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Assessment of Efficacy of Endoscopic Discectomy as a Line of Management for Herniation of Lumbar Disc

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ABSTRACT

Background: The majority of studies show positive results when treating lumbar disc herniations with open discectomy, which is the method of choice according to many writers. Even if traditional discectomy produces results that are equivalent, microdiscectomy is currently considered as the gold standard.

Aim of work: This study aimed to investigate the endoscopic lumbar discectomy's efficacy, safety, and outcomes for patients with a herniated lumbar disc.

Subjects and Methods: From April 2020 to May 2021, 18 patients with a herniated lumbar disc underwent endoscopic lumbar discectomy in the Department of Orthopedics at Zagazig University Hospitals. Thorough history and precise clinical examination were done for all the participating. All patients underwent the preoperative imaging tests as Lumbo-sacral spine plain x-ray, Lumbo-sacral spine CT scan and Lumbar-sacral spine MRI. Then, patients with lumbar disc herniation who had symptoms that persist after six weeks of conservative treatment or who had neurological deficits are frequently considered for surgical treatment (Endoscopic Discectomy). Three to twelve months was the follow-up period.

Results: Postoperatively, VAS score was significantly lower than it was before the procedure. Postoperatively, ODI score was significantly lower than it was before the procedure. 11.1% experienced an unintentional durotomy, 5.6% experienced a superficial infection, and 83.3% experienced no postoperative complications with a statistically significant difference.

Conclusion: Endoscopic lumbar discectomy is a minimally invasive procedure that starts with a small incision in the skin for better cosmetic results and avoidance of tissue dissection to reduce intra-operative blood loss, iatrogenic devascularization, and denervation of the paraspinous muscles.

Keywords: Endoscopic, Discectomy, Lumbar, Disc.

INTRODUCTION

Sciatica and low back pain are two of the most common and disabling spine diseases in medical history [1, 2]. Smith and Foley developed the micro-endoscopic discectomy system in 1997, allowing spinal surgeons to decompress a symptomatic lumbar nerve root using tubular retractors that preserve the integrity of the supporting muscles and ligaments. By splitting the muscle rather than cutting it, this system can reduce postoperative back pain by reducing muscle damage. It is less invasive than other minimally invasive surgical lumbar discectomy approaches in that it reduces tissue stress, allows direct view of nerve root and disc disorders, and allows bone decompression without nerve root injury or tear as a result of the surgical approach [3].

The micro-endoscopic discectomy (MED) technique preserves the ligamentum flavum, epidural adipose tissue and vascular tissue, which improves outcomes and decreases peridural fibrosis, making reoperation safer and easier [4]. MED can effectively remove massive, uncontained lumbar disc herniations. We can make the most of our efforts if we utilize tight selection criteria. The biggest indicator is single- or multi-level radiculopathy brought on by a large, uncontained, single-level herniation of the lumbar disc [5]. Multifidus-sparing MED, a less invasive alternative to conventional microdiscectomy, allows for adequate retrieval of highly migrated intracanal lumbar disc herniations [6].

The MED's multifidus-sparing method and minimum skin incision enhanced clinical outcomes [7]. Transforaminal endoscopic discectomy and foraminotomy is a minimally invasive treatment approach for spondylolisthesis and lumbar radiculopathy that does not necessitate the removal of as many unstable facet joints as standard laminectomy and medial facetectomy. Endoscopic fenestration is a safe and efficient therapy option for patients with degenerative lumbar stenosis. It keeps the spine stable and allows for proper neural element decompression. Despite the popularity of lumbar micro-endoscopic discectomy, which involves a shorter operation and hospital stay, many spinal surgeons prefer open discectomy [8,9].

AIM OF WORK

Endoscopic lumbar discectomy's efficacy, safety, and outcomes for patients with a herniated lumbar disc are the focus of this study.

METHODS

18 patients with a herniated lumbar disc underwent endoscopic lumbar discectomy in the Orthopedics Department, Zagazig University Hospitals between April 2020 and May 2021. **Inclusion criteria:** Patients

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with motor, sensory, or visceral impairments brought on by a single-level posterolateral herniated lumbar disc.

Exclusion criteria: Patients with clinical manifestations caused by a De-novo single level postero-lateral herniated lumbar disc who had not responded to conservative treatment for more than six weeks.

A complete history of each participant patient was documented in detail. The two primary parts of the clinical examination performed on all subjects were the general examination and the neurological examination. Preoperative imaging exams including lumbar-sacral spine MRI, lumbar-sacral spine CT scan, and lumbar-sacral spine plain x-ray were performed for all patients. Then, individuals with lumbar disc herniation who had neurological deficits or whose symptoms persisted after six weeks of conservative treatment were usually considered for surgical treatment (Endoscopic Discectomy).

The follow-up time ranged from three to twelve months. Given that the clinical manifestations of lumbar disc herniation are predominantly subjective, the assessment of the surgical result was largely based on the patient's self-assessment and improvement in back pain and radicular discomfort. The post-operative results were based on the same two scaling schemes that were employed before the procedure: The Oswestry Disability Index (ODI) and the Visual Analogue Scale (VAS). Regarding the follow-up radiologically, it was achieved through postero-anterior views of the lumbosacral spine on a plain X-ray for some patients one day after surgery to measure the size of the done fenestration, C.T. lumbosacral spine with three-dimensional reconstruction to precisely determine the size of the performed fenestration that is required for surgery in some instances and to estimate the amount of bone removal and MRI of the lumbosacral spine with or without contrast (in non-relieved or complicated cases with persistent symptoms or intolerable radicular pain following surgery).

Ethic consent:

The study was carried out in conformity with the Helsinki Declaration and approve from The Local Ethics Committees [IRB]. Before any of the participants actually took part in the study, their written informed consents were requested.

Statistics/data analysis

Data were displayed as tables and graphs, and categorical qualitative variables were reported as absolute frequencies (number), relative frequencies for continuous quantitative variables and mean ± SD & median (range) for continuous quantitative variables. Statistical Package of Social Services version 26 (SPSS) was used to analyse the data that had been gathered (percentage). Following a normality check, appropriate statistical tests of significance were applied. When the statistically significant probability was equal or less than 0.05 (P 0.05), the findings were deemed to be significant and those < 0.001 as highly significant.

RESULTS

The study showed that 72.2% of patients had a contained disc, 27.8% had a ruptured disc, 33.3% had thick lamina, 27.8% had a sequestered fragment, 11.1% had hypertrophied flavum, and 5.6% had conjoint root, with hypertrophied flavum and conjoint root showing a statistically significant difference (Table 1).

Table (1): Results of the operations

	N=18	%	χ2	p
Contained disc	**13**	**72.2**	**13**	**0.096**
Ruptured disc	**5**	**27.8**	**13**	**0.096**
Thick lamina	**6**	**33.3**	**12**	**0.239**
Sequestrated fragment	**5**	**27.8**	**13**	**0.096**
Hypertrophied flavum	**2**	**11.1**	**16**	**0.001****
Conjoint root	**1**	**5.6**	**17**	**0.001****

22.2% of patients had surgery that lasted 45 to 55 minutes, 27.8% had surgery that lasted 60 to 70 minutes, 38.9% had surgery that lasted 75 to 90 minutes, and 11.1% had surgery that lasted 120 minutes, with a statistically non-significant difference. The average time for surgery was 75 minutes, with a range of 45 to 120 minutes (Table 2).

Table (2): The distribution of the patients who were studied based on how long they had surgery

	N=18	%
45 – 55 minutes	**4**	**22.2**
60 – 70 minutes	**5**	**27.8**
75 – 90 minutes	**7**	**38.9**
120 minutes	**2**	**11.1**
χ2	**2.889**	
P	**0.409**	

Table (3) cleared that there was a statistically significant difference in the amount of blood loss between those who lost less than 100 milliliters and those who lost between 100 and 200 milliliters.75 cc of blood were lost on average (range: 30-200 cc).

Table (3): The patients' distribution according to the amount of blood lost

	N=18	%
50 - <100 ml	**14**	**77.8**
100 – 200 ml	**4**	**22.2**
χ2	**14**	
P	**0.031***	

44.4% of surgery wounds measured between 2 and 3 centimeters, while 55.6% measured greater than or equal to 3 centimeters, with a statistically non-significant difference. The average size of the wound was 2.9 cm, with a range of 2.5-3.5 cm (Table 4).

Table (4): The distribution of the examined patients by wound size

	N=18	%
2 - <3 cm	**8**	**44.4**
3 – 4 cm	**10**	**55.6**
χ^2	**10**	
p	**0.815**	

Postoperatively, the VAS score was significantly lower than it was before the procedure. The mean VAS before surgery was 7.889 (range, 7-9), while the mean VAS after surgery was 1.772 (range, 1-3) (Table 5).

Table (5): Pre- and post-operative VAS distribution of the studied patients

	Preoperative	**Postoperative**
	N=18 (%)	**N=18 (%)**
1	**0 (0)**	**8 (44.4)**
2	**0 (0)**	**7 (38.9)**
3	**0 (0)**	**3 (16.7)**
7	**7 (38.9)**	**0 (0)**
8	**6 (33.3)**	**0 (0)**
9	**5 (27.8)**	**0 (0)**
Mean ± SD	**7.889 ± 0.832**	**1.772 ± 0.752**
T	**37**	
P	**0.001****	

Postoperatively, the ODI score was significantly lower than it was before the procedure. The average ODI before surgery was 74.778 (range, 60-94), while the average ODI after surgery was 17.778 (range, 10-26) (Table 6).

Table (6): The distribution of the patients who were studied based on their pre- and post-operative ODI

	Preoperative	**Postoperative**
	N=18 (%)	**N=18 (%)**
0 – 20	**0 (0)**	**14 (77.8)**
21 – 40	**0 (0)**	**4 (22.2)**
41 – 60	**0 (0)**	**0 (0)**
61 – 80	**12 (66.7)**	**0 (0)**
81 - 100	**6 (33.3)**	**0 (0)**
Mean ± SD	**74.778 ± 10.762**	**17.778 ± 4.596**
T	**27.018**	
P	**0.001****	

Table (7) shows that 11.1% experienced an unintentional durotomy, 5.6% experienced a superficial infection, and 83.3% experienced no postoperative complications with a statistically significant difference.

Table (7): The distribution of the studied patients according to the surgical complications that were encountered

	N=18	**%**
No	**15**	**83.3**
Superficial infection	**1**	**5.6**
Unintended durotomy	**2**	**11.1**
χ^2	**20.333**	
P	**<0.001****	

DISCUSSION

Many authors considered open discectomy to be the gold standard for treating lumbar disc herniations, and the majority of trials had positive results. Although conventional discectomy produces equivalent results, microdiscectomy is currently considered the gold standard. The success rate of microdiscectomy is also between 88% and 98.5%. Both methods have yielded good surgical results in patients with disc prolapse over time [10].

Regarding the length of skin incision in our research, it varied between 2.5 and 3.5 centimeters (mean: 2.9 centimeters). **Righesso *et al*.** [11] cleared that the length of the skin incisions ranged from 1.9 to 2.3 centimeters (mean 2.1 centimeters). While, **Teli *et al.*** [12] revealed that the average length of their skin incisions was 1 cm).

Surgery time in our work ranged from 45 to 120 minutes, with a mean of 75 minutes. In the early cases of the study, surgeries took longer to complete. The majority of publications that discuss MED as an alternative to standard microscopic discectomy match our figures well. **Oertel *et al.*** [13] found that surgery took on average 70 minutes, ranging from 25 to 210 minutes. **Brayda-Bruno *et al*.** [14] divided it into the first 30 cases (early learning curve), where the mean operative time was 110 minutes, and the last 30 cases (late learning curve), where the mean time was reduced to 75 minutes. The mean surgical time was 97 minutes. In **Casal-Moro *et al.*** [10] study, the mean operative time was 60 minutes. Over the course of the four-year study period, the mean operative time for series was 74.1 minutes, with a gradual decrease in duration.

The amount of blood lost in the current study was between 30 and 200 cc (mean 75 cc). In **Righesso *et al.*** [11] cleared that the mean amount of blood lost was 50 cc, with a range of 10 to 70 cc. **Garg *et al*.** [2] showed that the average amount of blood lost was 40 cc, with a range of 20-60 cc. Less blood loss occurred in the endoscopically treated patients as a result of that the endoscope's more cautious dissection of the paravertebral muscles combined with the amplification, which allowed for more effective hemostasis of the epidural vessels in a manner similar to that described by the microscopic technique [15].

Regarding complications, the procedure was well tolerated on an operational level, with few operative and postoperative (early and late) complications. The majority of complications occurred in the series' early operated patients. The majority of clinical series techniques demonstrated low morbidity, typically due to dural tears. Three patients had dural tears, which were all repaired intraoperatively using a small piece of Dura-Gen dural grafts matrix covered in fibrin glue and applied through the tubular retractor, and one patient had a delayed pseudomeningocele formation in a series of the first 100 consecutive patients treated with MED [16]. There were two dural tears (11.1%) in our study. All of them were fixed intraoperatively with a fat graft and gel foam, and none of them had CSF leaks or pseudomeningocele. Concerning this aspect, in **Choi and co.** [6] series, there were two (3%) cases of the thecal sac being injured with little CSF leakage and not requiring open repair.

Regarding postoperative infections, none of our patients had discitis or deep wound infections, but one of our patients (5.6%) had a surgical wound infection that was treated with frequent dressings and topical antibiotics. In **Brayda-Bruno** [14] study, 0.7% had superficial wound infections. In contrast, **Teli *et al*.** [12] showed that 1.4% of the patients had spondylodiscitis.

In our series, the preoperative VAS ranged from 7-9 (mean 7.89) to 1-3 (mean 1.77) and the immediate postoperative VAS ranged from 7-9 (mean 7.89). There was a difference between the immediate postoperative VAS and the preoperative VAS that was statistically significant. In addition, there was a statistically significant difference between the VAS at six months and before the procedure. However, there was no significant difference between the VAS at six months and one hour after surgery. **Choi *et al*.** [6] results are comparable to ours series, with a range of 6 to 10, the mean preoperative VAS for leg pain was 7.89. The mean VAS for leg pain at the most recent follow-up examination was 1.58, with a range of 0-7. A statistically significant improvement in VAS for leg pain was observed. **Righesso *et al.*** [11] cleared that the mean VAS was 7.9 (range 6-10), 2 (range 1-4) immediately postoperatively, 1 (range 0-6) six months postoperatively, and 1 (range 0-6) at the most recent follow-up. There was a statistically significant improvement in VAS over the various time periods that were examined. **Teli *et al*.** [12] demonstrated that the mean VAS before surgery was 8 (range: 7-9), and the mean VAS after surgery was 3 (range: 2-4). **Casal-Moro and others** [10] showed that the mean VAS for leg pain was 7.9 and decreased to 1.2 after two months of follow-up.

In our series, the ODI ranged from 60 to 94 (mean 74.78) before surgery, and it ranged from 10 to 26 (mean 17.78) immediately after surgery. The preoperative and immediate postoperative ODI were significantly different. In terms of ODI, our findings were comparable to those of **Choi *et al*.** [6], the mean ODI before surgery was 57.43, with a range of 34 to 89 and the mean ODI at the most recent follow-up examination was 11.52, with a range of 2 to 40. There was a statistically significant decrease in the ODI. In **Righesso and others** [11], the mean preoperative ODI was 54 (range 28-100), but it decreased to 10 (range 0-40) six months after surgery. There was a statistically significant decrease in ODI. **Teli *et al.*** [12] reported that the mean preoperative and postoperative ODIs were 40 and 15, respectively. In **Casal-Moro and Others** [10], the mean preoperative ODI was 69.6, and the mean postoperatively was 14.1. Based on these data, the procedure that was used to decompress the nerve root was effective.

Conclusion:

Endoscopic lumbar discectomy is a minimally invasive technique that begins with a tiny incision in the skin and avoids tissue dissection to prevent intra-operative blood loss, iatrogenic devascularization, and paraspinous muscle denervation. It also lowers the risk of post-operative epidural fibrosis by preserving the ligamentum flavum and epidural fat. It saves time in the operating room, ensures a favorable clinical outcome, and has a low rate of surgical complications. Endoscopic discectomy has a considerable influence and value on post-operative discomfort, early patient mobilization, and a return to ordinary daily activities with good quality of life, as well as a usual one-day hospital stay.

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References:

1. **Sato T, Ito T, Hirano T *et al.* (2011):** Low back pain in childhood and adolescence: assessment of sports activities. European Spine Journal, 20 (1): 94-99.
2. **Garg B, Nagraja B, Jayaswal A (2011):** Microendoscopic versus open discectomy for lumbar disc herniation: A prospective randomized study. J Orthop Surg (Hong Kong), 19: 30–4.
3. **Nakagawa Y, Yoshida M, Maia K (2005):** Microendoscopic Discectomy (MED) For Surgical Management of Lumbar Disc Disease: Technical Note. The Internet Journal of Spine Surgery, 2: 1-7.
4. **Li M, Yang H, Yang Q (2015):** Full-endoscopic technique discectomy versus microendoscopic discectomy for the surgical treatment of lumbar disc herniation. Pain Physician, 18: 359–363.
5. **Hussein M, Abdeldayem A, Mattar M (2014):** Surgical technique and effectiveness of microendoscopic discectomy for large uncontained lumbar disc herniations: a prospective, randomized, controlled study with 8 years of follow-up. Eur Spine J., 23: 1992-1999.
6. **Choi G, Lee H, Raiturker P *et al.* (2006):** Percutaneous endoscopic interlaminar discectomy for intracanalicular

disc herniations at L5-S1 using a rigid working channel endoscope. Neurosurgery, 58: ONS59-68.

7. **Tzaan C (2012):** Transforaminal percutaneous endoscopic lumbar discectomy. Chang Gung Med. J., 30: 226-34.
8. **Xu S, Tan S, Xia Q *et al*. (2010):** Bilateral decompression via unilateral fenestration using mobile microendoscopic discectomy technique for lumbar spinal stenosis. Orthop Surg., 2: 106–110.
9. **Schick U, Döhnert J, Richter A *et al.* (2002):** Microendoscopic lumbar discectomy versus open surgery: an intraoperative EMG study. Eur Spine J., 11: 20-6.
10. **Casal-Moro R, Castro-Menéndez M, Hernández-Blanco M *et al*. (2011):** Long-term outcome after microendoscopic diskectomy for lumbar disk herniation: a prospective clinical study with a 5-year follow-up. Neurosurgery, 68 (6): 1568-75.
11. **Righesso O, Falavigna A, Avanzi O (2007):** Comparison of open discectomy with microendoscopic discectomy in lumbar disc herniations: Results of a randomized controlled trial. Neurosurgery, 61: 545–9.
12. **Teli M, Lovi A, Brayda-Bruno M *et al.* (2010):** Higher Risk of Dural Tears and Recurrent Herniation with Lumbar Micro-Endoscopic Discectomy. European Spine Journal, 19: 443-450.
13. **Oertel J, Mondorf Y, Gaab R (2009):** A new endoscopic spine system: the first results with Easy GO. Springer-Verlag. Acta Neurochir., 151: 10271033.
14. **Brayda-Bruno M, Tibiletti M, Ito K *et al.* (2014):** Advances in the diagnosis of degenerated lumbar discs and their possible clinical application. Eur Spine J., 23 (3): 315–323.
15. **Shin A, Kim N, Shin C *et al.* (2008):** The efficacy of Microendoscopic discectomy in reducing iatrogenic muscle injury. J Neurosurg Spine, 8: 39–43.
16. **Blecher R, Anekstein Y, Mirovsky Y (2014):** Incidental dural tears during lumbar spine surgery: a retrospective case study of 84 degenerative lumbar spine patients. Asian Spine J., 8: 639-645.