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
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)

Parallel blocks with the oversized hole left open for passive sliding
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

**Mean 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

P < 0.01

Points in graphs are means with 95% Confidence intervals
P-values calculated with paired T-tests
## 3D correction

<table>
<thead>
<tr>
<th></th>
<th>N=17</th>
<th>Pre-op</th>
<th>Post-op</th>
<th>Last FU</th>
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</thead>
<tbody>
<tr>
<td>Frontal Cobb</td>
<td></td>
<td>65 ± 12*</td>
<td>30 ± 11</td>
<td>37 ± 12</td>
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<tr>
<td>Rotation Nash-Moe</td>
<td></td>
<td>27 ± 8</td>
<td>20 ± 9</td>
<td>23 ± 9</td>
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<tr>
<td>Kyphosis T4-T12</td>
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<td>27 ± 19</td>
<td>20 ± 12</td>
<td>24 ± 17</td>
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<tr>
<td>Lordosis L1-L5</td>
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<td>37 ± 17</td>
<td>34 ± 13</td>
<td>40 ± 13</td>
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Numbers are means with ± standard deviations

*Immediate before magnetic rod implantation; Pre-primary growth instrumentation: 59±17°
# 3D correction

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<td><strong>43 % reduction p&lt;0.01</strong></td>
<td>37 ± 12</td>
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<tr>
<td>Rotation Nash-Moe</td>
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<td><strong>15 % reduction n.s.</strong></td>
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*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

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<td>N=18</td>
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<tr>
<td>Apical translation</td>
<td>5.5 ± 2.7</td>
<td>2.7 ± 1.6</td>
<td>2.8 ± 1.6</td>
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<tr>
<td>Coronal balance</td>
<td>2.2 ± 1.4</td>
<td>1.9 ± 1.8</td>
<td>1.5 ± 1.6</td>
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<tr>
<td>Sagittal balance</td>
<td>4.0 ± 2.6</td>
<td>3.5 ± 2.5</td>
<td>3.3 ± 2.4</td>
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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