Lana Mango

SEIZURES

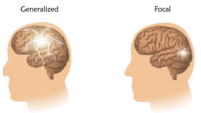
- **What are they**: sudden alteration of behavior due to altered / transient electrical activity in the cortex, one area depolarizes spreading the impulse across the cortex.

- **Clinical features**: depend on the location
  1. Abnormal motor activity
     - * Myoclonic ↑ MT
     - * Atonic: Loss of tone
     - * Tonic: stiffness
  2. Abnormal sensation
  3. Hyperventilation in children → hepatorenal cyanosis
  4. Loss of consciousness
  5. Tongue Biting
  6. Incontinence
  7. Epigastric Riding
  8. Sweating
  9. Piloerection
  10. Pupillary changes

  Autonomic symptoms

  11. Anxiety
  12. Fear
  13. Deja vu feeling
  14. Aura
      - → small simple seizure (partial)
      - → Affects enough of the brain to cause symptoms
      - → Not enough to cause unconsciousness
      - → Location affected:
        - ① occipital → flashing lights
        - ② motor cortex → muscle jerking
      - → warning before major seizure.

  Psychic symptoms



Types of Seizure:

1. simple: No altered awareness
2. complex: Altered awareness → spaced out → Loss of consciousness

1. **Partial** (may 2° ly generalize) involves a discrete area of the brain → focal epilepsy seizure involving only one area of the body (motor, sens., autonomic/mental/reflexes)
   - * ex: recurrent uncontrolled twitching
     - ↳ a. simple partial: no altered consciousness
     - ↳ b. complex partial: + impaired consciousness

   Jacksonian seizure
   - * Simple Partial
   - * Involves part of the motor cortex
   - * No change in alertness
   - * Predictable pattern of progression.
   - * Involves 1 side of the body

   ① Starting amplitude → height of height → spreads to the entire high of the cortex (motor) Place

2. **Generalized** entire brain is involved. May start out as a partial seizure.

	Type	Features
①	Grand Mal or Tonic-Clonic	Unconsciousness, convulsions, muscle rigidity
②	Petit Mal or Absence	Brief loss of consciousness look, stare ahead
③	Myoclonic	Repetitive, jerking motion
④	Tonic	Muscle stiffness and rigidity
⑤	Atonic or Drop Seizure	Loss of muscle tone Baccia

Muscle Activity in a Seizure

1. Tonic: Sustained muscle tone
2. Clonic: Muscle jerks (sudden contraction then release.
3. Atonic: Loss of muscle tone

Postictal State: major distinction b/w syncope & epilepsy.

- Follows seizures: A period of brain recovery
- Duration: mins – hrs (unlike syncope: rapid recovery)
- Involves:
  1. Confusion
  2. Focal neur. deficit
  3. Lack of alertness
  4. Todd's paralysis → · muscles · weakness for several hrs · may mimic a seizure thus 1° to a stroke. (sometimes) · After motor cortical seizure ex: motor seizure of left arm.

STATUS EPILEPTICUS

- A seizure that doesn't stop
- Emergency
- May lead to:
  1. K^+ Abnormalities → Arrhythmia
  2. Lactic Acidosis
  3. Cortical Laminar Necrosis → Permanent neurologic disease
     - ④ Severe HTN
     - ⑤ Neuromuscular Death
- Criteria:
  - → ≥ 5 minutes of continuous seizure up to 30
  - → ≥ 2 seizures w. incomplete recovery of consciousness b/w. (Acute Repetitive treated w/ SE cure) with 24 hrs
- Occurs w. Generalized Tonic Clonic seizures.
  - → Rarely ever occurs in partial.
- **Treatment:** To Break seizure
  - most common cause: w. no previous epilepsy
  - True seizure → ↑ HR, ↑ BP, ↑ Lactate, ↑ K, ↑ Glucose, ↑ Cortisol
  - Pseudo seizure → Normal, Pale, True → cyanosed
  - True → Tachycardia
  - Func. → normal
  - ① CBC ② Tox screen

CAUSES OF SEIZURES

- Single seizure: Provoked by ① Fever ② Lack of sleep ③ Hypoglycemia ④ Drugs & alcohol. Other causes: ① Tumor ② Stroke
- Epilepsy: Multiple unprovoked seizures

CAUSE ACCORDING TO AGE

Infants < 6mo	Children	Adults
CNS disease*	Febrile	Stroke
Metabolic*	Epilepsy	Infection
Epilepsy rare		CNS mass
mainly in prem-ature infants		Withdrawal ↓
		Intoxication
		Metabolic
	Post-fever development	New epilepsy rare

Post-fever development: mainly in children

Hypoxic-ischemic encephalopathy

CNS Disease: hypoxic-ischemic encephalopathy, CNS hemorrhage
Metabolic: hypoglycemia, electrolyte abnormalities

SEIZURE WORKUP

1. Ca, Na, glucose → Hypoglycemia & electrolyte imbalance cause seizures
2. CBC, RFT, LFT → Systemic Disease that could have caused it
3. Toxicology → Drug toxicity (ABBA's)
4. CT/MRI brain → Tumor or stroke
5. Lumbar Puncture → Meningitis, encephalitis
6. EKG → Rule out cardiac Syncope
7. EEG — IF CAUSE OF SEIZURE IS STILL UNKNOWN
   - voltage changes in diff parts of the brain: ① Frontal ② Occipital ③ Parietal
   - Only done if diagnosis is unclear

True seizures: 1-2min
Other (pseudo): 30 min to 1hr

DRIVING POST-SEIZURE

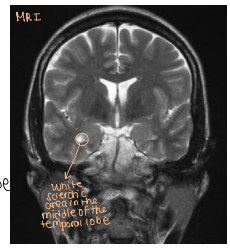
- Provoked seizure → correct cause → Pt can drive as soon as cause is solved
- Unprovoked seizure → Wait 6-12 months until pt can drive again (to avoid risk of recurrence)

SEIZURE MANAGEMENT

1. Clear way for pt.
2. Loosen clothing around neck → ↑ Breathing
3. Move / Place on his/her side → Avoid aspiration
4. Avoid forcing their mouth open

TEMPORAL LOBE EPILEPSY

- most common focal seizures
- Complex → Loss of consciousness
- Partial → Involves middle part of temporal lobe → Hippocampal sclerosis
- Symptoms / signs:
  1. Hand movement, fidgeting
  2. Lip smacking, chewing
  3. Impaired consciousness + confusion

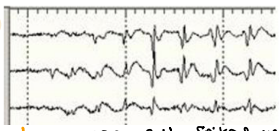


- Dx: MRI

CHILDHOOD EPILEPSY:

① CHILDHOOD ABSENCE EPILEPSY

- Duration: seconds
- Signs:
  1. Sudden impaired consciousness
  2. Child looks into space "not paying attention in class"
  3. Absence of change in motor tone
  4. Remits by puberty
  5. No post-ictal confusion



- EEG: 3 Hz spike & wave pattern
- Treatment: Ethosuximide

② JUVENILE MYOCLONIC EPILEPSY

- Childhood epilepsy
- Involves diff types of seizures.
  - ① Absence (4-5 years)
  - ② Myoclonic (15 years of age)
  - ③ Grand mal (Tonic clonic)
- Hallmark:
  - → Myoclonic Jerks on AWAKENING from sleep
  - → Shock-like irregular movements of both arms

③ FEBRILE SEIZURES

- Common 2-4% of children.
- Age < 5
- generalized tonic clonic
- Events: ① loss of consciousness ② Shakes
- Not epilepsy even if it happens 2-3 times
- Good Prognosis → small risk of epilepsy
- Clinical Dx: Clinical (x MRI, EEG) (Lumbar Func → If suspects meningitis)
- Acute treatment: IV Lorazepam
  - child recovers → discharge

④ BENIGN ROLANDIC EPILEPSY

MOST COMMON CHILDHOOD EPILEPSY

- Age: 6-10
- Occurs in Rolandic Fissure (central sulcus)
- Focal seizure that:
  1. starts in the face
  2. Spreads to other body parts
- No loss of consciousness (simple)
- BENIGN w. centrotemporal sharp waves
- Remits in a few years

centrotemporal spikes

⑤ LENOX GASTAUT SYNDROME

- Childhood epilepsy
- 3-5 years of age
- multiple types:
  1. Tonic
  2. Atonic
  3. Myotonic
  4. Absence + intellectual disability
- Dx: [Hybrid]
  1. Atonic, myotonic, tonic, absence seizures
  2. Intellectual Disability
  3. EEG: generalized slow (<2.5 Hz) spike wave pattern

PSYCHOGENIC NONEPILEPTIC SEIZURE

- Clinical presentation of seizure + normal EEG + No underlying CNS disease + Hx of trauma. (conversion disorder)
- Treatment: Psychotherapy

SEIZURE TREATMENT

① **Prevent seizure** used in pts w. recurrent seizures (unprovoked seizure)

MRI tre, fam hx, trauma caused by the seizure,

② **Status epilepticus treatment** to break the seizure

STATUS EPILEPTICUS

① ABC → Airway, Breathing, circulation

② IV Lorazepam or diazepam
→ fast acting
→ multiple 1 or 2mg doses till seizure stops.

③ load long acting IV antiseizure drugs to prevent recurrence
→ Fosphenytoin → Phenobarbital
→ Valproate
→ Levetiracetam

Fosphenytoin: IMP 15-20mg/kg; no pressure risk if used slowly; cardiac arrhythmia if not infused through slow infusion.

Valproate / Levetiracetam: unlike normal seizures, no hangover

IF SEIZURE DOESNT STOP:

④ Phenobarbital + General anaesthesia & intubation

SEIZURE PREVENTION

Dont treat psychogenic

Antiepileptic drugs:

Na Channel Blockers	GABA Activators	Other Mechanisms
Phenytoin	Benzodiazepines (specific for status epilepticus)	Gabapentin
Fosphenytoin (also used in status epilepsy)	Barbiturates (Barbiturate anesthesia)	Levetiracetam (also used in status epilepsy)
Carbamazepine	Thiopental	Topiramate
Oxcarbazepine	Tiagabine	Valproic acid (also used in status epilepsy)
Lacosamide	Vigabatrin	Ethosuximide (specific for absence seizure)
Lamotrigine		Primidone

Blocks T type Ca channels in the thalamus

side effect: ⑤ upset stomach acc. (nausea, vomiting) ⑥ drowsiness

specific medication: ethosuximide → absence seizure, Benzodiazepine → status epilepticus

- Side effects :-
  ① Teratogenic
  ② Rash stevenjohnson syndrome
  ③ Induction of P450 enzyme
  ④ ↓ Bone density

  Requires blood level monitoring

  → test risk: ① valproic acid ② carbamazepine ③ phenytoin ④ phenobarbital
  → Affect. w. ↓ Folic Acid metabolism → neural tube defect
  → Pregnant Pt's w. seizures: ① levetiraetam ② lamotrigine ③ folate supplement. 4 mg/day
  → ① neural tube defects ② cleft palate; ③ short fingers ④ congenital heart disease; ⑤ Abnorm. facial features
  → Excessive skin necrosis + sloughing: ① Carbamazepine ② Lamotrigine ③ Phenytoin
  → Pt's w. seizures are more likely to get III with the HLA B1502 allele.
  → ↑ frequency in Asian population
  → pre AED's screening sometimes done
  → same AED's that induce P450: ① Carbamazepine ② Phenytoin ③ Phenobarbital
  → more that induce P450 → ↓ vitamin D levels.
  → hepatic enzyme that metabolizes.
  → induced → ↑ er metabolism of drugs → drug levels fall
  → ① Carbamazepine ② Phenobarbital ③ Phenytoin

Seep 2 → Propifol? Check verification

- **BLOOD LEVEL MONITORING**
  ① Phenytoin
  ② Carbamazepine
  ③ Ethosuximide
  ④ Lamotrigine
  ⑤ Levetiracetam
  ⑥ Valproic Acid

PHENYTOIN

- Inactivates Na channels → monitor blood levels
- Side effects: ① gingival hyperplasia
  ② Body hair growth → hirsutism
  ③ neuro. effect: → confusion → Ataxia → Blurred vision
  ③ folic acid depletion → teratogenic → megaloblastic anemia
  ④ ↓ Bone density
  ⑤ Fetal Hydantoin Syndrome

ACUTE TOXICITY / OVER-DOSE
① Confusion
② Ataxia
③ Nystagmus
④ Abnorm. reflexes
⑤ Purple glove syndrome: dilted to injection site
⑥ Drug interactions:
- Valproate displaces phenytoin is albumin bound → Valproate displaces phenytoin is metab. by P450 → TWO PWA inhibits P450 → toxicity

VALPROIC ACID

- Mechanism:
  ① Blocks Na channels
  ② ↓ GABA Breakdown & ↑ GABA synthesis → inhibition ↑
- Used as:
  ① AED
  ② Mood stabilizer:
  → Bipolar
  → mania
- Side effects:
  ① Teratogenic
  ② Hepatotoxic
  ③ weight gain
  ④ Thrombocytopenia (platelets ↓)
  ⑤ Tremor
  ⑥ spina bifida
  ⑦ nausea/vomit

FOSPHENYTOIN

- used instead of phenytoin → x purple glove syndrome
  → Rapid onset of action → used to treat status epilepticus: Drug of choice after carbamazepine admin.
  → Prodrug of phenytoin

CARBAMAZEPINE

- Blocks Na channels (like phenytoin)
- Similar to Phenytoin (same adv. effects)
- Steven Johnson Synd. (Ptr w. HLA B1502)
- Suppresses BM
- Hepatotoxic
- SIADH (hyponatremia) → makes kidneys more sensitive to ADH
  → Boosts ADH lvl
  → kidneys reabsorb more water

BARBITURATES:

Phenobarbital; Thio-Penta; Pento-barbital

- Easy to OD on
  → Replaced by benzodiazepines
- Pot: used as sedatives
- GABA activators
- Cons: ① Narrow therap. index
  ② Induce P450
  ③ Dangerous when used w. alcohol
  → Resp & CNS depression

LEVATIRACETAM

- Titrate dose to clinical effect
- Mild side effects → most adverse effect: somnolence
  → side effects only occur during initial treatment
- Useful for many types of seizures
- Unknown mech.

GABAPENTIN

- Ca channels
- Adv effect: sedation
- Pts w. CKD (low GFR): ↑es chance of toxicity (exc. in urine)

TOPIRAMATE

- Blocks Na
- ↑GABA
- side effect:
  ① mental dulling
  ② sedation
  ③ mild metab. acidosis (carb. anhydr. inh.)
  ④ kidney stones (decitrate exc → Citrate binds & Ca2+ in urine → ↑ free Ca2+ in urine ≈)