Adolescent Idiopathic Scoliosis Lenke Classification Rule Breakers: Reckless Rebels or Informed Innovators

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Introduction:

The Lenke classification has been the mainstay classification for adolescent idiopathic scoliosis (AIS) for the last 2 decades. It provides treatment recommendations based on deformity classification; however, some surgeons deviate from Lenke treatment recommendations. Specifically, the Lenke classification recommends thoracolumbar fusion for AIS patients with Lenke 3,4,6 curves; however, some patients undergo selective thoracic fusion instead. The purpose of this study is to compare radiographic and clinical outcomes between AIS patients whose treatment was consistent with the Lenke classification recommendations and patients with treatment deviation.

Method:

This was a retrospective review of a prospectively collected multi-site patient registry. AIS patients with Lenke 3,4,6 B and C curves were included. Patients without 5 years postoperative radiographic outcome data were excluded. Patients were divided into two cohorts, those who underwent thoracolumbar fusion, rule followers (RFs), and those that did not, rule breakers (RBs). Five-year postoperative radiographic parameters, flexibility data, and patient reported outcomes measures were compared between the RF and RB groups. Chi-squared tests and Fisher exact tests were used to analyze categorical data. T-tests and Mann-Whitney U tests were used to analyze parametric and nonparametric continuous data.

Results:

A total of 215 (RF: 173, RB: 42), patients were included. The 5-year postoperative lumbar Cobb ($p < 0.01$) and C7-CSVL distance (p 0.02) was greater in the RBs compared to the RFs. There was no difference in the change in postoperative C7-CSVL distance from 1st erect, sagittal vertical axis (SVA) distance or change SVA from 1st erect between groups ($p< 0.05$). There was no difference between the incidence of clinically significant residual lumbar cobb (cobb > 40) (p: 0.58), lumbar cobb decompensation (delta cobb ≥ 10) (p: 0.18), coronal imbalance (C7-CSVL > 2) (p: 0.52), progressive coronal imbalance (delta C7-CSVL > 0.5) (p: 0.62), distal adding on (p: 0.35), anterior or posterior sagittal imbalance (SVA >2) (p: 0.81, p: 0.29), progressive sagittal imbalance (delta SVA > 1) (p: 0.53). The postoperative coronal imbalance absolute risk reduction with “rule following” was 4%; meaning 25 patients need to undergo a thoracolumbar fusion, instead of selective thoracic, to prevent coronal imbalance in 1 patient. Postoperative clinical flexibility in the forward, left and right direction was greater in the RB group compared to the RF group. Postoperative SRS-22 self-image sub-scores were greater in the RF group compared to the RB group. There were no other differences in other SRS-22 sub-scores between groups.

Conclusion:

Although the Lenke classification provides a clear method for AIS description, strict adherence to treatment recommendations would result in unnecessary lumbar fusion in a significant number of patients. A concise, treatment-oriented classification system is needed to better predict which patients need thoracolumbar fusion.