Is Neuromonitoring necessary for VEPTR expansion and implant exchanges in Early Onset Scoliosis?

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Disclosures

- DepuySynthes Spine: Consultant, Royalties, Speaker
- Children’s Spine Foundation: Research Support
- Ellipse Technologies: Consultant (wife)
- Spineguard: Consultant
VEPTR

- Rib-based distraction to treat EOS
- Many etiologies
- Repetitive surgeries
- Risk of neurologic injury with repetitive distraction?
Literature: Neuromonitoring changes with lengthening procedures

- Skaggs et. al.: 0.08% (VEPTR)
- Sankar et.al.: 0.9% (GR)
- El-Harwary et. el.: 0% (VEPTR IDE)
Neuromonitoring practices among select CSF Centers

- Monitor *new* implants:
  - 100% (SLC, Boston, CHOP, Shriners PHL, Campbell, Denver, Columbia)

- Monitor *all* procedures
  - Boston

- Never monitor expansions unless previous neuromonitoring changes
  - SLC, CHOP, Shriners PHL, Campbell Clinic, Denver, Columbia
<table>
<thead>
<tr>
<th>Category</th>
<th>Total Implant/revision Surgeries</th>
<th>Total Surgeries with SSEP/MEP use</th>
<th>SSEP/MEP Usage %</th>
<th>Changes in SSEP/MEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Sites</td>
<td>3358</td>
<td>880</td>
<td>25%</td>
<td>1</td>
</tr>
<tr>
<td>Initial/Revision</td>
<td>899</td>
<td>346</td>
<td>38%</td>
<td>1</td>
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<tr>
<td>Expansion</td>
<td>2659</td>
<td>534</td>
<td>20%</td>
<td>0</td>
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</tbody>
</table>

*Preliminary data; Not completely audited*
Hypothesis

Neuromonitoring is not necessary for routine VEPTR expansion surgery in the absence of previous neuromonitoring changes.
Methods

- IRB Approved Retrospective Review of CSF Registry
- Single site (SLC)
- Single surgeon (JTS)
- Minimum follow-up of 1 year with documented physical exam
Results

- **95 children**
- **EOS**
  - Idiopathic: 16
  - Congenital: 31
  - Neuromuscular: 36
  - Syndromic: 12
- **823 expansion or exchange procedures**
Cost Estimates

- OR Monitoring Set up time @ $45/min.: 10 minutes = $450.
- Average estimated total monitoring cost per procedure: $1500
- Estimated potential lifetime cost of VEPTR program if monitoring for expansions: $1,234,500
Results

- Average Age: 6.05 years
- Procedures
  - Initial Implantation: 95
  - Expansion: 635
  - Revision: 98
  - Exchange: 90
- Complication rate: 20%
No documented neurologic injuries in 823 consecutive lengthening and exchange procedures
Discussion

- Documented rate of neurologic injury with expansion surgery is low
- Cost of repetitive surgery in EOS is high
- Cost of a neurologic injury is very high
Conclusion

- Routine lengthening surgery has minimal if any risk of neurologic injury
- Monitoring *is* recommended if there were documented neuromonitoring changes at the time of initial implant surgery
- Eliminating routine neuromonitoring offers significant cost savings over the course of treatment
Thank You