Prediction of Curve Correction Using Alternate Level Pedicle Screw Placement in Patients With Adolescent Idiopathic Scoliosis (AIS) Lenke 1 and 2 Using Supine Side Bending (SB) and Fulcrum Bending (FB) Radiograph

The Influence of Curve Magnitude and Lenke AR Curves

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Study Design. Prospective cohort study.

Objective. To compare side bending (SB) and fulcrum bending (FB) radiographs in patients with adolescent idiopathic scoliosis (AIS) and effect of magnitude and AR curves on curve correctability.

Summary of Background Data. The prediction of correction using side bending flexibility (SBF) and fulcrum bending flexibility (FBF) in alternate level pedicle screw (P2) configuration and effect of curve magnitude and AR curves are not well understood.

Methods. 100 AIS Lenke 1 and 2 were recruited. Curve magnitude was stratified to G1 (41°–60°), G2 (61°–80°), G3 (>80°). The main thoracic (MT) curves were subclassified to AR curves [Miyajima F, Pawelek JB, Van Valin SE, et al. Is the lumbar modifier useful in surgical decision making? Defining two distinct Lenke 1A curve patterns. Spine 2008;33:2545–51]. Preoperatively SBF and FBF were determined whereas postoperative parameters were correction rate (CR), fulcrum bending correction index (FBCI), and side bending correction index (SBCI). Correlation test were carried out between SBF, FBF, SBCI over CR for the cohort.

Results. There were 38 (G1), 42 (G2), and 20 (G3) patients. 34% were AR curves. SBF for G1, G2, and G3 were 61 ± 14.4, 59.2 ± 16.2 and 43.1 ± 13.1% (P = 0.000) whereas FBF for G1, G2, and G3 were 71.1 ± 16.5, 58.3 ± 18.1 and 52.7 ± 17.1% (P = 0.000). The CR was G1 (74.5 ± 11.5%), G2 (69.2 ± 12.7%), and G3 (70.2 ± 8.6%). FBCI was 1.11 ± 0.3 (G1), 1.28 ± 0.4 (G2) and 1.48 ± 0.6 for G3. SBCI was 1.26 ± 0.2 (G1), 1.50 ± 0.5 (G2), and 1.72 ± 0.4 for G3. There was strong correlation for SBF and FBF versus CR for G1 and G2. For G3, a very strong correlation was established between SBF (r = 0.846, r² = 0.716) and FBF versus CR (r = 0.700, r² = 0.54). AR curves demonstrated higher SBF and FBF.

Conclusion. CR remains almost constant in G1, G2, and G3. SBCI and FBCI increase significantly in G1, G2, and G3. Correlation between SBF and FBF and CR was strong for G1, G2, and very strong for G3. AR curves showed better correctability with SB and FB films.

Key words: adolescent idiopathic scoliosis, side bending film, fulcrum bending film, flexibility, pedicle screws, curve magnitude, AR curves.

Level of Evidence: 3

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Flexibility assessment in scoliosis allows surgeons to determine the surgical strategy for correction as well as to estimate the amount of curve correction obtained postoperatively. Many methods have been described to assess curve flexibility which includes supine SB radiographs,6,7 FB radiographs,6,8 traction radiographs,6,7 push prone radiographs,6,7 traction radiograph under general anesthesia (UGA),9,11 and more recently controlled bidirectional orthopedic forces12 and modified FB radiographs.13 However, the correctability of the curve using these radiographs depends not only on the technique of flexibility assessment but also on various factors such as curve magnitude, type of curve, location of apical vertebrae and age.13,14 The evolution of spinal instrumentation in the last 2 decades has also lead to increased amount of correction.15,16 Use of segmental pedicle screws that allows 3-column purchase have allowed superior correction strength compared with hooks and wires.11,22 These factors must be taken into consideration before determining...