The Egyptian Journal of Hospital Medicine (October 2021) Vol. 85 (1), Page 2852-2856

# Minimally Invasive Lumbar Discectomy Versus Conventional Discectomy for Symptomatic Lumbar Disc Herniation

**Essam Aldin Gaber Saleh[1], Tarek Rageh[2], Mohamed Hamed[1], Ahmed Said Fahim Mansour[1], Alaa Mohamed Badawy Alhayes*[1]**

Departments of [1]Neurosurgery and [2]General Surgery, Faculty of Medicine, Menoufia University, Egypt

***Corresponding Author**: Alaa Mohamed Badawy Alhayes, **Mobile:** (+20) 01129813441,

**Email:** magdymohamedalaa@gmail.com

## ABSTRACT

**Background:** Lumbar disc herniation is a localized displacement of disc material beyond the normal margins of the intervertebral disc space and is the most common cause of sciatica. Lumbar microdiscectomy (MD) and open discectomy (OD) are commonly performed surgical procedures for patients with lumbar disc herniation.

**Objective:** The aim of the current work was to compare the benefits and harms of minimally invasive discectomy (MID) versus MD/OD for management of lumbar intervertebral discopathy.

**Patients and Methods:** This cross-sectional study was conducted at Menoufia university hospitals & Al-Haram Specialized Hospital including 36 Patients (with single or double level disc prolapse (L4-L5 or L5-S1) who underwent discectomy using microscopic/or conventional discectomy.

**Results:** In group (1): 75% of the patients had good pain improvement (60 – 90%) and the rest had moderate improvement (40 – 60 %). In group (1) only 30% experienced intermittent pain while the rest have no pain. While in group (2) about 50% had an intermittent pain. There is no significant difference**.** In group (1) the mean days of hospital stay was (6.10 $\pm$ 1.6) while in Group (2) the mean days of hospital stay was (1.60 + 0.12). The group (2) has significant short hospital stay length than group (1).

**Conclusion:** It could be concluded that endoscopic approach was associated with similar postoperative pain improvement and frequency and lower operating time, blood loss and hospital stay in comparison to open approaches. We believe that both techniques are safe, and both can be used to lumber disk surgery, but microscopic technique is preferred for its better outcomes.

**Keywords:** Minimally invasive lumbar discectomy- conventional discectomy- lumbar disc herniation.

## INTRODUCTION

Low back pain is one of the most common reasons for people to seek medical help; its prevalence ranges from 60–90% [(1)]**.** Lumbago is a general term referring for low back pain while Sciatica is a name given to pain in the area of distribution of the sciatic nerve (L4 to S3) which is commonly felt in the buttock and over the poster lateral aspects of the leg [(2)]**.**

The most common cause of sciatica is lumbar disc herniation which may result from acute traumatic injury or from preceding degenerative changes within the lumbar disc [(3)]**.** The degenerative disc disease (DDD) occurs even in asymptomatic patients, but for about 10% of the population it results in permanent chronic pain and disability [(4)]**.**

The lifetime prevalence of a lumbar disc herniation is approximately 2%. The natural history of sciatica secondary to lumbar disc herniation is spontaneous improvement in the majority of cases. Among patients with radiculopathy secondary to lumbar herniation, approximately 10-25% (0.5 of the population) experience persistent symptoms [(5)]**.**

Virchow first described traumatic lumbar vertebral disc disease in 1857 contributors from physicians striving to understand back pain and sciatica have encouraged the development of new surgical intervention as well as conservative modalities for treatment of herniated lumbar disc [(6)]**.**

Lumbar disc herniation is a localized displacement of disc material beyond the normal margins of the intervertebral disc space and is the most common cause of sciatica, affecting 1% to 5% of the population annually [(7)]**.**

First-line treatments for sciatica are nonsurgical and may consist of physical therapy, pharmacologic therapy, and/or epidural steroid injection. Acute sciatica symptoms subside in most patients independent of treatment. For symptoms that are resistant to initial conservative treatments, continued conservative care or lumbar discectomy to remove the offending herniated disc material may be considered [(8)].

Lumbar microdiscectomy (MD) and open-discectomy (OD) are commonly performed surgical procedures for patients with lumbar disc herniation. Mixter et al. were the first to describe pitfalls of laminectomies and later in 1978 Caspar and Williams initially reported the technique of lumbar MD, which slightly contributes to a relatively smaller incision, less soft tissue damage, therefore reduced postoperative pain, early discharge from hospital and return to work compared to OD [(9)]**.**

The aim of the current work was to compare the benefits and harms of MID versus MD/OD for management of lumbar intervertebral discopathy.

## PATIENTS AND METHODS





Received: 2/5/2021
Accepted: 28/6/2021

This cross-sectional study included a total of 36 Patients (with single or double level disc prolapse (L4-L5 or L5-S1) who underwent discectomy using microscopic/or conventional discectomy., attending at Menoufia University Hospitals & Al-Haram Specialized Hospital. The patients were divided into two major groups; the 1 st one undergone standard (conventional) discectomy (n=20); the 2nd group undergone microscopic discectomy.

**Inclusion criteria:** Patients with single or double level lumbar disc herniation, age: between 21 and 76 years, chief complaint; sciatica (single sided or in both lower limbs) going with the right radiological diagnosis Signs consistent with nerve root compression, including any one of the following: (a) Reproduction of low back or leg pain with straight leg raise 45°. (b) Muscle weakness involving a major muscle group of the lower extremity. (c) Diminished lower extremity muscle stretch reflex (quadriceps and Achilles tendon). (d) Diminished or absence of sensation to pinprick in any lower extremity dermatome, and MRI or CT demonstrating anatomical unilateral LDH correlating with the patient's symptoms.

**Exclusion criteria:** Other types of degenerative disc diseases (DDD), Prior lumbar surgery (recurrent disc prolapse), segmental instability, vertebral fractures and spinal infections, tumors, pregnancy, and patients refuse to participate.

**All patients were subjected to the following:**

- **Full history taking:** Personal history: Age, residence, work nature, complains: onset, nature (pain, site, radiation, effect on daily work, pressure symptoms e.g. Incontinence), and medications used and frequency.
- **Physical examination:** General condition, and neurological examination.
- **Investigations:** (1) Routine pre-operative Laboratory investigations: to evaluate patients fitness for operative procedure (CBC, INR, RBS, kidney function tests, Liver function tests, viral markers). (2) Radiological: dynamic X-ray to exclude instability, C-T lumbosacral spine, and MRI lumbosacral spine with or without contrast.
- **Follow up after surgery with comparison between the two groups in the following:** Pain severity and frequency, length of hospital stay, and postoperative investigations including CT spine and MRI spine, the imaging examination was carried out whether the patient had any pathological conditions agreeably to accurate functional and neurological evaluation.

***Ethical Consideration*:**

**An approval of the study was obtained from Menoufia University academic and ethical committee. Every patient signed an informed written consent for acceptance of the operation. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.**

***Statistical analysis***

The collected data were tabulated and analyzed using SPSS version 16 software (Spss Inc, Chicago, ILL Company). Categorical data were presented as number and percentages. Chi square test ($X^2$), or Fisher's exact test (FET) were used to analyze categorical variables. Quantitative data were tested for normality using Kolomogrov Smirnove test assuming normality at P>0.05. Quantitative data were expressed as mean ± standard deviation, median and range. Student "t" test was used to analyze normally distributed variables among 2 independent groups, or Man Whitney U test for nonparametric ones. Spearman's correlation coefficient (rho) was used to assess correlation between non parametric variables. The accepted level of significance in this work was stated at 0.05 (P <0.05 was considered significant). *P value >0.05 is non-significant (N-S).P<0.05 is significant (S)*

**RESULTS**

The age in group 1 was ranged from 25 to 65 with mean ± SD = (47.1 ± 11.0) and mean age in group 2 was ranged from 20 to 63 with mean + SD = (41.6 ± 12.1). There is no significant difference between the two groups**.** Females were dominant in group (1) (**60%)** and were (**50%**) in group (2). There is no significant difference between the two groups. The BMI in group (1) was ranged from 20.7 to 37.2 with mean ± SD = (27.3 ± 4.26) and mean age in group (2) was ranged from 19.6 to 32.2 with mean ± SD = (25.8 ± 3.58). There is no significant difference between the two groups **(Table 1)**.

For work nature of the group (1): **55%** had a heavy work, **25%** had office work job, **10%** were a housewife and **10%** with no job while in group (2): **56%** had a heavy work, **31%** had office work job, **12.5%** were a house wife and the rest with no job. There is no significant difference between the two groups **(Table 2).**

In group (1): all of the patients presented with pain, (**85%**) of them with gradual onset, (**30%**) had the pain in the back (**50%**) in the lower limp and (**20%**) in both, (**70%**) have radiating pain, in (**75%**) of them pain had affecting their daily life and finally (**35%**) of the patients presented with pressure symptoms. In group (2): all of the patients presented with pain, (**87.5%**) of them with gradual onset, (**31.25%**) of the patients had the pain in the back (**43.75%**) in the lower limp and (**25%**) in both, (**50%**) have radiating pain, in (**75%**) of them pain had affecting their daily life and finally (**25%**) of the patients presented with pressure symptoms **(Table 3)**.

Medications used (80%) of the patients in group (1) were using NSAID, (10%) were using

Narcotics and the rest (10%) weren't using anything. While in group (2): (62.5%) were using NSAID, (25%) were using Narcotics and the rest (12.5%) weren't using anything. There is significant difference regarding the medications used **(Table 4)**.

There is significant difference regarding the general condition **(Table 5).**

In group (1): 75% of the patients had good pain improvement (60 – 90%) and the rest had moderate improvement (40 – 60 %) **(Table 6).**

In group (1) only 30% experienced intermittent pain while the rest have no pain. While in group (2) about 50% had an intermittent pain. There is no significant difference **(Table 7).**

In group (1) the mean days of hospital stay was (6.10 ± 1.6) while in Group (2) the mean days of hospital stay was (1.60 + 0.12). The group (2) has significant short hospital stay length than group (1) **(Table 8)**.

**Table (1): Demographic distribution between two groups.**

| | Group (1) N = 20 | Group (2) N = 16 | Mann-Whitney U |
|---|---|---|---|
| **Age (mean + SD)** | (47.1 ± 11.0) | (41.6 ± 12.1). | 0.285 |
| **Gender (%)** | Female = 60%<br>Male = 40% | Female = 50%<br>Male = 50% | 0.55 |
| **BMI (kg/m$^2$) (mean + SD)** | (27.3 ± 4.26) | (25.8 ± 3.58) | 0.66 |

**Table (2): Work nature in the two groups**

| Work nature (%) | Group (1) N = 20 | Group (2) N = 16 | P value |
|---|---|---|---|
| - **Heavy** | 11 (55%) | 9 (56.2%) | 0.94 |
| - **Office working** | 5 (25%) | 5 (31.2%) | 0.68 |
| - **House wife** | 2 (10%) | 2 (12.5) | 0.85 |
| - **None** | 2 (10%) | 0 | 0.19 |

**Table (3): The main complain in patients.**

| Complain (%) | Group (1) N = 20 | Group (2) N = 16 | P value |
|---|---|---|---|
| **Pain** | 100% | 100% | |
| **Gradual onset** | 17 (85%) | 14 (87.5%) | 0.85 |
| **Site:** | | | |
| - **Back** | 6 (30%) | 5 (31.25%) | 0,93 |
| - **Lower limp** | 10 (50%) | 2 (43.75%) | 0.71 |
| - **Both** | 4 (20%) | 4 (25%) | 0.72 |
| **With radiation** | 14 (70%) | 8 (50%) | 0,22 |
| **Affecting daily work** | 15 (75%) | 12 (75%) | - |
| **With pressure symptoms** | 7 (35%) | 4 (25%) | 0.5 |

**Table (4): Medications used in the two groups**

| Medications (%) | Group (1) N = 20 | Group (2) N = 16 | P value |
|---|---|---|---|
| **NSAID** | 16 (80%) | 10 (62.5%) | 0.23 |
| **Narcotics** | 2 (10%) | 4 (25%) | 0.18 |
| **None** | 2 (10%) | 2 (12.5) | 0.23 |

**Table (5): General conditions of the two groups**

| General condition (%) | Group (1) N = 20 | Group (2) N = 16 | P value |
|---|---|---|---|
| **Good** | 90% | 75% | |
| **Moderate** | 10% | 25% | 0.23 |
| **Poor** | - | - | |

**Table 6: Pain improvement between the two groups.**

| Pain improvement (%) | Group (1) N = 20 | Group (2) N = 16 | P value |
|---|---|---|---|
| **Good** | 15 (75%) | 13 (81.25%) | |
| **Moderate** | 5 (25%) | 3 (18.75%) | 0.63 |
| **Poor** | - | - | |
| **Not improved** | - | - | |
| **Worse** | - | - | |

**Table (7): Pain frequency between the two groups.**

| Pain frequency (%) | Group (1) N = 20 | Group (2) N = 16 | P value |
|---|---|---|---|
| **Continuous** | - | - | 0.22 |
| **Intermittent** | 6 (30%) | 8 (50%) | |
| **No pain** | 14 (70%) | 8 (50%) | |

**Table (8): Hospital length stay between the two groups.**

| | Group (1) N = 20 | Group (2) N = 16 | P value |
|---|---|---|---|
| **Hospital length stay (mean + SD) days** | (6.10 $\pm$ 1.6) | (1.60 + 0.12) | <0.001* |

## DISCUSSION

In the current study, the preoperative evaluations of the patients in both groups were performed in the same manner, and no differences were observed in terms of age, symptoms, and findings? As regard the Physical therapy needed, the preoperative pain improvement and frequency in both OD and MD groups, there was no significant difference between the two groups In addition, no statistical difference was found in the postoperative complication rates.

In our study there is no significant differences were found regarding the baseline characteristic of the study groups. These data similar to that of **Calikoglu and Murteza** [(10)] and **Garg at al.** [(11)] who found differences in characteristic of the study groups.

Also, in the preoperative and the operative data the both groups were similar. In the prospective randomized study by **Katayama *et al.*** [(4)] no difference was found between the results of classical and MD operations performed by the same surgeon, which is consistent with our results.

Regarding the postoperative follow up, there was no difference regarding postoperative pain improvement and frequency, CSF leak and need for physical therapy, both methods were effective. But MD group show shorter surgical time, shorter length of hospital stays, less bold loos volume and ealier the time needed to back to normal life.

**Schmid *et al.*** [(12)] compared MD and OD in their study and found that the duration of OD was shorter, and that the length of hospital stay was significantly shorter in MD, but they found no difference in terms of pre- and postoperative complications.

In the study by **Phan *et al.*** [(13)] large and comprehensive studies were evaluated and full endoscopic discectomy (FED), MD, and OD results were compared. Clinical outcomes were assessed using the visual analog scale and the Oswestry index (OSI) scales, with similar results observed between FED and OD as well as between MD and OD, without any significant differences between the groups. Furthermore, when all complications (recurrence, wound infections, nerve damage, and dural injury)

were evaluated both pre- and postoperatively, no difference was observed between the groups. Similarly, no difference has been observed in the clinical results of several other comparative studies. However, it has been reported that MED provides a serious advantage in terms of less paravertebral tissue traumatization, less blood loss, less bed rest, and persistent back pain.

Despite the relatively long duration of MD operation, **Ryang *et al.*** [(14)] have reported mildly better blood loss, lesser tissue damage and complications, and significantly better clinical outcomes.

**Henriksen *et al.*** [(15)] have reported, in a controlled and prospective study, that the reduction of the fascial incision and muscle dissection by a mean of 70–31 mm did not shorten the length of hospital stay and that there was no effect on the postoperative morbidity.

In this study, patients who underwent OD and MD in were evaluated, and no difference was observed between patients in the two groups in terms of clinical complications. However. For all ODs, incisions are made as small as possible and minimally invasive approaches are used. Because no significant difference was observed between both methods in our study, we believe that it is appropriate to use both methods in disk surgery.

## CONCLUSION

Based on the current analysis, endoscopic approach was associated with similar postoperative pain improvement and frequency and lower operating time, blood loss and hospital stay in comparison to open approaches. We believe that both techniques are safe, and both can be used to lumber disk surgery, but microscopic technique is preferred for its better outcomes.

## REFERENCES


1. **Kaner T (2010):** Minimum two-year follow-up of cases with recurrent disc herniation treated with microdiscectomy and posterior dynamic transpedicular stabilisation. The Open Orthopaedics Journal, 4: 120-124.
2. **Liyew W (2020):** Clinical Presentations of Lumbar Disc Degeneration and Lumbosacral Nerve Lesions.
3. **Rasmussen C (2005):** Rates of lumbar disc surgery before and after implementation of multidisciplinary nonsurgical spine clinics. Spine, 30: 2469-2473.
4. **Katayama Y, Yukihiro M, Hisatake Y *et al.* (2006):** Comparison of Surgical Outcomes between Macro Discectomy and Micro Discectomy for Lumbar Disc Herniation: A Prospective Randomized Study with Surgery Performed by the Same Spine Surgeon. Clinical Spine Surgery, 19: 344–47.
5. **Goodman S (2009):** Differential Diagnosis for Physical Therapists: screening for referaral.Saunders. Elsevier . https://www.amazon.com/Differential-Diagnosis-Physical-Therapists-Screening/dp/0721606199
6. **Jaikumar S (2002):** History of minimally invasive spine surgery. Neurosurgery, 5: 1-14.
7. **Kreiner D (2014):** An evidence-based clinical guideline for the diagnosis and treatment of lumbar disc herniation with radiculopathy. The Spine Journal, 14: 180-191.
8. **Vroomen P, de Krom M, Wilmink J *et al.* (2002):** Diagnostic value of history and physical examination in patients suspected of lumbosacral nerve root compression. J Neurol Neurosurg Psychiatry, 72(5):630–4.
9. **Veresciagina K, Bronius S, Kazys V *et al.* (2010):** Clinical outcomes of patients with lumbar disc herniation, selected for one-level open-discectomy and microdiscectomy. European Spine Journal, 19: 1450-1458.
10. **Calikoglu C, Murteza C (2018):** Open Discectomy vs. Microdiscectomy: Results from 519 Patients Operated for Lumbar Disc Herniation. The Eurasian Journal of Medicine, 50: 178–81.
11. **Garg B, Upendra B, Arvind J (2011):** Microendoscopic versus Open Discectomy for Lumbar Disc Herniation: A Prospective Randomised Study. Journal of Orthopaedic Surgery, 19: 30–34.
12. **Schmid S, Wechsler C, Farshad M *et al.* (2016):** Surgery for Lumbar Disc Herniation: Analysis of 500 Consecutive Patients Treated in an Interdisciplinary Spine Centre. Journal of Clinical Neuroscience, 27: 40–43.
13. **Phan K, Joshua X, Konrad S *et al.* (2017):** Full-Endoscopic versus Micro-Endoscopic and Open Discectomy: A Systematic Review and Meta-Analysis of Outcomes and Complications. Clinical Neurology and Neurosurgery, 154 (2017): 1–12.
14. **Ryang Y, Markus F, Lothar M *et al.* (2008):** Standard Open Microdiscectomy versus Minimal Access Trocar Microdiscectomy: Results of a Prospective Randomized Study. Neurosurgery, 62: 174–82.
15. **Henriksen L, Eskesen V, Jantzen E (1996):** A Controlled Study of Microsurgical versus Standard Lumbar Discectomy. British Journal of Neurosurgery, 10: 289–94.