



Original Article

Comparison of the Outcomes of Anterior versus Posterior Approaches in Multilevel Cervical Prolapsed Intervertebral Discs

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ABSTRACT

Objective: To compare outcomes of the anterior versus posterior approach in multilevel cervical prolapsed intervertebral discs.

Materials and Methods: This is a prospective study conducted on 40 patients, 20 in each group in the Department of Neurosurgery of a tertiary care hospital. Group A patients were operated on by the anterior cervical approach and Group B was operated by the posterior cervical approach. Postoperatively all the patients were followed to assess the outcome, neurological deficit.

Results: Mean age in Group A was 38 years while in Group B, it was 53 years. Group A had 65% male and 35% female patients while Group B had 60% male and 40% female patients. In Group A, 9 (45%) patients had radiculopathy while 11 (55%) patients had myelopathy, while in Group B 7 (35%) developed radiculopathy, and 13 (65%) patients developed myelopathy. We assessed the patients postoperatively and found that in Group A, 18 (90%) patients were improved and 2 (10%) patients had clinically shown worse outcomes. While in Group B, 15 (75%) patients had improvement, and 5 (25%) patients had worse outcomes.

Conclusion: The anterior approach had a short hospital stay and early recovery which makes it a more commonly used procedure by surgeons as compared to the posterior approach the outcome results of our study also showed that the anterior approach was good and had better functional outcomes than the posterior approach, but the difference was not significant statistically.

Keywords: Multilevel prolapsed intervertebral discs, cervical laminoplasty, anterior cervical discectomy and fusion, posterior cervical decompression.

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Date of Submission: 31-12-2023
Date of Revision: 07-02-2023
Date of Acceptance: 28-02-2023
Date of Online Publishing: 05-03-2023
Date of Print: 05-03-2023

DOI: 10.36552/pjns.v27i1.809

INTRODUCTION

An intervertebral disc is a cartilaginous structure and it has three components i.e., an inner nucleus pulposus, an outer annulus fibrosus, and endplates that secure the discs to adjacent vertebrae. Disc herniations usually happen when part or all of the nucleus pulposus protrudes through the annulus fibrosus and they can occur

acutely or more chronically.¹

Cervical radiculopathy is a condition characterized by dysfunction of the cervical nerve roots, resulting in discomfort radiating from the neck into the distribution of the affected nerve root.² Compression is most usually caused by disc herniation, osteophyte impingement spondylosis, instability, and trauma.³

Cervical myelopathy is a degenerative disorder characterized by compression at the cervical level causing spasticity, hyperreflexia, digit/hand clumsiness, and gait instability. The pattern of disease is insidious in onset that progresses over time and there is a decline in the functional status of the patient.⁴

Cervical radiculopathy can have a wide range of clinical symptoms that include pain, sensory impairments, motor deficits, decreased reflexes, or any combination of the aforementioned. The C6 – C7 disc herniation is most usually affected, followed by the C5 – C6 level. Impingement of the nerve root by disc material is affected by both mechanical and chemical mechanisms. Mechanical nerve compression most likely results in localized ischemia and nerve injury. The Spurling test and shoulder abduction test are two provocative tests that can help in the diagnosis of cervical radiculopathy. Magnetic resonance imaging (MRI) is commonly used to diagnose the cervical pathology causing radiculopathy and myelopathy. Additional radiographs such as an X-ray and computed tomography (CT) scan are used to diagnose such cases. Electromyographic (EMG) tests may be beneficial in distinguishing peripheral nerve entrapment disorders from cervical radiculopathy.⁵

If conservative treatments fail, surgical decompression might be required. In the early 1940s, clinical symptoms were initially categorized using topographical references to alterations in cervical discs. During the same period, the posterior surgical approach to the cervical spine was devised, which was later modified.⁶

At the end of the 1950s, anterior access for

operation of the cervical disc alterations was reported.⁶ Anterior cervical decompression and fusion have become routine techniques for treating cervical radiculopathies. It's often characterized as a safe and effective treatment with high fusion rates.⁸

Cervical surgeries are commonly performed for degenerative conditions. In the setting of multilevel prolapsed intervertebral discs 2 and 3 levels are usually operated via anterior cervical discectomy and fusion (ACDF) and 3 and more levels are operated by posterior cervical fusion.⁹

Our study aims to assess the outcomes of anterior versus posterior approaches in multilevel prolapsed intervertebral discs. The clinical relevance of these two techniques is debatable. Hence, it is important to compare these two techniques to provide an efficient and pragmatic surgical technique for surgical decision-making to reduce complications.

MATERIALS AND METHODS

Study Design

The study design was prospective and conducted from 20-06-2021 to 20-12-2021 at the Department of Neurosurgery, in a tertiary care hospital in Karachi.

Inclusion Criteria

We included 40 patients in our study (20 in each group), ages ranging between 20 to 65 years, and cervical prolapsed disc at 2 or more levels (up to a maximum of 4 levels) degenerative disc.

Exclusion Criteria

Prolapse disc level of more than 4, previous history of surgery, severe myelopathy, and cervical fractures were excluded.

Data Collection Procedure

All baseline data including the patient's age,

gender, and duration of illness, was noted. All patients were categorized into 2 groups, in which Group A was operated via an Anterior approach (anterior cervical corpectomy/discectomy & fusion), and Group B was operated via a Posterior approach (posterior cervical laminectomy, laminoplasty, and foraminotomy). Post-operatively all the patients were followed up to 6 weeks to assess the outcome. The outcome of our study was categorized as "Satisfactory" and "Unsatisfactory". A satisfactory outcome was defined as any improvement in the neurological condition from the preoperative status while an unsatisfactory outcome was defined as any worsening in the neurological condition and/or any permanent postoperative complications.

Data Analysis

Data were analyzed through SPSS, to calculate mean, frequencies, and p values. Quantitative data is calculated for a mean, qualitative data is calculated for frequencies and the P value is used to compare the variables. A p-value of less than 0.05 was taken as significant in our study.

RESULTS

Age & Gender

In our study, the mean age in Group A was 38yrs while in Group B was 53yrs. Group A had 13 males and 7 females while Group B had 12 males and 8 females as given in Table 1.

Duration of Illness

In our study 11(27.5%) patients had a duration of illness of <3 months, in which Group A had 6 patients and Group B had 5 patients. Most patients, 18 (45%) in our study had a duration of 3 – 6 months in which Group A had 11 patients and Group B had 7 patients, and with a duration of illness > 6 months had 11 (27.5%) patients in which Group A had 3 and Group B had 8 patients.

Trauma

In our study 22 (55%) patients presented with a history of trauma of which 15 (68.1%) patients were in Group A and 7 (31.8%) patients were in Group B.

Table 1: General characteristics and frequencies of patients

S. No.	Category	Sub-Category	Total (%)	Anterior Approach	Posterior Approach	P-Value
1.	Gender	Male	25 (62.0%)	13	12	0.50
		Female	15 (37.0%)	7	8	
2.	Age	20 – 35	7 (17.5%)	5	2	0.017
		36 – 50	14 (35.0%)	10	4	
		51 – 65	19 (47.5%)	5	14	
3.	Duration of illness	< 3 months	11 (27.5%)	6	5	0.197
		3 – 6 months	18 (45.0%)	11	7	
		> 6 months	11 (27.5%)	3	8	
4.	Neurological Deficit	Radiculopathy	16 (40.0%)	9	7	0.37
		Myelopathy	24 (60.0%)	11	13	
5.	History of Cervical Trauma	Yes	22 (55.0%)	15	7	0.012
		No	18 (45.0%)	5	13	
6.	Number of involved Levels	2	17 (42.5%)	15	2	0.00
		3	12 (30.0%)	5	7	
		4	11 (27.5%)	0	11	
7.	Complication	Neurological Deficit	3 (7.5%)	1	2	0.85
		CSF Leak	2 (5%)	1	1	
		Respiratory Distress	3 (7.5%)	1	2	

Level Involved

Most of the patients in our study 17 (42.5%) had 2-level disc involvement in which Group A had 15 (88.2%) patients and Group B had 2 (11.8%) patients. Only 12 (30%) patients had 3 levels involved in which Group A had 5 (41.7%) and Group B had 7 (58.3%) patients. While there were 11 (27.5%) patients that had 4-level disc involvement and all of them (100%) were from Group B.

Neurological Deficit

Patients in our study presented with symptoms of radiculopathy and myelopathy. While myelopathy is the most common presenting feature and was seen in 24 (60%) patients while 16 (40%) patients had radiculopathy. In Group A, 9 (45%) patients had radiculopathy and 11 (55%) patients had myelopathy, while in Group B, 7 (35%) patients developed radiculopathy and 13 (65%) patients developed myelopathy.

Complication

In our study total of 8 (20%) patients developed complications that include neurological deficit, CSF leak, and respiratory distress. In Group A, one patient had a neurological deficit which was improved post-operatively, one patient had a CSF leak that was managed conservatively and one patient had respiratory distress. While in Group B two patients had a neurological deficit, one patient had a CSF leak which was resolved spontaneously and two patients had respiratory distress immediately after surgery and these patients did not show any improvement.

Outcome

We assessed the patients post-operatively and found that in Group A out of 20 patients, 18

Table 2: Cross table showing a comparison between outcomes with the anterior and posterior approach.

		Outcome		Total	P-Value
		Satisfactory	Un satisfactory		
Approaches	Anterior	18 (90%)	2 (10%)	20	0.20
	Posterior	15 (75%)	5 (25%)	20	
Total		33 (82.5%)	7 (17.5%)	40	

(90%) patients improved and had satisfactory outcomes post-operatively, and 2 (10%) patients had a worse outcome, while in Group B 15 (75%) patients were improved, 5 (25%) patients showed clinically had worse outcomes as shown in Table 2.

DISCUSSION

Cervical radiculopathy is a degenerative disorder characterized by dysfunction of the cervical nerve roots, resulting in pain that radiates from the neck into the distribution of the affected nerve root.²

Neurological impairment frequently results from cervical myelopathy. The onset is generally accompanied by decreasing gait and balance, diminished hand dexterity, and fine motor dysfunction. Most frequently, upper and lower extremity sensorimotor dysfunction and sphincter disruption advance slowly and step by step as the illness does. The anterior approach includes disc (more than one disc), corpectomy with instrumentation, and bone fusion. All forms of cervical spinal canal stenosis may be treated using the posterior approach, which includes laminectomy, and laminoplasty with instrumentation with or without fusion.¹²

One of the published literature shows that there is no difference between the anterior and posterior approaches in clinical results, complications, and outcomes.¹⁴ One study from the literature also shows no superiority of the anterior or posterior approach, while others recommended that the anterior approach is usually performed when < 3 segments were involved.⁶

Patients in our study were found to be younger patients in Group A and middle-aged patients in Group B than the majority of published literature.¹³ In the course of our research, we determined that the average age in Group A was 38 years old, with the ages ranging anywhere from 36 to 50, and in Group B was 53 years with the age ranging from 51-65 years. While a study conducted by Abou-Zeid et al showed that most patients in his study were found to be old age with a mean age in Group A was 64 years ranging between (48 – 75 years) while in group B was 66 years the range of (56 – 79 years).¹³ A study by Yang et al. reported that the mean age of patients in Group A was 41.3 (28 – 57) years and in Group B was 40.5 (32-68) years.¹¹

Our study showed that the male: female ratio in Group A was 1.8:1 and in Group B was 1.5:1. The study by Joo PY et al, showed male: female ratio in Group A was 1:1.07 and Group B was 1:1.07, while other literature shows male: female in Group A was 1.5:1 and in Group B was 1.75:1.^{9,13}

The duration of illness in our study was categorized into < 3 months, 3 – 6 months, and >6 months for both groups. While in the study of Abou-Zeid et al, showed that Group A has a range of 4 – 30 months and Group B has a range of 2 – 24 months.¹³

In our study, we included 2, 3, and 4 cervical disc levels. The limitation is that 4-level cervical discs are only included in Group B and operated via the Posterior cervical approach. In Group A, 75% of patients had 2-level and 25% 3-level discs involved. While in Group B, 55% had 4 levels, 35% had 3 levels and 10% had 2 level discs involved. While a study by Audat ZA et al reported in his study that 67.2% involve 1 level followed by 2 levels 22% and > 3 levels 8.8%.¹¹ In another published literature that includes 4 cervical levels in both groups in which Group A had 50% of patients and Group B had 50% of patients.¹⁰

Out of 40 patients in our study only eight

patients developed complications. In Group A, one patient had a neurological deficit which was improved post-operatively, one patient had a CSF leak which was managed conservatively and the leak resolved spontaneously and one patient had respiratory distress. While in Group B two patients had a neurological deficit, one patient had a CSF leak which was managed conservatively and two patients had respiratory distress these patients did not show any improvement postoperatively and showed clinically worse outcomes. While published literature showed that in Group A, two patients had temporary dysphagia and one patient had permanent dysphagia, one patient had temporary hoarseness and one patient had inadvertent durotomy that doesn't cause CSF leak. While in Group B two patients had temporary C5 palsy that was recovered with time and one patient had post-operative wound hematoma that needed evacuation and one patient had inadvertent durotomy with lax pseudo meningocele that was managed conservatively.¹³

CONCLUSION

The anterior approach, when compared to the traditional posterior approach, had short hospital stays and early recovery which makes it a common procedure by surgeons. The outcome results of our study showed that the anterior approach was good and had a better functional outcome than the posterior approach but the difference was not significant statistically.

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Additional Information

Disclosures: Authors report no conflict of interest.

Ethical Review Board Approval: The study was conformed to the ethical review board requirements.

Human Subjects: Consent was obtained by all patients/participants in this study.

Conflicts of Interest:

In compliance with the ICMJE uniform disclosure form, all authors declare the following:

Financial Relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.

Other Relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

Financial Relationships: None

AUTHORS CONTRIBUTIONS

Sr.#	Author's Full Name	Intellectual Contribution to Paper in Terms of:
1.	Anas Ahmed	1. Study design and methodology.
2.	Farrukh Javeed	2. Paper writing.
3.	Sehrish Altaf	3. Data collection and calculations.
4.	Iram Bokhari	4. Analysis of data and interpretation of results.
5.	ArfaQasim	5. Literature review and referencing.
6.	Lal Rehman	6. Editing and quality insurer.