

**INTRODUCTION** Selective fusion in adolescent idiopathic scoliosis (AIS) with Lenke type 1 curves is associated with a risk of coronal imbalance. Coronal imbalance can either be expressed as a deviation of the C7 plumbline from the central sacral vertical line (list) or as truncanal shift. Irrespective of the definition, the aim of surgery is to achieve a balanced spine

**PURPOSE** To explore the clinical utility of preoperative and immediate postoperative risk factors for coronal imbalance.

**MATERIALS AND METHODS** We included AIS patients with a Lenke type 1 curve with A, B and C lumbar modifiers. All patients were surgically treated with selective fusion defined as a lowest instrumented vertebra at L2 or cranial and had two-year follow-up. We assessed a series of radiographic parameters and calculated the curve flexibility (based on fulcrum bending radiographs) and the fulcrum bending flexibility index (FBCI). We defined patients as having coronal imbalance in cases of more than 2 cm of truncanal shift or more than 2 cm list at two-year follow-up.

**RESULTS** A total of 301 patients were included in the study. Coronal imbalance at two-year follow-up was found in 38 patients (13%). At the preoperative stage, we found a significant difference in main curve flexibility with  $66\pm 15\%$  in the balanced group (at two-year follow-up) and  $60\pm 15\%$  in the imbalanced group ( $p = 0.032$ ). At the immediate postoperative stage, mean curve correction was  $71\pm 13\%$  vs.  $70\pm 13\%$  and mean FBCI was  $112\pm 29\%$  vs.  $122\pm 29\%$  in the balanced and unbalanced group, respectively ( $p = 0.031$ ). A postoperative FBCI of more than 125% (third quartile) resulted in an odds ratio of 2.1 (95%CI:1.1-4.3) for coronal imbalance at two years ( $p = 0.031$ ).

Looking at the whole cohort from postoperative to two-year follow-up, we saw no significant changes in fusion mass or LIV tilt. Radiographic shoulder height changed from 16 mm in both groups at the postoperative stage to  $11\pm 7$  vs  $7\pm 6$  mm in the balanced and imbalanced group at the two-year follow-up ( $p = 0.002$ ).

**CONCLUSIONS** A decreased preoperative flexibility and a higher FBCI was significantly associated with coronal imbalance. A high FBCI is an indication of a curve correction that exceeds the inherent flexibility of the spine, and our results add to a growing body of evidence that “overcorrection” of the main curve can lead to postoperative imbalance.