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Surgical Outcomes of Lumbar Discectomy for Prolapsed Intervertebral Disc

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Abstract

Introduction: Lumbar disc herniation causes disability globally. Lumbar discectomy is the standard surgical treatment for symptomatic prolapsed intervertebral disc (PIVD) unresponsive to conservative care. Outcome data from resource-limited settings like Bangladesh are limited.

Objective: To evaluate the surgical outcomes of lumbar discectomy in patients with PIVD, focusing on pain relief, functional improvement, patient satisfaction, recurrence, and complications.

Methods: This retrospective study at Ibn Sina Medical College Hospital in Dhaka (Oct 2024–Apr 2026) included 70 patients undergoing lumbar discectomy for MRI-confirmed PIVD. Pain was measured with VAS, disability with ODI pre- and post-operation. Satisfaction was assessed via the MacNab criteria. Paired t-test analyzed data ($p<0.05$).

Results: The mean age was 43.2 ± 13.5 years with male predominance (58.6%). Most herniations were at L4–L5 (40.0%) and L5–S1 (34.3%). Mean surgery lasted 72.4 minutes with 62.8 mL blood loss and a 2.9-day hospital stay. No complications occurred. VAS score dropped from 8.7 ± 0.5 to 3.7 ± 0.7 (57% reduction, $p<0.001$), and ODI improved from 61.2 ± 8.6% to 18.5 ± 6.4% (70% improvement, $p<0.001$). Excellent or good outcomes were in 88.6% per MacNab criteria. Recurrence happened in 18.6%, but only 1.4% needed reoperation.

Conclusions: Lumbar discectomy is a safe and highly effective surgical treatment for PIVD, providing significant pain relief and functional improvement with high patient satisfaction, a low reoperation rate, and no perioperative complications.

Keywords: Lumbar discectomy; Prolapsed intervertebral disc; VAS; ODI; MacNab criteria; Bangladesh

Introduction

Low back pain is one of the leading causes of disability worldwide and imposes a substantial socioeconomic burden on individuals and healthcare systems. Lumbar disc herniation (LDH), commonly known as prolapsed intervertebral disc (PIVD), is among the most frequent causes of low back pain and lumbosacral radiculopathy, affecting approximately 1–3% of the adult population annually [1,2]. The condition occurs when the nucleus pulposus protrudes through a defect in the annulus fibrosus, resulting in compression and inflammatory irritation of adjacent nerve roots. Patients commonly present with low back pain, sciatica, sensory disturbances, motor weakness, and varying degrees of functional disability [2,3].

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Lumbar disc herniation most frequently affects individuals between 30 and 50 years of age and is associated with several risk factors, including heavy physical work, smoking, obesity, sedentary lifestyle, and genetic predisposition [1,4]. The L4–L5 and L5–S1 levels are the most commonly affected segments due to the greater biomechanical stress they experience [5]. Although spontaneous resolution of symptoms may occur in some patients, persistent nerve root compression can significantly impair quality of life and daily functioning [3,6].

The initial management of lumbar disc herniation is generally conservative and includes analgesics, non-steroidal anti-inflammatory drugs, physiotherapy, exercise programs, activity modification, and epidural steroid injections [6,7]. Most patients experience symptomatic improvement within several weeks of non-operative treatment. However, surgery is indicated in patients with persistent disabling radicular pain, progressive neurological deficits, cauda equina syndrome, or failure of adequate conservative treatment [3,7,8].

Lumbar discectomy remains the standard surgical procedure for symptomatic lumbar disc herniation refractory to conservative management. Since the introduction of microscopic techniques, lumbar discectomy has evolved significantly, with modern approaches including open discectomy, microdiscectomy, tubular microdiscectomy, microendoscopic discectomy, and percutaneous endoscopic lumbar discectomy [9,10]. These techniques aim to achieve adequate neural decompression while minimizing tissue damage, blood loss, postoperative pain, and length of hospital stay [10,11].

Numerous studies have demonstrated favorable outcomes following lumbar discectomy. Significant reductions in pain scores and disability indices have been consistently reported, with success rates ranging from 75% to 95% depending on patient selection, surgical technique, and duration of follow-up [9,12]. Rajamani et al. [13] reported substantial improvements in postoperative pain and functional outcomes among 946 patients undergoing various lumbar discectomy procedures, with minimally invasive techniques associated with shorter hospitalization and lower perioperative morbidity [13]. Similarly, recent systematic reviews have shown that minimally invasive discectomy techniques provide clinical outcomes comparable to conventional surgery while offering advantages in postoperative recovery [10,14].

Despite the high success rate of lumbar discectomy, complications such as dural tears, surgical site infection, recurrent disc herniation, persistent low back pain, epidural fibrosis, and the need for revision surgery continue to be reported [11,15]. Recurrence rates following lumbar discectomy range from 3% to 15%, and several patient-related and surgical factors have been implicated in unfavorable outcomes [15]. Therefore, continuous evaluation of surgical outcomes remains essential for improving patient selection, optimizing perioperative management, and enhancing long-term results.

In developing countries like Bangladesh, lumbar disc herniation is a growing health issue due to urbanization, changing jobs, and longer life expectancy. While lumbar discectomy is common in hospitals, local data on outcomes is limited. Retrospective analysis can reveal the procedure's effectiveness, safety, and complications. This study assesses lumbar discectomy outcomes in patients with prolapsed discs, focusing on pain relief, function, satisfaction, recurrence, and complications.

Objective

General Objective

1. To evaluate the surgical outcomes of lumbar discectomy in patients with prolapsed intervertebral disc (PIVD). Specific Objectives
2. To assess the effectiveness of lumbar discectomy in reducing pain by comparing preoperative and postoperative Visual Analog Scale (VAS) scores.
3. To evaluate functional improvement following lumbar discectomy by comparing preoperative and postoperative Oswestry Disability Index (ODI) scores.
4. To determine postoperative clinical outcomes, including patient satisfaction, recurrence, and surgery-related complications following lumbar discectomy.

Materials and Methodology

This retrospective observational study was conducted in the Department of Orthopaedic Surgery at Ibn Sina Medical College Hospital, Dhaka, Bangladesh, over a period extending from October 2024 to April 2026. The study was designed to evaluate the surgical outcomes of lumbar discectomy in patients diagnosed with prolapsed intervertebral disc (PIVD). Medical records of patients who underwent lumbar discectomy during the study period were reviewed retrospectively. A total of 70 patients were included in the study using purposive sampling based on the availability and completeness of hospital records. Ethical approval was obtained from Ibn Sina Medical College Hospital's IRB before data collection. Patient confidentiality and anonymity were maintained by removing personal identifiers. The study adhered to the Declaration of Helsinki and institutional guidelines for biomedical research involving humans. Patients with symptomatic lumbar disc herniation confirmed by clinical evaluation and magnetic resonance imaging (MRI), who underwent lumbar discectomy and had adequate follow-up data, were included in the study. Patients with previous lumbar spine surgery, spinal trauma, spinal tumors, infections,

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congenital spinal deformities, or incomplete medical records were excluded from the study. Data were collected from hospital records, operative notes, outpatient follow-up records, radiological reports, and discharge summaries using a predesigned data collection sheet. The collected variables included demographic characteristics such as age, sex, body mass index (BMI), duration of symptoms, and associated comorbidities. Clinical variables included the level of disc herniation, presenting symptoms, preoperative neurological status, and radiological findings. Surgical variables such as operative time, intraoperative blood loss, and duration of hospital stay were also recorded. The main outcome measures included pain relief, functional gains, patient satisfaction, recurrence rates, and postoperative complications. Pain levels were measured with the Visual Analog Scale (VAS) ranging from 0 to 10, with 0 representing no pain and 10 indicating the worst pain possible. Functional disability was assessed using the Oswestry Disability Index (ODI) from 0 to 100, where higher scores reflect greater disability. Both VAS and ODI scores were recorded preoperatively and at the latest postoperative follow-up. Patient satisfaction and overall surgical outcomes were assessed using the Modified MacNab Criteria, which categorize outcomes as excellent, good, fair, or poor. Secondary outcome measures included symptom recurrence, need for reoperation, time to return to daily activities, and time to return to work. All patients underwent lumbar discectomy according to standard surgical protocols practiced in the department. The surgical approach and perioperative management were determined by the operating surgeon based on individual patient characteristics and clinical indications. Postoperative care included pain management, early mobilization, physiotherapy, and scheduled follow-up assessments. Follow-up information was obtained from outpatient records and documented postoperative evaluations. Data were entered, checked, and analyzed using the Statistical Package for Social Sciences (SPSS) software version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize demographic, clinical, and surgical variables. Continuous variables were expressed as mean ± standard deviation (SD), whereas categorical variables were presented as frequencies and percentages. Comparisons between preoperative and postoperative VAS and ODI scores were performed using the paired Student's t-test. A p-value of less than 0.05 was considered statistically significant.

Result

Table 1 summarizes the demographic characteristics of the study patients. The mean age was 43.2 ± 13.5 years (range: 17–70 years), with the largest age group being 40–49 years (34.3%), followed by 30–39 years (22.9%). The mean BMI was 29.8 ± 4.2 kg/m² (range: 19–36 kg/m²). Half of the patients (50.0%) were overweight, while 42.9% were obese. Most patients were non-smokers (71.4%), whereas 11.4% were current smokers and 17.1% were former smokers.

Table 1: Demographic characteristics of the study patients (N=70).

Characteristic	Category	N	(%)
Age group (years)	<30	12	17.1
	30–39	16	22.9
	40–49	24	34.3
	50–59	10	14.3
	≥60	8	11.4
	mean ± SD (range)	43.2 ± 13.5 (17–70)	
BMI (kg/m²)	Normal (18.5–24.9)	5	7.1
	Overweight (25–29.9)	35	50
	Obese (≥30)	30	42.9
	mean ± SD (range)	29.8 ± 4.2 (19–36)	
Smoking status	Non-smoker	50	71.4
	Smoker	8	11.4
	Former smoker	12	17.1

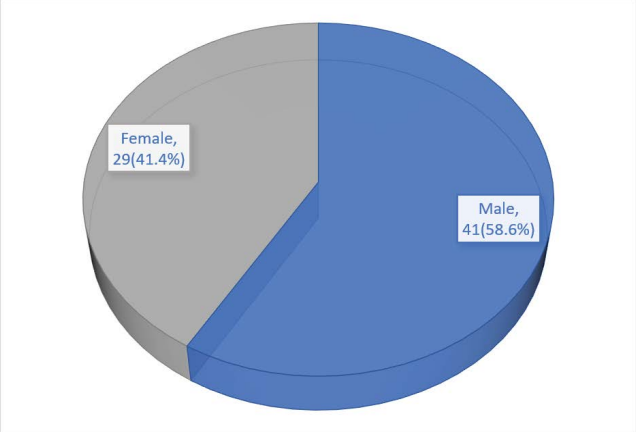

Figure 1: Gender distribution of the study patients (N=70).

Figure 1 shows the gender distribution in that the sample comprised 41 males (58.6%) and 29 females (41.4%), with a male-to-female ratio of 1.41:1.

Table 2: Status of comorbidities among study patients (N=70).

Comorbidity	n (%)
Hypertension	18 (25.7%)
Diabetes	16 (22.9%)
Cardiovascular disease	14 (20.0%)
Others	22 (31.4%)
No comorbidity	20 (28.6%)

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Table 2 presents the status of comorbidities among patients. Hypertension was the most common comorbidity, affecting 25.7% of patients, followed by diabetes mellitus (22.9%) and cardiovascular disease (20.0%). Other comorbid conditions were reported in 31.4% of patients. Notably, 28.6% of patients had no documented comorbidity.

Table 3: Radiological findings on preoperative MRI (N=70).

Variable		n (%)
Level of herniation	L4-L5	28 (40.0%)
	L5-S1	24 (34.3%)
	L3-L4	8 (11.4%)
	Multiple levels	6 (8.6%)
	Other	4 (5.7%)
Type of disc herniation	Contained	17 (24.3%)
	Non-contained	42 (60.0%)
	Sequestered	11 (15.7%)
Nerve root compression present		68 (97.1%)
Modic changes present		18 (25.7%)

Table 3 describes the preoperative MRI findings. The most frequently affected level was L4–L5 (40.0%), followed by L5–S1 (34.3%). Multiple-level involvement was observed in 8.6% of patients. Non-contained disc herniation was the predominant type (60.0%), while contained and sequestered herniations accounted for 24.3% and 15.7%, respectively. Nerve root compression was identified in 97.1% of patients, and Modic changes were present in 25.7%.

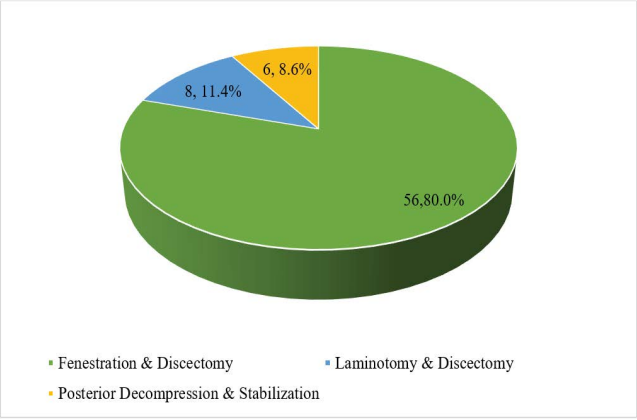

Figure 2: Surgical approach of the study patients (N=70).

Figure 2 shows the Surgical approach of the study patients. Fenestration and discectomy were used in 56 patients (8.0%); laminotomy & discectomy were used in 8 patients (28.89%); and posterior decompression and stabilization were used in 6 patients (8.6%).

Table 4 summarizes the intraoperative and perioperative parameters. The mean operating time was 72.4 ± 36.2 minutes (range: 25–180 minutes), while the mean intraoperative blood loss was 62.8 ± 71.5 mL (range: 0–350 mL). No intraoperative complications were reported. The mean hospital stay was 2.9 ± 1.0 days (range: 1–5 days), and the mean follow-up duration was 16.9 ± 2.2 months.

Table 4: Intraoperative and perioperative parameters of the study patients (N=70).

Parameter	Value
Operating time (minutes), mean ± SD (range)	72.4 ± 36.2 (25–180)
Intraoperative blood loss (ml), mean ± SD (range)	62.8 ± 71.5 (0–350)
Intraoperative complications, n (%)	0 (0%)
Length of hospital stay (days), mean ± SD (range)	2.9 ± 1.0 (1–5)
Follow-up duration (Months), mean ± SD (range)	16.9 ± 2.2

Table 5 compares preoperative and postoperative clinical outcomes. Significant improvements were observed following surgery. The mean Visual Analog Scale (VAS) pain score decreased from 8.7 ± 0.5 preoperatively to 3.7 ± 0.7 postoperatively ($p < 0.001$). Similarly, the mean Oswestry Disability Index (ODI) score improved significantly from 61.2 ± 8.6% to 18.5 ± 6.4% ($p < 0.001$).

Table 5: Preoperative and postoperative outcomes of the study patients (N=70).

Outcome Measure	Preoperative	Postoperative	P-value
VAS pain score, mean ± SD	8.7 ± 0.5	3.7 ± 0.7	<0.001
ODI score (%), mean ± SD	61.2 ± 8.6	18.5 ± 6.4	<0.001

Table 6 outlines the postoperative recovery timeline. Patients returned to their daily activities after a mean duration of 4.8 ± 1.5 weeks (range: 1.5–10 weeks). The mean time required to return to work was 17.4 ± 2.0 weeks (range: 3–20 weeks).

Table 6: Postoperative recovery timeline of the study patients (N=70).

Parameter	Mean ± SD (range)
Time to return to daily activities (weeks)	4.8 ± 1.5 (1.5–10)
Time to return to work (weeks)	17.4 ± 2.0 (3–20)

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Table 7 presents adverse events and long-term outcomes. No immediate postoperative complications were observed. Recurrence of symptoms occurred in 18.6% of patients, whereas 81.4% remained symptom-free during follow-up. Only one patient (1.4%) required reoperation, while the remaining 98.6% did not require further surgical intervention.

Table 7: Adverse events and long-term outcomes (N=70).

Outcome	n (%)
Immediate postoperative complications	0 (0%)
Recurrence of symptoms	13(18.6%)
No recurrence	57 (81.4%)
Reoperation required	1 (1.4%)
No reoperation	68(98.6%)

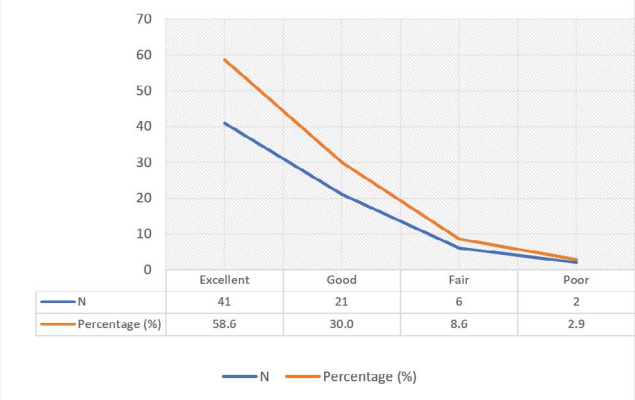

Figure 3: Patient Satisfaction based on MacNab Criteria (N=70).

Figure 3 shows patient satisfaction according to the MacNab criteria. The majority of patients reported excellent (41,58.6%) or good outcomes (21, 30.0%), indicating a high level of satisfaction with the surgical treatment and its functional results.

Discussion

This study assessed surgical outcomes of lumbar discectomy in 70 patients with PIVD at a Bangladesh hospital. The key results showed the procedure was highly effective, reducing pain (VAS: 8.7 to 3.7, $p<0.001$) and disability (ODI: 61.2% to 18.5%, $p<0.001$), with a low the reoperation rate (1.4%) and high satisfaction (88.6% good and excellent outcomes by MacNab). These findings align with literature supporting lumbar discectomy as the standard surgical treatment for a herniated disc unresponsive to conservative care [16,17].

The mean age of patients was 43.2 ± 13.5 years, with most (57.2%) in the 30–49 age range, aligning with lumbar disc herniation typically affecting 30-50-year-olds during peak biomechanical stress [16,18]. Male predominance (58.6%, ratio 1.41:1) matches other large series; Ahsan et al. [19] reported similar figures in 2380 patients [19]. Regarding BMI, 92.9% were overweight or obese, with a mean of 29.8 ± 4.2 kg/m², highlighting obesity as a key risk factor for herniation and poorer outcomes [20,21]. This reflects broader public health trends in developing countries. Hypertension (25.7%) and diabetes (22.9%) were common; diabetes, linked to poorer neurological recovery and persistent radicular pain due to neuropathy, is notable [20]. Despite many comorbidities, our surgical results were excellent, indicating that lumbar discectomy is safe and effective with proper perioperative care.

Preoperative MRI showed L4–L5 (40.0%) and L5–S1 (34.3%) as the most common herniation levels, reflecting that these lower lumbar segments bear the greatest load and stress [16,22]. Non-contained herniations (60.0%) were most frequent, followed by contained (24.3%) and sequestered (15.7%) fragments. Nerve root compression occurred in 97.1%, correlating with high preoperative VAS and ODI scores indicating clinical disability. Modic changes, linked to endplate degeneration and inflammation, were seen in 25.7% and associated with back pain and potentially affecting outcomes, though their prognostic significance is debated [23].

The surgical approaches included fenestration and discectomy (80.0%), laminotomy with discectomy (11.4%), and posterior decompression with stabilization (8.6%). The mean operating time was 72.4 ± 36.2 minutes, and blood loss was 62.8 ± 71.5 mL, comparable to published data. Ahsan et al. [19] reported mean times of 55 and 95 minutes and blood loss of 50 and 100 mL for limited and aggressive discectomy [19]. The slightly longer operative time may reflect more complex cases and the learning curve in a resource-limited setting. No intraoperative complications were recorded, which is commendable but should be cautiously interpreted due to the study's retrospective nature and small sample size. Published complication rates range from 1% to 10%, with dural tear (1–7%), wound infection (1–5%), and nerve injury (0.5–3%) [17,19]. The absence of complications may indicate careful patient selection, meticulous technique, or underreporting. The mean hospital stay was 2.9 ± 1.0 days, aligning with trends toward early discharge after lumbar discectomy. A systematic review found no significant difference in hospital stay between limited and aggressive discectomy approaches [21].

This study shows significant improvements in pain and disability. The mean VAS score dropped from 8.7 to 3.7 (57% reduction), and ODI improved from 61.2% to 18.5% (70% improvement). These outcomes are comparable to or better than those reported in previous studies, such as Ahsan et al. [19] and Haque et al. [24], with our study showing a 5-point

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VAS reduction and an 8.7% ODI reduction, both of which are clinically meaningful [19,24]. The preoperative VAS was higher, possibly due to patient differences or reporting factors.

Patients resumed daily activities after about 4.8 weeks and work after 17.4 weeks. The long return-to-work period (~4 months) may be due to physical job demands in Bangladesh (e.g., heavy lifting, standing) or caution from patients and employers. In high-income countries, return to work usually occurs within 4–12 weeks after lumbar discectomy [25].

Symptom recurrence occurred in 18.6% of patients over about 17 months, with only 1.4% needing reoperation. This recurrence rate is within the 7-24% range reported after primary lumbar discectomy [20,21]. A 2024 meta-analysis by Ambrosio et al. [21] found no significant reherniation risk difference between discectomy and sequestrectomy (OR: 0.85, 95% CI: 0.57–1.26, p=0.42) [21]. Factors explaining the higher recurrence include obesity (42.9%), which is linked to increased intradiscal pressure and poor healing [20,21], and non-contained herniations (60%), which are linked to larger annular defects. Other risk factors are younger age, male gender, smoking, diabetes, and larger annular tears [20,21]. Despite the 18.6% recurrence, only 1.4% required reoperation, indicating most recurrences were asymptomatic or managed conservatively. The low reoperation rate aligns with data showing that not all radiographic recurrences cause symptoms needing surgery [26]. Conservative treatments like physiotherapy, analgesics, and epidural injections often suffice.

The MacNab criteria, a validated patient-reported outcome for spinal surgery, showed 88.6% of patients achieved excellent (58.6%) or good (30.0%) outcomes. This high satisfaction rate aligns with improvements in VAS and ODI scores, highlighting the success of lumbar discectomy. Our satisfaction rates match those in the literature. Ahsan et al. [19] reported higher satisfaction with limited discectomy than with aggressive discectomy ($p<0.05$), with 85% and 78.6% satisfactory outcomes [19]. Ambrosio et al. [21] found higher satisfaction with sequestrectomy than extensive discectomy (OR: 0.60, 95% CI: 0.40–0.90, p=0.01) [21].

Limitations of this Study

This retrospective, single-center study with a small sample size (N=70) may introduce selection bias and limit generalizability. The lack of a control group prevents direct comparison of effectiveness. Although the mean follow-up of 16.9 months allows for early outcomes, it is insufficient for long-term issues such as adjacent segment degeneration or late recurrences. Data from medical records may be incomplete or inaccurate, especially for complications and minor adverse events. Important outcomes such as patient-reported quality of life, psychological factors, or objective functional measures were not assessed. Variations in postoperative management and non-standardized rehabilitation could also affect recovery and results.

Conclusions

Lumbar discectomy is a safe, effective surgical option for prolapsed intervertebral disc patients unresponsive to conservative treatment. It significantly reduces pain (57% decrease in VAS score) and disability (70% reduction in ODI). Patient satisfaction is high, with 88.6% rated as excellent or good by the MacNab criteria. Symptom recurrence occurs in 18.6%, but reoperation is low at 1.4%. These results support lumbar discectomy as the standard treatment for symptomatic lumbar disc herniation, especially in resource-limited settings. Longer-term studies are needed to evaluate outcomes and recurrence factors.

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