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RESEARCH ARTICLE
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Neurovegetative Disorders In Elderly Persons

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ABSTRACT

According to one definition, old age is a condition in which the likelihood of sudden death increases significantly. Considering that the vast majority of patients who died suddenly had coronary heart disease, and the prevalence of this pathology in the group of people over 60 years of age exceeds that in the group of middle-aged people by 8 times, the importance of the problem of studying predictors of sudden death in patients with coronary heart disease (coronary artery disease) of the elderly is beyond doubt.

Keywords: *autonomic dysfunction, comorbid, heart disease, Lillier-Strander method, elderly and senile people*

INTRODUCTION

It should be noted that only a small percentage of older people maintain their health, and most of them, reaching this age, acquire a number of chronic diseases, most often comorbid ones. According to many authors, in the structure of morbidity in elderly and senile patients, as well as among the entire population of economically developed countries, the leading place is occupied by comorbid pathology (4,6).

Studies of the last two decades indicate a significant relationship between the state of autonomic nervous regulation and mortality from cardiovascular causes, including sudden death [7]. Experimental evidence of the dependence of the frequency of occurrence of life-threatening arrhythmias and an increase in the activity of the sympathetic, or inhibition of the parasympathetic division of the autonomic nervous system [8] stimulated the development of quantitative markers for diagnosing the state of autonomic regulation, among which the most promising is the study of heart rate variability (HRV).

Autonomic dysfunction syndrome is currently considered as a comorbid pathology of chronic cerebral ischemia that accompanies it as it develops. With increasing age, the patient has a gradation of autonomic dysfunction. Changes occurring in the autonomic nervous system precede subsequent neurological disorders and serve as a manifestation of maladaptive reactions (2,3).

It is believed that as the body ages, various adaptive mechanisms are activated to compensate for the violations that occur [2]. In this regard, it is especially important to study the mechanisms of adaptation, which, despite the elderly and senile age of people and the presence of various chronic invalidizing diseases in many of them, still provide sufficient life expectancy. However, the question remains whether these adaptive

mechanisms are the same or whether adaptation features depend on the nature of existing diseases. There are a number of indications in the literature that autonomic regulation is involved in the implementation of the mechanisms of aging, and a general biological pattern is the weakening of autonomic control with age. It can be assumed that the features of autonomic regulation may reflect the mechanisms of psychophysiological adaptation of elderly and senile people both to various forms of pathology and to changes in the psychosocial status, which ultimately affects the life expectancy of such patients.

The aim of the work is to reveal the features of neurovegetative disorders in elderly patients.

MATERIAL AND RESEARCH METHODS

The study included 163 elderly patients aged 60 to 74 years (average 67.2±6.8 years) with clinically and laboratory-confirmed chronic cerebral ischemia stage 2 (CCI2) and autonomic dysfunction syndrome (AVS) (106 (64, 4%) women, 58 (35.6%) men). All patients were hospitalized in the neurology department of the clinic of the Andijan State Medical Institute.

TABLE 1: Distribution of patients by groups

Groups	n	%	average age, years (M+σ)
I group - men	58	35,4%	64,1±4,5
II group - women	106	64,6%	68,3±3,9
Total	164	100,0%	67,2±6,8

By gender, the patients were divided into 2 groups - group I consisted of men (58 patients), group II consisted of women (106 patients). The average age for women was 68.3+3.9 years, for men - 64.1+4.5 years. The control group (CG) consisted of 20 patients who did not have clinical and laboratory criteria for CCI and SVD, comparable in sex and age. (Table 1).

The state of the ANS was assessed according to the characteristics of the initial vegetative tone (IVT), vegetative reactivity (VR) and vegetative support of activity (VOD). IWT and VR make it possible to judge the homeostatic capabilities of the body, WOD - about its adaptive mechanisms. The initial vegetative tone (IVT) was assessed on the basis of the vegetative index (VI) of Kerdo, the minute volume of blood (MBV) (by the Lillier-Strander method) and cardiointervalography (CIG) [1].

Assessment of the initial vegetative tone (IVT) makes it possible to study vegetative parameters in relative rest (balance of the parasympathetic and sympathetic influence of the ANS). Stress Index (TI) - displaying the body's adaptation to pathology. Vagotonia was considered to be SI < 30 a.u., eitonia - SI = 30-60 a.u., sympathicotonia - SI > 90 a.u., SI >160 a.u. – hypersympathicotonia (1).

The autonomic regulation of heart rate was studied by the method of mathematical analysis of heart rate variability (HRV) using the software and hardware complex "Varicard 2.5". An ECG was recorded for 5 minutes in the wedge position, then a clinoorthostatic test was performed. Statistical analysis included the study of SDNN (ms), RMSSD (ms), pNN50 (%); spectral analysis - in % HF, LF, VLF-waves; variational pulsometry - Mo (ms), AMo (ms), SI (conventional units). A comprehensive assessment of HRV was carried out on the basis of the indicator of activity of regulatory systems (PARS) with differentiation of various degrees of tension of regulatory systems. When investigating external respiration, it is always necessary to take into account the close relationship between the respiratory apparatus and other (primarily cardiovascular) systems. This can be done by calculating the Skibinsky index. The simple and indirect methods for determining physical performance include the Ruffier functional test, in which the heart rate is used at different periods of recovery after a relatively small load.

Statistical processing of the results was carried out using the Microsoft Office 2000 Pro for Windows OSR 2 set of application programs on an Intel Pentium-166 PC computer (Microsoft Office 97 Professional, 1997); the computer

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program STATISTICA 6.0 was used for statistical analysis. The analysis included the determination of arithmetic mean values, correlation coefficients. The significance of differences between groups in terms of arithmetic mean values, as well as the reliability of the correlation coefficient, was determined by Student's t test. The result was considered reliable at $t>2$, at which $p<0.05$.

RESEARCH RESULTS

In elderly patients, the survey revealed the following symptoms of SVD - headaches (GB) - in 68.9%, esophageal dyskinesia (aerophagia, lump in the throat) - in 34.1%, dyskinesia of the stomach and intestines (irritable bowel syndrome) - in 64.6%, clino-orthostatic hypotension (COH) - in 43.3%, neurogenic bladder dysfunction was in 23.8%, vestibulopathic syndrome (dizziness) - in 24.4%, panic attacks - in 18.9% , local hyperhidrosis - in 37.8%, angiotrophoneurosis was rare in 9.1% of cases (vol. 2).

With regard to gender differences, it was found that the frequency of vegetative complaints in women was more pronounced than in men. Reliably significant differences were in such complaints as "dyskinesia of the esophagus (aerophagia, lump in the throat)"; "dyskinesia of the stomach and intestines (irritable bowel syndrome)"; "neurogenic bladder dysfunction"; "panic attacks" and "local hyperhidrosis" (Table 2).

TABLE 2: The severity of autonomic symptoms in elderly patients

Symptoms	Group I, n=58		II group, n=106		p
SVD	n	%	n	%	1--2
headache	39	67,2%	74	69,8%	
esophageal dyskinesia (aerophagia, lump in throat)	15	25,9%	41	38,7%	0,05
dyskinesia of the stomach and intestines (irritable bowel syndrome)	20	34,5%	86	81,1%	0,005
clino-orthostatic hypotension (COH)	20	34,5%	51	48,1%	
neurogenic bladder dysfunction	10	17,2%	29	27,4%	0,005
vestibulopathic syndrome	12	20,7%	28	26,4%	
panic attacks	8	13,8%	23	21,7%	0,005
local hyperhidrosis	11	19,0%	51	48,1%	0,005
angiotrophoneurosis	4	6,9%	11	10,4%	

In the elderly with a history of vagotonic type, pathology of the endocrine system was detected 1.5 times more often ($p<0.05$), frequent functional disorders of the gastrointestinal tract (GIT), with sympathicotonic type, dysfunctions of the cardiovascular system, frequent extrasystoles, tachycardia were registered , mild pathology of the central nervous system, deviations in the neurological status (microsymptoms) were observed with a high frequency in all forms of SVD.

In the course of a structural study of concomitant neurological pathologies, it was found that women more often have markers of more complex neurological dysfunctions, including neurogenic bladder dysfunction (1.7 times), panic attacks (2.3 times), $p<0.05$).

The study revealed that the imbalance of vegetative homeostasis was characterized by the majority of the subjects - 90.9% (n=149). In the groups, there was a small number of patients with eutonia, which is a sign of a balance of regulatory sympathoadrenal and cholinergic effects on the body. In general, in elderly patients, there was a predominance of sympathicotonia compared with vagotonia and normotonia - 56.1%, 34.8% and 9.1%, respectively. Sympathicotonia speaks

of the intensity of adaptive-compensatory mechanisms in the body.

In the studied groups, there was a significantly significant difference in the number of patients with sympathicotonia depending on gender. So in men, sympathicotonia was detected - in 31 patients (53.4%), in 22 patients (37.9%) - vagotonia was observed, only 8.6% of patients had normal autonomic tone (Table 1).

Among women, the prevalence of sympathetic influence was also observed - in 61 (57.5%) patients, parasympathicotonia was in 35 women (33.0%), eutonia 10 (9.4%) (Fig. 1). Patients with sympathicotonia predominated in the group of women. In the group of men, patients with parasympathetic vegetative tone significantly predominated ($p<0.05$).

Autonomic reactivity (AR) in 56.1% of the subjects was stated to be hypersympathicotonic, which states the disadaptation of the body as a result of an imbalance in autonomic regulation, reveals potential prerequisites for the risk of reducing the functional reserves of the cardiovascular system and provoking clinoorthostatic hypertension, extrasystole, paroxysms of tachycardia or atrial fibrillation.

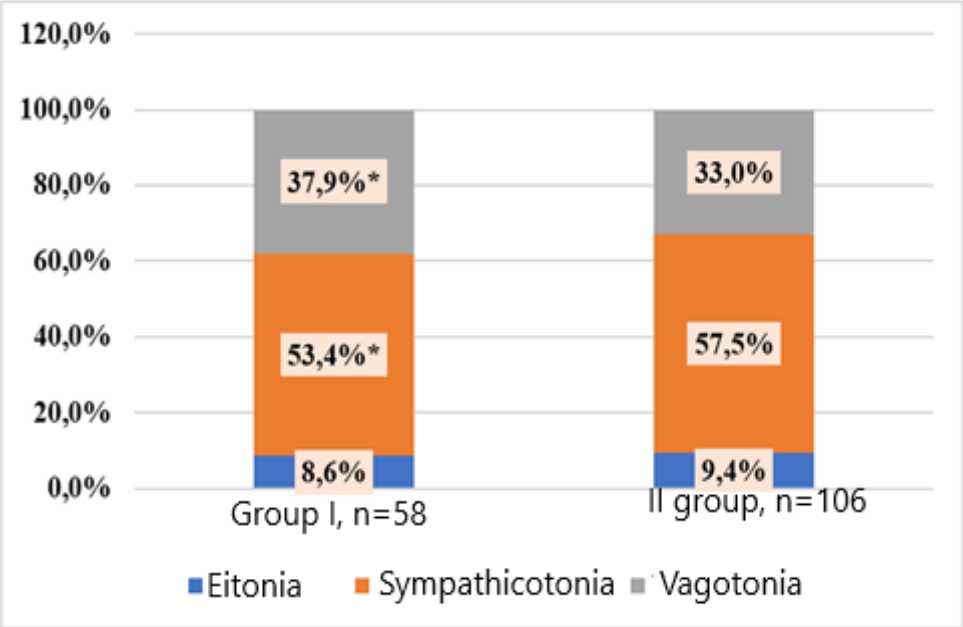

FIGURE 1: Initial autonomic tone in the elderly with CCI II by gender
Note: *-significance of differences $p<0.05$

The result of testing on the questionnaire of vegetative changes had a direct relationship with the degree of AH ($r = 0.54$) and blood glucose level ($r = 0.54$) in the MS group. In the group without SVD, there was a positive correlation between the score of autonomic disorders and the level of anxiety on the HADS scale ($r = 0.49$) and the degree of AH ($r = 0.45$) at $p < 0.05$.

It was found that the activity of psychosomatic complaints positively correlated with the average anxiety score ($rij=+0.41$, $p<0.05$). Based on the results of a survey and examination of patients, a group of somatic symptoms was identified that most often correlated with psychosomatic distress, depression and anxiety: headache ($rij=+0.5$, $p<0.05$), abdominal pain ($rij =+0.6$, $p<0.05$), fatigue ($rij=+0.3$, $p<0.05$), increased heart rate ($rij=+0.4$, $p<0.05$), "unsatisfied breath" ($rij=+0.3$, $p<0.05$). Together, they represent a somatovegetative symptom complex that aggravates the course of the underlying chronic disease.

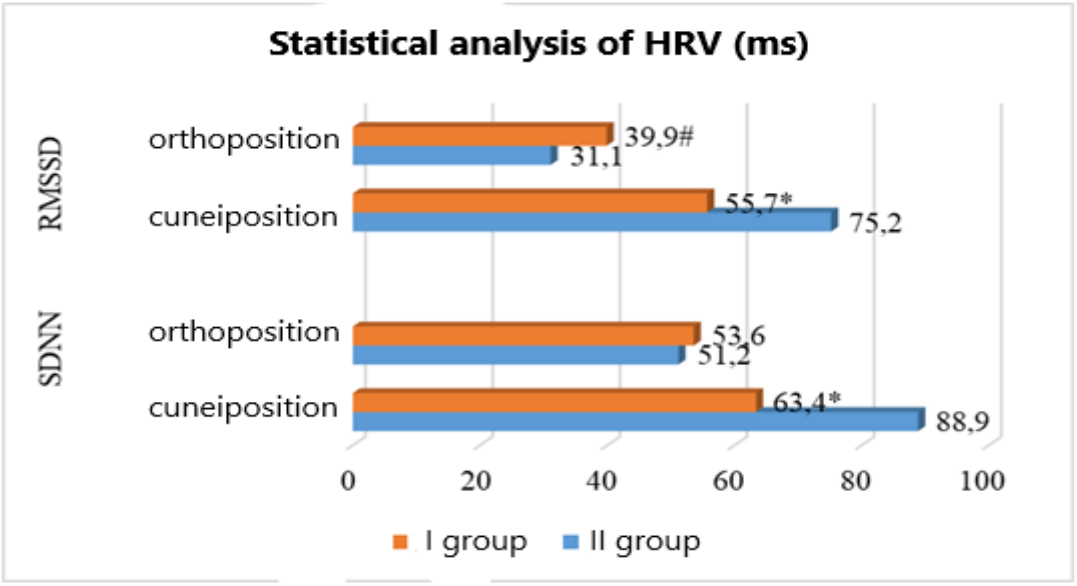

FIGURE 2: Indicators of statistical analysis of HRV (ms) in the elderly, depending on the syndrome of autonomic dystonia.

Note: *- p<0.01 (reliability of HRV indicators in cuneiform position); # - p<0.01 (significance of HRV indicators in orthoposition);

Analysis of the statistical indicators of heart rate (SDNN, RMSSD) in elderly people with SVD revealed a shift in the autonomic balance towards parasympathetic activity on heart activity at rest relative to patients without SVD (Figure 2). During the performance of the orthotest, the studied parameters showed a downward trend associated with an increase in sympathetic influences, which are more characteristic of SVD.

In the cuneiform position, the SI values in group I were 124.6±41.9 arb. units. and in group II - 135.4±26.2 units, which indicates the dominance of sympathetic influences, which are most pronounced in elderly people with SVD. In orthostasis, the highest values were found in patients with SVD (327.5 ± 94.2 units) relative to elderly people without SVD (301.4 ± 103.7 units), which is associated with an increase in the central mechanisms of regulation on rhythm hearts.

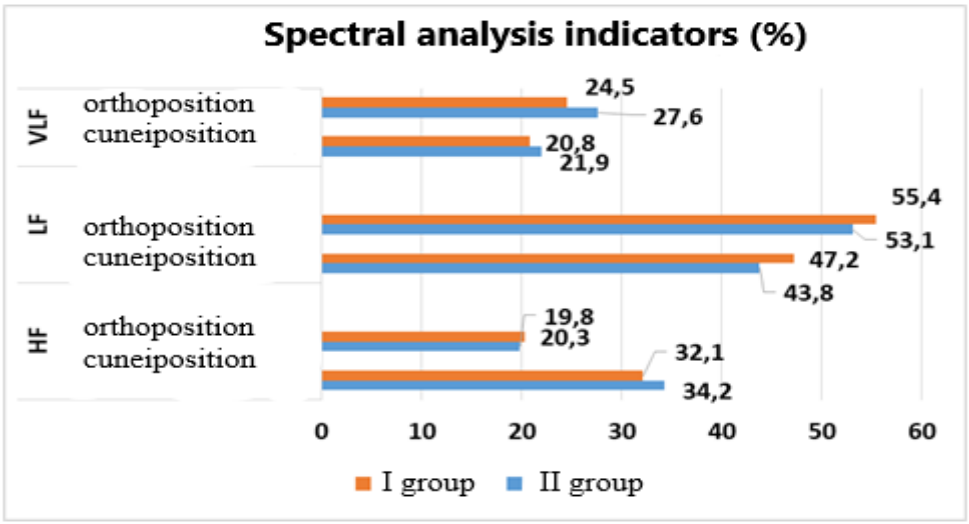

FIGURE 3: Spectral analysis parameters in the elderly depending on the presence of SVD (%)

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Taking into account the spectral analysis index of HRV HF% in groups in cuneiform position, a pronounced predominance of the parasympathetic link of regulation was observed (Figure 3).

The study of intragroup differences in the percentage distribution of PARS in the elderly revealed the dominance of moderate PARS3-4 tension in group I in 41.6% of patients and severe PARS4-6 tension in 52.7% of patients.

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The performance of the stress test led to an increase in the sympathetic effects of the ANS on the heart rate, the most pronounced in group I (19.8±2.4%). In the wedge and ortho positions, the LF% indicator was higher than the norm in both groups of boys, and the VLF% values did not go beyond the norm.

In the ortho position, 35.7% of group II and 47.3% of group I had a predominance of pronounced tension. The percentage of people with overstrain of regulatory systems in group I increased by 29.7%, and in group II decreased by 15.3%.

Thus, taking into account the indicators of heart rate variability (SDNN, RMSSD, Mo, AMo, SI, HF, LF, VLF), instability of the autonomic supply of heart rate in the elderly with SVD was revealed, manifested in the predominance of sympathetic activity at rest and a shift in the autonomic balance towards sympathetic activity when performing a clinoorthostatic test. In the elderly without SVD, autonomic homeostasis was more stable. The established features indicate the functional lability of the regulatory apparatus of the heart rate, which in the future may lead to a decrease in the adaptive capabilities of regulatory systems.

A comprehensive assessment of the functional state of regulatory systems revealed the tension of the adaptive capabilities of the heart rate regulation systems in the groups of examined elderly people with SVD, which was most pronounced in females.

A comparative study was conducted to normalize HRV with the addition of a vegetotropic drug to standard therapy. For this purpose, the drug Afabazol was prescribed 10 mg, 1 tablet 2 times a day for 1 month.

After a course of vegetotropic therapy in group I, half of the patients noted a decrease in the frequency of cephalalgia, 24% - dizziness, 30% stated normalization of sleep. The effectiveness of vegetotropic therapy was almost identical in subjects with a predominance of both sympathetic tone and parasympathetic tone of the ANS.

In group II, in adolescents, after a course of vegetotropic therapy, headaches stopped in 96% of sympathotonics and 80% of vagotonics, dizziness stopped in 40% and 32%, respectively, normalization of sleep was noted by 48% and 36%, respectively.

Analysis of the CIG results revealed that in group I, IN decreased by more than 71 arb. units (139.14±11.3 c.u. vs. 218.2.8±10.1 c.u. before treatment), vagotonics were characterized by an increase in SI by 8 c.u. up to 26.9±0.8 c.u. vs. 17.6±0.5 c.u. before treatment.

In group II, the course of therapy reduced the IN by 64 c.u. (101.2 USD vs. 158.3 USD before treatment). In vagotonics, the IN increased by 24 c.u. (41.3 USD vs. 17.9 USD before treatment).

The results obtained by us stated a greater effectiveness of therapy in sympathicotonia, a clear tendency to eitonic IWT was noted, with vagotonia a significantly smaller, but still positive dynamics was recorded in the form of a decrease in the parasympathetic effect of the ANS with vagotonic IWT.

Normalization of VR was achieved by the end of therapy in 32.4% of the studied group I, in group II - 34.9%.

In group I, the balance of the entire ANS was registered in 12.6%, in group II, excessive vegetative support for the activity of VOD - in 15.6%, insufficient VOD - in 25.9%, the norm - in 17.5%, Spectral analysis revealed a moderate increase in the TR index in 52.8% of sympathotonics of group I, which confirms the improvement in the VOD of the heart muscle, in group II, the normalization of TR was in 62.3%, in 44.8% the number of slow waves significantly increased, i.e. the parasympathetic influence decreased, the TP indicator, the power of the spectrum, the influence of the sympathetic-adrenal system increased, which indicates an increase in the intensity of ergotropic influences on HRV.

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TABLE 3: Indicators of the Stange test, Rufier index and Skibinskaya index

Groups	Cardiorespiratory tests		
	Stange test	**Skibinskaya index**	**Rufier index**
I group	51,2±5,3	21,2±3,7	2,9±1,1
II group	40,7±4,9	12,3±4,1	4,8±1,3

The results of cardiorespiratory tests (Stange test, Skibinskaya test and Rufier test) determine the tension of the adaptive reserve in the elderly, especially in females (Table 3).

Thus, according to the parameters of heart rate variability (SDNN; RMSSD; Mo; AMo; SI; HF; LF; VLF), a real imbalance in the autonomic supply of heart rhythm in the elderly was revealed, and the prevalence of sympathetic activity at rest and in the clinoorthostatic test was stated. It was concluded that the lability of the autonomic regulation of the heart rate sharply inhibits the adaptive potential of regulatory systems.

The functioning of the cardiorespiratory system of the subjects studied according to the Skibinskaya, Rufier and Stange test indices, the tension of the adaptive reserve in the elderly, especially in females, was stated.

CONCLUSION

Among the elderly, autonomic dysfunction occurs in 90.9% of cases, more often in females. It should also be noted that features of autonomic tone were found in elderly patients with a predominance of hyperactivity of the sympathetic autonomic nervous system. This suggests that there is a high probability of disruption of the adaptive capabilities of the body. Considering the high degree of severity of various comorbid conditions, we can talk about the risk of a decrease in the functional reserves of the cardiovascular system. A comprehensive study of the functional state of regulation stated the prevalence of tension in the heart rhythm regulation systems in the elderly, especially in females. Therefore, for the prevention of such complications as atrial fibrillation, clino-orthostatic hypotension, etc., it is necessary to maintain the balance of autonomic regulation of cardiac activity, and for the early diagnosis of early markers of CVS pathology, functional studies and exercise tests in the elderly should be used.

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