Traditional Growing Rods Versus Magnetically Controlled Growing Rods in Early Onset Scoliosis:
A Case-Matched Two Year Study

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### Presenter’s Disclosures

<table>
<thead>
<tr>
<th>Author</th>
<th>Disclosure</th>
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<tbody>
<tr>
<td>Behrooz A. Akbarnia, MD</td>
<td>DePuy Spine (a, b, c), Ellipse (b,c), K2M (b), KSpine (b,c), Nuvasive (a,b,c)</td>
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- **a.** Grants/Research Support
- **b.** Consultant
- **c.** Stock/Shareholder
- **d.** Speakers’ Bureau
- **e.** Other Financial Support
INTRODUCTION

- Studies have shown repeated traditional growing rod (TGR) lengthenings can significantly increase the risk of complications

- *Bess et al, JBJS, 2010*
INTRODUCTION

• Magentically controlled growing rods (MCGR) were developed to lengthen rods non-invasively

• Pre-clinical studies showed promising results

• Akbarnia et al, Spine, 2012
Early clinical results of using MCGR:
- Safe and effective
- Significant reduction in the number of surgical procedures

Cheung et al, Lancet, 2012
The purpose of this study was to perform a case-matched comparison of MCGR and TGR patients with 2 years of follow-up.
• Retrospective review of MCGR patients who met the following criteria:
  - \(< 10\) years old
  - Major curve \(>30^\circ\)
  - T1-T12 \(<22\) cm
  - No previous spine surgery
  - \(> 2\)-year follow-up

• 17 MCGR patients met the inclusion criteria

• 12 of 17 patients had complete data available for analysis
• Each MCGR patient was matched to a TGR patient by:
  - Etiology (per C-EOS)
  - Gender
  - Single vs. dual rods
  - Pre-op age (+/-10 months)
  - Pre-op major curve (+/- 20°)

• Etiologies were classified per C-EOS (Vitale):
  - Idiopathic
  - Congenital/Structural
  - Neuromuscular
  - Syndromic

• One male MCGR patient was matched to a female TGR patient since a male-male match could not be performed
METHODS

Spinal growth calculation: "Annual T1-S1 Growth"

Annual T1-S1 Growth (mm/year) = \( \Delta \text{ in T1-S1 from post index to latest F/U} \)

Length of follow-up
RESULTS

- **MCGR patients:**
  - Mean age = 6.8 years
  - Mean follow-up = 2.5 years

- Follow-up was greater for TGR patients by 1.6 years

- **Distribution of etiologies:**
  - 4 neuromuscular
  - 4 syndromic
  - 3 idiopathic
  - 1 congenital
### RESULTS

<table>
<thead>
<tr>
<th>Major Curve</th>
<th>Pre-op (mean)</th>
<th>Initial Post-op (mean)</th>
<th>≥2 YR Post-op (mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCGR</td>
<td>59°</td>
<td>32°</td>
<td>38°</td>
</tr>
<tr>
<td>TGR</td>
<td>60°</td>
<td>31°</td>
<td>41°</td>
</tr>
<tr>
<td>T1-S1 Spinal Length</td>
<td>MCG</td>
<td>270 mm $\Delta18$</td>
<td>295 mm $\Delta15$</td>
</tr>
<tr>
<td>TGR</td>
<td>264 mm $\Delta41$</td>
<td>311 mm $\Delta36$</td>
<td>347 mm</td>
</tr>
</tbody>
</table>
RESULTS

• **Curve correction** was similar between MCGR and TGR throughout treatment

• Mean **T1-S1 increase** after index surgery was greater in TGR compared to MCGR

• **Annual T1-S1 growth** was **7.1 mm/year** for MCGR and **10.6 mm/year** for TGR patients
## RESULTS (Procedures)

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Total # of Surgeries</th>
<th>Total # of Lengthenings</th>
<th>Total # of Revisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCGR</td>
<td>17</td>
<td>137</td>
<td>5</td>
</tr>
<tr>
<td>TGR</td>
<td>69</td>
<td>49</td>
<td>8</td>
</tr>
</tbody>
</table>

- **MCGR:** 17 surgeries, 137 lengthenings, 5 revisions (42% of patients)
- **TGR:** 69 surgeries, 49 lengthenings, 8 revisions (67% of patients)
First patient in US, 8+11 boy

Major Cobb (T5-L1)= 105° , T1-T12 height= 157 mm, T1-S1 height= 264 mm

SAI ratio= 0.81, Lumbar lordosis= 69° , Thoracic kyphosis= 77°
MAY 2013: Post-op X-Rays

Major Cobb (T6-L1)= 55°, T1-T6= 35°, L1-L4= 16°
T1-T12 height= 183 mm, T1-S1 height= 312 mm
Pre-Operation
Post-Operation
In this small yet carefully matched series, **major curve correction was similar** between MCGR and TGR patients throughout treatment.

- MCGR patients had **52 fewer surgical procedures** than TGR patients.

- While curve correction was similar, **annual T1-S1 growth was 3.5 mm/year greater in TGR patients** compared to MCGR patients.
THANK YOU

ICEOS

7TH INTERNATIONAL CONGRESS
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