The Part is Not the Same as the Whole: Evaluating L4-S1 versus Total Lumbar Lordosis Attainment for Adult Scoliosis Patients Fused with Pre-Bent Rods

The implementation of patient-specific rods to achieve optimal L4-S1 and Lumbar Lordosis (LL) metrics shows promise for restoring desired anatomical alignment and improving individual treatment.

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Introduction

Recent studies suggest that L4-S1 lordosis is similar across individuals whereas lumbar lordosis (LL) differs according to sagittal shape classification. Pre-bent rods account for both total and L4-S1 lordotic goals, although whether factors impacting achievement of each is unknown.

Methods

- Patients > 18 years old with idiopathic or degenerative scoliosis receiving posterior instrumented fusion from a single surgeon/single institution were reviewed.
- Fusions >6 levels with LIV at the sacrum/pelvis, lumbar PCOs, and PSRs were included.
- Revision cases were excluded.
- Demographics, operative/inpatient variables, pre- and post-radiographic measurements were recorded.
- Post-operative sagittal alignment was compared to pre-op measurements and planned targets.
- Lumbar lordosis (LL) and L4-S1 restoration were evaluated in multivariable regression models that included scoliosis type and pre-operative spinopelvic parameters significantly different from planned.

Results

- 29 patients were included; average age was 66.1 ± 9.5 years; 21 were female (21/29, 72.4%); average BMI was 26.8 ± 5.3 kg/m2.
- Degenerative scoliosis was more common than idiopathic (22/29, 75.9%).
- Post-operative LL but not L4-S1 lordosis was significantly different from planned parameters (- 5.1°, 95% CI –[9.0 – 1.2°], p = 0.01; - 2.2°, 95% CI –[5.4 – 9.8°], p = 0.5).
- On multivariable linear regression, neither scoliosis type, magnitude of planned lumbar correction, pre-operative fractional curve or starting spinopelvic parameters correlated with magnitude of planned versus obtained LL (r2 = .1, p = .59).
- L4-S1 LL was significantly correlated with amount of correction required (p <0.005), but no other parameter (r2 = .78, p <0.005).

	Pre-Op Standing	Plan	Last Follow-Up
PT, °	21.2 ± 14.9	17.0 ± 17.7	22.5 ± 7.9†
SS, °	31.0 ± 9.4	33.6 ± 8.9	29.9 ± 11.1†
SVA, mm	49.0 ± 47.0	12.2 ± 13.8	31.4 ± 33.4§†
Th5-Th12, °	31.4 ± 17.3	32.7 ± 16.4	42.5 ± 13.2§†
L4-S1, °	-36.2 ± 10.8	-38.7 ± 18.3	-40.9 ± 8.7§
LL, °	-41.9 ± 16.0	-51.2 ± 15.4	-46.1 ± 17.9†
Fractional Curve, °	16.0 ± 12.3		7.1 ± 7.2§