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The Significance of Immuno-Biochemical Indicators in the Transformation of IHD into Acute Miokard Infarct

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Abstract Today, the problem of the ischemic state of the myocardium is considered an unresolved problem in the cardiological service. Immunobiochemical markers are used for early diagnosis. In this article, we decided to report the results of our research regarding this topical problem.

Keywords Ischemic heart disease (IHD), Cardiovascular diseases (CVD), Biomarkers

1. Introduction

In the modern world, the search for and study of new biomarkers capable of assisting in the early diagnosis of cardiovascular diseases (CVD), serving as a tool for assessing the effectiveness of therapy, being a prognostic marker of possible clinical outcomes, and a significant indicator in risk stratification remains relevant [1,3,7,10]. In clinical practice, the problem of multiple combined diseases has long been identified. Up to 80% of the healthcare budget in developed countries is spent on patients with four or more diseases. The most common term for this phenomenon is comorbidity [2,4,6,11]. However, only the part of combined diseases that has a common genetic basis and similar pathogenesis belongs to syntropia, diseases of "attraction," "mutual attraction" [5,8,9,12,13]. Many clinically proven syntropic diseases are known: immunocompromised diseases (allergic and autoimmune); endocrine diseases, including combined.

The study included 190 patients with coronary heart disease (CHD) aged 25 to 93 years. Of these, the 1st group consisted of 125 patients with coronary heart disease, where women were somewhat more numerous - 65 (52%), with an average age of 63.2±8.7 years. The number of men was 60 (48%), their average age was 62.1 ± 11.1 years; The 2nd group consisted of 65 patients with obesity, including 30 women (average age 62.6±7.8 years) and 35 men (average age 62.8±10.3 years).

2. Materials and Methods of Research

The verification of coronary heart disease was carried out according to the requirements of the World Health Organization (WHO), classified according to the International Classification of Diseases (ICD-10). Exclusion criteria for the study were patients with acute coronavirus infection (positive PCR test and presence of IgM class antibodies on ELISA), cardiomyopathies and myocarditis, acute infectious and systemic diseases. Inclusion criteria were patients with a diagnosis of coronary heart disease, clinically confirmed by changes in the electrocardiogram and/or the dynamics of cardiospecific enzymes, hospitalized for OCS. The onset of symptoms was no more than 24 hours before hospitalization. Symptoms that make suspicion of OCS (anginal pain at rest $\geq$ 20 min, first-time occurrence of angina of at least III functional class (FC), increase of angina class to III FC) and presence of OCS signs with ST elevation on ECG (or absence of changes on ECG).

3. Research Results

According to the results of the Framingham study, in patients with stable angina, the risk of developing a non-fatal myocardial infarction and death from coronary heart disease within 2 years is: 14.3 and 5.5% in men and 6.1 and 3.8% in women, respectively. Upon admission of patients with OCS attacks to the hospital, a general blood analysis with an expanded leucoformula is performed according to the diagnostic standards adopted in the Republic of Uzbekistan.

For statistical processing, patients were distributed according to the syntropy of coronary artery disease with and without obesity. In this case, the 1st group consisted of 125 patients with coronary heart disease with transition to MI (without obesity and excess weight), the 2nd group consisted of 65 patients with coronary heart disease with transition to MI against the background of obesity (of varying degrees). The obtained results of biochemical blood tests in patients showed no statistically significant shifts compared to the 1st and 2nd groups. Blood biochemical spectrum in cardiovascular pathology.

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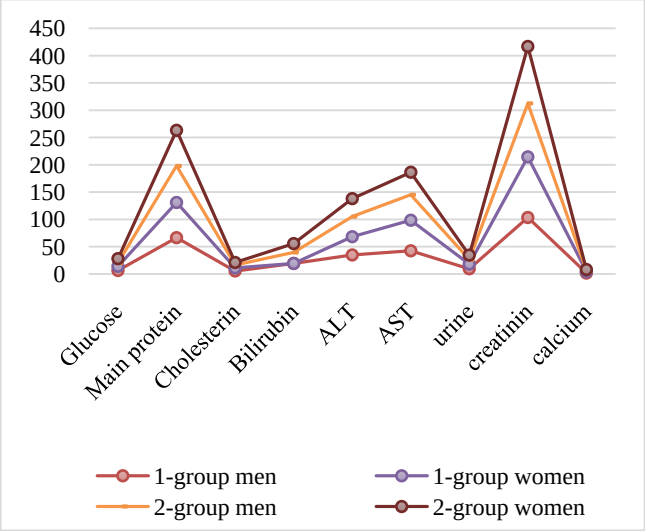

Figure 1. Blood biochemical spectrum in cardiovascular pathology

Consequently, the studied parameters of the biochemical potential of the blood in coronary heart disease cannot serve as indicators of the severity and prognosis of the transition of coronary heart disease to MI. At the same time, there is no difference in biochemical blood parameters between the comparison group and the sex.

The obtained results do not have statistical significance, although they show the development of MI in women against the background of relative hyperglycemia and hypoproteinemia. Thus, the analysis of blood biochemical parameters in OMI allowed us to establish the absence of a gender link between the mechanism of its formation and the transition of OCS to MI. Studying the nature of the inflammation allows for predicting the transition of OCS to MI and choosing the tactics for further management of this category of patients. All this served as the basis for conducting immunological blood tests in patients with coronary heart disease.

The study of cytokines in MI showed statistically significant shifts in the studied parameters depending on the sex and syntropy of MI with obesity. Thus, an increase in the level of IL-17A is noted in women of the 2nd group by 3.4 times (up to 219.6±26.0 pg/ml), compared to the data of women of the 1st group - 64.2±8.7 pg/ml, P<0.05 (Table 1).

The established reliable increase in the level of IL-17A in women of the 2nd group by 3.4 times shows a connection with obesity. It was also established that MI in women is accompanied by a 3-fold increase in the level of TNF-α, versus the values of women in the 1st group - 29.6±3.9 pg/ml.

Comparative assessment of the studied parameters, taking into account the syntropy of BMI with obesity, showed the presence of a correlation between them. Consequently, IHD in women is accompanied by an increase in TNF-α, which indicates cell death, more precisely, ischemia and cardiomyocyte necrosis.

It has been proven that the release of TNF increases capillary permeability, damages the vascular endothelium, and causes intravascular thrombosis. High levels of TNFα (>300 pg/ml) are detected during septic shock. Maintaining high levels indicates the possibility of undesirable consequences.

During the study, a relative deficiency of INF-γ was established in women of the 2nd group, revealing a decrease of 2.5 times compared to the data of women of the 1st group, p<0.05. As a result, it can be concluded that in women with obesity, interferon synthesis deficiency is observed, in particular, INF-γ, which is 2.5 times higher than in women with obesity.

Consequently, in women with coronary heart disease and obesity, in response to damage to the vascular wall due to impaired microcirculation in the myocardium and coronary vessel spasm, pro-inflammatory cytokines are triggered, with the active secretion of IL-17A and TNF-α in the blood serum against the values of this category of patients without obesity.

Comparative analysis, taking into account gender, showed an increase in the level of IL-17A in men of the 2nd group by 2.4 times (up to 127.4±17.8 pg/ml), compared to men of the 1st group - 53.1±6.8 pg/ml, P<0.05 (Table 1).

It was revealed that an even greater increase in the level of TNF-α (8.4 times) is observed in men with obesity with coronary artery disease, compared to the values of men in the 1st group-29. Unlike women, in men with coronary artery disease, there is a slight tendency towards changes in the content of INF-γ, which was within 90.3±9.0 ng/ml in men of the 1st group and 76.7±6.2 ng/ml in men of the 2nd group, statistically insignificant.

The research results allowed us to conclude that the following are effective indicators of the transformation of coronary heart disease into acute respiratory infection:

- for men: - IL-17A ≥ 106.0 pg/ml, TNF-α ≥ 168.0 pg/ml;
- for women: - IL-17A ≥ 118.0 pg/ml, TNF-α ≥ 47.2 pg/ml Based on the research results, a prognostic scheme was developed using balancing arrows indicating the risk of AII, taking into account gender.

Table 1. Cytokines in OIM

References	1-group		2-group	
	Men`s, n=60	Women`s, n=35	Men`s, n=65	Women`s, n=30
IL-17A, pg/ml	53,1±6,8	64,2 ±8,7	127,4±17,8*	219,6±26,0^
TNF-α, pg/ml	29,1±1,8	29,6±3,9	244,6±39,4*	87,6±20,7^
INF-γ, pg/ml	90,3±9,0	84,4 ±9,8	76,7±6,2	34,4±6,8^

Note: * Significance is significant for men of the 1st group (*P<0.05);
^ The values are significant compared to the women of the 1st group (^p<0.05).

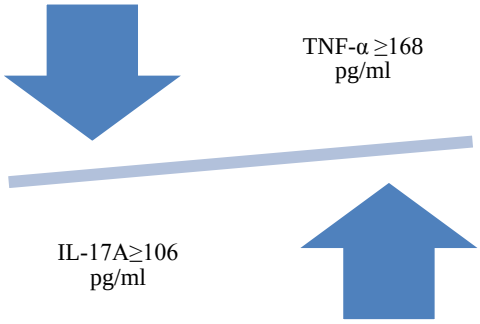

Figure 2. Scheme for predicting acute myocardial infarction in men

For the convenience of using this scheme in practice and the ease of calculating cytokine indicators, only two important cytokines, IL-17A and TNF-α, were selected. In men, an increase in TNF-α indicates activation of cellular necrosis (myocardial ischemia) against a background of an increase in IL-17A levels above 100 pg/ml. Conversely, an increase in IL-17A ≥ 118 pg/ml in women poses a risk of MI even with low TNF-α concentrations (Figure 3).

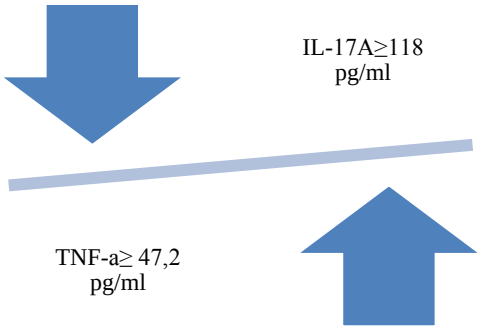

Figure 3. Diagram of the prognosis of acute myocardial infarction in women

4. Conclusions

Thus, the mechanism of OII development is closely related to the disruption of intercellular interaction at the level of cellular structures, which is determined by the state of pro- and anti-inflammatory cytokine synthesis. The activity of inflammatory markers has important prognostic significance for assessing the progression of coronary heart disease and its transformation into MI.

Women in the postmenopausal period have a high risk of coronary artery disease transforming into AII against a background of obesity. For the early detection of the risk of developing and prevention of MI, it is important to regularly examine and study the cytokine status for both men and women, depending on the combination of coronary artery disease with obesity.

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