ORIGINAL RESEARCH PAPER
Volume - 13 | Issue - 06 | June - 2024 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

# A CASE SERIES OF CERVICAL COMPRESSIVE RADICULOMYELOPATHY DUE TO DISCOGENIC COMPRESSION - ITS MANAGEMENT AND OUTCOME AT A TERTIARY CARE CENTER IN NORTH EAST INDIA.

Neurosurgery

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## ABSTRACT

**Introduction** Anterior cervical discectomy and fusion (ACDF) constitute the conventional treatment of cervical disc herniation causing radiculopathy and myelopathy. This study aimed to analyze prospectively collected data from a sample of patients treated with single-level or two-level ACDF to evaluate relief of radiculopathy or myelopathy symptoms. **Methods** Forty-two patients (26 males and 16 females) who underwent successful either single-level or two-level ACDF for symptomatic cervical Disc Disease were selected for the study. Radiculopathy and myelopathy symptoms were evaluated preoperatively and at 1, 3, 6, and 9 months postoperatively. **Results** The clinical and radiological outcomes were satisfactory after a minimum 9-month follow-up. Radiculopathy in the form of neck and arm pain and myelopathy in the form of improvement of handgrip was observed in the subsequent follow-ups all showing a constant improvement over the 9-month follow-up period. **Conclusions** ACDF is an effective method for cervical disc herniation treatment, in terms of postoperative improvement in pain levels and improvement of myelopathy symptoms.

## KEYWORDS

Anterior Cervical Discectomy And Fusion, Cervical Disc Herniation, Radiculopathy, Myelopathy

## INTRODUCTION:

Smith and Robinson first introduced anterior decompression of the cervical spine and Cloward established it as a treatment for cervical disc degeneration disease (DDD). (1) (2) (3) Since then, anterior cervical discectomy/decompression and fusion (ACDF) has been used as the standard procedure for the treatment of single and multiple cervical DDD. (4) (5) (6) ACDF is believed to have several advantages compared to discectomy alone. (7) However, the scarcity of randomized studies is due to the lack of an established gold standard method concerning ACDF. (3) ACDF procedures with anterior cervical plating are thought to enhance stabilization with improvement in fusion, cervical alignment, implant subsidence, and failure rates. (8) (9) (10) Nevertheless, complications including increased dysphagia rates and implant-associated problems such as breakage, loosening of screws, screw penetration to the endplate, and fractures have been reported, especially in multilevel ACDF. (11) (12) (13) (14) Over the last decades, questions have also arisen regarding the ideal technique(15) and the optimal material for ACDF.(16)

Autogenous tricortical iliac crest graft has been considered the "gold standard" of anterior reconstruction due to its high fusion rate. (17) (18) However, it brings around 25% of donor site morbidity including hematoma, persistent donor site pain, and infection. (19) (20)To prevent these complications, Bagby *et al*. designed the first hollow cylindrical cage device (Bagby Bone Basket) made of stainless steel which allowed the bone to grow. (21) Subsequently, the titanium mesh cage (TMC) gradually replaced the stainless steel cages. It became the most widely used device in anterior fusion due to its excellent mechanical behavior and preferable clinical outcomes. (22) (23) Knowing the anatomy before performing an ACDF is critical to avoid unnecessary complications.

In a study of 30 cadaveric specimens, Civelek *et al*. (2007) documented several common critical anatomical landmarks for performing ACDF surgery. (24)They found; that the common carotid artery bifurcation mostly occurred at the C-4 level (78%); the inferior omohyoid belly crossed the field largely at the C5-6 level; the facial vein drained into the internal jugular vein predominantly at the C3-4 (54%) level; the superior sympathetic ganglion was located in most cases at C-4, while the location of the intermediate ganglion varied; the vertebral artery entered the transverse foramen at C-6 (90%), followed by C-7 (7%), and C4 (3%) respectively; finally, the inferior thyroid artery was usually found at the C6-7 level. (24)

We report our early experience on a prospectively collected series of patients treated with single-level or 2-level ACDF using either titanium cage, zero-profile plate, or PEEK Cage and followed up to 9 months after surgery. The indications, procedure steps, clinical outcomes, and complications are elaborated below.

## MATERIALS AND METHODS

### Patient population

All patients in our study were diagnosed with cervical DDD and they had filled all the indications for ACDF. All operations were performed by the same neurosurgeon and all the procedures were performed at the same hospital. Patients agreed to participate in the study and signed a fully informed written consent. The study has been approved by the hospital committee and the scientific committee. Inclusion criteria included: (I) Adult individuals aged over 18 years old; (II) symptomatic cervical disc disease with cervical radiculopathy (including neck or arm pain and/or sensory/motor neurologic deficit on clinical examination), confirmed by magnetic resonance imaging (MRI) of the cervical spine, in compliance with clinical findings; (III) Single or two level cervical herniated disc. Exclusion criteria were: (I) More than 2 level cervical disc degeneration; (II) Previous cervical spine surgery; (III) Pre-operative dysphagia; (IV) Allergy implant materials; (V) Active malignancy or infection or body mass index (BMI) ≥40; (VI) Segmental instability; (VII) Present vertebral fracture; (VIII) Active rheumatic disease or metabolic bone disease affecting the cervical spine; (IX) Pregnancy; (X) History of psychiatric disorder or recent substance abuse. Between June 2022 and May 2023, 42 consecutive patients were selected to undergo ACDF for cervical disc herniation at levels from C3-C4 down to C6-C7 presenting with cervical radiculopathy or myelopathy symptoms after failing conservative treatment for at least 6 weeks and corresponding findings on MRI. Of those 42 patients, 32 (76.19%) patients had one-level disease and the rest 10 (23.80%) patients had two-level disease. The patient study sample consisted of 26 (61.90%) male and 16 (38.09%) female patients with ages ranging from 27 to 68 years (mean 49.6±7 years). Of the 42 enrolled patients, 33 (78.57%) underwent ACDF at the C5-C6 level, which was the most common location. Titanium, PEEK Cage, or Zero-Profile Cage was implanted. Their health-related quality of life was evaluated by measuring the handgrip and the Neck and Arm pain in the form of a visual analog scale (VAS).

### Surgical methods

A standard surgical technique for anterior cervical microdiscectomy was used. (25) All patients were monitored in terms of blood pressure, pulse rate, oxygen saturation, and electrocardiographic signals. All patients were operated by the same neurosurgeon using a standard, right-sided, transverse neck incision. The surgical exposure involves access to the operating site and retraction of the tissues using minimal instrumentation. The trachea, esophagus, and coronary artery were retracted in order to clearly see the vertebral bodies and discs. The

confirmation of the level was done by inserting a marker into the disc and confirming the correct operative level utilizing a lateral radiograph. The discectomy and endplate preparation were performed using a curette. This was followed by the removal of any disc material pressing the spinal cord and/or nerve roots, any osteophytes that were contacting the neural elements and cartilaginous endplates. The implant selection was performed with trial spacers. Then the implant was inserted. IITV assistance was used intraoperatively to check the correct device's placement.

***Data collection and outcome evaluation***

Clinical outcomes were assessed preoperatively and at the follow-up phases. The handgrip was used to monitor the resolution of myelopathy and VAS was used to assess Neck and Arm Pain. After surgery, patients were assessed at 1, 3, 6 and 9 months. The incidence of hoarseness and dysphagia were noted.

Pre-operative clinical evaluation was done by a neurosurgeon. This included a pre-operative full neurological examination with thorough documentation of neck pain, radicular pain, and neurological deficits. Pre-operative radiological studies of the cervical spine included X-rays (anteroposterior, lateral, oblique, and flexion/extension views), computed tomography (CT), and mainly MRI including T1 and T2-weighted sequences in transverse and sagittal planes. Postoperatively, static and dynamic X-rays were obtained at each follow-up visit to assess the position of the implanted devices and the fusion rate.

Assessment of fusion and subsidence was done with X-ray examinations on each phase of the follow-up. Degenerative changes in the adjacent segments were evaluated on MRI at the final follow-up.

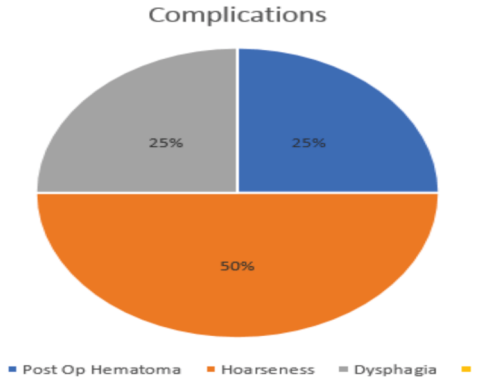
***Data analysis***

The statistical analysis of this study was performed with the statistical package SPSS, version 26. The P value <0.05 was determined as a statistically significant difference level. Continuous variables were expressed as mean ± standard.

## RESULTS

All patients showed improvement postoperatively during the different phases of the follow-up. Neck Pain, as well as arm pain and myelopathy seen in the form of increased hand grip power and gait improvement, showed constant improvement during the follow-up, with the greatest scores presenting at 9 months. The handgrip, neck pain, and arm pain showed higher improvement in the first 2 months postoperatively compared to the preoperative status and then there was a gradual and constant amelioration up to the 9 months of the follow-up.

Operation time was estimated at 45±15 min and blood loss at 5±2 mL. Postoperative complications occurred in approximately 4.76% of the 42 patients. No device-related complications were encountered. There was no implant subsidence during follow-up and all patients had radiological evidence of fusion by 6 months postoperatively. However, the following complications occurred: one postoperative hematoma which resolved itself; one patient with mild dysphagia which was no longer present after 14 days and two patients had voice arrest which normalised by 2 months after a short course of steroids. Postoperatively, patients were put on the hard cervical collar for 6 weeks.




## DISCUSSION

ACDF is an effective and safe procedure for the surgical treatment of patients with cervical Disc disease. Cervical cages were first introduced as a substitute for autologous iliac bone grafts avoiding autograft harvesting-related complications. (26) They accomplish internal fixation while, simultaneously, supplying structural support for the cancellous bone which is incorporated more quickly than an allograft. (27) Anterior cervical discectomy and fusion (ACDF) has proven to be an effective surgical intervention for addressing both cervical radiculopathy and myelopathy and has become standard treatment for both of these disease states over the last half-century. (28) (29) (30) (31) Though recent reports suggest neck pain frequently improves following ACDF, historically there is notable variability in neck pain improvement following ACDF. Thus, anterior cervical fusion remains a procedure primarily indicated for treating radiculopathy and myelopathy. (32) (33) (34) (35)

Our study examines the clinical outcomes as regards to pain levels and myelopathy symptoms after ACDF. It is to be noted that, neck pain is common among individuals with cervical disc disease. There are a variety of theories regarding the source of neck pain in these patients, ranging from the degenerated disc itself, facet joints posteriorly, and the surrounding muscles and ligaments. (36) Regardless of the source(s) of preoperative pain, some recent reports suggest that overall, patients with preoperative radiculopathy and/or myelopathy tend to have a significant reduction in neck pain following ACDF surgery. (32) (33) (34)

The response of neck pain to ACDF is important as it is closely related to satisfaction following ACDF. (37) (38). Massel et al, (32) studied a cohort of patients with myelopathy and/or radiculopathy and reported that regardless of the predominant neck or arm pain symptoms, neck pain improved following ACDF (44.2% decrease in neck pain). (32) Other studies have separately evaluated the utility of ACDF concerning neck and arm pain resolution, noting uniform relief for both symptoms after surgery. (33) (34)

In our study too, radiculopathy and/or myelopathy showed significant improvement in the follow-up period. The improvement was gradual and constant something that underlines the long-term effectiveness of the procedure which is consistent with other studies.

As regards to fusion, subsidence, and other complications, the results are comparable to the relevant literature. Also the complication rate in our study - hematoma in one of the patient, dysphagia in another patient and voice arrest in two of the patients which subsided on conservative management are at par to several recent studies.

This study is limited by the relatively small number of patients and the shorter mean follow-up period to evaluate the long-term efficacy of the procedure. Nevertheless, we feel that this study provides useful information regarding the efficacy of ACDF in addressing the myeloradiculopathy symptoms of cervical Disc disease. There were certain other limitations in our study, such as the difficulty in the assessment of bone fusion with plain radiographs, and the non-feasibility of assessing every patient with a CT scan. Further large-scale, prospective, randomized studies with long-term follow-up periods are needed to overcome these limitations. The shorter operation time and less blood loss intraoperatively indicates meticulous dissection, less traction and less damage to prevertebral soft tissues during surgery plays a key role in the overall outcome of the surgery ultimately which may have contributed to the relatively low complications rate.

## CONCLUSIONS

ACDF using either a titanium cage, PEEK Cage, or Zero-Profile Plate in patients with cervical discogenic compression showed satisfactory results in terms of handgrip improvement and radiculopathy symptoms after a 9-month follow-up. Nevertheless, longer follow-up studies are needed to evaluate the superiority of one material over the other and the long-term radiological as well as clinical outcomes in these groups of patients. Overall, the results show that ACDF is an effective, reliable, and safe method for the treatment of either single or 2-level cervical disc disease.

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