

Surgical and Health-Related Quality of Life Outcomes of Growing Rod Graduates with Severe vs. Moderate Early Onset Scoliosis

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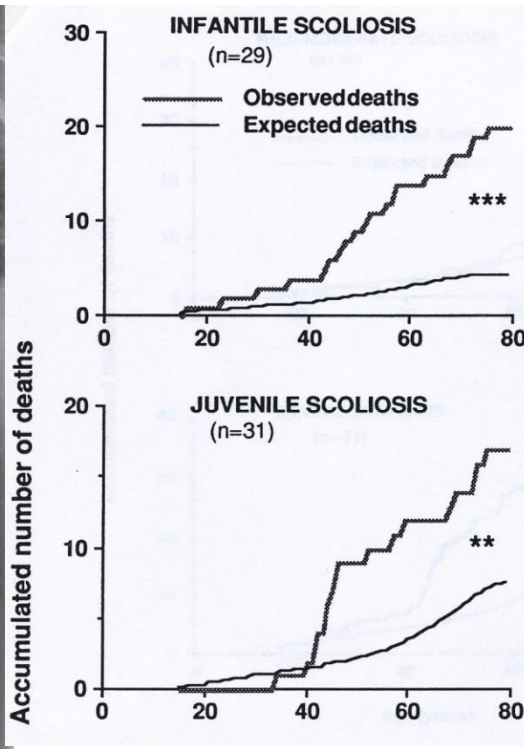
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Severe Early Onset Scoliosis



Pehrsson et al. Spine 1992

Severe EOS: Major coronal curve $> 90^\circ$
(C-EOS; Williams et al. JBJS 2014)

Associated with increased mortality
(Pehrsson et al. Spine 1992)

No previous studies at the end of
growth-friendly management in severe
EOS

Growing rods lack apical control,
correction with cantilever & distraction
of concavity (Akbarnia JBJS 2007)

Delaying tactics popular, unclear how
long we can wait in terms of major
curve magnitude (Fletcher et al. JPO 2012)

Severe and Moderate EOS cohorts

A retrospective review of prospectively collected Growing Spine Study Group database for growing rod surgery in EOS with min 2-yr FU (n = 569)

Severe EOS:

40 children aged 10 years or less with severe EOS (major curve $\geq 90^\circ$) operated using traditional growing rods, with minimum 2-yr FU after last lengthening or final fusion

Moderate EOS from the same database:

40 age (± 1 year), gender, cause of EOS, and number of lengthening matched (± 1) children

Data Collection

Time points of interest: Preop, Index surgery, Distraction period, Pre-definitive, Post-definitive

Clinical data collected: Age at surgery, Height, Weight, Etiology of EOS, Preop Halo traction, FU time, Number of lengthenings,

Surgical data: OR time; Blood loss; Type and levels of instrumentation; Revisions (Planned, unplanned)

Complications: Wound related (Deep surgical site infection); Implant (misplacement, pull-out, rod fracture); Alignment (PJK); Neurologic (New deficit, loss of MEPs); Other

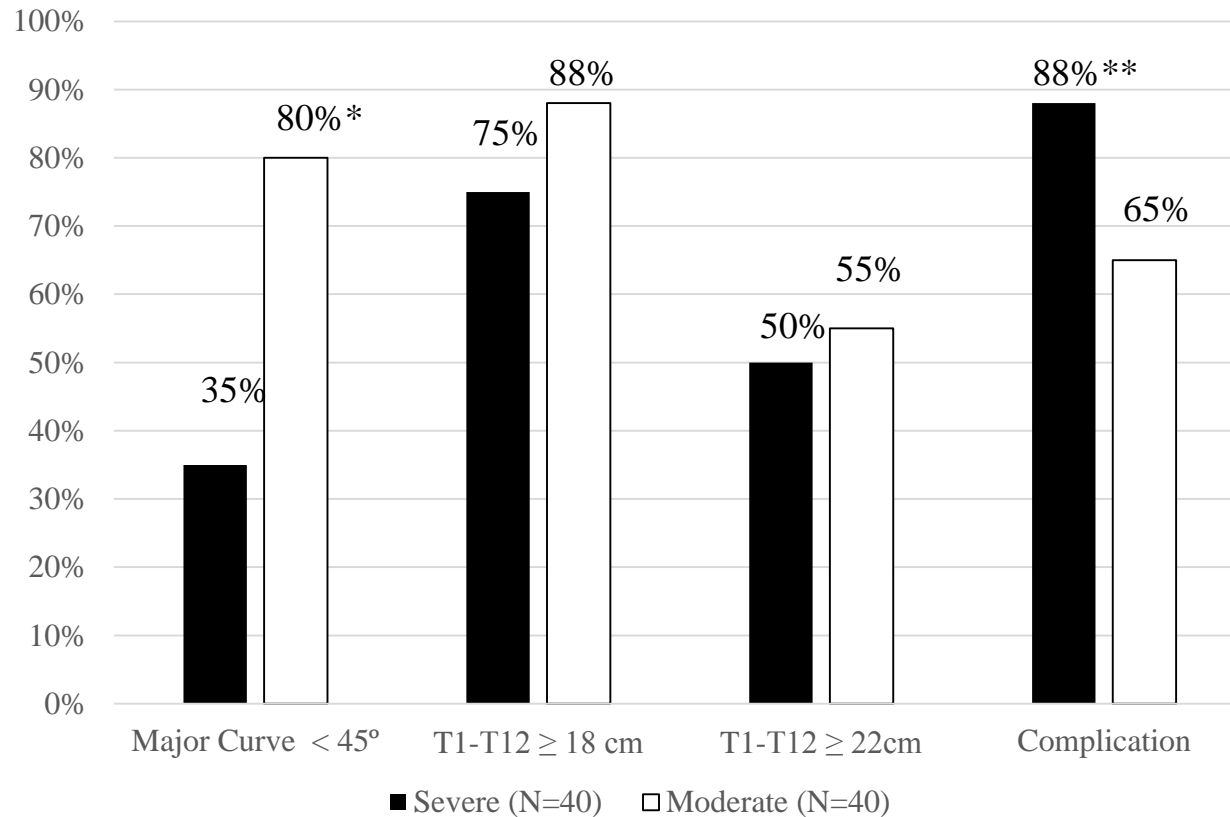
Clinical Characteristics

Characteristics	Severe (n=40)	Typical (n=40)	P value
Age, yrs	5.4 (1.4-9.7)	5.3 (1.4-9.9)	0.94
Follow-up, yrs	9.9 (3.4-21)	8.0 (3.9-13)	0.007
Congenital	8	8	1.0
Idiopathic	12	12	
Neuromuscular	13	13	
Syndromic	7	7	
Preop halo traction	6	3	0.29
No. of lengthenings	7.0 (3-15)	8.2 (3-18)	0.11
Final fusion	27	12	0.001

Radiographic Outcomes

Characteristics	Severe (n=40)	Moderate (n=40)	P value
Major curve (°)			
Preop	102 (90-139)	63 (33-88)	<0.001
After Index	58 (20-107)	37 (11-88)	<0.001
FFU	56 (10-91)	36 (12-89)	<0.001
T1-S1 height (mm)			
Preop	227 (138-380)	266 (145-416)	0.001
After Index	275 (137-365)	292 (168-431)	0.16
FFU	337 (159-447)	363 (260-510)	0.077
T1-T12 height (mm)			
Preop	140 (73-244)	155 (72-257)	0.24
After Index	167 (71-233)	177 (82-261)	0.28
FFU	213 (80-291)	224 (139-321)	0.27

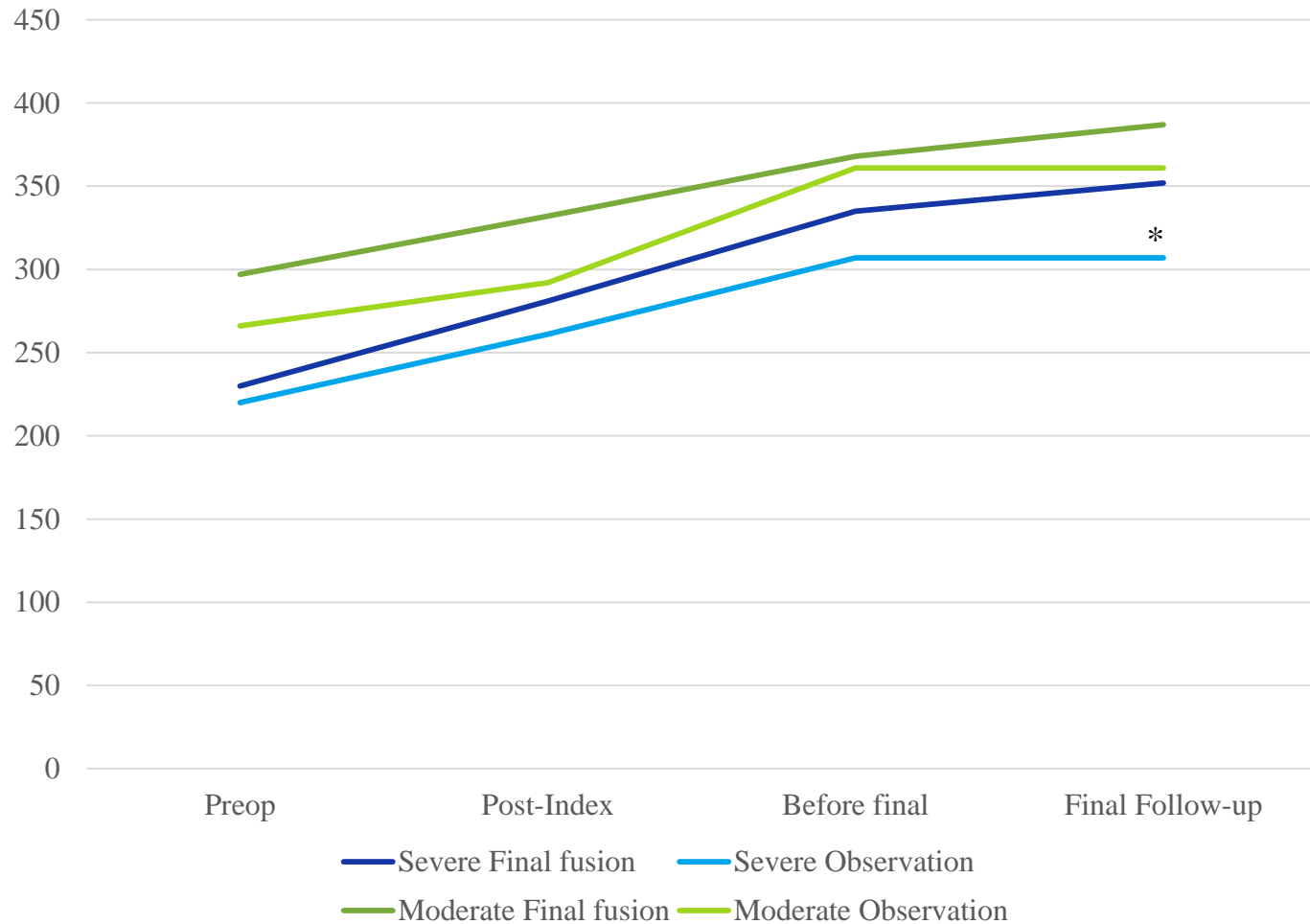
Outcomes at the End of Growing Rod Management



*P<0.001

**P<0.05

Effect of Final fusion on T1-S1 Height



*P=0.025 between final fusion and observation in the severe group

Complications

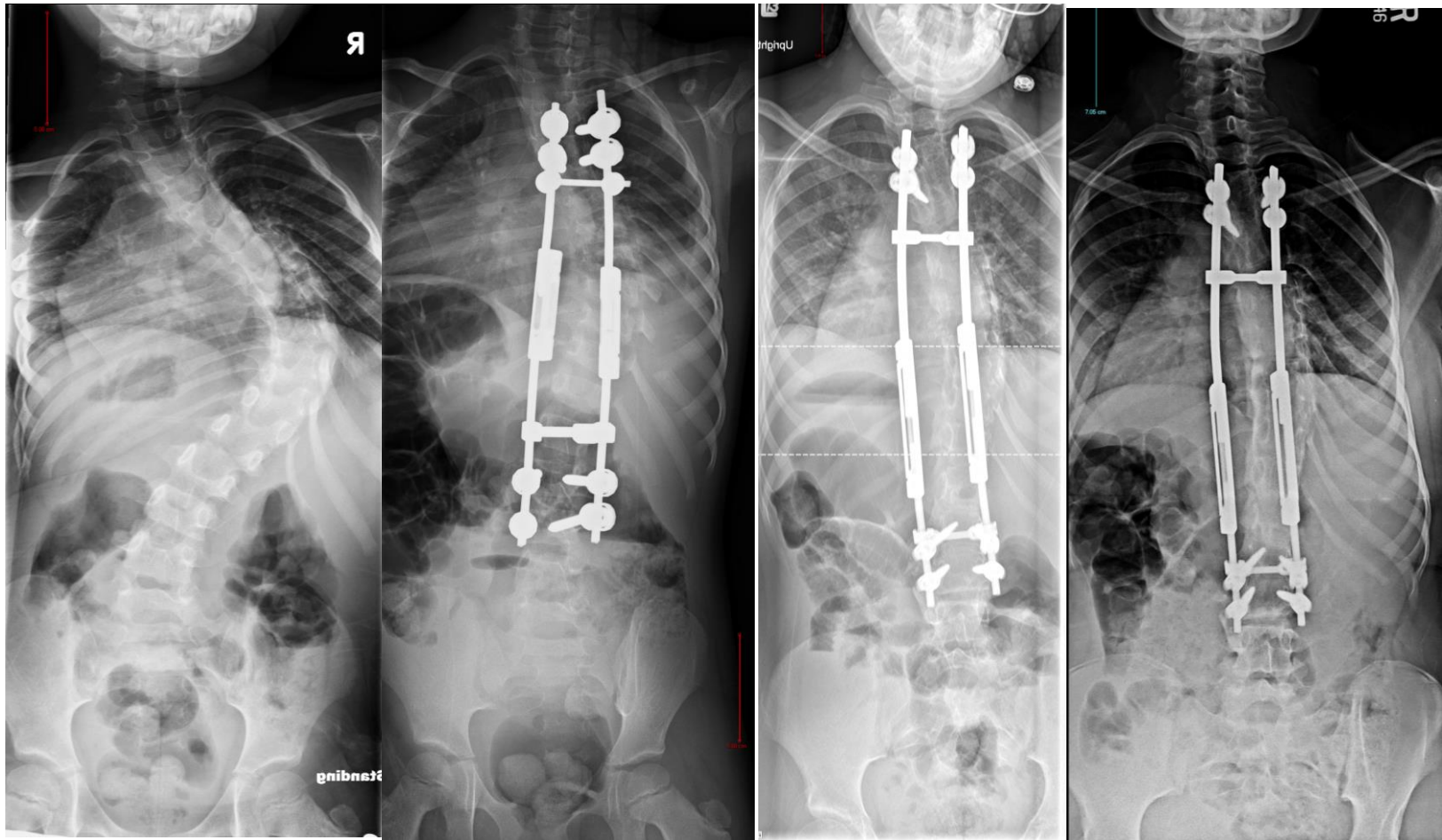
	Severe (n=40)	Typical (n=40)	P value
Surgical* complication, n (%)	32 (80%)	24 (60%)	0.051
Surgery for complication, n (%)	29 (73%)	25 (63%)	0.34
Deep surgical site infection, n (%)	13 (33%)	4 (10%)	0.027

*Included wound-related, implant-related, alignment-related; neurologic, dural tears

24-Item EOS Questionnaire

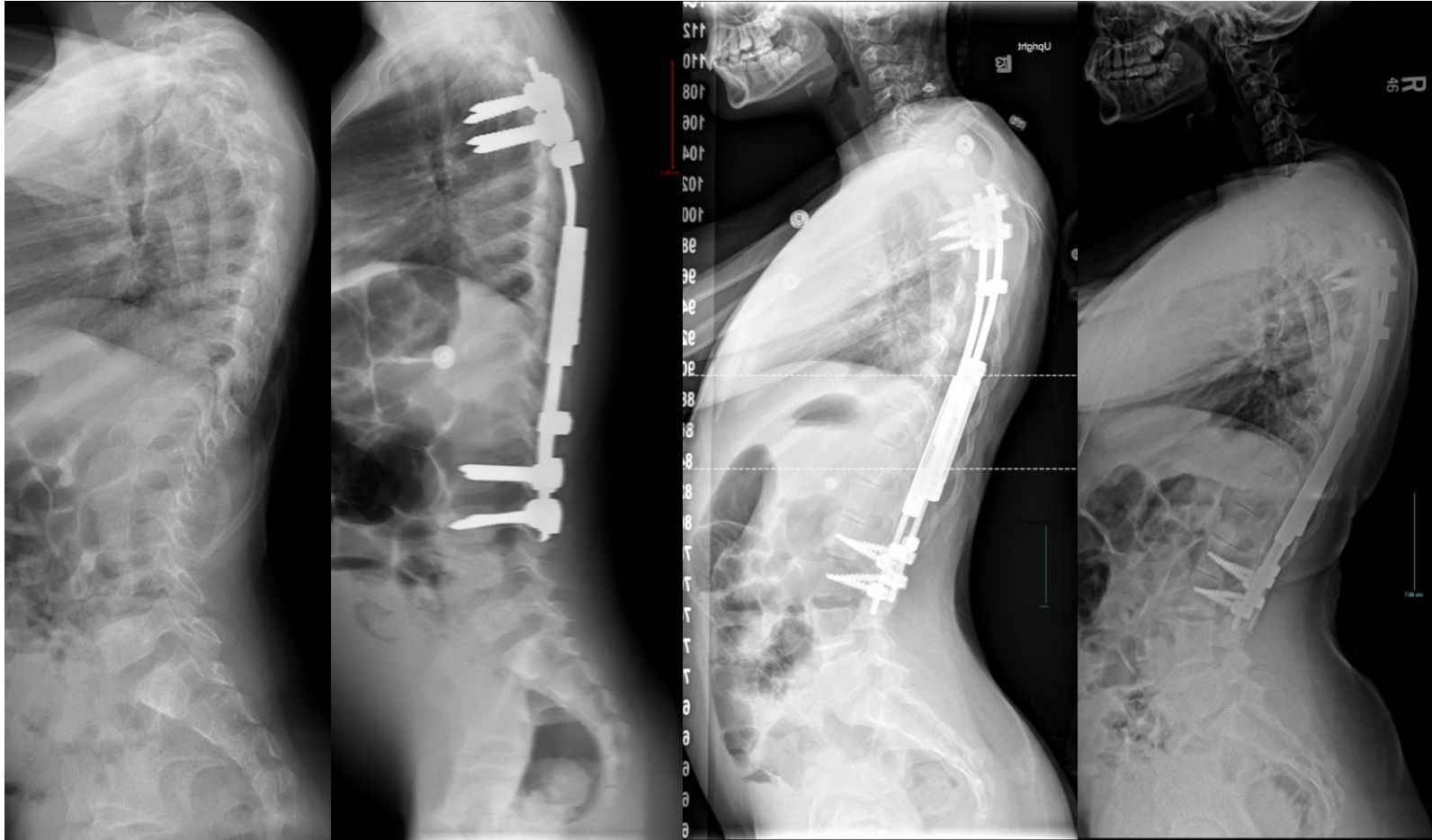
Domain	Severe (n=40)	Moderate (n=40)	P value
Daily living	60 (13-100)	51 (0-100)	0.43
Emotion	74 (0-100)	73 (25-100)	0.66
Fatigue/energy level	71 (0-100)	62 (25-100)	0.23
Financial burden	66 (25-100)	75 (0-100)	0.79
General health	71 (13-100)	76 (50-100)	0.58
Overall satisfaction	77 (25-100)	66 (0-100)	0.25
Pain/Fatigue	71 (13-100)	79 (50-100)	0.49
Parental burden	70 (15-100)	65 (5-100)	0.59
Physical function	56 (0-100)	69 (8-100)	0.26
Pulmonary function	93 (63-100)	87 (75-100)	0.056
Transfer	77 (0-100)	75 (0-100)	0.93

Growing Rod Graduate



4-year-old girl with 94° idiopathic early onset scoliosis. 10-yr FU. Two rod fractures. No final fusion. 3 years follow-up after last lengthening

Sagittal balance



Same patient as in the previous slide. Note elongation of vertebral bodies.

Conclusions

Severe EOS can be treated effectively using growing rod surgery.

Delaying EOS surgery until major curve achieves 90 degrees results into larger residual curve and more complications than treating it at earlier.

At the end of growing rod management (Severe vs. Moderate):

35% vs. 80% had major curve < 45 degrees

75% vs. 88% had reached T1-T12 > 18 cm

50% vs. 55% had reached T1-T12 > 22 cm

Scores on the EOSQ-24 questionnaire were highest for the pulmonary function domain in both severe and moderate EOS groups.