

## Pediatric Seizures—What's Shakin'?

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A little about seizures...

- Well-known to the ancients
  - Early Greek writings--Hippocrates.
  - Bible--in the Gospel (Mark 9:14-29)
- One of the most common neurological conditions, affecting 1% of the population world-wide.
- Aliases:
  - Epilepsy: "the falling disease"
  - The Sacred disease
  - Idiocy, fits, spells, attacks
- Famous people with epilepsy:
  - Aristotle proposed an association with genius...
  - Representative Tony Coelho (D, California)
  - Neil Young
  - [Formerly known as] Prince
  - Child deaths
    - Jet Travolta (16 y/o)
    - Ivan Cameron (6 y/o)
- Epidemiology Overview
  - Newborns – rare, inborn metabolic
    - Neonatal – anoxia (60%), ICH (10%), metabolic (6%), infection (10%)
  - Children – febrile, metabolic
    - Absence
      - Onset 4-10 yr, resolves by 20
      - JAE prepubescent
      - JME 10-20 yr
    - Febrile
      - 6 months to 5 years
      - 2-5% of all children, 10% have more than 3
  - Age < 30 – idiopathic epilepsy, metabolic

- 30-60 – idiopathic epilepsy, tumor, metabolic
  - > 60 – tumor, ischemia, metabolic
- Seizure
- Paroxysmal discharge of neurons in the brain resulting in a clinical change in neurologic behavior or activity.
- Convulsions
- Involuntary skeletal muscular activity associated with a seizure.
- Epilepsy
- Definition variable and controversial
  - Condition of the brain with numerous potential causes which predisposes the individual to have recurrent epileptic seizures
    - Can be acquired
    - Threshold and association with brain abnormality
    - Cannot be a single seizure
      - Happens to 7% of population
- Automatisms
- Stereotyped motor or behavioral phenomena carried out in a state of impaired consciousness and of which the individual usually has no knowledge.
    - No lateralizing diagnostic value
- Conversion Reaction
- A defense mechanism by which the anxiety stemming from an unconscious conflict is converted and expressed symbolically as a physical symptom; transformation of an emotion into a physical reaction as in conversion hysteria.
- Pseudoseizures
- Spells which resemble epileptic seizures by their description but are of non-epileptic, usually psychogenic, origin.
- Postictal
- After-seizure phase
  - Minutes to hours
  - Confusion
  - Somnolence
  - Agitation
- Reflex epilepsies
- Rare
  - Seizures provoked consistently by specific

sensory stimuli

- flickering lights
- video games or television
- specific piece of music
- reading
- immersion in hot water
- Etc.

Status Epilepticus

- Prolonged epileptic state
  - Series of seizures which are closely spaced
    - In the case of generalized tonic-clonic seizures consciousness is not regained between attacks.
  - Single continuous seizure, usually defined as lasting longer than 30 minutes.
- 60,000-150,000/yr in U.S.

Six Key Descriptive Terms

- Partial vs. Generalized
- Simple vs. Complex
- Primary, Secondary

Partial seizures

- Focal
- Limited to one area of brain

Motor Homunculus

- What do real estate and seizures have in common?
  - Location, location, location!

**Simple** partial seizures

- Involves local motor, sensory, or autonomic dysfunction
- Consciousness is not impaired
- Examples

- Focal motor seizure
- Jacksonian/"marching" seizure
- Aura preceding GTC

Aura

- Simple partial seizure producing sensory, autonomic, or psychic manifestations

**Complex** partial seizures

- Involves focal activity that affects mental status, mood, behavior
  - Temporal lobe most common origin
  - Psychomotor
  - May involve automatisms

Generalized seizures

- Produces widespread neurologic malfunction
- Seizure activity that spreads to the entire cerebral cortex
- Convulsive or non-convulsive (Nonconvulsive)
- Childhood absence epilepsy (CAE)
  - Generalized, non-convulsive seizures
  - Common: 4-12 y/o
    - Peak 5-6 y/o
  - Staring, blinking, chewing/mouthing
  - Prone to clustering
  - No postictal confusion
  - Often outgrown by adulthood
  - 3 Hz spike and wave EEG
- (Convulsive) generalized seizures
  - Myoclonic
  - Tonic
  - Atonic
  - Clonic
  - Tonic-clonic

Generalized Tonic-Clonic Seizures (GTC)

- Typical progression
  - Aura
    - (Loss of consciousness)
    - Tonic phase
    - Hypertonic phase
    - Clonic phase
    - Postictal phase (coma, stupor)

Pediatric Epileptic Syndromes

Infantile spasms

- 4-8 m/o
- Clustered myoclonic spasms
- With waking/falling asleep

■ Benign Rolandic epilepsy

- 3-13 y/o
- Speech/facial manifestations
- May progress to GTC
- Usually during sleep/awakening

Key Observations

- Prodrome?
- Involuntary movements
- Consciousness
- Progression
- Postictal signs?

- Duration
  - Majority < 30 seconds
  - 90% of seizures last less than 90 seconds
- Hyperthermia can be confounding
  - Not all hot kids had a febrile seizure!

#### Key Management Principles

- Scene safety
- Watch and document the seizure evolution and progression
- Assure airway, ventilation, and oxygenation
- Assure substrates oxygen and glucose
- Correct reversible causes
  - Hypoxia, hypoglycemia, arrhythmia
- Anticonvulsant for prolonged seizure

#### ALS/BLS Triage

- BLS
  - Uncomplicated febrile
  - Solitary breakthrough with Sz history
- ALS
  - New onset
  - Concurrent illness or injury
  - Recurrent, breakthrough
  - Prolonged postictal presentation (S.E.?)

#### Evidence-based practices

- Febrile Sz
  - Subsequent Sz age related
  - AAP: Intermittent Tx fever, then sz
    - Anticonvulsants have more complications in young children
- Benzodiazepine Tx
  - PR, IM, IN effective surrogates to IV
  - Versed vs. Ativan vs. Valium
    - Consider IM midazolam over IV diazepam

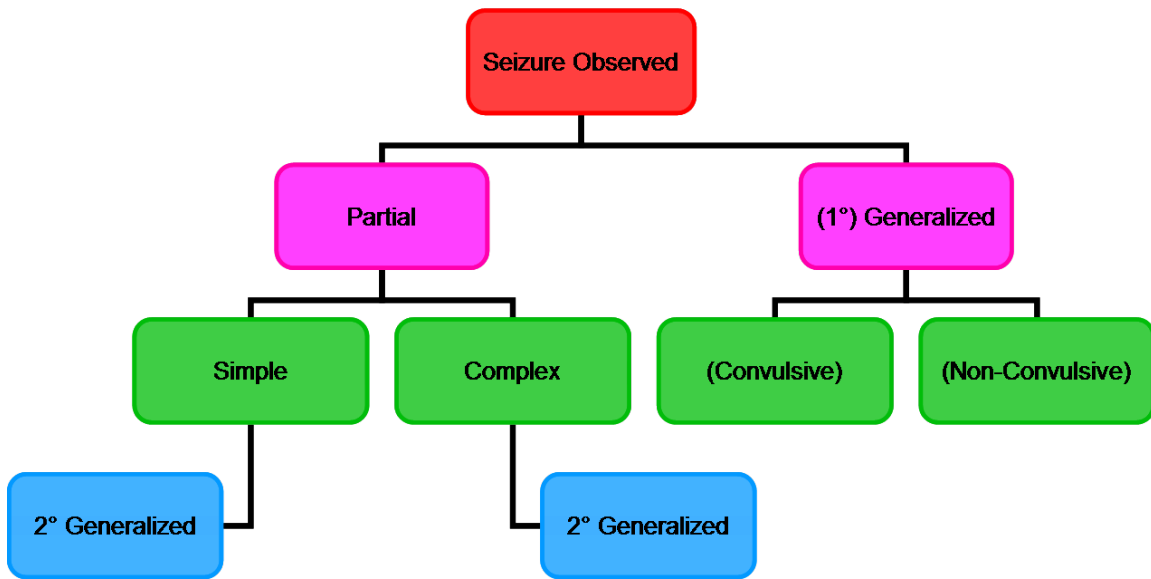
#### Resources

- <http://www.epilepsy.com>
- <http://www.ilae.org>
- AAP: <http://www.pediatriccareonline.org>
- <http://www.emedicine.medscape.com>

#### Summary

- Not all seizures have convulsions and not all convulsive spells are seizures.
- Careful history and observations about seizure progression are key in diagnosis.
- Most are short and rarely require anticonvulsant therapy.
- Seizures can be systematically described and classified.

1989 ILAE Seizure Classification



ILAE 2010 Proposed Classification

- Onset
  - GENERALIZED SEIZURES
    - Tonic clonic (in any combination)
    - Absence
      - . Typical
      - . Atypical
      - . Absence with special features
      - . Myoclonic absence
      - . Eyelid myoclonia
    - Myoclonic
      - . Myoclonic
      - . Myoclonic atonic
      - . Myoclonic tonic
    - Clonic
      - Tonic
      - Atonic
  - FOCAL SEIZURES
  - MAY BE FOCAL, GENERALIZED, OR UNCLEAR
    - Epileptic spasms
  - Syndrome vs. epilepsy
  - Etiology
    - Genetic
    - Structural/metabolic
    - Unknown
- Organization