

Status Epilepticus

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Definition

- Prolonged seizure activity lasting greater than 30 minutes
- Or, recurrent seizures without the interval of recovery (consciousness) lasting greater than 30 minutes

Remember

- Most seizures are brief, lasting less than 5 minutes
- If a seizure is lasting greater than 10 minutes, are likely to be prolonged

Epidemiology

- 1/3 cases are due to acute insults to the brain, including meningitis, encephalitis, head trauma, hypoxia, hypoglycemia, drug intoxication or withdrawal
- 1/3 cases have a history of chronic epilepsy or febrile convulsions
- 1/3 of cases of new-onset epilepsy

Etiology

- Idiopathic: no acute precipitating CNS or metabolic insult– normal child
- Remote Symptomatic: no acute precipitant, but prior CNS insult known to increase seizure risk
- Acute Symptomatic: an acute illness with known CNS insult or metabolic disturbance

Etiology

- Progressive Encephalopathy: occurring with a known progressive neurological disease- degenerative
- Febrile: sole provocation is fever
- Precipitants of SE: stress, sleep deprivation, fever, infections, missed medications, medications that lower the seizure threshold, menstrual issues, and many others

Pathophysiology

- Animal models with SE have shown irreversible neuronal damage occurs after 30 minutes of continual convulsions
- Neuronal damage occurs even when experimental animals are paralyzed and artificially ventilated

Pathophysiology

- In these animals, in which adequate glucose levels have been maintained, these studies suggest although systemic complications such as hypoxia, hypoglycemia, lactic acidosis, and especially hyperpyrexia may exacerbate the damage that results from sustained seizure activity, the seizure itself is a substantial contributor

Mortality

- Determined largely by the underlying etiology, but may be aggravated by delayed or inadequate treatment which prolongs the duration of the episode
- In past, mortality rates in children have ranged from 6-18%
- More recent studies where patients have been treated aggressively, have mortality of 3-5%

Morbidity

- In one study, 9% of children suffered new motor or cognitive deficits following SE
 - However, only 1.5% of the patients with unprovoked (remote symptomatic or idiopathic) or febrile status sustained neurologic sequellae attributable to the SE itself

Classification

- Generalized Convulsive SE-
 - 1° or 2° Generalized
 - Bilateral tonic and clonic in some combination but not always symmetric
 - Consciousness always impaired
 - Reasonable (but variable) post ictal period
 - Beware “burn out” - EEG can help
 - Most common and most dangerous
- Absence SE- nonconvulsive
- Complex Partial SE- nonconvulsive
- Simple Partial SE

Treatment Step 1

■ ABCDE

- Maintain Airway- patient at risk for aspiration
- Breathing- place O₂, be ready for intubation
- Circulation- obtain IV access
- Dextrose: check glucose levels
- Electrolytes: check electrolytes (Na, Ca, Mg, PO₄), and anticonvulsent levels

Treatment Medications

- Ideal drug for treating SE
 - Rapid entry into CNS
 - Rapid onset of action
 - Long duration of action
 - Safety
 - Absence of sedation
 - Useful as maintenance AED

Treatment Step 2

- Benzodiazepine Therapy
 - Diazepam
 - Lorazepam

Diazepam

- Highly lipid soluble
 - Rapid CNS entry- stops seizures in 1-3 minutes
- Rapid redistribution in fatty tissues
 - Brain concentrations fall quickly
 - Duration of action is 15-30 minutes
 - $T_{1/2} = 30$ hr
- Dose: <3yrs, 0.5mg/kg, >3yrs, 0.3mg/kg
- Side Effects: sedation, decreased respiration and blood pressure

Lorazepam

- Less lipid soluble than diazepam
 - Slower CNS, stops seizures in 6-10 min
- Not as rapidly redistributed to fat stores
 - Longer duration of action 12-24 hr
 - $T_{1/2} = 14$ hr
- Dose: 0.05—0.1mg/kg
- Side Effects: decreased LOC, respiration and BP

Treatment

Step 3

Phenytoin/Fosphenytoin

Phenytoin

- IV dosing 20 mg/kg load
- Stops seizures in 10-30 minutes
- Duration of action 24 hrs, $T_{1/2}=24\text{hr}$
- Max infusion rate of 1mg/kg/min, max- 50 mg/min
- Side Effects: arrhythmias, hypotension, wide QT interval, phlebitis
- pH=11-12, may only give IV or po

Treatment Step 3

Fosphenytoin- phenytoin prodrug

- IV dosing: 20 mg/kg load
- Safer than phenytoin
- pH=8-9
- May give IV or IM
- May give faster than phenytoin(100-150mg/min)
- Much more expensive

Treatment Step 4

■ Phenobarbital

- Lipid solubility < phenytoin
- Duration of action > 48 hrs, $T_{1/2} = 100$ hours
- Dose 20 mg/kg
- Side Effects: sedation, decreased respiration and BP
- Be ready to intubate!!

Treatment

Step 5

- If you haven't called Neurology, please call us!!!
- Consider IV Valproic Acid (Depacon)
 - FDA approved only for replacement or oral dosing
 - Rapid loading dose appears safe
 - 25-30mg/kg rapidly infused
 - Side Effects: dizziness, HA, nausea

- Consider Leviteracetam IV Load
 - Off label
 - I use 30mg /kg IV x1

Refractory Status Epilepticus

- Intubation, IV access
- Continuous EEG monitoring
- Medication Coma
 - Pentobarbital
 - Midazolam
 - Propofol
 - Very high dose phenobarb

Consider the Etiology

- PE: focal – mass, trauma
- Serum studies: electrolytes, LFTs, CBC, Cx, anticonvulsent levels, Tox screen, follow u/a for possible rhabdomyolysis
- Neuroimaging: plain CT of head (use contrast if suspect brain tumor or AVM)

Consider the Etiology

- LP: necessary for any febrile seizure under the age of 18 months
 - Must strongly consider in comatose patient – please check imaging first
 - Remember SE can cause pleocytosis (usually < 20 cells)
 - Do not delay antimicrobial therapy if CNS infection is suspected
 - Consider acyclovir

SUMMARY

- ABCDE
- Lorazepam (0.1mg/kg) or Diazepam
 - Give 5 minute interval then may repeat
- Fosphenytoin: 20mg/kg, may give additional 10mg/kg after initial load
- Phenobarb: 20mg/kg- be ready for intubation
- If neurology not involved, call us
- Drug Coma