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АЛЬТЕРНАТИВНЫЕ ВАРИАНТЫ НУТРИТИВНОГО СТАТУСА ПАЦИЕНТОВ С ХРОНИЧЕСКОЙ СЕРДЕЧНОЙ НЕДОСТАТОЧНОСТЬЮ: ФЕНОТИП ХСН С САРКОПЕНИЧЕСКИМ ОЖИРЕНИЕМ

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Alternative Options for the Nutritional Status of Patients with Chronic Heart Failure: CHF Phenotype with Sarcopenic Obesity

Резюме

Более 7 % в общей популяции страдает хронической сердечной недостаточностью. Известно, что 65 % лиц, страдающих хронической сердечной недостаточностью, старше 60 лет, а средний возраст пациентов составляет 70 лет. Для пациентов с ХСН характерно изменение нутритивного статуса. Ожирение является одним из ведущих факторов риска заболеваний, ведущих к хронической сердечной недостаточности. Зачастую в исходе заболевания пациенты чаще приобретают недостаточность питания. С учетом саркопении, характерной для пациентов пожилого возраста, возможно формирование фенотипа ХСН с саркопеническим ожирением.

Для саркопенического ожирения характерна нормальная или повышенная жировая масса и миопения. Саркопеническое ожирение провоцирует гиподиагностику нарушений нутритивного статуса, а также, с учетом гормональной активности жировой массы, вносит вклад в прогрессирование хронической сердечной недостаточности. Все перечисленное ведет к потере функциональной активности пациентов, снижению качества их жизни и требует разработки индивидуального плана ведения.

Ключевые слова: *хроническая сердечная недостаточность, саркопения, саркопеническое ожирение*

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Abstract

More than 7% in the general population suffers from chronic heart failure. It is known that 65% of people with chronic heart failure are over 60 years old, and the average age of patients is 70 years. Patients with CHF are characterized by a change in nutritive status. Often, patients suffer from malinutrition in the outcome of the disease. However, given the prevalence of obesity and this role in the pathogenesis of diseases leading to chronic heart failure, there are patients with increased body weight. Given the sarcopenia characteristic of elderly patients, it is possible to form a phenotype of CHF with sarcopenic obesity. Sarcopenic obesity is characterized by normal or increased fat mass and miopenia. Sarcopenic obesity provokes hypodiagnosis of disorders of nutritive status, and also, taking into account the hormonal activity of the fat mass, contributes to the progression of chronic heart failure. All this leads to a loss of functional activity of patients, a decrease in their quality of life and requires the development of an individual management plan for such a patient.

Key words: *chronic heart failure, sarcopenia, sarcopenic obesity*

Conflict of interests

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BMI — body mass index, HFpEF — heart failure with preserved ejection fraction, CVD — cardiovascular diseases, CHF — chronic heart failure

Healthy longevity is a current healthcare trend. This is due to the demographic situation — the growing proportion of the elderly population and improvements in the quality of medical care. The Action Strategy for the Benefit of Elderly People in the Russian Federation until 2025 determines the importance of the functional activity of elderly people. It is known that health indicators deteriorate with age, and comorbidity increases [1]. Due to the high prevalence of cardiovascular diseases, the number of patients with chronic heart failure (CHF) is growing year after year. CHF is an outcome of cardiovascular diseases and affects the quality of life and life expectancy.

Today, knowledge about non-drug and drug methods of treating CHF is being actively systematized. The two active areas of therapy are symptomatic treatment and treatment aimed at the prognosis of the disease. It is important to understand that most patients with CHF are old, which means that geriatric syndromes should be taken into account when planning management approaches [2, 3].

Nutritional status is of particular concern in the management of elderly patients. It has been proven that the pathogenetic changes characteristic of CHF cause hyperactivation of the neuroendocrine and humoral systems, the development of hypermetabolism, and impaired nutrient absorption. The result is protein-energy malnutrition [4].

Underweight is known to be a predictor of life expectancy. Cachexia is an extreme degree of malnutrition, accompanied by a decrease in fat and muscle mass, and is an independent predictor of decreased survival in patients with chronic heart failure [5, 6].

However, among patients with CHF, there are both underweight and overweight patients. Whereas protein-energy malnutrition is often an outcome of CHF, some researchers distinguish the obesity-dependent phenotype of heart failure, taking into account the prevalence of obesity worldwide and its definition as a risk factor for cardiovascular diseases (CVD) [6]. High body mass index (BMI) is a proven risk factor for new-onset heart failure (HF), regardless of systolic dysfunction. The presence of obesity in a patient complicates the diagnosis of HF, which is associated with similar clinical symptoms — dyspnea, low exercise tolerance, as well as the difficulties in instrumental diagnosis. This phenotype is more typical for individuals with CHF with preserved ejection fraction (HFpEF) [6, 7].

The specific features of the obesity phenotype in HFpEF are the correlation of obesity with arterial stiffness in women (but not in men), and the reversibility of left ventricular hypertrophy in response to weight loss, depending on the duration of morbid obesity [6]. Obesity is associated with a fourfold increase in the prevalence of obstructive sleep apnea syndrome, which, through various mechanisms (sympathetic activation and increased left ventricle afterload, hypoxic pulmonary vasoconstriction and decreased left ventricle preload, oxidative stress and stimulation of inflammation, hypoxia), is involved in the heart failure pathogenesis [6].

Subcutaneous and visceral adipose tissue produces neurohumoral factors that cause insulin resistance, arterial hypertension, dyslipidemia, oxidative stress, and systemic inflammation. Numerous metabolic disorders affect the structure of the heart and its function [8].

As a result of a metabolic shift, lipotoxic damage to the myocardium and other organs and tissues (liver, pancreatic β-cells, heart) may develop [9]. The correlation between obesity and structural and functional changes in the heart, including left ventricular hypertrophy,

contractile dysfunction, cardiomyocyte (CMC) apoptosis, has been demonstrated.

Several meta-analyzes show the presence of a J-shaped BMI-mortality association [10–12]. The minimum mortality rate is typical for persons with a BMI in the range of 20.0 up to 25 kg/m^2, and every extra five units of the indicator are associated with an increase in the relative risk (RR) overall and cardiovascular death by an average of one-third [13]. However, the literature describes the so-called *obesity paradox*: people with chronic diseases who have a higher BMI are characterized by better survival and a lower incidence of fatal events. For the first time, such a pattern was identified in persons with CHF. The I-PRESERVED study assessed the relationship between BMI and preserved ejection fraction, adverse outcomes in 4019 heart failure patients with preserved ejection fraction. The risk of all-cause mortality and hospitalization was significantly higher in patients with BMI ≥ 35 kg/m^2 and patients with BMI < 23.5 kg/m^2 compared with patients whose body mass index ranged from 23.5–26.4 kg/m^2, 26.5–30.9 kg/m^2, and 31–34.9 kg/m^2. Similar results were obtained in the CHARM study (7599 patients with heart failure) in a cohort of patients with heart failure with preserved ejection fraction [7, 13].

The functional activity of an elderly person, which means his/her physical independence, is determined by the state of his/her muscular system. Sarcopenia is one of the geriatric symptoms affecting the quality of life of patients. Sarcopenia is defined as a progressive skeletal muscle disease that increases the risk of adverse physical outcomes such as falls, fractures, impaired physical function, disability and mortality [14]. Sarcopenia is characterized by myopenia, dynapenia, and muscle dysfunction. Sarcopenia is often considered a condition associated with malnutrition or the risk of malnutrition [15].

Sarcopenia is associated with other abnormalities in body composition — low bone mass (osteosarcopenia), high fatty mass (sarcopenic obesity), or their combination (osteoarthritides obesity). The pathogenesis and clinical role of sarcopenia have been well studied, whereas sarcopenic obesity was relatively recently studied [15, 16].

The pathogenetic basis of sarcopenic obesity is systemic inflammation, oxidative stress, mitochondrial dysfunction, endocrine disorders and physical inactivity. Endocrine disorders include aberrant insulin-like growth factor/growth hormone levels, abnormal thyroid hormone levels, insulin resistance. These hormonal abnormalities alter skeletal muscle metabolism, leading to anabolic deficits with a consequent decline in functional capacity. Chronic inflammation in obesity can lead to myopenia and is partially regulated by adiponectin, leptin, and insulin [7]. Also, chronic inflammation is a factor contributing to the development of iron deficiency [17]. Hypoxia accompanying anemia may be one of the reasons for decreased exercise tolerance in patients with HFpEF. Reduced exercise tolerance is both a leading HFpEF symptom and a contributing factor to fat gain and muscle loss. Therefore, the likelihood of sarcopenic obesity increases in patients with HFpEF [17].

Aging is the most significant risk factor for cardiovascular disease, with CHF with preserved ejection fraction dominating among the elderly [18]. Therefore, elderly patients with CHF-pEF are at risk of sarcopenic obesity.

Due to the lack of uniform criteria for sarcopenic obesity, its prevalence in the older age group, according to different studies, varies from 4 to 84% in men and from 4 to 94% in women. Sarcopenic obesity is associated with deterioration in physical status to a greater extent than obesity alone or sarcopenia alone. Alongside limitations in everyday life, patients with sarcopenic obesity are characterized by a high level of disability and mortality [14, 19–23].

According to the literature, sarcopenic obesity is associated with a high risk of cardiovascular diseases, congestive heart failure, metabolic syndrome, arterial hypertension and dyslipidemia, and death from all causes [21, 23, 25, 26].

Sarcopenic obesity with low muscle mass may cause higher mortality in people with normal BMI, and, conversely, a higher lean mass is associated with lower mortality in patients with chronic CVD [27–30].

The high incidence of sarcopenic obesity in CHF was confirmed by the prospective multicenter study SICA-HF (Studies Investigating Co-morbidities Aggravating Heart Failure), which included more than 1,500 patients with chronic heart failure. The main objective of the study was to investigate diseases concomitant to heart failure, especially in relation to obesity, cachexia and type 2 diabetes mellitus. The progressive decline in muscle mass, strength and function accompanying aging, were associated with senile asthenia syndrome and HF progression [6, 31]. Importantly, this study demonstrates the lowest life quality score in sarcopenic obesity patients and a positive correlation between appendicular muscle mass, muscle strength, and life quality.

Reciprocal effects of sarcopenia and obesity are shown in Figure 1 [22].

The concept of obesity phenotypes proposed by Carbone S et al. (2015), which takes into account body composition (manifestation of adipose and lean tissue), physical activity and cardiorespiratory load level, suggests the impact of the combination of these factors on the state of the cardiovascular system, the development and progression of CVD, the risk of cardiovascular complications and death [32].

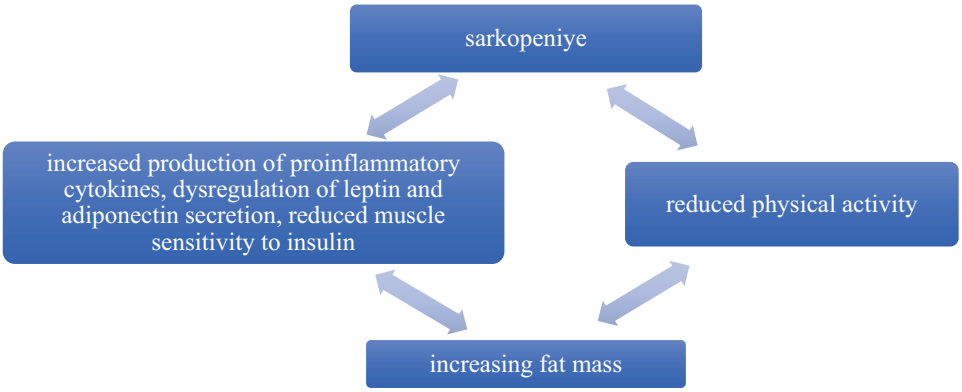

Figure 1. *The mutual impact of sarcopenia and obesity*

Therefore, there are different metabolic pathways for sarcopenia depending on changes in adipose mass with aging and chronic disease. This leads to two different paradigms of sarcopenia, i.e., cachexia and sarcopenic obesity. [32].

Sarcopenic obesity, which can be considered a complication of sarcopenia, limits mobility, resulting in dependence on physical assistance, disability and other adverse outcomes [20]. These facts must be taken into account in diagnosis and when planning the tactics of managing patients with CHF. In particular, it is possible to carry out dynamometry in an outpatient setting, as well as a short battery of tests of physical functioning [22]. These studies do not require material and time costs. However, they allow the assessment of the state of the muscular system. Comparison of anthropometry and assessment of muscular strength, mass and function will allow the doctor to develop an individual approach to the management of the patient.

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