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Original Research Article

Randomized study of functional outcome of microdiscectomy versus endoscopic lumbar discectomy in lumbar disc herniations

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Abstract

Objectives: To evaluate and compare the functional outcome of Lumbar disc herniations treated by open microscopic discectomy and endoscopic lumbar discectomy assesed by VAS AND ODI AND SF-36 score.To compare intraoperative blood loss, duration of surgery, length of hospital stays between the mentioned two groups.

Methods: Our study consists of 30 cases of lumbar disc herniations operated with microdiscectomy / endoscopic lumbar discectomy at Sanjay Gandhi institute of trauma and orthopaedics Bengalore. from december 2020 to december 2022 with follow up period of 12months for each patient after the surgery. Functional outcome was assessed through VAS AND ODI AND SF-36 score in every visit.

Results: The mean Age (Years) was 35.67 ± 6.36. out of 30 patients 15 (50.0%) of the participants had Group: OLM. 15 (50.0%) of the participants had Group: ELD. (46.7%) of the betweenthe2groupsintermsofDurationofSurgery (Minutes)(W=212.000,p=<0.001),with the median Duration Of Surgery (Minutes) being highest in the Group: OLM group.There was a significant difference between the 2 groups in terms of Blood Loss (mL) (W = 222.500, p = <0.001), with the median Blood Loss (mL) being highest in the Group: OLM group. there was a significant difference between the 2 groups in terms of improvement in VAS,ODI, and SF-36 score during the first 3 months of postoperative follow up. But after 3 months there Were no statistically significant changes between these 2 groups.

Interpretation and conclusion: The clinical results of endoscopic discectomy are similar to those of microdiscectomy in regard to improvement in radiated pain and disability but offer an advantage in relationit causes lesser soft tissue dissection, preservation of bony structures and allows early recovary of the patients,and it could lead to less surgical time, and blood loss. Endoscopic discectomy is a safe and effective technique,representing an alternative to the gold standard microdiscectomy.

Key words: lumbar disc herniations, open lumbar microdiscectomy, endoscopic lumbar discectomy, lumbar instability.

Introduction

Lumbar disc herniations is a common medical condition with incidence rate of 40% [1]with a pathological process that leads to spinal surgery. LDH is considered to be the most prevalent disc herniations and always causes signs and symptoms. One of the most challenging medical problem is sciatica symptoms [2]. The nerve root compression caused by bulge of the nucleus pulposus and the secondary inflammatory reaction represent two crucial factors that result in

lumbosacral redicular syndrome. With the aggravation of LDH, incontinence may develop.
Currently, early conservative treatment is used when the symptoms are mild. However surgery is adopted if symptoms worsen over the time.
Various Surgerical treatments are proposed for LDH. The Classic surgical treatment is open lumbar discectomy with partial laminectomy. Williams [3] described the concept of open lumbar microdiscectomy (OLM), which became the gold standard of surgical treatment for LDH so far. OLM is a minimally invasive surgery with microscopic, but also results in muscle damage partial laminectomy, and nerve retraction. This is prone to develop lumbar instability in future, of which 10% or more will become clinically symptomatic [4-7].
Endoscopic lumbar discectomy (ELD) has become popular over the past few years for the treatment of LDH. Recently, some reports[8, 9] suggested that ELD could be an alternative treatment for LDH with comparative clinic outcomes to conventional open lumbar discectomy.

Advantages of endoscopic lumbar discectomy (ELD)

1. ELD causes lesser soft tissue dissection,
2. ELD allows preservation of bony structures
3. ELD allows for early recovery of the patient.
4. ELD could lead to less surgical time, and blood loss.

Several studies have tried to investigate the clinical outcomes between ELD and OLM on clinical outcome, complication rate and reoperation rate in treating lumbar disc herniation, however, their results favour ELD in term of the stated parameter [2, 10-13]. Thus, in this study, we are conducting randomised control studies to estimate the effectiveness of ELD compared with OLM for lumbar disc herniation and to demonstrate which approach is better for treatment of LDH.

Review of literature

1. Published work by Mayer *et al*.[11] comparedendoscopic discectomy with microsurgical discectomy. This randomised prospective study with a two-year follow-up compared two cohorts of patients matched for age, sex, occupation, pre-operative complaints, conservative therapy, disability and symptomatology. Results showed that those who underwent percutaneous endoscopic discectomy had significantly greater resolution of back pain, leg pain and sensory deficit. This cohort of patients also returned to their occupation in 95 per cent of cases, whereas in the micro-discectomy group, only 72.2 per cent of patients returned to their former occupation.
2. Lee *et al*.[10]published work comparing the radiologic evaluation of endoscopic lumbar discectomy and open micro-discectomy. In this study, 60 patients, matched for sex, age and disc level, were assigned to each treatment arm and followed up for three years. Results showed superior clinical scores in the endoscopic group but without clinical significance. In addition, there was preservation of disc height and foraminal height in the endoscopic group, with the conclusion that the percutaneous endoscopic lumbar discectomy provides a less- invasive technique.
3. Hermantin *et al*[15]. published their work in a prospective, randomised study comparing the results of open discectomy with those of video-assisted arthroscopic micro-discectomy. Sixty patients were divided into two groups: the first group would undergo an open laminotomyand discectomy (Group 1), while patients in Group 2 would undergo a video-assisted arthroscopic micro-discectomy. Follow-up ranged from 19 to 42 months. Results showed that clinical parameters were similar in both groups; however, the post-operative disability andthe need for narcotics were less in Group 2, and patients in this group also returned to work more quickly.
4. Yeung *et al*.[9] published results on posterolateral endoscopic excision for lumbar disc herniation – a retrospective study of 307 patients assessed at least one year after the index

procedure. Surgeon-performed assessments demonstrated satisfactory results in 89.3 per cent of cases, while 90.7 per cent of patients said they would undergo the same procedure again if faced with a similar disc herniation. The combined complication rate was 3.5 per cent. The author suggests that outcomes of endoscopic micro-discectomy appear to be comparable with traditional, open, trans-canal micro-discectomy.

5. Amit jhala *et al*, and manish mistry *et al*, states that endoscopic discectomy is minimally invasive procedure for discectomy and results of this procedure acceptable, safe and effective
6. Guilherme meyer *et al* statesthat postoperative pain and disability improvement is more effective in endoscopic lumbar discectomy compare to microdiscectomy study donein 2020 with sample size of 47 patients.
7. Wenfeng ruhan *et al*, Fan feng *et al*,done randomized controlled trials in 2016 with sample size of 1398 patients and states that endoscopic discectomy leads to less operation time and hospital stay than microscopic discectomy.

Materials and Methods

Source of data:Data collected from patients presenting with lumbar disc herniations satisfying inclusion criteria admitted in Sanjay Gandhi Institute Of Trauma and Orthopaedics, Bangalore.

Method of collection of data

a. Study design: Randomisedstudy
b. Study period: December 2020 to December 2022
c. Place of study: Sanjay Gandhi Institute of Trauma and Orthopaedics, Bangalore.
d. Sample size:30(15+15) calculated using OpenEpi

Inclusion criteria

1. Patients with symptoms not improved with conservative treatment(for at least 6 weeks of treatment)
2. Patients with LDH with detoriating neurological deficits 3.age -18-70 years
3. Cauda equina syndrome caused due to LDH
4. ability to understand the content of the subject information / informed consent form andto be willing to participate in the clinical investigation

Exclusion criteria

1. Age less than 18 and more than 70 yrs
2. LDH Symptoms improving with conservative treatment
3. LDH with spondylolysthesis
4. LDH with unstability of lumbar spine which requires stabilization 5.LDH with spinal canal stenosis

Methodology

After obtaining the institutional ethics committee clearance and written informed consent, the in-patients in the Department of Orthopaedics fulfilling the inclusion criteria will be enrolled in the study.

Each patient will be given a unique identity number. Demographic data, medical history, concomitant medications, physical examination, clinical examination including recording of vital signs, details of surgery will be recorded in the study proforma and relevant radiological investigations as mentioned in the assessment tools will be done at baseline visit. (visit 1).as per results of randomization these patients will undergo either microscopic or endoscopic lumbar discectomy.Follow-up visits will be at 3 months (visit 1), 6months (visit 2), and 12

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months (visit 3) from the date of surgery. At follow-up visits, patient is evaluated clinically (improve in disability and pain relief)Based on these data the final outcome is assessed.

Assessment of results

Demographic data of age, sex, preoperative diagnosis, level of lumbar spine involvement was collected from both the groups. Intraoperative blood loss, duration of surgery, duration of hospital stay was also compared between two groups. Patients were asked to follow up at 3 months,6 months, 12 months, Clinical outcome was assessed by VAS, ODI score and SF 36 scores

Statistical analysis

Demographic data- age, sex, diagnosis, level of involvement, duration of surgery, duration of hospital stay was compared by skewness of data, Shapiro – wilk test. And their respective association compared by Wilcoxon- Mann- Whitney test. Clinical assessment by VAS, ODI and SF 36 scores.

CASE -1

35yr male with complaints right lower limb radiating pain since 6 months

Fig 1: Pre operative MRI shows L4-L5 lumbar disc prolapse

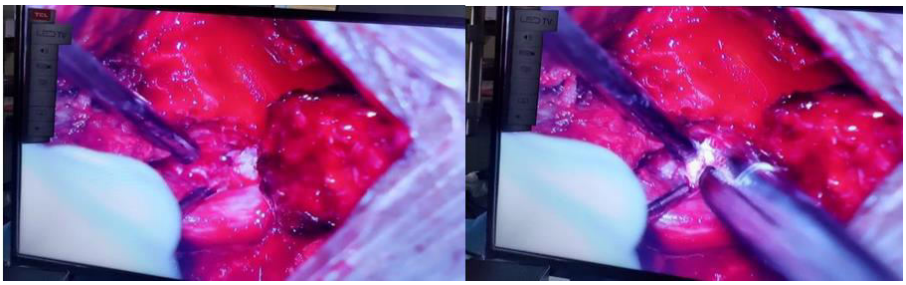

Fig 2: Intra-operative pictures

CASE -2

40yr male with complaints right lower limb radiating pain since 8 months

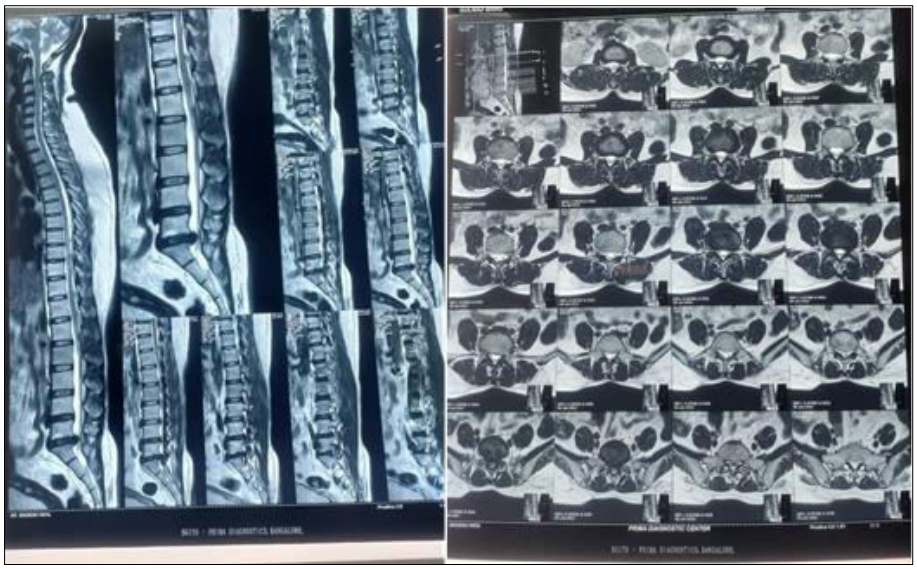

Fig 3: Pre operative MRI shows L5-S1 lumbar disc Herniation

Operated with endoscopic lumbar discectomy

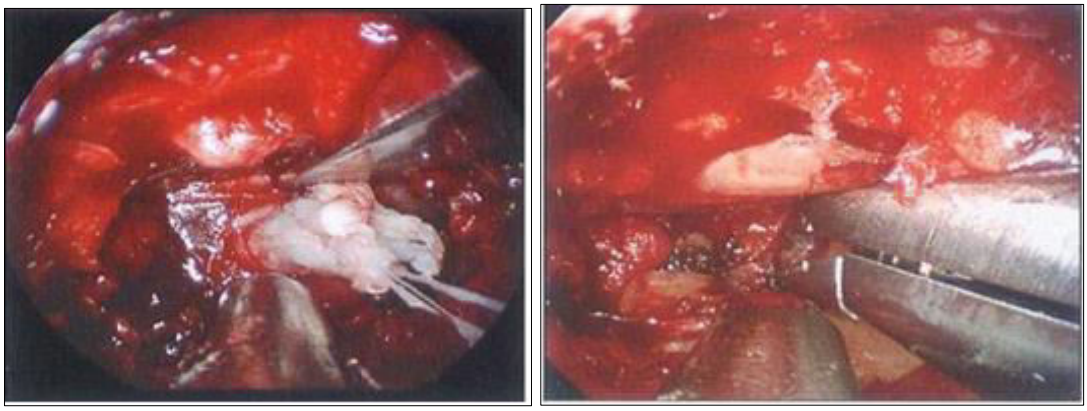

Fig 4: Intra-operative pictures

Results

15 (50.0%) of the participants had Group: OLM. 15 (50.0%) of the participants had Group: ELD.
The mean Age (Years) was 35.67 ± 6.36.
8 (26.7%) of the participants had Age: 21-30 Years. 16 (53.3%) of the participants had Age: 31-40 Years. 6 (20.0%) of the participants had Age: 41-50 Years.
17 (56.7%) of the participants had Gender: Male. 13 (43.3%) of the participants had Gender: Female.
30 (100.0%) of the participants had Diagnosis: IVDP.
5 (16.7%) of the participants had Level: L3-L4. 11 (36.7%) of the participants had Level: L4-L5. 14 (46.7%) of the participants had Level: L5-S1.

Summary of Basic Details

Table 1: Summary of basic details

Basic Details	Mean ± SD || Median (IQR) || Min-Max || Frequency (%)
Group	
OLM	15 (50.0%)
ELD	15 (50.0%)
Age (Years)	35.67 ± 6.36 || 35.00 (30.25-39.50) || 24.00 - 48.00

Age	
21-30 Years	8(26.7%)

Table 2: Association between 'Group' and 'Duration of Surgery (Minutes)'

Basic Details	Mean ± SD || Median (IQR) || Min-Max || Frequency (%)
31-40 Years	16 (53.3%)
41-50 Years	6 (20.0%)
Gender	
Male	17 (56.7%)
Female	13 (43.3%)
Diagnosis (IVDP)	30 (100.0%)
Level	
L3-L4	5 (16.7%)
L4-L5	11 (36.7%)
L5-S1	14 (46.7%)

There was a significant difference between the 2 groups in terms of Duration of Surgery (Minutes) (W =212.000, p = <0.001), with the median Duration of Surgery (Minutes) being highest in the Group: OLM group

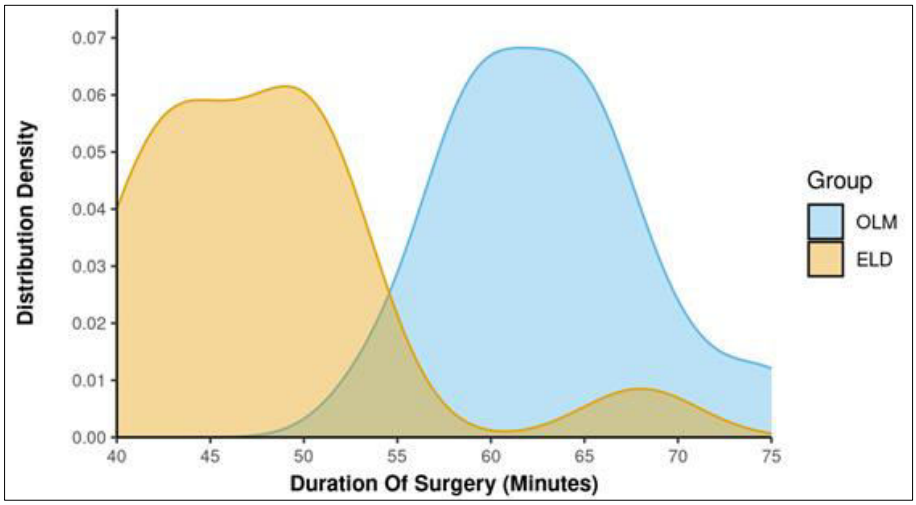

Fig5: Association between Group and Duration of Surgery (Minutes)

Table 3: Association between 'Group' and 'Blood Loss (mL)'

Blood Loss (mL)	Group		Wilcoxon-Mann- Whitney U Test	
	OLM	ELD	W	p value
Mean (SD)	118.00 (16.56)	76.00 (11.83)	222.500	<0.001
Median (IQR)	120 (100-120)	80 (75-80)		
Min - Max	100 - 150	50 - 100		

There was a significant difference between the 2 groups in terms of Blood Loss (mL) (W = 222.500, p = <0.001), with the median Blood Loss (mL) being highest in the Group: OLM group.
Strength of Association (Point-Biserial Correlation) = 0.83 (Large Effect Size)

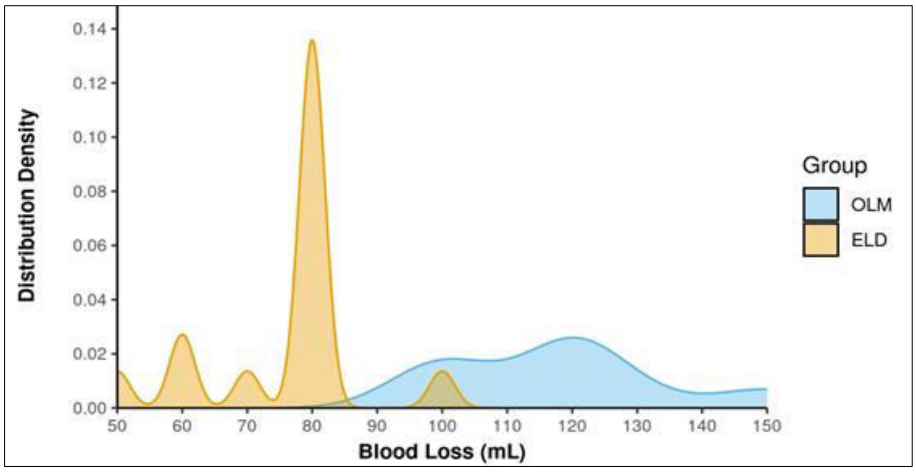

Fig 6: Association between Group and Blood Loss (mL)

Table 4: Association between 'Group' and 'Hospital Stay (Days)'

Hospital Stay (Days)	Group		Wilcoxon-Mann- Whitney U Test	
	OLM	ELD	W	p value
Mean (SD)	2.60 (0.74)	1.40 (0.51)	201.000	<0.001
Median (IQR)	2 (2-3)	1 (1-2)		
Min - Max	2 - 4	1 - 2		

There was a significant difference between the 2 groups in terms of Hospital Stay (Days) (W = 201.000, p = <0.001), with the median Hospital Stay (Days) being highest in the Group: OLM group.

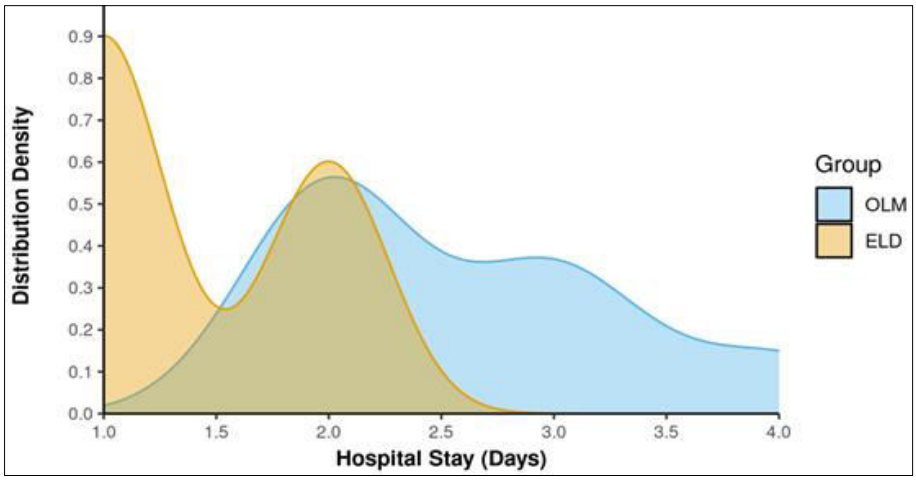

Fig 7: Association between Group and Hospital Stay (Days)

Table 5: Comparison of the two Groups in Terms of change in VAS Score over time

VAS Score	Group		P value for comparison of the two groups at each of the timepoints (Wilcoxon- Mann-Whitney Test)
	OLM	ELD	
	Mean (SD)	Mean (SD)	
Pre-Operative	7.80 (0.41)	7.60 (0.51)	0.251
Post-Operative	4.87 (0.52)	4.13 (0.52)	0.001
3 Months	3.87 (0.64)	3.27 (0.46)	0.009
6 Months	2.60 (0.51)	2.27 (0.46)	0.074
12 Months	1.20 (0.41)	1.20 (0.41)	1.000
P Value for change in VAS Score over time within each group (Friedman Test)	<0.001	<0.001	

Overall P Value for comparison of change in VAS Score over time between the two groups (Generalized Estimating Equations)	0.018	

The two groups differed significantly in terms of VAS Score at the following timepoints: Post-Operative, 3 Months.

The following is a line diagram depicting the change in VAS Score over time in the two groups.

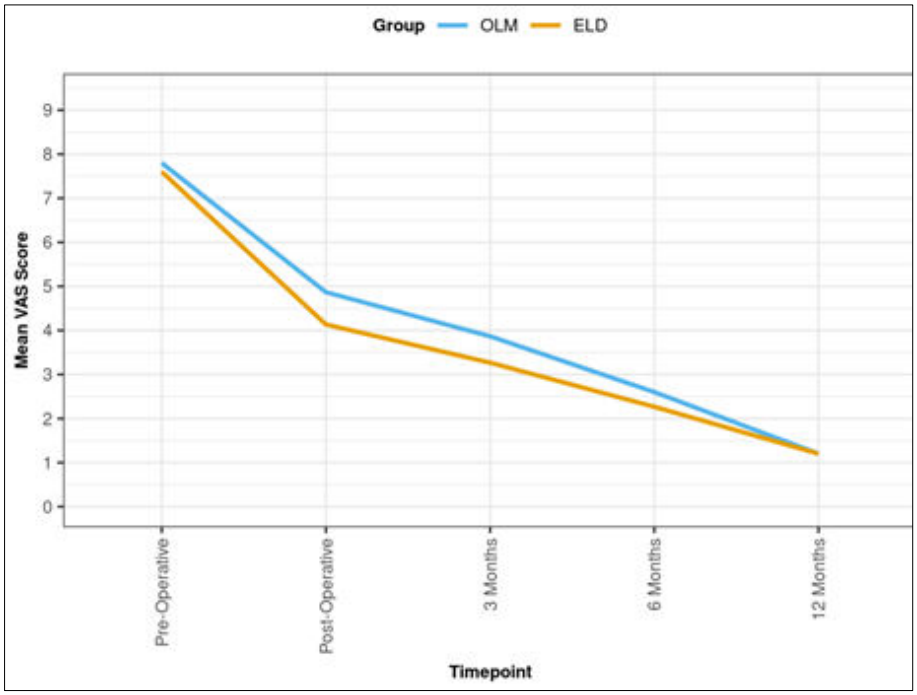

Fig 8: Change in VAS score over time

Table 6: Comparison of the two Groups in Terms of change in ODI Score over time

ODI Score	Group		P value for comparison of the two groups at each of the timepoints (Wilcoxon-Mann-Whitney Test)
	OLM	ELD	
	Mean (SD)	Mean (SD)	
Pre-Operative	71.00 (4.69)	70.40 (3.76)	0.558
Post-Operative	61.60 (3.92)	60.20 (4.25)	0.375
3 Months	41.00 (2.48)	33.67 (3.06)	<0.001
6 Months	18.93 (1.83)	18.67 (1.45)	0.773
12 Months	10.07 (1.39)	9.53 (1.13)	0.245
P Value for change in ODI Score over time within each group (Friedman Test)	<0.001	<0.001	
Overall P Value for comparison of change in ODI Score over time between the two groups (Generalized Estimating Equations)	<0.001		

The two groups differed significantly in terms of ODI Score at the following time points: 3 Months.

The following is a line diagram depicting the change in ODI Score over time in the two groups.

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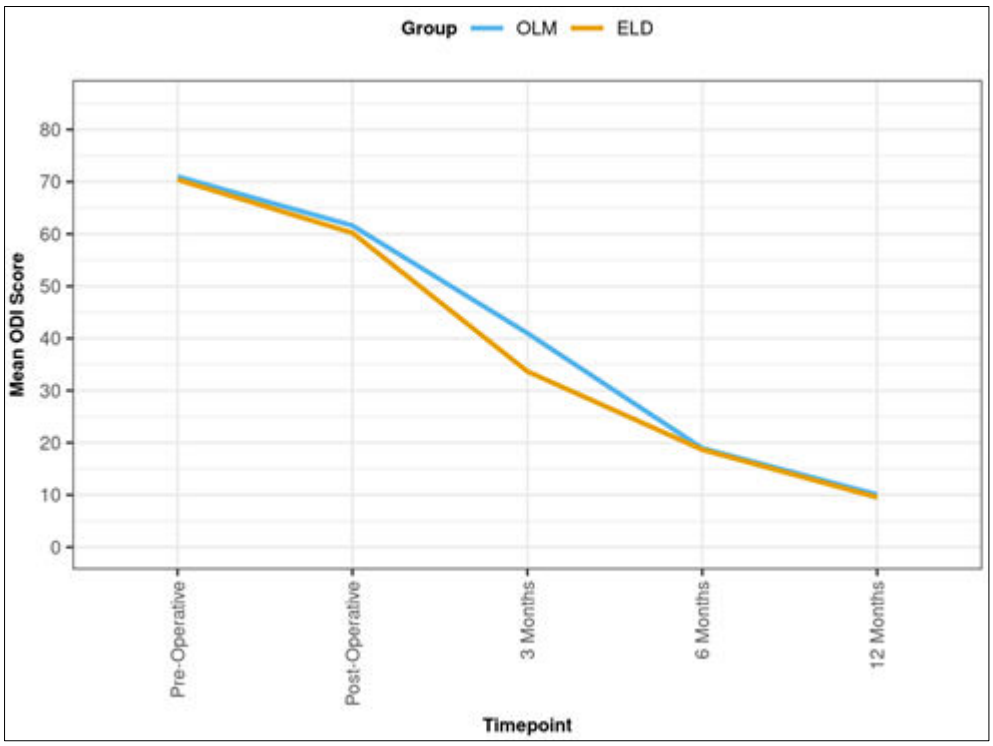

Fig 9: Change in ODI Score Over Time

Comparison of the two Groups in Terms of change in SF-36 Score over time

The two groups differed significantly in terms of SF-36 Score at the following timepoints: Post- Operative, 3 Months.
In Group: OLM, the mean SF-36 Score increased from a minimum of 10.93 at the Pre-Operative timepoint to a maximum of 84 at the 12 Months timepoint. This change was statistically significant (Friedman Test: $\chi 2 = 60.0$, $p = <0.001$).
In Group: ELD, the mean SF-36 Score decreased from a minimum of 10.73 at the Pre-Operative timepoint to a maximum of 87.83 at the 12 Months timepoint. This change was statistically significant (Friedman Test: $\chi 2 = 60.0$, $p = <0.001$).
The overall change in SF-36 Score over time was compared in the two groups using the Generalized Estimating Equations method. There was a significant difference in the trend of SF-36 Score over time between the two groups ($p = <0.001$).

Discussion

Thisrandomizedclinical study showed that the ELD is safe and Effective. results of the this study shows similar results to those found in literature [10,11,13,14,15]

- The mean Age (Years) was 35.67 ± 6.36.
  8 (26.7%) of the participants had Age: 21-30 Years. 16 (53.3%) of the participants had Age: 31-40 Years. 6 (20.0%) of the participants had Age: 41-50 Years.
  In our study most of the patient belongs to age group of 30-40 yrs with mean age of 35.67 ± 6.36.
- 17 (56.7%) of the participants had Gender: Male.
  13 (43.3%) of the participants had Gender: Female.
  In our study most of the lumbar disc herniation had noted in male patients as compare toFemale patient
- 5 (16.7%) of the participants had Level: L3-L4. 11 (36.7%) of the participants had

Level: L4-L5. 14 (46.7%) of the participants had Level: L5-S1. in our study group. patients had disc herniations Most commonly at L5-S1 level followed by L4-L5 level followed by L3-L4level which is least common type of herniation.

- Our study shows. There was a significant difference in duration of surgery in both groups. Mean duration of surgery in open lumbar microdiscectomy was 62.93 minutes.Where as Mean duration of surgery in endoscopic discectomy was 50 minutes.Thus endoscopic Lumbar discectomy is less time consuming than open lumbar microdiscectomy.
- Our study shows there was a significant intraoperative blood loss in open lumbar Microdiscectomy as compared to endoscopic lumbar discectomy. With mean blood Loss in OLM was 118ml where as mean blood loss in ELD was 76 ml.
- In our study post operative duration was hospital stay was more in patients operated with OML with mean duration of hospital stay was 2.6 days. as compared to patients operatedwith ELD with mean duration was 1.4 days which is significant[10, 11, 15].
- Our study shows the both groups differed significantly in terms of VAS Score at the following time points: Post-Operative, 3 Months. Vas score is significantly decreased in post operative,and at 3 months follow up in patients operated with ELD as compared to in patients operated with OLM. This indicates early functional recovery in patients treated with ELD. After 3 months there is no significant difference in vas score in both groups. Similar to results those found in literature [10, 15]
- Our study shows the both groups differed significantly in terms ofODIat the following time points: Post-Operative, 3 Months.ODIis significantly decreased in post
- operative,and at 3 months follow up in patients operated with ELD as compared to in patients operated with OLM. This indicates early functional recovery in patients treated with ELD. After 3 months there is no significant difference in ODI in both groups. Similar to results those found in literature [15]
- Our study shows the both groups differed significantly in terms of SF-36 score at the following time points: Post-Operative, 3 Months. SF-36 score is significantly increased in post operative,and at 3 months follow up in patients operated with ELD as compared to in patients operated with OLM. This indicates early functional recovery in patients treated with ELD. After 3 months there is no significant difference in SF-36 score in both groups. Similar to results those found in literature

Conclusion

The clinical results of endoscopic discectomy are similar to those of microdiscectomy in regard to improvement in radiated pain and disability but offer an advantage in relationit causes lesser soft tissue dissection, preservation of bony structures and allows early recovary of the patients,and it could lead to less surgical time, and blood loss.Endoscopic discectomy is a safe and effective technique, representing an alternative to the gold standard microdiscectomy.

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