The Effect of Growth Friendly Surgery on Coronal and Sagittal Plane Spine Growth in Idiopathic Scoliosis

Disclosure

- Ron El-Hawary
  - Consultant – Depuy Synthes, Medtronic, HBI
  - Research – Depuy Synthes, Medtronic

- Charlie Johnston
  - Consultant – Depuy Synthes
  - Royalties – Medtronic, Elsevier
Auto fusion?
Supports delay tactic with casting
Limitations of the paper include:

- **Heterogeneity** of patients
- **Sagittal** plane not addressed
Purpose

- Purpose:
  - To evaluate the effect of lengthening procedures on coronal, sagittal, and true spine length in children with idiopathic scoliosis

- Hypothesis:
  - Spine length continues to increase with each lengthening procedure; however, these gains occur in the sagittal plane
Inclusion Criteria

- Idiopathic Scoliosis (<10 yrs)
  - Children’s Spine and Growing Spine Study Groups

- Treated with posterior distraction surgery
  - Rib–based
  - Spine–based.

- Minimum 5 year follow up.

- Minimum 5 lengthening procedures.
Methods

- Primary outcome was change in T1–T12 length per lengthening procedure
  - PA Radiograph
    - Traditional
    - Linear
Methods

- Primary outcome was change in T1–T12 length per lengthening procedure
  - Lateral Radiograph
    - Linear
Methods

- Primary outcome was change in T1–T12 length per lengthening procedure
  - Lateral Radiograph
    - Arc of Curvature
    - True Spine Length
Results

- 18 patients
  - 9 Growing Rod and 9 VEPTR

- Mean age of 4.1 years

- Three groups were compared:
  - Post Implantation (L1)
  - 2nd through 5th lengthenings (L2–L5)
  - 6th through 10th lengthenings (L6–L10)
## Results

<table>
<thead>
<tr>
<th></th>
<th>Pre–Implant</th>
<th>L1</th>
<th>L2 – 5</th>
<th>L6 – 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cobb angle</td>
<td>52.6°</td>
<td>45.0°</td>
<td>44.7°</td>
<td>48.6°</td>
</tr>
<tr>
<td>Kyphosis</td>
<td>40.9°</td>
<td>32.1°</td>
<td>45.3°</td>
<td>47.5°</td>
</tr>
<tr>
<td>Coronal T1–T12</td>
<td>16.4cm</td>
<td>16.0cm</td>
<td>17.6cm</td>
<td>17.8cm</td>
</tr>
<tr>
<td>Sagittal T1–T12</td>
<td>16.8cm</td>
<td>16.4cm</td>
<td>17.4cm</td>
<td>18.3cm</td>
</tr>
<tr>
<td>True T1–T12</td>
<td>18.6cm</td>
<td>18.4cm</td>
<td>19.5cm</td>
<td>20.8cm</td>
</tr>
<tr>
<td>Change coronal T1–T12 per lengthening</td>
<td>Not applicable</td>
<td>5.7mm</td>
<td>4.0mm</td>
<td>1.7mm</td>
</tr>
<tr>
<td>Change in sagittal T1–T12 per lengthening</td>
<td>Not applicable</td>
<td>4.0mm</td>
<td>3.3mm</td>
<td>3.1mm</td>
</tr>
<tr>
<td>Change in true T1–T12 per lengthening</td>
<td>Not applicable</td>
<td>2.8mm</td>
<td>4.4mm</td>
<td>4.4mm</td>
</tr>
</tbody>
</table>
Coronal T1–T12

Gains in Thoracic Length per Procedure

Thoracic Length (mm)

- L1
- L2–L5
- L6–L10

6
5
4
3
2
1
0

6
5
4
3
2
1
0
Sagittal T1–T12

Gains in Thoracic Length per Procedure
True Spine Length T1–T12

Gains in Thoracic Length per Procedure

![Image of spine with annotations]

Thoracic Length (mm)
Results

Gains in Thoracic Length per Procedure

- **Coronal (Traditional)**
- **Sagittal**
- **True Spine Length**

Method of Measurement

<table>
<thead>
<tr>
<th></th>
<th>L1</th>
<th>L2-5</th>
<th>L6-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronal (Trad.)</td>
<td>6</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Sagittal</td>
<td>3</td>
<td>2.5</td>
<td>2</td>
</tr>
<tr>
<td>True Spine</td>
<td>3</td>
<td>2.5</td>
<td>2</td>
</tr>
</tbody>
</table>
Conclusions

- Although there is the appearance of a law of diminishing returns when measured in the coronal plane, these changes were:
  - Less apparent when measured in the sagittal plane.
  - Nullified with measurement of true spine length.
Conclusions

- These findings support the hypothesis that, when measured in the plane of distraction, a law of diminishing returns may not be apparent.
Thank You