Title: What Effect Does T1 Slope Have on Sagittal Balance and the Relationship with Caudal End of Three or More Level Posterior Cervical Fusions?

Background: Extending posterior cervical fusions into the upper thoracic spine for degenerative cervical pathologies has been thought to reduce rates of pseudoarthrosis and distal junctional kyphosis, leading to overall improved clinical outcomes

Research Questions: Investigate the effect of T1 slope on post-operative Sagittal Vertical Axis (SVA) and whether extension of posterior cervical fusions into the upper thoracic spine (T1/ T2 caudal levels) provides improved sagittal balance in comparison to C7 caudal level

Design: Retrospective study

Methods: A database of 327 patients from seven different centers who underwent a three or more-level posterior cervical fusion was created. Two cohorts were created based on fusion caudal level: C7 or T1/T2. The cohorts were then divided again into two subgroups, high T1 slope (>25°) and low T1 slope (≤25°)

Results: 224 patients were included in the C7 caudal and 103 were included in the T1/T2 caudal cohort. The C7 cohort was 55% female, with a mean age of 61±12 yrs. The T1/T2 cohort was 44% female with a mean age of 63.1±12.6 yrs. Mean BMI of the C7 was 28.9±6.8, and 29.1±5.8 in the T1/T2 cohort. Mean SVA was significantly higher in patients with high T1 slopes as compared to patients with Low T1 slopes across all time intervals. The 25^{th} percentile SVA of High T1 slopes were greater than the median SVA values of Low T1 slopes at all intervals. For both the high and low T1 slope cohorts, patients with a caudal T1/T2 had higher SVA values

than their C7 counterparts at all intervals despite maintenance of cervical lordosis, however these differences were not statistically significant

Conclusion: Increased sagittal imbalance was higher in patients with >25° T1 slope ranging across preoperative to 24 months postoperative. Extension of the posterior cervical fusion to T1 or T2 did not improve sagittal balance in patients with high T1 slopes. The results of this study do not support routinely extending posterior cervical fusions into T1 or T2 to improve post-operative sagittal balance.