The Use of Spinal and Rib Based Distraction Systems in Early Onset Scoliosis Associated with Myelomeningocele

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Children’s Spine Study Group
Growing Spine Study Group
Study Design

- Demographics
- Treatment methods
- Measurements
- Complications
- Standard statistical analysis
Study Design

- Retrospective review of two IRB approved Registries
- Diagnosis: Myelomeningocele
- Managed using distraction based growth-friendly instrumentation attached either to the ribs or spine
Results

- 34 Children w/ complete data
  - Growing rods: 12
  - VEPTR: 22
- Mean age initial implant: 6.6 years
- Average f/u: 4.4 years
Measurements

- Average Pre-op Cobb: 61°
- Average Post-OP Cobb: 37°
- Average most recent Cobb: 49°
- Initial T1-S1 Spine Height: 23cm
- Most recent T1-S1: 30cm
Comparison of Rib vs. Spine Anchor Measurements

<table>
<thead>
<tr>
<th></th>
<th>RIB-BASED (n=22)</th>
<th>SPINE BASED (n=12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>6.3</td>
<td>7.2</td>
</tr>
<tr>
<td>Follow up</td>
<td>4.4</td>
<td>5.4</td>
</tr>
<tr>
<td>Pre-op Cobb</td>
<td>53.8</td>
<td>73.5</td>
</tr>
<tr>
<td>Final Cobb</td>
<td>42.1</td>
<td>47.0</td>
</tr>
<tr>
<td>Pre T1-S1 Height</td>
<td>22.7</td>
<td>23.9</td>
</tr>
<tr>
<td>Final T1-S1 Height</td>
<td>28.7</td>
<td>31.9</td>
</tr>
<tr>
<td>1-S1 Gain</td>
<td>6.0</td>
<td>8.0</td>
</tr>
</tbody>
</table>
Complications

- 63 complications in 34 patients
  - Infection 24
  - Migration 15
  - Wound Dehiscence 8
  - Implant failure 10
  - Other 8
  - Death 1
Comparison of Rib vs. Spine Anchors Complications

<table>
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<tr>
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<th>%</th>
<th>SPINE-BASED</th>
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<tbody>
<tr>
<td>Reakage</td>
<td>6</td>
<td>11.7%</td>
<td>4</td>
<td>26.7%</td>
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<tr>
<td>Infection</td>
<td>17</td>
<td>33.3%</td>
<td>7</td>
<td>46%</td>
</tr>
<tr>
<td>Migration</td>
<td>11</td>
<td>21.6%</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

Numbers are too small for meaningful comparison between techniques
Complications Classified

- Grade 1: 17
- Grade 2A: 22
- Grade 2B: 23
- Grade 3: 1

Smith et. al.: ICEOS, 2012; Dublin, Ireland
### Comparison of Rib vs. Spine Anchors Complications

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Numbers are too small for meaningful comparison between techniques.
Conclusions

Spine and rib-based anchors are an effective method to manage scoliosis in the growing spine with Spina Bifida
Disclosures

- **Smith:**
  - DepuySynthes: consultant; royalties
  - Spinguard: consultant
  - Ellipse Technologies: consultant (wife)

- **Heflin:**
  - Nothing to disclose

- **Sponseller:**
  - DepuySynthes; JBJS; Globus; Oakstone Medical Publishers

- **Karlin:**
EOS and Spina Bifida

- Develops early
- Progressive
- Seating problems
- Skin breakdown
- Hygiene issues
- Pulmonary function
- Comfort
Treatment Options

- Limited
- Poor response to bracing or seating modifications
- Thoracic insufficiency syndrome with early fusion
- High rate of complications with surgery
Purpose

- Evaluate and compare rib and spine based distraction for the management of early onset scoliosis associated with spina bifida
TM: 8 y/o male with Spina Bifida and severe lordosis measuring 75°
Case Example
Initial Post Op film s/p bilateral rib to pelvis VEPTR
6 yrs s/p VEPTR expansions
Fusion, age 14
JL: 6 y/o male with scoliosis and spina bifida
JL: Initial rib to pelvis VEPTR
8 year f/u with VEPTR
DS: 18 m/o with Spina Bifida and a gibbus deformity. Patient is ambulatory.
DS: Initial rib to pelvis VEPTR
DS: 6 years after VEPTR
Discussion

- Rib and Spine-based distraction techniques effectively stabilize curve progression in Spina Bifida
- Most complications (49%) were infection or wound issues related to poor skin
- Complications were mostly manageable
Limitations

- Retrospective review
- Limited numbers for comparison of spine vs. rib-based anchor techniques
Conclusions

Spine and rib-based anchors are an effective method to manage scoliosis in the growing spine with Spina Bifida