Growing Rods for Scoliosis in Spinal Muscular Atrophy: Structural Effects and Use of Hospital Care

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Growing Rods for Scoliosis in Spinal Muscular Atrophy Disclosures

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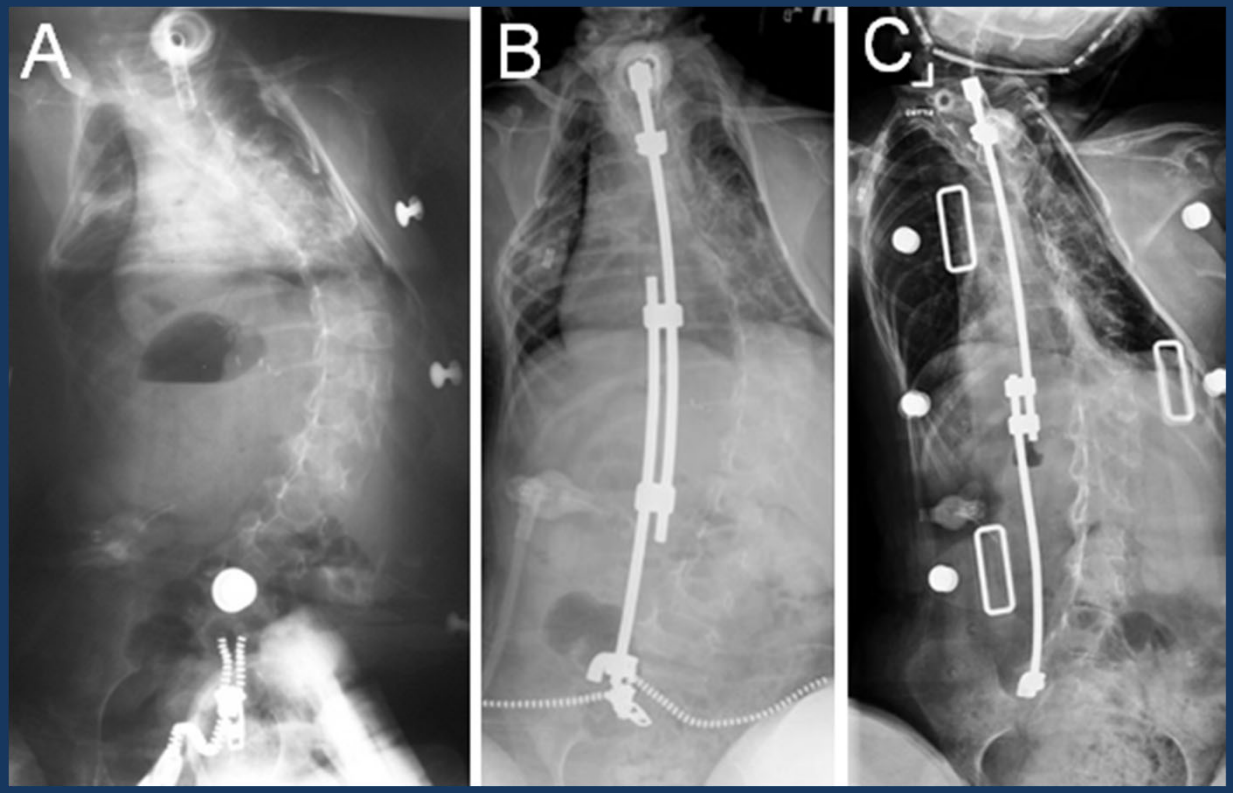
Objectives

- Evaluate use of growing rods for scoliosis in SMA
  - Structural effectiveness
  - Perioperative hospital care
    - Rate of significant complications



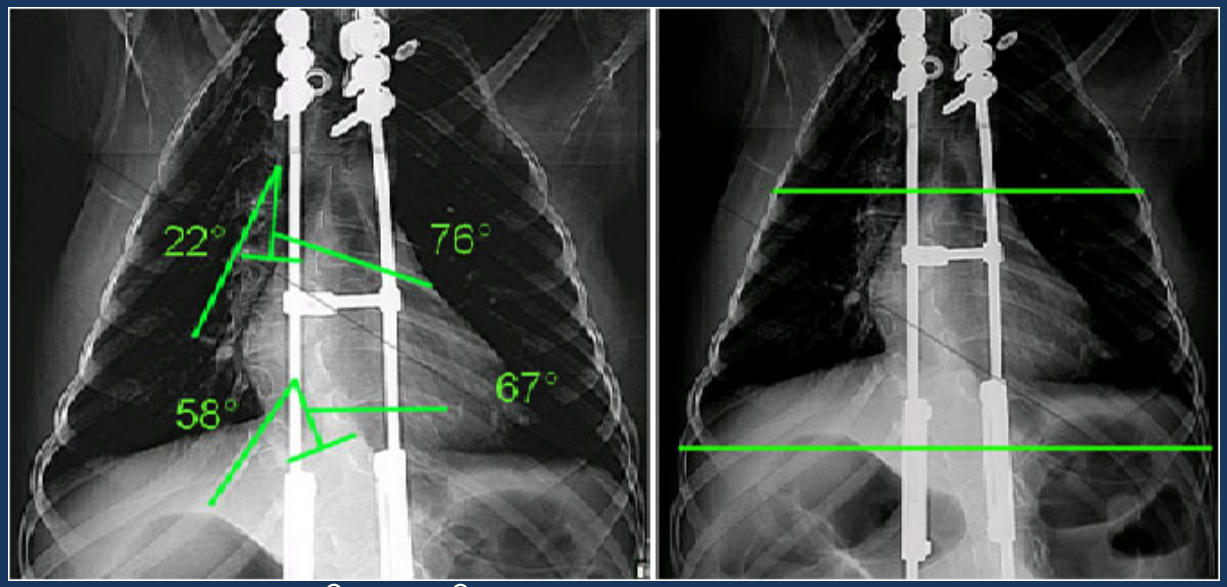
Materials and Methods
Patient Population

- 15 SMA patients treated with GRs
  - Age at insertion 8.0 ± 2.1 years (range, 3.5-10.8)
  - Follow-up 54 ± 33 months
  - 6 single rods, 9 dual rods
  - Levels spanned 16 ± 1.7
  - Instrumentation to pelvis in 10 patients
- SMA patients compared to 80 early onset idiopathic scoliosis patients treated with GRs
- All patients from GSSG database

Materials and Methods
Thoracic / Rib Collapse

- SMA patients have progressive rib collapse leading to increasingly triangular thoracic shape

- Quantified shape using
  - T6:T10 RVA ratio
  - T6:T12 thoracic width ratio



T6:T10 RVA $= \frac{(22^\circ + 76^\circ)}{(58^\circ + 67^\circ)} = 0.78$

T6:T12 Thoracic Width = 0.69

Results
SMA Coronal Alignment

Measurement	Mean ± Std Dev
Cobb	
Preop	89 ± 19°
Post-initial	45 ± 10°
Latest f/u	55 ± 17°
Pelvic Obliquity	
Preop	31 ± 14°
Post-initial	9 ± 6°
Latest f/u	11 ± 10°

Results
Length Measurements

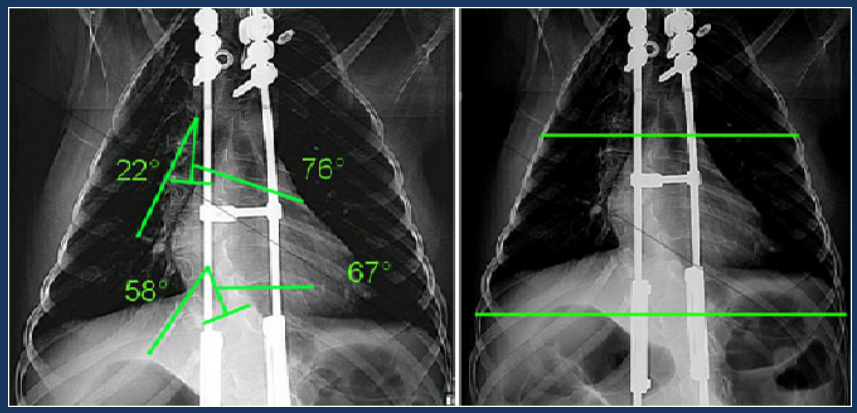
Measurement	Mean ± Std Dev
T1-S1 Length	
Preop	26.7 ± 1.9 cm
Post-initial	31.5 ± 2.9 cm
Latest f/u	34.5 ± 3.9 cm
Yearly growth during GR treatment	1.2 ± 0.6 cm
SAL Ratio	
Preop	0.86 ± 0.15
Post-initial	0.91 ± 0.13
Latest f/u	0.94 ± 0.21

Results
Final Fusion

Measurement	Mean ± Std Dev
Final Fusion	
Number of patients	6
Age at fusion	13.1 ± 2.5 years
Preoperative Cobb angle	75 ± 17°
Pre-fusion Cobb Angle	61 ± 20°
Post-fusion Cobb angle	54 ± 12°

Results
Measures of Rib Collapse Over Time

	ΔT6:T12 Thoracic Width	ΔT6 Convex Angle
SMA	-0.04 ± 0.08	-15° ± 16°
Idiopathic	0.00 ± 0.06	-2° ± 17°



- SMA group
  - Compared to idiopathic group more rib collapse (P = 0.08) and decrease in thoracic width ratio (P = 0.14)
  - GRs do not halt rib collapse in SMA, but may slow progression
    - No untreated controls

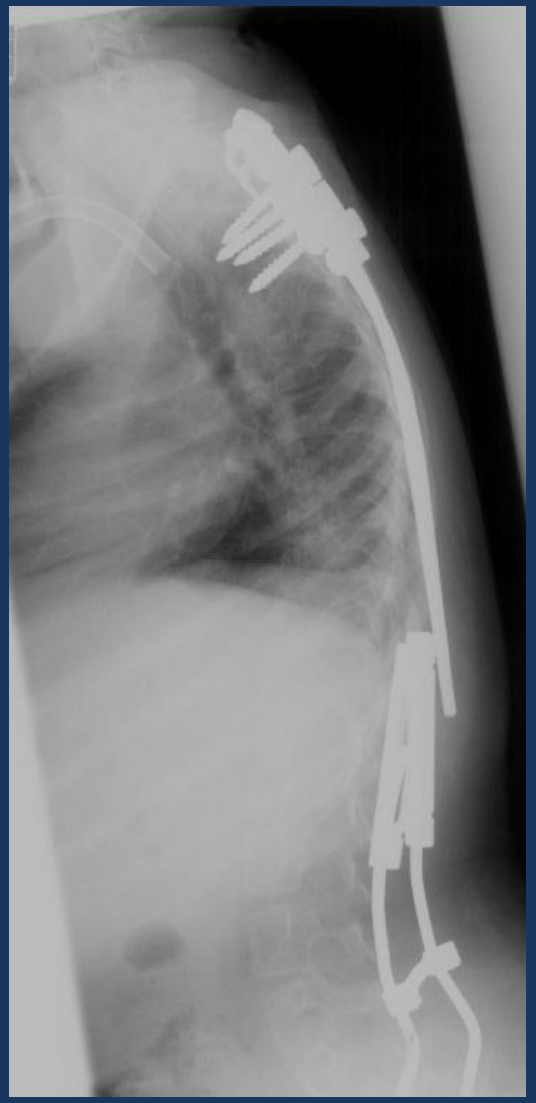
Results
Use of Hospital Care

Diagnosis	GR Insertion (days)	GR Lengthening (days)	Final Fusion (days)	% Outpatient Lengthenings
SMA	7.8 ± 6.5	2.1 ± 3.9	10.6 ± 7.8	39%
Idiopathic	5.3 ± 3.2	0.8 ± 1.0	5.6 ± 3.1	47%
P Value (SMA > Idiopathic)	0.08	0.01	0.11	

- Hospital stay durations compared for 15 SMA patients and 80 idiopathic scoliosis patients
- SMA hospital stays longer for lengthening procedures
  - Trend towards longer stays in insertion and final fusion procedures
- Percent of outpatient lengthenings comparable!

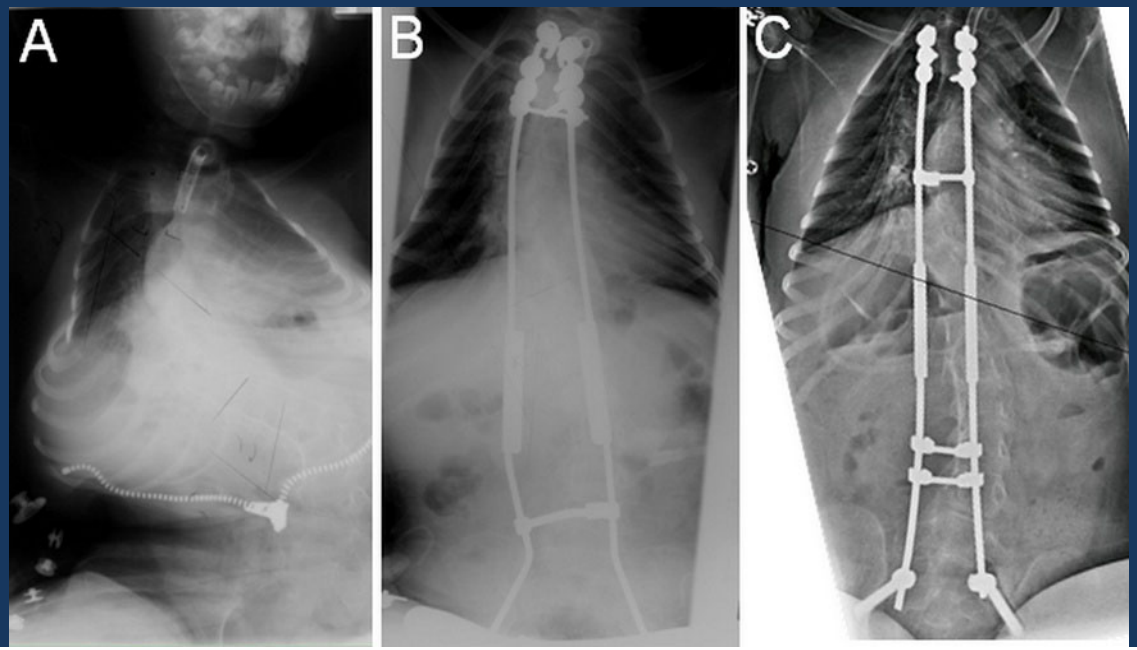
Results
Complications

- Rate of significant complications compared for SMA and idiopathic scoliosis
- Significant complications required intervention during the inpatient stay or unplanned surgery
- Fewer complications per patient in SMA
  - 0.5 per SMA Patient
  - 1.1 per Idiopathic Patient
  - P = 0.05
- More serious complications in SMA
  - 2 patients required tracheostomies
  - 1 intraoperative cardiac arrest (resuscitated)
- No
  - neurologic complications
  - No infections
  - No mortality



Conclusions

- GRs safely improve trunk/lung height, control curve,pelvic obliquity
- Do not halt rib collapse, but may slow progression
- Lengthening hospital stays longer in SMA
- Rate of significant complications lower in SMA
- SMA patients had more unique complications
- GRs beneficial in young patients with SMA



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