aEEG – Mystery Solved

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The speaker has signed a disclosure form and indicated he has no significant financial interest or relationship with companies or the manufacturer(s) of any commercial product/service that will be discussed as part of this presentation.

Session Summary

This presentation will provide an overview of the basic patterns of aEEG. The strengths and limitations of monitoring will be addressed. The lecture will conclude with several practice strips.

Session Objectives

Upon completion of this presentation, the participant will:

- understand the principles of aEEG;
- understand the basics of pattern recognition and how it changes with different gestational ages;
- understand how the aEEG relates to HIE;
- have information on aEEG and seizures.

References


**Session Outline**

See handout on the following pages.
aEEG - Mystery Solved

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Lecture Outline

• I. aEEG principles- How it works
• II. aEEG basics
  – Patterns of reading
  – Effect of gestational age
• III. aEEG and HIE
• IV. aEEG and seizures
• V. Quiz Time

I. aEEG principles- How it works

Conventional EEG:
16 channels; 21 Electrodes

Olympic Brainz Monitor:
3 channels/5electrodes

Easier to apply and manage electrodes at the bedside

I. aEEG principles- How it works

– aEEG can be used as a monitoring tool by bedside staff right on the unit
  • Validate suspicious behaviour/movements
  • Escalate care based on what is seen
– aEEG provides information during off hours
  • Especially nights, weekends, holidays
  • Babies are often admitted when neurologists and EEG techs are not readily available.
**cEEG vs aEEG**

Conventional EEG, 16 channels

Olympic Brainz Monitor: 3 channels aEEG and raw EEG

Easier to see long-term trends at the bedside

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**II. aEEG Basics**
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1. CNV: continuous activity with lower (minimum) amplitude around (5) to 7 to 10 µV and maximum amplitude 10 to 25 µV.

2. DNC: discontinuous background with minimum amplitude variable, but less than 5 µV, and maximum amplitude more than 10 µV.

3. Burst suppression: discontinuous background with minimum amplitude without variability at 0 to 1 µV, and bursts with amplitude more than 25 µV.

4. CLV: continuous background pattern of very low voltage (around or below 5 µV).

5. Inactive, flat trace: mainly inactive (isoelectric tracing) background below 5 µV.


Gestation or Postconceptional age | Dominant Background Pattern | SWC
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24-27 | DC | immature
28-29 | DC/C | immature-mature
30-38+ | C/DC in QS | mature

Hellstrom-Westas and de Vries; Toet et al.
II. aEEG Basics

HIE
General
- Background and Sleep wake cycling
  - maturing baby
  - HIE
- Reasons for Power
  - Background pattern changes with HI

III. aEEG and HIE

Al Naqeeb
III. aEEG and HIE

• Outcome prediction using aEEG:
  - For normothermia HIE babies, the best single early predictor (<6h) of neurological outcome at 18 months is based on pattern recognition scoring of single channel aEEG (PPV 0.86)
  - Hypothermia changes the predictive value of early aEEG
    • Normalization of an infant’s aEEG while being cooled occurs later
  - Infants with good outcome had normalized background pattern by 24 hours when treated with normothermia and by 48 hours when treated with hypothermia

III. aEEG and HIE

• Outcome prediction using aEEG:
  - Reappearance of SWC within 36 h gives a good prognosis in normothermic infants
  - In hypothermic infants, the reappearance of SWC could be as late as 60 h in infants who developed normally
  - Time to normal trace (TTNT) is a better predictor than time to normal SWC appearance
    • never achieving SWC always predicts poor outcome

Studies Predicting Prognosis in Hypothermia Treated Infants with HIE Thorasen et al 2010

Studies Predicting Prognosis in Hypothermia Treated Infants with HIE Thorasen et al 2010

Hypothermia and Rewarming Seizures

IV. aEEG and Seizures

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A Few Facts About Seizures During the Newborn Period...

- Seizures are more common in the neonatal period than at any other time in life:
  - As high as 57.5/1000 in <1500g and 2.8/1000 in 2500-3999g

- With moderate-severe HIE, the incidence of seizures is >50%
  - Gluckman, Lancet 2005; Cool Cap Trial.

- % of electrographic neonatal seizures provoke no obvious clinical signs
  - Some infants have all subclinical seizures.
  - Mizrahi, Epilepsia 2001; Clancy, Epilepsia 2001

IV. aEEG and Seizures

- Difficult to identify by clinical observation alone
  - Very subtle presentation
  - Become less apparent when patient sedated or paralysed
  - Up to 80% of seizures are subclinical (Flanagan 1993)
  - After giving phenobarbital, at least 50% of seizures continue but are subclinical (Seiber 1993) - false sense of confidence

- Multiple causes with varying timing of onset
  - Hypoxia, trauma, infection, metabolic disorders, cardiac surgery

- Anticonvulsant medications
  - Unpredictable results
  - Effectiveness is difficult to evaluate
  - Clinicians need a reliable way to know when seizures have been controlled

- 80-90% of neonates with EEG confirmed seizures were identified by aEEG.
- Lawrence et al. found that 73% of seizures >30s and 87% of >60s.
- Availability of raw signal enhances accuracy.
- Using 2 channel aEEG 76% of non-status seizures were identified.
- Slightly better performance with 2 channel.
IV. aEEG and Seizures


A12b: aEEG--MYSTERY SOLVED
IV. Quiz Time

A12b: aEEG--MYSTERY SOLVED
A12b: aEEG—MYSTERY SOLVED