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Structure of Cognitive Disorders in Patients with Atrial Fibrillation

Структура когнитивных нарушений у пациентов с фибрилляцией предсердий

Abstract

Introduction. Cognitive disorders against the background of atrial fibrillation are an important fundamental problem of modern cardioneurology, since, on the one hand, they significantly reduce the possibilities of treatment, worsen the prognosis and lead to maladjustment of patients with arrhythmia, and on the other hand, they are a unique model for studying the adaptation of the brain in response to disorders. systemic and cerebral hemodynamics, which arise under the influence of arrhythmias.
Purpose. To study the structure of cognitive disorders in patients with different forms of atrial fibrillation (AF).
Materials and methods. We examined 372 patients (mean age 63.8±4.3 years), who, depending on the presence of arrhythmia, were divided into 2 clinical groups: the main (n=257) and control (n=115). Patients of the main group were divided into 2 subgroups: subgroup I – patients with persistent/paroxysmal form of AF (n=176), subgroup II – patients with permanent form of AF (n=81). Neuropsychological methods were used in the work: Mini-Mental State Examination (MMSE), Frontal Assessment Battery (FAB), dementia scale of Mattis (DSM), test "10 words", test "5 words", verbal association test, lines orientation test, test "unpainted objects", clock drawing test, test of connection of numbers and letters, Boston naming test.
Results. The neuropsychological pattern of patients with AF is represented by neurodynamic and regulatory disorders, which are manifested by the deterioration of executive functions, auditory-speech memory, spatial gnosis, perception, concentration of attention, and a decrease in the speed of psychomotor processes. In patients of subgroup I established disorders of the neurodynamic component of cognitive activity, which do not reach the expressed cognitive disorders in terms of their clinical significance and do not affect professional and social activity. In patients of subgroup II on the first plan extend the violation of regulatory functions, forming a polymodal cognitive deficit with a relatively uniform violation of all cognitive functions.
Conclusions. Atrial fibrillation is an independent risk factor for cognitive disorders and characterized by diffuse deterioration of all cognitive functions, which is more pronounced in persistent form of AF.
Keywords: atrial fibrillation, cognitive disorders, neuropsychological status, cognitive functions.

Резюме

Введение. Когнитивные нарушения на фоне фибрилляции предсердий – важная фундаментальная проблема современной кардионеврологии, поскольку, с одной стороны, они значительно снижают возможности лечения, ухудшают прогноз и приводят к дезадаптации пациентов с аритмией, а с другой – являются уникальной моделью для изучения адаптации мозга в ответ на нарушения системной и церебральной гемодинамики, которые возникают под влиянием аритмий.

Цель. Изучение структуры когнитивных нарушений у пациентов с различными формами фибрилляции предсердий (ФП).

Материалы и методы. Обследовано 372 пациента (средний возраст 63,8±4,3 года), которые, в зависимости от наличия аритмии, распределены на 2 клинические группы: основная (n=257) и контрольная (n=115). Пациенты основной группы распределены на две подгруппы: I подгруппа – пациенты с персистирующей/пароксизмальной формой ФП (n=176), II подгруппа – пациенты с постоянной формой ФП (n=81). В работе использованы нейропсихологические методики: краткая шкала оценки психического статуса (MMSE), батарея тестов для оценки лобной дисфункции (БТЛД), шкала деменции Маттиса (ШДМ), тест «10 слов», тест «5 слов», тест вербальных ассоциаций, тест ориентации линий, тест «узнавания недорисованных предметов», тест рисования часов, тест соединения цифр и букв, бостонский тест называния.

Результаты. Нейропсихологический паттерн пациентов с ФП представлен нейродинамическими и регуляторными нарушениями, которые проявляются ухудшением исполнительных функций, слухоречевой памяти, пространственного гнозиса, восприятия, концентрации внимания, снижением скорости психомоторных процессов. У пациентов I подгруппы установлено нарушение нейродинамической составляющей когнитивной деятельности, которое не достигает по своей клинической значимости выраженных когнитивных расстройств и не сказывается на профессиональной и социальной активности. У пациентов II подгруппы на первый план выходят нарушения регуляторных функций, формируя полимодальный когнитивный дефицит с относительно равномерным нарушением всех когнитивных функций.

Выводы. ФП является независимым фактором риска когнитивных нарушений и характеризуется диффузным ухудшением всех когнитивных функций, которые более выражены при постоянной форме ФП.

Ключевые слова: фибрилляция предсердий, когнитивные нарушения, нейропсихологический статус, когнитивные функции.

■ INTRODUCTION

Disorders of higher cerebral functions are one of the most pressing medical and social problems, as they lead to a decrease in quality of life, disorders of social and professional activities, and in the long run – to the development of dementia and complete social disadaptation [1–4]. Early diagnostics of cognitive disorders makes it possible to prescribe timely treatment and intimate the onset of disability. Important clinical significance have pre-dementia cognitive disorders, since they are more exposed to therapeutic correction [5].

Detection of early, potentially reciprocal cognitive disorders on the background of cardiovascular pathology gives the opportunity to quickly see groups of patients with an increased risk of causing cognitive dysfunction, especially among working age people.

Most studies on cognitive disorders have investigated the role of arterial hypertension and cerebral atherosclerosis in their development [6–9], but the effect of cardiac arrhythmias on the development of cognitive deficits has not been sufficiently studied. The literature reflects the issue of changes in the nervous system in various forms of cardiac arrhythmias [10–13], but most of the data on this issue are obtained for elderly patients, including patients with stroke.

The possibilities of developing cognitive disorders in young and middle-aged patients with cardiac arrhythmias and lack of explicit morphological cerebrovascular disorders are investigated. About the importance of the problem and to bring to light the fact that in birch 2018 the publication of the European Heart Rhythm Association (EHRA), Heart Rhythm Association (HRS), Latin American Heart Rhythm Society (LAHRS), Asian-Pacific Association of Heart Rhythm (APHRS) on the problems of arrhythmias and cognitive functions: what is the best tactic? [14]. Have a documentary about how to go to diagnostics and tactics for the treatment of cognitive disorders in patients with arrhythmias.

Possible mechanisms of cognitive disorders in case of cardiac rate are reducing the perfusion of the brain as a result of low cardiac rate; the emergence of leukoaraiosis, "dumb" brain infarctions; transient ischemic attacks; hypercoagulation; neurodegenerative cerebral changes [15–17]. Structural damages of the brain of the focal or diffuse character due to ischemia are considered as one of the factors of vascular dementia, and the constant form of atrial fibrillation is considered a predictor of violations of the cognitive sphere [18–20]. The above positions stipulated the relevance of the chosen direction of the study, identified its purpose and tasks.

■ PURPOSE OF THE STUDY

To determine the state of cognitive functions in patients with different forms of atrial fibrillation.

■ MATERIALS AND METHODS

372 patients aged from 30 to 75 years (mean age 63.8±4.3 years old) were examined, of which 257 patients were the main group and 115 patients were the control group. The main group, which includes patients with different forms of atrial fibrillation, were divided into 2 subgroups: subgroup I – 176 patients with persistent (paroxysmal) form of atrial fibrillation (AF), subgroup II – 81 patients with a permanent form of AF. Among patients subgroups I in 117 (66.5%) persons are diagnosed with a persistent form of AF, 59 (33.5%) persons – a paroxysmal form of AF. The control group is represented by patients with a sinus right heart rhythm against the background of cardiological pathology.

Background diseases, which led to the development of AF were: ischemic heart disease and/or hypertonic disease – 173 (67.3%) patients, non-coronary myocardial diseases – 41 (15.9%) patients, chronic rheumatic heart disease – 17 (6.6%) patients, pathology of thyroid gland – 13 (5.1%) of patients. Idiopathic arrhythmias were 13 (5.1%) patients. The criterion of "idiopathic" ("alone") arrhythmias was considered the absence of an explicit structural substrate of heart damage.

Criteria for the inclusion of patients in the study: age to 75 years, the presence of AF (persistent, paroxysmal, constant form) verified on the basis of clinical data, ECG, daily ECG monitoring; patient's ability to carry out productive contact with a doctor to evaluate cognitive status; voluntary informed patient consent or, if necessary, the consent of the person who cares for the patient.

Criteria for the exclusion of patients in the study: the absence of a voluntary informed patient's consent; vascular dementia (total score for MMSE <24, for FAB <11, on the scale of Dementia Mattis <115); other possible causes of the cognitive disorders, including cerebrovascular disease: Parkinson's disease and Parkinsonism syndrome, Gentington's disease, Wilson – Konovalov disease, normotensive hydrocephalus, brain tumors (primary and metastatic), neuroinfections, epilepsy, demyelinating diseases, Alzheimer's disease, fronto-temporal degeneration, dementia with Lewy bodies; brain injuries and their consequences, which are the only cause of cognitive deficits; suffered acute cerebrovascular disorders; unstable angina, myocardial infarction during the last 3 months; any somatic diseases in the stage of decompensation, mental pathology or alcoholism (including: daily consumption of more than 30 ml of alcohol for the last 3 months), narcotic deposition. Criteria for the evaluation of the need to maximize the effect on the results of the study of pathology with proven action on cognitive functions.

Tachysystolic form of atrial fibrillation at the time of hospitalization was 83.3% of patients. 32 (18.2%) patients had short paroxysms (3–4 complexes each). In 59 (33.5%) patients paroxysm of atrial fibrillation recorded for the first time, among them – in 37 (62.7%) patients were difficult to determine the duration of arrhythmia detection.

Frequent episodes (>1 every 3 months) were reported in 84 (47.7%) patients. The most common variants of the frequency of episodes were: >1 time per week and >1 time per year (among the frequent); >1 time per day and <1 time per year (among the infrequent). The average duration of the arrhythmic anamnesis in patients with a persistent atrial fibrillation form was 5.6±1.8 years old, with a paroxysmal form of atrial fibrillation – 4.1±1.2 years. In 84 (47.7%) patients recorded frequent episodes (>1 in every 3 months). The most common variants of the episode frequencies were: >1 time a week and >1 time a year (among the frequent); >1 time a day and <1 time a year (among the infrequent).

A necessary condition for the examined persons was the ability to hear, understand the spoken language, have visual acuity sufficient for the perception of tasks (the use of reading glasses was allowed). When the patient complained of weakness, drowsiness, or other symptoms that temporarily limited the performance of tasks, the patient was given rest of sufficient duration or the study was postponed to another day. All neuropsychological studies, including those conducted in the dynamics, were performed personally by the author, which excluded any differences and errors in the methodology of conducting and evaluating test results. The test battery consisted of 11 tests. The total duration of testing was about 30 minutes.

Screening neuropsychological testing [21–23] was performed to rule out dementia. It included: Mini-Mental State Examination (MMSE) (Folstein M. et

al., 1975), Frontal Assessment Battery (FAB) (Dubois B. et al., 2000), dementia scale of Mattis (DSM) (Mattis S., 1976). Extensive neuropsychological testing was performed to determine the neuropsychological profile and structure of the cognitive disorders [24–28]. It included test "10 words" (Luria A.R., 1969), test "5 words" (Grober E. et al., 1988), verbal association test (Kazdin A., 1982), lines orientation test (Benton A., 1975), test "unpainted objects" (Luria A.R., 1969), clock drawing test (Sunderland T. et al., 1989), test of connection of numbers and letters (Trail making test) (Reitan R.M., 1958), Boston naming test (Kaplan J. et al., 1978).

The research results were accumulated in an electronic database using an Excel spreadsheet editor (as part of the Microsoft Office 2010 software package).

The analysis of the obtained data solved such tasks as the description of the studied parameters in groups, assessment of the significance of differences between quantitative and qualitative indicators, verification of the empirical distribution of variables for compliance with the law of normal distribution. The results of statistical processing of the studied quantitative variables are represented by the average value and standard deviation M±σ. For qualitative data were determined frequencies – n (%).

The following methods of statistical analysis were used in the study: determination of numerical characteristics of variables, comparison of parametric data (after checking quantitative data for normal distribution using Kolmogorov – Smirnov and Shapiro – Wilk tests) using Student's t-test (for 2 independent samples) and method ANOVA – for several groups, assessment of the significance of differences in quantitative indicators in independent samples: according to the Mann – Whitney U-test (Mann – Whitney U Test) – for 2 independent samples and Kraskel – Wallis test – for several groups. Comparison of bound samples was performed using the Wilcoxon test (for 2 groups).

The study used application packages Statistica for Windows v. 8.0 (StatSoft Inc, USA, 2012), in accordance with the recommendations for processing the results of biomedical research.

■ RESULTS AND DISCUSSION

With an objective evaluation of the cognitive sphere using neuropsychological tests, the cognitive disorders were diagnosed in 134 (76.1%) patients with a persistent (paroxysmal) form of AF (subgroup I), 67 (82.7%) of patients with a permanent form of AF (subgroup II) and 76 (65.2%) patients with cardiac pathology without arrhythmias.

Integral assessment of cognitive functions in patients with atrial fibrillation. The results of neuropsychological testing of patients of subgroup I significantly differed from the control group only in the total score MMSE (26.0±0.3 points and 26.8±0.2 points, respectively, p=0.027). In particular, some patients incorrectly named the current date, the day of the week. In patients of subgroup II more pronounced cognitive disorders were noted, which was manifested by a significant difference from the control group of the total indicators of all integrated express tests (Table 1).

When analyzing the results of MMSE subtests, it was found that copying the image was performed correctly by only 40.7% of patients of subgroup II. In 48.1% of patients discovered a disturbed serial counting (five-fold

Table 1
Integral assessment of cognitive functions in patients with atrial fibrillation

Neuropsychological test	Main group		Control group[3] (n=115)	p
	I[1] (n=176)	II[2] (n=81)		
	The average value and standard deviation			
MMSE	26.0±0.3	24.8±0.5	26.8±0.2	$_{1-3}$=0.027 $_{2-3}$<0.001
– orientation	9.5±0.3	9.0±0.3	9.8±0.2	$_{1-2}$=0.04 $_{2-3}$=0.028
– memory	2.2±0.2	1.8±0.4	2.7±0.1	$_{1-3}$=0.026
– account operations	4.3±0.2	3.6±0.3	4.8±0.2	$_{2-3}$=0.03 $_{2-3}$=0.001
– perceptual-gnostic functions	7.9±0.4	6.6±0.5	8.3±0.4	$_{1-2}$=0.043 $_{2-3}$=0.008
FAB	15.2±0.5	13.8±0.5	15.8±0.6	$_{1-2}$=0.049 $_{2-3}$=0.011
– conceptualization	2.6±0.2	2.0±0.3	2.8±0.2	$_{2-3}$=0.028
– speed of speech	2.7±0.2	2.1±0.3	2.9±0.1	$_{2-3}$=0.012
– dynamic praxis	2.6±0.2	1.8±0.3	2.8±0.2	$_{1-2}$=0.027 $_{2-3}$=0.006
– braking control	2.6±0.2	2.0±0.3	2.8±0.2	$_{2-3}$=0.028
DSM	131.2±3.0	123.5±2.5	134.4±4.6	$_{1-2}$=0.049 $_{2-3}$=0.039
– warning	32.1±1.6	30.0±2.1	34.8±1.2	$_{2-3}$=0.049
– activity and perseveration	33.6±0.8	30.7±1.2	35.0±0.8	$_{1-2}$=0.045 $_{2-3}$=0.003
– constructive praxis	5.7±0.2	5.0±0.4	5.9±0.2	$_{2-3}$=0.045
– conceptualization	35.6±1.2	32.4±1.0	37.3±1.8	$_{1-2}$=0.041 $_{2-3}$=0.018
– memory	20.7±0.7	19.4±1.2	22.4±0.5	$_{1-3}$=0.049 $_{2-3}$=0.022

subtraction from 100 to 7). The largest number of errors occurred when naming the date, direct and delayed reproduction of unrelated words. 58% of patients made many mistakes when performing the task, but tried to correct them when pointing at them. 22.2% of patients, starting with the correct answer, got lost in stereotypical erroneous answers, not noticing the errors, which were mainly in the nature of impulsive responses with rapid self-correction or correction when focusing the patient's attention on the error.

In patients of subgroup II by FAB revealed a significant decrease in the subtests of simple and complex reactions of choice, dynamic praxis and speech speed. The rude violation of the arbitrary reproduction of mnestic material was noted. Indicators of the subtest for dynamic praxis showed spatial apraxia (apractognosy).

Performance of FAB by patients of subgroup I and control group did not cause difficulties in subtests of conceptualization, dynamic praxis, simple reaction of choice and assessment of grasping reflexes. The largest number of errors occurred when evaluating the test of sound associations (see evaluation of the test of literal associations) and complicated reaction of choice only by the type of impulsive actions with the possibility of self-correction, but without real violations of recognition of rhythmic structure or its reproduction. The nature of the identified violations indicated the

prevalence of attention deficit and a slight decrease in frontal control over arbitrary activities, as the leading mechanisms of their occurrence.

Memory impairment in AF was noted in integrated tests for errors in the direct reproduction of 3 unrelated words by MMSE. Patients in subgroup I worse than the patients of control group performed the MMSE "memory" subtest (2.2±0.2 and 2.7±0.1 points, respectively, p=0.026). Results of the DSM "memory" subtest in patients of subgroup I (20.7±0.7 points, p=0.049) and subgroup II (19.4±1.2 points, p=0.022) were significantly worse than in patients control group (22.4±0.5 points) (Table 1).

Mnestic disorders were confirmed in tests "10 and 5 words" (Table 2). Decreases in direct reproduction of learned material were found in all groups. However, there was some improvement in memorization during repeated demonstrations of the stimulus task. Significant differences between subgroup I and control group in the test "10 words" were only in the 3rd direct (p=0.046) and delayed (p=0.04) reproduction. There was an insignificant difference between the results of the 1st (p=0.35) and 2nd (p=0.37) direct reproduction.

Significant difference in the results of the test "5 words" between subgroups I and II was only in the first direct reproduction (p = 0.026). Delayed reproduction in patients of subgroups I and II was significantly lower than in control group (p=0.035 and p=0.017). Thus, patients in subgroup I had the greatest impairment of long-term memory.

One of the reasons for the increased sensitivity of the trace of auditory-speech memory to interference was probably the lack of information processing at the stage of memorization. The external organization of the memorization process increased the stability of the memory trace. In general, the role of interference in the forgetting the material, a beneficial effect of techniques that organize mnestic activity, indicate a predominantly neurodynamic nature of verbal memory disorders.

Patients with AF were characterized by a significant decrease in speech rate in the verbal association test compared with patients with control group.

Table 2
Neuropsychological examination of memory in patients with atrial fibrillation

Neuropsychological test	Main group		Control group[3] (n=115)	p
	I[1] (n=176)	II[2] (n=81)		
	The average value and standard deviation			
Test "10 words" Direct reproduction: 1st direct 2nd direct 3rd direct Deferred reproduction	 4.6±0.4 5.3±0.5 5.8±0.4 6.1±0.3	 3.8±0.2 4.4±0.4 4.8±0.6 5.0±0.6	 5.2±0.5 6.0±0.6 6.8±0.3 7.3±0.5	 $_{2-3}$=0.01 $_{2-3}$=0.028 $_{1-3}$=0.046 $_{2-3}$=0.003 $_{1-3}$=0.04 $_{2-3}$=0.004
Test "5 words" Direct reproduction: 1st direct 2nd direct Delayed reproduction	 2.8±0.1 3.0±0.2 3.7±0.3	 2.3±0.2 2.5±0.3 3.2±0.5	 3.0±0.2 3.3±0.2 4.6±0.3	 $_{1-2}$=0.026 $_{2-3}$=0.014 $_{2-3}$=0.028 $_{1-3}$=0.035 $_{2-3}$=0.017

At the same time, the difference in the indicator "literal associations" was significant, but in quantitative terms less than in the indicator "categorical associations". This indicates a predominantly neurodynamic nature of the speed of speech.

Established a significant decrease in the speed of speech in patients of subgroup II compared with subgroup I, which indicates a direct dependence of the severity of these disorders on the form of AF. In addition, the high level of distraction of patients of subgroup II during the test, the need for re-stimulation to further its implementation. After reminders, patients continued to name the words, which may indicate a slight decrease in the level of voluntary attention and frontal control over the performance of the test (Table 3).

Patients of subgroup I and control group did not have problems with tests to study visual-spatial and simulant gnosis (Table 4).

In patients of subgroup II, a significant deterioration of the identification of the angle between the lines in the test of the orientation of the lines, as well as the recognition of unpainted objects, indicating a violation of visual-spatial and simulant gnosis. In a number of cases, errors were noted when performing the clock drawing test. They manifested themselves in the form of inaccuracies in the location of the hands, the presence of an unequal distance between the numbers located on the dial. The difficulties of drawing the clock by patients of the subgroup I indicate the presence of light elements of constructive dyspraxia.

Decreased attention in patients with AF was noted earlier in the description of the results of the test of "verbal associations", but this parameter can't be rated quantitatively. Significant deviations have been

Table 3
Neuropsychological study of speech speed in patients with atrial fibrillation

Neuropsychological test	Main group		Control group[3] (n=115)	p
	I[1] (n=176)	II[2] (n=81)		
	The average value and standard deviation			
Literal associations	10.6±0.9	8.4±0.6	13.9±1.4	$_{1-3}$=0.048 $_{1-2}$=0.043 $_{2-3}$<0.001
Categorical associations	13.3±0.9	10.6±1.0	15.6±0.7	$_{1-3}$=0.044 $_{1-2}$=0.046 $_{2-3}$<0.001

Table 4
Neuropsychological study of visual-spatial and simulant gnosis in patients with atrial fibrillation

Neuropsychological test	Main group		Control group[3] (n=115)	p
	I[1] (n=176)	II[2] (n=81)		
	The average value and standard deviation			
Line orientation test	23.6±0.8	21.6±0.6	25.2±1.1	$_{1-2}$=0.046 $_{2-3}$=0.004
Unpainted objects	8.9±0.5	7.8±0.2	9.4±0.7	$_{1-2}$=0.042 $_{2-3}$=0.029
Clock drawing test	8.8±0.3	8.0±0.2	9.2±0.5	$_{2-1,3}$=0.027

discovered when performing special tests that require special attention. Thus, the time to perform both blocks of the test of the connection of numbers and letters in patients with AF is significantly increased compared to control group (Table 5).

Established a significant increase in the time of execution of the task in the transition of persisting (paroxysmal) form of AF to permanent. The reason for this is a violation of the switching of attention when changing tasks. In this case, in all groups, the degree of increase in the time of connection of numbers (block A) and letters (block B) did not differ significantly, which indicates a predominantly neurodynamic nature of attention disorders in the absence of primary regulatory disorders.

In the Boston naming test in patients of subgroup I and control group, categorical clues were minimal, indicating the absence of clinically significant violation of visual-subject gnosis. However, in subgroup II, hints were needed more often to name the image correctly. The frequency of literal clues in patients of subgroup II was significantly higher than in subgroup I ($p=0.049$) and control group ($p<0.001$) (Table 5).

Thus, in patients with AF there were violations of all parameters of cognitive functions, which are based on dysregulatory mechanisms and insufficiency of the neurodynamic component of cognitive activity.

In patients with a persistent form of FP, cognitive disorders were expressed to a small extent and was predominantly neurodynamic character. Noted significant differences from the control group by indicators of attention, speech speed and long-term memory. Significant violations of orientation, spatial functions, conceptualization, nominative function of speech, as well as primary memory disorders in patients of subgroups I did not detect. According to the theory of systemic dynamic localization of higher mental functions AR Luria, in patients of the subgroup I there were violations of the neurodynamic component of cognitive activity (I functional block), which did not reach the expressed clinical significance of cognitive disorders and did not affect professional and social activity. The existing

Table 5
Neuropsychological study of attention and nominative function of speech in patients with atrial fibrillation

Neuropsychological test	Main group		Control group[3] (n=115)	p
	I[1] (n=176)	II[2] (n=81)		
	The average value and standard deviation			
Number and letter connection test, block A	52.3±2.6	67.3±3.8	45.6±2.1	$_{1-3}$=0.046 $_{2-3}$<0.001 $_{1-2}$=0.001
Number and letter connection test, block B	102.9±5.4	133.6±8.4	89.2±4.3	$_{1-3}$=0.048 $_{2-3}$<0.001 $_{1-2}$=0.002
Literal clues	3.5±0.5	5.2±0.7	2.2±0.4	$_{1-2}$=0.049 $_{1-3}$=0.043 $_{2-3}$<0.001
Categorical clues	1.6±0.2	3.8±1.0	1.4±0.2	$_{1-2}$=0.032 $_{2-3}$=0.02

cognitive disorders, despite their moderate severity, were well perceived by patients: the vast majority of them noted a deterioration in memory and mental performance during active questioning.

In patients with a permanent form of AF, more pronounced disorders were noted, the leading mechanism of development of which was mental inactivity and inertia of higher nervous activity, which was confirmed by significantly worse results of total indicators of neuropsychological tests. Memory impairment was characterized mainly by a lack of direct and delayed word reproduction.

There were modal-nonspecific mnestic disorders associated with a decrease in activity and selective memorization and disorders of attention. There are no primary memory impairments, the other side of mnestic activity suffers, namely the ability to create strong memory motives and maintain the active stress needed for random memorization, as well as the ability to switch from one set of traces to another. According to the concept of AR Luria, this profile of disorders indicates dysfunction of I and III functional blocks, that is, deep and anterior parts of the brain. These disorders are based on the functional separation of the frontal lobes and subcortical formations due to changes in the white matter of the brain.

■ CONCLUSIONS

1. Atrial fibrillation is an independent risk factor for cognitive disorders and characterized by diffuse deterioration of all cognitive functions. The neuropsychological pattern of patients with atrial fibrillation is represented by neurodynamic and regulatory disorders, which are manifested by the deterioration of executive functions, auditory-speech memory, spatial gnosis, perception, concentration of attention, decreased speed of psychomotor processes.
2. In patients with persistent (paroxysmal) form of atrial fibrillation established disorders of the neurodynamic component of cognitive activity, which do not reach the expressed cognitive disorders in terms of their clinical significance and do not affect professional and social activity. In patients with a permanent form of atrial fibrillation come to the fore violations of regulatory functions, forming a polymodal cognitive deficit with a relatively uniform violation of all cognitive functions.
3. To objectify cognitive disorders, it is recommended to use the following neuropsychological tests: the first stage – MMSE, FAB, DSM; the second stage – "10 words", "5 words", verbal associations, orientation of lines, recognition of unpainted objects, drawing a clock, connection of numbers and letters, Boston naming test. Reducing the score by 1–2 points on the screening scales is the basis for an in-depth neuropsychological examination. Patients with cognitive disorders on the background of atrial fibrillation must pass neuropsychological testing at least once a year.

Conflict of interest. The author declares no conflict of interest.

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