Epilepsy

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- ➔ Definition of epileptic seizure, provoked seizure and epilepsy.
- ➔ Status epilepticus.
- ➔ Frequent causes of seizure and risk factors.
- ➔ Triggers of seizures in epileptic patient.
- ➔ Epilepsy classification and seizure semiology.
- ➔ Diagnosis of a seizure
- ➔ Seizure vs syncope
- ➔ Approach to seizure disorder (History, examination, investigation))
- ➔ Medical and surgical management of epilepsy.
- ➔ How to select antiepileptic medications.
- ➔ When to stop antiepileptic medications.

References:
Slides - Black
Doctor's notes - Red
Davidson / Step up
Extra explanation - Grey

Optional:

p1178 to p1186

Editing file

Epileptic seizure vs Provoked seizure vs Epilepsy.

- ✓ **Epileptic seizure:** transient occurrence of signs and symptoms of sudden changes in neurological function due to abnormal excessive ,synchronous discharge of cortical neurons.
- ✓ **Provoked seizures:** is occur in the setting of acute medical and neurological illnesses in people with no prior history of seizures (Infection, medication etc..) they usually do not occur again and the patients are not said to have epilepsy.

- ✓ **Epilepsy:** an ongoing liability (vulnerability) to recurrent epileptic seizures. **Recurrence of two or more unprovoked seizures to make the diagnosis.**

- ✓ **Status epilepticus (SE):** defined as recurrent convulsions that last for more than 20 minutes and are interrupted by only brief periods of partial relief.
- ✓ Status epilepticus could be the occurrence of or two or more seizures without recovery of consciousness between them over a similar period. (even if less than 20 min)
- ✓ Any type of seizure can lead to SE, the most serious form of status epilepticus is the generalized tonic-clonic type.

Seizure Semiology
"the study of signs"

Description of a seizure helps classify the seizure, determine diagnostic evaluation, choice of medication, prognosis, and possible genetic transmission.

- Myoclonic seizures or 'jerks' take the form of momentary brief contractions of a muscle or muscle groups, e.g. causing a sudden involuntary twitch of a finger or hand.
- Clonic: Rhythmic jerking.
- Tonic seizures consist of stiffening of the body, not followed by jerking.

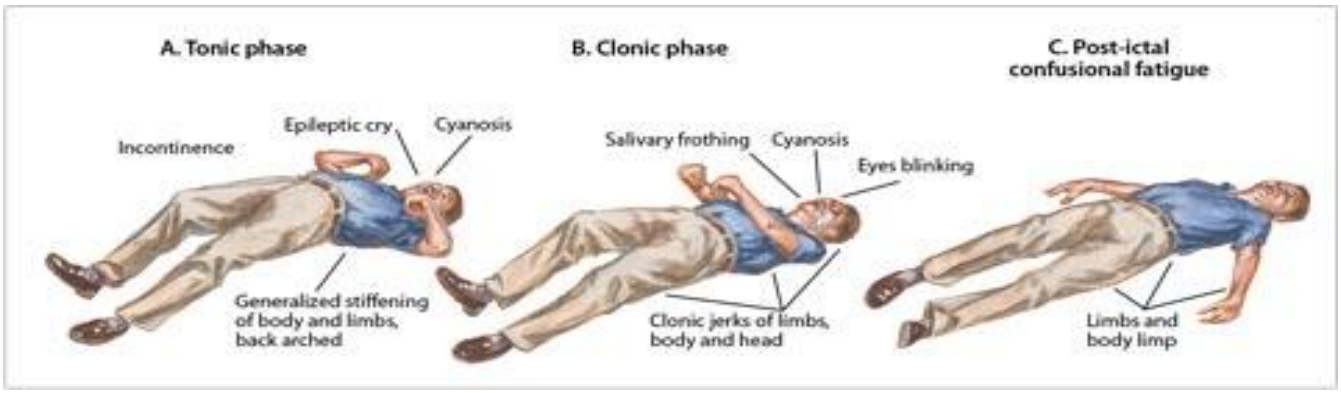
So a Tonic-Clonic Seizure is stiffness followed by jerking. Commonly referred to as "convulsion" or "grand mal".

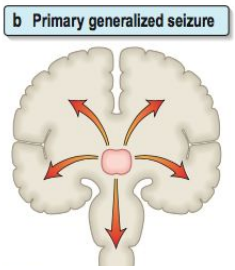
- Atonic seizure. A sudden collapse with loss of muscle tone and consciousness. "drop seizures"
- Absence, typical: brief (usually< 30 seconds) episode of unresponsiveness, may be accompanied by eyelid fluttering or automatismes (petit mal).
- Absence, atypical: longer in duration and associated with more automatisms and motor signs than typical absence.

There is no convulsions or postictal symptoms in absence seizures.

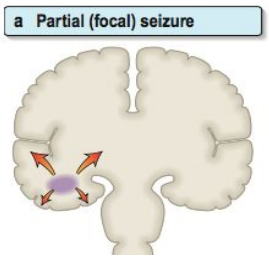
- Post-ictal phase. A period of flaccid unresponsiveness is followed by gradual return of awareness with confusion and drowsiness lasting 15 minutes to an hour or longer.

The teacher of a 5-year-old girl refers her for evaluation of ”spacing out": She is not paying attention and seems to be daydreaming during class. Her neurological exam is normal. During hyperventilation, she stares and comes unresponsive for 10 seconds. She then is completely back to her baseline. What is her diagnosis? Childhood absence epilepsy.





Different Types of seizures



We can divide seizures into two different classifications according to the spread of the electrical discharge into 1) Generalized Seizures which involves both hemispheres , 2) Partial or Focal Seizures, which is restricted to one area in the cortex in one hemisphere.

The symptoms in the focal seizure reflect the normal function of that area.

Occipital onset → visual changes.
Temporal lobe onset → false recognition (déjà vu)
Sensory area onset → sensory alteration (burning, tingling)
Motor area onset → jerking

Generalized: seizures are usually sudden without any warning, Partial: seizures are usually preceded by an aura

Generalized Seizures	*A partial (focal) seizure*
Absence seizures (petit mal): ***Typical, Atypical, Absence with special features,*** ***Myoclonic absence and eyelid myoclonia***	**Simple partial seizures- Without impairment of consciousness**
Generalized tonic-clonic seizures (grand mal seizures)	**Complex partial seizures- With impairment of consciousness Ex: Jacksonian seizure**
Myoclonic: Tonic or Atonic	
Tonic	
Clonic	
Atonic	

Can a partial seizure progress to involve both hemisphere? Yes. It’s called **partial seizure with a secondary generalization.**

Complex partial seizures usually originate in the temporal lobe.

Causes of Seizure

The range of causes of epilepsy is different at different ages and in different countries.
Neurocysticercosis and malaria are common causes of seizures worldwide and should be considered in patients from high-risk areas.
Children and teenagers – genetic, perinatal and congenital disorders predominate
Younger adults – trauma, drugs and alcohol are common
Older ages (over 60 years) – cerebrovascular disease and mass lesions such as neoplasms

Basically, Anything that can disrupt the normal brain architect (space occupying lesions) or normal neurotransmitter physiology (biochemical, temperature, drugs) can cause seizures.

Seizures are caused by "VITAMINS":

- ➔ **Vascular (stroke, bleed, arteriovenous malformation)**
- ➔ **Infection (meningitis, abscess, encephalitis)**
- ➔ **Trauma (especially frontal, penetrating injuries)**
- ➔ **Autoimmune (CNS vasculitis)**
- ➔ **Metabolic (hyponatremia, hypocalcemia, hypomagnesemia, hypoglycemia, hypoxia, Hyperthermia, Eclampsia, drug overdose/withdrawal-Alcohol withdrawal, Benzodiazepine withdrawal)**
- ➔ **Idiopathic (majority of the cases)**
- ➔ **Neoplasm**
- ➔ **pSychiatric**

A 55-year-old university professor presents with a GTC seizure. He has a normal examination. He drinks four glasses of scotch every night. but did not drink last night because he was babysitting his grandson. What is the likely etiology and how should he be treated? Alcohol withdrawal seizure treated with benzodiazepines.

Pathophysiology of Epilepsy

✓ **The inhibitory transmitter gamma-aminobutyric acid (GABA) acts on ion channels to enhance chloride inflow and reduce the chances of action potential formation. Excitatory amino acids (glutamate and aspartate) allow influx of sodium and calcium, producing the opposite effect. It is likely that many seizures result from an imbalance between this excitation and inhibition.**

✓ **Seizure thresholds Part of the genetic likelihood of developing seizures is called a seizure threshold. This is our individual level of resistance to seizures. Any of us could have a seizure under certain circumstances, but for most people, their natural resistance to having seizures is high enough to stop that happening.**

Antiepileptic drugs work in two different mechanisms:
1- Reducing electrical excitability of cell membranes, through inhibition of sodium channel
2- Enhancing GABA. This may be achieved by inhibiting GABA-transaminase Or by drugs with direct GABA-agonist properties.

Triggers and Risk Factors

Remember to ask about those risk factors specifically when taking a history

Risk factors for developing Epilepsy	Triggers (in a patient with a diagnosis of Epilepsy)
✓ Febrile convulsion	✓ Poor compliance
✓ Perinatal insult	✓ Sleep deprivation
✓ CNS infection	✓ Stress
✓ CNS mass lesion	✓ Alcohol
✓ Family history of epilepsy	✓ Infection
✓ Head injury	✓ Menstrual cycle
✓ Abnormal gestation or delivery (prolonged delivery)	
✓ Developmental delay	
✓ Stroke (ischemic or hemorrhagic)	

Febrile convulsions is a main risk factor for Hippocampal Sclerosis, which is a major cause of epilepsy.

Differential Diagnosis of a Seizure

- ✓ **Transient Ischemic Attacks**
- ✓ **Syncope**
- ✓ **Migraine**
- ✓ **Movement disorders (ex: Tics)**
- ✓ **Panic attack**
- ✓ **Psychogenic seizure**

Psychogenic Nonepileptic Seizures (Pseudoseizures)

- ✓ **Paroxysmal changes in behavior that resemble epileptic seizures but are without organic cause and EEG changes, usually due to a conversion disorder.**
- ✓ **Dramatic flailing of the limbs and arching of the back, with side-to-side head movements and vocalizing.**
- ✓ **Many have comorbid psychiatric illness or a history of abuse.**
- ✓ **Differential diagnosis includes frontal lobe seizures (Requires videotelemetry with prolonged EEG recordings to differentiate between them)**

Seizure vs Syncope

Comparison of clinical features in cardiogenic syncope versus seizure disorders

Clinical features	Cardiogenic syncope	Seizure disorders
Loss of consciousness	Typical	Common
Episode duration	Seconds	Minutes
Involuntary movements	Common	Typical
Amnesia	Yes	Yes
Arrhythmia	Common	Rare*
Electroencephalogram	Slow waves Flattening	Focal or general spike activity
Responsive to AEDs	No	Often
Short term mortality†	High	Low

Investigating a Seizure

EEG is the test of choice for the diagnosis of epilepsy. The diagnosis of idiopathic seizures is made only after secondary precipitating factors have been ruled out. **An abnormal EEG alone is not diagnostic of epilepsy**. Always check serum electrolytes, glucose, toxicology, and arterial blood gas to rule out hypoxia as a cause of a patient's seizure**. CT scan or MRI of the head is usually indicated to rule out a structural lesion** as the cause of seizure. **Think of any seizure as a symptom**, much like shortness of breath or chest pain.

1)EEG

EEG may distinguish between partial and generalized epilepsies.

EEG abnormalities in epilepsy: focal cortical spikes (e.g. over a temporal lobe) or generalized spike-and- wave activity (in PGE). Epileptic activity is continuous in status epilepticus.

Sleep recordings or 24 h ambulatory EEG increase sensitivity when routine EEG is normal.

Inpatient EEG videotelemetry helpful for diagnosis in attacks of uncertain cause.

If the patient is a known epilepsy patient, check for **anticonvulsant levels.**

2) CT and MRI (to check for structural lesions)

An important part of the workup of a patient with a first seizure

MRI is more sensitive than a CT scan in identifying structural changes, but not always practical (e.g., in an unstable patient)

3) Lumbar Puncture and blood cultures—if patient is febrile

4) **CBC, electrolytes, blood glucose, LFTs, renal function tests, serum calcium, Urinalysis.**

Management of Epilepsy

Immediate Care of a Seizure

- Move person away from danger.
- After convulsions cease, turn person into 'recovery' position (semi-prone).
- Tongue-biting occurs at seizure onset and cannot be prevented by observers. Do not insert anything in the mouth and make sure the airway is clear.
- If convulsions continue for more than 5 mins seek urgent medical attention.
- Do not leave person alone until fully recovered.

Status epilepticus

- A medical emergency, with a mortality rate of up to 20%
- First step in the treatment of any acutely seizing patient is ABC, secure the airway, breathing, and circulation.
- evaluate and treat any precipitating causes of seizure. If a reversible cause is identified, treat.
- If the patient continues to seize, **The initial drug of choice is lorazepam or diazepam.**
- If the patient continues to seize, add phenytoin or fosphenytoin.
- If the patient continues to seize add phenobarbital.
- If, despite all of the above therapy, the patient continues to seize, add midazolam or propofol.
- The longer the duration of status, the greater the risk of permanent cerebral damage.

Epilepsy in Women

- **Contraception**
- Some AEDs induce hepatic enzymes that metabolise synthetic hormones, increasing the risk of **contraceptive failure.**
- This is most marked with carbamazepine, phenytoin and barbiturates.
- Solution: Increase OCP dose or shift to other contraceptive method (IUCD or barrier methods)
- **Birth Defects**
- Withdrawing drug therapy in pregnancy is more risky than continuation.
- Risk of malformation is minimized if a single drug is used.
- **Lamotrigine** have the lowest incidence of fetal malformations.
- **Sodium Valproate** has the highest teratogenic effect among AED.
- Folic acid supplements should be taken before conception.

Epilepsy Management

- **Medical Management**
  - Antiepileptic drugs (AED)
- **Surgical Management**
  - Those who continue to experience seizures despite appropriate drug treatment (Intractable epilepsy) are candidates for surgery.
  - Surgical resection of epileptogenic brain tissue
  - Hemispherectomy (removal of one hemisphere)
  - Corpus callosotomy (disconnecting the two hemispheres) **is the treatment choice in Drop Attacks.**
- **Other Procedures**
  - Vagal Nerve Stimulation
  - Deep Brain Stimulation
- **General Lifestyle Modifications**
  - Avoid activities where they might place themselves or others at risk if they have a seizure. This include activities requiring prolonged proximity to water, prolonged cycle journeys.
  - Certain occupations, such as firefighter or airline pilot, are not open to anyone who has a an active diagnosis of epilepsy.
  - Driving precautions.

Antiepileptic Drugs

- ✓ **Full control of seizures can be expected in approximately 70% of patients.**
- ✓ **Resistant to drug treatments is seen in approximately of 30% of patients.**

26.46 Guidelines for choice of anti-epileptic drug

Epilepsy type	First-line	Second-line	Third-line
Focal onset and/or secondary GTCS	Lamotrigine	Carbamazepine Levetiracetam Sodium valproate Topiramate Zonisamide Lacosamide	Clobazam Gabapentin Oxcarbazepine Phenobarbital Phenytoin Pregabalin Primidone Tiagabine
GTCS	Sodium valproate Levetiracetam	Lamotrigine Topiramate Zonisamide	Carbamazepine Phenytoin Primidone Phenobarbital Acetazolamide
Absence	Ethosuximide	Sodium valproate	Lamotrigine Clonazepam
Myoclonic	Sodium valproate	Levetiracetam Clonazepam	Lamotrigine Phenobarbital
N.B. Use as few drugs as possible at the lowest possible dose.			

Tonic-clonic *(grand mal)* seizures: **Phenytoin**, **Valproate**.
***Partial (focal)* seizures: Carbamazepine**, **valproate**; **clonazepam** or **phenytoin** are alternatives.
***Absence seizures (petit mal)*: Ethosuximide** or **valproate**.
Myoclonic seizures: **Valproate** or **Clonazepam**.
Use of **single drug** is preferred when possible.
If patient is seizure-free for **three years**, withdrawal of pharmacotherapy should be considered.

Taking history from a patient presenting with a seizure

What happened:

➔ **Before:** aura vs presyncopal prodrome

(Was any warning noted before the spell?)

➔ **During:** convulsion, automatisms vs brief syncopal blackout and pallor

(What did the patient do during the spell?)

(Was the patient able to relate to the environment during the spell ?)

➔ **After:** post-ictal confusion and headache vs rapid recovery in syncope

(How did the patient feel after the spell? How long did it take for the patient to get back to baseline condition?)

(How long did it last?)

Circumstances

➔ Seizure triggers? Sleep deprivation, alcohol binge or drugs

➔ Syncope triggers? Pain, heat, prolonged standing, etc.

➔ *Epilepsy risk factors?*

Childhood febrile convulsions
Significant head injury
Meningitis or encephalitis
Family history of epilepsy

Previous unrecognized seizures? (How frequent do the spells occur?)

Myoclonic jerks
Absences
Auras (simple partial seizures)

Alcohol excess?

Medication lowering seizure threshold?

MCQ’s

Q1: A 46-year-old woman with atrial fibrillation is seen in clinic following an episode of syncope while shopping. She has a family history of epilepsy and a past medical history of breast cancer. She remembers feeling dizzy for a couple of seconds then waking up on the floor. What is the most useful step in management?

A. Lying–standing blood pressure
B. A collateral history
C. An ECG
D. An MRI brain
E. A CT head

Q2: A 23-year-old woman is brought into accident and emergency after collapsing at her office. She admits having been stressed and had stayed up all night preparing for a presentation she gave this morning. She describes sitting at her desk and seeing multicoloured circles of light in her right visual field then waking in the ambulance with an oxygen mask on. She feels tired, achy and confused. Her colleague who witnessed the event tells of his fright as he saw her collapse and start jerking both arms and legs. What best describes her seizure?

- **Tonic–clonicseizure**
- **Generalized seizure**
- **Grand mal seizure**
- **Simple partial seizure with secondary generalization**
- **Pseudoseizure**

Answers: 1,B. 2,D

Thank you

If you have any question please contact with us at:
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