١٤٤١/١٠/١٤

Epilepsy in children

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Objectives

- Definitions
- Epidemiology
- Classification
- Etiology
- Epileptic syndroms
- Treatment
- Prognosis
- Disorders that mimic seizures

Definitions

- Seizure
- Epilepsy
- Status Epilepticus
- Febrile convulsions

Seizure

- Transient occurrence of signs and/or symptoms(change (not loss!) in LOC, motor activity, sensory phenomena or inappropriate behavior) resulting from abnormal excessive or synchronous neuronal activity in the brain

  * So the symptoms could be motor or sensory or behavioral or change in the LOC

Epilepsy

- Epilepsy: two or more unprovoked attacks, in a time frame longer than 24 h.
- Epileptic syndrome: one or more specific seizure types, has a specific age of onset and specific prognosis. (and a specific EEg pattern)

ليش برينا انه نقسم المرضى و نخوف أي syndromes عشان نخوف أي syndrome عندهم؟ عشان نتعامل معها، إذا عرفنا الـ syndrome بقدر أحدد نوع العلاج و بتقدر نحط prognosis

Note
A→ Airway : make sure the airway is patent and clear
B→Breathing: make sure the pt is breathing well (they usually need a mask because they're usually hypoxic →either because of seizure activity or because of the spasticity in the airway (ex in tonic seizure)
C→Circulation: make sure the pt is not hypotensive or hypertensive.

Status epilepticus

→or recurrent seizures

→damaged من وين اجت الـ ٣٠ دقيقة؟ لأنه عادة بعد ٣٠ دقيقة بدأ يصير (irreversible damage)

- Continuous seizure >= 30 min, generalized or focal, during which the patient remains unconscious or has two or more sequential seizures without full recovery of consciousness between seizures.
- New definition 5 min → خلال ٣٣ ليش صارت ٥ دقايق؟ لأنه لازم نبدا ٥ دقايق
- Treatment of Status epilepticus ← هاد رح ينشرح بالأونة

* Seizure that are not stopped within the first 5 mins are unlikely to stop spontaneously

← يعني الـ seizure اللي بتقعد أكثر من ٥ دقايق مستبعد انها توقف لحالها و بتكون بتحتاج لـ intervention حتى توقف.

So after 5 mins you have to start treatment.

ملاحظة: إذا مريض بلش يتشنج قدامك، اعطي نفسك فرصة تشوف الـ seizure و تعرف نوعها و حضر الـ anti-seizure ٣٣ اللي بدك إياها... و أهم اشي ٥ first aid هي الـ ABC بروتوكول الـ ٥ دقايق

Febrile convulsion

- A Seizure is association with febrile illness (fever) in the absence of CNS infection, or acute electrolyte imbalance in children between 6-60m without prior afebrile seizures.
  → So it should not be provoked by hypoglycemia or hypocalcemia ... etc
- Age: 6-60 months (peak 18) (6 mths – 6 yrs)
- 2-5% of children
- Most common form of seizures in children.

يعني بطفل عمر ٧ أو ٨ سنين ما منشوفها.
إذا استمرت لبعد الـ ٦ سنين هاي بطلت febrile convulsion
و إذا بلشت على عمر أصغر من ٦ أشهر بالغالب هاي مش febrile convulsion.
(في عنا حالات extremes، بس بدنا نظل ببالنا انه كل ما رحنا عالـ extreme بدي أظلي في بالي DDx غير)
↲ بمعنى آخر ... ممكن تيجي عالـ ٥ أشهر؟ نعم، بس ما بحطها بأول الـ DDx

Febrile convulsion –cont

- Classification:

-Simple: generalized
<15 min
not recurring in 24 h

(most type of febrile convusions are simple)
إذا أي وحدة من هدول الـ ٣ اختلفت ← صارت complex

-complex: focal
OR >15 min
OR multiple

* Risk of epilepsy in simple febrile convulsion is the same as the normal population (~2%) → يعني ما بتخوف
However in the case of complex febrile convulsion, the risk of epilepsy is very much increased.

Febrile convulsion –cont

- After first febrile seizure: 30% recurrence (1/3) of a second febrile seizure.
- 50% after two or more seizures.

Risk factors for recurrence of FC

- Age<12 m
- Family history of febrile convulsion.
- Height of temperature (the lowest the highest the risk) ex. a child that seizes on 38°c has a higher risk of reccurence than a child that seizes on 40°c
- Duration of fever (the shorter the higher the risk)
- Male gender
- Daycare attendance

→ The shorter the duration before the seizure, the higher the risk of recurrence and the higher the risk of developing epilepsy, and the higher the risk of developing other types of seizures

* The sudden inclinement (increase) in the fever is what causes the febrile convulsion

فمثلاً ممكن نوخد حرارة طفل تكون ٣٧,٥ و بعد ساعة تتشنج و لما أخدنا حرارته كانت ٣٩ ، فالارتفاع السريع بدرجة الحرارة هاي ، كل ما كانت أسرع كل ما زادت احتمالية يصير في recurrence و زادت احتمالية انه يتحول لـ epilepsy ← أنواع ثانية من الـ seizures غير الـ febrile.

Risk of developing epilepsy

- Risk of developing epilepsy after single FC is not different than the risk in the general population
- Complex febrile convulsion
- Neurodevelopmental abnormalities. (ex. Cerebral palsy pts)
- Family history of epilepsy
- Duration of the fever before the seizure is short.

لو نضل نعطي المريض خافضات حرارة و مضادات حيوية بحيث نمنع ارتفاع الحرارة، نظل ممكن نمنع حدوث febrile convulsion ثانية؟
بدراسة ثبت إنه ثلث الأطفال اللي منعطيهم regular Abx ممكن إنه يتكرر عندهم الـ FC
و السبب فيها هي الـ rapid ↑ in the temp (انه تطلع الحرارة فجأة)

Treatment of FC

- Management of the acute febrile illness
- Counseling and education of the family → to abort the seizure
- Treatment of the seizure: rectal diazepam → مفعوله زي الـ IV
- Prophylactic treatment: debate

← إذا اجاك المريض بـ febrile seizure الأولوية إنك توقفها (to abort the seizure) من خلال الـ management of status epilepticus (اللي رح نتحكي بالأونه)
→ once you abort the seizure you have to treat the underlying conviction (cause)
← عشان ما تظل الحرارة عالية ... و طلي منعالجها accordingly
↳ ex. * if the underlying cause is gastroenteritis → we give good hydration and correct the electrolyte imbalance ... ect
* if chest infx (ex. pneumonia) → we use Abx and monitor the pt
يعني الفكرة انه منعالج السبب بارتفاع الحرارة.
→ Then counselling the parents (teach them how to deal w/ a seizing child, tell them the first aid steps)

ملاحظة على الـ prophylaxis → FC pts are not candidates for maintenence therapy (anti-epileptics) because they are not epileptic

One option in HI is to give the child anti-epileptics during the course of the fever → phenobarbital or Valium فمثلاً عندو التهاب بحلقه، فبعطيه لمدة يومين ٣ مرات باليومين ... فهيك منمنع الـ seizure تصير خلال هاي الفترة. نظريًا هاد الحكي مزبوط، لكن فعليًا احنا منعوض الطفل side effects ← دوخان نايم و مسطل و ما دح يوخ it might mask a serious illness و لا سوء إنه support for HI ما دح يوخ، dehydration ← فبتعوض good hydration

Epidemiology of epilepsy

- Birth-16 year: 4-10% experience at least one seizure, mostly in childhood.
- Cumulative risk(risk to develop epilepsy throughout an individual lifetime): 3-5%

ابتداءً من هاد السلايد احنا منحكي عن موضوع epilepsy الـ (خلصنا موضوع الـ FC)

* keep in mind that FC is NOT epilepsy

Classification of epilepsy

1. according to semiology:
   - generalized
   - focal: simple, complex or focal w/ secondary generalization
2. according to etiology:
   - idiopathic → we can't find a reason or an underlying cause (they may have a genetic factor ?)
   - symptomatic ex. brain tumor / head trauma or brain hemorrage / neurocutaneous disorders
   - cryptogenic → An epilepsy w/ a presumed symptomatic nature in which the cause has not been identified
3. according to clinical + age+ EEG: syndromic classification

according to etiology

- Idiopathic: no cause (genetic)
- Symptomatic: cause is found
  -Acute symptomatic seizure
  -Remote symptomatic epilepsy
- Presumed symptomatic/cryptogenic: probably there is an underlying cause but is not evident at the moment

according to semiology:

- Generalized: ictal discharge generalized (two cerebral hemispheres), loss of consciousness: → complete LOC
  -Tonic clonic
  -Tonic
  -Clonic
  -Astatic

→ brain طالعة من كل الـ

- Myoclonic
- Absence

Automatism refers to a set of breif unconscious behaviors in which the subject is unaware of his/her behaviors

بكون اشي بنعمل مش بمكانه زي انه يعبر يحرك فمه و كأنه بيوكل اشي بس فعليًا ما في اشي بفمه

بتحكي معه ، بتطلع فيك بس ما بجاوبك

He's conscious but not aware or not responsive

Focal Complex هاد الحكي عادة منشوفه بال

according to semiology, cont.:

- Focal/partial → usually arising from a lobe or lesion or a specific area in the brain
  - -Simple: sensory seizures (auras) or brief motor seizures. DDX tics (partial voluntary control, less often stereotyped than seizure)
  - -Complex: change in LOC, often proceeded by aura(abd. Pain, sense of fear, visual hallucination, focal sensation), automatisms
  - -focal onset with secondary generalization
    - ↳ Starts as focal then becomes a completely generalized seizure

*It is usually associated w/ an aura → لازم أسأل عنها هل

Epilepsy syndromes

syndrome شو ممكن نشوف age group مرحلة نعرف كل

Examples of epilepsy syndromes according to age of presentation:

- Neonatal:
  - -Benign familial neonatal seizures, at 2-3d, AD → familial Autosomal Dominant
  - -Benign neonatal seizures, at age4-6d (5th day seizure)
  - -Early infantile epileptic encephalopathy(Ohtahara syndrome)
  - -Early myoclonic encephalopathy

Most pts will heal and not suffer from epilepsy

*Both Benign familial neonatal and Benign neonatal seizure are a diagnosis of exclusion (we have to rule out serious cause first!)

Epilepsy syndromes, cont.

▶ Infant

-Infantile spasms (West syndrome)

-Benign myoclonic epilepsy of infancy

-Sever myoclonic epilepsy of infancy (Dravet syndrome)

↳ usually starts as a FC
(although it is rare that a FC develops into epilepsy)

Epilepsy syndromes, cont.

▶ Preschooler

-Sever myoclonic epilepsy of infancy (Dravet syndrome)

-Lennox Gastaut syndrome

-Epilepsy with myoclonic-astatic seizures (Doose syndrome)

↳ Atonic seizures

Epilepsy syndromes, cont.

- Child
  - -Childhood absence epilepsy
  - -Epilepsy with myoclonic abscenc
  - -Benign epilepsy with centrotemporal spikes (Rolandic)
  - -Childhood epilepsy with occipital paroxysms(Panayiotopoulos type)
  - -Landau-Kleffner syndrome

هدول اللتين بشرحوا بعض شوي

→ usually present w/ headache, and might be associated w/ vomitting and autonomic changes

→ Benign types of seizures
→ has a good prognosis

→ They develop aquired aphasia

يعني الطفل بكون لعمر معين (عادة لعمر الـ ٣ سنين) بكون حكا بشكل طبيعي و ماعندو مشكلة ، و فجأة بفقد القدرة عل الكلام ← بتعمله status epilepticus تبلاقيه EEG و علاجو شوي معقد

Epilepsy syndromes, cont.

- Adolescent
  - -Juvenile absence epilepsy
  - -Juvenile myoclonic epilepsy
  - -Grand mal seizure upon awakening

→ *These usually start out as absence seizures

* Sometimes you can have one type of seizure that develops into another type

فأنا لما ألحق الـ pt ممكن أتوقع شو نوع الـ seizure أو الـ syndrome إللي

ممكن انه يصير بعد عمر معين (يعني بلش و هو صغير absence بعدين بس كبر صار myoclonic)

و هاد الحكي برهوني لأنه الـ ttt بتختلف

Examples of epileptic syndromes: West syndrom

- Peak onset: 4-7 m, but can occur in the late neonatal period or after 12 m
- Clinically: spasms (flexion, extension, mixed), associated with variable encephalopathy
- Causes: symptomatic(90%), presumed symptomatic. Prognosis strongly influenced by the underlying etiology
- EEG:

  interictal: hypsarrhythmia

  ictal: spasms

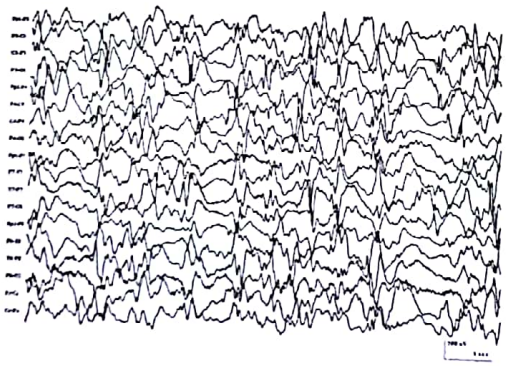
↳ infantile

↳ these usually occur in clusters → جيعي وبا بيجي (they were used to be called Salaam attacks)

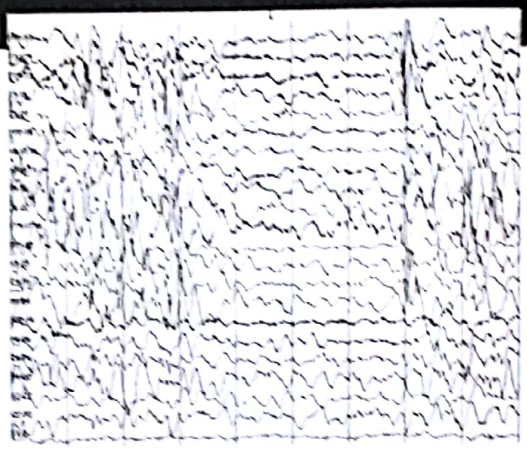
↳ ex. sudden flexion/extension then sustained

* This is one of the bad syndromes.
* It is not easy to treat
* Usually there is a serious underlying cause so they need work up

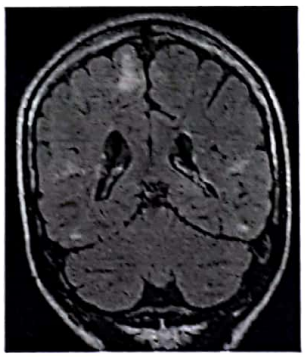
hypsarrhythmia



Spasms



Cortical tubers in tuberous sclerosis



One of the causes of west syndrome that we think about is Tuberous Sclerosis (which is a neurocutaneous disease)

* ضروري أعرف سبب الـ seizure عشان أعرف على شو كمان بدي أدور وأعالج ومن شو بدي أحميه

→ Tuberous Sclerosis is a systemic disease

- These pts have skin changes (ex. ash leaf spots (hypopigmented) that are seen better under UV light) and underlying neurological disease
- These pts are also liable for neoplasms in the kidneys and in the heart

* They can be diagnosed antenatally

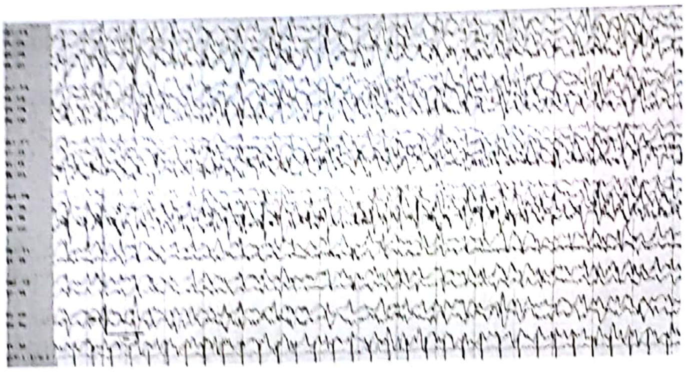
West syndrome, cont

- Treatment
  - -ACTH, most effective (بس صعب نحصله)
  - -High dose oral corticosteroid(S/E: immunosuppression, HTN, diabetes)
  - -Vigabatrin particularly in tuberous sclerosis(S/E: irreversible visual field deficit with prolonged use (فلازم نخلي بالنا انه ما نقدر استعمله لفترة طويلة)
- Prognosis – developmental delay, many will have seizures later in life, can evolve to Lennox Gastaut Syndrome (مش إنه بتحول ... هو المريض بكون طلع من مرحلة عمرية لمرحلة عمرية ثانية)

Lennox Gastaut Syndrome

- Age of onset – 1-7 years of age (or they may have started before as West syndrome and continued as Lennox Gastaut)
  - ↪ Variable
- Seizure types – tonic (mostly nocturnal), atonic, myoclonic, atypical absence, generalized tonic clonic, focal
- Associated EEG patterns – generalized 1-2hz slow spike and wave, generalized slowing, paroxysmal fast activity (recruiting rhythm) during sleep
- Common etiologies – variety of etiologies, proceeded by infantile spasms in 9-40% of cases
- Treatment – felbamate, clobazam, rufinamide, topiramate, zonisamide, ketogenic diet, valproate, levetiracetam, VNS, corpus callosotomy, focal cortical resection (if there is a focus) (we have a lot of options to treat — كل ما نشوف اد options طالعة كتيرة بعرف انه المرض difficult to treat)
- Prognosis – moderate to severe intellectual impairment, usually correlates with etiology and seizure control

EEG: Slow Spike and Wave



→ Treatment of Absence Seizure

1st line → ethosuximide (بس هاد مش موجود بالأردن)

2nd line → Sodium Valproate (broad-spectrum anti-epileptic)

3rd line → Lamotrigine

* إذا كانت absence لحال الـ ethosuximide أحسن اشي
* إذا معها seizure ثاني زي الـ juvenile myoclonic ← بعطيه valproic acid

Childhood absence epilepsy

* Dx → clinical Dx

- Age of onset: 3-10 years, peak at 6-7 years (مع بداية المدرسة); [onset before age 3 years likely represents different epilepsy syndrome] → we usually think of glut-1 deficiency in this case.
- Seizures: EEG: Typical absence seizure, 3 Hz spike and wave → فيي ممكن أعملها بالعيادة.
  - Type: generalized absence seizures, can be provoked by hyperventilation (بيجي سريع) in up to 90%; 3% will also have generalized convulsive seizures → Atypical absence seizure
  - Semiology: [staring, behavioral arrest, unresponsiveness] (Typical absence seizure) Infrequent associated automatisms, clonic jerks, loss of postural tone.
  - Duration: brief, up to to 5 seconds (max 10 sec) → إذا حكالك نص دقيقة بسرح، هاي مش absence seizure
  - Frequency: high, hundreds per day if untreated

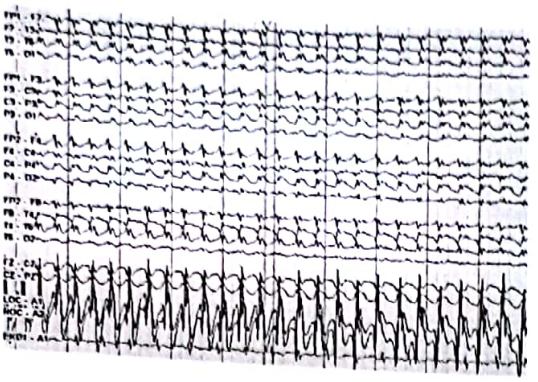
* هدول من الـ seizures اللي ما بستنى عليهم ... أول ما نشخصهم مبدأ بعلاجهم معظمهم تبعالجوا و مع العمر بتبطل تصير معهم ... و نسبة قليلة منهم (١٠-٢٠٪) بتصير أنواع ثانية من الـ seizure

* إجاك مريض عالعيادة عمره ٧ سنين بحكولك كان الفصل الأول أموره تمام بالمدرسة و هسا بلش يتراجع علاماته بتنزل و بضل ~~يسرح كثير~~ (يصفن) لمدة ٥-١٠ ثواني

(بكون سبب تراجعه دراسيًا من كثر ما بصفن، لأنه مثلاً بكون يكتب ورا المعلمة و من كل كلمة بروح عليه حرف أو من كل جملة بتروح عليه كلمة ... بكون بسمع للمعلمة و كل شوي يصفن ٥ ثواني، فمش عم بوخذ معلومة كاملة)

EEG: Typical absence seizure, 3 Hz spike and wave

3 per second



Rolandic (BECTS)

- Etiology: Unknown, although a family history of epilepsy is common
- Age of onset: 4-10 years
- Seizures
  - Type: focal seizures, typically out of sleep
  - Semiology: drooling, dysarthria, speech arrest, tingling or clonic activity of unilateral face with spread to arm, may progress to hemiclonic or generalized convulsive
  - Duration: self-limited, status epilepticus is uncommon
  - Frequency: typically low

* It is a benign type of seizure

* يصحى من النوم مثلاً مش قادر يحرك ايدو أو مش قادر يفتح فمه أو مش قادر يحكي ... إلخ و عادة بينتبهوا عليهم لما يصير عنده هم (secondary generalized) convulsive movements
و لما نوخه مستوري كويس من التريفن منكتشف انها كانت focal

Rolandic Epilepsy

- Interictal EEG: High amplitude centrotemporal spikes and sharp waves with dramatic activation during sleep Serial EEGs may show shifting asymmetry of spike wave discharges
- Imaging: normal
- Treatment: pharmacoresponsive, may not require preventative medications if seizures are infrequent.
- Clinical course: self limited epilepsy with spontaneous remission, usually by age 15-17 years
- Comorbidities: Normal cognition, although learning and behavioral disorders can occur

What to do

- History and Examination
- Rule out disorders that mimic seizures

- Role of neuroimaging (Brain MRI superior to CT scan): tumors, vascular malformation, inflammation, metabolic disease
- EEG
- Metabolic work up
- Genetic studies

Causes of seizure

- Unknown
- Perinatal complications
- Electrolyte imbalance
- Inborn errors of metabolism
- Infections trauma
- Tumors
- Cerebrovascular diseases

→ Electrolyte imbalances that provoke seizures:
- hyponatremia and hypernatremia
- hypoglycemia
- hypocalcemia
- hypomagnesemia

Disorders that mimic seizures

syncope هاي ← إذا اجاك طفل بحكي مثلاً كان واقف بطابور المدرسة فجأة داخ و وقع sudden loss of consciousness

- Arrhythmias
  - Long QT and torsades
  - VTach
  - Anytime there is poor cardiac output impairing cerebral perfusion, you can see motor activity / hypoxic convulsions.
- Breath-Holding Spells
  - Actually not associated with inspiratory hold. The child typically screams/cries and exhales fully.
  - They can loose postural tone and have motor activity.
  - Up to 15% will have generalize hypoxic convulsions

* syncope could be cardiogenic or neurogenic or neurocardiogenic (cardiac output restriction)

بعدين إجاك طفل عمرو ١٤ شهر بقلك هاد الولد بس يكون بلعب، إذا حدا أخذ منه شغلة، بصير يبكي، بوخذ زفير و بيقطع نفسه و يزرق ... بتسأل من متى بلشت، بحكولك بعد الـ٦ شهور أو سنة و ما زالت

لـ هاي مش seizure و إنما Cyanotic Breath-Holding spells

طيب شو الحل؟ اسعف الطفل خلال الـ spell (مثلاً حركه أو قرمه لقدام) عشان يرجع نفسه و بعدين اتركه (ما تعطي اللي بدو إياه)

* Pts who have breath holding spells commonly they have iron deficiency anemia However it is not a cause ... but an association

* في بعض الدراسات بتحكي انه بعطي هدول الأطفال حديد حتى لو ما عندهم نقص.

Disorders that mimic seizures

- Migraine Syndromes
  - Basilar Migraine
  - Familial Hemiplegic Migraine
- Gastroesophageal reflux may cause generalized stiffness or posturing.
  - Can have apnea also.
  - Often occurs 20-30 min after a meal.
- Dystonic Reactions
  - Always look at the medication list!!

↳ ex. metoclopramide

Disorders that mimic seizures, cont.

- Sleep-Related Phenomena
  - Benign sleep myoclonus
  - Periodic sleep jerks
  - Narcolepsy
  - Sleep terrors
- Tics → focal seizures بتشبه الـ
- Benign paroxysmal vertigo
- pseudoseizure → psychosocial
- Jitteriness in newborn → it's hallmark is tremor

مش معناها انه المريض بكذب أو بمثل ... في مريض كانوا يحكوا انه بتشنج بالمدرسة و بس بالمدرسة ، بعملوله تخطيط و فحوصات و ما بين اشي و كأنه تكررت أكثر من مرة مشوا على anti-epileptics و مع هيك ضلت تيجيه و بس بالمدرسة بتصير ... بالآخر طلبوا انه يصوروا الطفل و هو بتشنج فلما شافوا الفيديو عرفوا انها مش seizure حقيقية من حركته ... عرفوا بعدين انه الطفل كان بتعرض للتنمر في المدرسة

مثلاً لما طفل عمره شهر بحكولك انه رجله بتصير تتحرك (أو توج) فإنت ممكن تفكر انه معه focal seizure و بعدين سألت انه إذا مسكنا رجله أو ثنيناها بتبطل توج ... بحكولك اه معناته هاي مش seizure ... هاي jitterness و عادة منشوفها بالـ infants

Jitterness could be associated w/ hypoglycemia or hypocalcemia ↲ (It is Benign.) بس ما بتخوف

Recurrence of unprovoked seizures

- First seizure: 20-40% will have recurrence → so 60-80% will not have a second episode
- Second seizure: up to 80% will have recurrence
- Recurrence usually within the first 6 m, rare after 2 y
- Factors that enhance recurrence in epileptic patient: (that is on antiepileptic ttt)
  - Poor compliance on medication
  - Fever (febrile illnesses) → The most common
  - change in sleep pattern → sleep deprivation or over-sleeping can provoke the seizures.
  - Choice of wrong drug
  - Drug interaction w/ another drug
  - Wrong dosing

عشان هيك احنا منبلش المرضى على ttt anti-epileptic بعد ثاني seizure مش من الأول

Treatment goals

- Prevent occurrence of seizure
- Prevent or reduce drug S/E, drug interaction
- Improve quality of life
- Provide simple, cost effective care

Modalities of treatment

- AED: old and new
- Ketogenic diet
- Epilepsy surgeries
- Vagal nerve stimulation

Drugs, old

- Phenobarbital
- Phenytoin
- Valproic acid
- Carbamazepine
- Clonazepam
- ethosuxamide

New drugs

- Lamotrigine
- Topiramat
- Levetiracetam
- Zonisamide
- Felbamate
- Gabapentine
- Oxcarbamazepine
- Vegabatrin
- Tigabine

لازم نعرف الـ side effects للأدوية !

AED- some S/E

منعة لـ generalized

→ broad spectrum anti-epileptic

- Valproic acid: weight gain, tremor, hair loss, hepatitis, thrombocytopenia

منعة لـ focal

- Carbamezapine: bone marrow suppression, steven Johnson, hyponatremia, liver toxicity
- Ethosuxamide: bone marrow suppression, steven Johnson
- Lamotrigine: steven Johnson, liver toxicity
- Topiramat: kidney stones, glaucoma, hyperhidrosis, weight loss
- Levetracitam: behavioral symptoms → ↑ intra-ocular pressure.

من الأدوية الجديدة و العرضية ، ما الله كيف S/E

renal excretion