Anaesthesia for epilepsy surgery

Essay

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By

Ibrahim Kamel Almashad

***M.B.B.Ch*,**

Faculty of Medicine, Tanta University

Under supervision of

Prof / **Mohamed Abd-Elkhalek Mohamed**

Professor of anaesthesiology and General intensive care medicine

Faculty of Medicine-Ain Shams University

Prof / **Adel Mikhail Fahmy**

Professor of anaesthesiology and General intensive care medicine

Faculty of Medicine-Ain Shams University

Dr/ **Ahmed Salah El-din Ahmed**

Lecturer of anaesthesiology and General intensive care medicine

Faculty of Medicine-Ain Shams University

Faculty of Medicine

Ain Shams University

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List of Abbreviations

ACTH	Adreno Cortico Trophic hormone.
AEDs	Anti epileptic drugs.
AMPA	The alpha-amino-3-hydroxy-5-methylisoxazole-4-propionic acid.
AMTR	Antero- medial Tempral lobe Resection.
CSF	Cerebro Spinal Fluid
CT	Computerized Tomography.
ECOG	Electro cortico Graphy.
ECT	Electro compulsive therapy.
EAA	Excitatory Amino acids Agonist
EEG	Electro Encephalo gram.
GA	General Anesthesia.
GABA	Gama Amino Butyric Acid.
GAD	Glutamic acid decarboxylase.
GCSE	Generlaized Convulsive Status epilepticus.
HHE	Hemiconvulsion-Hemiplegia-Epilepsy.
LC	Locus Ceruleus.
MAC	Minimum Alveolar Concentration.
MRI	Magnetic Resonance Imaging.
MST	Multiple Subpial Transections .
NG	Nodosa Ganglion.
NMDA	*N* -methyl-D-aspartate.
NTS	Nucleaus of Tractus Solitarius.
PB	Parabrachial nucleus .
PCS	Patient controlled sedation.
RSE	Refractory status epilepticus.
SE	Status epilepticus.
SLE	Systemic lupus erythematosus.
TGB	Tiagabine.
VGB	Vigabatrin.
VNS	Vagus nerve stimulator.

Introduction

Epilepsy is the most common serious neurological disease, with a prevalence commonly quoted as 5-10 cases per 1000 persons. Incidence varies due to a number of factors. In developed countries, it has been found to be around 50 cases per 100,000 persons per year. In developing countries, the incidence is higher (of the order of 100-190/100,000/year) for reasons which are not entirely clear. Thus from an anesthetic perspective, it is important to understand the issues of safe management of epileptics in the peri-operative period **(Perks ,et al, 2012) .**

Epilepsy may be defined as a paroxysmal, abnormal cerebral electrical discharge associated with a clinical change; taking a variety of forms, but usually including some impairment of consciousness. In simple terms, a seizure can be seen as the result of imbalance between excitatory and inhibitory neuronal activity. This leads to the generation of hyper-synchronous firing of a large number of cortical neurons **(Sander, 2003).**

Some types of epilepsy may be treated by surgical intervention like refractory epilepsy and temporal lobe epilepsy **(Ian, et al , 2011).**

Choice of anesthetic agent and other drugs used during anaesthesia should be adjusted, depending on their pharmacokinetic and pharmacological actions, in addition to their interaction with any concurrent medication the patient may be taking **(Smith ,1996).**

In the peri-operative management of epileptic patients, it is important, whenever possible to insure an adequate control of the disease, being essential a careful review of medical history, especially

in regard to the evolution of the disease, factors triggering the seizures (fasting, stress, sleep deprivation, alcohol and drugs), and co-morbidities and their treatment . The presence of mental retardation, hypotonia, and risk factors for aspiration and airway obstruction should be examined **(Maranhao,2011.).**

Many of the drugs used during anaesthesia possess both proconvulsant and anticonvulsant properties, which could impact on the choice of anesthetic drugs **(Modica , et al, 1990).**

Chapter 1

Definition and types of Epilepsy.

Epilepsy

A seizure is any abnormal clinical event caused by electrical discharge from the brain, while epilepsy is a tendency to have seizures and considered as a symptom of the brain rather than a disease itself. A single seizure is not epilepsy but an indication for investigation. The recurrence of attacks after the first one approach about 70% in the first year mainly occurs in the first or second month ***(Davidson, 2010).***

PATHOPHYSIOLOGY:

In the normally functioning cortex, synchronous discharge amongst `1neighboring groups of neurons is limited by recurrent and collateral inhibitory circuits. The inhibitory transmitter gamma-amino butyric acid (GABA) is particularly important in this role and drugs which block GABA receptors provoke seizures. There are also a large number of excitatory neurotransmitters, of which acetylcholine and the amino acids glutamate and aspartate are examples. Epileptic cerebral cortex exhibits hyper synchronous repetitive discharges involving large group of neurons. Intracellular recordings show burst of rapid-action potential firing, with reduction of the Trans membrane potential (paroxysmal depolarization shift). It is likely that both reduction in inhibitory systems and excessive excitation play a part in the genesis of seizure activity. Cells undergoing repetitive epileptic discharges undergo morphological and physiological changes which make them more likely to produce subsequent abnormal discharges (kindling) ***(Maranhao , et al, 2011).***

The chief division of seizure types on physiological types is between partial (focal) seizure in which paroxysmal neuronal activity is limited to one part of cerebrum, and generalized seizure where the electrophysiological abnormality involves both hemispheres simultaneously and synchronously. If partial seizure remains localized, the symptomatology depends on the cortical are/a affected. If the consciousness is preserved the attack is called simple. If the activity involves some parts of the brain dealing with consciousness, the attack is termed complex partial seizure and further spread into the diencephalon and hence throughout the remainder of the cortex leads to secondarily generalized seizure ***(Davidson, 2010).***

In primary generalized seizures, the abnormal activity is seen to begin synchronously throughout the cortex without an initial partial onset. It probably originates in the central diencephalon mechanisms controlling cortical activation. This is recognizable on an EEG which shows spikes and waves of abnormal activity and quite often provocation of abnormalities with hyperventilation and/or photic stimulation. This may cause a major seizure identical to secondarily generalized seizure, or a more restricted clinical manifestation if the abnormal electrical activity fails to affect muscle tone. In this case there is an absence, in which consciousness is lost but the patient remains standing or sitting in an attack which may be difficult to distinguish clinically from a complex partial seizure in the temporal lobe ***(Davidson, 2010).***

Trigger factors *(Davidson, 2010)*:

- Sleep deprivation.
- Alcohol withdrawal.
- Recreational drug abuse.
- Physical and mental exhaustion.
- Flickering lights.
- Infections and metabolic disturbances.
- Uncommonly: loud noise, music, reading and hot baths.

Types of epilepsy:

The classification of epilepsy is best achieved by separately considering the clinical events, the abnormal electrophysiology, the anatomical site of seizures genesis and the pathological cause of the problem (Table-1). The clinical classification most used is the proposal by the International League against Epilepsy ***(Aminof, 2009).***

Table-1 : classifications of epilepsy

Seizure type	**. Simple partial.**	**. Tonic.**
	. Complex partial.	**. Clonic.**
	. Typical absence.	**. Atonic.**
	. Atypical absence.	**. Myoclonic.**
	. Tonic clonic.	**. Status epilepticus.**
Electrophysiology	**. Focal spikes / sharp waves.**	
	. Generalized spike and wave.	
Anatomical sites	**. Cortex.**	
	. Generalized (diencephalon).	
	. Multifocal.	
Pathological causes	**.Cerebral brain injury.**	
	.Hydrocephalus.	
	.Cerebral anoxia.	
	.Genetic.	
	Inborn errors of metabolism - Storage diseases.	
	.Drugs.	
	Antibiotics - Antimalarial - Cyclosporine - Antiarrhythmic - Amphetamines.	
	.Alcohol.	
	.Infections.	
	.Meningitis.	
	.Post infectious encephalopathy.	
	.Inflammatory diseases.	
	.Multiple sclerosis.	
	.Systemic lupus erythematous.	
	.Metabolic disorders.	
	Hypocalcaemia - Hypoglycemia - Hypernatremia - Hypomagnesaemia - Renal failure - Liver failure	

(Davidson, 2010)

CLINICAL FEATURES AND TYPES:

The focal seizures (partial) are those whose clinical manifestations indicate the involvement of a region of one cerebral hemisphere. With the spread of discharges, the focal seizures may develop into a tonic-clonic seizure. This is what is called a focal crisis with secondary generalization. The focal seizures can be classified as:

A. **Simple partial:** in this group, the epileptic phenomenon is represented by auras. Among them, are the sensory (paresthesia, pain and visceral sensations), visual, auditory, olfactory and gustatory crises. Consciousness is preserved ***(Aminof, 2009).***

B. **Complex partial:** Partial seizures may cause episodes of altered consciousness without the patient collapsing to the ground, especially if arising from the temporal (common) or the frontal lobe (less common). The patient stops what he/she is doing and stares blankly, often making rhythmic smacking movements of the lips or displaying other automatisms, such as picking at their clothes. After a few minutes the patient returns to consciousness and feel some drowsy. Immediately before developing the attack the patient may report some alterations of mood, memory and perceptions such as undue familiarity or unreality, complex hallucinations of sound, smell, taste, vision, emotional changes and visceral sensations. ***(Aminof, 2009).***

In generalized seizures, the clinical manifestations indicate involvement of both hemispheres from the beginning, and electroencephalographic discharges are bilateral. As in generalized seizures, the ascending reticular system is affected by early

discharges, and consciousness is always impaired ***(Aminof, 2009).***

The generalized seizures can be classified as:

- **Typical absence seizures (petit mal):** it consists of brief episodes of impaired consciousness, accompanied by very mild motor manifestations, such as oral and manual automatisms, blinking, increased or decreased muscle tone and autonomic signs. They last about 10 to 30 seconds, and start and end abruptly, occurring usually several times a day. They are triggered by hyperventilation, activation of such importance that failure to observe the classic crisis during hyperventilation for three to five minutes should cast doubt on that diagnosis. Absences may manifest themselves only with impairment of consciousness, with discrete clonic, tonic or atonic components, with automatisms or autonomic phenomena as incontinence (enuresis), for example ***(Shahar et al., 2007)***.

- **Atypical absence seizures:** in these crises, the impairment of consciousness is decreased, the beginning and ending are less abrupt and muscle tone is often changed they are not triggered by hyperpneia ***(Aminof, 2009)***.

- **Myoclonic seizures:** they are characterized as sudden, brief, shock-like seizures. They can affect facial or torso muscles, extremities, muscle group or isolated muscles, and can be generalized, occurring isolated or repeatedly. Myoclonic seizures commonly occur after sleep deprivation, waking or sleeping ***(Striano, et al, 2012).***