measured. Using Student's t test, the angular parameters will be compared between standing posture and sitting posture. The changes of sagittal alignment in sitting position from standing position will be discussed. Using Pearson's correlation test according to different position, difference of relationship between spinal and pelvic parameters in standing versus sitting position will be discussed. **Results:** Average pelvic incidence (PI) was 46.2 $\pm$ 8.6 degrees. When moving from standing to a seated position, the spine lost nearly 24-degree lumbar lordosis (LL) (49.6 $\pm$ 9.8 VS 25.2 $\pm$ 10.8, $P < 0.001$). The sagittal vertical axis (SVA) also moved more anteriorly by 45 mm (-20.7 ± 20.8 VS 24.5 ± 29.5, $P < 0.001$). Regarding changes from the standing to sitting positions, average pelvic tilt (PT), lordosis tilt (LT), T_1-pelvic angle (T_1PA) were greater ($P < 0.05$), and thoracic kyphosis (TK), sacral slope (SS) were decreased ($P < 0.05$). In sitting position, the correlation between PI and LL was lost, but correlation between PI-SVA and LL-SVA were still remained. **Conclusion:** In sitting position, the majority of the changes occurred in the lumbar spine and pelvis alignment. Sitting significantly straightened the spine with decreased TK, LL, and SS. Lumbar alignment and SVA moved anteriorly. Pelvis rotation and lumbar hypolordosis were the mechanisms of adjusting the trunk sagittal balance in sitting position. This variation in sitting position and its relationship with standing should be fully understood in terms of long-term effects of the sitting position in patients with lumbar and thoracic fusion, and the pathogenesis of lumbar degenerative changes in young patients due to the most common posture of today's work time.

A093: Predicting the Risk of Curve Progression by the Radius and Distal Ulna (DRU) Classification for Patients With Adolescent Idiopathic Scoliosis

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Introduction: For patients with adolescent idiopathic scoliosis (AIS), having an accurate growth measure like skeletal maturity assessment tool is mandatory in predicting remaining growth potential, which is important for timely interventions to prevent poor outcomes [1]. Curve progression to 40 degrees may lead to adulthood progression, while progression to 50 degrees commonly requires surgery [2, 3]. This study aims to validate the role of the distal radius and ulna (DRU) classification in predicting the *risk* of curve progression in AIS, according to curve magnitude upon initial presentation. **Material and Methods:** AIS patients presenting with Risser 0-3 were recruited and followed until skeletal maturity or when surgery was offered at Cobb angle $\geq$ 50 degrees (°). Body height, arm span, Cobb angle, curve type, age at menarche, Risser sign, DRU grades, and any brace use were examined. Final Cobb angle at either skeletal maturity/surgical intervention and whether any progression were used as outcome measure. Statistical analysis was performed to testing any association between curve progression and various parameters. Logistic regression was used in determining the probabilities of curve progression to final Cobb angle thresholds of 40° and 50°, based on initial curve magnitude and DRU grading. **Results:** A total of 513 AIS patients were recruited, with follow-up duration of 4.7 $\pm$ 2.5 years. At initial presentation, patients were of a mean age of 12.5 $\pm$ 1.3 years, 50.2% were pre-menarche, 226 (44.1%) at Risser 0, 175 (34.1%) at radius grade 6, and 156 (30.4%) at ulna grade 5. Bracing was prescribed for 61.6% of patients, among these 32 eventually underwent surgery. Final curve progression to $\geq$ 40° and $\geq$ 50° were both found to be significantly correlated to initial curve magnitudes, modified Lenke curve types, menarche, Risser stages, radius and ulna grades ($p < 0.05$). Based on the prediction model, with R6/U5 at initial presentation, most curves progress with an initial Cobb of 25°; whereas an initial Cobb angle $\geq$ 35° had a high risk ($\sim$50-75%) of progression to final 40° and 50°. Patients at R9 did not progress to $\geq$ 50° regardless of initial curve magnitudes. **Conclusion:** The significant relationship of initial curve magnitudes and DRU grades with final curve progression outcomes of 40° and 50° provided the basis for developing this predictive model. Cobb angle of 25° appeared to be the main cut-off for the likelihood of poor outcomes at peak height velocity (PHV) at R6U5, suggesting that bracing is required immediately for immature patients prior to/at PHV if the initial curve reaches $\geq$ 25°. With same skeletal immaturity, larger initial curves of $\geq$ 35° are predicted with higher risk to reach both unfavourable thresholds, hence a poor prognosis and likelihood of requiring surgery. Despite being near or at skeletal maturity, those with $\geq$ 35° are still at fair risk for progression to 50°. These patients are of priority for early brace intervention. By utilizing the DRU growth status and initial severity of deformity, the risk of curve progression to unfavourable outcomes is predicted. This can aid clinicians in deciding on monitoring, bracing or offering surgery, and whether and when bracing should be introduced at various stages of growth for AIS patients.

References

1. Busscher I, Wapstra FH, Veldhuizen AG: Predicting growth and curve progression in the individual patient with adolescent idiopathic scoliosis: design of a prospective longitudinal cohort study. *BMC Musculoskelet Disord* 2010, 11:93.
2. Weinstein SL, Dolan LA, Spratt KF, Peterson KK, Spoonamore MJ, Ponseti IV: Health and function of patients with untreated idiopathic scoliosis: a 50-year natural history study. *Jama* 2003, 289:559-567.
3. Weinstein SL, Ponseti IV: Curve progression in idiopathic scoliosis. *J Bone Joint Surg Am* 1983, 65:447-455.