

# Assessment of the Cognitive State of Patients with Autonomic Disorders in Chronic Cerebral Ischemia

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**Abstract** The syndrome of autonomic dysfunction is currently considered as a comorbid pathology of chronic cerebral ischemia (CCI), accompanying it as it develops. Changes occurring in the autonomic nervous system precede the subsequent neurological disorders and serve as a manifestation of maladaptive reactions. **Background.** The aim of our study was to conduct a neuropsychological study to identify cognitive impairment in patients with autonomic dysfunction at various stages of chronic cerebral ischemia. **Methods.** A study was conducted on 99 patients with autonomic dysfunction in CCI. There were examined cognitive violations at help special neuropsychological scales – MMSE, MoCA, HADS. The assessment of the vegetative status was performed using the Wayne questionnaire. **Results.** The results of our study revealed the absence of a direct proportional relationship between the patient's age and the stage of CCI, but there was a clear tendency towards an increase in the manifestations of CCI as the age of the patients increased. When studying the cognitive sphere with the MMSE scale, a direct correlation was noted between the worsening of cognitive impairment and the increase in the stage of chronic cerebral ischemia. The MoCA test showed memory impairment, difficulties in performing speed and attention tasks, as well as delayed recall in patients with stages II and III of chronic cerebral ischemia. Assessment of anxiety and depression using the HADS scale revealed an increase in anxiety-depressive manifestations with an increase in the severity of chronic cerebral ischemia (stage I – 8,0±1,5 points; stage II – 12,3±1,5 points and stage III – 14,2±1,7 points). **Conclusions.** In patients with autonomic dysfunction in chronic cerebral ischemia, cognitive impairment was observed. For definitions expressions cognitive dysfunctions follows apply special evaluation scales. Our studies revealed direct correlation changes in the severity of cognitive impairment with an increase in the stage of CCI.

**Keywords** Chronic cerebral ischemia, Autonomic dysfunction syndrome, Cognitive impairment, Wein questionnaire, Special rating scales

## 1. Introduction

Chronic cerebral ischemia (CCI) is the most common cerebrovascular disease and is characterized by a negative impact on the quality of life of the population [2]. According to various studies, the epidemiological prevalence of CCI in the entire structure of cerebrovascular pathology is 60-75% [5].

The syndrome of autonomic dysfunction in chronic cerebral ischemia manifests itself mainly by vegetative symptoms and emotional disorders [1,4]. The initial manifestations of CCI affect the emotional sphere to a greater extent, and are often manifested by astheno-depressive, asthenic and neurosis-like conditions [1].

There is an increase in the number of patients with chronic cerebral circulatory insufficiency associated with cognitive

impairment [2]. Cognitive impairment in CCI develops in more than 20% of cases [7]. At the same time, vascular cognitive impairment of both dementia and non-dementia forms of cognitive decline in the age category of patients over 65 years reaches a prevalence of 2,8% to 10% [3,7]. According to various authors, moderate and severe cognitive dysfunction occurs in 16,5% of cases in patients with CCI over 60 years of age[6]. Cognitive impairment in patients with CCI occurs as a result of brain damage caused by dysfunction of extra- and intracranial blood circulation during progressive ischemia. Mild cognitive impairment in cerebrovascular diseases is manifested by memory loss, impaired concentration and attention span, and the development of generalized asthenization. In addition, with CCI, sleep disorders are often observed, which manifest themselves already at an early stage of the disease and have a significant impact on the quality of life of patients [2,7].

Currently, as a result of the high level of instability in the social sphere and the constant process of stress, there is an increase in the demands on the adaptive capabilities of a person. As a result of decompensation of adaptation mechanisms, the

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development of manifestations of various diseases occurs [1,2,4].

Dysfunction of the autonomic nervous system in CCI develops as a result of pathological disturbances in the area of non-specific systems of the brain that regulate psycho-auto-somatic unity [2]. Most researchers associate selected neurophysiological characteristics with the peculiarities of psychological and constitutional-genetic status in patients with dysfunction of the autonomic nervous system [7].

Clinical manifestations of autonomic dysfunction and their diagnostics are quite subjective, since they are based on the patient's own sensations. In this regard, the issues of diagnostics and objectification of autonomic dysfunctions in chronic cerebral ischemia are of particular relevance [4,5].

To date, there are a number of studies devoted to the analysis of the vegetative status and cognitive sphere in CCI, but they are quite few in number, have different designs and often show divergent results. In addition, vegetative disorders in patients with CCI are usually studied without regard to age-related changes in the central nervous system. These circumstances served to determine the purpose and objectives of this study. The purpose of our study was to conduct a neuropsychological study to identify cognitive disorders in patients with autonomic dysfunctions at various stages of chronic cerebral ischemia.

## 2. Materials and Methods

We conducted studies on 99 patients with chronic cerebral ischemia. All patients were hospitalized in the neurological department of the Tashkent Medical Academy. Our study included patients who signed a written informed consent to participate in the study. To analyze the state of the autonomic nervous system, the "Questionnaire for identifying signs of autonomic changes" by A.M. Vein (1998) was used. The Mini-Mental State Examination (MMSE) was used for screening assessment of the presence of cognitive impairment. The screening assessment was necessary because complaints of autonomic dysfunction and patients' responses to the "Questionnaire for the Identification of Signs of Autonomic Changes" by A.M. Vein, as well as to the scales for identifying emotional, anxiety and depressive disorders are purely subjective, and the results largely depend on the presence and severity of cognitive dysfunction. Therefore, patients with MMSE less than 20 points were not included in the study. The Montreal Cognitive Assessment Scale (MoCA test) was used for objectification and quantitative assessment of the identified disorders in the cognitive sphere. Emotional disorders in the form of irritability, tearfulness, emotional lability and sudden mood swings, as well as anxiety and depression always accompany autonomic dysfunction. The use of the Hospital Anxiety and Depression Scale (HADS) allows to identify the state of anxiety and depression in the patient. In statistical analysis, the data were evaluated using SPSS software for Windows (version 21.0).

## 3. Result and Discussion

The analysis of the average age of patients treated in the neurological department of the TMA for chronic cerebral ischemia of stages I, II and III was carried out. Table 1 shows the distribution of patients depending on the stage of CCI.

**Table 1.** Analysis of the average age of patients depending on the stage of chronic cerebral ischemia

Stages of chronic cerebral ischemia	Stage I		Stage II		Stage III		Total	
	Men	Women	Men	Women	Men	Women	Men	Women
Men	25	25,3	20	20,2	2	2,0	47	47,5
Women	27	27,3	22	22,2	3	3,0	52	52,5
Total	52	53,6	42	42,4	5	5,0	99	100
Average age (years)	68,8±6,9		77,9±10,6		84,9±8,0		77,2 ±9,8	

As can be seen from the data in the table, there is no direct proportional relationship between age and the stage of CCI, but there is a clear tendency towards an increase in the manifestations of CCI as the age of patients increases.

All the patients examined were found to have certain concomitant diseases: atherosclerosis of the cerebral vessels (100%) with stenosis of the brachiocephalic trunk vessels of no more than 60% (38,4%), stable angina in 47,6%, arterial hypertension - 71%, dyslipidemia – 74,5%, impaired glucose tolerance and type II diabetes mellitus (insulin-independent) – 20,2%, chronic gastroduodenitis – 41,7%, deforming spondylosis and spondyloarthritis in 66,8% of patients.

The study of the state of the autonomic nervous system in patients with CCI was conducted using the "Questionnaire for identifying signs of autonomic changes". Using the "Questionnaire for identifying signs of autonomic changes" made it possible to determine the presence of autonomic dysfunction when the study result exceeded 15 points. The study showed that in patients with stage I CCI, the sum of points ranged from 15 to 19 and averaged 16,5±1,8; in patients with stage II CCI – 21,2±2,4 points (from 18 to 24 points); with stage III CCI - from 22 to 28 points and an average of 25,0±2,1 points.

Impaired cognitive function is a characteristic manifestation of chronic cerebral ischemia, which can be detected already at stage I of the disease and naturally increases as the stage of CCI increases. All patients were tested using MMSE, which revealed cognitive decline increasing from stages I to III of CCI. Thus, in patients with stage I of CCI, the MMSE score fluctuated from 30 to 26 and averaged 27,5±1,6 points. In patients with stage II of CCI, the average score was 25,5 ±2,4 (fluctuations from 28 to 23 points), and at stage III of CCI, the average score was 20,9±2,8 with fluctuations from 27 to 20 points. According to the data obtained, it should be considered that the stage of chronic cerebral ischemia plays the greatest role in the severity of cognitive impairment.

When conducting the MoCA test in patients with stage I CCI, the average score was 26,8±1,9. In patients with stage II

CCI, the result was  $26,2 \pm 1,8$ . At stage III CCI, the average score was  $24,1 \pm 2,1$ . When conducting the test, patients with stages II and III CCI showed memory impairment, difficulties in performing tasks on speed and attention, as well as on delayed playback. In patients with stages II and III chronic cerebral ischemia, when performing tasks, difficulties in switching attention, memorizing and reproducing information were noted, associated with mental slowness.

The presence and severity of anxiety and depression were assessed using the Hospital Anxiety and Depression Scale (HADS). Patients with stage I CCI had only anxiety disorders ( $8,0 \pm 1,5$  points). At stage II CCI, an increase in anxiety ( $12,3 \pm 1,5$  points) and depression ( $13,1 \pm 1,9$  points) was noted. At stage III CCI, manifestations of anxiety and depression were even more pronounced (anxiety –  $13,8 \pm 1,4$  points, depression –  $14,2 \pm 1,7$  points) compared to the figures at stages I and II of the disease. Thus, as the severity of chronic cerebral ischemia increases, an increase in anxiety-depressive manifestations is noted.

In patients with chronic cerebral ischemia, especially in older age groups, in addition to the main neurological symptoms of the disease, it is necessary to identify autonomic disorders, which are a set of clinical manifestations from various systems of the body. Severe autonomic disorders aggravate the course of chronic cerebral ischemia and significantly affect the quality of life of patients. In our study, autonomic disorders in chronic cerebral ischemia were detected in 100% of observations and were characterized by various clinical manifestations affecting various systems (cardiovascular, respiratory, urinary, gastrointestinal tract, etc.) and having a significant impact on the course of chronic cerebral ischemia.

Along with autonomic disorders, changes in the psychoemotional state were observed, characterized by states of anxiety and depression, changing depending on the stage of the disease. In patients with stage I, only anxiety disorders were noted ( $8,0 \pm 1,5$  points on the HADS scale). At stage II, an increase in anxiety ( $12,3 \pm 1,5$  points on the HADS scale) and depression ( $13,1 \pm 1,9$  points on the HADS scale) was

observed.

Thus, in the diagnosis of autonomic dysfunction in chronic cerebral ischemia, it is necessary to use clinical examination data, scales and tests that determine the presence of autonomic dysfunction and cognitive impairment in patients.

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