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FEATURES OF CLINIC-HAEMODYNAMIC INDEXES FOR PATIENTS WITH THE DIFFERENT FORMS OF MIGRAINE

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ОСОБЛИВОСТІ КЛІНІКО-ГЕМОДИНАМІЧНИХ ПОКАЗНИКІВ У ХВОРИХ З РІЗНИМИ ФОРМАМИ МІГРЕНІ

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ОСОБЕННОСТИ КЛИНИКО-ГЕМОДИНАМИЧЕСКИХ ПОКАЗАТЕЛЕЙ У БОЛЬНЫХ С РАЗНЫМИ ФОРМАМИ МИГРЕНИ

The article is dedicated to the hemodynamic features in patients with migraine. 58 patients suffering from migraine have been examined: 48 patients with migraine without aura and 10 ones with migraine with aura. The indices of blood flow linear velocity in the middle cerebral, vertebral and basilar arteries in the two groups of patients (suffering from migraine with and without aura) have been assessed. It was detected that regardless of the form of migraine, hemodynamics status in the middle cerebral artery in the period between attacks is significantly different from the same indices in the group of virtually healthy individuals and exceeds the norm, demonstrating the increase of the tone of the vascular wall and its readiness for vasoconstriction in case of even insignificant activity of factors causing migraine. Thus, patients suffering from migraine require preventive treatment in the interictal period in order to prevent migraine-associated complications such as migraine status or cerebral infarction.

Key words: migraine, migraine with aura, migraine without aura, hemodynamic parameters, linear speed blood flow, migrainous stroke.

Стаття присвячена дослідженню гемодинамічних особливостей у хворих на мігрень. Було обстежено 58 хворих на мігрень: 48 —на мігрень без аури та 10 — на мігрень з аурою. Проводили оцінку показників лінійної швидкості кровотоку у середньомозкових, хребетних та базилярній артеріях в двох групах хворих: з мігренню з аурою та мігренню без аури. Виявлено, що не залежно від форми мігрені, стан гемодинаміки в басейні середньомозкових артерій в період між нападами суттєво відрізняється від таких самих показників в групі практично здорових і перевищує значення норми, що свідчить про підвищення тонусу судинної стінки і її готовності до вазоконстрикції, навіть при незначній дії чинників, які провокують мігрень. Таким чином, пацієнти, які страждають на мігрень, потребують превентивного лікування в період між нападами мігрені з метою попередження мігрень-асоційованих ускладнень, таких як мігренозний статус або інфаркт мозку.

Ключові слова: мігрень, мігрень з аурою, мігрень без аури, гемодинамічні показники, лінійна швидкість кровотоку, мігренозний інсульт.

Статья посвящена исследованию гемодинамических особенностей у больных мигренью. Было обследовано 58 больных мигренью: 48 —с мигренью без ауры и 10 — с мигренью с аурой. Проводили оценку показателей линейной скорости кровотока по средним мозговым, позвоночным и базилярным артериям в двух группах больных: с мигренью с аурой и с мигренью без ауры. Выявлено, что независимо от формы мигрени, состояние гемодинамики в бассейне средних мозговых артерий в период между приступами существенно отличается от таких же показателей в группе практически здоровых и превышает значение нормы, что свидетельствует о повышении тонуса сосудистой стенки и ее готовности к вазоконстрикции при даже при незначительном действии факторов, провоцирующих приступ мигрени. Таким образом, пациенты, страдающие мигренью, нуждаются в превентивном лечении в межприступный период с целью предупреждения мигрень-ассоциированных осложнений, таких как мигренозный статус или инфаркт мозга.

Ключевые слова: мигрень, мигрень с аурой, мигрень без ауры, гемодинамические показатели, линейная скорость кровотока, мигренозной инсульт.

Migraine is a topical socio-economic issue of our time. According to the data of World Health Organization migraine ranks the 19th place among all deconditioning chronic human diseases [3, 4]. During the attack there is marked reduction of capacity in 70 % of patients; there is observed a complete cessation of daily activities in one-third of patients [3, 13, 14]. Another important factor is that migraine affects mainly young people of working age from 25 to 45 years old, representing about 68 % of cases, and the peak of the disease accounts for age of 25 to 34 years old [1, 3].

Migraine is a chronic disease that often leads to structural changes in the vessels of the brain. According to MRI assessments, in patients who continued to suffer from migraine (over 15 years) with a frequency of more than 3 attacks per month, the probability of detection of pathological changes in the CNS is increasing [8, 9]. Frequent attacks of migraine may lead to several complications such as chronic migraine, migraine status, migrainous infarct (migraine-induced stroke), persistent aura without infarction and epileptic seizure, caused by migraine.

In the study of Oxfordshire Community Stroke Project, it was found that the overall incidence of migraine stroke is 3.36 cases per 100 thousand people per year [11]. Thus, the migraine stroke makes for almost 25 % of cerebral infarctions in individuals younger than 50 years, keeping in mind that the incidence of ischemic stroke in persons younger than 50 years is 6.5 and 22.8 cases per 100 thousand of the population [9; 11]. According to the data of Women's Health Study, in which within 10 years we were studying the relation of migraine with stroke, it has been proven a reliable increase in the risk of any type of stroke among patients with migraine in comparison with the control group of healthy individuals (relative risk = 1.53; 95 % confidence interval 1.02—2.31). A meta-analysis of 11 "case — control" studies showed that the risk of stroke in patients suffering from migraine with aura is significantly higher than in patients with migraine without aura [2]. The authors of this study noted that in patients with migraine with aura the risk of haemorrhagic stroke was not increased, while the risk of ischemic stroke was significantly higher than that of the other study participants, mainly in patients at the age of 45—54 years old [2;12].

A number of studies have conducted the assessment of dopplerographic parameters in patients with different forms of migraine during the headache attack. In the study it was observed that in patients with migraine there has been violation of reactivity under hypercapnic and orthostatic load, which, in turn, is associated with impaired humoral metabolism and neurogenic contour of cerebral circulation regulation [10]. In patients with migraine with aura it was observed the hyper-

reactivity under the ventilation load that is reflecting the hyperbarcontroller vascular response [5; 6]. In several studies it was shown that the hemodynamic parameters in the pain phase of the migraine attack are characterized by excessive blood filling of the external carotid artery [5;6]. At the same time there are quite a few works devoted to the study of hemodynamic parameters in patients with migraine between attacks of headache. Therefore, the study of the mechanisms of pathogenesis of migraine and state of cerebral hemodynamics in patients with migraine is important today, and enables further comprehensive approach to the treatment and prevention of various forms of its complications.

Aims — the study of cerebral hemodynamics' indexes in patients with migraine between headache attacks.

There were examined 58 patients diagnosed with migraine: men — 5 (8.62 %), women — 53 (91.38 %). The diagnosis was determined according to the criteria of the International classification of headache of IInd review, 2003 [7]. Among them 48 patients (82.76 %) were suffering from migraine without aura and 10 patients (17.24 %) — with migraine with aura. All examined patients had migraine mostly of right (29 patients — 50 %) or left (22 patients — 37.93 %) localization, rarely with severe vestibular syndrome (7 patients — 12.07 %).

In the group of patients with migraine unilateral headache attacks occurred during their life with the predominant localization in the right or left temporal fossa, orbit, with the spread on the same side of the neck or in the back of the head. In some patients the attack of headache was accompanied by nausea, rarely vomiting. In 10 patients of the studied group the attack of headache was preceded by an aura for an hour before the attack, it was presented not only by visual disorders, but also by transient neurological symptoms such as numbness and weakness in the hand, paresthesia and numbness of half of the face, dysarthria lasting from 15 to 60 minutes. Some patients have described the feeling of "unreality" of the visible image at the beginning of a headache attack, the perception of the image in the form of increased or decreased subjects towards to their self, the so-called symptom of "Alice in the Looking-Glass".

The severity of headache was assessed on a 10-point Visual analogue scale (VAS). Among 58 patients the 39 of them evaluate the headache during the attack on 8—10 points, 12 patients on 6—7 points, 7 patients evaluate the intensity of headache during the attack on 4—5 points. More than half of the patients have noted that, at least once in their life, the unilateral headache lasted more than three days and it was hard to treat. Studies on hemodynamics were performed in patients, diagnosed with migraine, in the interictal period.

Control group consisted of 58 volunteers who do not suffer from migraines and had no headaches of any other etiology lately.

The studies of the linear blood flow velocity was carried out using the transcranial doppler, produced by "EME Necolet" (USA), which allowed to determine the parameters of the linear blood flow velocity (LBFV) at the specified depth.

Statistical analysis was performed using the package of Minitab 14. We have suggested the existence of differences between patients with migraine and healthy individuals. In the study practice, in order to identify the differences between groups of individuals, the tests on statistical hypothesis concerning the equality of the indexes of the centers of distributions of the compared groups is carried out. An important prerequisite for such analysis is the control of the distribution variant of the studied parameters, in particular the hypotheses regarding the distribution according the normal distribution law.

As a result of the hypothesis testing about the subordination of distribution of values of the normal law of distribution using the Kolmogorov-Smirnov test it was set the significant (at the level $p < 0.05$) difference from this distribution. Therefore, to test the equality of the studied parameters it is appropriate to apply nonparametric tests checking equality of center indicators of the distribution of the two totals, in particular, because we have a group of unrelated persons by Mann-Whitney medians test.

Using the transcranial doppler ultrasound method it was studied the average linear velocity of blood flow through the right and left middle cerebral arteries (MCA), the right and left vertebral arteries (VA) and basilar artery (BA) in the 1st group of patients (healthy) and the 2nd group of patients (patients with migraine). It was carried out the statistical processing of the data with the help of Mann-Whitney test. The results are shown in the table 1.

On the basis of the analysis using the criterion of Mann-Whitney it was found out a significant difference between the values of the linear velocity of blood flow in the right MCA and left MCA, and BA (as estimated significance levels are $p < 0.05$), while the values of the linear blood flow velocity on both vertebral arteries in patients with migraine have not significant difference between the same indicators in the group of healthy controls (because the empirical p value is much more than the accepted level of 0.05). Table 1 shows a significant difference of the values of the linear velocity of blood flow through the right and left middle cerebral arteries in patients with migraine in period between attacks in comparison with the control group, the test of Mann-Whitney makes 0.002 and 0.01, respectively. Considering the obtained data, there was performed the statistical analysis of hemodynamic parameters in patients with migraine without aura (group 3) and in patients with migraine with aura (group 4) compared with the control group. The results are shown in tables 2 and 3, accordingly.

Table 1

Mean values and standard deviations of hemodynamics in patients with migraine in period between attacks and in the control group

	Linear blood flow velocity through				
	middle cerebral arteries		vertebral arteries		basilar artery
	d	s	d	s	
Group 1	92.41 ± 7.96	93.88 ± 5.63	31.72 ± 2.32	31.95 ± 2.0	34.09 ± 3.03
Group 2	101.55 ± 13.94*	101.53 ± 14.02*	31.93 ± 6.39	33.36 ± 6.2	40.38 ± 11.63*
The empirical significance level of Mann-Whitney criterion	0.002	0.01	0.84	0.25	0.025

* — The significant difference between the indices of the control group and in patients with migraine $p < 0,05$

Table 2

Mean values and standard deviations of hemodynamics in patients with migraine without aura in period between attacks and in the control group

	LBFV through MCA d	LBFV through MCA s	LBFV through VA d	LBFV through VA s	LBFV through BA
Group 1	92.41 ± 7.96	93.88 ± 5.63	31.72 ± 2.32	31.95 ± 2.02	34.09 ± 3.03
Group 3	100.5 ± 13.5*	101.3 ± 13.9*	32.54 ± 6.72	34.04 ± 6.36	41.3 ± 11.5*
The empirical significance level of Mann-Whitney criterion	0.0103	0.0216*	0.55	0.0594	0.0026*

* — The significant difference between the indices of the control group and in patients with migraine $p < 0.05$

Table 3

Mean values and standard deviations of hemodynamics in patients with migraine with aura in period between attacks and in the control group

	LBFV through MCA d	LBFV through MCA s	LBFV through VA d	LBFV through VA s	LBFV through BA
Group 1	92.41 ± 7.96	93.88 ± 5.63	31.72 ± 2.32	31.95 ± 2.02	34.09 ± 3.03
Group 4	109.2 ± 17.0*	104.6 ± 17.1*	33.18 ± 6.84	31.36 ± 3.78	41.6 ± 13.9
The empirical significance level of Mann-Whitney criterion	0.0037	0.0441	0.898	0.88	0.465

* — The significant difference between the indices of the control group and in patients with migraine $p < 0.05$

After analyzing the data of table 2 we have revealed a significant difference of the values of the linear velocity of blood flow not only at the right and left middle cerebral arteries (Mann-Whitney index makes 0.01 and 0.02, respectively, $p < 0.05$), and basilar artery (Mann-Whitney index makes 0.0026 $p < 0.05$) in patients with migraine without aura in contrast to the control group. In patients with migraine with aura in period between attacks a significant difference of hemodynamic performance is preserved only in middle cerebral arteries (Mann-Whitney index makes 0.0037 and 0.044, accordingly, $p < 0.05$), in vertebral and basilar arteries significant difference was not observed (Mann-Whitney index makes 0.89 through the right VA; 0.88 through the left VA and 0.465 through BA $p > 0.05$).

Our studies have shown that regardless of the form of migraine, hemodynamic status in the medial cerebral artery in the period between attacks is significantly different from those parameters in healthy group. This indicates an increase in the tone of the vascular wall and its willingness to vasoconstriction in these patients even with little action of factors which provokes an attack of migraine. Thus, all patients with migraine are requiring the preventive treatment between attacks in order to prevent the migraine-associated complications, such as migraine status and cerebral infarction.

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