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CHANGES OF THE CARDIOVASCULAR SYSTEM STATE IN YOUNG MEN DEPENDING ON THEIR PSYCHOLOGICAL STATUS

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The purpose of the study was to establish the influence of the psycho-emotional state on clinical and hemodynamic parameters and the level of physical performance in young men. 82 young men (average age 28.4±5.2 years) without cardiovascular pathology and any somatic diseases in the anamnesis were examined. Depending on the psycho-emotional state, according to the anxiety questionnaire by Ch. D. Spielberg, the examined white men were divided into 2 groups: the main – with high anxiety – 43 people and the control – 39 people without violations of psycho-emotional status. It was established that young men without pathology of the cardiovascular system with a high level of anxiety according to the scale of Ch. D. Spielberg had reduced physical capacity according to the test with dosed physical load. It was determined that young men with reduced physical capacity and increased anxiety have a high prevalence of heart rhythm disorders according to daily ECG monitoring and signs of left ventricular diastolic dysfunction.

Key words: young people, psychoemotional disorders, daily monitoring of electrocardiography, dosed physical exercise test, diastolic function.

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ЗМІНИ СТАНУ СЕРЦЕВО-СУДИННОЇ СИСТЕМИ У МОЛОДИХ ЧОЛОВІКІВ В ЗАЛЕЖНОСТІ ВІД ЇХ ПСИХОЛОГІЧНОГО СТАТУСУ

Метою роботи було вивчити вплив психоемоційного стану на клініко-гемодинамічні показники і рівень фізичної працездатності у молодих чоловіків. Обстежено 82 молодих чоловіків (середній вік 28,4±5,2 роки) без серцево-судинної патології та будь-яких соматичних захворювань в анамнезі. В залежності від психоемоційного стану за даними опитувальника тривожності Ч.Д. Спілберга обстежені чоловіки біли розподілені на 2 групи: основна – з високою тривожністю – 43 особи і контрольна – 39 осіб без порушень психоемоційного статусу. Встановлено, що у чоловіків без патології серцево-судинної системи молодого віку з підвищеним рівнем тривожності за шкалою Ч.Д. Спілберга встановлено зниження фізичної працездатності за даними проби з дозованим фізичним навантаженням. Визначено, що у чоловіків молодого віку зі зниженою фізичною працездатністю та підвищеним рівнем тривожності виявляється висока поширеність порушень ритму серця за даними добового моніторингу ЕКГ та відзначаються ознаки діастолічної дисфункції лівого шлуночка.

Ключові слова: особи молодого віку, психоемоційні порушення, добовий моніторинг електрокардіографії, проба з дозованим фізичним навантаженням, діастолічна функція.

The work is a fragment of the research project "To determine the features of immuno-cytokine imbalance in comorbid patients with hypertension and type 2 diabetes and cardiovascular and renal complications", state registration No. 0123U101711.

Because the prevalence of chronic stress and stressful conditions in today's world is increasing rapidly [12], the identification of stress as an independent risk factor for CVD and the development of new preventive strategies have become challenges for public health, and it needs urgent attention. Previous studies have shown a link between post-traumatic stress disorder and cardiovascular disease (for example, coronary heart disease, myocardial infarction and stroke), repeated cardiovascular events, as well as mortality from all causes with cardiovascular diseases [4, 14]. To reduce mortality from cardiovascular diseases, their timely diagnosis is extremely important [11]. One of the ways to solve many aspects of

cardiovascular diseases is to create an effective system for its active detection at the earliest stages of development, because the best way to reduce morbidity and mortality from cardiovascular diseases is their primary prevention. Therefore, studying the psycho-emotional stress influence on the state of the cardiovascular system in young people is an extremely important task.

The purpose of the study was to establish the influence of the psycho-emotional state on clinical and hemodynamic indices and the level of physical performance in young men.

Materials and methods. 82 young men (average age 28.4 ± 5.2 years) without cardiovascular pathology and any somatic diseases in the anamnesis were examined.

Exclusion criteria were: cardiovascular diseases (myocarditis, arterial hypertension, heart defects, ischemic heart disease, cardiomyopathies), somatic diseases, excess body weight, and dyselectrolyte disorders.

All subjects signed an informed consent to participate in the study.

To assess situational and personal anxiety, the anxiety questionnaire by Ch. D. Spielberg, containing 40 questions, was used. The result was evaluated as follows: up to 30 – low anxiety, 31–45 – moderate anxiety, 46 and more – high anxiety. Depending on the psycho-emotional state, the examined men were divided into 2 groups: the main group – with high anxiety – 43 people (mean age 28.9 ± 6.3 years) and the control group – 39 people (mean age 28.1 ± 3.7 years) without violations of psycho-emotional status. In the main group, the degree of reactive and personal anxiety was (49.3 ± 1.4) and (48.7 ± 1.6) points, respectively, and in the control group – 28.1 ± 1.2 and 28.5 ± 1.3 , respectively.

All the examinees underwent a general clinical examination, which included a survey to identify risk factors for cardiovascular diseases, an examination, anthropometric measurements, a medical physical examination, including office blood pressure (BP) measurement, general blood and urine analysis (with determination of microalbuminuria with a test strip), biochemical blood analysis with determination of fasting glucose, lipid metabolism indicators, creatinine (with calculation of GFR according to the CKD-EPI formula), ECG in 12 standard leads on the ECG600G device (“Heaco Ltd“, Great Britain). Evaluation of ECG data was carried out according to generally accepted criteria.

All examined persons underwent a dosed exercise test (cycling ergometry, according to the protocol of R. Bruse (1971)) with the achievement of submaximal (85 %) heart rate (HR) according to age and gender. Work capacity and tolerance of physical exertion were assessed by calculating the maximum oxygen consumption (MOC) at the last level of exercise in metabolic units (MU).

Daily ECG monitoring (DM ECG) was performed on the CardioSens computerized complex, manufactured by “MEDICA-KHAI” (Kharkiv, Ukraine).

The assessment of the structural and functional parameters of the heart was performed on the device “GE Medical Systems” (Germany) with a Doppler sensor that allows operation in M- and B-modes, and also that it has an energy Doppler sensor, which makes it possible to determine the diastolic function of the left ventricle (LV) in the pulse-wave mode.

To characterize the heart systolic function, the LV ejection fraction (EF) was determined according to Simpson. According to echocardiography, LV systolic function was preserved in all subjects. The main indicators of transmitral blood flow were analyzed: E (maximum flow rate of the early filling period), A (maximum flow rate of the late filling period), E/A ratio, – as well as parameters of the kinetics of the fibrous ring of the mitral valve: the early speed e' of the diastolic movement of the lateral (e' lateral) and septal (e' septal) parts with the calculation of the average value of the speed of the early diastolic movement of the fibrous ring (e' mean); left atrial volume (LAV) and LAV index (i LAV). The ratio of the speed of the transmitral flow to the average speed of the fibrous ring of the mitral valve E/e' , which indirectly reflects the filling pressure of the LV, was calculated.

Statistical processing of the research results was carried out using the STATISTICA 10.0 program and a package of application programs. Arithmetic averages of the investigated values, root mean square deviations, and representativeness errors were calculated. Spearman's correlation analysis was used to identify the relationship between the studied values. The difference in indicators in the groups was assessed by the Mann-Whitney test and the Student's test. The level of significance p was accepted as less than 0.05.

Results of the study and their discussion. According to the data of the sample with dosed physical load, the physical capacity in the control group was 10.2 ± 0.6 MET and was assessed as high, while in the main group – 7.5 ± 0.5 MET and is classified as low ($p < 0.001$). At the same time, clinically significant signs of heart failure were not detected.

During the daily monitoring of the ECG in the subjects of the control group, no changes in the ECG during the day were registered. At the same time, in the main group, 15 (34.9 %) persons had supraventricular extrasystoles and 23 (53.5 %) had ventricular extrasystoles. In 3 (6.98 %) people of the main group, transient

atrioventricular blockade of the 1st degree was registered, both at rest during daytime hours and during sleep from 3 to 9 episodes per day for 12-27 minutes. Moreover, no complaints were detected in persons with rhythm and conduction disorders, both in the anamnesis and during daily ECG monitoring.

According to daily ECG monitoring, in the main group, an average of 85 supraventricular extrasystoles per day (from 0 to 621) and 68 ventricular extrasystoles (from 0 to 256) were registered. Supraventricular extrasystole in all cases was represented by an atrial form. Ventricular extrasystoles in 91 % of cases were polymorphic, monotopic and in 9 % – paired, monotopic, monomorphic. A correlation was established between the personal anxiety index and supraventricular ($r=0.31$; $p<0.05$) and ventricular extrasystole ($r=0.35$; $p<0.05$).

According to the echocardiography data, there were no violations of the geometry of the LV in young men. The analysis of LV ejection fraction, LV volume indices in systole and diastole, LV wall thickness and LV mass and mass index did not reveal any significant differences between the groups of examined individuals. At the same time, the main group of examinees found a significant increase in the left atrial volume index by 10.3 % ($p<0.05$).

Indices of LV diastolic function in the examined persons are presented in Table 1.

Table 1

Parameters of LV diastolic function according to Doppler echocardiography data in the examined groups (M±m)

Parameters	Main group (n=43)	Control group (n=39)
iLAV, ml/m ²	24.6±0.8	22.3±0.5*
E/A	1.1±0.06*	0.9±0.05
e' lateral, mm/s	11.3±0.9*	8.6±0.6
e' septal, mm/s	10.1±0.7*	8.2±0.5
E/e'	8.6±0.6	7.2±0.3*

Notes: * – differences are significant compared to the control group ($p<0.05$)

When analyzing the diastolic function of the LV in the examined men of the main group, a significant increase in the parameters of the ratio E/A, e' lateral, e' septal and E/e' ($p<0.05$) was found compared to the control group. A correlation was established between indicators of reactive anxiety and the E/A ratio ($r=0.45$; $p<0.05$).

Today's trend is a steady increase in the number of psychotraumatic, frustrating and stressogenic factors that negatively affect a person, his professional well-being and health [15].

In today's world, people face a huge number of stressful situations every day. We all live in extremely stressful times we constantly experience one or another stressful situations. Some people go into an anxiety disorder during a stressful event, and sometimes a minimal stressful episode is enough to initiate the development of pathogenetic consequences of anxiety disorders. And some people, who are permanently in a current stressful situation and experience stress after stress, maintain a sufficiently adequate emotional response, and such an adequate emotional response does not go into anxiety disorders.

Anxiety is characterized not only by the development of asthenia and cognitive disorders, but also by somatic complications. Persistent induction of the sympathoadrenal response leads to an increase in the risk of developing cardiovascular pathology and complicates the course of these diseases. In turn, somatic manifestations can only increase anxiety, which leads to the formation of a vicious circle [8, 10].

The system of cardiovascular regulation is the most sensitive to the influence of adverse social and psychological factors, which play an important role in the occurrence and development of cardiovascular diseases in most patients [3]. It should be especially noted that in the early stages, exposure to stressful agents can lead to asymptomatic changes in the cardiovascular system. Recent studies have shown that depression, anxiety level, and psychoemotional stress are independent risk factors for cardiovascular disease, which should be considered together with other generally recognized cardiovascular risk factors [2].

It is well known that mental stress causes endothelial dysfunction through increased activity of the sympathetic nervous system, release of corticotropin-releasing hormone from the hypothalamus, suppression of nitric oxide (NO) synthesis by cortisol, and increased levels of pro-inflammatory cytokines [8]. Mental stress-induced increase in the activity of the sympathetic nervous system and concomitant release of the parasympathetic inflammatory reflex leads to systemic inflammation and activation of the neuro-hemopoietic-arterial axis [10]. Increased sympathetic tone can cause the proliferation of arterial smooth muscle cells, which leads to vascular hypertrophy, thus contributing to the development of arterial hypertension [6]. Emotional events also cause instability in cardiac repolarization due to an imbalance in autonomic nerve stimulation of the heart by the brain, which can lead to asymmetric repolarization and arrhythmia [13].

In the presented work, an examination of young men without a history of cardiovascular pathology was carried out to identify signs of increased anxiety and, depending on the data obtained, individuals with a low and increased level of anxiety according to the scale of Ch. D. Spielberg were distinguished. It was established that young men with an unchanged psycho-emotional status were characterized by high work capacity, while persons with an increased level of anxiety showed a significant decrease in physical work capacity.

Attention is drawn to the rhythm and conduction disturbances identified by us in individuals with a high level of anxiety and the presence of a correlation between the personal anxiety index and supraventricular and ventricular extrasystole. The obtained data indicate the influence of the psycho-emotional factor on the development of rhythm disorders. In earlier studies, it was found that the main changes on the ECG in young people with a stressful effect on the heart were rhythm and conduction disturbances [6].

Many studies have shown that stress, anger, and depression have a significant impact on cardiac arrhythmogenesis [9]. Negatively charged emotions not only lead to coronary ischemia, platelet activation, vasoconstriction, hemodynamic changes and catecholamine release, but also have a significant effect on the electrical parameters of the atria and ventricles [5].

According to echocardiography, the systolic function of the LV was preserved in young people of both examined groups, no hypertrophy or dilatation of the left ventricle was detected. At the same time, in young people with a high level of anxiety, a significant increase in iLAV, E/A, e' lateral, e' septal and E/e' indicators was found, which indicates the development of diastolic dysfunction in the main group.

In an experimental study [1], it was established that chronic mild stress increases vegetative activity without affecting its balance, leads to activation of the renin-angiotensin-aldosterone system with increased expression of angiotensin type 1 receptor mRNA, as well as moderate heart hypertrophy. A relationship between chronic anger and stiffness of the common carotid artery in healthy men was also noted. [7]. It is possible that in individuals who experience frequent anger, this factor contributes to myocardial remodeling and, ultimately, diastolic dysfunction.

Conclusions

1. In young men without pathology of the cardiovascular system, but with an increased level of anxiety according to the scale of Ch. D. Spielberg, a decrease in physical capacity was established according to the data of the test with dosed physical load.

2. It has been established that young men with reduced physical capacity and high levels of anxiety have a high prevalence of heart rhythm disorders according to daily ECG monitoring.

3. In young men without a history of cardiovascular diseases with an increased level of anxiety, Doppler echocardiography shows signs of left ventricular diastolic dysfunction.

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DISABILITY AS A CONSEQUENCE OF MENTAL DISORDERS: NEW METHODOLOGICAL APPROACHES FROM THE STANDPOINT OF THE INTERNATIONAL CLASSIFICATION OF FUNCTIONING

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As of the beginning of 2017, about 300 thousand people with mental disorders in the country had a disability group, while the annual increase in persons with disabilities due to mental disorders is approximately 10 thousand people annually. It is important to develop methodological approaches to the classification of mental disorders from the standpoint of the social approach. The aim of the study was to determine the violations of vital activity criteria in persons with disabilities due to mental illness and their compliance with certain domains of the ICF to determine the feasibility of using this classifier in conducting medical and social expertise. The results showed a significant correlation between impairments of functions in the ICF domains and impairments of vital activity categories depending on the disability group. For the first time, new methodological approaches that combine medical criteria for disability and social approaches of the ICF are proposed. The application of this approach will improve the provision of expert assistance to the population from the standpoint of evidence-based medicine.

Key words: disability and health; international classification of functioning; disability, mental disorders.

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ІНВАЛІДНІСТЬ ЯК НАСЛІДОК ПСИХІЧНИХ РОЗЛАДІВ: НОВІ МЕТОДОЛОГІЧНІ ПІДХОДИ З ПОЗИЦІЙ МІЖНАРОДНОЇ КЛАСИФІКАЦІЇ ФУНКЦІОНУВАННЯ

Станом на початок 2017 р. в державі близько 300 тис. хворих на психічні розлади мали групу інвалідності, при цьому щорічний приріст осіб з інвалідністю за рахунок розладів психіки щорічно становить приблизно 10 тис осіб. Актуальним є розробка методичних підходів до класифікації проявів порушень психіки з позицій соціального підходу. Метою дослідження було визначення порушень критеріїв життєдіяльності в осіб з інвалідністю внаслідок захворювань психіки і їх відповідність певним доменам МКФ для визначення доцільності використання даного класифікатора при проведенні медико-соціальної експертизи. Результати показали достовірний кореляційний зв'язок між порушеннями функцій за доменами МКФ та порушеннями категорій життєдіяльності залежно від групи інвалідності. Вперше запропоновано нові методичні підходи, які поєднують медичні критерії інвалідності та соціальні підходи МКФ. Застосування даного підходу дозволить удосконалити надання експертної допомоги населенню з позицій доказової медицини.

Ключові слова: інвалідність і здоров'я; міжнародна класифікація функціонування; обмеження життєдіяльності, психічні розлади.

The work is a fragment of the research project "Improvement of scientific and methodological approaches to determining the criteria for limiting vital activity in the consequences of injuries and diseases", 0121U100080.

Today, mental disorders are becoming the most widespread ailments of our time [15]. Mental disorders are found in all categories of the population and in all age categories of mankind. Epidemiological studies conducted at the initiative of the WHO say that by 2025, mental illnesses will be among the top five diseases leading in the number of human labor costs, leaving behind even cardiovascular diseases and will become one of the main causes of disability of the global population [15]. In 2019, one in eight people, or 970 million people worldwide, suffered from a mental disorder. At the same time, more than 25.0 % of adults suffer from one or more mental disorders during their lifetime [13]. US statistics show that there are about 46 million people over 18 have mental disorders, which is 20 % of the country's population; another 11.4 million people (5 %) have serious functional disorders that prevent their daily functioning [6, 13].