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Comparison Between ACDF and Instrumented Posterior Decompression and Fusion in Cervical Spondylotic Myelopathy at the National Orthopaedic Hospital Dala, Kano, Nigeria: A Retrospective Comparative Study of 85 Patients

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ABSTRACT

Background: Cervical spondylotic myelopathy (CSM) is a leading cause of spinal cord dysfunction. Both anterior cervical discectomy and fusion (ACDF) and posterior decompression with instrumented fusion are established surgical approaches, but comparative data from Nigerian populations remain limited. This study compared clinical outcomes, perioperative parameters, and complications between ACDF and posterior instrumented fusion for CSM at the National Orthopaedic Hospital Dala (NOHD), Kano, Nigeria.

Methods: A retrospective comparative study reviewed records of 85 patients who underwent surgical decompression for CSM between January 2018 and December 2024. Patients were divided into two groups: ACDF (n=48) and posterior decompression with instrumented fusion (n=37). Data extracted included demographics, operative parameters, complications, and outcomes assessed by modified Japanese Orthopaedic Association (mJOA) score and Neck Disability Index (NDI) at baseline, 6 months, and 12 months post-surgery. Recovery rate was calculated using the Hirabayashi formula.

Results: The ACDF group had younger mean age (54.2 ± 9.8 vs. 62.6 ± 11.4 years; p=0.001) and fewer levels fused (1.8 ± 0.6 vs. 3.4 ± 0.8; p<0.001). ACDF was associated with shorter operative time (182 ± 46 vs. 236 ± 62 minutes; p<0.001), lower blood loss (210 ± 95 vs. 450 ± 240 mL; p<0.001), and shorter hospital stay (5.2 ± 2.4 vs. 8.4 ± 3.2 days; p<0.001). Both groups achieved significant mJOA improvement at 12 months: ACDF from 10.8 ± 2.4 to 14.2 ± 2.1 (p<0.001); posterior from 9.6 ± 2.6 to 13.1 ± 2.3 (p<0.001). Mean recovery rates were 56.8 ± 22.4% for ACDF and 48.6 ± 24.2% for posterior (p=0.12). NDI improved from 46.8 ± 14.2% to 24.6 ± 12.4% in ACDF and from 52.4 ± 15.6% to 29.8 ± 14.2% in posterior (p=0.08). Complication rates were 12.5% (ACDF) and 21.6% (posterior) (p=0.26). ACDF complications included dysphagia (6.3%) and graft-related (2.1%); posterior complications included C5 palsy (5.4%) and wound infection (8.1%).

Conclusion: Both ACDF and posterior instrumented fusion achieve significant neurological improvement in CSM patients at NOHD Kano. ACDF is associated with shorter operative time, less blood loss, and shorter hospital stay, while posterior approaches are preferred for multilevel disease and in older patients. Surgical approach should be individualized based on pathology, levels involved, and patient factors.

KEYWORDS: ACDF, Cervical spondylotic myelopathy, comparative study, posterior cervical fusion, patient-reported outcomes, Kano, Nigeria

INTRODUCTION

Cervical spondylotic myelopathy (CSM) is the most common cause of spinal cord dysfunction in adults worldwide, resulting from degenerative changes that lead to progressive compression of the cervical spinal cord [1,2]. The condition affects 20–25% of the population aged 50 years and under, and 70–95% of those aged 65 years and over. Without surgical intervention, 20–62% of patients experience neurological deterioration over time [3].

Surgical decompression is the established standard of care for moderate to severe CSM, aiming to halt disease progression and facilitate neurological recovery [4]. The choice between anterior and posterior surgical approaches remains debated, with each offering distinct advantages and disadvantages. Anterior cervical discectomy and fusion (ACDF) allows direct decompression of

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ventral pathology, is associated with shorter operative time and hospital stay, and avoids posterior muscle dissection. Posterior approaches, including laminectomy with instrumented fusion, are advantageous for multilevel disease (≥3 levels), posterior cord compression, and in patients with cervical lordosis [5,6].

Recent meta-analyses have attempted to clarify the comparative effectiveness of these approaches. A 2025 systematic review of 542 patients found no statistically significant difference between anterior and posterior approaches in terms of postoperative functional improvement (p=0.47), with both techniques providing similar functional benefits. Another meta-analysis of 2,712 patients reported that while ACDF was associated with lower blood loss, shorter length of stay, and better NDI scores, posterior approaches achieved better preservation of cervical range of motion. The Quality Outcomes Database analysis of 1,151 patients found that after adjusting for baseline differences, ACDF patients were more likely to achieve clinically significant improvement in NDI at 12 months.

In Nigeria, published data on CSM surgical outcomes remain limited. The Enugu series of 46 patients undergoing cervical hemilaminectomy reported mean mJOA improvement from 8.2 to 12.2 at one year, with recovery rate of 50.5%. However, no study has directly compared ACDF and instrumented posterior fusion in a Nigerian population.

The National Orthopaedic Hospital Dala (NOHD), Kano, serves as a major referral centre for North-western Nigeria, managing a growing volume of patients with degenerative cervical spine disease. This study aimed to compare clinical outcomes, perioperative parameters, and complications between ACDF and instrumented posterior decompression and fusion for CSM at NOHD Kano.

METHODOLOGY

This retrospective comparative study was conducted at the Spine Unit of the National Orthopaedic Hospital Dala, Kano, Nigeria, between January and March 2025, reviewing patients who underwent surgery from January 2018 to December 2024. Ethical approval was obtained and individual patient consent was waived due to the retrospective design.

We included patients aged ≥18 years who underwent surgical decompression for CSM via either ACDF or posterior decompression with instrumented fusion. Indications for surgery were: clinical signs of myelopathy, MRI evidence of cervical cord compression, and failure of conservative management for at least 3 months.

Exclusion criteria comprised: previous cervical surgery at the same level, concomitant ossification of posterior longitudinal ligament (OPLL), trauma, infection, tumour, incomplete medical records with >20% missing data, and follow-up duration <12 months.

The choice of surgical approach was determined by the attending spine surgeon based on: Number of levels compressed (≤2 levels favoured ACDF; ≥3 levels favoured posterior), Location of compression (ventral pathology favoured ACDF), Cervical alignment (kyphosis favoured posterior with fusion), Patient age and comorbidities, and Surgeon preference and expertise

A standardized data extraction form captured:

· Demographics: age, sex, comorbidities

· Clinical parameters: symptom duration, Nurick grade, modified Japanese Orthopaedic Association (mJOA) score [9], Neck Disability Index (NDI) [10]

· Radiographic parameters: number of levels compressed, T2 cord signal change, cervical alignment

· Operative parameters: levels fused, operative time, estimated blood loss, transfusion requirements, length of hospital stay

· Complications: intraoperative, early postoperative (≤30 days), and late postoperative (>30 days)

· Outcome measures: mJOA and NDI assessed at 6 and 12 months post-surgery

Outcome Definitions

· Recovery rate: Calculated using Hirabayashi formula: [(postoperative mJOA – preoperative mJOA) / (18 – preoperative mJOA)] × 100% [11]

· Satisfactory outcome: Recovery rate ≥50%

· MCID: Minimum clinically important difference for mJOA (≥2 points) and NDI (≥15 points)

Data were analysed using SPSS version 26. Descriptive statistics were computed as frequencies/percentages and mean ± standard deviation (SD). Independent t-tests and chi-square tests compared ACDF and posterior groups. Paired t-tests compared pre- and post-operative scores within groups. Statistical significance was set at $p<0.05$.

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RESULTS

A total of 85 patients met inclusion criteria: 48 in the ACDF group and 37 in the posterior instrumented fusion group. Table 1 summarises baseline characteristics. The ACDF group was significantly younger and had higher preoperative mJOA scores (less severe myelopathy). The posterior group had longer symptom duration and more severe baseline disability, though these differences did not reach statistical significance.

Radiographic and Surgical Parameters is shown in Table 2. As expected, the posterior group had significantly more levels of disease and underwent more extensive fusions. Table 3 shows Perioperative Parameters and ACDF was associated with significantly shorter operative time, less blood loss, lower transfusion requirements, and shorter hospital stay.

Both groups achieved significant improvements in mJOA and NDI at 12 months ($p<0.001$ for all within-group comparisons). The ACDF group had higher absolute 12-month mJOA scores, reflecting their better preoperative status, but the magnitude of improvement was similar between groups. This is clearly elucidated in Table 4.

Table 5 shows the outcome and the ACDF group had higher recovery rates and greater proportions achieving satisfactory outcomes, these differences did not reach statistical significance.

Overall complication rate was 12.5% in the ACDF group and 21.6% in the posterior group ($p=0.26$). ACDF complications were predominantly dysphagia, while posterior complications included wound infections, C5 palsy, and implant-related issues. All C5 palsy cases recovered fully by 6 months. This is stated in Table 6

DISCUSSION

This study provides the first direct comparison between ACDF and instrumented posterior fusion for CSM in a Nigerian population, demonstrating that both approaches achieve significant neurological improvement with acceptable complication profiles.

The significant age difference between groups (54.2 vs. 62.6 years, $p=0.001$) reflects appropriate patient selection, with older patients preferentially undergoing posterior approaches to avoid complications of prolonged anterior surgery and dysphagia risk. The higher proportion of multilevel disease in the posterior group (78.4% with ≥3 levels) aligns with established indications for posterior surgery [5,6]. These selection patterns mirror those reported in the Quality Outcomes Database analysis, where posterior surgery patients were older and had more severe disease.

Our finding that ACDF was associated with shorter operative time (182 vs. 236 minutes), lower blood loss (210 vs. 450 mL), and shorter hospital stay (5.2 vs. 8.4 days) is consistent with the 2025 meta-analysis of 2,712 patients, which reported significantly lower blood loss ($p=0.0003$) and shorter length of stay ($p<0.00001$) for anterior surgery. The 32.4% transfusion rate in the posterior group reflects the more extensive nature of these procedures and aligns with the Nigerian hemilaminectomy series where mean blood loss was 260 mL for less invasive posterior procedures.

Both groups achieved significant neurological improvement, with mean mJOA improvement of 3.4 points (ACDF) and 3.5 points (posterior). These improvements exceed the MCID of 2 points and compare favourably with the Enugu hemilaminectomy series where mJOA improved from 8.2 to 12.2 (4.0 points). The ACDF group's higher absolute 12-month mJOA scores reflect their better preoperative status, consistent with the observation that patients with milder myelopathy have greater recovery potential [12].

The mean recovery rates of 56.8% (ACDF) and 48.6% (posterior) are comparable to the 50.5% reported in the Enugu series and the 52.6% in our prior posterior CSM study. The absence of statistically significant difference in recovery rates ($p=0.12$) aligns with the 2025 meta-analysis which found no significant difference in functional improvement between approaches ($p=0.47$).

The 12.5% complication rate in the ACDF group is lower than the 21.6% in the posterior group, though this difference was not statistically significant ($p=0.26$). Dysphagia (6.3%) was the most common ACDF complication, consistent with the 5–8% rates reported in the meta-analysis. The 5.4% incidence of C5 palsy in the posterior group aligns with the 5–12% range reported for posterior cervical surgery [13] and is lower than the 11.8% reported in some posterior series.

The 8.1% wound infection rate in the posterior group exceeds the 3.3% reported in the West African FOCOS series [14] but is comparable to the 6.3% in the Enugu hemilaminectomy series. This highlights the need for continued attention to perioperative infection prevention protocols.

Our findings are consistent with recent high-quality evidence. The 2025 meta-analysis of 542 patients concluded that both anterior and posterior approaches provide similar functional benefits, with a tendency towards faster recovery in anterior surgery. The larger

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meta-analysis of 2,712 patients confirmed no significant difference in JOA scores or recovery rates between approaches, while noting the perioperative advantages of anterior surgery.

The Quality Outcomes Database analysis of 1,151 patients found that after adjusting for baseline differences, ACDF patients were more likely to achieve MCID in NDI at 12 months (p=0.003). While our study showed a trend favouring ACDF in NDI improvement (83.3% vs. 75.7% achieving MCID), this did not reach statistical significance, likely due to our smaller sample size.

Our findings have several implications:

1. Individualized approach selection: Both techniques are effective when appropriately selected. ACDF is preferred for 1–2 level disease with ventral compression; posterior approaches for ≥3 levels, preserved lordosis, and older patients .
2. Perioperative advantages: ACDF offers shorter operative time, less blood loss, and shorter hospital stay, which are important considerations in resource-constrained settings.
3. Complication awareness: Dysphagia is common after ACDF; C5 palsy and wound infection are concerns after posterior surgery. Patients should be counselled accordingly.
4. Outcome expectations: Patients can expect significant neurological improvement regardless of approach, with recovery rates of 50–60%.
5. Elderly patients: The higher age in the posterior group (62.6 years) and the Korean NSQIP analysis showing ACDF has the lowest risk in geriatric patients should inform decision-making for elderly patients.

This study has several limitations. The retrospective, non-randomized design introduces selection bias. The sample size (n=85) limited statistical power for detecting differences in subgroup analyses. Single-centre design may limit generalisability. The two groups differed significantly in baseline characteristics (age, disease severity, levels involved), reflecting real-world practice but confounding direct comparisons. Follow-up of 12 months does not capture long-term outcomes such as adjacent segment disease.

Both ACDF and instrumented posterior decompression and fusion achieve significant neurological improvement in CSM patients at the National Orthopaedic Hospital Dala, Kano. ACDF is associated with shorter operative time, less blood loss, and shorter hospital stay, while posterior approaches are preferred for multilevel disease and in older patients. Mean mJOA improvement (3.4–3.5 points) and recovery rates (48.6–56.8%) are comparable to regional and international benchmarks. Complication rates are acceptable, with dysphagia predominating after ACDF and wound infections/C5 palsy after posterior surgery. Surgical approach should be individualized based on pathology, levels involved, and patient factors. These findings provide the first Nigerian comparative data to inform evidence-based decision-making for CSM surgery.

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Table 1: Demographic and Clinical Characteristics

Characteristic	ACDF (n=48)	Posterior (n=37)	p-value
Age (years) mean ± SD	54.2 ± 9.8	62.6 ± 11.4	0.001
Age range (years)	38–72	45–84	
Sex male n (%) Female n (%)	 32 (66.7) 16 (33.3)	 24 (64.9) 13 (35.1)	0.86
Hypertension n (%)	18 (37.5)	16 (43.2)	0.59
Diabetes mellitus n (%)	10 (20.8)	9 (24.3)	0.70
Symptom duration (months) mean ± SD	14.6 ± 10.2	18.4 ± 13.6	0.15
Symptom duration >12 months n (%)	26 (54.2)	22 (59.5)	0.62
Preoperative mJOA mean ± SD	10.8 ± 2.4	9.6 ± 2.6	0.03
Preoperative NDI (%) mean ± SD	46.8 ± 14.2	52.4 ± 15.6	0.09
T2 cord signal change present n (%)	34 (70.8)	30 (81.1)	0.27

Table 2: Radiographic and Surgical Parameters

Parameter	ACDF (n=48)	Posterior (n=37)	p-value
Levels compressed mean ± SD	1.9 ± 0.7	3.5 ± 0.9	<0.001
Single-level disease n (%)	22 (45.8)	0 (0)	<0.001
2-level disease n (%)	20 (41.7)	8 (21.6)	0.048
≥3-level disease n (%)	6 (12.5)	29 (78.4)	<0.001
Levels fused mean ± SD	1.8 ± 0.6	3.4 ± 0.8	<0.001
Preoperative C2–C7 Cobb angle (°) mean ± SD	14.2 ± 5.8	12.6 ± 6.4	0.23

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Table 3: Perioperative Parameters

Parameter	ACDF (n=48)	Posterior (n=37)	p-value
Operative time (minutes) mean ± SD	182 ± 46	236 ± 62	<0.001
Estimated blood loss (mL) mean ± SD	210 ± 95	450 ± 240	<0.001
Patients requiring transfusion n (%)	4 (8.3)	12 (32.4)	0.004
Hospital stay (days) mean ± SD	5.2 ± 2.4	8.4 ± 3.2	<0.001

Table 4: mJOA and NDI Scores at 12 Months

Outcome	ACDF (n=48)	Posterior (n=37)	p-value (between groups)
12-month mJOA mean ± SD	14.2 ± 2.1	13.1 ± 2.3	0.02
mJOA improvement	3.4 ± 2.0	3.5 ± 2.2	0.83
12-month NDI (%) mean ± SD	24.6 ± 12.4	29.8 ± 14.2	0.07
NDI improvement	22.2 ± 13.8	22.6 ± 14.4	0.90

Table 5: Neurological Recovery at 12 Months

Outcome Measure	ACDF (n=48)	Posterior (n=37)	p-value
Mean recovery rate (%)	56.8 ± 22.4	48.6 ± 24.2	0.12
Satisfactory outcome (≥50% recovery) n (%)	32 (66.7)	20 (54.1)	0.24
Achieved mJOA MCID (≥2 points) n (%)	42 (87.5)	31 (83.8)	0.62
Achieved NDI MCID (≥15 points) n (%)	40 (83.3)	28 (75.7)	0.38

Table 6: Complications by Surgical Approach

Complication	Type ACDF (n=48)	Posterior (n=37)
Dysphagia (transient)	3 (6.3)	0 (0)
Graft-related (subsidence)	1 (2.1)	0 (0)
Haematoma	1 (2.1)	0 (0)
C5 palsy	0 (0)	2 (5.4)
Superficial wound infection	0 (0)	2 (5.4)
Deep wound infection	0 (0)	1 (2.7)
Screw loosening (asymptomatic)	0 (0)	2 (5.4)
Dural tear	0 (0)	1 (2.7)
Pneumonia	1 (2.1)	0 (0)
Any complication	6 (12.5)	8 (21.6)
Reoperation rate	1 (2.1)	2 (5.4)

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