

Growing Rods in Cerebral Palsy

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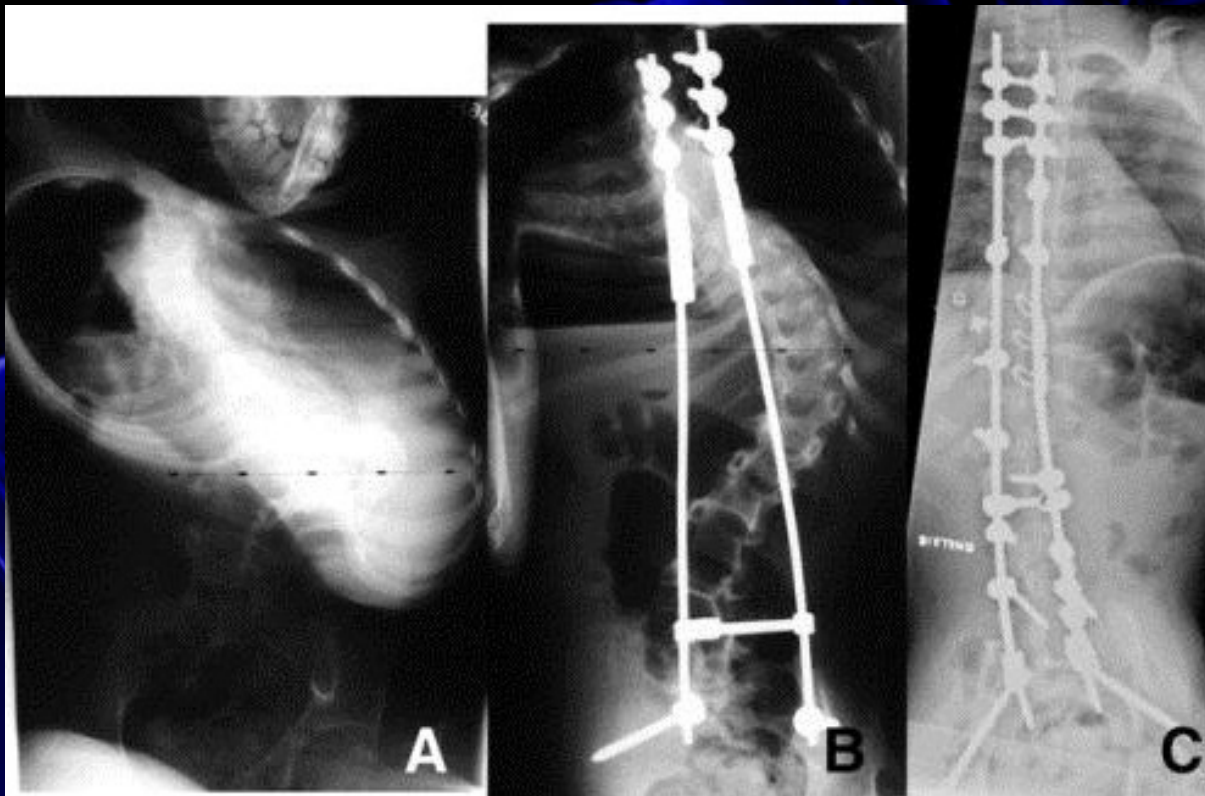
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Summary

- Significant scoliosis develops very early in some children with cerebral palsy (CP). Growing rods (GR) are effective in controlling the scoliosis.



Left Image: Sitting and supine films of an 11-year-old patient with cerebral palsy with a preoperative major curve of 110° and pelvic obliquity of 25° (A) who had growing rods for 4 years with major curve of 71° and pelvic obliquity of 12° (B) until final fusion was performed (C).*

*Sponseller *et al.* Pelvic fixation of growing rods: comparison of constructs. *Spine* 2009;34(16):1706-10.

Introduction

- Control of early-onset scoliosis in children with CP may be important in preventing the development of restrictive pulmonary disease.

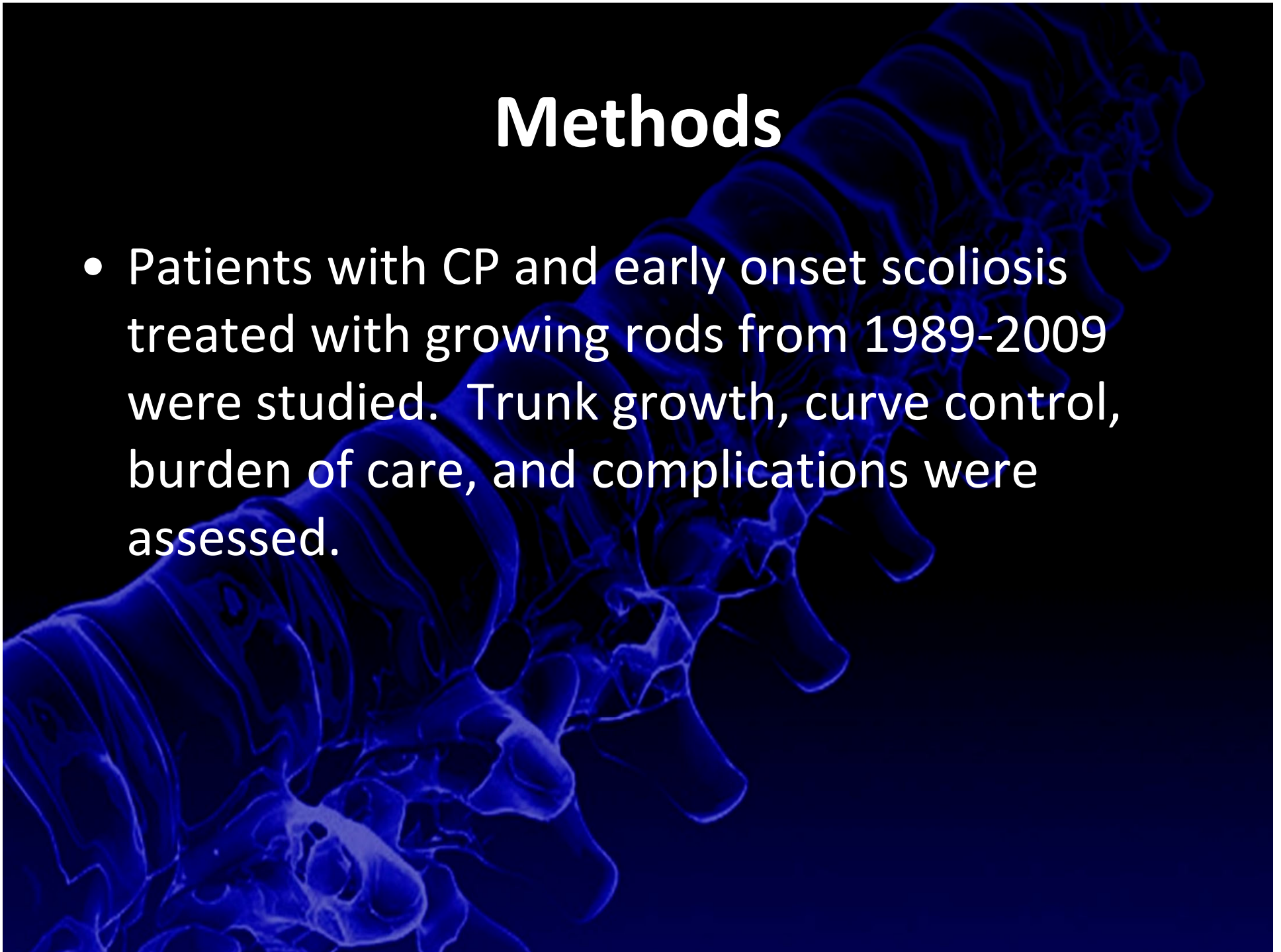


Preoperative and postoperative AP radiographs in a 47 month old female treated surgically for scoliosis with dual growing rod instrumentation.

Image credit: San Diego Center for Spinal Disorders

Methods

- Patients with CP and early onset scoliosis treated with growing rods from 1989-2009 were studied. Trunk growth, curve control, burden of care, and complications were assessed.



Study Parameters



- Sixteen patients with CP underwent GR surgery at a mean age of 8.5 years (SD, 2.1 years).
- Mean length of follow-up was 37.3 months (SD, 23.8 months).
- 3 patients were treated with single rods and 13 with dual rods.

Results (1)

- Mean curve was 85.2° (SD, 22.0°) preoperatively, 37.1° (SD, 17.4°) at first postoperative measurement, and 53.3° (SD, 23.7°) at follow-up.
- Mean 16.2 levels (SD, 2.6 levels) were instrumented, and 9 were extended to the pelvis.
- T1-S1 length increased from mean 263.2 cm (SD, 31.6 cm) preoperatively to 306.9 cm (SD, 38.8 cm) post-initial operation and to 324.9 cm (SD, 23.3 cm) at final follow up.
- 6 patients underwent final fusion at mean age of 12.2 years (SD, 1.8 years) and final curve correction was 37.4% (SD, 32.4%).

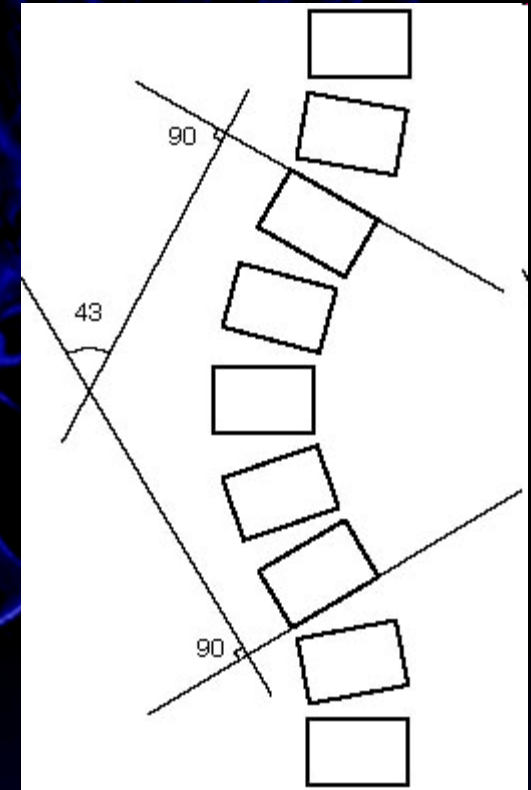
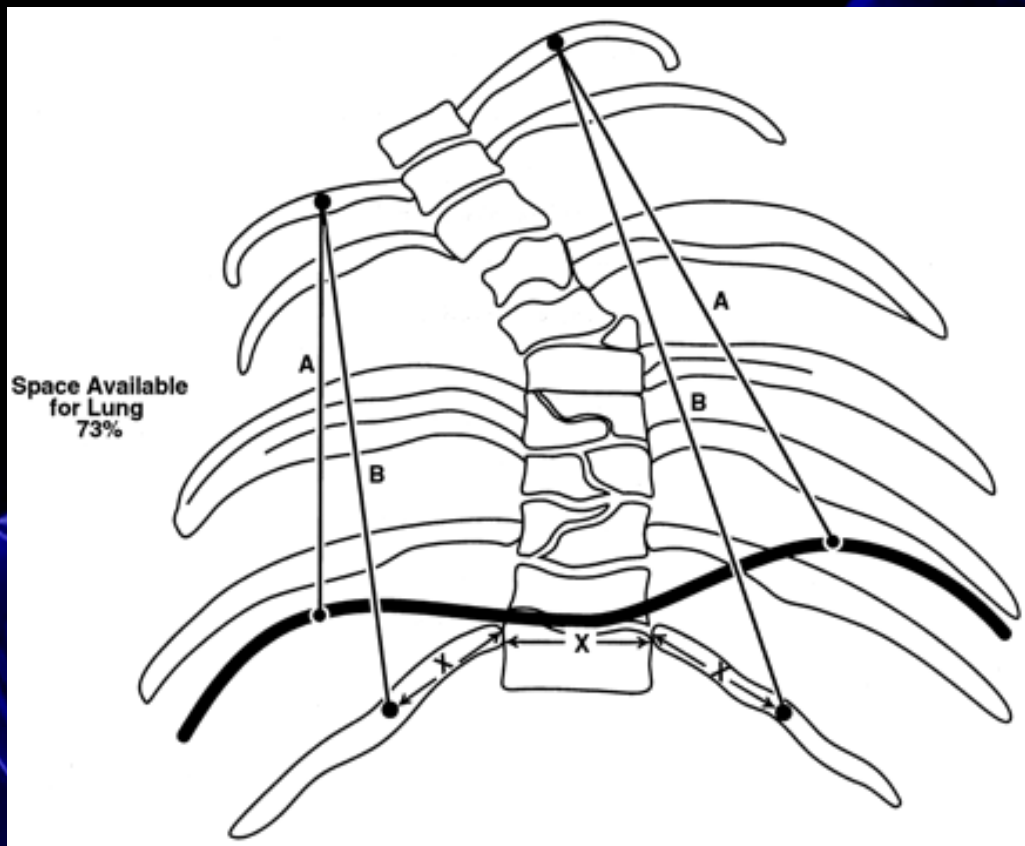


Diagram showing the calculation of a Cobb angle in a patient with a thoracic curve with the apex to the right. The Cobb angle measures 43 degrees.

Image Credit: PediatricEducation.org

Results (2)

- Space available for the lung ratio increased from 0.7 (SD, 0.2) to 1.0 (SD, 0.1).



Left Image: The height of the hemithorax is defined as the distance from the middle of the most cephalad rib down to the center of the hemidiaphragm (A lines). A ratio is derived by dividing the height of the concave hemithorax by the height of the convex hemithorax, defining the space available for the lung ratio.

*Campell RM *et al.* The characteristics of thoracic insufficiency syndrome associated with fused ribs and congenital scoliosis. *J Bone Joint Surg Am* 2003;85:399-408.

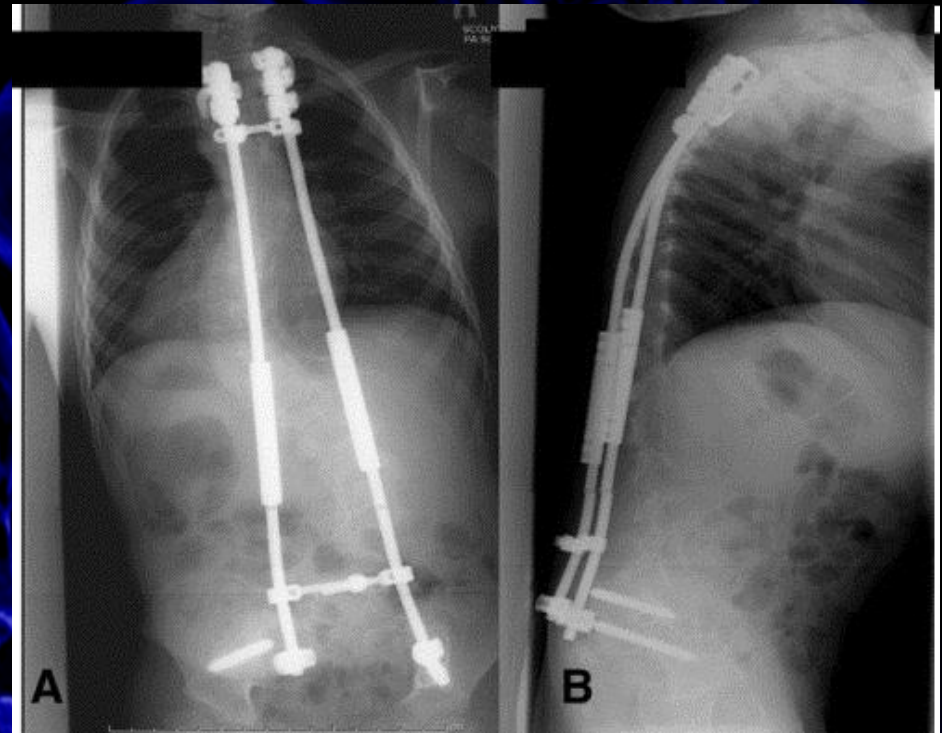
Burden of Care

- After initial insertion of GR, hospital stay for these 16 patients with CP was mean of 6.3 days (SD, 3.2 days), as compared to mean hospital stay of 6.1 days for initial insertion for patients with idiopathic scoliosis and 9.2 days for patients with neuromuscular scoliosis, according to the literature.*
- Mean number of lengthening procedures was 3.8 (SD, 3.4) at mean interval of 8.0 months (SD, 4.0 months) and with mean hospital stay of 0.9 days (SD, 3.4 days) following each lengthening procedure.

*Murphy NA, Firth S, Jorgensen T, Young PC. Spinal surgery in children with idiopathic and neuromuscular scoliosis. What's the difference? *J Pediatr Orthop* 2006; 26(2):216-20.

Complications

- 91 total surgeries performed
- 1 superficial wound infection
- 7 deep wound infections
- 2 rod fractures
- 1 anchor dislodgement
- 1 case of atelectasis
- No patient required tracheostomy, experienced neurologic deterioration, or developed pneumonia.



Anteroposterior (A) and lateral (B) radiographs of a 6-year-old patient with a broken iliac screw that was subsequently revised.*

*Sponseller *et al.* Pelvic fixation of growing rods: comparison of constructs. *Spine* 2009;34(16):1706-10

Conclusion

- GR are useful for CP patients who develop severe scoliosis at a young age. The rate of deep wound infection remains problematically high. Other medical complications, however, are infrequent. Burden of care is significant and deserves further study.

References

- **Sponseller *et al.*** Pelvic fixation of growing rods: comparison of constructs. *Spine* 2009;34(16):1706-10.
- **Campell RM *et al.*** The characteristics of thoracic insufficiency syndrome associated with fused ribs and congenital scoliosis. *J Bone Joint Surg Am* 2003;85:399-408.
- **Murphy NA, Firth S, Jorgensen T, Young PC.** Spinal surgery in children with idiopathic and neuromuscular scoliosis. What's the difference? *J Pediatr Orthop* 2006; 26(2):216-20.