

Each implant was done with 2 rods sub-muscular tunnelled. Patients were lengthened at intervals of 3 months with distraction approximately of 3.5 mm (ultrasound monitoring). At every lengthening, they performed a spirometry. We matched data with a group of children affected by neuromuscular scoliosis (6 by SMA II and 2 by metabolic myopathy) in conservative treatment.

**Results:** All children showed at each timepoint a restrictive pulmonary pattern at spirometry. After implantation of MCGR, the pulmonary function stopped worsening: with lengthening following the protocol described, the forced vital capacity (FVC) (one-way ANOVA,  $p=0.42$ ) and the forced expiratory volume in the first second (FEV1) (one-way ANOVA,  $p=0.63$ ) did not further decrease. Comparing data between children treated with MCGR and control group, at the same age, we observed an higher FEV1 (age-class 3, 44% vs 24%,  $p=0.04$ ) and FVC in treated group (age-class 3, 43% vs 24%,  $p=0.04$ ) (Figure 1: black points MCGR group, red points control group). We also found a weak correlation between FEV1 and FVC variation and Cobb angle variation (both  $R^2=0.19$ ,  $p=0.06$ ).

**Conclusions:** With MCGR we reduced morbidity and complications due to surgery. We found a better pulmonary function in children after MCGR compared to control group.

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## Paper #5

### Sliding-Growing Rod Technique in the Treatment of Early Onset Scoliosis: Clinical and Radiological Outcomes and Effect on Pulmonary Functions



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**Summary:** A new surgical strategy called Sliding-Growing Rod Technique (SGRT) provides and maintains satisfactory curve corrections on both planes, allows self growth of the spine with a rate of 1.23 mm growth per month, decreases the number of repeated lengthening procedures, and shown to have low complication rates and improved pulmonary functions.

**Hypothesis:** SGRT will maintain correction of EOS deformity on both planes and reduce the number of lengthening procedures and avoid spontaneous fusion.

**Design:** Retrospective.

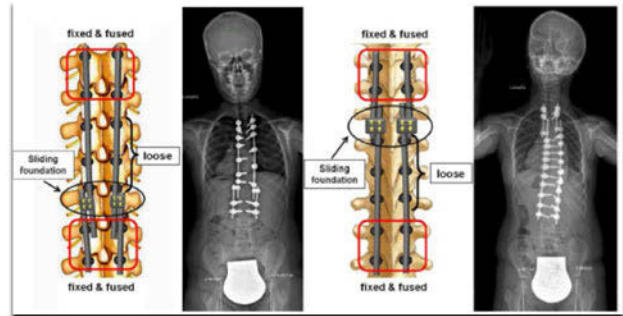
**Introduction:** Traditional growing rods (TGR) used for the treatment of EOS had various drawbacks including repeated lengthening procedures, implant failure, junctional kyphosis and spontaneous fusion. The aim of this study is to assess whether SGRT which provides dynamic fixation in contrast to TGR; works, decrease the complication rates and improve the pulmonary functions.

**Methods:** 16(10F/6M) pts with mean age 6.7(5-10) yrs were evaluated. Technique included placement of pedicle screws to the proximal, distal, apical, strategic and intermediate vertebrae with muscle-sparing technique. Following rod placement and correction, the most proximal and distal two segments were fixed and fused; the rest of the set screws were kept loose (unlocked) to allow vertical spinal growth. Sliding foundation was placed either below the most proximal or above the most distal fixed and fused segments and self-lengthening was achieved by side to side connectors. Preop, f/up, final x-rays and pre/postop PFTs were evaluated.

**Results:** Mean f/up was 30.6 months (24-45). Ave MT curve of 56.9[deg] was corrected to 23[deg] with a %60 correction rate. Ave TL/L curve of 43.1[deg] was corrected to 13.5[deg] with a %71.7 correction rate. Preop TK of 34.4[deg] and LL of 57[deg] was maintained at 33.4[deg] and 56.4[deg] respectively. Mean increase in T1-T12 length was 0.85mm and 1.23mm per month in T1-S1 height. None of the pts had neurological impairment. There were no rod breakage, infection or spontaneous fusion. Only 2 screws in 1 patient were revised for loosening. Set screw dislodgement was found in 5 pts; among them only 2 had

correction loss. SGRT prevented 59 planned lengthenings. Mean %predict FVC of 74,7 improved to 86 and FEV1 of 81 improved to 88,7 at final f/up.

**Conclusions:** In contrast to TGR, SGRT is a dynamic growing system which allows self growth of the spine and maintains correction on both planes. SGRT demonstrated low complication rates, decreased the number of planned lengthenings, avoided spontaneous fusion and improved the pulmonary functions



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## Paper #6

### Posterior Hemivertebra Resection and Short Segment Fusion with Pedicle Screw Fixation for Congenital Scoliosis in Children Younger than 5 Year; with Minimum 8 Years Follow-up



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**Summary:** Surgical outcomes of 10 patients with congenital deformity who were younger than 5 years at the time of surgery were evaluated retrospectively. Posterior hemivertebra resection and short segment fusion prevented development of the secondary structural curves, did not demonstrate any adding-on, crankshaft deformity and did not cause any iatrogenic spinal canal stenosis or growth retardation after minimum 8 years of f/up.

**Hypothesis:** Posterior hemivertebrectomy and short segment fusion at an early age before the secondary structural changes occur will prevent any adding-on and crankshaft deformity and will allow more mobile spine.

**Design:** Retrospective.

**Introduction:** The aim of this study is to evaluate the surgical outcomes of posterior hemivertebra resection and short segment fusion with pedicle screw fixation in congenital scoliosis in children younger than 5 years with minimum 8 years f/up.

**Methods:** 10(6F/4M) patients who were operated younger than 5 years and had at least 8 years f/up were included. All pts underwent hemivertebrectomy and pedicle screw fixation at ave age of 3y4m (1y7m to 4y4m). Main and compensatory curves, correction rates and sagittal parameters were measured on pre/post and f/up x-rays. Preop and final CT scans were compared to evaluate vertebral body and spinal canal parameters.

**Results:** Mean f/up was 8y5m (8-11 years). 7 pts had single and 3 pts had double hemivertebra (ipsilateral, consecutive). 5 pts had pure scoliosis and 5 patients had kyphoscoliosis deformity due to posterolateral hemivertebra. Preop main curve of 29.1[deg] was corrected to 4.4[deg] and 5.3[deg] at final f/up with %81 correction rate. Preop proximal compensatory curve of 12.6[deg] was corrected to 4.1[deg] and 3[deg] at final f/up. Distal compensatory curve of 8.1[deg] improved to 2.3[deg] and 1.6[deg] at final f/up. Local kyphosis of 24.4[deg] improved to 3.8[deg] in