Original Article

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Clinical Presentation and Outcomes after Anterior Cervical Discectomy and Fusion for Degenerative Cervical Disc Disease:

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Abstract

Background: Anterior cervical discectomy and fusion (ACDF) is a well-established surgical procedure for the treatment of degenerative cervical disc disease, particularly in patients with radiculopathy and myelopathy who do not respond to conservative management.

Methods: This retrospective cohort study included 110 patients who underwent single- or two-level ACDF between January 2020 and December 2024 at a tertiary care center. Demographic data, clinical presentation, surgical details, and postoperative outcomes were analyzed. Associations between implant type, surgical level, and complication rates were evaluated using the Chi-square test.

Results: The mean age of patients was 50.17 ± 14.47 years, with a nearly equal sex distribution. The overall complication rate was 24.5%, with most complications being minor and transient. Complete symptom resolution was observed in 20.9% of patients, while 79.1% experienced significant improvement. No statistically significant association was found between implant type and complication rate ($p = 0.245$) or surgical level and complication rate ($p = 0.509$).

Conclusion: ACDF is a safe and effective procedure for degenerative cervical spine disorders, providing significant clinical improvement in most patients. Further prospective studies with longer follow-up are recommended to evaluate long-term outcomes.

Keywords: Anterior Cervical Discectomy, Fusion, Degenerative Cervical Disc Disease

INTRODUCTION

The anterior cervical discectomy and fusion (ACDF) is one of the most commonly performed spine procedures for the treatment of a variety of indications in the cervical spine[1].This procedure is generally used to treat nerve root or spinal cord compression by decompressing these structures in the cervical spine, which is followed by vertebral stabilization. Since its introduction in 1958, anterior cervical discectomy and fusion (ACDF) has been considered the gold standard for the surgical treatment of various degenerative cervical spine conditions, owing to its proven effectiveness and favorable safety profile. Fusing the two bodies with screws and plates using synthetic cages, autografts, or allografts[2]. The anterior approach relieves neural compression by revealing the spinal canal and disc spaces, preserving the posterior musculature, and restoring neck height and alignment[3]. ACDF is best for pain reduction, neurological rehabilitation, and functional impairment improvement in radiculopathy and mild to moderate myelopathy, according to various clinical trials[4].The fusion rate after ACDF can range from 85% to 95%, depending on the number of levels performed, the graft material used, instrumentation, and patient-specific factors like age, bone quality, and smoking status. Despite being safe and effective, ACDF has risks. Complications may include postoperative dysphagia, laryngeal nerve irritation, wound infection, pseudarthrosis (non-fusion), and ASD, which vary per study[5].

ACDF has gained increasing attention in recent years, leading to a substantial body of research in the field of cervical spine surgery. Conservative treatments including physical therapy, NSAIDs, cervical collars, and epidural steroid injections are used for most patients. ACDF has been recommended for the subgroup of patients who do not respond to the conservative management[6,7,8,9,10]. When neurological impairment is apparent or symptoms persist despite non-operative treatment, surgery is needed to prevent lasting damage and improve function. In well-selected group of patients (i.e., significant radicular pain, younger age, single-level soft disc, male gender, nonsmokers, matching radiological and clinical findings, and well-preserved neurological functions), ACDF has been shown to be associated with good outcome[11,12].

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METHODS AND MATERIALS

Study design

Retrospective cohort study based on hospital records from

the Department of Neurosurgery, Manipal Teaching Hospital, Western Nepal.

Study period and setting

A review of hospital records of all patients who underwent single- or two-level anterior cervical discectomy and fusion between January 2020 and December 2024 at the Department of Neurosurgery, Manipal Teaching Hospital, Phulbari, Nepal. Standard demographic data, clinical presentation, surgical details, and pre- and postoperative outcomes were collected.

Inclusion criteria

1) Patients aged 18 years and above who underwent single- or two-level ACDF for degenerative cervical disc disease, with documented preoperative clinical symptoms and postoperative outcome measures, and
2) Minimum follow-up of 3 months were included in the study.

Exclusion criteria

1) History of prior cervical spine surgery
2) Cervical trauma, infection, or neoplasm
3) Incomplete or missing clinical or radiological data

RESULTS

The study included a total of 110 patients who underwent anterior cervical spine surgery. The mean age of the patients was 50.17 ± 14.47 years. Regarding sex distribution, there were 52 males (47.3%) and 58 females (52.7%). The overall complication rate was 24.5% (27 out of 110 patients).

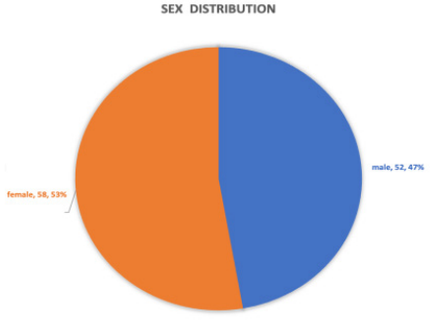

Figure 1. Sex distribution

Implant Type vs Complication Rate

Table 1.1: Implant Types and its complication

Implant Type	No Complication	Complication
Cage + Bone Graft + Plate	59	17
Standalone Cage	24	10

Chi-square test revealed a p-value of 0.245, indicating no statistically significant association between implant type and complication rate indicating no statistically significant association ($p > 0.05$).

Surgical Level vs Complication Rate

Table 1.2: Surgical Level VS Complication Rate

Level	No Complication	Complication
C4-C5	22	9
C5-C6	28	5
C5-C6, C6-C7	19	8
C6-C7	14	5

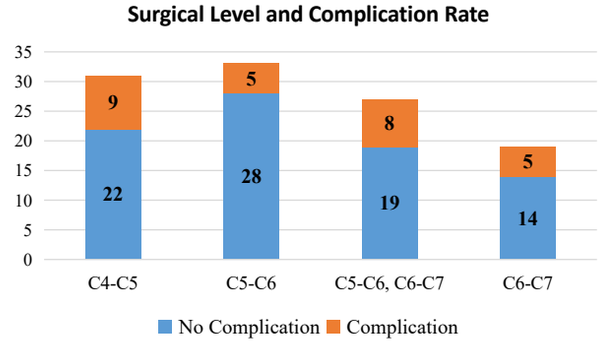

Figure 2. Surgical Level VS Complication Rate

Similarly, the Chi-square test for the association between surgical level and complication rate yielded a p-value of 0.509, indicating no statistically significant association ($p > 0.05$). These findings suggest that neither transient the type of implant used nor the acent seg specific surgical level significantly omplete influenced the occurence of I patients complications in this patient cohort.

Regarding clinical outcomes, the overall complication rate was observed to be 24.5% (27 out of 110 patients). The reported complications were mostly minor and transient in nature, including transient dysphagia, hoarseness, mild wound infection, and adjacent segment pain, all of which were managed conservatively. Complete symptom resolution was achieved in 20.9% (23/110) of patients, while significant partial improvement or mixed outcomes were observed in 79.1% (87/110) of cases, indicating that the majority of patients experienced significant clinical benefit following surgery.

Statistical analysis using the Chi-square test was performed to evaluate potential associations. The association between implant type and complication rate showed a p-value of 0.245, indicating no statistically significant relationship ($p > 0.05$). Similarly, the Chi-square test for the association between surgical level and complication rate yielded a p-value of 0.509, again demonstrating no statistically significant association ($p > 0.05$). These findings suggest that neither the type of implant used nor the specific surgical level significantly influenced the occurrence of complications in this patient cohort

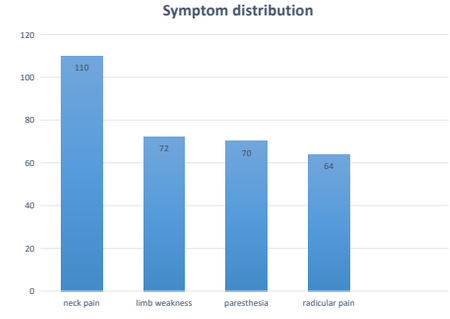

Figure 3. Distribution of symptoms

In this study,all the patients have complaints of neck pain, 72 patients had weakness of limbs,70 patients had paresthesia and 64 patients had radicular pain. These symptoms are overlapped in many patients.

The data were abstracted from patient records with a variable follow-up duration, predominantly ranging from 3 months. Most patients showed satisfactory improvement in presenting symptoms following surgery, supporting the overall safety and efficacy of the procedure in this series.

DISCUSSION

The present study included a total of 110 patients who underwent anterior cervical discectomy and fusion (ACDF). The mean age of the study population was 50.17 ± 14.47 years, with ages ranging from 22 to 78 years. Several studies indicate a higher prevalence of cervical spondylosis in females compared to males. In our study, cohort consisted of 52 males (47.3%) and 58 females (52.7%), reflecting a nearly equal sex distribution. Cervical degenerative disc disease is most commonly reported in middle-age group (35–55 years)[13,14].This retrospective study involving 110 patients demonstrates that ACDF is a highly effective surgical intervention for treating cervical spine disorders such as disc herniation, cervical spondylotic myelopathy, and radiculopathy. The results indicate substantial postoperative improvement in pain levels, functional ability, and neurological status.

The marked improvement in functional outcomes, as assessed by NDI, indicates significant enhancement in patients' daily activities and independence. This is particularly important in individuals presenting with debilitating symptoms like limb weakness, numbness, or gait instability due to cervical myelopathy or radiculopathy. Neurological improvement in majority of cases is a promising result, underscoring the importance of timely decompression. This finding is in agreement with studies showing that early surgical intervention correlates positively with neurological recovery, particularly in compressive myelopathy.

Postoperative complications ranging from 4.4% to as high as 20% are reported following ACDF[15-21].Postoperative complications following ACDF reported include injury to esophagus/trachea/vascular/neural structures, wound hematoma, wound infection, bone graft extrusion, instrumentation failure, pseudoarthrosis, etc[22-25].

The findings of this study support the continued use of ACDF as a standard treatment for degenerative cervical spine conditions. The significant improvement in pain, function, and neurological status reinforces its role as a definitive intervention. Future prospective studies with randomized control designs and longer follow-up periods are recommended to better evaluate the durability of surgical outcomes, the true incidence of Adjacent segment disease , and the impact of newer technologies such as cervical disc arthroplasty. Further research should also investigate the role of patient-specific factors (e.g., bone mineral density, nutritional status, and genetic predispositions) in influencing fusion and recovery.

Limitations of the study.

Firstly, the retrospective nature of the study limits the ability to control for confounding variables such as severity of disease, bone quality, and precise surgical techniques. Secondly, the absence of a control group (e.g., patients undergoing posterior approaches or conservative management) restricts comparative analysis. Thirdly, follow-up duration was limited to a minimum of three months, which is insufficient to capture long-term complications such as adjacent segment disease, hardware failure, or chronic pseudarthrosis.

CONCLUSION

Anterior Cervical Discectomy and Fusion can properly treat cervical spine issues like disc herniation, spondylotic myelopathy, and radiculopathy. This retrospective analysis of 110 patients indicated that ACDF significantly reduced pain, improved neurological function, and aided functional recovery. Although the study had a large sample size and uniform surgical process, it was retrospective, had no control group, and had a short follow-up time. Bigger, prospective, multicenter trials with longer follow-up timeframes are needed to confirm these results, assess long-term durability, and guide surgical technique and patient care improvements.

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