

# Traditional Growing Rods vs Magnetically Controlled Growing Rods in Patients with Idiopathic Early Onset Scoliosis at 5-year Follow-up

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**INTRODUCTION:** Distraction based spinal instrumentation represents the most common surgical treatment for idiopathic early onset scoliosis (EOS). Magnetically controlled growing rods (MCGRs) provide similar deformity correction and spinal height increase with less surgical procedures as traditional growing rods (TGRs). MCGRs have shown a reduction in the frequency of deep surgical site infection and unplanned revisions in patients with severe early onset scoliosis. We aimed to compare outcomes of MCGRs and TGRs for idiopathic EOS after five years of growth friendly treatment.

**METHODS:** An international multicenter database was queried to identify children with idiopathic early onset scoliosis (major curve >30 degrees, aged 9 years and younger), who underwent growth-friendly treatment using TGR or MCGR (minimum 3 distractions) with 5-year follow-up. Health-related quality of life was assessed using the Early Onset Scoliosis 24 questionnaire (EOSQ-24). All outcomes are reported at 5-year follow-up. A Poisson regression analysis was used to compare risk of complications during follow-up.

**RESULTS:** Thirty-eight children were treated with MCGRs and 62 with TGRs (mean age 6.4 years at index surgery for both groups). Number of lengthenings averaged  $16 \pm 11$  (SD) in the MCGR and  $5.9 \pm 2.3$  in the TGR group ( $p < 0.001$ ). Out of these patients, 20 (53%) in the MCGR group and 39 (63%) in the TGR group underwent final fusion during 5-yr FU. The mean  $\pm$  SD preoperative major coronal curve at initial surgery was  $67^\circ \pm 22^\circ$  in the MCGR group and  $78^\circ \pm 21^\circ$  in the TGR group ( $p = 0.024$ ). At the 5-year follow-up, mean major curves were  $40^\circ \pm 14^\circ$  and  $53^\circ \pm 19^\circ$  ( $p < 0.001$ ), respectively. Median (IQR) major curve correction was 44% (29%) in the MCGR and 32% (24%) in the TGR group at 5-year FU ( $p = 0.122$ ). The mean T1-T12 heights were 164 mm  $\pm$  26 mm and 161 mm  $\pm$  29 mm preoperatively ( $p = 0.662$ ) and 209 mm  $\pm$  31 mm and 229 mm  $\pm$  46 mm at the 5-year follow-up ( $p = 0.871$ ). Median (IQR) annual thoracic growth (T1-T12) was 3.5 mm (IQR 6.2) in the MCGR and 6.0 mm (IQR 5.3) in the TGR group during the growth-friendly management ( $p = 0.08$ ). In patients undergoing final fusion T1-T12 height was significantly higher in the MCGR (mean 259 mm) than in the TGR group (mean 229 mm,  $p = 0.003$ ). There were 39 complications in the MCGR group and 135 in the TGR group (RR 0.472, 95%CI 0.326–0.667), and 40 revisions in the MCGR group and 176 in the TGR group (RR 0.370, 95%CI 0.256–0.526) (Figure). In all, 22 patients in the MCGR and 40 patients in the TGR group underwent unplanned revisions (RR 0.909, 95%CI 0.526–1.493). The pulmonary function domain was lower in the MCGR group (mean 94) than in the TGR group (mean 100) at the 5-year follow-up ( $p = 0.024$ ), while there were no other significant differences in other EOSQ-24 domains between the study groups.

**DISCUSSION AND CONCLUSION:** The risk of complications and revision surgery are significantly lower in children operated using MCGR than TGR for idiopathic early onset scoliosis during 5-year follow-up. Thoracic height was significantly higher after final fusion in the MCGR than in the TGR group. Pulmonary function domain score was significantly lower in the MCGR group than in the TGR group.

