

STATUS EPILEPTICUS

Amrita Bhagat

ER Conference September 9, 2011

Question 1

- A 3 week old infant vomiting with every feed, poor weight gain, and jaundice presents to the ED for lethargy. While in the ED, the infant experienced the onset of a generalized tonic-clonic seizure, which has never occurred before. Temperature is 39 °C, pulse and respiratory rate are elevated, blood pressure is within normal limits, and oxygen saturation is 99% on room air. After noting vital signs, you learn that the seizure began approximately 8 minutes ago and has not ceased. What is the most likely underlying etiology of the seizure and how will you treat it?

Question 1

- A: Simple febrile seizure; 15 mg/kg acetaminophen
- B: Hypoxic-ischemic encephalopathy; administer 100% supplemental oxygen
- C: Inborn error of metabolism; 0.1 mg/kg lorazepam
- D: Presentation of epilepsy; 0.5 mg/kg diazepam
- E: Sepsis; 50 mg/kg ampicillin and cefotaxime

Question 1

- A: Simple febrile seizure; 15 mg/kg acetaminophen
- B: Hypoxic-ischemic encephalopathy; administer 100% supplemental oxygen
- C: Inborn error of metabolism; 0.1 mg/kg lorazepam
- D: Presentation of epilepsy; 0.5 mg/kg diazepam
- E: Sepsis; 50 mg/kg ampicillin and cefotaxime

Question 1: Answer C

- The infant likely has an inborn error of metabolism such as galactosemia, which can explain the history of vomiting, poor weight gain, and jaundice. Inborn errors of metabolism can also present with seizures. After securing the airway, checking vital signs, giving oxygen, and noting the time of seizure onset, you should obtain IV access, and give lorazepam. The first line of treatment for seizures is a benzodiazepine. Additionally, a blood glucose level should be obtained.

Status Epilepticus: Definition

- Status epilepticus (SE) is defined as a simple, prolonged seizure or recurrent seizures associated with impaired consciousness for 30 minutes or longer.
- It can be convulsive or non-convulsive.
- Convulsive SE consists of prolonged partial (focal motor) or generalized tonic-clonic seizures.
- Non-convulsive SE consists of prolonged absence or complex partial seizures.

Question 1: Wrong Answers

- A: It is possible that the infant is having a simple febrile seizure but this alone cannot explain the history of poor weight gain. Although usually benign, febrile seizures can progress to SE.
- B: Hypoxic-ischemic encephalopathy is not likely since the patient is saturating well on room air.
- D: The first episode of seizure in an infant is almost never due to epilepsy. A child with known epilepsy, however, may present in SE. Additionally, lorazepam is preferable to diazepam because it has a longer half-life and is less sedating than diazepam.
- E: An infant with sepsis may present with seizures and may also result from an underlying inborn error of metabolism (such as E. Coli sepsis in galactosemia), but infection alone is not as likely to explain the three week history of poor feeding and poor weight gain.

Question 2:

- A 12 year old boy with a history of autism and epilepsy presents to the ED by ambulance after the onset of a generalized tonic-clonic seizure that began approximately 20 minutes ago. The patient is afebrile, HR is 105, RR is 20, blood pressure is slightly elevated, and the patient is on supplemental oxygen. The airway is secure, an IV is in place, and lorazepam and fosphenytoin were administered prior to arrival. The patient remains post-ictal and unresponsive and seizure activity resumes within 5 minutes of arrival. What do you do next?

Question 2:

- A: Draw blood for laboratory tests and order an EEG.
- B: Give diazepam and ask the nurse to prepare a loading dose of phenobarbital.
- C: Anticipate intubation and admit to the PICU.
- D: Give another dose of lorazepam while obtaining a complete history and physical.
- E: Transfer to the PICU and institute general anesthesia.

Question 2:

- A: Draw blood for laboratory tests and order an EEG.
- B: Give diazepam and ask the nurse to prepare a loading dose of phenobarbital.
- C: Anticipate intubation and admit to the PICU.
- D: Give another dose of lorazepam while obtaining a complete history and physical.
- E: Transfer to the PICU and institute general anesthesia.

Question 2: Answer B

- The duration of recurrent seizure activity and impaired consciousness in this patient is at least 25 minutes. It is appropriate to readminister lorazepam or diazepam after 10 to 15 minutes of continuous seizure activity. After 30 minutes, the patient should be loaded with a second long-acting agent such as phenobarbital (10 mg/kg). Intubation should also be anticipated.

Question 2: Wrong Answers

- A: Blood should be drawn if it has not already been so metabolic disturbances can be assessed and other labs can be done, but it is not urgent to do an EEG. The patient has an established seizure history and the first priority is to stabilize the patient.
- C: It is prudent to anticipate intubation in a patient that has been in SE for >30 minutes, but transfer to the PICU is recommended at 45-60 minutes. The more immediate task is to administer a loading dose of phenobarbital in an attempt to break the seizure.
- D: Another dose of lorazepam is reasonable, but obtaining a complete history and physical is secondary to stabilizing the patient.
- E: Intubation and transfer to the PICU is recommended when SE has exceeded 45 minutes in duration.

Common Etiologies of Status Epilepticus in Various Age Groups

Neonate

- Hypoxic-ischemic encephalopathy
- Infection
- Inborn errors of metabolism (eg, nonketotic hyperglycemia)
- Stroke or intraventricular hemorrhage
- Congenital malformation
- Pyridoxine deficiency and dependency

Child

- Infection
- "Simple febrile seizure"
- Metabolic disturbance
- Congenital malformation
- Presentation of epilepsy

Adult

- Stroke
- Inadequate anticonvulsant concentrations
- Trauma
- Tumor
- Unknown or undefined

DURATION OF SEIZURE

PROCEDURES

0 to 5 minutes

Ensure safety of patient
 Monitor cardiopulmonary function and vital signs
 Give oxygen
 Obtain history and perform complete physical examination
 Note time

5 to 10 minutes

Obtain intravenous access
 Draw blood for laboratory tests
 Give 2 mL/kg of glucose and B vitamins
 Give lorazepam: 0.05 to 0.1 mg/kg (Maximum dose, 4 mg)
 or diazepam: Pediatric, 0.2 to 0.5 mg/kg
 Adult, 5 to 10 mg/dose

>10 minutes

Convulsive status
 Neonatal patient: Phenobarbital 20 mg/kg
 Pediatric and adult patients: Phenytoin 20 mg/kg (Prescribe as: fosphenytoin at 20 mg phenytoin equivalents/kg)

>30 minutes

Load with second long-acting agent
 Phenobarbital 10 mg/kg. May give additional 5- to 10-mg doses until 40 mg/kg or maximum dose of 1 g is reached
 Anticipate intubation

45 to 60 minutes

Transfer to intensive care unit
 Institute general anesthesia
 Monitor continuously via electroencephalography

Drugs Used in the Management of SE

Lorazepam:

Route: Intravenous, IO
Dose: 0.05 to 0.1 mg/kg up to 4 mg/dose
Rate: Can give IV push over 2 minutes; can be given 5 to 10 minutes apart
Maximum dose: 4.0 mg
Onset of action: 2 to 3 minutes
Duration: Usually 12 to 24 hours
Side effects: Confusion, drowsiness, respiratory depression, hypotension

Diazepam:

Route: Intravenous, IO, PR
Dose: Pediatric: 0.2 to 0.5 mg/kg
Adult: 0.2 mg/kg (10 mg average adult dose)
Rate: May repeat every 15 to 30 minutes
Maximum dose: Usually not more than three doses given at 5 mg/min
Onset of action: 1 to 3 minutes; PR doses take 1 to 2 hours
Duration of action: 5 to 15 minutes
Side effects: Somnolence, confusion, hypotension, ataxia, bradycardia, respiratory depression

Phenytoin:

Route: Intravenous, IO
Dose: 20 mg/kg
Maximum dose: 1,000 mg
Rate: <0.5 mg to 1.0 mg/kg per min to a maximum rate of 50 mg/min
Onset of action: 10 to 30 minutes after infusion
Duration of action: 12 to 24 hours
Side effects: Hypotension, respiratory depression, risk of cardiac arrhythmia

Fosphenytoin:

Route: Intravenous, intramuscular
Dose: 20 mg/kg phenytoin equivalents
Rate: Children: 3 mg/kg per min phenytoin equivalents
Adult: 150 mg/min phenytoin equivalents
Onset of action: Within 2 to 3 minutes after loading dose
Duration: 12 to 24 hours
Side effects: Pruritus, paresthesia in groin area

Phenobarbital:

Route: Intravenous, IO
Dose: 20 mg/kg
Maximum dose: Additional 5 to 10 mg/g dose every 20 minutes until maximum dose of 40 mg/kg or total dose of 1 g
Rate: <100 mg/min
Onset of action: 10 to 20 minutes; intramuscular may take up to 2 to 4 hours
Duration of action: 1 to 3 days
Side effects: Respiratory depression, hypotension, circulatory collapse

Valproate:

Route: Oral, PR
Dose: NG: 67 mmg/kg; RP: 200 mg suppositories; enema: 60 mg/kg
Side effects: gastrointestinal irritation, tremor, ataxia, liver failure, pancreatitis

Valproate:

Route: Intravenous
Dose: In valproate-naive patient, 15 mg/kg divided qid

Midazolam:

Route: IV (oral, intravenous available)
Dose: 0.05 to 0.1 mg/kg IV
Rate: Load with 0.2 mcg/min and titrate continuous infusion to 0.4 to 0.6 mcg/kg per min
Onset of action: IV within 5 to 10 minutes
Duration: 1 to 6 hours
Side effects: hypotension, bradycardia, central nervous system and respiratory depression

References

- Sabo-Graham T and Seay AR. Consultation with the Specialist: Management of Status Epilepticus in Children. *Pediatrics in Review*. 1998;19;306.
- Phillips S, Shanahan R. Etiology and mortality of status epilepticus in children. *Arch Neurol*. 1989;46:74–76.
- Sotero de Menezes M and Corden TE. Pediatric Status Epilepticus.
<http://emedicine.medscape.com/article/908394-overview>
- Uptodate.com: Inborn Errors of Metabolism
- Uptodate.com: Status Epilepticus