

# The Role of Chemical Factors in the Occurrence of the Nervous System Disorders

## Posttraumatic epilepsy

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*Because an epilepsy occurring at a time interval after a crano-cerebral trauma can be considered post-traumatic epilepsy, so in a causal relationship with the trauma, it must meet some conditions. Epilepsy is a chronic cerebral disorder manifested by recurrent, spontaneous epileptic seizures; with a sudden episode, a stereotype of motor, sensitive, sensory, behavioural manifestation, and / or alteration of the state of consciousness due to sudden, unprovoked activation of a neuronal population. To support the diagnosis of the first epileptic seizure, additional information is required from the anamnesis, the general and neurological clinical examination of the patient. The diagnostic approach continues, under the direct supervision of the neurologist, by identifying the aetiology of epilepsy. The study includes 27 epilepsy cases studied in 2014-2018. The most common type of epileptic seizure is the tonic-clonic one that affects the entire brain, and this is also the most visible form of epilepsy that manifests itself in the form of a generalized crisis, identified by involuntary convulsions that lead to partial or total loss of consciousness during the crisis. Epilepsy is caused by an explosion of intense electrical activity that suddenly occurs in the brain, and the resulting convulsions can occur in several forms depending on the area where this intense brain activity occurs.*

*Keywords: epilepsy, trauma, neurological disorders, epileptic seizures, psychiatric problems.*

Epilepsy comes from ancient Greek, which means *crisis*, *convulsion or attack*, popularly called *black disease*, a group of long-lasting neurological disorders characterized by one or more epileptic seizures.

Crises have a tendency to repeat, with no underlying cause, while crises arising due to a particular cause are not necessarily considered epilepsy. Epileptic seizures are the result of an excessive or abnormal activity of nerve cells in the cortex at the brain level; diagnosis involves removing other conditions that may cause similar symptoms (such as syncope) and identifying other immediate causes. The most common types of seizures are convulsive; the rest of the crises are of an unconvulsive nature.

Epileptic seizures are periodic disorders of the electrical activity of the brain, leading to temporary cerebral dysfunction. When the nerve impulses are abnormally low, a crisis may occur [1-4].

There are six major types of generalized seizures: *tonic-clonic*, *tonic seizures*, *clonic*, *myoclonic*, *epileptic absence* and *atonic seizures*. All of these involve the loss of consciousness and generally occur without any warning. The tonic-clonic convulsions manifest with a limb contraction, followed by their stretching and an arched back, with duration of 10-30 seconds (the tonic stage). During the contraction of the chest muscles, a scream can be heard. This is often followed by a trembling of the limbs in unison (the clonic phase). Tonic convulsions produce constant contractions of the muscles [5-11].

Strong stimuli that irritate the brain, such as lesions, certain medications, sleep deprivation, infections, fever,

lower blood oxygen levels, or lower blood glucose levels - can trigger a seizure regardless of whether or not a person is suffering from a convulsive disorder or not [12-14].

Myotonic seizures involve muscle spasms, either in restricted regions or at the level of the entire body. Epileptic absences may be subtle, with a slight head turning or blinking of the eyes. The person does not fall back and returns to a normal state immediately after the end of the crisis [15-18].

A number of people with epilepsy suffer from seizures that are often triggered by certain events, known as reflex epileptic seizures. Individuals with reflex epilepsy suffer from seizures that are only triggered by certain stimuli.

Epilepsy can have various effects on social and psychological well-being. These effects include social isolation, stigmatization or disability, they can lead to poor school results and poor workplace outcomes. Learning difficulties are common in people with this condition, especially among children with epilepsy. The stigma of epilepsy can also affect the families of the patients [19-26]. People with epilepsy may experience certain disorders, depending partially on the current epileptic syndrome, including depression, anxiety, and migraines.

The underlying cause of epilepsy may be of a genetic nature or due to metabolic or structural problems, but some of the cases are unknown. Genetic, congenital and developmental problems are the most common among young people, while brain tumours and strokes are more likely to occur in the elderly [27-30]. Genetics is a factor involved in most cases, either directly or indirectly. Some cases of epilepsy are due to a defect of a single gene; the

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majority of cases are due to the interaction between multiple genes and environmental factors .

In case of identical twins, if one of them is affected, the odds are of 60% so the other one is affected; in the case of non-identified twins, the risk is 15%. These risks are higher in people with generalized rather than focal seizures. If both twins are affected, most of them have the same epileptic syndrome (80-90% of cases). The close relatives of a person suffering from epilepsy are at a five times higher risk than the general population [31-34].

Down syndrome is the most common genetic cause of mild and moderate mental retardation caused by the presence of an additional chromosome 21. Chromosomes are microscopic chromatic structures present in almost every constituent cell of the human body tissues. They bear the plan of all the features we inherit. This plan is carried in the form of a coded message present in deoxyribonucleic acid (DNA). In case of man, there are 23 pairs of chromosomes in each cell, of which 22 pairs of autosomes and one pair of heterosomes. A set of 23 chromosomes is inherited from the father and the other set is received from the mother.

Epilepsy may occur as a result of a number of other diseases, such as: tumours, strokes, cranial trauma, previous central nervous system infections, genetic abnormalities, as well as brain injuries occurring around birth [35-40].

*Posttraumatic epilepsy* in a causal relationship directly with trauma meets several conditions, of which the most important are: there was no form of epilepsy prior to trauma; there is no other epileptogenic brain lesion (tumour, angioma, tuberculoma, parasitic cyst, etc.); the incriminated trauma was intense enough for the lesional brain effect to be epileptogenic.

The impact-epilepsy interval may be very short, of a few minutes, or very long, of a few years, but basically the first epileptic seizure can occur in any post-traumatic moment.

The impact-epilepsy interval, with a particular prognostic and therapeutic significance, can be considered as a criterion for the classification of post-traumatic epilepsies, such a classification would be post-traumatic epilepsy: immediate, occurring within minutes after impact; recent occurrence at some hours, days or weeks after impact; late, occurring at least three months after impact [41-45].

Clinically there may be almost all kinds of seizure.

The incidence of post-traumatic epilepsy cannot be globally assessed because it has a high variability depending on several factors. After closed cranio-cerebral trauma the incidence is 1-5%, whereas after incidence of open cranio-cerebral trauma the incidence increases up to 30% and if there was a cranio-cerebral plaque, the incidence is over 45%.

Age is of great importance. In children under the age of 5, recent post-traumatic epilepsy is more common than in other age groups, and late-onset epilepsy starts after a longer interval in children under 16 years of age. After the age of 30, post-traumatic epilepsy is rare, and after 50 years of age, exceptional.

Other factors, including pre-existing non-traumatic brain disorders (arteriosclerosis, meningoencephalitis), influence posttraumatic epilepsy. Immediate epilepsy has good prognosis, generally after a few months it yields. Early epilepsy is symptomatic, it is due to a posttraumatic complication (hematoma, abscess, sequalae), heals after suppressing the cause. Tardive epilepsy is rarely due to a complication (abscess), but rather due to a

meningocerebral scar or a diffuse sclerosis of the brain. In the case of diffuse sclerosis of the brain, epileptic seizures usually become more common and neuropsychotic symptoms occur. Prognosis is reserved and treatment is conservative. In the case of a meningo-cerebral scar, epilepsy often takes a surgical aspect [46-52].

The epileptic crisis has a very short duration and usually ends before a treatment is introduced, in which case the precautionary measures for the recurrence of the crisis are mandatory.

In case of generalized crises (tonic, clonic, tonic-clonic) that are assisted by a sanitary framework it is obligatory to establish the following measures: ensuring the freedom of the airways; preventing the occurrence of secondary trauma to the crisis. These measures can also be provided by the patient's family members after prior training

The prophylaxis of the recurrence of the crisis is achieved by: administering a fast-acting antiepileptic: diazepam, IV, diluted in 10 ml physiological serum or glucose: 0.15-0.25 mg / kg; by rectal route: 0.2mg / kgc. Venous administration may be repeated after min. 20 minutes, and rectal one after min. 4 hours [53, 54].

Combating precipitating factors: fever, hypoglycaemia etc.

The epileptic state is a severe complication in the evolution of known epilepsy, or it may even represent the onset of epilepsy or of acute epileptic seizures.

Based on the clinically-convulsive (tonic-clonic, clonic, tonic, myoclonic or partial motor) or non-convulsive (absent, focal) appearance - and patient age one may determine most likely the cause in the absence of a rapid diagnosis of certainty: insufficient or suddenly interrupted treatment, infectious, vascular, hypoxic, metabolic, toxic (alcohol) comorbidities,

The condition of generalized convulsive epileptic state is a neurological emergency due to the morbidity and mortality it causes.

To reduce the risk of seizures repetition, the administration of anticonvulsants may be needed. These medicines are not usually prescribed for people who had only one generalized crisis the cause of which has not been identified. However, treatment is needed in patients who have experienced more than one crisis (55).

Anticonvulsants can completely prevent convulsive seizures in over half of people receiving this treatment and significantly reduce the frequency of seizures in another third of patients. The efficacy of these drugs is slightly lower in patients with absence seizures.

There is no medicine the management of which can control all types of seizures. In most people, seizures can be controlled by taking a single medicine.

Anticonvulsants, although very effective, may have side effects. Many of them cause drowsiness, and sometimes - paradoxically - cause hyperactivity in children.

There are a number of epileptic syndromes, which are generally classified by age and onset of the disease: neonatal period, childhood, maturity, and cases with no correlation with age. There are also groups with specific constellations of symptoms, those due to specific metabolic or structural causes, or those due to an unknown cause. The ability to classify a cause of epilepsy in a specific syndrome is more common in children. Some of these types include: *benign rolandic epilepsy* (2.8 per 100,000), *child absence epilepsy* (0.8 per 100,000) and *juvenile myoclonic epilepsy* (0.7 per 100,000). *Fever convulsions* and *benign neonatal convulsions* are not epilepsy forms (56).

## Experimental part

### Material and Method

The study includes 27 cases with post-traumatic epilepsy and psychiatric problems studied in the 2014-2018 period.

### Chemical factors

Chemical factors are of great importance in the emergence of nervous system disorders. Among these we can mention the actions of certain toxic substances (benzene, aniline, lead, arsenic, carbon oxide and others). Narcotics (chloroform, ether, morphine, alcohol etc.) have selective action on the central nervous system.

Nervous system trauma causes the development of endogenous pathological conditions. During vascular sclerosis, a decrease or a strong contusion can cause cerebral haemorrhage. Such role has the traumatism which occurs in the course of epilepsy.

Generally, nervous system reactions to toxic action usually manifest through disorders of internal inhibition processes. Initially, there is an increase in the cortical excitability, and during the state of intoxication, phenomena of diffuse cortical inhibition are observed, which has a supraliminal protection inhibitory nature.

The normal correlations between cortical and subcortical activity are altered.

### Results and discussions

When in children with crises beginning before the age of 2 years are usually caused by high fever or metabolic diseases such as abnormal blood glucose, calcium, magnesium, and vitamin B6 or sodium levels.

If seizures are recurrent, these are probably caused by a hereditary brain disease (as is the case with nocturnal frontal lobe epilepsy, which has an autosomal dominant transmission). Crises that begin after the age of 25 years old may be caused by structural brain injuries, such as those caused by cranial trauma, stroke or tumour.

People with epileptic disease have an increased risk of having a crisis when they are under intense physical or emotional stress, or when they do not get enough sleep. Strong stimuli that irritate the brain - such as injuries, certain medications, sleep deprivation, infections, fever, lowering blood oxygen levels, or lowering blood glucose levels - can trigger a seizure regardless of whether or not the person suffers from a convulsive disease or not. These seizures are known as *cases seizures*. Avoiding these stimuli can help prevent seizures.

Symptoms vary depending on the area affected by abnormal electrical discharge; depending on the magnitude of the seizure: partial (affecting only a cerebral area) or generalized (affects large areas of the brain located at the level of both cerebral hemispheres).

Partial seizures can be simple (the person is fully aware and perceives the environment) or complex (the state of consciousness is altered, but consciousness is not completely lost). Partial crises may be simple partial seizures, complex partial seizures, and partial continuous epilepsy. Generalized crises cause loss of consciousness and abnormal movements, which usually begin immediately. Loss of consciousness may be short or prolonged. Generalized seizures can be tonic-clonic seizures, primary generalized epilepsy, absence seizures, atone seizures, myoclonic seizures, and epileptic status.

To reduce the risk of seizures repeating, anticonvulsants may be needed. These drugs are not usually prescribed for people who have had only one generalized seizure the cause of which has not been identified.

Convulsions specific to epilepsy in children are characterized by body stiffness, repetitive movements, unusual sensations such as a strange taste or smell / unusual sensation in the stomach. It can take few seconds to a few minutes. The child may sometimes be conscious or, on the contrary, lose consciousness and will not remember anything during the seizure later. For some children, the seizures are carried out according to a pattern and follow at a certain amount of time (called the epileptic syndrome); they are likely to disappear by itself after the child celebrates a certain age (benign) or, on the contrary, aggravate and interfere with the development of the child, while associated disabilities may also arise. Symptoms are different depending on the child's age and other pre-existing conditions [57].

The causes that give rise to epilepsy in children are: trauma to the brain (like a serious blow to the head), problems at birth (lack of oxygen to the brain or birth defects), metabolic diseases (chemical imbalances of the brain) brain tumours, blood vessel malformations, stroke, or an infection that affects the brain (meningitis or encephalitis). Epilepsy having a known structural cause is designated as symptomatic epilepsy. Also, in some cases epilepsy has a genetic cause, namely, it is inherited from a parent or a change at the genetic level may occur (chromosomal disorders). Epilepsy with a hereditary probable cause is called idiopathic epilepsy [58- 60].

The most common reasons for seizures and epilepsy in children are:

premature delivery presents the risk of bleeding within the brain, which may cause seizure attacks and intracranial haemorrhage; children who at the time of their birth suffer from lack of oxygen in the brain are at risk of prenatal hypoxia; this can cause brain damage and may lead to epilepsy, low levels of glucose, sodium or calcium in the blood can cause epilepsy, infections such as encephalitis and meningitis are causes of seizures and epilepsy; children born with abnormal or poorly functioning brain have a high chance of epilepsy; epilepsy is often inherited from parents.

Although children of all ages may tend to zone out, this may be a symptom of epilepsy in an easier form [61-64].

Absence crises last about 10 s, ending abruptly and consist of moments when the child may be unconscious and unresponsive. In many cases, the child can resume normal activity immediately after the crisis is over, but because it is not aware that it has occurred, diagnosis can be difficult. Absence crises can occur with a variable frequency from one person to another, between 1 and 100 times a day. Undiagnosed, these may affect school performance and may trigger tonic-clonic seizures later in life.

Anticonvulsants can completely prevent convulsive seizures in over half of people receiving this treatment and significantly reduce the frequency of seizures in another third of patients. The efficacy of these medicines is slightly lower in patients with absence seizures. Half of the patients responding to anticonvulsants may eventually discontinue treatment without other seizures. But in 10-20% of people with epileptic disease the administration of anticonvulsants does not help prevent seizures.

Anticonvulsants, although very effective, may have side effects. Many of them cause drowsiness, and sometimes - paradoxically - hyperactivity in children. Periodic blood tests are performed to determine whether the anticonvulsant affects kidneys, liver or blood cells [65,66].

Any anticonvulsant medication has side effects: decreased memory capacity, difficulty in concentrating, or lethargy. It is important to find the dose that prevents the

onset of the seizure and causes the smallest side effects, a situation which can be determined after a few weeks of treatment. Regular tests are required to determine the concentration of the medicine in the blood.

Neurological manifestations primarily involve the precipitation of convulsive seizures in epileptic people, by increasing the excitability of adrenergic receptors. Administration of corticosteroids in epileptic patients requires the increase of anticonvulsant medication doses and clinical surveillance and ECG [67- 69].

Seizures are preceded by a premonitory sensation, such as noises, followed by loss of consciousness. Most anticonvulsants affect the degradation of other substances by the liver, influencing the action of other medicines.

Lately, a new form of epilepsy has emerged - the *Dravet syndrome*; this rare and incurable epilepsy manifests by seizures difficult to control even with a cocktail of multiple anti-epileptic medicines. Various other related events add to the seizures: developmental disorders, language acquirement delays, walking instability, and in some cases autism.

## Conclusions

Epilepsy is a neurological disorder (it affects the brain and the nervous system) during which a person has a tendency for seizures with onset in the brain; this organ consists of millions of nerve cells that use electrical signals to control functions, senses and thoughts, and if the signals are interrupted, the epileptic seizure or convulsion occurs.

Epilepsy located in temporal lobes affects cognitive functions, including feelings, emotions, thoughts, and experiences of each individual.

Epileptic patients with behavioural disorders associate abundant paroxysmal activity and low sleep efficacy.

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