

Casting doubt on the efficacy of bracing for early onset scoliosis

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Disclosures

- Li: see program



Early onset scoliosis (EOS)

- Potentially fatal if untreated
- Spine deformity → chest wall deformity → pulmonary restriction



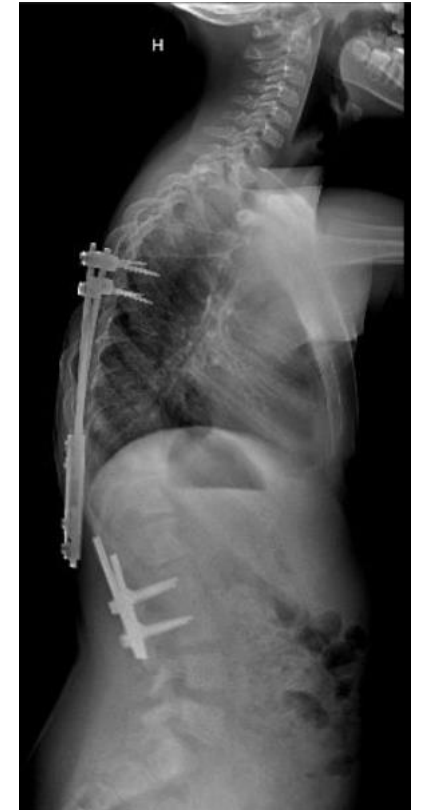
Goals of treatment

- Control (or **CORRECT**) spine and chest wall deformity
- Optimize pulmonary function
- Maximize growth of spine
- Preserve spinal motion
- Low complication rate



Operative treatment

- Early fusion → increased rates of pulmonary compromise
- Infection
- Implant failure
- Spontaneous fusion



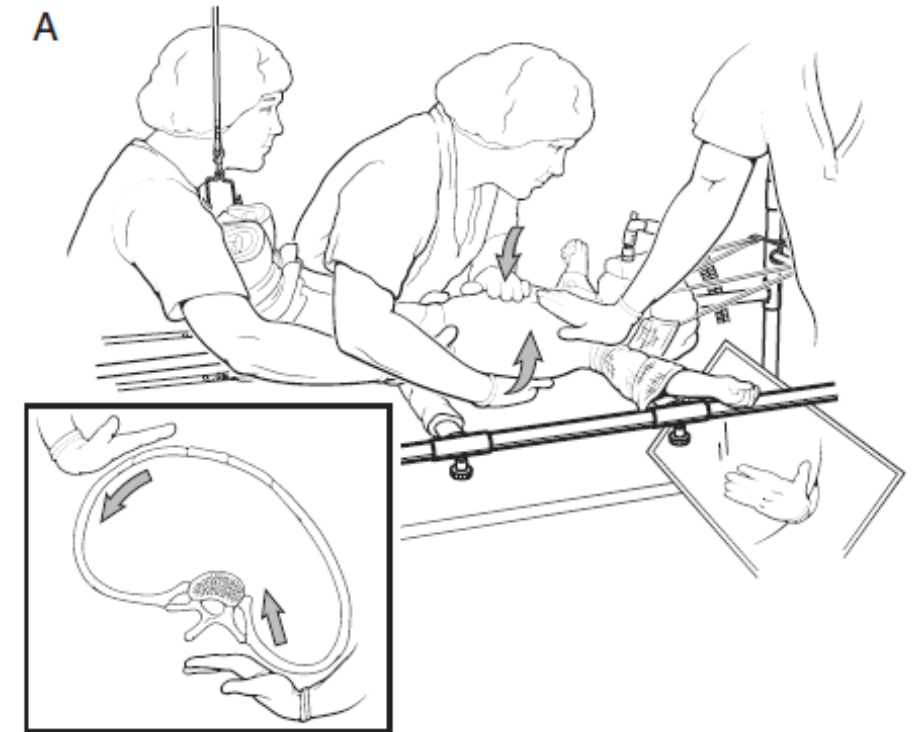
Nonoperative treatment

- Cast vs brace
- No data on efficacy of bracing for EOS



EDF casting

- Cotrel and Morel
- Elongation, Derotation, Flexion
- Improved fit
- Constant corrective force
- Can lead to curve resolution



Reproduced from Sanders JO, et al: Derotational casting for progressive infantile scoliosis. *J Pediatr Orthop* 2009;29:581-587.





Growth as a corrective force in the early treatment of progressive infantile scoliosis

M. H. Mehta

*From the Royal
National
Orthopaedic
Hospital Trust,
Stanmore, England*

- 136 children
 - 100 idiopathic
- **69% had full curve correction** by age 3.5 years
- 31% had partial curve correction
- Younger age, smaller curve associated with curve resolution

JBJS-B 2005



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Growth as a corrective force in the early treatment of progressive infantile scoliosis

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- 77% with full curve correction treated by age 2 years
- **Casting should be initiated <2 years**
- Younger age → faster time to curve resolution

JBJS-B 2005



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Derotational Casting for Progressive Infantile Scoliosis

James O. Sanders, MD, Jacques D'Astous, MD,† Marcie Fitzgerald, PA-C,‡
Joseph G. Khoury, MD,§ Shyam Kishan, MD,|| and Peter F. Sturm, MD¶*

- 55 children
 - 37 idiopathic
- 89% had curve improvement
- Better prognosis:
 - Age <20 months
 - Curve <60°
 - Idiopathic

TABLE 2. Combined Data of the Centers

Follow-up Cobb Angle	No. Patients	Average Age at Start of Casting (y)	Average Cobb Angle at Start of Casting	Average RVAD at Start of Casting
10 or less	17	1.1	37	26
11 to 21	10	2.2	41	20
21 to 40	13	2.6	53	33
> 40	15	3.1	71	37
Cobb worsened	6	2.1	71	48
Total group	55	2.2	51	30

JPO 2009



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- ≥ 1 year of casting to full curve correction
- Older children, larger curves, non-idiopathic still had curve improvement → delay in surgery

JPO 2009



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Serial Casting as a Delay Tactic in the Treatment of Moderate-to-Severe Early-onset Scoliosis

Nicholas D. Fletcher, MD, Anna McClung, BSN, RN,† Karl E. Rathjen, MD,†
Jaime R. Denning, MD,‡ Richard Browne, PhD,† and Charles E. Johnston III, MD†*

- 29 children
 - Non-idiopathic
 - Age >2.5 years with idiopathic curve >50°
- Casting **maintained** the curve
 - 69° before first cast → 76° at last follow-up

JPO 2012



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- 52% eventually required surgery
- **Surgery delayed 39 months** from first cast
- **72% avoided growing spine surgery**

JPO 2012



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The Role of Serial Casting in Early-onset Scoliosis (EOS)

David M. Baulesh, BA, Jeannie Huh, MD,† Timothy Judkins, MD,*
Sumeet Garg, MD,*‡ Nancy H. Miller, MD,*‡ and Mark A. Erickson, MD*‡*

- 36 children
 - 17 non-idiopathic
- Non-idiopathic patients did not maintain curve correction obtained with casting at final follow-up
- **Surgery delayed 2.1 years** from first cast

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Serial Derotational Casting in Congenital Scoliosis as a Time-buying Strategy

Halil G. Demirkiran, MD, Senol Bekmez, MD,† Rustem Celilov, MD,* Mehmet Ayyaz, MD,* Ozgur Dede, MD,‡ and Muharrem Yazici, MD**

- Spine Deformity 2015
- 74 children (33 non-idiopathic)

The therapeutic characteristics of serial casting on congenital scoliosis: a comparison with non-congenital cases from a single-center experience

Jun Cao, Xue-jun Zhang*, Ning Sun*, Lin Sun, Dong Guo, Xin-yu Qi, Yun-song Bai and Bao-sheng Sun

- All had curve improvement
- Non-idiopathic patients had less curve correction
- **Delay need for surgery** in non-idiopathic patients

- JPO 2015, 11 children

Serial Derotational Casting in Idiopathic and Non-Idiopathic Progressive Early-Onset Scoliosis

Yazeed M. Gussous, MBBS^a, Sergey Tarima, PhD^b, Shi Zhao, MS^b, Safdar Khan, MD^c, Angela Caudill, MPT^d, Peter Sturm, MD^e, Kim W. Hammerberg, MD^{d,f,*}

- J Ortho Surg Res 2017
- 23 children (8 congenital)

Complications

- Skin breakdown/irritation (usually minor)
- Dhawale et al, JPO 2013: difficulty with ventilation during cast application (usually temporary)



Casting for EOS

- Curve correction/resolution:
 - Age <2 years
 - Smaller curves (<50-60°)
 - Idiopathic
- Delay surgery:
 - Older patients
 - Larger curves
 - Non-idiopathic
- What about initial cast correction as a predictor of success?

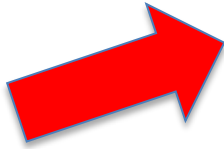
I love casting!!!



Initial Cast Correction as a Predictor of Treatment Outcome Success for Infantile Idiopathic Scoliosis



Jaime A. Gomez, MD, Alexandra Grzywna, BA,† Patricia E. Miller, MS,†
Lawrence I. Karlin, MD,† Sumeet Garg, MD,‡ James O. Sanders, MD,§
Peter F. Sturm, MD, MBA,|| Paul D. Sponseller, MD,¶ Jacques L. D'Astous, MD,#
Michael P. Glotzbecker, MD,† Children's Spine Study Group,**
and Growing Spine Study Group††*



- 68 children
- 37% with treatment success (curve $<15^{\circ}$ at final follow-up)
- Younger age, smaller curve, greater % curve correction in first cast

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Bracing young children is difficult because of compliance and rapid rate of growth, whereas growth-friendly surgery in young children has high complication rates.^{4,5} Serial casts for EOS can correct or stop curve progression, preventing the need for surgical-intervention or delaying it until a child is older.¹⁰

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Survey to describe variability in early onset scoliosis cast practices



A. Grzywna¹

A. McClung²

J. Sanders³

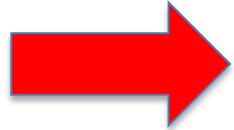
P. Sturm⁴

L. Karlin¹

M. Glotzbecker¹

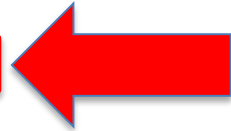
Children's Spine Study Group⁵

Growing Spine Study Group²



Level of Evidence V

Expert opinion



- Survey of CSSSG/GSSSG members
- 55/92 (60%) response rate

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Level of Evidence V **Expert opinion**



- EDF cast most common (76%)
- Idiopathic and syndromic
- Major curve angle most important parameter to start casting
 - Median 30° (20-70°)

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Level of Evidence V **Expert opinion**



- Minimum age 10 months (3-24 months)
- Wide variability with how first in-cast/out-of-cast x-rays taken, cast over or under the arm, brace use after casting

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Nonsurgical Management of Early-onset Scoliosis

Robert J. Thorsness, MD

John R. Faust, MD

Caleb J. Behrend, MD

James O. Sanders, MD

- JAAOS 2015

Serial elongation-derotation-flexion casting for children with early-onset scoliosis

- World J Orthop 2015

Early-Onset Scoliosis: A Review of History, Current Treatment, and Future Directions

Federico Canavese, Antoine Samba, Alain Dimeglio, Mounira Mansour, Marie Rousset

- Pediatrics 2016

Scott Yang, MD,^{a,b} Lindsay M Andras, MD,^a Gregory J Redding, MD,^c David L Skaggs, MD, MMM^a

- “**Bracing... efficacy remains unproven in EOS**”
- “**Casting... may result in complete correction in some patients... plays an important role in delaying... surgery in most patients”**





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