

DIAGNOSIS OF THE ORIGIN, SYMPTOMS, AND MODERN TREATMENT OF EPILEPSY

Tolmasov Ruzibek Tolmasovich

Tashkent State Medical University Senior Lecturer of the Department of Human Anatomy and OXTA,
ruzibektolmasov@gmail.com

Alijonov Abdulahad Akbarjon o'g'li

Tashkent State Medical University Treatment Case No. 2 Faculty student

Sobirjonov Hamidullo Nomonjon o'g'li

Tashkent State Medical University Treatment Case No. 2 Faculty student

Annotation: This article covers the causes, pathogenesis, clinical manifestations, diagnosis, and modern treatment methods of epilepsy. Epilepsy is a chronic neurological disorder characterized by excessive and synchronous electrical activity of brain neurons and recurrent seizures. The etiology of the disease is multifactorial, and genetic factors, perinatal trauma, traumatic brain injury, stroke, infections, and metabolic disorders can cause epileptic activity. Electroencephalography (EEG), magnetic resonance imaging (MRI), and modern neuroimaging technologies are important in the diagnosis of epilepsy. Treatment requires a comprehensive approach, and the main directions include antiepileptic drugs, surgical intervention, nerve stimulation, and a ketogenic diet. Modern therapy contributes to a significant improvement in the quality of life of patients with epilepsy.

Keywords: Epilepsy, seizure, neuronal activity, etiology, pathogenesis, diagnosis, electroencephalography (EEG), magnetic resonance imaging (MRI), anti-epileptic therapy, surgical treatment, ketogenic diet, nerve stimulation, modern treatment methods.

Introduction: Epilepsy is a chronic neurological disease of the central nervous system, manifested by recurrent seizures as a result of acute, uncontrolled, and synchronous electrical activity of brain neurons. According to the World Health Organization (WHO), more than 50 million people worldwide live with epilepsy, which is one of the most common neurological diseases. The disease can occur at any age, but is more common in children and the elderly. The origin of epilepsy is multifactorial, and the development of the disease can be caused by organic changes in the structure of the brain, genetic disorders, genetic predisposition, perinatal injuries, traumatic brain injuries, stroke, and neuroinfections. However, in 30-40% of cases, it is impossible to determine the exact etiology, and such cases are assessed as idiopathic epilepsy.

Epilepsy is accompanied not only by a seizure, but also by a change in psychoemotional state, a decrease in cognitive functions, and problems of social adaptation. Early diagnosis, modern treatment methods, and an individual approach to the patient play an important role in improving the quality of life of people living with epilepsy.

This article provides detailed information about the origin of epilepsy, clinical signs, diagnostic methods, and modern treatment approaches.

EPILEPSY

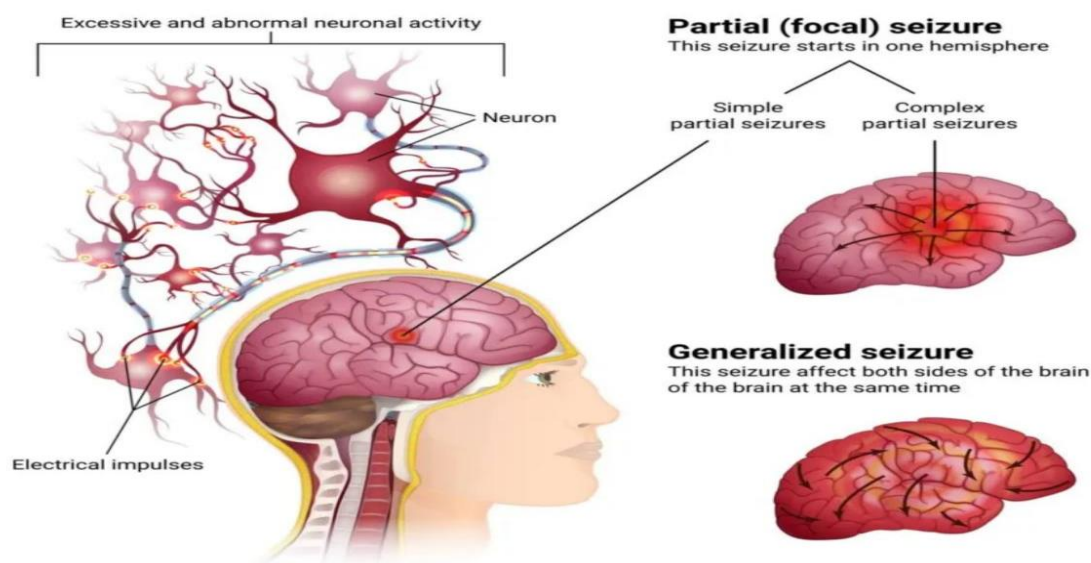


Figure 1: Pathophysiology and types of epilepsy: *abnormal electricity in neurons activity, mechanism of focal (simple and complex) and generalized seizures.*

Materials and methods: In the process of preparing this scientific article, modern scientific literature on epilepsy, international medical sources, textbooks, clinical studies, and scientific recommendations of recent years published by the World Health Organization (WHO) and the American Academy of Neurology (AAN) were thoroughly studied and analyzed. Existing scientific sources on the causes of epilepsy, clinical symptoms, diagnostic methods, and modern treatment approaches were compared, and their effectiveness was evaluated. The main goal of the study was to analyze the early diagnosis of epilepsy, determine its type, and analyze effective treatment approaches.

Modern diagnostic methods for diagnosing epilepsy have been widely studied:

Electroencephalography (EEG) is the most important diagnostic method for epilepsy. It helps determine the location and level of activity of the epileptic focus by recording the electrical activity of brain neurons. The complex of "spike" and "sharp wave" in EEG results is considered a characteristic sign of epilepsy.

2. Magnetic resonance imaging (MRI) is used to detect organic changes in brain structures (tumor, hemorrhage, hippocampal sclerosis, aneurysm). MRI plays an important role in determining the structural causes of epilepsy.

3. Computed tomography (CT) is especially useful in traumatic or bleeding-related epileptic syndromes. CT assesses changes in bone, blood, and soft tissues.

4. Laboratory tests - blood electrolyte balance (Na^+ , K^+ , Ca^{2+} , Mg^{2+}), glucose levels, and liver-kidney function indicators are checked to assess the likelihood of metabolic or toxic epilepsy.

5. Neuropsychological tests - allow studying the cognitive consequences of epilepsy by assessing the patient's memory, attention, speech, and emotional state. Clinical data on the effectiveness, dosage, and side effects of antiepileptic drugs (valproate, carbamazepine, levetiracetam, lamotrigine, etc.) were compared. Modern neurosurgical approaches, such as vagus nerve stimulation (VNS) and deep brain stimulation (DBS), used in severe cases of non-drug response, were also studied. As a database of the study, articles published on such international scientific platforms as PubMed, ScienceDirect, Scopus,

and Google Scholar, as well as national clinical protocols for the diagnosis and treatment of epilepsy (2022-2024), approved by the Ministry of Health of the Republic of Uzbekistan, were used. In general, a comprehensive approach was used in the study of epilepsy: based on clinical observation, laboratory analysis, instrumental diagnostics, and statistical analysis, the mechanisms of disease development, clinical manifestations, and the effectiveness of treatment were scientifically analyzed.

Results and Discussions: Epilepsy is a chronic disease of the central nervous system that presents with recurrent seizures (convulsive or non-convulsive) due to excessive electrical activity of brain neurons. Globally, the incidence of epilepsy is 50-70 new cases per 100,000 population per year. According to WHO data, more than 80% of epilepsy patients in developing countries do not have adequate diagnostic and treatment opportunities.

Etiology of epilepsy: The etiology of epilepsy is associated with various factors, which are divided into two main groups:

1. Primary (idiopathic) epilepsy is associated with a genetic predisposition or impaired function of ion channels, and no clear organic changes in brain structure are detected. This form often manifests during childhood or adolescence.
2. Secondary (symptomatic) epilepsy develops as a result of pathological processes in brain tissue. This includes:
 - traumatic brain injuries (traumas, contusions);
 - cerebrovascular disorders (stroke, hemorrhages);
 - infectious diseases (meningoencephalitis, encephalitis, toxoplasmosis);
 - brain tumor or metastases;
 - congenital defects of the central nervous system;
 - Metabolic and toxic factors (hypoglycemia, chronic alcoholism, heavy metal poisoning).

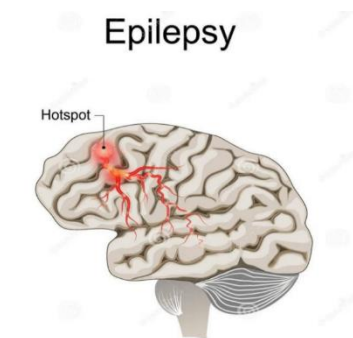


Figure 2: Epileptogenic zone: formation of a 'hotspot' in the cerebral cortex with the onset of seizures and propagation of pathological electrical impulses

Pathogenesis of epilepsy: Dysfunction of ion channels in the membrane of neurons, impaired synaptic transmission, and decreased activity of inhibitory neurotransmitters (mainly GABA) play an important role in the pathogenesis of the disease. At the same time, an increase in the amount of the excitatory mediator - glutamate - leads to the synchronization of interneuronal electrical signals. As a result, an "epilepsy focus" is formed in the brain - here electrical impulses appear with unnatural force and spread throughout the entire brain. This process manifests as a clinical seizure.

Clinical signs of epilepsy: The clinical manifestations of epilepsy depend on the form of the seizure. They are mainly divided into the following types:

1. Generalized seizures - simultaneous increase in electrical activity in both hemispheres of the brain. Symbols:

- sudden loss of consciousness;
 - hardening of the body (tonic phase) followed by rhythmic tremors (clonic phase);
 - bite the tongue, foam from the mouth, urinary incontinence;
 - Deep sleep after the attack (postictal state).
2. Focal (partial) seizures - epileptic activity is limited only to a certain area of the cerebral cortex. Symbols:
 - trembling on a part of the body (e.g., hands, feet, or face);
 - speech disorders, visual or auditory hallucinations;
 - States of preserved consciousness (simple seizure) or brief loss of consciousness (complex seizure).
 3. Absence seizures - common in children, the patient stops for several seconds, their eyes fix on one point, movements stop, then the condition returns.

Diagnosis of epilepsy: An integrated approach plays an important role in the diagnosis of epilepsy. Basic diagnostic methods include:

1. Electroencephalography (EEG) - determines the location of the epileptic focus, the frequency of seizures, and the degree of electrical activity.
2. Magnetic resonance imaging (MRI) is the most important method for detecting structural changes (tumor, hemorrhage, injury).
3. Computed tomography (CT) is useful in traumatic or bleeding-related epilepsy.
4. Laboratory tests - measurement of blood electrolytes, glucose, liver and kidney function indicators, determination of metabolic causes.
5. Neuropsychological tests - allow assessing the impact of epilepsy on memory, thinking, and speech.

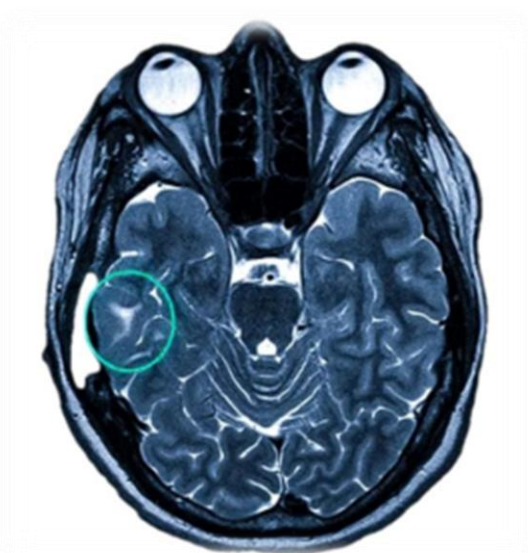


Figure 3: Brain T2 MRI image: Probable epileptogen in left temporal region hotspot is indicated.

Modern methods of epilepsy treatment: The main goal of epilepsy treatment is to control epileptic seizures, identify and reduce their frequency, and improve the patient's quality of life. Treatment is carried out in the following stages:

1. Etiological treatment
 - Eliminate the underlying cause if a brain tumor, hemorrhage, or infection is detected.
2. Antiepileptic pharmacotherapy
 - Main drugs: valproic acid, carbamazepine, levetiracetam, lamotrigine, topiramate, clobazam
 - The choice of medication is determined individually depending on the type of epilepsy, the patient's age, sex, and other diseases.
 - Medications are taken regularly and for a long time (at least 2-3 years).
3. In drug-resistant epilepsy, additional therapeutic strategies are required.
 - Vagus nerve stimulation (VNS) - neuronal activity is regulated by an electromagnetic device implanted into the left vagus nerve.
 - Deep brain stimulation (DBS) - placement of electrodes in the thalamus or other centers to control pathological impulses.
 - Surgical removal of the epileptic focus is used in cases of deep localization and non-response to the drug.
4. Additional therapies
 - A ketogenic diet (high fat, low-carbohydrate diet) is effective in reducing seizures in childhood epilepsy.
 - Psychotherapy and rehabilitation play an important role in social adaptation, reducing stress, and restoring cognitive functions.

Prognosis and complications: The course and prognosis of epilepsy depend on the form of the disease, the patient's age, and response to treatment. In 70-75% of cases, complete control can be achieved with the help of antiepileptic drugs. In 20-25% of patients who do not respond to medications, surgical or neurostimulation methods are used.

Complications of epilepsy include:

- decreased memory and attention;
- mental changes (depression, anxiety);
- injuries (fall, bite of the tongue, bone fracture);
- Epileptic status (prolonged seizures) - a life-threatening condition.

Conclusion: Epilepsy is one of the oldest known neurological diseases among humanity and remains relevant in medicine today. It is a chronic disease of the central nervous system characterized by recurrent seizures resulting from excessive electrical activity of brain neurons.

Studies show that hereditary factors, organic changes in brain structure, infections, trauma, and metabolic disorders play an important role in the occurrence of epilepsy. In the pathogenesis of the disease, the pathological excitability of neurons increases as a result of a disruption of the balance between the GABA and glutamate systems.

The combination of electroencephalography (EEG), magnetic resonance imaging (MRI), and laboratory tests in the detection of epilepsy forms the main basis of diagnostics. These methods are important in determining the epileptic focus, differentiating the form of the disease, and choosing an effective treatment strategy. Modern treatment approaches, in particular, anti-epileptic drugs (valproate, carbamazepine, levetiracetam, lamotrigine, etc.), neurostimulation (vagus nerve

stimulation, deep brain stimulation), and surgical methods allow for a significant reduction in the frequency of seizures in many patients. Also, ketogenic diet and psychotherapeutic support play an important role in the comprehensive rehabilitation of epilepsy.

At the same time, in the treatment of epilepsy, regular medication intake, stress reduction, adherence to sleep hygiene, refusal of alcoholic beverages (alcohol) and drugs, and a healthy lifestyle contribute to the control of the disease.

Epilepsy is a disease that cannot always be completely cured, but the quality of life of patients can be significantly improved through systematic diagnostics, early diagnosis, an individual approach, and modern therapy.

References:

1. Fisher R.S., Cross J.H., French J.A. et al. "Operational classification of seizure types by the International League Against Epilepsy (ILAE)." *Epilepsia*, 2017; 58(4): 522–530.
2. Löscher W., Klitgaard H., Twyman R.E., Schmidt D. "New avenues for anti-epileptic drug discovery and development." *Nature Reviews Drug Discovery*, 2020; 19(10): 1–25.
3. Krumholz A., Wiebe S., Gronseth G. et al. "Practice guideline: Evaluating an apparent unprovoked first seizure in adults." *Neurology*, 2015; 84(16): 1705–1713.
4. Tolmasov R. T. et al. Pancreas Disease-Modern Diabetes Treatment Methods and Anatomy //American Journal of Pediatric Medicine and Health Sciences. – 2025. – T. 3. – №. 4. – C. 132-137.
5. Tolmasov R. T., Shukurov U. M. Modern Treatment Methods of Kidney Structure and Chronic Pyelonephritis //American Journal of Pediatric Medicine and Health Sciences. – 2025. – T. 3. – №. 4. – C. 264-271.
6. Tolmasov R. T. et al. Early Detection and Modern Treatment Methods of Congenital Heart Defect //American Journal of Biomedicine and Pharmacy. – 2025. – T. 2. – №. 5. – C. 46-54.
7. Tolmasovich T. R., Faliddinovich F. S., Jasurbekovich E. P. TREATMENT METHODS AND ANATOMY OF ISCHEMIC HEART DISEASE IN MODERN MEDICINE //AMERICAN JOURNAL OF APPLIED MEDICAL SCIENCE. – 2025. – T. 3. – №. 1. – C. 324-331.
8. Tolmasov R. LABORATORY METHODS FOR THE DIAGNOSIS OF UPPER AND LOWER RESPIRATORY TRACT INFECTIONS IN CHILDREN //International journal of medical sciences. – 2025. – T. 1. – №. 2. – C. 89-93.
9. Tolmasov R. T., Khudoynazarova S. S. OSTEOCHONDROSIS AND ITS TREATMENT METHODS IN MODERN MEDICINE //European Journal of Modern Medicine and Practice. – 2025. – T. 5. – №. 3. – C. 225-231.
10. Glauser T., Ben-Menachem E., Bourgeois B., et al. "Updated ILAE evidence review of antiepileptic drug efficacy and effectiveness." *Epilepsia*, 2020; 61(1): 1–44.
11. Tolmasovich T. R., Faliddinovich F. S., Jasurbekovich E. P. TREATMENT METHODS AND ANATOMY OF ISCHEMIC HEART DISEASE IN MODERN MEDICINE //AMERICAN JOURNAL OF APPLIED MEDICAL SCIENCE. – 2025. – T. 3. – №. 1. – C. 324-331.
12. Tolmasov R. LABORATORY METHODS FOR THE DIAGNOSIS OF UPPER AND LOWER RESPIRATORY TRACT INFECTIONS IN CHILDREN //International journal of medical sciences. – 2025. – T. 1. – №. 2. – C. 89-93.
13. Tolmasov R. T., Khudoynazarova S. S. OSTEOCHONDROSIS AND ITS TREATMENT METHODS IN MODERN MEDICINE //European Journal of Modern Medicine and Practice. – 2025. – T. 5. – №. 3. – C. 225-231.

14. Tolmasovich T. R., Toxir o'g'li E. S., Maratovich M. O. TREATMENT METHODS AND ANATOMY OF UMBILICAL HERNIA IN MODERN MEDICINE //AMERICAN JOURNAL OF APPLIED MEDICAL SCIENCE. – 2025. – T. 3. – №. 1. – C. 198-205.
15. Kwan P., Arzimanoglou A., Berg A.T. et al. "Definition of drug resistant epilepsy: Consensus proposal by the ILAE." *Epilepsia*, 2010; 51(6): 1069–1077.
16. Tolmasovich T. R., Toxir o'g'li E. S., Maratovich M. O. TREATMENT METHODS AND ANATOMY OF UMBILICAL HERNIA IN MODERN MEDICINE //AMERICAN JOURNAL OF APPLIED MEDICAL SCIENCE. – 2025. – T. 3. – №. 1. – C. 198-205.
17. French J.A., Brodie M.J., Caraballo R. et al. "Keeping the balance: update on the use of antiepileptic drugs." *Lancet Neurology*, 2021; 20(8): 685–700.