



Seizures in Childhood

The child who has just had a seizure but now appears well is a common clinical problem in the emergency department. Most of these children do well, but the potential for a life-threatening illness to be present is substantial. The lecturer will examine the literature to determine the most cost-effective approach to seizures in children based on age and clinical presentation.

- Discuss the differential diagnosis of febrile, nonfebrile, and neonatal seizures.
- Describe a cost-effective approach to the management of seizures in children.

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FACULTY

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Track: Pediatric Disorders
Course: Seizures in Childhood
MO-34
1 Hour
Faculty: Brent R. King, MD

Course Description:

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Seizures in Childhood

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Objectives

- ◆ Discuss the types of seizures seen in newborns
- ◆ Discuss the classification of febrile seizures
- ◆ Diagnostic approach to children with non-febrile seizures
- Approach to the child with status epilepticus

Neonatal Seizures

- **●●●●●●●●●●**
- ◆ Diagnostic evaluation
- Treatment
- ◆ "The Bottom Line"

Neonatal Seizures - Classification

- . Subtle
- . Clonic
 - . Focal
 - . Multifocal
- ◆ Tonic
 - . Focal
 - . Generalized

Neonatal Seizures - Classification (con't)

- ◆ Myoclonic
 - Focal
 - Multifocal
 - Generalized

Neonatal Seizures - Subtle

- ◆ Not clearly Clonic, Tonic, Myoclonic
- . Subtle **movements**
 - . e.g. **eye** blinking, **tongue thrusts**
- ◆ Repetitive motions of hands or feet
 - "Boxing"
 - Pedaling
- **May or may** not have EEG **abnormality**

Neonatal Seizures - Clonic

- ◆ Two types - Focal and Multifocal
- ◆ Different from clonic seizures in older kids
 - Slower (1 -3 jerks/second)
 - Infant may be unconscious even with focal events
 - Several body parts are involved in multifocal. Non-Jacksonian migration

Neonatal Seizures - Clonic
(con't)

- ◆ Whether the *seizure* is focal or multifocal the *abnormality is* usually focal.
- ◆ BUT focal events in newborns can be caused by generalized processes (e.g. metabolic abnormalities)

Neonatal Seizures - Tonic (Focal)

- ◆ Posturing of a limb
- Asymmetric posturing of the head, neck, or trunk
- Often have associated EEG abnormalities

**Neonatal Seizures - Tonic
(Generalized)**

- ◆ May resemble decorticate or decerebrate posturing
- ◆ EEG abnormalities not consistently seen
 - . May be posturing

Neonatal Seizures - Myoclonic

- ◆ Different from clonic activity
 - More rapid jerks
 - Predilection for flexor muscles
- ◆ Three types
 - Focal
 - Multifocal
 - Generalized

**Neonatal Seizures - Myoclonic
(Focal)**

- **Flexor** muscles of one extremity (usually upper)
- 3 of 4 1 patients studied had an associated EEG abnormality

Neonatal Seizures Myoclonic (Multifocal)

- ◆ Asynchronous twitching of **several** parts of the body
- **none** of **5 infants** studied had EEG abnormalities

Neonatal Seizures - Myoclonic (Generalized)

- ◆ **Bilateral flexion jerks** of upper (and sometimes lower) **extremities**
- ◆ Often associated with abnormal EEG

Benign Myoclonus

- ◆ Associated with sleep
- ◆ Seen in **normal** newborns
- **Resolves** by six **months** of age
- ◆ No EEG abnormalities

Neonatal Seizures - Classification
Summary

- ◆ Distinct types of seizures
- ◆ Not like those **seen** in older children
- Not consistently associated **with EEG abnormalities**

Neonatal Seizures - Questions

- ◆ *Are the movements not associated with EEG abnormalities really seizures?*
- ◆ The answer is unknown
- ◆ Animal studies suggest that some seizures may occur deep within the brain and not be recorded by surface electrodes

Neonatal Seizures - Questions

- ◆ *How can true seizures be identified?*
- ◆ Stimulus sensitivity
 - True seizures should **not** be initiated by tactile stimulation
- ◆ Suppressibility
 - True seizures should not be suppressed or eliminated by gentle passive restraint

How can seizures be identified (con't)

- ◆ Association with autonomic changes
 - True seizures should be associated with autonomic changes (e.g. tachycardia, increased BP)

Neonatal Seizures - Questions

- ◆ *What about treatment?*
- ◆ Best candidates:
 - Pts who meet above criteria and meet criteria for status epilepticus
- ◆ Treat causes
- ◆ Look for elevated ICP

Treatment (con't)

- ◆ Drug therapy
 - benzodiazepines
 - phenobarbital
- ◆ Consider consultation prior to treatment of patients **not** in status

The Bottom Line(s)

- ◆ Babies make a lot of “funny” movements
 - Many of these are not electrical seizures
- ◆ Babies “break the rules”
- ◆ Use clinical criteria to identify true seizures
- ◆ Look for underlying causes

Febrile Seizures

- ◆ Definitions
- Diagnostic evaluation
- ◆ The “Bottom Line”

Febrile Seizure

- ◆ Definition
 - Convulsive activity accompanied by fever
 - Child 6 months to 5 years of age
 - No CNS infection
 - No underlying seizure disorder

Febrile Seizure - Types

- ◆ Simple
 - Brief (<15 mins long)
 - Generalized
 - Do not recur within 24 hours
- ◆ Complex (or complicated)
 - All others

Febrile Seizure - Significance of Classification

- ◆ Long term prognosis
 - Simple febrile seizures are not predictive of later epilepsy
- ◆ Short term prognosis
 - Simple febrile seizures are rarely associated with a serious underlying cause
 - Simple febrile seizures have no associated morbidity or mortality

Simple Febrile Seizures - Diagnostic Evaluation

- CBC, **lytes**, calcium, BUN, **creatinine**, etc.
 - Not warranted
- Neuroimaging
 - Not warranted
- **Dextrostick** should be routine

Simple Febrile Seizure - To LP or Not to LP?

- ◆ Meningitis very unlikely overall.
- ◆ Older children
 - LP only if toxic appearing, meningeal signs, etc
- ◆ Children under 9 mos to 1 year
 - More difficult to evaluate clinically
 - LP should be considered

Complex Febrile Seizure - Diagnostic Evaluation

- ◆ Chemistries, CBC, etc.
 - Still unlikely to be abnormal and should be obtained only if indicated by history or exam
- ◆ Neuro imaging
 - Only for persistent focal findings, evidence of head trauma, etc.
- ◆ Dextrostick is *still* routine

Complex Febrile Seizure - LP?

- ◆ Bacterial meningitis is **more common**
- ◆ Older children usually have suspicious findings
- ◆ Younger **patients** are **often** candidates

The Bottom Line(s)

- ◆ Simple febrile seizures have a good prognosis
 - Diagnostic work-up is **very rarely needed**
- ◆ **Complex febrile** seizures are **more likely to** represent a serious underlying problem

Hyponatremic Seizures

- ◆ **Diagnosis**
 - **Confirmation and Management**

Hyponatremic Seizures - “The Sodium Will be Done in an Hour”

- ◆ **Making a diagnosis**
 - Infants and young children
 - Low rectal temperature
 - History of excessive free water intake
 - Severe seizures

Confirmation and Management

- ◆ Rapid **serum** sodium (“Supergas”)
- If “Supergas” is **not available** Consider 20cc/Kg NS
- Once Dx is known - 10cc/Kg 3% Saline
 - **Caution should be used**
 - **Rapid correction is associated with osmotic demyelination syndrome**

Hyponatremic Seizures - The Bottom Line(s)

- ◆ Consider in:
 - **Infants under 6 months of age**
 - **Hypothermia**
 - **Status epilepticus**
 - **History of free water intake**

Older Child with a First Non-Febrile Seizure

- How much work-up should be done in **the ED?**
- **Lytes**, Calcium, Magnesium, etc.
 - **Very unlikely to be abnormal in children who are non-tonic and not in status**
- ◆ **Dextrostick** Cheap and simple Do it
- ◆ Consider Causes (e.g. **Toxins**)

Older Child with Non-Febrile Seizure

- ◆ Imaging
 - History suggesting a lesion
 - Focal Findings
 - Non-Generalized Seizure
 - Persistent alteration of mental status

First Non-Febrile Seizure

- ◆ Imaging
 - Pts who recover normally can have imaging study as an outpatient
- ◆ EEG
 - Also best done electively

First Non-Febrile Seizure - Treatment?

- Definition of epilepsy is at least two non-febrile seizures without a cause
- ◆ Most neurologists do not treat first seizures
- ◆ Discharge instructions are important
 - swimming
 - Bathing
 - Other activities

First Non-Febrile Seizure - The Bottom Line(s)

- ◆ Diagnostic work-up is **usually not needed** in children who have brief seizures and who recover completely in the ED with no **persistent abnormalities**
- ◆ Presumptive treatment only *after* **consultation**
- Discharge instructions are very important

“His eyes rolled back and he tried to go to sleep!”- Pallid Breath Holding Spells

- ◆ Can look **like** seizures
- Patients are usually **young children**
 - Most cases start before **18 months**
 - Step by 3 or 4 years of age
- ◆ Minor **noxious** stimulus

Pallid Breath Holding Spells - Clinical Picture

- ◆ Child becomes quiet
 - Pallor **and/or** diaphoresis may be noted
- Pulse is **slow** and may appear “weak”
- ◆ May be a brief episode (<30secs) of tonic-clonic activity
- ◆ An apparent “post-ictal” phase

Pallid Breath Holding Spells - Etiology

- ◆ Not primary seizures
- ◆ Possibly an exaggerated vagal discharge
 - Bradycardia
 - Brief periods of aystole
- Movements are related to cerebral anoxia

Pallid Breath Holding Spells - Natural History

- Rarely if ever serious
- Half of affected children have stopped by age 4
- ◆ Almost all have stopped by school age
- ◆ Differential diagnosis includes Prolonged QT Syndrome
 - Consider in the older child with PBHS

Pallid Breath Holding Spells - The Bottom Line(s)

- Probable cause of many "seizures" related to minor head trauma
- ◆ Benign condition
- Think of prolonged QT
 - Esp in older children
 - Very especially in the child who is older at age of onset

Status Epilepticus

- ◆ Definition
- ◆ Treatment Options

Status Epilepticus - Definition

- ◆ A. **Seizure** lasting longer **than 30 mins**
- B. Intermittent seizures for **>30 mins** without a lucid interval
- ◆ C. (Practical) Almost **any child who arrives at the ED seizing**

Status Epilepticus -Types

- ◆ Generalized Convulsive Status Epilepticus
 - Most common type
 - **Convulsive Status** 

Status Epilepticus - Initial Treatment

- . Identify and address treatable causes
 - Glucose
 - Trauma
 - . Etc.
- ◆ ABC's

Treatment of Status - First Line

- ◆ Benzodiazepines
 - Lorazepam 0.1 mg/kg I.V.
 - Diazepam 0.2 mg/kg I.V

Treatment of Status -First Line

- ◆ No I.V. ?
 - Diazepam 0.5 mg/kg P.R.
 - Lorazepam or Midazolam 0.2 mg/kg P.R.
 - Midazolam 0.2 mg/kg Nasally
 - Midazolam 0.1 mg/kg I.M.

Treatment of Status - When Benzos Fail

- ◆ Give more
 - Up to three doses
 - Be prepared to support ventilation
- ◆ If benzos still don't work ...

Treatment of Status - Second Line Agents

- ◆ Fosphenytoin 20 mgPE/kg LV. or I.M.
- Or Phenytoin 20 mg/kg I.V.

**Status - Second Line Agents
(con't)**

- ◆ *Why Fosphenytoin (Cerebyx - Parke-Davis)? Isn't it really expensive?*
- ◆ Yes, but ...
- ◆ Less risk of tissue damage
 - Fewer scarring extravasations
 - Fewer lawsuits
- ◆ I.M. injections possible
- ◆ Can be administered faster

Status Epilepticus - Third Line Agents

- ◆ Reconsider treatable causes
- ◆ Give more fosphenytoin or phenytoin
 - May give a total of 30 mgPE/kg or 30 mg/kg, respectively
- ◆ Consider phenobarbital 20 mg/kg I.V.
 - Risk of apnea and or loss of upper airway reflexes is high
 - Consider elective intubation

Status Epilepticus - Third Line Agents (con't)

- ◆ Consider a *single* dose of lidocaine 1 to 1.5 mg/kg I.V.
 - Higher doses of lidocaine are epileptogenic
 - Some reports from Europe of success in refractory seizures

Status Epilepticus - Refractory Seizures

- ◆ pentobarbital coma
- midazolam continuous infusion
- ◆ propofol

Status Epilepticus - Other Agents

- ◆ IV Valproate
 - Recently released
 - Case report of success in refractory status (25 mg/kg)

Status Epilepticus - The Bottom Line(s)

- . Start with **benzos**
- ◆ Then go to **fosphenytoin or phenytoin**
- Consider **treatable causes**
- . Protect the **airway**
- . Newer **agents** (e.g. IV valproate) may have a role
