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# CLINICAL AND NEUROPHYSIOLOGIC VERIFICATION OF AGE-RELATED DIFFERENCES IN EPILEPSY IN CHILDREN AND ADOLESCENTS

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**Abstract:**

Epilepsy of childhood and adolescence, is a problem of interdisciplinary approach, many specialists. The polymorphism of transformation in the body of the young generation, requires a clearer approach not only to the diagnosis of the disease, but also to the optimization of treatment, taking into account the interaction of drugs with each other, their influence on hormonal status, fertility indicators and other side effects. Globally, there are more than 10 million children under 15 years of age who are registered with active epilepsy, which is approximately 25% of the total population affected by this pathology (1, 5). Interestingly, the incidence shows declines over time, so up to 50 per 100000 after 9 years of life. In addition, literature sources indicate the fact of cumulative change, where at the age up to 15 years in 1.5% of children if there is at least one unprovoked seizure, then in the future in 1% of these same children epileptic seizures continue to recur in adulthood.

**Keywords:** Clinical And Neurophysiologic Verification, Age Difference Of Epilepsy, Children And Adolescents

**INTRODUCTION.** An important component in the diagnosis and diagnostic protocols of epilepsy in children and adolescents, is to consider the etiology of seizures. If the etiologic aspect is of an idiopathic unclear nature, it should be revisited at all stages of decision making, as it is the etiology of epilepsy that is of primary importance in the prescription of antiepileptic therapy, disease prognosis, and patient management tactics [3, 7]. Resistance of epileptic seizures in children and adolescents is associated with a variety of etiological factors, for example, recent data show that hippocampal sclerosis is closely associated with mesiotemporal epilepsy, and according to neuroimaging data, 21% of children have hippocampal sclerosis, and in 60% of cases such seizures are difficult to correct [4, 10]. There is a causal relationship between the duration and frequency of seizures (subsequently developing focal temporal lobe epilepsy) depending directly on the level of hippocampal sclerosis. In contrast to the adult organism, the child organism has its own stage, which has its own specific anatomo-physiological features, where a separate age group is determined by quantitative indicators (height, weight, head circumference, chest, blood pressure), qualitative indicators of morpho-functioning of individual organs and systems. That in turn determines the state of reactivity of the organism and the degree of susceptibility to its diseases, due to the different time of maturation of organs and systems, somewhere gradually, somewhere faster and, accordingly, differs in the specificity of function at each stage of development [9, 11]. The main processes of the growing organism, adaptive capacity. Reorganization of neuro-regulatory mechanisms and neurohumoral communication, in particular activation of the pituitary and hypothalamic system, including sex differences. In addition, it is necessary to take into account the peculiarities of the nervous system of the adolescent psychomotor, with weakness of inhibitory processes, insufficient stimulus control, environmental factors [8, 12]. Thus, epilepsy in children and adolescents has a number of controversial issues, therefore, the problem of epilepsy at this age remains relevant and requires further study.

**THE AIM OF THE STUDY** was to investigate and identify the peculiarities of clinical, neurological, neurophysiological and neuroimaging indicators of epilepsy in the context of age-related changes in children and adolescents.

**MATERIAL AND METHODS OF RESEARCH.** In accordance with the objective, 63 patients with epilepsy of different forms with the debut of the disease from 12-13 years of age, who made up group 1, were

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examined. The second group, as a comparison 47 patients, again with different forms of epilepsy from 17-18 years old. All patients were observed in outpatient conditions, polyclinic on the basis of multidisciplinary clinic of Samarkand Medical State University for the period 2022-2024. Inclusion criteria for the study, patients aged 12-13 years17-18 years, with established diagnosis of epilepsy (by history and for the given period). The main emphasis for exclusion in the study, indicators of the underlying disease in which the epileptic seizure occurred (cerebral palsy, a consequence of traumatic brain injury, a consequence of encephalitis, etc.). Patients were first of all classified according to seizure pattern indicators and categorized according to the form of the disease. The diagnosis of epilepsy was established according to the criteria of the international classification and based on the report of the ILAE Commission on Classification and Terminology (2001). The data of clinical and anamnestic findings were compared with the indicators of electroencephalographic diagnostics in dynamics, and the results of neuroimaging of the brain. The distribution of the examined patients by sex was as follows, in group 1 boys 53%, girls respectively 47%; in group 2 boys 51%, girls respectively 49%, insignificant transformation of the male sex (which corresponds to the literature sources). All patients in the presence of their parents underwent the questionnaire stage (random questioning on anamnesis); standard laboratory analysis (according to the protocol of outpatient admission); Electroencephalography recording was performed in dynamics, video-EEG monitoring (VEM), on the apparatus "Bioss" (Russia) and on the universal encephalograph "MBNNeurokartogrof" (Russia), where the initial signal was obtained according to standard methodological signals. EEG was analyzed according to Zhirmudskaya EA (1993), with 5 types distinguished. Separately (selectively), the examined patients underwent neuroimaging of the brain in order to detect neurostructural changes in the brain on the PHILIPS Panorama HFO 1.0 Tesla device in T, 12 modes. Statistical analysis was performed on an individual computer, with the traditional use of the Student's criterion of reliability.

The results of the study. As mentioned above, patients diagnosed with epilepsy who applied to the polyclinic service (MC SamSMU), on an outpatient basis (using a standard research protocol), were interviewed at the first stage. The questionnaire differed from the usual anamnesis collection, with a more detailed description of the anamnesis of life, a description of ancestry, a history of the present disease, in addition, the questionnaire included parallel neuropsychological tests (determination of cognitive potential and mental abnormalities). Of all the noted risk factors for generalized epilepsy, in the examined patients, hereditary predisposition (according to anamnesis) occupied 35% (the incidence of the disease in relatives of the second degree of kinship or episodes of seizures in 15% of cases). Among perinatal disorders, statistically significant risk factors for the development of GE were the threat of termination of pregnancy and asphyxia of newborns. The second important stage of the study was the examination of the patient for the presence of neurological disorders. Thus, in patients of groups 1 and 2, there were no gross focal neurological symptoms and signs of decreased intelligence. Patients had, depending on the form of epilepsy, diffuse neurological microsymptomatics without neurological deficiency, in the form of muscular hypotension, anisoreflexia, mild motor awkwardness, and minor insufficiency on the part of the VII and XII pairs of cranial nerves. The study of the neurological status of 79% did not reveal focal neurological symptoms (which corresponds to literary sources). The use of the international classification of epilepsy ILAE revealed the following forms of epilepsy among the examined contingent of children of group 1: idiopathic focal epilepsy was noted in 5% of cases; idiopathic generalized epilepsy, in most cases, was detected in 50% of cases; children with symptomatic focal epilepsy and with cryptogenic focal epilepsy, collectively accounted for 43%; the rest 2%, patients with progressive myoclonus epilepsy. At the same time, in the 2nd group of patients older in age (adolescence), epilepsy with symptomatic and cryptogenic forms prevailed in 56%, in contrast to the 1st group, the second form accounted for the other half of the percentage - the idiopathic generalized form of epilepsy 44%. During the analysis of the survey of patients (and parents), the features of the type of epilepsy with different frequency of occurrence were revealed. So in group 1, generalized seizures dominated, and secondary generalized 63%, an insignificant percentage revealed focal seizures in 12%, the remaining patients formed a group with "other" seizures, which included absences, myoclonic seizures, etc. Electroencephalography for patients with epilepsy is included in the gold standard of the diagnostic protocol , in this regard, all children and adolescents who applied to the neurologist's office at the polyclinic underwent the EEG diagnostic method. In group 1 patients with focal and cryptogenic epilepsy, regional slowdowns

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were noted, while multi-regional epileptiform activity was recorded in children with focal epilepsy in 80% of cases, and with cryptogenic focal epilepsy in 76%, the severity of the discharge of the regional peak-wave complex, or acute-slow wave complex and regional semi-peaks - in 88% of cases (25%). Diffuse changes in bioelectric activity and epileptiform activity, as part of the factor of secondary bilateral synchronization, were determined in 22% of cases in children with focal epilepsy. Interestingly, in cases of determination of generalized and diffuse discharges, a combination of phenomena such as a peak wave or an acute slow wave on the EEG was detected during repeated images (recordings) in children, when diagnosed on different EEG devices. At the same time, in children with epilepsy with generalized seizures, it was noted on the EEG, a difference in variants, a diffuse change in bioelectric activity and generalized epileptiform discharges in 36% of cases; focal epileptiform activity was detected in 15% of cases. In 50%, there were no epileptic foci, (taking into account the continued monitoring of several hours of video EEG). In group 2, diffuse changes in epileptiform activity were detected, in the form of short peak-wave combinations, and short bilaterally synchronous acute - slow waves. In patients with generalized seizures, in 89% of cases, focal epileptiform changes were noted, which appeared in the form of a peak wave, an acute slow-wave projection, more often in the frontal regions according to a low index, and rare bifrontal peak waves. Rare cases of absentee epilepsy, describes the presence of generalized epiactivity in patients on EEG (in all cases), as options: bilaterally synchronous peak waves (frequency 3.5-4.5 Hz) and single diffuse peak waves. From the group of children aged 12-13 years, out of 63 three appeals, as noted above, an idiopathic variant (character) of epilepsy was determined, for such children, a specific type of epileptiform activity, the so-called benign type of epileptiform patterns, the difference of which is only the nature of localization, were characteristic of EEG. For example, occipital - in benign occipital epilepsy; central temporal - in Rolandic (self-canceling) epilepsy; central temporal - in focal epilepsy with pseudogeneralized seizures. From each group, patients underwent brain neuroimaging selectively, 37 patients from group 1, 30 patients from group 2.

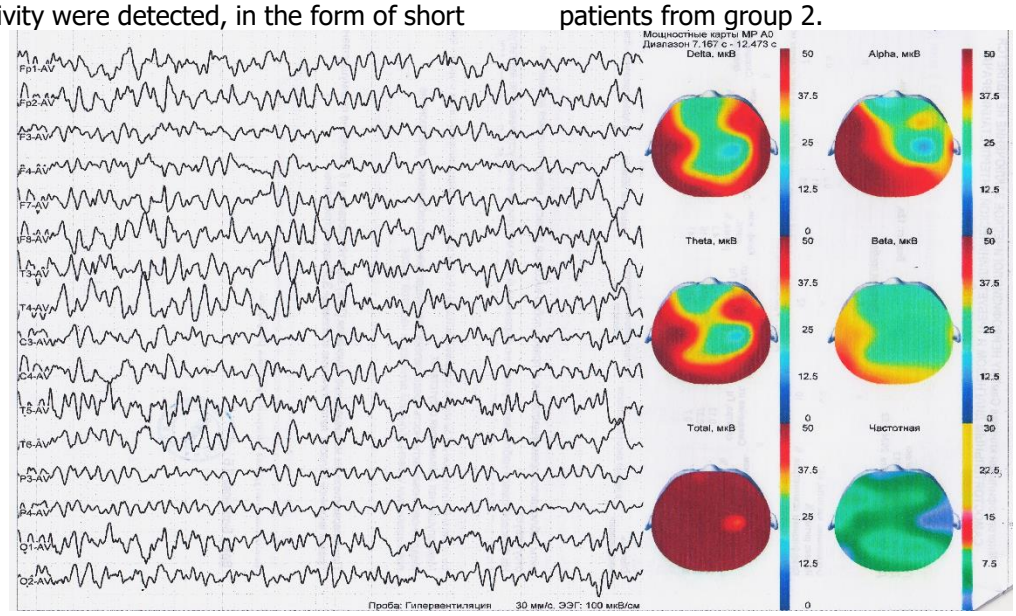


**Fig. 1.** Patient F., born in 2012, Pronounced diffuse EEG changes are recorded without signs of local pathology. Specific EEG phenomena have been noted in the form of successfully epileptiform

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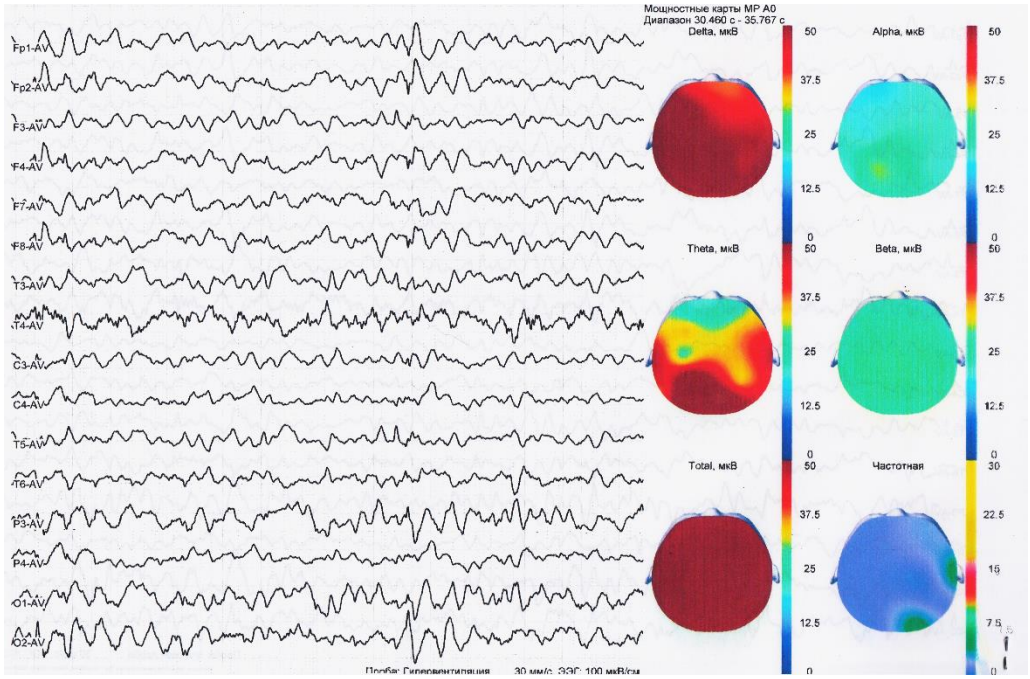


**Fig. 2.** Patient K., born in 2012, Pronounced diffuse EEG changes are recorded without signs of local pathology. Specific EEG phenomena in the form of conditionally epileptiform high amplitude hypersynchronous discharges are noted.

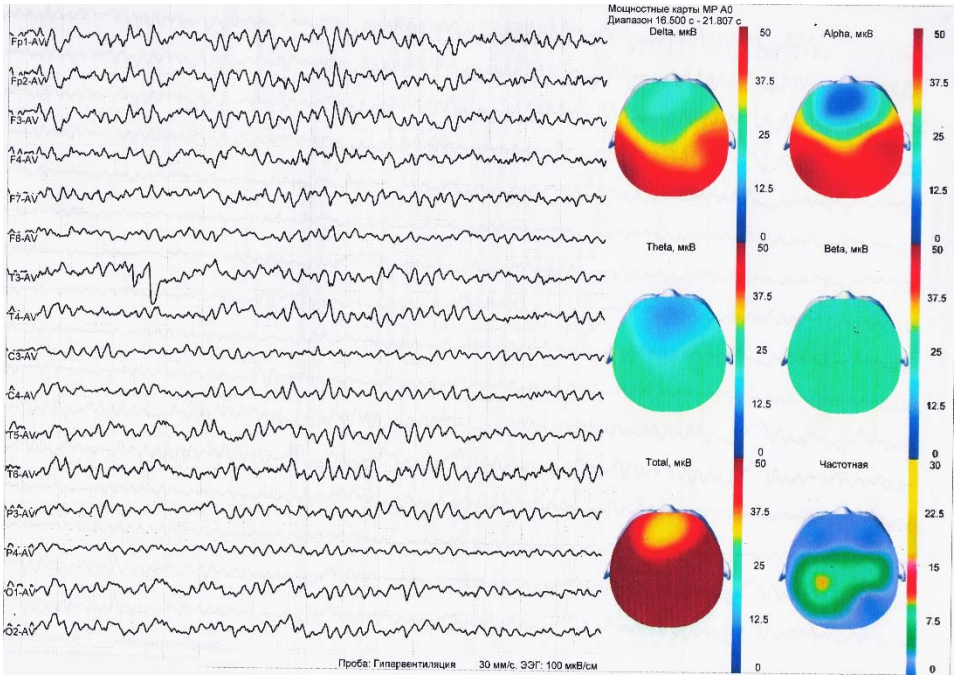


**Fig. 3.** Patient I., born in 2012, Moderate diffuse EEG changes are recorded without signs of local pathology. Specific EEG phenomena in the form of conditionally epileptiform medium amplitude synchronous discharges are noted.

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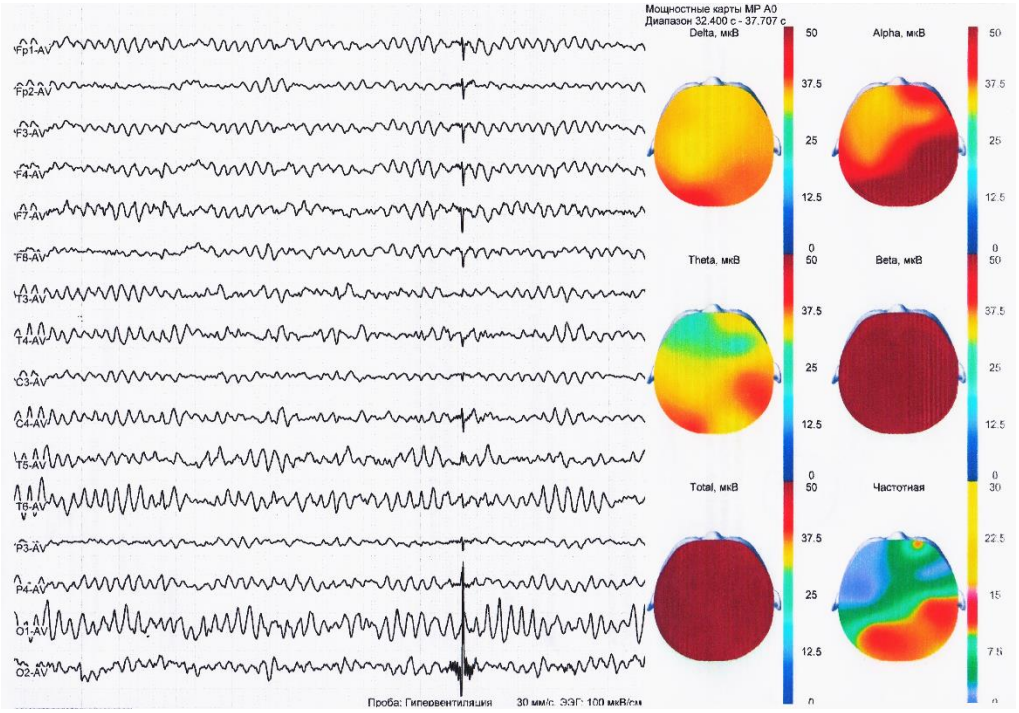


**Fig. 4.** Patient S., born in 2006, Moderate diffuse EEG changes are recorded without signs of local pathology. Specific EEG phenomena in the form of conditionally epileptiform high amplitude hypersynchronous discharges are noted.

MRI examination of the brain, it was necessary to exclude structural changes in the brain and to differentiate the diagnosis. According to neuroimaging data, there were no problems in the brain (meaning structural disorders), in almost 80% of cases (which is confirmed by sources of scientific publications), in addition, this fact is mainly related to idiopathic focal and cryptogenic epilepsies. In 20% of cases, the structure of structural lesions was found in cases of the disease that are poorly amenable to therapy, in other words, resistant patients, with a hint of progression of the process, for example, myoclonus epilepsy. A characteristic aspect, when studying neuroimaging in children, turned out to be an insufficiently informative method, judging from the point of view of statistical indicators, for example, in patients with an idiopathic form of generalized seizures, only 10% of cases showed moderate brain atrophy and 18% mild asymmetry of brain regions. Significant pathological signs of the disorder can be detected in patients of the older adolescent level, with the earliest onset of epileptic seizures, with a relatively high frequency and duration of the attack itself. The next step in the work was to analyze the results of electroencephalography in a comparative aspect of both age-related features and hemispheric differences. The result of the indicators of patients in separate groups (1 and 2) showed that the level of coincidence of bioelectric activity and convulsive activity on the EEG for short interhemispheric leads (in unchanged electrodes); in terms of the level inside the hemisphere (on both sides of the hemisphere) with an eye to the coverage of A- and T-rhythm indicators did not significantly differ in patients in the an EEG type group. At the same time, there is a clear difference in hemispheric originality between groups, where age differences and the nature of bioelectric activity of the brain are an important element, in the group (12-13 years old, and the group (17-18 years old). Thus, in patients of group 1, the level of the indicator in the A - and T - ranges was not realized to the level of adults, in group 2, the EEG data were within the normal range of the indicator of adults or slightly higher. Another feature of patients of childhood and adolescence is the detection, as a rule, and the separation of patients according to the localization of the focus of epiactivity, where foci of epiactivity are noted in almost 70% of cases. In most cases, this is the temporal part of the brain (34%), the frontal part (22%), the rest of the cases are in smaller percentages (these indicators are confirmed by literature data). As a result, it should be noted that the EEG diagnostic indicators revealed pathological changes in 69% of cases. Where, the results of a decrease in bioelectric activity are most often seen, in 19% of cases or high

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peak wave activity in 65% of observations. In addition, in childhood and adolescence, the fact that there are no pathological signs on the EEG in the intercalary period is important, in 54%. Thus, the analysis of the study result in comparative groups of children 12-13 years old and adolescents 17-18 years old (older children) with epilepsy, according to clinical neurological, neurophysiological and neuroimaging indicators, showed in terms of dynamics, an exceptional variety of seizures, which clearly reflects the difference in the nature of the manifestation of the attack with the age of patients, it should also be noted that in the difference from epilepsy in the adult population according to literature sources, in which symptomatic epilepsy prevails, children and adolescents mostly suffer from an idiopathic form of the disease. Epilepsy with onset in childhood manifests itself with a high polymorphism in types of seizures, these are simple and complex partial, absences, myoclonic, tonic, atonic, clonic and tonic-clonic seizures. For epilepsy, in the older adolescent group -17-18 years old, in comparison with the group of children 12-13 years old, there were no such types of seizures as atonic or tonic.

**CONCLUSIONS:** thus, it should be noted that this study confirmed the need to separate epilepsy depending on age, that is, despite the seemingly similar signs in terms of the level of development of children 12-13 years old and 17-18 years old, there is a significant difference in clinical neurological, neurophysiological and neuroimaging signs, in addition, do not forget about the possible the transition of types of epilepsy with age, sometimes even to a clinic that does not fit into a certain category, the so-called atypical forms or the difference in clinical symptoms with indicators of bioelectric activity.

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