Epilepsy

James C. Pappas, MD

Peyton Manning Children’s Hospital
Definitions

- **Seizure**: Discrete event caused by transient hyper-synchronous, abnormal neuronal activity.
- **Epileptic Seizure**: A seizure without a cause.
- **Epilepsy**: Chronic brain disorder of various etiologies characterized by recurrent unprovoked seizures.
The History of Epilepsy

- Epilepsy has existed for thousands of years.
- Only recently have we gained understanding
Babylonians

- Wrote about the causes of epilepsy 3,000 years ago.
- They thought seizures were caused by demons attacking the person.
- Different seizure types were caused by attack from different demons.
Ancient Greeks

- Thought epilepsy was caused by offending the moon goddess.
- Thought epilepsy could be cured by eating mistletoe cut without a blade when the moon was at its smallest. This would not be effective if the mistletoe had touched the ground. It would not be effective against the “falling sickness” if it had fallen itself.
Hippocrates, The Father of Medicine

- 300 BC wrote that one could not get epilepsy from the gods since this would be thinking badly of the gods.
- Though epilepsy came from the brain and was due to natural causes.
- Humeral theory, seizures caused by thick cold phlem meeting warm blood.
Ancient Romans

- Epilepsy came from Demons.
- Thought epilepsy was contagious. Epileptics were forced to live alone.
1600’s

- Belief that epilepsy caused by demons was fading.
- Still thought epilepsy was contagious.
- Epileptics were put into hospitals separate from the insane (in order to keep the insane from getting seizures).
Early 1900’s

- Epileptics were not allowed to marry.
- Epileptics were surgically sterilized and were not allowed to have children.
Childhood Epilepsy

- Most prevalent childhood neurological disorder
  - Affects 0.5% to 1% through age 16 years
- 120,000 children newly diagnosed with seizures/year
  - 20,000 to 45,000 diagnosed with epilepsy/year
- Active epilepsy
  - Estimated 325,000 between 5 and 14 years of age
Incidence Rates by Age*

*Data from Rochester, Minn (1975-1984).
†Y axis is logarithmic.

Prevalence and Incidence of Epilepsy in the United States

- **Incidence**
  - 44 per 100,000 person-years\(^1\)
  - 70,000 to 128,000 new cases annually\(^2\)
  - 30 to 50 new cases of epilepsy are diagnosed annually per 100,000\(^3\)
  - Cumulative incidence of epilepsy through 74 years of age: 3.1%\(^1\)

- **Prevalence**
  - 10% of the population will experience a seizure at some point in their lives\(^4\)
  - ~2 to 2.5 million people in the US have epilepsy\(^2,5\)

Cumulative adjusted lifetime risk: 1.3% to 3.1%\(^2\)
Seizure Types

- Partial Simple Seizure
- Complex Partial Seizure
- Absence
- Clonic Seizure
- Tonic Seizure
- Tonic-Clonic Seizure
- Myoclonic Seizure
- Atonic Seizure
Incidence of Seizure Types

- Complex partial: 36%
- Simple partial: 14%
- Generalized tonic-clonic: 23%
- Partial unknown: 7%
- Unclassified: 3%
- Myoclonic: 3%
- Absence: 6%
- Other generalized: 8%

Non-epileptic Seizures

- Syncope
- Migraine
- Psychogenic
- Toxic
- Metabolic
- Cerebrovascular
- Breath Holding Spell
- Reflux
Absence Seizures

- Impairment of Consciousness usually lasting only seconds
- May have some automatisms or other movements.
- No post-ictal state.
- Multiple episodes daily, up to 100
- Childhood absence peak onset at 6-7 years of age
- Juvenile absence peak onset at 12-18 years of age.
Absence Seizures

3 Hz Spike & Wave
Complex Partial Seizure

- CPS are seizures arising from a single brain region.
- There may be some verbal response or some purposeful movements during a CPS.
- Decreased awareness of surroundings and decrease awareness of self.
- Have automatisms or quasi purposeful movements.
- Ave 20 seconds to 2 minutes. May have status.
- Seizure followed by a post-ictal state.
- 35% of all epilepsies.
Partial Simple Seizure

- Seizure arising from a single region of the brain.
- Individual remains awake and alert, fully aware of self and surroundings.
- May be motor with focal motor movements
- May be sensory involving feeling, smell, etc.
- May be autonomic presenting as an unpleasant sensation in the stomach, chest, or head or with change in heart rate or sweating.
Partial Seizure, Secondarily Generalized

- Start out as a Complex Partial Seizure or Partial Simple Seizure.
- Seizure activity spreads to involve the entire brain and becomes a generalized Tonic-Clonic seizure.
Generalized Tonic-Clonic Seizure

- Rigid muscles or tonic phase followed by violent muscle contractions.
- Loss of awareness
- May people who have one GTC seizure will never have another.
Generalized Tonic, Clonic and Tonic-clonic Seizure

- May have tonic phase followed by clonic phase.
- Can be tonic only or clonic only.
  - Consciousness returns slowly, and the person may be drowsy, confused, agitated, or depressed.
- Convulsive Status Epilepticus
Generalized Tonic Seizure or Tonic Phase

- All the muscles stiffen. Air being forced past the vocal cords causes a cry or groan. The person loses consciousness and falls to the floor. The tongue or cheek may be bitten, so bloody saliva may come from the mouth. The person may turn a bit blue in the face.
Clonic phase: The arms and usually the legs begin to jerk rapidly and rhythmically, bending and relaxing at the elbows, hips, and knees. After a few minutes, the jerking slows and stops. Bladder or bowel control sometimes is lost as the body relaxes.
Atonic Seizures

- Sudden loss of muscle tone and strength.
- Also called “Drop Seizures”.
- Often result in injury
- Individuals often fall if not supported.
Myoclonic Seizure

- Abrupt muscle jerks
- Often symmetrical but may be focal
- May occur as a single event or in a series
- Consciousness and memory are not impaired.
- Individuals often spill or drop things they are holding.
Do Seizures Beget Seizures?

- Animal models on kindling suggest that seizures increase the instability of nerve elements resulting in a tendency to have more seizures.
- In animal models seizures during certain periods of brain development may predispose to the development of epilepsy.
- Data from children suggest that even prolonged seizures rarely cause clinically evident brain damage.
- No data to suggest that a second seizure has any impact on future epilepsy or response to medications.
- Recurrent seizures may be different, i.e., Mesial temporal sclerosis.
Outcome/Prognosis

- Approximately 2/3 of patients with epilepsy will achieve seizure control with medications.
- Up to 60% of Children with Epilepsy will outgrow their seizures.
- Medication side effects and seizures cause a decrease in quality of life in individuals with epilepsy.
- Individuals with epilepsy are often less successful in school and in the work force.
Emergency Response to Seizures

- ABC’s
- Stay Calm
- Turn child on his side
- Time episode
- Protect from injury but do not restrain and do not place any objects in the mouth
- Diastat can be given for seizures lasting over 5 minutes
- Remain with child
- Allow child to sleep or rest after seizure
When to Call 911

- Seizure lasting over 5 to 10 minutes
- First seizure
- Injury with seizure
- Significant cyanosis or respiratory distress (normal respirations rarely seen with generalized seizures).
- Recurrent seizures particularly without full recovery
- Lack of response within 15 to 20 minutes
Status Epilepticus

- Prolonged or repetitive seizure activity without intervening periods of recovery between episodes.
- Significant morbidity and mortality particularly in adults
- Mortality as high as 20%
Classification of Status Epilepticus

- 26% acute symptomatic (Acute CNS lesion or insult)
- 33% remote symptomatic (Prior CNS lesion or encephalopathy)
- 1% Remote symptomatic with acute trigger
- 3% progressive encephalopathy
- Febrile (fever with no CNS infection)
- 15% cryptogenic
Treatment of Convulsive Status Epilepticus

- ABC’s
- IV access and labs
- Rectal valium if no IV access, Ativan if IV access
- Phosphenytoin or Phenobarbital
- Vitamin B6 for neonates
- Benzo drip, pentobarbital drip or general anaesthesia.
Diastat (Rectal Valium)

- Similar blood levels to IV Valium without immediate peak
- Immediate peak is what can cause respiratory depression
- Tested for home use and safety
- Can be used for Status epilepticus or for seizure clusters
- Should work within five minutes
- Most common side effect drowsiness
Diastat Administration

- Placed child on side
- Bend upper leg forward
- Separate buttocks
- Lubricate tip and insert into rectum
- Slowly push plunger until empty
- Hold buttocks together for several seconds afterwards to avoid leakage.
Nasal Versed

- Not FDA approved
- Given nasally with nasal atomizer
- Similar side effects to Diastat
Sudden Unexplained Death in Epilepsy Patients (SUDEP)

- Up to 20% of epilepsy deaths
- 1 to 2 per 1000 per year among epilepsy clinic populations
- Cause is unknown but may involve seizure-induced cardiorespiratory abnormalities.
In Conclusion

- Epilepsy is the most common neurologic disorder in children and the third most common in adults.
- An accurate description of seizure or seizure type is important to appropriate treatment.
- Rapid treatment of status epilepticus is important to decrease morbidity and mortality.
- There is a historical bias in society that exist today.