PATHOPHYSIOLOGY OF NERVOUS SYSTEM (EPILEPSY)

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

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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
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:
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).
complex partial seizures:

- impairment of consciousness
- purposeless behaviour is common
- affected person may wander about aimlessly
- aggressive behaviour (violence)
- automatism (e.g., 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 10–30 sec
- Staring (with occ. eye blinking) & loss in postural tone
- 100 or more daily
- Onset occurs from 3–16 yrs, disappear by 40 yrs.

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 1 min

Clonic phase:
- Rapid muscle jerking
- Muscle flaccidity
- Incontence, tongue biting, tachy cardia, heavy salvation
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

Epilepsy may occur with:

- Metabolic problems
- Other neurological conditions
- High fever, especially in infants
- Genetic factors

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

- Developmental disabilities
- Autism
- Cognitive impairments
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)
Neurological imaging studies

- Magnetic Resonance Imaging (MRI)
- Functional MRI (fMRI)
- Computed Tomography (CT)
- Positron emission tomography (PET)
- Single-photon emission computerized tomography (SPECT)
<table>
<thead>
<tr>
<th>Seizure type</th>
<th>Choice 1</th>
<th>Choice 2</th>
<th>Choice 3</th>
<th>Choice 4</th>
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</thead>
<tbody>
<tr>
<td>Simple partial</td>
<td>Carbamazepine (alone/comb.)</td>
<td>Phenytoin</td>
<td>Primidone Lamotrigine Oxcarbazepine Lacosamide</td>
<td>Gabapentin Levetiracetam Zonisamide Tiagabine</td>
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<tr>
<td>Complex partial</td>
<td>Carbamazepine Lamotrigine</td>
<td>Phenytoin</td>
<td>Phenobarbital Zonisamide Oxcarbazepine</td>
<td>Valproic acid Primidone Topiramate* Tiagabine Vigabatrin**</td>
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<tr>
<td>Primary generalized</td>
<td>Valproic acid</td>
<td>Carbamazepine</td>
<td>Phenytoin</td>
<td>Phenobarbital</td>
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<td>Tonic-clonic</td>
<td>Lamotrigine</td>
<td>-</td>
<td>Valproic acid</td>
<td>Topiramate Tiagabine</td>
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<tr>
<td>Absence</td>
<td>Lamotrigine* Ethosuximide</td>
<td>Zonisamide Valproic acid</td>
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<tr>
<td>Myoclonic atonic</td>
<td>Valproic acid</td>
<td>Clonazepam</td>
<td>Zonisamide</td>
<td>Felbamate* (alone/comb.)</td>
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<tr>
<td>Status epilepticus</td>
<td>Diazepam</td>
<td>Phenytoin</td>
<td>Phenobarbital</td>
<td>-</td>
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<td>Psychomotor</td>
<td>Phenytoin</td>
<td>-</td>
<td>-</td>
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<td>Lennox-Gastaut syndrome</td>
<td>Valproic acid Felbamate</td>
<td>Lamotrigine Topiramate Rufinamide</td>
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