

28 Pathophysiology of Epilepsy

CNS



Sources:
Female Slides

Seizures are symptoms of a disturbance in brain function , which can be due to epilepsy or other causes

A seizure is a sudden surge in electrical activity in the brain that causes an alteration in sensation, behavior, or consciousness

Seizures

Abnormal , excessive electrical discharge of a group of neurons within the brain.
When a person has recurrent (2 or more) , unprovoked seizures → " epileptic " .
Hence seizures can be a **symptom** of epilepsy .

What is the difference between seizures and epilepsy ?

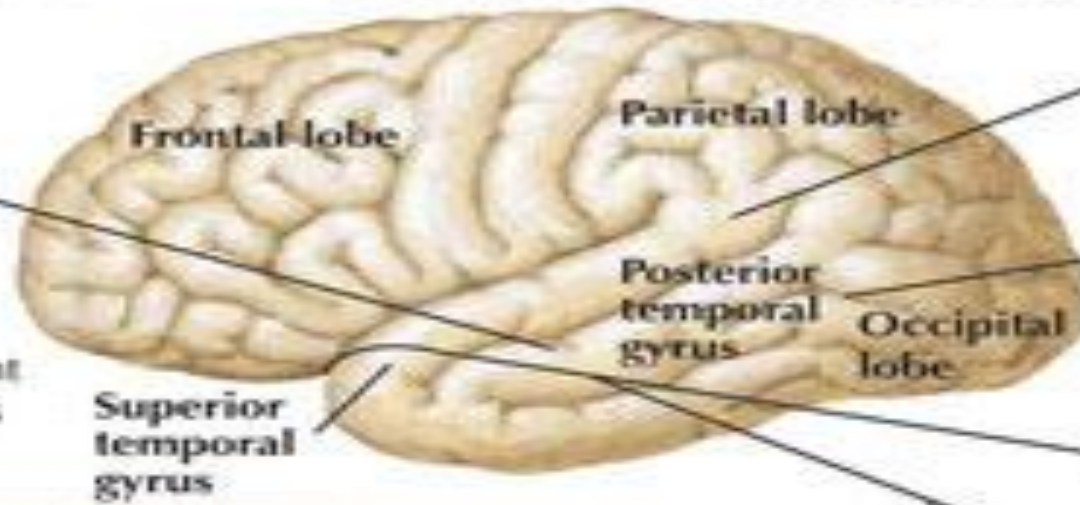
Seizures are a symptom of epilepsy. But not all people who appear to have seizures have epilepsy; epilepsy is a group of related disorders characterized by a tendency for recurrent seizures.

Complex Partial Seizures

Impairment of consciousness:
cognitive, affective symptoms



Dreamy state; blank, vacant expression; déjà vu; jamais vu; or fear



Formed auditory hallucinations. Hears music etc



Formed visual hallucinations. Sees house, trees that are not there



Bad or unusual smell

Olfactory hallucinations

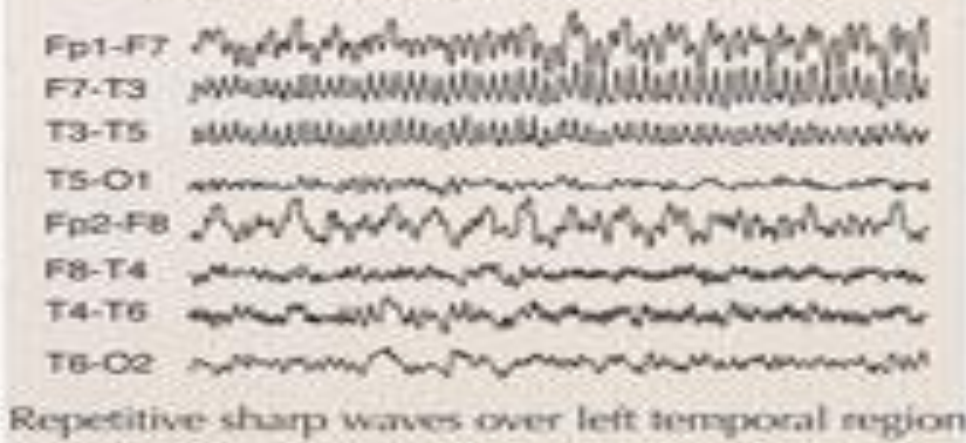


Psychomotor phenomena. Chewing movements, wetting lips, automatisms (picking at clothing)



Dysphasia

EEG: left temporal lobe seizure



- These seizures can be motor seizures that cause change in muscle activity. For example, a person may have abnormal movements such as jerking of a finger or stiffening of part of the body.
- These seizures can be sensory seizures that cause changes in any one of the senses. For example, People with sensory seizures may smell or taste things that aren't there
- These seizures can be autonomic seizures that cause changes in the part of the nervous system that automatically controls bodily functions. For example, These common seizures may include strange or unpleasant sensations in the stomach, chest, or head; changes in the heart rate or breathing; sweating; or goose bumps.
- These seizures can be psychic seizures that change how people think, feel, or experience things. For example problems with memory, They may suddenly feel emotions like fear, depression, or happiness with no outside reason

Classification of Seizures

Partial (or Focal) Seizures

- **Simple Partial**
 - Awareness not impaired
- **Complex Partial**
 - Awareness impaired/lost
- **Partial Seizures secondarily generalizing**

Generalized Seizures

- **Absence** *Brief loss of consciousness
 - Typical
 - Atypical
- **Myoclonic** *Sporadic (isolated), jerking movements
- **Clonic** *Repetitive, jerking movements
- **Tonic** *Muscle stiffness, rigidity
- **Tonic-Clonic**
- **Atonic** *Loss of muscle tone

Seizures

Partial seizures

Generalized seizures

Simple partial seizures

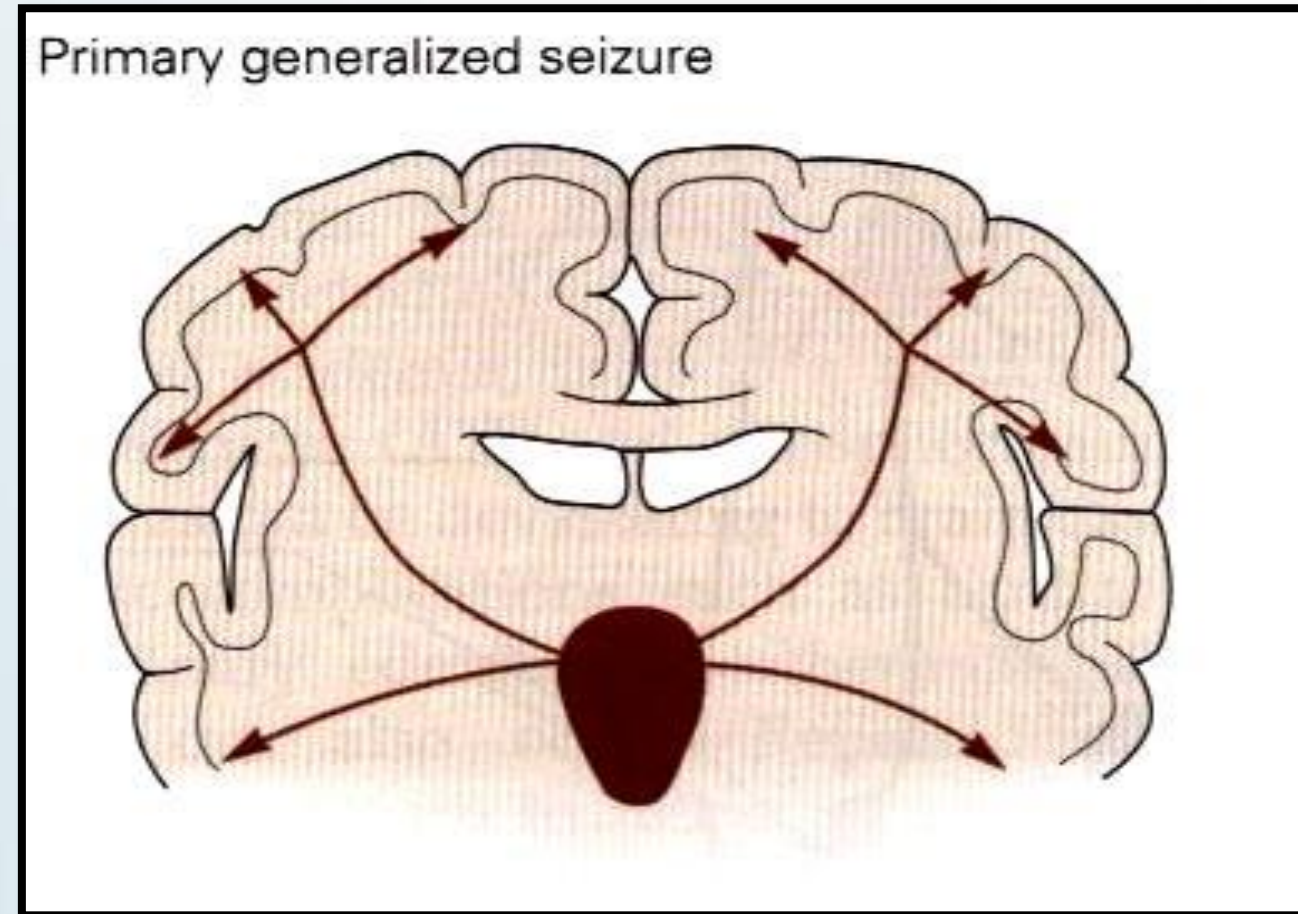
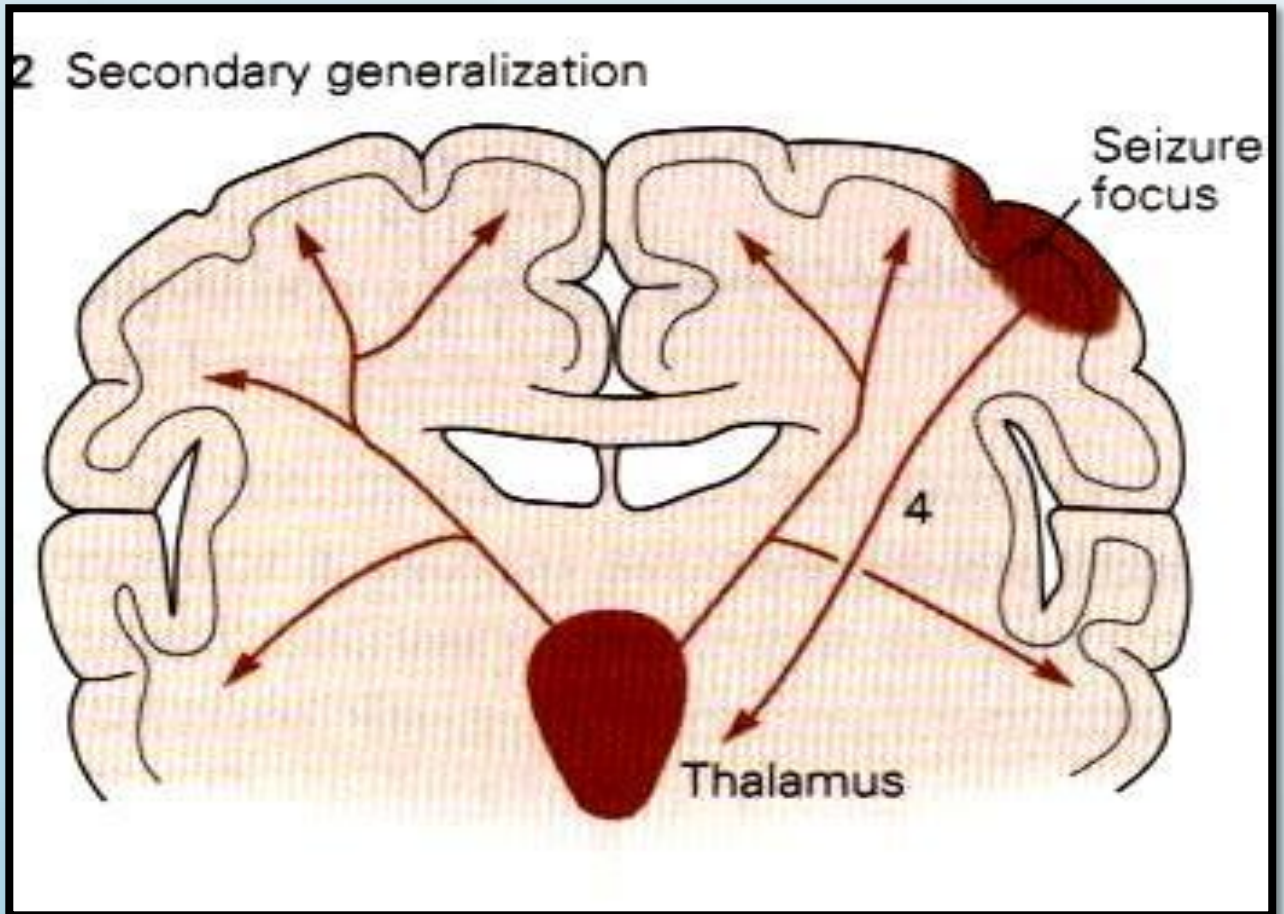
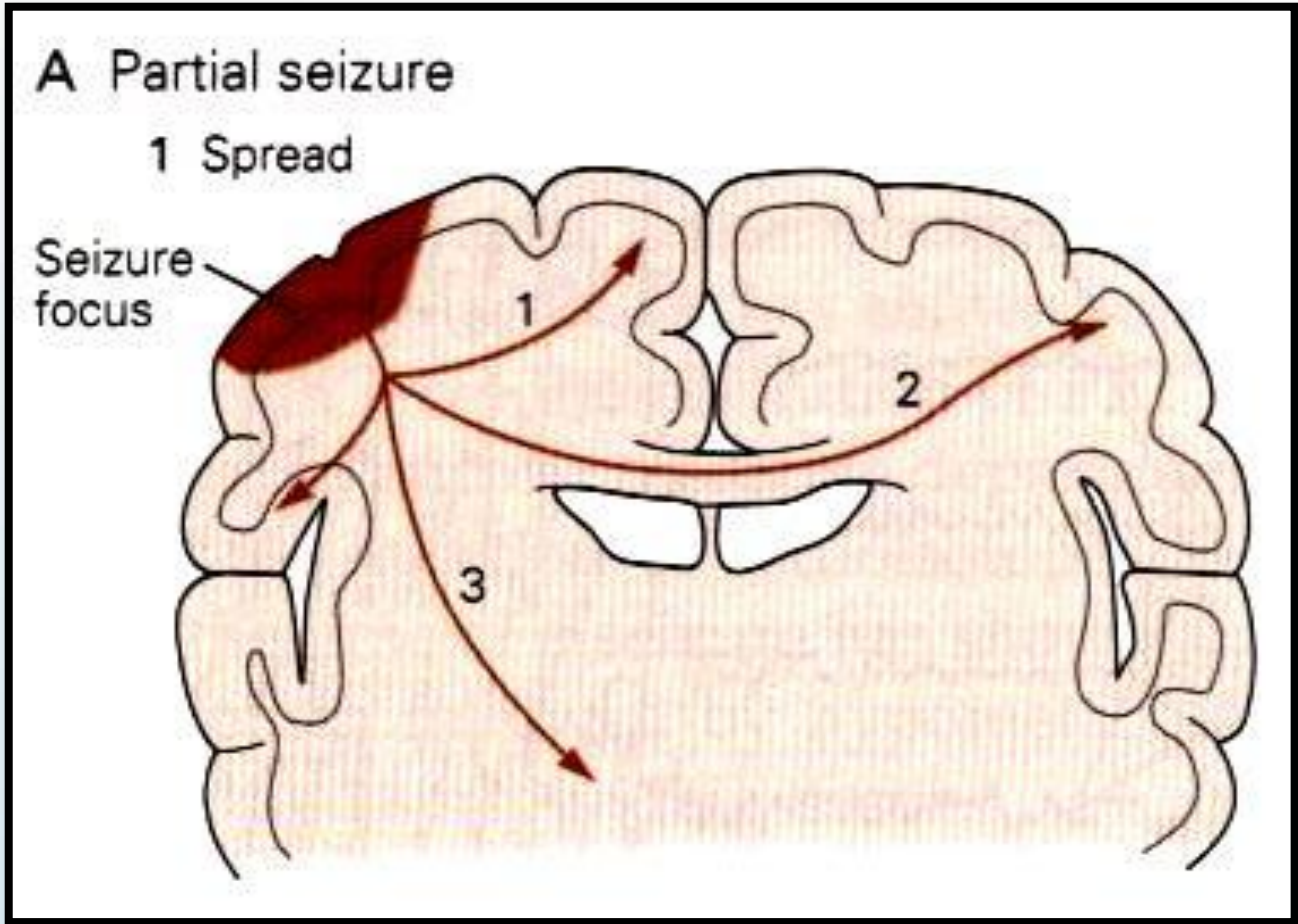
Complex partial seizures

Generalized tonic-clonic seizures
(Grand Mal epileptic seizure)

Absence seizures
(Petit mal epileptic seizures)

Seizure Classification & Clinical Manifestations

<u>Partial seizures</u>		<u>Generalized seizures</u>	
Focal / Partial seizures → their onset (start) is limited to part of the cerebral hemisphere		Generalized seizures → those that involve the cerebral cortex diffusely (whole of it) from the beginning (generalized seizures)	
Simple partial seizures	Complex partial seizures	Generalized tonic-clonic seizures (Grand Mal epileptic seizure)	Absence seizures (Petit mal epileptic seizures)
Manifest motor, somatosensory, and psychomotor symptoms <u>without impairment of consciousness</u>	Manifest <u>impairment of consciousness</u> with or without simple partial symptoms	Manifest a <u>loss of consciousness</u> convulsive	Manifest a <u>loss of consciousness</u> non-convulsive



The onset of a seizure

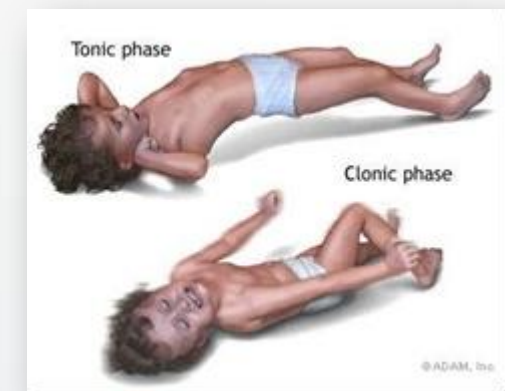
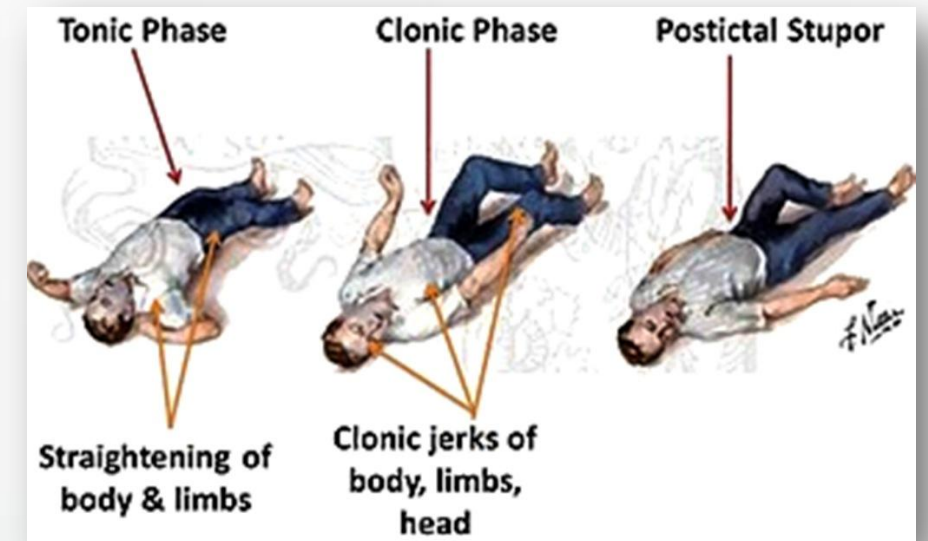
Small group of abnormal neurons undergo:

- Prolonged depolarization
- Rapid firing of repeated action potentials

Spread to adjacent neurons or neurons with which they are connected into the process.

A clinical seizure occurs when the electrical discharges of a large number of cells become abnormally linked together, creating a storm of electrical activity in the brain.

Seizures may then spread to involve adjacent areas of the brain or through established anatomic pathways to other distant areas.



1. Generalized tonic-clonic (grand mal) seizure

+/- aura

- ✓ peculiar sensation or dizziness .
- ✓ sudden onset of seizure with **loss of consciousness**

tonic phase :

- ✓ Rigid muscle contraction in which clenched jaw and hands
- ✓ eyes open with pupils dilated .
- ✓ lasts 30 to 60 seconds .

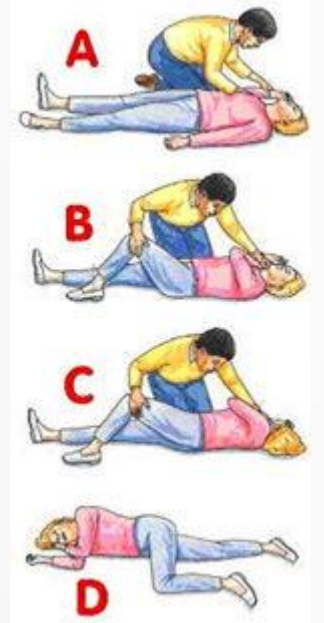
clonic phase:

- ✓ **Rhythmic**: jerky contraction and relaxation of all muscles .
 - ✓ **incontinence and frothing at the lips.**
 - ✓ may bite tongue or cheek .
 - ✓ lasts several minutes
- إذا استمر أكثر من ٢٠ دقيقة يجب ادخاله الى المستشفى لانه قد يؤدي الى الوفاة .

+/- postictal state:

Sleeping or dazed for up to several hours. (we put the patient in recovery position)

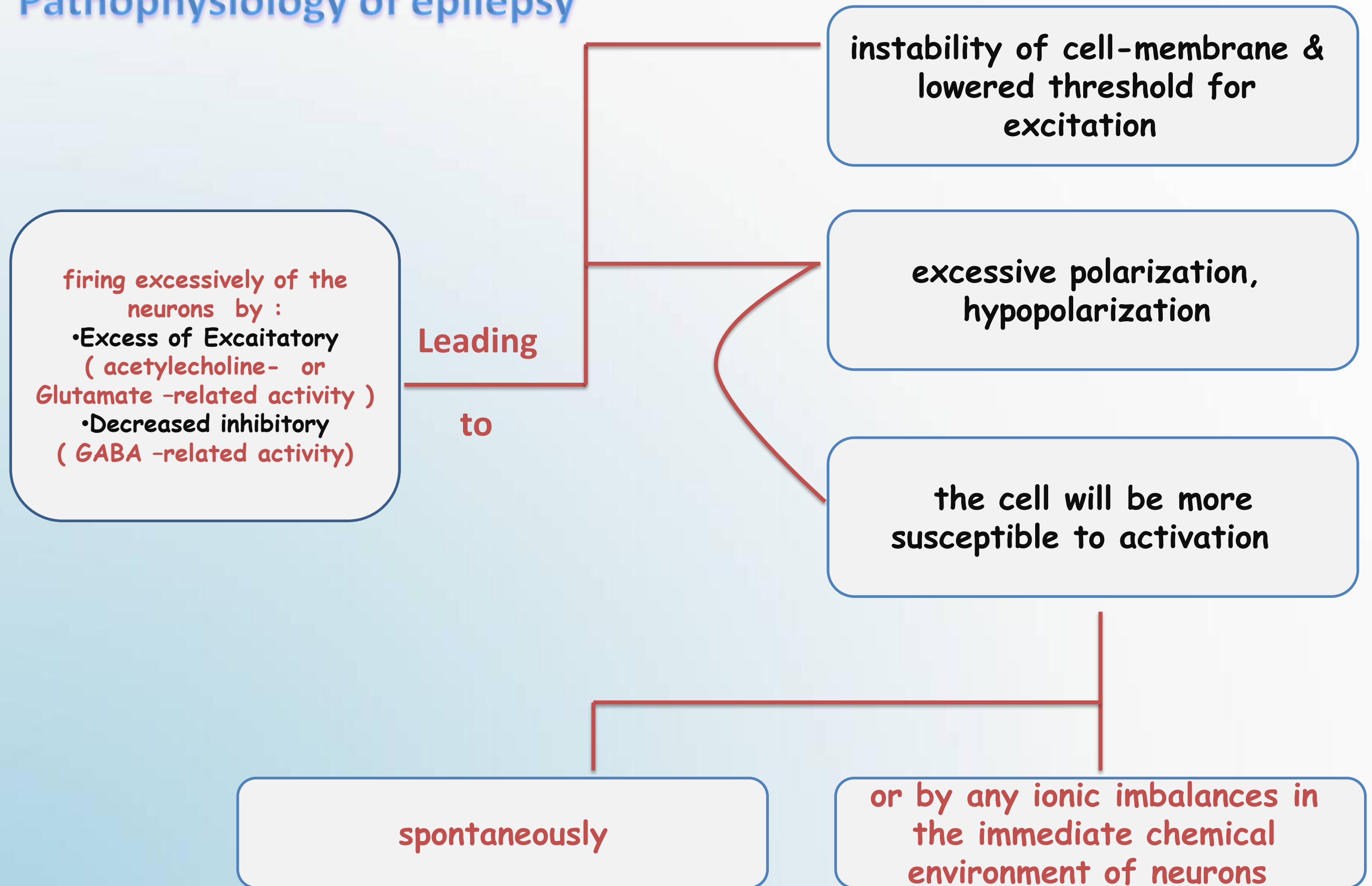
Recovery Position



2. Absence (petit mal) seizure

- ✓ . Loss of contact with environment **for 5 to 30 seconds.**
- ✓ Appears to be day dreaming or may roll eyes, nod head, move hands, or smack lips.
- ✓ Resumes activity and is **not aware of seizure.**

Pathophysiology of epilepsy



Clinical manifestations accompanying a seizure :

- ✓ indescribable bodily sensations,
- ✓ "pins and needles" sensations,
- ✓ smells or sounds,
- ✓ fear or depression,
- ✓ hallucinations,
- ✓ momentary jerks or head nods,
- ✓ staring with loss of awareness, and
- ✓ Convulsions → (i.e., involuntary muscle contractions) lasting seconds to minutes.

➤ clinical manifestations of a seizure reflect the area of the brain from which the seizure begins (i.e., seizure focus) and the spread of the electrical discharge. الاعراض تعتمد على مكان وجود النوبة في المخ وأماكن انتشارها

Causes of epilepsy :

- ✓ Genetic abnormalities-increasing a person's susceptibility to seizures_that are triggered by an environmental factor
- ✓ run in families (inherited)
- ✓ Some types linked to genes
- ✓ Several types of epilepsy have now been linked to defective genes for ion channels, the "gates" that control the flow of ions in to and out of cells and that regulate neuron signaling.

Diagnosis :

✓ Electroencephalogram (EEG)

-Diagnosis

-classifying seizures

That will help in therapeutic decisions

✓ In EEG we will see spikes or sharp waves (Epileptiform EEG patterns)

✓ Focal epileptiform discharges indicate focal epilepsy .

✓ Generalized epileptiform activity indicates a generalized form of epilepsy.





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