Neonatal Seizures – Part II

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Unanswered questions

- Do seizures matter?
- Should subclinical seizures be treated?
- When should anti-convulsant therapy be discontinued?
Do Seizures matter?


- Untreated seizures are suspected to correlate with more adverse outcomes. Newborns with longer duration and greater number of seizures had worse outcomes.

Differentiating seizures from non-seizure events

**Purpose:** To determine the gap between EEG seizure burden, video recorded clinical findings, and clinical documentation of seizures by neonatal clinicians

**Method:** 51 infants at risk for seizures were monitored with video EEG and clinical documentation at bedside

**Results:**
- 9 had EEG seizures and 3 had clinical seizures
- Of 526 EEG seizures, **only 34%** had clinical manifestations
- Of 177 clinical seizures, **only 27%** had EEG seizures

Percentage time electrographic seizures had clinical signs recognized by clinicians

Treatment of subclinical seizures

- **Purpose:** To determine if treatment of both clinical and EEG seizures reduces EEG seizure duration and decreases brain injury.

- **Methods:** Term infants with HIE and seizures were randomized to treatment both clinical and subclinical seizures (Group A) or treatment only clinical seizures (Group B)

- **Results:**
  
<table>
<thead>
<tr>
<th>Group</th>
<th>Median seizure duration (minutes)</th>
<th>P</th>
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<tbody>
<tr>
<td>Group A (n=19)</td>
<td>196 ± 340</td>
<td>P=NS</td>
</tr>
<tr>
<td>Group B (n=14)</td>
<td>503 ± 1084</td>
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</table>

- **Conclusions:** Significant relationship between seizure duration and MRI severity scores

**Conclusions:**

- Trend towards reduction in seizure duration when clinical and subclinical seizures were treated.
- In addition, more brain injury was seen with longer seizure duration, supporting the assumption that seizures enhance existing brain injury.

*Van Rooij LGM et al. Pediatrics (2010)*
Purpose: Determine impact of treating EEG seizures vs. clinical seizures on seizure burden, MRI, and neurodevelopmental outcome

Methods: Newborns with HIE were randomized to either
- Treatment of EEG seizures (ES)
- Treatment of clinical seizures (CS)
All were monitored with cEEG and those with status epilepticus were excluded.

Results:
- 35 of 69 (51%) developed seizures
- Total seizure burden significantly lower in ES group (p=.02)
- Total number of seizures and time to treatment lower in ES (p=.04)
- Significant association seizure burden and MRI injury score (p<.03)
- Increasing seizure burden correlated with lower Bayley scores (p=.03)

Conclusions: EEG monitoring and treatment of EEG seizures reduces seizure burden. Increasing seizure burden is associated more severe brain injury and lower Bayley III scores.

Speculation: Early detection and treatment of EEG seizures may reduce cumulative seizure burden leading to less brain injury by MRI and improved neurodevelopmental outcome.

aEEG data with raw EEG trace enabled detection of 85% of seizure burden making it a reasonable option when cEEG is not available.
Seizure prophylaxis after hospital discharge


- Continued prophylaxis may have clinical benefits as animal data suggest that brief, recurrent seizures may have long-term adverse consequences.


Seizure recurrence and developmental outcomes are unrelated to phenobarbital prophylaxis

**Purpose:** Evaluate seizure recurrence and neurodevelopmental outcome in neonates treated and not-treated after hospital discharge

**Methods:** 132 infants >34 weeks, 25% discharged on phenobarbital, 75% no treatment

**Results:** No significant difference in seizure recurrence, epilepsy, abnormal neurodevelopment or cerebral palsy.

**Conclusions:** Infants discharged home without prophylaxis did as well if not better than those continued on phenobarbital.

Outcomes of neonatal seizures

Seizure etiology is main determinant of outcome

Overall increased risk:

- Cerebral palsy 13%
- Epilepsy 18%
- Intellectual disability 15%
- Mortality 19%

Other factors:

- **Perinatal clinical variables:** Prematurity increases mortality and morbidities significantly, abnormal neurologic exam
- **Seizure characteristics:** Presence EEG seizures associated poor outcome
- **EEG variables:** normal background versus persistent abnormal pattern
- **Response to therapy:** Lack of response predicts poor outcome