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Case Report

Anterior Cervical Discectomy and Fusion: A Two-Case Series and Literature Review on Management and Outcomes

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Abstract

Background: Anterior cervical discectomy and fusion (ACDF) is a common surgical intervention for cervical spine pathologies, including disc herniation and spinal stenosis. Despite its efficacy, complications such as paraplegia can occur, often due to hematomas or iatrogenic injuries.
Case Report: A 42-year-old man presented with persistent pain in his cervical spine radiating to his left arm, numbness in his fingers, and limited movement in his cervical spine. Magnetic resonance imaging (MRI) revealed a C6-C7 disc herniation and C5-C6 spinal canal stenosis. ACDF was performed at C6-C7 with a cage and bone autograft, achieving decompression and stabilization. A 47-year-old female patient presented via the emergency department complaining of severe, recurring pain in the cervical spine radiating to the right shoulder and scapula region and headaches. According to the patient, she has been suffering from severe pain, considered a real nuisance, for several months. MRI showed intervertebral disc herniation and foraminal stenosis at the C5-C6 vertebrae. Anterior microsurgical decompression and fusion with a cage were performed at C5-C6.
Conclusion: ACDF effectively restores cervical alignment and dynamics in single-level cervical pathologies, with transient postoperative complications such as dysphagia resolving during recovery. It remains the preferred approach for anterior cervical disc herniation.

Keywords: Cervical Vertebrae; Spinal Fusion; Spinal Stenosis; Discectomy; Intervertebral Disc Displacement

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Background

Anterior cervical discectomy and fusion (ACDF) is a surgical procedure employed in the cervical spine pathologies. The most significant or prevalent complication is paraplegia or paralysis as a neurological deficiency, typically resulting from hematomas or iatrogenic injuries. Nonetheless, several paraplegias remain enigmatic, prompting some to attribute their etiology to white blood cell (WBC) syndrome, which generates free oxygen radicals that damage the spinal cord (1). The incidence of cervical hernias is 18 per 100000 individuals, with a peak occurrence in the sixth decade of life (2).

Cervical hernias may arise from trauma or mechanical degenerative alterations. The most frequently impacted levels are C5-C6, and the roots of C6-C7, leading to symptoms such as arm pain, triceps weakness, hand drop, and middle finger paresthesia. ACDF is a surgical procedure that entails the excision of the intervertebral disc to retrieve its components and relieve pressure on the neural tissue (3). A bone graft, such as an interbody implant, with a cervical plate accompanied by screws, is then inserted, supporting the spine and its various levels (4). The use of interbody spacers tends to limit spinal motion, while the use of a dynamic rotational plate will increase stability and offer a more ideal effect (5). This study aims to evaluate the efficacy of ACDF in restoring cervical alignment, alleviating pain, and improving neck biomechanics in two patients with cervical disc herniation and stenosis.

Case Report

This case series describes two patients who underwent ACDF for cervical spine pathologies. Ethical approval was obtained from the institutional ethics committee, adhering to the Declaration of Helsinki. Informed consent was obtained from both patients.

Case 1: A 42-year-old man presented with persistent pain in his cervical spine radiating to his left arm, numbness in his fingers, and limited movement in his cervical spine. According to the patient, he has been experiencing pain in his cervical spine for a long time. He reported a history of conservative treatments under medical supervision [non-steroidal anti-inflammatory drugs (NSAIDs), B vitamins, muscle relaxants, physical therapy, and exercise therapy], which had a temporary effect. Once again, the pain returned as a genuine, prolonged discomfort, lasting several months.

Magnetic resonance imaging (MRI) of the cervical spine was recommended and it showed osteochondrosis, spondyloarthrosis of the cervical spine, a herniated disk at C6-C7, and spinal canal stenosis at the C5-C6 level shown in figure 1. Admission and hospitalization were recommended, followed by surgical treatment.

On physical examination, the patient was alert and oriented. Vital signs were within normal limits, with a heart rate of 68 beats per minute and blood pressure of 128/78 mmHg. Cervical range of motion (ROM) was markedly reduced due to pain. The normal cervical lordotic curvature was diminished.

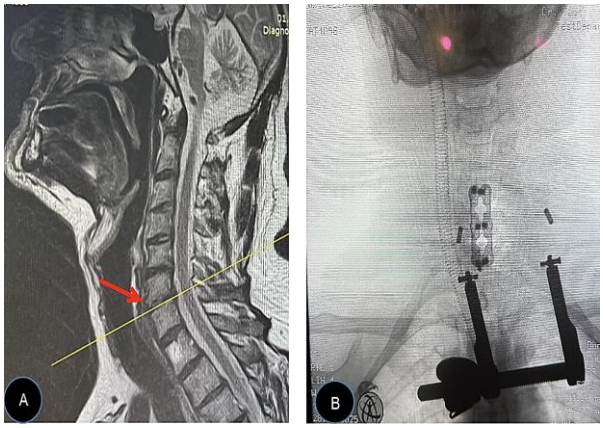

Figure 1. A) Preoperative sagittal view with cervical stenosis at levels C5-C6; B) Postoperative axial image using fluoroscope, placement of cage and anterior cervical plate

Palpation elicited marked tenderness over the paravertebral region from C2 to C7, and increased muscle tone (hypertonicity) was noted in the surrounding musculature. Peripheral pulses in both upper and lower extremities were palpable and symmetric; the distal limbs were warm, indicating intact peripheral perfusion.

The preoperative clinical diagnosis included cervical osteochondrosis, spondyloarthrosis, a C6-C7 disc herniation, spinal canal stenosis at C5-C6, and vertebrogenic pain syndrome. Surgical intervention was indicated due to spinal canal stenosis with nerve root compression, persistent and severe pain unresponsive to conservative therapy, and the need to prevent progressive neurological deficits.

Surgical Procedure: The patient underwent anterior cervical decompression and fusion (ACDF) at the C6-C7 level. Under general anesthesia with tracheal intubation and mechanical ventilation, the patient was placed in the supine position with a support roll beneath the shoulders. Following triple antiseptic preparation of the surgical field, intraoperative fluoroscopy was used to confirm the C6-C7 level. A left-sided transverse incision was made over the vertebral projection, and soft tissue dissection was performed using a combination of sharp and blunt techniques. The anterior surfaces of the cervical vertebral bodies were exposed. A retractor was used to displace the trachea and esophagus medially and the neurovascular bundle laterally.

Under 2.5 × magnification, microsurgical instruments were employed to perform a discectomy and anterior decompression at the C6-C7 level. The spinal cord and nerve roots were adequately decompressed, and all visible compressive elements were removed. The intervertebral space was prepared by cleaning the endplates to the point of punctate bleeding. A cage bed was created, and an appropriately sized interbody cage (14 mm × 6 mm), packed with autologous bone graft, was implanted. The cage was noted to be stable. Hemostasis was achieved, and fluoroscopic imaging confirmed satisfactory implant positioning (Figure 1).

Postoperatively, the patient was transferred to the intensive care unit (ICU), where he was fitted with a cervical brace. He reported postoperative neck pain and mild dysphagia, which was monitored and managed conservatively. Empirical antibiotic therapy was administered to prevent infection. Follow-up imaging demonstrated correct placement and stability of the instrumentation. The patient was discharged in stable condition with a referral for outpatient follow-up and rehabilitation.

Case 2: A 47-year-old female patient presented to the emergency department complaining of severe, recurring pain in the cervical spine radiating to the right shoulder and scapula region and headaches. According to the patient, she has been suffering from severe pain, considered a real nuisance, for several months.

On physical assignments, the patient was conscious, alert, and oriented. Vital signs were stable, with a pulse rate of 68 beats per minute and a blood pressure of 120/80 mmHg. Physical examination revealed preservation of the spinal axis, although ROM in both the cervical and thoracic spine was significantly restricted due to pain. Cervical and lumbar lordosis appeared flattened. Palpation elicited sharp pain along the paravertebral points from C3 to T3, and tenderness was noted at trigger points in the right cervical region. Muscular hypertonicity was evident in the cervical and thoracic regions.

Neurological examination showed a negative Lasègue sign. However, signs of neural tension were positive in the right upper limb. Wassermann and Matskevich signs were negative. Sensory and motor functions in all extremities were preserved.

MRI of the cervical spine revealed degenerative-dystrophic changes in the cervical spine, intervertebral disc herniation, and foraminal stenosis at the C5-C6 vertebrae with signs of compression of the nervous structures at this level. Surgical treatment was recommended (Figure 2).

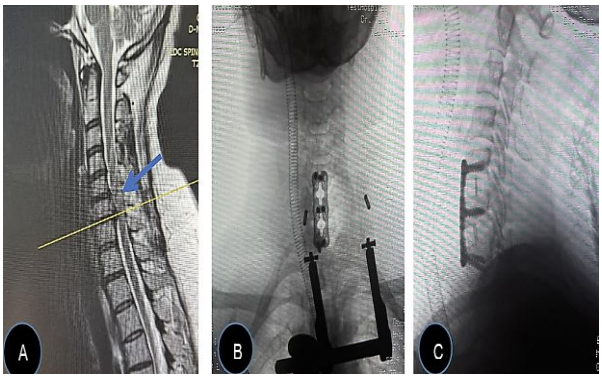

Figure 2. A) Preoperative sagittal magnetic resonance imaging (MRI) with an image of cervical stenosis at levels C5-C6; B) Postoperative axial fluoroscopic image with a view of the anterior cervical plate; C) Lateral fluoroscopic control image with a view of the inserted cervical plate

Diagnosis: Diagnosis included degenerative-dystrophic disease of the cervical spine, intervertebral disc herniation and foraminal stenosis at the C5-C6 vertebrae, vertebrogenic and radicular pain syndrome.

Indications for Surgery: Given the presence of a herniated intervertebral disc, stenosis, pain radiating to the lower extremities, motor deficits, and the ineffectiveness of conservative therapy to achieve the fastest possible restoration of function and pain relief, the proposed treatment was spinal fusion.

Surgical Procedure: The patient was placed in a supine position with a roller under the shoulder blades. General anesthesia was administered with tracheal intubation and artificial ventilation. After preparing the surgical field, intraoperative fluoroscopy was used to localize the C5-C6 vertebral level (Figure 2).

A left-sided transverse soft tissue incision was made above the C5-C6 projection. Access to the anterior surface of the vertebral bodies was achieved using a combination of sharp and blunt dissection. A retractor was positioned to displace the trachea and esophagus medially and the neurovascular bundle laterally. An anterior cervical discectomy and decompression of the spinal cord and nerve roots at the C5-C6 level were then performed. The compressive pathology within the spinal canal was successfully relieved. The intervertebral space was prepared by cleaning the superior and inferior endplates.

A single interbody cage, sized 14 mm × 7 mm, was selected and implanted along with Histograft as a bone substitute. The cage was noted to be stable upon placement. Hemostasis was achieved, and the fixation elements were confirmed to be stable. Intraoperative imaging confirmed satisfactory implant positioning (Figure 2).

Postoperative Course: In the immediate postoperative period, the patient was transferred to the ICU, where a cervical collar was applied. The patient experienced mild neck pain and transient dysphagia, which were managed conservatively. Given the overall stable postoperative course and absence of complications, the patient was discharged with instructions for outpatient follow-up and consultation.

Discussion

ACDF effectively addresses cervical sagittal malalignment caused by degenerative changes that cause pain due to spinal cord compression and, therefore, the development of myelopathy (6, 7). Repairing this sagittal imbalance leads to the restoration of cervical dynamics and, therefore, neurological recovery, improving clinical pain outcomes, and preventing or slowing degeneration of the adjacent segment (8).

For herniated discs located anterior to the spinal cord, posterior surgery will not be able to remove the anterior compressive component; therefore, it will clearly be inadequate after surgery. An anterior approach for a giant herniated disc is the best, as the most common surgical method is anterior cervical corpectomy (9, 10). An anterior cervical corpectomy removes the intervertebral discs and part of the vertebra itself to decompress the spinal cord and the affected roots. Regarding anterior cervical corpectomy, one of its greatest advantages is the ability to remove the nucleus pulposus in a clear and direct manner (11). However, corpectomy can present a host of complications, from vertebral artery injury to a dural tear, which will lead to cerebrospinal fluid (CSF) leaks and can cause displacement of the implanted graft, among others (12).

Complications: Postoperatively, complications will determine the clinical significance of the ACDF for the use of polyetheretherketone (PEEK) cages (13, 14). These include the presence of pharyngitis in patients with filled PEEK cages. Fusion with filled cages has also caused transient hoarseness, leading to reoperation for inferior disc disease, as well as cases of hematomas and transient dysphagia following anterior cage dislocation (15-17). Empty PEEK cages may require reoperation or revision (18). Adjacent segment disease and nonunion may also lead to reoperation. Cervical hematomas require intervention and evacuation in the presence of neurological impairment that can cause transient Horner's syndrome, persistent left myelopathy, and reflex-like dystrophy (19, 20). ACDF can cause postoperative complications due to poor anatomical management. Smoking can also be a cause, as it can be associated with infections in surgical sites that can lead to reoperations (21).

Biomechanical Cage: The spine's spinal angle is represented by its lordotic alignment, especially in the cervical and lumbar vertebrae, as well as a kyphotic alignment of the thoracic and sacral vertebrae. Therefore, spinal movement will include flexion, lateral bending, and axial rotation. Thus, we use ACDF and anterior cervical corpectomy and fusion (ACCF) techniques to maintain cervical lordosis and the height of the intervertebral discs. The biomechanics of the titanium mesh cage can be tested by comparing its stiffness with axial compression, torsion, flexion, extension, and lateral bending in various groups. If we compare the in vitro biomechanics of cervical fusion cages with other structures in an ovine model after ACDF, we continue to compare the intact motion segments. The titanium mesh cage with a cylindrical design shows better stiffness, flexion, extension, etc., yielding better results than titanium cages with a screw design obtained in vitro from an ovine model. Notably, the mean stiffness values for axial rotation and lateral bending were significantly higher in titanium mesh constructs compared to alternative grafting methods, indicating the advantage of combining titanium cages with autologous bone grafts (22).

To detect deep infections during ACDF, laboratory investigations may include a complete blood count (CBC), erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), and imaging studies such as cervical spine X-rays, MRI, and computed tomography (CT) scans. Ultrasound can assist in evaluating the frequency and extent of the abscess cavity; therefore, barium contrast X-ray is included to detect esophageal perforations (23).

Both anterior and posterior approaches are effective for spinal cord decompression in patients with cervical spondylitic myelopathy, achieving better clinical outcomes (24). Anterior approaches are the preferred approach for single-level anterior cervical pathologies (25). The posterior approach is used for two levels. In degenerative diseases, using a discectomy with fusion and a cage with anterior plate fixation would be superior to a corpectomy (26). In fusion with a structural graft, plate fixation is preferred in the absence of complicated structural failures, which would shorten the hospital stay (10, 26, 27).

Conclusion

ACDF is a reliable and widely used surgical option for managing single-level anterior cervical pathologies. It effectively restores cervical alignment, reduces pain, and improves spinal biomechanics. While some patients may experience temporary issues such as dysphagia after surgery, these are usually mild and resolve on their own with conservative care. Compared to anterior cervical corpectomy, ACDF is associated with fewer complications, making it the preferred choice in most single-level cases. A careful surgical technique, along with close postoperative monitoring, plays a key role in ensuring good outcomes and reducing the risk of complications. Based on the findings of this study, ACDF is recommended as the optimal approach for single-level anterior cervical pathology, while the posterior approach is more suitable for two-level involvement.

Conflict of Interest

The authors declare no conflict of interest in this study.

Acknowledgements

None.

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