Al-Azhar International Medical Journal

Volume 4 | Issue 6 Article 3

2023
Section: Neurosurgery

Outcome of lumbar discectomy by using endoscopic interlaminar approach

Ibrahim Gamil Ewaiss
Neurosurgery department, Faculty of Medicine- Al-Azhar University, Cairo ,Egypt

Mostafa Mahmoud El sayed Aboelkhir
Neurosurgery department, Faculty of Medicine- Al-Azhar University, Cairo ,Egypt

Abelgelel Ragab Abdelgelel Atta
Department of Neurosurgery, Faculty of medicine, Al-Azhar university, Cairo, Egypt,
abdelgelelneuron@gmail.com

How to Cite This Article

Ewaiss, Ibrahim Gamil; Aboelkhir, Mostafa Mahmoud El sayed; and Atta, Abelgelel Ragab Abdelgelel (2023) "Outcome of lumbar discectomy by using endoscopic interlaminar approach," *Al-Azhar International Medical Journal*: Vol. 4: Iss. 6, Article 3.
DOI: https://doi.org/10.58675/2682-339X.1834

ORIGINAL ARTICLE

Outcome of Lumbar Discectomy Using Endoscopic Interlaminar Approach

Ibrahim Gamal Ewaiss, Mostafa Mahmoud Elsayed Abo-Elkheir, Abdelgelel Ragab Abdelgelel Atta*

Neurosurgery Department, Faculty of Medicine- Al-Azhar University, Egypt

Abstract

Background: **Lumbar degenerative disk disease is a condition, which causes anatomical and morphological changes leading to clinical complaints. Lumbar disk herniation (LDH) is a common neurosurgical disease, which causes economic and medical burdens to families, society, and the country.**

Aim: **This study sought to assess the effectiveness of interlaminar endoscopic lumbar discectomy as a minimally invasive method for treating lumbar disk herniation in Al-Azhar University Hospitals.**

Patients and methods: **This study, which included both prospective data, involved 25 patients between February 2021 and October 2022, who had lumber disk prolapse and were treated with endoscopic lumbar discectomy using the EasyGo system and the Endoscopic Karl Storz system at the Neurosurgery Department of the Al-Azhar University Hospitals. Postoperative follow-up of at least 3−6 months was required.**

Results: **There significant reduction in ODI from preoperative to 3 months postoperatively among the studied patients. Majority of the patients were excellent (52%), while 24% were good, (16%) were fair and (8%) patient was poor.**

Conclusion: **In carefully chosen patients, endoscopic discectomy for lumbar disk prolapse was a safe and minimally invasive procedure with certain challenges.**

Keywords: Endoscopic interlaminar approach, Lumbar degenerative disk disease, Lumbar discectomy

1. Introduction

Clinical problems are brought on by lumbar degenerative disk degeneration, which results in anatomical and morphological alterations. Families, society, and the country are all burdened by the common neurosurgical problem known as lumbar disk herniation (LDH), both financially and medically. Lumbar disk degeneration is the most frequent cause of low back pain globally.[1]

Low back discomfort is particularly prevalent in industrialized regions of the world.

It is the second most frequent reason for primary care doctor visits and the most frequent cause of impairment among people over 45 years.[2]

For the treatment of low back pain, people around the world spend more than $100 billion USD annually. Despite the great frequency of low back pain in both industrialized and developing nations, its cause, diagnosis, and treatment remain a mystery.[1] The biggest avascular tissue structure in the body, the intervertebral disk is made up of cartilage placed superiorly and inferiorly, an outer annulus fibrosus, and an inner nucleus pulposus. Because of the proteoglycans' osmotic characteristics, the intervertebral disk resists compression. The intervertebral disk, next to the facets, is the most significant load-bearing element of the spine due to its resistance to anterior and lateral shearing, flexion, and compression.[3]

Presently, conventional discectomy (CD) and percutaneous endoscopic lumbar discectomy are available as treatments for LDH (PELD). Because of its high success rate of approximately 90% and good result, CD is considered the standard surgical method in the management of LDH unresponsive to conservative therapy. However, CD is associated

Accepted 27 December 2022.
Available online 23 August 2023

* Corresponding author. Faculty of Medicine, Al-Azhar University, Egypt.
E-mail address: abdelgelelneuron@gmail.com (A.R.A. Atta).

https://doi.org/10.58675/2682-339X.1834

with some complications, including epidural scarring, destabilization of spinal canal structures, and tissue traumatization.[4]

Most concerns are about the incomplete removal of disk fragments, a steep learning curve, recurrence, and radiation exposure. The risk of surgical failure may be a major obstacle to performing PELD. In addition, the osseous structure of the spine can compromise the mobility of the instruments.[5]

This study sought to assess the effectiveness of interlaminar endoscopic lumbar discectomy as a minimally invasive method for treating lumbar disk herniation in Al-Azhar University Hospitals.

2. Patients and methods

This was a prospective study that was carried out at the Neurosurgery Department of the Al-Azhar University Hospitals on 25 patients between February 2021 and October 2022, who had lumbar disk prolapse and who were treated with endoscopic lumbar discectomy through interlaminar approach discectomy by the EasyGo system using endoscopic Karl Storz system, with postoperative follow-up of at least 3–6 months.

Inclusion Criteria: The following criteria were met by all patients with lumbar disk prolapse who were included in this study: A single level disk prolapse, failure of conservative therapy for at least 6 weeks, and whether the disk prolapse is central or paracentral are all associated with unilateral radicular discomfort.

Exclusion Criteria: The following patients were excluded from this study: Cases proved to have bilateral radiculopathy, more than one level disk prolapse, calcified disks, spondylolysis, spondylolisthesis, previous lumbar spine surgery, cauda equina syndrome, and associated bony stenosis.

All cases were subjected to:

History Taking: Personal information is gathered, such as name, age, sex, occupation, and symptomatology, such as pain (site, radicular distribution, or claudication). The patient's complaint is also examined, including its mode of start, duration, and course of illness; motor, sensory, and sphincter affection showing itself.

It is crucial to correlate the radicular distribution of symptoms with the MRI. **History:** Similar conditions, neurological and neurosurgical issues, as well as other health issues like hypertension, diabetes mellitus, TB, renal, cardiac, chest, surgery, and radiation, etc.

2.1. Examination

General Examination: General appearance, pulse, temperature, blood pressure, respiration rate, chest, heart, abdominal, urogenital, and skeletal system examinations are all routinely performed on every patient.

Neurological Examination: Motor system: motor function, muscular tone, and condition. Reflexes include pathogenic, deep, and superficial reflexes. Sensation includes cerebral, deep, and surface-level sensations. Additional tests: Test SLR.

2.2. Investigations

Routine laboratory invitations: Preoperative patient preparation included complete blood counts, blood glucose levels, liver and kidney function assessments, bleeding profiles, and ESR and CRP levels.

Radiological investigations: All patients were submitted to plain radiography including lateral, posterior, and anterior views. Magnetic resonance imaging (MRI) was done for all cases using T1; T2 sagittal images and axial views.

Informed consent: Patients who took part in this study provided written informed consent.

Surgical technique: All cases were subjected to interlaminar endoscopic lumbar discectomy using EasyGo system of Karl Storz.

Postoperative management: Antibiotics and nonsteroidal anti-inflammatory drugs was used for an average of 14 days. Patients will do postoperative radiological studies to assess the integrity of the operation.

Follow-up: Follow-up for 3 months postoperative and clinical outcomes were assessed using the visual analog scale (VAS) score (for mean pre- and postoperative pain score measurement) and Oswestry Disability Index (ODI). Patient satisfaction was measured by the Modified MacNab Criteria at 3 months postoperative. Time of return to work, recurrence or persistence of symptoms which need revision open surgery were assessed. On the second visit, the patient was examined for any signs of leakage or infection. It was questioned regarding complaints of fever, backache, and leg discomfort.

3. Results

This table shows that the mean operative time was 92.5 min and the mean blood loss was 72.81 ml, while the mean hospital stay was 1.48 days Tables 1 and 2.

This table shows that there is a significant decrease in low back pain and radicular pain VAS from preoperative to 3 months postoperatively among the studied patients (Tables 3 and 4).

Table 1. Demographic data distribution among the studied patients This table shows that the mean age was 38.42 ± 6.59 years and the mean BMI was 26.13 ± 3.64 kg/m^2, while 60% of the patients were males.

Variable	Studied patients (n = 25)
Age (years)	
Mean ± SD	38.42 ± 6.59
Sex	
Male	15 (60%)
Female	10 (40%)
BMI (kg/m^2)	
Mean ± SD	26.13 ± 3.64

Table 2. Operative data among the studied patients.

	Studied patients (n = 25)
Operative duration (min)	
Mean ± SD	92.5 ± 20.48
Blood loss (ml)	
Mean ± SD	72.81 ± 27.65
Hospital stay (days)	
Mean ± SD	1.48 ± 0.536

Table 3. Low back pain VAS among the studied patients.

	Low back pain VAS	Radicular pain VAS
Preoperative		
Mean ± SD	7.68 ± 1.34	7.64 ± 1.57
Postoperative		
Mean ± SD	3.5 ± 1.13	2.83 ± 0.882
3-month follow-up		
Mean ± SD	2.01 ± 0.688	1.44 ± 0.562
Fr test	**<0.001**	**<0.001**

Table 4. Oswestry Disability Index among the studied patients.

ODI	Studied patients (n = 25)
Preoperative	
Mean ± SD	42.5 ± 4.92
Postoperative	
Mean ± SD	22.61 ± 4.35
3-month follow-up	
Mean ± SD	17.42 ± 2.58
Fr test	**<0.001**

This table shows that there a significant reduction in ODI from preoperative to 3 months post-operatively among the studied patients.

This table shows that the majority of the patients were excellent (52%), while 24% were good, 16% were fair, and (8%) of the patients were poor Table 5.

This table shows that the most found complications were durotomy (8%) Table 6.

This table shows that 4% of the patients had recurrence/persistent symptoms and were reoperated. However, the mean time of return to work was 34.65 ± 7.13 days Table 7.

Table 5. Outcome according to the modified MacNab's criteria among the studied patients.

	Studied patients (n = 25) N (%)
Excellent	13 (52%)
Good	6 (24%)
Fair	4 (16%)
Poor	2 (8%)

Table 6. Complications among the studied patients.

	Studied patients (n = 25) N (%)
Durotomy (unintended)	2 (8%)
Nerve injury	1 (4%)
Wound infection	1 (4%)
Reoperation	1 (4%)

Table 7. Follow-up and recurrence rate among the studied patients.

	Studied patients (n = 25)
Recurrence/persistent symptoms	1 (4%)
Time of return to work (days)	
Mean ± SD	34.65 ± 7.13

4. Discussion

The Neurosurgery Department at Al-Azhar University Hospitals conducted this prospective study on 25 patients who had lumbar disk prolapse and were treated with endoscopic lumbar discectomy using the EasyGo system and the Endoscopic Karl Storz system, with a minimum postoperative follow-up of 3–6 months. Of the patients, 60% were male, Having a mean BMI of 26.13 kg/m2 and a mean age of 38.42 6.59 years. Our results agreed with those of the **El-Ghannam et al.**, study, which showed that 35 consecutive patients with lumbar disk prolapse underwent percutaneous endoscopic lumbar discectomy using the interlaminar approach discectomy. The patients were 37.5 years old on average (range 20–55 years). There were 16 (45.7%) females and 19 (54.3) males in attendance.[6]

In a research by **Chen et al.** that used an interlaminar approach to endoscopically remove a lumbar disk herniation at the L5-S1 level, 123 patients were included. All patients underwent surgery and underwent at least a year's worth of monitoring. There were 40 women and 83 males in attendance. The patient's age was on average 39. (range, 18–61 years).[7]

According to the current study, the typical operating time was 92.5 min, the typical blood loss was 72.81 ml, and the typical hospital stay was 1.48 days. Our findings were supported by a study by **El-Ghannam et al.**, which discovered that the typical

operation time was 90 min (60–120 min). A 50 ml blood loss was normal (25–60). An average hospital stay lasted 36 h (range 24–48 h).[6]

In addition, the average hospital stay in the study by **Zhou et al.** was 3.32 0.98 days, while the average surgical time was 85.79 12.90 min[8].

The review patients' VAS scores for low back pain and radicular pain decreased overall from before surgery to 3 months after it. Our findings were supported by the **Zhou et al.** study, which indicated that all patients reported intense pain after a procedure and a shift in the VAS pattern at each subsequent time point. Before the surgery, the VAS-Back was 5.58 2.01; 1 day later, it was 4.05 1.08 (t = 3.62; P 0.05). At the most recent development, the typical VAS-Back score for these patients dropped from 5.58 2.01 to 2.37 1.01 (t = 7.14, P 0.05). Before the operation, the VAS-Leg score was 7.00. It then dropped to 3.58. It then dropped to 1.30 a day or so later (t = 7.53, P 0.05). The normal VAS-Leg score decreased from 7.00 1.56 to 1.63 1.01 (t = 20.97, P 0.05). In addition, the VAS-Back for men decreased from 5.17 2.13 before the exercise to 2.25 1.14 following the most recent development (t = 4.61, P 0.05). The VAS-Leg decreased from 6.83 × 1.85 to 1.50 × 1.00 (t = 13.48, P 0.05), as well. The VAS-Back for women dropped at the most recent development from 6.29 1.70 before the activity to 2.57 0.79 (t = 6.57, P 0.05). The VAS-Leg score decreased from 7.29 0.95 to 1.86 1.07 (t = 26.87, P 0.05) as well.[8]

Similar to this, the **Chen et al. study** showed that when 7 VAS scores for leg and back pain were compared to preoperative characteristics, there was a quantitatively significant improvement.[7]

Besides, **Hua et al.** exhibited that mean postoperative VAS scores were essentially chipped away at differentiated and the preoperative scores ($P < .05$).[9]

Similarly, in the examination of **Wasinpongwanich et al.**, the mean preoperative, VAS-back torture score and the VAS-leg torture score was 5.00. Postoperative VAS-back and leg torture score results at multi-week were lessened to 1.66 and 1.79, independently, and remained at 1.89–3.14 and 1.59–2.66.[10]

Besides, **El-Ghannam et al.** expressed that postoperative improvement of sciatica happened in 27 patients (80%) and 8 patients (20%) have not gotten to the next level. The current review showed that there is a critical decrease in ODI from preoperative to 90 days postoperatively among concentrated patients <ytiralc rof ecnetnes eht kechc lsP:QA>[6].

Likewise, **Zhou et al.** showed that the patients' utilitarian improvement was perfect. The average ODI scores extended from 44.84 10.82% to 11.12 5.80% at the most recent turn of events (t = 10.92, P 0.05). The normal ODI scores for male patients dropped from 48.50 10.59% preoperatively to 18.00 6.50% at the most recent turn of events (t = 8.80, P 0.05). The commonplace ODI scores for female patients dropped from 38.57 9.64% preoperatively to 13.71 3.15% at the most recent turn of events (t = 6.63, P 0.05).[8]

The ongoing review showed that a larger part of the patients was phenomenal (52%), while 24% were great, 16% were fair, and 8% of patients were poor.

Our outcomes were in accordance with the investigation of **Kim et al.**, as they detailed that the result at the last follow-up was phenomenal in 12 patients, great in 3, fair in 2, and poor in 1.[11]

However, in the investigation of **Zhou et al.**, no unfortunate outcome was accounted for and 89.47% of patients accomplished a phenomenal or great recuperation.[8]

In the study in our hands, the most found complications were durotomy, discitis, (8%) followed by wound infection and nerve injury (4%).

Our results were supported by the study of **El-Ghannam et al.**, which reported that postoperative complications occurred in seven patients (17%). Incidental durotomy occurred in three cases (7%), nerve injury occurred in three cases (7%), laceration of nerve root occurred in one case, and neuropraxia in two cases. The two neuropraxia cases were improved by medical treatment in the form of neurotonics. Infection occurs in one case (3%) and the patient was diabetic and improved by antibiotics.[6]

Also, in a series reported by **Hongfei et al.** nerve root injury occurred in 1.2% of cases. There were no instances of posterior surgical site infection. Dural tears occurred in 0.9%.[12]

In another case series reported by **Cao et al.** no patient was noted with postoperative infections after PELD.[13]

In addition, the **Ahn et al. study on** a total of nine patients (1.1%) reported to have had symptomatic dural rips.[14]

There were no cases of intraoperative incidental durotomy or postoperative cerebrospinal fluid leakage in the series described by **Lee et al.** and **Xia et al.**[15,16]

In a study published by **Chen et al.**, adhesions between the calcification of the disk and the nerve root resulted in dural tears and CSF fluid leakage in three patients. However, after a week of bed rest, their symptoms improved, and they were released.[17]

Furthermore, **Wasinpongwanich et al.** showed that dural tears ($n = 1$) and nerve root-related complications ($n = 3$) were the only intraoperative complications. Numbness ($n = 18$), weakness

($n = 5$), and a residual disk ($n = 1$) were other postoperative consequences. There were no reported infections or hematomas.[10]

Our results showed that 4% of the patients had recurrence/persistent symptoms and were reoperated. However, the mean time of return to work was 34.65 ± 7.13 days.

In a series reported by **Joswig et al**. recurrent lumbar disk herniations occurred in 28%. Recurrence rates after discectomy vary between 5 and 20% being independent of the technique used. Success rate for revision operations, on the other hand, is worse than primary operations due to epidural fibrosis scar tissue, stenosis, arachnoiditis, segmental instability, and additional traumas to develop during the revision procedure.[18]

The patient's ability to resume former employment is a further indicator of success. In this study, patients were allowed to return to their prior jobs for an average of 35 days with restrictions, avoiding strenuous manual labor for 2 months. In addition, **Kim et al**. and **Zhou et al**. demonstrated that there was no recurrence during follow-up.[8,11]

4.1. Conclusion

In carefully chosen patients, endoscopic discectomy for lumbar disk prolapse was a safe and minimally invasive procedure with certain challenges like a steep learning curve and the partial removal of disk fragments. Patients are comfortable following surgery due to early mobilization and pain management. They can return to work sooner because the length of their hospital stay was greatly shortened.

Disclosure

The authors have no financial interest to declare about the content of this article.

Authorship

All authors have a substantial contribution to the article.

Sources of funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflicts of interest

There are no conflicts of interest.

References

1. Weiler C, Lopez-Ramos M, Mayer HM, Korge A, Siepe CJ, Wuertz K, et al. Histological analysis of surgical lumbar intervertebral disc tissue provides evidence for an association between disc degeneration and increased body mass index. *BMC Res Notes*. 2011;4:497.
2. Lehtola V, Luomajoki H, Leinonen V, Gibbons S, Airaksinen O. Efficacy of movement control exercises versus general exercises on recurrent sub-acute nonspecific low back pain in a sub-group of patients with movement control dysfunction. Protocol of a randomized controlled trial. *BMC Muscoskel Disord*. 2012;13:55.
3. Palepu V, Kodigudla M, Goel VK. Biomechanics of disc degeneration. *Adv Orthop*. 2012, 726210.
4. Serdar IH, Sedat G. Full-endoscopic interlaminar lumbar discectomy minimally invasive spine surgery. *Curr Aspects*. 2016;12:69–74.
5. Wang B, Lu G, Patel AA, Ren P, Cheng I. An evaluation of the learning curve for a complex surgical technique: the full endoscopic interlaminar approach for lumbar disc herniations. *Spine J*. 2011;11:122–130.
6. El-Ghannam O, Abo-Shosha M, Saad Al-Kholy H, Montaser H, Fathi El-Sayed A. Surgical outcome of percutaneous endoscopic interlaminar lumbar discectomy technique. *Al-Azhar Med J*. 2020;49:723–734.
7. Chen HT, Tsai CH, Chao SC, Kao TH, Chen YJ, Hsu HC, et al. Endoscopic discectomy of L5-S1 disc herniation via an interlaminar approach: prospective controlled study under local and general anesthesia. *Surg Neurol Int*. 2011;2:93.
8. Zhou Z, Ni HJ, Zhao W, Gu GF, Chen J, Zhu YJ, et al. Percutaneous endoscopic lumbar discectomy via transforaminal approach combined with interlaminar approach for L4/5 and L5/S1 two-level disc herniation. *Orthop Surg*. 2021;13:979–988.
9. Hua W, Zhang Y, Wu X, Gao Y, Li S, Wang K, et al. Outcomes of discectomy by using full-endoscopic visualization technique via the interlaminar and transforaminal approaches in the treatment of L5-S1 disc herniation: an observational study. *Medicine*. 2018;97, e13456.
10. Wasinpongwanich K, Pongpirul K, Lwin KMM, Kesornsak W, Kuansongtham V, Ruetten S. Full-endoscopic interlaminar lumbar discectomy: retrospective review of clinical results and complications in 545 international patients. *World Neurosurg*. 2019;132:e922–e928.
11. Kim CH, Chung CK, Woo JW. Surgical outcome of percutaneous endoscopic interlaminar lumbar discectomy for highly migrated disk herniation. *Clin Spine Surg*. 2016;29:E259–E266.
12. Hongfei X, Ma X, Xiaoliang C, Gu Tongtong DO. Unique complications of percutaneous endoscopic lumbar discectomy and percutaneous endoscopic interlaminar discectomy. *Pain Physician*. 2018;21:E105–E112.
13. Cao J, Huang W, Wu T, Jia J, Cheng X. Percutaneous endoscopic lumbar discectomy for lumbar disc herniation as day surgery–short-term clinical results of 235 consecutive cases. *Medicine*. 2019;98, e18064.
14. Ahn Y, Lee HY, Lee SH, Lee JH. Dural tears in percutaneous endoscopic lumbar discectomy. *Eur Spine J*. 2011;20:58–64.
15. Lee DY, Shim CS, Ahn Y, Choi YG, Kim HJ, Lee SH. Comparison of percutaneous endoscopic lumbar discectomy and open lumbar microdiscectomy for recurrent disc herniation. *J Korean Neurosur Soc*. 2009;46:515–521.
16. Xia X-P, Chen H-L, Cheng H-B. Prevalence of adjacent segment degeneration after spine surgery: a systematic review and meta-analysis. *Spine*. 2013;38:597–608.
17. Chen Y, Wang JX, Sun B, Cao P, Tian Y, Shen XL, et al. Percutaneous endoscopic lumbar discectomy in treating calcified lumbar intervertebral disc herniation. *World Neurosurg*. 2019;122:e1449–e1456.
18. Joswig H, Richter H, Haile SR, Hildebrandt G, Fournier JY. Introducing interlaminar fullendoscopic lumbar diskectomy: a critical analysis of complications, recurrence rates, and outcome in view of two spinal surgeons' learning curves. *J Neurol Surg Cent Eur Neurosurg*. 2016;77:406–415.