Seizures: Nuts and Bolts

National Pediatric Nighttime Curriculum

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Learning Objectives

- Understand the importance of initial assessment of patients who have seizures
- Be able to initiate treatment for patients who have seizures
- Know alternatives to first line treatments for status epilepticus

Case #1

- 14-month-old developmentally normal boy who presents with generalized tonic-clonic seizures associated with fever.
  - How would you initiate management?
  - What other information would be useful to you as you are starting to intervene?
  - What type of work-up does this patient need?

Case # 2

- 12-year-old boy with obstructive hydrocephalus and VP shunt who presents with generalized tonic-clonic seizures for the past 15 minutes.
  - How would you initiate management?
  - What other information would be useful to you as you are starting to intervene?
  - What type of work-up does this patient need?

Types of Seizure

- Partial Seizures
  - Simple vs. Complex
  - Different types (motor, sensory, autonomic, “psychic”)
- Generalized Seizures
  - Convulsive vs. Nonconvulsive
  - Secondarily generalized vs. Secondary

Status Epilepticus

- A patient is in status epilepticus if seizure activity has lasted > 30 minutes or there are multiple seizure episodes with failure to regain consciousness between episodes

- This is an arbitrary definition

Management of Seizures

- Initial assessment
  - **A**irway
  - **B**reathing
  - **C**irculation
- Call for help
  - Hospitalist
  - Neuro
  - PICU/RRT
- Ask for more history
  - How long has the patient been seizing?
  - New-onset vs. known seizure disorder
  - Baseline seizure frequency, is this typical or not?
  - Events leading up to this episode
  - Meds/triggers
  - History of status

Management of Seizures

- Consider rapid work-up for underlying etiologies
  - CNS infection
  - Acute HIE
  - Metabolic disease
  - Electrolyte imbalance
  - TBI
  - Drugs, intoxications, poisonings
  - Cerebrovascular event

Benzodiazepines

- Lorazepam (Ativan)
  - 0.05-0.1 mg/kg IV q10-15 min, max dose 4 mg
    - Less respiratory depression than diazepam, longer duration of action, slower onset (2 min)
- Midazolam (Versed)
  - 0.15 mg/kg IV then continuous infusion of 1 mcg/kg/min
    - Other formulations available: IM, **buccal**, intranasal, oral, and rectal
    - Short half life, faster onset (1 min)

Benzodiazepines (2)

- Diazepam (Valium)
  - 0.05-0.3 mg/kg IV q15-30 min, max dose 10 mg
    - Quick onset (10-20 sec), rectal formulation, higher risk of respiratory depression
    - Not considered first line
      - Lower efficacy
      - Increased respiratory depression

Fosphenytoin/Phenytoin

- Fosphenytoin (Cerebyx)
  - 15-20 mg PE/kg IV/IM, may infuse 3 mg/kg/min (max 150 mg/min), max dose 1500 mg PE/24 hours
    - Prodrug of phenytoin which has fewer side effects
    - Can cause cardiac arrhythmias
    - Avoid for status with myoclonic seizures or absence seizures
    - Consider alternatives in seizures associated with illicit drug use
- Phenytoin (Dilantin)
  - Not used first line as there are many side effects
    - Cardiac arrhythmias/hypotension associated with propylene glycol used to dissolve phenytoin
    - Local pain, venous thrombosis and purple glove syndrome → skin necrosis, limb ischemia → amputation

Barbiturates

- Phenobarbital (Luminal)
  - 15-20 mg/kg IV/IM, may repeat 5 mg/kg IV q15-30 min, max dose 40 mg/kg
    - Prolonged sedation, respiratory depression, hypotension
  - Generally used after failure of benzodiazepines and fosphenytoin
- Pentobarbital (Nembutal)
  - 12 mg/kg IV followed by 5 mg/kg/hr infusion
    - Titrate to EEG inactivity
  - Used for refractory status epilepticus

Other agents

- Propofol (Diprivan)
  - Rapid onset, short duration of action
  - Mechanism of action is unclear
  - Hypotension, apnea and bradycardia are common
    - **Intubation and ventilation are required for the use of this medication**
  - Prolonged use can result in hypertriglyceridemia and pulmonary edema
  - Associated with fatal acidosis and rhabdomyolysis

Other agents (2)

- AEDs with some data to suggest use in refractory SE
  - Valproic acid (Depakote): not yet approved for SE, some data to support its use
  - Topiramate (Topamax): PO only
  - Levetiracetam (Keppra): adult data only

References

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- Wilfong A. Overview of the classification, etiology, and clinical features of pediatric seizures and epilepsy. *Up To Date,* 2011.