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Cardiotrophin-1 as a prognostic biomarker of cardiovascular complications in comorbid patients with hypertension and concomitant type 2 diabetes mellitus and obesity

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Abstract.

Background. Since cardiovascular diseases (CVD) still occupy a leading place in the structure of mortality, the study of biomarkers that can be key in the diagnosis of early signs of the development of cardiovascular pathology continues. One such promising molecule is cardiotrophin-1 (CTF-1). The purpose of this study is to determinate of the circulating level of CTF-1 in comorbid patients with hypertension, and comparative analysis of its serum concentration in the presence of various comorbidities. Materials and methods. 111 patients with hypertension (men/women – 50/61) aged 54.37±1.18 and 20 persons of the control group were examined. In the process of careful examination and supervision of patients, they were divided into 4 groups depending on the presence of comorbid pathology in them: patients with AH- group 1 – 22 people; patients with AH + OB – group 2 – 30 people; AH+T2DM – group 3 – 31 people; patients with AH+T2DM + OB – group 4 – 28 people. Results. A direct correlation of CTF-1 level with weight, BMI, glycated hemoglobin level, SBP and DBP was established ($p < 0.001$). The data we obtained prove that CTF-1 can be a trigger for the occurrence of cardiovascular complications, since its level progressively increases with increasing severity of comorbid pathology, and its highest serum concentration is found in patients with hypertension with concomitant T2DM and obesity. Conclusions. The level of CTF-1 was significantly higher in patients with AH, T2DM, OB compared to patients with AH, patients with AH and OB, as well as with this indicator in the control group. The study of the relationship between the serum level of CTF-1 and metabolic and hormonal indicators in comorbid patients is a promising direction for further research.

Keywords:

*cardiotrophin-1
biomarker
arterial hypertension
type 2 diabetes mellitus
obesity*

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Arterial hypertension (AH), type 2 diabetes mellitus (T2DM), and obesity remain among the most common diseases in the world, with pandemic growth rates. All of the above pathological conditions constitute prognostically unfavorable factors that determine a significantly high cardiovascular risk and lead to the occurrence of coronary heart disease, myocardial dysfunction, heart failure, and other conditions.

The above comorbidity poses a major risk factor for increased disability, and cardiovascular mortality, and is a leading cause of severe medical, social, and economic problems worldwide [1, 2].

Since cardiovascular diseases (CVDs) are still by far the largest cause of death, biomarkers that can be key to diagnosing early signs of cardiovascular disease are being studied.

Cardiotrophin-1 (CTF-1) is one of these promising molecules. CTF-1 comprises a protein with a molecular mass of 21.5 kDa, which belongs to the interleukin-6 (IL-6) family.

Based on the current studies, it can be concluded that CTF-1 is a pivotal factor in the complex system of regulating the morphological "response" to various functional needs of the cardiovascular system, which allows it to be considered as a risk marker for the occurrence and severity of excessive cardiovascular remodeling [3-5].

Purpose of the study. Determining the CTF-1 circulating level in comorbid patients with hypertension and conducting a comparative analysis of its serum concentration based on different comorbidity.

Materials and methods: 111 patients with AH (men/women - 50/61) and 20 control subjects aged 54.37 ± 1.18 were examined. During a thorough examination and follow-up of patients, they were classified into 4 groups depending on the comorbidities they had: patients with AH - group 1 - 22 people; patients with AH in combination with obesity - group 2 - 30 people; AH in combination with type 2 diabetes - group 3 - 31 people; patients with AH, type 2 diabetes, and obesity - group 4 - 28 people.

Body weight and height were measured in all patients; BMI = body weight/height² (m²) was calculated. CTF-1 levels, glycosylated hemoglobin (HbA1c), lipid metabolism (total

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cholesterol, triglycerides, high-density lipoprotein, low-density lipoprotein, very low-density lipoprotein concentrations in the blood serum), systolic and diastolic blood pressure were determined.

Statistical data analysis was performed using Statistica, 12 (Stat Soft Inc, USA) and Microsoft Office Excel 2013. The data are presented as mean (M) and standard deviation (δ). Differences between groups of mean values were evaluated using the Student's t-test. An error of less than 5% ($p < 0.05$) was considered reliable.

Results and discussions. When analyzing the CTF-1 level in the examined groups of patients, a significant increase was determined in all patients compared with the control group, as well as when comparing the groups with each other, $p < 0.001$ (Fig. 1)

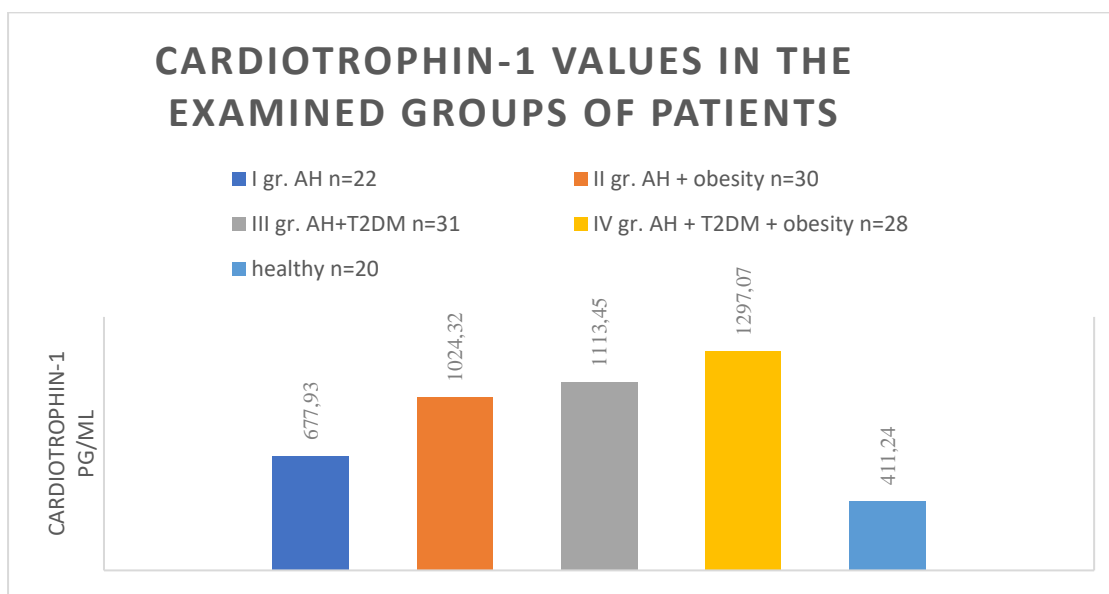


Figure 1

Note: all shifts are significant, $p < 0.001$

A direct correlation between CTF-1 level and weight, BMI, glycated hemoglobin level, SBP, and DBP was found ($p < 0.001$).

The data obtained by us indicate that CTF-1 may be a trigger for cardiovascular complications, as its level

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progressively increases with the severity of comorbidities, and its highest serum concentration was found in patients with AH and concomitant T2DM and obesity. The detected changes prove the effect of the adipose tissue hormone CTF-1 in the development of comorbid pathology and suggest that CTF-1 is a prospective biomarker for the development of cardiovascular complications.

Conclusions.

1. The CTF-1 level was significantly higher in patients with AH, T2DM, and obesity compared with patients with AH, patients with AH and obesity, as well as with the control group.

2. The CTF-1 serum concentration has a positive correlation with systolic and diastolic blood pressure, weight, body mass index, total cholesterol, and glycated hemoglobin levels.

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