



Regional Thoracic and Lumbar Sagittal Cobb Angle Changes and UIV Determine Evolution of Cervical Alignment after ASD Surgery: Series of 171 Patients with 2 Year Follow Up

Brian J Neuman MD; Amit Jain BS; Daniel M. Sciubba BS, MD; Eric Klineberg MD; Han Jo Kim MD; Lukas Zebala MD; Gregory Mundis MD; Malla Keefe; Virginie Lafage PhD; Peter G Passias MD; Renaud Lafage; Themistocles Protopsaltis MD; D. Kojo Hamilton MD; Justin K Scheer BS; Christopher P. Ames MD; International Spine Study Group



Introduction

The aim of our study was to assess the influence of operative changes in spinopelvic parameters on cervical alignment in ASD pts.

Methods

171 ASD pts =18 yrs who underwent surgical correction of their deformity were assessed for changes from baseline to the 2-yr F/U (base-2yr) in the: C2-C7 sagittal vertical axis (C2-C7 SVA), T1-slope (T1S), and C2-C7 lordosis (C2-C7Lord). Multivariate models were constructed to analyze the influence of: UIV selection (T9 and below vs. above T9), and operative changes from baseline to 6-weeks (base-6wk) in the following spinopelvic parameters: thoracic kyphosis (TK), lumbar lordosis (LL), C7-S1 SVA, pelvic incidence (PI), pelvic tilt (PT) and sacral slope (SS).

Results

The base-2yr changes in C2-C7 SVA and in T1S were both significantly associated with the surgical changes from base-6wk in TK, LL and with the UIV selection (Figure 1). Interestingly, the operative correction of C7-S1 SVA from base-6wk was not significantly associated with either changes in C2-C7 SVA or T1S over the 2-yr F/U. Multivariate model revealed that changes from base-2yr in the C2-C7Lord were associated with the base-6wk changes in the C7-S1 SVA (P=0.004). The majority of changes in the C2-C7 SVA over the 2-yr F/U occurred in the first 6 weeks after surgery (base-2yr 95% CI: -0.1mm to +4.6mm, and base-6wk 95% CI: +0.7mm to +4.7mm). Over the 2-yr F/U, on average, there was loss of C2-C7Lord, majority of which was lost in the first 6 weeks after surgery (base-2yr 95% CI: -3.2 to +0.5deg, and base-6wk 95% CI: -4.8 to -1.2deg).

Figure 1: Multivariate Regression Model Analyzing the Effect of Spinopelvic Parameters on Cervical Alignment

Parameters	Change from baseline to 2 yrs in C2C7 SVA	Change from baseline to 2 yrs in T1 Slope	Changes from baseline to 2 yrs in C2C7 Lordosis
Change from Baseline to 6 weeks in:			
- Thoracic Kyphosis	P<0.001*	P<0.001*	P=0.100
- Lumbar Lordosis	P=0.027*	P<0.001*	P=0.234
- C7-S1 SVA	P=0.499	P=0.936	P=0.004*
- Pelvic Incidence	P=0.757	P=0.247	P=0.715
- Pelvic Tilt	P=0.768	P=0.239	P=0.726
- Pelvic Slope	P=0.784	P=0.232	P=0.753
Selection of UIV	P=0.009*	P=0.009*	P=0.072

Learning Objectives

By the conclusion of this session, participants should be able to: 1) understand the effects of changes in TK, LL and C7-S1 SVA on cervical alignment, 2) understand the effect of UIV selection on cervical reciprocal changes, and 3) recognize that the majority of changes occur in the first 6 weeks after surgery and persist.

Conclusions

Reciprocal changes in cervical alignment occur in response to operative changes in TK, LL and C7-S1 SVA. Cervical alignment is also influenced by UIV selection. Majority of changes occur in the first 6 weeks and persist over 2-yrs.