



## FEATURES OF VENOUS CEREBRAL DYSFUNCTION IN PATIENTS WITH COPD ACCORDING TO RHEOENCEPHALOGRAPHY

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### ABOUT ARTICLE

**Key words:** venous cerebral dysfunction, COPD, rheoencephalography, rheographic indicators, blood filling, resistance, vascular wall, vascular resistance.

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**Abstract:** This article discusses the features of venous cerebral dysfunction in patients with COPD according to rheoencephalography. It has been established that the main rheographic indicators characterizing pulse blood filling, tone and resistance of the vascular wall, the state of venous outflow and vascular resistance correlate well with the data obtained from ultrasound and angiographic studies, which increases the informative value of the REG method.

## REOENSEFALOGRAFIYA BO'YICHA KOAH BILAN OG'RIGAN BEMORLARDA VENOZ MIYA DISFUNKTSIYASINING XUSUSIYATLARI

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Dotsent

Tibbiyot xodimlarining kasbiy malakasini oshirish markazi  
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### MAQOLA HAQIDA

**Kalit so'zlar:** venoz miya disfunktsiyasi, KOAH, reoensefalografiya, reografik ko'rsatkichlar, qonni to'ldirish, qarshilik, tomir devori, qon tomir qarshiligi.

**Аннотация:** Ushbu maqolada reoensefalografiya bo'yicha KOAH bilan og'rigan bemorlarda venoz miya disfunktsiyasining xususiyatlari ko'rib

chiqiladi. Pulsli qonni to'ldirish, tomir devorining tonusi va qarshiligini, venoz chiqish holatini va tomir qarshiligini tavsiflovchi asosiy reografik ko'rsatkichlar ultratovush va angiografik tadqiqotlar natijasida olingan ma'lumotlar bilan yaxshi mos kelishi aniqlandi, bu esa REG ning informatsion qiymatini oshiradi. usuli.

## ОСОБЕННОСТИ ВЕНОЗНОЙ ЦЕРЕБРАЛЬНОЙ ДИСФУНКЦИИ У БОЛЬНЫХ ХОБЛ ПО ДАННЫМ РЕОЭНЦЕФАЛОГРАФИИ

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### О СТАТЬЕ

<b>Ключевые слова:</b> венозная церебральная дисфункция, реоэнцефалография, реографические показатели, кровенаполнение, резистентность, сосудистая стенка, сосудистое сопротивление.	<b>Аннотация:</b> В данной статье обсуждаются особенности венозной церебральной дисфункции у больных ХОБЛ по данным реоэнцефалографии. Установлено, что основные реографические показатели, характеризующие пульсовое кровенаполнение, тонус и резистентность сосудистой стенки, состояние венозного оттока и сосудистое сопротивление, хорошо коррелируют с данными, полученными при ультразвуковом и ангиографическом исследованиях, что повышает информативность РЭГ. метод.
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### INTRODUCTION

In recent years, due to the intensive development of neuroimaging methods, rheoencephalography, as a technique for determining the features of cerebral hemodynamics, has become much less frequently used in clinical practice. Many researchers, as a way to objectify the features of the arterial link of cerebral perfusion, rightly prefer ultrasound cerebral Doppler [1].

Nevertheless, long-term studies using this simple method, accessible to a doctor, show its high reliability in recognizing violations of the elastic-tonic properties of blood vessels and violations of the outflow of venous blood from the cranial cavity. It has been established that the main rheographic indicators characterizing pulse blood filling, tone and resistance of the vascular wall, the state of venous outflow and vascular resistance correlate well with the data obtained from ultrasound and angiographic studies, which increases the informative value of the REG method.

### THE MAIN RESULTS AND FINDINGS

To study venous cerebral dysfunction in patients with COPD according to rheoencephalography data.

The clinical part of the work was carried out on the basis of the department of neurology, therapy and pulmonology of the clinic of the Andijan State Medical Institute in 2020-2023. The study included 130 people (79 men and 51 women) diagnosed with COPD stages I, II and III, aged 49 to 82 years, mean age  $67.23 \pm 12.47$  years. In a comprehensive clinical and instrumental examination of 130 patients, 68 people (57%) were diagnosed with stage II COPD and 52 people (43%) with stage III COPD. The diagnosis of chronic obstructive pulmonary disease (COPD) was made on the basis of complaints (shortness of breath, cough with sputum), clinical picture of the disease, anamnestic data (presence of risk factors), results of physical and laboratory examinations, instrumental data (measurements of airflow limitation (spirometry) - FEV1/FVC ratio  $< 70\%$ ; post-bronchodilation FEV1 less than 80% predicted) in accordance with the Global Strategy for the Diagnosis, Treatment and Prevention of Chronic Obstructive Pulmonary Disease (2,4,5).

Table 1

Distribution of patients by groups

Groups	abc	%
Main group (MG)	85	65,4%
Camparison group (CG)	45	34,6%
Total	130	100,0%

During the study, the patients were divided into 3 groups. Main group (MG), comparison group (CG) and control group (CG). The MG consisted of 85 patients (65.4%) with COPD and cerebral venous insufficiency (CVD), the CG comprised 45 patients (34.6%) with COPD without signs of venous insufficiency, the CG consisted of 20 relatively healthy individuals of comparable age and floor with OG and CG groups. Total 150 people (Table 1).

Clinical-neurological and instrumental research methods were used. The study of cerebral hemodynamics by the method of rheoencephalography (REG). To assess the blood flow in the fronto-temporal zone, electrodes were applied in the fronto-mastoid (FM) lead, and in the parietal-occipital zone - in the occipito-mastoid (OM) [3.]. The following REG parameters were studied: rheographic (RI), dicrotic (DCI), diastolic (DSI) indices, peripheral resistance index (RPI) and venous outflow (VO).

On the rheoencephalogram, a venous wave (VV) is detected in pathology at the end of diastole immediately before the start of the next wave. The venous wave indicates general

hemodynamic manifestations (impaired outflow from the cranial cavity, which may be the result of an increase in pressure in the large veins of the brain), and when a venous wave appears, local changes in the cerebral venous circulation can be detected, since it can appear locally on REG - in one region of the rheoencephalogram.

The early stage of violation of the venous outflow is detected by a change in the shape of the catacrot on the rewave - it will be convex, the dicrotic tooth moves to the top. With a pronounced venous outflow, a venous wave of greater amplitude is noted on the REG. Moving the dicrotic tooth closer to the top is a sign of difficulty in the outflow of venous blood. Thus, the location and shape of the diastolic wave on REG-grams reflects the state of the tone of intracranial venules and veins.

It should also be noted that compensated intracranial hypertension on REG determines the hypertonic type of the curve. On REG it is manifested by the fact that the amplitude increases and the descent of the catacrotic phase is flattened with a large smoothing of the top and the formation of a convex catacrot. Cerebral blood flow depends on the relationship between intravascular and extravascular pressure. And when the pressure inside the vessel becomes equal to the mean arterial pressure (BP), vascular paralysis quickly sets in, in other words, atony of the cerebral vessels. These phenomena are reflected in the REG-grams - intracranial hypertension, which develops as a result of a sharp increase or decrease in the tone of the cerebral vessels, also revealed obstructed blood flow. These phenomena of pre- and post-capillary hypertension characterize the subcompensated phase.

To analyze the obtained data, the Statistica software package was used using the Statistica 8.0 and Excel applications. The distribution of features was assessed for normality using the Kolmogorov-Smirnov criterion (normal distribution). To identify differences between the indicators in the compared groups, the Student's t-test was used. The critical level of significance (p) when testing statistical hypotheses in the study was taken equal to 0.05. When describing the results of the study, quantitative data are presented as  $M(\pm\sigma)$ , where M is the arithmetic mean,  $\sigma$  is the standard deviation, qualitative data are presented as absolute values, percentages and shares.

According to the analysis of REG-grams, in 97 (80.8%) patients, REG showed a pattern of impaired venous outflow, of which in females, obstruction of venous outflow was detected in 56.3%, in men - in 43.7%. Obstruction of the venous outflow of the 1st degree significantly prevailed ( $p<0.045$ ) in women in 58.0% of cases, compared with men, where this figure was lower - 42.0%. Obstruction of the venous outflow of the 2nd degree significantly prevailed ( $p<0.006$ ) in women in 63.4% of cases, in men it was recorded in 36.6%. In females, in addition to violations of the venous outflow, REG was characterized by normo-hypertonic (34.3%) and arterial-hypertonic type of REG (65.7%), a decrease in pulse blood filling of cerebral vessels (21.1%), in

men, the arterial-hypertensive type of REG was more often observed (57.1%), vertebrogenic effect on the vertebral arteries (45.2%), a decrease in pulse blood supply - in 25.8% of cases.

When analyzing rheoencephalograms, it was found that in patients with CG, the indicators did not significantly differ from the reference indicators (3). For patients with CG, a decrease in the amplitude of pulse blood filling by 10-15% of the age norm, an increase in the resistance of the vascular wall and difficulty in venous outflow to the II degree were characteristic. In patients with MG, there was a decrease in the amplitude of pulse blood filling to 20% of the age norm, an increase in the resistance of the vascular wall and difficulty in venous outflow up to grade III.

Also, the study revealed that VO is reduced not only in patients with MG, but also in patients with CG (Table 2).

So, in patients in the CG in both leads, there is a decrease in VO and DCI, an increase in RI and RPI. Significant differences in these indicators were compared with the MG. Thus, signs of a violation of the venous outflow from the skull may be in patients with COPD without clinical signs of VCP, they have a significant decrease in venous outflow, an increase in the tone of small vessels compared to CG.

Table 2

REG parameters in patients with COPD frontotemporal leads on the left ( $M \pm m$ ) depending on the presence of VCP

Parameters	MG	CG	CG	p<	p<	p<
	1	2	3	1-2	1-3	2-3
RI, Om	1,45±0,03	1,32±0,01	1,29±0,03	0,005	0,005	
UTST	0,35±0,02	0,32±0,02	0,29±0,03		0,005	
APST	0,48±0,03	0,43±0,02	0,41±0,02			0,05
VO, %	18,97±0,9	21,78±0,6	22,93±0,8	0,005	0,005	
DCI	0,52±0,02	0,55±0,02	0,57±0,03		0,05	
RPI	1,67±0,2	1,52±0,02	1,84±0,1	0,005	0,005	0,05
DSI	0,61±0,02	0,67±0,03	0,72±0,03	0,05	0,005	0,05

There was also a decrease in the blood filling of the microvasculature in all the studied areas of the brain. According to the increase in DCI and DSI indices, the tone of the sphincters of arterioles located between the capillaries and venules that determine the outflow of blood from the microvasculature in the MG patients was significantly higher than in the CG and CG groups. This was also noted in the increase in the integral indicator - IPS. The least susceptible to changes are the values of microcirculation indicators in the CG. Venous outflow was obstructed in the MG and CG (Table 2).

### CONCLUSION

Thus, in the group of patients with MG, vascular disorders were observed both in the arterial system and in the venous system, which was reflected in an increase in the tone of the vessels in the study area and a decrease in their throughput. A significant decrease in the blood supply to the frontal parts of the brain was noted. Significant changes were observed in the indices of RI, VO, DCI in women than in men. Informative REG indicators characterizing the state of the main parts of the circulatory system of the brain in patients with COPD have been identified. In the examined persons, a rather high level of registration of venous outflow was observed - 80.8%, this indicator in females was significantly higher compared to male patients. Also, the study revealed that VO is increased not only in patients with MG, but also in patients with CG, in whom the clinical syndrome of VCP has not yet formed, in other words, a violation of venous hemodynamics in patients with cardiovascular diseases appears long before the clinical signs of VCP.

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