The 3 Most Influential Papers Over the Last 10 Years and How They Changed My Approach to EOS

Paul Sponseller, MD
Friday, Nov. 21 10:23-10:35
Most influential ever

• Moe 1984 CORR

Harrington Instrumentation Without Fusion Plus External Orthotic Support for the Treatment of Difficult Curvature Problems in Young Children

JOHN H. MOE, M.D.,* KHALIL KHARRAT, M.D., ROBERT B. WINTER, M.D.,** AND JOHN L. CUMMINS, M.D.†

• -laid the groundwork for most influential past decade
Most heavily cited past 10 yrs:

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<th>Author</th>
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<tr>
<td>Akabarnia et al.</td>
<td>2005</td>
<td>Dual growing rod technique for the treatment of progressive early-onset scoliosis</td>
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<td>Thompson et al.</td>
<td>2005</td>
<td>Comparison of single and dual growing rod techniques followed through development</td>
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<td>Growing rod techniques in early-onset scoliosis.</td>
<td>141</td>
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<td>Akabarnia et al.</td>
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<td>Dual growing rod technique followed for three to eleven years until final fusion</td>
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<td>Bess et al.</td>
<td>2010</td>
<td>Complications of growing-rod treatment for early-onset scoliosis: analysis of 106 cases</td>
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<td>Elsebai et al.</td>
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<td>Safety and efficacy of growing rod technique for pediatric congenital spinal deformity</td>
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<td>Comparison of complications among growing spinal implants.</td>
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<td>Sankar et al.</td>
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<td>Lengthening of dual growing rods and the law of diminishing returns</td>
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<td>Yang et al.</td>
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<td>Growing rods for spinal deformity: characterizing consensus and variation in patient outcomes</td>
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<td>Yazici and Emre</td>
<td>2009</td>
<td>For congenital scoliosis: expandable spinal rods and vertical expandable pedicle fixation</td>
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<td>Cheung et al.</td>
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<td>Magnetically controlled growing rods for severe spinal curvature in young children</td>
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<td>Sponseller et al.</td>
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<td>Mahar et al.</td>
<td>2008</td>
<td>Biomechanical comparison of different anchors (foundations) for the pediatric spine</td>
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<td>Cahill et al.</td>
<td>2010</td>
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<td>Sankar et al.</td>
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<td>Farooq et al.</td>
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<td>Minimizing complications with single submuscular growing rods: a review of 20 cases</td>
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Most Citations per year

• Bess, JBJS 2010
  – Dual rods had lower complication rate than Single GR
  – 24% increase in complications per additional procedure

• Complications are “Hot” now

• Is this why he does mostly adults?
Fastest Rise to the Top Twenty:

- Cheung: MCGR; Lancet 2012, Spine 2013
  - New technology is always watched
Most influential of past decade

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§

Grow the spine for health
Most Influential: DGR

- 23 patients; mean 7 lengthenings
- 9 cm gain in height
- Curve correction 55%
- First showed improved mechanics solved the problems of Moe rods
  - Concept of Foundations
  - Lengthening connectors
“Law of Diminishing Returns”

Lengthening of Dual Growing Rods and the Law of Diminishing Returns
Wudhav N. Sankar, MD, David L. Skaggs, MD, Muharrem Yazici, MD, Charles E. Johnston II, MD, Suken A. Shah, MD, Pooya Javidan, MD, Rishi V. Kadakia, BS, Thomas F. Day, MD, and Behrooz A. Akbarnia, MD

Spine stiffens with time
P<0.05
Diminishing Returns

• Carefully searched GSSG database
  – Minimum 2 years /3 lengthenings
    • 28 pts from 5 centers
  – Personally calibrated xrays pre and post lengthening
  – Found gain 1.1cm at first to 0.7 cm at fifth lengthening
Law of Diminishing Returns

- Artfully titled
- Causes us to think critically about timing
- Opens question of no Final Fusion
- Will frequent MCGR lengthening change this?
  - prediction: no
Why influential?

• Captured what others were seeing
  – “Despite periodic lengthenings, the spine was becoming more rigid” - Moe 1984
• 31 patients with TIS: fused ribs & CS
• Mean 3 lengthenings
• CT measurement of lung volumes in nearly half of pts
• Ipsilateral Lung volume increased 219%
• Curve correction 38%
In a later paper, Yazici & Emans expanded, “GR should be used where the primary problem is the vertebral column. If the patient has rib fusions and/or TIS, expansion thoracostomy and VEPTR should be an appropriate option.”
Why Influential

- Showed power of rib anchors as spine “jack” in situations of fused ribs
- Early look at response of lung volume
VEPTR

• Continued questions remain about chest wall compliance

• We still have not shown whether we improve pulmonary function vs natural history
Challenge for Next influential papers

- Demonstrate improved Health Outcomes
- Decrease burden of Care
  - Fewer operations
  - Fever complications
- Target intervention to correct population
Thank You