

Magnetically Controlled Growing Rods: Sagittal Plane Analysis and the Risk of Proximal Junctional Kyphosis

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Disclosures

- Purnendu Gupta
 - DePuy, A Johnson & Johnson Company: Consultant
- Felix Brassard
 - Nothing to disclose
- Jennifer Schottler
 - Nothing to disclose
- Alicia January
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- Kevin Morash
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Introduction

- Early onset scoliosis
 - Remains a challenging problem
 - Infantile casting
 - Bracing
 - Traditional growing rods
 - Goals
 - Preserve trunk height and chest/lung volume
 - Concern for multiple general anaesthetics in early childhood
- Magnetically Controlled Growing Rods (MCGR)
 - Potential benefit of decreasing anaesthesia/surgical procedures
 - Challenges in sagittal contouring due to actuator geometry



Introduction/Methods

- Hypothesis:
 - MCGR insertion may have increased risk of proximal junctional kyphosis (PJK) due to actuator geometry
 - PJK (Proximal junctional angle (PJA) ≥ 10 degrees and PJA > 10 degrees more than pre-operative measurement)
- Methods:
 - Multi-center, retrospective, CSSG registry data
 - Radiographic analysis pre-op, immediate post-op and 24 month follow up
- Inclusion/Exclusion:
 - MCGR insertion with minimum 24 month follow up



Results

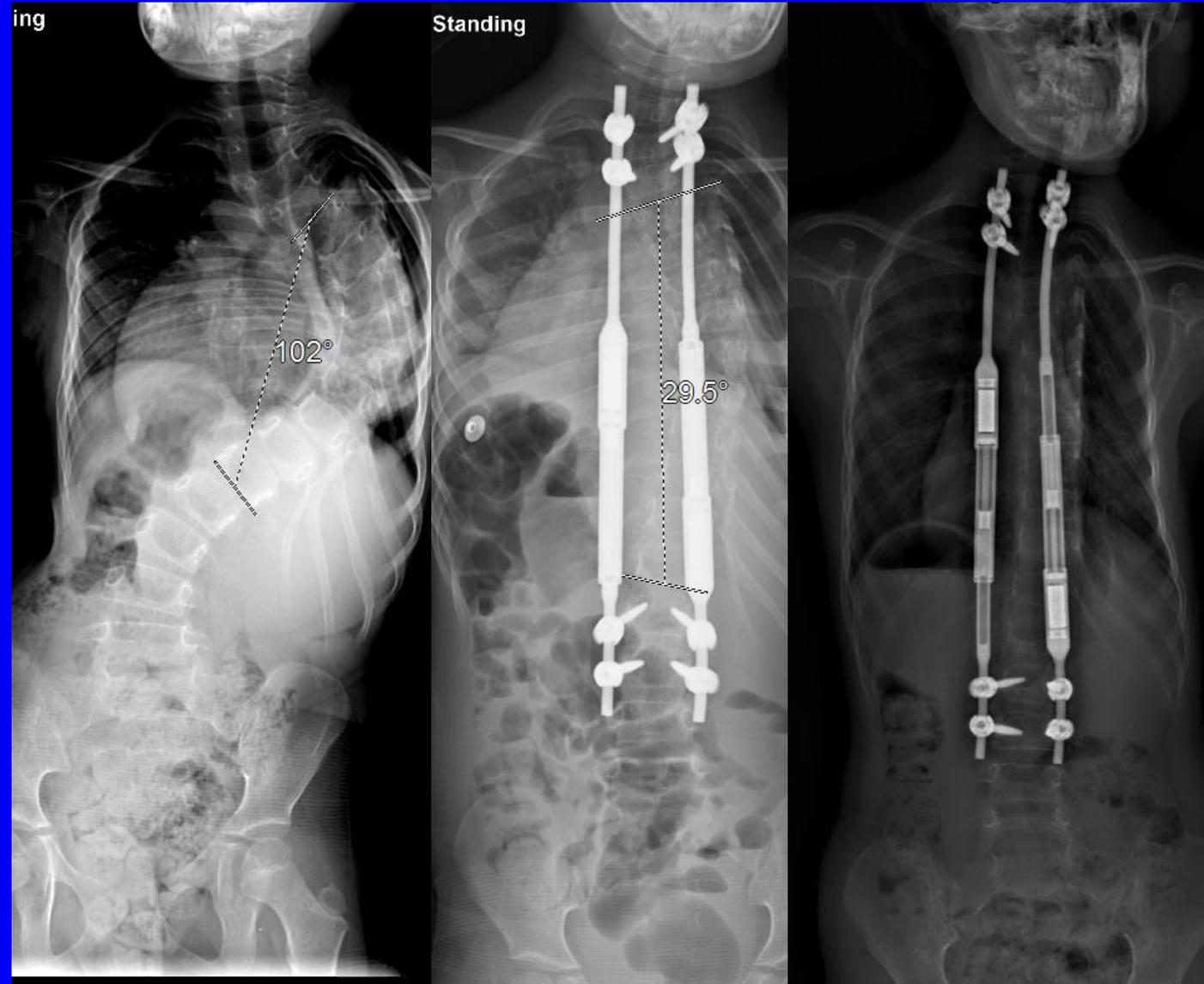
Data:

- N=67
- 34 (51%) male, 33 (49%) female
- 2-13 years of age
 - Idiopathic (n=28)
 - Neuromuscular (n=23)
 - Syndromic (n=10)
 - Congenital (n=6)
- M=7.4 (± 2.7) years at initial implantation
- Pre-op curves: (M= 70.5 \pm 18.7 degrees)
- 443 lengthenings (M = 6.6/patient)



Results

- **Cobb angle: Scoliosis improved significantly**
 - 70.5 ± 18.7 degrees pre-op to
 - 38.6 ± 15.0 immediate post-op ($p < .001$)
 - 43.9 ± 17.0 at 24-month follow-up ($p < .001$)



Results

Sagittal analysis data:

- No significant changes in thoracic kyphosis (TK) ($p=.113$)
 - Pre-op to Post-op (28.9 vs. 25.8, $p=.289$)
 - Pre-op to 24 months (28.9 vs. 32.1, $p=.278$)
- No significant changes in T1 slope ($p=.141$)
 - Pre-op to Post-op (19.9 vs. 23.9, $p=.048$)
 - Pre-op to 24 months (19.9 vs. 23.3, $p=.373$)



Results

- T1–T12 height : Significant increase
 - 17.4 cm \pm 3.2 pre-op to
 - 20.1 cm \pm 3.4 post-op (p<.001)
 - 21.2cm \pm 3.9 at 24-month follow-up (p<.001)
 - Post-op to 24-month follow up
 - 20.1 cm \pm 3.4 post-op to 21.2 cm \pm 3.9 at 24-month follow-up (p=.006)



• Complications

- 61 complications occurred in 39 (58%) of patients
 - 23 implant failures/device migration
 - 14 pain
 - 13 infections
 - 3 pulmonary
 - 2 bursa/bursitis
 - 1 neurologic injury
 - 5 other
- 2 participants accounted for 15% of the complications
 - One had 5 complications and the other had 4 complications

Results



- 45 unplanned return to OR
 - 23 implant failure/device migration
 - 16 infections*
 - 3 pain
 - 1 neurologic
 - 2 other

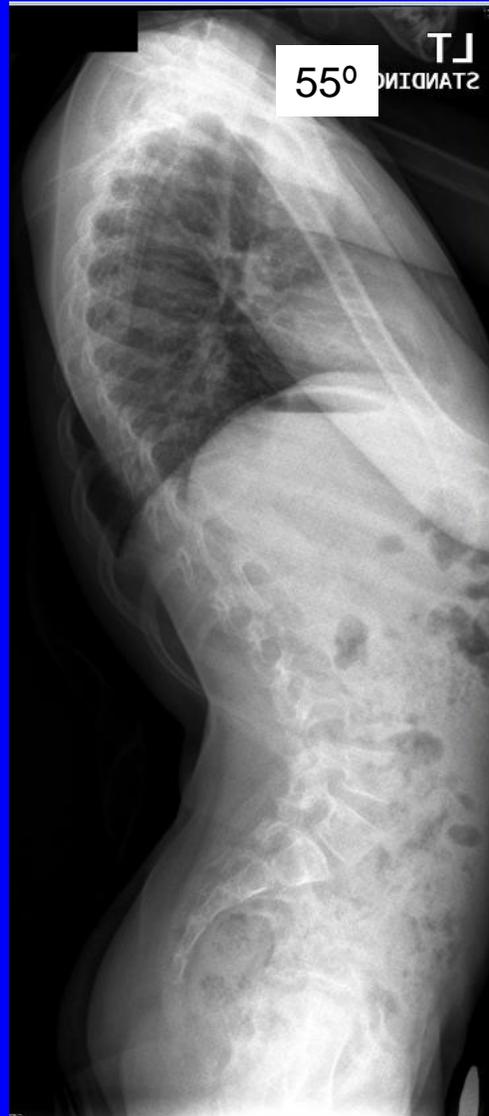
*Same infection required repeat surgical interventions



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- At 24-month evaluation, PJK developed in 4 of 33 (12%) patients

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April 2014



May 2016



Results

- 3 of 4 (75%) with PJK had pre-op max kyphosis $> 50^\circ$ (vs. 36% in those without PJK)
- 2 of 4 (50%) had a pre-op PI-LL mismatch >30 (vs. 19% in those without PJK)
- Patients with PJK had a higher average pre-op SVA than those who did not develop PJK (62mm. vs. 13mm.)
- Centroid of actuator slightly higher in those with PJK



Conclusions

- Significant improvement in scoliosis
- Significant increase in T1-T12 height and risk of proximal junctional kyphosis
- Further study needed on larger data set to understand if higher pre-op kyphosis, PI-LL mismatch, SVA or higher centroid of actuator are risk factors for PJK which may impact patient selection and technique for MCGR



Thank you