

ORIGINAL ARTICLE

EFFECTIVENESS OF CERVICAL LAMINOFORAMINOTOMY FOR UNILATERAL SOFT DISC HERNIATION

Asghar Ali¹, Shahbaz Ali Khan^{2✉}, Ehtisham Ahmed Khan², Abid Hussain³, Ahsan Aurangzeb², Fatima Javed², Haider Ali³, Amir Hamza Qazi¹

¹Bacha Khan Medical College, Mardan Medical Complex, Mardan-Pakistan

²Department of Neurosurgery, Ayub Medical College, Abbottabad-Pakistan

³Bolan Medical College, Quetta-Pakistan

Background: Cervical disc herniation is one of the very few morbid and prevalent spinal conditions affecting quality of life, often leading to debilitating symptoms. Early recognition of signs and symptoms is crucial for timely intervention, as conservative methods may prove insufficient in cases with neurological deficits. Surgical interventions, including anterior and posterior approaches, as well as hybrid approaches, have evolved to address the challenges posed by cervical disc herniation and cervical spondylosis. This study explores the effectiveness of laminoforaminotomy, a targeted surgical approach for unilateral soft disc herniation. The technique aims to achieve optimal clinical outcomes by minimizing disruption to adjacent tissues and preserving motion segments. **Methods:** A retrospective study was conducted on 23 patients diagnosed with cervical radiculopathy who underwent posterior keyhole laminoforaminotomy between February and July 2023 at a Tertiary Care Hospital. **Results:** The age distribution of the participants ranged from 32 to 67 years, with the largest group in the 41–50 age range. Males constituted 69.56% of the patients. The distribution of cervical disc herniations varied across levels, with the C4–C5 level exhibiting the highest occurrence. Postoperative complications were observed in 3 out of 23 patients. A total of 82.62% patients were pain free at 6 months after the surgery. **Conclusion:** Laminoforaminotomy demonstrates promising short-term results in addressing unilateral soft disc herniation, with an 82.62% success rate.

Keywords: Cervical disc herniation; QOL; Laminoforaminotomy; Neurological deficits

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INTRODUCTION

Cervical disc herniation is a prevalent and often debilitating condition affecting the cervical spine. It results from the dehydration of the intervertebral disc, leading to a range of symptoms that significantly impact an individual's quality of life.¹ Cervical Disc herniation typically occurs due to weakening or tearing of the annulus fibrosis, causing the nucleus pulposus to protrude and exert pressure on adjacent nerves. Recognizing the signs and symptoms of cervical disc herniation is crucial for early intervention. Patients commonly experience neck pain radiating down to the shoulders and arms, along with tingling, numbness, and weakness.² As the condition progresses, individuals may face reduced range of motion and difficulty in daily activities. The morbidity that comes with progression of the disease thus underscores the importance of timely intervention, via anterior, anterolateral or posterior approaches.³

The recommended approach for managing symptomatic cervical degenerative disc disease

initially leans towards conservative methods. Non-surgical interventions prove effective, particularly in cases without neurological deficits. However, when conservative treatments fall short or neurological deficits start to appear, various surgical options should be considered as the next line of treatment strategy.⁴ Neurosurgeons employ a personalized approach, tailoring interventions to the individual's specific condition for optimal outcomes. Cervical disc herniation and cervical spondylosis present significant challenges, leading to the evolution of surgical interventions over the years. While the anterior approach has been a mainstay for midline or paramedian localized herniation, concerns about potential complications exist due to its proximity to critical vital structures.⁵ Conversely, posterior cervical laminoforaminotomy offers a distinctive advantage, particularly for posterolaterally located herniations and osteophytic structures. This approach minimizes the risk of trauma during the surgery and preserves the motion segment mobility.⁶

Posterior cervical laminoforaminotomy emerges as a targeted surgical approach for cervical radiculopathy resulting from unilateral soft lateral disc herniation or cervical spondylosis with resultant narrowing of the lateral recess. This technique tailors to the precise decompression of the cervical nerve root by addressing the neural foramen, preserving the structural integrity of the spinal column.⁷ The technique aims to optimize clinical outcomes by minimizing disruption to adjacent tissues, preserving motion segments, and facilitating a more rapid recovery. The technique involves a meticulous dissection to access the affected neural foramen, where the disc herniation is impinging upon the nerve root.⁸ By specifically targeting the affected segment, one can achieve effective decompression while minimizing trauma to the surrounding tissues. This precision is particularly crucial in mitigating the risk of collateral damage to healthy structures during the surgical process.⁹ Furthermore, the emphasis on preserving motion segments is pivotal for maintaining the normal biomechanics of the cervical spine. By minimizing disruption to adjacent vertebral levels, cervical laminoforaminotomy seeks to reduce the likelihood of accelerated degeneration or instability in the adjacent motion segment, that can result from more extensive anterior, anterolateral, and or hybrid approaches.¹⁰

One of the notable advantages of this approach is the potential for a more rapid recovery compared to traditional anterolateral surgical approaches. The targeted nature of cervical laminoforaminotomy allows for a streamlined postoperative course, with patients experiencing reduced post-operative pain and a quicker return to normal activities.¹¹ This study aimed at assessing the outcome of patients who underwent keyhole laminoforaminotomy for laterally placed cervical prolapsed intervertebral discs

MATERIAL AND METHODS

A retrospective study was conducted at a Bacha Khan Medical College, Mardan Medical Complex, Mardan-Pakistan, analyzing postoperative data of 23 patients diagnosed with cervical radiculopathy who underwent posterior keyhole laminoforaminotomy between February and July 2023. Patients included in the study were aged 30 to 70 years, presenting with persistent radicular pain exceeding two months, and exhibiting confirmed cervical disc herniation on MRI. Inclusion criteria encompassed single-level and adjacent bi-segmental herniation, desiccated discs with body root involvement, lateral canal stenosis, and unilateral

herniation greater than one-third of the spinal canal diameter, often accompanied by lateral recess stenosis. Exclusion criteria ruled out patients with degenerative spondylolisthesis, spinal canal stenosis, pregnancy, and severe somatic or psychiatric illnesses. Sampling was carried out using a non-probability consecutive technique among elderly patients. Data were collected through a pre-tested method in Microsoft Excel and analyzed using SPSS version 26, employing descriptive statistical tools. A sample size of 23 patients was derived via the WHO calculator, assuming a prevalence of 25% with a 5% margin of error. Ethical approval was secured under the designated ethical number. Surgically, patients were positioned prone in reverse Trendelenburg, with the head fixed in a neutral position. Level localization was achieved with fluoroscopy, followed by subperiosteal muscle retraction to the facet level. Under microscopic visualization, laminoforaminotomy was performed using a 2 mm Kerrison rongeur or a high-speed diamond drill, disc pathology was addressed with a micro nerve hook, and osteophytes were removed using a curette. Decompression was ensured through confirmation of proximal and distal pedicles.

Postoperatively, patients received analgesic and anti-inflammatory medications for one week, accompanied by the use of soft cervical collars for two weeks. The hospital stay duration was two days. Follow-up assessments at the 6th month included questioning patients about their preoperative and postoperative pain levels, evaluated using the Numeric Pain Scale (NPS), ranging from 0 (no pain) to 10 (intolerable pain).

RESULTS

A total of 23 patients were included in this study. Age of the participants ranged from 32 years to 67 years. The 31-40 age range constituted around 21.73% of the total patients, the 41-50 age group was the largest at approximately 43.47% of the patients, the 51-60 age range represented about 21.73% of patients, and the 61-67 age group comprised around 13.04% of the total patients. In this research study male were 16 accounting for 69.56% of the total patients while female patients were 7 (30.43%).

The distribution of disc herniation across different cervical levels was investigated in a sample of 16 cases. At the C1-C2 level, two cases were observed, constituting 12.50% of the total cases. Moving to the C2-C3 level, three cases were identified, making up 18.75% of the sample. Similarly, at the C3-C4 level, three cases were noted, also representing 18.75% of the total cases. The C4-C5 level exhibited the highest occurrence, with four cases, accounting for 25.00% of the cases. The C5-C6 and C6-C7 levels each presented one case,

contributing 6.25% to the sample. Finally, the C7-T1 level had two cases, making up 12.50% of the total cases.

The distribution of disc herniation across different cervical levels in female patients was examined in a sample of 7 cases. No instances of herniation were observed at the C1-C2 and C2-C3 levels. However, at the C3-C4 level, one case was identified, constituting 14.29% of the total cases. Similarly, the C4-C5 and C6-C7 levels each presented one case, accounting for 14.29% of the sample. The C5-C6 level exhibited the highest occurrence, with three cases, making up 42.86% of the cases. Additionally, both the C6-C7 and C7-T1 levels had one case each, representing 14.29% of the total cases.

The success rate of operation in patients with disc herniation through cervical laminoforaminotomy was found to be 82.62%. VAS score improved by more than 5 points in all the patients. A total of 19 patients had no complaints and their complaints completely subsided. Post-operative complications were observed in 03 patients. One patient developed local infection, which required reoperation and debridement. Two patients encountered complications characterized by the formation of wound hematomas post-surgery, both improved with conservative measures. All the patients were followed up for 03 months.

Tabel-1: Age Distribution of Patients

Age Groups	Numbers	Percentages
31-40	05	21.73%
41-50	10	43.47%
51-60	05	21.73%
61-67	03	13.04%

Table-2: Cervical disc herniation levels and the respective patient frequencies

Disc Level	Numbers	Percentages
C1-C2	02	12.50%
C2-C3	03	18.75%
C3-C4	03	18.75%
C4-C5	04	25.00%
C5-C6	01	6.25%
C6-C7	01	6.25%
C7-T1	02	12.50%

Table-3: Cervical disc herniation levels and the respective patient frequencies

Disc Level	Numbers	Percentages
C1-C2	0	0
C2-C3	0	0
C3-C4	01	14.29%
C4-C5	01	14.29%
C5-C6	03	42.86%
C6-C7	01	14.29%
C7-T1	01	14.29%

Table-4: Distribution and Characteristics of All Cervical Disc Herniation Cases

Patient ID	Age	Gender	Disc level
1	60	Male	C2-C3
2	34	Female	C3-C4
3	56	Female	C4-C5
4	60	Male	C4-C5
5	45	Male	C5-C6
6	41	Female	C6-C7
7	50	Male	C1-C2
8	52	Male	C3-C4
9	32	Male	C4-C5
10	44	Male	C4-C5
11	49	Female	C5-C6
12	67	Female	C7-T1
13	38	Male	C1-C2
14	33	Male	C2-C3
15	50	Male	C6-C7
16	53	Male	C3-C4
17	62	Female	C5-C6
18	46	Male	C7-T1
19	48	Male	C4-C5
20	41	Female	C5-C6
21	32	Male	C3-C4
22	46	Male	C7-T1
23	55	Male	C2-C3

DISCUSSION

This study highlights the effectiveness of posterior cervical laminoforaminotomy as a surgical intervention for unilateral cervical disc herniation, particularly in patients unresponsive to conservative management. The age distribution, with a predominant representation in the 41–50 years age group, aligns with prior epidemiological data indicating that cervical radiculopathy most commonly presents in middle-aged adults, likely due to cumulative degenerative changes.¹

Male predominance (69.56%) in our cohort parallels earlier findings suggesting a higher incidence in males, possibly due to occupational exposures or anatomical differences.² Interestingly, female patients in our sample demonstrated a higher prevalence of C5-C6 herniation—a pattern observed in other studies as well, warranting further biomechanical investigation.⁶

The overall surgical success rate of 82.62% is comparable to other published reports on minimally invasive posterior approaches.^{9,11} Improvements in VAS scores across all patients support the efficacy of this decompression technique. The absence of spinal fusion reduces the risk of adjacent segment disease, a known complication of ACDF.⁸

Three patients developed postoperative complications—one infection requiring reoperation and two hematomas managed conservatively. These rates are consistent with known complication profiles for minimally invasive spine surgery and

underscore the importance of meticulous surgical technique and perioperative protocols.¹⁰ Limitations include a small sample size and short follow-up duration, limiting long-term outcome assessment such as recurrence or segmental instability. Future prospective studies with larger, randomized cohorts are needed to validate these findings and develop patient-specific surgical algorithms.

CONCLUSION

In summary, our study reveals the efficacy of posterior keyhole laminoforaminotomy in addressing cervical disc herniation, boasting an 82.62% success rate. The demographic analysis highlights the prevalence of this condition in the 41–50 age range, predominantly among males. Despite its success, postoperative complications, notably a local infection, underscore the importance of meticulous care. This targeted surgical approach minimizes tissue disruption, promising a swift recovery and contributing to the evolving landscape of spinal health interventions. Our findings advocate for continued research to refine selection criteria and enhance patient outcomes.

AUTHORS' CONTRIBUTION

AA, SAK, EAK: Conceptualization of the study design, literature search, write-up, proof reading. AA, FJ, HA: Data collection, data analysis, data interpretation, AHQ: Data analysis, write-up, proof-reading.

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Address for Correspondence:

Dr. Shahbaz Ali Khan, Department of Neurosurgery, Ayub Medical College, Abbottabad-Pakistan

Cell: +92 333 503 1983

Email: shahbaz@ayubmed.edu.pk