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Comparative Outcomes of Endoscopic vs. Open Lumbar Discectomy in Single-Level Disc Herniation

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ABSTRACT

Background: Lumbar disc herniation is the most common and a major reason for spinal surgery. Endoscopic lumbar discectomy and open discectomy are the choice of surgical treatment.

Objective: The aim of this study was to compare the outcomes of endoscopic versus open lumbar discectomy in single-level disc herniation.

Material and method: The current retrospective study was carried out at the orthopaedic department, Nowshera Medical College and Qazi Hussain Ahmad Medical Complex Nowshera. The study duration was one year from June 2023 to June 2024 after taking approval from the ethical committee of the hospital. 84 individuals with single-level LDH who had surgery at our institution were included in this study. 40 of them had Endoscopic Lumbar Discectomy (ELD), and 44 had Open Lumbar Discectomy (OLD). The visual analogue scale (VAS) was used to measure pain intensity before surgery after the procedure. Participants' satisfactory responses were evaluated by the Macnab criterion. The Mann-Whitney U test or the unpaired Student's t-test was used to analyze the continuous data. Statistical Software, version 16, was used to analyze all data. Fisher's exact test or the Chi-square test was used to evaluate categorical results. A p-value of less than 0.05 was considered statistically significant.

Results: A total of 84 individuals with single-level LDH were included in this study.44 individuals had done had open lumbar discectomy and 40 had endoscopic lumbar discectomy. The baseline data showed no statistically significant differences. The ELD group had a significantly lower mean, post-operative, surgical site pain VAS score than the OLD group, however, at 96 hours, there was no significant difference. The ELD group consumed a lower average amount of morphine. The ELD group had a significantly shorter mean hospital stay than the OLD group (p=0.003). There was no statistically significant difference among the ELD and OLD groups in McNab's outcome evaluation of patient satisfaction in terms of good to excellent (p=0.091). Hospital expenses were considerably greater in the ELD group, while OT was longer in the ELD group (99.5±28.5 minutes) than in the OLD group (p<0.001).

Conclusion: Our study concluded that endoscopic lumbar discectomy for single-level lumbar discectomy had shorter hospital stay, less opioid use, and less postoperative pain but more expenses as compared to open lumbar discectomy. The two groups' patient satisfaction results were similar.

Keywords: *Endoscopic; Open Lumbar Discectomy; Single-Level; Disc Herniation*

1. INTRODUCTION

A lumbar disc herniation, sometimes referred to as a slipped or, occurs when the soft, jelly-like nucleus pulposus of a lower back spinal disc pushes through a tear in the annulus fibrosus.[1] Sciatica can be brought on by this displacement compressing and irritating the dural sac and lumbar nerve roots. Sciatica has been reported since ancient times, but Mixter and Barr were the first to discover a connection between it and disc herniation.[2] Of the degenerative lumbar spine disorders now diagnosed, lumbar disc herniation is the most common and a major reason for spinal surgery.[3] Even while the issue frequently resolves

on its own, the increasing rate of surgical therapy has been attributed to improved availability to medical care, regular imaging tests, and the safety of surgical procedures. Transdural resection was replaced by traditional open methods as the first line of therapy for lumbar disc herniation, followed by the development of microsurgery, endoscopic, and percutaneous procedures.[4-5] For many years, the gold-standard procedure for surgical therapy has been an open lumbar discectomy.[6] While most people find that conservative treatment relieves their symptoms, 10–20% of patients have chronic pain that requires surgery.[7-8] Due to its positive clinical results, open lumbar discectomy is still often performed despite possible side effects include scar tissue development, facet joint injury, and postoperative lumbar instability.[9-10] With the development of surgical microscopy in the 1970s, Mixter and Barr's innovative research paved the way for Endoscopic discectomy procedures, which have since become a standard therapy for lumbar disc herniation. Endoscopic discectomy offers benefits like less tissue damage than conventional open discectomy, which reduces epidural fibrosis, postoperative pain, and segmental instability.[11-12] In terms of pain management, functional impairment, and patient satisfaction, an earlier study found that endoscopic lumbar discectomy produced clinical results comparable to open discectomy. Its benefits included a shorter hospital stay, less predicted blood loss, and decreased postoperative back pain for the week after surgery.[13] The current study was carried out to find out the Comparative Outcomes of Endoscopic versus Open Lumbar Discectomy in Single-Level Disc Herniation

2. MATERIAL AND METHOD

The current retrospective study was carried out at the orthopaedic department, Nowshera Medical College and Qazi Hussain Ahmad Medical Complex Nowshera. The study duration was one year from June 2023 to June 2024 after taking approval from the ethical committee of the hospital. A total of 84 individuals of different age groups and both genders with single level lumbar disc herniation diagnosed by MRI, had significant pain that did not improve with conservative treatment after at least six weeks were included., individuals with history of lumbar surgery and had medical conditions unfit for surgery and pregnant and lactating women were excluded. 84 individuals with single-level LDH who had surgery at our institution were included in this study. 40 of them had Endoscopic Lumbar Discectomy (ELD), and 44 had Open Lumbar Discectomy (OLD). The visual analogue scale (VAS), which has scores ranging from 0 to 10, was used to measure pain intensity before surgery and then two, four, twelve, twenty-four, forty-eight, seventy-two, and ninety-six hours after the procedure. From medical records all the post and peri-operative data were collected including operative time, hospital costs, operative time, level of surgery and surgical complication. Participants satisfactory response were evaluated by the Macnab criterion, which is scored with excellent, good, fair, poor, and clinical results at the final follow-up. Clinical data were first classified before being split into continuous, polytomous, and dichotomous categories. Means and standard deviations were used to show the continuous data, and percentages were used to represent the categorical data. The Mann-Whitney U test or the unpaired Student's t-test were used to analyze the continuous data. The generalized estimating equations (GEE) model and the Bonferroni test were used to analyze intra- and inter-group data for serial assessment of postoperative VAS scores. Statistical Software, version 16, was used to analyze all data. Fisher's exact test or the Chi-square test was used to evaluate categorical results. A p-value of less than 0.05 was considered statistically significant.

3. RESULTS

A total of 84 individuals with single-level LDH were included in this study out of which 46(55%) were female and 38 (45%) were male. The mean age in ELD group was 38.1±8.7 and in OLD was 35.2±9.2 years. The most prevalent kind of surgery level in both groups was L4/5 23(52.2%) in ELD and 19(47.5%) in OLD. 44 individuals had done had open lumbar discectomy and 40 had endoscopic lumbar discectomy. The baseline data showed no statistically significant differences as presented in **table 1**. The ELD group had a significantly lower mean, post-operative, surgical site pain VAS score than the OLD group at 2, 4, 12, 24, 48, and 72 hours after surgery ($p<0.001$, <0.001, <0.001, <0.001, <0.001, as well as 0.017, respectively), however, at 96 hours, there was no significant difference. Compared to the OLD group, the ELD group consumed a lower average amount of morphine (6 mg versus 8 mg, respectively, $p<0.001$). Between the two groups, there was no discernible difference in EBL or surgical drain output. The ELD group had a significantly shorter mean hospital stay than the OLD group (5.2±2.9 days compared to 8.3±4.6 days, $p=0.003$). Both groups experienced similar perioperative complications: one patient in the ELD group required revision surgery due to a postoperative spinal epidural hematoma, and another patient in the OLD group had a retained redivac drain that needed to be surgically removed. Between the two groups, the median follow-up duration was comparable ($p=0.158$). There was no statistically significant difference among the ELD and OLD groups in McNab's outcome evaluation of patient satisfaction in terms of good to excellent (97.5% versus 86. %, $p=0.091$). Hospital expenses were considerably greater in the ELD group (1,345±360.9) than in the OLD group (710.6±260.) ($p<0.001$), while OT was longer in the ELD group (99.5±28.5 minutes) than in the OLD group (66.9±22.2) ($p<0.001$).The comparative outcomes of both groups presented in **table 2**.

Table 1 Demographic features of the study participants

Features	ELD N=44(%)	OLD N=40	Value of P

Gender			
Male	18(40%)	20(65%)	0.289
Female	26(59.0%)	20(65%)	
Age in years mean SD	38.1±8.7	35.2±9.2	0.181
Level of discectomy			0.961
L2/3 case	1(2.2)	2(5%)	
L3/4 case	2(4.4%)	zero	
L4/5 case	23(52.2%)	19(47.5%)	
L5/S1 case	18(40.9%)	19(47.5%)	
Side			0.521
Left	20(45.4%)	21(52.5%)	
Right	24(54.5%)	19(47.5%)	
Preoperative leg pain VAS score; mean±SD	3.2±2.8	3.5±2.5	0.534

Table 2 comparison of outcomes between ELD and OLD

Features	ELD N=44(%)	OLD N=40	Value of P
Blood loss in ml median (IQR)	22 (22 to 52)	32 (22 to 52)	0.078
Operative times (min); mean±SD	99.5±28.5	66.9±22.2	<0.001*
Surgical drain output (mL); median (IQR)	82 (32 to 132)	52 (12 to152)	0.631
Morphine consumption (mg); median (IQR)	6(zero to 12)	8 (8 to 18)	<0.001*
Hospital stay (days); mean±SD	5.2±2.9	8.3±4.6	0.003*
Hospital costs (pkr); mean±SD	1,345±360.9	710.6±260.7	<0.001*
Duration of follow-up (months); median (IQR)	5 (2 to 10)	6 (3 to 12)	0.158
McNab's outcome (good or excellent); n (%)	42 (97.5%)	32 (85%)	0.091

*** Statistically significant, p<0.05**

OLD=open lumbar discectomy

IQR=interquartile range

VAS=visual analogue scale

ELD= **endoscopic lumbar discectomy**

4. DISCUSSION

Treatment options for single-level disc herniation include endoscopic and open lumbar discectomy. Endoscopic treatments often have advantages with respect to of recovery time, blood loss, & the possibility of a quicker return to work. Open procedures require a larger incision and may cause more tissue disruption, but they are still effective. Due to its low surgical technique requirement and the availability of surgical tools in the majority of hospitals, endoscopic lumbar discectomy gained

popularity.[14] the present study was conducted to compare the outcomes of endoscopic and open lumbar discectomy in the treatment of single-level disc herniation. 84 individuals with single-level LDH who had surgery at our institution were included in this study. 40 of them had Endoscopic Lumbar Discectomy and 44 had Open Lumbar Discectomy. The baseline data showed no statistically significant differences. The ELD group had a significantly lower mean, post-operative, surgical site pain VAS score than the OLD group at 2, 4, 12, 24, 48, and 72 hours after surgery however, at 96 hours, there was no significant difference. Compared to the OLD group, the ELD group consumed a lower average amount of morphine ($p<0.001$). The findings of this study is similar to the study conducted by Soliman.[15] The CRP and CPK levels of patients who received ELD were lower than those of patients who received OLD, according to those previous studies.[6-7] Although CRP and CPK are not often measured in patients with single-level LDH having elective surgery, the current study regrettably did not examine the variations in CRP and CPK levels between ELD and OLD before and after surgery. In our study the ELD group had a significantly shorter mean hospital stay than the OLD group (5.2±2.9 days compared to 8.3±4.6 days, $p=0.003$).this findings support the statement that Endoscopic procedures minimize injury to nearby tissues by using specialized equipment and a tiny incision that is guided by a camera. Patients usually resume to their regular activities more quickly, have less pain, and stay in the hospital for shorter periods of time.[3] In this study There was no statistically significant difference among the both groups in McNab's outcome evaluation of patient satisfaction in terms of good to excellent (, $p=0.091$). Hospital expenses were considerably greater in the ELD group than in the OLD group ($p<0.001$), while OT was longer in the ELD group than in the OLD group ($p<0.001$).these findings are similar with the previous study.[16] The current study had several limitations because it was a retrospective analysis and the OLD was more widely used a few years prior to the switch to ELB. To validate the benefits of ELB over OLD, a randomized controlled study needs to be conducted. Additionally, the retroactive nature of the data limited its applicability. Furthermore, there was no evaluator who reviewed the postoperative pain assessment. However, morphine use was assessed to determine the level of pain in the same participants. The author's inclusion of relevant public health variables in addition to those pertaining to surgical outcomes—specifically, hospital stay, hospital expenses, and McNab's outcome—is one of the study's strong points. Furthermore, the preliminary results of this study offer attending surgeons useful information that they may utilize as a reference for selecting surgical techniques and organizing better care.

5. CONCLUSION

Our study concluded that endoscopic lumbar discectomy for single-level lumbar discectomy had shorter hospital stay, less opioid use, and less postoperative pain but more expenses as compared to open lumbar discectomy. The two groups' patient satisfaction results were similar.

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