

The Effect of C2-C3 Disc Angle on Postoperative Adverse Events in Cervical Spondylotic Myelopathy

Bryan S Lee MD; Kevin M Walsh MD; Daniel Lubelski MD; Emily Hu BA; Richard C Lee BA; Maheen Nadeem BS; Joseph E Tanenbaum BA; Iain H. Kalfas MD; Richard P. Schlenk MD; Thomas E. Mroz MD; Michael P. Steinmetz MD; Edward C.

Benzel MD

Department of Neurosurgery, Center for Spine Health, Case Western Reserve University, Cleveland Clinic, Cleveland, OH



Cleveland Clinic

Learning Objectives

- Identify the essential cervical alignment measurements, including the C2-C3 disc angle.
- Utilize the appropriately measured radiographic variables as predictors of postoperative adverse events.
- Routinely evaluate the C2-C3 disc angle to help minimize surgical complications and optimize outcomes.

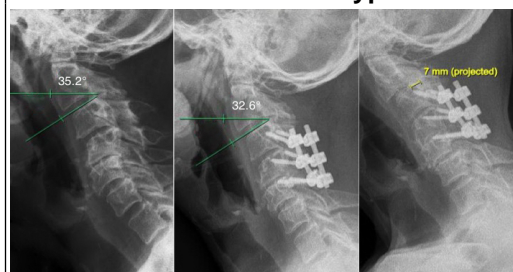
Introduction

Complete radiographic and clinical evaluations are essential in the surgical treatment of cervical spondylotic myelopathy (CSM). Prior studies correlated cervical sagittal imbalance and kyphosis with disability and worse health-related quality of life. The present study is the first to consider C2-C3 disc angle as an additional radiographic predictor of postoperative adverse events.

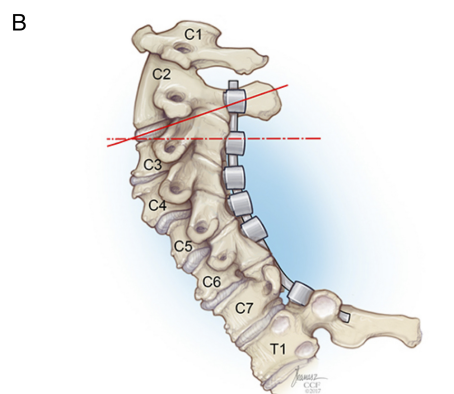
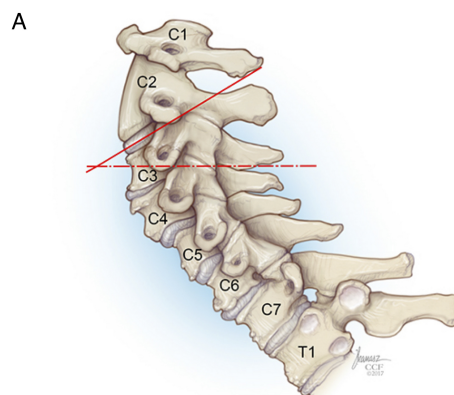
Methods

- Retrospective chart review was performed to identify patients with CSM who underwent surgeries from 2010 to 2014. Data collected included demographics, baseline presenting factors, and postoperative outcomes.
- Cervical sagittal alignment variables were measured using the preoperative and postoperative radiographs.
- Univariable logistic regressions were used to explore the association between dependent and independent variables, and a multivariable logistic regression model was created using stepwise variable selection.

Postoperative Progressive Anterolisthesis and Kyphosis



Illustrative Representation of the Measurement of C2-C3 Disc Angle



(A) In a degenerative spine; (B) After surgical deformity correction with decompression and instrumented fusion

Results

- We identified 171 patients who had complete preoperative and postoperative radiographic and outcomes data.
- The overall rate of postoperative adverse events was 15% (25/171), and postoperative C2-C3 disc angle, C2-C7 sagittal vertical axis, and C2-C7 Cobb angle were found to be significantly associated with adverse events.
- Inclusion of postoperative C2-C3 disc angle in the analysis led to the best prediction of adverse events.
- The mean postoperative C2-C3 disc angle for patients with any postoperative adverse event was 32.3 ± 17.2 degrees, and the mean for those without any adverse event was 22.4 ± 11.1 ($p < 0.0001$).

Radiographic Parameters in Postoperative Adverse Events

Adverse Events	With each AE	Without each AE	P-value
Reoperation			
Preoperative Cobb angle	-2.6±13.5	-6.2±15.3	0.4
SVA	44.3±21.3	38.9±17.3	0.3
C2-C3 disc angle	24.2±13.1	30.8±23.1	0.1
T1 slope	38.6±6.7	27.0±7.1	0.3
Postoperative Cobb angle	-0.9±15.0	-5.5±13.3	0.1
SVA	50.1±23.5	41.9±17.6	0.05
C2-C3 disc angle	34.3±20.6	24.3±12.4	0.002*
T1 slope	29.7±8.5	28.5±7.8	0.5
Kyphosis			
Preoperative Cobb angle	-6.4±15.2	-5.5±15.1	0.8
SVA	42.1±14.9	38.9±18.7	0.4
C2-C3 disc angle	27.3±17.8	24.4±13.8	0.4
T1 slope	25.9±7.2	27.6±7.0	0.3
Postoperative Cobb angle			
SVA	2.1±14.1	-7.1±12.6	0.0002*
C2-C3 disc angle	48.8±20.6	41.3±17.8	0.03*
T1 slope	35.8±17.6	22.5±11.2	<0.0001*
Pseudarthrosis			
Preoperative Cobb angle	27.3±8.0	29.2±7.8	0.2
SVA	-2.8±14.8	-5.8±14.3	0.6
SVA	26.9±16.2	39.9±17.2	0.1
C2-C3 disc angle	19.0±8.9	25.0±15.1	0.4
T1 slope	23.6±3.8	27.5±7.2	0.2
Postoperative Cobb angle	2.9±20.3	-5.5±13.6	0.1
SVA	49.1±17.0	42.4±18.3	0.3
C2-C3 disc angle	39.1 ± 9.6	24.7 ± 14.1	0.009*
T1 slope	23.7±4.9	28.8±8.0	0.05
Adjacent Segment Degeneration			
Preoperative Cobb angle	-3.3±13.7	-6.4±15.4	0.4
SVA	40.9±16.8	39.3±18.3	0.7
C2-C3 disc angle	27.2±17.8	24.4±13.8	0.4
T1 slope	26.4±6.9	27.5±7.1	0.5
Postoperative Cobb angle	2.4±12.9	-7.2±13.0	0.0001*
SVA	47.2±19.9	41.8±19.3	0.1
C2-C3 disc angle	34.1±17.3	23.1±11.9	<0.0001*
T1 slope	27.7±7.4	29.0±8.0	0.4
Adjacent Segment Disease			
Preoperative Cobb angle	-3.1±15.3	-6.2±15.0	0.4
SVA	40.1±18.4	39.4±17.9	0.7
C2-C3 disc angle	27.8±20.2	24.5±13.5	0.4
T1 slope	27.0±4.9	27.3±7.5	0.9
Postoperative Cobb angle	1.7 ± 12.0	-6.3±13.5	0.004*
SVA	46.3±18.6	42.4±18.8	0.3
C2-C3 disc angle	34.3±17.8	23.8±12.5	0.0004*
T1 slope	27.3±5.9	29.0±8.2	0.3

mean ± standard deviation for continuous variables; *Statistically significant; AE = Postoperative adverse event; SVA = Sagittal vertical axis

Conclusions

In our retrospective analysis of postoperative adverse events in patients with CSM, a significant association was found between C2-C3 disc angle and postoperative adverse events. The authors propose that C2-C3 disc angle be used as an additional parameter of cervical spinal sagittal alignment and predictor for operative outcomes.

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