UMC Utrecht

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

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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˚ and

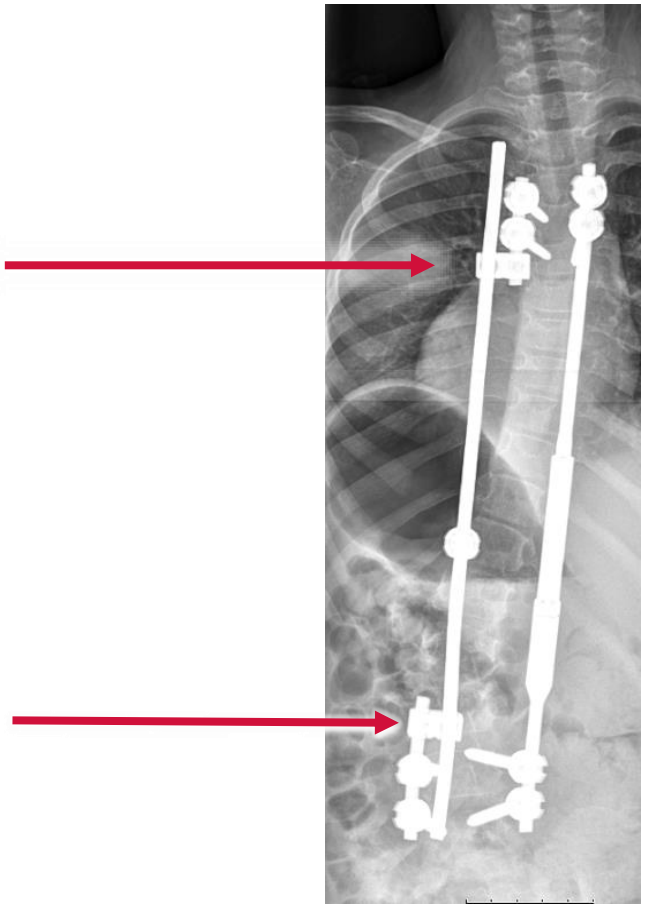
Skeletally immature before primary surgery

Exclusion

< 2 year radiographic follow-up

MCGR with sliding rod construct (n=9)

Parallel blocks with the oversized hole left open for passive sliding



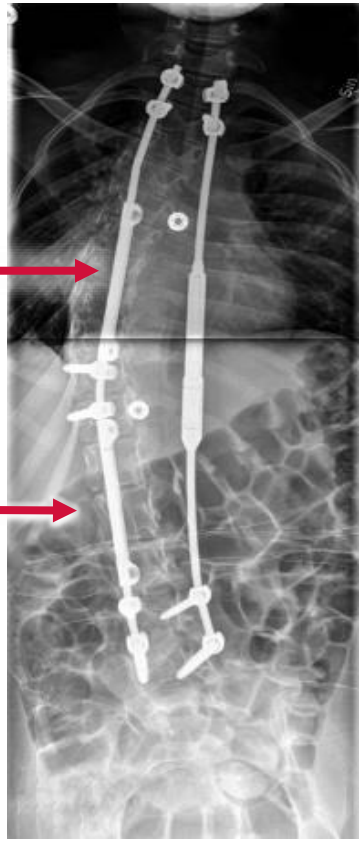
Mean age at MCGR surgery: 8.0 (Range 6.4-9.3)
Neuromuscular 4, Idiopathic 4, Syndromic 1

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.

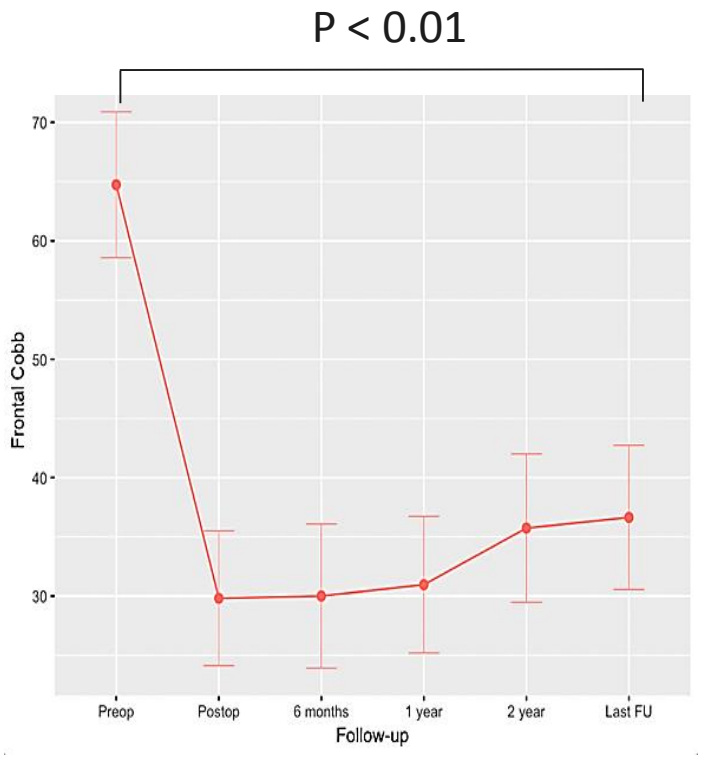
MCGR with CB system (n=8)

Mean age at MCGR surgery: 11.7

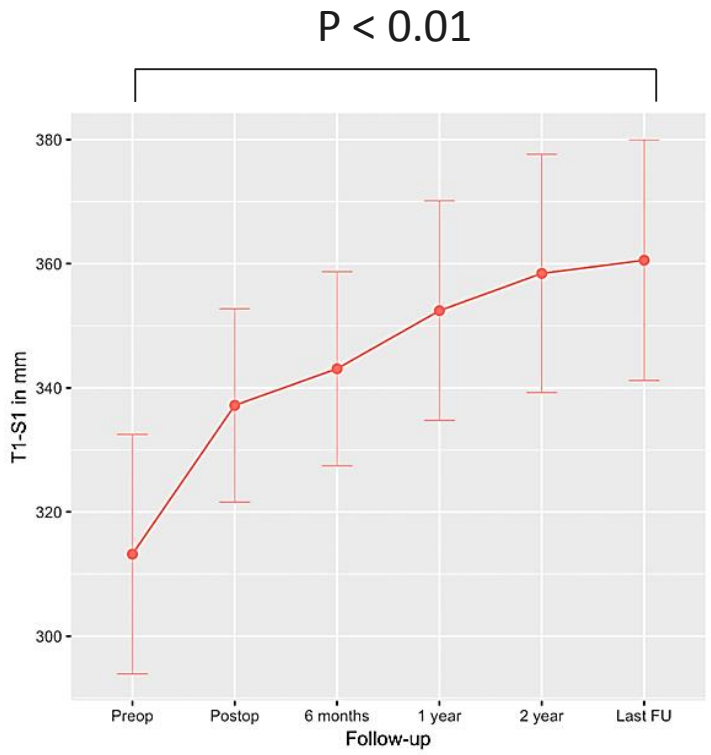
Neuromuscular 5, Idiopathic 2, Syndromic 2

Results

Cobb angle over time



T1-S1 growth over time



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
Frontal Cobb	65 ± 12*	30 ± 11	37 ± 12
Rotation Nash-Moe	27 ± 8	20 ± 9	23 ± 9
Kyphosis T4-T12	27 ± 19	20 ± 12	24 ± 17
Lordosis L1-L5	37 ± 17	34 ± 13	40 ± 13

Numbers are means with ± standard deviations

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

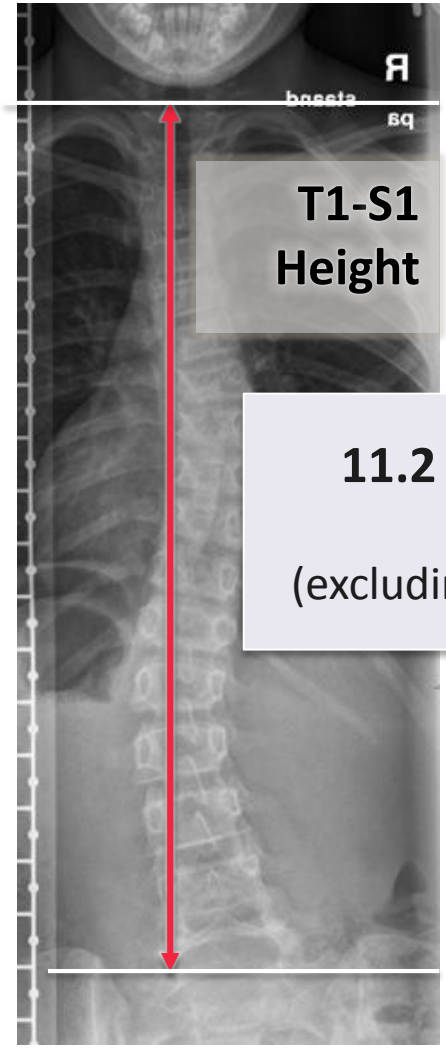
3D correction

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

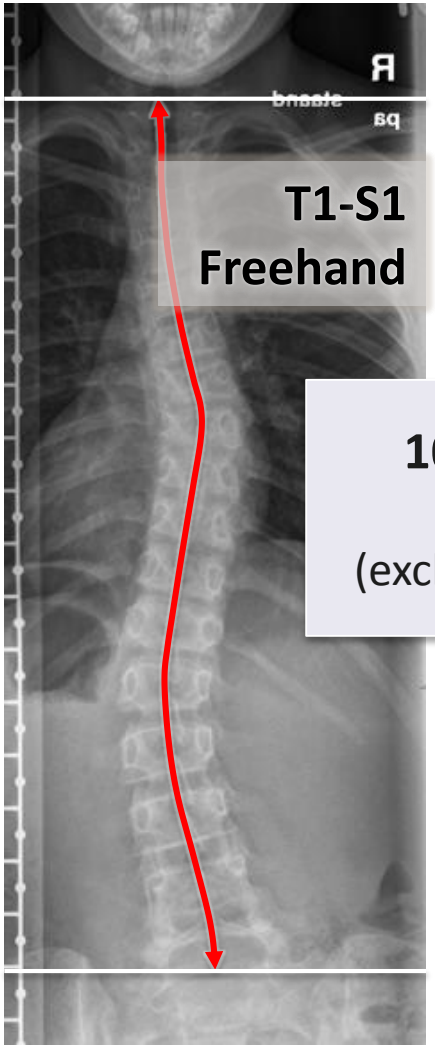
Numbers are means with ± standard deviations

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

Adequate 2 year growth



11.2 mm per year
SD ± 9.4
(excluding initial surgery)



10.8 mm per year
SD ± 11.5
(excluding initial surgery)

Balance unchanged after surgery

N=18	Pre-op	Post-op	Last FU
Apical translation	5.5 ± 2.7	2.7 ± 1.6	2.8 ± 1.6
Coronal balance	2.2 ± 1.4	1.9 ± 1.8	1.5 ± 1.6
Sagittal balance	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