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Classification

other types: Tonic Atonic
 Tonic-clonic Seizure: انتفوسا

if the cause can't be reversed بنسبها
 Epilepsy لا يشفى عنه seizures

Generalized seizures

e.g. febrile seizure → ↑ risk of epilepsy
 in 2 hemisphere

Reversible cause ← seizure
 eg: ↓ Na⁺ / ↓ Ca²⁺
 ↓ glucose / febrile seizures

young children
 brain infec. or neurological problem

Focal or partial seizures:

Seizure
 له منطقة معينة بالماغز بيسبب فيها ال

بتحرك ايه او اجبه

1. Focal seizures without loss of consciousness

2. Focal seizures with loss of consciousness

3. Focal seizures with secondary generalisation

↓
 Spread across the cerebral cortex
 bilateral convulsive movement
 اولها بيكون focal بيسبب بيسبب

* Absent seizure
 conscious
 loss of cognitive function
 but no convulsions
 شكاية بوزايف

Aura: التي جوس فيها المريفن مشن الي انظر بنشوفه

Epilepsy: الي بنشوفه

اذا كان له علاقه بال RAAS
بيصير فقان للوي كامل

ممکن ينتشر و ممکن لا
بيصير Secondary general

Focal seizures presentation

عصب المنطقه الي تاثيرت بال brain (اي Neuronal Tract تاثير)

Auditory Pathway → Auditory Symptoms
olfactory " → olfactory "

- Cognitive symptoms: لراض ما قبل ال Epilepsy
ينقدر منها نحدد بالزيت
مكان ال. ام. بيغه
(او بين مكان ال focus)

Seizures can start with aura in the form of automatism (hand or oral) and it can be reactive (drinking from a cup in the hand) or perseverative (continuation of complex act). This form is usually localised to the

temporal lobe

Most Epileptogenic area

حساسه اكثر من غيرها

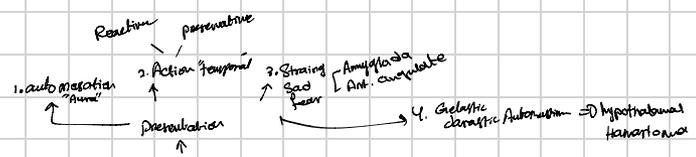
Medial lobe (Medial part)
Neocortical lobe
بتنقسم الي

3 خوف قديو

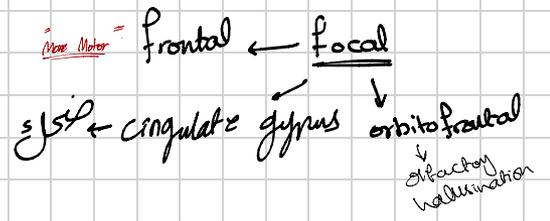
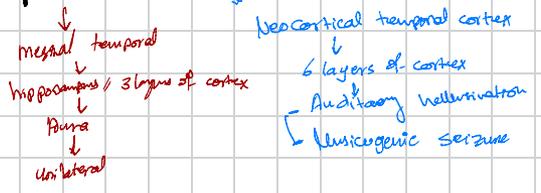
This can be followed by staring, fearful or sad expression.

This is usually localised to the amygdala or anterior cingulate Gelastic or dacrystic auomatisms (hypothalamic hamartomas)

* The most of Aura Form \Rightarrow temporal lobe

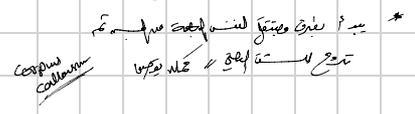


loss conscious without 2nd generalization
 Type \leftarrow focal epilepsy "partial"



* Clonic / tonic-clonic \Rightarrow Primary Motor area \downarrow

\hookrightarrow Jacksonian march



Focal seizures

↖ 6 layers cortex

مركز ال Auditory cortex

Neocortical temporal cortex epilepsy

Auditory hallucination, vertigo, language disturbances, musicogenic seizures

تشنجات موسيقية

Focal seizures

المخزاشيا فيها motor function

or Complex

زي ابيه متحرك رايح جاي

1 • Frontal seizures bizarre motor automatims, hypermotor activity, salivation, spitting

Complex movements

2 • Cingulate gyrus focus may causes expression of a particular affect such as laughter

سكته رضخه اكثر

olfactory Pathway

3 • Orbitofrontal cortex: complex motor automatism and olfactory hallucinations.

قبل ما يقعد الوعيا تنم ربحه غريبه

المخز ومده ببعير فيها Secondary generalization

4 • Clonic, or Tonic clonic movement in primary motor area according to the motor homunculus involved.

• An example of partial seizures that affect the primary motor cortex is Jacksonian march



بتبدأ ب ابيه متلا ويتبع زي migration لل body, الوجه والاطكسا

المتشعر عن طريقا Corpus Callosum

له ابيانا عشان يسيطرو على عوا. بقصوه

Arm, facial, laryngeal
+ tachy → contralateral
insula

1. Fencers posture → supplementary motor cortex
2. uni. forced gaze + head deviation "versive" → Premotor
- frontal etc

Focal seizures

• **Fencers posture**: asymmetric bilateral movement of the upper limbs: supplementary motor cortex. This can be bilateral **without** loss of consciousness

مشكلة بال

ممكن يفقه ويمكن لا

• **Unilateral forced gaze and head deviation** (versive seizures): premotor cortex and frontal eyes field.

إذا حارت تشنجات
بالرأس والعيون بين
بصرتها إليها بال

لها إذا حار focus هون بتحرك العين للجهة الأتانية ويتحرك الرأس معها لنفس الجهة

Arm and facial seizures, with laryngeal movement, tachycardia, : contraateral **insula**

Tonic clonic seizures

بشد الجسم

بصوتك الجسم

- convulsive activity typically lasts < 1 minute.
- Mood changes can precede seizures by days

Immediately pretonic-clonic phase: a few myoclonic jerks or brief clonic seizure activity; occasionally begins with forced eye and head deviation

- Tonic phase: contracture of the axial musculature with upward eye deviation, pupillary dilation, and forced expiration of air {epileptic cry}; usually involves some decerebrate posturing. Tongue and jaw muscle tonus causes perioral injury, typically lateral tongue biting. Frequently, patient becomes cyanotic, tachycardic, and hypertensive

لوعضن لسانه من قدام
ما بيكون من اللفظ

Tonic clonic seizures

- **Clonic phase:** starts as low-amplitude, high-frequency (~ 8 Hz) convulsive movements of the extremities $>$ the thorax and abdomen that progresses to high-amplitude, low-frequency (~ 4 Hz) movements. **Development of atonia breaks the seizure and causes**
urine
incontinence

- بالبداية:
 - Low amplitude (الحركة صغيرة)
 - High frequency ~ 8 Hz (سريعة)
 - بتبئش بالأطراف \rightarrow بعدين الصدر والبطن
- بعدين بصير العكس:
 - High amplitude (jerks قوية)
 - Low frequency ~ 4 Hz (أبطأ)
- Atonia (فقدان التوتر العضلي) \rightarrow بتصير بالنهاية
 - Breaks the seizure (تنهي النوبة)
 - (تبول أو تبرز لإرادي) incontinence ممكن بصير

Tonic clonic seizures

- Postictal phase: patient is poorly responsive and hypotonic; confusion and memory impairment may last a few minutes to hours, occasionally followed by psychiatric changes (depression, psychosis, anxiety, irritability) that can persist for about a day (a) Postictal phase involves generalized fatigue, soreness, and migrainous headaches

بيكنا متي
متنكر شو
حمار ولا اليا
حواليا

*

*

*

Clonic phase بصير زي التنبه مافيا

Tonic seizures

- diffuse contraction of the axial musculature, sometimes involving the proximal limbs or entire limbs; 

It can be in the form of startle response that can follow a stimulus of any type

صبة Atonic seizures Drop Attack

(النوبات) < 1min

- Sudden loss of consciousness and muscle tone especially of the head. This can result in a drop attacks ^{اسم نيز}

- These are usually preceded by myoclonic jerks ^{involuntary sudden onset movement}

- EEG may demonstrate polyspikes and waves during the ictal period and followed by generalised slowing of the central area

→ physiological myoclonic jerks
الانقباض (البا) بتعريف اول ما الوحد يفتق

+ hiccups



نفضات
تجسيم العصب اكثر
Myoclonic seizures
ممكن تكون unilateral or Generalised
تسببها الى
Cortical Myoclonic
Lesion in Brain stem or Spinal cord
Peripheral Nerve Lesion

- Shock like movement of one muscle or a group of muscles.
- Irregular and can be singular or repetitive.
- It affects the eyelid, facial muscles, upper limbs and lower limbs
- EEG: Polyspikes and waves

Epilepsy syndromes



Generalised epilepsy syndromes

- Infantile spasms
- Lennox – Gastaut syndrome
- Juvenile myoclonic epilepsy
- Absence epilepsy

Absence
Tonic Clonic
Myoclonic

Age: 11-12

Juvenile Myoclonic epilepsy

- Symptoms: seizures involve bilateral but asymmetric flexor movements of the upper extremities or rarely of the lower extremities that develop after awakening
- usually no loss of consciousness
- Other types of seizures commonly exist such as absence and tonic clonic
- Photic stimulation provokes discharges

لا يفضل ال seizures مسفره لسنين
 لكن يستجيب للطايع كثير منيا
 لا صعب فصل weaning من الادوية لانو
 رز تويح ال seizures
 "المرضى عنده اكثر من نوع"

✂ ✂

Juvenile Myoclonic epilepsy

لحمة منه اطفال + اطفال frequency من ال Absence

- interictal EEG demonstrates bursts of bilateral, symmetric 3.5– 6-Hz spike-and-wave and polyspike discharges; ictal EEG exhibits diffuse polyspike activity followed by 1– 3-Hz slow waves
- Pathophysiology: genetic, but usually with complex inheritance pattern
- Treatment: valproate > lamotrigine, levetiracetam, topiramate, zonisamide

AD

hyper ventilation ← تغيير من ال

Absence epilepsy

↳ AD / good prognosis / preschool age (5-6 yrs) / Assoc. w/ Autism / more than once daily

- Symptoms: 5– 10-second long unresponsive staring spells ± rhythmic facial movements or picking behaviors; does not have an aura or postictal state
- Childhood-onset form is usually self-limited, whereas the juvenile-onset form is more likely to persist into adulthood
- autosomal dominant inheritance
- slow-wave discharges on EEG may relate to cyclic activity of T-type calcium channels and repolarizing potassium currents in the reticular thalamic nucleus

Absence epilepsy

- Occur on a daily basis in the childhood-onset form, more infrequently in the juvenile-onset form
- 50% also have generalized tonic-clonic seizures, more commonly in the juvenile-onset form; these are infrequent and can be well controlled with medication
- Diagnostic testing: EEG demonstrates bilateral spike-and-wave complexes at 3 Hz that are reliably activated by hyperventilation.

treatment

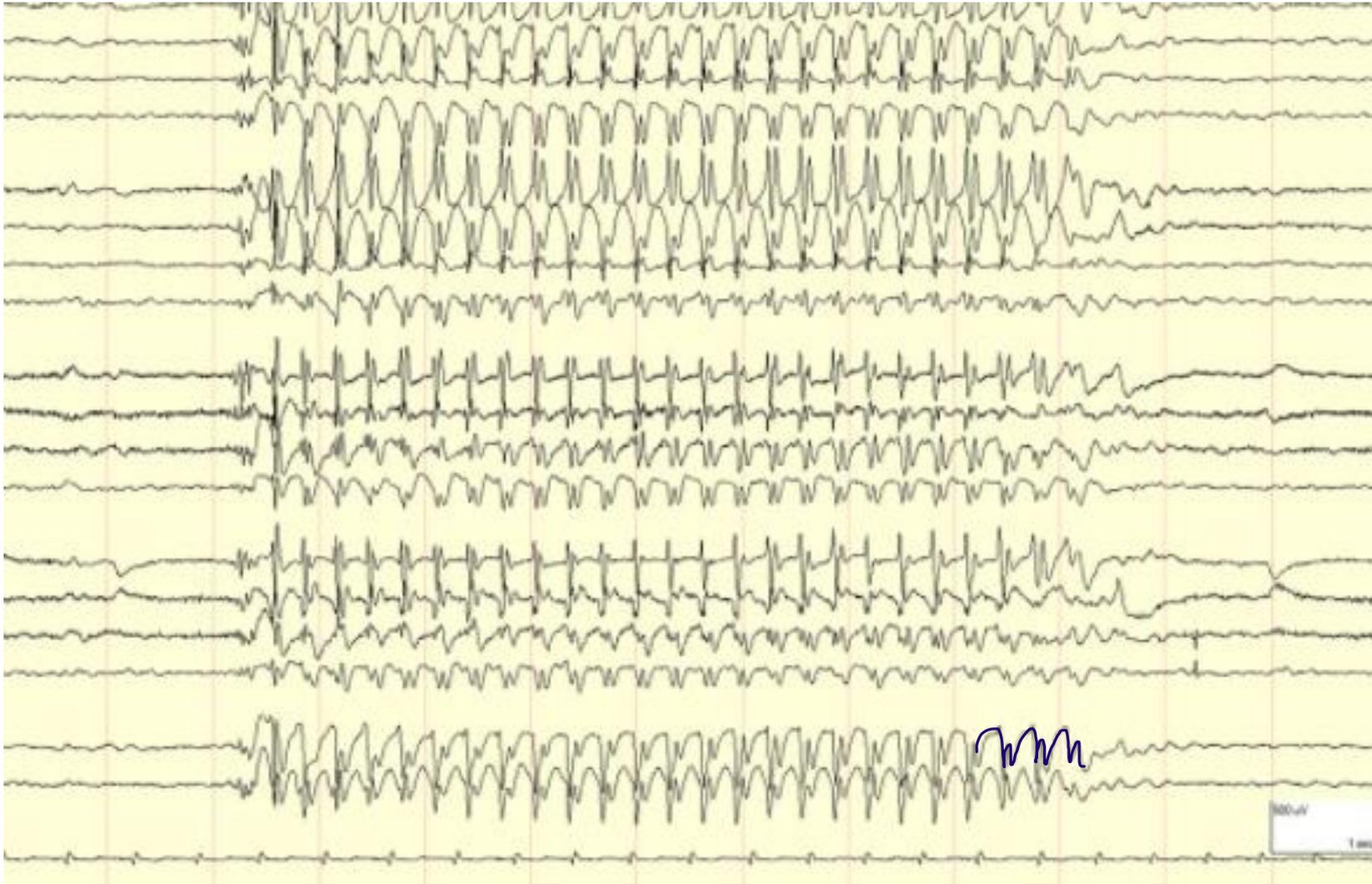
- Treatment:

1. ethosuximide, valproate, acetazolamide

2. Avoid carbamazepine, phenytoin, and gabapentin, which have all been found to increase seizure frequency and may induce absence status epilepticus

X [carbamazepine
phenytoin
gabapentin] ⇒ Absence

Absence epilepsy



Antiepileptic drugs

فباغ لىوا

- Predictive factors for successful seizure remission

1. A single type of seizure
2. Had no seizures for > 2 years
3. A normal neurological exam and IQ
4. A normalized EEG on antiepileptic treatment

* اذا اعطيت dose 50% وتضمن عليها
يرفع ال dose ال maximum

* اذا اعطيت ال maximum كانت نسبة قصتها 80%
بعطه دوا ثاني ال هيف انوحى ال auras تمنقى

*

Epilpesy treatment

- Management of medication failure
 1. If maximal doses of an antiepileptic drug (AED) fail to control the seizures, there is only a 10% likelihood of developing control over seizures with a second AED
 2. There is < 5% likelihood of developing control over seizures with a third AED or by using multiple AEDs after failing a second AED
 3. 25% of patients with chronic refractory seizures are eventually found to have the wrong diagnosis

AED prophylaxis

- Prophylactic AED use in patients with another neurological disorder, but without seizures, is usually not recommended
1. Brain tumor: prophylaxis does not seem to reduce development of seizures in patients with primary or metastatic tumors
 2. Stroke: not indicated for ischemic stroke, although AEDs are routinely used short-term in subarachnoid hemorrhage patients because of the fear of increased intracranial pressure that accompanies seizures
 3. Severe head trauma : (prolonged loss of consciousness, amnesia, depressed skull fracture, contusion, or hematoma) can be treated with acute prophylaxis limited to 1 week



Drug (in order of use)	Dose	Time to effect	Duration of action
#1: Benzodiazepines			
Lorazepam (Ativan)	Adult: 4–8 mg IV Pediatric: 1–4 mg IV	6 minutes	24 hours
Diazepam (Valium, Diastat)	Adult: 10 mg IV Pediatric: 5–10 mg IV or PR	2 minutes	30 minutes
Midazolam (Versed)	Adult: 0.2 mg/kg IM Pediatric: 0.1 mg/kg IM	15 minutes	2 hours
#2: Phenytoin (Dilantin), phosphenytoin (Cerebyx)	20 mg/kg IV, or same of phenytoin equivalents for phosphenytoin—supplement 10 mg/kg if first dose fails	10 minutes	24 hours
#3: Phenobarbital	20 mg/kg IV	20 minutes	>48 hours
#4: Anesthetic coma			
Propofol drip	Load 2 mg/kg IV, then 2–10 mg/kg/hour titrated		
Pentobarbital drip	Load 10 mg/kg IV, then 0.5–3 mg/kg/hour titrated		

Drug	Mechanism of action	Specific side-effects*	Notes
Carbamazepine (Tegretol, Carbatrol)	- Slows recovery of voltage-gated Na channels	- Hyponatremia - Transient diplopia or visual blurring after dosing - Asymptomatic leukopenia	- Used for trigeminal neuralgia, bipolar disorder - Avoid in absence, myotonic, atonic seizures - Target range = 8-12 µg/mL
Phenytoin (Dilantin) ★ Fosphenytoin (Cerebyx)	- <u>Slow recovery of voltage-gated Na channels</u> <u>Na</u>	- Gum hyperplasia, hirsutism, coarse facies - Pseudolymphoma - Skin rash (5%)* - Purple glove syndrome (IV route) - Osteoporosis - Arrhythmia	- Half-life depends upon dose - IV Dilantin precipitates in glucose solution - Dilantin brand is sustained-release qd dose - Fosphenytoin loaded 3x faster - May worsen absence seizures - Target range = 1-2 µg/mL free level
Gabapentin (Neurontin)	- Unknown	- Weight gain	- Antiepileptic effect in doses >1800 mg - Lower doses used for neuropathic pain
Lacosamide (Vimpat)	- Enhances slow inactivation of voltage-gated Na channels	- Dizziness and ataxia, particularly when combined with traditional Na channel blocker	- Oral and injectable forms - Class V controlled substance
Oxcarbazepine (Trileptal)	- Unknown	- Hyponatremia (30% in the elderly)	- Equivalent dose is 1.5x that of carbamazepine - Converted to bioactive monohydroxy derivative
Pregabalin (Lyrica)	- Increase in neuronal GABA levels and GAD activity	- Dizziness, somnolence, weight gain, peripheral edema	- Anxiolytic, analgesic and antiepileptic - Class V controlled substance
Tiagabine (Gabitril)	- Inhibits GABA reuptake	- Non-convulsive status epilepticus (contraindicated in generalized seizures)	- Limited efficacy
Vigabatrin†	- Inhibits GABA metabolism	- Effective against infantile spasms, particularly in tuberous sclerosis	

Skip



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Na
==

Drug	Mechanism of action	Specific side-effects*	Notes
Valproate (Depakote, Depacon)	<ul style="list-style-type: none"> - Slows recovery of voltage-gated Na channels - Inhibits T-type voltage-gated Ca channels in thalamus - Increases GABA synthesis 	<ul style="list-style-type: none"> - Weight gain, hair loss, tremor - Thrombocytopenia - Hyperammonemia leading to encephalopathy - Carnitine depletion, which can be fatal in the malnourished 	<ul style="list-style-type: none"> - Depakote ER can be divided bid - Used for migraine, bipolar disorder - Increases half-life of lamotrigine 2-3 fold - Target range = 30-100 µg/mL
Clonazepam, clorazepate	<ul style="list-style-type: none"> - Increase GABA_A receptor currents 	<ul style="list-style-type: none"> - Respiratory depression, somnolence 	<ul style="list-style-type: none"> - Tolerance develops within 6 months
Phenobarbital ★	<ul style="list-style-type: none"> - Activates GABA_A receptor - Inhibits voltage-gated Ca channels 	<ul style="list-style-type: none"> - Respiratory depression, somnolence - Cognitive slowing with chronic use 	<ul style="list-style-type: none"> - Limited use due to side effects - Target range = 15-40 µg/mL
Primidone (Mysoline)	<ul style="list-style-type: none"> - As per phenobarbital 	<ul style="list-style-type: none"> - As per phenobarbital 	<ul style="list-style-type: none"> - Converted to phenobarbital - Used for essential tremor
Lamotrigine (Lamictal) ★	<ul style="list-style-type: none"> - May decrease glutamate release 	<ul style="list-style-type: none"> - Ataxia - Diplopia - Rash (1%)* * 	<ul style="list-style-type: none"> - Synergistic effect when used with valproate, but also increases its toxicity - Low teratogenic risk - Non-sedating
Levetiracetam (Keppra)	<ul style="list-style-type: none"> - Unknown 	<ul style="list-style-type: none"> - Psychosis and irritability 	<ul style="list-style-type: none"> - Effective for epileptic and non-epileptic myoclonus
Topiramate (Topamax)	<ul style="list-style-type: none"> - Inhibits voltage-gated Na channels - Inhibits AMPA receptors - Activates GABA_A receptors 	<ul style="list-style-type: none"> - Aphasia/anomia and cognitive slowing - Nephrolithiasis - Acute angle-closure glaucoma 	<ul style="list-style-type: none"> - Inhibits oral contraceptives - Causes weight loss
Zonisamide (Zonegran)	<ul style="list-style-type: none"> - Inhibits T-type voltage-gated Ca channels - Slows recovery of voltage-gated Na channels 	<ul style="list-style-type: none"> - Nephrolithiasis - Weight loss 	
Rufinamide (Banzel)	<ul style="list-style-type: none"> - Prolongs Na channel inactivation 	<ul style="list-style-type: none"> - Drowsiness, dizziness, fatigue, and ataxia - Rare QT shortening 	<ul style="list-style-type: none"> - Limited efficacy against focal seizures
Felbamate [†]	<ul style="list-style-type: none"> - Antagonizes the glycine site on NMDA receptor 	<ul style="list-style-type: none"> - Rarely used due to high incidence of aplastic anemia 	