WHOLE Lotta SHAKIN’ GOIN’ ON

ADAM KIYATOS, MD, FACEP
ASSOCIATE CHIEF OF EMERGENCY SERVICES - UPMC MIRCOY

SEIZURE DEFINITIONS

- Partial (focal) – only involves part of the brain
- General – Involves entire brain
- Simple – No loss of consciousness
- Complex – Consciousness impaired
- Motor activity
  - Clonic – rhythmic jerking
  - Tonic – rigid
  - Atonic – flaccid
- Absence – staring spells (formerly Petit mal)

EXAMPLES

Absence Seizure
Partial Seizure

CASE 1

26 yo male presents after seizure
- 2 minutes generalized tonic – clonic activity
- Stopped on its own
- Initial confusion – Now back to normal

WHAT DO YOU WANT TO KNOW

- History of seizures? – Yes
- What Med? – Dilantin
- Circumstances of seizure? – How felt before/after
- Drugs/Alcohol? – No
- Follow up?
- Driving?

BREAKTHROUGH SEIZURE WORKUP

- Glucose
- AED level (if obtainable)
- Investigate other causes
  - Infection
  - Tox
  - Trauma
CASE 2

- 26 yo male presents after seizure
- 2 minutes generalized tonic – clonic activity
- Stopped on its own
- Initial confusion – Now back to normal
- Same but NO seizure history

INITIAL SEIZURE WORKUP

- Differential
  - Tox
  - Tumor
  - Infection
  - Syncope
  - Psychogenic nonepileptic attack (Pseudoseizure)

INITIAL SEIZURE WORKUP

- Chemistries (Na↑↓, Uremia, Magnesium↓, Calcium↓)
- UDS
- Glucose
- EKG
- +/- Brain imaging

TREATMENT

- Usually no Anti-Epileptic drugs
- Discharge if back to normal
- Outpatient EEG, MRI
- DOT form

STATUS EPILEPTICUS

- Mortality (0.5-20%)
- Status – Seizure lasting >5 min or 2 seizures without returning to normal in between
- Refractory Status – Continued seizure after Benzo and one antiepileptic drug (AED)
- Nonconvulsant status – no motor activity but continued EEG evidence of seizure

STATUS EPILEPTICUS TREATMENT

- STOP THE SHAKIN!!
- 1st Line – Benzo – Which One!!
**PREHOSPITAL TREATMENT OF STATUS EPILEPTICUS TRIAL**

- 205 Subjects, adjusted OR shows only trend toward Lorazepam

<table>
<thead>
<tr>
<th>Drug</th>
<th>Subjects</th>
<th>% Terminated Prior to ED Arrival</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV Diazepam 5mg</td>
<td>68</td>
<td>42.6</td>
</tr>
<tr>
<td>IV Lorazepam 2 mg</td>
<td>66</td>
<td>59.1</td>
</tr>
<tr>
<td>IV Placebo</td>
<td>71</td>
<td>21.1</td>
</tr>
</tbody>
</table>

**TAKE YOUR PICK!**

<table>
<thead>
<tr>
<th>Benzodiazepines</th>
<th>Clinical Application</th>
<th>Drug and Route</th>
<th>Dose</th>
<th>Maximum Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lorazepam—IV/IM</td>
<td>Limited use in prehospital setting due to difficulty to stock in emergency vehicles and required refrigeration.</td>
<td>2 mg–4 mg</td>
<td>8 mg</td>
<td></td>
</tr>
<tr>
<td>Diazepam—IV/IM/PR</td>
<td>Rectal mucosa allows rapid effectiveness within 5–10 min</td>
<td>5 mg–10 mg</td>
<td>20 mg</td>
<td></td>
</tr>
<tr>
<td>Midazolam—IM/IV</td>
<td>All modes of administration can be used safely in prehospital setting.</td>
<td>10 mg (5 mg if &lt;50 kg)</td>
<td>10 mg</td>
<td></td>
</tr>
</tbody>
</table>

**STATUS EPILEPTICUS TREATMENT**

- STOP THE SHAKING!
- 1st Line – Benzod – Which One?
- 2nd Line – Lots of Choices

**Non-Benzo/Diazepine Anti-Epileptic Drugs (AEDs)**

<table>
<thead>
<tr>
<th>Drug and Route</th>
<th>Dose **</th>
<th>Medium Dose</th>
<th>Benefits</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenobarbital—PO/N</td>
<td>Oral loading 20 mg/kg intravenous rates 10 mg/kg</td>
<td>Maximum dose of 250 mg every 2 hours and maximum total dose 300 mg</td>
<td>Recommended by ACEP guidelines as first “urgent” second-line therapy</td>
<td>Hypotension, hyperpyrexia, localized soft tissue infection</td>
</tr>
<tr>
<td>Phenytoin—PO/IV</td>
<td>Oral dose of 20 mg/kg intravenous rate at 18 mg/kg</td>
<td>Maximum dose of 400 mg every 2 hours orally Maximum rate of 50 mg/min</td>
<td>Recommended by ACEP guidelines as first “urgent” second-line therapy</td>
<td>Hypotension, arrhythmias and localized soft tissue infection</td>
</tr>
<tr>
<td>Phenytoin—PO/IV</td>
<td>Oral loading 15 mg/kg rapid intravenous loading dose 50 mg/kg/day intravenous every 15 min to dose of 60 mg/kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phenytoin—PO/IV</td>
<td>Rapid intravenous 150 mg</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ESTABLISHED STATUS EPILEPTICUS TREATMENT TRIAL (ESETT) – CURRENTLY ENROLLING

- Blinded head to head trial of:
  - Fosphenytoin
  - Valproic Acid
  - Levitiracetam

STATUS EPILEPTICUS TREATMENT

- Look for the cause

<table>
<thead>
<tr>
<th>Acute Causes</th>
<th>Chronic Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syncope</td>
<td>Noncompliance with AED</td>
</tr>
<tr>
<td>Renal Failure</td>
<td>Poor Sleep</td>
</tr>
<tr>
<td>Sepsis</td>
<td>Withdrawal (Benzos/ETOH)</td>
</tr>
<tr>
<td>Toxin</td>
<td>Remote CNS injury (sickle, trauma)</td>
</tr>
<tr>
<td>Anoxia</td>
<td>Demyelination</td>
</tr>
<tr>
<td>Stroke</td>
<td></td>
</tr>
<tr>
<td>Trauma</td>
<td></td>
</tr>
</tbody>
</table>

STATUS WORKUP

- Chemistry, Glucose, Ca,Magnesium
- AED level
- CT Head

- Sometimes
  - CBC
  - EKG
  - Urine Tox, Acetaminophen, ASA, ETOH
  - LP
  - Troponin
  - ABG

PROLACTIN LEVEL??

- Depends on who you ask!
- Usually elevated in generalized tonic-clonic seizure. Less reliably elevated in complex partial seizures
- High false positive rates
- May help if negative and drawn 20 minutes after generalized “spell”
EEG

- Helpful to evaluate for Nonconvulsant status
- Logistically somewhat difficult
  - Specialized technician come to ED with machine
  - Need Neurologist available to read the EEG

MICRO EEG®

SPECIAL CIRCUMSTANCES

LATE PREGNANCY AND SEIZURE

- Assume Eclampsia
- ABC’s
- Lots of labs, OB involvement or transfer to where they are
- Magnesium is treatment of choice 4-6 grams bolus then 1-2 grams/hour
- Lorazepam/diazepam or phenytoin if seizures continue
- BP control — hydralazine or labetalol
- Delivery of baby

FEBRILE SEIZURE

- The setting is fever in a child aged 6 months to 5 years
- The single seizure is generalized and lasts less than 15 minutes
- The child is otherwise neurologically healthy and without neurologic abnormality by examination or by developmental history
- Fever (and seizure) is not caused by meningitis, encephalitis, or any other illness affecting the brain
- The seizure is described as either a generalized clonic or a generalized tonic-clonic seizure

FEBRILE SEIZURE WORKUP
FEBRILE SEIZURE PROGNOSIS

- Risk of Recurrent Febrile Seizure
  - <12 months old: 50%
  - >12 months old: 30%

- Risk of developing epilepsy
  - 2.4%, twice the rate of the general population


SEIZURE SUMMARY

- Stop the Shaking
  - Benzods!!!
  - After that, lots of choices
  - Paralize and intubate if needed

- Seizure workup differs based on situation
  - Recurrent seizure with history of epilepsy often requires little testing
  - If new, persistent or patient sick...
    - Look for the cause

WANT MORE??