

Impact of T1 Slope-Cervical Lordosis Discrepancy on Sagittal Vertical Axis and Patient Reported Outcomes Following Posterior Cervical Fusion: A Multi-Center Retrospective Analysis

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INTRODUCTION: The relationship between T1 slope (TS) and cervical lordosis (CL) mirrors the established correlation between pelvic incidence (PI) and lumbar lordosis (LL) in assessing spinal alignment and predicting functional outcomes in patients undergoing spinal surgeries. Understanding these parameters is crucial as they influence disability and pain outcomes post-surgery. Our null hypothesis was that there is no significant association between TS-CL discrepancy greater than 17° and Sagittal Vertical Axis (cSVA) exceeding 4 cm, nor does an cSVA > 4 cm correlate with poorer patient-reported outcomes (Visual Analog Scale (VAS) for pain and Oswestry Disability Index (ODI)). The dual purpose of this study was to- 1) Evaluate whether a TS-CL discrepancy greater than 17° predicts a cSVA greater than 4 cm in patients undergoing multi-level posterior cervical fusion for stenosis and myelopathy, 2) investigate if an SVA > 4 cm correlates with higher patient-reported outcomes.

METHODS: A retrospective analysis was conducted on a multi-center database including 356 patients who underwent posterior cervical fusion involving a minimum of three levels for stenosis and myelopathy. Inclusion criteria required the surgical level to be caudal to C7 and a minimum follow-up period of two years. Data collected encompassed demographic details, radiographic measurements (T1 slope, C2-C7 CL, C2-C7 cSVA), and patient-reported outcomes (VAS, ODI).

RESULTS: The cohort had a mean age of 63 ± 12 years, with 52.6% being male and a mean BMI of 28.7 ± 6.4. The most frequently treated levels were C3-C7 (42.3%). A significant correlation was observed between TS-CL discrepancy greater than 17° and cSVA greater than 4 cm ($r = 0.71$). Specifically, 72.6% of patients with TS-CL > 17° exhibited an SVA > 4 cm. Furthermore, patients with SVA > 4 cm reported higher mean pain scores (VAS = 4.6 ± 2.9 vs. 3.6 ± 1.6, $p > 0.05$) and disability scores (ODI = 43.2 ± 23.6 vs. 36.6 ± 18.2, $p > 0.05$) compared to those with lower SVAs.

DISCUSSION AND CONCLUSION: The findings substantiate that a TS-CL discrepancy greater than 17° is associated with an increased cSVA exceeding 4 cm in patients undergoing multi-level posterior cervical fusion. Moreover, patients with higher SVA demonstrated poorer outcomes in terms of pain and disability, as indicated by VAS and ODI scores. These results underscore the importance of preoperative evaluation of TS-CL discrepancy to optimize surgical planning and enhance postoperative outcomes related to spinal alignment and patient-reported quality of life.