Growing Rod Treatment Improves Nutritional Condition of Patients with Early-onset Scoliosis

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PEKING UNION MEDICAL COLLEGE HOSPITAL

Xingye Li, Jianxiong Shen, Jianguo Zhang, Shugang Li, Hong Zhao, Yu Zhao, Youxi Lin

Peking Union Medical College Hospital, Beijing

Disclosure

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Authors:	Xingye Li	No Relationships
	Jianxiong Shen	No Relationships
	Jianguo Zhang	No Relationships
	Shugang Li	No Relationships
	Hong Zhao	No Relationships
	Yu Zhao	No Relationships
	Youxi Lin	No Relationships

Background

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- 47 % of EOS patients <5 percentile for weight
- In a status of malnutrition/ failing to thrive

--Myung, K. S.,et al. J Child Orthop, 8(3): 251-6, 2014.

Malnutrition in patients with EOS:

- Reduced food intake
- Lacking physical exercises
- Increased breathing work
- Psychological disorders

--Bowen, R.E. et al. J Pediatr Orthop, 28 (6): 665-8, 2008.

Growing rod is one of the effective treatments for EOS

--Akbarnia, B. A.; et al. Spine (Phila Pa 1976), 30(17 Suppl): S46-57, 2005.

--Thompson, G. H. et al. *J Pediatr Orthop, 27(3): 354-61, 2007.*

Hypothesis

Growing rod treatment improves nutritional status of EOS patients

Methods

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- Retrospective study involved 52 patients with EOS
- Growing rod implanted, and lengthened every 6 months
- Minimum follow-up 24 months
- Body weight measured at each admission

Methods

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- Evaluated nutritional status by Z-score
- Z-score calculated with weight-for-age formula
- Z-score: indicates standard deviation above or below median body weight of a certain age

Methods

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- Calculation based on weight-for-age SD curves, which indicates Gaussian distribution according to the reference curve established on national population consensus

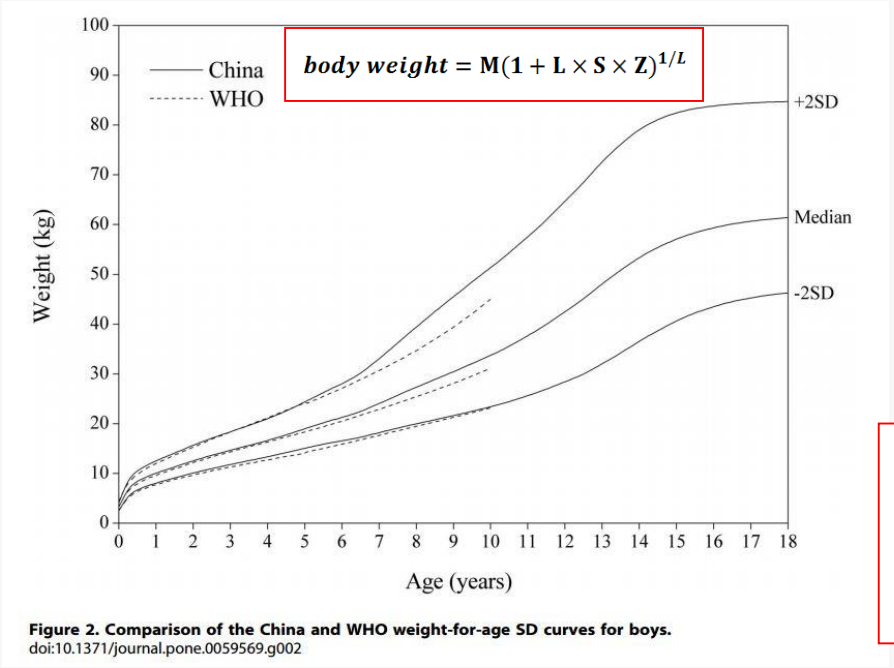

Figure 2. Comparison of the China and WHO weight-for-age SD curves for boys.
doi:10.1371/journal.pone.0059569.g002

Gender	Months	Weight for age			Height for age		
		L	M	S	L	M	S
1	81.5	1.197307	22.55702	0.145327	0.853577	120.4554	0.044241
1	82.5	1.210475	22.7593	0.145996	0.819756	120.9821	0.044295
1	83.5	1.223565	22.96273	0.146666	0.786246	121.5072	0.04435
1	84.5	1.236497	23.16742	0.147337	0.753244	122.0305	0.044403
1	85.5	1.249186	23.37343	0.148012	0.72094	122.552	0.044457
1	86.5	1.261555	23.58086	0.14869	0.689516	123.0714	0.044511
1	87.5	1.273524	23.78979	0.149374	0.659143	123.5886	0.044566
1	88.5	1.285014	24.00031	0.150065	0.629998	124.1035	0.044621
1	89.5	1.295952	24.21251	0.150764	0.602204	124.616	0.044678
1	90.5	1.306268	24.42648	0.151472	0.575908	125.1259	0.044736
1	91.5	1.315898	24.64231	0.15219	0.551231	125.6331	0.044795

$$Z = \frac{\left(\frac{body\ weight}{M}\right)^{L} - 1}{L \times S}$$

Z: corresponding to the required centile

L: the skewness of the dataset

M: the median

S: the coefficient of variation

--Zong et al. 10.1371/journal.pone.0059569.

Results

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- 34 females and 18 males
- Mean age 6.9 years at inclusion
- Median follow-up 35 months
- Pre-op: average body weight 19.9kg, Z-score -0.94

	Mean ± SD
Age (yr)	6.9 ± 2.5
Height (cm)	110.0 ± 16.1
Weight (kg)	19.9 ± 6.6
Z-score	-0.94 ± 1.30
F/U(mon)	35.3 ± 9.6

Etiology	N
Congenital	33(63.5%)
Neuromuscular	8(15.4%)
Neurofibromatosis	6(11.5%)
Idiopathic	3(5.8%)
Others	2(3.8%)
All	52

Results

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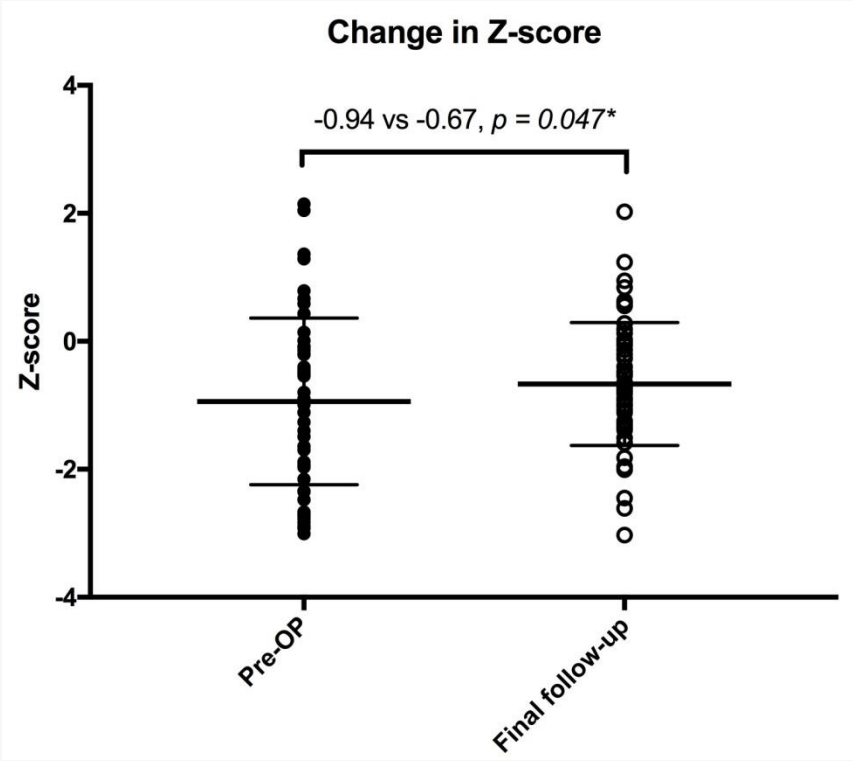
- For all patients
- Significant increase in Z-score (-0.94 pre-op vs. -0.67 final f/u, $p<0.05$)



Results

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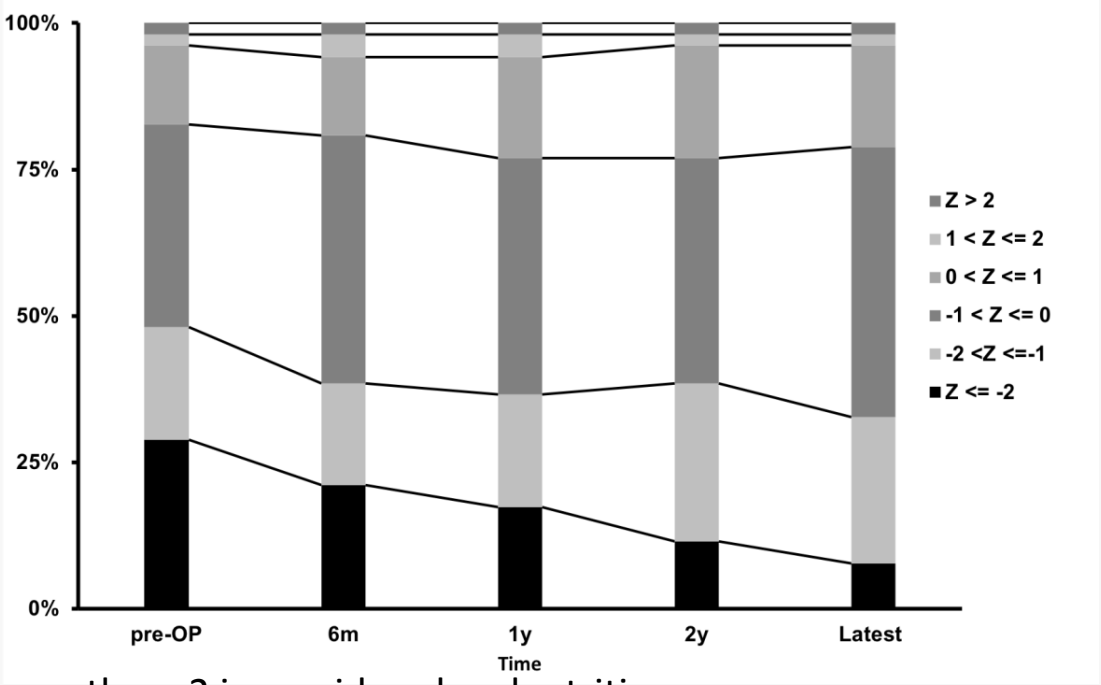
- **Number of Patients with Z<-2**:

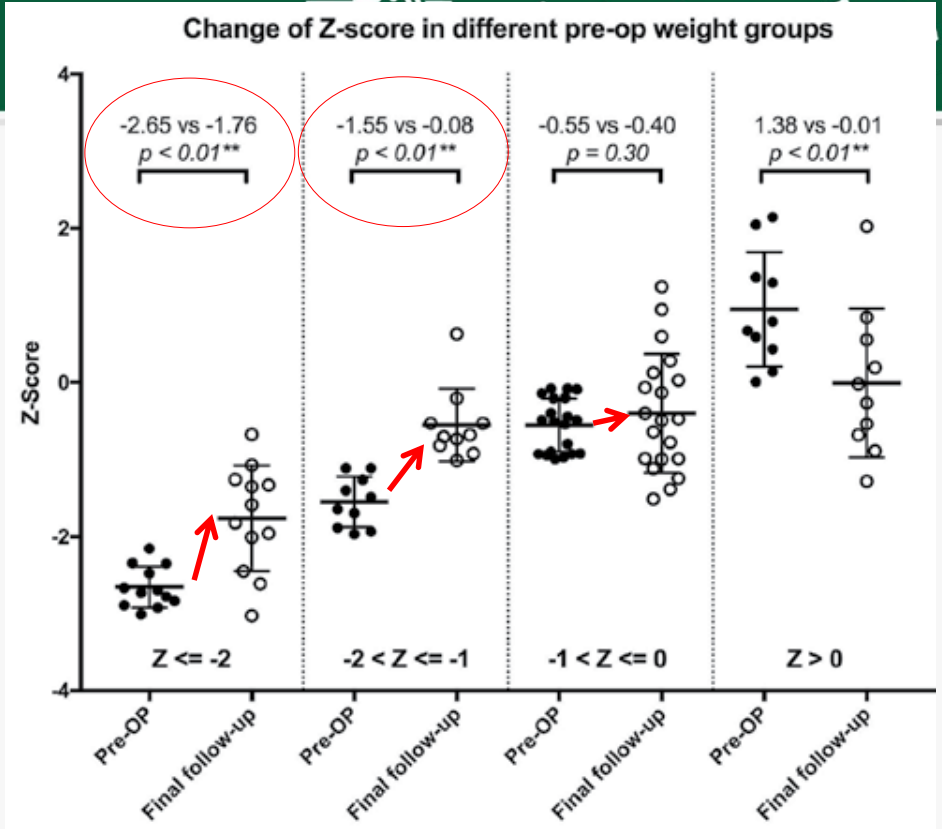
Pre-op	15 (28.9%)
6 months	11 (21.1%)
1 year	9 (17.3%)
2 years	6 (11.5%)
Final f/u	4 (7.7%)



- According to WHO standards, Z-score lower than -2 is considered malnutrition.
- **The ratio of malnutrition in EOS patients decreased from 28.9% pre-op to 7.7% at final f/u.**

Results

- Divided into 4 groups according to pre-op Z-score
- More significant increase in patients with low pre-op Z-score



Conclusions

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- Growing rod treatment improves nutritional status of EOS patients.

- Patients with lower body weight benefits more from growing rod treatment.