DYNAMICS OF THE LEVEL OF BRAIN NATRIURETIC PEPTIDE IN PATIENTS WITH CHF ON THE BACKGROUND OF CORONOVIRUS INFECTION

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ABSTRACT

Chronic heart failure (CHF) retains a leading position among all causes of cardiovascular mortality, especially in such a difficult period as the coronavirus pandemic. It is important that heart failure is much more severe in patients with COVID-19 than in people without this disease, which is one of the most common causes that increases the risk of mortality in SARS-CoV-2 infection. Although the WHO announced the end of the COVID-19 pandemic this spring, it cannot be denied that the SARS-CoV-2 virus, including its various strains, has not disappeared anywhere and still poses a serious threat to the health system around the world.

Keywords: Brain natriuretic peptide, heart failure, ejection fraction, heart failure with low ejection fraction.

INTRODUCTION

As everyone already knows, the SARS-CoV-2 virus has a high tropism to lung cells, as a result of which significant lung damage develops, including pneumonia and acute respiratory distress syndrome (ARDS). COVID-19 has a high risk of developing multiple organ failure, including due to damage to the cardiovascular system [1]. In conditions of chronic heart failure, SARS-CoV-2 can cause myocardial damage and acute decompensation through various mechanisms, which include virus penetration through APF2 receptors, direct damage to the heart and vascular endotelium, increased thrombotic activity, stress cardiomyopathy, cytokine storm [2]. It was found that in many patients with severe COVID-19, myocardial damage is noted, accompanied by an increase in the level of the corresponding markers – natriuretic peptides, cardiac troponins, creatine phosphokinase MB-type [3]. Extensive research has been conducted on the relationship between troponin and prognosis in COVID-19. It has been reliably proven to increase the level of cardiac troponin in patients hospitalized for coronavirus infection [4,5,6]. However, there is insufficient data on natriuretic peptides, and therefore we would like to study the dynamics of BNP in this pathology. The N-terminal precursor of the brain natriuretic peptide (NT-proBNP) reflects hemodynamic stress and has been successfully used to stratify risk in heart failure (HF), as well as in other conditions such as pulmonary embolism and pneumonia [7,8,9,10].

OBJECTIVE

To find out how the level of brain natriuretic peptide changes in patients with CHF who have had COVID-19, as well as to determine its significance in predicting complications and general mortality in patients with CHF against the background of coronovirus infection.

MATERIALS AND METHODS OF RESEARCH

A retrospective analysis of 106 case histories of patients hospitalized in a specialized hospital was carried out. The diagnosis of CHF was made on the basis of anamnesis, complaints, clinical laboratory data and recommendations of the European Association of Cardiology "ESC Recommendations for the diagnosis and treatment of acute and chronic heart failure 2021". Of these, data from 60 patients (26 men and 34 women) aged 45-70 (average 63 ±6) years were selected for the study, the main diagnosis of which were coronary heart disease, GB, cardiomyopathy of various genesis complicated by CHF FC 2-3. All patients passed the 6-minute walk test. Conventional research methods were performed in all patients, including serum N-terminal precursor of cerebral natriuretic peptide (NT-proBNP) and transthoracic echocardiography was performed. In order to compare the effects of the SARS-CoV-2 virus on the NT-proBNP level, we tried to select relatively similar patients and divided them into two groups: the first group - patients with CHF who underwent COVID-19 3 to 12 months ago (30 people) and the second group - patients with CHF, non-transferable COVID-19 (30 people).

The results of the study and their discussion

In recent years, the value of natriuretic peptides has been proven in the diagnosis of heart failure (HF) in patients with acute dyspnea, namely B-type – brain natriuretic peptide (BNP), which also has a high prognostic value in patients with already established HF [11].

Guideline of the American College of Cardiology/The American Heart Association (ACC/AHA) recommends the use of a natriuretic peptide to diagnose HF and predict the severity of an already established HF (Recommendation Class I). The American Heart Failure Society (HFSA) does not recognize any other biomarkers of HF other than natriuretic peptide [12]. According to the recommendations of the European Society of Cardiology (ESC), the determination of BNP levels below 35 pg/ml and NT-proBNP below 125 pg/ml can be used to exclude the diagnosis of CHF, and 100 and 300 pg/ml for BNP and NT-proBNP, respectively, to exclude acute heart failure (AHF), but only after echocardiography. Thus, the use of BNP and NT-proBNP is currently included in the gold standard for the diagnosis of both AHF and CHF in all developed countries.

When comparing both groups, the difference between their averages was not so high, except for the NT-proBNP indicator.

Criteria		The first group	The second group
Average age (years)		62,4 ± 6	63,5 ± 6
Male		10 (33%)	16 (53%)
6-MWT		250,8 ± 13,8	242,1 ± 14,6
Echocardiography	EF of LV (%)	49,75 ± 2,18	50,13 ± 1,86
	FDS of LV (mm)	55,41 ± 1,22	57,41 ± 1,42
	FSS of LV(mm)	40,6 ± 1,62	42,11 ± 1,56

	FDV of LV (ml)	145,61 ± 7,85	164,28 ± 10,57
	FDV of LV (ml)	78,28 ± 7,41	85,68 ± 8,66
	LV myocardial mass (grams)	274,55 ± 11,47	311,98 ± 8,95
	NT-proBNP (пг/мл)	3739,6 ± 625,4	922,06 ± 141,5

The average level of NT-proBNP in group 1 was 4 times higher than in group 2 and amounted to 3739.6 pg/ml, p=0.0075. The left ventricular ejection fraction (LVEF) was 49.75=2.18% and 50.13=1.86% in groups 1 and 2, respectively. In group 1, 14 patients (46.6%) were diagnosed – HF with preserved ejection fraction (CHF with pEF), 6 patients (20%) – HF with moderately reduced ejection fraction (CHF with mrEF) and 10 patients (33.3%) – HF with low ejection fraction (CHF with lEF). In group 2, 14 patients (46.6%) had – CHF with pEF, 11 patients (36.6%) had – CHF with mrEF and 5 patients (16.6%) had – CHF with lEF.

CONCLUSIONS

The level of NT-proBNP was significantly higher in group 1 patients compared to group 2 patients. The prevalence of CHF in group 2 was twice as low as in group 1, which indicates more pronounced structural changes in patients with CHF who underwent COVID-19. Thus, coronavirus infection worsens the course of CHF, thereby affecting the quality of life, the frequency of hospitalizations and the life expectancy of a patient with CHF.

Based on the above, timely analysis of the level of cerebral natriuretic peptide in patients with chronic heart failure who have suffered a coronavirus infection is one of the most important and early biomarkers of myocardial damage, thereby helping doctors to begin timely therapy of CHF before the appearance of obvious clinical symptoms and the development of decompensation of HF. The question of the effect of the transmitted infection on the long-term consequences in people with CHF remains open.

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