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MEDICAL SCIENCES

STRUCTURAL AND FUNCTIONAL STATE OF THE CARDIOVASCULAR SYSTEM IN PATIENTS WITH ARTERIAL HYPERTENSION AND CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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Abstract

Arterial hypertension (AH) is an urgent problem of world medicine. The risk of cardiovascular complications and mortality in patients with hypertension increases in the presence of comorbid diseases, such as COPD. The aim was to determine the features of the dynamics of blood pressure in patients with arterial hypertension and comorbid COPD on the basis of data from 24-hour blood pressure monitoring and echocardiographic examination of the heart. Materials and methods. 58 stable patients with stage II arterial hypertension 1-3 degrees were examined. The patients were divided into two groups: group I included patients with hypertension and COPD (n=26), group II - patients with hypertension (n=32). 24-hour blood pressure monitoring and echocardiographic examination of the heart were conducted for all patients. Statistica 10.0 was used. Results. In patients with AH and COPD, a significantly higher value of HR and PAT*HR was revealed, which is obviously a protective reaction in connection with increasing hypoxia in patients with chronic obstructive pulmonary disease. Conclusions. In patients with hypertension, the development of comorbid COPD contributes to an increase in the average daily heart rate, an increase in morning systolic blood pressure. The presence of COPD in patients with hypertension contributes to an increase in cardiovascular risk.

Keywords. Arterial hypertension, chronic obstructive lung disease, comorbidity, 24-hour blood pressure monitoring.

Introduction. Arterial hypertension (AH) is an urgent problem of world medicine. In Ukraine, hypertension is characterized by a high prevalence and a large number of complications [1,2]. Achievement of the target level of blood pressure (BP) in patients with essential hypertension (HD) is a prerequisite for reducing the cardiovascular risk of complications and mortality. Unfortunately, population control rates for this risk factor are quite low. Among the main reasons for the ineffective antihypertensive treatment and subsequently the development of cardiovascular complications, mortality, in addition to personal, social factors, the use of low doses of drugs and the use of irrational combinations, the use of generic drugs, the significance of the vascular wall stiffness indicator as a marker of the development of adverse events in this category of patients. The latter is determined by several methods. The "gold standard" is a non-invasive method for determining the speed of propagation of a pulse wave. In 2006 Dolan et al. described a non-invasive method for determining the stiffness of the vascular wall using 24-hour blood pressure monitoring (ambulatory arterial stiffness index (AASI)) [4,6]. 24-hour blood pressure monitoring is considered as an auxiliary to the "office" method of analyzing the blood pressure profile, which has recently been recognized as the only method of analysis. The importance of this diagnostic method is increasing in connection with the development of a memorandum by the European Society of Hypertension and subsequently the introduction of guidelines in the practice of doctors regarding modern requirements for the implementation and interpretation of 24-hour blood pressure monitoring results [2,4,6]. The risk of cardiovascular complications and mortality increases in the

presence of comorbid diseases. So, according to different authors, the prevalence of hypertension in patients with chronic obstructive pulmonary disease (COPD) varies in the range from 6.8 to 76.3%, with an average of 34.3%. Given the common pathogenetic links in the development of AH and COPD (hypoxia, hypercapnia, endothelial dysfunction, oxidative imbalance, dysregulation of the vascular wall due to activation of the sympathoadrenal and renin-angiotensin-aldosterone systems) [1,2,4,7], the negative effect of these diseases against each other, which contributes to their more rapid development and progression to severe cardiopulmonary failure, chronic pulmonary heart [6, 12, 29] [3,4,6].

The aim of the study. To determine the features of the dynamics of blood pressure in patients with arterial hypertension and comorbid COPD on the basis of data from 24-hour blood pressure monitoring and echocardiographic examination of the heart.

Materials and methods. 58 stable patients with stage II arterial hypertension (left ventricular hypertrophy) 1-3 degrees were examined. 26 patients had comorbid COPD categories A-D. The criteria for inclusion of patients in the studies were the presence of verified arterial hypertension, according to the recommendations of the European cardiological community [9], as well as a verified diagnosis of COPD according to GOLD 2019 [3], stable condition of patients, and informed consent of patients to participate in the study. The exclusion criteria were: patients' age over 70 years, a history of acute cardiovascular events, cardiac arrhythmias and conduction disturbances, the presence of oncological diseases, and surgical interventions in the last 6 months. The patients included in the study were

divided into two groups: group I included patients with hypertension and COPD (n = 26), group II - patients with hypertension (n = 32). Group I consisted of 15 men and 11 women (p > 0.05), mean age - 57.0 (9.5) years, 8 patients had COPD category A, category B - 10, category C - 5 and category D - 3 patients. In 5 patients, AH of grade 1 was determined, in 11 - grade 2, in 10 patients - grade 3. Group II consisted of 18 women and 14 men (p > 0.05), the average age was 51.0 (8.1) years. 8 people had arterial hypertension of 1 degree, 2 degrees - 14, 3 degrees - 10 patients. Patients of both groups underwent daily monitoring of blood pressure using a portable apparatus-software complex with digital recording, monitoring of blood pressure and ECG (according to Holter) ("Cardiotechnika-04", "Inkar", St. Petersburg, Russian Federation). The work adhered to the basic methodological requirements (national and foreign) during the ABPM [1,5,8,9]. The characteristic of the main indicators of the device installation provided for adequate selection of the cuff, programming the device operation in the 15-20 min mode during the day (7.00-22.59) and 30 min at night (23.00-6.59), the total registration time was 24-26 hours. When interpreting the results of the ABPM, the night time time was counted in the appropriate time interval from 00 h 01 min to 5 h 59 min, daytime - from 6 h 00 min to 23 h

59 min. The following ABPM indicators were analyzed: mean systolic (SBP) and diastolic (DBP) pressure per day; average pulse pressure (PAO) per day; morning rise and the speed of morning rise in SBP and DBP; indices of nocturnal decrease in SBP, hypertension, time, area, ratio of hypertension index to area index; outpatient vascular wall stiffness index (AASI) per day; symmetric vascular wall stiffness index (in English sources - sym_AASI) per day; symmetric slope index (in English sources - sym_slope) per day. An electrocardiographic study of the heart was carried out with the determination of the main indicators and indices. The data were statistically processed using the Statistica 10.0 software package (StatSoft Inc., USA). The normality of distribution of quantitative traits was analyzed using the Shapiro-Wilk test. Descriptive statistics data are presented in the form of arithmetic mean and standard deviation (M (SD)), comparison of indicators in groups was carried out using Student's and Pearson's criteria in the case of a normal distribution of features, and in the case of a non-normal distribution - in the form of a median, upper and lower quartiles (Me [25%; 75%]) using the Mann-Whitney test. The difference p < 0.05 was considered statistically significant.

Results and discussion. The obtained data of 24-hour blood pressure monitoring are presented in table 1.

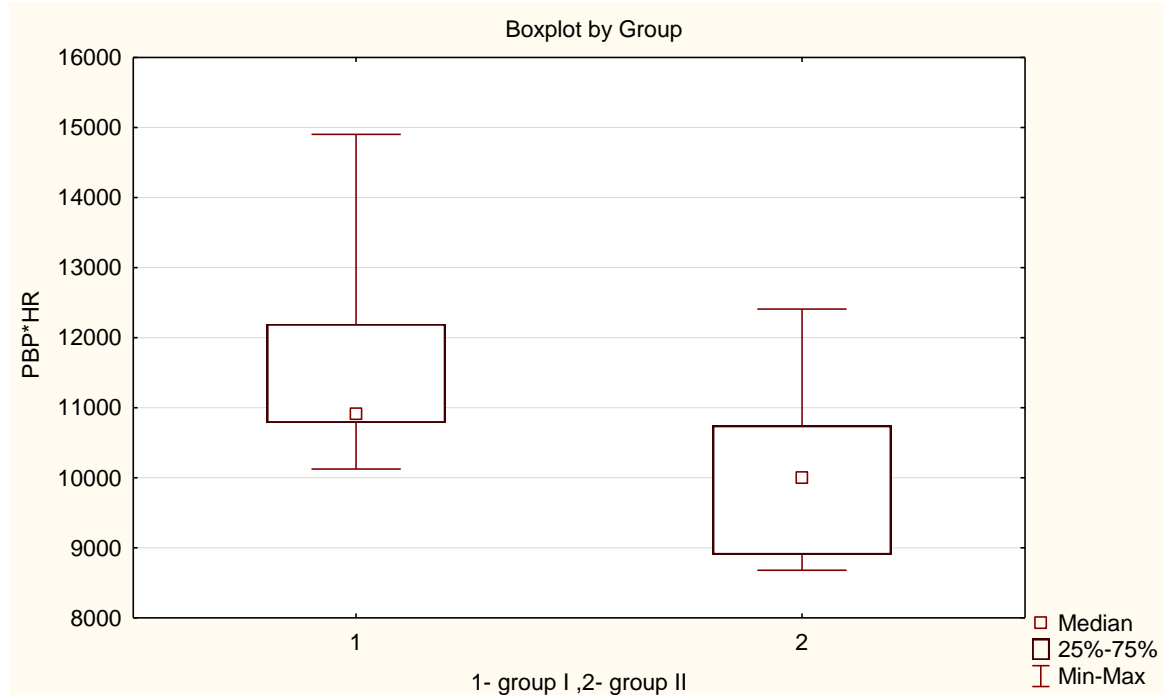
Table 1

Indicators of daily blood pressure monitoring.

Indicators	Group I	Group II	p
Heart rate, beats/min	88,00 (82,0;92,0)	77,0(70,0;85,0)	0,01
Middle SBP, mm Hg	125,00 (113,0;140,0)	136,0(124,0;142,0)	0,67
Middle DBP mm Hg	84,0(81,0;88,0)	84,0(82,0;92,0)	0,73
Daily night reduction SBP,%	8,50(-2,7;13,9)	8,1(2,5;12,8)	0,78
Daily night reduction, DBP %	8,2(-0,2;16,2)	14,7(3,2;18,6)	0,51
Variability of SBP	14,2(13,2;15,0)	14,2(13,2;18,2)	0,78
Variability of DBP	13,0(11,3;13,5)	13,9(10,7;16,6)	0,26
PBP, mm Hg	50,5(40,0;56,0)	52,0(39,0;55,0)	0,67
PBP*HR	10914,5(10788,0;12193,0)	10001,0(8906,0;10744,0)	0,03
Morning SBP rise	39,0(29,0;47,0)	28,5(23,0;57,0)	0,04
Morning DBP rise	31,0(20,0;34,0)	29,0(14,0;41,0)	0,91
SBP rise rate, mm Hg/min	1,4(0,3;1,9)	0,4(0,3;1,3)	0,14
DBP rise rate, mm Hg/min	0,3(0,2;0,7)	0,4(0,3;1,2)	0,36
SBP load	53,4(31,2;75,9)	64,6(39,7;83,9)	0,47
DBP load	57,5(56,0;73,9)	68,6(56,3;85,4)	0,34
The area under the SAT graph, mm Hg	7,4(3,0;11,0)	8,3(3,4;14,2)	0,79
Area under the GAO graph, mm Hg	6,2(4,5;7,3)	8,0(6,0;14,3)	0,56
AASI	0,3(0,2;0,5)	0,4(0,2;0,5)	0,56

In patients with AH and COPD, a significantly higher value of HR and PAT*HR was revealed, which is obviously a protective reaction in connection with increasing hypoxia in patients with chronic obstructive

pulmonary disease. These patients also had a significant increase in morning SAT, which contributes to an increased risk of cardiovascular complications [2,6].



Graph 1. PAT*HR in patients of two groups.

The data of echocardiographic examination of the heart of patients are shown in table 2.

Table 2

Indicators of echocardiographic examination in patients.

Indicators	Group I	Group II	p
Left ventricular ejection fraction, %	55,6(42,0;60,0)	64,0(56,5;71,5)	0,02
Left ventricular myocardium mass, g	172,0(144,0;198,5)	168,3(159,3;220,3)	0,3
Myocardial mass index, g/m ²	104,0(103,0;126,0)	105,0(102,0;128,0)	0,72
Ventricular septum thickness, sm	1,2(1,1;1,4)	1,2(1,1;1,3)	0,72
Mean pulmonary artery pressure, mm Hg	33,0(25,0;40,0)	22,5(20,4;28,7)	0,002
Left atrium, sm	3,9(3,4;4,4)	3,5(3,2;4,0)	0,02
EDD	5,1(4,5;5,6)	5,1(4,5;5,9)	0,68
ESD	3,8(3,3;4,1)	4,2(3,4;4,7)	0,88
EDV	139,5(118,5;147,6)	145,0(123,9;158,5)	0,03
ESV	43,5(32,0;57,0)	46,4(37,1;55,5)	0,4

In patients with AH and COPD, a significant decrease in EF was revealed, which indicates the development of systolic dysfunction in this category of patients. The presence of comorbid COPD leads to a significant increase in pressure in the pulmonary artery and the formation of secondary pulmonary hypertension (table 2), which leads to an increase in the load on the right heart and left atrium, contributing to the progression of pulmonary and heart failure [6].

Conclusions. In patients with hypertension, the development of comorbid COPD contributes to an increase in the average daily heart rate, an increase in morning systolic blood pressure. In comparison with patients with isolated hypertension, the presence of comorbid COPD leads to the development of pulmonary hypertension followed by dilatation of the left atrium and the formation of left ventricular systolic dysfunction. The obtained data suggest that the presence of COPD in patients with hypertension contributes to an increase in cardiovascular risk, and therefore this

cohort of patients needs the earliest possible comprehensive assessment of the structural and functional state of central hemodynamics.

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NEURORETINAL CHANGES IN EYE INJURY

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Abstract

A study of the retinal ganglion cell complex (GCC) in the macular area and the retinal nerve fiber layer (RNFL) in the peripapillary area was carried out using SD-OCT in 78 patients in the early period after closed contusion eye injury. An increase in the thickness of the ganglion cell complex in the macular zone and the peripapillary layer of nerve fibers, as well as an increase in the volume of focal loss (FLV) of the ganglion cell complex, was noted in the injured eye in the early period after a closed eye injury. With a closed eye injury, changes in the peripapillary RNFL primarily occur, changes in the ganglion cell complex are secondary.

Keywords: Spectral-domain optical coherence tomography, closed eye trauma, ganglion cell complex, retinal nerve fiber layer, traumatic optic neuropathy.

Relevance

Traumatic optic neuropathy (TON) is observed in 0,5–5% of cases of closed craniocerebral trauma (1) and in 2,5% of cases of maxillofacial and midface injuries (2). At the same time, with the preservation of high visual functions and visual fields, the diagnosis of TON is not made and the state of the optic nerve in this category of patients remained, until recently, poorly studied by modern diagnostic methods.

TON causes significant axonal loss with severe vision loss. Several studies have demonstrated axonal loss using optical coherence tomography or scanning laser polarimetry after TON (3-6).

A more sensitive diagnostic method is Spectral-domain optical coherence tomography (SD-OCT), which has become widespread as a non-invasive method for tracking structural changes in the retinal layers. SD-OCT allows an objective assessment of structural damage in vivo and is used to assess damage to the peripapillary of retinal nerve fibers layer (RNFL), as well as retinal ganglion cell complex (GCC) (7-9).

However, to our knowledge, a direct comparison between RNFL and GCC thickness after TON has been made in only two studies. Kanamori A. et al. (10) examined 4 patients with TON and noted a decrease in RNFL and GCC thickness several months after injury.

Lee W.J. et al. (11) used SD-OCT in two TON patients to study RNFL and GCC in order to determine the area where the lesion was first detected. Comparison of these two areas, according to Lee W.J. et al., can provide information on the progression and pathophysiology of the disease. The data obtained from two patients who underwent research over several months turned out to be inconsistent. In the first case, thinning was found earlier in the macular GCC than in the peripapillary RNFL. In the second case, the abnormality map showed thinning in the peripapillary RNFL earlier than in the macular GCC.

Objective

To study the retinal ganglion cell complex in the macular area and the peripapillary of retinal nerve fibers layer using Spectral-domain optical coherence tomography in patients in the early period after closed eye injury.

Material and methods

78 patients with closed eye trauma and transparent optical media were examined. The primary examination of the patients was carried out $3,43 \pm 0,14$ days after the injury, and the repeated examination was performed $10,48 \pm 0,15$ days after the injury. SD-OCT was performed on an RTVue-100 apparatus (Optovue Inc., Fremont, USA). The device provides measurement of