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Comparison of Microdiscectomy versus Conventional Discectomy for Single Level Lumbar Disc Herniation

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ABSTRACT

Background: Lumbar disc herniation is a common spinal disorder causing radicular pain, neurological deficits, and functional disability. Surgical intervention is indicated when conservative management fails. Microdiscectomy and conventional discectomy are widely practiced surgical techniques, but comparative evidence regarding their effectiveness, recovery, and complications remains limited, particularly in the Bangladeshi population. **Aim of the Study:** To compare microdiscectomy and conventional discectomy in terms of perioperative parameters, pain relief, functional outcomes, and complications in patients with single-level lumbar disc herniation. **Methods & Materials:** A prospective comparative study was conducted on 120 patients (60 microdiscectomy, 60 conventional discectomy). Outcomes included operative time, blood loss, incision length, VAS pain scores, ODI, postoperative recovery, complications, and Modified Macnab criteria at six months. **Results:** Microdiscectomy demonstrated significantly shorter operative time (72.4 ± 15.6 vs 84.3 ± 17.1 min; p=0.001), reduced intraoperative blood loss (58.6 ± 22.4 vs 112.8 ± 34.6 ml; p<0.001), and smaller incision length (2.5 ± 0.6 vs 5.1 ± 0.9 cm; p<0.001) compared with conventional discectomy. Postoperative recovery was faster with microdiscectomy, including earlier mobilization (12.6 ± 5.4 vs 20.7 ± 6.8 h; p<0.001), shorter hospital stay (2.1 ± 0.9 vs 4.3 ± 1.4 days; p<0.001), and quicker return to work (4.8 ± 1.9 vs 7.3 ± 2.6 weeks; p<0.001). Improvement in VAS leg pain (6.5 ± 1.1 vs 5.7 ± 1.3; p=0.001), VAS back pain (4.9 ± 1.2 vs 4.2 ± 1.4; p=0.008), and ODI (44.6 ± 10.1 vs 40.4 ± 9.7; p=0.01) was significantly greater in the microdiscectomy group. Overall successful outcomes (excellent + good) were higher in the microdiscectomy group (86.7% vs 76.7%). **Conclusion:** Microdiscectomy is associated with superior perioperative safety, reduced surgical trauma, faster recovery, and better pain and functional outcomes compared with conventional discectomy, supporting its preference in appropriately selected patients with single-level lumbar disc herniation.

Keywords: *Microdiscectomy, Conventional Discectomy, Lumbar Disc Herniation, Oswestry Disability Index, Visual Analog Scale, Surgical Outcomes*

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INTRODUCTION

Lumbar disc herniation refers to the displacement of the nucleus pulposus through a tear in the annulus fibrosus, which may compress adjacent nerve roots and lead to symptoms such as low back pain, sciatica, and neurological deficits [1]. Globally, lumbar disc herniation affects approximately 1-3% of the general population [2]. In Bangladesh, the prevalence rate is around 2-4% of patients who suffer from symptomatic lumbar disc herniation, particularly among the working-age population [3]. The transition from conventional to microscopic techniques represents an evolution in surgical precision. In conventional discectomy, a larger midline incision is made to strip the paravertebral muscles from the lamina, providing a wide view of the spinal canal. In contrast, microdiscectomy utilizes a much smaller incision and an operating microscope to achieve high-intensity illumination and magnification. By enhancing the visual field, the surgeon can precisely identify the herniated fragment while minimizing the trauma to the surrounding ligamentum flavum and neural structures [4]. The management of lumbar disc herniation involves both conservative and surgical approaches. When symptoms persist despite conservative therapy, surgical removal of the herniated disc fragment becomes necessary. This approach minimizes tissue damage and facilitates precise decompression of the affected nerve root [5]. The impact of these surgical procedures is substantial. Both techniques help to relieve nerve compression, reduce radicular pain, and improve functional mobility. The comparative impact of these procedures center on the balance between surgical exposure and tissue preservation. Microdiscectomy (MD) significantly reduces intraoperative blood loss and surgical site morbidity [6,7]. Each technique has its pros and cons. Microdiscectomy offers minimal tissue trauma, lower blood loss, and quicker return to normal activities, but it requires specialized equipment and surgical expertise. Microdiscectomy has been associated with shorter hospital stay, reduced postoperative pain, and faster recovery compared with conventional open discectomy [8]. On the other hand, conventional discectomy is technically simpler and widely practiced, although it may involve greater muscle dissection and longer recovery time. Consequently, the inherent learning curve associated with microscopic equipment may temporarily increase operative times in specific settings compared to the well-established protocols of open surgery [9]. The importance of comparing these procedures lies in identifying the most effective surgical strategy for improving patient outcomes. Lumbar disc herniation significantly affects physical function and work productivity, particularly among middle-aged adults. Therefore, determining the optimal surgical approach can help reduce complications, improve recovery, and enhance overall quality of life [10]. However, existing research has several limitations. Many studies are retrospective, involve small sample sizes, or have short follow-up periods, which may limit the reliability of their conclusions. Additionally, differences in surgical expertise, patient characteristics, and postoperative care can influence the reported outcomes [11]. For these reasons,

further comparative studies are necessary to provide clearer evidence regarding the relative benefits of microdiscectomy and conventional discectomy. The study aimed to compare the outcomes of microdiscectomy and conventional discectomy in patients with single-level lumbar disc herniation, focusing on surgical effectiveness, postoperative recovery, and complications to determine the most suitable treatment approach for affected patients.

METHODS & MATERIALS

This prospective comparative study was conducted at the Department of Orthopedic Surgery, Bangladesh Medical University, Dhaka, Bangladesh from Jane 2024 to July 2025. A total of 120 patients diagnosed with symptomatic single-level lumbar disc herniation who failed conservative management were included in the study. Patients were divided into two groups according to the surgical technique used:

- Group A: Microdiscectomy (n = 60)
- Group B: Conventional open discectomy (n = 60)

All patients were evaluated clinically and radiologically prior to surgery.

Inclusion Criteria

Patients were included if they met the following criteria:

- Age 18–65 years
- Single-level lumbar disc herniation confirmed by MRI
- Persistent radicular pain with or without neurological deficit
- Symptoms refractory to at least 6 weeks of conservative treatment
- Indication for surgical intervention

Exclusion Criteria

Patients were excluded if they had:

- Multilevel lumbar disc herniation
- Previous lumbar spine surgery
- Lumbar spinal stenosis or spondylolisthesis
- Spinal infection, tumor, or trauma
- Severe systemic illness contraindicating surgery

Surgical Procedures

Microdiscectomy

Microdiscectomy was performed using an operating microscope through a small midline incision (approximately 2–3 cm). Minimal muscle dissection was carried out, followed by laminotomy and removal of the herniated disc fragment under magnified visualization while preserving surrounding structures.

Conventional Discectomy

Conventional open discectomy was performed through a larger midline incision (approximately 4–6 cm) with paraspinal muscle retraction. Partial laminotomy and flavectomy were carried out to expose the affected nerve root, followed by removal of the herniated disc material.

Data Collection

Data were collected using a structured and standardized data collection form designed specifically for the study. All eligible patients underwent detailed clinical evaluation, radiological assessment, and perioperative documentation to ensure comprehensive recording of relevant variables. The data collection process was carried out by trained physicians and research assistants under the supervision of the principal investigators to maintain accuracy and consistency.

At baseline, demographic information including age, sex, and body mass index (BMI) was recorded for all participants. In addition, detailed clinical history was obtained, including duration of symptoms, presence of radicular pain, previous treatment history, and associated neurological symptoms. A thorough physical and neurological examination was performed for each patient, focusing on motor power, sensory deficits, and reflex changes in the lower limbs. The Straight Leg Raising (SLR) test was also conducted as part of the routine neurological evaluation to assess nerve root irritation.

Radiological confirmation of lumbar disc herniation was obtained through magnetic resonance imaging (MRI) of the lumbosacral spine, which was used to identify the affected disc level and confirm the presence of single-level disc herniation, most commonly at L4–L5 or L5–S1 levels. The imaging findings were reviewed by experienced spine surgeons or radiologists to ensure diagnostic accuracy before inclusion in the study.

Intraoperative data were recorded during the surgical procedure by the operating team. These included operative time (measured in minutes from skin incision to wound closure), intraoperative blood loss (measured in milliliters using suction measurements and surgical sponges), incision length (in centimeters), and any intraoperative complications such as dural tears or nerve root injury. The surgical technique used—either microdiscectomy or conventional open discectomy—was also documented for each patient.

Preoperative pain intensity and functional disability were assessed using validated clinical scales. Pain severity was evaluated using the Visual Analog Scale (VAS) for both leg pain and back pain, where scores range from 0 (no pain) to 10 (worst imaginable pain). Functional disability was assessed using the Oswestry Disability Index (ODI), a widely used instrument for measuring disability associated with low back pain. These scores were recorded preoperatively and again during postoperative follow-up visits to evaluate treatment outcomes.

Postoperative recovery parameters were also systematically documented. These included duration of hospital stay (in days), time to first mobilization after surgery (in hours), and time taken to return to work or normal daily activities (in weeks). Postoperative complications such as dural tear, surgical site infection, discitis, and recurrent disc herniation were carefully monitored and recorded during the hospital stay and subsequent follow-up visits.

All patients were followed up for a minimum period of six months after surgery to assess functional recovery and overall clinical outcomes. At the final follow-up, the surgical outcome was evaluated using the Modified Macnab criteria, which categorizes outcomes into excellent, good, fair, and poor based on the patient's pain relief, functional improvement, and ability to resume normal activities. These outcome measures allowed for a comprehensive comparison between the microdiscectomy and conventional discectomy groups in terms of both clinical effectiveness and postoperative recovery.

All collected data were reviewed, verified for completeness, and entered into a secure database before being subjected to statistical analysis. Care was taken to maintain patient confidentiality throughout the data collection and analysis process.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 26. Continuous variables were presented as mean ± standard deviation (SD), while categorical variables were expressed as frequency and percentage. Differences between the microdiscectomy and conventional discectomy groups were evaluated using the independent sample t-test for continuous variables and the Chi-square test or Fisher’s exact test for categorical variables. Mean differences with 95% confidence intervals (CI) were calculated where appropriate. A p-value < 0.05 was considered statistically significant.

RESULT

The majority of patients in both groups were aged 30–50 years, accounting for 51.67% in the microdiscectomy group and 56.67% in the conventional discectomy group. The mean age was (39.8±10.7 vs 41.2±11.1 years; p=0.48). Male patients predominated in both groups (63.33% vs 60.00%), (p=0.71). Mean BMI (26.3±3.5 vs 27.1±3.8 kg/m²; p=0.24) and symptom

duration (7.8±3.1 vs 8.2±3.4 months; p=0.53) were comparable. L4–L5 was the most commonly affected disc level in both groups (56.67% vs 51.67%), followed by L5–S1 (43.33% vs 48.33%) (p=0.58). Neurological deficits, including motor deficit (30.00% vs 33.33%), sensory deficit (41.67% vs 45.00%), and positive straight leg raising test (81.67% vs 86.67%), were also comparable between the groups with no statistically significant differences (*Table I*).

Table I
Baseline demographic and clinical characteristics among the study population (*n* = 120).

Variable	Microdiscectomy (n=60)		Conventional Discectomy (n=60)		p-value
	n	%	n	%	
Age (years)					
<30	14	23.33	11	18.33	0.63
30–50	31	51.67	34	56.67	
>50	15	25.00	14	23.33	
Mean ± SD	39.8 ± 10.7		41.2 ± 11.1		0.48
Gender					
Male	38	63.33	36	60.00	0.71
Female	22	36.67	24	40.00	
BMI (kg/m²)					
Mean ± SD	26.3 ± 3.5		27.1 ± 3.8		0.24
Duration of Symptoms (months)					
Mean ± SD	7.8 ± 3.1		8.2 ± 3.4		0.53
Level of Disc Herniation					
L4–L5	34	56.67	31	51.67	0.58
L5–S1	26	43.33	29	48.33	
Neurological deficit					
Motor deficit	18	30.00	20	33.33	0.69
Sensory deficit	25	41.67	27	45.00	0.71
Positive Straight Leg Raising Test	49	81.67	52	86.67	0.46

The mean operative time was significantly shorter in the microdiscectomy group compared with the conventional discectomy group (72.4±15.6 vs 84.3±17.1 minutes; p=0.001). Intraoperative blood loss was also significantly lower in the microdiscectomy group (58.6±22.4 ml) compared with the conventional discectomy group (112.8±34.6 ml) (p<0.001). Intraoperative complications were observed in 3.33% of patients in the microdiscectomy group and 8.33% in the conventional discectomy group (*Table II*).

Table II
Intraoperative Surgical Parameters among the Study Population.

Variable	Microdiscectomy (n=60)	Conventional Discectomy (n=60)	p-value
Operative Time (minutes), Mean ± SD	72.4 ± 15.6	84.3 ± 17.1	0.001
Intraoperative Blood Loss (ml), Mean ± SD	58.6 ± 22.4	112.8 ± 34.6	<0.001
Incision Length (cm)	2.5 ± 0.6	5.1 ± 0.9	<0.001
Intraoperative Complications	2 (3.33)	5 (8.33)	0.24

Postoperative VAS leg pain was lower in the microdiscectomy group (1.6 ± 0.8) than in the conventional group (2.3±1.0) (p=0.002). Postoperative VAS back pain was also lower with microdiscectomy (1.9 ± 0.9) than with conventional discectomy (2.7±1.1) (p=0.001) *Table III*.

Table III
Preoperative and postoperative pain and disability scores among the study population.

Outcome Measure	Microdiscectomy (n = 60)		Conventional Discectomy (n = 60)		p-value*
	Preoperative	Postoperative	Preoperative	Postoperative	
VAS Leg Pain Score	8.1 ± 0.9	1.6 ± 0.8	8.0 ± 1.0	2.3 ± 1.0	0.002
VAS Back Pain Score	6.8 ± 1.2	1.9 ± 0.9	6.9 ± 1.1	2.7 ± 1.1	0.001
Oswestry Disability Index (%)	61.4 ± 9.5	16.8 ± 6.3	62.1 ± 8.8	21.7 ± 7.5	0.003

Microdiscectomy patients recovered faster, with shorter hospital stay (2.1±0.9 vs 4.3±1.4 days), earlier mobilization (12.6±5.4 vs 20.7±6.8 hours), and earlier return to work (4.8±1.9 vs 7.3±2.6 weeks), all significant (p<0.001) *Table IV*.

Table IV
Postoperative recovery outcomes among the study population.

Variable	Microdiscectomy (n=60)	Conventional Discectomy (n=60)	p-value
Hospital Stay (days)	2.1 ± 0.9	4.3 ± 1.4	<0.001
Time to Mobilization (hours)	12.6 ± 5.4	20.7 ± 6.8	<0.001
Return to Work (weeks)	4.8 ± 1.9	7.3 ± 2.6	<0.001

Excellent outcomes at 6 months were observed in 53.33% of the microdiscectomy group versus 40.00% of the conventional discectomy group. The combined successful outcome (excellent + good) was higher with microdiscectomy (86.67%) than with conventional discectomy (76.67%) *Table V*.

Table V
Modified Macnab outcome classification at 6-month follow-up among the study population.

Macnab Outcome	Microdiscectomy (n = 60)		Conventional Discectomy (n = 60)		p-value
	n	%	n	%	
Excellent	32	53.33	24	40.00	0.15
Good	20	33.33	22	36.67	
Fair	6	10.00	9	15.00	
Poor	2	3.33	5	8.33	
Excellent + Good (Successful Outcome)	52	86.67	46	76.67	

The Oswestry Disability Index improved more in the microdiscectomy group (44.6±10.1) than in the conventional discectomy group (40.4±9.7), with a mean difference of 4.2 (95% CI: 1.02–7.38) *Table VI*.

Table VI
Mean improvement in pain and disability scores among the study population.

Outcome Measure	Microdiscectomy (n = 60) Mean Δ	Conventional Discectomy (n = 60) Mean Δ	Mean Difference	95% CI	p-value
VAS Leg Pain Score	6.5 ± 1.1	5.7 ± 1.3	0.8	0.34 – 1.26	0.001
VAS Back Pain Score	4.9 ± 1.2	4.2 ± 1.4	0.7	0.19 – 1.21	0.008
Oswestry Disability Index (%)	44.6 ± 10.1	40.4 ± 9.7	4.2	1.02 – 7.38	0.01

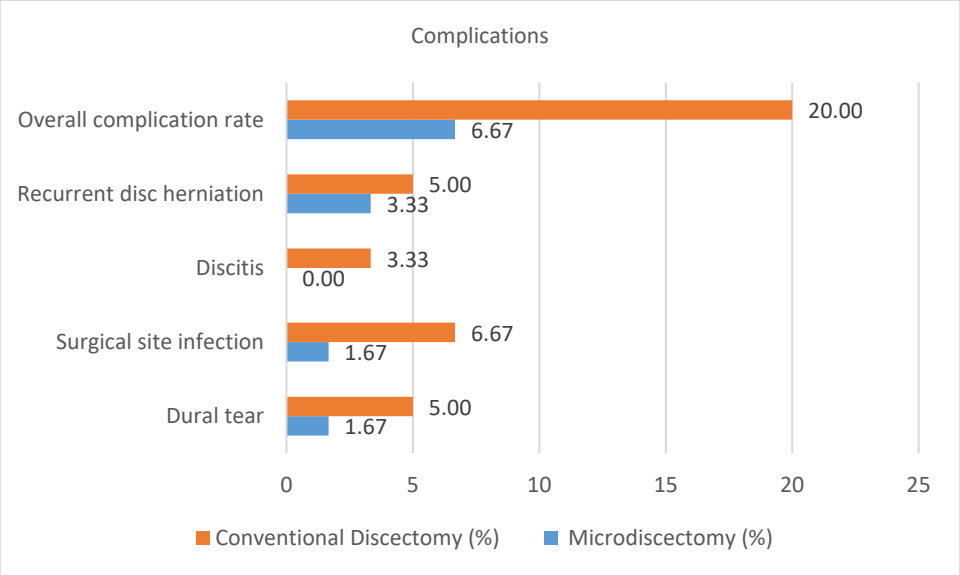

Figure 1 Distribution of postoperative complications among the study population.

Figure 1 shows fewer postoperative complications in the microdiscectomy group (6.67%) compared with the conventional discectomy group (20.00%).

DISCUSSION

Single-level lumbar disc herniation remains a common cause of lower back pain, and various surgical techniques, including microdiscectomy and conventional discectomy, have been developed to optimize patient outcomes [12]. This prospective comparative study evaluated the outcomes of microdiscectomy versus conventional discectomy in patients with single-level lumbar disc herniation. Our findings demonstrate that microdiscectomy offers significant perioperative advantages, improved early functional recovery, and lower complication rates compared to conventional discectomy, while maintaining comparable long-term clinical outcomes. Baseline demographic and clinical characteristics were similar between the two groups, with no statistically significant differences in age, gender, BMI, duration of symptoms, disc level, or preoperative neurological deficits ($p > 0.05$). This homogeneity reduces selection bias and strengthens the validity of intergroup comparisons, consistent with previous studies reporting similar baseline comparability in minimally invasive versus open lumbar discectomy cohorts [13]. Microdiscectomy demonstrated significant intraoperative advantages, including reduced operative time (72.4±15.6 vs. 84.3±17.1 min, p=0.001), lower blood loss (58.6±22.4 vs. 112.8±34.6 ml, $p < 0.001$), and smaller incision length (2.5±0.6 vs. 5.1±0.9 cm, $p < 0.001$). These findings align with earlier studies emphasizing the minimally invasive nature of microdiscectomy, which preserves paraspinal musculature and soft tissue, thereby reducing surgical trauma [14,15]. Although intraoperative complication rates were lower in the microdiscectomy group (3.33% vs. 8.33%), this difference did not reach statistical significance, likely due to the sample size. However, the overall postoperative complication profile favored microdiscectomy, with significantly lower rates of dural tear, surgical site infection,

discitis, and recurrent herniation, culminating in an overall complication rate of 6.67% versus 20% in conventional discectomy. This is consistent with meta-analyses reporting lower morbidity and wound-related complications in minimally invasive lumbar discectomy [13]. Postoperative recovery was markedly faster in the microdiscectomy group. Time to mobilization (12.6±5.4 vs. 20.7±6.8 hours, p<0.001), hospital stay (2.1±0.9 vs. 4.3±1.4 days, p<0.001), and return to work (4.8±1.9 vs. 7.3±2.6 weeks, p<0.001) were all significantly shorter compared to conventional discectomy. These observations underscore the benefits of minimally invasive approaches in promoting early functional recovery and reducing hospitalization, echoing findings from Elkatatny et al. [16]. At six months, functional outcomes assessed using the Modified Macnab criteria were comparable between groups, with successful outcomes (excellent + good) achieved in 86.7% of microdiscectomy patients and 76.7% of conventional discectomy patients (p = 0.15). This reinforces the concept that minimally invasive and conventional discectomy yield similar long-term efficacy in symptomatic relief and functional restoration [17,18]. Both techniques resulted in substantial improvement in pain and disability, as measured by VAS and Oswestry Disability Index scores. Microdiscectomy achieved a slightly greater reduction in leg pain (mean Δ 6.5 vs. 5.7, p=0.001), back pain (mean Δ 4.9 vs. 4.2, p=0.008), and ODI (mean Δ 44.6% vs. 40.4%, p=0.01). While the differences are statistically significant, the clinical relevance of these modest improvements should be interpreted cautiously. Similar trends were reported in previous randomized and observational studies comparing minimally invasive to open lumbar discectomy [19]. Postoperative complications were overall lower in the microdiscectomy group compared to conventional discectomy. Dural tears occurred in 1.67% versus 5%, surgical site infections in 1.67% versus 6.67%, discitis in 0% versus 3.33%, and recurrent disc herniation in 3.33% versus 5% of patients, resulting in an overall complication rate of 6.67% for microdiscectomy and 20% for conventional discectomy. This trend highlights the reduced tissue trauma and infection risk associated with minimally invasive approaches. These findings are consistent with previous reports indicating that microdiscectomy reduces iatrogenic injury and wound-related complications [20-23]. The lower complication rate may also contribute to the observed faster postoperative recovery, shorter hospital stays, and earlier return to work in the microdiscectomy group.

LIMITATIONS

The study is limited by its single-center design and relatively short follow-up of six months, which may not capture long-term recurrence or complications. The sample size, although adequate for statistical comparison, may not fully represent the broader population. Additionally, surgeon experience and technique variability could influence outcomes, particularly for microdiscectomy. Cost-effectiveness and patient-reported quality-of-life measures were not assessed. Multicenter studies with longer follow-up and standardized surgical protocols are required to validate these findings and establish broader generalizability.

CONCLUSION

This prospective comparative study demonstrates that microdiscectomy offers significant advantages over conventional discectomy for single-level lumbar disc herniation. Patients undergoing microdiscectomy experienced shorter operative times, reduced intraoperative blood loss, smaller incisions, and faster postoperative recovery, including earlier mobilization and return to work. Pain relief and functional improvement, as measured by VAS and ODI scores, were significantly greater in the microdiscectomy group, with a trend toward higher overall successful outcomes based on the Modified Macnab criteria. Although both techniques effectively relieve radicular symptoms, microdiscectomy provides superior perioperative safety and rehabilitation benefits, making it the preferred surgical approach for appropriately selected patients, particularly in centers equipped with microscopic facilities and trained surgical teams.

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CONFLICT OF INTEREST

None declared

ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee.

REFERENCES

1. Khan Z, Sharafat S, Ali H. Comparative analysis of success rates and complications between lumbar microdiscectomy and open discectomy for lumbar disc herniation. Pakistan Journal of Medical Sciences. 2025 Apr;41(4):992.
2. Andersson GB. Epidemiological features of chronic low-back pain. The lancet. 1999 Aug 14;354(9178):581-5.
3. Dutta S, Kundu S, Al Mamun A, Musa M, Rahman MS. Clinical Profile and Outcomes of Patients with Lumbar Disc Prolapse Undergoing Conservative versus Surgical Management in a Tertiary Hospital of Bangladesh. TAJ: Journal of Teachers Association. 2024 Jun 30;37(1):300-5.
4. Mohammad N, Rahman MA, Arefin S, Al Mahbub A, Raihan MF, Hasan MM, Hossain M, Hossain AM. Prevalence of Transitional Vertebra in Lumbar Disc Herniation in Bangabandhu Sheikh Mujib Medical University. Bangladesh Journal of Neurosurgery. 2022;12(2):76-85.
5. Gibson JA, Waddell G. Surgical interventions for lumbar disc prolapse. Cochrane database of systematic reviews. 2007(1).
6. Fan F, Xu Q, Yan F, Xie Y, Deng Z, Hu C, Zhu X, Cai L. Comparison of 7 surgical interventions for lumbar disc herniation: a network meta-analysis. Pain physician. 2017;20(6):E863.
7. Nicolas RO, Vassal M, Dhenin A, Lonjon G. Conventional microdiscectomy versus unilateral biportal endoscopy for lumbar disc herniation during the learning curve: Propensity-score matched analysis of clinical results. Brain and Spine. 2025 Nov 19:105872.
8. Arts MP, Brand R, Van Den Akker ME, Koes BW, Bartels RH, Peul WC, Leiden-The Hague Spine Intervention Prognostic Study Group (SIPS. Tubular diskectomy vs conventional microdiskectomy for sciatica: a randomized controlled trial. Jama. 2009 Jul 8;302(2):149-58.
9. Parker SL, Mendenhall SK, Godil SS, Sivasubramanian P, Cahill K, Ziewacz J, McGirt MJ. Incidence of low back pain after lumbar discectomy for herniated disc and its effect on patient-reported outcomes. Clinical Orthopaedics and Related Research®. 2015 Jun;473(6):1988-99.
10. Jacobs WC, van Tulder M, Arts M, Rubinstein SM, van Middelkoop M, Ostelo R, Verhagen A, Koes B, Peul WC. Surgery versus conservative management of sciatica due to a lumbar herniated disc: a systematic review. European Spine Journal. 2011 Apr;20(4):513-22.
11. Xiaoqian Jiang MM, Wenlai Guo MD, Di You MD. A comparison of minimally invasive surgical techniques and standard open discectomy for lumbar disc herniation: a network meta-analysis. Pain Physician. 2024 Mar;27:E305-16.
12. Zhang T, Guo N, Wang K, Gao G, Li Y, Gao F, Yang W, Wang Y, Wang Y. Comparison of outcomes between tubular microdiscectomy and conventional microdiscectomy for lumbar disc herniation: a systematic review and meta-analysis of randomized controlled trials. Journal of Orthopaedic Surgery and Research. 2023 Jul 3;18(1):479.
13. Khan Z, Sharafat S, Ali H. Comparative analysis of success rates and complications between lumbar microdiscectomy and open discectomy for lumbar disc herniation. Pakistan Journal of Medical Sciences. 2025 Apr;41(4):992.
14. Porchet F, Bartanusz V, Kleinstueck FS, Lattig F, Jeszenszky D, Grob D, Mannion AF. Microdiscectomy compared with standard discectomy: an old problem revisited with new outcome measures within the framework of a spine surgical registry. European spine journal. 2009 Aug;18(Suppl 3):360-6.
15. Yadav RI, Long L, Yanming C. Comparison of the effectiveness and

outcome of microendoscopic and open discectomy in patients suffering from lumbar disc herniation. Medicine. 2019 Dec 1;98(50):e16627.
16. Elkatatny AA, Hamdy TM, Moenes KM. Comparison between results of microdiscectomy and open discectomy in management of high-level lumbar disc prolapse. Open Access Macedonian Journal of Medical Sciences. 2019 Aug 30;7(17):2851.
17. Findlay GF, Hall BI, Musa BS, Oliveira MD, Fear SC. A 10-year follow-up of the outcome of lumbar microdiscectomy. Spine. 1998 May 15;23(10):1168-71.
18. Majeed SA, Vikraman CS, Mathew V, S AT. Comparison of outcomes between conventional lumbar fenestration discectomy and minimally invasive lumbar discectomy: an observational study with a minimum 2-year follow-up. Journal of orthopaedic surgery and Research. 2013 Sep 24;8(1):34.
19. Yang CC, Chen CM, Lin MH, Huang WC, Lee MH, Kim JS, Chen KT. Complications of full-endoscopic lumbar discectomy versus open lumbar microdiscectomy: a systematic review and meta-analysis. World Neurosurgery. 2022 Dec 1;168:333-48.
20. Koebbe CJ, Maroon JC, Abla A, El-Kadi H, Bost J. Lumbar microdiscectomy: a historical perspective and current technical considerations. Neurosurgical focus. 2002 Aug 1;13(2):1-6.
21. Desai A, Ball PA, Bekelis K, Lurie JD, Mirza SK, Tosteson TD, Weinstein JN. Outcomes after incidental durotomy during first-time lumbar discectomy. Journal of Neurosurgery: Spine. 2011 May 1;14(5):647-53.
22. Vangen-Lønne V, Madsbu MA, Salvesen Ø, Nygaard ØP, Solberg TK, Gulati S. Microdiscectomy for lumbar disc herniation: a single-center observational study. World neurosurgery. 2020 May 1;137:e577-83.
23. Kogias E, Klingler JH, Jimenez PF, Vasilikos I, Sircar R, Scholz C, Hubbe U. Incidental durotomy in open versus tubular revision microdiscectomy: a retrospective controlled study on incidence, management, and outcome. Clinical spine surgery. 2017 Dec 1;30(10):E1333-7.