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ORIGINAL ARTICLE

Lumbar disc herniation: Outcomes of Unilateral Bi-Portal Endoscopic Technique: At a Tertiary Care Hospital, Pakistan.

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ABSTRACT… Objective: To measure the clinical outcome of unilateral bi-portal endoscopic technique for lumbar disc herniation. **Sudy Design:** Prospective Cohort study. **Setting:** Department of Orthopaedics & Spine Centre, Ghurki Trust Teaching Hospital, Lahore. **Period:** October 01, 2023, to December 30, 2024. **Methods:** The study included 60 patients between the age of 20-60 years diagnosed with lumbar disc herniation and lumbar canal stenosis. All the p-values ≤ 0.05 were considered to be statistically significant. **Results:** In our study, the majority, 39 (65.0%), were male patients with a mean age of 40.94±8.76 ranging from 29 to 60 years. The mean ODI score significantly decreased among patients. 83.3% of patients were very satisfied, indicating no pain, no restriction of mobility, and a return to regular work and level of activity; 10.0% of patients reported good levels. 3.3% of cases were found to be fair, and 3.3% of cases were found to have poor satisfaction levels. **Conclusion:** Our results showed that this technique is as safe and effective as other MIS techniques, and most of our patients showed significant improvement after surgery. However, a comparison of UBE and other MIS techniques must be assessed to demonstrate this technique's effectiveness.

Key words: Lumbar Disc Herniation, Oswestry Disability Index (ODI), Unilateral Bi-portal Endoscopy.

INTRODUCTION

LDH is a clinically symptomatic condition caused by a bulging disc material compressing the spinal nerve root. At some time in their lives, between 70 and 85 percent of people will have lower back pain, along with or without leg discomfort. LDH can be absorbed spontaneously, according to certain studies[1] Surgery is necessary, nevertheless, in cases when neurological deficits—including sensory or motor problems—combine with medical treatment-resistant symptoms. Open lumbar microdiscectomy (OLM) combined with partial laminotomy is the current standard for treating LDH. OLM, however, raises the likelihood of persistent back discomfort and postoperative spinal instability.[2] Similar to an open discectomy, this treatment is more invasive. OLM necessitates extensive fenestration to the annulus, manipulation of neural and vascular tissues, removal of bone, and spinal canal entry. For the treatment of LDH, minimally invasive spine surgery is becoming increasingly common. A minimally invasive spinal surgery (MLS) procedure called percutaneous endoscopic discectomy offers several benefits over open spinal manipulation (OLM), including a smaller incision, a shorter hospital stay (HS), and the preservation of bony and muscle tissue.[2-3] Conventional arthroscopic techniques for spinal illness have been treated using a novel endoscopic technique that applies a unilateral biportal endoscopic (UBE) approach.[4]

Comparing UBE against micro and tubular approaches, the two surgical methods yield less osseous and muscle tissue preservation. During a traditional lumbar laminectomy, the multifidus muscle is separated and retracted from the spinous process to the facet joint. Damage to the susceptible posterior dorsal rami might result from this exposure.

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Additionally, pressure-induced muscular atrophy and worse persistent lower back discomfort can lead to extended retraction times. However, UBE makes it possible to have shorter hospital stays and make smaller incisions. Similar to UBE, tubular surgery can lessen soft-tissue damage in comparison to open techniques; nevertheless, surgical approaches for spinal stenosis were evaluated in a randomized trial. Furthermore, the biportal method with an endoscope allows for extremely high magnification of the spinal diseases and cheaper capital costs, and two hands with unrestricted movement. Using UBE, a surgeon may visualize the neurological aspects while maintaining optimal ergonomic efficiency. In addition to reducing the danger of infection and assisting with bleeding, continuous irrigation via the endoscope.[5-10]

The study aimed to evaluate the efficacy and safety of the unilateral biportal endoscopic technique in treating lumbar disc herniation among patients admitted to tertiary care hospitals in Pakistan. Because of the imposing burden of lumbar disc herniation, the matter of interest is how minimally invasive surgical strategies can help to provide better patient outcomes. One of the possible benefits of unilateral biportal endoscopic surgery is that it has very little tissue trauma, the patients can recover faster in comparison with traditional open surgery, and it is less expensive than the tubular technique. This research aims to document the use of our technique in the Pakistan medical care setting and contribute to the international database for the knowledge of minimally invasive spine surgery. This will benefit both the clinical practice and surgical training programs, providing enhanced patient care for those with lumbar disc herniation in Pakistan and globally.

METHODS

This prospective study was performed at the Department of Orthopaedics & Spine Centre, Ghurki Trust Teaching Hospital, Lahore, after ethical approval (Ref. No 2025/02/R-11, Dated: 10-02-25) from the Hospital Ethical Committee from October 01, 2023, to December 30, 2024. The study included 60 patients between the ages of 20-60 years diagnosed with lumbar disc herniation and lumbar canal stenosis. Patients presented with revision of surgery were excluded from the study. Informed consent was taken from each patient. All demographic profiles, like age, gender, and residence, were noted. Surgery was performed under general anaesthesia and in a prone position on the spine table—0-degree knee arthroscope and bone burr used in the surgery.

Surgical Technique

After general anesthesia is induced, the patient is positioned prone on the radiolucent spine table. The lumbosacral region is cleansed and covered in accordance with procedure. Using the biplanar fluoroscope and Kirschner wires, we find and label the initial target point, the skin incisions, and the disc level of interest after proper alignment and draping (Figure-1). The two skin incisions are around 2 to 3 cm apart and follow the medial pedicle line, depending on the patient's body habitus. We do the translaminar approach from the ipsilateral side of the lesion. The cranial portal acts as the viewing gate for the endoscope and saline input when employing the left-side approach, whereas the caudal portal acts as the working gateway for the surgical tools and saline outflow. For cosmesis and better saline outflow, we choose transverse incisions for the skin and deep fascia beneath. Using a blunt dilator, we delicately penetrate the paraspinal muscles to separate them from the lamina.

Triangulating the scope and instrument tips at the target location is the first step in each UBE technique (Figure-2). For the translaminar procedure, we use an arthroscope that is 4 mm and 0 degrees. We clean the soft tissue on the lamina and coagulate the bleeders from soft tissues using the radiofrequency ablation probe. Fluid saline intake and outflow are necessary to maintain a clean surgical field. After verifying the starting location, we remove the inferior and superior margins of the lamina using a Kerrison punch and a diamond-shaped bone burr. Next, the ligament flavum is removed. A nerve retractor is used to find and retract the nerve root to the medial side, arthroscopic scissors are used to expose the disc space (Figure-3), and pituitary

forceps are used to remove the disc. (Figure-4) Closure proceeded as normal. (Figure-5)

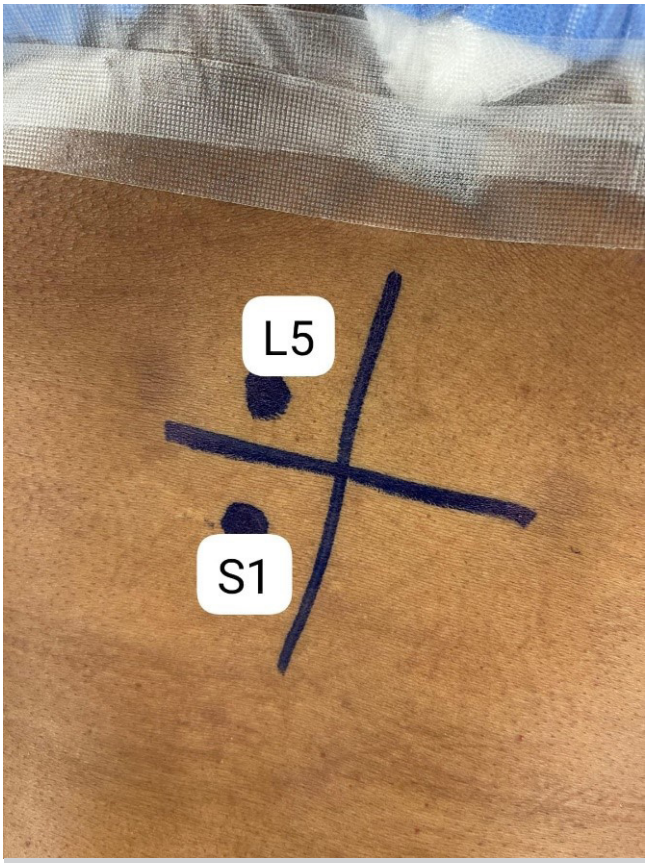

Figure-1. Preoperative marking of incisions

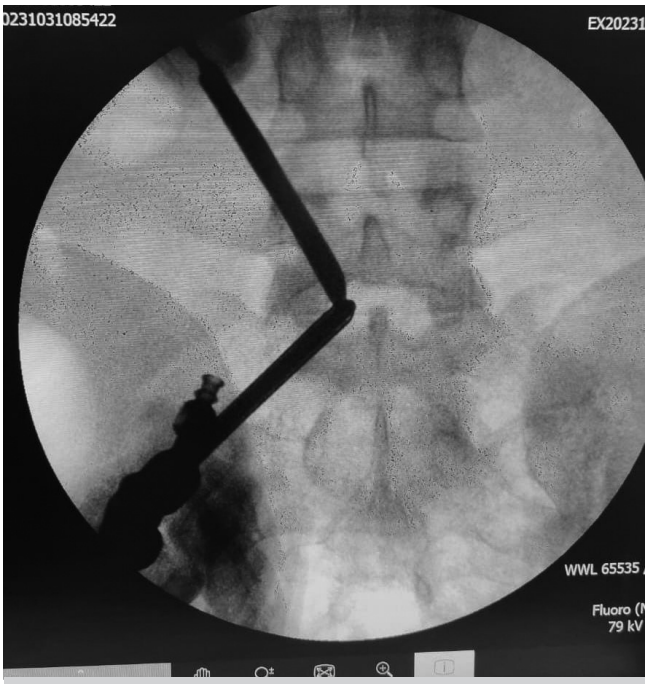

Figure-2. Triangulation of the scope & instrument

Figure-3. Arthroscopic SCISSOR

Figure-4

Figure-5

After surgery, patients were evaluated at 3 weeks. Evaluations of clinical data, such as the Oswestry disability index and visual analog scale for pain, were also considered. Modified McNab's criteria

were used to assess patient satisfaction. All the collected data were entered and analyzed using SPSS version 27 & R-studio version 4.2.1. Friedman's test was applied to measure significant differences between baseline and 6 weeks regarding ODI score, and a paired sample t-test was used to measure differences in pre- and post-op back and leg pain. All the p-values ≤ 0.05 were considered to be statistically significant.

RESULTS

In our study, the majority, 39 (65.0%), were male patients, while 21(35.0%) were female cases with a mean age of 42.03±9.73 ranging from 24 to 64 years. A slight majority of patients have right-sided disc herniation (53.3%) compared to left-sided (46.7%). Herniations at the L5-S1 level are more prevalent (63.3%) compared to the L4-L5 level (36.7%). The mean duration of symptoms is 8.47±7.30 months, ranging from 1 to 36 months. The average length of hospital stay is 1.41±0.76 days, ranging from 1 to 4 days (Table-I)

Parameters	N(%)	M(SD) Range
Gender		
Male	39(65.0.)	
Female	21(35.0)	
Age (years)		42.03(9.73) 24-64
Side		
Left	28(46.7)	
Right	32(53.3)	
Levels		
L4-L5	22(36.7)	
L5-S1	38(63.3)	
Duration of Symptoms (Months)		8.47(7.30) 1-36
Length of stay (days)		1.41(0.76) 1-4

Table-I. Summary of demographic and clinical characteristics of patients (N=60)

The Oswestry Disability Index (ODI) scores indicate a significant improvement in patient disability following surgery. Preoperative scores averaged 32.96, reflecting moderate disability. Postoperative scores showed a drastic reduction: 10.69 on the day of surgery, 8.31 on the first postoperative day, and further decreases to 3.35 at three weeks, 1.27 at six weeks, 0.58 at twelve weeks and 0.50. This progressive decline in ODI scores demonstrates the intervention's effectiveness in reducing disability and improving functional outcomes over time, with most patients nearing minimal disability by twelve weeks to six months. The Friedman test results reveal significant differences among the ODI scores over time (Chi-Square = 121.436, df = 5, $p < 0.001$). (Table-II)

The Visual Analog Scale (VAS) scores show a marked improvement in pain levels following surgery. Preoperative scores averaged 7.27 for back pain and 6.95 for leg pain, indicating severe discomfort. Postoperatively, these scores significantly decreased to 2.29 for back pain and 1.62 for leg pain, demonstrating substantial relief. The p-value of <.001 for back pain highlights a statistically significant reduction, confirming the effectiveness of the surgery in alleviating both back and leg pain. (Table-II)

Time Points	M	SD	P-Value
ODI Score			
Baseline	32.96	7.22	<.001
Postoperative (Day 0)	10.69	1.59	
Day 1	8.31	2.20	
Week 3	3.34	2.91	
Week 6	1.27	1.82	
Week 12	0.58	0.5	
6 months	0.50	0.18	
VAS score			
Pre-op back	7.27	0.84	<.001
Post-op back	2.29	0.78	
Pre-op leg	6.95	1.10	
Post-op leg	1.62	0.72	

Table-II. Comparison of mean ODI score & VAS score over different periods

80% of patients had no complications after the surgical intervention, while 5 cases of dura tear,

4 instances of post-op numbness and 3 cases of recurrence were observed in our study. (Figure-6)

By evaluating patients after surgery using Modified Macnab Criteria, 83.3% of patients were very satisfied, indicating no pain, no restriction of mobility, and a return to regular work and level of activity; 10.0% of patients reported good levels. 3.3% of cases were fair, and 3.3% had poor satisfaction. (Figure-7)

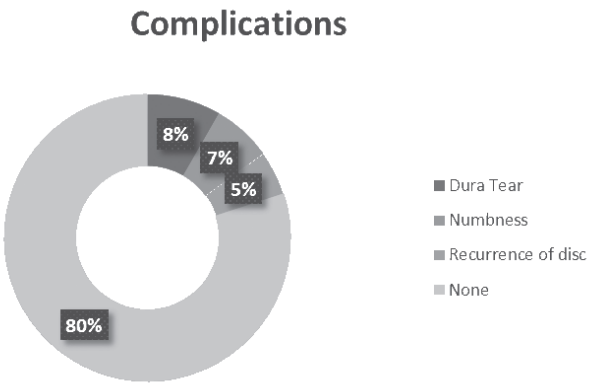

Figure-6. Postoperative complications

Figure-7. Patient satisfaction using modified macnab criteria

DISCUSSION

The findings of our study show a significant improvement in VAS score, ODI score, and patient satisfaction preoperative to last follow-up as $p<.001$. Our study is consistent with previous studies, as Kim et al. (2018) conducted the analysis based on clinical outcomes. The findings reveal that there was an improvement observed in VAS score from pre and postoperatively as (0.93 ± 0.7), in ODI score (14.5 ± 11.9), according to modified MacNab score (75.45%) patients were satisfied after surgical intervention.[1]

Another study conducted by Jiang et al. shows similar results as our findings show comparable demographics, with similar mean ages (46 years vs. 42 years) and a predominance of male patients (55% vs. 65%). Both studies report L5-S1 as the most common disc level affected, though our research shows a higher prevalence (63.3% vs. 37.5%). Regarding outcomes, both studies demonstrate significant postoperative improvements in ODI and VAS scores, reflecting reduced disability and pain. However, the Jiang et al. study observed more extended hospital stays (3.33–7.04 days) and complications (dural tears). Satisfaction rates were high across both studies, with 83–86% in the Jiang et al. and 83.3% very satisfied in our cohort.[12]

Duong et al.[13] the study indicated that According to the modified Macnab criteria, most patients (95.7%) had excellent or good outcomes, and the most common levels of LDH treated were L4-L5 and L5-S1. The UBE surgery significantly improved the patients' functional outcomes and lower back and leg discomfort. Another study revealed that the UBE procedures were performed on 556 patients across 11 studies, with a mean follow-up of 15.2 months. The mean overall complication rate was 6.7%, from 0% to 13.8%. - Patients experienced significant improvements in leg and back pain, as well as disability scores, after the UBE procedures. - The average satisfied outcome (excellent/good) based on the Macnab criteria was 84.3%, ranging from 75.35% to 95%.[14] 95.11% of patients had excellent or good results according to the modified Macnab criteria following the UBE discectomy procedure.[15]

While another study found a high percentage of 87% patient satisfaction following surgical intervention, our study's patient satisfaction rate was 83.3%.[8] According to another research, the VAS for leg pain dropped from 8.3 ± 1.1 to 2.4 ± 1.1, and the ODI score dropped from 67.2 ± 1.7 to 24.3 ± 8.5. The study also indicated positive results from UBE, which is in line with our findings.

The study had drawbacks: short follow-up time,

limited sample size, and retrospective design of this study. Furthermore, due to the retrospective study design, selection bias appears inherent in patient preferences, and the surgeon's experience may impact the results. However, given the good clinical outcomes and the ease of use of the new endoscopic equipment, the results suggest that UBE may be a viable surgical option instead of OLM. Sufficient randomized prospective investigations on UBE are necessary to confirm the current findings.

In our study, 3 cases presented with recurrence of the pain ranging from 3 weeks to 5 weeks at the same level. Two of them need instrumentation due to underlying discitis. Others underwent UBE disc excision again for recurrent disc and postoperative uneventful. Five patients underwent dural tears, but no significant problem was encountered in the postoperative period. 4 patients had symptoms of disturbed sensations in concerned dermatomes, which was relieved in one patient after one month; however, the other 3 had the same.

This study highlights advancements in surgical treatment for lumbar disc herniation (LDH) within Pakistan's tertiary care settings. Evaluating the clinical outcomes associated with unilateral biportal endoscopic (UBE) disc excision emphasizes the procedure's potential as a minimally invasive alternative to the tubular technique. The findings demonstrate that the UBE approach offers significant advantages, including rapid pain relief, reduced blood loss, cost-effectiveness, and shorter hospital stays, aligning with global trends favouring minimally invasive spine surgeries. The results support the practical application of UBE in managing LDH, offering both clinical and surgical benefits. Furthermore, this research underscores the importance of ongoing innovation and clinical practice to enhance patient care and surgical outcomes for LDH in Pakistan and internationally.

CONCLUSION

Our results showed that this technique is as safe and effective as other MIS techniques, and most of our patients showed significant improvement after surgery; however, a comparison of UBE and other MIS techniques needs to be assessed in future to demonstrate the effectiveness of this technique.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Zubair Khalid:** Conceptualization of framework.
2	**Rizwan Akram:** Critical review.
3	**Latif Khan:** Literature review.
4	**Faheem Ahmad Usmani:** Study methodology.
5	**Asad Amin:** Data collection.
6	**Sadaf Saddiq:** Data analysis.
7	**Harris Dogar:** Data collection.