Summary: The aim of this case-control study was to develop a RSS to predict SSI in patients with EOS undergoing repetitive lengthening utilizing traditional growth instrumentation. 171 patients with an average age of 4.7 years at surgery were enrolled. The SSI rate was 22.8%. Syndromic etiology, pulmonary comorbidity, major curve magnitude >90, non-ambulatory status, high BMI, and pelvic instrumentation were prognostic of SSI. The models predictive ability was 74.0%, indicating this model's utility in evidence-based guidance regarding surgical risks.

Hypothesis: In patients with EOS undergoing spinal surgery, development of a RSS utilizing preoperative risk factors can provide a means to predict risk of SSI.

Design: Case-Control Study.

Introduction: Surgical site infections (SSI) in children with early onset scoliosis (EOS) have a major impact on quality of life, caretaker burden and healthcare expenditure. This study aims to develop a risk severity score (RSS) system to predict SSI in EOS patients undergoing spinal surgery.

Methods: This was a case-control study identifying risk factors for SSI and developing a RSS for SSI in patients with EOS undergoing repetitive lengthening utilizing traditional growth instrumentation. Pediatric patients who underwent surgery in 15 academic institutions between Nov 2002 and Feb 2011 were enrolled. Patients with growing spinal instrumentation and a minimum 5-year follow-up were included. Patient characteristics, preop lab values, and clinical data were collected. The CDC's definition of SSI (infection within 90 days of surgery) was used.

Results: In total, 171 patients were identified. Average age at surgery was 4.7 years and 55% of patients were female. EOS etiology included: 76 congenital, 45 neuromuscular, 30 syndromic, and 20 idiopathic. The SSI rate was 22.8%. Regression analysis revealed syndromic etiology (OR 5.3), pulmonary comorbidity (OR 2.2), major curve magnitude >90 (OR 1.7), non-ambulatory status (OR 2.7), high BMI (95th percentile and above) (OR 1.1), and pelvic instrumentation (OR 1.2) were prognostic of SSI. The RSS predicted an infection risk of 5.7% when no risk factors were present and 79.6% when all risk factors were present. The model's predictive ability of 74.0% indicates it is a good model, accurately identifying true positives while minimizing false positives.

Conclusions: This study revealed a high risk of SSI in patients with EOS (22.8%). The RSS provides a means to predict SSI risk in EOS patients preoperatively. It allows us to provide evidence-based guidance to patients regarding surgical risks and providor outcome comparisons. Variables unable to be measured adequately such as perioperative infection prophylaxis likely contribute to SSI and need further investigation.

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Paper #32

Vertebral Column Resection: Indications and Utilization in the EOS Population

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Summary: Early-onset scoliosis patients treated with VCR were predominantly congenital or neuromuscular, with most being treated at the original procedure with nearly 50% treated with growth-friendly instrumentation and the remainder with limited/definitive fusion. Patients had 53% correction of the major curve (in plane of primary deformity) and increases in thoracic (1.6 cm) and spinal (1.2 cm) height. Complication rate was 29% with 2 incidents of temporary neurologic deficits related to surgery.

Hypothesis: There will be limited pre-operative indications for the use of vertebral column resection (VCR) to treat patients with severe early-onset scoliosis (EOS).

Design: Multicenter review of retrospective and prospective data.

Introduction: VCR is a surgical technique reserved for patients with severe spinal deformity, as it carries a high risk of morbidity. VCR has been reported among adults and adolescents, however, there is little reported on how VCR in utilized in EOS.

Methods: A retrospective review of a multicenter EOS database was performed to identify patients who were ≤ 10 years at the time of VCR. Comparisons: pre and post VCR surgery for radiographic parameters, and peri-operative outcomes, including complications.

Results: 24 patients with VCR were identified with mean follow-up after VCR of 2.3 years. Mean age at VCR was 6.3±3.0 yrs. Diagnoses: neuromuscular 9 (36%), congenital 8 (32%) and other 7 (28%). Primary deformity: kyphosis 16 (64%), scoliosis 5 (24%) and kyphoscoliosis 3 (12%). VCR occurred as original surgery in 19 (O=VCR: 79%), and revision in 5 (R=VCR: 21%). Pre-op major curve was 89 (major curve being either coronal or sagittal depending on primary deformity), and spine and thoracic height were 22.0 and 13.2 cm, with no differences between groups (Table 1). Reason for VCR was deformity correction in 22 (88%) and decompression of the spinal cord in 3 (12%). VCRs per patient was 1.79 (range 1-4). Growth friendly instrumentation (GFI) was used in 9 (47%) and definitive/limited fusion (PSF) in 10 (53%); in R=VCR 2 (40%) had GFI and 3 (60%) PSF. Curve correction of 53% and increase in spine heights were both significant (Table 1), but did not differ between groups. Pre-op neurologic deficits related to deformity were present in 2 (8.3%) with complete recovery post-op. Incidence of perioperative complications was 7 (29%), including 2 (8.3%) neurologic deficits that resolved at follow-up.

Conclusions: VCR in EOS is used primarily in severe neuromuscular or congenital deformities. VCR as the original surgery was more common than revision with nearly half of patients undergoing GFI. VCR resulted in satisfactory coronal and sagittal plane deformity correction.

Table 1
Radiographic Parameters

	All VCR	*p* Value	0=VCR	R=VCR	*p* Value
Pre Major Curve (°)	89±28		92±27	76±31	.891
Post Major Curve (°)	36±23		37±24	29±19	.331
Major Curve Correction (%)	538±34	**<.001**	54±36	47±30	.891
Pre Spinal Height (cm)	22.0±3.7		21.6±3.7	24.7±2.7	**.039**
Post Spinal Height (cm)	22.8±4.0		24.0±4.4	25.2±1.9	.199
Increase Spinal Height (cm)	1.6±2.5	**.016**	1.7±2.6	1.3±1.8	.961
Pre Thoracic Height (cm)	13.2±2.9		12.7±2.8	14.7±27.0	.313
Post Thoracic Height (cm)	13.9±3.4		14.1±3 6	16.3±1.7	.15
Increase Thoracic Height (cm)	12±2.3	**.046**	1.0±2.5	1.6±1.3	.445

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