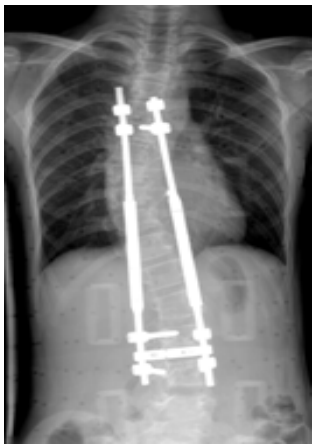
THE OXFORD AND EXETER EXPERIENCE OF A REMOTELY EXPANDABLE GROWING ROD DEVICE FOR NON-INVASIVE LENGTHENING IN EOS USING THE TAIL GATING PRINCIPLE



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Introduction

- A magnetic remotely controlled growing rod system has been used as a new treatment option for EOS
- Single or dual growing rod systems requiring multiple anaesthetic episodes remain the convention
- Case indication for new system not fully established
- EOS due to multiple aetiologies treated
- We present our early results

Aims

•To evaluate the following:

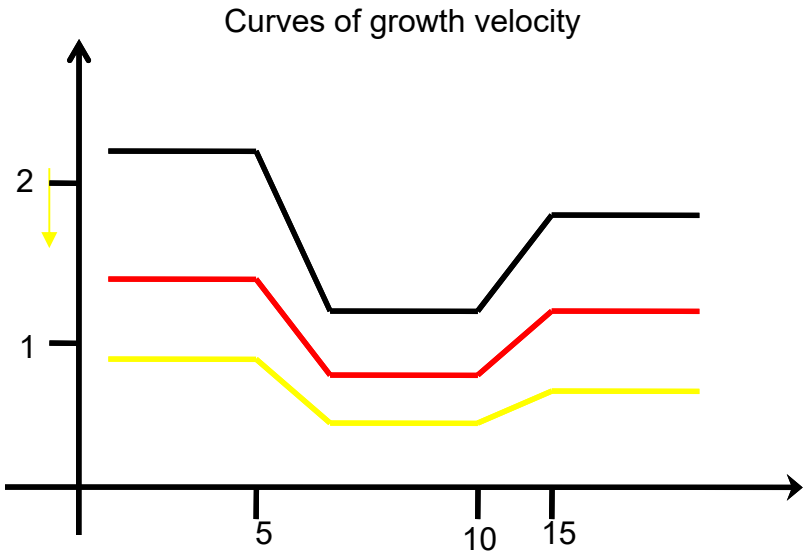
- Cobb Angle correction and sustainability of correction
- Set distraction vs. Actual distraction
- Growth (Height and Weight)
- Complications
- VAS scores (Parent Vs child) post-op
- Ease of handling of device

Method

- Magec rods inserted under GA (2 mini open incisions)
- 4 screws proximal & distal (distal hooks in 1 pt)
- Sub-muscular rod placement
- 3 monthly distractions at 4mm per distraction.
- Fluoroscopy alternating with x-ray) at 3 monthly intervals.
- Pre-op sitting/standing + weight + cobb angle
- Post-op sitting/standing + weight + cobb angle 6 monthly

- 14 pts (9 M/3 F)
- All had surgery for EOS
- 7 primary 7 conversions
- Average age of 5.6 years
- 7 distraction x 2
- 3 distraction x 3

ANNUAL GROWTH VELOCITY T1 - L5
(Dimeglio)



Birth – 5 yrs	2.2cm	20kg
5 – 10 yrs	1.1cm	30kg
10 yrs – Puberty	1.8cm	>30kg

- ‘Maximum’ distraction with conventional GR
- ‘Law of diminishing returns’
  Skaggs et al Spine 2011
- ‘Tail-gating’ concept to shadow growth
- Spine in EOS does have growth potential
- Magec rods allow for controlled distraction
- Apply knowledge of expected growth
- Less force on construct = less risk of failure
- ‘Scientific approach’

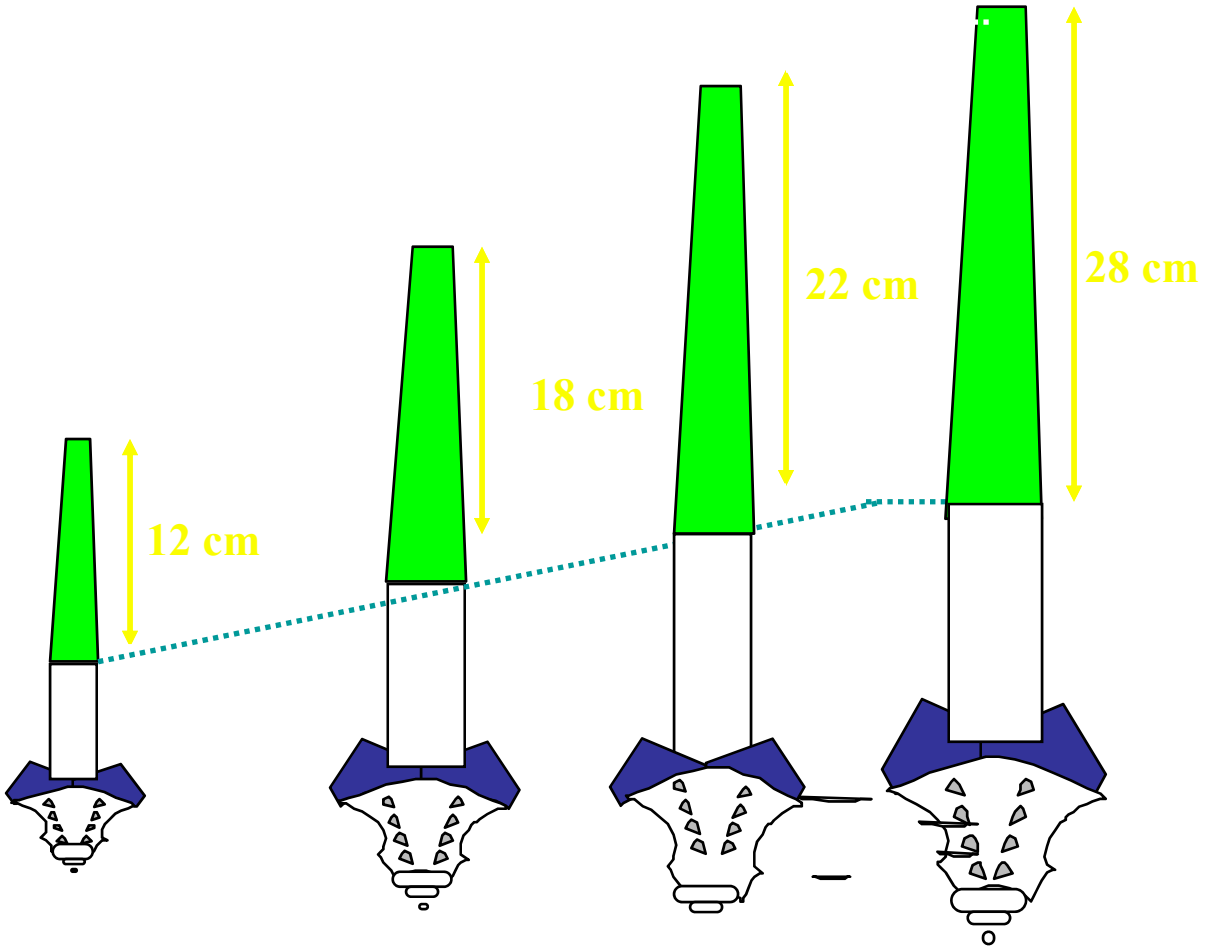
Diagnosis	Age	Sex	Levels instrumented	Length of follow up	complications
Central core disease	6	M	T4/5-L3/S1	10 months	
Central core disease	6	M	T3/4-L2/3	10 months	
Idiopathic	3	M	T4/5-L3/4	9 months	Hook displacement
VACTER syndrome	4	M	T1/2-L5/S1	9 months	
Prader Willi syndrome	6	M	T4/T5-L3/L4	6 months	
Sticklers syndrome	3	F	T3/4-Pelvis	3 months	Rod breakage
Smith Lemli Opitz syndrome	6	M	T3-5-L4/5	3 months	
Osteogenesis imperfecta	2	M	T3/T4-L3/L4	6 months	
Phocomelia syndrome	3	M	T4/T5-L3/L4	6 months	
Charge syndrome	6	M	T4/T5-L4/L5	3 months	
Chromosome 17 duplication	9	F	T3/4-L4/5	2 months	
NF type I	9	F	T4/T5-T12/L1	3 months	
Idiopathic	9	F	T3/T4-T11/12	3 months	
Idiopathic	7	M	T3/T4-L2/3	3 months	

Growth

Spinal length	Post-op	6 month follow up
T1 –T12	140 mm	134 mm
T1-S1	264 mm	259 mm

Growth	Pre-op	6 month follow up
Standing height	91.3 cm	96.6 cm
Sitting height	41.6 cm	56.5 cm
Weight	14.3 Kg	17.0 Kg

Evolution of T1-T12 Segment



Courtesy of Alain Dimeglio

The growing spine, Springer Velarg 1990

PERCENTILE CHARTS

- All children have maintained there projected percentile growth on Mosely Chart.

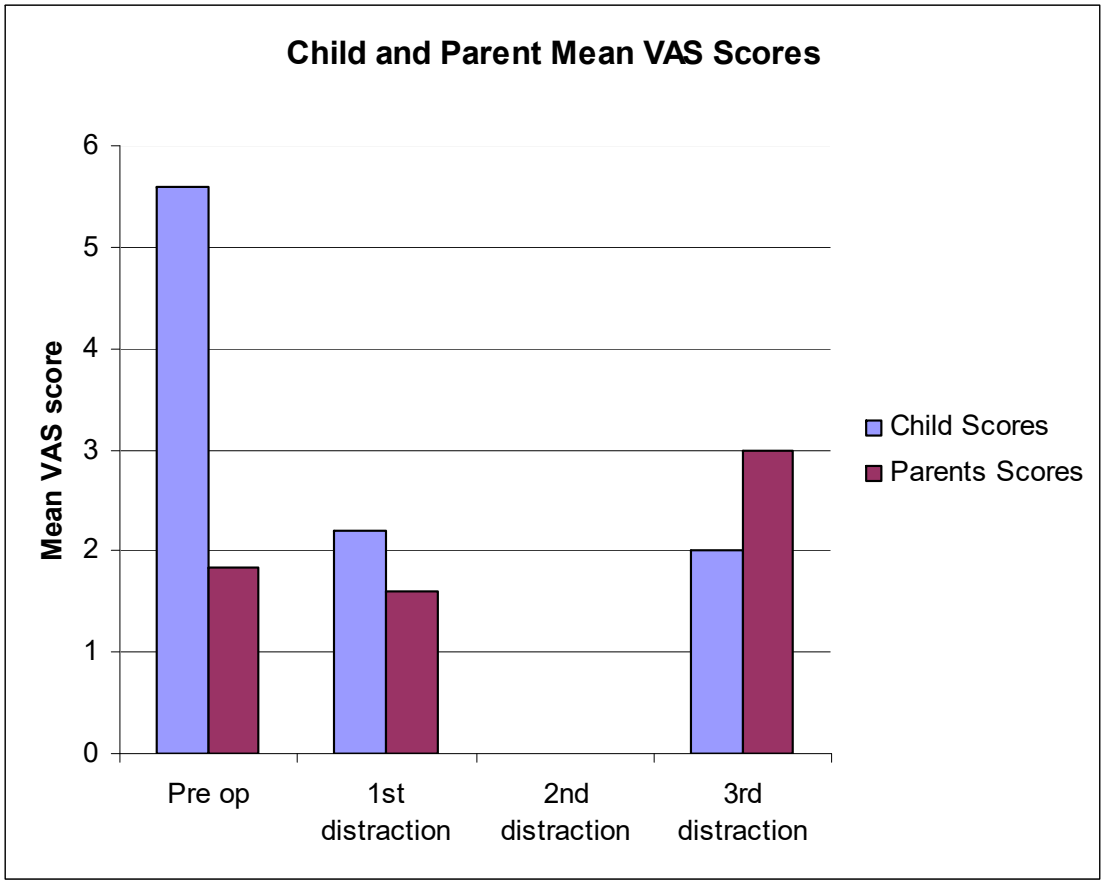
- One child has climbed 10 percentiles.

COMPARATORS

Average	Oxford	Noordeen 2012 SRS	Akbarnia 2012 SRS
Post-op cobb angle	40.6^0 (55.8^0)	46^0 (68^0)	35^0 (57^0)
Last follow up Cobb angle	38.3^0	41^0	35^0
Loss of correction	-	-	-
T1-S1 Length	259mm (264mm)	348mm (304mm)	2.35mm/month (DR)

Complications	Oxford/Exeter	Akbarnia SRS 2012	Noordeen SRS 2012
Infections	-	1/14	1/34
Implant related	2/14 (1 rod breakage, 1 hook pull out)	3/14 (loss of distraction)	4/34 (2 loss of distraction, 1 rod breakage, 1 hook pull out)

VAS scores


Child and Parent Mean VAS Scores
Mean VAS score
6
5
4
3
2
1
0
Pre op
1st distraction
2nd distraction
3rd distraction
Child Scores
Parents Scores

Results

- Average correction in Cobb angle of 20 degrees following surgery
- Average set distraction of 3.8mm (3-4mm) per Rod
- Average measured distraction 3.7mm (1.8-6.1mm) per Rod
- No difficulties with ease of use of the device

Conclusion

- Early results suggest good curve correction and sustainability of correction
- Set distraction not always proportionate to actual distraction
- Projected percentile growth maintained in all cases
- No infections
- No unexpected adverse events or safety issues
- Downward trend in VAS scores in children from baseline with increasing no of distractions
- Reversed trend in VAS scores in parents
- Easy handling