Effects of Serial Casting with or without Bracing on Sagittal Parameters in Early Onset Scoliosis

Robert K.Lark MD, MS, Anthony A. Catanzano, Jr. M.D. Michael Vitale, MD Charles Johnston MD, Paul Sponseller MD, PSSG

Duke University Health System
Department of Orthopaedic Surgery

Duke Orthopaedics

PEDIATRIC SPINE STUDY GROUP

Disclosures

- Robert Lark : Nuvasive, Depuy Synthes
- Anthony Catanzano: none
- Michael Vitale: in program
- Charles Johnston: in program
- Paul Sponseller: none
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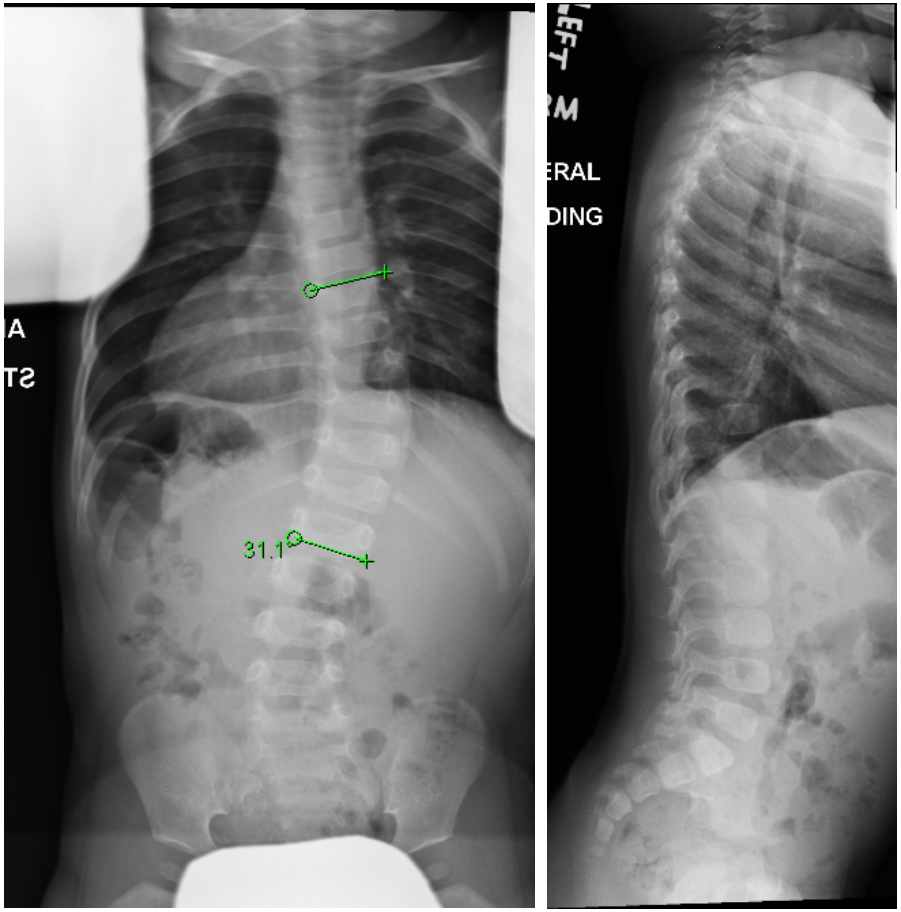
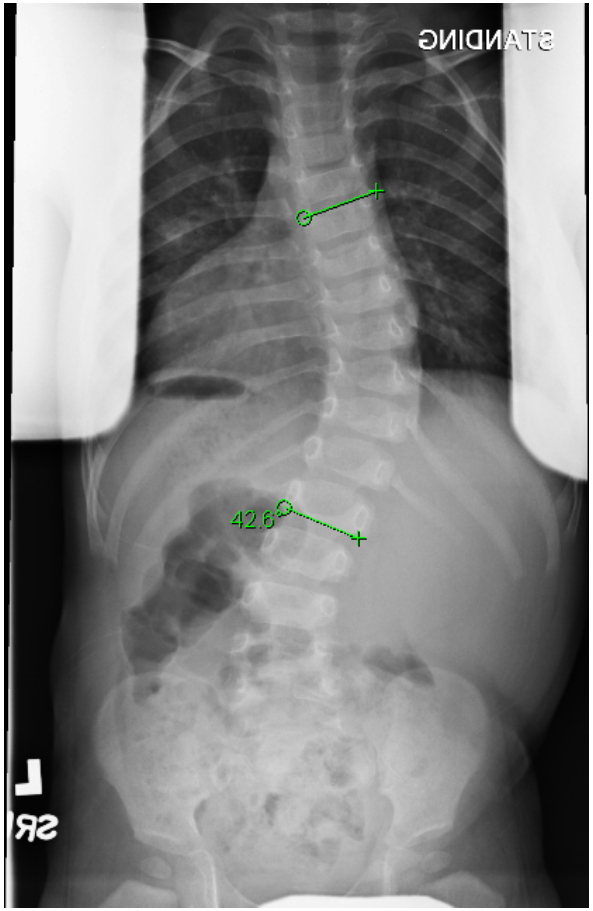
Case Presentation

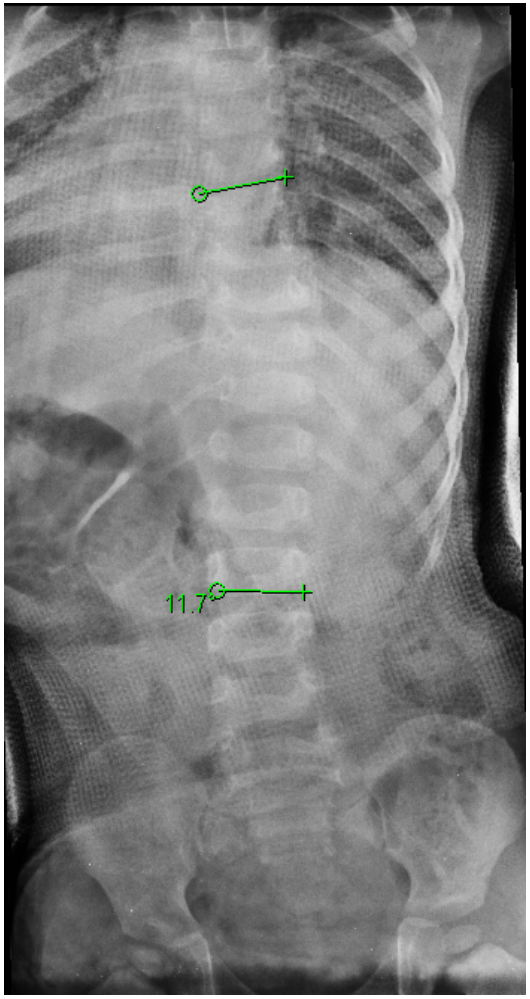


13 months



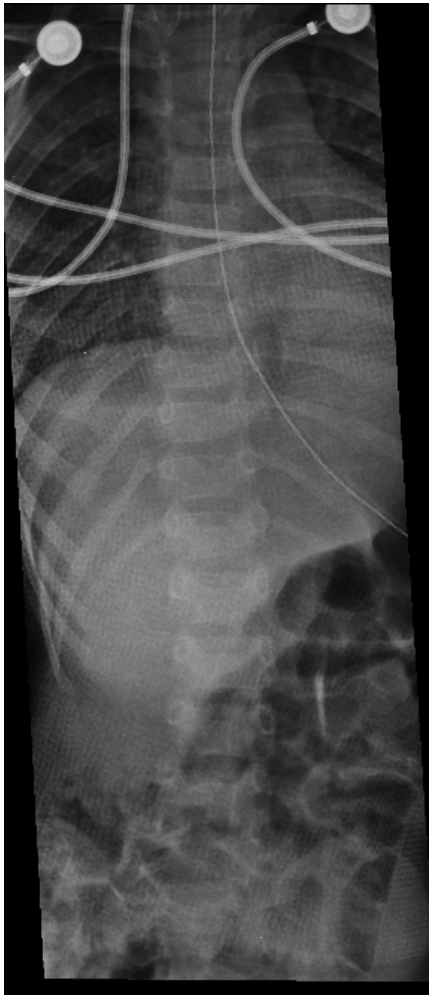
16 months

Case Presentation – in cast films



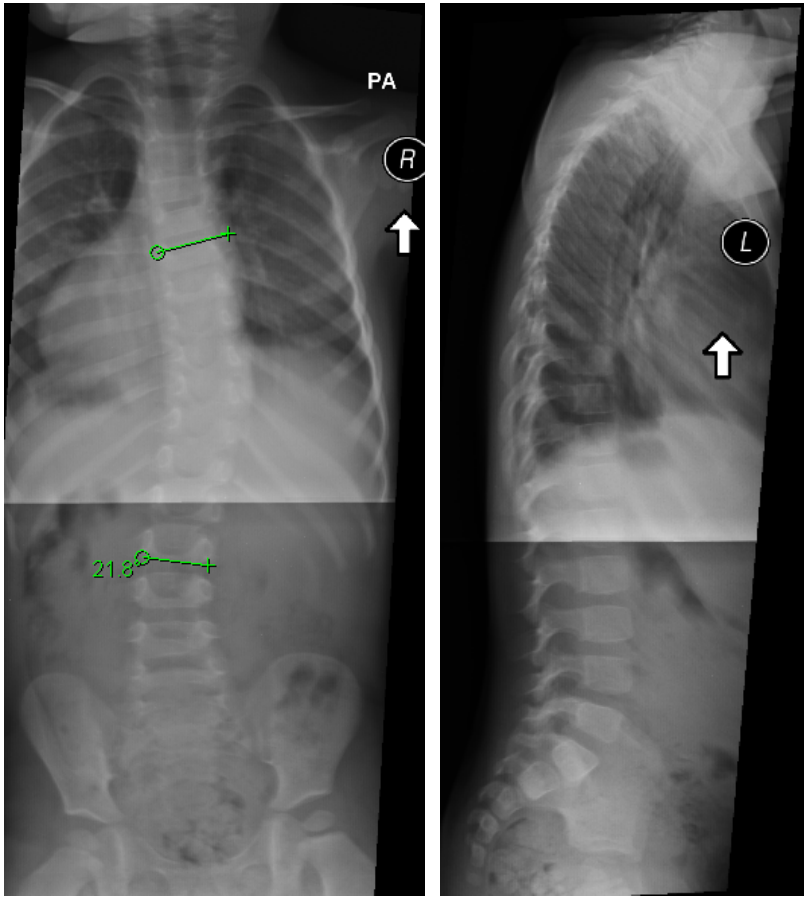
17 months

19 months

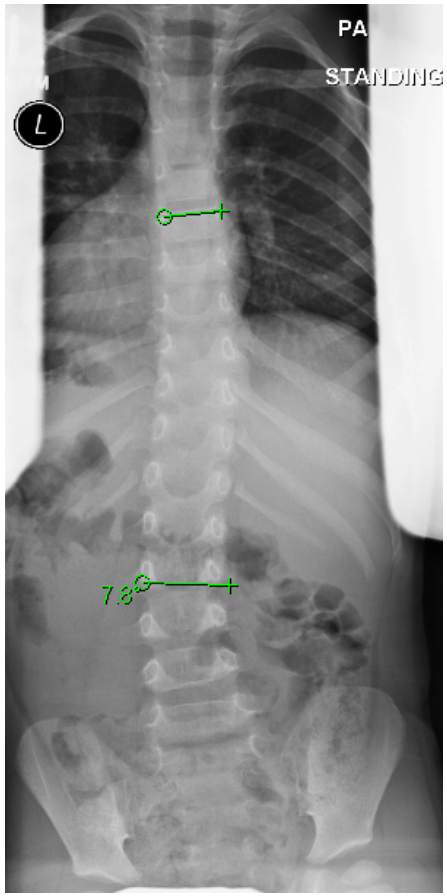


21 months

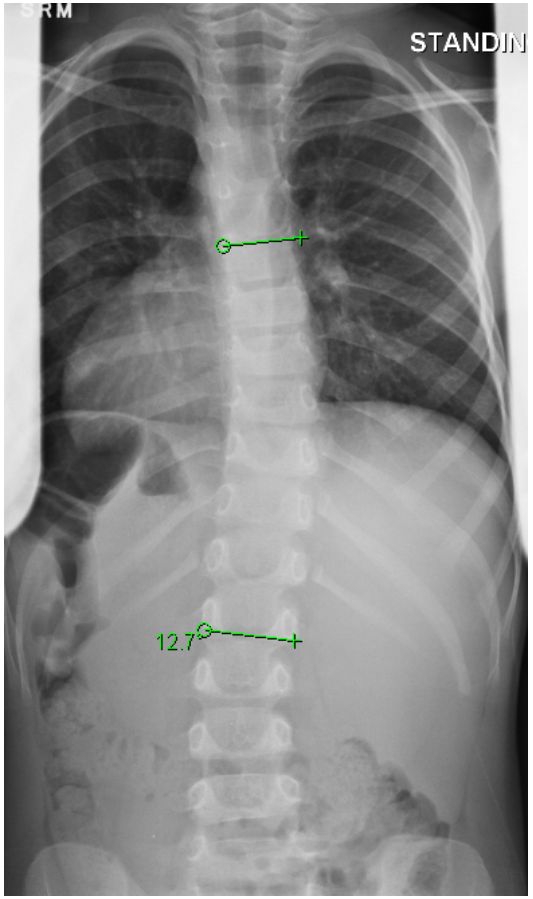
Case Presentation



2+1 years

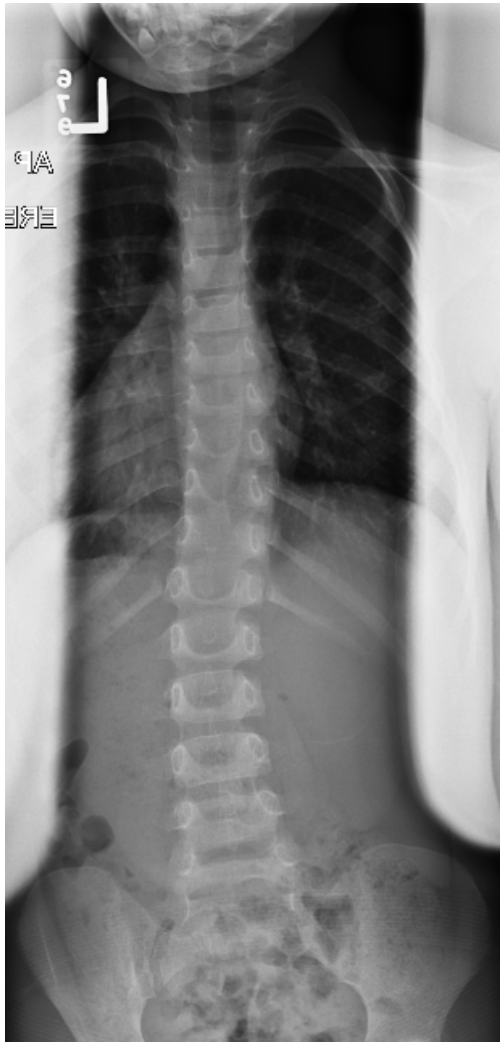


2+7 years

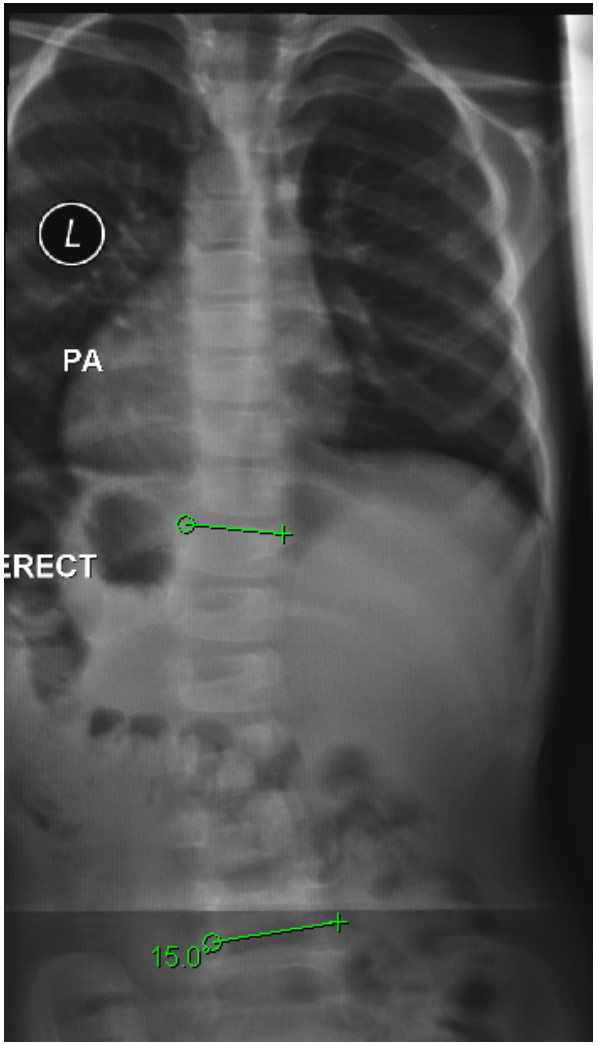


3+1 years

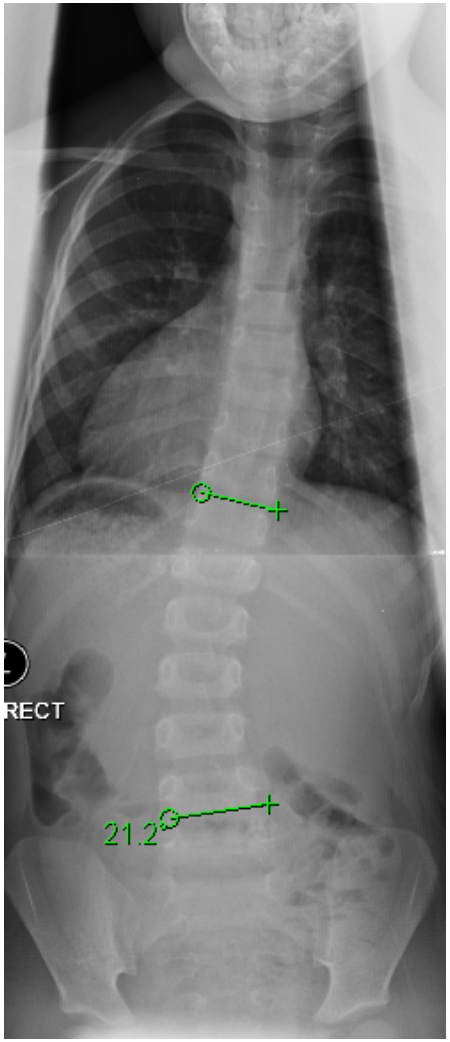
Case Presentation



3+6 years

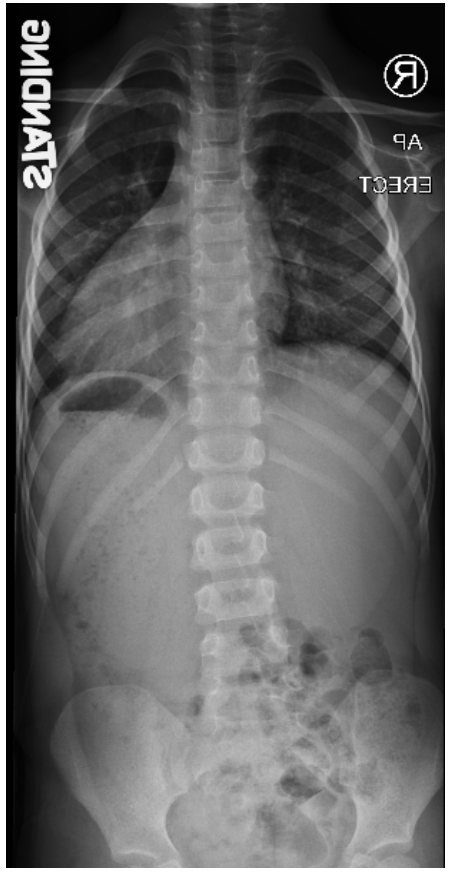


4+0 years

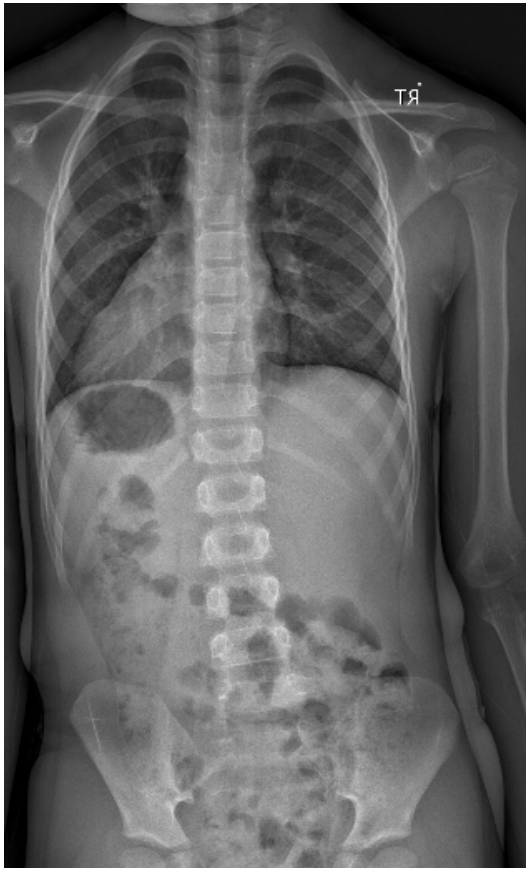


4+6 years

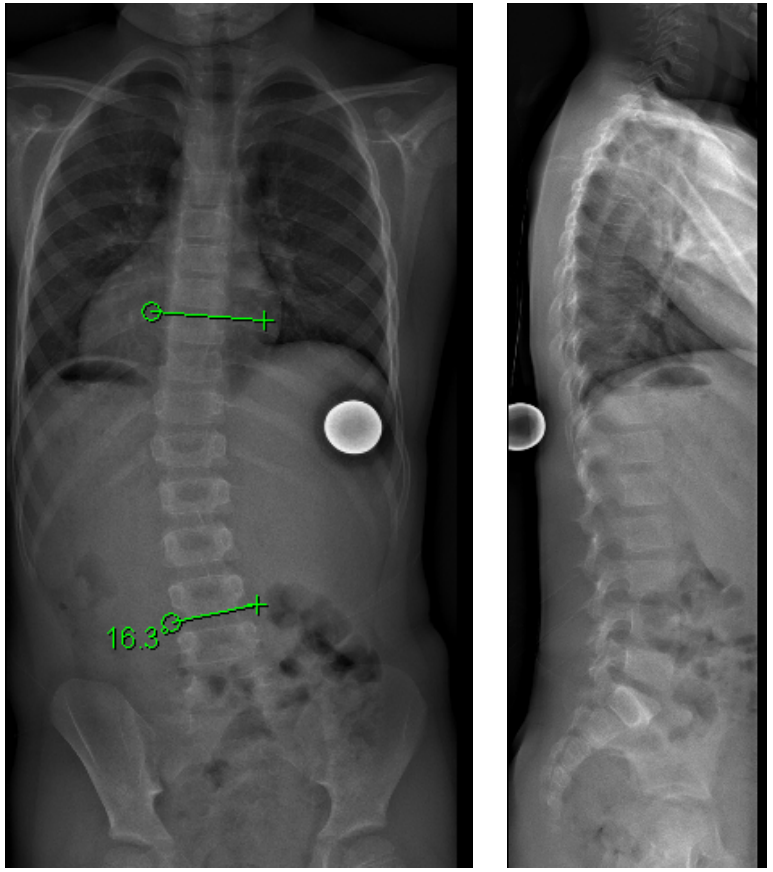
Case Presentation



5 years

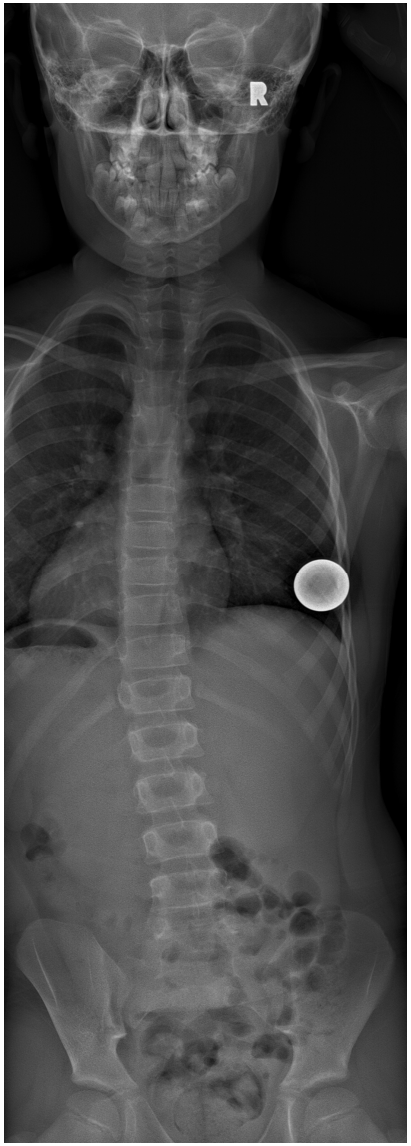


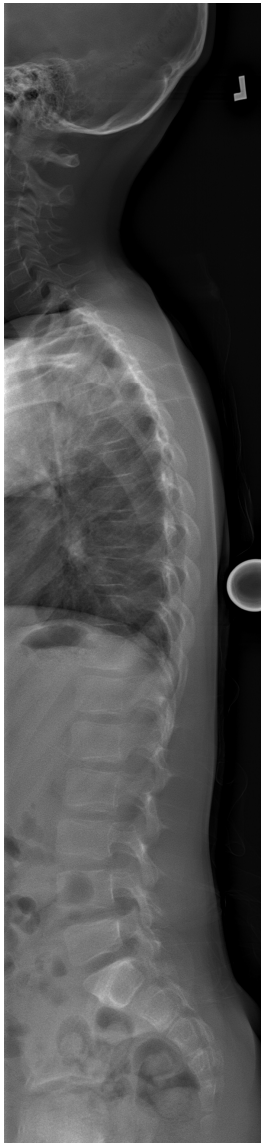
6 years



7 years

Case Presentation





Background

- EDF casting works for **(IS)**[1,2]
- Definition of success based on coronal Cobb angle
- Cast application typically involves longitudinal traction
- Longitudinal traction reduces lumbar lordosis and thoracic kyphosis
- Some series report worsening thoracic lordosis with elongation bracing in AIS

Background

Effect of the Boston thoracic brace on the frontal and sagittal curves of the spine

Stig Willner

The Effect of Sagittal Curve Changes on Brace Correction of Idiopathic Scoliosis

MARGARETA LINDH, RPT, PhD

■ **SPINE**

Underarm bracing for adolescent idiopathic scoliosis leads to flatback deformity

THE ROLE OF SAGITTAL SPINOPELVIC PARAMETERS

Hypothesis

- Serial casting for EOS may result in unwanted changes to the sagittal profile

Methods

- Retrospective review
  - Query of PSSG database for casting / bracing patients
- Patient cohort parameters
  - Only infantile idiopathic scoliosis patients included
- Exclusion criteria
  - No sagittal xrays at pre or post treatment visit
  - Previous Surgery
- Outcome measures
  - Pre versus Post treatment sagittal measures
    - Thoracic kyphosis
    - Lumbar Lordosis
    - Pelvic Incidence
    - Sacral Slope

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Patient Characteristics

	N = 25
Males	11
Females	14
Age at first cast	2+3 (9 mos – 4+10)
Time in cast (years)	2.4 (0.5 - 6.5)
Age at end of casting / bracing (years)	4+9 (2+9 - 9+7)

Results

	Pre Casting (deg)	Post Casting (deg)	P-value
Major Cobb	52 (23)	44 (29)	0.06
Thoracic Kyphosis	33 (15)	43 (19)	0.06
Lumbar Lordosis	39 (16)	49 (15)	0.03
Pelvic Incidence	49 (13)	46 (11)	0.48
Sacral Slope	34 (19)	39 (10)	0.23
Pelvic Tilt	18 (12)	6 (13)	0.01

Table 1. Sagittal Alignment of the Spine and Pelvis (Mean ± Standard Deviation)

Parameter	Patients < 10 Yrs Old (n = 35)	Patients ≥ 10 Yrs Old (n = 145)	All Patients (n = 180)
Mean age (yr)	7.3 ± 1.8	13.1 ± 2.1	12.0 ± 3.1
Pelvic incidence (°)	44.6 ± 10.6	49.3 ± 11.2	48.4 ± 11.2
Pelvic tilt (°)	4.3 ± 8.1	7.9 ± 7.7	7.2 ± 7.9
Sacral slope (°)	40.3 ± 8.7	41.4 ± 8.5	41.2 ± 8.5
Thoracic kyphosis (°)	38.3 ± 9.8	44.2 ± 10.3	43.0 ± 10.4
Lumbar lordosis (°)	45.6 ± 12.1	49.2 ± 12.4	48.5 ± 12.4

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Published Normative Data

Table 6. Statistically Significant Parameters Among Age Groups

	T1–T2 (°)	L4–L5 (°)	T10–L2 (°)	L4–S1 (°)	Kyphosis (°)	Lordosis (°)	T apex	T1 offset (mm)	SVA (mm)	Beta (°)	Alpha (°)
Group 1	1.8 ± 3.0 (−6 to 11)	−11.6 ± 4.7 (−27 to 0)	7.5 ± 7.5 (−7 to 28)	−34.1 ± 7.7 (−60 to −14)	44.9 ± 11.4 (23 to 70)	−44.3 ± 11.0 (−77 to −10)	T8 vertebra (T3–4 disc to T12)	6.9 ± 2.4 (2 to 12)	25.4 ± 43.0 (−75 to 103)	39.8 ± 7.5 (27 to 60)	−19.2 ± 9.1 (−42 to −4)
Group 2	3.4 ± 4.4 (−4 to 13)	−13.7 ± 5.7 (−30 to −5)	5.8 ± 7.8 (−11 to 19)	−38.2 ± 10.7 (−71 to −9)	47.8 ± 10.5 (25 to 69)	−51.7 ± 11.5 (−81 to −30)	T7 vertebra (T2 to T12)	7.5 ± 3.2 (2 to 17)	6.7 ± 46.0 (−78 to 114)	39.6 ± 8.4 (20 to 56)	−15.6 ± 7.7 (−34 to 0)
Group 3	1.6 ± 2.5 (−3 to 6)	−15.1 ± 4.6 (−27 to −6)	3.6 ± 8.8 (−11 to 23)	−41.0 ± 7.9 (−63 to −19)	45.8 ± 10.6 (21 to 64)	−57.3 ± 10.0 (−72 to −31)	T7 vertebra (T3–4 disc to T11)	7.2 ± 3.6 (0 to 14)	−0.8 ± 41.2 (−93 to 78)	46.9 ± 8.9 (32 to 66)	−12.3 ± 6.7 (−26 to −1)
Group 4	3.6 ± 3.1 (−1 to 10)	−14.2 ± 5.1 (−27 to −6)	9.8 ± 7.1 (−7 to 20)	−40.4 ± 8.4 (−64 to −28)	53.3 ± 9.1 (37 to 72)	−54.6 ± 9.8 (−77 to −39)	T7 vertebra (T5 to T10)	9.8 ± 2.9 (2 to 15)	−8.6 ± 44.4 (−80 to 99)	46.3 ± 11.8 (31 to 99)	−15.2 ± 7.9 (−32 to 0)
P	0.015	0.0130	0.014	0.001	0.005	0.000	0.007	0.000	0.004	0.000	0.05

When all age groups are evaluated together, the brackets indicate the significant difference among age groups.

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Limitations

- Small patient cohort with limited follow-up
- Potential selection bias based on availability of lateral radiographs
- Population difference in published normative data

Conclusions

- Serial casting / bracing did not result in loss of thoracic kyphosis or lumbar lordosis

- Sagittal pelvic parameters did not change and are on par with published normative data