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THE IMPORTANCE OF STUDYING PERINATAL PATHOLOGIES IN THE FORMATION OF BIOELECTRIC BRAIN ACTIVITY IN CHILDREN

Resume, The aim of the work was a comparative study of the parameters of brain bioelectric activity (amplitude and frequency characteristics of alpha and beta rhythm, the nature of slow wave activity and its zonal distribution, reactions to photostimulation and hyperventilation) in patients with consequences of perinatal hypoxic involvement of the central nervous system.

Key words: brain dysfunction, bioelectrical activity, electr - encephalography, lesions, brain studies.

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ВАЖНОСТЬ ИЗУЧЕНИЯ ПЕРИНАТАЛЬНЫХ ПАТОЛОГИЙ В ФОРМИРОВАНИИ БИОЭЛЕКТРИЧЕСКОЙ АКТИВНОСТИ МОЗГА У ДЕТЕЙ

Резюме: Целью работы стало сравнительное исследование показателей биоэлектрической активности головного мозга (амплитудно-частотных характеристик альфа- и бета-ритма, характера медленноволновой активности и её зонального распределения, реакции на фотостимуляцию и гипервентиляцию) у пациентов с последствиями перинатального гипоксического поражения ЦНС.

Ключевые слова: мозговая дисфункция, биоэлектрическая активность, электр – энцефалография, поражения, исследования головного мозга.

Introduction. The development of neurology has been marked by significant successes in the study of pathogenesis, clinic and treatment of diseases of the nervous system.

Against the background of a decrease in the birth rate, the number of children with CNS diseases remains high. There is an undoubted connection between pathological conditions of the perinatal period and a number of serious diseases of the nervous system, the symptoms of which appear after a long time [2,7].

A large number of publications have been devoted to the issue of so-called minimal cerebral dysfunction (MMD) [1,3,5], however, there are no unified approaches to the formulation of the diagnosis. There is a contradictory opinion about the etiology, pathogenesis and need for treatment of this pathology. For most pediatricians, psychologists and educators, the term itself and its content remain obscure, and children with such a diagnosis do not receive adequate treatment [5,6,]. It is assumed that, with MMD, children have dysfunction of the frontal lobes (prefrontal cortex), subcortical nuclei and the pathways connecting them. One of the confirmations of this assumption is the similarity of neuropsychological disorders in children with attention deficit disorder and in adults with damage to the frontal lobes of the brain[3,6]. Spectral tomography of the brain in 65% of children with attention deficit hyperactivity disorder revealed a decrease in blood flow in the prefrontal cortex under intellectual stress, whereas in the control group - only 5%.

The purpose of the study: To study the features of bioelectric brain activity in children with minimal brain dysfunction

Materials and methods of research: In order to study the bioelectric activity of the brain of MMD patients, we conducted a study of the structural features of the bioelectric activity of the brain in MMD children.

All subjects (n=55) were divided into two groups. The 1st group included children with MMD with attention deficit hyperactivity disorder - 38 people, the

second group with attention deficit hyperactivity disorder – 16 people, aged 3-7 years, attending mass preschools.

According to the anamnesis in the postnatal period, the examined children were diagnosed with perinatal encephalopathy (PEP) and/or hyperexcitability syndrome, muscular dystonia syndrome, hypertension-hydrocephalus syndrome, or risk factors considered in neurology as threatening due to perinatal central nervous system damage (prolonged anhydrous period in childbirth, cyanosis of the skin of a newborn, etc.).

The EEG was recorded on a 16-channel encephalograph (Medicor), the location of the electrodes according to the 10-20 system, recording in the frequency band 1-70 Hz, mono- (relative to the ear electrode) and bipolar at rest and under functional loads (photostimulation at frequencies 1-20 Hz, at 2 min hypervetilation). A resting EEG fragment (2-4 min) was analyzed using the principles of structural EEG analysis [8]. The EEG indicators proposed by N.Yu.Kazhushko (2003) of this method for children aged 7-10 years were used as normative ones. In particular, for healthy children, as the age norm of mature EEG, the authors distinguish the dominance of a regular alpha rhythm with a frequency of 8-10 Hz with the assimilation of the flickering rhythm during photostimulation corresponding to this band. The maturity of the regulatory structures of the brain at this age is usually manifested by the absence of paroxysmal activity. For mature EEG of children aged 6-7 years with learning difficulties, the authors describe EEG with pointed forms of alpha activity, a decrease in the frequency of rest rhythm and rhythm assimilation during photostimulation, and paroxysmal activity.

When analyzing the features of the bioelectric activity of the brain, we also used an indicator of the amplitude level: background EEG in the range of up to 50 MV was described as low-amplitude, in the range from 50 to 100 MV - as high-amplitude, more than 100 MV - as excessively high.

To assess cerebral hemodynamics in children of group 1, we used the rheoencephalography (REG) method [3, 6,]. REG was recorded using the 4 RG-2M device in the fronto- and occipito-mastoidal leads bilaterally, at rest and with head rotation. REG complements the transcranial ultrasound indicators with data on the intensity of pulse blood filling in the basin of the internal carotid arteries (MENA) and the vertebral-basilar basin (VBB), which were evaluated in comparison with age norms.

Results and discussion: As the results of our research have shown, in children of the 1st group, the normative EEG parameters with a regular alpha rhythm of 8-10 Hz were detected only in 9 people (14.1% of cases), rhythm assimilation in the frequency range of 8-10 Hz was detected in 3.8% of cases. In the remaining children, regular alpha activity of a pointed shape in combination with 9-activity (both irregular in nature and in the form of groups of high-amplitude theta waves), with acute waves, acute wave-slow wave complexes prevailed on the EEG in the parieto-occipital cortex of the large hemispheres

When studying the features of bioelectric brain activity in children of group 2, we found that high-amplitude EEG in 82% of cases is characterized by the presence of a spatially organized regular alpha rhythm with a frequency from 7-8 to 10 Hz. Just as in group 1, alpha activity on such EEGS was combined with slow and/or pointed forms of activity. Low-amplitude EEGS with spatially organized alpha activity were detected in only 45% of children.

Thus, the described types of EEG in children of both groups 1 and 2 do not actually meet the age criteria for the maturity of EEG in healthy children.

The use of cerebral blood flow indicators to assess the functional state of the central nervous system of children with MMD revealed the following features. In group 1, the studied parameters of cerebral blood flow through both vascular basins at rest and under stress were sufficient only in 5.1% of children. At rest, a deficiency in the intensity of pulse blood supply (Ahm) in the vertebrobasilar basin (VBB) was found in 34.6% of children, and in 7.6% it was

also combined with a deficiency in the carotid basin (MENA). When loading with head rotation, the number of children with a deficiency in BBB increased by more than 2 times (up to 74.4%), by 30-80% of the initial value (with an acceptable reduction rate of 20%). This led either to a decrease in the initially sufficient blood flow to the level of deficiency, or aggravated the initial vascular inferiority. In 43.6% of group 1 children, the described changes were combined with a decrease in the reactivity of the vessels of the resistive bed to functional load, which indicated the depletion of regulatory mechanisms that allow maintaining an optimal level of blood flow.

Thus, children with MMD are characterized by the presence of specific features of the bioelectric activity of the brain and cerebral blood flow. They are manifested by the instability of the parameters of spontaneous bioelectric activity of the cerebral cortex in the range of the main rhythm in the form of the simultaneous presence on the EEG of the posterior cortex of fragments of the alpha rhythm and slower forms of activity of the theta range, pointed waves. In addition, a significant proportion of children showed a significant decrease in the intensity of blood filling in the vertebral artery basin (VBB) at rest and/or under functional loads.

Sufficient performance with such initial parameters of the functional state of the brain in the examined groups of children with MMD can be ensured due to the preservation (in our studies in 92.4% of children) of cerebral blood flow in the carotid basin, the action of mechanisms of autoregulatory effects on the resistive bed (56.4% of children). It is assumed that it is the compensatory capabilities of the child's brain and the plasticity of his vascular system in conditions of a certain load regime that allow him to achieve sufficiently high performance when performing a leading age load. This happens as long as it does not deplete the functional reserves of the body in a highly stressful environment. In these cases, the combination of the described disorders of cerebral hemodynamics and the functional state of the central nervous system

according to EEG data leads to complaints from children of increased fatigue after school, periodic headaches, drowsiness, restlessness, sleep disorders, i.e. latent vascular inferiority begins to "sound clinically".

A comparative analysis of complaints and features of spontaneous EEG shows a fundamental similarity in the prevalence of a number of complaints in children with different types of EEG. The most noticeable differences are observed in the frequency of occurrence of school difficulties, including dysgraphy, dyslexia, restlessness and distractibility, including in the structure of attention deficit hyperactivity disorder. As can be seen, in the group of children with low amplitude poorly organized (immature) The EEG clearly shows a tendency towards a comparative predominance of difficulties. It is possible that the brain mechanisms for the formation of a mature cortical rhythm structure in children at risk are relatively inert and, with age, cannot provide a sufficient basis for performing complex integrative activities (including educational ones).

The data we have obtained are informative due to the fact that according to an in-depth neuropsychological examination of first-graders in mass schools, up to 73% of children have an unformed state of certain higher mental functions (VPF), and to a large extent these are children with MMD.

The revealed features of the bioelectric activity of the brain in MMD children due to school difficulties can be interpreted in the light of the idea of the levels of central nervous system damage [8].

Conclusions: Thus, according to the results of a study of spontaneous bioelectric brain activity in children with MMD, an EEG pattern was revealed in the parietal-occipital and posterior-temporal cortex of the cerebral hemispheres in the form of coexistence of fragments of the main (alpha) rhythm in combination with slow and/or pointed forms of activity, which indicates the instability of the mechanisms of regulation of the functional state The Central nervous system. It was found that the formation of the described EEG pattern is

associated with the influence of the hypoxia factor due to disorders of cerebral hemodynamics, mainly in the vertebrobasilar basin.

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