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FEATURES OF THE CLINICAL COURSE OF CAD IN PATIENTS WITH COVID-19, DEPENDING ON THE PRESENCE OF METABOLIC SYNDROME

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ABSTRACT

This analysis will not only more accurately determine the nature of the development of the metabolic syndrome, the progression of coronary artery disease, but will also help to identify the impact of 2019-nCoV infection on heart damage.

Objective: to study the pathogenetic significance of COVID-19 in the progression of the metabolic syndrome and destabilization of coronary artery disease.

The object of the study was 147 patients with coronary artery disease against the background of metabolic syndrome, who received treatment in a COVID specialized center.

The subject of the study is the blood and blood serum of patients with coronary artery disease for the quantitative determination of the main biochemical parameters (lipid spectrum).

Conclusions: A feature of the clinical course of IHD with MS in patients with COVID-19 is frequent multiple anginal attacks, cases of tachycardia, impaired rhythm variability in the form of ventricular extrasystoles, complete blockade of the left bundle branch block, ST segment elevation on the ECG, increased T-wave inversion, progression unstable angina pectoris.

In patients with coronary artery disease against the background of MS with COVID-19, an increase in the atherogenic index, mean TG level, and a decrease in mean values of serum HDL concentration were found compared with the optimal parameters and values in the group of patients without MS.

At the end of 2019, with the appearance in the world of a new coronavirus called SARS-CoV-2, which causes Covid-19, a global threat with severe consequences loomed over humanity [6]. Today, despite the worldwide unified search for methods and countermeasures, the disease is still spreading, new unfavorable variants of the course are observed against the backdrop of an overloaded healthcare system [7].

A larger and deeper study of the etiopathogenetic and clinical manifestations of Covid-19 in individuals with chronic lesions of various organs and systems confirms the pattern of adverse outcomes and prognosis [6; 7]. The emerging complications in patients infected with SARS-CoV-2, both with overt clinical manifestations and asymptomatic carriage, are of interest to the scientific community.

The most common comorbidities giving severe course and complications of Covid-19 were arterial hypertension (49.7%), obesity (48.3%), chronic lung disease (34.6%), diabetes mellitus (28.3%) and other cardiovascular diseases (27.8%) [9]. Arterial hypertension (AH), obesity, hyperglycemia, which are currently socially significant diseases that have the nature of an epidemic, fit into the concept of metabolic syndrome (MS). [1-3; 13].

It is known that MS is strongly associated with adipose tissue dysfunction in obesity, while the presence of concomitant diseases such as chronic kidney disease, chronic respiratory and cardiovascular diseases worsen the prognosis of Covid-19 [13]. The literature highlights the phenomenon of "metabolically healthy obesity", however, all authors are unanimous in their opinion that the compensatory mechanism of the body lasts a relatively short period of time. It is the duration of the presence of a large array of visceral fat in the human body that plays a key role in the development of associated complications, primarily carbohydrate and lipid metabolism disorders, as well as cardiac disorders.

With excess body weight in certain places in the body, a depot of adipose tissue is formed, mainly in subcutaneous adipose tissue, visceral adipose tissue, yellow bone marrow, mammary glands, and omentum. An increase in the mass of adipose tissue potentiates the systemic action of tissue angiotensin II, which ultimately disrupts microcirculation, the elasticity of the vascular wall and leads to different complications of cardiovascular system [10-12].

It has been reliably studied that the causative agent of a new coronavirus infection enters the human body through the entrance gate, which is the epithelium of the upper respiratory tract and the epithelial cells of the stomach and intestines. Adipose tissue has a high concentration of ACE2 receptors, which facilitates penetration into the cells of the SARSCoV-2 coronavirus [4; 5; 8].

In view of the number of complications with which patients with MS infected with SARS-CoV-2 needed not only hospitalization, but also resuscitation, the problem of MS is even more acute than in the “favorable” period, before the spread of a new coronavirus infection.

Materials and research methods. During the study, 147 people over 18 years of age were examined with a virus infection and all patients were distributed as follows: the main group, which included 59 patients with COVID-19 and CAD on the background of metabolic syndrome; the comparison group, which included 58 patients with COVID-19 and CAD without MS, the control group consisted of 30 healthy individuals without clinical signs of coronary heart disease and metabolic syndrome.

Coronary artery disease (CAD) was diagnosed at the prehospital stage by collecting an anamnesis of clinical instrumental laboratory data.

The determination of the interdependence of the considered parameters of the samples using the Student's test and the Pearson chi test ($\chi 2$) was carried out using the test of its significance.

Results. We examined 147 patients hospitalized in the COVID Specialized Center and the Samarkand Regional Infectious Diseases Hospital with a verified diagnosis of COVID-19. Of these, patients with CAD and MS were 59 (30 men and 29 women) and 58 patients with CAD without MS (26 men and 32 women). Table 1 presents the complaints of hospitalized patients, anamnesis indicating the presence of bad habits (smoking), physical and ECG data.

As the results of the study showed, in women with coronary heart disease and COVID-19 against the background of MS, painless forms of coronary artery disease were 26.4% more common than women without MS. Most likely, this is due to the pre-manifest period, that is, latent type 2 diabetes mellitus and the development of diabetic neuropathy in 54% of cases in patients with coronary artery disease against the background of MS. Among men, more than 50% were smokers and anamnesis showed an earlier onset of CAD.

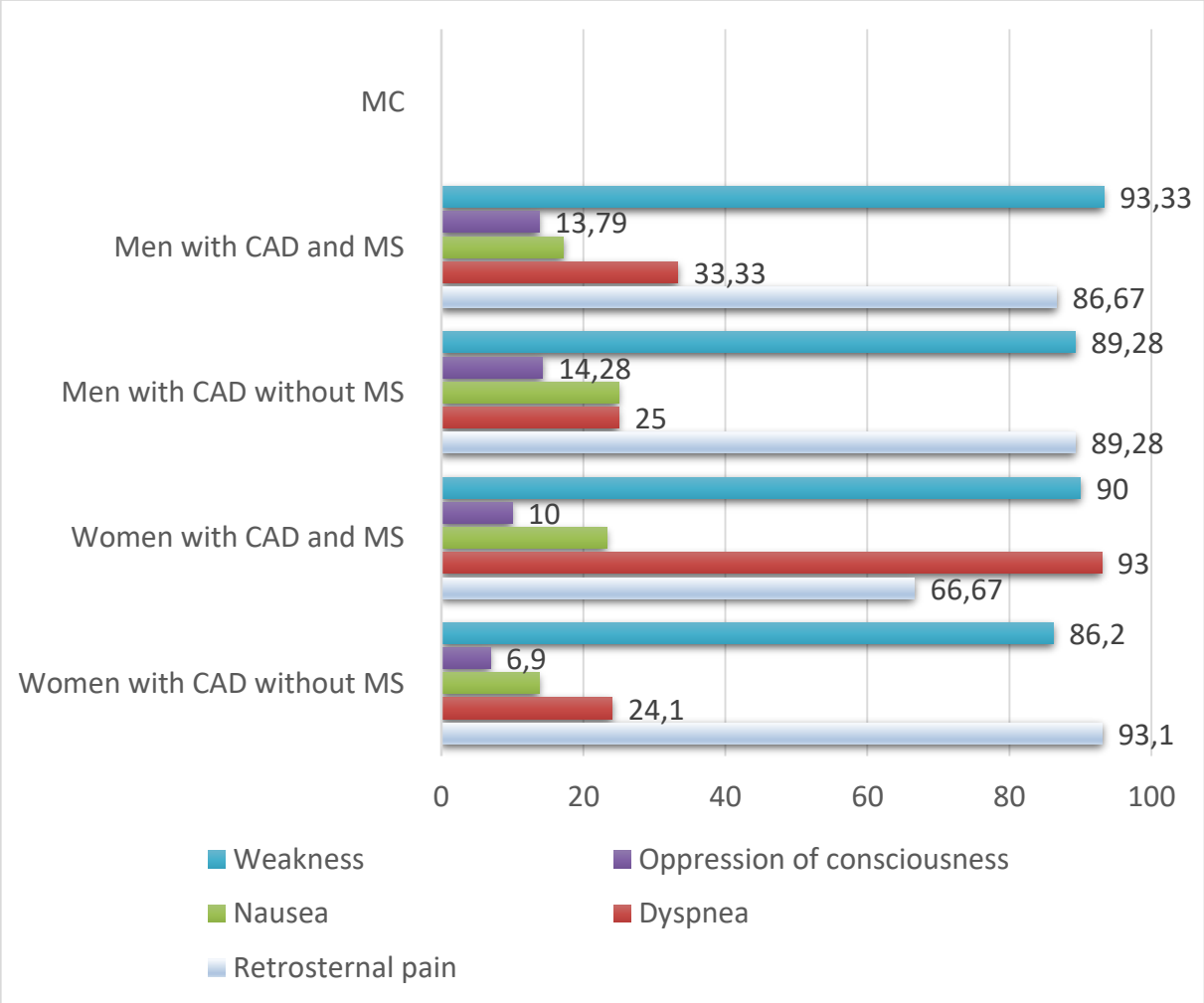

Fig. 1. Distribution of symptoms among patients.

In men without MS, systolic blood pressure was 137.6 ± 23.6 mm Hg. Art., diastolic - 82±13.4 mm Hg. Art.; in men with MS - 129.4±252.7 and 78.9±12.7 mm Hg. Art. respectively. There were no significant differences in blood pressure values among patients (Table 1).

Table 1

Physical examination data

	Women with CAD without MS (n=32)	Women with CAD and MS (n=29)	Men with CAD without MS (n=26)	Men with CAD and MS (n=30)
Wheezing in the lungs	7 (24,1%)	11 (36,67%)	7 (25%)	11 (39,28%)
Complaints about palpitations	6 (20,68%)	9 (30%)	6 (21,43%)	8 (28,57%)
High level BP	26 (87,5%)	28 (96,7%)	19 (67,8%)	26 (87,5%)
ECG changes:				
ST segment elevation	17 (58,62%)	22 (73,33%)	21 (75%)	21 (75%)
ST segment depression	12 (41,38%)	8 (26,67%)	6 (21,43%)	9 (32,14%)

* χ^2=7,276, p=0,003493 **χ^2=3,8, p=0,02496

Among hospitalized patients, type 2 diabetes mellitus was first detected in 24% of cases among patients with CAD with MS, which developed against the background of COVID-19.

During hospitalization, the glucose level: in women with coronary artery disease without MS, on average, was 7.7±2.8 mmol/l; in women with MS - 9.8±5 mmol/l; while in men without MS this indicator was 7.7±2.4 mmol/l; in men with MS - 12 ± 4.9 mmol/l, which indicates an increased glucose level among men with CAD and MS with COVID-19. The results of the study showed that a quarter of the observed patients had persistent hyperglycemia, in whom type 2 diabetes mellitus was subsequently diagnosed for the first time. (Table 2).

Table 2

The frequency of newly diagnosed type 2 diabetes mellitus among patients with coronary artery disease and COVID-19

	Women with CAD without MS (n=32)	Women with CAD and MS (n=29)	Men with CAD without MS (n=26)	Men with CAD and MS (n=30)
Absolute number of patients with DM	3*	18**	1*	11**
% ratio of patients	12,5	60	1,7	37,5
Type 2 DM compensation phase:				
Compensated	1 (25%)	4 (22,2%)	0 (0%)	4 (33,3%)
Subcompensated	2 (75%)	12 (66,7%)	1 (100%)	3 (25%)
Decompensated	0 (0%)	2 (11,1 %) ***	0 (0%)	4 (33,3%) ***

* χ^2= 4,665, p=0,01539

** χ^2=3,139, p=0,03823

*** χ^2=3,578, p=0,02628

Among patients without MS, diabetes mellitus was detected in women in 12.5% of cases, while in women with MS, type 2 diabetes developed due to COVID-19 in 60%. Moreover, it should be noted that in patients with decompensated DM among those with severe hyperglycemia, it was observed in patients with CAD with MS, which, apparently, is since severe forms of diabetes are combined with other components of MS.

Thus, coronavirus infection was a pathogenetic impetus for the progression of MS and destabilization of coronary artery disease, resulting in the manifestation of decompensated type 2 diabetes.

The analysis of lipid profile parameters in patients with COVID-19 and coronary heart disease with metabolic syndrome revealed an increase in the atherogenic index by 2.66 higher compared to patients without MS. The average level of TG was higher by 1.37 mmol compared to the comparison group. VLDL was also comparable higher in patients with CAD and MS. The values of serum concentrations of TC and LDL in patients with CAD were higher than the optimal values, but the intergroup differences were not significant. The average level of HDL was decreased in patients with metabolic syndrome relative to those of patients with CAD (Table 3).

A significant increase in the prevalence of hyperlipidemia and dyslipidemia was found in the main study group. The most common variant of lipid metabolism disorders in the metabolic syndrome was a combination of hypertriglycerinemia, low HDL levels and an increase in the LDL fraction (Table 4).

Table 3

Indicators of blood lipid spectrum in patients with CAD

Index (M ± m)	Study Group	
	CAD+MS (*n* = 59)	CAD (*n* = 58)
Total cholesterol, mmol/l	6,49 ± 1,93	6,38 ± 2,04
Triglycerides, mmol/l	3,89 ± 0.67*	1,52 ± 0,49
LDL, mmol/l	5,61 ± 1,72	4,50 ± 1,05
HDL, mmol/l	0,67 ± 0,09•	2,26 ± 0,54
Atherogenic index	5,34 ± 1,23*	2,68 ± 0,21

* - significance of differences in indicators when compared with the CHD group at $p < 0.05$, • - at $p < 0.01$

Table 4

Lipid metabolism disorders among patients with COVID-19 and coronary artery disease

Index (M ± m)	CAD+MS (*n* = 59)		CAD (*n* = 58)	
	Number of patients	%	Number of patients	%
Triglycerides, mmol/l	38	64*	25	43
LDL > 2,6 mmol/l	39	66	37	64

TC > 5,0 mmol/l	35	59	42	72
HDL < 1,0 mmol/l (male), < 1.3 mmol/l (female)	40	68•	21	36

* - significance of differences in indicators when compared with the group of coronary artery disease without MS at p < 0.05, • - at p < 0.01

In patients with CAD with MS in 38 patients of the main group, the level of TG> 1.7 mmol/l, the level of HDL < 1.0 mmol/l (male), <1.3 mmol/l (female) was observed in 40 patients which amounted to 68%.

When conducting an echocardiological study, the average values of the ejection fraction and stroke volume, calculated by the disk method, were found in the main group to be 50.93 ± 3.63 and 26.56 ± 2.48 ml/m2, in the comparison group -56.52 ± 2.29 and 30.18 ± 1.34 ml/m2, respectively.

The normal geometry of the left ventricle among patients with COVID-19 and coronary artery disease against the background of MS, when compared with the comparison group, was significantly lower (31% vs. 12%). In the structure of left ventricular remodeling in patients with COVID-19 and CAD without MS, the concentric type prevailed (55.5% vs. 25%, p<0.005). In patients with COVID-19 and CAD with MS, compared with patients with CAD without MS, concentric LV myocardial hypertrophy was more common (59% versus 10%).

Thus, a significant increase in the prevalence of hyperlipidemia, dyslipidemia in patients with CAD with metabolic syndrome was revealed. In such patients, an increase in the atherogenic index, the average level of triglycerides, a decrease in the average values of the serum concentration of HDL compared with the optimal parameters and values in the group of COVID-19 and coronary artery disease.

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