DISTRACTION – A Philosophical Debate

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Spine Unit
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Disclosures

• Nuvasive
Dual Growing Rod Technique for the Treatment of Progressive Early-Onset Scoliosis
A Multicenter Study

Behrooz A. Akbarnia, MD,* David S. Marks, FRCS,† Oheneba Boachie-Adjei, MD,‡ Alistair G. Thompson, FRCS,† and Marc A. Asher, MD§

Table 3. Results of 23 Patients With 2-yr Follow-up Treated With Primary Dual Growing Rods Without Fusion

<table>
<thead>
<tr>
<th>Reference</th>
<th>Pre-Initia l</th>
<th>Post-Initial</th>
<th>Follow-up</th>
<th>T1–S1 Growth (cm/yr)</th>
<th>Length of Instrumentation (cm)</th>
<th>Latest Follow-up</th>
<th>Complications* (during treatment period)</th>
<th>Unplanned Surgery? (no. of surgeries)</th>
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A six-year observational study of 31 children with early-onset scoliosis treated using magnetically controlled growing rods with a minimum follow-up of two years

T. Subramanian, A. Ahmad, D. M. Mardare, D. C. Kieser, D. Mayers, C. Naadi

**Aims**
Magnetically controlled growing rod (MCGR) systems use non-invasive spinal lengthening for the surgical treatment of early-onset scoliosis (EOS). The primary aim of this study was to evaluate the performance of these devices in the prevention of progression of the deformity. A secondary aim was to record the rate of complications.

<table>
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<tr>
<th>Parameter</th>
<th>Preoperative</th>
<th>Postoperative</th>
<th>6 mths</th>
<th>12 mths</th>
<th>24 mths</th>
<th>Latest follow-up</th>
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<td>28</td>
<td>30</td>
<td>31</td>
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<tr>
<td>Mean (range)</td>
<td>20.3 (13.2 to 27.6)</td>
<td>25.4 (13.8 to 48.2)</td>
<td>25.8 (13.9 to 51.8)</td>
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<tr>
<td>Mean (range)</td>
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<td>64.3 (53.0 to 76.0)</td>
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<tr>
<td>Mean (range)</td>
<td>113.0 (86.8 to 135.4)</td>
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<td>120.6 (90.4 to 151.5)</td>
<td>124.0 (90.8 to 153.5)</td>
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<td>+15.12 (1.9 to 31.2)</td>
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</table>

*Change from immediate postoperative values to values at the latest follow-up
Commentary & Perspective

Guiding Growth Is Promising But Can It Compare with Growth Promotion?

Commentary on an article by Richard E. McCarthy, MD, and Frances L. McCallagh, MSc: “Medullary Growth Guidance for Early-Onset Scoliosis: Results After a Minimum of Five Years of Follow-up.”

Daniel J. Stacatto, MD

Targeted Distraction

Spinal Growth in Children With Early-Onset Scoliosis Treated With a Tailgating Technique for Magnetically Controlled Growing Rods

Mihai Mandare, MD, MSc; David Christopher Kieser, MBChB, PhD, FRACS, FNZOA; Adil Ahmad, MBBS, MRCS, BSc; Thejusvi Subramanian, MBBS; Shahnawaz Haleem, MBBS, MSc, MRCS; MRCSEd, FRCS (Tr & Orth); Prithish Thakar, BSc, MBBS, MRCSEd, MSc, FRCS (Tr & Orth); James Wilson-MacDonald, MBBS, FRCS (Tr & Orth); and Colin Neufeld, MBBS, FRCS, FRCSI (Ortho)
Management Themes in Early Onset Scoliosis
By Behrouz A. Akbarnia, MD

Orthopaedic Advances

“Growth Friendly” Spine Surgery: Management Options for the Young Child With Scoliosis

Jaime A. Gomez, MD
Joseph K. Lee, MD
Paul D. Kim, MD
David P. Reyes, MD
Michael G. Vitale, MD

Abstract
The natural history of early onset scoliosis is dismal and associated with poor pulmonary function and increased mortality. Although limited in situ fusion may be appropriate for certain types of congenital scoliosis deformities, spinal deformity that affects young children often requires a “growth friendly” surgical approach that allows for curve control while maintaining growth of the spine and thorax. Growth-friendly surgical management of early onset scoliosis can follow a distraction-based (ie, growth rods, verticle expandable prosthetic titanium rib [Synthes, West Chester, PA]), guided-growth (ie, Luque trolley technique, Shilla technique), or compression-based (ie, tethers, staples) strategy.

Preoperative Medical and Surgical Planning for Early Onset Scoliosis
Charles E. Johnston, MD

Key Points
- Children with EOS may have significant contributory comorbidities, including pulmonary, cardiac, neurologic, gastrointestinal, and metabolic/nutritional conditions which must be addressed to permit safe and effective treatment of the spine/chest wall deformity.
- Objective criteria for instituting active corrective treatment include demonstration of deformity progression; failure of thoracic spine and/or thoracic circumferential growth; failure of thoracic volume growth; failure to gain weight or thrive.
- Many options exist for spinal or chest wall constructs and procedures, with their implementation dictated by length of deformity (local or long segment), age of patient, diagnosis, and potential for morbidity and complications of each procedure.
What is Growth Guidance?
What is growth Guidance?

NICE guideline
Published: 27 September 2017
(nice.org.uk/guidance/ng75)

Faltering growth: recognition and management of faltering growth in children
A child's growth and development can be divided into four periods:

- Infancy
- Preschool years
- Middle childhood years
- Adolescence
Physical development is divided into two areas
• Growth and development.
• Growth is the physical changes of, the increase in size, height and weight.
• Development is how children gain control over their physical actions to do complicated and difficult activities more skilfully and easily.
• Growth and development are linked because the development and improvement of physical skills depends on the size of the child and their muscular strength.
• Physical development will usually follow a sequence even though the age may vary.
• There are factors that can affect this sequence, such as a disability.
Infantile scoliosis, 16 Years
Deficit on the sitting height 25 cm
Weight 22 kgs
Normal Length of the lower limbs

Courtesy of Alain Dimeglio
VOLUMETRIC GROWTH

The thorax: the fourth dimension of the spine

New born  5 years  10 years  15 years
6%  30%  50%  100%

The growing spine, Springer Velarg 1990
GROWTH PARAMETER REFS IN LIT OVER LAST 10YRS

LITERATURE SEARCH
Much of the same?

• Goals similar – Weight gain/Height gain/Spinal length/Lung development/Psychosocial development

• Why do we refer to one method as distraction based and another as Growth Guidance?

• Aren’t they doing the same thing?
• Are we talking Spinal Growth or overall Growth Guidance?

• ?Distraction based  ?Growth Guidance
Skaggs Growth Friendly Treatment Classification

- **Nonoperative**
  - Observation
  - Bracing
  - Casting

- **Operative**
  - **Distraction Based**
    - Single or Dual rod (Internal drive or MCGR)
    - VEPTR
    - Hybrid VEPTR-“knock-offs”
  - **Growth Guidance**
    - Luque trolley
    - Shilla
  - **Compression Based**
    - Staples
    - Screws/Tethers

Skaggs et al – JPO May 2014
Growth Guidance

**Active**
- TGR
- MCGR
- VEPTR

**Passive**
- Observation
- Bracing
- Casting
- Luque Trolley
- Shilla

**Differential**
- VBT
- Staples
- Convex Epiphysiodesis
There is a tide in the affairs of men, which taken at the flood, leads onto fortune. Omitted, all the voyage of their life is bound in shallows and in miseries

On such a full sea are we now afloat

And we must take the current when it serves, or lose our ventures

William Shakespeare