing the neuropsychological examination data of the two identified variants of MCI.*

Рисунок 1. *Диаграммы размаха сравнения данных нейропсихологического обследования двух выявленных вариантов УКР.*

DISCUSSION

The neuropsychological assessment revealed that patients with MCI following cardioembolic stroke primarily develop neurodynamic and dysregulatory impairments. These deficits are associated with damage to

MP scale	Average score
Fazekas	3,35
Scheltens	18,94
Wahlund	12,75
Medial Temporal lobe Atrophy (MTA)	1,41
Koedam	1,11
Global Cortical Atrophy (GCA)	7,65

Table 4. *MR scale data in the study group of patients with MCI*
Таблица 4. *Данные МР-шкал в исследуемой группе пациентов с УКР*

the 1st and 3rd structural-functional blocks, according to A.R. Luria's theory of higher cortical function organization [14]. Thic MCI type is usually represented with disorders in the programming, regulation and control over the progression of psychic activity, processes of formation of intentions, goals of psychic activity, regulation and control of actions including behavior, disorders of attention, motivation, decrease of speed of psychic processes with the development of bradyphrenia [15]. The development of these impairments is based on either a fronto-subcortical syndrome (primary or secondary frontal lobe pathology) or a disconnection phenomenon [8, 16]. Such cases may also demonstrate deterioration of short-term memory and formation of a nonspecific forgetfulness with preserved recognition and mediated memorizing [15, 17, 18]. For amnestic impairments, hippocampal-type memory dysfunctions, long-term memory, primary memorizing of new information (true amnesia) or recognition are characteristic [15, 18]. Such impairments stem from lesions of hippocampal structures and its connections [18–20]. This type of MCIs may indicate a pre-dementia (preclinical) stage of Alzheimer's disease [20]. The assessment of cerebral changes using visual MR scales, mildly pronounced atrophic changes of the white and the gray matter are observed. Al the same time, lesions of the frontal lobes prevail as well as those of subcortical structures, which also characterized the development of fronto-subcortical syndrome and aligns with findings of neuropsychological examination. In some cases, atrophic changes in the hippocampal area and in the mediobasal structures of temporal lobes were detected. In the clinical picture, they were combined with hippocampal-type memory impairments. This may indicate that these patients have a competing neurodegenerative process and formation of mixed cognitive disorders. Identification of atrophic changes in the parietal lobes was less frequent. Quite expectedly, according to fundamentals of functional neuroanatomy, these patients demonstrated formation of visuospatial impairments that was combined with neurodynamic and dysregulatory impairments.

CONCLUSION

A comprehensive diagnostic approach involving careful collection of complaints and history, neuropsychological testing and assessment of structural brain changes using visual semi-quantitative MR scales facilitates detection of cognitive impairments at the pre-dementia stage and identification of their potential anatomical substrate. This approach assists implementation of optimal therapeutic approaches to their treatment and prevention of progression to the stage of dementia. Determination of the amnestic type of MCI may indirectly indicate an alternative pathological process such as pre-dementia stage of the Alzheimer's disease, which enables direction of the patient for further examination to confirm or exclude this condition.

Thus, the identification of mild cognitive impairments (MCI) in patients during the acute phase of ischemic stroke enables neurologists to formulate appropriate recommendations for the subsequent rehabilitation period, with a focus on the correction of higher cortical function deficits.

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Оригинальность. При создании настоящей работы автором не использовались ранее опубликованные сведения (текст, иллюстрации, данные).	***Statement of originality.*** No previously published material (text, images, or data) was used in this work.
Доступ к данным. Редакционная политика в отношении совместного использования данных к настоящей работе не применима.	***Data availability statement.*** The editorial policy regarding data sharing does not apply to this work.
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