First Seizure: Evaluation and Diagnosis

Carolyn Hickman, PhD, RN, CPNP
Nurse Practitioner, Pediatric Neurology
Disclosures

• NONE
Objectives

• Distinguish between seizures versus epilepsy.
• Provide overview of incidence and prevalence of seizures and epilepsy.
• Review the different types/presentations of seizures.
• Describe the initial assessment of a child presenting with a new-onset seizure.
• Identify appropriate testing for a patient with a new-onset seizure.
• Discuss the value of EEG and neuroimaging in diagnosis and treatment.
• Review patient safety and seizure first aid.
• Discuss family counseling after a first-time seizure.
Goals

• Be able to discern between seizures and epilepsy.
• Become aware of the prevalence and incidence of seizures and epilepsy in children.
• Be aware of various causes of seizures.
• Be familiar with the various types of seizures.
• Become aware of the appropriate testing for a new onset provoked seizure.
• Be able to distinguish between a provoked vs unprovoked seizure.
• Become familiar with seizure first aid and safety.
Prevalence/Incidence of Seizures in Children

- 5% of children will have at least 1 seizure.
- 20% - 80% risk of having a 2nd seizure after 1st.
- 1% of children will experience an afebrile seizure by 14 years of age.
- 5% of children will have a febrile seizure by age 6 years.
- 40 to 50% recurrence at 2 years if 1st unprovoked seizure left untreated.
Prevalence/Incidence of Seizures in Children (cont’d)

- Approximately 120,000 children in U.S. seen annually for new-onset seizure.
- Between 75,000 to 100,000 of them are children less than age 5 years, who have experienced a febrile seizure.
Prevalence/Incidence of Epilepsy in Children

- Increase prevalence of epilepsy in African Americans and children in lower socioeconomic groups.
- Increase prevalence of epilepsy in males.
- Prevalence of epilepsy increases with age.
- No identifiable cause in 70% of new cases.
- Approximately 45,000 children less than age 15 years develop epilepsy annually.
- Approximately 326,000 school children through age 15 years have epilepsy.
Definition of Seizure

- A clinical manifestation of excessive discharge in a population of hyper-excitable neurons in the brain (International League Against Epilepsy).
- A sudden surge of electrical activity in the brain (Epilepsy Foundation).
What is Epilepsy?

• “A disorder of the brain characterized by an enduring predisposition to generate seizures and by the neurobiological, cognitive, psychological, and social consequences of this condition” (International League Against Epilepsy).

• This definition highlights the importance of not only caring for the child’s seizures but also the child’s global well-being.

• When a child has an appropriate history of two or more unprovoked seizures separated by at least 24 hours, they are considered to have epilepsy (Epilepsy Foundation of America).
Symptomatic Causes of Seizures (Provoked)

- High fever
- CNS infection
- Head trauma
- Intoxications
- Drug Effects
- Lack of oxygen supply to brain, Fainting
- Structural or metabolic abnormalities
- Cerebrovascular event
- Convulsive syncope
Types of Seizures

- Partial
  - Simple Partial Seizures
  - Complex Partial Seizures
  - Partial seizure with secondary generalization
- Epilepsy Syndromes
  - Benign epilepsy of childhood with centro-temporal spikes
  - Epilepsia partialis continua
Types of Seizures (con’t)

• Primary Generalized
  – Absence Seizures
  – Myoclonic Seizures
  – Atonic Seizures
  – Tonic-Clonic Seizures

– Epilepsy Syndromes
  - Infantile spasms (West Syndrome)
  - Lennox-Gastaut syndrome
  - Childhood Absence Epilepsy
  - Juvenile Myoclonic Epilepsy
  - Febrile Seizures
Simple Partial Seizures

• Caused by focal epileptiform discharges.
• Seizure activity restricted to 1 side of body.
• Preserved consciousness.
• Symptoms may be motor, sensory, or cognitive depending on location of neuron discharge (e.g. seizure discharge from 1 occipital lobe may cause visual symptoms such as scintillating colored spots or scotomata in the visual field on opposite side of seizure).
• May be followed by Todd’s paralysis (weakness of the limbs involved in seizure).
Complex Partial Seizures

• Seizures that originate in a limited area of one cerebral hemisphere.
• Results in impaired consciousness.
• May be preceded by an aura before consciousness is loss.
• May begin as simple partial seizure and progress to consciousness impairment.
• Staring and automatisms, which are involuntary coordinated motor activity that occurs when there is clouding of consciousness.
Partial Seizure with secondary generalization

- Partial seizure of any type may progress to become secondarily generalized.
Auras

• Symptoms of an aura depend on the location of the cortical discharge.
• Auditory, olfactory, or visual illusions or hallucinations.
• Affective symptoms such as fear or other unpleasant feelings may occur.
• Déjà vu (feeling that an experience has occurred before). Jamais vu (feeling that previously experienced sensation is unfamiliar and strange).
• Young children may say there was a “funny feeling” that occurred in head or stomach.
Automatisms

• Include simple phenomenon such as chewing, lip smacking, swallowing, and hissing.
• Include more complicated activities such as picking at clothes, searching, or ambulating.
• Usually followed by postictal amnesia.
Benign Epilepsy of Childhood with Centro-temporal Spikes

- Also known as rolandic epilepsy, sylvian seizures, and centro-temporal epilepsy.
- Onset between ages 5 and 8 years.
- Males more often affected than females.
- Seizures typically occur during sleep.
- Seizure may be generalized at onset, most last less than 2 minutes in duration.
- Consciousness retained.
- If seizures are infrequent, treatment may not be necessary.
- Remit around 9 to 12 years of age, but no later than 17 years.
Generalized Seizures

- Bilateral symmetrical without focal onset
- Spreads to both hemispheres
- Loss of consciousness
Absence Seizures

• Generalized, non-convulsive seizures.
• Characterized by interruption of activity, staring, and unresponsiveness, for 5 to 15 seconds.
• Unresponsiveness may be accompanied by eye fluttering and upward rotation of eyes and occasional mild clonic movements or automatisms.
• Onset is generally between 4 and 8 years of age.
• Seizures may occur over 100 times/day and may interfere with child’s learning ability.
• Starts abruptly and ends abruptly with resumption of child’s pre-ictal activity.
• Child may be unaware that the episode occurred.
Myoclonic Seizures

• Characterized by brief, sudden muscle contractions (jerks) that may involve one part of the body or may be generalized.
• Occur in clusters, especially during the period of falling asleep or shortly after awakening.
• There is no alteration in consciousness associated with the jerks.
Atonic Seizures

• Also termed “astatic” seizures or “drop attacks”.

• Characterized by sudden decrease in muscle tone, which may result in head nodding or mild flexion of the legs, or slumping to floor.

• There is usually no detectable alteration in consciousness with these seizures.
Generalized Tonic-Clonic Seizures

• Also known as grand mal seizures.
• Consist of motor manifestations and loss of consciousness.
• Tonic phase – a sustained contraction of muscles, and as a result patient falls to ground. Extensor posturing with tonic contraction of the diaphragm and intercostal muscles. Typically lasts less than 1 minute.
• Clonic phase – consist of bilateral and rhythmic jerking. Jerks may be accompanied by expiratory grunts. May last several minutes. Bowel and bladder incontinence may occur. Tongue may be bitten. Several minutes duration.
• Post-ictal: vomiting, confusion, lethargy, with gradual recovery of consciousness over minutes to hours.
Juvenile Myoclonic Epilepsy

- Age of onset of 12 to 18 years.
- Typically no aura.
- Represents 4% of all epilepsy.
- Characterized by myoclonic jerks (precedes GTC convulsions by months to years), generalized convulsions, absence.
- Precipitated by sleep deprivation, ETOH, and hormonal changes.
- Genetic; a locus on the short arm of chromosome 6 has been identified.
Febrile Seizures

• Onset 3 months to 6 years.
• Peak age: 18 to 24 months.
• Most are simple (i.e. single, brief, less than 15 minutes in duration) and generalized.
• Approximately 1/3 are complex (i.e. multiple occurrences within 24 hours, prolonged, or focal).
• Approximately 30% will experience recurrence, with higher rate (50%) in children with 1st seizure before 12 months of age.
• Precipitated by fever.
Critical Historical Elements

• Sequence of behavior prior to seizure event.
• Setting in which seizure occurred.
• Child’s behavior prior to, during, and after.
• Description of seizure by observer.
• Duration and frequency of the spell.
• Family history of epilepsy, genetic disorders.
• Neurodevelopmental history,
• Psychosocial history (stressors, ETOH, drugs).
• Medical history (birth, CNS insults, infections, fever, trauma).
Seizure Semiology

• Aura: Subjective presyncopal, epigastric, etc
• Behavioral Changes - irritability
• Autonomic – pupillary dilation, drooling, change in respiratory or heart rate, incontinence, pallor, vomiting.
• Level of consciousness - conscious, unconscious, impaired (inability to understand or speak).
Seizure Semiology (con’t)

- Pre-ictal symptoms - Describe by patient or witness.
- Vocal - Cry or gasp, slurring of words, garbled speech.
- Motor – Head or eye turning, posturing, jerking (rhythmic), stiffening, automatisms (e.g. lip smacking, picking at clothing, tapping), generalized or focal movements.
Common (but not pathognomonic) Post-ictal Symptoms

- Amnesia
- Confusion
- Lethargy
- Headache/Muscle tension
- Sleepiness
- Transient focal weakness
- Nausea/vomiting
- Tongue biting
Labs considered based on history

- Glucose
- Electrolytes
- Calcium
- Sodium
- Magnesium
- Toxicology, if suspected poison
Labs considered if a Metabolic Abnormality is suspected

- Basic metabolic panel
- Ammonia
- Serum lactate
- Pyruvate
- Amino acids
- Urine organic acid
- Further lab studies guided by history, exam, and clinical course
EEG

• Recommended as the standard of care for child presenting with first afebrile seizure by AAN and CNS.
• Assist in differentiation of spells.
• Helps to evaluate risk of recurrence
• Helps with medication selection and syndrome diagnosis.
• HOWEVER, presence/absence of abnormalities does not diagnose/exclude an epileptic etiology.
MRI Imaging

- MRI recommended imaging because of its ability to detect developmental abnormalities.
- Recent head injury/trauma, recurrent or prolonged seizures, focal or new neurologic deficits, papilledema.
- Consider if patient has not returned to baseline.
- A focal EEG.
MRI Imaging (con’t)

• Significant cognitive or motor impairment.
• Unexpected abnormalities on neuro exam.
• Partial onset seizures.
• EEG inconsistent with a benign or primary generalized epilepsy.
• Patients less than 1 year of age.
Neuroimaging Not Indicated

- Clearly defined epilepsy syndrome (e.g. petite mal, benign rolandic, etc.).
Lumbar Puncture

- Consider in presence of fever, altered mental status.
- Presence of meningeal signs (neck pain, kernig or Brudzinski signs).
- Persistent changes in mental status in patient younger than age 6 months.
- Consider in children with onset of a febrile seizure before age 18 months, because clinical meningeal signs may be absent at this age.
Management: Home

- Rectal diazepam
- Clonazepam wafers
- These drugs play an important role in treatment, especially in stopping acute, prolonged seizures.
Treat or Not to Treat??

• Treatment is based on underlying etiology and epilepsy seizure syndrome.
• Risk of seizure recurrence is weighed against adverse side effects.
Management: Chronic

- Choice of medication determined by seizure type.
- Ex: Partial seizures = Carbamazepine, Oxycarbazepine, Levitaracetam, Valproic Acid, Zonisamide, Lamotrigine, Topiramate.
- Ex: Generalized seizures = Valproic Acid, Topiramate, Lomitrigine, Phenobarbital (preferably less than 18 months old), Phenytoin, Levatiracetam.
Patient/Family Education

Seizure First Aid

• Ensure safety of patient (e.g. assist patient to ground/floor).
• Position patient on side to avoid aspiration, if she or he vomits.
• Avoid putting things in patient’s mouth.
• Know when to use rescue medications (i.e. seizure lasting greater than 3 minutes).
• Know when to seek emergency care (i.e. seizure lasting greater than 5 minutes).
Patient Education
Seizure Safety

• Never leave patient with seizures unattended in any type of standing water.

• Avoid roller coaster and other aggressive amusement park rides.

• Avoid the following sports: scuba diving, swinging on high swings, parachuting, bungee jumping, etc.
Patient/Family Education (con’t)

• Global well-being (behavioral problems, memory impairment, school difficulties).
• 25 to 35% of children with seizures will have problems in these areas.
• Neuropsychological evaluation.
• Seizure diary or tracking tool.
• Anticonvulsants lower risk of recurrence but does not guarantee that a child will not have a seizure while taking medication.
References

• Epilepsy Foundation of America. www.epilepsy.com
Questions

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