International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 14, No. 5, May 2025 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.5.2025.95

Original Research

Functional Outcome of Patients with Lumbar Intervertebral Disc Prolapse Post Fenestration Discectomy

Shailesh Kumar,[1] Manmeet Malik,[2] Ashish Jhajhria,[3] Kartik,[4] Tarun Kumar Soni,[5] Nikhil Yadav,[6] Saurav Brar[7]

[1,3,4,5,6,7]Post Graduate, Department of Orthopaedics, PGIMS, Rohtak, Haryana, India
[2]Assistant Professor, Department of Orthopaedics, PGIMS, Rohtak, Haryana, India
[7]Senior Resident, Department of Orthopaedics, PGIMS, Rohtak, Haryana, India

Corresponding author:
Shailesh Kumar
Post Graduate, Department of Orthopaedics, PGIMS, Rohtak, Haryana, India

Received: 11 March, 2025 Accepted: 16 April, 2025 Published: 10 May, 2025

Abstract:

Introduction:70 to 80% of individuals suffer from low back pain related to prolapse of the lumbar disc, particularly among young, active workers. The condition results in a great deal of pain, sciatica, and impairments in motor function development which has become more severe as a global healthcare issue. Though conservative therapies prove useful, instances of surgery, for example, fenestration discectomy, promise efficient alleviation from such conditions with less morbidity, adequate recovery durations, and better quality of life outcomes in the longer term. This study evaluates the functional outcomes of lumbar disc prolapse patients after fenestration discectomy surgery.

Method: This prospective cohort study, conducted in Pt B D Sharma PGIMS, Rohtak, from June 2019 to June 2021, investigated the outcomes of fenestration discectomy in 30 patients presenting with lumbar disc herniation. Patients were included if MRI definitively diagnosed lumbar disc herniation with radicular symptoms, thus forming a relatively homogenous cohort of subjects and yielding the most reliable outcome results.

Result: It comprised only 30 patients with lumbar disc prolapse, of which the largest age group was predominantly male and aged forty-one to sixty. The most commonly affected disc level was L4-L5. After fenestration discectomy, 63.33% achieved an excellent outcome, 30% had a good result, and 6.67% had a fair recovery outcome, suggesting that fenestration discectomy has a valid role in enhancing functional independence.

Conclusion: This study concluded that fenestration discectomy improves functional outcomes in patients with lumbar disc prolapse. It had no complications, reduced recovery time, and favourable results, though the small sample size limits the findings.

Keywords: Lumbar disc prolapse, fenestration discectomy, functional outcomes, spine surgery and postoperative recovery.

Introduction

One of the most debilitating conditions in the world, low back pain affects people of all ages. A prevalent musculoskeletal condition that affects people worldwide is low back pain. Between 70and 80% of persons experienced low back pain at some point. Between 15% and 45% of people experience low back pain yearly, which varies greatly depending on the demographic being examined and the surveillance techniques used [1].

One of the main reasons for low back pain with a significant morbidity rate is lumbar disc prolapse worldwide, primarily affecting young people in the working class. Lumbar intervertebral disc prolapse is a common disorder that has a major effect on the quality of life of individuals. The displacement of disc material outside the usual confines of the intervertebral disc space often compresses surrounding neural structures, resulting in a range of symptoms, such as regional back pain, radiating leg discomfort (sciatica), sensory abnormalities, & motor dysfunction. This disease places a significant strain on healthcare systems and is among the primary causes of disability worldwide. Both conservative and surgical treatment shave advanced as a result of the need for efficient treatment modalities [2,3].

The prevalence of lumbar disc prolapse is highest among people in their fourth and fifth decades of life. However, it affects people of all ages worldwide. Age, lifestyle choices, and occupational hazards all increase the risk of disc herniation by degenerating intervertebral discs. In addition to causing physical discomfort, this ailment presents psychological and socioeconomic difficulties, highlighting the

DOI: 10.69605/ijlbpr_14.5.2025.95

significance of prompt diagnosis and treatment. According to the authors, 50 to 70% of people will have low back pain throughout their lives, with sciatica contributing to 40 % of cases. However, only 4 to 6 % of cases involve clinically severe sciatica that requires special care.Numerous factors can induce disc degeneration, which leads to the collapse of the disc between the vertebrae to the vertebral foramina, namely into the L4-L5 as well as L5-S1 levels. The L3-L4 and L2-L3 are responsible for most of the remaining prolapse.

Since the outcome of surgery is dependent on numerous criteria, including a thorough clinical history, Disk prolapse may be differentiated among different causes, such as sciatica and low back pain, with careful patient screening, a physical examination, and relevant radiological investigations.

Conservative treatments like medication, physical therapy, and lifestyle changes are frequently used in the early stages of lumbar disc prolapse care. Although a sizable percentage of patients find that these methods help them with their symptoms, some people may need surgery if their symptoms are severe or persistent. A straightforward and efficient treatment for surgical excision from a prolapsed disc that has shown to be a generally safe procedure with favourable results for most patients is the treatment for severe sciatic pain. The fenestration technique has been used for years to remove the troublesome disc because it offers certain benefits over the commonly used laminectomy operation.

Substantial changes have been made to the lumbar discectomy procedure. Spengler (1982) described restricted disc excision, which involves removing just the ligamentum flavum and if necessary, a tiny portion cut of the inferior lamina to extract the extruded disc and expose the prolapsed disc area.In 1985, Nagi said that the fenestration method of discectomy produced 93.5% good to excellent results, making it an exceptionally satisfactory approach. Compared to laminectomy, it is claimed that the fenestration discectomy approach requires less time, causes less blood loss, has fewer postoperative complications, and preserves spine stability because of the surgery's intrinsic, less invasive character. The potential of fenestration discectomy to enhance functional outcomes, such as pain management, neurological rehabilitation, and general quality of life, is frequently used to gauge its success. Evaluating these results is essential to comprehending the procedure’s longterm effectiveness and determining the variables that affect recovery.

Method

Research Design: This prospective observational cohort study was conducted in the Department of Orthopaedics at PGIMS, Rohtak, for two years, from June 2019 to June 2021. This study design was chosen to analyse the result of fenestration discectomy in patients with lumbar disc herniation. In a cohort of patients, observations were made prospectively, and these were collected systematically and analysed in terms of clinical outcomes, functional parole, and complications that the patients of procedures might endure. The research was performed in one of the tertiary care hospitals; in this case, it was PGIMS, which provided access to a diverse patient population through both emergency and outpatient departments. The advanced diagnostic facilities, including MR imaging at the hospital, set the basis for the patient's inclusion as they could accurately identify the lumbar disc herniation and its radiculitis. Patients with MRI confirmation of lumbar disc herniation in whom clinical symptoms and signs of radiculitis, such as pain along the nerve path, sensory abnormalities, or motor deficits, were the populations considered. The inclusion criterion ensured a homogeneous group of individuals affected directly by the condition under investigation to improve the reliability of findings. The total number of patients included in this study was 30. The sample size calculation was based on a previous study by Dr. Mohan Kumar et al.,which reported very good or fair results in 96.6% of patients undergoing fenestration discectomy. The minimum requirement of sample- size calculation could be computed using the formula:

$N \geq (p(1-p))/(ME/z\alpha)2$ Where:

p=Proportion of patients with excellent or fair outcomes (0.966)

ME=Margin of error(6.5%)

zα = Z-value for a 5% level of significance (1.96)

Thus, the study fits the statistical prerequisites in attaining validity and precision in the parameter. The patients were recruited consecutively as they presented to the hospital and met the criteria defined for inclusion. Data were collected uniformly, comprising demographic information, clinical signs and symptoms, MRI findings and post surgical outcomes. Patients were followed up over time to see functional recovery as well as resolution of symptoms. Prospective cohort design offered real-time data collection and reduced recall bias. Observational methodology guaranteed that clinical practices were never changed for research demands and thus maintained external validity.This study wanted to deliver clear evidence on fenestration discectomy as an effective and safe way of managing lumbar disc herniation, enriching clinical orthopaedics.

Inclusion Criteria

Age-20-65years

Lumbar disc herniation with evidence of exiting nerve root compression in MRI with symptoms of radiculopathy.

Clinical examination confirmed with MRI finding

Back pain with radicular pain of more than 6 weeks duration.

Failure to respond to non-operative treatment.

DOI: 10.69605/ijlbpr_14.5.2025.95

Exclusion Criteria

Back pain for less than 6 weeks duration.
Those without evidence of lumbar disc herniation on MRI.
Osseous cause for lumbar canal stenosis on MRI, e.g. vertebral fractures.
Signs of lumbar disc degeneration without lumbar disc herniation on MRI.
Presence of other associated spinal pathologies.
Those who have had previous discectomies.
Lack of consent.
Spondylolisthesis >Grade1
Radiological evidence of facet joint arthritis.
Prior lumbar spine surgery

Statistical Analysis

Categorical variables were presented in terms of number and percentage (%), but continuous variables were expressed as mean ± SD and median. The Kolmogorov-Smirnov test was used to test the normality of the data. If, somehow, normality rejection happened, a non- parametric analysis would be performed on it. We used the paired t-test/ Wilcoxon Test for non- normally distributed data sets between pre and post-observations to compare quantitative variables. A numerical threshold of $p<0.05$ was considered statistically significant. The data used for analysis were entered into an MS EXCEL spreadsheet and analysed using the Statistical Package for Social Sciences (SPSS) version 21.0.

Result

Table 1 illustrates the overall distribution of patients according to age and gender. The much- studied 30 patients-33.33, % aged 51-60 years, the next group of 30% comprises patients aged between 41-50 years. Next, those included 20% of patients aged 31-40 years. The smaller percentage proportion of adults ≥ 61 years is 10%, and the one consisting of those million is only 6.67% comprising patients younger than 30 years. This distributional so refers to 56.67% male patients and 43.33% female patients with a male-to-female ratio of 1.3:1. This means that among the demographic data, it shows a tendency that middle-aged and older adults of this group predominantly get affected, especially men.

Table1: Patient Demographics and Gender Distribution

Age groups	Frequency	Percentage(%)	Sex	No. of cases	Percentage(%)
<30	2	6.67	Male	17	56.67
31-40	6	20	Female	13	43.33
41-50	9	30			
51-60	10	33.33			
>61	3	10			
TOTAL	30	100	TOTAL	30	100

Table 2 provides a detailed analysis of disc prolapse levels, radicular pain distribution, and associated neurological symptoms among 30 patients. The most common level of disc prolapse was L4-L5, affecting 46.67% of patients, followed byL5-S1(33.33%),L3-L4(13.33%),andL2-L3 (6.67%). Regarding radicular pain, 43.33% of patients experienced pain on the left side, 36.67% on the right, and 20% had bilateral radicular pain.
Neurological involvement was evident in all patients (100%) through nerve tension signs, motor deficits were observed in 50%, sensory deficits in 36.67%, and combined motor and sensory involvement in 30%. Notably, no patients experienced bladder or bowel dysfunction. This analysis highlights L4-L5 and L5-S1 as the most commonly affected disc levels, with significant neurological and radicular pain presentations.

Table 2: Comprehensive Analysis of Disc Prolapse and Associated Symptoms

Category	Subcategory	No of cases	Percentage(%)
Level of Disc Prolapse	L2-L3	2	6.67
	L3-L4	4	13.33
	L4-L5	14	46.67
	L5-S1	10	33.33
	Total	30	100
Side of Radicular Pain	Left	13	43.33
	Right	11	36.67
	Bilateral	6	20
	Total	30	100
Neurological Involvement	Nerve Tension Signs	30	100
	Motor	15	50
	Sensory	11	36.67
	Both Motor and Sensory	9	30
	Bladder and Bowel	0	0

DOI: 10.69605/ijlbpr_14.5.2025.95

An overview of functional recoveries within a waiting group of thirty patients post-treatment can be presented in Table 3. This indicates that more than half (63.33%) have achieved an excellent outcome, reflecting significant improvement and resolution of symptoms. Another 30% experienced good outcomes, which suggested moderate recovery and functional improvement. Only 6.67% had fair recovery outcomes, indicating limited recovery by these patients. The above distribution demonstrates the effectiveness of treatment since most individuals tend to develop favourable outcomes.

Table 3: Distribution of Functional Out comes in Patients

Functional outcome	No. Of cases	Percentage(%)
Excellent	19	63.33
Good	9	30
Fair	2	6.67

Figure 1 shows the outcome distribution patterns of the population that underwent fenestration discectomy concerning functional independence. Data indicated many patients with excellent outcomes, hence the procedure's effectiveness. It is widely used, but quite a large sub-group falls in the good outcome category, while the fair is considerably smaller. This trend thus adds weightage to the overall success of the procedure among most patients in restoring functional ability.

Table 4: Reviews of other similar studies

Author	Findings
Wankhade et al.,2016	They found that the fenestration approach had a positive functional out- come in terms of going back to work and having all back and leg pain completely gone after six months
Shietal.,2012	Most patients had satisfactory long-term results from lumbar discectomy by fenestration
Azimi et al., 2016	The results indicate that laminotomy discectomy or fenestration is a suc- cessful treatment for LDH.
Swamy et al., 2017	They conclude that the degree of disc prolapse following discectomy has no discernible impact on the patient's functional outcome.

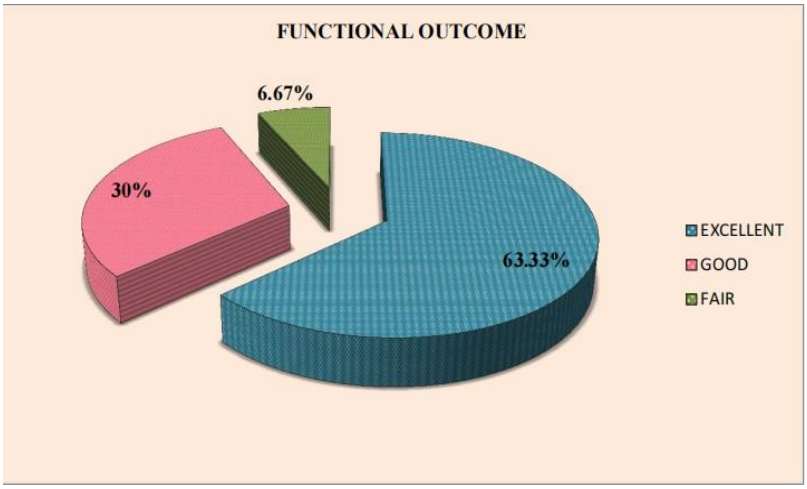

Figure 1: Functional outcome of fenestration discectomy

DISCUSSION

When lumbar disc prolapses, patients receive treatment using the fenestration technique, a study was conducted to ascertain the degree of functional recovery, pain alleviation, or return to work.They found that the fenestration approach had a positive functional outcome in terms of returning to work and total healing of leg and back pain by the end of six months. Furthermore, a functional outcome is negatively predicted by advanced age, prolonged symptoms, and the existence of various psychiatric problems [7].

A study examined the long-term effects of discectomy and pertinent variables linked to clinical outcomes. Most patients had satisfactory long-term results from lumbar discectomy by fenestration. The length of strong preoperative symptoms, smoking, and heavy physical labour were all associated with poor clinical outcomes[8].

Sangwan et al. state that the only way micro-discectomy exposure varies from the fenestration technique is in its scope. In both cases, the disc

DOI: 10.69605/ijlbpr_14.5.2025.95

removal itself is restricted. Making an incision in the annulus fibrosus is crucial when a protruding disc herniation is discovered. The increase in fenestration methods offers the advantage of addressing lateral recess stenosis. Suppose the surgeon feels that the nerve root continues to be limited after disc excision. In that case, they must be prepared to do foraminotomy, either undercutting in the upper or lower lamina, in addition to lumbar discectomy [9].

One typical orthopaedic complication brought on by lumbar disc degeneration is low back pain. Compared to other surgical treatments, fenestration discectomy takes less time, results in less blood loss, has fewer post-operative problems, and does not affect spine stability. A study evaluated the functional results of patients with lumbar disc disease regarding pain alleviation and neurological recovery after fenestration discectomy. The study stated that regardless of the length of symptoms, the functional success of the fenestration approach After six months, there was a satisfying comeback to work and complete pain alleviation [10].

Patients having lumbar intervertebral prolapse within the 20–60 age range participated in a research range and had their functional and neurological recovery and sequelae after a traditional fenestration discectomy evaluated.They concluded that fenestration discectomy reduces blood loss, takes less time, is safe, and has a lower postoperative morbidity rate [11].

A study assessed the outcomes of lumbar disc prolapse treated with a single-level discectomy using the fenestration technique. Considering everything, fenestration and discectomy are superior procedures that offer the following benefits: reduced tissue damage, increased spinal function, a smooth recovery for the patient, enhanced working position with ongoing clinical effectiveness, and early rehabilitation [12].

Based on the Core Outcome Measures Index (COMI), a study evaluated the surgical results and functional status of laminotomy versus fenestration in lumbar disc hernia (LDH). The results indicate that laminotomy discectomy or fenestration is a successful treatment for LDH. However, the surgical results from both approaches are equally good [13].

A study assessed the outcomes of discectomy for prolapsed lumbar discs. The objective physical results and the consequences are assessed with the patient's subjective assessment of low back pain and radicular symptoms following surgery. Although numerous new methods exist for treating lumbar disc prolapse, the most widely accepted approach is still the traditional routine discectomy via fenestration. According to some studies, 91% of patients experienced great, good, and adequate results, while 9% experienced moderate or poor results [14].

A study was carried out to determine if lumbar disc prolapse at varying levels affects patients' functional outcomes following discectomy. Fifty adult patients who were admitted to D. Y. Patil Medical College were included in the study. Those in the 40–60 age range frequently participated. Based on the study's findings and a review of other related prior research, they conclude that the degree of disc prolapse following discectomy has no discernible impact on the patient's functional outcome [15].

CONCLUSION

This study concluded that fenestration discectomy is a good surgical option for improving the functional outcome of patients with lumbar disc prolapse and relieving patients' quality of life. In the current research, 30 patients suffering from single-level lumbar disc prolapse were treated with fenestration discectomy, a simple, safe, and reliable procedure. The appropriate patient selection and good surgical techniques resulted in the absence of any intraoperative and post operative complications. The spine's stability was maintained in surgery with reduced blood loss and immediate relief of symptoms. The advantages of this procedure include less morbidity, early postoperative mobilisation, and a relatively shorter hospital stay. Most patients achieved excellent or good functional outcomes and could return to work quickly. Factors such as age, sex, duration of complaints, side of radiculopathy, and neurological deficits did not appear to statistically correlate with final surgical outcomes as per the observations in our study. The JOA low back pain score and Visual Analog Scale (VAS) score proved valuable in evaluating patient progress before and after surgery. The JOA score combined both subjective and objective elements.It proved to be especially practical and reliable in assessing outcomes and was used in previous studies to facilitate comparison with current research. Our study had a significant limitation regarding the small sample size.

REFERENCES

1. Anderson GBJ. Epidemiological features of chronic low back pain.Lancet.1999;354:581–85.
2. Aslam M, Khan FR, Huda N, Pant A, Julfiqar M, Goel A. Outcome of Discectomy by Fenestration Technique in Prolapsed Lumbar Inter-vertebralDisc.AnnIntMedDenRes.2015;1(3):286–90.
3. Chakrabarty PS. Excision of lumber disc through fenestration: A Prospective study to analyse functional results. Ind J Med Res Pha Sci. 2015;2(1):10–13
4. Manohara Babu KV. Surgical management of Lumbar disc prolapse by Fenestration technique. J.Orthopaedics. 2006;3(4):e6.
5. Sangwan SS, Kundu ZS, Singh R, Kamboj P, Siwach RC, Aggarwal P. Lumbar disc excision through fenestration. Ind J Orthop. 2006;40(2):86–89.
6. Nahar K, Srivastava RK. Prospective study of prolapsed lumbar intervertebral disc treatment by fenestration. Int J Res Med. 2013;2(2):170-73
7. Garg M, Kumar S. Interlaminar discectomy and selective foraminotomy in lumbar disc herniation. J OrthSurg.2001;9:15–18.
8. Wankhade UG, Umashankar MK, Reddy BJ.

DOI: 10.69605/ijlbpr_14.5.2025.95

Functional outcome of lumbar discectomy by fenestration technique in lumbar disc prolapse–return to work and relief of pain. Journal of Clinical and Diagnostic Research 2016;10(3): RC09.

9. Shi J, Wang Y, Zhou F, Zhang H, Yang H. Long-term clinical outcomes in patients undergoing lumbar discectomy by fenestration. J Int Med Res. 2012;40(6):2355-61
10. Sangwan SS, Kundu ZS, Singh R, Kamboj P, Siwach RC,Aggarwal P. Lumbar disc excision through fenestration. Ind J Orthop. 2006;40(2):86–89.
11. Antony D, Jose R. Functional out- come of lumbar fenestration discectomy in patients with intervertebral disc prolapse treated at a tertiary care centre in South India. Journal of Evolution of Medical and Dental Sciences, 2016;5(90):6689-6694.
12. Sharma S, Bairwa JL, Meena H, Pachori SK, Tak MS. To study functional outcome of single level discectomy by fenestration method in lumber disc prolapse-A prospective study. IP International Journal of Orthopaedic Rheumatology, 2023;9(1):44-48.
13. Azimi P, Mohammadi HR, Nayeb-Aghaei H, Azhari S, Safdari-Ghandehari H, Sadeghi S. Functionality status and surgical outcome of fenestration versus laminotomy discectomy in patients with lumbar disc herniation. Iranian Journal of Neurosurgery, 2015;1(1), 23-27.
14. Kumar PA ,Krishna CVM, Rao KS, Rambabu P, Krishna KV et al. Study of functional outcome of discectomy for lumbar disc pro- lapse. Journal of Evolution of Medical and Dental Sciences, 2016;5(42):2597-2603.
15. Swamy A, Swamy A, Sharma K, Khir-Sagar A. Functional outcome of discectomy for lumbar disc prolapse. J Spine, 2017;6 (382):2.