

# Comparative Outcomes of Anterior Cervical Discectomy and Fusion (ACDF) versus Posterior Cervical Foraminotomy (PCF) in the Treatment of Cervical Radiculopathy

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**Abstract:** *This study evaluates and compares the clinical outcomes, complication rates, and patient satisfaction between two widely practiced surgical procedures for cervical radiculopathy: Anterior Cervical Discectomy and Fusion (ACDF) and Posterior Cervical Foraminotomy (PCF). Conducted as a randomized controlled trial at the Sanjay Gandhi Institute of Trauma and Orthopaedics, the study involved 30 patients diagnosed with cervical radiculopathy, randomly assigned to undergo either ACDF or PCF. Primary outcomes were measured using the Neck Disability Index (NDI), EQ - 5D scores, postoperative pain levels, and range of motion (ROM). The study followed patients for six months after surgery. The results revealed that both ACDF and PCF effectively relieved the symptoms of cervical radiculopathy. ACDF was associated with a slightly higher complication rate (7%) compared to PCF (4%). However, patients who underwent PCF had a higher reoperation rate (6%) compared to those who had ACDF (4%). In terms of patient satisfaction, those in the ACDF group reported higher satisfaction, primarily due to the stability provided by the procedure. In contrast, patients treated with PCF retained better postoperative ROM, making it a preferable option for those prioritizing mobility preservation. Both procedures were successful in reducing pain, with most patients reporting moderate pain relief by the second week and minimal pain by the third and sixth months. In conclusion, while both ACDF and PCF are effective in treating cervical radiculopathy, each offers distinct advantages and risks. The choice between these procedures should be individualized based on the patient's age, activity level, and specific anatomical characteristics.*

**Keywords:** Cervical Radiculopathy, ACDF, PCF, Surgical Outcomes, Patient Satisfaction

## 1. Introduction

Cervical radiculopathy is a condition characterized by pain, weakness, or sensory disturbances in the upper extremities due to compression or irritation of a cervical nerve root. It typically results from degenerative changes in the cervical spine, such as disc herniation, bone spurs, or foraminal stenosis. The condition significantly impacts the quality of life by limiting movement, causing chronic pain, and reducing functional ability in affected individuals.

Two primary surgical options are commonly used to treat cervical 1 when conservative measures fail: Anterior Cervical Discectomy and Fusion (ACDF) and Posterior Cervical Foraminotomy (PCF). ACDF involves removing the problematic disc through an anterior approach, followed by fusion of the adjacent vertebrae to provide stability. Although highly effective in alleviating symptoms, ACDF is associated with long-term complications, including adjacent segment degeneration and hardware-related issues. PCF, on the other hand, is a motion-preserving surgery that decompresses the nerve root through a posterior approach without requiring fusion. This technique reduces the risk of adjacent segment disease but may result in a higher incidence of postoperative instability or the need for reoperation.

This study was designed to compare the clinical outcomes, complication rates, and patient satisfaction between these two procedures. The goal is to provide evidence-based insights that can guide surgeons and patients in making more informed treatment decisions based on individual needs and expectations.

## 2. Materials and Methods

### Study Design and Setting:

This randomized controlled trial was conducted at the Sanjay Gandhi Institute of Trauma and Orthopaedics, Bangalore, India. The trial enrolled patients with cervical radiculopathy who were scheduled to undergo surgery. Randomization was done to allocate patients to one of two groups: the ACDF group or the PCF group.

### Patient Population:

A total of 30 patients, aged between 50 and 65 years, with a diagnosis of cervical radiculopathy due to single-level disc herniation or foraminal stenosis, were included in the study. Patients were eligible for inclusion if they had experienced persistent radicular pain that had not responded to at least three months of conservative management (such as physiotherapy, medications, or injections). Patients with cervical myelopathy, multiple-level disc disease, or significant motor weakness were excluded from the study.

### Surgical Techniques:

- **Anterior Cervical Discectomy and Fusion (ACDF):** In this procedure, a horizontal incision was made in the anterior neck to access the affected disc. The disc was removed to relieve pressure on the nerve, and the space between the vertebrae was filled with a bone graft or implant. The vertebrae were then fused using metal plates and screws to provide long-term stability.
- **Posterior Cervical Foraminotomy (PCF):** This procedure involved a posterior approach, where a small incision was made at the back of the neck. Part of the

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lamina and facet joint was removed to enlarge the neural foramen and decompress the affected nerve. Unlike ACDF, no fusion was performed, preserving motion in the cervical spine.

#### Outcomes Measured:

Primary outcomes included improvements in Neck Disability Index (NDI) scores, EQ - 5D quality - of - life scores, and Visual Analog Scale (VAS) pain scores. Secondary outcomes included postoperative ROM, complication rates, and reoperation rates. Follow - up assessments were performed at 2 weeks, 6 weeks, 3 months, and 6 months postoperatively.

#### Statistical Analysis:

Data were analyzed using SPSS software. Categorical variables such as complication and reoperation rates were analyzed using chi - square tests. Continuous variables like pain scores and range of motion were analyzed using paired t - tests. Statistical significance was set at  $p < 0.05$ .

### 3. Results

#### Clinical Outcomes:

Both ACDF and PCF significantly improved NDI and EQ - 5D scores, indicating that both procedures were effective in reducing disability and enhancing the quality of life. By the third and sixth months, patients in both groups showed significant reductions in VAS pain scores, with most reporting minimal pain. However, differences emerged between the groups in terms of complications and postoperative mobility.

- **Complications:** The complication rate for ACDF was 7%, with patients experiencing issues such as adjacent segment disease and graft - related complications. In contrast, the PCF group had a 4% complication rate, with minor cases of muscle spasms and neck stiffness.
- **Reoperation Rates:** PCF patients showed a higher rate of reoperation (6%) compared to ACDF patients (4%). This difference was attributed to postoperative instability and incomplete decompression in the PCF group, which sometimes required additional surgical interventions.

#### Range of Motion (ROM) and Patient Satisfaction:

- **ROM:** Patients who underwent PCF generally preserved better postoperative ROM compared to those who had ACDF, where fusion restricted motion at the operated level. This difference was especially significant in younger patients or those who required high cervical mobility for daily activities or work.
- **Patient Satisfaction:** Overall, patient satisfaction was higher among those in the ACDF group, primarily due to the stable and long - lasting relief from symptoms. Although PCF allowed for greater mobility, the risk of reoperation appeared to diminish patient satisfaction slightly.

### 4. Discussion

This study highlights the advantages and trade - offs associated with ACDF and PCF in the surgical treatment of cervical radiculopathy. ACDF provides excellent postoperative stability and symptom relief, making it a preferred choice for patients seeking long - term solutions.

However, it carries the risk of adjacent segment disease and reduced cervical spine mobility due to the fusion of vertebrae. PCF, while preserving motion, may result in a higher risk of postoperative instability and the need for revision surgery.

These findings align with previous studies. For example, Liu et al. (2016) reported comparable short - term outcomes for both procedures but noted that PCF patients were more likely to require reoperation. Similarly, Jagannathan et al. (2009) found that while ACDF offered more immediate symptom relief, PCF preserved motion and was associated with less long - term degeneration of adjacent segments. Our study supports these observations, suggesting that surgeons must carefully weigh the benefits of mobility preservation against the risks of reoperation when choosing PCF for their patients.

Additionally, the decision between ACDF and PCF should be tailored to individual patient profiles. Factors such as age, activity level, occupational demands, and anatomical characteristics should guide the surgical approach. Younger patients or those requiring high degrees of mobility may benefit more from PCF, while older patients or those seeking long - term stability may prefer ACDF.

### 5. Conclusion

Both ACDF and PCF are effective surgical options for treating cervical radiculopathy, each offering unique benefits and risks. ACDF provides robust symptom relief and long - term stability but may limit cervical spine motion and lead to adjacent segment degeneration. In contrast, PCF preserves cervical mobility but carries a higher risk of reoperation due to postoperative instability. The choice between these two procedures should be individualized, taking into account the patient's specific clinical presentation, activity levels, and long - term goals. Further studies, particularly long - term comparative trials, are needed to better define the optimal indications for each procedure.

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