

Postoperative Changes in Cervical Sagittal Alignment Following Corrective Surgery for Adolescent Idiopathic Scoliosis: A Lenke Type–Based Analysis with Adult AIS Comparison

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[S Y N O P S I S]

This study aimed to clarify the long-term changes and clinical significance of sagittal alignment—particularly cervical alignment—following corrective surgery for adolescent idiopathic scoliosis (AIS). A total of 394 patients were analyzed, including those classified as Lenke Types 1, 2, 5, and 6, and adult idiopathic scoliosis (AdIS) patients who underwent posterior spinal fusion after skeletal maturity. Sagittal parameters such as C2-7 angle, T1 slope, thoracic kyphosis (TK), lumbar lordosis (LL), and pelvic incidence (PI) were assessed using standing whole-spine radiographs obtained preoperatively and at 1 week, 2 years, and 5 years postoperatively.

In all Lenke subtypes, restoration of thoracic kyphosis contributed to recovery of cervical lordosis through increased T1 slope. In particular, patients with a postoperative T1 slope $\geq 15^\circ$ demonstrated significantly better normalization of C2-7 angle. In Lenke Type 2, proximal thoracic kyphosis (PTK) recovery was closely linked to increased T1 slope. In Type 5, patients with low PI had higher risks of PJK and persistent cervical kyphosis. In Type 6, insufficient thoracic kyphosis led to sustained cervical malalignment. Among AdIS patients, the recovery of cervical lordosis was limited compared to younger AIS patients, likely due to reduced spinal flexibility and structural degeneration.

These findings highlight that AIS correction should focus not only on coronal correction but also on sagittal alignment, especially the management of T1 slope and thoracic kyphosis, to maintain lifelong cervical spinal health. AIS surgery should be approached as a comprehensive spinal balance restoration strategy for long-term wellness.