**CHANGES IN INTIMA-MEDIA STRUCTURE IN HYPERTENSIVE PATIENTS WITH COMORBID PATHOLOGY**

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**Abstract**

The aim of study was to investigate changes in the arterial wall in patients with arterial hypertension with diabetes and abdominal obesity.

The average thickness of the intima-media complex of the common carotid arteries was higher in all examined groups with hypertensive patients compared with the control group. Patients with combined arterial hypertension and diabetes mellitus and obesity had a significant difference compared with isolated arterial hypertension.

The study found that when hypertension combined with diabetes and obesity, intima-media becomes significantly thicker. In patients with isolated stage II hypertension, the intima-media thickness was significantly more in comparison with the norm, and when combined with diabetes and obesity, this value become significantly greater.

**Keywords**: hypertension, diabetes, obesity, atherosclerosis.

Prevalence of high blood pressure (BP) in 2014 worldwide totaled 29.2% in men and 24.8% women, according to WHO data Statistics Division [8].

Arterial hypertension (AH) is one among the lead-ing risk factors (except for hypercholesterolemia, and smoking) which are responsible for more than 73% of all cardiovascular deaths. These factors determine its influence on the damage of the structure and function of the arterial blood vessels. That is why the value of the vascular status assessment is increased in the study of hypertension in recent years. Many studies suggest that essential hypertension leads to increased arterial stiffness and the pulse-wave velocity (PWV).

Age and blood pressure are important markers that determine the stiffness of the arterial wall in patients with hypertension. An increased blood pressure accel-erates age involution changes in the wall itself and form atherosclerotic plaques [7]. In patients with hyperten-sion the pulse-wave velocity is increased according to the age more rapidly than in those with normal blood pressure.

Interconnection between the pulse-wave velocity and systolic blood pressure (SBP) in hypertensive pa-tients is determined by the formula: PWV (m / s) = 0.06 SBP (mm Hg) + 0.09 Age (years) - 2.7.

The importance of hypertension duration in the formation of pathological changes in the wall is con-firmed by statistically significant correlation between the duration of hypertension and arterial stiffness pa-rameters predominantly in elastic and muscle type.

There are evidences supporting the relationship between the pathology of arteries and lipid and carbo-hydrate metabolism as well as those that haven’t shown it.

Most researchers are inclined to believe that ab-dominal obesity determines the increase of arterial stiffness due to release of biologically active substances from adipocytes, but not due to total weight increasing [6].

Chronic subclinical inflammation, which plays an important part in the genesis and progression of ather-osclerosis, is associated with obesity [7]. Abdominal adipose tissue synthesizes adipokines (leptin, adiponec-tin and cytokines - interleukin-6, tumor necrosis factor-a), which can cause inflammation, or their synthesis is associated with inflammation. An elevated level of C-reactive protein shows a high prevalence of subclinical inflammation in patients with obesity and a common basis for all the inflammatory components [7

Hypertensive patients with obesity have higher rates of arterial stiffness. It is considered that one of the key moments in the formation of atherosclerotic plaques in these patients is the transformation of smooth muscle cells and macrophages. The leading role in this process belongs to lipids. Its increased level, es-pecially triglycerides, has a toxic effect on the endothe-lium of blood vessels, increases platelet aggregation, reduces the fibrinolytic activity of blood. Hyperglyce-mia also increases the stiffness of the arterial wall (de-creases the content of elastic fibers). Moreover, adipo-cytes produce bioactive peptides (angiotensin, interleu-kin-1, leptin and adiponectin), which negatively affect the structure and function of the arteries [5].

The C.D. Lee investigation showed that increased carotid artery intima-media thickness (IMT) is more of-ten in patients with abnormal tolerance to physical ex-ertion [2]. Increased stiffness of the arteries is one of the major causes of morbidity and mortality. So know-ing about artery stiffness and its identification at an early stage will allow to assess cardiovascular risk and to correct treatment adequately.

**The purpose of research** - to study the changes in the arterial wall in patients with hypertension and as-sociated with diabetes and abdominal obesity.

**Material and methods**. A total of 195 patients with hypertension were divided into 2 groups. The first group consisted of 96 patients with arterial hyperten-sion stage I. The second group (control) 99 patients had The scientific method №15/2018 17

been diagnosed with hypertension stage II. The average age of the patients was 62,7 ± 6,4 years (from 45 to 74 years), 42% were men and 58% women. The average systolic blood pressure (SBP) in the examined patients were (166,2 ± 5,6 mm Hg.), and the average diastolic blood pressure (DBP) - 97,3 ± 2,6 mm Hg

Heart rate (HR) was equal to 86,7 ± 2,4 beats in 1 min. Congestive heart failure was not above II A stage (II Class NYHA). The study also included 20 people with no signs of hypertension, diabetes and obesity (heart rate inside the norm boarders) as the control group (average age of their constituents - 52.4 years, from 40 to 59 years, men were 12 women - 8 ). The groups were matched by sex, age, severity of clinical status, co-morbidities.

The criteria for inclusion of patients in the study were that they have clinical signs of hypertension, con-firmed by additional methods of examination. Clinical diagnosis was established on the basis of complaints of the patient, medical history, physical examination data. The diagnosis was verified with the use of laboratory and instrumental methods in accordance with recom-mendations of the European Society of Cardiology (2012-2013). The instrumental methods that were used: electrocardiography in 12 standard leads in the supine position after 5 minutes of rest; transthoracic echocar-diography (apparatus «Philips HD11XE», the United States, according to a generally recognized method of pulse-echo method with a frequency of 7.5 MHz ultra-sound).

The thickness of the intima-media complex was measured bilaterally in the distal third of the common carotid artery (CCA) in its bifurcation and in the prox-imal third of the internal CA. The maximum value was considered the largest value among the specified loca-tions (threshold level was considered as 0.9 mm). The criteria for the presence of atherosclerotic plaque (AP) in the CA is a local thickening of the artery for more than 9.5 mm, or by 50% compared to the surrounding portions of arteries or local thickening of 1.5 mm with its protrusion toward the lumen [4].

Patients with concomitant acute inflammatory, in-fectious, cancer, immune diseases and chronic diseases in the acute stage, with rheumatologic diseases, hyper-tension patients with a level of EF <50%, anemia, renal failure, episodes of acute heart failure, acute coronary syndrome within previous 3 months, paroxysmal tach-ycardia, extra systole arrhythmia, chronic obstructive pulmonary disease, occlusive vascular disease of the lower extremities were excluded from the study.

Body weight was assessed by body mass index (BMI), recommended by the WHO. The optimal BMI was in the range of 18.5-24.9 units. The criterion for overweight was - BMI 25-29.9 units and for obe-sity - BMI more than 30.0 units. The average anthropo-metric index in patients - a body mass index –was equal to 30,6 ± 1,4 kg / m2. waist-to-hip-ratio was taken into account to specify the type of fat distribution: central type considered in women with W/H> 0.85; in men W/H> 1.0 [9].

The study was approved by the Institutional Com-mittee on Bioethics and is consistent with the principles outlined in the Helsinki Declaration "(Br Med, J. 1964, p.177). The work was carried out under the Charter of Ukrainian Association of Bioethics and standards GCP (1992), in accordance with the requirements and stand-ards of ICH GCP (2002), pursuant to the provisions of the ethics of Health of Ukraine № 66 dated 13.02.2006. All patients expressed their informed consent for the study and were fully aware of the methods and scope of the study.

Since the quantitative variables in all compared groups were close to the normal probability distribu-tion, we used parametric methods. The critical value of 0.05 is selected as the significance level of p. Qualita-tive and quantitative indicators was assessed using ab-solute and relative (percentage) frequencies. The cen-tral pattern and variability of quantitative indicators were calculated by bringing the arithmetic mean value (M) and standard deviation (m), results are presented in the form of: M ± m. Statistical hypothesis of no differ-ence between the two comparable groups was tested by using suitable Student's test (for dependent or inde-pendent samples). Mathematical calculations were car-ried out in SOFA Statistics.

**Results**. The average thickness of the intima-me-dia complex of the common carotid arteries was higher in the groups with hypertensive patients compared with the control group. The thickness of the intima-media was higher in hypertensive patients in the first group than in the control group by 7.02%, but not signifi-cantly. This index was already much greater with sig-nificant value (p <0.05) in patients that have comorbid disease with diabetes mellitus (by 21.05%) and with obesity (by 19.29%), but they were not significantly different from patients with isolated hypertension (p> 0.1). We have not observed differences in rates between patients with diabetes and obesity, (p> 0.1), but when combined pathology, these changes were already sig-nificant compared with isolated arterial hypertension patients (an increase of 22.95%, p <0.05).

Table

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| Intima-media thickness in investigated groups of patients, mm Group  | Control group, n=20  | AH (isolated)  | AH+DM  | AH+Obesity  | AH+DM+Obesity  |
| AH 1 stg.  | 0,57±0,02  | n=21; 0,61±0,03  | n=27; 0,69±0,03\*#  | n=25; 0,68±0,03\*#  | n=23; 0,75±0,04\*#  |
| AH 2 stg.  | 0,57±0,02  | n=23; 0,63±0,03\*  | n=27; 0,71±0,03\*#  | n=24; 0,70±0,03\*#  | n=25; 0,77±0,04\*#  |