

a, b, c) H&E stain and d) SEM images of metal debris from pediatric tissue biopsies adjacent to implant.

groups of pediatric patients: 1) those with Ti growing spine devices, 2) those with Ti instrumentation for fusion, 3) control patients with implants in the extremities.

Methods: Prospective multicenter study. Children undergoing growing rod, spinofusion or other extremity implant removal (control group) had serum titanium, cobalt (Co), and chromium (Cr) ion levels drawn at the time of surgery. Intraoperative tissue specimens from the time of surgery were analyzed for the presence of metallic debris. 44 patients had at least one set of labs (11 growing devices, 11 fusions, and 16 controls). Growing spine devices included 2 MCGRs, 4 rib-based, and 5 traditional growing rods. 28 patients had labs drawn on two occasions for validation.

Results: Serum Ti levels were significantly elevated in patients with growing spine devices at 3.1 ng/ml vs. 1.2 ng/mL in those without growing rods ($p=0.005$). Cobalt level in the growing spine group was 1.2 ng/mL, in the control group was 0.2 ng/mL ($p=0.0003$). Serum chromium levels in growing spine patients was 0.6 ng/mL vs. 0.3 ng/mL in controls ($p=0.035$). On matched pairs analysis, patients who had labs drawn before and after spine implant placement had a statistically significant increase in serum Co levels (0.3 ng/ml vs. 1 ng/ml, respectively; $p=0.044$) and Ti levels (0.6 ng/mL vs. 3.5 ng/mL, respectively; $p<0.001$). Tissue biopsies adjacent to Ti implants showed macrophage activity and presence of metal debris.

Conclusion: Serum Ti, Co, and Chr levels were elevated in patients with growing rods compared to those with extremity implants.

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Paper #17

Foundation Iliac Fusion Combined With Shilla Technique: A Reasonable Option For The Treatment Of Neuromuscular Scoliosis (NMS) With Pelvic Obliquity

Zhenkai Wu, Richard Schwend



Summary: The combination of solid pelvic fixation and Shilla technique has advantage over traditional growing rods in these frail patients: Load sharing through many implant sites, using the child's natural vertebral growth as the engine for guided growth and minimum revision surgery.

Hypothesis: A combination the Shilla technique and pelvic fixation will 1) correct and control the pelvic obliquity 2) provide continuous growth of vertebra bodies 3) have less revision surgery than traditional growing rods.

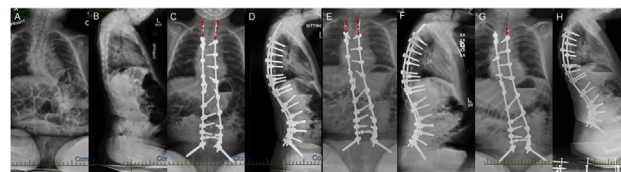
Introduction: Compared to traditional growing rod instrumentation, the Shilla technique allows the spinal column to grow spontaneously. However, in

the treatment of patients with neuromuscular scoliosis, it is not known whether the Shilla technique in conjunction with solid pelvic fixation is effective.

Methods: An IRB approved, single center, retrospective, cohort study was performed. A search of RedCap of the operative spine patients from January 2008-July 2016 yielded NMS patients who underwent a Shilla technique and pelvic screw fixation. Demographic, operative, complications and radiographic data were obtained.

Results: Nine cases underwent this surgical procedure. Six cases (4 female, 2 male) (2 SMA2, 3 hypotonic CP, 1 SB) with minimum 2-year follow-up are included in this study. Ages at index surgery ranged from 4.6 to 8.5 years. Cobb angle, pelvic obliquity and lordosis angle showed marked postop improvement (mean preop Cobb 65 deg/ post op 22 deg). With time, there was clear sliding of the upper most screw on the rod, control of the scoliosis and no obvious progression of the pelvic obliquity. The apex location migrated more than two vertebral proximal in two cases with the upper most screws sliding out of the rod at the end of follow-up. At mean 6 years follow-up there were no major complications. Only one patient (SMA2) needed a subsequent surgery (final deformity correction and fusion at the end of growth).

Conclusion: Use of the Shilla technique combined with solid pelvic fixation provides continuous growth of the spine, prevents progression of pelvic obliquity, without multiple surgical lengthening procedures. Curve apex migration and the most proximal screws sliding out of the rods were only minor complications.



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Paper #18

A “One Stop Shop”: Additional Surgeries at the Time of Rib-based Implant Procedures - Is it Safe?

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Summary: Retrospective review shows no association for increased risk of complications when patients with early onset scoliosis (EOS) have additional procedures performed in conjunction with rib-based implant instrumentation. **Hypothesis:** Patients who undergo additional procedures in the same surgical setting as rib-based implant insertion, lengthening, or revision surgery are more at risk of complications.

Introduction: EOS patients with rib-based implants often require repeated invasive surgery to treat their spinal deformity, thus increasing risk of complications and exposure to anesthesia. Furthermore, many of these patients have comorbidities that require additional procedures, which further contributes to potential adverse outcomes. Our study is preliminary work towards determining if we can safely pair other surgeries with rib-based implant procedures.

Methods: Review of EOS patients treated with rib-based implants with at least 2 yrs f/u who had at least one other surgical service operate in conjunction with rib-based implant insertion/expansion/revision procedure. Univariate analysis was used to assess the difference between patients with complications and without complications.

Results: 49 patients underwent 100 rib-based implant procedures where another surgery occurred under the same anesthetic. Otolaryngology was the most common department adding surgical care, followed by non-spine