

# ***Does rod orientation and use of cross connector affect spinal height in magnetically controlled growing rod patients?***

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**International Congress on Early Onset Scoliosis (ICEOS); November 16 &17, 2017; San Diego, USA**



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# Disclosure

## Growing Spine Foundation funded the study

- **Behrooz A. Akbarnia** - Nuvasive, K2M, DePuy Synthes (a), Nuvasive, K2M (d), Nuvasive, K2M (f), Nuvasive, K2M (g), GSF, SDSF, SRS, SOLAS (h)
- **Charles E. Johnston** – Medtronic, Saunders/Mosby-Elsevier (a), OrthopedicsJournal of Childrens Orthopedics, POSNA, SRS (h)
- **Suken Shah** – DePuy (a,c,g), Globus (e), Ethicon (g), Innovative surgical designs (f), K2M (g,i), NuVasive, Stryker (d), POSNA, SRS, Setting Scoliosis Straight, AAOS (h)
- **John Emans** – DePuy/Synthes spine (a), DePuy/Synthes spine, Medtronic spine, Zimmer/Biomet (d)
- **Gregory M. Mundis** – DePuy, Johnson and Johnson (b), ISSGF (g), K2M (a,b,d), NuVasive (a,b,d,g)
- **Burt Yaszay** – AAOS (h), DePuy, Johnson & Johnson (b,d,g), Globus (b,d), Harms Study group (g), K2M (d, g), NuVasive (b,d), Orthopediatrics, K2M (a), POSNA, SRS, spine deformity (h), Stryker (b)
- **Peter F Sturm** – DePuy, Medtronic, Nuvasive (d), Biomet (e), Journal of Children's Orthopaedics, Scoliosis Research Society, POSNA (h)
- **Pooria Hosseini** – SRS, SOLAS (h)
  
- For the remaining authors none were declared.

(a) Royalties (b) Speakers bureau/paid presentations (c) Paid employee (d) Paid consultant (e) Unpaid consultant (f) Stock or stock options (g) Research support from a company or supplier as a PI (h) Board member/committee appointments for a society (i) Other financial or material support



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# Introduction

- Magnetically controlled growing rods (MCGR) are becoming the gold standard in surgical management for early onset scoliosis (EOS) patients.
- However, there are still **many unanswered questions** about the **most effective use** of this technique.



# Purpose

The purpose of this study was to investigate the **effect of rod orientation** and use of **cross connectors** on the spinal height gain in patients treated with MCGR.



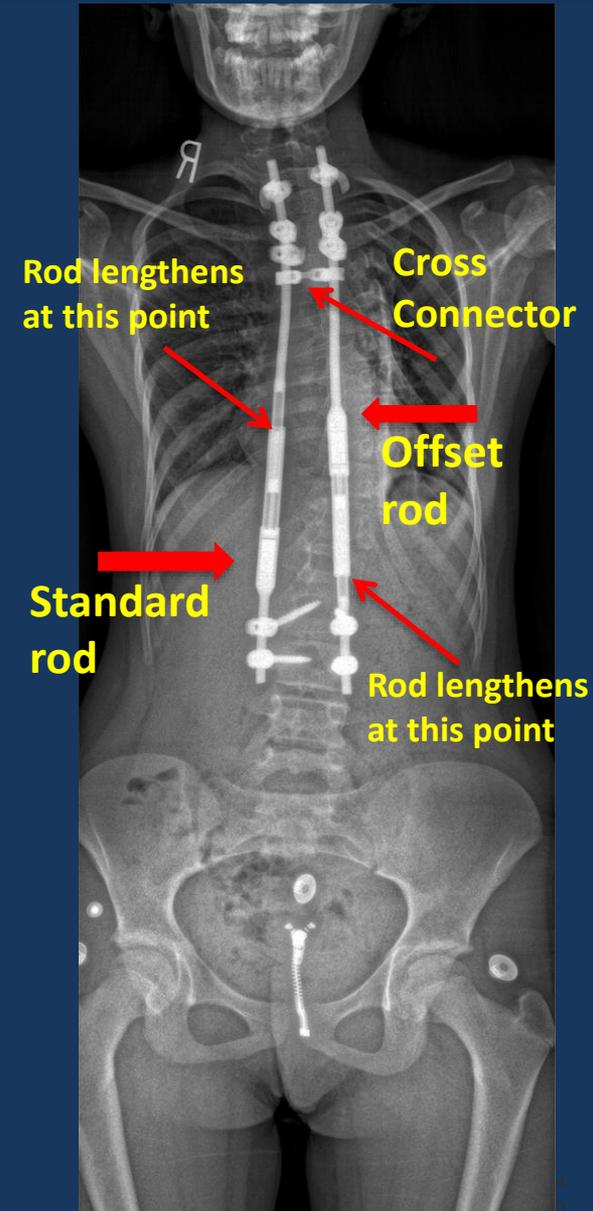
# Methods

- Retrospective study of multicenter EOS database.
- Inclusion criteria:
  - EOS patients with spine-based dual MCGR
  - Minimum 2-year follow up
  - Available imaging



# Methods

- The first analysis compared patients by rod orientation: standard (both rods in standard orientation) or offset rod (one rod in standard and the other in inverse orientation).
- The second analysis compared the use of cross connectors: yes (CC+) or no (CC-).
- The three outcome measures of interest included left and right rod height gain and percentage change for both T1-T12 and T1-S1 height.



# Results – Rod orientation

## Rod orientation analysis

- 40 patients were divided into standard (n=13) and offset (n=27) groups.
- At pre-operative time point there was no significant differences in
  - Age
  - Gender
  - BMI
  - Follow up
  - Ambulatory status
  - Etiology
  - Primary curve size
  - T1-S1 height
  - T1-T12 height
  - Number of distractions per year



# Rod orientation

The left and right rod length gain per year, T1-T12 and T1-S1 height percentage change was **similar** between groups ( $p > 0.5$ ).

## Rod Orientation Analysis (pre-operative)

	Standard	Offset	<i>p</i>
<b>N</b>	13	27	
<b>Age</b>	7.8 ± 1.4	7.6 ± 2.0	0.732
<b>BMI</b>	15.0 ± 2.5	16.4 ± 3.3	0.327
<b>Gender - Female</b>	6 (46.2%)	9 (33.3%)	0.433
<b>Follow-up (yrs)</b>	2.4 ± 0.5	2.4 ± 0.4	0.977
<b>Coronal Curve (°)</b>	77.3 ± 15.1	77.7 ± 18.8	0.938
<b>T1-S1 Height (mm)</b>	278.6 ± 41.0	270.0 ± 56.4	0.543
<b>T1-T12 Height (mm)</b>	169.2 ± 24.0	170.3 ± 38.4	0.849

## Rod Orientation Analysis, Outcomes

		Standard	Offset	<i>p</i>
<b>Rod Height Gain/Year (mm)</b>	<b>Left</b>	10.5 ± 4.1	9.9 ± 3.4	0.792
	<b>Right</b>	9.9 ± 4.4	10.4 ± 3.9	0.545
<b>T1-S1 % Height Change</b>		14.9 ± 15.3	12.8 ± 13.2	0.963
<b>T1-T12 % Height Change</b>		10.3 ± 14.1	10.3 ± 15.1	0.745



# Results – Cross connector

## Cross Connector

- In the cross connector analysis patients were grouped to CC+ (n=17) and CC- (n=23).
- The aforementioned parameters in rod orientation section were also similar between groups **except for number of distractions per year** (CC+ 3.7 vs. CC- 3.0 per year;  $p=0.008$ ).
- To control for this difference, all three height parameters were assessed based on **height gain per distraction**.



# Cross connector

Height gain per distraction **was not statistically different** between CC+ and CC- ( $P > 0.05$ ).

## Cross Connector Analysis (Pre-operative)

	CC-	CC+	<i>p</i>
N	23	17	
Age	7.5 ± 2.0	7.9 ± 1.5	0.329
BMI	16.0 ± 3.5	15.9 ± 2.7	0.589
Gender - Female	9 (39.1%)	6 (35.3%)	0.804
Follow-up (yrs)	2.4 ± 0.4	2.4 ± 0.5	0.829
Coronal Curve (°)	78.7 ± 17.0	75.9 ± 18.7	0.759
T1-S1 Height (mm)	269.3 ± 58.5	277.3 ± 42.0	0.511
T1-T12 Height (mm)	168.9 ± 39.5	171.8 ± 26.6	0.911
Distractions per year	3.0 ± 0.8	3.7 ± 1.2	0.008

## Cross connector Analysis, Outcomes

		CC-	CC+	<i>p</i>
Rod Height Gain/Year (mm)	Left	9.1 ± 3.0	11.4 ± 4.0	0.084
	Right	9.5 ± 3.8	11.2 ± 4.2	0.191
Rod Height Gain/Distracton (mm)	Left	3.2 ± 1.2	3.3 ± 1.3	0.827
	Right	3.3 ± 1.3	3.2 ± 1.3	0.759
T1-S1 % Height Change		11.1 ± 12.0	16.7 ± 15.5	0.529
T1-T12 % Height Change		9.6 14.7	11.3 14.9	0.849



# Conclusion

- Rod orientation and presence of cross connector **do not appear** to affect the rod, thoracic, and spinal height gain in EOS patients treated with MCGR.
- Future studies with **larger sample sizes** are required to confirm the findings.

