

Proximal Rib versus Proximal Spine Anchors In Growing Rods: Updated Results from a Collaboration between Two National Databases

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-Disclosures-

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Other: CSSG - BOD

POSNA – BOD

IPOS- Chairman

Some Relevant

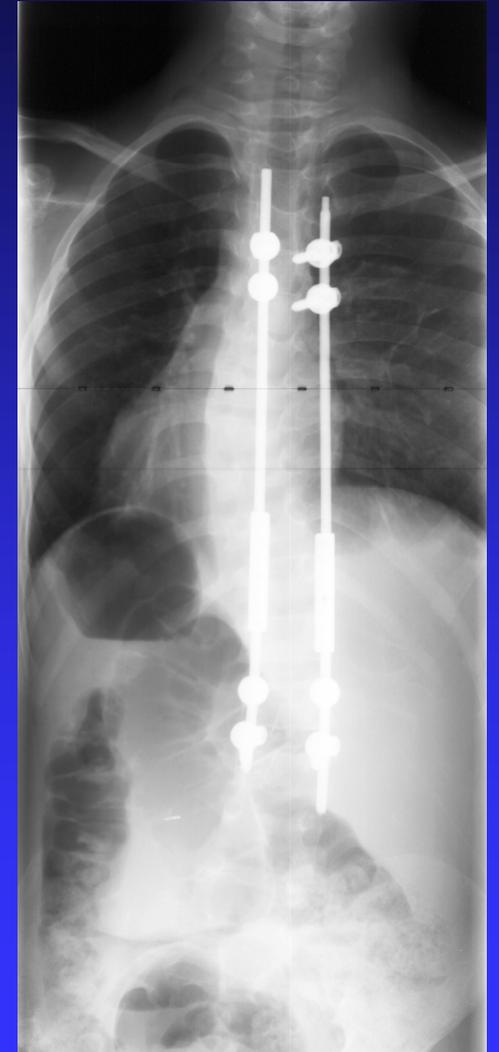
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Prospective Study



To compare outcomes of **RIB** versus **SPINE** based Proximal Anchors in growing instrumentation surgery.



Methods

Design:

Prospective, multi-center study of growing instrumentation surgery

Participants:

• Inclusion:

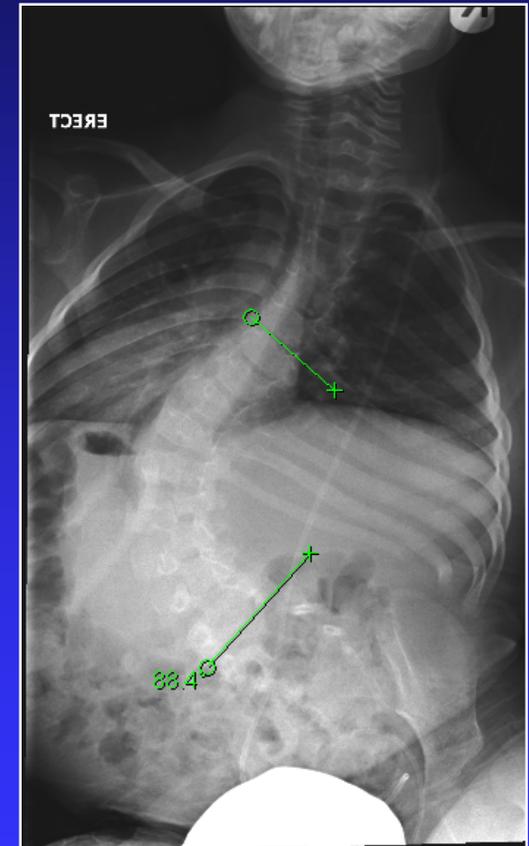
- Early Onset Scoliosis (EOS)
- 3.0 – 9.9 years of age
- Cobb $> 40^\circ$
- Dual Rods

• Exclusion:

- Prior spine surgery
- Guided-growth constructs, Magnetically Controlled Growing Rods (MCGR)

Outcomes:

- Cobb correction (6 mo post-op):
- Complications – over time
- EOSQ



Enrollment Targets

The study initially aimed to include **70 patients**

- 35 Rib-based proximal anchor patients
- 35 Spine-based proximal anchor patients

Enrollment has now reached **106 patients**

- 73 Rib-based patients
- 33 Spine-based patients



Patient Characteristics

Total (n) = 106	Rib Anchors	Spine Anchors	P-value
Subjects (n)	73	33	
Age (yo)	6.45 ± 2.0	6.21 ± 2.05	0.619
Gender	39% male	36% male	0.775
Weight (kg)	21.79 ± 7.45	31.25 ± 9.69	0.397
Height (cm)	112.85 ± 17.13	141.00 ± NA	
Sitting Height (cm)	62.42 ± 12.34	103.75 ± NA	
Arm Span (cm)	114.87 ± 28.16	142.00 ± NA	
Kyphosis (deg)	53.94 ± 20.21	44.22 ± 23.13	0.047
Cobb (deg)	70.92 ± 17.18	73.52 ± 17.51	0.475
Follow up (years)	1.025 ± 0.46	1.46 ± 0.63	<0.01

Some Differences in C-EOS

Total (n) = 106	Rib Anchors	Spine Anchors
Etiology (106)	73 patients	33 patients
Congenital (C)	17.81% (13)	3.03% (1)
Neuromuscular (M)	49.32% (36)	24.24% (8)
Syndromic (S)	15.01% (11)	51.51% (17)
Idiopathic (I)	18.81% (13)	21.21% (7)
C-EOS Cobb (105)	72 patients	33 patients
2: 20-50 (deg)	12.5% (9)	6.06% (2)
3: >50 – 90 (deg)	72.2% (52)	81.81% (27)
4: > 90 (deg)	15.28% (11)	12.12% (4)
Kyphosis (92)	65 patients	27 patients
(-): < 20 deg	4.61% (3)	18.52% (5)
N: 20 – 50 deg	41.54% (27)	44.44% (12)
(+): > 50 deg	53.85% (35)	37.04% (10)

Overall, no significant difference in Cobb angle correction between patients who received rib vs spine anchors

	Rib	Spine	P-value
Subjects (97)	70	27	
Pre-Op Cobb	70.92 ± 17.18	73.52 ± 17.51	0.508
6 mo Cobb Correction (%)	28.73 ± 22.55	35.9 ± 24.7	0.175

No significant difference in the QoL EOSQ scores between patients who received rib or spine anchors

Total (n) = 35	Rib	Spine	P-value
Subjects (35)	32	3	
Pre-Op EOSQ QoL Domain	69.78 ± 20.32	80.25 ± 11.84	0.390
6 mo Score Change (%)	4.75 ± 21.94	-6.55 ± 37.43	0.425

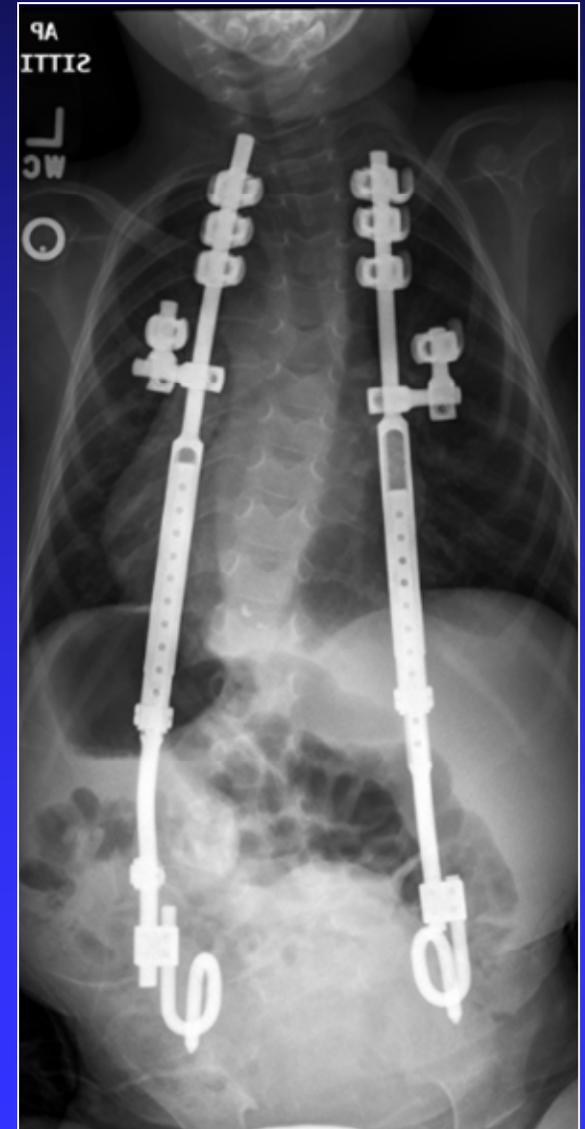
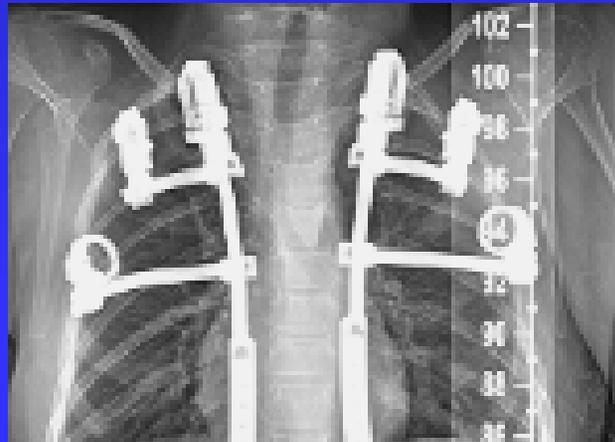
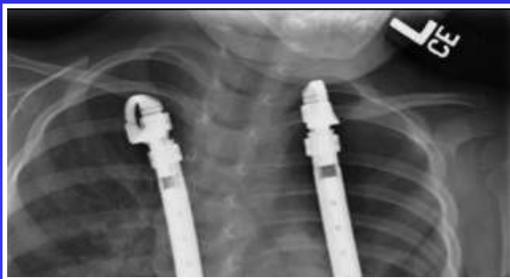
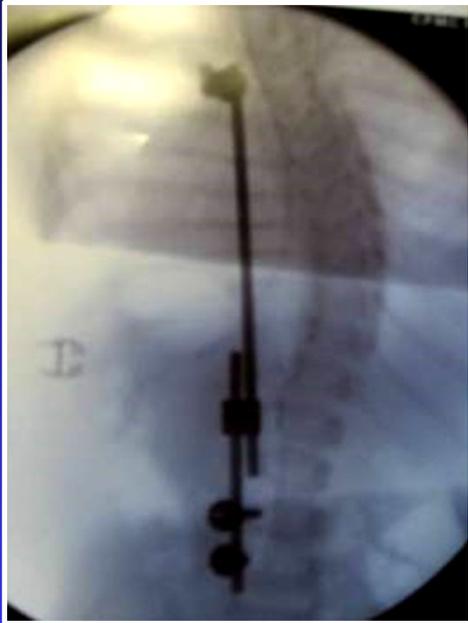
Hardware Migration at 2 years

- 8/73 (11%) in rib based group
- 2/33 (6%) in spine based group



Apples and Oranges

Quantifying Rib Fixation



Number of Proximal Anchors

Only 1 patient with 5 or more proximal anchors experienced migration

	Rib Anchors					Spine Anchors				
	Total	≤2	3-4	< 5	≥ 5	Total	≤2	3-4	< 5	≥ 5
Total N	73	32	21	53	20	33	0	23	23	10
Device Migration	8 (11%)	4 (12.5%)	3 (14.3%)	7 (13%)	1 (5%)	2 (6%)	0	2 (8.7%)	2 (9%)	0

More proximal Anchors in Spine Group

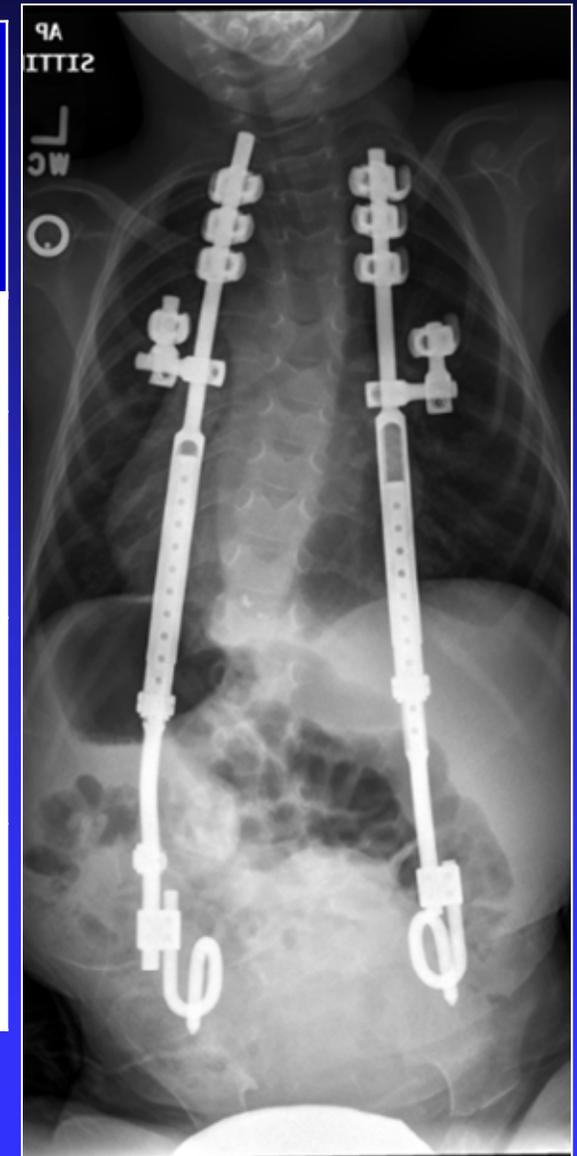
Total (n) = 106	Rib Anchors	Spine Anchors	P-value
Subjects (n)	73	33	
Proximal Anchors	3.21 ± 1.60	4.67 ± 1.16	<0.01
Instrumentation Type	63 VEPTR 10 GR	2 VEPTR 31 GR	

Growing Rod to Growing Rod Comparison

Total (n) = 41	GR to Rib	GR to Spine	P-value
Subjects (n)	10	31	
Proximal Anchors	6.7 ± 1.34	4.71 ± 1.19	<0.01
Cobb Correction	55.57 ± 12.74	35.09 ± 25.32	0.002
Device Migration	0/10 (0%)	2/31 (6.5%)	0.412
Pre-Op EOSQ QoL Domain	67.9 ± 22.3	77.2 ± 19.0	0.204
6 mo Score Change (%)	3.38 ± 34.63	-18.4 ± 40.02	0.13

Rib/VEPTR vs Rib TGR Comparison

	VEPTR to Rib	GR to Rib	P-Value
Subjects (n)	63	10	
Proximal Anchors	3.1 ± 1.5	6.7 ± 1.3	<0.001
Cobb Correction	24.2 ± 20.5	55.5 ± 12.7	<0.001
Device Migration	8/63 (13%)	0/10 (0%)	0.234



The more proximal anchors, the greater Cobb correction and less device migration

Conclusions

- **At first glance,**
- **No difference** in curve correction, change in EOSQ-24 score between rib-based and spine-based patients
- **Higher rates of proximal migration** in rib based group but,



Conclusions: GR to GR

- **Excluding VEPTR...**
- Comparing rib based GR vs spine based GR, rib based GR have more anchors, better curve correction and no migration
- Having **5 or more proximal anchors** was protective against proximal device migration

Next Steps?

- Continue enrollment in order to stratify for proximal implant number
- Incorporate MAGEC
- Longer term f/u



Thank You

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