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MODERN APPROACHES TO LABORATORY DIAGNOSIS OF EPILEPSY: CURRENT METHODS AND THEIR SIGNIFICANCE

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Abstract

Epilepsy is a chronic neurological disease characterized by various subtypes and a variety of painful manifestations, which often complicate accurate diagnosis and effective treatment. Laboratory methods, such as molecular genetic testing, biochemical blood analysis, the study of biomarkers and new therapeutic targets, make it possible to clarify the diagnosis, differentiate subtypes of epilepsy and adaptive therapy for each patient.This article describes the latest laboratory methods and their clinical significance, including the occurrence of genetic mutations, monitoring of antiepileptic drugs and metabolic analysis, which gives a new look at the pathogenesis and prognosis of the course of epilepsy.

Keywords: epilepsy, laboratory diagnostics, genetic development, biomarkers, antiepileptic drugs, metabolomics, neuroinflammation, pathogenesis of epilepsy.

Introduction

Epilepsy is one of the most common chronic neurological diseases affecting more than 65 million people worldwide.Epilepsy can spread in any form and lead to lung attacks leading to convulsive states.Effective diagnosis requires not only an analysis of the clinical picture, but also the use of comprehensive laboratory tests that help to detail the features of the disease and determine its cause.

Diagnosis of epilepsy includes the use of neuroimaging (MRI, CT), electroencephalography (EEG) and other methods, but laboratory tests are becoming key tests in identifying

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pathophysiological and genetic factors of epilepsy. Methods such as genetic development and biomarkers allow for a deeper study of the causes and mechanisms of diseases, which is important for personalized medicine.

The main laboratory methods for the diagnosis of epilepsy

Genetic development

Genetic studies play a crucial role in identifying the causes of epilepsy, especially in hereditary forms that occur in childhood. To date, more than 500 genes associated with epilepsy are known. Genetic testing allows you to identify mutations in genes such as SCN1A, SCN2A, KCNQ2 and many others that are associated with various subtypes of diseases. Modern technologies such as next generation sequencing (NGS) and panel genes.

Of particular importance is the genetic development in pharmacoresistant forms of epilepsy, when standard antiepileptic drugs do not have an effect. The detection of genetic mutations makes it possible to predict the response to genetic drugs and to apply ineffective treatment.

Monitoring of antiepileptic drugs

Antiepileptic therapy requires regular monitoring of blood levels to achieve effective treatment. This process is known as therapeutic drug monitoring and plays a crucial role in preventing toxicity and controlling epileptic seizures. Side–effects include high-performance liquid chromatography and mass spectrometry, which allow accurate measurement of PEP levels such as carbamazepine, lamotrigine, valproic acid.The individual response to monitoring of antiepileptic drugs deteriorates greatly, and therefore a personalized approach to therapy based on Diptychs allows you to adjust the dosage for each patient, which is especially important for long-term therapy.

Biochemical and immunological markers

To date, neuron biomarkers such as interleukin-6 (IL-6) and other cytokines are being actively studied, which make it possible to assess the degree of neuroinflammation associated with epilepsy. Studies show that inflammatory processes play a crucial role in the pathogenesis of epilepsy, especially in cases where the disease is combined with traumatic or infectious brain lesions.To date, neuron biomarkers such as interleukin-6 (IL-6) and other cytokines are being actively studied, which make it possible to assess the degree of neuroinflammation associated with epilepsy. Studies show that inflammatory processes play a crucial role in the pathogenesis of epilepsy, especially in cases where the disease is combined with traumatic or infectious brain lesions.

Results

The results of laboratory studies open up new possibilities for the management of epilepsy. Genetic testing allows not only to identify subtypes of epilepsy, but also to improve the prognosis, carry out effective treatment and avoid side effects. In turn, therapeutic monitoring ensures constant monitoring of the level of antiepileptic drugs in the blood, which ensures more accurate control of seizures and prevention of exacerbations.

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Studies of biomarkers, such as inflammatory cytokines and proteins, allow us to assess the degree of brain damage and the frequency of disease-associated metabolic changes, which in the future may lead to mild diseases and the activity of epilepsy.

Conclusion:

Modern laboratory methods for diagnosing epilepsy provide valuable data for determining the disease and allow for a more accurate approach to it separately. Genetic testing, biochemical and metabolic analysis are becoming important components in the individual therapy of epilepsy, helping to improve the quality of life of patients and increase the effectiveness of treatment. The introduction of these methods into clinical practice makes it possible to provide an integrated and personalized approach that opens up prospects for further development of medical systems.

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