

PATHOPHYSIOLOGY OF NERVOUS SYSTEM (EPILEPSY)

For Class- B.Pharmacy 2nd Semester
Subject- Pathophysiology (BP204T)

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Seizure ??

Epilepsy??

A *seizure* is a paroxysmal event characterized by abnormal, excessive, hypersynchronous discharge of cortical neuron activity.

Epilepsy can be defined as a chronic seizure disorder or group of disorders characterized by seizures that usually recur unpredictably in the absence of a consistent provoking factor.

Epilepsy is not contagious

it is not a mental illness

or a cognitive disability.

The neurological dysfunction seen in epilepsy can :

- ✓ begin at birth
- ✓ childhood
- ✓ adolescence or
- ✓ even in adulthood



CLASSIFICATION

I. Partial seizures

A. Simple seizures

(without impairment of consciousness)

1. With motor symptoms
2. With special sensory or somatosensory symptoms
3. With psychic symptoms

B. Complex seizures

(with impairment of consciousness)

1. Simple partial onset followed by impairment of consciousness
2. Impaired consciousness at onset

C. Secondarily generalized

(partial onset evolving to generalized tonic-clonic seizures)

II. Generalized seizures

- A. Absence
- B. Myoclonic
- C. Clonic
- D. Tonic
- E. Tonic-clonic
- F. Atonic
- G. Infantile spasms

III. Unclassified seizures

IV. Status epilepticus

PARTIAL SEIZURES:

Partial seizure

Common, 80% patients

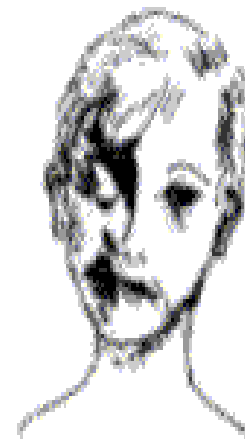
• simple partial seizures:
do not cause loss of consciousness

Signs & symptoms:

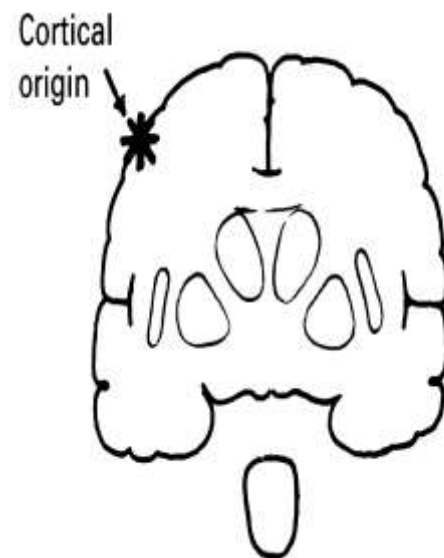
- ◆ motor – convulsive jerking, chewing motions, lip smacking
- ◆ Sensory & somatosensory – paresthesias, auras
- ◆ Automatic – sweating, flushing, pupil dilation
- ◆ Behavioural – hallucinations, dysphasia, impaired consciousness (rare).



Before the seizure.



– Jerking of the right half of the face. The patient is fully conscious.



complex partial seizures:

- **impairment of consciousness**
- **purposeless behaviour is common**
- **affected person may wander about aimlessly**
- **aggressive behaviour (violence)**
- **automatism (eg: picking at clothes)**
- **visual, auditory, or olfactory hallucinations**

GENERALIZED SEIZURES:

- *Affecting both hemispheres*
- *Diffuse*

3 types:

1) Idiopathic epilepsies

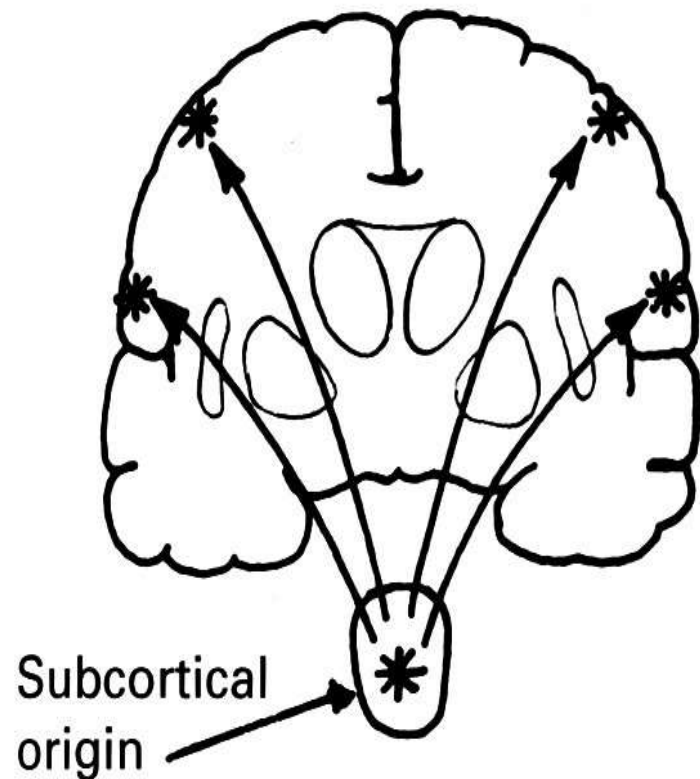
- *Age related*
- *Genetic origin*

2) Symptomatic epilepsies

- *A consequence of a known/suspected underlying disorder of CNS*

3) Cryptogenic epilepsies

- *Disorder of a hidden course*
- *Age related*



ABSENCE SEIZURES (petit mal)

- ❖ Alterations of consciousness (absence) lasting 10–30sec
- ❖ Staring (with occ. eye blinking) & loss in postural tone
- ❖ 100 or more daily
- ❖ Onset occurs from 3–16yrs, disappear by 40yrs.

MYOCLONIC:

- ❖ sudden, Involuntary jerking of facial, limb or trunk muscles, in rhythmic manner

CLONIC:

- ❖ Sustained muscle contractions alternating with relaxations

TONIC:

- ❖ Sustained muscle stiffening

TONIC-CLONIC (grand mal) : Sudden loss of consciousness

Tonic phase:

- Pt become rigid & falls to the ground
- Respiration are interrupted
- Back arches
- Lasts about 1min

Clonic phase:

- Rapid muscle jerking
- Muscle flaccidity
- Incontinence, tongue biting, tachy cardia, heavy salivation



During postictal phase:

- Head ache, confusion, nausea, drowsiness, disorientation
- May last for hours

ATONIC (drop attacks):

- Sudden loss of postural tone, pt falls to the ground
- Occur primarily in children



UNCLASSIFIED SEIZURES

NEONATAL



STATUS EPILEPTICUS:

Seizure occur repeatedly with **no** recovery of consciousness b/w attacks

CAUSES

- High fever, especially in infants
- Drug use, alcohol withdrawal
- Near-drowning or lack of oxygen from another cause
- Metabolic disturbances
- Head trauma
- Brain tumor, infection, stroke
- Complication of diabetes or pregnancy

Causes of epilepsy

- Stroke
- Brain tumor
- Brain infection
- Past head injury
- Drug use, alcohol withdrawal
- Metabolic problems
- Other neurological conditions
- High fever, especially in infants
- Genetic factors

Epilepsy may occur with

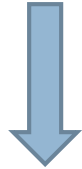
- Developmental disabilities
- Autism
- Cognitive impairments

... but the majority of people who have epilepsy do not have other impairments and live very normal lives.

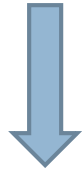
PATHOPHYSIOLOGY

Paroxysmal discharges in cortical neurons

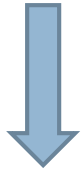
A seizure originates from grey matter of any cortical or subcortical area



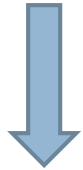
Abnormal firing of neurons



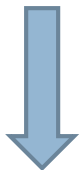
Breakdown of normal membrane conductance & inhibitory synaptic currents



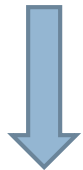
Locally



widely



Focal seizure



Generalized seizure

- Abnormality of Potassium conductance
- Defect in voltage sensitive ion channels
- Deficiency in membrane ATPase

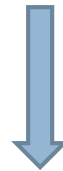


Neurone membrane instability



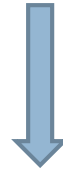
seizures

Deficiency of inhibitory neurotransmitters
Increase in excitatory neurotransmitters



promotes

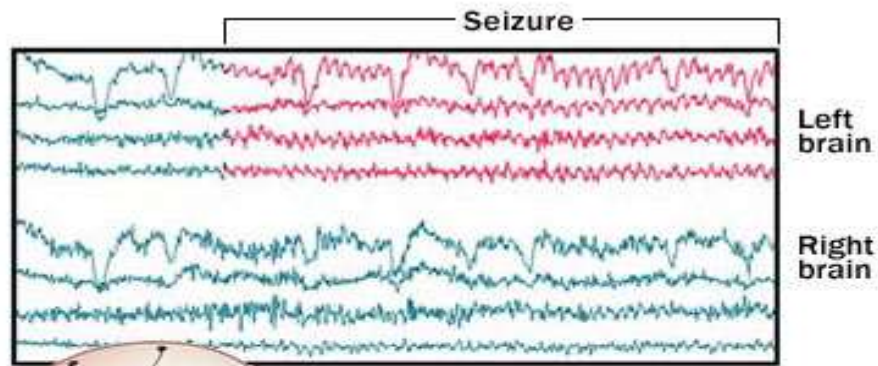
Abnormal neuronal activity



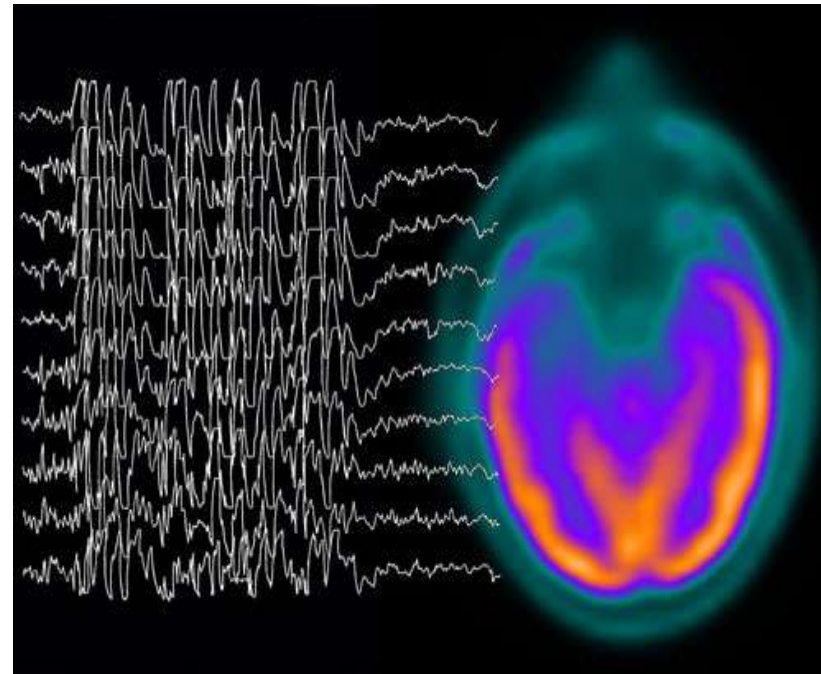
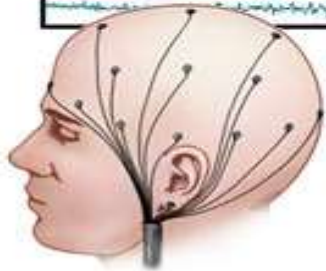
Seizure

DIAGNOSIS

- Electroencephalogram (EEG)



An electroencephalogram (EEG)



•Neurological imaging studies

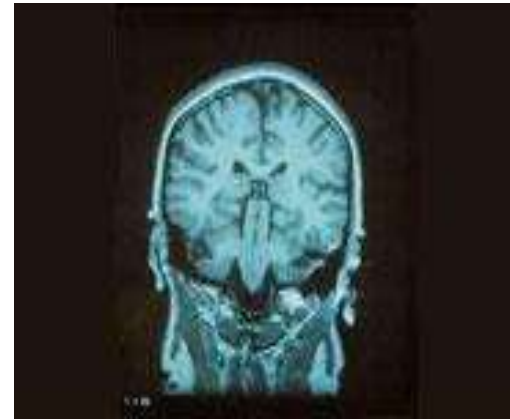
*Magnetic Resonance Imaging (MRI)

*Functional MRI (fMRI)

*Computed Tomography (CT)

*Positron emission tomography (PET)

*Single-photon emission computerized tomography (SPECT)



MANAGEMENT

Seizure type	Choice 1	Choice 2	Choice 3	Choice 4
Simple partial	Carbamazepine (alone/comb.)	Phenytoin	Primidone Lamotrigine Oxcarbazepine Lacosamide	Gabapentin Levetiracetam Zonisamide Tiagabine
Complex partial	Carbamazepine Lamotrigine	Phenytoin	Phenobarbital Zonisamide Oxcarbazepine	Valproic acid Primidone Topiramate* Tiagabine Vigabatrin**
Primary generalized	Valproic acid	Carbamazepine	Phenytoin	Phenobarbital
Tonic-clonic	Lamotrigine	-	Valproic acid	Topiramate Tiagabine
Absence	Lamotrigine* Ethosuximide	Zonisamide Valproic acid	-	-
Myoclonic atonic	Valproic acid	Clonazepam	Zonisamide	Felbamate* (alone/comb.)
Status epilepticus	Diazepam	Phenytoin	Phenobarbital	-
Psychomotor	Phenytoin	-	-	-
Lennox-Gastaut syndrome	Valproic acid Felbamate	Lamotrigine Topiramate Rufinamide	-	-