

Anesthetic Management Of Patients With Epilepsy

Essay

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AED	Antiepileptic drugs
AMPA	Alfa-amino-3-hydroxyl-5-methylisooxazole-4-propionic acid
ATP	Adenosine triphosphate
BDZ	Benzodiazepines
Ca⁺⁺	Calcium ions
CBZ	Carbamazepine
Cl⁻	Chloride ions
CMV	Cytomegalo virus
CNS	Central nervous system
CSF	Cerebrospinal fluid
CT-scan	Computer assisted tomography scan
DBS	Deep Brain Stimulation
ECG	Electrocardiograph
EEG	Electroencephalograph
ESR	Erythrocyte sedimentation rate
ETCO₂	End-tidal carbon dioxide
FDA	Food and Drug Administration
GABA^A	γ -Amino butyric acid-A subunit
GABA^B	γ -Amino butyric acid-B subunit
GAD	Glutamic acid decarboxylase

GBP	Gabapentin
GCSE	Generalized convulsive status epilepticus
GTCS	Generalized tonic clonic seizure
H⁺	Hydrogen ions
HIV	Human immunodeficiency virus
ICP	Intracranial pressure
ICU	Intensive care unit
ILAE	International League Against Epilepsy
ILCOR	International Liaison Committee of Resuscitation
IM	Intramuscular
IPSP	inhibitory post-synaptic potential
ISAP	Intra-carotid Sodium Amobarbital Procedure
IV	Intravenous
K⁺	Potassium ions
LEV	levetiractam
LTG	Lamotrigine
MAC	Minimum alveolar concentration
MRI	Magnetic Resonance Imaging
N₂O	Nitrous oxide
Na⁺	Sodium ions
NIBP	Non-invasive blood pressure
NMDA	N-methyl-D-aspartate

NT	Neurotransmitter
OXC	Oxcarbazepine
PCO	Polycystic ovary
PDS	Paroxysmal depolarization shift
PE	Phenytoin Equivalent
PET	Positive Emission Tomography
PHB	Phenobarbital
PHT	Phenytoin
POSTS	Posterior Occipital Sharp Transients of Sleep
SE	Status Epilepticus
SPECT	Single Photon Emission Computerized Tomography
SPO₂	Oxygen saturation
SUDEP	Sudden Unexpected Death of Epilepsy
SV₂A	Synaptic vesicle protein 2A
TGB	Tiagabine
UCL	University College in London
VGB	Vigabatrin
VNS	Vagus Nerve Stimulation
VPA	Valproic acid
WBC	White Blood cells count
ZNS	Zonisamide

المعالجة التخديرية لحالات مرضى الصرع

رسالة

توطئة للحصول على درجة الماجستير فى التخدير

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Introduction

Epilepsy is as old as mankind. It was first described over 3000 years ago in Babylon (ancient Iraq). Seizures were attributed by ancient Greeks to the goddess of the moon “Selene”. About 2500 years ago, Hippocrates (the father of medicine) rejected the ideas regarding the divine etiology of epilepsy and introduced the electrical and magnetic phenomenon responsible for epilepsy, however, his ideas were discarded and the mystical and supernatural beliefs dominated (*Pierce, 2002*).

Epilepsy is the most common neurological disorder. It is defined as recurrent, unprovoked seizures, caused by excessive synchronous neuronal activity in the brain, Mechanisms of seizures are multiple and often appear to diverse, however, one principle is often discussed is that seizures arise when there is disruption between excitation and inhibition mechanisms that control neuronal discharge of action potential in the brain (*Rho et al, 2004*).

The most commonly used technique for diagnosis of epilepsy is the EEG, which was discovered on 1929 by the German psychiatrist Hans Berger. But because seizures are usually sudden, temporary changes in the electrical function of the brain, careful history taking from a witnessing companion to the patient is the key for diagnosis of epilepsy (*Richard, 2007*).

Unfortunately, patients with epilepsy are exposed to many hazards due to seizure activity like falling, drowning or complications of epilepsy itself like status epilepticus where

seizures are prolonged and patients may need to be hospitalized, or SUDEP (*Tomson et al, 2008*).

Management of patients with epilepsy is often challenging, as the goal of therapy is to completely control seizures without producing any unacceptable side effects, as most antiepileptic drugs usually produce medical and psychiatric side effects. That's why monotherapy is preferred in controlling of seizures (*Gidal et al, 2009*).

When surgery is contemplated the role of the anesthesiologist is paramount. Conducting safe anesthesia requires a high degree of preparation, and attention to details. Then the choice of anesthetic agents and anesthetic techniques are the second step (*Bahgat and Dash, 2006*).

Epilepsy is as old as mankind. One of the oldest descriptions of secondarily generalized tonic clonic seizures was recorded over 3000 years ago in Babylon (ancient Iraq). The Greeks attributed seizures to the goddess of the moon “Selene” (*Eadie and Bladin, 2001*).

Hippocrates (the father of medicine) wrote the first book about epilepsy, entitled “On sacred Disease” about 2500 years ago, he rejected the ideas regarding the divine etiology of epilepsy and concluded that the cause was abnormal brain consistency, but Hippocrates teachings were forgotten, and divine etiologies again dominated beliefs about epileptic seizures. For centuries epilepsy was considered a curse of the gods, or worse (*Pierce, 2002*).

What is Epilepsy:

Epilepsy is a common chronic neurological disorder, characterized by recurrent, unprovoked seizures; these seizures are transient signs and/or symptoms of abnormal, excessive synchronous neuronal activity in the brain (*Fisher et al, 2005*).

Seizure is any abnormal clinical event, such as abnormal behavior or movement, caused by electrical discharge in the brain, whilst *epilepsy* is the tendency to have recurrent seizures. Therefore, seizures are a symptom of brain disease rather than a disease itself. A single seizure is not epilepsy, but is an indication for investigation (*Pellock, 2007*).

Seizures are a symptom of epilepsy, but not all people who appear to have seizures, have epilepsy. Seizures of epilepsy should be unprovoked seizures where provoked seizures are single seizures that may occur as a result of trauma, hypoglycemia, high fever, and alcohol or drug abuse. Also seizures of epilepsy should be differentiated from non-epileptic seizures (also called pseudo-seizures) which are not accompanied

by abnormal electrical activity in the brain, but may be caused by psychological issues or stress (*Beghi, 2009*).

Epidemiology:

Epilepsy is one of the most common, serious, neurological disorders. In fact, it is considered the second most common after stroke (*Hirtz et al, 2007*).

Prevalence: Prevalence is the ratio of those with a certain disease to the entire population. Since, epilepsy is a chronic disease, therefore it has a high prevalence rate; epilepsy is more common in developing countries than in the developed ones. Racial differences were not reported. The prevalence of active epilepsy is roughly 5-10 per 1000 people. Up to 5% of people experience non-febrile seizures at some point in life (*Picot et al, 2008*).

Men											
Age	0-4	5-15	16-24	25-34	35-44	45-54	55-64	65-74	75-84	85+	Total
Prevalence per 1,000	1.8	4.4	6.6	7.9	8	9.4	9.5	10.9	13.9	15.1	
Women											
Age	0-4	5-15	16-24	25-34	35-44	45-54	55-64	65-74	75-84	85+	Total
Prevalence per 1,000	1.8	4.1	6.9	7.9	7.8	8.7	9	10.2	9.9	11	

Table (1): Represents epilepsy prevalence according to gender and age group (*The Joint Epilepsy Council, 2005*)

Incidence: Incidence is the rate at which new cases of a disease occur within a given period (*e.g.* a year) in a given population. In case of epilepsy, the annual incidence is usually calculated per 100,000 populations. In all known surveys the annual incidence is

highest in the youngest age groups, decreases during childhood, diminishes among adults and rises again in the old age. Epilepsy's approximate annual incidence rate is 40-70 per 100,000 populations in industrialized countries and 100-190 per 100,000 populations in resource poor countries. It is noticed that socio-economically deprived people are at higher risk while, in industrialized countries, the incidence rate decreased in children but increased among the elderly (*Banerjee and Hauser, 2008*).

Causes:

Epilepsy may develop after a particular identifiable cause (e.g.: asphyxia and head injury), in this case it is called *Symptomatic Epilepsy*, or it may develop without any identifiable cause, then it is called *Idiopathic Epilepsy*. In case of symptomatic epilepsy, it may be traced to various factors such as:

- 1- Head injury: Including birth injuries or head injuries later in life e.g.: car accidents that may result in permanent changes in the brain tissues *i.e.* scar tissues.
- 2- Infections: Either intracranial (e.g.: meningitis, encephalitis, or AIDS), or extracranial (e.g.: febrile illness or tetanus).
- 3- Metabolic: e.g.: hypocalcemia or hypoglycemia.
- 4- Anoxia: Including prenatal injuries where the fetus is susceptible to brain damage caused by an infection of the mother, poor nutrition, or oxygen deficiency. About 20% of seizures in children are associated with cerebral palsy or other neurological abnormalities.
- 5- Degenerative disease: e.g.: dementia which is a leading cause of epilepsy among elderly.
- 6- Circulatory disturbances: e.g.: Stroke which is responsible for half of epilepsy cases in those over the age of 65.
- 7- Developmental disorders: Epilepsy can be associated with other developmental disorders such as autism and Down syndrome.
- 8- Space occupying lesions: e.g.: tumor or hemorrhage.
- 9- Genetic influence: Some types of epilepsy run in families, making it likely that there is a genetic influence (*Devinsky, 2008*).

Genetic, congenital and developmental conditions are mostly associated with epilepsy among younger patients, tumors are more likely over 40, head trauma and central nervous system infections may occur at any age (*Hirtz et al, 2007*).

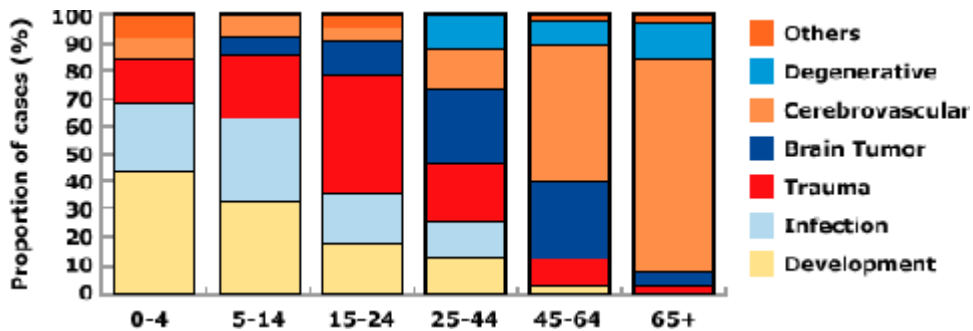


Figure (1): represents epidemiology of epilepsy according to etiology (*Annegers, 2001*).

Pathophysiology:

A general definition for the word “seizure” is abnormal, synchronous excitation of a neuronal population. Seizures, typically last for seconds or minutes but they can be prolonged in case of status epilepticus. Importantly, the clinical manifestations vary; some seizures may not involve muscular contractions (convulsions) at all (*Scharfmann and Pedley, 2006*).

Mechanisms of seizures are multiple and often appear so diverse. However, one principle that is often discussed is that seizures arise when there is a disruption of mechanisms that normally create a balance between excitation and inhibition. Thus, normally there are controls that keep neurons from excessive action potential discharge, but there are also mechanisms that facilitate neuronal firing, so that the nervous system can function appropriately. Therefore, any disruption in the mechanisms can lead to occurrence of seizure (*Rho et al, 2004*).