# THE LEVEL OF SYSTEMIC INFLAMMATION AND THE STATE OF CENTRAL HEMODYNAMICS IN PATIENTS WITH CORONARY HEART DISEASE WITH METABOLIC SYNDROME

S.V. Shut', N.I. Chekalina, T.A. Trybrat, V.D. Sakevych, V.P. Boriak
Ukrainian Medical Stomatological Academy, Poltava, Ukraine

**Introduction.**

Metabolic syndrome (MS) is one of the possible risk factors for coronary heart disease (CHD) [2,7]. Meanwhile, cardiovascular disease, and first and foremost, CHD, is one of the leading causes of death in developed countries of the world [1,8]. The prognosis for patients with coronary heart disease depends, predominantly, on the progression of coronary atherosclerosis (CA). Clinical significance of MS is determined by its important prognostic value in the development of cardiovascular diseases (CVD), and in particular, CHD, due to disturbance of the function of endothelial and smooth muscle cells of the vessels, local intravascular inflammation, increased platelets function and thrombosis [4,8]. The achievement of recent years is the concept as to the important role of chronic systemic inflammation (CSI) and insulin resistance (IR) in the pathogenesis of CA and CHD, which is especially relevant for MS patients [3, 8, 9].

CSI in CA is supported by induction of cytokine-associated pathways of intracellular signaling. The central component of CSI is the nuclear factor kappa B (NF-kB), the main activators of which are proinflammatory cytokines (CK), especially interleukin 1 (IL-1) and tumor necrosis factor α (TNFα) [3, 4]. The effector unit of CSI is the Th1 CK of the immune response type, involved in the formation and destabilization of the atheromatous plaque [5, 9].

Due to the structural and functional remodeling, activation of neuro-humoral systems and reactions involving inflammatory molecules in patients with CHD, the systolic function of the left ventricle (LV) is impaired. The biomechanical reorganization of the heart causes changes in the expression of genes that mediate CSI, apoptotic reactions, etc. [6].

The aim of our research was to study the relationship between the level of CSI and impaired central hemodynamics in patients with CHD with metabolic syndrome.

**Materials and methods**.

We examined 115 patients with coronary heart disease against the background of MS, who met the main criteria of IDF and WHO: 64 men and 51 women aged 57±8.3 years) and 30 apparently healthy individuals (the control group).

The criteria for inclusion in the study were the age of men and women of 40-75 years, the presence of coronary heart disease: exertional angina, FC II, in the absence of destabilization of the course for at least two months with metabolic syndrome, informed consent of the patient to participate in the study. The exclusion criteria were the presence of chronic heart failure above stage I, high blood pressure, complications of cardiac rhythm and conduction, rheumatism, cancer, anemia, renal and hepatic insufficiency.

To achieve the aim of the research, patients were examined in terms of blood levels of IL-1β and TNFα, fibrinogen (FG) of plasma and underwent echocardiography (echo) [7]. The global contractile ability of the LV was estimated

by the shock volume (SV), the ejection fraction (EF) and the velocity of blood flow (*v*) in the outer tract (OT) of the LV. The diastolic function of the LV was investigated by recording the transmitral blood flow rates by the ratio of the rates of early (E) and late (A) diastolic LV filling (E / A), by the time of retarding of the early diastolic filling of the LV (DT) and the time of isovolumetric relaxation (IVRT) [7].

**Results**. In patients with CHD with MS, an increase in blood concentrations of pro-inflammatory CKs was found: the TNFα level was 8.38±2.15 pg / ml, and the level of IL-1β was 9.29±2.80 pg / ml. In 37.4% of patients with CHD, high levels of FG in the blood plasma were observed.

In patients with CHD with MS, EF of the LV, SV and *v* in OT of the LV were significantly lower in comparison with the group of apparently healthy persons ($p < 0.05$). The ratio of transmitral blood flow phases in patients with coronary heart disease was disturbed – $E / A < 1$, DT was increased ($p < 0.05$), IVRT was delayed ($p < 0.05$).

The study of the ratio of indicators of central hemodynamics and CSI markers revealed the inverse correlation between EF of the LV and TNFα ($r = -0.340$, $p < 0.05$), EF of the LV and FG ($r = -0.369$, $p < 0.01$), E / A and IL-1β ($r = 0.333$, $p < 0.05$).

**Conclusion**. The obtained results demonstrate the negative effect of CSI on the systolic and diastolic function of the LV in patients with CHD with MS.

**Prospects for further research.** Further study of the levels of pro-inflammatory CKs and other markers of inflammation in patients with CA and CHD with MS can be the basis for constructing a diagnostic algorithm to determine the predictors of destabilization of the course and progression of this pathology for the development of optimal pathogenetically substantiated therapies.

**Key words**: coronary heart disease, metabolic syndrome, chronic systemic inflammation, cytokines, central hemodynamics.

## References:

1. Shi, A., Tao, Z., Wei, P.& Zhao, J.,2016.Epidemiological aspects of heart. Exp Ther Med diseases.12(3), pp. 1645–1650.

2. Galkina, E.&Ley, K., 2009. Immune and inflammatory mechanisms of atherosclerosis. Annu Rev Immunol. 27, pp. 165–197.

3. Ridker, P.M., Howard, C.P., Walter, V., Everent, B., Libby, P., Hensen, J. &Thuren T., 2012. Effects of interleukin-1β inhibition with canakinumab on hemoglobin A1c, lipids, C-reactiveprotein, interleukin-6, andfibrinogen: a phase IIb randomized, placebo-controlled trial. Circulation. 126(23), pp. 2739-2748.

4. Hashizume, M. & Mihara M., 2012. Atherogenic effects of TNF-α and IL-6 via up-regulation of scavenger receptors. Cytokine. 58(3), pp. 424–430.

5. Hedrick, C.C., 2015. Lymphocytes in Atherosclerosis. Arterioscler Thromb Vasc Biol. 35(2), pp. 253–257.

6. Galenko-Iaroshevsky, P.A., Sukoyan, G.V., Ionov, D.I., Zelenskaya, A.V. &Khvitia N.G., 2017. Possibility of inhibition of TNF-α/NF-kB signaling pathway activation in myocardium and reverse cardiac hemodynamics in chronic ischemic heart disease J ClinExpPathol. 7(3). DOI: 10.4172/2161-0681.1000310

7. Evangelista, A., Flachskampf, F., Lancellotti, P., Badano, L., Aquilar, R., Monaghan, M., Zamorano, J. &Nihoyannopoulos, P., 2008. European Association of

Echocardiography recommendations for standardization of performance, digital storage and reporting of echocardiographic studies. Eur J Echocardiogr. 9, pp. 438-448.

8.A gluco-metabolic risk index with cardiovascular risk stratification potential in patients with coronary artery disease / M. Anselmino, K. Malmberg, L. Ryden, J. Ohrvik // DiabVasc Dis Res. – 2009. – №6 (2). – P.62-70.

9. Behrendt D. Endothelial function. From vascular biology to clinical applications / D. Behrendt, P. Ganz // Amer. J. Cardiol. – 2002. – V.21. – P.40–48.