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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

5/3/2021

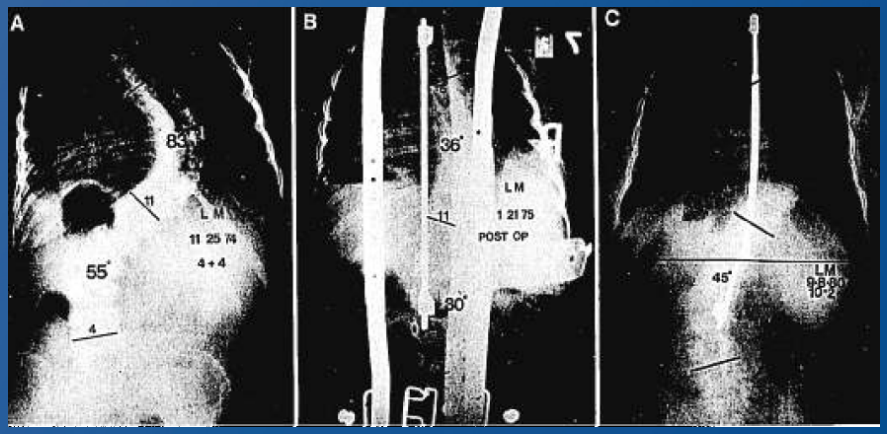
Most influential ever

- 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. CUMMINE, M.D.†

- -laid the groundwork for most influential past decade



Most heavily cited past 10 yrs:

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	Author	Year	Title	Times Cited	Journal
1	Akabarnia et a	2005	Dual growing rod technique for the treatment of progressive early-onset sco	268	Spine
2	Thompson et a	2005	Comparison of single and dual growing rod techniques followed through det	177	Spine
3	Thompson et a	2007	Growing rod techniques in early-onset scoliosis.	141	JPO
4	Akabania et a	2008	Dual growing rod technique followed for three to eleven years until final fus	125	Spine
5	Bess et al.	2010	Complications of growing-rod treatment for early-onset scoliosis: analysis o	106	JBJS
6	Elsebai et al.	2011	Safety and efficacy of growing rod technique for pediatric congenital spinal d	49	JPO
7	Sankar et al.	2010	Comparison of complications among growing spinal implants.	45	Spine
8	Sankar et al.	2011	Lengthening of dual growing rods and the law of diminishing returns	44	Spine
9	Yang et al.	2010	Growing rods for spinal deformity: characterizing consensus and variation in	44	JPO
10	Yazici and Ema	2009	for congenital scoliosis: expandable spinal rods and vertical expandable pro	41	Spine
11	Cheung et al.	2012	Magnetically controlled growing rods for severe spinal curvature in young ch	34	Lancet
12	Sponseller et	2009	Pelvic fixation of growing rods: comparison of constructs	34	Spine
13	Mahar et al.	2008	Biomechanical comparison of different anchors (foundations) for the pediat	32	Spine
14	Cahall et al.	2010	Autofusion in the immature spine treated with growing rods	29	Spine
15	Sankar et al.	2009	Neurologic risk in growing rod spine surgery in early onset scoliosis: is neur	29	Spine
16	Yang et al.	2011	Growing rod fractures: risk factors and opportunities for prevention	27	Spine
17	Smith et al.	2007	use of growth-sparing instrumentation in pediatric spinal deformity	25	Ort Clin NA
18	Farooq et al.	2010	Minimizing complications with single submuscular growing rods: a review of	20	Spine

Most Citations per year

Complications of Growing-Rod Treatment for Early-Onset Scoliosis

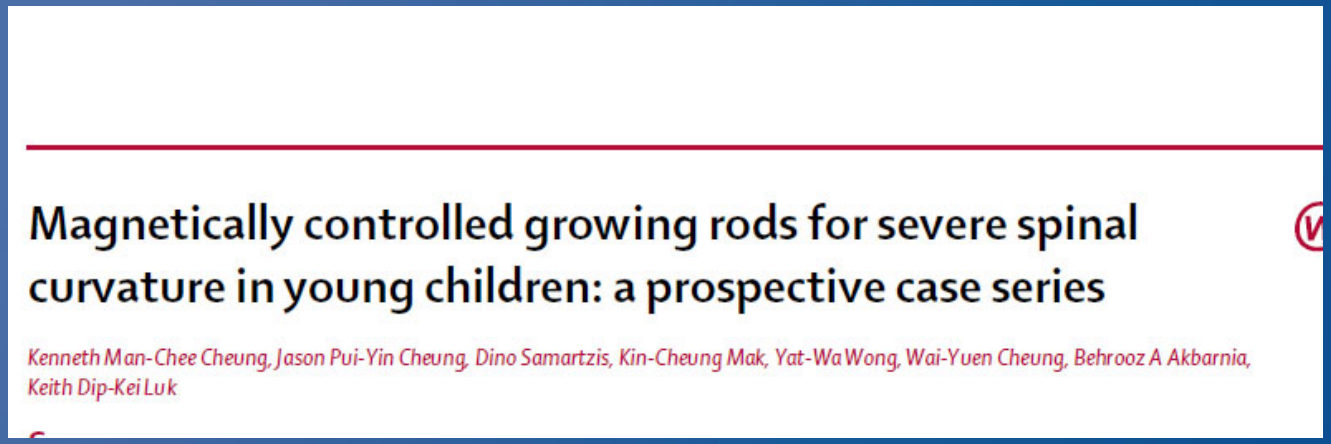
Analysis of One Hundred and Forty Patients

By Shay Bess, MD, Behrooz A. Akbarnia, MD, George H. Thompson, MD, Paul D. Sponseller, MD, Suken A. Shah, MD, Hazem El Sebaie, FRCS, MD, Oheneba Boachie-Adjei, MD, Lawrence I. Karlin, MD, Sarah Canale, BS, Connie Poe-Kochert, RN, CNP, and David L. Skaggs, MD

Investigation performed at San Diego Center for Spinal Disorders, La Jolla, California

- 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:



Magnetically controlled growing rods for severe spinal curvature in young children: a prospective case series

Kenneth Man-Chee Cheung, Jason Pui-Yin Cheung, Dino Samartzis, Kin-Cheung Mak, Yat-Wa Wong, Wai-Yuen Cheung, Behrooz A Akbarnia, Keith Dip-Kei Luk

- Cheung: MCGR; Lancet 2012, Spine 2013
  - New technology is always watched

Most influential of past decade

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SPINE Volume 30, Number 17S, pp S46–S57
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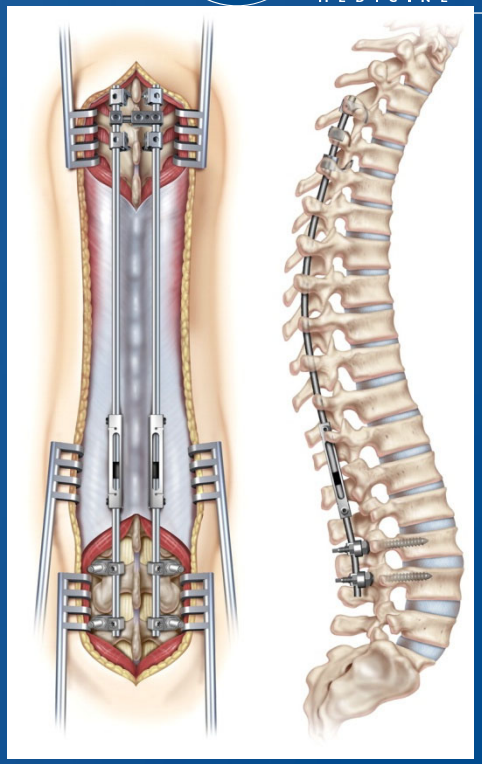
Dual Growing Rod Technique for the Treatment of Progressive Early-Onset Scoliosis

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

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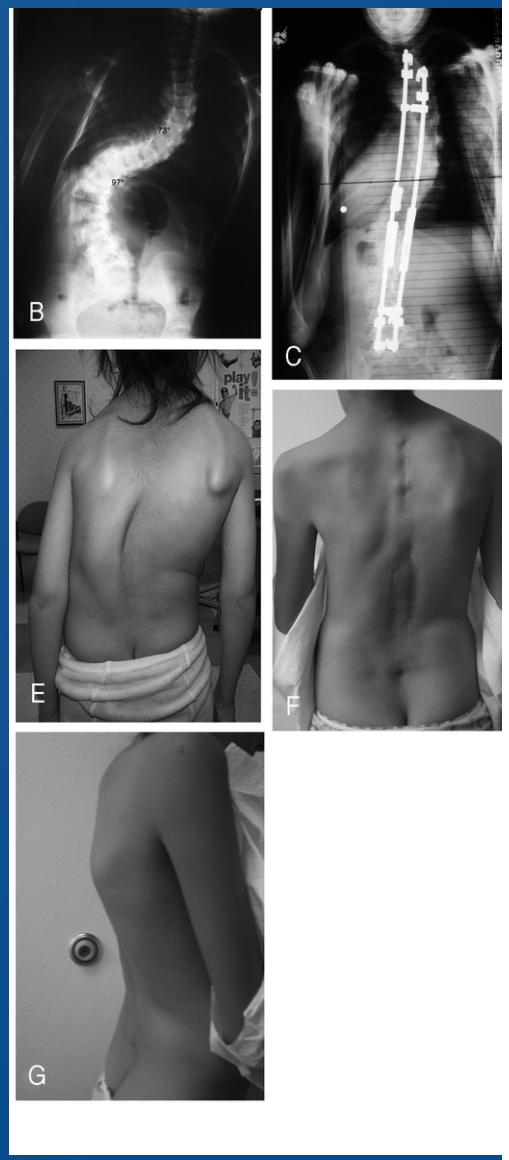
- 23 patients; mean 7 lengthenings
- 9 cm gain in height
- Curve correction 55%
- First showed improved mechanics solved the problems of Moe rods
  - Concept of Foundations
  - Lengthening connectors



“Law of Diminishing Returns”

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Lengthening of Dual Growing Rods and the Law of Diminishing Returns

Wudbhav 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

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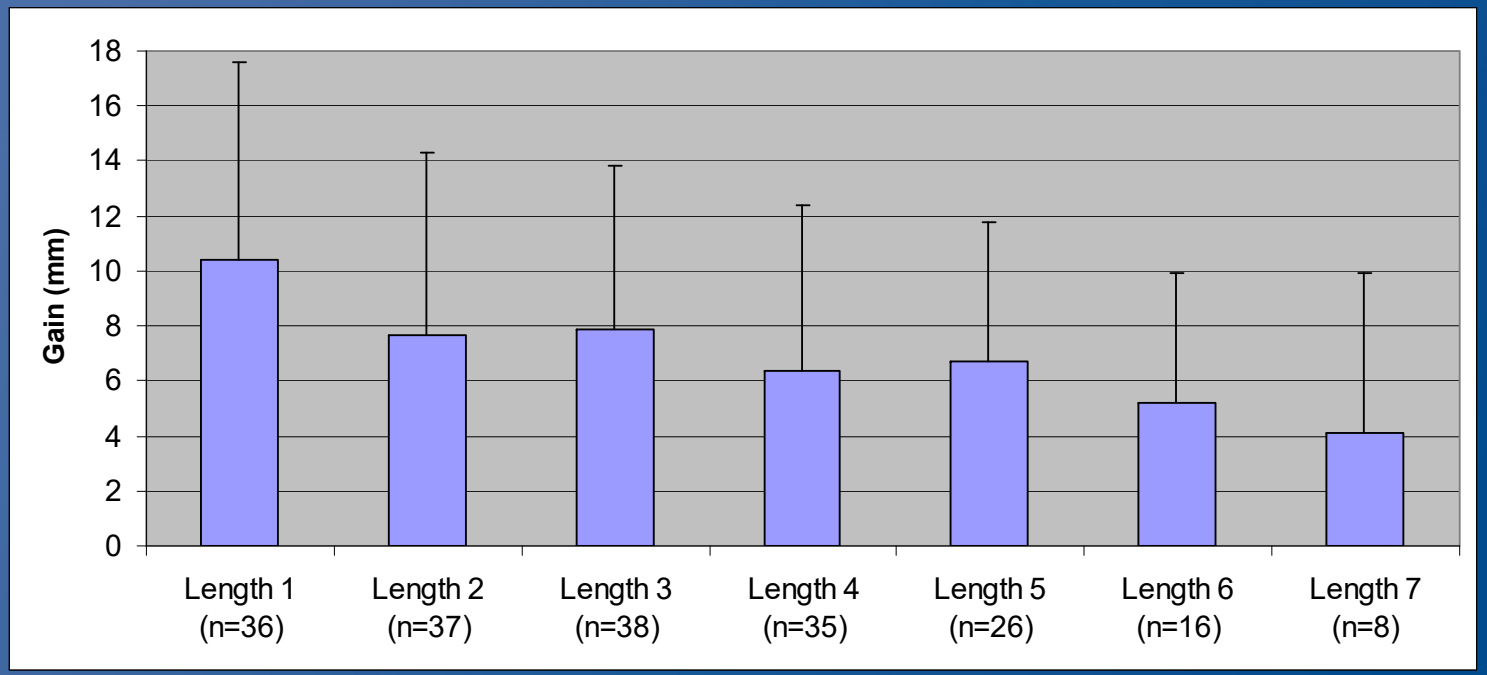
- Carefully searched GSSG database
  - Minimum 2 years /3 lengthenings
    - 28 pts from 5 centers
  - Personally calibrated xrays pre and post lengthening
  - Found gain 1.1cm at first to 0.7 cm at fifth lengthening



Law of Diminishing Returns

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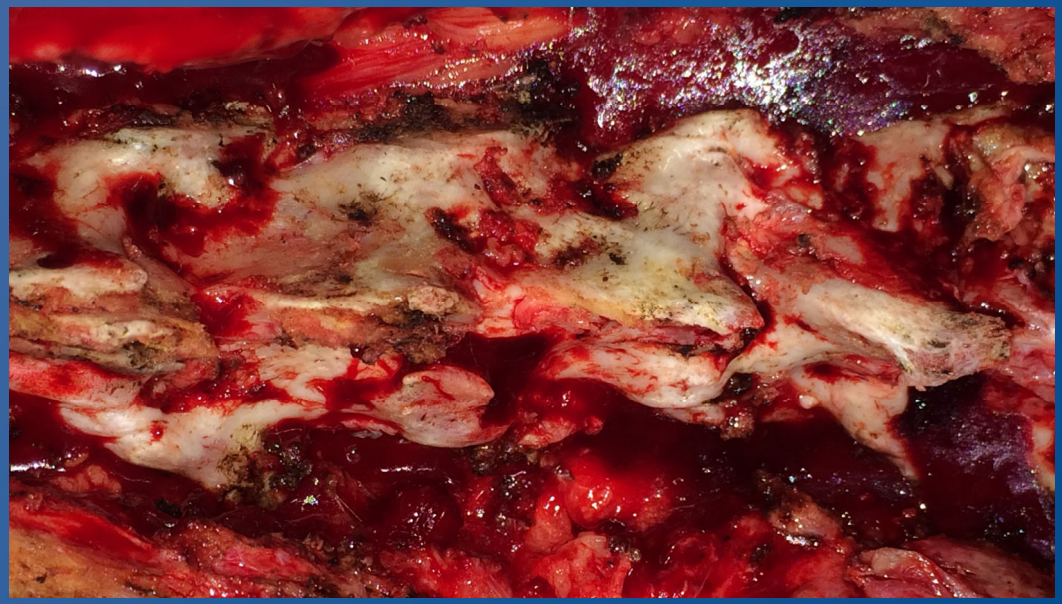
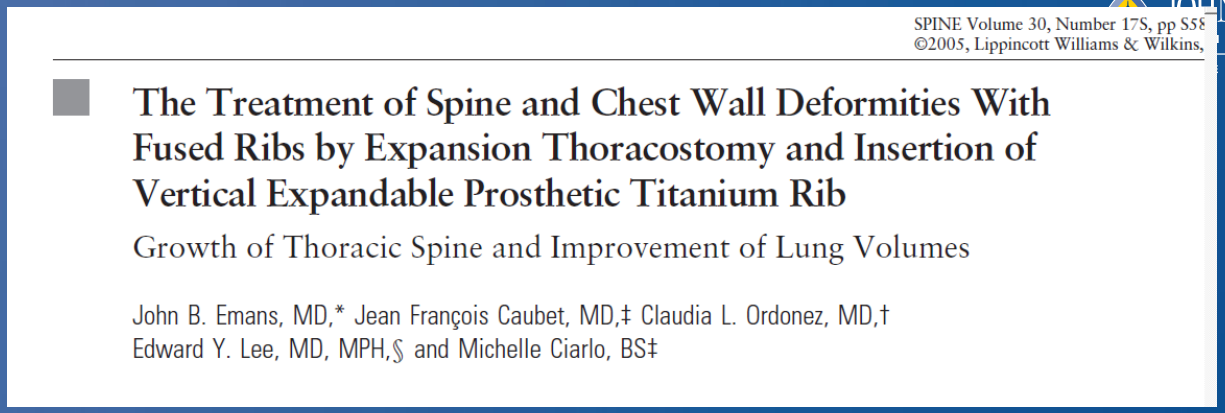
- Artfully titled
- Causes us to think critically about timing
- Opens question of no Final Fusion
- Will frequent MCGR lengthening change this?
  - prediction: no

Why influential?

- Captured what others were seeing
  - "Despite periodic lengthenings, the spine was becoming more rigid"- *Moe 1984*



VEPTR



SPINE Volume 30, Number 17S, pp S58
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The Treatment of Spine and Chest Wall Deformities With Fused Ribs by Expansion Thoracostomy and Insertion of Vertical Expandable Prosthetic Titanium Rib

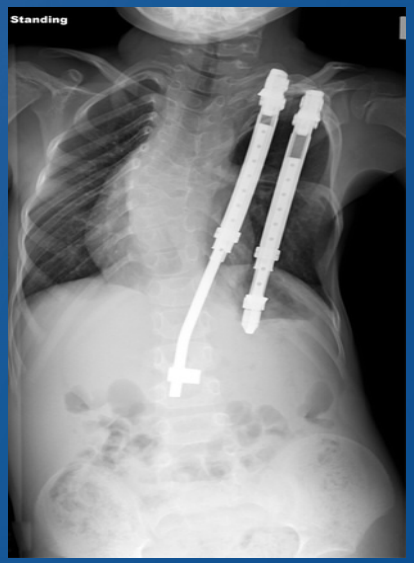
Growth of Thoracic Spine and Improvement of Lung Volumes

John B. Emans, MD,* Jean François Caubet, MD,‡ Claudia L. Ordonez, MD,†
Edward Y. Lee, MD, MPH,§ and Michelle Ciarlo, BS‡

- **3**1 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%

VEPTR

- 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
  - Dede O et al: **Pulmonary and Radiographic Outcomes of VEPTR in Early-Onset Scoliosis. JBJS 2014**

- 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

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