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Appendix Table 1a. Univariate analysis of potential risk factors before traditional growing rod surgery

Risk Factor	Reoperation (n=32)	No Reoperation (n=135)	Crude Odds Ratio	95% Confidence Interval	P-value
Demographic					
Age at First Visit (years)	6.6±2.5	7.2±2.5	-	-	0.233
Gender					
Male	10 (31%)	59 (44%)	1.708	0.751- 3.883	0.198
Female	22 (69%)	76 (56%)			
BMI	17.1±7.5	16.9±4.2	-	-	0.856
Co-morbidities					
Non-ambulatory	5 (26%)	30 (27%)	0.964	0.320- 2.908	0.949
Cardiac	6 (19%)	31 (23%)	0.797	0.300- 2.119	0.649
Pulmonary	7 (23%)	21 (16%)	1.569	0.600- 4.108	0.356
Developmental Delay	13 (42%)	34 (25%)	2.124	0.943- 4.787	0.066*
Gastrointestinal	8 (26%)	25 (19%)	1.517	0.608- 3.784	0.370
Musculoskeletal	16 (52%)	40 (30%)	2.507	1.131- 5.555	0.021
Neurologic	13 (42%)	26 (19%)	3.000	1.306- 6.894	0.008

Renal	4 (13%)	11 (8%)	1.657	0.490-5.599	0.413
Other	8 (26%)	40 (30%)	0.817	0.337-1.982	0.655
Scoliosis Type					
Idiopathic	5 (16%)	40 (30%)	2.274	0.817-6.326	0.108
Non-idiopathic	27 (84%)	95 (70%)			
Breakdown					
Idiopathic	5 (16%)	40 (30%)	-	-	0.072*
Congenital	2 (6%)	19 (14%)			
Neuromuscular	11 (34%)	45 (33%)			
Syndromic	14 (44%)	29 (22%)			
Other	0 (0%)	2 (2%)			
Prior Treatments					
None	6 (21%)	58 (44%)	-	-	0.096*
Brace	19 (68%)	58 (44%)			
Traction	0 (0%)	3 (2%)			
Surgery	3 (11%)	12 (9%)			
Deformity Radiographic Characteristics (Preoperative)					
Primary Curve Cobb Angle (degree)	78.4±22.9	73.6±17.8	-	-	0.275
Coronal T1 to S1 Length (mm)	250.5±55.0	277.3±51.0	-	-	0.010
Coronal Imbalance (mm)	39.0±59.0	32.7±45.2	-	-	0.538
Maximum Kyphosis	48.4±21.0	48.5±25.8	-	-	0.990
Sagittal Balance	18.7±44.4	21.1±42.1	-	-	0.799

*Not included in multivariate analysis due to <90% completion

Appendix Table 1b. Incidence of Neuromuscular Conditions

Neuromuscular condition	N (%)
Cerebral Palsy	19 (33.9%)
Spinal Muscular Atrophy	9 (16.1%)
Intrathecal abnormality (i.e. syrinx, tethered cord)	7 (12.5%)
Muscular Dystrophy	5 (8.9%)
Myelodysplasia (Spina Bifida)	5 (8.9%)
Myopathy (i.e. nemaline rod myopathy)	5 (8.9%)
Friedreich Ataxia	1 (1.8%)
Other	5 (8.9%)

Appendix Table 1c. Incidence of Syndromic Conditions

Syndromic condition	N (%)
Chromosomal abnormality	8 (18.6%)
Marfan Syndrome	7 (16.3%)
Neurofibromatosis	6 (14.0%)
Arthrogryposis	4 (9.3%)
Di George Syndrome	3 (7.0%)
Osteogenesis Imperfecta	1 (2.3%)
Rett Syndrome	1 (2.3%)
Pierre Robin Syndrome	1 (2.3%)
Cri-du-chat	1 (2.3%)
Loeys- Dietz Syndrome	1 (2.3%)
Metatropic Dwarfism	1 (2.3%)
Pyruvate dehydrogenase deficiency	1 (2.3%)
Coffin-Siris	1 (2.3%)
Prader-Willi	1 (2.3%)
Turner Syndrome	1 (2.3%)
VATER	1 (2.3%)
Unknown	4 (9.3%)

Appendix Table 2. Univariate analysis of potential risk factors during initial traditional growing rod surgery

Risk Factor	Reoperation (n=32)	No Reoperation (n=135)	Crude Odds Ratio	95% Confidence Interval	P-value
Demographic					
Age (years)	6.7±2.5	7.3±2.6	-	-	0.291
BMI	15.0±3.4	16.9±4.6	-	-	0.227
ASA Grade					
1	3 (12%)	13 (12%)	-	-	0.233
2	10 (40%)	47 (44%)			
3	11 (44%)	48 (44%)			
4	1 (4%)	0 (0%)			
Construct Type					
Spine Based	31 (97%)	127 (95%)	0.585	0.069-4.934	>0.999
Rib Based	1 (3%)	7 (5%)			
Anterior and Posterior Approach	4 (14%)	6 (6%)	2.889	0.756-11.041	0.118
Number of Devices	1.8±0.4	1.7±0.5	-	-	0.048
Device Depth					
Subcutaneous	8 (29%)	13 (11%)	0.234	0.079-0.694	0.019*
Deep	20 (71%)	103 (89%)			
Operated Levels					
Anterior Fusion	0.6±1.5	0.2±0.8	-	-	0.196
Posterior Fusion	2.4±1.1	2.3±1.3	-	-	0.688
Posterior Levels Spanned	14.6±2.0	13.5±2.1	-	-	0.023

Pelvic Fixation					
Sacrum/ Ilium/ Pelvic Fixation	6 (21%)	15 (12%)	1.861	0.652-5.310	0.240
Antibiotics					
Vancomycin Powder	2 (9%)	1 (1%)	-	-	0.101
Deformity Radiographic Characteristics (After Initial Growing Rod Surgery)					
Primary Curve Cobb Angle (degree)	46.0±16.6	42.9±14.0	-	-	0.286
Coronal T1 to S1 Length (mm)	294.7±40.7	316.9±49.4	-	-	0.021*
Coronal Imbalance (mm)	28.3±43.6	20.9±18.3	-	-	0.202
Maximum Kyphosis	41.3±16.1	37.4±15.0	-	-	0.263
Sagittal Balance	19.1±40.2	19.4±40.5	-	-	0.997

*Not included in multivariate analysis due to <90% completion

Appendix Table 3. Univariate analysis of potential risk factors during traditional growing rod lengthening period

Risk Factor	Reoperation (n=32)	No Reoperation (n=135)	Crude Odds Ratio	95% Confidence Interval	P-value
Demographic					
Age (years)	12.9±2.8	12.4±2.0	-	-	0.230
BMI	23.2±16.3	21.2±8.6	-	-	0.421
Surgery Characteristics					
Number of Lengthenings	6.3±4.2	6.1±3.3	-	-	0.703
Number of Years of Lengthening	6.1±2.9	5.1±2.5	-	-	0.050
Deformity Radiographic Characteristics					
Primary Curve Cobb Angle (degree)	60.6±23.0	54.5±19.9	-	-	0.150
Coronal T1 to S1 Length (mm)	339.3±51.9	352.4±56.3	-	-	0.275
Coronal Imbalance (mm)	26.4±28.1	32.8±45.5	-	-	0.529
Maximum Kyphosis	54.9±23.3	50.6±22.4	-	-	0.392
Sagittal Balance	24.5±41.4	23.6±58.1	-	-	0.951
Complications During Lengthening (mean number of complications)					
Neurologic	0.09±0.30	0.04±0.24	-	-	0.184
Anchor-related	0.88±1.23	0.48±0.80	-	-	0.075*
Device-related	0.91±1.2	0.82±1.4	-	-	0.257
Medical	0.53±1.01	0.20±0.49	-	-	0.022
Wound	0.25±0.67	0.13±0.58	-	-	0.147
Surgical Site Infection	0.75±1.2	0.29±0.82	-	-	0.008
Pseudarthrosis	0±0	0.04±0.27	-	-	0.326
Junctional Kyphosis	0.13±0.34	0.02±0.15	-	-	0.009
Curve Progression	0.09±0.30	0.01±0.09	-	-	0.004
Planned Return to Operating Room	1.0±1.1	0.77±1.2	-	-	0.112

Unplanned Return to Operating Room	1.5±1.8	0.75±1.6	-	-	0.005
Nonoperative Resolution of Complication	0.50±0.95	0.24±0.55	-	-	0.135

*Not included in multivariate analysis due to <90% completion

Appendix Table 4. Univariate analysis of potential risk factors after final fusion following traditional growing rod surgery

Risk Factor	Reoperation (n=32)	No Reoperation (n=135)	Crude Odds Ratio	95% Confidence Interval	P-value
Demographic					
Age (years)	12.6±2.0	12.6±1.9	-	-	0.966
BMI	19.2±4.9	20.6±5.1	-	-	0.295
ASA Grade					
1	2 (8%)	6 (5%)	-	-	0.608
2	11 (46%)	48 (41%)			
3	9 (38%)	59 (50%)			
4	2 (8%)	5 (4%)			
Construct Type					
Anterior and Posterior Fusions	7 (23%)	13 (10%)	2.715	0.981-7.513	0.048
Number of Devices	1.8±0.6	2.0±0.2	-	-	0.102
Material					
Stainless Steel	4 (21%)	33 (32%)	-	-	0.521
Titanium	7 (37%)	41 (40%)			
Cobalt Chromium	8 (42%)	27 (27%)			
Vitallium	0 (0%)	1 (1%)			
Device Depth					
Subcutaneous	0 (0%)	3 (3%)	-	-	>0.999
Deep	20 (100%)	96 (97%)			
Operated Levels					

Anterior Fusion	1.0±2.0	1.0±2.9	-	-	0.951
Posterior Fusion	11.3±4.5	11.1±4.4	-	-	0.809
Posterior Levels Spanned	13.1±4.7	13.3±3.4	-	-	0.866
Pelvic Fixation					
Sacrum/ Ilium/ Pelvic Fixation	5 (20%)	16 (15%)	1.438	0.472-4.382	0.522
Antibiotics					
Vancomycin Powder	12 (43%)	13 (11%)	6.000	2.333-15.434	<0.001*
Deformity Radiographic Characteristics					
Primary Curve Cobb Angle (degree)	50.0±24.9	39.5±16.9	-	-	0.053*
Coronal T1 to S1 Length (mm)	342.8±58.4	374.0±52.7	-	-	0.010*
Coronal Imbalance (mm)	21.2±11.6	33.3±51.2	-	-	0.288
Maximum Kyphosis	50.4±24.2	45.0±17.8	-	-	0.222
Sagittal Balance	32.3±56.7	17.0±53.7	-	-	0.220
Perioperative Complications (average number of complications)					
Neurologic	0±0	0.04±0.21	-	-	0.226
Anchor-related	0.03±0.18	0.01±0.09	-	-	0.266
Medical	0.05±0.21	0.07±0.28	-	-	0.526
Planned Return to Operating Room	0.03±0.18	0.05±0.22	-	-	0.625
Unplanned Return to Operating Room	0.03±0.18	0.01±0.12	-	-	0.530
Nonoperative Resolution of Complication	0±0	0.05±0.25	-	-	0.226

*Not included in multivariate analysis due to <90% completion