

Comparative Analysis of Cervical Spine Fixation with Conventional Cervical Plating Versus Stand Alone Cage in Cervical Spine Injuries**Dr. Kunal Saoji¹, Dr. Ashwin Chavhan²**¹Associate Professor, Dept. of Orthopaedics, DMMC, Nagpur²Assistant Professor, DMMC, Nagpur

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Conflict of interest: Nil

Abstract:**Objective:** Compare the outcomes of anterior cervical discectomy and fusion (ACDF) with a standalone interbody cage versus a conventional cage and anterior cervical plate technique.**Methods:** A single tertiary care facility treated adult patients between January 2021 and October 2022 in this retrospective cohort research. The Institutional Ethical Review Board gave their approval to the project. Patients who had already undergone treatment during the study period were found, and those who met the criteria for inclusion were enrolled. Age requirements ranged from 18 to 100 years, and ACDF could be performed using either a normal graft and plate or a separate cervical cage device.**Results:** There were 25 individuals who had received a plate-cage procedure and 25 patients (n=50) who had undergone solo cage procedures. A mean of 714 ± 123 days after their solo operation. Patients who received a plate-cage operation and had a two-year follow-up at a mean of 742 ± 116 days were still alive. The standalone group had a higher proportion of single level surgeries while the plate-cage group had a higher proportion of multiple (two or more) level surgery ($p < 0.01$). There was a significant difference between groups in graft material and duration of surgery ($p < 0.01$).**Conclusion:** Despite radiographic indications of higher rates of subsidence and poorer restoration of cervical lordosis, ACDF with a cage-only approach seems to have better clinical outcomes than the cage-plate technique. To verify the results, additional randomised controlled trials with longer-term follow-up are required.**Keywords:** Cervical Spine, Discectomy, ACDF, Fixation.

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Introduction

Anterior cervical discectomy and fusion (ACDF) has been used to treat cervical degenerative disc degeneration, radiculopathy, and myelopathy since Smith and Robinson [1] first described it in 1958. [2–5] Advances in ACDF procedures have resulted in the invention and widespread use of anterior plate fixation, which adds further stability. [6] However, there have been reports of adverse events related to anterior cervical plates, including dysphagia, neurovascular injuries, and soft tissue damage to the oesophagus. [7,8] Stand-alone interbody cages that promote stability and cervical vertebral fusion without the need of an anterior plate were created to address these issues. [9] However, this novel approach has its own drawbacks, including cervical kyphosis, cage subsidence, and cervical dislocation. [10] A widespread agreement over which of the two procedures is better than the other has not yet been established despite previous studies comparing them.

The benefits of anterior cervical plate fixation and standalone cages have been merged in new fusion devices. [11] By offering tight limited screw fixation, a solo anchored spacer (Zero-P; Synthes

GmbH Oberdorf, Switzerland) has been used in clinical practise to prevent postoperative dysphagia and strike a balance between the need for a thick plate and small-plate size (low- and zeroprofile). [12]

This study compared surgical characteristics, clinical and radiological results, and complications in patients who fused with anterior plate systems or with stand-alone anchored implants.

Materials and methods

A single tertiary care facility treated adult patients between January 2021 and October 2022 in this retrospective cohort research. The Institutional Ethical Review Board gave their approval to the project. Patients who had already undergone treatment during the study period were found, and those who met the criteria for inclusion were enrolled. Age requirements ranged from 18 to 100 years, and ACDF could be performed using either a normal graft and plate or a separate cervical cage device. Patients who had received a posterior cervical surgery, corpectomy, or any other alternative procedure were not allowed to participate.

General demographic data (sex, age, BMI), medical history and comorbidities (Charlson comorbidity score, COPD, diabetes, cardiovascular disease, immunosuppression status, history of smoking, prior cervical surgeries), primary diagnosis (myelopathy, radiculopathy, trauma), and surgical characteristics were gathered as baseline data (levels of surgery, side of approach, graft material, length of surgery, and estimated blood loss). Senior orthopaedic and neurological spine surgeons carried out each procedure. The same self-retaining retraction device (Shadow-Line) was used in each case to retract the

oesophagus and other tissue, even though the same spinal instrumentation vendor was not employed. Frequency counts and their percentages were calculated for categorical variables. Means and standard deviations were calculated for continuous variables and displayed. The Chi-square test was applied to compare categorical variables. Simple linear regression was applied to outcomes that were continuous. The threshold for statistical significance was fixed at $p < 0.05$. To evaluate the possibility of follow-up bias, we compared patients in each therapy group who completed their 2-year follow-up with those who did not using the same methodology



Figure 1 : (A) Prolapsed intervertebral disc at C5-C6 along with collapsed C5-C6 vertebral bodies (B) Intraoperative image showing fixation with stand alone cage (C and D) Post Operative X-ray of the stand alone cage fixation

Results

There were 25 individuals who had received a plate-cage procedure and 25 patients (n=50) who had undergone solo cage procedures. A mean of 714 ± 123 days after their solo operation. Patients who received a plate-cage operation and had a two-year follow-up at a mean of 742 ± 116 days were still alive.

The standalone group had a higher proportion of single level surgeries while the plate-cage group had a higher proportion of multiple (two or more) level surgery ($p < 0.01$). There was a significant difference

between groups in graft material and duration of surgery ($p < 0.01$).

There were not many statistically or clinically significant differences in any of the characteristics between those who completed and those who did not complete their 2-year follow-up when comparing within treatment groups, giving confidence that recall bias was unlikely to affect the comparative estimates. The stand-alone group, where the proportions were similar, did not exhibit this variation

Table 1: Surgical characteristics comparing the two groups

Variable	Standalone (n=25)	Plate and Interbody (n=25)	P
Age, Mean $\pm$ SD	56.4 ± 11.5	57.6 ± 11.4	0.29
BMI, Mean $\pm$ SD	29.4 ± 5.8	29.2 ± 6.3	0.77
Charlson comorbidity index, mean $\pm$ SD	0.74 ± 1.4	0.72 ± 1.1	0.93
Pre-op VAS, mean $\pm$ SD	5.3 ± 2.1	5.4 ± 1.9	0.68
Length of surgery (min), mean $\pm$ SD	107.7 ± 43.0	143.0 ± 50.6	<0.01
Estimated blood loss, mean $\pm$ SD	84.6 ± 32.4	97.0 ± 101.3	0.10

Discussion

Treatment for cervical disc degeneration, radiculopathy, and myelopathy includes ACDF. With low reported rates of pseudoarthrosis for 1- to 2-level fusions, ACDF with an anterior cervical plate has been demonstrated to be an efficient form of fusion. [6] However, there has been growing interest in the use of methods such as standalone cages that do not require plate fixation due to the postoperative difficulties that have been linked to the presence of an anterior plate. In contrast to a traditional cage-plate technique, our study showed that ACDF with a cage-only technique was linked with a lower incidence of postoperative dysphagia, intraoperative blood loss, and ASD. A cage-only approach, however, was discovered to have higher rates of cage subsidence, lower postoperative disc height, and lessened cervical lordosis restoration.

According to Fountas et al. [13], the development of dysphagia may be influenced by esophageal damage, soft tissue edema, hematoma, and adhesion formation around the anterior cervical plate. The rate of postoperative dysphagia and the thickness of the plate have a favourable association, according to Lee et al. [14] Additionally, Fogel and McDonnell showed in their metaanalysis that in patients who had previously undergone ACDF, removal of an anterior plate and lysis of concomitant esophageal adhesions dramatically decreased incidence of both immediate and chronic postoperative dysphagia. [15].

Additionally, a statistically significant reduction in intraoperative blood loss was linked to the cage-only

approach. This difference, however, is probably not clinically relevant because the usual blood loss during an ACDF is quite minimal. Regarding the incidence of ASD, ACDF using a cage-only technique was discovered to be superior to the traditional cage-plate strategy. According to biomechanical research, using a traditional cage-plate approach for ACDF alters the mechanical characteristics of intervertebral discs at levels above and below the fusion. After fusion, nearby segments are under more stress and are more mobile, which could speed up ASD. [16] ASD is connected to both sagittal malalignment and rapid disc degeneration, which may call for further care months to years after the index procedure. [17]

Conclusion

In conclusion, ACDF using a stand-alone cage approach is linked to a lower incidence of postoperative dysphagia and a lower likelihood of developing autism spectrum disorder (ASD). Although the cage-alone method was linked to a lesser restoration of normal cervical lordosis, this did not appear to have an immediate clinical impact. The research included in this meta-analysis had relatively short-term follow-up, therefore the long-term results are yet unknown. Despite radiological evidence of increased cage sinking and less restoration of cervical lordosis, the cage-only treatment seems to have better short-term clinical effects than the traditional cage-plate technique.

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