Diagnosing Epilepsy in Children and Adolescents

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Disclosures

None relevant to this talk.
Aims & Goals

• Discuss the difference between seizure & epilepsy
• Discuss the diagnosis process
• Discuss potential mimics of seizures in children

• Better understand the existence of the varieties of seizures
• Be able to make the distinction between seizure and epilepsy
• Become aware of the limitations of the diagnostic process
Overview

• Definitions
• Why People Have Epilepsy
• The Process of Diagnosing Epilepsy
• Mimics of Seizures
• Testing
• Challenges
• Conclusions
• Resources
Definitions
Seizure vs Epilepsy

Seizure
- An abnormal, excessive or synchronous neuronal activity in the brain.

Epilepsy
- At least two unprovoked (or reflex) seizures occurring greater than 24 hours apart, OR
- One unprovoked (or reflex) seizure and a probability of further seizures similar to the general recurrence risk (at least 60%) after two unprovoked seizures, occurring over the next 10 years, OR
- Diagnosis of an epilepsy syndrome

POST-TRAUMATIC

FEVRILE

POST-STROKE

OVERDOSES

ELECTROLYTE ABNORMALITIES

HYPOGLYCEMIC

CNS INFECTION

SEIZURES

UNPROVOKED

bilateral tonic-clonic

focal with alteration in awareness

tonic

focal without alteration in awareness

clonic

absence

atonic

epileptic spasms

myoclonic

EPILEPSY
Provoked Seizures

These are not Epilepsy because there is small risk of a seizure in the absence of a precipitating factor

- Febrile seizures in children age 0.5 – 6 years old
- Alcohol-withdrawal seizures
- Metabolic seizures (sodium, calcium, magnesium, glucose, oxygen)
- Toxic seizures (drug reactions or withdrawal, renal failure)
- Convulsive syncope
- Acute concussive convolution
- Seizures within first week after brain trauma, infection or stroke
Why People Have Epilepsy
Reasons for Epilepsy

- Brain injury (remote) – trauma, hemorrhages, strokes, infections
- Genetic
- Malformations in brain structure
- Tumors
- Unknown
(remote) Brain injury
Angelman syndrome (genetic syndrome)
Malformations in brain structure (a)
Malformations in brain structure (b)
Malformations in brain structure (c)
The Process of Diagnosing Epilepsy
How to Diagnose a Seizure?

- Note the criteria for epilepsy never specifically mentioned a brainwave study (electroencephalogram, EEG) OR imaging of the brain (CT or MRI)*

- "Order up a history and start a physical"
How to Diagnose a Seizure?

• Unlike other health conditions, seizures are rarely witnessed in the office.

• We rely on descriptions provided by family “history”
  – (videos are always appreciated 😊) .
How to Diagnose a Seizure?

• Some highly suggestive symptoms:
  – An aura or warning (for instance, sense of déjà vu or unusual visual disturbance)
  – Abruptly stopping in the middle of an activity with unresponsiveness or slowed behavior during the event
  – Forced gaze or head deviation
  – Certain types of motor activity (clonic, myoclonic, tonic, dystonic)
  – Color changes (turning blue/purple or pale)
  – Incontinence with the event
  – Following an episode and having: migraine, inability to talk, slurred speech, or weakness on one side of the body.
How to Diagnose a Seizure?

• Some important aspects from the history:
  – Prior history of seizures (perhaps not realized at the time and confirming a diagnosis of epilepsy already)
  – Prior history of febrile seizures (3-20% with later epilepsy)
  – Developmental problems (depending on the severity and type, could impact later risk)
  – Family history of seizures (<10% of later epilepsy in 1st degree relatives)
  – Prior history of brain trauma or brain infections
How to Diagnose a Seizure?

• The physical exam identifies abnormalities of the nervous system that support a diagnosis of epilepsy
  – Unusual physical features (eg, facial features, skin findings)
  – Cognitive testing (eg, intellectual disability)
  – Weakness (eg, cerebral palsy)
Mimics of Seizures
What Else Can Look Like a Seizure?

**Neonate/infant**
- gastroesophageal reflux
- colic
- apnea
- congenital heart disease
- primitive reflexes
- stereotypies
- sleep jerks

**Young child**
- breath-holding spells
- heart arrhythmias
- fainting spells
- nightmares/night terrors
- sleep apnea
- sleep jerks
- daydreaming
- learning problems
What Else Can Look Like a Seizure?

Adolescent

- migraine
- daydreaming
- ADHD
- learning disability
- psychiatric disorders (depression, anxiety, obsessive-compulsive disorder, somatoform disorders)
How to Diagnose a Seizure?

• Ancillary studies (which neuro-imaging and electroencephalography (EEG)) can be used to assist in establishing a diagnosis of epilepsy
Testing
Magnetic Resonance Imaging
Magnetic Resonance Imaging

www.slideshare.net/JayantiGyawali/mri-brain
accessed 1/7/2019
Electroencephalography

Abnormal electrical impulses during a seizure

Brain

www.hopkinsmedicine.org/healthlibrary/test_procedures/neurological/electroencephalogram_eeg_92,p07655
kidshealth.org/en/parents/eeg.html
accessed 1/7/2019
Electroencephalography
Limitations of EEG: Abnormality in a deep portion of the brain
Challenges
Seizure vs Epilepsy

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Challenges

• One unprovoked seizure and “a probability of further seizures similar to the general recurrence risk (at least 60%) after two unprovoked seizures”
What constitutes a high recurrence risk?

• a single seizure occurring at least a month after a stroke

• A child with a single seizure conjoined with a structural or remote symptomatic etiology and an epileptiform electroencephalography (EEG) study.

• A first seizure might present as status epilepticus, but this does NOT in itself imply epilepsy.

• Recurrence risks are not known for the majority of individual cases.
What constitutes high recurrence risk?

- A single seizure plus a lesion or a single seizure plus epileptiform EEG spikes does NOT automatically satisfy criteria for this operational definition of epilepsy, because data may vary among different studies and specific clinical circumstances.

- Children with epileptiform EEG patterns after their first seizure had a 2-year risk for recurrence of 71%.

- A first idiopathic seizure and abnormal EEG patterns had recurrence risk of 56% at 3 years.

- No formula can be applied for additive risks, since data are lacking on how such risks combine; such cases will have to be decided by individualized considerations.

- Recurrence risk is a function of time, such that the longer the time since the last seizure, the lower the risk.
Conclusions

• Two, unprovoked seizures more than 24 hours apart = EPILEPSY

• One seizure + evidence to suggest high recurrence risk = EPILEPSY
Conclusions

• Seizures are rarely witnessed in the office.
• Taking a history and obtaining a physical are the most important tool in establishing a diagnosis of epilepsy — brain imaging and EEG are important, but not always necessary.
Resources

• Epilepsy Foundation of Arizona (epilepsyaz.org/Facebook/Twitter)
• Epilepsy Foundation of America (epilepsy.com)
• National Association of Epilepsy Centers (naec-epilepsy.org)
• Emily Center at Phoenix Children’s (phoenixchildrens.org/conditions/medical-conditions)