Incidence of False Positive Spinal Cord Monitoring Alerts in Surgery for Early Onset Scoliosis

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BACKGROUND

• Role for multimodal SCM established [1, 2]
  – More effective than single modality
  – Descending pathways – MEPs
  – Ascending pathways – SEPs

• SCM – Effective in EOS patients [3]
• Risk factors for neuromonitoring changes [4]
  – Cobb >90°
  – Hyperkyphosis
  – Osteotomy

• High predictive accuracy in idiopathic Pts [5]
  – False positives associated with labile MAP

• Value of SCM in non-idiopathic cases established [6, 7, 8]
  – Subject to greater variability
SCM PROTOCOL – Pre-Operative

• Pre-op SEPs
  – Check responses (MRI if delayed)
  – Assess for contra-indications to MEPs

• Contra-indications to MEPs [9]
  – Hx of seizures
  – Hx skull #s
  – Hx craniotomy
  – Intracranial metal
  – Cochlear implants
  – Cardiac pacemakers

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## SCM PROTOCOL – Peri-Operative

### SEPs
- **Head** (corkscrew electrodes)
  - Over sensory homunculus
  - Erb’s points
- **Arms** (stimulating electrode)
  - Over ulnar nerve
- **Legs** (stimulating electrode)
  - Over tibial nerve
- **Max stim.** – 40mA

### MEPs
- **Head** (stimulating corkscrew electrodes)
  - Motor cortex (C1-2)
- **Arms**
  - In ADM
- **Legs**
  - In quads, tib ant, abd hall
- **Max stim.** – 200mA
SCM – Significant Changes

• SEPs ≥ 50% drop from baseline

• MEPs – present Vs absent
  – Surgeon informed if ≥ 80% drop from baseline
  – Prospectively studying other thresholds
METHODS

• Prospective series of 70 consecutive operative procedures on EOS Pts
    • All surgeons within the spine division
  – Neurophysiology database
  – Retrospective case notes review
  – Retrospective radiology review
RESULTS

• 70 patients
  – 37 males, 33 females
• Mean age 4 years
Neuromuscular Cases (n=9)

- Monitoring
  - 2 dual
  - 7 SEPs only
  - 0 alerts

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Congenital Cases (n=27)

- Monitoring
  - 14 MEPs & SEPs
  - 8 alerts
    - 5 dual monitored
    - 5 false +ves
    - 3 other cases – SCM normalized 2° to loosening instrumentation
    - No post-op deficits
Idiopathic Cases (n=32)

• Monitoring
  – 15 MEPs & SEPs
  – 4 alerts
    • 2 dual monitored
    • 0 false +ves
    • 4 cases – SCM normalized
      – 3 following correction MAP
      – 1 following surgical manoeuvre
  • No post-op deficits

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DISCUSSION

• SCM is of value in surgical Tx of EOS
  – No cases of post-op deficits in this series

• SCM alerts are more common in congenital cases
  – 30% of congenital cases (Vs 12.5% idiopathic)

• False +ve alerts common in congenital cases
  – 62.5% of alerts (Vs 0% of alerts in idiopathic cases)
  – ?due to ↑frequency of neural axis / vascular abN
• Trend towards monitoring alerts in larger curves
  – SCM alerts Cobb = 72° (Vs 63°)

• Sublaminar wires highly associated with monitoring alerts
  – 75% cases

• Series too small to permit
  – Further subgroup analysis
  – Sensitivity / specificity analysis

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CONCLUSION

• Dual modality SCM is the standard of care in the surgical Tx of EOS

• Correction of congenital scoliosis is associated with
  – More frequent SCM alerts
  – More false +ve alerts

• SCM alerts while useful to guide surgeons
  – NOT an alternative to a wakeup test
REFERENCES


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