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COMORBID ASPECTS IN COVID-19 ASSOCIATED CEREBRAL STROKE

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Abstract: The aim of the study was to analyze the clinical outcomes of comorbid conditions in patients with ischemic stroke (IS) against the background of SARS-CoV-2 infection. The results of 72 patients of the main group with acute cerebrovascular accident and laboratory-confirmed SARS-CoV-2 coronavirus infection and 104 patients of the control group of IS without COVID-19 infection were analyzed. Diabetes mellitus was significantly more common in IS associated with COVID-19 infection, and this fact can be explained by the role of endothelial dysfunction in the pathogenesis of IS associated with COVID-19. According to the results of the study, the mortality of patients in the acute period of ischemic stroke that developed against the background of infection with COVID-19 was higher (40.3%) compared with the acute period of ischemic stroke without infection with COVID-19. Thus, this study confirms the high percentage of comorbid conditions in COVID-19 associated ischemic stroke.

Keywords: ischemic stroke, coronavirus infection, COVID-19, acute respiratory distress syndrome, SARS-CoV-2.

The pandemic of coronavirus infection COVID-19 (Coronavirus Disease-2019), which is caused by a new strain of coronavirus - SARS-CoV-2 (severe acute respiratory syndrome coronavirus-2), has caused a rapid increase in the number of cases and high mortality worldwide [1,2].

The published data provide information that the entire group of viruses under consideration is characterized by neurotropism, and direct exposure to the SARS-CoV-2 virus in severe forms of the disease is accompanied by neurological symptoms and syndromes in 36% of cases [5,9]. Thus, according to various authors, SARS-CoV-2, in addition to pneumonia and acute respiratory distress syndrome (ARDS), is the cause of complications such as encephalopathy, encephalitis and meningoencephalitis, acute demyelinating lesions, Guillain-Barré syndrome, as well as acute cerebrovascular accidents. , among which ischemic strokes (IS) predominate [7,10].

According to a retrospective analysis conducted at the Union Hospital (Wuhan, China) and including 221 patients with a confirmed diagnosis of COVID-19, the incidence of IS was 5% (11 patients), venous sinus thrombosis was 0.5% (1 patient), cerebral hemorrhages - 0.5% (1 patient) [8]. And according to the results of the New York study, which included 3556 patients hospitalized with a diagnosis of COVID-19, the number of cases of IS was 0.9% (32 patients) [12].

In addition, existing comorbid conditions in patients, such as arterial hypertension, diabetes mellitus, coronary heart disease, also increase the risk of developing IS. As a result of a meta-analysis of comorbidities in COVID-19, it was found that arterial hypertension was present in 21.1% of cases; diabetes, 9.7; cardiovascular diseases and pathology of the respiratory system occurred in 8.4% and 1.5% of patients, respectively [9]. COVID-19 causes decompensation of these risk factors and exacerbates endothelial dysfunction, which is a common feature of these conditions, which also leads to hypercoagulation and thrombosis, significantly increasing the risk of IS [3,14].

Thus, the clinical features of the combination of a new coronavirus infection and cerebrovascular pathology are an important aspect in practice and require further study.

The purpose of this study is to investigate the relationship between COVID-19

associated ischemic stroke and comorbid conditions.

Methods: We analyzed 220 cases of hemispheric IS. The patients were divided into two groups. The main group consisted of 90 patients with hemispheric IS and laboratory-confirmed coronavirus infection. The control group consisted of 130 patients with hemispheric IS who did not have a history of COVID-19. To determine the severity of the disease, all patients underwent testing on the NIHSS, Rankin, Rivermead and Glasgow Coma Scales, as well as clinical and laboratory studies (inflammatory markers, coagulogram) both at admission and at discharge.

Results of the study: We analyzed 220 cases of hemispheric IS. Patients were divided into two groups. The main group consisted of 90 patients with hemispheric IS and laboratory-confirmed SARS-CoV-2 coronavirus infection. Their mean age was 68.4ё1.7 years (minimum 44 years, maximum 82 years). Among them, female patients accounted for 45.9% (n=101), male patients - 54.4% (n=49). The distribution of observed patients by age and sex is shown in Table 1.

Table 1
Distribution of patients by age and gender in the studied groups

№.	Group	Age	Sex				*P*
			Male		Female		
			abs	%	abs	%	
1	Main (n =90)	68,4±1.7	49	54,4	41	45,6	*0.037*
2	Control (n=130)	71,9±1.1	85	65,4	45	34,6	
	Total		134		86		

In both groups, the following comorbid diseases of the cardiovascular continuum were analyzed: arterial hypertension was the most common of them and had the same prevalence in both groups (94 and 98%, respectively). Atherosclerosis was also a common risk factor; in the group of patients who had undergone COVID-19, it was detected in 57% of cases (n=51), and in the control group it was statistically significantly more common in 81% (n=105) of cases ($p<0.002$). Diabetes mellitus as a risk factor for the development of IS significantly prevailed in the group of patients with concomitant COVID-19 (16%) compared with the control group (7%) ($p<0.037$). Atrial fibrillation in both groups was detected in the same number of patients (19%). IHD (history of acute myocardial infarction or angina pectoris) in the group of patients with COVID-19 was observed in 36,6% (n=33) of cases, while in patients without this infection it was detected in 32% (n= 42) of cases ($p< 0.077$).

When comparing the results of the NIHSS scales, Glasgow, Rankin and Rivermead coma at admission, no statistically significant differences were found (Fig. 1).

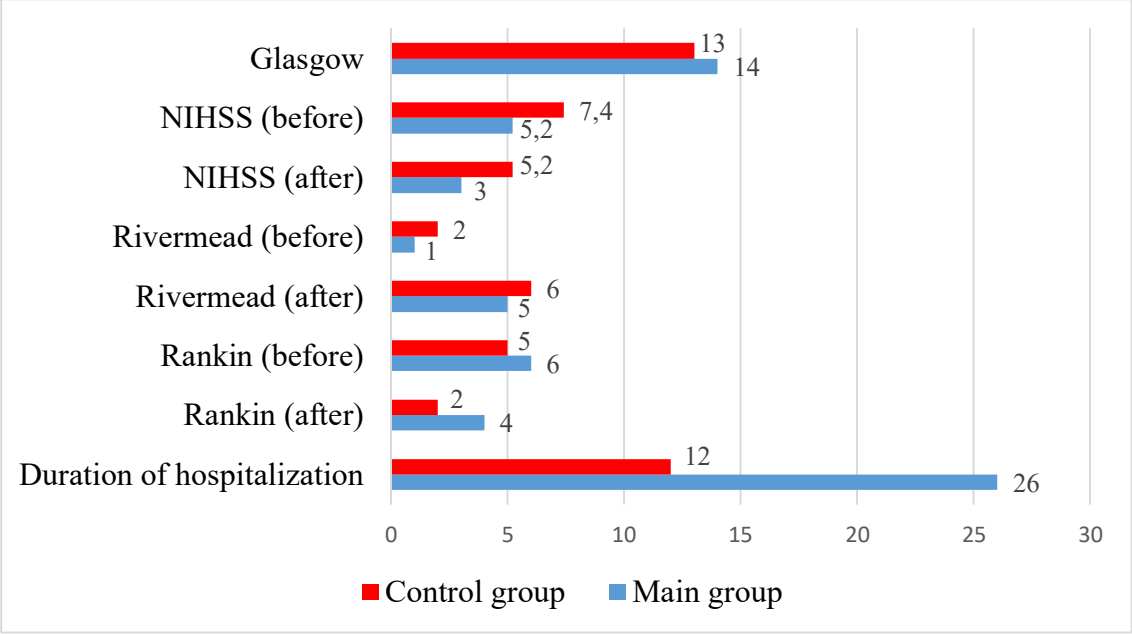

Fig.1. The value of quantitative scales in the main and control groups

When comparing the results at admission and discharge in the control group, patients with stroke on average showed positive dynamics on all scales ($p<0.05$). In the main group, a similar situation was observed only on the Rivemid and Rankin scales (Table 3). It was found that in patients with a combination of stroke and COVID-19, the improvement in NIHSS stroke score was not statistically significant ($p<0.122$). At the same time, no significant differences were found in the main group in terms of the NIHSS stroke severity scale and the Rivermead mobility index at discharge.

Laboratory data made it possible to assess the manifestations of systemic inflammatory changes and risk factors for stroke. According to the analysis, in the main group there was a more significant indicator of C-reactive protein - 29.7, in the control group - 10.2 ($p<0.001$). The quantitative indicators of leukocytes were 10.12 and 9.8 in the main group and the control group. Similar data were established for lymphocytes - 9.7; 10.2 respectively ($p<0.72$). Clinical and laboratory data are shown in table 2.

Table 2
Clinical and laboratory markers of inflammation

№.	Parameters	Group		*P*
		Main	Control	
1	CRP max , (0–6 before)	29.7	10.2	*<0.001*
2	CRP (after)	16.5	8.2	
3	Leukocytes (4.0–9.0) (before)	10.12	9.8	*<0.46*
4	Leukocytes (after)	9.8	7.8	
5	Lymphocytes, % (19–37) (before)	9.7	10.2	*<0.72*
6	Lymphocytes (after)	9.5	9.8	

The study of coagulation parameters showed that the data on APTT, prothrombin time were somewhat more pronounced in the main group, INR significantly differed in the groups - 1.18; 1.12 ($p<0.015$). The level of prothrombin was noted to be more significant in the control group - 92.7, while in patients of the main group this indicator corresponded to the value of 77.8 ($p=0.17$). The data is shown in Fig. 2.

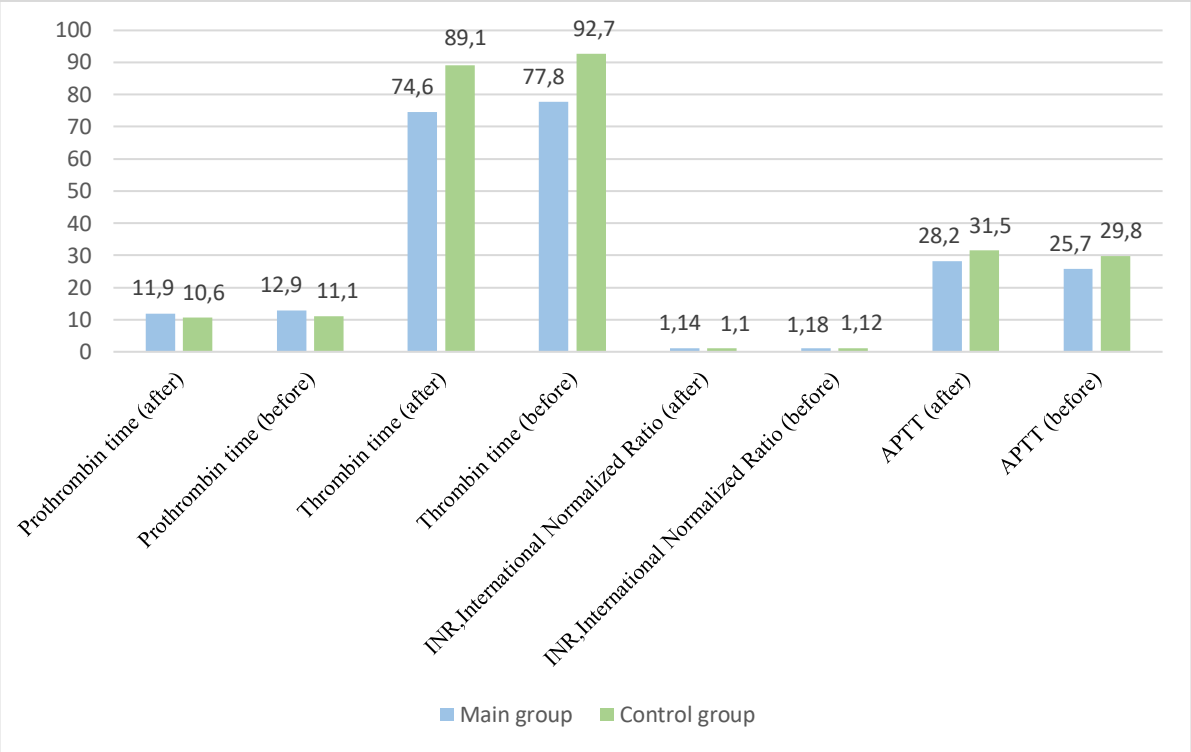

Fig.2. Dynamics of coagulogram parameters in both groups

Conclusions:

1.The results obtained showed that diabetes mellitus was significantly more common in patients with stroke in combination with COVID-19, which can be explained by the role of endothelial dysfunction in the pathogenesis of COVID-associated stroke, which most likely determines the course of IS.

2.Diabetes mellitus was significantly more common in patients with stroke in combination with COVID-19, and this fact can be explained by the role of endothelial dysfunction in the pathogenesis of COVID-associated stroke, which most likely determines the course of IS.

3.Patients in the acute period of stroke and COVID-19 died more often (40.3%) than patients with stroke and without this infection (18.3%). It should be noted that this figure practically coincides with the number of severe forms of COVID-19 (44.4%).

4.Thus, the present study confirms the data that the combination of stroke and COVID-19 is associated with a higher percentage of deaths.

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