



UMC Utrecht

# **3 year follow-up of single magnetically controlled growing rod (MCGR) with contralateral gliding system and apical control for early onset scoliosis**

Sebastiaan PJ Wijdicks, Simon T Skov, Haisheng Li, René M Castelein RM,  
Moyo C Kruyt, Cody Bünger



# Magnetic controlled growth rod

- The use of magnetic controlled growing rods (MCGRs) in EOS is increasing worldwide
- MCGRs allow for noninvasive extensions with good growth maintenance
- Combining MCGR with a contralateral passive sliding construct could improve efficiency in terms of cost and 3D correction
- Collaboration: 9 patients from University Medical Center of Utrecht (the Netherlands) and 9 patients from Aarhus University Hospital (Denmark)



# Aim and design

- Aim  
to investigate the clinical effectiveness and safety of the MCGR hybrid
- Two center retrospective cohort study with inclusion of all consecutive patients from 2014 to 2016

## Inclusion

Primary and conversion cases  
Progressive Scoliosis  $>40^\circ$  and  
Skeletally immature before primary surgery

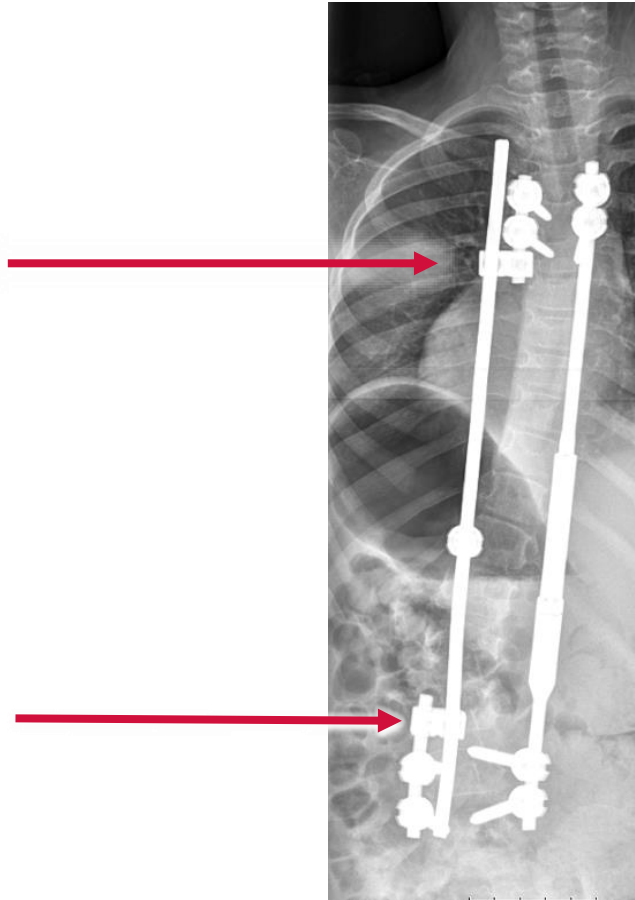
## Exclusion

$< 2$  year radiographic follow-up



# MCGR with sliding rod construct (n=9)

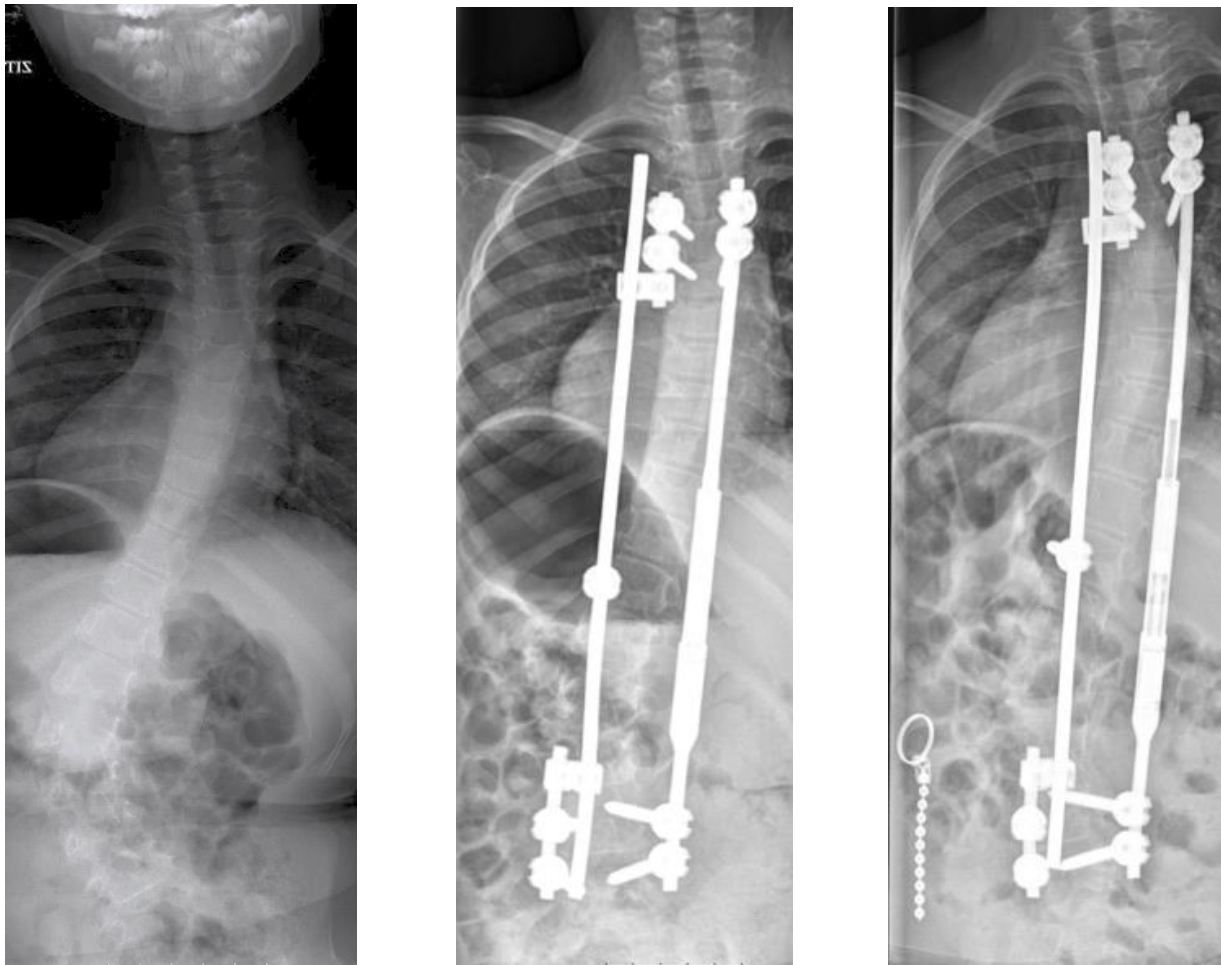
Parallel  
blocks  
with the  
oversized  
hole left  
open for  
passive  
sliding



Mean age at MCGR surgery: 8.0 (Range 6.4-9.3)  
Neuromuscular 4, Idiopathic 4, Syndromic 1



# MCGR with sliding rod construct (n=9)

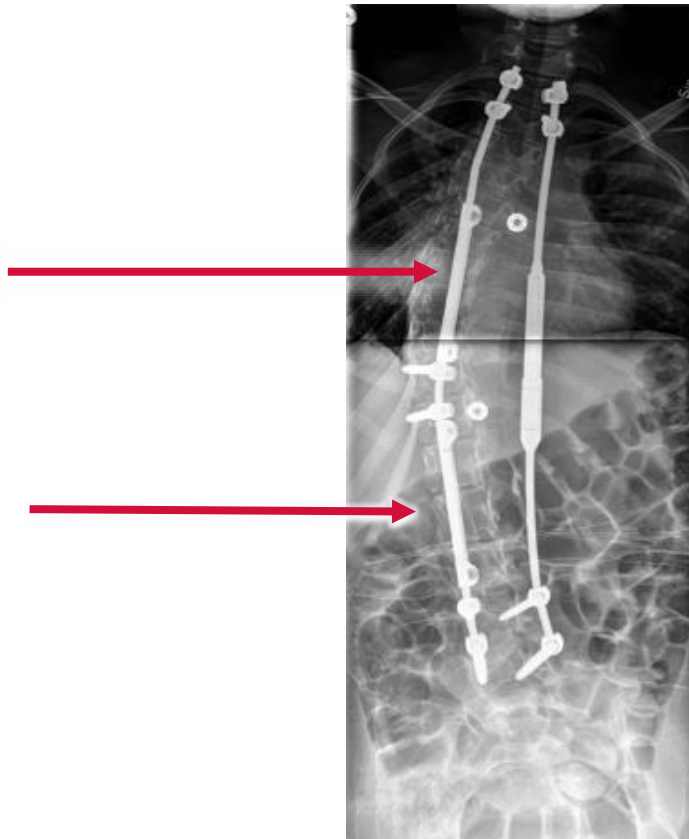


Mean age at MCGR surgery: 8.0  
Neuromuscular 4, Idiopathic 4, Syndromic 1



# MCGR with CB system (n=9)

CB system  
with  
longitudinal  
connectors  
and one side  
unlocked for  
passive  
sliding



Meand age at MCGR surgery: 11.7 (range 6.9-18.1\*)

Neuromuscular 5, Idiopathic 2, Syndromic 2

\* Skeletally immature, 5-7 years delayed according to hand bone-age.



# MCGR with CB system (n=8)



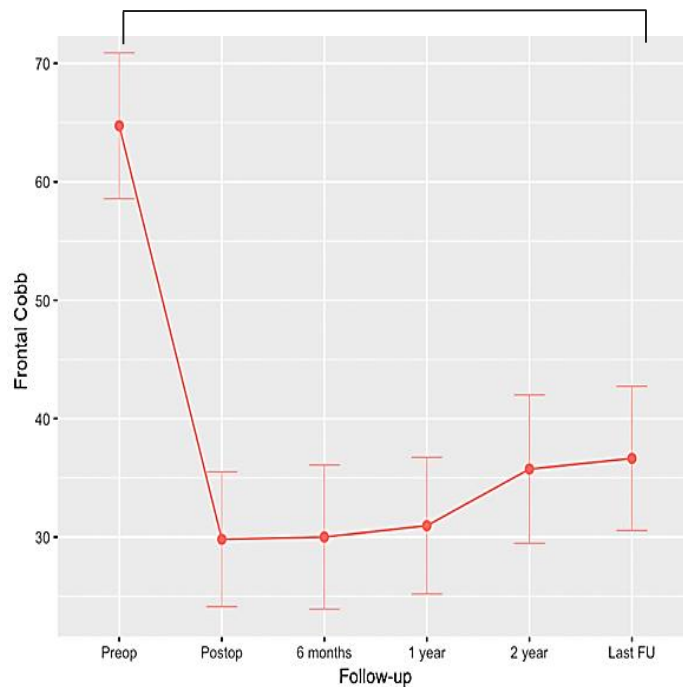
Mean age at MCGR surgery: 11.7  
Neuromuscular 5, Idiopathic 2, Syndromic 2



# Results

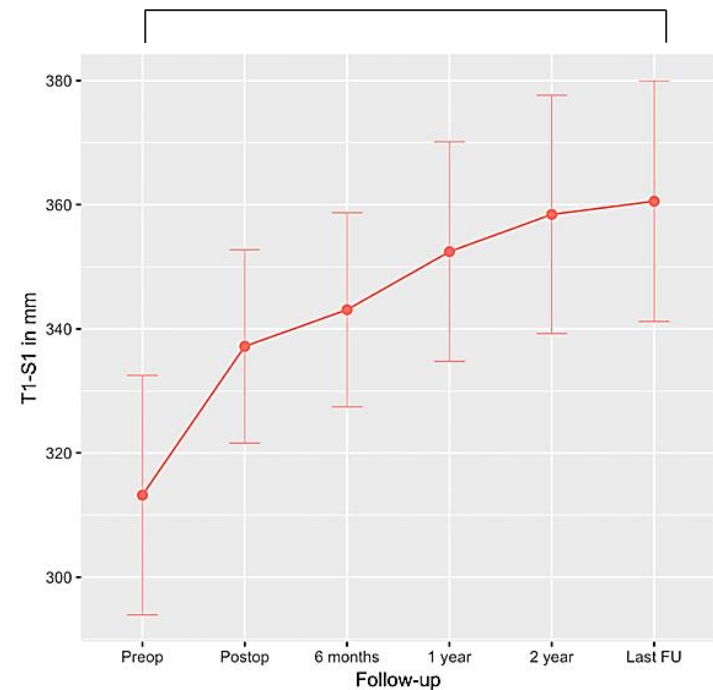
## Cobb angle over time

$P < 0.01$



## T1-S1 growth over time

$P < 0.01$



Points in graphs are means with 95% Confidence intervals  
P-values calculated with paired T-tests





# 3D correction

N=17	Pre-op	Post-op	Last FU
<b>Frontal Cobb</b>	65 ± 12*	30 ± 11	37 ± 12
<b>Rotation Nash-Moe</b>	27 ± 8	20 ± 9	23 ± 9
<b>Kyphosis T4-T12</b>	27 ± 19	20 ± 12	24 ± 17
<b>Lordosis L1-L5</b>	37 ± 17	34 ± 13	40 ± 13

Numbers are means with ± standard deviations

\*Immediate before magnetic rod implantation; Pre-primary growth instrumentation: 59±17°



# 3D correction

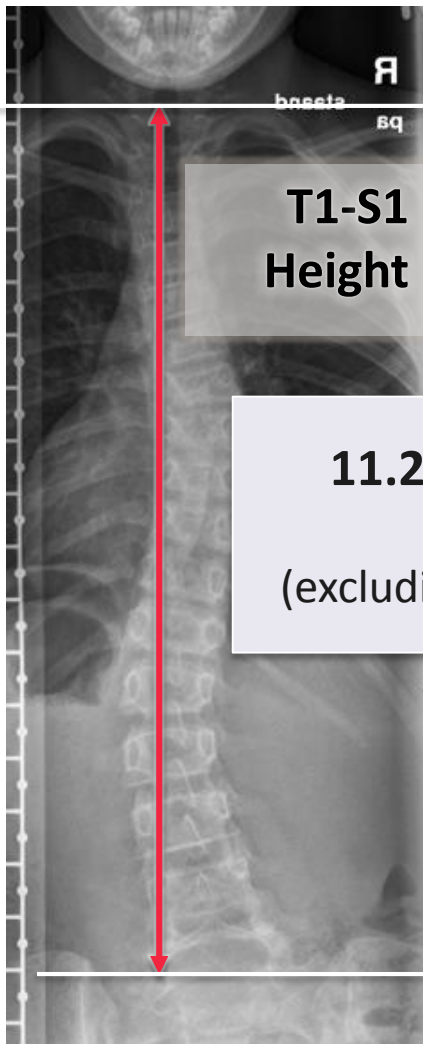
N=17	Pre-op	Post-op	Last FU
<b>Frontal Cobb</b>	65 ± 12*	<b>43 % reduction p&lt;0.01</b>	37 ± 12
<b>Rotation Nash-Moe</b>	27 ± 8	<b>15 % reduction n.s.</b>	23 ± 9
<b>Kyphosis T4-T12</b>	27 ± 19	20 ± 12	24 ± 17
<b>Lordosis L1-L5</b>	37 ± 17	34 ± 13	40 ± 13

Numbers are means with ± standard deviations

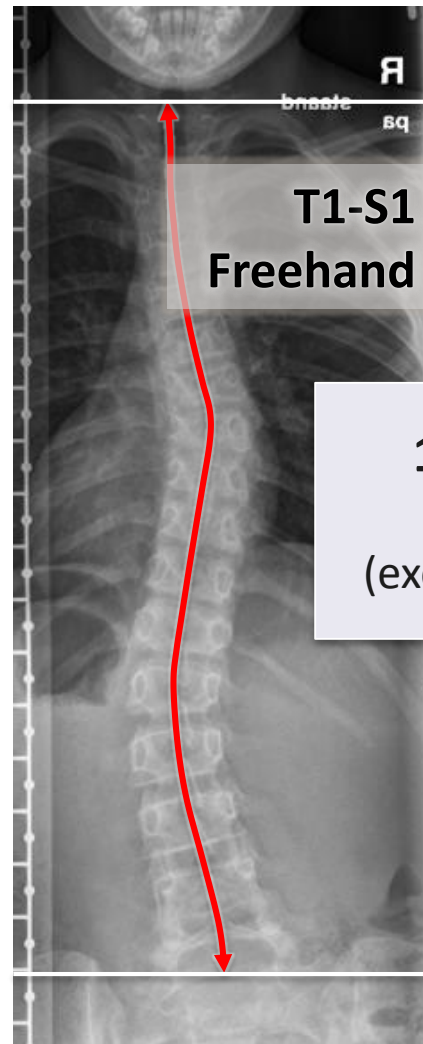
\*Immediate before magnetic rod implantation; Pre-primary growth instrumentation: 59±17°



# Adequate 2 year growth



**11.2 mm per year**  
SD  $\pm$  9.4  
(excluding initial surgery)



**10.8 mm per year**  
SD  $\pm$  11.5  
(excluding initial surgery)



# Balance unchanged after surgery

<b>N=18</b>	<b>Pre-op</b>	<b>Post-op</b>	<b>Last FU</b>
<b>Apical translation</b>	5.5 ± 2.7	2.7 ± 1.6	2.8 ± 1.6
<b>Coronal balance</b>	2.2 ± 1.4	1.9 ± 1.8	1.5 ± 1.6
<b>Sagittal balance</b>	4.0 ± 2.6	3.5 ± 2.5	3.3 ± 2.4

Numbers are means with ± standard deviations

\*Immediate before magnetic rod implantation; Pre-primary growth instrumentation: 64°±14°



# Complications

- 9 implant related complications in 6 out of 18 patients (33%)
- 5 surgical complications
  - 4 conversions to different growth friendly systems
  - 1 case of MCGR distraction failure (solved with distraction under general anesthesia)
- 4 non-surgical complications
  - failures of distractions
  - vertebral fracture in an OI patient above the implant
- No superficial or deep infections or other material failures (e.g. screw pull out) were experienced



# Conclusion

- Maintenance of correction and growth appears to be reasonable
- Few MCGR related complications and no infections were encountered
- This new concept may represent a significant gain in both cost-effectiveness of growth rod treatment and 3D correction in EOS

