Seizures Overview
Clinical Pearls

SESSION ONE
Disclosures

**Presenter:** Dr. Andrea Andrade, M.D. FRCP(C)

No conflicts to disclose
Learning Objectives

1. Increase your ability to identify, define, and accurately assess seizure types

2. Increase your understanding of febrile seizures; including treatment and management strategies

3. Understand under what circumstances a specialist referral may be necessary
Seizures
Seizures vs Epilepsy

Official definitions:

• An epileptic seizure is a transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal activity in the brain

• Epilepsy is a disease characterized by an enduring predisposition to generate epileptic seizures and by the neurobiological, cognitive, psychological, and social consequences of this condition.

• These are official definitions

A seizure is episodic abnormal behavior due to a paroxysmal electrical discharge of neurons [nerve cells] in the brain.

Epilepsy means spontaneous recurrent seizures.

Seizure and epilepsy are not the same. Seizure is an event and epilepsy is the disease involving recurrent unprovoked seizures.

Understanding Seizures: The Basics

• Seizures types are classified into
  • Generalized onset
  • Focal onset
    • May secondarily generalize
  • Unknown onset

Source: http://epilepsyontario.org/about-epilepsy/what-is-epilepsy/
Understanding Seizures: The Basics

• A focal seizure may be composed of three events [but not always]

• The aura is a premonition by the patient that seizure is about to happen. Actually the aura is the beginning of the seizure because the warning sensation is caused by a paroxysmal discharge of neurons in that part of brain that causes the warning sensation

• The ictus is the seizure

• The postictal state is the period of altered level of consciousness that follows the ictus

Source: http://epilepsyontario.org/about-epilepsy/what-is-epilepsy/
Understanding Seizures: The Basics

• Seizures can have a different clinical appearance depending on where in the brain the neurons are discharging in a paroxysmal fashion, and how much of the brain the seizure affects as it spreads. For example:

  • Convulsions – generalized seizure
  • Jerking of arm, leg, or face – focal seizure
  • Lack of awareness or other strange behaviors – focal seizure [temporal lobe]
  • Lack of awareness – generalized seizure [absence]

Source: http://epilepsyontario.org/about-epilepsy/what-is-epilepsy/
Seizure Videos

Courtesy of Epilepsy Ontario

Tonic Clonic seizure:
https://vimeo.com/151566172

Focal Dyscognitive [temporal lobe] seizure:
https://vimeo.com/151633047

Absence seizure:
https://vimeo.com/151563054

Source: http://epilepsyontario.org/research-and-resources/seizure-videos/
Evaluation: Key Areas of Focus

• Detailed history of Event
  o ? Aura, ? Postictal confusion

• Past and Recent Medical History
  o Identify risk factors – Trauma, ingestion, drugs, etc.

• Family History
  o Key

• General Physical Examination
  o Dysmorphisms, heart

• Neurological Examination
  o Focality
Seizures: Causes

• Normal history and exam: cause is rarely identified without a genetic work up

• Neurodevelopmental abnormalities: cause likely will be identified or may already have been determined before seizure onset

Source: http://pediatriccare.solutions.aap.org/content.aspx?resultClick=1&gbosid=165567#sec_59043243
Seizure - Workup

Guideline on Initial Laboratory Tests After First Afebrile Seizures or New Onset Epilepsy in Children

- Laboratory tests should be driven by clinical circumstances
- Toxicology screening should be considered across the entire paediatric age range if there is any relevant history.
Seizure - Workup

Electroencephalography [EEG]

- A critical part of the neurodiagnostic evaluation of the adult and child with an apparent unprovoked first seizure
- May indicate diagnosis, prognosis and have treatment implications
- Can be done electively

Source: https://www.criticalcareontario.ca/EN/Epilepsy%20Guideline%20Series/Provincial%20Guidelines%20for%20Management%20of%20Epilepsy%20in%20Adults%20and%20Children_January%20202015.pdf
Seizure - Workup

A word about EEG

• Primary care providers, and pediatricians shouldn’t expect to read an EEG, but need to know how to interpret the report.

• A few hints;
  • Be aware of who is reading the EEG. It may be an adult neurologist unfamiliar with developmental features of the EEG in a child
  • Be aware of the limitations of EEG
  • Be aware of the buzz words to look for in an EEG report
Seizure - Workup

Limitations of EEG

• Records field electrical potential of $10^7$ neurons out of $10^{11}$ neurons in brain

• Records 45 minutes out of a 24 hour day so many things can be missed

• Recording the tiny electrical signal from the brain requires amplification and thus creates possibilities for artifacts which limit interpretation

HOWEVER, STILL THE MOST IMPORTANT DIAGNOSTIC TEST DONE IN EPILEPSY WORKUP
Seizure - Workup

Buzzwords in EEG interpretation

• Description of *background activity* as slow or normal – this is non-specific abnormality which may mean nothing

• Description of *focal slowing* on one side or side to side asymmetry – this is significant and raises possibility of structural lesion underlying the side where slow wave activity is described. Usually indication for MRI

• Description of *epileptiform activity, ie. spike, spike wave, sharp waves* – all wave forms that appear and disappear quickly. Suggestive, but not diagnostic of a seizure disorder.
Seizure - Workup

EEG

• An EEG abnormality by itself is not sufficient to make a diagnosis that an epileptic seizure occurred, nor can its absence rule out a seizure.
Seizure - Workup

Guideline on Neuroimaging in Pediatric Patients After First Afebrile Seizure or New Onset Epilepsy

• For children with first seizure, neuroimaging is reserved for those with focal seizures, focal neurological abnormalities associated with the seizure, a pre-existing neurological disorder, or adolescents.

• CT is pretty worthless – MR always procedure of choice

Source:https://www.criticalcareontario.ca/EN/Epilepsy%20Guideline%20Series/Provincial%20Guidelines%20for%20Management%20of%20Epilepsy%20in%20Adults%20and%20Children_January%202015.pdf
Seizure - Workup

Guideline for Other Tests

• Seizure-like attacks with a cardiovascular cause may be misdiagnosed as epilepsy. A 12-lead electrocardiography (ECG) should be performed in adults with suspected epilepsy. In children and young people, a 12-lead ECG should be considered in cases of diagnostic uncertainty.

Source: https://www.criticalcareontario.ca/EN/Epilepsy%20Guideline%20Series/Provincial%20Guidelines%20for%20Management%20of%20Epilepsy%20in%20Adults%20and%20Children_January%202015.pdf
Burden of Epilepsy

• 70 % of patients with epilepsy can have the seizures controlled with medications

• 30 % continue to have medically refractory epilepsy, i.e. frequent, severe seizures in spite of treatment with antiepileptic drugs
Burden of Epilepsy

• Social stigma
• Psychiatric co-morbidity
• Poor school performance, peer relationships
• Higher unemployment
• Inability to drive
• Marriage and family less likely
• Lower educational status
• Higher mortality
Patient/Caregiver Education Tips

• Fear of a brain tumor causing the seizures
• Fear of dying from epilepsy

  o After seeing their child have a seizures, many patients and parents of children with epilepsy are worried that death could result from a seizure. It should be pointed out to patients and families that dying from a seizure is relatively rare, however there is this thing called SUDEP [which stands for sudden unexplained death in epilepsy]... and it occurs in 1 in 1000 people living with epilepsy each year

Source: https://www.criticalcareontario.ca/EN/Epilepsy%20Guideline%20Series/Provincial%20Guidelines%20for%20Management%20of%20Epilepsy%20in%20Adults%20and%20Children_January%202015.pdf
Febrile Seizures
What is a Febrile Seizure?

• A seizure that occurs in association with a fever (temperature at or above 100.4°F or 38°C by any method)

• Very common in children (3-4%)

• Age of onset: 6 months to 5 years
  o (median age 18-22 months)

• No evidence of a CNS infection, or acute neurologic illness

• Usually occurs in an otherwise healthy child

• There may/may not be a family history of febrile seizures/epilepsy

Sources: http://pediatrics.aappublications.org/content/127/2/389.full.pdf and http://pediatriccare.solutions.aap.org/chapter.aspx?scriptId=56754849&bookId=1017&resultClick=1#56780691
Febrile Seizures

• Simple febrile seizures are generalized tonic-clonic convulsions that last less than 15 minutes and do not recur within 24 hours

• Complex febrile seizures are less common and are focal or prolonged beyond 15 minutes or reoccur within 24 hours
Febrile Seizures: Evaluation

• Thorough history and examination
  o Aimed at determining the cause of fever

  o Routine laboratory tests, electroencephalography, and neuroimaging are NOT recommended in patients with simple febrile seizures.

Source: Baumann RJ, Duffner PK. Pediatr Neurol. 2000
Febrile Seizures: Rx

- No negative impact on intellect or behavior, or increased risk of death
- No AEDs
When to Refer

From Emergency Department:

• Patients with new onset epileptic seizure(s) should be advised to follow up with their family physician, pediatrician, or nurse practitioner

• Patients with an established diagnosis of epilepsy may present to the ED after recurrence of seizures. These patients should be advised to follow up with their family practice physician, nurse practitioner, or pediatrician

Source: https://www.criticalcareontario.ca/EN/Epilepsy%20Guideline%20Series/Provincial%20Guidelines%20for%20Management%20of%20Epilepsy%20in%20Adults%20and%20Children_January%202015.pdf
When to Refer

From Family Physician/Nurse Practitioner/Pediatrician

• After the first unprovoked epileptic seizure, patients should be referred for an EEG, and if necessary, MRI brain. Patients with abnormalities in the MRI should be referred to a specialist.

• Once the diagnosis of epilepsy is established, antiepileptic drug [AED] treatment may be initiated by the primary care provider/pediatrician.

• All patients who fail to respond to adequate trial of the first AED should be considered for referral to an epileptologist unless the primary care provider feels comfortable adding a second drug.

Source: https://www.criticalcareontario.ca/EN/Epilepsy%20Guideline%20Series/Provincial%20Guidelines%20for%20Management%20of%20Epilepsy%20in%20Adults%20and%20Children_January%202015.pdf
When to Refer

- Medically refractory
- Potential surgical candidates
- Requirement for diet therapy for epilepsy
- Concerns based on clinical judgment, even if the epilepsy is not medically refractory
  - Adverse drug effects
  - Psychosocial co-morbidities

Source: https://www.criticalcareontario.ca/EN/Epilepsy%20Guideline%20Series/Provincial%20Guidelines%20for%20Management%20of%20Epilepsy%20in%20Adults%20and%20Children_January%202015.pdf
Where to Refer/Read

MAP OF ONTARIO’S REGIONAL AND DISTRICT EPILEPSY CENTRES

https://www.criticalcareontario.ca/EN/Library/Epilepsy%20Guideline%20Series/Pages/default.aspx
Questions and Discussion?