Proximal Junctional Kyphosis in Distraction-Based Growing Rods

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Disclosures

- David Skaggs — Medtronic (b,d); Stryker (b,d)
- Christopher Lee — None
- Karen Myung — None

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c. Stock/Shareholder
d. Speakers' Bureau
e. Other Financial Support

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Purpose

- We examine the rate of proximal junctional kyphosis in distraction-based growing rods.

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Complications in Distraction-Based Growing Rods

TABLE II Complications for All Patients and Single and Dual-Growing-Rod Groups

	Total	Single Growing Rod	Dual Growing Rods	P Value*
Total no. of complications	177	94	83	NS
No. of patients with a minimum of one complication	81	43	38	NS
No. of complications per patient†	1.2 (0-7)	1.3 (0-7)	1.2 (0-7)	NS
Complication rate per surgical procedure (%)	20	21	18	NS
Wound complications†	23/30 (0-4)	8/9 (0-2)	15/21 (0-4)	NS
Infections§				
Superficial	6/6	0/0	6/6	≤0.05
Deep	14/15	6/6	8/9	NS
Other wound problems§	11/13	3/4	8/9	NS
Unplanned surgery due to wound problems#	16/29 (0-4)	7/10 (0-3)	9/19 (0-4)	NS
Implant complications†	63/106 (0-6)	34/64 (0-6)	29/42 (0-4)	NS
Hook dislodgement§	30/37	21/27	9/10	≤0.05
Screw dislodgement§	3/5	0/0	3/5	NS
Rod fracture§	34/52	16/30	18/22	NS
Prominent implants§	6/6	2/2	4/4	NS
Other implant problems§	4/5	2/3	2/2	NS
Unplanned surgery due to implant problems#	26/39 (0-3)	19/29 (0-3)	7/10 (0-3)	≤0.05
Alignment complications§	10/11	4/4	6/7	NS
Junctional kyphosis§	3/3	1/1	2/2	NS
Curve decompensation§	3/4	0/0	3/4	NS
Other alignment problems§	3/3	3/3	0	NS
Unplanned surgery due to alignment problems#	5/6 (0-2)	3/3 (0-1)	2/3 (0-2)	NS
Neurological complications	4	1	3	NS
Surgical or medical complications†	17/22 (0-3)	11/15 (0-2)	6/7 (0-3)	NS
Pulmonary problems§	10/10	8/8	2/2	NS
Dural tear§	4/4	3/3	1/1	NS
Other (gastrointestinal, hematoma, estimated operative blood loss of >500 mL)§	8/8	4/4	4/4	NS

*NS = not significant. P values of ≤0.05 indicate a significant difference between the single and dual-rod groups. †The values are given as: mean (range). ‡The values are given as: number of patients/number of complications (range). §The values are given as: number of patients/number of complications. #The values are given as: number of patients/number of surgical procedures (range).

- Complications per patient as high as 2.2
- Junctional kyphosis present in 3/177 patients (2%)

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Bess *et. al*, *JBJS* 2010

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Methods

- Retrospective review of 32 consecutive patients at a single institution
- Primary Cobb angle 89º (range, 51º-128º)
- Mean Kyphosis 57º (20º-104º)
- Diagnosis – Congenital, IIS, Other
- Mean age at index procedure 4.4 years (range, 1-10)

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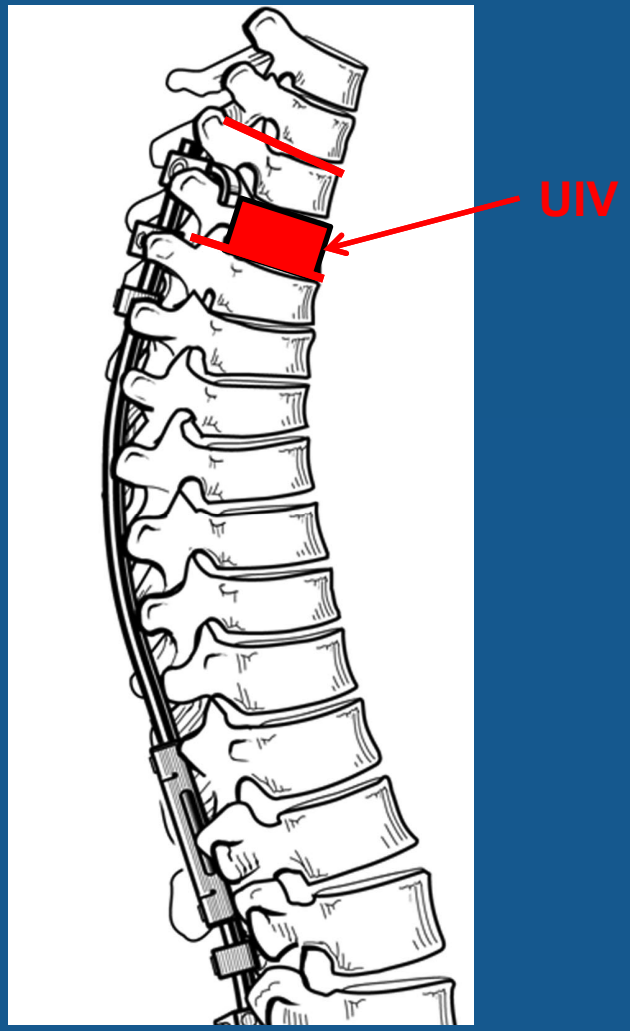
Definition of PJK

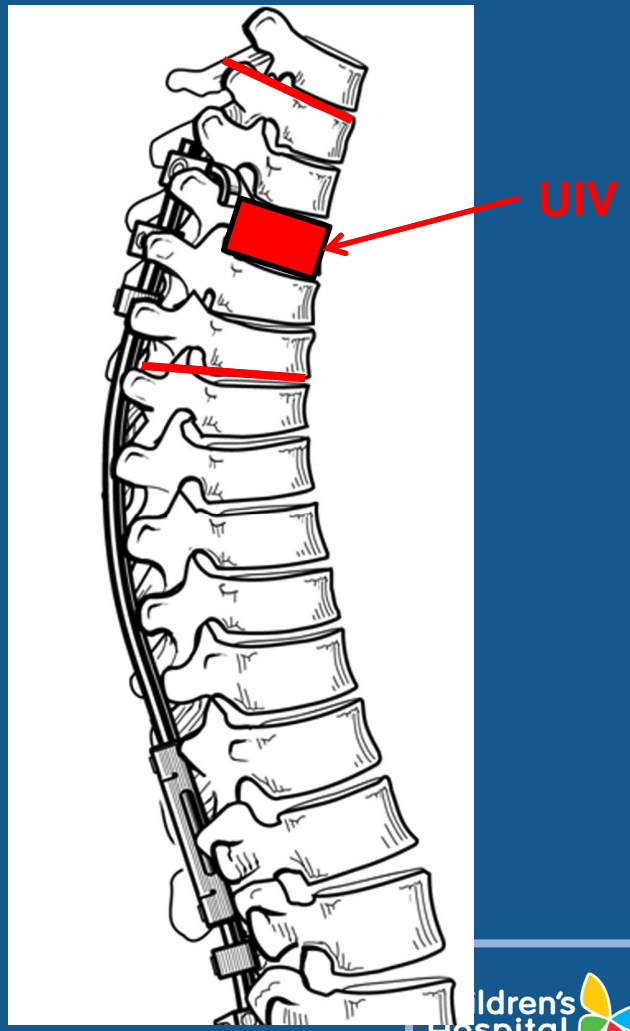
PJK was defined as fulfilling 2 criteria:

- An angle ≥10º between:
  - the endplates of the vertebrae 2 levels cephalad to the UIV and
  - the vertebrae 2 levels caudal to the UIV

- This angle must be at least 10º greater than preoperative values.

GSSG Method vs. CHLA Method





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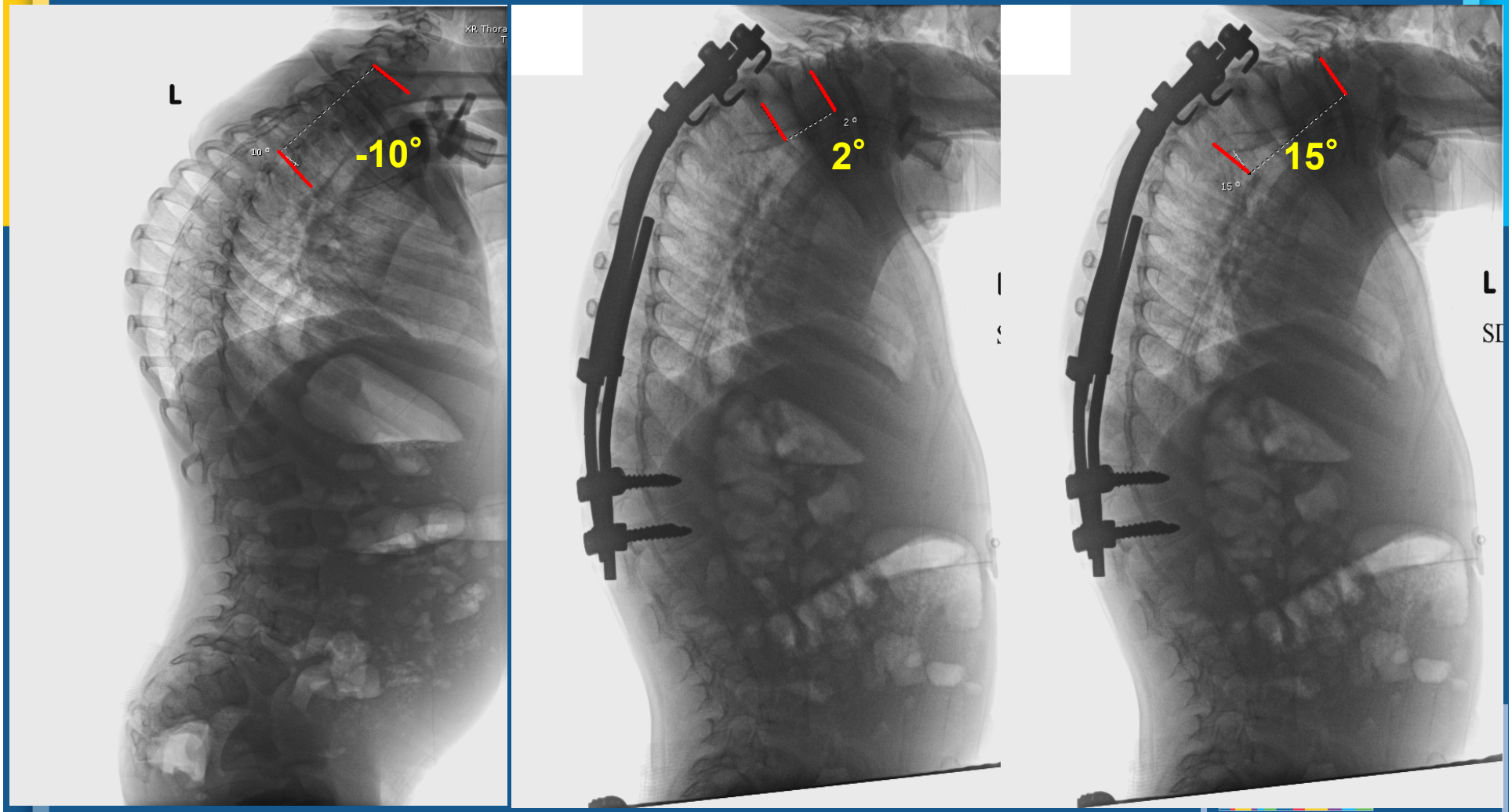
Comparison of Methods

Pre-Op

GSSG Method

New Method



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Results

- 18/32 patients (56%) developed PJK
- 3/4 patients that underwent final fusion had included levels cephalad to original growing rod construct

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Results

- 10/16 (62%) with dual rods vs. 5/13 (38%) with single rods developed PJK (p=0.36)
- 10/17 patients (59%) with spine-to-spine constructs vs. 5/12 patients (42%) with hybrid constructs developed PJK (p=0.59)

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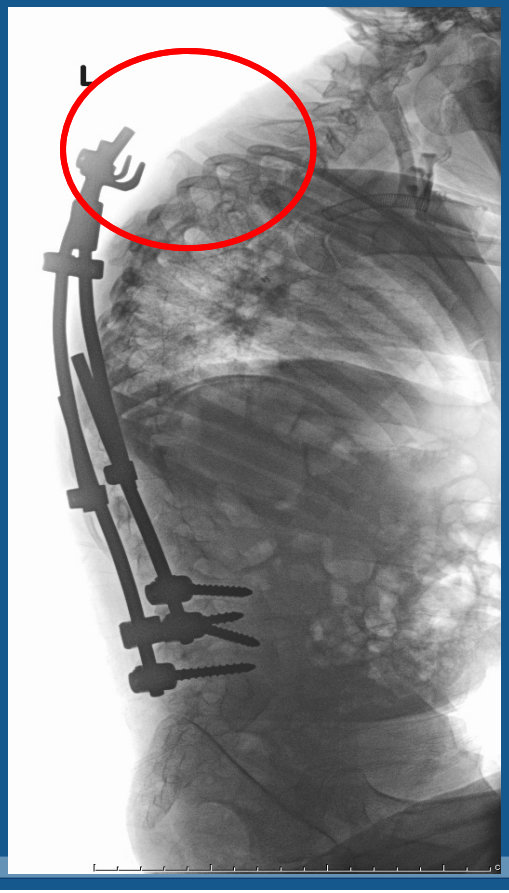
Complications

- 8/18 patients (44%) with PJK had upper anchor failure
  - 7 required unplanned operations to revise
- 5/14 patients (36%) without PJK had upper anchor failure
- Not statistically significant (p=0.89)



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Discussion

- Increased preoperative thoracic hyperkyphosis and more rigid fixation risk factors for development of PJK
- Clinical implication of PJK in patients with growing rods could be addition of cephalad levels of instrumentation at final fusion
- Further studies needed to compare methods and examine clinical implications

Comparison of Incidence

Study	Number of Patients	Incidence of PJK	Upper Implant Complications
Bess *et al.*	81	4, 2%	36, 44%
Sankar *et al.*	36	N/A	33, 92%
Akbarnia *et al.*	23	1, 4%	3, 13%
Thompson *et al.*	28	N/A	4, 14%
Lee *et al.*	32	18, 56%	30, 94%

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Lee *et al.*	32	18, 56%	30, 94%

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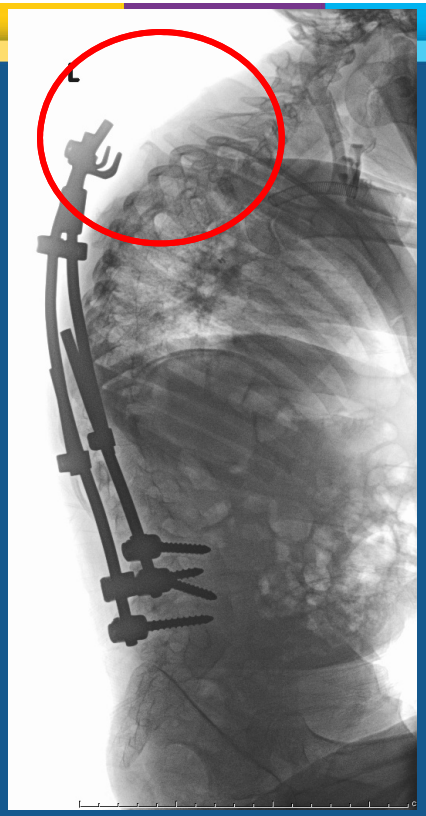
- ***18/32 (56%) with PJK***
  - Almost 2x as common with dual rods

…3/4 patients that underwent final fusion had included levels cephalad to initial growing rod constructs



Take Home Lesson:

PJK occurs in more than half of children treated with distraction-based growing rods

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THANK YOU


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