Clinical and EEG Characteristics of Nonconvulsive Status Epilepticus in critically ill pediatric patients

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Introduction

• Nonconvulsive status epilepticus (NCSE)
  • Prolonged state of impaired consciousness with continuous paroxysmal activity or electroencephalographic (EEG) discharges

• 25% of all status epilepticus patients (Towne, 2000)

• 14% of patients after controlling GCSE (Generalized convulsive status epilepticus)
Introduction

• Exacerbation of preexisting epilepsy and Cerebrovascular accidents were most common cause of NCSE (Abend NS, 2007)

• In comatose adults, NCSE occurs frequently and correlates with poor outcome
  (Young GB, 1996; Shneker, 2003; Glaassen, 2006)
Introduction

- 7-46% of comatose patients had NCS or NCSE at the Pediatric Intensive Care Unit (PICU) (Shahwan, 2010; Abend NS, 2011)

- Few comprehensive studies detailing clinical and EEG characteristic and outcome of NCSE in critically ill pediatric patients
Purpose

- To investigate the clinical and EEG features and outcome in acute ill pediatric patients with NCSE
Methods

• From May 2006 to March 2012 in PICU of Seoul National University Children’s Hospital

• Study subjects
  • Critically ill pediatric patients admitted in PICU
  • Acute deterioration of consciousness
  • NCSE confirmed with EEG

• EEG
  • Model: Comet
  • Grass-Technology (USA) 40 channel Digital EEG system
Methods

• Definition of NCSE (Young, 1996; Chong & Hirsh, 2005)
  • Change in mental status from baseline of at least 30 min duration without convulsive activity

  • Continuous or nearly continuous ictal discharges
    • typical or atypical spike wave, multiple or polyspike discharges
    • rhythmic delta mixed with sharp waves and with definite evolution
    • other rhythmic pattern with definitive evolution in frequency, duration or morphology
Methods

• Retrospective review
  • Associated medical condition
  • Acute CNS lesion
  • Brain MRI
  • EEG
  • Outcome
Results
Clinical characteristics

- Male: Female 16 : 6
- Mean age (range) 6.8 yrs (1 mo– 22yrs)

- Presence of convulsive seizure
  - preceding convulsive seizure 19
  - NCSE only 3

- Presence of epilepsy
  - Acute symptomatic 19
  - Known epilepsy 3
Epilepsy vs. Acute symptomatic

- Known Epilepsy: 3
- Presumed Encephalitis: 11
- Other Etiologies: 8
## Known epilepsy (n=3)

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<thead>
<tr>
<th></th>
<th>Pt 1</th>
<th>Pt 2</th>
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<tbody>
<tr>
<td>MRI finding</td>
<td>hemimegalencephaly</td>
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<td>Polymicrogyria</td>
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<tr>
<td>Aggravating factor</td>
<td>respiratory infection</td>
<td>respiratory infection</td>
<td>respiratory infection</td>
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<tr>
<td>Preceding convulsive seizure</td>
<td>+</td>
<td>+</td>
<td>+</td>
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<tr>
<td>Time to EEG recording</td>
<td>1.5 hr</td>
<td>2 hr</td>
<td>3 hr</td>
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<td>Time to mental state recovery</td>
<td>&lt; 24 hr</td>
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<tr>
<td>EEG pattern</td>
<td>Focal spike wave</td>
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<tr>
<td>Persistent seizure after 1yr</td>
<td>+</td>
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<tr>
<td>Mortality</td>
<td>-</td>
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Presumed encephalitis (n=11)

- Time to EEG recording: 2.63 hr (0.5~5)
- Preceding convulsive seizure: 11
- Time to mental state recovery:
  - < 24 hr: 8
  - > 24 hr: 3
- Persistent seizure after 1yr: 8 (73%)
- Mortality: 0
Other etiologies (n=8)

- **Associated medical conditions**
  - Post op. (Heart, Brain, GI) 4
  - Multi-organ failure from septic shock 3
    - Cong. Immune deficiency 2
    - Post transplantation 1
  - Autoimmune diseases 1

- **Acute CNS lesions** 5 (63%)
  - Intracranial hemorrhage 3
  - Abscess / infarct 1
  - PRES 1
Other etiologies (n=8)

- Time to EEG recording: 7.87 hr (1~48)
- NCSE only: 3 (38%)
- Time to mental state recovery:
  - < 24 hr: 3
  - > 24 hr: 5
- Persistent seizure after 1 yr: 2 (25%)
- Mortality: 3 (38%)
EEG features of NCSE

- Generalized ictal discharges 3
- Focal ictal discharges 19
  - Morphology
    - spike or poly-spike waves 14
    - sharp waves 5
    - rhythmic pattern with definitive evolution 3
EEG features of NCSE

HSY (M/6) Encephalitis

Continuous generalized high voltage spike or sharp wave discharges
EEG features of NCSE

KSY (M/5) Encephalitis

Continuous spike wave discharges from Left hemisphere
<table>
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<tr>
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<th><strong>Other etiologies</strong> (n=8)</th>
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<td>6</td>
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Conclusions

• Common etiologies of NCSE
  • After convulsive seizures with encephalitis
  • Acute CNS lesions associated with other serious medical condition
  • Aggravation of known epilepsy

• Etiologies other than known epilepsy and encephalitis
  • High proportion of acute CNS lesions
  • Delay in EEG recording and NCSE detection
  • NCSE without convulsive seizure
  • High mortality