Clinical Signs & EEG Patterns of Emergence from Anesthesia in Children

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Background

Multichannel EEG
- Gross body movement
- Eye lash reflex
- Eye position

Methods

Study participants:
- 43 enrolled from June 2015 to February 2016 at BCH
  - 34 (79%) had eye checks performed
  - 2 were excluded for isoflurane anesthesia
  - 32 included in initial analysis

End-tidal sevoflurane concentration (etSEVO): 1.0% -> 0%

Methods:

- End-tidal sevoflurane concentration (etSEVO): 1.0% -> 0%
- Subjects studied continuously from emergence phase of general anesthesia in children aged 0-20 months.
- Study period:
  - Protocol
  - Written informed consent
  - Require general anesthesia for surgery
  - Aged 0 to 20 months (N=43)
  - Clinical subjects
- Study demographics and clinical information:
  - Age at study, months (mean, 95% CI): 11 (8.6-12)
  - Age at birth, weeks (median, 95% CI): 39 (39)
- Airway management:
  - ET, n: 24
  - LMA, n: 6
  - Mask, n: 2

Study Aim:

To examine the relationship between clinical signs and end-tidal gas concentration during emergence from general anesthesia in children aged 0-20 months.

Study Aim:

Multichannel EEG

- Spontaneous & purposeful body movements, changes in eye gaze, and eye lash reflex are commonly used signs of depth of anesthesia.
- Correlation of traditional clinical signs of anesthesia with end-tidal vapor concentrations in young children requires further characterisation.

Results

1. Dysconjugate eyes appear transiently through emergence

2. Dysconjugate eyes are more commonly observed at >0.3% etSEVO in all ages

- Return of conjugate gaze was independent of age (all data grouped together).

3. Younger subjects (0-6M) are most likely to exhibit dysconjugate eyes between 0.1 - 0% etSEVO

- % Assessments with dysconjugate eyes between 0.1 - 0% etSEVO:
  - 0-6M: 33.3%
  - 7-12M: 21.4%
  - 13-20M: 20%

- Eye lash reflex was restored in all subjects at 0.1-0% etSEVO.
  (One infant had eye lash reflex restored at 0.3% etSEVO.)

Conclusions

The results show that during emergence from sevoflurane general anesthesia, recovery of oculomotor (eye gaze and eye lash reflex) activity precedes recovery of skeletal muscle and are independent of postnatal age.

Multivariable analysis of clinical signs with EEG spectral patterns and age will provide valuable information in understanding the ontogeny of brain function during emergence from general anesthesia.

4. Onset of gross body movement appears around 0.3% etSEVO in all ages

- Cortical changes in power may precede recovery of key clinical signs during emergence. Studies are ongoing to support this hypothesis.

5. Frontal spectral changes during emergence in an 11M subject

- Fig 6: Frontal spectral changes (F7) during emergence in an 11M subject