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FEATURES OF THE FUNCTIONAL STATE OF MUSCLE TISSUE IN ELDERLY PATIENTS WITH URGENT SURGICAL PATHOLOGY

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ABSTRACT

Sarcopenia is an important factor in the occurrence of complications in elderly patients with urgent surgical pathology. Decreased muscle strength and function is an important criterion for impaired early activation of such patients, which increases the number of complications and length of stay in the clinic. Identification of functional disorders of muscle tissue, as well as other metabolic disorders, such as type 2 diabetes, disorders of lipid metabolism, is important for the appointment of an adequate complex of intensive care. Prescribing levocarnitine and D-fructose-1,6-diphosphate sodium salt of hydrate is an important part of the treatment program in such patients.

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Introduction. According to the European Working Group on Sarcopenia in Older People (EWGSOP), "Sarcopenia is a syndrome characterized by progressive and generalized loss of muscle mass and muscle strength with an increased risk of adverse events such as impaired mobility, impaired quality of life, or death." [1]. According to the US Center for Disease Control and Prevention (CDC), sarcopenia is considered one of the top five risk factors for morbidity and mortality in people over 65; associated with an increased risk of all-cause mortality and decreased self-care ability [2].

Sarcopenia is classified as primary or age-related when aging is the main cause of its development and other causes of this condition are excluded [3]. Sarcopenia, which develops against the background of severe eating disorders or restrictions on mobility, as well as against the background of other diseases, is secondary [4]. Sarcopenia is a polyetiologic disease, and therefore, in some patients it is difficult and impossible to isolate primary or secondary sarcopenia.

Multiple factors are associated with decreased muscle mass and / or strength in older adults [5, 6]. The underlying causes or mechanisms associated with sarcopenia include inadequate nutrition, lack of exercise, bed rest, age-related hormonal changes, loss of motor neurons, atherosclerosis, obesity, insulin resistance, and exposure to inflammatory cytokines.

With age, the distribution of fat mass in the body changes, there is an increase in abdominal fat and a decrease in subcutaneous fat mass [7, 8]. Simultaneously, there is a decrease in the quality of muscles, namely, a decrease in the size and number of muscle fibers (loss of type II fibers prevails), a decrease in muscle protein synthesis and a decrease in mitochondrial function [9, 10]. In patients with an excessive amount of fat mass, a change in lipid metabolism in muscles was noted. Increased infiltration of muscle tissue with lipids and adipose tissue both inside and around muscle cells. This is likely due to a systemic increase in free fatty acids [11]. According to the literature, the results of computed tomography demonstrate, when scanning at the level of the middle third of the thigh, an increase in the amount of fat mass in and around the muscles [12]. Thus, aging includes an increase and redistribution of fat mass, and changes in muscle mass: "more fat, less muscle."

The aim of the study was to determine the severity of sarcopenia in elderly patients with urgent surgical pathology of the abdominal cavity.

Materials and methods

The study was a clinical prospective open cohort randomized and was conducted on the basis of the Department of Anesthesiology and Intensive Care for patients of the surgical profile of the municipal non-profit enterprise "City Clinical Hospital of Ambulance and Emergency Care. prof. OI Meshchaninov" Kharkiv City Council and on the basis of the Department of Intensive Care of the State Institution" Institute of General Emergency Surgery named after V.T. Zaitseva" of the National Academy of Medical Sciences of Ukraine (2019–2020). To achieve this goal, we examined 90 elderly patients (73.3 ± 7.9 years) with surgical pathology of the abdominal cavity, who underwent emergency surgery under general anesthesia based on sodium thiopental with artificial lung ventilation, the average duration of which was 109,2 ± 24,6 min. The inclusion criteria were: age at least 60 years; absence of somatic diseases in the stage of decompensation, class II-III according to the ASA classification. Depending on the protocol of postoperative therapy, patients were divided into 3 groups, and they were domesticated by age, sex, anthropometric data, volume and duration of surgery and concomitant comorbid background (table 1).

Table 1. Clinical characteristics of the examined patients, (M ± σ)

Indicators	Groups		
	I	II	III
Number of patients	30	30	30
Men	9	10	8
Women	21	20	22
Age, years	72,4±6,1	72,1±5,6	72,2±5,9
Height, sm	161,2±10,4	164,4±12,1	162,6±11,9
Body weight, kg	76,8±7,9	78,4±6,7	78,1±6,9
Duration of operation, min.	109,4±31,1	110,1±29,6	109,8±32,2

Group I (n = 30) - patients who underwent standard intensive perioperative therapy, group II (n = 30): standard intensive therapy with the addition of levocarnitine from the first day of stay in the intensive care unit 15 mg / kg body weight per day intravenously slowly; group III (n = 30): standard intensive care with the addition of levocarnitine from the first day of stay in the intensive care unit 15 mg / kg body weight per day intravenously slowly for 5 days and a solution of D-fructose-1,6-diphosphate sodium salt of hydrate 150 mg / kg 2 times daily intravenously at a rate of 10 ml per minute for 5 days in the clinic.

By type a concomitant somatic pathology, patients were distributed as follows: hypertension 1-2 tbsp. I group of 12 patients, II group of 14 patients, III group of 12 patients; coronary heart disease Group I 17 patients, Group II 15 patients, Group III 14 patients; heart failure I-IIA class I group 22 patients, II group 20 patients, III group 18 patients; type II diabetes mellitus group I 28 patients, group II 27 patients, group III 27 patients. All patients with confirmed type II diabetes mellitus at the time of admission received metformin 1827.2 ± 236.1 mg per day as antidiabetic therapy.

During the interview, the patient clarified the presence of complaints of impaired mobility, difficulty walking, getting up from a chair. Anamnestic data on the presence of falls and fractures in the anamnesis were evaluated. At the time of admission, data on glycated hemoglobin levels and other laboratory parameters (glucose, creatinine, total protein and albumin, serum lipid parameters, protein in single and / or daily urine) were copied from outpatient charts, statements, medical histories.

The diagnosis of sarcopenia was based on the recommendations proposed by the European Working Group on Sarcopeniain Older People (EWGSOP, 2009) [1].

The diagnosis was based on the determination of muscle mass, strength and function. When diagnosing sarcopenia, the EWGSOP recommends the following criteria: Decreased muscle mass combined with decreased muscle strength or muscle function.

There were 3 stages of sarcopenia, according to EWGSOP recommendations: presarcopenia, sarcopenia, severe sarcopenia [1]. In patients with a decrease in muscle mass index alone, the stage of presarcopenia was established; with a decrease in muscle mass and muscle strength, the stage of sarcopenia was established.

The study of muscle mass was performed immediately after surgery in the operating room using the method of bioimpedancemetry on the analyzer "MEDASS" ABC-02. After obtaining the results of the measurement of skeletal muscle mass in kg, the calculation of the musculoskeletal mass index (SMM (kg) / height (m2) = ISMM, kg / m2) was performed. The ISMM corresponding to the decrease in muscle mass was taken to be less than 6.75 kg / m2.

Evaluation of muscle strength was performed by the method of wrist dynamometry using a mechanical wrist dynamometer DK-25, the evaluation of this indicator was performed taking into account the body mass index.

To be able to use the Student's t test, the Fischer-Snedekor test was calculated - the ratio of the larger variance to the smaller one. All mathematical operations and graphical constructions were performed using the software packages "Microsoft Office XP": "Microsoft XP Home" and "Microsoft Excel XP".

Results of the research

It was important to determine the peculiarities of metabolism and muscle condition in patients at the time of their occurrence of urgent surgical pathology. Since, according to many authoritative sources [13, 14], more than 80% of elderly patients treated in surgical clinics have a reduced sarcopenic index, regardless of body mass index, it was important to compare the length of stay of patients in groups I, II and III in the intensive care unit and in the clinic in general, taking into account the additional appointment in patients of groups II and III of substances that in one way or another affect the functional state of the muscles.

On the first day of stay in the clinic we will identify the following features of the metabolism of the studied patients (table 2).

Table 2. Clinical characteristics of the studied patients

Indicators	Groups		
	I (n=30)	II (n=30)	III (n=30)
Presarcopenia, %	53% (16)	47% (14)	43% (13)
Sarcopenia, %	47% (14)	53% (16)	57% (17)
BMI, (kg / m2)	26,2±0,4	25,9±0,2	26,4±0,6
HbA1c (%)	8,4±0,2	7,9±0,4	8,1±0,4
Dynamometry (right hand, best result from 2 attempts), kg	16,2±1,2	15,9±1,6	16,4±1,7
Reduced muscle strength according to KDM data, (%)	67,2±3,1	65,8±5,2	66,1±4,9
Intake of statins, %	93%	90%	96%
Creatinine, μmol / L	82,4±6,2	81,8±4,6	82,2±5,1
GFR, ml / min / 1,73m2	60,2±8,2	62,6±7,1	61,9±6,4
Total cholesterol, mmol / l	5,08±0,4	4,48±0,6	5,11±0,2
Total protein, g / l	72,4±2,7	71,9±4,4	70,2±2,6
The number of treatment days in ICU	5,4±1,1	4,1±0,4	$3,2\pm0,2^{*I,III}{}^{*II,III}$

***** - $p<0,05$ - probable difference between groups

At the initial analysis to determine the metabolic status of elderly patients treated in the surgical department for emergency surgery was 53%, 47% and 43% in patients of groups I, II and III, respectively, or sarcopenia, 47%, 53% and 57% in patients of groups I, II and III, respectively. Also important was the presence of elevated glycated hemoglobin (HbA1c), which was $8.4 \pm 0.2\%$, $7.9 \pm 0.4\%$ and $8.1 \pm 0.4\%$ in patients of groups I, II and III, respectively, which indicated the presence of type II diabetes mellitus, which characterizes the corresponding changes in the body by carbohydrate metabolism. Despite the almost normal body mass index in most patients, BMI 26.2 ± 0.4 kg / m2, 25.9 ± 0.2 kg / m2 and 26.4 ± 0.6 kg / m2 in groups I, II and III, respectively, it was important to determine the dynamics and muscle strength, which confirmed the presence of presarcopenia / sarcopenia in all patients. Thus, in group I the indicators of dynamometry and muscle strength were 16.2 ± 1.2 kg and $67.2 \pm 3.1\%$, in group II - 15.9 ± 1.6 kg and 65.8 ± 5.2 %, in group III - 16.4 ± 1.7 kg and $66.1 \pm 4.9\%$, respectively.

It was important to obtain data on the use of statins in the studied patients. Thus, more than 90% of elderly patients admitted to a surgical hospital with urgent pathology had disorders of lipid metabolism. The block status of patients was satisfactory, which indicated the acute origin of surgical pathology.

Given the fact that the fundamental difference between the groups, taking into account the pathogenetic mechanisms of sarcopenia, was the appointment of a solution of levocarnitine in group II and a solution of levocarnitine in parallel with a solution of D-fructose-1,6-diphosphate sodium salt of hydrate in group III, probable ($p<0.05$) differences in the number of days of treatment of patients in the intensive care unit, 5.4 ± 1.1 days in group I, 4.1 ± 0.4 days in group II, 3.2 ± 0.2 days in patients of group III indicated the importance of the functional state of the muscles during the postoperative period in elderly patients with urgent surgical pathology.

Conclusions.

Sarcopenia in elderly patients admitted to a surgical hospital is an important factor influencing the duration of treatment in the intensive care unit and, consequently, the occurrence of complications.

The appointment of levocarnitine is pathogenetically justified in this group of patients as a protector of the functional state of muscle tissue.

The appointment of D-fructose-1,6-diphosphate sodium salt of hydrate is an important component of the algorithm of intensive care in elderly patients with surgical pathology, which has an energy-protective effect and promotes their early activation.

Conflict of interest. The authors do not declare a conflict of interest.

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