Original Article

Functional & Neurological Outcome of Lumbar Discectomy at L4/5 and L5/S1

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Abstract

Background: Lumbar disc herniation (LDH) is the most common specific cause of low back pain (LBP). It is a degenerative process as well as acute trauma causing annular tear with extrusion of the nucleus pulposus through the posterior midline or posterolateral aspect of the disc, leading to compression of the thecal sac and nerve roots with radicular symptoms. Disc prolapse often affects the lumbar region, typically at L4/L5 or L5/S1. Individuals with occupation of prolonged standing (e. g. traffic police), prolonged sitting (desk job) weightlifters, and those with multiple jerking trauma (e. g. bikers, dancers) are at higher risk. Surgery is reserved for those who are not responding to nonsurgical management for at least 6 weeks. Surgical management of lumbar intervertebral disc prolapse (PLID) is crucial for alleviating pain and restoring function. In Bangladesh, evaluating surgical outcomes is essential. Aim of the study: To evaluate the functional & neurological outcome of lumbar discectomy at L4/5 and L5/S1. **Methods:** This prospective observational study was conducted in the different private hospitals in Satkhira, Bangladesh, from January 2020 to December 2023. A total of 112 patients with low back pain who diagnosed with PLID do not respond to conservative treatment or progressive neurological deficits were enrolled and analyzed in this study. Detailed demographic and clinical data were recorded, and patients voluntarily joined a clinical follow-up program, with assessments preoperatively, on day one post-surgery, after one week, at 12 weeks, and after 1 year. Functional improvement was assessed by the ODI score & categorized into excellent, good, fair & poor, neurological improvement was assessed by the Nurick score improvement of pain control by VAS score. **Results:** Pre-operative ODI score was 54.6±12.8 & post-operative score was improved to 10.2±3.3. The pre-operative & post-operative Nurick score was 2.9 & 0.8 respectively. There was significant improvement in pre-operative & post- operative VAS score for leg pain was 6.90 ± 1.9 & 2.0 ± 0.8 respectively & for low back pain was 5.8±1.2 & 2.2±0.8 respectively. **Conclusion:** The study found that PLID surgery at a district-level private hospital in Bangladesh resulted in significant pain reduction and excellent outcomes for most patients.

Keywords: Disc prolapse, surgical management, lumbosacral spine, and back pain.

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Introduction

The surgical management of prolapse of lumbar intervertebral discs (PLID) stands as a critical intervention in the realm of spinal healthcare, aiming to alleviate pain and restore functionality for individuals grappling with this debilitating condition. In Bangladesh, a country with a burgeoning healthcare landscape, evaluating surgical outcomes is paramount. The vertebral disc comprises an outer tough annulus fibrosis and an inner gel-like nucleus pulposus. Degenerative changes in the annulus fibrosis result in the protrusion of the inner nucleus pulposus. Disc degeneration can be attributed to both degenerative disc disease and ageing. This condition is commonly known as disc prolapse or a slipped disc [1]. In our community, disc prolapse holds significance, particularly for individuals engaged in stressful occupations, as they are more prone to spinal injuries that eventually lead to disc prolapse. Postero-lateral disc prolapse is predominant due to the presence of the posterior longitudinal ligament, although central disc herniation does occur [2]. Most disc prolapses (95%) manifest in the lumbar region at the L4/L5 or L5/S1 levels [3]. Professionals with prolonged sitting, smokers, weightlifters, individuals experiencing trauma, and drivers are all at an increased risk of disc prolapse. Age is a contributing factor to disc wear and tear, with degenerative diseases being considered a more significant cause than trauma, according to most authors [4]. Professional athletes are also susceptible to disc injuries [5, 6]. The initial presentation of disc prolapse often includes backache due to ligament pressure and sciatica due to nerve compression. Compression of other nerve roots can lead to muscle weakness, limb numbness, paraesthesia, and urinary retention, attributed to the compression of cauda equina nerves. The lifetime incidence of sciatica in the general population ranges from 13 to 40% [7]. During the examination, lower back tenderness and spasms of paravertebral muscles may be observed. A straight leg raising test might reveal limited movement on the affected side. Crossed sciatic tension, performed by raising the unaffected leg, may induce increased pain on the affected side, though this is not a common finding. The femoral stretch test, indicating L3/L4 nerve involvement, is another particular test. At the level of prolapse, paraesthesia, muscle weakness, and reduced reflexes may be noted. L5 nerve root impairment results in loss of sensation on the dorsal side of the foot and lateral side of the leg, along with weakness in significant toe extension. S1 nerve root impairment causes weakness in ankle jerk reflex, plantar flexion, foot eversion, and loss of sensation on the lateral and plantar aspects of the foot. Compression of cauda equina nerves can lead to loss of lower back sensation and urinary retention. The differential diagnosis for disc prolapses includes tuberculosis, spinal stenosis, vertebral abscess, ankylosing spondylitis, vertebral hematomas, vertebral tumors, nerve tumors, paravertebral muscle sprain, and mechanical pain. Given the substantial disease burden in our community, we conducted a study to determine outcomes for patients treated at our center for prolapsed intervertebral discs. The study aimed to explore the various demographic aspects of patients undergone PLID surgery, focusing on clinical presentation, complications, and surgical outcomes.

Methodology

This prospective observational study was conducted in a different private Hospital, Satkhira, Bangladesh, from January 2020 to December 2023. A total of 112 patients undergoing PLID surgery were enrolled and analyzed in this study. MRI was utilized to confirm the diagnosis, focusing on identifying disc prolapse at the specific level and side corresponding to the clinical symptoms and physical examina-

tion findings. Dynamic View X-ray of L/S Spine was done to see instability. In this study, a purposive sampling technique was employed to select participants. Detailed demographic and clinical information for each participant was meticulously recorded. The study population comprised individuals who voluntarily agreed to participate in a standardized clinical follow-up program, which included consultations and the collection of patient-based outcome measures. These assessments were conducted at various times, including preoperatively, day one post-surgery, after one week, after 12 weeks and after 1 year of follow-up. To ensure the integrity of the study, specific exclusion criteria were applied.

Inclusion criteria:

- Patients aged 18-60 with symptomatic low-back pain from lumbar intervertebral disc prolapse
- Patients who failed from conservative treatment
- Cauda equina Syndrome.
- Disc prolapsed at L4, 5; L5, S1 level

Exclusion criteria:

- Patients with prolapsed lumbar intervertebral disc (PLID) associated with other spinal pathologies such as spinal tumors, infections, and inflammation, those who had undergone repeat lumbar disc surgery due to symptom recurrence, and individuals with PLID caused by direct trauma resulting in vertebral fracture-dislocation, severe co-morbidity unfit for surgery, PLID other than L4, 5; L5, S1 level were excluded from the study.

Pain was assessed using VAS scores [8], and functional outcome by ODI and neurological assessment by Nurick score. The data analysis used MS Office tools to facilitate accurate and comprehensive research outcomes. All statistical analyses were performed using the statistical package for the social science (SPSS) program and Windows. Continuous parameters were expressed as mean±SD and categorical parameters as frequency and percentage.

Results

The study was conducted at different private hospitals of Satkhira district of Bangladesh and focused on evaluating surgical outcomes for the prolapse of lumbar intervertebral discs (PLID) among 112 participants. Among the participants, the majority were in the age group of 31-40 years, constituting 70 (46.05%) of the total sample. The second most represented age group was 21-30 years, comprising 54 (35.53%) participants. A smaller proportion of 23 (15.18%) participants were in the age groups of 41-50 years, and only 2.68% were aged 51-60 years (Table 1). Figure 1 illustrates the gender distribution, with males comprising the majority (61.61%) and females (38.39%). Eighty-eight patients experienced PLID on the left (58.04%) and 35.71% on the right. Bilateral involvement, where both sides were affected, was noted in a smaller proportion of cases (6.25%) (Figure 2). Before surgery, participants reported a mean VAS score of 7.4±1.2. Immediately postoperative on Day 1, the mean VAS score decreased to 6.8±1.1. At the 12-week follow-up, the mean VAS score significantly dropped to 2.8±0.4 (Table 3). Eighty-five (75.89%) patients were achieved an excellent outcome, 20(17.86%) reported a good outcome, 5(4.46%) experienced a fair outcome, and 2(1.76%) reported a poor outcome following surgery (table 6).

Table I. Age distribution of participants (n=112).

Age (year)	**Frequency** n (%)
21-30	40 (35.71)
31-40	52 (46.43)
41-50	17 (15.18)
51-60	3 (2.68)
Total	112 (100)

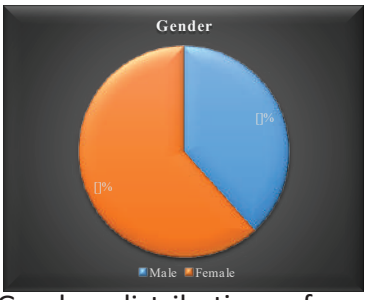


Fig. 1: Gender distribution of participants (n=112).

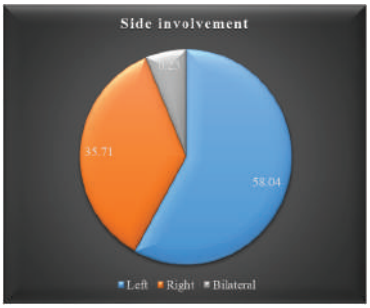


Fig. 2: Side involvement (N=112).

Table II. Levels of disc prolapse (n=112).

Levels of disc prolapse	Frequency n (%)
L4-L5	69 (61.61)
L5-S1	43 (38.39)

Table III. VAS score distribution to assess pain (n=112).

Period	VAS scores mean±SD
Preoperative	7.4±1.2
Day 1	6.8±1.1
After 1 week	3.9±0.7
After 12 weeks	2.8±0.4

Table IV. Pre-operative and post-operative comparison of pain after 12 months (n=30) (according to VAS score).

Pain	Preoperative VAS scores mean±SD	Final (f/up) VAS scores mean±SD	*p* value
Back Pain	6.90±1.8	1.8±0.7	<0.001[s]
Leg Pain	5.8±1.1	2.1±0.7	<0.001[s]

Table V. Pre-operative and post-operative Nurick & ODI score of the patients (n=112).

Score	Preoperative	Postoperative
Nurick	2.8	0.7
ODI (mean±SD)	54.5±12.7	10.1±3.2

Table VI. Distribution of outcomes among the study population (n=112).

Outcomes	Frequency n (%)
Excellent	85 (75.89)
Good	20 (17.86)
Fair	5 (4.46)
Poor	2 (1.79)

Discussion

The demographic characteristics observed in our study show a majority of male participants, accounting for 61%, with the remaining 39% being female. Moreover, the age distribution in our research spanned a wide range, from 17 to 63 years, with the highest proportion of cases, precisely 46%, falling within the 41-50 age group. This age group is particularly significant as it represents a stage in life when lumbar disc-related conditions are more prevalent, thereby emphasizing the relevance of our study's findings. Interestingly, these findings closely correspond with those reported in a study conducted by Audat, Ziad, as referenced in [9]. In their study, they treated a total of seventy-one patients, with a similar gender distribution of 60% male and 40% female, who had herniated intervertebral disc conditions in one or two levels of the lower lumbar spine. The age range of patients in their study also mirrors ours, ranging from 17 to 63 years, with a mean age of 36.48 and a standard deviation of 10.057 years. These parallels in demographic characteristics underline the consistency of these parameters across studies focusing on lumbar disc-related conditions. In our study, when examining the side involvement of prolapsed lumbar discs among the cases, it

was evident that most, specifically 58% of cases, were affected on the left side. In contrast, 35% of cases exhibited right-sided involvement, while 7% had bilateral involvement. These findings align closely with another study [10], which reported that most cases (57%) had involvement on the left side. Furthermore, when considering the level of disc prolapse among the participants in our study, most cases, accounting for 61.6%, had disc prolapse at the L4-L5 level. Additionally, 38.3% of cases had disc prolapse at the L5-S1 level. These results closely resemble those reported in another study [11], where 55.2% of patients had a disc prolapse at the L4-L5 level, 35.5% at the L5-S1 level. This study's mean VAS score was 6.9±1.8 before surgery, indicating a high pain level. However, the positive news is that on the first-day post-surgery, the mean VAS score decreased to 6.1±1.1; after one week, there was a further reduction in pain, with a mean VAS score of 3.4±0.7. At the 12-week mark, the mean VAS score dropped even further to 1.8±0.7, indicating a significant improvement in pain management and overall patient comfort. These findings were comparable with a previous study [12]. Several points are considered when assessing the results of lumbar disc surgery [13]. In our Study Nurick score reduced from preoperative 2.8 post operative 0.7 which is Similar to Anowarul Islam et al. where they show Nurick score reduced preoperative 2.9 to post operative 0.8 [13]. In our study, as per the ODI outcome criteria, 72% of our participants got excellent results, followed by 18% who got good results. In the previous study [14], most patients (75.9%) had excellent functional outcomes, 13.8% good, 6.9% fair, and 3.4% had poor functional outcomes per ODI.

Conclusion

The study found that PLID surgery at a district-level private hospital in Bangladesh resulted in significant pain reduction and excellent outcomes for most patients. Lumbar discectomy is a safe & effective method to treat the patients with lumbar disc prolapse with shorter hospital stay & better prognosis with minimum & considerable complications.

Limitations of the study: This study was limited by its single-center design and relatively small sample size, which may affect the generalizability of the findings to other populations and healthcare settings. Additionally, the follow-up period of 1 year may not capture long-term outcomes and complications post-surgery. The exclusion criteria, including patients with recurrent lumbar disc surgery and those with concurrent spinal pathologies, may result in a selection bias, potentially skewing the outcomes.

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