



Axial plane characteristics of primary thoracic (lenke 1) scoliosis.

Tamás S. Illés^{1,2}, Kelwin Pérez Contreras^{3,4,6}, Stig Mindedahl Jespersen^{3,4,5}

¹Department of Orthopedics Szent Kristóf Outpatient Clinic, Budapest, Hungary

²National Medical Academy, Paris, France

³Dept of Orthopedics, Odense Universitetshospital, Denmark

⁴Orthopedics research unit, Odense Universitetshospital, Denmark

⁵Neurosurgery research unit, Odense Universitetshospital, Denmark

⁶Universidad Central de Venezuela

Background

There is insufficient information regarding the axial plane characteristics of scoliosis despite its 3D nature. The posterior-anterior vertebral vector (VV) has been proposed to characterize the axial plane appearances of Lenke 1 thoracic scoliosis. This non-randomized retrospective study aimed to highlight the importance of having knowledge of axial plane features when determining fusion levels and correction techniques of thoracic curves.

Aim: In this study, 254 Lenke 1 curves were analyzed with VV to determine axial plane characteristics. The SterEOS 3D measurements were then compared with the VV-based projected angle calculations. K-means clustering was used to identify axial plane curve patterns. VV projected angle data were used to determine apical vertebral (APV) axial rotations, APV lateral displacement, and intervertebral rotations (IVR) in the axial plane.

Method: Regression analysis was used to determine the relationship between the coronal angles and axial plane characteristics. Pearson correlation and Bland-Altman tests revealed a close correlation between 3D angles and VV projected angles. Eight axial plane clusters were distinct exhibiting different lateral APV displacement toward the interacetabular axis with relatively small axial rotations and a simultaneous decrease in sagittal curves. Knowing the IVR in the axial plane helps to accurately determine the limits of the structural curves.

Results

The regression analysis results showed that the correlation of coronal curve magnitude was significantly stronger ($r = 0.89$) with APV lateral translation than with APV axial rotation ($r = 0.69$).

Conclusion

Based on these findings, the primary goal of scoliosis correction should focus on minimizing lateral translation rather than eliminating axial rotation. This method be foundation for robot assist surgery on ground of navigation and marched radiology data.