Epilepsy and its Effect on Quality of Life

A Review Article

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Table of Contents

List of Tables

ABSTRACT OF the REVIEW ARTICLE
Epilepsy and Its Effect on Life Quality

It is well known that people with epilepsy experience many changes in their life style that impact their learning and interaction with the society. Thus, this review article comes to help in getting a better understanding about epilepsy, its causes, symptoms, management and treatment as it is very important to know about all these topics to help people with epilepsy living a normal life.

Epilepsy is one of the most common neurological disorders that affects many people around the world. It can affect any age group, from newborns to the elderly. Epilepsy is characterized by recurrent seizures that are unpredictable in frequency which in turn can certainly have an impact on patients' lifestyle and their families. For some people this impact is minor, while others may need to make larger lifestyle changes. During the episode of epileptic seizure, brain's electrical activity gets disturbed which causes a range of symptoms varying from staring off into space to some jerky movements. Some epilepsy patients may lose their consciousness. Epilepsy can be caused by a variety of malformations that affect the development of the brain. Those may include scars in the brain (especially temporal lobe and related structures) from prior infections, trauma or long seizures, brain tumors, or stroke. Some epilepsies are genetic, due to a mutation in a specific gene whose function is tightly connected with signal transmission in brain cells. These forms of epilepsy tend to begin earlier in life and are often difficult to treat. Epilepsy could treated with anti-epileptic drugs (AEDs), ketogenic diet, surgery, and deep brain stimulation.

The article is organized in many sections to cover the following subjects: epilepsy definition and occurrence, its causes, pathophysiology, symptoms and signs, diagnosis, treatment and management. We tried to cover the important points that may help the readers to get a clear idea about epilepsy and its underlying points that would make the article easy to be understood.

Introduction

Epilepsy is one of the most common neurological disorders that affects about 1-3% of the word population. First, we want to clarify the difference between the two common terms: epileptic seizures and epilepsy as many may get confused about them. An epileptic seizure can be defined as a transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal activity in the brain [1]. In 2005, the International League against Epilepsy (ILAE) defined epilepsy as a disorder of the brain characterized by an enduring predisposition to generate epileptic seizures and by the neurobiological, cognitive, psychological, and social consequences of this condition. The definition of epilepsy requires the occurrence of at least one epileptic seizure. Epilepsy is one of the most common neurologic conditions, with an incidence of approximately 50 new cases per year per 100,000 population. About 1% of the population suffers from epilepsy, and about one-third of patients have refractory epilepsy (i.e., seizures not controlled by two or more appropriately chosen antiepileptic medications or other therapies). Approximately 75% of epilepsy begins during childhood, reflecting the heightened susceptibility of the developing brain to seizures[1] .

There are many factors that affect the quality of life of people with epilepsy, including seizure severity, stigma, fear, and the presence of cognitive or psychiatric problems [2]. Dodrill et al suggested that seizures may be only one of several variables that impact the psychosocial functioning of patients with epilepsy. They found that vocational adjustment is the most frequently reported factor related to patient psychosocial outcome. Measuring the outcome of epilepsy treatment has traditionally assessed seizure frequency and severity, adverse effects and antiepileptic drug levels. The quality of life (QOL) evaluation is a relatively new measure to evaluate the outcome of epilepsy. QOL is influenced by biological factors as well as cultural, social and religious beliefs and values. Patients' perceptions often include additional parameters that encompass the effects of epilepsy on daily activities and functions. Thus, in this article we tried to cover and explain some important aspects related to the impact of epilepsy on quality of life of epileptic patients.

Classification of Seizure and Epilepsies

Seizures are classified into three categories: ***generalized, focal (also called partial), and epileptic spasms***. Focal seizures originate in neuronal networks limited to part of one cerebral hemisphere. Generalized seizures begin in bilateral distributed neuronal networks. A seizure can begin focally and becomes generalized. Seizures can originate in the cortex or in subcortical structures. Using a detailed history, EEG findings, and ancillary information, a physician can often categorize the seizure/epilepsy type [1,3].

The main subtypes of ***generalized seizures*** are absence, generalized tonic–clonic (GTC), myoclonic, and atonic (see Table 1). Absence seizures (formerly called petit mal) involve staring with unresponsiveness to external verbal stimuli, sometimes with eye blinking or head nodding. GTC seizures consist of bilateral symmetric convulsive movements (stiffening followed by jerking) of all limbs with impairment of consciousness. Myoclonic seizures consist of sudden, brief ("lightning-fast") movements that are not associated with any obvious disturbance of consciousness. These brief involuntary muscle contractions may affect one or several muscles; therefore, myoclonic seizures can be generalized or focal. Atonic seizures involve the loss of body tone, often resulting in a head drop or fall [1] [4].

Table 1: Classification of Seizures

Table 1. Epileptic seizures

Generalized seizures
Tonic–clonic
Absence
Typical
Atypical
Myoclonic
Atonic
Focal seizures
Epileptic spasms

The clinical manifestations of a ***focal seizure*** depend on the area of cortex involved. For example, a focal seizure arising from the occipital lobe may present with visual phenomena; from the precentral gyrus, with rhythmic clonic or tonic motor activity; and from the postcentral gyrus, with sensory symptoms, such as paresthesias. When

consciousness is impaired during a focal seizure, that is, the patient is unable to respond normally to verbal or tactile stimuli, the seizure is classified as dyscognitive (formerly called complex partial); seizures arising from the temporal lobe are often dyscognitive. Some seizures are preceded by an aura, which is a focal seizure wherein a patient retains awareness and describes motor, sensory, autonomic, or psychic symptoms. An aura precedes a focal dyscognitive or generalized seizure by seconds or minutes and is most often experienced by patients with temporal lobe epilepsy [1].

The origin of the third category of seizure types, ***epileptic spasms***, is uncertain. Epileptic spasms are manifest by sudden extension or flexion of extremities, held for several seconds, and then recur in clusters. Epileptic spasms can occur at any age; when they begin in the first year of life, they comprise a syndrome called infantile spasms (IS) [1].

Epilepsies (epilepsy syndromes) were previously classified according to their onset site (generalized or related to a specific cortical localization) and etiology, that is, whether the cause was known (symptomatic) or not known (idiopathic).

Etiology

The etiology of epileptic seizures differs across the lifespan and depends upon the age of seizure onset. The most common causes of epilepsy for each age group have been reported by the Epilepsy Foundation of America and are listed in TABLE III [5]6] .

Mesial temporal (Ammon's horn) sclerosis is the most common single lesion to be found post mortem in the brains of chronic epileptics who die a natural death. Evidence shows that it usually arises in infancy, often as a result of a prolonged febrile convulsion, and that it then becomes a potent epileptogenic lesion [6].

The causes and prognoses of epilepsies in children are varied and, therefore, each child with epilepsy needs an individualized, multiaxial assessment of their epilepsy syndrome, and any additional morbidities[7].

Table 2: Etiology of Seizures based on Age Groups

Age Group	Potential Causes
Newborns	1. Brain malformations 2. Lack of oxygen during birth 3. Low levels of blood sugar, blood calcium, blood, magnesium, or other electrolyte disturbances 4. Inborn errors of metabolism 5. Intracranial hemorrhage 6. Maternal drug use 7. Infection
Neonatal	1. Perinatal injury 2. Hypoxia 3. Hypoglycemia 4. Hypocalcemia 5. Pyridoxine deficiency 6. Intraventricular hemorrhage 7. Intraparenchymal hemorrhage 8. Subdural hemorrhage
Children	1. Perinatal injury 2. Developmental malformation 3. Febrile seizures 4. Stroke 5. Vascular malformations 6. Head injury 7. Infections 8. Brain tumors 9. Amino acid disorders 10. Urea cycle disorders 11. Gray matter storage diseases
Infants and Children	1. Fever (febrile seizures) 2. Infections 3. Brain tumor (rarely) 4. Mesial temporal (Ammon's horn) sclerosis
Children and Adults	1. Congenital conditions (Down syndrome, Angelman syndrome, tuberous sclerosis and neurofibromatosis 2. Genetic factors 3. Head trauma 4. Progressive brain diseases (rare)
Middle years	Neoplasm (high risk)
Adults/Elderly	1. Trauma 2. Tumor 3. Substance abuse or drug withdrawal 4. Drug reactions (stimulants, antihistamines, tricyclics, phenothiazines, butyrophenones, certain antibiotics, aminophylline) 5. CNS infections 6. Stroke 7. Intracranial hemorrhage 8. Vascular malformations 9. Systemic/metabolic derangements 10. Alzheimer disease 11. Dementia (high risk for > 65 years) 12. Cerebrovascular disease (high risk for > 65 years)

Pathophysiology of Epilepsy

Epileptic seizures arise from an excessively synchronous and sustained discharge of a group of neurons. The single feature of all epileptic syndromes is a persistent increase of neuronal excitability. Abnormal cellular discharges may be associated with a variety of causative factors such as trauma, oxygen deprivation, tumors, infection, and metabolic derangements. However, no specific causative factors are found in about half of the patients suffering from epilepsy [8]. Underlying causes and pathophysiological mechanisms are (partially) understood for some forms of epilepsy, e.g. epilepsies caused by disorders of neuronal migration and monogenic epilepsies.

Symptoms

Because epilepsy is caused by abnormal activity in the brain, seizures can affect any process the brain coordinates. Seizure signs and symptoms may include [9]:

- Temporary confusion
- A staring spell
- Uncontrollable jerking movements of the arms and legs
- Loss of consciousness or awareness
- Psychic symptoms such as fear, anxiety or deja vu

Symptoms vary depending on the type of seizure. In most cases, a person with epilepsy will tend to have the same type of seizure each time, so the symptoms will be similar from one episode to another.

Risk factors

Certain factors may increase your risk of epilepsy:

- ✓ **Age:** The onset of epilepsy is most common in children and older adults, but the condition can occur at any age.
- ✓ **Family history:** If there is a family history of epilepsy, one may be at an increased risk of developing a seizure disorder.

- ✓ **Head injuries:** Head injuries are responsible for some cases of epilepsy. One can reduce the risk by wearing a seat belt while riding in a car and by wearing a helmet while bicycling, skiing, riding a motorcycle or engaging in other activities with a high risk of head injury.
- ✓ **Stroke and other vascular diseases:**Stroke and other blood vessel (vascular) diseases can lead to brain damage that may trigger epilepsy. Many steps can be taken to reduce the risk of these diseases, including limiting the intake of alcohol and avoiding cigarettes, eating a healthy diet, and exercising regularly.
- ✓ **Dementia:** Dementia can increase the risk of epilepsy in older adults.
- ✓ **Brain infections:** Infections such as meningitis, which causes inflammation in the brain or spinal cord, can increase the risk.
- ✓ **Seizures in childhood:** High fevers in childhood can sometimes be associated with seizures. Children who have seizures due to high fevers generally won't develop epilepsy. The risk of epilepsy increases if a child has a long seizure, another nervous system condition or a family history of epilepsy.

Diagnostic Evaluation

- ***History and Examination:*** The history and neurologic examination are the cornerstones of the diagnosis of seizures and epilepsy. Important historical features include the clinical context in which the seizure occurred, including premonitory signs, details of the seizure itself, such as phenomenology, responsiveness, focal features, and the postictal state. Further inquiry centers on whether an epilepsy syndrome is present, guides the nature and extent of the evaluation, and determines treatment and prognosis [1].

  The neurological examination assesses focal signs that might implicate or localize cerebral pathology. For example, increased tone on one side of the body could indicate pathology in the contralateral hemisphere, such as a cortical dysplasia. The general physical examination is also important to determine whether the patient has an underlying condition. For example, abnormal skin markings could indicate a neurocutaneous disorder in which epilepsy is common, such as tuberous sclerosis [1].

- ***EEG:*** This is the only test that directly detects electrical activity in the brain, and seizures are defined by abnormal electrical activity in the brain. During an EEG, electrodes (small metal disks) are attached to specific locations on the head. The electrodes are attached to a monitor to record the brain's electrical activity. The EEG is useful not only to confirm a diagnosis of epilepsy, but also to determine the type of epilepsy [10]. A routine EEG only records about 20 minutes of brain waves (however, the routine EEG procedure takes about 90 minutes). Because 20 minutes is such a short amount of time, the results of routine EEG studies are often normal, even in people known to have epilepsy. Therefore, prolonged EEG monitoring may be necessary.
- ***EEG-video monitoring*** is an even better diagnostic method. During this type of monitoring, an EEG monitors the brain's activity and cameras videotape body movements and behavior during a seizure. Prolonged monitoring often requires the patient to spend time in a special facility for several days. Prolonged EEG-video monitoring is the only definitive way to diagnose epilepsy
- ***Neuroimaging:*** Computed tomography (CT) and magnetic resonance imaging (MRI) scans are important adjuncts to the clinical examination and EEG in the evaluation of a person with seizures. Neuroimaging techniques are especially sensitive for central nervous system (CNS) structural lesions. Focal neurologic findings on examination (e.g., unilateral weakness, asymmetric reflexes) mandate neuroimaging. MRI is more likely to show an abnormality in a patient with focal seizures, abnormal neurologic findings, or focal discharges on EEG. MRI is more sensitive than CT and is therefore preferred, especially for the detection of cortical malformation, dysgenesis, or hippocampal sclerosis. Quantitative, computer-assisted volume analysis of the temporal lobes may detect asymmetries that are not readily apparent on visual analysis of the scan. CT is valuable in the acute setting to detect hemorrhage, calcification, or tumors [1]. Several new imaging techniques are available to aid in the assessment of epilepsy such as fMRI, PET, SPECT, and MEG.

Treatment and Management

The primary treatment strategy for epileptic seizures is the elimination of the underlying cause. The majority of epileptic seizures are controlled through drug therapy. The type of treatment prescribed will depend on several factors including the frequency and severity of the seizures as well as the person's age, overall health and medical history. An accurate diagnosis of the type of epilepsy (not just the type of seizure, since most seizure types occur in different types of epilepsy) is also critical in choosing the best treatment. Here are the most common types for epilepsy treatment:

A. ***Pharmacological Treatment (Antiepileptic Drug AED):*** Many drugs are available to treat epilepsy such as: phenytoin (Dilantin), phenobarbital, carbamazepine (Tegretol, Carbatrol), and primidone (Mysoline). Although the different types of epilepsy vary greatly, in general, medications can control seizures in about 70% of epilepsy patients. Idiopathic generalized epilepsies and benign focal epilepsy of childhood are the easiest to treat, whereas symptomatic generalized epilepsies are the most difficult. The majority of partial epilepsies fall somewhere in between [10]. Seizure medications should not be stopped abruptly.

B. ***Epilepsy surgery***: Some patients with drug-resistant epilepsy benefit from surgical resection of epileptogenic brain tissue. Less invasive treatments, including vagal nerve stimulation or deep brain stimulation, may also be helpful in some patients. All those who continue to experience seizures despite appropriate drug treatment should be considered for surgical treatment. Planning such interventions requires intensive specialist assessment and investigation to identify the site of seizure onset and the dispensability of any target areas for resection, i.e. whether the area of brain involved is necessary for a critical function such as vision or motor function [11].

C. ***The ketogenic diet:*** This is effective for treating certain types of epilepsy. Specifically, it is effective in children with severe symptomatic generalized epilepsies with more than one type of seizure and brain damage. However, the diet requires careful planning and may be difficult to follow, so is usually not feasible in older children or adults. The diet is started in the hospital, and when successful, it is usually maintained for 2 to 3 years. It requires a very motivated family and a qualified dietician [10].

Epilepsy Patients and Their Lifestyle

If seizures are well controlled, patients are encouraged to lead as normal a life as possible, conducting activities of daily living, working and recreation. However, certain precautions must be taken [12].

- ***Driving:*** Driving a motor vehicle is an essential part of living and working in urban areas. Each country has its own law about people with epilepsy and driving. Even if the patient is within the law and has a valid driving license, routine precautions, such as not driving when sleepy or avoiding driving for an extended period should be taken.
- ***Working with heavy machines:*** Although people with epilepsy are encouraged to work, working with heavy and dangerous machines should be avoided.
- ***Daily activities:*** Simple precautions should be taken while engaging in daily activities and doing chores around the house, such as cooking. These activities should be avoided when the patient is tired, has not had adequate sleep or when an aura occurs.
- ***Rural areas:*** Although life is simpler in rural areas compared to urban areas, there are other hazards, such as falling into a well, into an open fire or getting limbs cut while working with machines such as harvesters, threshers and tractors used in agriculture. Patients and families should take adequate precautions.

Conclusions

This article introduced the main concepts of epilepsy and epileptic seizures to allow the readers to get useful information that would help in making epilepsy principles easy to be understood and help epilepsy patient to have a normal life. Understanding those concepts would contribute in helping epilepsy patients to manage their epileptic seizures and guide the patients to control them.

Recommendations

Here are some important recommendations related to epilepsy [13]:

- EEG is an essential part of the diagnostic evaluation of epileptic seizures both in children and in adults. If the EEG during wakefulness is normal, sleep EEG can be recommended.
- In the presence of a first acute symptomatic seizure (metabolic encephalopathy, acute CNS injury in patients with an underlying treatable condition), treatment of the cause is recommended. Symptomatic therapy of a first unprovoked seizure is generally not justified unless the seizure is prolonged.
- Except for infants less than 6 months of age, examination of the CSF is recommended in children and adults only when cerebral infection is suspected (Hirtz et al., 2000).
- The risk of acute and chronic adverse effects of drugs should be strongly considered when starting treatment; in which case, risks should be minimized by careful AED selection, gradual dose titration, choice of appropriate target dose, and monitoring of clinical response.
- Selected categories of patients, like the elderly or those with learning disabilities, may be encouraged to start treatment after a first seizure, but this is still a controversial issue. There are situations that may indicate deferral of treatment (e.g., pregnancy) while others, for example, patients performing potentially dangerous activities, may favor initiation of treatment. In either case, the patient should be involved in the decision process.

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