

Comparison of Radiological Outcome in Anterior Cervical Discectomy and Fusion: Cage-Only v/s Cage and Plate Fixation

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ABSTRACT

Aim: A retrospective analysis of the outcome of anterior cervical discectomy and fusion comparing cage-only and cage-and-plate fixation on the basis of radiographic changes.

Setting: In the department of Neurosurgery of a tertiary care hospital for two-year duration from January 2019 to December 2020.

Methods: 56 patients who endured one-level ACDF (n = 34) and two-level ACDF (n = 22) for cervical disc disease were enrolled in the study and underwent a 12-months follow-up. Patients were separated according to cervical level and divided into cage-only group (ACDF-C) and cage-and-plate fixation group (ACDF-CP). The subsidence and status of fusion were evaluated on the radiography.

Results: Comparing the ACDF-C with ACDF-CP at one level, the subsidence was detected in 50% of patients in the former group and in 33.3% of cases in the later at 12 months follow up. The two groups do not have statistically significant variance in terms of occurrence percentage (p = 0.32). In the two levels comparison of ACDF, ACDF-C had significantly more subsidence (75%) than the ACDF-CP group (28.5%; p= 0.046). The rate of fusion in single level ACDF of ACDF-C was not much different on statistics from that in the ACDF-CP group (87.5% and 88.8%, p= 0.43). The fusion was also similar in the two levels ACDF (ACDF-C= 87.5% and ACDF-CP= 92.8%; p= 0.30).

Conclusions: This study's radiological outcome did not exhibit any extra advantage of plate fixation compared to the cage-only in the 1-level ACDF subjects; however in ACDF at 2-level, a subsidence is much more probable without fixation of plate and therefore adding a plate to cage must be taken important.

Keywords: cervical plate, cervical discectomy, spinal fusion, subsidence.

INTRODUCTION

Anterior cervical discectomy and fusion (ACDF) is typical treatment for progressive diseases of the cervical disc¹⁻². The ACDF employs multiple fixation techniques and modalities, each with their own advantages and disadvantages. Like, autografts are related with noteworthy morbidity at the donor site³⁻⁴. Because of these problems, interbody fusion by attaching only the cage or cage with the fixation of the plate is the primary technique of fusion castoff in surgeries of ACDF⁵. The benefit of cervical plate is its capability to increase the steadiness of the fused vertebral bodies, while the fusion with only cage is beneficial in terms of brief surgery time, simplicity and minimal loss of blood and money⁶. Various analysis has equated the radiological and clinical outcomes of cage-and-plate fixation and cage-only practices⁷⁻⁸. In few analyses, lower subsidence rates and higher fusion percentage is noticed with cage-and-plate fixation while additional analyses exhibited no alteration among the two techniques⁹. In newly published meta-analysis, no differences in radiological and clinical results were found amid the cage and fixation of plate and cage-only group at ACDF 1-level surgery¹⁰⁻¹¹. The authors conducted a retrospective analysis of the effect of ACDF at single-level and two-level comparing plate fixation constructs and stand-alone cages for radiographic changes.

METHODS

This study was held in the department of Neurosurgery in a tertiary care hospital for two-year duration from January 2019 to December 2020. Patients diagnosed with cervical disc degenerative disease conveyed by pain in arm, who underwent consecutive 1- or 2-level ACDF cage-and-plate fixation surgery and cage-only surgery included in this observational retrospective study. The subjects in the study were alienated into four groups contingent on the surgery was one or two-level and whether the plate was fixed or not. 34 patients endured ACDF surgery at one-level; 16 (10 males and 6 females) of these accomplished with

cage-only and 18(10 males and 8 females) of them endured cage-and-plate fixation. 22 patients accomplished ACDF surgery at two-level; 8(7 males and 1 female) of these accomplished with cage-only; while cage fixation of plate was done in 14(10 males and 4 females). PEEK cage was applied for Interbody fusion. The demineralized bone matrix was filled in the PEEK cage and placed in the disc space. An anterior cervical plate was used for plate augmentation.

The 50.3 (51.7 ± 11.2) years was the mean age in the ACDF-C group only at one-level surgery and ACDF-CP group has mean age of 49.8 (49.8 ± 11.8) years. 61.2 (61.2 ± 8.9) years was the mean age in the 2 level ACDF-C group and 52.5 (52.9 ± 11.6) years in ACDF-CP group: Table 1 and 2

Table 1: Demographic data in one-level ACDF (n= 34)

	ACDF-C	ACDF-CP	p-value
Age (years)	51.7 ± 11.2 (35-70)	49.8 ± 11.8 (30-76)	0.52
Sex			0.701
Male	10	10	
Female	6	8	
cervical level			0.529
C3-4	3	2	
C4-5	1	4	
C5-6	4	7	
C6-7	8	5	

Table 2: Demographic data in two-level ACDF (n= 22)

	ACDF-C	ACDF-CP	p-value
Age (years)	61.2±8.9 (52-73)	52.9 ± 11.6 (45-75)	0.072
Sex			0.401
Male	7	10	
Female	1	4	
Cervical level			0.110
C3-4-5	1	3	
C4-5-6	1	7	
C5-6-7	6	4	

At 12 months follow up on the radiography subsidence and status of fusion were evaluated. The subsidence was defined as difference in preoperative and follow up measurement taken on lateral plain x-ray, from superior end plate midpoint of the cranial and inferior end plate midpoint of the caudal vertebra. This difference was taken as >2mm in 1-level and >4mm in 2-level ACDF. The fusion was defined as <2° movement measured on the lateral dynamic x-ray (flexion/extension). Fisher's tests along with chi-square tests were used for statistical significance of variances in radiological findings of the two groups. All data was accomplished and compiled with the SPSS 22.0 and p <0.05 was taken as significant.

RESULTS

At the 12-months follow up, subsidence reported in 8 of 16 patients in the 1-level ACDF-C group (50%) and 6 of 18 cases in the 1-level ACDF-CP group (33.3%). The two groups did not have statistically significant variance in terms of occurrence percentage (p = 0.32). (Table 3).

The subsidence was noticed in 6 among 8 cases in the ACDF-C at 2-level (75%) and 4 out of 14 cases in the ACDF-CP group at 2-level (28.5%). This subsidence found higher significantly in ACDF-C group than the ACDF-CP group. (p= 0.046).

The rate of fusion was 14 among 16 cases in the ACDF-C group at 1-level (87.5%) and 16 out of 18 cases in the ACDF-CP group at 1-level (88.8%), with no statistically substantial change among the both groups (p= 0.43)

The fusion status was appreciated in 7 out of 8 cases in the two-level ACDF-C group (87.5%) and 13 among 14 cases in the 2-level ACDF-CP group (92.8%). The rate of fusion looked advance in cage-and-plate fixation group yet the finding was not significant (p= 0.30): Table 3

Table-3: Radiologic Outcome between ACDF-C and ACDF-CP

	One-level ACDF-C	One-level ACDF-CP	P value	2-level ACDF-C	2-level ACDF-CP	P value
Subsidence	8 (50)	6 (33.3)	0.32	6 (75)	4 (28.5)	0.046
Fusion	14 (87.5)	16 (88.8)	0.43	7(87.5)	13 (92.8)	0.30

DISCUSSION

Though there are many operating procedures for ACDF, main complication is donor site morbidity of iliac bone autografts¹¹. Therefore, PEEK cage used for inter-body fusion is extensively cast-off. Few analyses associating cage-and-plate fixation and cage-only fusion are testified. Multiple outcomes associating the clinical results plate fixation and cage only groups showed no statistically important difference¹²⁻¹³. However, in the analysis by Song and Lee et al; the results of VAS in the group of cage fixation with plate were suggestively good in the one-level ACDF group as compared to the cage alone group. This clarified by the instability of the lordotic curve of the cervical bones as a result of the subsidence of the cage, or the amplified tightness in the posterior cervical segment due to non-union¹⁴⁻¹⁵. Concerning the association between clinical outcome and subsidence, few analyses have found no relationship, though Lee et al. stated that high subsidence groups had bad clinical consequences¹⁶. In additional earlier researches, when the subsidence and fusion rate, and comparison of fusion segment kyphosis was done, the group of cages itself had less rate of fusion and augmented ratio of kyphosis and subsidence. It has also been reported that the achievement proportion declines as the numeral of levels upsurges¹⁷⁻¹⁸. This indicates that the cervical body fixative force is inferior in the cage -solitary group than in group of plate-supported fixation. There is a great deal of research into adjacent segmental diseases and adjacent segmental degeneration (ASD) supplementary new myelopathy or radiculopathy post-ACDF¹⁹. Statistics on whether ASD is naturally occurring development of

adjacent osteoarthritis and thus ACD-related, or is a result of a postoperative biomechanical change, is controversial and little known.

Stated causing aspects comprise the incidence of ASD before surgical procedure, excessive dispersion of disc space and amplified range of motion at adjacent levels²⁰⁻²¹. However, these causing aspects don't settle the dispute about the source of ASD. The ASD jeopardy was conveyed as advanced in the cage with plate group and occasionally significant. Ji et al. Assumed that the higher jeopardy of ASD in the group of people with plate fixation was probably because of the greater force of fixation, which in turn increased the amount of pressure exerted on adjacent intervertebral discs during vertebral and cervical movement after surgery²²⁻²³. The cage itself has no loosening, removal, or any complications with the plate hardware such as dysphagia or foreign body sensation²⁴. Though comparison of ASD was not done this research, a description showing association between clinical outcomes and ASD indicates that cage-only surgery may be more beneficial than single-level fusion cage-plate fixation²⁵. As the rate of success declines in the cage-only procedure as the level of fusion upsurges, the cage-and-plate technique is probable to have more benefit than to cage-only surgery in 2-level fusion cases.

CONCLUSION

The radiological outcome did not exhibit any extra advantage of plate fixation compared to the cage-only in the 1-level ACDF subjects; whereas in ACDF at 2-level, subsidence is more probable without a cervical anterior plate and hence adding a plate to cage must be taken important.

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