Surgical Treatment of Scoliosis in Non-Ambulatory Spastic Quadriplegic Cerebral Palsy Patients: A Matched Cohort Comparison of Unit Rod Technique and All-Pedicle Screw Constructs

Scott J. Luhmann, MD, Sara Fuhrhop, BS, Murat Oto, MD, Freeman Miller, MD, Kirk W. Dabney, MD, Keith H. Bridwell, MD, Kathryn A. Keeler, MD, Lawrence G. Lenke, M.D

Background

Surgical treatment of severe spinal deformity for the non-ambulatory spastic quadriplegic patient (GMFCS IV/V) has been:
- Unit rod (UR)
- Sublaminar wire fixation
- Galveston intrapelvic fixation

Outcomes of UR/sublaminar wire/Galveston:
- Up to 81% correction of major Cobb
- Up to 88% correction of pelvic obliquity
- Complications up to 81%
- 23% construct related
- 17% pseudarthrosis
- 16% infection

Pedicle screw constructs are the optimal spinal deformity construct in idiopathic patients.

Can we get better results (and fewer complications) in these GMFCS IV/V patients with all-screw constructs?

Objectives

To compare unit rod instrumentation technique to all-pedicle screw constructs in the surgical care of scoliosis in GMFCS IV/V nonambulatory spastic quadriplegic cerebral palsy patients.

Methods

IRB approval

Surgical database query to identify all patients with cerebral palsy who underwent spinal fusion surgery at St. Louis Children's Hospital and Shriners Hospital.

Inclusion

Patients <18 years of age
- Nonambulatory spastic cerebral palsy (GMFCS IV/V)
- Primary spinal fusion (upper thoracic spine to pelvis)
- All-pedicle screw constructs (PS)
- Minimum f/u 2 years

N = 14

Results: Pelvic Obliquity

<table>
<thead>
<tr>
<th>Pedicle Screw (PS)</th>
<th>Unit Rod (UR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preop</td>
<td>33.9 ± 21.7</td>
</tr>
<tr>
<td>Initial Postop</td>
<td>8.5 ± 9.3</td>
</tr>
<tr>
<td>Final f/u</td>
<td>8.4 ± 7.5</td>
</tr>
</tbody>
</table>

Results: Coronal Cobb

<table>
<thead>
<tr>
<th>Pedicle Screw (PS)</th>
<th>Unit Rod (UR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preop</td>
<td>100.9 ± 21.9</td>
</tr>
<tr>
<td>Initial Postop</td>
<td>16.9 ± 10.0</td>
</tr>
<tr>
<td>Final f/u</td>
<td>13.5 ± 9.4</td>
</tr>
</tbody>
</table>

Results: Postoperative Recovery

<table>
<thead>
<tr>
<th>Pedicle Screw (PS)</th>
<th>Unit Rod (UR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days in ICU</td>
<td>3.6 ± 3.1</td>
</tr>
<tr>
<td>Days in hospital</td>
<td>11.1 ± 6.0</td>
</tr>
</tbody>
</table>

Pedicle Screw (PS) advantages:
- Better coronal Cobb improvement, lower EBL, shorter hospital stay
- No need for anterior releases (vs. 21% in UR)

Is the benefit of lower cost construct (UR group) negated by longer hospitalizations and higher surgical costs (excluding construct cost)?

Conclusion

When comparing unit rod instrumentation to all-pedicle screw constructs in the surgical care of scoliosis in GMFCS IV/V:

No differences in:
- Correction of pelvic obliquity
- Days in ICU
- Complications
- Reoperations

Pedicle screws had better:
- Coronal Cobb correction
- Lower EBL
- Shorter hospital stay

Both constructs were effective in correcting the spinal deformity with a low level of complications and reoperations. UR advantages: cost of construct

PS advantages:
- Better coronal Cobb improvement, lower EBL, shorter hospital stay
- No need for anterior releases (vs. 21% in UR)
- Is the benefit of lower cost construct (UR group) negated by longer hospitalizations and higher surgical costs (excluding construct cost)