Patient Outcomes After Early Fusion for Congenital Scoliosis

Michael G. Vitale MD MPH, Hiroko Matsumoto MA, Jaime A. Gomez MD, Michael R. Bye MD, Joshua E. Hyman MD, Whitney A. Booker BS, David P. Roye Jr MD

Morgan Stanley
Children's Hospital of NewYork-Presbyterian
Columbia University Medical Center

Columbia Orthopaedics
Pediatric Orthopaedic Surgery

Background

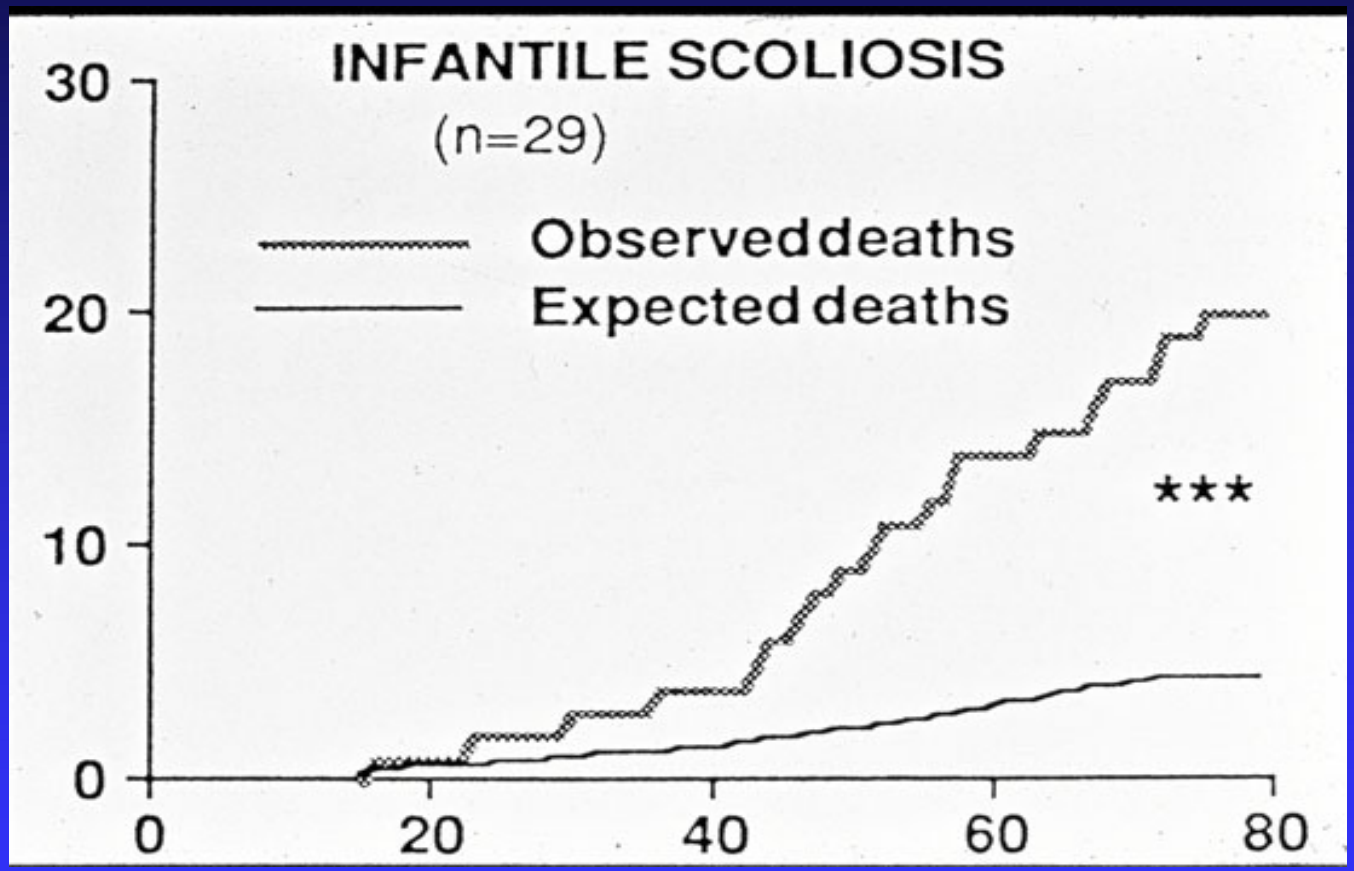
- Campbell, Dimeglio and others have heightened the awareness of the interrelationship between lung, chest, and spine development during early growth

Early Spine Fusion is Associated with Adverse Pulmonary Outcomes

- Goldberg CJ, et al. Respiratory function and cosmesis at maturity in infantile-onset scoliosis. Spine. 2003; 28: 2397-406.
- Emans JB, et al. Earlier and More Extensive Thoracic Fusion is Associated with Diminished Pulmonary Function: Outcomes after Spinal Fusion of 4 or more Thoracic Spinal Segments Before Age 5. Poster presentation, IMAST, Bermuda, 2004.
- Karol, L. et al. The effect of early thoracic fusion on pulmonary function in non-neuromuscular scoliosis, SRS , Miami, 2005

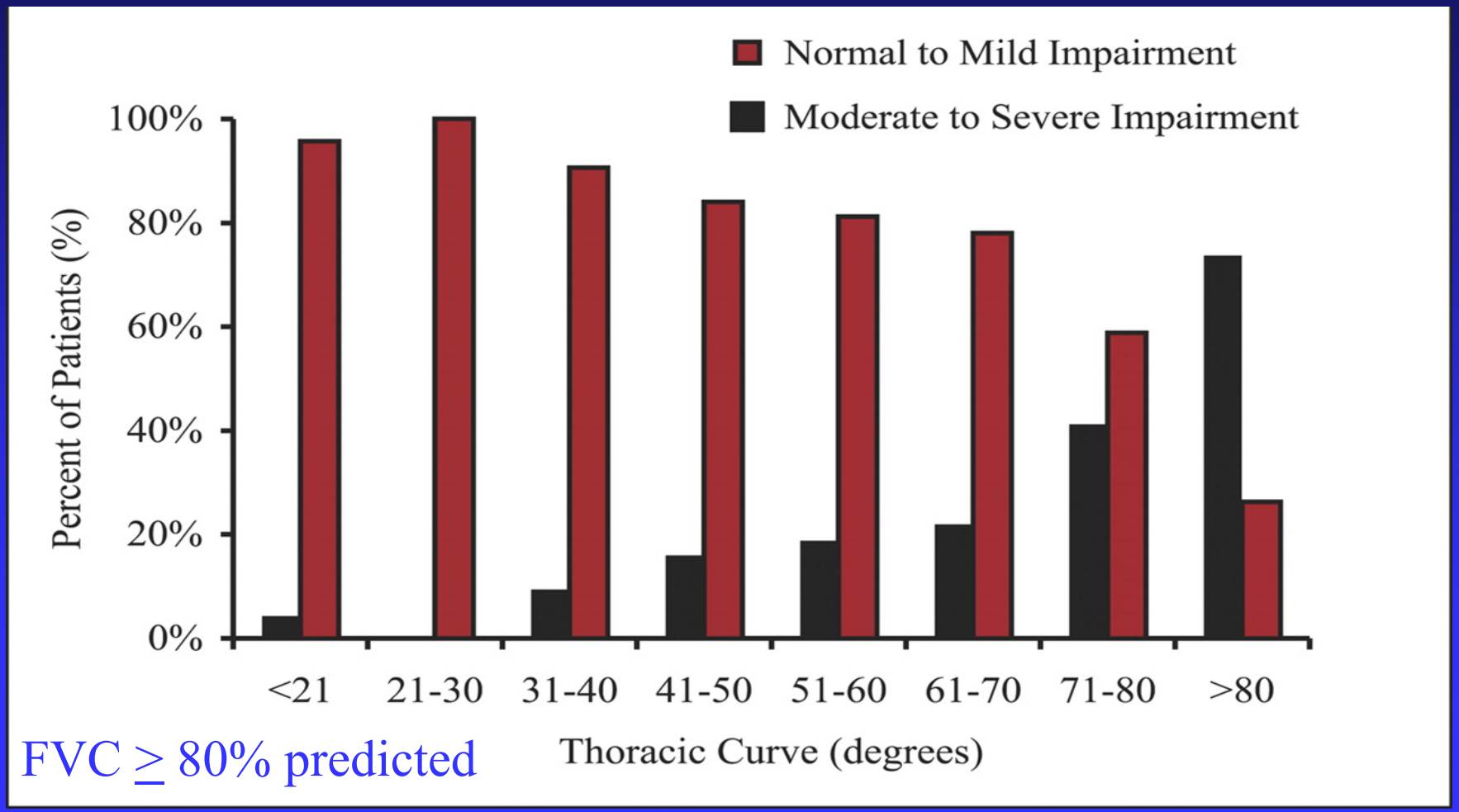
Natural History: Infantile Idiopathic

of Deaths



Pehrsson, Larssson, Oden & Nachemson, Spine, 1992

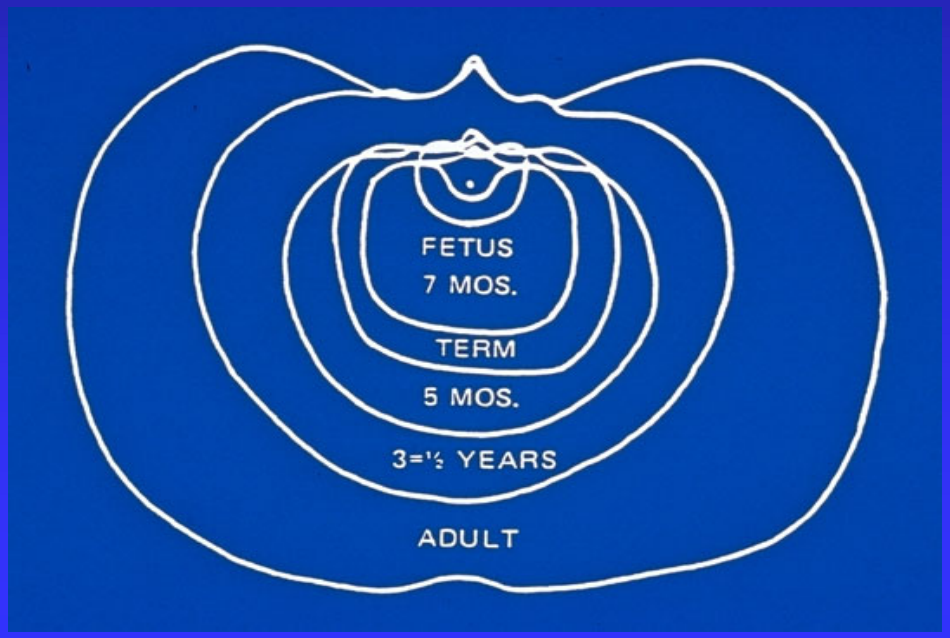
The Effect of Thoracic Curve on Pulmonary Impairment

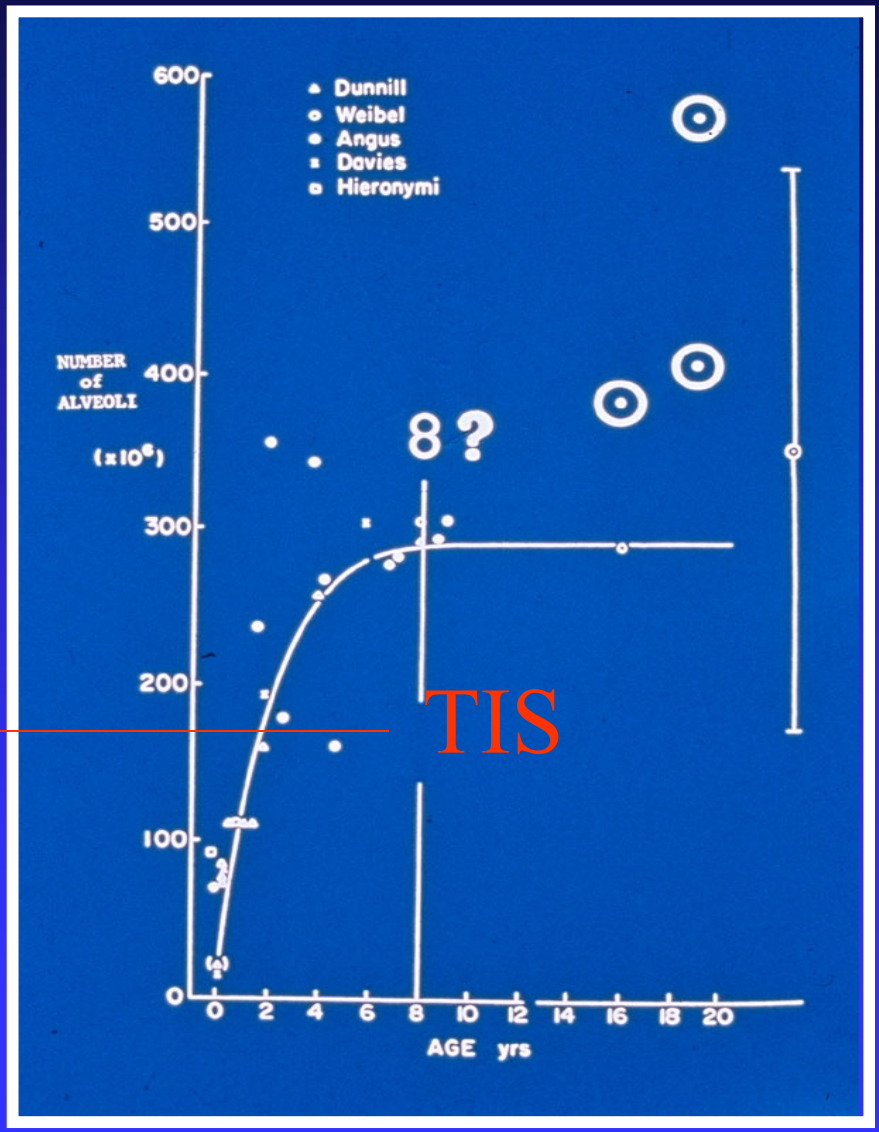


FVC $\geq$ 80% predicted

Thoracic Insufficiency Syndrome

Alveoli multiply during first 7 years of life if thorax normal





Purpose

- To evaluate the pulmonary function and quality of life outcomes (QOL) of children who were treated with fusion for their progressive congenital scoliosis
- To examine relationships between pulmonary function, radiographic measures, and quality of life in these children

Methods

21 children with progressive congenital scoliosis

- "Traditional" surgery which involved early thoracic fusion (< 6 years age)
  - growing rods used in some

Average 7 year f/u after fusion at 5 years

Female Male	N=12 (57.1%) N=9 (42.9%)
Age at surgery (years)	Mean = 4.9
Age at visit (years)	Mean=12.6
Time from surgery (years)	Mean= 6.9

Methods

Endpoints

- **Pulmonary Function (FVC, FEV1, TLC, VC)**
- **Quality of Life: Child Health Questionnaire Parent Form (CHQ)**
- **Radiographic Measures**

Results: Post op Curves

At Post-operative Follow-up

	N	Mean
Cervicothoracic	1	24.0
Thoracic	13	40.3
Thoracolumbar	13	43.9
Lumbar	3	23.3
Major (N=21)	21	42.8
Kyphosis	21	44.0

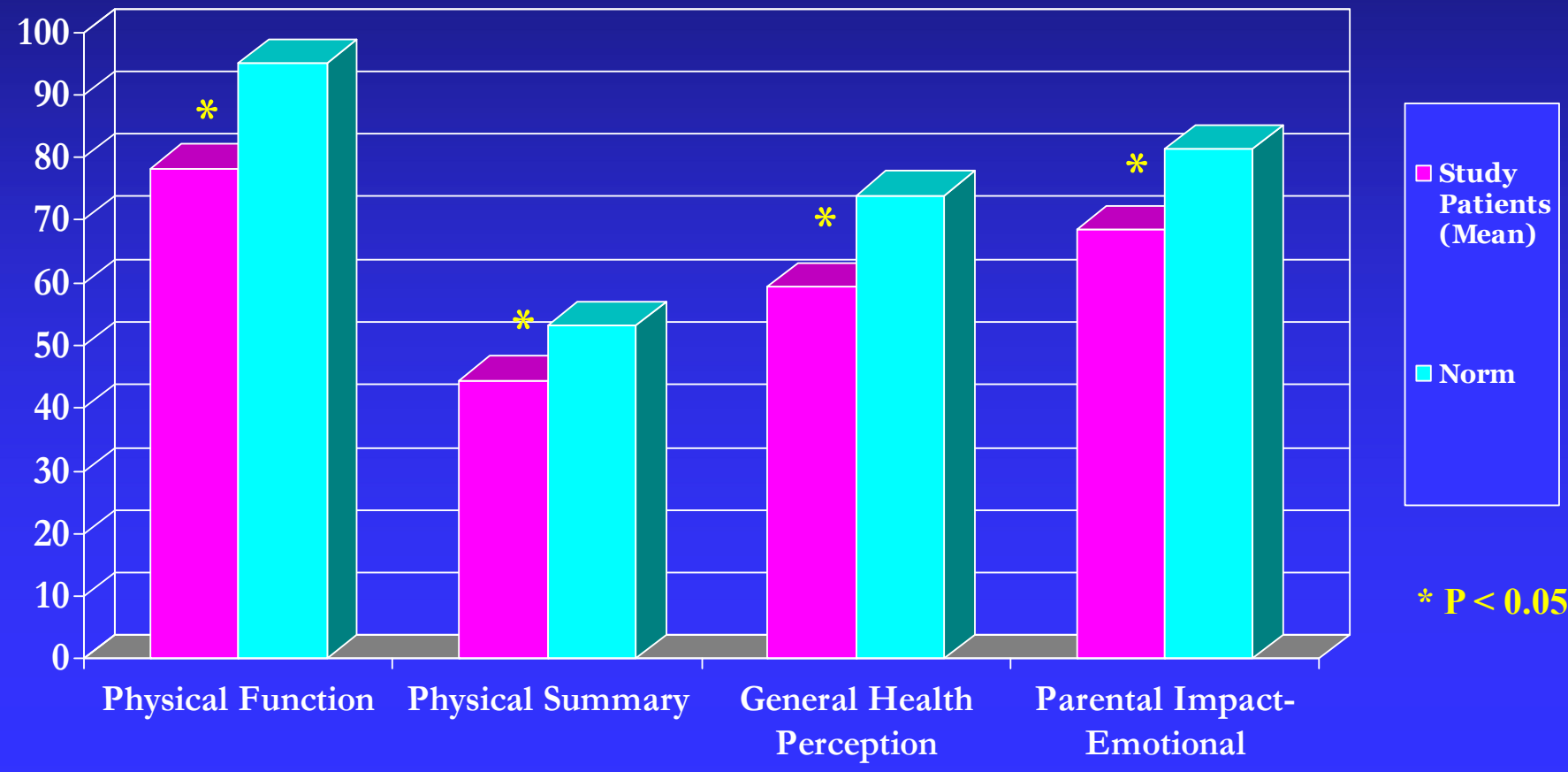
Results: Pulmonary Function Tests

	Predicted %			
	Mean	SD	Minimum	Maximum
Forced Vital Capacity	74.4 *	19.4	39	100
Forced Expiratory Volume	73.0 *	20.2	34	103
Total Lung Capacity	88.5 *	17.0	54	110
Vital Capacity	75.6 *	19.6	39	100

*p <0.001

Results: Quality of Life

Physical scores were significantly lower but psychological scores were similar compared with healthy children.



Correlations: Cobb Angles and PFT

- Patients with larger main thoracic curves have worse PFTs

	FVC	FEV1	TLC	VC
Thoracic Curve Size	-.532[t]	-.590*	-.370	-.506

* p <0.05 , [t] p< 0.10

Correlations: Cobb Angles and CHQ

- Residual Curve Size is associated with lower physical function scores
- Hyperkyphosis is correlated with lower self esteem

	ROLE/SOCIAL-PHYSICAL	SELF ESTEEM	FAMILY ACTIVITIES	PHYSICAL SUMMARY
Thoracic curves	-.482[t]	.070	-.679*	-.335
Thoracolumbar curves	-.574*	.006	.045	-.701*
Kyphotic curves	-.371[t]	-.560*	-.264	-.259

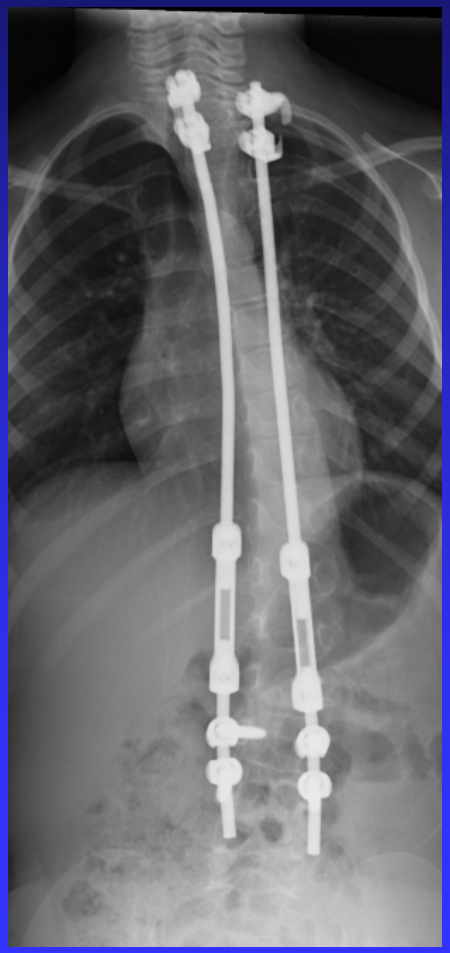
* $p < 0.05$, [t]$p < 0.10$

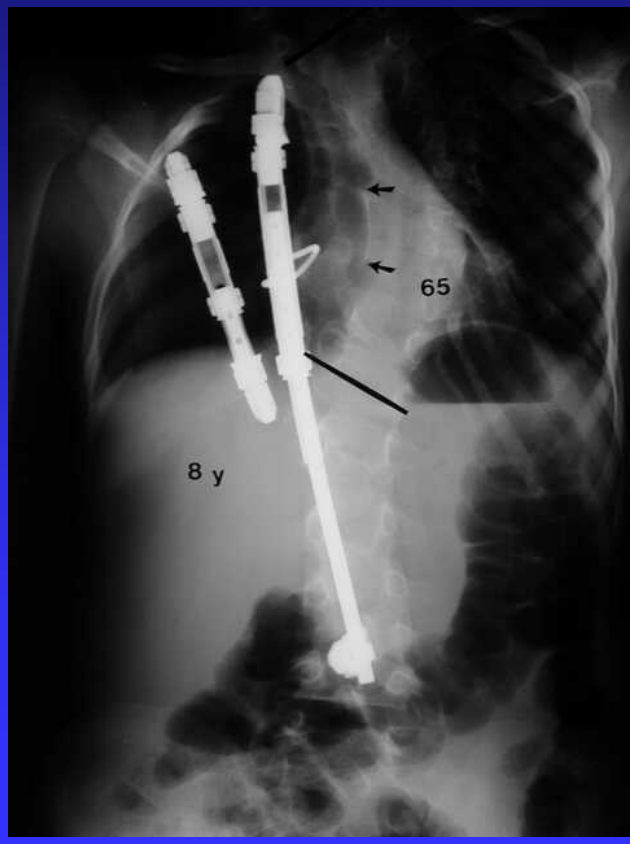
Conclusion

- At a mean follow up of 7 years, children who underwent thoracic fusion before the age of 6 demonstrate
  - Lower PFTs
  - Lower physical QOL scores
- Larger residual curvature seems to be correlated with PFT and QOL perturbations
- Is this a function of the disease (scoliosis) or the treatment ? (fusion)

Reflections

- EOS is bad disease
- Early Fusion is bad treatment
- Do newly available methods of treatment do better ?





Thank You

mgv1@columbia.edu

Morgan Stanley
Children's Hospital of NewYork-Presbyterian
Columbia University Medical Center

Columbia Orthopaedics
Pediatric Orthopaedic Surgery