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ORIGINAL ARTICLE

Transforaminal Endoscopic Lumbar Discectomy

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Abstract

Background: **Clinical problems might result from the structural and morphological changes brought on by lumbar degenerative disc degeneration. The medical costs and lost productivity that result from treating lumbar disc herniation (LDH) are a major burden on families, communities, and nations. Lumbar discectomy for prolapsed intervertebral disc associated with radicular symptoms in lower limb is probably the most widely performed spinal intervention.**

Aim: **Percutaneous transforaminal endoscopic lumbar discectomy is a less invasive approach for treating LDH, and the purpose of this study is to assess its efficacy.**

Patients and methods: **This study was conducted at the Neurosurgery Department, Ibn Sina Hospital Eldokky, AlGalaa Military Hospital, and Suez Canal University Hospital. Twenty cases with confirmed lumbar disc prolapse underwent percutaneous endoscopic lumbar discectomy using transforaminal approach discectomy.**

Results: **That the majority of the patients (60 %) were L4−L5 involved and 40 % were L5−S1 involved, while 65.7 % of the cases were males. Average age was 42.73 ± 9.14 years and mean BMI was 25.66 ± 3.58 kg/m^2. Patients' low back pain visual analog scale scores decreased significantly from preoperative to postoperative periods of 6 months.**

Conclusion: **Full endoscopic discectomy using the transforaminal approach may be an option to open surgery for L4−L5 and L5−S1 LDH.**

Keywords: Discectomy, Endoscopic, Lumbar

1. Introduction

Changes in anatomy and shape brought on by lumbar degenerative disc degeneration are the root of many patients' problems. The medical costs and lost productivity that result from treating lumbar disc herniation (LDH) are a major burden on families, communities, and nations.[1] Lumbar discectomy for prolapsed intervertebral disc associated with radicular symptoms in lower limb is probably the most widely performed spinal intervention.[2]

In both the industrialized and the developing world, LDH is a major cause of disability, accounting for a significant fraction of disability-adjusted life years.[3] Several techniques, such as the transforaminal, extraforaminal, and interlaminar approach, have been developed thanks to the advancement of more advanced endoscopes and tools the last few years. As L5−S1 has particularly challenging anatomy between the broad transverse processes, facets, because of the limited disc space and the iliac crest, lumbar spinal stenosis, and disc herniation are typically treated by the interlaminar technique.[4] Due to its anatomical similarities to open surgery, interlaminar (PELD) is well-known among spine surgeons.

The Endospine by J. Destandeau, a conic 'free-hand' working channel, and the Metrx system by Medtronic, a tubular retractor, are two of the devices that Foley and Smith have proposed for endoscopic interlaminar approach.[5]

Surgeons continue to have trouble with PELD despite the extraordinary progress of endoscopic tools and techniques that allow for satisfactory results equivalent to traditional open surgery.[6,7]

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Incomplete disc fragment removal, a high learning curve, the potential for recurrence, and the risk of radiation exposure are the primary sources of anxiety failure during PELD is a potential problem that might prevent its use. However, the spine's osseous structure might restrict the instruments' range of motion. Percutaneous transforaminal endoscopic lumbar discectomy is a minimally invasive treatment for LDH, and this study aims to assess its efficacy.[8,9]

2. Patients and methods

All of the research for this article took place at the Neurosurgery Department, Ibn Sina hospital Eldokky, AlGalaa Military Hospital, and Suez Canal University Hospital.

2.1. Study population

Twenty cases diagnosed with lumbar disc prolapse and processed with PELD through transforaminal approach discectomy were included in this study.

2.2. Inclusion criteria

Cases were selected if they fulfilled any of the following conditions for lumbar disc prolapse: positive nerve root tension sign, radiculopathy, clinical evidence of a sensory or motor neurologic deficit, MRI shows the lumbar spine demonstrating disc prolapse, consistent with clinical symptoms. There was a failure of conservative therapy after 12 weeks for a single-level disc prolapse.

2.3. Exclusion criteria

These patients were not included in the analysis: severe lumbar stenosis. In addition, lumbar instability (radiographic evidence of >3 mm of slippage to neighboring vertebra during flexion and extension), central canal stenosis, lateral recess stenosis, disc herniation coupled with calcification, recurrent cases, more than one level disc prolapse, trauma, infection, coupled with psychological diseases, tumors, or immune metabolic diseases.

2.4. Methods

All cases have been resolved: (a) an exhaustive study of the past, (b) a medical checkup, (c) research projects as regular laboratory tests: liver and kidney function, PT, PTT, and INR, as well as a complete blood count, erythrocyte sedimentation rate, and C-reactive protein.

2.5. Statistical analysis

Microsoft Excel was used to code, input, and analyze information gleaned from the patient's medical history, physical examination, and outcome measures. After that, we brought our data into SPSS 23.0 Version (IBM,Armonk,New York,Unites State) to analyze it. These tests were performed to determine statistical significance among groups, using qualitative information shown as numbers and percentages and quantitative information shown as mean ± SD. χ^2 analysis of connection and dissimilarity between qualitative variables. *t*-test comparisons between quantitatively distinct groups. The thresholds for numerical significance ($P < 0.05$) and great significance ($P < 0.001$) were established as follows.

3. Results

Table 1 showed that mean age was 42.73 ± 9.14 years and mean BMI was 25.66 ± 3.58 kg/m^2, while 65 % (13 patients) of the patients were males and 35 % (seven patients) were females.

Table 2 demonstrated that the average operational time, wound length, blood loss, and hospital stay are all detailed here. Total operative time was 128.5 min, wound length was 2.64 cm, blood loss was 106.3 ml, and hospital stay (days) was 1.56.

Table 3 demonstrated that patients' low back pain visual analog scale (VAS) scores decreased significantly between preoperative and postoperative time periods of 6 months as in mean ± SD in preoperative was 7.68 ± 1.65, in postoperative was 2.91 ± 0.852 and in 6-month follow up was 1.72 ± 0.643 with *P* value less than 0.001 which

Table 1. Demographic data distribution among the studied patients.

Variables	Studied patients ($N = 20$)
Age (years) (mean ± SD)	42.73 ± 9.14
Sex [*n* (%)]	
Male	13 (65)
Female	7 (35)
BMI (kg/m^2) (mean ± SD)	25.66 ± 5.83

Table 2. Operative data among the studied patients.

	Studied patients ($N = 20$) (mean ± SD)
Operative duration (min)	128.5 ± 31.78
Wound length (cm)	2.64 ± 0.087
Blood loss (ml)	106.3 ± 49.65
Hospital stay (days)	1.56 ± 0.317

Table 3. Patient visual analog scale data for low back pain.

Low back pain VAS	Studied patients ($N = 20$) (mean ± SD)
Preoperative	7.68 ± 1.65
Postoperative	2.91 ± 0.852
6-months follow up	1.72 ± 0.643
Fr test	<0.001

Table 4. Radicular pain visual analog scale among the studied patients.

Radicular pain VAS	Studied patients ($N = 20$) (mean ± SD)
Preoperative	7.64 ± 1.57
Postoperative	2.83 ± 0.882
6-month follow up	1.53 ± 0.562
Fr test	<0.001

showed high significant difference between the studied groups (Fig. 1).

Table 4 showed that the participants in this study had a statistically significant reduction in radicular pain VAS from preoperative to postoperative periods of 6 months as in mean ± SD in preoperative was 7.64 ± 1.57, in postoperative was 2.83 ± 0.882 and in 6-month follow up was 1.53 ± 0.562 with *P* value less than 0.001 which showed high significant difference between the studied groups (Fig. 2).

Table 5 showed that there a significant reduction in Oswestry disability index (ODI) from preoperative to 6-month postoperatively among studied patients as in mean ± SD in preoperative was 42.5 ± 4.92, in postoperative was 22.61 ± 4.35 and in 6-month follow up was 17.42 ± 2.58 with *P* value less than 0.001 which showed high significant difference between the studied groups (Fig. 3).

Table 6 showed that majority of the patients were excellent (75 %, 15 patients), while 20 % (four patients) were good, and 5 % (one patient) were fair.

Table 7 showed that the most found complication was dysesthesia (15 %, three patients) followed by wound infection and discitis (10 %, two patients) in each complication then dural tear (5 %, one patients) (Fig. 4).

4. Discussion

LDH is a clinically symptomatic disorder characterized by the compression of spinal nerve roots by projecting disc debris, causing low back pain and sciatica as the most prevalent symptoms. If the doctor-prescribed treatment does not work, surgical intervention is an option.[10]

Spine surgery aims to decompress neural structures while protecting the spinal column's most vital components – muscles, facet joints, ligaments, and bone.[11]

Our data showed that the average age of our patients was 42.73 ± 9.14 years, the average BMI was 25.66 ± 3.58 kg/m^2, and that 65 % of our patients were men.

According to Daoud *et al.*[11] who set out to assess the early experience of transforaminal endoscopic lumbar discectomy, surgical technique, complications, and overall results, the average patient was 41.14 ± 11.60 years old; 33 (66 %) patients were male,

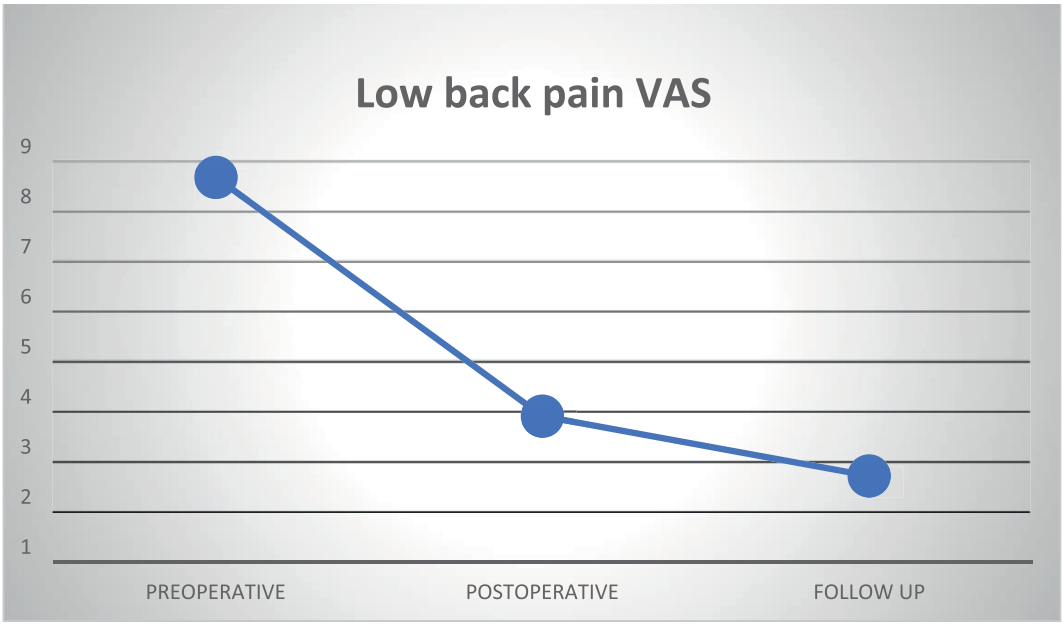

Fig. 1. Low back pain VAS among the studied patients. VAS, visual analog scale.

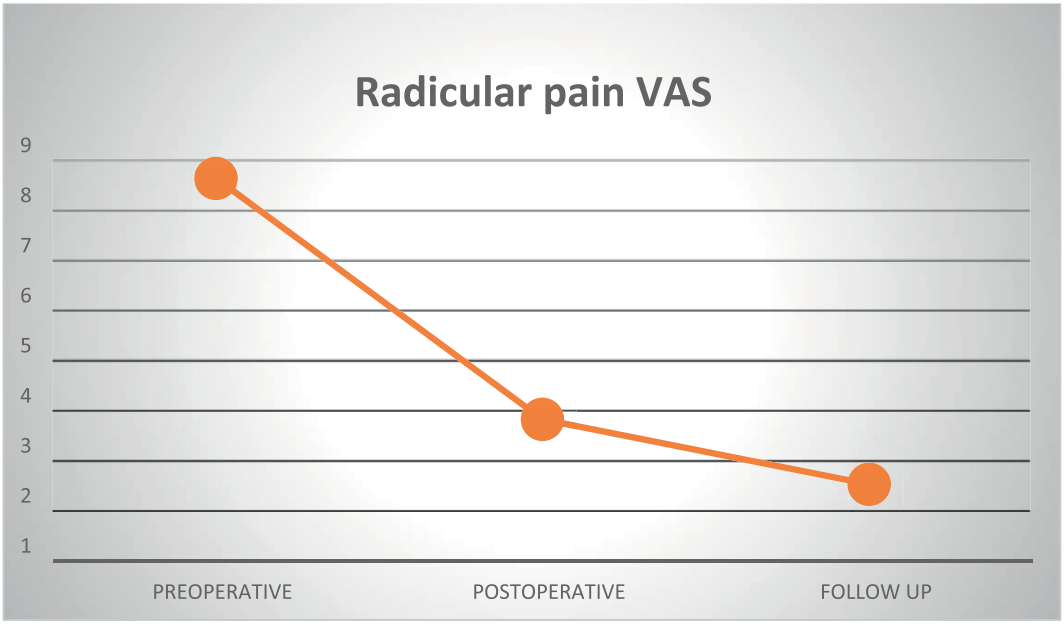

Fig. 2. Radicular pain VAS among the studied patients. VAS, visual analog scale.

Table 5. Oswestry disability index among the studied patients.

Oswestry disability index	Studied patients ($N = 20$) (mean ± SD)
Preoperative	42.5 ± 4.92
Postoperative	22.61 ± 4.35
6-month follow up	17.42 ± 2.58
Fr test	<0.001

Table 6. Outcome according to modified MacNab's criteria among the studied patients.

	Studied patients ($N = 20$) [n (%)]
Excellent	15 (75)
Good	4 (20)
Fair	1 (5)
Poor	0

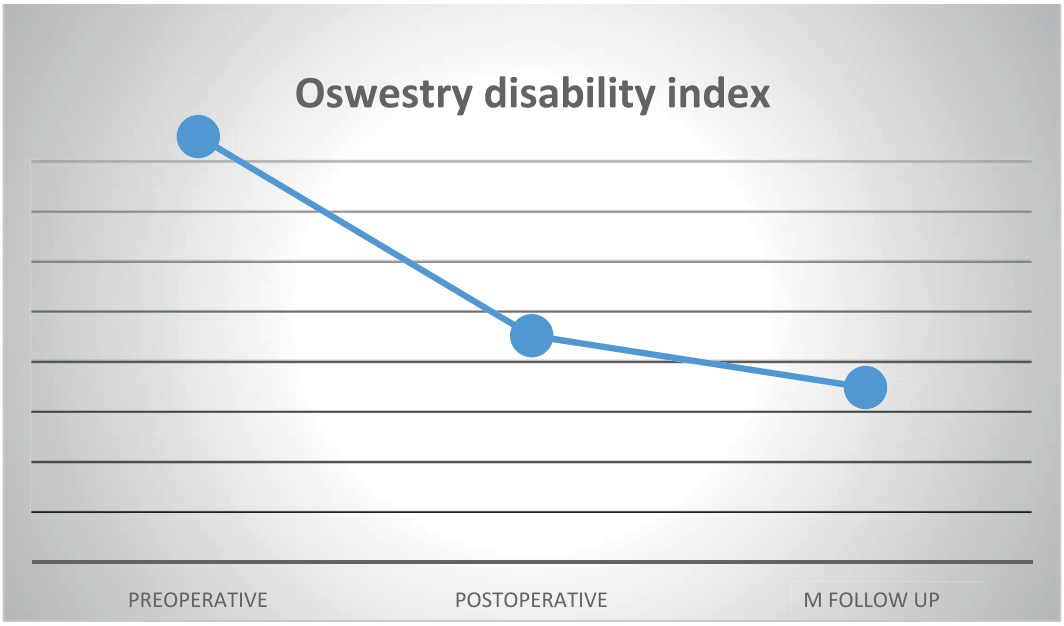

Fig. 3. Oswestry disability index among the studied patients.

Table 7. Complications among the studied patients.

	Studied patients ($N = 20$) [n (%)]
Dural tear	1 (5)
Superficial wound infection	2 (10)
Discitis	2 (10)
Dysesthesia	3 (15)

while 17 (34 %) patients were female. The prevalence of LDP being higher in males is consistent with the results of the great majority of research. The mean age of 72 patients who underwent PTED was 41.78 ± 13.00, their BMI was 25.73 ± 4.90 and there were 42 males and 29 females. These numbers are similar to those found in a retrospective research by Chen et al.[12] that aimed to match the security and effectiveness of PTED and open fenestration discectomy for the treatment of LDH.

Our study found that the average length of hospital stay was 1.56 days, the average length of surgery was 128.5 min, the average length of wounds was 2.64 cm, and the average amount of blood lost was 106.3 ml.

Yu et al.[13] conducted a study to determine whether PTED leads to better clinical outcomes compared with microendoscopic discectomy in the surgical management of single-level LDH. They found that the operation time was 71.2 ± 15.1 min in the PTED group and 69.4 ± 12.5 min in the MED group, with no significant difference detected ($P = 0.518$). The PTED group had a lower incision length ($P < 0.001$), and their intraoperative blood loss was 18.6 6.3 ml, compared to 45.2 ± 21.8 ml in the MED group ($P < 0.001$).

The operating time, hospital stay, and time to return to work for the TELD group were all drastically reduced as compared to the group studied by Ahn.[14] For the TELD cohort, the average duration of surgery was 49.38 ± 13.87 min, and the average length of hospitalization was 2.1 ± 1.1 days.

In our study there was a significant decline in low back pain VAS from preoperative to 6-month postoperatively among the studied patients. Preoperative VAS (7.68 ± 1.65) comparing to postoperative (2.91 ± 0.852) and 6-month follow up (1.72 ± 0.643).

Also there was a significant decrease in radicular pain VAS from preoperative to 6-month postoperatively among the studied patients. Change from 7.64 ± 1.57 preoperative to 1.53 ± 0.562 after 6-month follow up.

Daoud et al.[11] found that the mean VAS score for back pain before surgery was 6.80 ± 1.12 and that it decreased significantly after surgery, at 1, 6, and 12 months postoperatively, to 2.70 ± 0.890, 1.68 ± 0.819, and 1.52 ± 0.68. There was a very statistically significant correlation between preoperative VAS sciatica scores and all postoperative values ($P < 0.001$), with the mean VAS scores being 7.64 ± 0.76, 2.32 ± 0.74, 1.80 ± 0.78, and 1.54 ± 0.696, respectively.

This agrees with the results of Ahn,[14] who found that the average VAS score for back pain decreased from 5.07 ± 2.00 to 1.91 ± 1.01 in the TELD group, and that the average VAS score for radicular pain decreased from 6.57 ± 2.31 to 1.44 ± 1.02.

In this study there was a significant reduction in ODI from preoperative to 6-month postoperatively among studied patients. It decline from 42.5 ± 4.92 (mean ± SD) preoperative to 22.61 ± 4.35 postoperative then to 17.42 ± 2.58 after 6-month period.

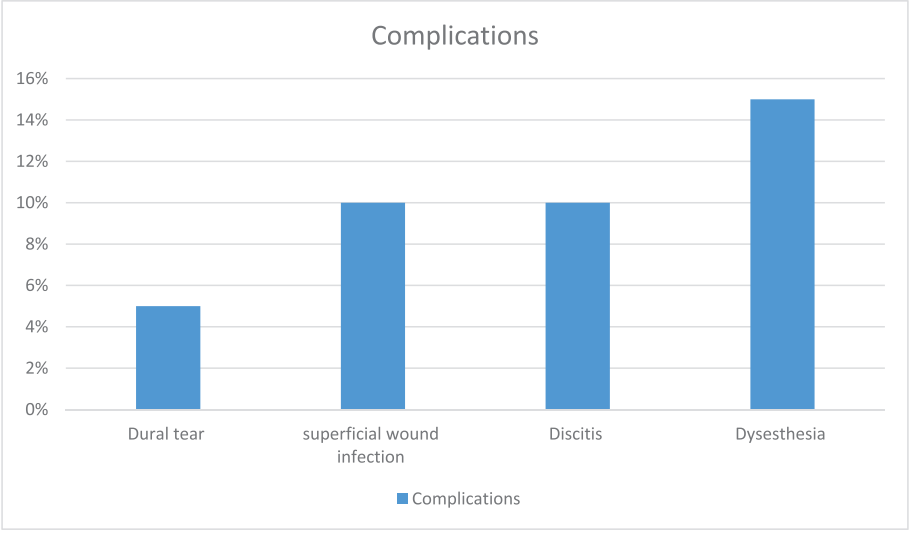

Fig. 4. Complications among the studied patients.

We are supported by Daoud et al.[11] founded that the mean ODI preoperatively, 6, and 12-month postoperatively as follow 41.68 ± 0.476, 23.76 ± 2.42, 14.60 ± 2.68, and statistically it was high significant ($P < 0.001$).

This also come in agreement with Ahn[14] founded that the mean ODI improved from 63.59 ± 15.57 to 13.88 ± 12.16 % in the TELD group.

In this study the most found complication was dysesthesia (15 %) followed by wound infection and discitis (10 %).

With regards to complications, Ahn[14] observed that the TELD group experienced seven (4.8 %) occurrences. Postoperative dysesthesia was the most common problem that arose after surgery. Due to irritation or tethering of the departing nerve root, four patients reported postoperative dysesthesia with hypesthesia or temporary weakness. There was one incidence of an epidural hematoma, one case of a hematoma in the psoas muscle and one case of a dural tear, all of which required open surgery to correct. No incidences of either mild or severe infection occurred in the TELD group.

4.1. Conclusion

The minimally invasive surgical procedure of transforaminal endoscopic lumbar discectomy has successfully treated numerous patients with LDH with excellent results. Minimal soft-tissue injury, shorter surgical and hospitalization stays, a low complication rate and early return to work are only some of the benefits of this approach, despite the lengthy learning curve.

A lack of comparison to alternative approaches may have impacted our assessments of the results, and the study's small sample size and short follow-up period are limitations. The clinical outcomes should be evaluated in larger, more well-designed comparative investigations as well as prospective, randomized, controlled trials.

Ethical statement

Ethical approval and consent done in college council (Al Azhar university) on 18/7/2017.

Conflicts of interest

There are no conflicts of interest.

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