



Clinical impact of 3-level anterior cervical decompression and fusion (ACDF) on the occipito-atlantoaxial complex: A retrospective study of patients who received a zero-profile anchored spacer versus cage-plate construct

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Introduction and Methods.

Little study analyzes the impact of the cervical operation on the upper cervical spine (UCS), the study aims to evaluate changes in the sagittal parameters of the occipito-atlantoaxial complex after 3-level ACDF

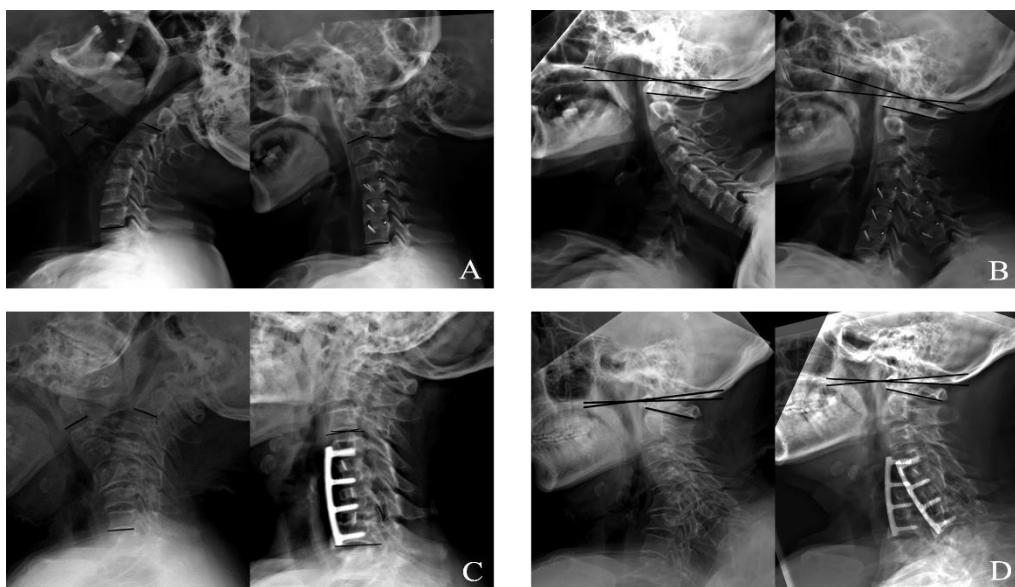


Fig. 1 The study aims to identify the influential factors by comparing ACDF with a zero-profile anchored spacer (ACDF-Z) versus a cage-plate construct (ACDF-P)

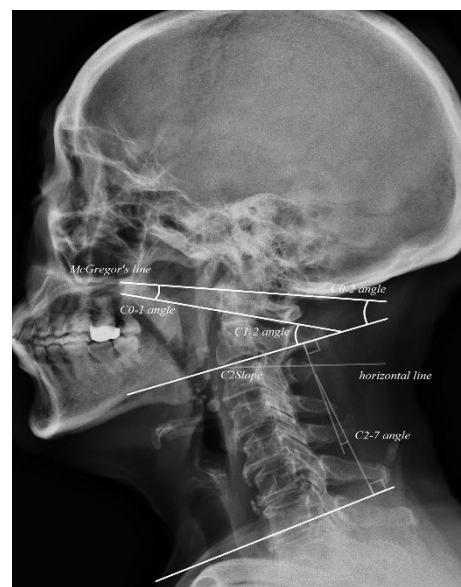


Fig. 2 The assessed cervical sagittal parameters were the platform angle of the axis, Cobb angle, and range of motion (ROM) of C2-7, C0-1, and C1-2

Table 1 Demographics and clinical data of the two groups

Parameters	ACDF-Z group (n=61)	ACDF-P group (n=33)	P value
Sex (male/female)	30/31	18/15	0.39
Age (years)	56.3 ± 8.4	58.2 ± 8.9	0.12
Clinical presentation			
Radiculopathy	22	7	0.31
Myelopathy	21	13	
Myeloradiculopathy	18	13	
Surgery segment			
C34 C45 C56	29	16	0.93
C45 C56 C67	32	17	
Follow-up (months)	24.9 ± 4.5	23.5 ± 3.3	0.56

We present a retrospective cohort study of 106 patients who underwent 3-level contiguous ACDF-Z or ACDF-P for cervical radiculopathy and/or myelopathy at our institution from 2017 to 2019. Data collected included neutral, flexion, and extension radiographs of the cervical spine, clinical findings and post-operative complications

Results.

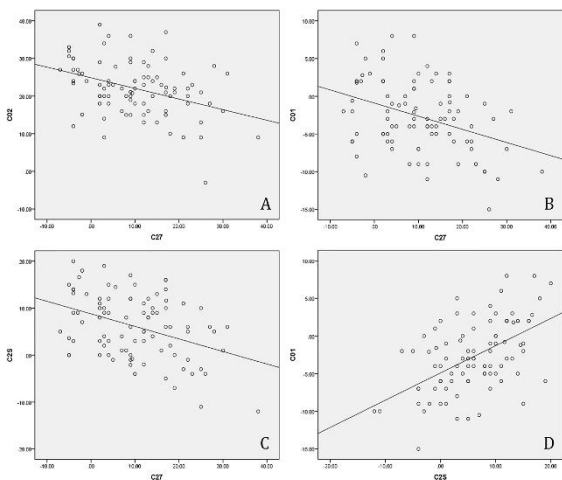


Fig. 3 The Cobb angle of the SCS was significantly correlated with the Cobb angle of the UCS ($r=-0.387$, $P<0.01$), C0-1 angle ($r=-0.368$, $P<0.01$), and C2 slope ($r=-0.385$, $P<0.01$)

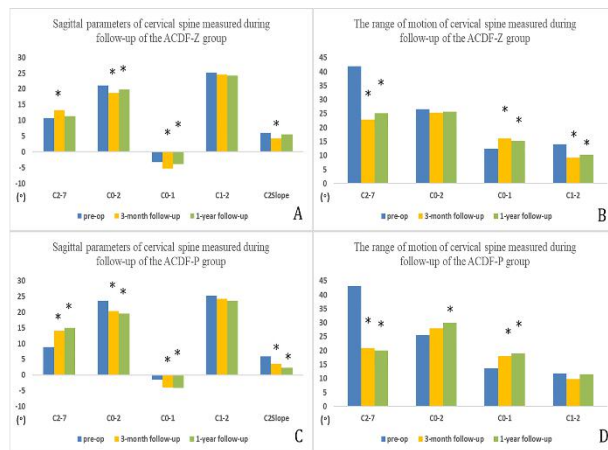


Fig. 4 Changes in the sagittal parameters of the cervical spine (A and C) and the range of motion of the cervical spine (B and D) *significant difference between the follow-ups, $P<0.05$

Parameters (°)	ACDF-Z group (n=61)	ACDF-P group (n=33)	P value
ROM of SCS			
Pre-op	42.0 ± 9.9	43.1 ± 16.9	0.65
3-month follow-up	22.9 ± 10.0*	21.0 ± 17.6*	0.51
1-year follow-up	25.2 ± 9.1*	20.0 ± 8.6*	0.01
Loss of ROM	16.9 ± 9.7	23.1 ± 13.2	0.02
ROM of UCS			
Pre-op	26.5 ± 12.3	25.5 ± 7.6	0.68
3-month follow-up	25.4 ± 13.7	27.9 ± 9.6	0.30
1-year follow-up	25.7 ± 6.1	29.9 ± 10.1*	0.01
Compensation of ROM	-0.8 ± 12.1	4.4 ± 9.2	0.02
ROM of C0-1			
Pre-op	12.4 ± 5.5	13.7 ± 5.0	0.22
3-month follow-up	16.1 ± 13.8*	18.1 ± 6.1*	0.34
1-year follow-up	15.3 ± 4.8*	18.9 ± 6.8*	0.01
ROM of C1-2			
Pre-op	14.1 ± 9.8	11.8 ± 3.7	0.19
3-month follow-up	9.3 ± 4.8*	9.8 ± 4.8	0.66
1-year follow-up	10.4 ± 5.5*	11.6 ± 4.7	0.26

* $p<0.05$ compared with preoperatively

In the both types of ACDFs groups, the Cobb angle of UCS decreased and the C0-1 ROM increased from preoperatively to 3 and 12 months postoperatively ($P<0.001$). The alignment restoration was lost at 12 months compared with 3 months in the ACDF-Z group (2.0 ± 4.3)°, but not in the ACDF-P group (-1.0 ± 3.9)° ($P<0.001$). The ACDF-P group showed more loss of C2-7 ROM (23.1 ± 13.2)° and more compensatory changes in C0-2 ROM (4.4 ± 9.2)° than the ACDF-Z group ((16.9 ± 9.7) ° and (-0.8 ± 12.1) °, respectively) ($P<0.05$)

Impact factors	Regression coefficient	Std error	β value	95%CI	P value
Alignment					
Gender	-0.324	1.047	-0.033	(0.380,0.587)	0.76
Age	-0.033	0.062	-0.059	(54.686,58.260)	0.59
SCS	0.085	0.053	0.170	(8.104,11.949)	0.11
Degeneration	-0.023	0.092	-0.028	(8.826,11.151)	0.80
Fusion fixation	2.967	1.063	0.291	(0.260,0.456)	0.01*
ROM					
Gender	0.474	2.457	0.021	(0.380,0.587)	0.99
Age	-0.126	0.147	-0.097	(54.782,58.271)	0.52
SCS	0.015	0.125	0.013	(8.086,12.032)	0.91
Degeneration	0.232	0.216	0.120	(8.848,11.163)	
Fusion fixation	5.271	2.494	0.225	(0.260,0.456)	0.03*

* $p<0.05$



Conclusion.

1. Both types of ACDF resulted in a decreased Cobb angle and increased ROM as compensatory changes in the atlantooccipital or atlantoaxial joints, may accelerate degeneration and lead to poorer long-term outcomes
2. The zero-profile anchored spacer had less impact on the occipito-atlantoaxial complex with worse maintaining the alignment restoration, which were contrary to the cage-plate device
3. The surgeon should be aware of the various influences of multi-level ACDFs on the occipito-atlantoaxial complex

Conflicts of interest

None of the authors has any potential conflict of interest



Take home message

1. Multi-level ACDF may accelerate degeneration of the atlantooccipital or atlantoaxial joint
2. The zero-profile anchored spacer had less impact on the occipito-atlantoaxial complex



Thanks for your attention !