Doi: https://doi.org/10.3329/ewmcj.v14i2.86294

East-West Med. Col. J. Vol. 14, No. 2 july 2026

Original Article

UNLOCKING RELIEF: A COMPREHENSIVE STUDY FOR A SAFER AND EARLIER RECOVERY BY MICROSCOPIC FENESTRATION AND DISCECTOMY FOR PLID

Bhuiyan SM[1], Nandi AK[2], Yasmin T[3], Shohan AKMNF[4], Islam MN[5], Rashid MH[6]

Article History:
Received:14 December 2025
Accepted: 4 January 2026

Abstract:

Background: *Prolapsed Intervertebral Disc (PLID) occurs when the nucleus pulposus herniates through the annulus fibrosus and compresses neural structures, resulting in pain, sensory disturbances, and motor weakness. Microscopic fenestration and discectomy has emerged as a minimally invasive and effective surgical option for lumbar disc prolapse.*

Objective: *To evaluate the clinical outcome, safety, recurrence, and postoperative complications of microscopic fenestration and discectomy in patients with PLID.*

Methods: *This prospective observational study was conducted at Zainul Haque Sikder Women's Medical College & Hospital (ZHSWMCH), Dhanmondi, Dhaka, from January 2024 to December 2024. A total of 64 patients aged 18–70 years with single or double level lumbar PLID were included. Preoperative diagnosis was confirmed by MRI. All patients underwent microscopic fenestration and discectomy under aseptic precautions by a single surgeon. Patients were followed up postoperatively for two weeks. Clinical outcomes were assessed through motor and sensory improvement, PROLO scale evaluation, and postoperative complications.*

Results: *Among the 64 patients, the majority belonged to the 41–60 years age group (43.75%). The most common level of disc prolapse was L4–L5 (71.8%), followed by L5–S1 (15.6%). Posterolateral left-sided prolapse was the most frequent presentation (40.6%). Preoperatively, extensor hallucis longus weakness was present in 43.7% patients, which reduced to 4.6% postoperatively. Sensory deficit at the L5 level was most common preoperatively (42.1%), while 57.1% patients had no sensory deficit postoperatively. Functional improvement assessed by the PROLO scale demonstrated marked postoperative recovery, with 47 patients categorized in E1 status after surgery compared to 13 preoperatively. Postoperative complications were minimal, with recurrence at the same level in only 2 patients and bladder-bowel complication in 1 patient.*

Outcome: *Microscopic fenestration and discectomy resulted in significant improvement in motor and sensory function, early mobilization, reduction in pain, better rehabilitation outcomes, and fewer postoperative complications. The procedure also proved cost-effective with reduced analgesic requirements and fewer follow-up visits.*

Conclusion: *Microscopic fenestration and discectomy is a safe, effective, and reliable surgical technique for the management of PLID. The procedure provides satisfactory functional recovery with minimal recurrence and complications, making it an appropriate surgical option for selected patients in resource-limited settings.*

EWMCJ Vol. 14, No. 2, July 2026: 197-201

Keywords:
Prolapsed Intervertebral Disc, PLID, Microscopic Fenestration and Discectomy, Lumbar Disc Herniation, Outcome

Introduction

Prolapsed lumbar intervertebral disc (PLID), also referred to as lumbar disc herniation, is a common spinal disorder in which the nucleus pulposus protrudes through a weakened or ruptured annulus fibrosus, resulting in compression or irritation of adjacent neural

1. Dr Md Sharif Bhuiyan, Assistant Professor , Z H Sikder Womens Medical College Hospital,West Dhanmondi, Dhaka-1209.
2. Dr. Amit Kumar Nandi. Resident,Dept. of Neurosrgery, Dhaka Medical College.
3. Dr. Tamanna Yasmin, Medical Officer, Al Noor Eye Hospital.
4. Dr. A K M Nahid Ferdous Shohan, Surgical Resident, Bangladesh Medical University.
5. Dr.Md.Nurnabi Islam. Resident, National Institute Of Neurosciences And Hospital,Dhaka.
6. Dr. Md. Humayun Rashid: Associate Professor & Head, Department of Neurosurgery, East West Medical College & Hospital, Dhaka.

Address of Correspondence: Dr Md Sharif Bhuiyan, Assistant Professor , Z H Sikder Womens Medical College Hospital,West Dhanmondi, Dhaka-1209. Phone:+8801710254803.Email: ssquite@gmail.com. Https://orcid.org/0009-0008-6817-6463

structures within the spinal canal. This pathological process commonly produces lower back pain, radiculopathy, sensory disturbances, and motor weakness depending on the level and severity of nerve root involvement. Lumbar disc herniation is most prevalent among young and middle-aged adults and occurs less frequently in children. Degenerative changes associated with aging are considered the primary etiological factor responsible for weakening of the intervertebral disc structure.[1,2]

The lumbar intervertebral disc is composed mainly of collagen fibers, proteoglycans, and glycosaminoglycans that maintain hydration and biomechanical integrity of the disc. Age-related degeneration reduces the capacity of fibrochondrocytes to synthesize these essential components, leading to dehydration, reduced disc height, annular fissuring, and eventual disc collapse. Progressive weakening of the annulus fibrosus predisposes the disc to herniation, especially when exposed to excessive biomechanical stress or repetitive strain. In severe cases, sudden catastrophic disruption of annular fibers may allow extrusion of nucleus pulposus material into the spinal canal, causing compression of the spinal cord or spinal nerve roots.[2,3]

Trauma and repetitive mechanical stress also play an important role in the pathogenesis of PLID. Falls, road traffic accidents, heavy lifting, and repetitive forward bending may transmit excessive forces across the lumbar spine, increasing the risk of annular tears and disc rupture. In many patients, disc herniation develops gradually due to cumulative minor injuries and progressive degeneration rather than a single traumatic event.[3,4]

Clinical manifestations of PLID vary according to the site and severity of disc prolapse. Common symptoms include lower back pain, radiating leg pain (sciatica), numbness or tingling sensations in the lower limbs, and muscular weakness. Severe compression may result in cauda equina syndrome characterized by bladder or bowel dysfunction, saddle anesthesia, and sexual dysfunction. Diagnosis is established through careful clinical evaluation, neurological examination, and imaging studies. Physical examination commonly includes assessment of reflexes, motor power, sensory function, and straight leg raising test. Magnetic resonance imaging (MRI) is considered the gold standard investigation for confirming lumbar disc herniation, while computed tomography (CT), X-ray, and electromyography (EMG) may provide additional diagnostic information.[1,5]

Several spinal disorders may clinically mimic PLID, including spinal stenosis, degenerative disc disease, spondylolisthesis, muscular strain, and osteoarthritis. Among lumbar disc levels, L4–L5 is the most commonly affected site resulting in L5 radiculopathy, followed by the L5–S1 level. Surgical management is considered in selected patients with persistent neurological deficits or refractory pain. Fenestration discectomy has demonstrated advantages over conventional laminectomy in terms of reduced tissue damage, adequate neural decompression, early mobilization, faster return to work, and lower incidence of postoperative back pain. Additionally, minimally invasive techniques such as percutaneous lumbar disc decompression (PLDD) and percutaneous endoscopic lumbar discectomy (PELD) have gained increasing popularity due to reduced postoperative morbidity and improved recovery outcomes.[4,6]

Materials and Methods

Prospective type of observational study was conducted for a period of one year from January 2024 to December 2024 at Zainul Haque Sikder Women's Medical College & Hospital (ZHSWMCH), Dhanmondi, Dhaka. Ethical approval was granted from Institutional Review Board, ZHSWMC. Total 64 patients were enrolled into the study. Patients were explained about the surgical technique in advance and informed written consent was taken. Inclusion criteria were patients aged From 18 years to 70 years either Single to 2 disc level involvement. Prolapsed disc due to degenerative changes or trauma in lumbar intervertebral disc was also enrolled into the study. Cauda equina syndrome due to prolapsed disc were added into the study. Exclusion criteria were ages below 18 and above 70 years with more than 2 disc level involvement and previous history of fenestration with discectomy or Preoperative spondylolisthesis or scoliosis or intervertebral infections. Standard for preoperative confirmatory diagnosis was MRI study. Surgery was done by a single surgeon in the same institution.

Surgical procedure: The operations were performed under general anaesthesia in the prone position under all aseptic precautions. Level was identified by fluoroscopy guidance. Local anaesthesia was injected with adrenaline to minimize bleeding from the operative

site. An incision of 2.5 to 3 cm was made, skin was cut in layers. Muscle was dissected subperiosteally, fenestration was done by drilling or bone ronger. Flavectomy was done, nerve root compression was identified, discectomy was performed, foraminotomy was done in maximum cases and freed and hemostasis checked, through irrigation and washing was done. Then the tissues were closed according to layers.

Results:

Table I shows that out of 64 patients 2 patients (3.12%) were aged below 10-20 years, 16 (25%) aged 21- 40 years, 28 (43.75%) aged 41-60 years and 18 (28.125%) aged 61-80 years.

Table-I

Frequency of the patients by age (n=64)
Age (years)

Age	Frequency (n)	Percentage (%)
10-20	2	3.12%
21-40	16	25%
41-60	28	43.75%
61-80	18	28.125%
Total	64	100%

Table II shows the level of disc prolapse where out of 64 patients 46 (71.8%) had at the level of L4-L5 and 08 (12.5%) had at the level of L3-L4 and 10 (15.6%) at the level of L5-S1.

Table-II

Frequency of patients with level of disc prolapse.

Site of disc prolapse	Frequency of pts (n=64)
L3-L4	8
L4-L5	46
L5 - S1	10
Total	64

Table III shows that most common site of disc prolapse was posterolateral - left being 26 (40.6%) patients, posteriolateral right is 19 (29%), central 13 (20.3%) and lateral being 6 (9.3%).

Table-III

Frequency of patients in relation to the side of disc prolapse.

Site of prolapsed disc	No of pts (64)	Percentage
Posteriolateral - right	19	29%
Posteriolateral - left	26	40.6%
Central	13	20.3%
Lateral	6	9.3%

Table IV shows that in the most common cause type of muscle weakness in EHL, being 28 (43.7 %) patients in this group. 24 (37.5%) cases had weakness in FHL and another group was both muscle weakness 12 (18.75%). Postoperatively only 8 (15.5%) patients complained of muscle weakness.

Table-IV

Comparison of pre-operative and post-operative motor weakness.

Muscle power	Pre-operative weakness	Percentage	Post-operative weakness	Percentage
EHL[1]	28	43.7%	3	4.6%
FHL[2]	24	37.5%	0	0.%
Both	12	18.75%	5	10.9%
Total	64	100%	8	15.5%

[3] EHL: extensor halluces longus,
[2] FHL: Flexor Halluces longus

Table-V

Comparison of preoperative and postoperative sensory weakness

Level of Sensory defect	Pre-operative		Post-operative	
	Patients (n)	%	Patients (n)	%
L4	13	20.3%	9	14.0%
L5	27	42.1%	11	17.18%
S1	18	28.1%	7	10.9%
None	6	9.3%	37	57.1%
Total	64	100%	64	100%

Table-V shows that preoperative 27 (42.1%) patients had the sensory deficit at L5 level. Sensory deficit at the level of L4 was 13(20.2%) and that of S1 was 18(28.1%). No Sensory deficit at any the level was 6 (09.67%). Out of all patients 27 (41%) patient had postoperative sensory deficit.

Table-VI

comparison between PROLO scale of preoperative and post-operative follow up.

Values	Pre-operative PROLO scale	Post-operative PROLO scale
E1	13	47
E2	24	10
E3	17	2
E4	7	1
E5	3	0
(n)	64	64

This data collected based on economical scale and n=64 being the number of patients. E1 – Completely Invalid, E2- No gainful occupation including ability to do house chores or retirement activities, E3 – Able to work but not at previous vocation, E4- Working at previous occupation with part time or limited status, E5- Able to work at occupation with no restriction.

Table-VII

Study showing post-operative complications.

Complications	Numbers of patients
Recurrence at the same level	2
Bladder and bowel complications	1

Discussion

Lumbar intervertebral disc herniation (LIDH) remains one of the most common causes of lower back pain and radiculopathy leading to functional disability and reduced quality of life worldwide. Surgical intervention is generally recommended in patients with persistent neurological deficits, severe pain refractory to conservative treatment, or progressive neurological impairment. Among the available surgical procedures, microscopic fenestration and discectomy have gained widespread acceptance because of their effectiveness in achieving adequate neural decompression with minimal tissue damage. Several studies have demonstrated favorable outcomes following microscopic discectomy, including early mobilization, reduced postoperative pain, and faster return to daily activities.[7,8]

In the present study, the majority of patients belonged to the 41–60 years age group, accounting for 46% of cases. Similar findings were reported by Schoenfeld and Weiner, who observed that lumbar disc herniation is more prevalent among middle-aged adults due to progressive degenerative changes of the intervertebral disc associated with aging and occupational stress.[9] Degenerative weakening of the annulus fibrosus combined with repetitive spinal loading contributes significantly to disc prolapse in this age group.

The most commonly affected level in this study was L4–L5, accounting for 46 cases. This finding is consistent with previous studies reporting L4–L5 as the most frequent site of lumbar disc herniation because of greater mobility and increased mechanical stress at this level.[10,11] The second most common level reported in the literature is L5–S1 due to the transition between the mobile lumbar spine and fixed sacral segment. Posterolateral disc prolapse was the most common pattern observed in our patients, particularly on the left side. This predominance may be related to anatomical weakness of the posterolateral annulus fibrosus and the mechanical distribution of spinal load during daily activities.[12]

Motor weakness involving the extensor hallucis longus (EHL) was the most frequent neurological deficit observed in the present study. Sensory deficit was most commonly noted in the L5 dermatome distribution. Similar neurological findings have been described by Kreiner et al., who reported that L5 nerve root compression is commonly associated with weakness of dorsiflexion and sensory impairment over the dorsum of the foot.[13]

Functional outcome assessment using the PROLO economic and functional rating scale demonstrated significant postoperative improvement. Before surgery, a considerable proportion of patients were unable to perform gainful occupation or normal daily activities due to severe pain and disability. However, postoperative assessment showed marked recovery, with the majority of patients returning to routine activities and experiencing minimal symptoms. These findings are in agreement with the results of Kubat et al., who demonstrated significant postoperative improvement in pain relief, physical functioning, and quality of life after microscopic lumbar discectomy.8 Similar outcomes were also reported in the Spine Patient Outcomes Research Trial (SPORT), where surgically treated patients showed superior long-term improvement in pain and function compared with non-operative treatment.[14]

Postoperative complications in lumbar disc surgery remain an important concern despite advances in microsurgical techniques. In the present study, recurrence at the same level was observed in two patients, while one patient developed bowel and bladder dysfunction postoperatively. Previous studies have reported complications including wound infection, dural tear, hematoma formation, discitis, nerve root injury, failed back syndrome, and recurrent disc prolapse.[15,16] Morgan-Hough et al. reported wound infection in approximately 3% of cases, hematoma formation in 2%, pulmonary embolism in 1%, and persistent postoperative back pain in 1.6% of patients undergoing lumbar discectomy. [15] Similarly, Asch et al. documented an overall complication rate of nearly 4% among patients undergoing lumbar disc surgery. [16]

The relatively low complication rate and favorable functional outcomes observed in the current study support the effectiveness and safety of microscopic fenestration and discectomy in appropriately selected patients with lumbar disc herniation. The procedure provides adequate neural decompression while minimizing spinal instability and tissue trauma. Furthermore, newer minimally invasive

techniques such as percutaneous endoscopic lumbar discectomy (PELD) and percutaneous lumbar disc decompression (PLDD) continue to evolve and may offer additional advantages in terms of reduced postoperative morbidity and faster recovery.[17,18] Nevertheless, careful patient selection, precise surgical technique, and long-term follow-up remain essential for achieving optimal clinical outcomes.

Conclusion

Microscopic fenestration and discectomy is a safe and effective technique in the context of treating patients with PLID. By considering many aspects our country like that of occupation, finance and lifestyle notable improvements was seen in recovery of spinal function both motor and sensory, cost effective in the sense of less requirements of analgesics and fewer follow ups and also had minimal complications or recurrence. There was also improvements in rehabilitation. On the basis of these results in the present study, surgical management of prolapsed lumbar intervertebral disc by fenestration and discectomy is a relatively safe, effective.

Limitations of the study

The findings from the current study suggest that both microscopic Fenestration Fenestration and discectomy can lead to meaningful improvements in physical function and reduction in pain for patients with PLID. While the present investigation provides valuable insights into the short-term outcomes of these surgical approaches, further research is needed to directly compare their long-term effectiveness and to better delineate the factors that may influence the relative success of the technique.

Conflict of interest:

None to declare

Ethical approval:

Approved by IRB, ZHSWMC, Dhanmondi, Dhaka.

References:

1. Pojskic M, Bisson E, Oertel J, Takami T, Zygourakis C, Costa F. Lumbar disc herniation: epidemiology, clinical and radiologic diagnosis WFNS spine committee recommendations. World Neurosurg X. 2024;22:100279.
2. Dydyk AM, M Das J. Disk Herniation. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025.
3. Schoenfeld AJ, Weiner BK. The epidemiology and pathophysiology of lumbar disc herniations. Semin Spine Surg. 2016;28(1):2-7.
4. Kreiner DS, Hwang SW, Easa JE, Resnick DK, Baisden JL, Bess S, et al. An evidence-based clinical guideline for the diagnosis and treatment of lumbar disc herniation with radiculopathy. Spine J. 2014;14(1):180-91.
5. Dydyk AM, Ngnitewe Massa R, Mesfin FB. Lumbar Degenerative Disk Disease. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024.
6. 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):2235-43.
7. Caspar W. A new surgical procedure for lumbar disc herniation causing less tissue damage through a microsurgical approach. Adv Neurosurg. 1977;4:74-7.
8. Yasargil MG. Microsurgical operation of herniated lumbar disc. Adv Neurosurg. 1977;4:81-3.
9. Schoenfeld AJ, Weiner BK. The epidemiology and pathophysiology of lumbar disc herniations. Semin Spine Surg. 2010;22(1):2-7.
10. Spangfort EV. The lumbar disc herniation: a computer-aided analysis of 2504 operations. Acta Orthop Scand Suppl. 1972;142:1-95.
11. Dydyk AM, Das JM. Lumbar Disc Herniation. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025.
12. Fardon DF, Milette PC. Nomenclature and classification of lumbar disc pathology. Spine. 2001;26(5):E93-113.
13. Kreiner DS, Hwang SW, Easa JE, Resnick DK, Baisden JL, Bess S, et al. An evidence-based clinical guideline for diagnosis and treatment of lumbar disc herniation with radiculopathy. Spine J. 2014;14(1):180-91.
14. Kubat O, Sumer M, Bektas O, Serin HM. Evaluation of clinical outcomes after microscopic lumbar discectomy. J Neurosci Rural Pract. 2014;5(3):261-5.
15. Weinstein JN, Tosteson TD, Lurie JD, Tosteson AN, Blood EA, Herkowitz H, et al. Surgical versus nonoperative treatment for lumbar disc herniation: four-year results for the Spine Patient Outcomes Research Trial (SPORT). Spine. 2008;33(25):2789-800.
16. Morgan-Hough CV, Jones PW, Eisenstein SM. Primary and revision lumbar discectomy: a 16-year review from one centre. J Bone Joint Surg Br. 2003;85(6):871-4.
17. Asch HL, Lewis PJ, Moreland DB, Egnatchik JG, Yu YJ, Clabeaux DE, et al. Prospective multiple outcomes study of outpatient lumbar microdiscectomy: should 75 to 80% success rates be the norm? J Neurosurg. 2002;96(1 Suppl):34-44.
18. Ruetten S, Komp M, Merk H, Godolias G. Surgical treatment for lumbar disc herniation with the full-endoscopic interlaminar and transforaminal approach versus conventional microsurgical technique. Spine. 2008;33(9):931-9.

Peer-Review History:
The peer review history for this paper can be accessed here: https://ewmch.com/review/