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Problems Of Epilepsy And Cognitive Activity Of The Brain.

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ABSTRACT

Epilepsy is one of the most common neurological diseases. Its prevalence is at least 5-8 cases per 1000 in adults and 10 cases per 1000 in children. Especially dangerous is the possibility of developing a status epilepticus in patients, in which each subsequent attack occurs earlier than the patient leaves the previous one and he has expressed disturbances of consciousness, hemodynamics, breathing, homeostasis for more than 30 minutes. The main criterion for determining the severity of epileptic status is the frequency of seizures, which excludes complete restoration of consciousness and can lead to the development of coma. With the increase in the severity of the epileptic process, the cognitive function level indicators decrease reliably, and in the left hemisphere foci the level of decrease is greater than in the right hemisphere foci. The determination of the severity of cognitive impairment allows one to predict the degree of disruption in patient adaptation and to monitor the dynamics of antiepileptic treatment for cognitive functions. Improving the methods of conservative treatment of epilepsy patients allowed to achieve seizures in a significant number of patients, and in the conditions of inpatient and outpatient treatment, 33-40% of the patients can receive long-term control over seizures. Correct organization of treatment of patients under consideration when introducing European standards for antiepileptic drug therapy can provide a different degree of positive effect in 95% of the observed patients, of which unstable arrest of seizures in 50-60% and persistent control in 33-40%. With the proper conduct of treatment-diagnostic and rehabilitation measures, it is possible to achieve almost complete recovery from epilepsy with the subsequent removal of the diagnosis.

Keywords: brain, cognitive activity, epilepsy, thinking, anticonvulsants.

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INTRODUCTION

Epilepsy is one of the most common neurological diseases. Its prevalence is at least 5-8 cases per 1000 in adults and 10 cases per 1000 in children. The incidence rate is also observed in the elderly [1]. Especially dangerous is the possibility of developing an epileptic status in patients, in which each subsequent attack occurs earlier than the patient leaves the previous one, he has expressed disorders of consciousness, hemodynamics, breathing, homeostasis for more than 30 minutes. The main criterion for determining the severity of epileptic status is the frequency of seizures, which excludes complete restoration of consciousness and can lead to the development of coma [2].

The problem of functional asymmetry of the brain is in the sphere of attention of specialists of various profiles. The peculiarity of the clinical manifestations of epilepsy, their dependence on the topography of the lesion, the specificity of the electrolyte correlates of the epileptic discharge make this disease a convenient model for studying the functional role of the left and right hemispheres of the brain [3]. And if the functional asymmetry of the large hemispheres plays an important role in the activity of the human brain in the norm, then in the case of cerebral pathology it significantly affects the character of pathophysiological symptoms. Electroencephalography-examination is one of the main objective methods for evaluating the functional state of the brain and has a very important diagnostic value in epilepsy, as well as in evaluating the results of therapeutic treatment [4].

The purpose of this work was to summarize information about the functional state of the brain in the epileptic process.

Functional state of the cerebral hemispheres in epilepsy

The functional state of the brain was assessed according to the indicators of computer mapping of spatial synchronism of cortical biopotentials, reflecting the general activation, local changes in the state of cortical zones, and interhemispheric relationships [5]. The bioelectrical activity was removed unipolarly (with a reference electrode on the chin) from 48 cortical points with a network of silvered electrodes consisting of 8 arcs (each with 6 electrodes), evenly distributed from the frontal pole to the occipital. To enhance bioelectrical activity, the "Bioscope" system was used. The analysis period was 4 s at a sampling frequency of 128 Hz. To quantify the spatial synchrony of cortical biopotentials, the coefficients of crosscorrelation were used, which were calculated between the biopotentials of all possible pairs of the electroencephalogram.

For patients with epilepsy with generalized seizures, both global and local increases in spatial synchronicity of cortical biopotentials are associated with the progression of the disease. Zones of maximum increase in synchronism were localized mainly in the cortical regions of the left hemisphere [6].

The global increase in the spatial synchrony of cortical biopotentials is characteristic of all forms of epilepsy. In this case, there is a direct dependence of such an increase on the conditional scale "involvement in the epileptic process of the right - left hemisphere": as the epileptiform activity in the direction from the right hemisphere to the left hemisphere increases, activation processes in all cortical zones are intensified [7].

Thus, among the mechanisms of generalization of epileptic activity, a special role belongs to the increase in the functional activity of the cortical zones of the left hemisphere, which makes it possible to consider it leading in the genesis of generalized convulsive paroxysms in right-handed people, while the posterior frontal sections of the left hemisphere play a distinct role in the mechanisms of the spread of paroxysmal activity [8,9].

Damage to the brain as a result of an epileptic seizure

Damage to the brain with epilepsy has been described for a long time, however, for a long time the question of whether nerve cell death occurs as a result of epileptic activity remains, as the epileptic attack is accompanied by serious systemic complications: hyper- or hypotension, hypoglycemia, hypoxemia, acidosis.

Studies of the brain of patients who died as a result of an epileptic seizure revealed the death of neurons in the brain, gliosis in the neocortex, hippocampal fields CA1 and CA3, dentate furrow, amygdala,

thalamus, and death of Purkinje cells in the cerebellum, damage to the striatum, hypothalamus Meldrum et al. showed that as a result of an epileptic attack caused by bicuculine, paralyzed baboons with artificially ventilated lungs develop damage to neurons in the neocortex and hippocampus caused by the actual epileptic discharges. In the study of the brain of patients who died after an epileptic attack without systemic complications and who did not have a diagnosis of epilepsy and brain pathologies, lesions were detected in the hippocampus (fields CA1, CA2, CA3), dentate furrow, amygdala, pyriform and entorhinal cortex [10].

Thus, it was shown that the death of neurons can occur as a result of prolonged epileptic activity, regardless of systemic metabolic factors.

Basics of Epilepsy Treatment

Treatment of epilepsy is based on a number of principles:

- Treatment for epilepsy should be started after a re-attack.
- The principle of monotherapy.
- Antiepileptic drugs are prescribed strictly in accordance with the form of epilepsy and the nature of the seizures.
- Treatment of epilepsy should start with small doses of the drug and gradually increase the dosage until complete control of seizures. The therapy should be individual, continuous.
- In case of ineffectiveness of one drug, it should be gradually replaced by another antiepileptic drug effective for this form of epilepsy. If one antiepileptic drug is ineffective, you can not immediately add to it a second drug, that is, switch to polytherapy, without using all the reserves of monotherapy.
- Gradual withdrawal of drugs when control over seizures (2-4 years of absence of seizures).
- If necessary, the complexity of therapy (etiopathogenetic approach).
- Continuity of therapy.
- The desire to improve the quality of life of the patient [11].

Main activities before anticonvulsant therapy

- Evaluation and documentation of the patient's status before the start of therapy: physical examination, laboratory tests, electroencephalography (including sleep electroencephalography), neuroradiologic examination (if necessary), evaluation of cognitive functions.
- Discussion of therapy, prognosis and social consequences (school, sports, elimination of provoking factors, cost of treatment) with parents.
- Coordination with parents or relatives of the patient's therapy goals.
- Selection of an adequate anticonvulsant (taking into account the epileptic syndrome, type of attacks, possible side effects of the drug).
- Explain the potential risk to parents when using the chosen drug and situations where they need to see a doctor [12].

The main indications for the use of anticoenoicants

- Treatment of patients with a precisely established diagnosis of "epilepsy" (the presence of repeated non-provoked seizures, the exclusion of attacks of non-epileptic genesis).
- Treatment of patients with one paroxysm (the alleged diagnosis of "epilepsy") with the following features: the patient has a history of febrile convulsions; the presence of a family burden of epilepsy; impaired mental function; focal neurological symptoms; when detecting "epileptiform" EEG patterns.
- Treatment of patients with one or more provoked attacks due to an acute illness or condition (encephalitis, withdrawal syndrome, use of convulsants) - while the treatment of the underlying disease continues.
- Prophylactic treatment of patients with diseases or conditions with a high likelihood of seizures or epilepsy (craniocerebral trauma, neurosurgical intervention, stroke, encephalitis) - anticonvulsant therapy should be started only if epileptic paroxysms occur [13].

Thus, the treatment of epilepsy is a complex process. It should be selected individually.

The problem of sudden death in epilepsy

After a headache, epilepsy is one of the most common diseases of the nervous system. Population studies conducted in developed countries suggest that 40-70 people per 100,000 population annually are epilepsy for the first time. Rochester Epidemiology Project, one of the largest and most significant databases, found that the annual incidence of epilepsy is 52.3 per 100,000 people [14].

Patients with epilepsy naturally exhibit a higher death rate than in the general population. In a third of cases, the cause of death of epileptic patients is associated with an attack; Some deaths can be attributed to the circumstances underlying the disease and are the cause of epilepsy; In addition, death may occur during epileptic status or be sudden and unexplained. Also, in patients with epilepsy there is a high probability of death from an accident (for example, drowning during bathing). In addition, patients with epilepsy commit suicide more often than in the general population. In various studies that evaluated the comparative risk of death in epilepsy patients, results were obtained in which the overall risk ratio was in the range of 1.4 for the general population (patients with idiopathic epilepsy were studied) to 3.6 (patients, previously hospitalized for epilepsy) [15].

If we exclude from the calculation of the comparative risk of mortality the deaths resulting from more likely one of the causal conditions for the development of epilepsy underlying it than epilepsy itself (for example, brain tumors, craniocerebral trauma), studies nevertheless show that the comparative risk of death in of patients with epilepsy are several times higher (from 2.9 to 3.2) than in the population as a whole. With epileptic status, even with the timely initiation of intensive care, mortality rates reach 10% in young and 50% in elderly patients. The highest mortality is in patients younger than 20 years, as well as in patients during the first two years after diagnosis.

The study of the prevalence of sudden death in epilepsy presents difficulties due to the absence of unified criteria for diagnosing this condition, differences in the methods used and heterogeneity of populations. The table shows the frequency of occurrence of SUDEP according to the data of various authors. All studies were divided into groups:

- Cases of sudden death confirmed at autopsy.
- Cases of sudden death, identified through the protocols of tests of antiepileptic drugs.
- Cases of sudden death, identified during clinical trials of antiepileptic drugs.
- Cases of sudden death that occurred in clinics, hospitals and other medical centers specializing in the treatment of epilepsy [16,17].

In the study of cardiovascular reflexes in patients with active epilepsy Devinsky (Waxman-Geschwind syndrome - a characteristic syndrome of personality change observed in some patients with epilepsy, mental personality disorder) and co-authors showed an increase in heart rate variability with carbamazepine, which was confirmed and other researchers [18]. In addition, the abrupt withdrawal of antiepileptic drugs from the carbamazepine group and phenytoin increases the risk of sudden death in epilepsy by increasing the risk of developing paroxysmal cardiac arrhythmias. Kenneback and co-authors showed a decrease in heart rate variability and an increase in ectopic ventricular activity associated with a drop in serum carbamazepine levels. This was accompanied by a decrease in the threshold of convulsive readiness and an increase in the frequency of epileptic seizures [19].

Thus, violations of the heart rhythm due to dysfunction of the autonomic nervous system in patients with epilepsy can make a very significant contribution to the development of the case of sudden death in epilepsy. To assess the level of danger of each of them separately, the cause of future research.

CONCLUSION

When the severity of the epileptic process increases, the cognitive function level (in the complex study) decreases reliably, and in the left hemisphere-focus the level of decrease is greater than in the right

hemisphere foci. The determination of the severity of cognitive impairment allows one to predict the degree of disruption in patient adaptation and to monitor the dynamics of antiepileptic treatment for cognitive functions. The improvement of the methods of conservative treatment of epilepsy patients made it possible to achieve seizures in a significant number of patients (up to 70%), and, as studies in scientific centers have shown, under conditions of inpatient and outpatient treatment, 33-40% of patients can receive years of control over attacks. It is this category of patients who have to solve complex questions of practical recovery and cancellation of ongoing pharmacotherapy. Correct organization of treatment of the patients under consideration, especially in the administrative region, when implementing the standards of antiepileptic drug therapy in the work of the European standards, can provide a different degree of positive effect in 95% of the observed, of which unstable arrest of seizures in 50-60% and persistent control in 33-40%. With the proper conduct of treatment-diagnostic and rehabilitation measures, there is a real opportunity to practically recover from epilepsy with the subsequent removal of the diagnosis.

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