African Journal of
Medicine, Surgery and Public Health Research

ISSN: 3434-3567

Index: Harvard, Boston, Sydney University, Dimensions, Lens, ResearchGet Scilit, Semantic, Google Scholar, Base etc

https://doi.org/10.58578/AJMSPHR.v2i2.5327

Advancements in Epilepsy Treatment: Challenges, Innovations, and Social Impacts on Patients

Muhammad Akram[1], Muhammad Tayyab Aslam[2], Isaac John Umaru[3]
[1,2]Government College University Faisalabad, Pakistan
[3]Federal University Wukari, Taraba State, Nigeria
makram_0451@yahoo.com

Article Info:

Submitted:	Revised:	Accepted:	Published:
Mar 2, 2025	Mar 18, 2025	Mar 30, 2025	Apr 5, 2025

Abstract

Epilepsy-related seizures can range greatly, from focal seizures that can impact certain brain areas to widespread tonic-clonic seizures. Although the exact origin of epilepsy is sometimes unknown, the underlying reasons are many and include genetic factors, brain damage, infections, stroke, tumors, and developmental abnormalities. The goal of both pharmaceutical and non-pharmacological treatments for epilepsy is to avoid seizures. With the aim of controlling seizures, antiepileptic medications (AEDs) are the first line of treatment for the majority of patients. However, about one-third of individuals with epilepsy suffer from drug-resistant seizures, which can cause cognitive, psychological, and social issues and have a significant impact on their quality of life. In these cases, alternative treatments like deep brain stimulation, vagus nerve stimulation, ketogenic diets, and surgery may be considered. New insights into the genetic and molecular mechanisms underlying epilepsy have created opportunities for personalized medicine, allowing for more focused therapeutic approaches. New treatment approaches have been made possible by the discovery of certain genetic mutations, changed ion channel function, and neuroinflammation in some forms of epilepsy. Even with these

developments, there are still obstacles in the way of attaining ideal seizure control and raising epileptic patients' quality of life. Because individuals with epilepsy may experience stigmatization, discrimination, and obstacles to social integration, work, and education, the illness also has significant social ramifications. To improve outcomes for individuals with epilepsy, comprehensive care models, enhanced diagnostic technologies, and public awareness campaigns are essential. Additionally, the burden that epilepsy causes on people and society may be lessened with continued study into the neurobiological processes of seizures and the creation of more potent therapies.

Keywords: Epileptic, Anti-seizure medications, Epilepsy surgery, nerve stimulation, Cognitive impairment

Introduction

A neurological disorder called epilepsy damages the brain and makes patients more prone to frequent, unprovoked seizures. It affects people of all ages, races, and ethnicities and is one of the most prevalent nervous system ailments. Seizures can be brought on by any illness that interferes with the regular connections between brain cells, such as a concussion, high temperature, hypoglycemia, or alcohol or drug withdrawal. Anyone may have one or more seizures in these conditions. Nonetheless, epilepsy is diagnosed when a person experiences two or more frequent unprovoked seizures. Neurotransmitter imbalances, tumors, stroke, and brain damage from disease or injury are only a few of the numerous potential causes of epilepsy. Most of the time, epilepsy may have no known etiology. A seizure: what is it? All of the body's reactions, both voluntary and involuntary, are managed and controlled by the brain. (Lubar et al., 1976) It is composed of nerve cells that typically use electrical activity to communicate with one another. When a burst of aberrant electrical impulses briefly interferes with normal brain electrical function in one or more brain regions, a seizure ensues. When one or more regions of a cerebral hemisphere experience aberrant brain electrical activity, focal seizures result. Another name for them is partial seizures. Children who have focal seizures, especially complicated ones, may have an aura before the seizure. Additionally, auras can be caused by changes in vision, hearing, or smell. Depending on whatever part of the brain is impacted, the youngster may exhibit a variety of symptoms. The child's vision may change if the aberrant electrical activity in the brain occurs in the occipital lobe, which is the area of the brain involved in vision. But

most often, muscles are impacted. Only a single muscle group, such as the fingers or the bigger muscles in the arms and legs, is affected by seizures. Consciousness is retained during this kind of seizure. Additionally, the youngster can feel pale, nauseous, or sweaty. (Gehlbach et al., 1974) The temporal lobe of the brain, which regulates emotions and memory, is where this kind of seizure typically happens. Typically, it lasts between one and two minutes. Consciousness is frequently lost during such convulsions. A youngster may lose knowledge of their surroundings, although losing consciousness does not always imply fainting. (Wieling et al., 2009) Despite appearing awake, the youngster displays a range of actions. Choking, lip-smacking, fleeing, yelling, sobbing, or laughing are a few examples of these. After the seizure, the youngster may complain of being sleepy or exhausted when they come to. Petit mal seizures are another name for absence seizures. Staring fits and a momentarily altered state of awareness are hallmarks of these seizures. The youngster usually keeps their posture during the seizure. The eyes may blink, or the mouth or face may move. Typically, the seizure lasts no more than 30 seconds. The youngster might not recall what happened once the seizure is ended and might carry on with their activity as if nothing had occurred. (Chrisman et al., 2013) These seizures may happen many times during the day. Sometimes, this kind of seizure is confused with a behavioral or learning disorder. Almost always, absence seizures start between the ages of 4 and 12. Atonic seizures, commonly known as drop seizures. An abrupt decrease of muscular tone during atonic seizures might cause a youngster to drop their head or fall off their feet. (Martin et al., 2010). The youngster is unconscious and limp during the seizure. Grand mal seizures are another name for generalized tonic-clonic seizures. There are five main phases that define the conventional form of this sort of seizure, which may not always occur. Not every instance of this kind of seizure exhibits all of these stages.

Epileptic

A neurological disorder called epilepsy damages the brain and makes patients more prone to frequent, unprovoked seizures. It affects people of all ages, races, and ethnicities and is one of the most prevalent nervous system ailments. Seizures can be brought on by any illness that interferes with the regular connections between brain cells, such as a concussion, high temperature, hypoglycemia, or alcohol or drug withdrawal. Anyone can have one or more seizures under these conditions. Nonetheless, epilepsy is diagnosed when

a person experiences two or more frequent unprovoked seizures. Neurotransmitter imbalances, tumors, stroke, and brain damage from disease or injury are only a few of the numerous potential causes of epilepsy.

All of the body's reactions, both voluntary and involuntary, are managed and controlled by the brain. It is composed of nerve cells that typically use electrical activity to communicate with one another. When a burst of aberrant electrical impulses briefly interferes with normal brain electrical function in one or more brain regions, a seizure ensues. convulsions that are focal. When one or more regions of a cerebral hemisphere experience aberrant brain electrical activity, focal seizures result. Another name for them is partial seizures. Children who have focal seizures, especially complicated ones, may have an aura before the seizure. Additionally, auras can be caused by changes in vision, hearing, or smell. Depending on whatever part of the brain is impacted, the youngster may exhibit a variety of symptoms. The child's vision may change if the aberrant electrical activity in the brain occurs in the occipital lobe, which is the area of the brain involved in vision. But most often, muscles are impacted. Only a single muscle group, such as the fingers or the bigger muscles in the arms and legs, is affected by seizures. Consciousness is retained during this kind of seizure. Additionally, the youngster can feel pale, nauseous, or sweaty. The temporal lobe of the brain, which regulates emotions and memory, is where this kind of seizure typically happens. Usually, it lasts between one and two minutes. Consciousness is frequently lost during such convulsions. A youngster losing consciousness does not necessarily faint; rather, they may become less aware of their surroundings. (Noachtar et al., 2009)

Epilepsy surgery

For epilepsy, this is the most common type of surgery. It involves the removal of brain tissue in the seizure-prone region by the surgeon. There might be a tumor or brain lesion in this location. Most frequently, one of the temporal lobes is the target of reconstructive surgery. Emotions, linguistic understanding, and visual memory are all governed by this region. Comparing this method to reconstructive surgery, it is less intrusive. A little piece of brain tissue is found and destroyed by ITLT using a laser. The surgeon uses magnetic resonance imaging (MRI) to assist in directing the laser. Deep into the brain, electrodes are implanted during this process. Additionally, a pacemaker-like device is inserted beneath the

skin in the chest. This gadget is connected to brain electrodes via a cable. Electrical impulses are sent by the electrodes to stop the seizure-causing activity. This process is MRI-guided, just as ITLT. The brain that links the left and right hemispheres' nerves is either completely or partially removed during this procedure. We refer to this region as the corpus callosum. Children who have erratic brain activity that extends from one hemisphere to the other are the ones who have this surgery the most frequently. The hemisphere, which is a component of the brain's folded gray matter, is removed during this treatment. The cerebral cortex is the name given to this region of gray matter. Only children who experience seizures that start in various parts of the same cerebral hemisphere are often candidates for this operation. Seizures of this kind are typically caused by a disorder that exists from birth or in early childhood. The main purpose of this treatment is to remove the brain's connecting nerves without removing any of the brain itself, usually in youngsters. In order to monitor brain electrical activity when not having a seizure, electrodes are applied to the scalp during this examination. The broad brain regions that may be impacted by seizures can be inferred from a baseline EEG. Seizures are captured on camera while an EEG is continuously recorded. This test requires hospitalization since anticonvulsant medication must be lowered or stopped for a brief period of time prior to seizures. The region of the brain where a seizure starts can be determined by analyzing changes in the EEG and body movements during the seizure. This kind of imaging test helps medical personnel find tumors or damaged cells that might cause seizures by producing detailed pictures using radio waves and a magnetic field. (Jobst et al., 2015)

Anti-seizure medications

Based on the idea that excessive sexual desire was the cause of epilepsy, bromides were introduced in 1850, marking the beginning of modern therapy for seizures. The safest anticonvulsant drugs to use while pregnant are not well studied. Pregnancy-related anticonvulsant drugs, including valproic acid, may raise the chance of severe birth abnormalities and certain cognitive issues. Before being pregnant, it's crucial to speak with a doctor about which anticonvulsant medicine is best. Anticonvulsant drugs are a crucial component of epilepsy and symptomatic seizure therapy. It may take some time to find the best anticonvulsant drug. They are ready to assist. Medication is the main method used to treat seizures. In order to maximize use, this page aims to give a summary of antiseizure

drugs and the state of the art. Patient autonomy is prioritized, and a personalized approach is the main focus. Prior to making any judgments, it is important to identify risk factors, such as abnormal electroencephalograms (EEGs), abnormal brain imaging, and the existence of nocturnal seizures. Patients should be informed that beginning medication can reduce the chance of seizure recurrence, which is highest within the first two years (21% to 45%). Although they are usually mild and reversible, anticonvulsant side effects should be thoroughly reviewed and discussed. (Rahim et al., 2021)

Nerve stimulation

When the electrical charge reaches the brainstem, it is released into various parts of the brain to alter how neurons operate. Vagus nerve stimulation functions similarly to a cardiac pacemaker. Indeed, VNS is occasionally referred to as a "brain pacemaker." After all conventional therapies have failed. VNS as a therapy option. Only a small subset of patients with depression or epilepsy who are not responding to medication can utilize VNS. VNS has just received approval as a rehabilitation tool for stroke survivors. Numerous body functions are under their control. The longest nerve is the vagus nerve, which is cranial nerve X (10). Each side of the body has one vagus nerve. From the neck to the chest and belly, both begin in the brainstem. An insulated line with electrodes at the end and a stimulator (pulse generator) make up the vagus nerve stimulation apparatus. In order to reveal the vagus nerve, the surgeon first makes two incisions (cuts): one in the upper left section of the chest and one on the left side of the neck. Through the neck incision, the wire's coiled electrodes are carefully wound around the left vagus nerve. The insulated cable that extends from the electrodes is then guided by the surgeon through the neck-to-chest incision. After that, the surgeon attaches a battery at the electrode's end. The battery is a little bigger than a coin made of silver. It enters the chest through the incision and enters a cavity created above the muscle. The system is tested following the implantation of the electrodes, wire, and device. The device is usually turned on at the lowest setting for 30 to 90 seconds to ensure it is stimulating the vagus nerve. The surgery usually takes between 45 and 90 minutes. In two to four weeks. Typically, adjustments start out at low levels to see how symptoms respond and to look for side effects. (George et al., 2000)

Cognitive impairment

As people age, it's normal and anticipated to gradually lose mental capacity. The descriptive labels dementia and MCI both indicate the extent of cognitive impairment and how it impacts day-to-day functioning. In contrast to dementia, MCI's mental deterioration does not interfere with day-to-day functioning. This is the primary distinction between the two conditions. Additionally, unlike those with dementia, those with MCI do not have personality changes. Dementia or moderate cognitive impairment (MCI) can result from a variety of underlying illnesses. The most frequent side effects are nausea, ataxia, and dizziness, and it is usually well tolerated. Electrocardiographic monitoring is advised at the beginning of treatment because of the well-known effect of dose-dependent prolongation of the PR interval on the ECG. It may lower blood levels of other medications metabolized by the CYP system since it is a strong CYP system inducer. Although it can also be administered as monotherapy in this situation, it is utilized as an adjuvant for refractory focal seizures. Additionally, it helps with infantile spasms in pediatric settings, particularly in kids with tuberous sclerosis complex. Patients should be treated with caution since they may lose their vision. In addition, the medication may result in headaches, weariness, dizziness, and aberrant MRI results (without evident neurological impairments). (Gauthier et al., 2006)

Conclusion

People's physical, mental, and emotional health are all greatly impacted by epilepsy, which is still a complicated and multidimensional neurological condition. Even though epilepsy is one of the most prevalent chronic illnesses in the world, diagnosing and treating it can still be difficult, particularly for people who have drug-resistant episodes. Even while antiepileptic medications (AEDs) are still the mainstay of care, ongoing scientific and technological developments give hope for more individualized and efficient therapy strategies. Better social integration and opportunity for individuals with epilepsy may be fostered by reducing the discrimination they encounter via increased public awareness, education, and support networks. Furthermore, enhancing the general well-being of individuals with epilepsy requires a comprehensive treatment strategy that incorporates cognitive rehabilitation and psychosocial assistance.

References

Chrisman, S. P., Quitiquit, C., & Rivara, F. P. (2013). Qualitative study of barriers to concussive symptom reporting in high school athletics. Journal of Adolescent Health, 52(3), 330-335.

Gauthier, S., Reisberg, B., Zaudig, M., Petersen, R. C., Ritchie, K., Broich, K., Belleville, S., Brodaty, H., Bennett, D., Chertkow, H., & Cummings, J. L. (2006). Mild cognitive impairment. The Lancet, 367(9518), 1262-1270.

Gehlbach, S. H., Williams, W. A., Perry, L. D., & Woodall, J. S. (1974). Green-tobacco sickness: An illness of tobacco harvesters. JAMA, 229(14), 1880-1883.

George, M. S., Sackeim, H. A., Rush, A. J., Marangell, L. B., Nahas, Z., Husain, M. M., Lisanby, S., Burt, T., Goldman, J., & Ballenger, J. C. (2000). Vagus nerve stimulation: A new tool for brain research and therapy. Biological Psychiatry, 47(4), 287-295.

Jobst, B. C., & Cascino, G. D. (2015). Resective epilepsy surgery for drug-resistant focal epilepsy: A review. JAMA, 313(3), 285-293.

Lubar, J. F., & Bahler, W. W. (1976). Behavioral management of epileptic seizures following EEG biofeedback training of the sensorimotor rhythm. Biofeedback and Self-regulation, 1(1), 77-104.

Martin, K., Bates, G., & Whitehouse, W. P. (2010). Transient loss of consciousness and syncope in children and young people: What you need to know. Archives of Disease in Childhood-Education and Practice, 95(3), 66-72.

Noachtar, S., & Rémi, J. (2009). The role of EEG in epilepsy: A critical review. Epilepsy & Behavior, 15(1), 22-33.

Rahim, F., Azizimalamiri, R., Sayyah, M., & Malayeri, A. (2021). Experimental therapeutic strategies in epilepsies using anti-seizure medications. Journal of Experimental Pharmacology, 13, 265-290.

Wieling, W., Thijs, R. D., van Dijk, N., Wilde, A. A., Benditt, D. G., & van Dijk, J. G. (2009). Symptoms and signs of syncope: A review of the link between physiology and clinical clues. Brain, 132(10), 2630-2642.