

The relationship between Craniocervical Sagittal Balance with the Outcomes of Cervical Disc Replacement

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Background: Cervical disc replacement (CDR) is an effective procedure for the treatment of cervical degenerative disc disease. Cervical sagittal alignment plays a crucial role in maintaining the physiological function of the cervical spine and could affect surgical outcomes and health-related quality of life.

Research question: To explore the relationship between craniocervical sagittal balance and clinical and radiological outcomes of cervical disc replacement (CDR).

Design: Retrospective cohort study.

Methods: 169 Patients who underwent 1-level and 2-level CDR were retrospectively analyzed. Clinical outcomes were evaluated using scores on the Japanese Orthopaedic Association (JOA), Visual Analogue Scale (VAS), and Neck Disability Index (NDI). The craniocervical sagittal alignment parameters, including the C0-C2 Cobb angle, C2-C7 Cobb angle, C2 slope, T1 slope, C2- C7 sagittal vertical axis (SVA), the center of gravity of the head (CGH)-C7 SVA, and range of motion (ROM) were measured.

Results: Both the pre- and postoperative C2 slope were significantly higher in the less mobile group than in the more mobile group. The CGH- C7 SVA before and after surgery was significantly larger in the less mobile group. Patients with a higher preoperative C2 slope and CGH-C7 SVA had lower cervical lordosis and ROM after surgery. There were no significant differences in the clinical outcomes between patients with different sagittal balance statuses. Patients with radiographic adjacent segment pathology (rASP) had significantly higher preoperative CGH-C7 SVA (19.57 ± 14.16 mm vs. 13.77 ± 13.83 mm, $P = 0.014$) and C2- C7 SVA (20.83 ± 9.62 mm vs. 17.06 ± 9.91 mm, $P = 0.041$).

Discussion: Craniocervical sagittal balance is associated with cervical lordosis and ROM at the index level after CDR. A higher preoperative SVA is related to the presence and progression of rASP. A relationship between sagittal alignment and clinical outcomes was not observed.

Fig. 1**Table 1. Comparison of sagittal parameters between less mobile and more mobile levels**

	Less mobile level (n=54)	More mobile level (n=167)	P value
Surgical level			0.641
1-level	27	90	
2-level	27	77	
C0-C2 angle			
Pre-op	21.35±9.38	20.93±8.61	0.661
Post-op	21.50±8.53	21.96±7.64	0.709
C2-C7 angle			
Pre-op	6.68±11.34	9.38±9.65	0.089
Post-op	9.22±9.94	12.42±8.60	0.035*
C2 slope			
Pre-op	13.63±8.34	11.18±7.02	0.035*
Post-op	12.15±7.15	9.50±6.45	0.011*
CGH-C7 SVA			
Pre-op	18.38±16.54	13.91±13.33	0.036*
Post-op	17.40±11.43	12.48±11.98	0.009*
C1-C7 SVA			
Pre-op	33.61±15.12	30.98±15.43	0.111
Post-op	35.09±10.28	30.33±10.45	0.004*
C2-C7 SVA			
Pre-op	20.00±12.28	17.10±9.24	0.052
Post-op	21.56±8.38	17.56±8.41	0.003*

FSU, functional spinal unit; ROM, range of motion; CL, cervical lordosis; CGH, the center of gravity of the head; SVA, sagittal vertical axis

*Significant difference between two groups