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The role of the obesity in the primary hypertension course among men and women

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Abstract. With the objective to study peculiarities of AH with obesity into the research included 60 patients, among them 45 women and 15 men, among all of them examined features of vasodilatation group, measured leptin and endothelin-1(ETH-1) levels. Detected AH accompanied by obesity peculiarities of course of in dependence from the gender. Among men leptin and ETH-1 levels were more favorable for blood pressure correction. Among women increasing leptin and ETH-1 levels accompanied by decreasing of nitric oxide levels is a negative process, what is necessary to take into consideration when prescribing antihypertensive therapy what needs additional new drugs for correction of endothelial dysfunction.

Key words: arterial hypertension, obesity, leptin.

Introduction. Arterial hypertension (AH) and its complications belong to the most important medical and social problems not only in Ukraine but also in economically developed countries in the world. In Ukraine, according to epidemiological researches, for AH suffer almost 13 million of people and 20-30% of cases accompanied by obesity [1; 2]. Disorders of endothelial structure and endothelial function are the most important among pathophysiological mechanisms of occurring AH. These disorders play the main role in control of vassal tonus by the help of vasoactive substances –vasoconstrictors and vasodilators. In physiological conditions interaction of endogenous vasoconstrictors (endothelin, angiotensin II, adrenalin) with vasodilators (nitric oxide, prostacyclin, endothelial relaxation factor) ensure balance of vasomotor reactions, supply normal blood pressure and adequate blood circulation. Long last influence of such risk factors as hypertension, dyslipidemia depress endothelial ability for vasodilatation also risk factors increase permeability of vessel's walls for lipids making assistance to atherosclerosis. [6; 8]. As it was previously mentioned in literature, obesity usually associated with the increasing of cardiovascular morbidity rate, but still not quite clear the mechanisms what are able to explain how develop AH and coronary heart disease (CHD) due to increasing body weight. For the last time the more attention is paid into the significance of obesity and hyperlipidemia like an independent risk factors of CHD and hypertension [3; 4; 5; 10]. If compare patients with the normal body weight, then increasing leptin concentration among obese patients is associated with susceptibility to myocardial infarction, stroke independently from the main cardiovascular risk factors. It is established that leptin assist to damage target organs in patients with AH, increase left ventricle hypertrophy and cause retinopathy and nephropathy [7; 11; 12]. Neglecting a huge number of scientific researches dedicated to obesity and hyperlipidemia influence into the AH course, the mechanisms what make women more than men potential to this comorbid pathology are still not enough investigated [9].

Research objective: to learn blood lipids spectrum, to study content of leptin, L-arginine, nitric oxide, endothelin-1 in patients with AH and obesity from the gender point of view.

Research materials and methods. There were examined 60 outpatients with AH I-II stage, 1-2 degree with overweight and obesity, among them 45 women and 15 men. To assess obesity grade we used body weight, body mass index (BMI), waist to hip ratio, calculation of obesity grade and detecting obesity type. Abdominal obesity type it means waist circumference is more than 80 cm in women and more than 94 cm in men. BMI calculated by Quetelet formula. The waist data used for the assessment of abdominal obesity grade.

The blood lipid level was measured by biochemical analyzer «Stat Fax 1904» with reagents «Human GmbH» (Germany). Detection of total cholesterol (TCh) was made by CHOD-PAP method (colorimetric enzyme analysis), wave length 500 nm, cholesterol of high density lipoproteins (Ch HDL) – enzyme method; the level lower than 0,9 mmol/L considered deviation from norm for men and for women—lower than 1,16 mmol/L. The level of triglycerides (TG) assessed by CHOD-PAP method with reagents «Human GmbH» (Germany). The level of cholesterol of low density lipoproteins (Ch LDL) calculated by Friedewald formula. To measure the nitric oxide level used specific color test with Griess reagent, for the free L-arginine level –spectrophotometry with trichloroacetic acid, for the endothelin-1 (ET-1) – immunoenzyme method using kit “Endothelin-1 ELISA kit” (Austria), for the leptin - immunoenzyme method using reagents kit «DRG» (Germany) for immunoenzyme analyzer «Stat Fax 303+» (USA).

The data received during research processed by software STATISTICA for Windows 5.0 (StatSoft, USA). Parametric characteristics were presented like arithmetic mean (M) and its deviations (m). Pearson test used for connection assessment, comparing between groups

provided by nonparametric Mann-Whitney test. The difference considered significant when $p < 0,05$.

Personal research results. There were no significant difference by age, BMI, average value of systolic and diastolic office blood pressure among included into the research patients of both sexes with AH and obesity. There were significant difference by values of lipid blood spectrum, by vasodilatation group, by leptin content among patients men and women (table 1). Thus concentration of triglycerides was significantly higher in men than in women, what accompanied by significantly higher level of nitric oxide, but concentration of endothelin-1 and leptin were significantly higher in women.

Table 1. Indices of blood lipids spectrum, of nitric oxide, of endothelin-1, of leptin in patients with arterial hypertension and obesity

Indices	Men (n=15)	Women (n=45)
Age, years	63,8±5,8	64,1±6,0
BMI, kg/m	33,1 ± 0,6	31,5±0,6
Systolic blood pressure, mmHg	164,5 ± 11,7	166,0 ± 6,8
Diastolic blood pressure, mmHg	94,8 ± 7,3	95,0 ± 5,4
Total cholesterol, mmol/L	5,51 ± 0,49	5,25 ± 0,5
Ch HDL, mmol/L	1,13 ± 0,11	1,14 ± 0,1
Ch LDL, mmol/L	3,26 ± 0,3	3,21 ± 0,31
TG, mmol/L	2,33 ± 0,17*	1,97 ± 0,2*
L-arginine, µmol/L	110,8 ± 9,9	111,6 ± 12,0
Nitric oxide, µmol/L	11,9 ± 0,12*	8,8 ± 0,08*
ETh-1, fcmol/ml	0,79 ± 0,08*	1,28 ± 0,13*
Leptin, ng/ml	13,8 ± 1,4*	17,6 ± 2,0*

Note: * $p < 0,05$ (by Mann-Whitney criteria)

Correlation analyzes detected for the each sex general connection and special connection between anthropometric data and components of blood lipid spectrum, vasodilatation group and leptin. General correlation connection detected in men and women between BMI and leptin ($r=0,75$, $r=0,79$), between levels of total cholesterol and leptin ($r=0,34$, $r=0,27$), between BMI and L-arginine ($r=0,36$, $r=0,41$). Among men detected positive

correlation between systolic blood pressure and levels of L-arginine ($r=0,34$), among women – negative correlation between BMI and levels of nitric oxide (NO) ($r=-0,36$), between NO and leptin levels ($r=-0,34$), what may indicate development of endothelial dysfunction and about disorders of endothelial compensatory abilities of generating nitric oxide in cases of obesity and increasing of leptin levels. Presented correlation show different gender mechanisms of endothelial dysfunction occurring in AH with obesity. These mechanisms include like general features of obesity influence and fat tissue hormone into the blood pressure increasing, like gender-dependent features. For women this presented by decreasing of nitric oxide accompanied by increasing BMI and leptin what is enorganic for men. Received results make necessary basement for looking forward to renew endothelial function.

Conclusions. 1. Detected different mechanisms of occurring endothelial dysfunction in men and women. 2. Among females hyperleptinemia accompanied by significant higher level of Eth-1 and lower level of nitric oxide. In males course of AH with obesity considered to be more favorable because of the lower levels of Eth and higher levels of nitric oxide. 4. Prescription choice of antihypertensive therapy demands of taking into consideration gender peculiarities.

Perspectives for the further researches. Received results make necessary basement for looking forward to renew endothelial function, especially by drugs correction.

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