CYTOKINES IN THE ETIOPATHOGENESIS OF ISCHEMIC STROKE AFTER COVID-19

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ABSTRACT

Clinical pathogenic specifics of ischemic stroke in these patients were assessed. The article describes the sex and age characteristics, the period of vascular catastrophe development, the degree of severity and lung damage, the prevalence of pathogenetic subtypes, concomitant pathology, neurological deficiency, the results of laboratory and instrumental research methods; an assessment of the information on some indicators has been made, adverse predictions of ischemic stroke have been established.

Keywords: COVID-19, ishemic stroke, cardio embolic subtype, dimer molecule, neurological disorders, concurrent diseases.

The aim of the study was to study the clinical and pathogenetic features of the course of ischemic stroke in patients with COVID-19 disease. A retrospective analysis of the medical records of 70 cases of AI in patients with COVID-19 with moderate severity who received inpatient treatment in 2020-2021 at the Regional Vascular Center in Saransk, repurposed to receive patients with COVID-19 infection, which has a primary vascular department. Diagnosis verification and determination of the subtype of stroke were carried out anamnetically, as well as during clinical neurological and radiological (computed tomography of the brain) examination methods. The epidemiological history, the severity of neurological deficit, the presence of concomitant pathology, the results of instrumental and laboratory examination methods were evaluated. The statistical method of the arithmetic mean in the sample was used.

Main results

The analysis of the gender characteristics of patients revealed an even ratio of men and women 1:1.1 (36 men (51%), 34 women (49%), respectively). The age of the patients (see Table 1) ranged from 47 to 88 years and averaged 64.3±4.5 years. The largest number of cases of AI against the background of COVID-19 was observed in people aged 60 to 69 years -30 people (43%).

The severity of the underlying disease and the place of immobilization of patients did not significantly affect the incidence of AI. Thus, this ONMC developed both in covid hospitals (54%) in patients with a moderate form of COVID-19, and when patients were in outpatient settings (46%) with a mild course. Of the 70 patients, only one has been vaccinated against COVID-19.

When transferring from covid hospitals, patients were admitted to a specialized medical institution on average 11 hours after the onset of stroke, from the outpatient stage – two to three days after the development of the first signs of the disease.

The patients underwent computed tomography (CT) of the chest organs, and bilateral polysegmental pneumonia was diagnosed in 100% of cases. In the majority (63%) of CT patients, the picture corresponded to a mild severity, while the volume of lung damage did not exceed 25%. Cases of CT-0 – 3%, CT-2 – 26%, CT-3 – 8% were also noted. Blood oxygen saturation in patients ranged from 70% to 99%, while in 40% of patients SpO2 was within normal values (97-99%). A decrease in this indicator to 91-96% was observed in 48% of patients, to 81-90% – in 8%, to 70-80% – in 4%.

Stroke that occurred for the first time was observed in 46 patients (66%), and in 24 (34%) it was repeated. Three main pathogenetic subtypes of AI were identified (according to the international TOAST classification): atherothrombotic in 19 (27%) patients, cardioembolic in 38 (54%), lacunar in 13 (19%). Stroke with an established rare etiology and stroke with an unspecified etiology were not noted in this group. Thus, the predominance of the above subtypes causes the development of AI against the background of atherosclerotic disease of large vessels, atrial fibrillation and microangiopathy, which coincides with other data. In

patients with vascular risk factors, COVID 19 may increase the likelihood of its occurrence. The reasons why flu-like diseases lead to ONMC are the effect of inflammatory mediators on the vascular endothelium and prothrombotic status.

When comparing subtypes of AI and concomitant pathology, their pathogenetic confirmation is traced: practically all patients were diagnosed with hypertension (97%) and cerebral atherosclerosis (92%). Systolic and diastolic blood pressure in patients at admission corresponded to arterial hypertension of the third degree (150-170 and 90-100 mmHg); three patients (4%) were admitted in a state of hypertensive crisis with indicators above 200 and 100 mmHg.

The anamnesis is also burdened by chronic cerebral ischemia (CHEM) in 45 patients, coronary heart disease (CHD) – in 33%, diabetes mellitus (DM) – in 26%. When assessing the constitution, obesity was noted in 17 (24%) patients (grade I – 9 (53%), II – 5 (29%), III – 3 (18%)). 37 people had a normosthenic physique, 16 had an asthenic physique. Seven patients (10%) with transient ischemic attacks (TIA), which are precursors of atherothrombotic AI, were also identified. Diseases such as diabetic foot were less frequently observed (2 cases), in one case of Lerish syndrome and hypothyroidism, the assessment of neurological disorders showed the predominance of motor disorders in the form of hemiparesis in 36 (51%) patients, pyramidal insufficiency in 10 (14%), which indicates the predominant involvement of the carotid basin in the process. Speech disorders in the form of sensorimotor types of aphasia were diagnosed in 26 (37%) people, dysarthria - in 32 (45%). Cognitive impairment was also noted in 14% of patients. The semiotics of the above-mentioned focal symptoms in a new coronavirus infection combined with ischemic stroke according to CT scans of the brain is associated with a predominant lesion of the internal carotid, medial cerebral, vertebral, main or posterior cerebral arteries [8]. The following syndromes were also observed in the AI clinic: convulsive (3 people), pseudobulbar (4), vestibulo-atactic (4), Ramsey-Hunt (1).

Upon admission to the hospital, the following indicators were evaluated: coagulogram (INR, ACTV, PTI), D-dimer, glucose, CRP.

The D-dimer has become a more informative indicator of thrombosis, since the mechanism of its production starts simultaneously with the process of thrombus formation. This indicator in the group was in the range from 100 ng/ml to 1359 ng/ml; in 75% of patients, an increase was observed in the range from 251 ng/ml to 1359 ng/ml (with an average level of 918.4 ng/ml), in other cases (25%) – below normal values (250 ng/ml).

According to the results of biochemical studies, not all patients had pronounced inflammatory changes: the upper and lower limits of CRP ranged from 1.3 to 127.9 mg/l, its increase was observed in 34 (49%) patients and averaged 51.1 mg/l. These results show that active inflammatory reactions, as well as thrombogenic ones, develop mainly in severe patients.

The range of fasting glucose levels at the onset of the disease ranged from 3.0 to 30.0 mmol/l, while normoglycemia was noted in 30 (43%) people, hyperglycemia in 40 (57%). Values from 6.6 to 10.5 mmol/l were observed in 33 patients, from 10.6 to 15.5 mmol/l in 5; from 15.6 to 30.0 mmol/l in 2. Subsequently, diabetes mellitus was diagnosed for the first time in 2 patients (9%). Taking into account the burdened history of type 2 diabetes in only 18 (26%) patients, in the remaining 20, transient hyperglycemia should be considered as stressful against the background of COVID-19. Violation of carbohydrate metabolism is associated according to the literature [3] with a high risk of cardiembolic stroke.

Upon admission to the hospital, AI during neuroimaging was confirmed in 63 (90%) patients, the rest underwent a dynamic CT scan of the brain. By localization, ischemic foci were distributed as follows: in the left hemisphere – 37%, in the right – 27%, in both hemispheres – 23%. In 13% of cases of AI with lacunar subtype, foci were not detected. There were also changes in the brain substance in the form of cortical atrophy (19%), leukoarrhoea (11%) and hydrocephalus (4%), indicating the presence of chronic cerebral ischemia.

The results of the somatic study showed the involvement of large main cerebral vessels and the cardiovascular system in the pathological process [8]. The

analysis of the central nervous system of the vessels of the head and neck revealed that the majority of patients had a stenosing character of cerebral atherosclerosis of extra- and intracerebral vessels (72%): stenosis prevailed in the carotid artery, including in the bifurcation area (40%) and the external segment (14%). At the same time, hemodynamically significant stenosis was detected in 27% of cases.

Stenosis of large cerebral arteries is accompanied by a change in the velocity characteristics of blood flow. Changes in its parameters were revealed in the form of a decrease in the rate of blood flow through the cerebral arteries in 17 patients (27%), an increase in speed in 14 (22%), and asymmetry in 7 (11%). Attention is drawn to the decrease in this indicator in the arteries of the Willis circle in a significant number of examined patients – in 25 (40%), which indicates a violation of collateral circulation. Thus, the nature of cerebral blood flow disorders confirms atherosclerotic disease of large cerebral vessels, with predominant involvement of the vessels of the carotid basin and connective arteries in the process, which has also been noted in other studies.

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