

Single-Level Anterior Cervical Discectomy and Fusion With Lower Five-Year Revisions Than Posterior Cervical Foraminotomy

Rahul Hariharan Jayaram¹, Peter Y Joo², Michael J Gouzoulis, Dennis L Caruana, Jonathan N Grauer
¹Orthopaedics and Rehabilitation, Yale School of Medicine, ²Yale New Haven Health

INTRODUCTION:

Single level cervical radiculopathy can often be treated surgically by anterior cervical discectomy and fusion (ACDF) or posterior cervical foraminotomy (PCF). While ACDF has the advantages of broad access to the disc and indirect decompression through distraction, PCF has the potential advantage of avoiding the anterior approach and fusion. Past studies have suggested that posterior approaches provide similar short-term outcomes as ACDF, however these posterior procedures may have an increased risk of revision surgery compared to anterior procedures. The current study utilized a large national administrative database to compare 90-day outcomes and five year revision of ACDF versus PCF performed for cervical radiculopathy.

METHODS:

The 2010 to Q3 2020 PearlDiver MSpine database was queried for patients undergoing elective single-level ACDF or PCF for radiculopathy (excluding cases performed for myelopathy, trauma, neoplasms, and/or infections). Ninety-day adverse events were assessed and compared with univariate and multivariate analyses. Five-year incidences of subsequent cervical revision were then assessed and compared.

RESULTS:

A total of 32,373 patient cases with cervical pathology that were treated by ACDF (30,168, 93.2%) or foraminotomy (2,205, 6.8%) were identified.

Multivariate analysis, controlling for age, sex, and comorbidities, demonstrated that PCF was associated with a significantly greater odds ratio (OR) than ACDF for aggregated serious adverse events (OR 2.14, $p < 0.001$), as well as surgical site infection (OR 3.53, $p < 0.001$), pulmonary embolism (OR 1.70, $p = 0.039$) and wound dehiscence (OR 5.82, $p < 0.001$). However, PCF had significantly lower odds than ACDF for pneumonia (OR 0.50, $p = 0.005$), dysphagia (OR 0.44, $p < 0.001$), and readmission (OR 0.32, $p < 0.001$).

At five years, PCF cases had a significantly higher cumulative revision rate compared to ACDF cases (26.8% vs. 15.4%, $p < 0.001$). When examining the types of approach used to revise the initial procedure, there were more posterior revisions than anterior revisions for both ACDF (54.3% vs. 31.3%, $p < 0.001$) and PCF (46.6% vs. 38.6%, $p < 0.001$).

DISCUSSION AND CONCLUSION:

This current study is the largest to date to compare short-term adverse events and long-term revision rates between single-level ACDF and PCF for the treatment of cervical radiculopathy. As one might expect, 90-day postoperative adverse events varied based on the approach/procedure. However, at five years, ACDF had had more than 10% lower cumulative revision incidence compared to PCF. While each treatment plan must consider the specific clinical scenario, the relative risks and revision rates of these surgical options for single level cervical radiculopathy are highlighted by the data presented.

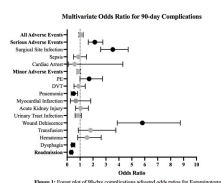


Figure 1: Forest plot of 90-day complications adjusted odds ratios for Foraminotomy vs ACDF as the reference population. Select adverse events shown.

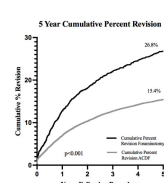


Figure 2: Five-year Kaplan-Meier survival plot of revision procedures following Foraminotomy versus ACDF. Log-rank test, $p < 0.001$.

	ACDF	Foraminotomy	p-value
N	30,168 (93.2%)	2,205 (6.8%)	
Age (mean ± s.d.)	52.9 ± 12.44	54.95 ± 13.05	<0.001
Sex			<0.001
Female	16,892 (56.0%)	1,085 (49.2%)	
Male	13,276 (44.0%)	1,120 (50.8%)	
CCI (mean ± s.d.)	3.95 ± 3.22	3.43 ± 3.05	<0.001
Insurance			
Commercial	22,844 (75.8%)	1,456 (67.2%)	
Medicaid	1,941 (6.4%)	110 (5.0%)	
Medicare	4,279 (14.3%)	380 (17.3%)	

CCI = Charlson Comorbidity Index
 s.d. = Standard Deviation
 ICI = Elixhauser Comorbidity Index

Outcome	ACDF	PCF	OR	95% CI	p-value
All Adverse Events	1,112 (3.7%)	112 (5.1%)	1.38	1.15-1.65	<0.001
Serious Adverse Events	112 (0.4%)	12 (0.5%)	1.45	0.85-2.48	0.17
Surgical Site Infection	12 (0.04%)	12 (0.5%)	3.53	1.45-8.65	<0.001
Stroke	12 (0.04%)	12 (0.5%)	1.15	0.55-2.45	0.72
Cerebral Ischemia	12 (0.04%)	12 (0.5%)	1.15	0.55-2.45	0.72
Minor Adverse Events	1,000 (3.3%)	100 (4.6%)	1.38	1.15-1.65	<0.001
PE	12 (0.04%)	12 (0.5%)	1.70	0.85-3.25	0.11
Pneumonia	12 (0.04%)	12 (0.5%)	0.50	0.25-1.00	0.05
Myocardial Infarction	12 (0.04%)	12 (0.5%)	1.15	0.55-2.45	0.72
Acute Kidney Injury	12 (0.04%)	12 (0.5%)	1.15	0.55-2.45	0.72
Urinary Tract Infection	12 (0.04%)	12 (0.5%)	1.15	0.55-2.45	0.72
Wound Dehiscence	12 (0.04%)	12 (0.5%)	5.82	1.45-23.5	<0.001
Dysphagia	12 (0.04%)	12 (0.5%)	0.44	0.25-0.75	<0.001
Readmission	12 (0.04%)	12 (0.5%)	0.32	0.15-0.70	<0.001

OR = Odds Ratio
 CI = Confidence Interval
 PE = Pulmonary Embolism
 ICI = Elixhauser Comorbidity Index

Initial Approach	Revised Approach	N	%	p-value
ACDF	ACDF	1,112	36.2%	<0.001
ACDF	PCF	1,000	31.3%	
PCF	ACDF	112	54.3%	
PCF	PCF	100	46.6%	

ACDF = Anterior Cervical Discectomy and Fusion
 PCF = Posterior Cervical Foraminotomy