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Epilepsy and its management: A review

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ABSTRACT

In today's fast-paced society, individuals are subjected to numerous forms of stress, and the majority of the world's population suffers from various neurological disorders. Epilepsy is one of the most prevalent neurological illnesses of the brain, affecting around 50 million individuals worldwide, with 90% of them living in poor nations. High fever is caused by genetic factors, brain infection, stroke, tumours, and epilepsy. It places a significant financial burden on health-care systems in developing nations, and it is linked to stigma and discrimination against patients and their families in the community, at work, at school, and at home. Many epilepsy sufferers experience considerable mental stress, behavioural problems, and social isolation. Seizures come in a variety of forms and are caused by a variety of systems in the brain. Hyperexcitability of neurons and hypersynchronous neural circuits are two characteristics of seizures. In predisposed brain local or generalised hyperexcitability regions, a multitude of processes change the equilibrium between excitation and inhibition, resulting in hypersynchronia. The review's goal is to talk about epilepsy's history, epidemiology, aetiology, pathophysiology, categorization, symptoms, diagnosis, management, and future trends.

Keywords: Anti-epileptic drugs, pathophysiology, seizures, epidemiology, hypersynchrony

INTRODUCTION

Epilepsy affects up to 1% of the population, making it the second most frequent neurological disorder after stroke.(1) Epilepsy affects over 50 million individuals globally, with 90 percent of them living in underdeveloped nations.(2) In recent years, the public's opinion of epilepsy has improved in various ways. It is a common chronic neurological illness characterised by recurring unprovoked epileptic seizures as the balance between brain excitability and inhibition shifts toward uncontrolled excitability. (3-5) There is now conclusive evidence that the pathophysiology of immature and adult brains, as well as the impact of strokes, differ significantly. It is a collection of diverse types of epileptic seizures that vary greatly in frequency, appearance, aetiology, and treatment. (6) Seizures are characterised by aberrant neuronal activity in the brain that is either excessive or synchronous. (7) Epileptic seizures usually result in a brief loss of consciousness, putting the patient at danger of bodily damage, and interfering with schooling and job. Epilepsy is more common in young children and individuals over 65, although it can strike anybody at any moment. Epilepsy is a sickness characterised by episodic aberrant electrical activity in the brain. (8) Not all epileptic syndromes are permanent; others are only present at specific phases of development. Anticonvulsant medications are the mainstay of epilepsy treatment. (9) Even with the finest medications available, more over 30% of persons with epilepsy do not have crisis control. (10,11) Despite the fact that these medications frequently control or reduce the frequency of seizures, some individuals exhibit little or no improvement, and in these circumstances, surgery may be considered. Because medications decrease seizures, symptomatic treatment is accessible, but no prevention or effective cures are available. Due to long-term therapy and the negative side effects of many drugs, medication compliance is a major issue. (12) The goal of this review is to offer a general understanding of epilepsy and its management.

History of epilepsy

The term epilepsy derives from the Greek word 'epilepsia,' which means 'to seize,' and has since fused into the form 'epi,' which means 'above,' and which they assume. (13) Epilepsy was once associated with weak religions or was constantly under the sway of a demon. Many people used to believe that epilepsy caused people to take on demons or that visions experienced by epileptics were sacred sickness delivered to you by the gods. Epilepsy was viewed as a demonic spirit's attack even among Hmong animist generations, yet the individual affected may be venerated as a shaman via specific experiences. (14) and (15)

Epidemiology

Epilepsy is a severe neurological illness that affects a large number of people. (16) There are an estimated 55 epileptics missing in India, 20 in the United States, and three in the United Kingdom. (17) In the United States, 120 persons per 100,000 seek medical help for a seizure that has just occurred. Even if they do not have epilepsy, at least 8% of the general population will experience a seizure. The likelihood of a second unjustified crisis occurring in the next five years varied from 23% to 80%. Epilepsy affects 44 persons per 100,000 each year when age is taken into account. Every year, about 125,000 new cases of epilepsy are diagnosed, with 30% of those diagnosed being under the age of 18. (18)

Causes of epilepsy

Epilepsy is caused by a variety of factors that are unknown. The term epilepsy does not reflect the reason or severity of a person's seizures; some cases of epilepsy are caused by hereditary factors, but it can also be caused by head traumas, strokes, infections, high temperature, or tumours. (19) It has been noticed that heredity (genetics) plays a significant part in many causes of epilepsy in young children, but they can also be a component in adults. Not everyone who suffers significant head trauma (a known cause of epileptic episodes) develops epilepsy. (7) Patients with epilepsy mention emotional stress, sleep sleep thermal stress deprivation, alcohol, and fever sickness as examples of triggering events. With epilepsy syndrome, the impact of different provoking variables differs. (20) In women with epilepsy, the menstrual cycle can impact relapse seizure patterns and catamenial seizure epilepsy. (21) (22)

Pathophysiology of epilepsy

Seizures are a kind of epilepsy that affects the brain. When the excitatory and inhibitory strengths of cortical neuron organise become unbalanced, a seizure occurs. In an unstable cell film or encompassing back / neighbouring cells, the underlying physiology of a convulsive scene may be found. Any cortical or subcortical zone can have a seizure root. A tiny number of neurons first concentrate in an aberrant manner. At the local level, normal membrane conductance, breakdown of inhibitory synaptic current, and excessive diffusion excitability cause a focused or more broadly attack, which leads to a generalised attack. This home spreads by physiological channels to locations near isolated areas. A deficit in voltage-dependent ion channels, as well as a shortage of membrane ATPases linked with ion transport, might produce an attack by causing an unstable neuronal membrane. Some neurotransmitters (e.g., glutamate, aspartate, acetylcholine, norepinephrine, histamine, corticotropin-releasing factor, purines, peptides, cytokines, and steroid hormones) increase neuronal excitability and propagation, whereas GABA and dopamine reduce neuronal activity and propagation. The need for increased blood flow to the brain to bring CO2 and provide substrate for metabolic activity of neurons increases during a seizure, and as the seizure progresses, the brain experiences greater ischemia, which can lead to neuronal death and brain damage. (6), (16), and (23)

Types of Seizures

Partial seizures

Simple partial seizures (focal cortical epilepsy) are characterised by a seizure focus in the context of motor activity, which causes attacks involving a single muscle group. Without losing consciousness, patients lose intentional control of the damaged body parts. (24-26)

II. Generalized seizures

Generalized seizures affect the whole brain, including the reticular system, resulting in abnormal electrical activity in both hemispheres. Generalized epileptic seizures are characterised by an abrupt loss of recognition. (27-30)

III. Unclassified category

Unclassified indeterminate epilepsy and epileptic disorders fall into a third group. Conditions like febrile convulsions, in which seizures are linked to certain settings, are examples of special syndromes. Approximately 2-4 percent of youngsters suffer from tissue disease-related problems.

IV. Status epilepticus

A prolonged seizure, or a period of repeated seizures with restoration of normal consciousness in the middle, lasting more than 30 minutes can be classified as epileptic status, though prolonged and repeated seizure activity lasting more than 5 to 10 minutes can also be considered epileptic status and require treatment.

Symptoms of seizure

In epilepsy, a seizure is a high-frequency discharge pulse from a group of neurons in the brain that occurs episodically. The magnitude and pattern of epileptic discharge spread throughout the brain, as well as the placement of epileptic discharges in the cortex, influence seizure clinical signs and symptoms. For example, the motor cortex generates convulsions, the hypothalamus causes peripheral autonomic discharge, and the reticular formation of the upper cerebral cords participates in loss of consciousness. (27)

Diagnosis

They have developed several tests to determine epilepsy in an individual and its type.

EEG Monitoring

The use of an electron encephalogram in the identification of different seizure disorders is quite beneficial. Even though many people who do not have epilepsy exhibit some atypical brain activity in video monitoring, EEG may be normal in some patients who yet have a clinical diagnosis of

epilepsy. To assess the type of a person's seizures, EEG is frequently utilised in conjunction with EEG.

Brain Scan

It's a crucial diagnostic technique for detecting brain cancers, cysts, and other structural abnormalities in the brain. CT (computed tomography), PET (positron emission tomography), and MRI (magnetic resonance imaging) are all popular brain scans. SPECT (single photon emission computed tomography), and MRS (multiple photon emission computed tomography) are also prevalent (magnetic resonance spectroscopy). The structure of the brain is shown via a CT scan and an MRI. The activity of brain abnormalities can be monitored using positron emission tomography and magnetic resonance imaging. The SPECT technique is used to locate seizure foci in the brain. Magnetic impulses generated by neurons are detected using MEG (magneto encephalogram). MRS is able to detect anomalies in the brain's metabolic processes.

Medical History

Medical history, including the symptoms and duration of seizures helps determine the epilepsy and type of seizures present in the person.

Blood Tests

Seizures are occasionally caused by acute toxic or stressful metabolic disorders, in which case appropriate therapy should be directed to specific abnormalities, for example, hypocalcemia. Blood samples are often screened for genetic or metabolic diseases that may be associated with seizures. Blood samples are analyzed to detect problems such as infections, lead poisoning, anemia and diabetes that can cause or trigger seizure. (31)

Management of Epilepsy

The phrases anticonvulsant and antiepileptic are interchangeable. Anticonvulsants inhibit artificially caused seizures in laboratory animals, while antiepileptic drugs are used to treat epilepsies in humans. (32,33). (Fig 1)

Chemical Class	Examples of antiepileptic drug
Barbiturates	Phenobarbitone, Mephobarbitone, Primidone
Hydantoins	Phonations, Mephenytoin
Iminostilbene	Carbamazepine
Oxazolidinedione	Trimethadione (Troxidone)
Succinimide	Ethosuximide
Aliphatic Carboxylic acid	Valproic acid (Sodium valproate)
Benzodiazepines	Clonazepam, Diazepam
Acetyl urea	Phenacemide
Newer drugs	Progabide, Vigabatrin, Gabapentin Lamotrigine, Felbamate, Topiramate, Tiagabine
Miscellaneous	Acetazolamide, Dexamphetamine

Fig 1: Classification of Anti-Epileptic drugs

Mechanism of action of antiepileptic drugs

Antiepileptic medicines work primarily through one of three mechanisms: I To lower the excitability of electrical cell membranes, particularly voltage sodium channels that are (block) dependent and responsible for the inward current that creates an action potential; (ii) Strengthen GABA-mediated synaptic inhibition by inhibiting GABA transaminase or drugs with agonist GABA direct properties; the result is an increase in the permeability of the chloride ion membrane, which reduces the excitability of the cell; (iii) Calcium channel inhibitors T-type (important convulsion control), or inhibit excitatory neurotransmitters Take glutamate, for example. (27,33,34)

CONCLUSION

As a result, anticonvulsant medication is chosen largely for its efficacy in treating certain types of epileptic seizures and epilepsy. Despite early and appropriate daily therapy with a sufficient anticonvulsant medication, a significant number of individuals with epilepsy suffer from intractable or drug-resistant epilepsy. As a result, new medications with better side effects and tolerability are needed, even if they come at the sacrifice of effectiveness when compared to present antiepileptic treatments. Despite the fact that there are several therapies accessible, there is a strong focus on novel ways. Many of these methods are centred on elucidating a genetic cellular and molecular basis of hyperexcitability, concepts that might lead to particular treatment targets.

REFERENCES

1. Stafstrom CE. Epilepsy: a review of selected clinical syndromes and advances in basic science. J Cereb Blood Flow Metab. 2006;26(8):983-1004. doi: 10.1038/sj.jcbfm.9600265, PMID 16437061.
2. Epilepsy: aetiogy (Sic), epidemiology and prognosis. World Health organization. p. 2007-06- 14; 2001; Achieved form the original [cited on 2007-5-18]. Available from: http://web.archieve.org/web/20070518073641/http://www. Available from: http://who.int/mediacentre/facsheets/fs165/en/Retrieved.
3. Commission on Epidemiology and prognosis. Epilepsia. 1993;34(4):592-96. doi: 10.1111/j.1528-1157.1993.tb00433.x, PMID 8330566.
4. Blume WT, Lüders HO, Mizrahi E, Tassinari C, Van Emde Boas W, Engel J. Glossary of descriptive terminology for ictal semiology; report of the ILAE task force on classification and terminology. Epilepsia. 2001;42(9):1212-18. doi: 10.1046/j.1528-1157.2001.22001.x, PMID 11580774.
5. Holmes GL, Ben-Ari Y. The neurobiology and consequences of epilepsy in the developing brain. Pediatr Res. 2001;49(3):320-25. doi: 10.1203/00006450-200103000-00004, PMID 11228256.
6. Gidal BE, Garnett WR. Epilepsy. In: Dipiro JT, Talbert RL, Yee GC, Matzke GR, Wells BG, Posey LM, editors Pharmacotherapy: a pathophysiologic approach. 6th ed. McGraw-Hill Companies Inc; 2005. p. 1023-46.
7. Fisher RS, van Emde Boas W, Blume W, Elger C, Genton P, Lee P et al. Epileptic seizures and epilepsy: definition proposed by the International League Against Epilepsy (ILAE) and the International Bureau for Epilepsy (IBE). Epilepsia. 2005;46(4):470-72. doi: 10.1111/j.0013-9580.2005.66104.x, PMID 15816939.
8. Epilepsy: A manual for physicians. New Delhi: Word Health Organization. Regional Office for South-East Asia; 2004. p.1.
9. The National Society for Epilepsy. What is epilepsy?; 2009. about epilepsy/what is epilepsy. Available from: http://www.epilepsynse.org.kk/ (accessed on Feb 15 2009].
10. Cascino GD. Epilepsy: contemporary perspectives on evaluation and treatment. Mayo Clin Proc. 1994;69(12):1199-211. doi: 10.1016/s0025-6196(12)65776-0, PMID 7967784.
11. Engel J Jr. Surgery for seizures. N Engl J Med. 1996;334(10):647-53. doi: 10.1056/NEJM199603073341008, 1056/NEJM199603073341008.PMID 8592530.
12. McNamara JO. Drugs effective in the therapy of the epilepsies. In: Hardman JG, Limbird LE, Goodman Gilman A, editors. Goodman and Gilman's the pharmacological basis of therapeutics. 10th ed. McGraw-Hill Companies Inc; 2001. p. 521-48.
13. Oxford English Dictionary. [retrieved Sep 8 2009].
14. Jilek-Aall L. Morbus sacer in Africa; some religious aspects ofepilepsy in traditional cultures. Epilepsia. 1999;40(3):382-86. doi: 10.1111/j.1528-1157.1999.tb00723.x, PMID 10080524.
15. Rho JM, Sankar R, Cavazos JE. Epilepsy: scientific foundations of clinical practice. New York: Marcel Dekker; 2004.
16. Hirtz D, Thurman DJ, Gwinn-Hardy K, Mohamed M, Chaudhuri AR, Zalutsky R. How common are the 'Common' neurologic disorders Neurology. Neurology. 2007;68(5):326-37. doi: 10.1212/01.wnl.0000252807.38124.a3, PMID 17261678.
17. Sridharan R. Epidemiology of epilepsy. Curr Sci. 2002;82(6):664-70.
18. Hanna NJ, Black M, Sander JW et al. The national sentinel audit of epilepsy related death. London: Stationary Office; 2002. p. 1-135.
19. Marieb EN. Human anatomy and physiology. 6th ed. New Delhi: Pearson Education Inc and Dorling Kindersley Publishing Inc; 2006. p. 430-88.
20. Frucht MM, Quigg M, Schwaner C, Fountain NB. Distribution of seizure precipitants among epilepsy syndromes. Epilepsia. 2000;41(12):1534-39. doi: 10.1111/j.1499-1654.2000.001534.x, PMID 11114210.
21. Herzog AG, Harden CL, Liporace J, Pennell P, Schomer DL, Sperling M et al. Frequency of catamenial seizure exacerbation in women with localization-related epilepsy. Ann Neurol. 2004;56(3):431-34. doi: 10.1002/ana.20214, PMID 15349872.
22. Lowenstein DH. Seizures and epilepsy. In: Kasper DL, Braunwald E, Fauci AS, Hauser SL, Longo DL, Jameson JL, editors. Harrison's principles of internal medicine. 16th ed. Vol. 2. McGraw-Hill Companies Inc; 2005. p. 2357-72.
23. Meisler MH, Kearney JA. Sodium channel mutations in epilepsy and other neurological disorders. J Clin Invest. 2005;115(8):2010-17. doi: 10.1172/JCI25466, PMID 16075041.
24. Commission on classification and Terminology of the International League Against Epilepsy. Proposal for revised clinical and electroencephalographic classification of epileptic seizures. Epilepsia. 1981;22(4):489-501. doi: 10.1111/j.1528-1157.1981.tb06159.x, PMID 6790275.
25. Commission on Classification and Terminology of the International League against Epilepsy. Proposal for revised classification of epilepsies and epileptic syndromes. Commission on Classification and Terminology of the International League Against Epilepsy. Epilepsia. 1989;30(4):389-99. doi: 10.1111/j.1528-1157.1989.tb05316.x, PMID 2502382.
26. Porter RJ, Meldrum BS. Antiseizure drugs. In: Katzung BG, editor Basic and clinical pharmacology. 10th ed. New York: McGraw-Hill Companies Inc; 2006. p. 378.
27. Rang HP, Dale MM, Ritter JM, Moore PK. Pharmacology. 5th ed. New Delhi: Churchill Livingstone Reed Elsevier India (P) Ltd; 2006. p. 550-60.
28. Tripathi KD. Essential of medical pharmacology. 5th ed. New Delhi: Jaypee Brothers Medical publishers (P) Ltd; 2003. p. 369-80.
29. Guyton AC, Hall JE. Text book of medical physiology; Elsevier a division of Reed Elsevier India (P) Ltd. 11th ed; 2007. p. 743-47.
30. Sweetman SC. Martindale the complete drug reference. 33rd ed. London: Pharmaceutical Press; 2002. p. 338-69.

31. Wolf P. Wolf P of Cabbages and kings: some consideration on classifications, diagnostic schemes, semiology and concepts. Epilepsia. 2003;44(1):1-4; discussion 4. doi: 10.1046/j.1528-1157.2003.09202_2.x, PMID 12581219.
32. Block JH, Beale JM. Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry. 11th ed. Lippincott Williams & Wilkins; 2010. p. 503.
33. Bennett PN, Brown MJ. Clinical pharmacology. New Delhi: Elsevier a division of Reed Elsevier India (P) Ltd. 9th ed; 2006. p. 413-22.
34. Rall TW, Schleifer LS. Drugs effective in the therapy of the epilepsies. In: Goodman Gilman A, Goodman LS, Rall TW, Murad F, editors Goodman & Gilman's the pharmacological basis of therapeutics. 7th ed. New York: Macmillan Publishing Company; 1985. p. 446-72.