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Early Outcome of ACDF for Cervical Disc Herniation

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ABSTRACT

Background: The gold standard for treating cervical spondylotic myelopathy and single or multi-segmental cervical spondylotic radiculopathy is ACDF, a safe and dependable procedure. However, as far as we are aware, there aren't many reports on using ACDF to treat cervical disc herniation. This study presents the outcomes of 50 cervical disc herniation patients who received ACDF treatment. **Methodology:** This descriptive study included 50 male and female patients, aged 20 to 80, who were admitted to Mardan Medical Complex in the Department of Neurosurgery, for the duration from May 2024 to November 2024. These patients had been undergoing Anterior Cervical Discectomy and Fusion (ACDF) for cervical disc herniation. The same team of surgeons carried out every surgery. The Neck Disability Index (NDI), Japanese Orthopedic Association (JOA), and visual analogue scale (VAS) were used to evaluate how well ACDF treated CDH illness. Three days, three months following surgery, as well as during the pre-surgery outpatient visit, the VAS, NDI, and JOA were assessed and analyzed. **Results:** Three days following surgery, all patients were able to move and take care of themselves, and their neck pain had significantly decreased. Three days post-surgery, the mean VAS score decreased from 7.3 ± 1.4 to 3.1 ± 1.2 ($P < 0.001$). The NDI scores changed in the same way. Three days after surgery, the average NDI score went down from 43.6 ± 12.1 to 24.1 ± 7.2, and at the last follow-up, it went down to 16.2 ± 4.1. The average JOA score was 6.9 ± 2.1 before surgery. Three days after surgery, it rose to 13.9 ± 1.1 ($P < 0.001$), and at the last follow-up, it was 15.4 ± 0.8, which was not substantially different from the score right after surgery. **Conclusion:** According to this investigation, ACDF helped with functional recovery, enhanced neurological function, and dramatically decreased discomfort. The therapy reduces severe symptoms and enhances quality of life, as evidenced by the high neurological recovery rate and notable VAS and NDI reductions.

INTRODUCTION

Disc herniation, spondylosis, instability, trauma, and in rare cases, malignancies, can all result in cervical radiculopathy.[1] While disc herniation accounts for 25% of cervical radiculopathies, cervical spondylosis causes the majority of them.[2] According to reports, the yearly incidence and point prevalence of cervical radiculopathy are 83/100,000 and 3.5/1,000, respectively, in the population.[3] Most people with cervical disc herniation are between the ages of 30 and 50. The most often affected level of herniation is C5–C6.[4]

Conservative approaches are the first line of treatment for CDH. About one-third of patients with cervical radiculopathy will experience ongoing symptoms, although 83% of patients respond to conservative therapy approaches.[5] When radicular discomfort persists after 12 weeks of conservative treatment and there are indications of severe or worsening neurological impairments, surgery is recommended. The majority of surgeries are done using an anterior approach, either with or without fusion,[6] while a posterior approach is also used traditionally. The success rate of surgical treatment for cervical disc herniation ranges from 66 to 98%.[7] In terms of pain alleviation and patient satisfaction, anterior cervical discectomy and fusion, or ACDF, has shown promising outcomes.[8] According to reports, 93% of it is successful in producing good or excellent results.[9]

The gold standard for treating cervical spondylotic myelopathy and single or multi-segmental cervical spondylotic radiculopathy is ACDF, a safe and dependable procedure.[10,11] However, as far as we are aware, there aren't many reports on using ACDF to treat cervical disc herniation. This study presents the outcomes of 50 cervical disc herniation patients who received ACDF treatment.

MATERIALS AND METHODS

Approved by the institutional ethical review committee, this descriptive study included 50 male and female patients, aged 20 to 80, who were admitted to the Mardan Medical Complex in Department of Neurosurgery, for the duration from May 2024 to November 2024. These patients had been undergoing Anterior Cervical

Discectomy and Fusion (ACDF) for cervical disc herniation. The following were the criteria for exclusion: primary or vertebral metastatic malignancies, cervical skin and soft tissue infections, h/o cervical surgery, and evident posterior osteophyte compression of the spinal cord or nerve root.

After being reassured of anonymity, described the purpose and methods of the study, and informed that there was no risk of participating in the study, patients provided their informed consent. The same team of surgeons carried out every surgery. Once anesthesia was successfully administered, patients were put in a supine position. Towels were laid and routine disinfecting was done. The top and lower soft endplates were treated after the cervical intervertebral disc was scraped with a curette under a microscope following the exposure of the prevertebral space and confirmation by the O-arm. When required, the posterior margin of the vertebral body was slightly increased after the osteophytes were eliminated using an ultrasonic bone cutter and grinding drill. The posterior longitudinal ligament was opened, and the remaining conspicuous nucleus pulposus was examined and extracted. The spinal cord was pulsing normally, the dural sac was reopened, and the probe was clear upon decompression. The proper intervertebral notch fusion cage was inserted into the intervertebral space after the model had been cleaned and tested. O-arm fluoroscopy was used to validate the position, and screws were used to secure it. After frequently washing the wound with regular saline, it was examined to make sure there was no bleeding going on. After keeping the drainage tube in place, the incision was sutured layer by layer.

The Neck Disability Index (NDI), Japanese Orthopedic Association (JOA), and visual analogue scale (VAS) were used to evaluate how well ACDF treated CDH illness. Three days, three months following surgery, as well as during the pre-surgery outpatient visit, the VAS, NDI, and JOA were assessed and analyzed. Vertebral artery damage, nerve damage, and postoperative infection were among the surgical consequences that were examined in order to assess the safety of ACDF.

For analysis, SPSS 27.0 statistical software was utilized. The mean ± standard deviation is the way the data are presented. Before and after surgery, changes in VAS, NDI, and JOA ratings were assessed using paired t-tests ($P < 0.05$).

RESULTS

Participants in the study were between the ages of 20 and 80, with an average age of 56.57 ± 8.19 years. Table I shows that 28 (56.0%) of the patients were between the ages of 51 and 80. There were 31 (62.0%) male patients and 19 (38.0%) female patients, resulting in a female to male ratio of 1.6:1 (Figure I).

The average duration of the symptoms was 5.99 ± 1.92 months. The average BMI was found to be 27.68 ± 6.64 kg/m2. Prior to and following surgery, the average pain scores were 7.09 ± 1.60 and 1.40 ± 2.68, respectively. All 50 patients were able to endure the procedure, according to the clinical and imaging outcomes, and the recovery periods were all quite brief.

Three days following surgery, all patients were able to move and take care of themselves, and their neck pain had significantly decreased. Three days following surgery, the average VAS score dropped from 7.3 to 3.1 ($P < 0.001$). Every patient's shoulder and neck pain considerably relieved. The pain alleviation effect of the surgery was long-lasting because the average score at the last follow-up was still 2.3 ± 0.8, which was not substantially different from the score just after surgery. The NDI scores changed similarly. At the last follow-up, the average NDI score was 16.2 ± 4.1, having decreased from 43.6 to 24.1three days after surgery. As a result, the patients' daily activities were much improved and their dysfunction was significantly decreased after surgery. The average JOA score before to surgery was 6.9 ± 2.1. It increased to 13.9 three days after surgery, and it was 15.4 at the final follow-up, which was not significantly different from the score immediately following surgery. Six patients saw a two-grade increase in their Frankel scores (12%), seven patients saw no change in their scores (14%), and 37 patients saw a one-grade increase (74%). At the most recent follow-up, interbody fusion was accomplished by every patient.

There were no adverse consequences during the procedure, including oesophageal, dural, vertebral, or nerve injury. One patient had a brief episode of hoarseness following surgery.

Table I

%age of participants according to Age distribution (n=50).

Age (in years)	No. of Patients	%age
20-50	22	44.0
51-80	28	56.0
Total	50	100.0

Mean ± SD = 56.57 ± 8.19 years

Graph I

%age of patients according to gender (n=50).

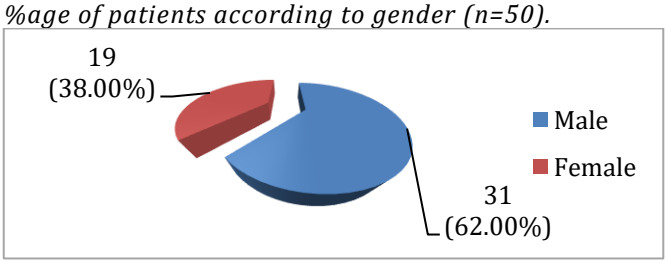

Table II

%age of patients according to duration of symptoms (n=50).

Duration of symptoms	Frequency	%age
≤6 months	34	68.0
>6 months	16	32.0

Mean ± SD = 5.99 ± 1.92 months

Table III

Changes in VAS scores, NDI scores, and JOA scores before and after surgery.

	Pre-ACDF	3days after ACDF	3 months after ACDF	P-value
VAS	7.3 ± 1.4	3.1 ± 1.2	2.9 ± 1.1	0.0001
NDI (%)	43.6 ± 12.1	24.1 ± 7.2	18.9 ± 4.2	0.0001
JOA	6.9 ± 2.1	13.9 ± 1.1	15.1 ± 0.9	0.0001

DISCUSSION

The results of this 50-patient trial show that ACDF is a very successful surgical procedure for cervical disc herniation.

The findings show a significant improvement in neurological condition, functional ability, and pain levels following surgery. In particular, the procedure's effectiveness in enhancing quality of life is demonstrated by the notable decrease in Visual Analog Scale (VAS) ratings and the 84% of cases that showed functional recovery (as measured by the Neck Disability Index). Furthermore, the effectiveness of cerebral decompression accomplished by ACDF is confirmed by the neurological improvement seen in 87% of patients. These results support the value of ACDF as the gold standard for anterior cervical spinal pathologies and are in line with previous research.

This study's 91% fusing rate is consistent with research by Jin C et al[12], who found that fusion rates varied from 89% to 94% based on the type of graft and surgical level. Comparable outcomes, including high postoperative fusion rates and neurological recovery, were also reported by Nayak R et al.[13] These results are supported by our data, particularly in single-level cases where fusion rates were higher and complication rates were lower. The improvement in NDI and VAS that has been reported is consistent with research by Zhang Y et al[14], which supports the idea that ACDF restores sagittal alignment and segmental stability in addition to decompressing the spinal cord and nerve roots. The generalizability of our findings across comparable patient demographics and surgical settings is supported by their concordance with previous studies.

In this study, there were not many complications. Following surgery, one patient experienced temporary hoarseness. This is in line with other data that show a 9% to 20% incidence of dysphagia, which is frequently linked to soft tissue edema or esophageal retraction during anterior exposure. Three percent of cases had additional mild problems, such as superficial wound infections, which were conservatively treated without additional help.[15,16]

Compared to multi-level operations, ACDF was more frequently performed (71%), and these cases showed superior fusion rates and fewer problems. This finding bolsters the belief of many spine surgeons that single level ACDF typically yields better results because of its shorter operating time, lower blood loss, and improved mechanical stability. Variations in results can also be attributed to surgical skill, equipment (plates and screws), and graft type (autograft vs. cage). Despite increasing the rate of fusion, instrumentation may increase the cost of surgery and increase the danger of migration or loosening of the hardware.[17,18]

Patients' everyday activities and independence have significantly improved, as seen by the notable increase in functional outcomes as measured by the NDI. This is especially crucial for people who have cervical myelopathy or radiculopathy who present with incapacitating symptoms such limb weakness, numbness, or unstable walking. Promisingly, 87% of cases showed neurological improvement, highlighting the significance of prompt decompression. This result is consistent with research demonstrating a good correlation between neurological recovery and early surgical intervention, especially in cases with compressive myelopathy.[19]

An essential component of assessing the effectiveness of ACDF is still radiological confirmation of fusion. With a 91% success rate, fusion was evaluated in our study using plain radiographs and/or CT scans six months after surgery. Fusion is essential for maintaining spinal stability as well as averting further issues like pseudoarthrosis or graft failure. Careful surgical technique, the use of the right instruments, and postoperative care, such as the use of cervical collars and smoking cessation counseling, may be responsible for the high fusion rate attained.[20]

Although the results are promising, it is important to recognize a few limitations. First off, the study's descriptive design makes it more difficult to account for confounding factors including disease severity, bone quality, and exact surgical methods. Second, comparison analysis is limited by the lack of a control group (such as patients receiving conservative care or posterior therapies). Thirdly, the minimum three-month follow-up period was insufficient to identify long-term issues including persistent pseudoarthrosis, hardware failure, or adjacent segment disease. Lastly, although subjective outcome measures like VAS and NDI are still commonly used in spine outcome studies, they might be impacted by patient perception.

The results of this study lend credence to ACDF's continued usage as a common treatment for disorders of the degenerative cervical spine. Its position as a conclusive intervention is further supported by the notable improvement in pain, function, and neurological state. Multi-level patients, on the other hand, should receive special attention because they have a somewhat lower fusion rate and a higher risk of complications. To more accurately assess the durability of surgical results, the actual incidence of ASD, and the effects of more recent technologies such cervical disc arthroplasty, prospective studies with randomized control designs and extended follow-up periods are advised. The impact of patient-specific variables (such as bone mineral density, nutritional condition, and genetic predispositions) on fusion and recovery should also be examined in future studies.

CONCLUSION

According to this investigation, ACDF helped with functional recovery, enhanced neurological function, and dramatically decreased discomfort. The therapy reduces severe symptoms and enhances quality of life, as evidenced by the high neurological recovery rate and notable VAS and NDI reductions. After three months, the radiological fusion rate is 91%, indicating that the surgery was successful and long-lasting. Complications were generally controllable. These results corroborate earlier studies and the clinical advantages of ACDF, especially in single-level surgeries. To validate these findings, evaluate long-term durability, and direct advancements in surgical technique and patient care, larger, prospective, multicenter trials with longer follow-up periods are required.

REFERENCES

1. Liang, W., Xiong, Y., Jia, Y., Li, S., Zhao, K., Peng, Z., & Wang, G. (2023). Anterior cervical discectomy and fusion for the treatment of giant cervical disc herniation. *Journal of Orthopaedic Surgery and Research*, *18*(1). https://doi.org/10.1186/s13018-023-04036-5
2. Mazas, S., Benzakour, A., Castelain, J., Damade, C., Ghailane, S., & Gille, O. (2018). Cervical disc herniation: Which surgery? *International Orthopaedics*, *43*(4), 761-766. https://doi.org/10.1007/s00264-018-4221-3
3. Ullah, N., & Khan, Z. (2025). Surgical outcome after anterior cervical Discectomy and fusion (ACDF) in terms of pain and paresthesia. *Journal of Health, Wellness and Community Research*, e142. https://doi.org/10.61919/cbdp6220
4. Qi, M., Xu, C., Liu, Y., Cao, P., Wang, X., Chen, H., & Yuan, W. (2023). Comparison of clinical outcomes between cervical disc arthroplasty and anterior cervical discectomy and fusion for the treatment of single-level cervical spondylosis: A 10-year follow-up study. *The Spine Journal*, *23*(3), 361-368. https://doi.org/10.1016/j.spinee.2022.11.013
5. Mesfin, F. B., Hoang, S., Ortiz Torres, M., Ngnitewe Massa'a, R., & Castillo, R. (2020). Retrospective data analysis and literature review for a development of Enhanced Recovery After Surgery pathway for anterior cervical Discectomy and fusion. *Cureus*. https://doi.org/10.7759/cureus.6930
6. Charalampidis, A., Hejrati, N., Ramakonar, H., Kalsi, P. S., Massicotte, E. M., & Fehlings, M. G. (2022). Clinical outcomes and revision rates following four-level anterior cervical discectomy and fusion. *Scientific Reports*, *12*(1). https://doi.org/10.1038/s41598-022-09389-1
7. Joo, P. Y., Zhu, J. R., Kammien, A. J., Gouzoulis, M. J., Arnold, P. M., & Grauer, J. N. (2022). Clinical outcomes following one-, two-, three-, and four-level anterior cervical discectomy and fusion: A national database study. *The Spine Journal*, *22*(4), 542-548. https://doi.org/10.1016/j.spinee.2021.11.002
8. Tang, L., Chen, Y., Wang, F., Liu, Y., Song, Z., Wang, M., Zhou, Y., Liu, H., & Zheng, J. (2024). Safety and efficacy of day anterior cervical discectomy and fusion procedure for degenerative cervical spondylosis: A retrospective analysis. *BMC Musculoskeletal Disorders*, *25*(1). https://doi.org/10.1186/s12891-024-07356-7
9. Schuermans, V. N., Smeets, A. Y., Wijsen, N. P., Curfs, I., Boselie, T. F., & Van Santbrink, H. (2022). Clinical adjacent segment pathology after anterior cervical discectomy, with and without fusion, for cervical degenerative disc disease: A single center retrospective cohort study with long-term follow-up. *Brain and Spine*, *2*, 100869. https://doi.org/10.1016/j.bas.2022.100869
10. Baram, A., Capo, G., Riva, M., Brembilla, C., Rosellini, E., De Robertis, M., Servadei, F., Pessina, F., & Fornari, M. (2024). Monocentric retrospective analysis of clinical outcomes, complications, and adjacent segment disease in 507 patients undergoing anterior cervical Discectomy and fusion for degenerative cervical Myelopathy. *World Neurosurgery*, *189*, e1049-e1056. https://doi.org/10.1016/j.wneu.2024.07.079
11. Lin, Y. (2021). Combined posterior and anterior approaches for cervical Intradural disc Herniation: A case report. *BioMedicine*, *11*(1), 56-59. https://doi.org/10.37796/2211-8039.1080
12. Jin, C., Xie, N., Wang, J., Ren, Y., Guo, Q., Jia, L., & Cheng, L. (2022). Clinical and radiographic outcomes of combined posterior Transfacet screw fixation and anterior cervical Discectomy and fusion surgery for unilateral cervical facet fracture with traumatic disc Herniation: A retrospective cohort study. *Pain and Therapy*, *11*(1), 225-240. https://doi.org/10.1007/s40122-021-00349-7
13. Nayak, R., Razzouk, J., Ramos, O., Ruckle, D., Chiu, A., Parel, P., Stoll, W. T., Patel, S., Thakkar, S., & Danisa, O. A. (2022). Reoperation and perioperative complications after surgical treatment of cervical Radiculopathy: A comparison between three procedures. *Spine*, *48*(4), 261-269. https://doi.org/10.1097/brs.0000000000004506
14. Zhang, Y., Yang, G., Zhou, T., Chen, Y., Gao, Z., Zhou, W., & Gu, Y. (2021). Efficacy and safety of anterior cervical Discectomy and fusion (ACDF) through mini-incision and posterior Laminoplasty (LAMP) for treatment of long-level cervical spondylosis. https://doi.org/10.21203/rs.3.rs-1199853/v1
15. Abhinav, K., Rajan, R. ., Kumar, K. ., & Chaudhary, A. . (2025). Retrospective Analysis of Outcomes after Anterior Cervical Discectomy and Fusion (ACDF) for Cervical Spine Disorders. *Journal of Neonatal Surgery*, *14*(32S), 3136–3141. https://www.jneonatalsurg.com/index.php/jns/article/view/7899
16. Rai, V., Sharma, V., Kumar, M., & Thakur, L. (2024). A systematic review of risk factors and adverse outcomes associated with anterior cervical discectomy and fusion surgery over the past decade. *Journal of Craniovertebral Junction and Spine*, *15*(2), 141-152. https://doi.org/10.4103/jcvjs.jcvjs_168_23
17. Quinto, E. S., Paisner, N. D., Huish, E. G., & Senegor, M. (2023). Ten-year outcomes of cervical disc arthroplasty versus anterior cervical Discectomy and fusion. *Spine*, *49*(7), 463-469. https://doi.org/10.1097/brs.0000000000004887
18. Soliman, M. R., Alkhamees, A., Khan, A., & Shamisa, A. (2021). Instrumented four-level anterior cervical Discectomy and fusion: Long-term clinical and radiographic outcomes. *Neurology India*, *69*(4), 937. https://doi.org/10.4103/0028-3886.323898
19. Zhang, J., Ruan, D., Xuan, A., He, Q., Zhang, C., Xu, C., ... & Zhou, Q. (2023). Comparative study of outcomes between allograft intervertebral disc transplantation and anterior cervical discectomy and fusion: a retrospective cohort study at least 5 years of follow-up. *European Spine Journal*, *32*(10), 3561-3574. https://doi.org/10.1007/s00586-023-07799-x
20. Chi, J., Raso, J., Tadepalli, V., Labaran, L., Oh, E., Wang, J., Shen, F. H., & Li, X. (2023). Outcomes following anterior cervical Discectomy and fusion in patients with ehlers-danlos syndrome. *Global Spine Journal*, *14*(6), 1699-1705. https://doi.org/10.1177/21925682231151924