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Clinical, Therapeutic and Caring Aspects of Epilepsy at the Developmental Age

Kliniczne, terapeutyczne i opiekuńcze aspekty padaczki w wieku rozwojowym

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Abstract

Epilepsy is a neurological disorder characterized by the occurrence of seizures of distinct nature. At the developmental age it occurs in 0.5% of people. Diagnostic and therapeutic process is complex. In the treatment, pharmacological, surgical, and dietetic methods are used. In the handling of a child affected by epilepsy, we should take into account the impact of the disease on the quality of patient's life and on that of their families'.
The aim of the work is to present the current clinical knowledge on the subject of epilepsy at the age of development and the problems, which the children and their parents must face. **(JNNN 2016;5(1):31–35)**
Key Words: epilepsy, children, diagnostic, treatment

Streszczenie

Padaczka jest schorzeniem neurologicznym charakteryzującym się występowaniem napadów padaczkowych o różnym charakterze. W wieku rozwojowym występuje u 0,5% osób. Proces diagnostyczny i terapeutyczny jest złożony. W leczeniu wykorzystuje się metody farmakologiczne, chirurgiczne, dietetyczne. W postępowaniu z dzieckiem chorym na padaczkę należy uwzględnić wpływ choroby na jakość życia pacjenta i jego rodziny.
Celem pracy jest przedstawienie aktualnej klinicznej wiedzy na temat padaczki w wieku rozwojowym oraz problemów z jakim muszą zmierzyć się dzieci oraz ich rodzice. **(PNN 2016;5(1):31–35)**
Słowa kluczowe: padaczka, dzieci, diagnostyka, leczenie

Introduction

Epilepsy is a disease which has accompanied the human for centuries. The perception of the disease has changed over the years. The introduction of the new definition of epilepsy and its classification allows for the appropriate implementation of treatment. New diagnostic and therapeutic methods which were adopted in the past decade will affect the perception of the disease both by society and by the patient. A major problem is the drug-resistance phenomenon and side effects of anti-epileptic drugs. In the care of the sick child with epilepsy, we should take into account the problems of everyday life, such as schoolwork, society education, patient's society stigma.

The aim of the work is to present the current clinical knowledge on the subject of epilepsy at the age of development and the problems, which the children and their parents must face.

Overview

Epilepsy is a disease known for centuries. The disease is first mentioned in Persian documents and Egyptian

Papyrus. Code of Hammurabi is dated to the early 18th century B.C and contains the record of a patient suffering from epilepsy. In ancient Mesopotamia, a document from the year 1050 B.C was found, which described convulsions. It mentioned the person in whom there had been tension in the hands and feet, wrest neck, wide open eyes and sialorrhea, and then loss of consciousness. Events about Jesus Christ healing of the affected for epilepsy can be read in the New Testament. This disease is described in the Jewish Talmud and in the works of the Roman thinkers [1].

For many centuries seizures were treated as a manifestation of demon possession. In dealing with the affected, spells and witchcrafts were applied. Only the Greek physician Hippocrates in 400 B.C in his work "*On the Sacred Disease*" described epilepsy as a brain affliction requiring treatment and diet. He mentioned, also a *craniotomy* as an alternative form of treatment [2].

During the Middle Ages people came back to the theory of declaring that the reason for the emergence of seizures was the Satan's action. It was only in the 19th century that research of neurophysiology allowed in 1850 for the recognition of epilepsy as a neurological disease. The introduction of electroencephalogram test (EEG) by Berger in 1928 became a breakthrough in the diagnosis of the disease [3].

Epilepsy is one of the most common chronic diseases of the nervous system. Among children and the young the prevalence of the disease is similar to that in adult population and it amounts to 0.5%. In the countries of Latin America and Africa from 1 to 1.5 % of children suffer from it. Parasitic infections prevalent in these areas may be a cause of epilepsy. In about 3% of children suffering from epilepsy, epilepsy seizures (SE) appear. The incidence rate of epilepsy depends on age. The highest, is during the neonatal period. A typical symptom for the infantile period is also the presence of the most severe epileptic syndromes. The reason is the imposition of various etiological factors. This includes adolescence and maturity of CNS (*central nervous system* — also known as OUN) dysfunctions, intrauterine and perinatal CNS damage, genetic disorders [4,5].

The International League Against Epilepsy (ILAE) introduced the new definition of epilepsy in 2014. The disease can be divided into the following cases [6]:

1. *At least two unprovoked (or reflex) seizures occurring more than 24 hours apart*;
2. *One unprovoked (or reflex) seizure and a probability of further seizures similar to the general recurrence risk (at least 60%) after two unprovoked seizures, occurring over the next 10 years*;
3. *Diagnosis of an epilepsy syndrome*.

Epileptic seizure is caused by the unloading of groups of neurons of the cerebral cortex. It is an unpredictable and uncontrolled phenomenon. Transitional brain dysfunction is caused by excessive and sudden bioelectric unloading in nerve cells [1].

The clinical picture of epileptic seizure can be different, depending on the location and the size of the irregular uploading. Spasticity, sensory, vegetative, mental disorders might appear, sometimes the disorder of consciousness may accompany. When uploading spreads to adjacent areas of the cortex, we are dealing with secondary generalized seizure. According to the classification, epilepsy seizures are divided into focal and generalized. In the diagnosis, an accurate description of the seizure is of significant importance [6,7].

In the classification of the concept of "*epilepsy syndromes*" one can identify the type of epilepsy seizures based on age, the prevalence of the first symptoms, diversity of generalized and partial epilepsy, and the distinction between the genetically epilepsy or different reasons. An example of epilepsy of infancy are Dravet's and West's syndrome (*severe myoclonic epilepsy of infancy* SMEI). During the infantile period epilepsy may be characterized by Lennox-Gastatut Syndrome (LGS), epilepsy in children with the seizures of unconsciousness [4].

Taking into account the cause, there are genetic origin of epilepsy, based on the knowledge or on suspected genetic defect. The second group of epilepsy is conditioned structurally or metabolically. Structural damage can be the result of trauma, stroke or infection. The reason may be also the disease with damage of the cerebral cortex such as *tuberous sclerosis*. The third group of epilepsy are diseases of unknown etiology [6,8].

In the diagnostic process, epilepsy requires to be differentiated from other epileptic events occurring in children's age. Fainting, involuntary movements, apnea, onanism, psychogenic dysfunction, Sandifer's Syndrome, sleep disorder belonged to the non-epileptic seizures (NES) symptoms [9,10].

Electroencephalogram test (EEG) has an indispensable role in the diagnosis of epilepsy and other epileptic seizures. This test shall be performed on each child of anamnesis indicating the presence of seizures. EEG is used to specify the type of seizures and indicate the factors provoking reasons for seizures. The test is useful in children with febrile seizures, in differential diagnosis of consciousness disorders in children. The appropriate factors of the EEG is the preparation of the child and its parents. The test must be carried out in physiological conditions, during the peaceful watch and sleep. Before the EEG is accomplished, it is good to alleviate fear and anxiety of the child through a short conversation or game. After the electrodes are put on, infants should be fed and put to sleep, so as to limit touching during the test. EEG lab should be child-friendly, located away from sources of noise. The behavior of the test taker has a significant impact. In the diagnosis of

epilepsy, brain bioelectrical activity is performed using modern techniques, such as Holter EEG monitoring and videometry [11].

In the diagnostic imaging, magnetic resonance imaging (MRI) and computed tomography (CT) are applied. The results allow to immortalize the structural change of the damaged encephalon showing the location, nature, and the extent of the pathological changes. In determining the epileptic focal radioisotope methods are also helpful. *Single photon emission computed tomography* (SPECT) allows to indicate the part of the brain responsible for uploading, specifying the increased cerebral flow during the seizure, however after seizure this location indicates the reduced flow. In distinguishing epileptic seizures *positron emission tomography* (PET) is also used. It specifies the place of increased metabolism of epileptic focal [12,13].

Epilepsy treatment in large part has a pharmacological character. It should be noted that anti-epileptic drugs have anticonvulsant activity, which do not show anti-epileptogenic activity. The Polish Society of Child Neurologists indicates in its recommendations the principle of treatment depending on the type of epilepsy, using split of medication for first, second and third type. When choosing a drug, it should be directed to the effectiveness of the relevant types of epilepsy, as well as safety, good tolerance, and speed of the therapeutic dose. The form of the medication must be adopted to the age and condition of the patient. When choosing the anti-epileptic drugs, other medications must be considered to be taken by a child, in order to avoid unfavourable interactions. It should be noted that children have faster metabolism than adults. Therefore, larger and more frequent doses of drugs are required [4,6].

The use of the monotherapy is effective in 70% of children in the treatment of epilepsy. In other cases, it is necessary to use two or more drugs at the same time. In case of polytherapy failure, epilepsy is described as drug-resistant [14–16].

Pharmacological treatment is associated with the possibility of side effects occurrence. The reason for their occurrence may be the mechanism of medications action, excessive immune reaction, or cytotoxic response of a sensitive person. Adverse reactions may result from the accumulation of drugs in the case of long-term therapy. Some of the anti-epileptic drugs may have teratogenic and carcinogenic impact. The side effects include: dizziness, headaches, drowsiness, ataxia, reduced concentration, difficulty with memory, hyperactivity, decrease or increase in weight, symptoms of liver damage or pancreas, mineralization of bones dysfunction, dermal changes. In order to minimize the occurrence of side effects of taking anti-epileptic drugs in children, periodical checkups must be fulfilled (complete blood count, liver function tests, visual field testing, calcium-phosphate metabolism), also monitoring the level of drugs in the blood serum must be carried out [6,17].

High hopes of the treatment of drug-resistant epilepsy involves the search for alternative routes of administration of anti-epileptic drugs, gene therapy, and cells implementation. In the treatment, the substances interacting with anti-epileptic drugs also are applied, potentiating their reaction. Research on the effectiveness of application of preparations, containing cannabis has not been proved [18,19]. Single cases of patients with drug-resistant epilepsy, in which the use of medical cannabis had therapeutic importance has been published in the scientific literature. Cannabis is a psychoactive compound with a long history of recreational and therapeutic use. Current considerations regarding cannabis use for medical purposes in children have been stimulated by recent case reports describing its beneficial effect with refractory epilepsy. Overall, there are insufficient data to support either the efficacy or safety of cannabis use for any indications in children, and an increasing amount of data suggests possible harm, most importantly in specific conditions. The potential for cannabis as a therapeutic agent must be evaluated carefully for both efficacy and safety in treating specific pediatric health conditions. Recommendations for therapeutic use in exceptional pediatric cases are offered, always providing that this treatment course is carefully evaluated in individuals and in ongoing, well-designed research studies to determine safety and efficacy [20,21].

Non-pharmacological treatment of epilepsy is the ketogenic diet. Implementing of a ketogenic diet precedes 1–2 days of starvation diet. Then the children are given 1g of protein per kg and from 2 to 4g of fat per of kg body weight. The amount of consumed carbohydrates is small. Diet causes *acidosis* and the emergence of the *ketonemia*. This affects the reduction of bioelectrical of the brain [4,19].

Failure in the pharmacological treatment of epilepsy can be caused by both the drug-resistance phenomenon as well as by other reasons. It might happen that epilepsy was not properly classified, the drugs were not selected, too small or too big doses of medication were applied. The lack of treatment effects may be caused by the presence of factors that trigger seizures, failure to comply with the recommendations of the pharmacological treatment or skipping doses of drugs. In the case of drug-resistance confirmation, a child may be qualified for neurosurgical treatment [22].

Surgical methods of treatment of epilepsy are divided into resection methods, involving the removal of part of the brain with focal point and palliative methods. The resection methods of surgical treatment of epilepsy include: *lobectomy* (mostly temporal lobe or its part, rarely occipital lobe, parietal lobe and frontal lobe), *hemispherectomy* (removes all cerebral hemisphere) and

lesionectomy (removal of epileptic focal emerging in structural changes). Among palliative methods of surgical treatment of epilepsy *callosotomy* is applied. *Callosotomy* is the intersection of the long fiber bundle passing through the corpus callosum. The effect of the treatment is to interrupt the spread of neurons uploading from one hemisphere to the other. Stimulation of the vagus nerve and deep stimulation of the brain belong to the palliative methods [2,23,24].

In the care of a child with epilepsy, the process of education should be taken into account. There is no contraindications to attending classes to pre-school or school. In exceptional cases, a child may benefit from individual learning in school or at home. With good control of seizures, it is necessary to ensure the right activity for the child's age. There should be no extreme sports, however, the child can ride a bike, swim, take part in activities with their peers. However, the child should always be secured with the presence of a caregiver. Planning the professional career for child, you need to pay attention to the types of work which is prohibited for patients with epilepsy (work at height, uniformed services, work on mechanical devices, professional driver) [6].

Epilepsy is a disease that has an impact both on the child's life and its family. Epilepsy seizures as well as adverse reactions of drugs taken often confine daily functioning. Children and youth suffer from a lack of acceptance on the part of their peers, from the stigma, often requiring psychological and psychiatric support, due to depression [25–27].

Chronic disease of the child causes disturbance of the psycho-social functioning of the whole family. From the moment of the diagnosis, parents go through a period of adaptation to the new situation. An important aspect is to provide comprehensive information for caregivers relevant essence of disease, the need for treatment, behavior during the attack, and the consequences of the disease. It becomes necessary to draw attention to the situation of the patient's siblings, as it often happens that the parents are focus all their attention mainly on the sick child. Caregivers of sick children suffering from epilepsy often struggle with low esteem and emotional exhaustion [28].

Conclusions

1. Epilepsy is a chronic disease of the nervous system in children, it mainly begins during the neonatal period.
2. Any attacks which may suggest epilepsy require full diagnostics in order to make correct identification and implementation of appropriate treatment.
3. In the treatment, the pharmacological, surgical, and dietetic methods are used. When implementing anti-epileptic drugs, the possibility of adverse reactions must be taken into consideration.
4. Taking care of the sick child suffering from epilepsy should be perceived as his/hers problems in a holistic way. Good cooperation with parents and teaching environment will include proper care of the child, considering its development, the need of education and psycho-social needs.
5. A child suffering from epilepsy is not an inconsiderable challenge for nursing staff. Knowledge of the current guidelines of the diagnostic process and therapeutic possibilities will allow a nurse to provide the child and the child's family with professional care.

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