

CHRONIC STRESS AND CEREBROVASCULAR DISEASES: ANALYSIS OF THE EFFECT ON CEREBRAL CIRCULATION AND THE DEVELOPMENT OF ENCEPHALOPATHIES

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Abstract: The problem of the influence of chronic stress on the development of cerebrovascular diseases is becoming increasingly relevant in modern medicine. In conditions of increasing psycho-emotional stress and an accelerating pace of life, there is a significant increase in stress-induced disorders of cerebral circulation, which determines the need for an in-depth study of this problem.

Key words: chronic stress, cerebrovascular diseases, cerebral circulation, encephalopathy, cerebral hemodynamics, stress-induced disorders, endothelial dysfunction, cognitive impairment.

Introduction. In the 80s, the Canadian physiologist G.Selye introduced the concept of "stress" and "stressor", where stress is a reaction or adaptation of the body, and the stressor is a factor that forces the body to react and change its function with deviations in homeostasis (Robert L. and Labat-Robert J., 2015), while the stressor triggers the process itself stress. But in order to change the functional shift in the body, the stressor must be significant enough and pose a threat. Subsequently, the theories of L.Levi (1975), P.K. Anokhin (1970), K.V. Sudakov and P.E. Umryukhin were proposed. (2010), based on the opinion that negative emotions are the leading factor in the development of emotional stress. The main purpose of stress reactions is to maintain homeostasis, which is controlled by the "stress system": the central and peripheral nervous system and the neuroendocrine mechanism of development.

In recent decades, there has been an increased interest in epidemiological, clinical and experimental studies that allow us to look at psychosocial stresses (of various origins) and their impact on the risk of cerebrovascular pathology (V.Y.Purshev, 2009). Thus, the authors of the meta-analysis (E.I.Fransson et al. (2015); Booth J. et al., (2015)), which included 14 European cohort studies, found that the risk factor for developing cancer in people under the influence of stress at work is very high. In addition, the authors noted that the potential pathomechanism of the influence of psychosocial stress is very complex and has not been fully resolved, which requires additional research (Kivimaki M. and Kawachi I., 2019).

The origin of the factors and causes contributing to the development of acute and chronic brain disorders, it is the psychosocial factor that remains on the sidelines (conflicts at work, burnout symptoms, increased anxiety, depressive disorders, personality traits, lability). All this creates difficulties in identifying the pathological effects of various stressors, as well as personality traits in stress assessment, which makes it difficult to determine the significance of psychosocial influences in optimizing therapy (Cao-Lei L. et al., 2018; Stenz L. et al., 2018). Accordingly, the above determines the need to study and clarify the role of factors of chronic psychosocial stress in the development of chronic brain disorders.

The aim of the study was to study and identify the features of the course of patients with chronic cerebral circulatory disorders exposed to chronic stress.

Research materials and methods. The research was conducted at the Multidisciplinary Clinic of Samarkand State Medical University and the Railway Hospital of Samarkand in the departments of neurology, neurosurgery, and therapy. The following patients served as the object of the study: group 1 - patients who were observed in the MC of SamSMU with a diagnosis of dyscirculatory encephalopathy, whose occupation was related to agriculture (farmers, farmers), in the number of 43 people; Group 2 patients with a diagnosis of dyscirculatory encephalopathy, 35 machinists (assistant machinists) by occupation. All patients in both groups were male. In contrast to group 1, patients in group 2, whose work is associated with an increased degree of tension and attention, work on the night shift, in a confined space of the locomotive, with exposure to vibration and electromagnetic fields (Aliev O.T., 2015). The average age of the patients was in both groups 40 +/- 5 years old. As the basis for the inclusion of patients in the study, at the first stage, all admitted patients were interviewed and questioned on a scale (PSM-25 psychological stress), and only after that, according to the test results, the patients were included in one or another group. For the purity of the study, a control group was taken separately (practically healthy people, selected during the period of preventive examination in outpatient settings at Moscow State Medical University, of identical age and gender), consisting of 37 people. Subsequent research in the departments conducted according to the standards included the identification of complaints, the collection of medical history (a burdened history of cardiovascular events in close relatives, the presence of bad habits (smoking, alcohol consumption). A study of the somatic (by the therapist) and neurological status (by a neurologist) was conducted. Blood pressure monitoring; standard laboratory parameters (blood biochemistry), serum cortisol levels; instrumental methods of EEG and ultrasound examination of brachiocephalic vessels. Statistical processing of the obtained research data was carried out using an application software package on an individual computer, where the correlation relationship was determined by the Spearman method, where the p-value was less than 0.05 ($p < 0.05$).

Result of investigation. As noted, at the first stage, patients were tested for the presence and level of stress (according to the PSM-25 Scale, adapted and translated into Uzbek). The scale includes questions (25), the answers are summed up at the end using a standard calculation and the number of points is determined, which normally does not reach 50 points. The result of the calculation among the patients selected for the study showed that the patients of the 2nd group had an average of 135 points, which corresponds to the average stress level.; The average score in group 1 was 95, which corresponds to a low stress level. The average score in both main groups was 118, combined.

The result of the survey and the complaints presented by the group were almost identical, but differed in frequency and severity, so headache (16.1%), dizziness (14.3%), tinnitus (11.5%), pain and pain in the eyeballs (23%) were common complaints in group 2; in At the same time, in group 1, pain in the lumbar and thoracic spine prevailed as a percentage (22.9%), although headache and dizziness were also characteristic of patients in this group. If in the 2nd group of machinists and assistant machinists there were a minimum number of complaints (for pain in the lumbar spine (2.6%)), then the percentage of complaints about anxiety and emotional lability of mood is higher than in the 1st group, and in addition, in most cases, the increase in the number of complaints is statistically significant. The situation looks different in the control groups. In the control group, complaints of anxiety were identified, only in 2 patients, and the number of complaints in the control at the end of the study was not so significant, and had no statistical significance (in the group itself).

The neurological status on examination revealed differences between the groups. Thus, among the patients of group 1 and group 2, the following symptoms revealed during neurological examination turned out to be similar and significantly more often observed: symptoms of oral automatism (in group 2, 10.6%, in group 1, 9.9%), pain on palpation of the exit of trigeminal points (in group 2, 18.6%, in group 1, 13.3%), an increase in tendon reflexes from the extremities (in group 1, 25.2%, in group 2, 34.7%), asymmetry of tendon reflexes from the extremities (in group 2, 19.8%, in group 1, 16.9%), pathological reflexes (in group 2, 7.1%, in group 1, 13.9%), restriction of movement in the cervical

spine (52.5% in group 2, 21% in group 1), and, accordingly, soreness on palpation of points of the cervical spine in percentage terms was almost the same as with restriction of movement; limited mobility in the lumbar spine with pain on palpation (11.9% in group 2, 53.5% in group 1%).

Thus, the result of a standard neurological examination suggests that the signs of disorders directly depend on the type of activity, as patients in group 2 are forced to endure prolonged discomfort (tension in the cervical region, visual strain), which is accompanied by a statistically significant increase in cases of impaired nervous system function (for example, impaired function of the tendon-muscular apparatus of the cervical region spine, anxiety, depression).

It is known that cortisol is a steroid hormone of the adrenal glands involved in the regulation of many metabolic processes, while simultaneously playing an important role in the body's adaptation to stressful situations, which is why it is often called the "stress hormone". In this regard, the right decision was to study this hormone in patients participating in the study. Thus, the indicator of cortisol in the blood serum in the control group was 347.3 nmol/l (on average). The cortisol level in patients in group 2 averaged 478.10 nmol/L, almost 18% higher than in the control group, where $p < 0.005$. The value of cortisol levels between groups 1 and 2 also had differences, so in group 1, cortisol averaged 409.09 nmol/l, it was higher than in the control group, but significantly less than in group 2. At the same time, comparing the cortisol content in groups 1 and 2 together (as the main group) with the control group, it was found that the level of cortisol in the main groups exceeded the value in the control by 33.1%. Thus, a study of patients on the nature of the adaptation of the hormone cortisol showed that such a reaction is a consequence of the activation of negative feedback mechanisms as a long-term chronic stress factor, which coincides with the literature data (Lutsky I.S., 2019).

Registration analysis of the bioelectric activity of the brain is widely used to study the neurophysiological foundations of depression and stress. The study of EEG in patients of the main groups revealed the features. For group 1 of patients with (according to anamnesis, testing, and cortisol indicators) a slightly increased level of anxiety and emotional lability, the result of an analysis of the structural and spatial organization of zones of bioelectric changes in the cerebral cortex, a decrease in interrelationships in the right posterior temporal region with bilaterally symmetrical zones of the left posterior temporal and mid-temporal leads was shown. In addition, there are clear parameters of decrease in the left frontal and central regions. Moreover, the decrease in communication is well recorded in the alpha range with an advantage in the right posterior-temporal zone with the frontal sections of both hemispheres.

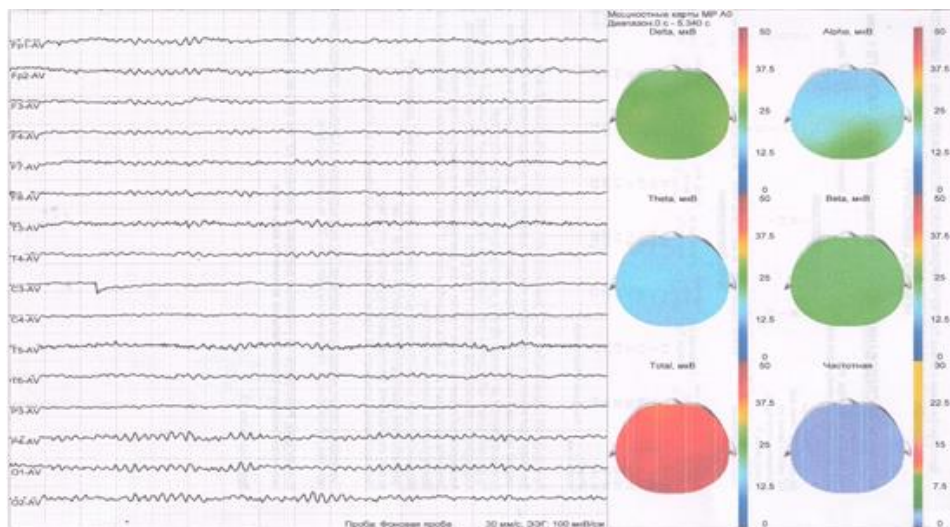


Fig. 1. Patient A., 50 years old. Moderate diffuse EEG changes are recorded without signs of local pathology. Specific EEG phenomena in the form of periodic EEG depression are noted.

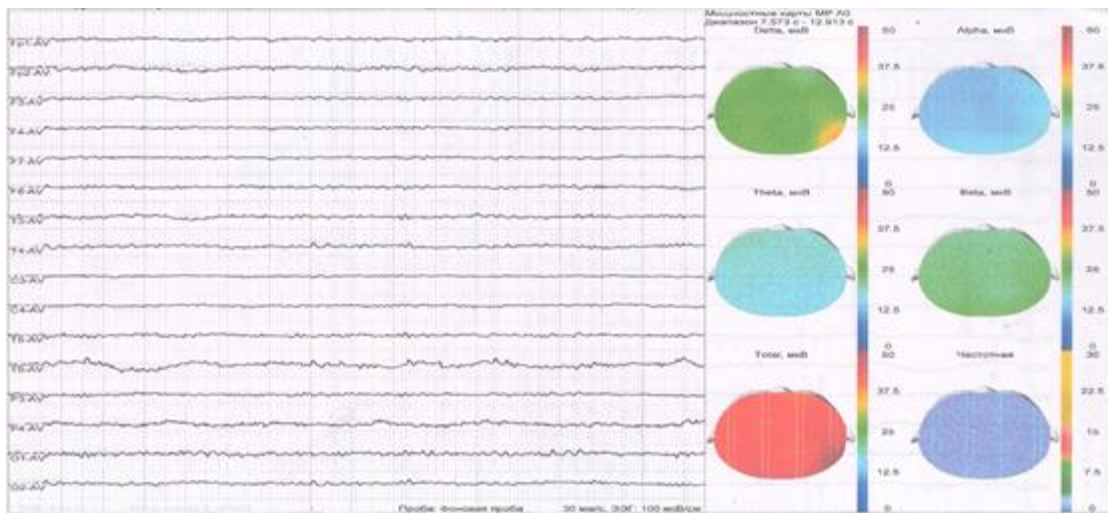


Fig. 2. Patient B., 48 years old. Moderate diffuse EEG changes are recorded without signs of local pathology. Decreased functional activity of the cerebral cortex.

The nature of the bioelectric activity of the cerebral cortex in group 1 patients with more pronounced signs of anxiety and emotional lability with elements I periodically manifested by reactive depression revealed a decrease in interhemispheric EEG connections, mainly in the right frontal region (posterior-frontal, central and anterior-frontal leads). At the same time, there is a pronounced increase in interconnections on the EEG, in the ranges from the left posterior and middle temporal zones, with a significant element in the delta range and an increase in interhemispheric connections in the beta range in the posterior temporal region of both hemispheres.

There were also decreases in comparable interactions with the right posterior temporal and an increase in the left inferior frontal region.

The aim of the study was to study the blood flow levels of the main vessels of the head in patients exposed to chronic stress. The first result of the study was conducted in the control group, for a correlation analysis of the comparison between the groups. The increased systolic linear blood flow velocity in terms of carotid arteries in the control group was 120.0 cm/sec (on average). At the same time, in group 2, the linear velocity (systolic) was 94 cm/sec (on average), which turned out to be almost 16% lower compared to the control group. The diastolic linear velocity in the control group averaged 36.7 cm/sec, compared to 21.6 cm/sec (average) in the 2 patient groups, which is 30% lower than the standard values in the control group. Analysis result when comparing the linear velocity between the main groups (1 and 2), a statistically significant difference was obtained, where increased differences between patients were noted similarly between the control group ($p < 0.05$), which strongly indicates and indicates the influence of chronic stress factors on the linear velocity parameters (elasticity, activity of endothelial processes).

Conclusions: it should be noted that the brain is the basis of stress implementation, where there is a relationship between the central/autonomic nervous system, cardiovascular, immune and endocrine systems. Chronic stress leads to prolonged and excessive secretion of hormones, in particular an increase in cortisol levels. The result of the linear velocity analysis showed a significant decrease in the main groups, while in group 2 the indicators differ significantly in comparison with the same control group ($p < 0.01$). A characteristic feature was revealed in group 1 patients with low levels of anxiety and emotional lability according to EEG data, where there is a decrease in the relationship between the posterior temporal and anterior frontal regions of the right hemisphere. In group 1 of patients with pronounced signs of anxiety (in the form of "anxious apprehension") and increased emotional lability, the EEG showed a reduced systemic relationship in the left frontal region (lower frontal zone), while the beta and tetra ranges were found to be greater with reactive anxiety. Thus, stress is primarily an adaptive reaction and a factor that triggers the mechanism of the pathological process: hormonal and metabolic imbalances, leading to prolonged exacerbation of chronic cerebral circulatory disorders.

Literature

1. Yaribeygi, H., Panahi, Y., Sahraei, H., Johnston, T.P., & Sahebkar, A. (2017). The impact of stress on body function: A review. This study examines the physiological mechanisms by which chronic stress impacts various bodily systems, including effects on oxidative stress, inflammation, and blood flow, all relevant to cerebral health .
2. Naderi, N., Aghajani, H., & Bayani, A. (2019). Psychological stress as a risk factor for cardiovascular disease. This study discusses how psychological stress contributes to cardiovascular and cerebrovascular diseases, with findings that underline how stress-related inflammation and heightened amygdala activity impact blood flow in the brain .
3. Mozharova O.A. PERSONALITY TRAITS OF A PERSON SUFFERING FROM CHRONIC PAIN DISORDER // Russian Journal of Pain, 2015, 1(44), 115-116
4. Gafurova Jamilya Fakhrizoda, Jurabekova Aziza Takhirovna, Abdullayeva Nargiza Nurmamatovna, Yuldasheva Dilobar Shukhrat Kizi, & Shmyrina Ksenia Vladimirovna (2020). Analysis of acute cerebral circulation disorders depending on early and late examination. Achievements of science and education, (3 (57)), 92-94.
5. Falkovskaya A.Yu., Mordovin V.F., Sukhareva A.E., Zybanova I.V., Manukyan M.A., Lichikaki V.A., Tsoi E.I., Gusakova A.M., Dorozhkina N.V. Cerebrovascular pathology in patients with resistant arterial hypertension in combination with type 2 diabetes mellitus. Diabetes mellitus. 2022;25(2):128-135. <https://doi.org/10.14341/DM12779>
6. Yesin R.G., Yesin O.R., Khakimova A.R. Stress-induced disorders. S.S. Korsakov Journal of Neurology and Psychiatry. 2020;120(5):131-137.
7. Kulikov V.P., Kuznetsova D.V., Zarya A.N. Cerebrovascular and cardiovascular CO2 reactivity in the pathogenesis of arterial hypertension. Arterial hypertension. 2017; 23(5): 433-446. <https://doi.org/10.18705/1607-419X-2017-23-5-433-446>
8. Bakulin I.S., Tanashyan M.M., Raskurazhev A.A. Endothelial dysfunction and oxidative stress in cerebral atherosclerosis and the possibilities of their pathogenetic correction. // Nervous Diseases, 2018 No. 2, 3-10. doi: 10.24411/2226-0757-2018-1206
9. Abramova M.F., Stepanova I.A., Abramov K.V., Kazykina T.N., Vasilyeva T.M. Cerebrovascular disorders and autonomic dystonia syndrome in children (adolescents) and young patients. Clinical and diagnostic algorithms of therapy. The medical alphabet. 2019;3(24):23-27. [https://doi.org/10.33667/2078-5631-2019-3-24\(399\)-23-27](https://doi.org/10.33667/2078-5631-2019-3-24(399)-23-27)