Impact Factor: 9.2 ISSN-L: 2544-980X

ASSESSMENT OF INTRACARDIAC HEMODYNAMICS TYPES OF CHRONIC HEART FAILURE ACCOMPANIED BY ANEMIA

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Abstract*: Markers of renal fibrosis were evaluated in dynamics in order to study specific changes in the kidneys of patients with various hemodynamic types and functional classes of chronic heart failure with anemia and to evaluate the effectiveness of treatment with the drug exex. It was found that the marker of renal fibrosis TGF-β1 is 2591.0±108.4 and 755.0±18.87 PG/ml, respectively (p0,01), when the indicators of chronic heart failure in the blood were without anemia and anemia. This was evidenced by the process of fibrosis that occurred in the kidneys. After complex treatment with the addition of iron preparation, the TGF-β1 index decreased by 2.25 times (p0.01), the clinical condition, quality of life and indicators of resistance to physical exertion significantly changed in a positive direction. 120 patients with chronic heart failure who participated in the study were divided into 2 groups (75 of them had anemia and 45 of them had anemia) and passed excellent clinical and laboratory tests. To fulfill the tasks assigned to us, 75 patients with CHF were divided into 3 groups (in each group, more than 25 of them were stored in the left ventricular blood ejection fraction, intermediate and low were formed). The results confirmed that galectin-3 and TGF-β1, which indicate the processes of fibrosis in the heart and kidneys, as well as aldosterone, which is considered a marker of fibrosis in both organs, increase in parallel when chronic heart failure is accompanied by anemia.*

Keywords: *chronic heart failure, chronic kidney disease, kidney dysfunction, fibrosis markers, cystatin-S, TGF-β1, ferrokinetic markers, galectin-3, types of hemodynamics.*

Introduction

Chronic heart failure (CHF) is a disease that is growing, and also has significant social and economic significance among the causes of morbidity and mortality in the world. Despite the advances in the treatment of cardiovascular diseases over the past 20 years, this serious complication remains a clinical problem that was not solved until the end of this period. According to epidemiological data, the prevalence of CHF ranges from 0.4% to 2% in the United States and European countries, this indicator increases significantly with age and reaches 60% in people over 10 years old. Currently, the incidence of CHF on our planet is steadily increasing, reaching a level comparable to the level of extremely dangerous infectious epidemic diseases in terms of scale and speed of spread [5, 30]. Almost 5.8 million of the USA population and 23 million citizens in the world suffer from chronic heart failure [9-13]. It is known that in chronic heart failure, systemic organ damage develops, and from its initial period, remodeling of the left ventricle of the heart occupies an important place [16, 20, 28].

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According to the recommendations of the European Society of Cardiology (ESC 2016), patients with chronic heart failure, taking into account hemodynamic disorders, have been divided into 3 groups since 2016. According to the indications of the left ventricular ejection fraction, its reduced (<40%), intermediate (40-49%) and preserved (≥50%) types are distinguished. The standard composition of pharmacological therapy gives a relatively positive result in patients with a decrease in the blood ejection fraction. On the contrary, in CHF, in which the leading fraction is preserved, taking into account nitrates, there is practically no positive effect with standard pharmacological treatment. Therefore, the stage of decompensation of the disease in almost all cases has negative consequences. Indeed, according to a number of authors, in the pathogenesis of CHF, a violation of the diastolic filling of the left ventricle is more important than systolic dysfunction, the severity of diseases, the consequences of which are associated with it. The process of diagnosing diastolic CHF is complicated by the fact that its pathophysiology has not been fully studied [2, 16, 21, 27, 31]. In addition to the widespread prevalence of CHF, as noted above, it differs from a number of other diseases by its unpleasant consequences and a high disability index [13]. In the population of patients with CHF (I-IV FC), the average mortality rate for 5 years was 59% in men and 45% in women, which is 6-7 times higher in the general population than at the same age [5, 9, 18, 26, 30]. Because with this complication, the degree of myocardial damage is important along with other organs and organs, that is, concomitant pathology, which determines the fate of patients and the consequences of the disease [28, 29]. Among them, anemia occupies a special place, which is often accompanied by CHF [6, 13, 22, 25]. Anemia not only increases the symptoms of CHF, but also increases the duration of hospitalization, as well as worsens the quality of life, reduces endurance to physical exertion, increases mortality by 2 or more times [7, 16, 28]. It should be noted that there is a weak (stagnant) reconnection between hemoglobin and the left ventricular blood flow fraction [28]. As noted in a number of observations, in patients suffering from CHF, anemia is considered an independent risk factor, in which oxygen supply to the myocardium is significantly reduced [3, 26, 30]. It is known that in addition to anemia, a number of other polymorbid diseases are detected in patients with chronic heart failure. Among them, kidney dysfunction is the leading cause not only in the pathogenesis and development of chronic heart failure, but also in the frequency of anemia [20-28]. However, at the same time, it remains to be noted that such a concomitant disease is poorly studied from a scientific point of view [7, 11, 20].

The purpose of the study. To evaluate the effectiveness of antianemia therapy based on standard therapy in the processes of renal and cardiac fibrosis in patients with various hemodynamic types (recorded medium and low) of chronic heart failure with anemia.

Materials And Methods 120 patients with chronic heart failure who participated in the study were divided into 2 groups (75 of them had anemia and 45 of them had anemia) and passed excellent clinical and laboratory tests. To fulfill the tasks assigned to us, 75 patients with CHF were divided into 3 groups (in each group, more than 25 of them were stored in the left ventricular blood ejection fraction, intermediate and low were formed). Their age ranged from 50 to 70 years, on average 64.0±5.0. All patients were under outpatient supervision after treatment in a hospital setting. The clinical classification of the observed patients is presented in Table 1.

Table 1. Classification of patients participated in the research

№	Indicators	Group I n=75		Group II n=45	
		Absolute	%	Absolute	%
.	Men	32	42,7	25	
2.	Women	43	57,3	20	55,5

3.	Ischemic heart disease	45	60.0	36	44,5
4.	Ischemic heart disease, post-infarction cardiosclerosis	25	33,4	8	17,8
5.	Hypertension disease	5	6,6	1	2,2
6.	Obesity				

In group I patients, the iron III hydrochloride sucrose complex (venofer) was administered intravenously 200 mg as an antianemic treatment based on the standard treatment of chronic heart failure during inpatient treatment. The total dose of the drug administered to eliminate iron deficiency was calculated using a special formula [total iron deficiency = body weight, kg x (hemoglobin index 150 patients, g / l) x 0.24 + 500 mg], adop Group II patients were prescribed standard treatment for commonly accepted CHF. As a standard treatment for chronic heart failure, patients in both groups received an enzyme inhibitor or an angiotensin receptor antagonist (as the drug eplerenone-antifibrosis), which converts angiotensin, beta-blockers and mineralocorticoid resins.

The diagnosis of chronic heart failure and its functional classes in patients participating in the study were determined based on their complaints, anamnesis, examination of the facility and laboratory and laboratory tests, as well as in accordance with the criteria of the New York Society of Cardiology (New York Heart Association, 1964). It was also based on the recommendation of the World Health Organization (hemoglobin <13.0 g/dl for men and <12.0 g/dl for women) as the main criterion for anemia in group I patients.

Results And Discussion

Various hemodynamic types of chronic heart failure in patients of all groups involved in the study were studied in a comparative study of electrolyte metabolism (sodium and potassium) indicators when anemia and anemia occurred without anemia. The reference on them is presented in Table 2.

Table 2. Analysis of indicators of electrolyte metabolism in various hemodynamic types of chronic heart failure accompanied by anemia

№	Chronic heart failure types of hemodynamics indicators	Treatment cycles	Na m mol / l	K m mol / l
1	With anemia, in which the fraction of blood ejection remains in the left ventricle	Before treatment	141,2±1,4	4,3±0,3
		After treatment	138,3±1,2	4,0±0,4
2	With intermediate anemia of the left ventricle blood throwing fraction	Before treatment	142,3±1,5	4,5±0,1
		After treatment	137,1±1,2**	3,9±0,2*
3	Fraction of blood ejection from the left ventricle with reduced anemia	Before treatment	144,7±1,2	5,4±0,6
		After treatment	139,2±1,3**	4,9±0,2*

Note: * - the differences are significant compared to the indicators before treatment (*- p <0.05, ** - r<0,01, * * * - r<0,001)

Table 3. Analysis of indicators of electrolyte metabolism at night in anemia of various hemodynamic types of chronic heart failure.

№	Chronic heart failure types of hemodynamic insufficiency	Treatment cycles	Na m mol / l	K m mol / l
1	In anemia, when a fraction of blood ejection is stored in the left ventricle	Before treatment	140,3±1,41	3,8±0,13
		After treatment	140,1±1,2	3,72±0,3
2	Left ventricular blood ejection fraction with intermediate anemia	Before treatment	141,1±1,1	3,9±0,21
		After treatment	140,7±1,2	3,8±0,3
3	Left ventricular blood throwing fraction with reduced anemia	Before treatment	140,6±1,2#	4,1±0,12
		After treatment	140,2±1,4	4,0±0,7

Note: * - the differences are significant compared to the indicators before treatment (*- p<0.05, ** - r<0,01, * * * - r<0,001) # - the differences are significant in relation to the indicators of the group with anemia (#- r <0.05, ## - r<0.01, ## - r<0.001)

As indicated in the table, the differences between patients with chronic heart failure registered in the blood ejection fraction of the left ventricle without anemia, and in intermediate patients, the serum sodium and potassium values did not show significant differences from each other (r>0.05), although the differences in the blood ejection fraction of the left ventricle decreased (r<0.05). Hypernatremia was observed in patients in the group with reduced left ventricular ejection fraction and anemia, and its reliability was lower than in patients without anemia (144.7±1.2 and 140.6±1.4; p<0.05). Also, in the presence of anemia, hyperkalemia was detected in this group (5.4±0.6 and 4.1±0.12, respectively; p<0.05). The data obtained confirm the development of hypernatremia and hyperkalemia in patients with chronic heart failure, accompanied by anemia and a decrease in the blood ejection fraction. The first of them is associated with sodium reabsorption, while the second is associated with potassium retention in the body due to chronic renal failure in patients of this group. We also erased the recorded indicators even after complex treatments with the addition of iron preparations. There were no significant changes in the indicators of sodium and potassium in the group in which the fraction of blood ejection from the left ventricle was preserved, and electrolytes were maintained at the standard level. It was noted that hyponatremia and hyperkalemia were significantly reduced after complex treatment in the group where the left ventricular ejection fraction decreased and anemia was observed. (137.1±1.2 and 139.2±1.3, respectively; r<0.01; 3.9±0.2 and 4.9±0.2; r<0.05). This complex confirms that anti-inflammatory therapy, which is added to the treatment, also has a positive effect on the electrolyte balance. In recent years, it has been proven that galectin-3 is a reliable marker of fibrosis of pathological processes in the body and, above all, in the heart. But even if this marker is studied in chronic heart failure, there is no data in the existing literature on its change in the course of anemia. In our observation, the fraction of blood ejection from the left ventricle was recorded, in the intermediate and descending groups, when they did not have anemia and anemia, galectin-3 indicators were 22.5±1.1 and 19.23±1.1, 19.55±1.3 and 18.5±1.5, 19.02±1.2 and 13.2±1.4 ng/ml, respectively, in all cases (p<0.05). Bunda noted that her indicators were 1.2, 1.1 and 1.4 times higher, respectively, for different types of hemodynamics than for people without it when anemia was detected. It is known that numerous studies have proven that aldosterone is actively involved not only in water-salt metabolism in the body, but also in the processes of fibrosis. In recent years, there have been reports that this hormone is produced not only in the adrenal glands, but also in other internal organs, including the kidneys, heart. In chronic heart failure, many studies have been conducted on its change under the influence of various FS and a number of medications. But when this serious complication occurs with concomitant diseases with anemia, there is not enough data on the indicators of aldosterone in the blood. From this point of view, we obtained its

indicators in patients with chronic heart failure without anemia and anemia. In patients with intermediate, reduced and anemia, in whom the Bund remained in the blood ejection fraction in the left ventricle, aldosterone was significantly higher by 1.1, 1.1 and 1.2 times ($p<0.05$) than in patients without anemia, respectively. Theindications confirm not only the hemodynamic types of chronic heart failure, but also an increase in the level of aldosterone in the blood, hence the processes of fibrosis, depending on the presence of anemia. TGF-β1 plays a leading role in the development of fibrosis processes in the body and, above all, in kidney tissues. But there is not enough information in scientific sources about the change of this cytokine in chronic heart failure accompanied by anemia. In our study, the indicators of TGF-β1 were higher in patients with intermediate, reduced and experimental anemia and anemia, respectively 2554.7±125.4 and 2209.4±122.2 ($p<0.05$), 2832.7±176.0 and 2194.3±75.8 ($p<0.05$), 2332.8±167.8 and 1994.2±73.1 PG/ml ($p<0.05$) in patients with intermediate, reduced and experimental anemia. In those who had anemia in bun, cytokine levels were recorded at 13.5%, 22.5% and 14.5% higher, respectively, than in those who did not have it. It is known that in recent years, special importance has been attached to cystatin-C in assessing the functional state of the kidneys. It has a number of advantages over creatine. Therefore, in our observation, we determined the indicators of cystatin-C in the blood of patients and assessed capillary filtration with its help. Histatin-C values were 10.1%, 24.6% and 4.54% higher, respectively, compared with patients without anemia in groups with preserved, intermediate, reduced and anemia in the left ventricular ejection fraction. It has been shown that patients with anemia develop kidney fibrosis processes early and this process negatively affects the functional state of the kidneys. The indicators of capillary filtration detected using cystatin-C also confirm these changes, which means that in all types of hemodynamics, when anemia was detected, it was noted that it decreased by 4.3%, 7.4% and 20.2%, respectively ($p<0.05$) compared with those without anemia.

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