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SOME FEATURES OF PERSISTENT INFLAMMATION AFTER COVID-19 IN PATIENTS UNDERGOING CORONARY BYPASS SURGERY

Abdullaeva S.Ya., Nikishin A.G., Mullabaeva G.U., Eshmetov Sh.U., Ergashev F.F., Abdurazzakov J.O., Urishbaev R.Sh., Alikulov O.F.
Republican Specialized Scientific and Practical Center of Cardiology

Abstract: The aim to study in a comparative aspect the features of basic laboratory parameters in patients who underwent CABG with a history of COVID-19

Key words: COVID-19, coronary bypass surgery.

Materials and methods.

A study was performed on 115 patients who underwent coronary bypass surgery (from 2 to 4 bypasses). All patients received conventional basic therapy, including acetylsalicylic acid (ASA), clopidogrel, beta-blocker bisoprolol 2.5-5 mg/day, an ACE inhibitor, rosuvastatin 20 mg/day. Patients with inflammatory diseases in the acute phase were not included in the study.

Patients were divided into 2 groups, taking into account the previous COVID-19. The first group consisted of patients with a history of COVID-19 (n = 29), and the second, respectively, without a history of coronavirus infection (n= 86).

Results

The groups were comparable in terms of the main clinical and demographic characteristics. Men predominated in both groups: 79.3% in the group of patients who underwent COVID-19 and 88.4% in the group of patients without a history of COVID-19. There were no significant differences between the groups in relation to the general blood test. There are also no differences in the level of fasting glucose and glycated hemoglobin, liver enzymes and glomerular filtration rate.

Conclusions:

1. In patients with coronary artery disease who underwent COVID-19, elevated levels of C-reactive protein and fibrinogen persist not only during the acute period of COVID-19, but also during the long post-COVID period

2. COVID-19 is an independent risk factor for cardiovascular complications not only in the acute period, but also after the disappearance of the main clinical manifestations.

Undoubtedly, in the context of the pandemic caused by the coronavirus infection COVID-19, patients with cardiovascular diseases stand out as a special risk group. The combination of coronary artery disease and COVID-19 significantly complicates the diagnosis, as well as the choice of treatment tactics and the determination of hospitalization of patients with emergency conditions. [1]. In addition, although in many individuals the disease proceeds without a pronounced clinic, in an asymptomatic or mild form [2], regardless of the form of the course of the disease, published data indicate changes in the hemostasis system that persist for a long time in the post-COVID period and an increased level of inflammatory markers in recovered patients [3, 4]. Hypoxemia, endothelial dysfunction, systemic inflammation, progression of atherosclerosis, prothrombotic activation of the system are highly likely to develop not only in the acute, but also in the long period of COVID-19 (Long COVID) [5], which can be a significant contraindication to surgical intervention.

The results of various studies demonstrate a high risk of developing cardiovascular complications among patients with coronary heart disease who have had influenza [4, 6, 7]. But in general, there are few data confirming a direct correlation between a viral

infection (including COVID-19) in history and developed cardiovascular complications [8, 9]. There are no uniform protocols in international recommendations for preoperative patients with a history of COVID-19 who require urgent cardiac surgery [10].

The aim to study in a comparative aspect the features of basic laboratory parameters in patients who underwent CABG with a history of COVID-19

Materials and methods.

A study was performed on 115 patients who underwent coronary bypass surgery (from 2 to 4 bypasses). All patients received conventional basic therapy, including acetylsalicylic acid (ASA), clopidogrel, beta-blocker bisoprolol 2.5-5 mg/day, an ACE inhibitor, rosuvastatin 20 mg/day. Patients with inflammatory diseases in the acute phase were not included in the study.

Patients were divided into 2 groups, taking into account the previous COVID-19. The first group consisted of patients with a history of COVID-19 (n = 29), and the second, respectively, without a history of coronavirus infection (n = 86).

The analysis of concomitant pathology was carried out in patients in the aspect of registration of cardiovascular pathology and chronic diseases in history. The presence of concomitant pathology was judged by the analysis of medical records and the results of inpatient examination of patients.

Results

The groups were comparable in terms of the main clinical and demographic characteristics. Men predominated in both groups: 79.3% in the group of patients who underwent COVID-19 and 88.4% in the group of patients without a history of COVID-19. There were no significant differences between the groups in relation to the general blood test.

Table 1. Complete blood count in groups.

	COVID (n = 29)	P	Non COVID (n = 86)
Leukocytes, 10 ⁹ /l	6,7 ± 1,7	0,16	7,5 ± 1,9
Hemoglobin, g/l	125,6 ± 12,3	0,83	126,4 ± 11,2
Red blood cells, 10 ¹² /l	4,5 ± 0,4	0,18	4,4 ± 0,3
Platelets, 10 ⁹ /l	247 ± 61,9	0,49	234,4 ± 43,2
ESR, mm/h	15,6 ± 11,1	0,46	17,9 ± 10,4

*differences are significant, at P ≤ 0.05

There are also no differences in the level of fasting glucose and glycated hemoglobin, liver enzymes and glomerular filtration rate.

Table 2. Biochemical analysis of blood in groups.

	COVID (n = 29)	P	Non COVID (n = 86)
Glucose mmol/l	6,6 ± 1,9	0,32	7,3 ± 2,6
HbAcl g/l	8,9 ± 1,9	0,26	7,5 ± 1,6
ALT IU/l	43 ± 34,6	0,51	32,6 ± 14,9
AST IU/l	39,1 ± 31,6	0,67	32,2 ± 14,1
GFR (EPI) ml/min/1.73m ²	70,2 ± 13,4	0,10	81,2 ± 16,5
CRP mg/l	15,8 ± 8,4	0,055	8,6 ± 1,8
Fibrinogen, g/l	4,2 ± 1,4	0,04	3,3 ± 0,8

*differences are significant, at $P \leq 0.05$

In the group of patients who underwent COVID-19, there is a higher level of C-reactive protein 15.8 ± 18.4 g/l to 8.6 ± 1.8 g/l and fibrinogen: 4.2 ± 1.4 to $3, 3 \pm 0.8$ in the group of patients without a history of COVID-19, $P = 0.04$, as well as higher levels of Ca^{+} and Na^{+} : 4.7 ± 0.4 mmol/l to 4.3 ± 0.5 mmol /l, $P = 0.07$ and 151.3 ± 2.2 mmol/l to 143.4 ± 4.7 mmol/l, $P = 0.003$, respectively, in the group of patients without a history of COVID-19.

Table 3. Analysis of electrolytes in groups

	Ковид (n = 29)	P	Без ковид (n = 86)
Potassium mmol/l	$4,7 \pm 0,4$	0,07	$4,3 \pm 0,5$
Sodium mmol/l	$151,3 \pm 2,2$	0,002	$143,4 \pm 4,7$
Chlorine mmol/l	$107 \pm 2,6$	0,25	$109,3 \pm 3,9$

*differences are significant, at $P \leq 0.05$

Discussion.

The cardiovascular manifestations of COVID-19 are important in terms of assessing and managing infected patients across all disease severity classes. These include: transient and chronic myocardial dysfunction, cardiogenic shock, arrhythmias and vascular thrombosis.

Of particular importance to the cardiothoracic surgeon is the prothrombotic state described in SARS-CoV-2. In an analysis of 1099 patients from more than 550 hospitals across China, D-dimer levels were elevated in 46.4% of those tested (260/560), and this anomaly was regarded as a predictor of mortality [11]. It has also been suggested that microvascular thrombosis and endothelial damage to the pulmonary vasculature may mediate the profound hypoxemia seen in severe cases. Recommendations for anticoagulant therapy have appeared, and prophylactic administration of low molecular weight heparin is appropriate for all hospitalized patients without contraindications [12].

After undergoing COVID-19, even against the background of relative health (a stable condition recommended for a planned major operation), electrolyte imbalance persists for a long time. In addition, our data demonstrate an initially higher level of fibrinogen in the group of patients who underwent COVID-19: 4.2 ± 1.4 g / l to 3.3 ± 0.8 g / l in the group of patients without a history of COVID-19, $P = 0.04$, which indicates persistent inflammation that persists for a long period of time after the disease, which indicates the probable persistence of the prothrombotic state described in SARS-CoV-2 as an undoubted trigger factor for worsening the course of coronary artery disease, especially on the eve of surgery [11]. In addition, it should be taken into account that plasma fibrinogen itself is a significant risk factor for the development of cardiovascular diseases in the population [13]. The results obtained allow us to regard as a potential predictor of an unfavorable course in patients with coronary artery disease, not only the acute period of COVID-19, but also a long post-COVID period.

Conclusions:

1. In patients with coronary artery disease who underwent COVID-19, elevated levels of C-reactive protein and fibrinogen persist not only during the acute period of COVID-19, but also during the long post-COVID period

2. COVID-19 is an independent risk factor for cardiovascular complications not only in the acute period, but also after the disappearance of the main clinical manifestations.

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