

**A PROSPECTIVE OBSERVATIONAL STUDY OF RISK FACTORS AND PROGNOSIS
OF SURGICAL PROCEDURES FOR LUMBAR DISK HERNIATION**

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Abstract

Introduction: Surgery for lumbar disc herniation (LDH) has shown some of the most promising results; yet, it is fraught with difficulties. One of the consequences of primary surgery is recurrent disc herniation. In the literature, the reported incidence of recurrent disc herniation ranges from 0.5% to 23%. Several studies have identified both modifiable and non-modifiable risk factors. Although many surgical treatment approaches have been used to treat recurrent disc herniation, there is significant variation among surgeons.

Materials and methods: This is a prospective, observational study conducted over a period of two years from January 2022 to December 2022 in Kurnool Medical College, Kurnool. Patients admitted in neurosurgery ward for surgical management were included. For the 100 selected patients the demographic profile, clinical profile, radiological profile and the surgical interventions done were studied. After the initial clinical assessment, MRI of the lumbar spine was done in all patients to assess the position, level, and type of herniation of the intervertebral disc. Surgical procedures consisted of classical microlumbar discectomy, minimally invasive discectomy, and Laminectomy and discectomy. All patients were followed up at least 12 months after surgeries for the presence of persistence of symptoms, neurological deficit and complications.

Results: Among the 100 patients, 15 patients were aged 21 to 30 years (15%), 26 patients were aged 31 to 40 years (26%), 30 patients were aged 41 to 50 years (30 %), 10 patients were aged 51 to 60 years (21 %) and 8 were aged above 60 years (8 %). The youngest patient was aged 21 years and the eldest patient was aged 67 years with a mean age of 44.25 ± 3.20 years. Out of 100 patients 56 / 100 (56 %) were males and 44 / 100 (44 %) were females with a male to female ratio of 1.29:1

Conclusion: Lumbar Disc Herniation was commonly observed in the middle age with a male predilection. Risk factors like age, overweight, high BMI and diabetes mellitus had poor

outcomes. Surgery for LDH was safe with a success rate of (92.5 %). Minimally invasive surgery is the best procedure for the younger age group. The surgical outcome was influenced by age of the patient, level of lesion, type of disc and surgical technique.

Key Words: lumbar disc herniation, MRI, BMI, diabetes mellitus, LDH.

INTRODUCTION

Surgery for lumbar disc herniation (LDH) has shown some of the most promising results; yet, it is fraught with difficulties. One of the consequences of primary surgery is recurrent disc herniation. In the literature, the reported incidence of recurrent disc herniation ranges from 0.5% to 23%.¹ Several studies have identified both modifiable and non-modifiable risk factors. Although many surgical treatment approaches have been used to treat recurrent disc herniation, there is significant variation among surgeons. The reasons for the disparities in perspectives may be linked to clinical and biomechanical aspects involved in the post-surgery prognosis. Knowledge of the various risk factors and surgical procedures might aid in the better planning of primary LDH treatment.²

The risk factors reported from studies resulting in recurrence following surgeries were age, gender, body mass index (BMI), smoking, herniation type, diabetes, and herniation level.³ Kim et al reported that men were at a higher risk than women. No such correlation between male gender and Disc surgeries was observed by others. Smoking according to some studies increased the recurrence.⁴ Intra-discal procedures were reported a success rate from 70 to 80 %. Immediate pain relief was reported in 75 % of the patients with microscopically assisted percutaneous nucleotomy (MAPN), 81.8 % success rate was achieved without leg pain as per Macnab criteria with endoscopic procedures. Japanese Orthopedic Association reported significant improvements on visual analog scale following hemi-laminoplasty.⁵ The standard discectomy showed recovery rate of 73.56 %. In this context the present prospective study was conducted to analyze the risk factors and their role in the prognosis of surgical procedures currently used for Lumbar disc herniation.

MATERIALS AND METHODS

Study Design: This is a prospective, observational study conducted over a period of two years from January 2022 to December 2022 in Kurnool Medical College, Kurnool. Patients admitted in neurosurgery ward for surgical management were included.

Inclusion Criteria:

- Patients with radicular pain and evidence of nerve root irritation were included.
- Patients with motor deficit.
- Patients with sensory deficit.
- Patients with radiological signs of herniated disc.

Exclusion criteria:

- Patients who have undergone prior lumbar surgery,
- Patients with scoliosis more than 15°
- Patients with segmental instability.
- Patients with Vertebral fractures.
- Patients with spine infection or tumor or inflammatory spondylo-arthritis.
- Patients with post-polio paralysis / motor neuron disease / connective tissue disorders.

Methods

For the 100 selected patients the demographic profile, clinical profile, radiological profile and the surgical interventions done were studied. After the initial clinical assessment, MRI of the lumbar spine was done in all patients to assess the position, level, and type of herniation of the intervertebral disc. Surgical procedures consisted of classical microlumbar discectomy, minimally invasive discectomy, and Laminectomy and discectomy. All patients were followed up at least 12 months after surgeries for the presence of persistence of symptoms, neurological deficit and complications. The Macnab criteria were used to determine the clinical outcome after Surgery. The reporting was graded as excellent, good, fair, or poor. Excellent Result: No complaints and was able to return to full working capacity.

Good Result: Full working capacity but slight low back and leg pain. Excellent results or good results were regarded as satisfactory outcomes. Fair Result: Patient does not have normal working capacity, low back and leg pain were reduced but the patient still required the administration of analgesics. Poor Result: The degree of pain was unchanged or worse and the patient required regular administration of analgesics.

Statistical Analysis: All the clinical data was entered in excel sheets and analyzed using www.socialscistatistics.com on the internet. The mean values, Standard deviation and percentages were calculated to express the incidences in the study.

RESULTS

Among the 100 patients, 15 patients were aged 21 to 30 years (15%), 26 patients were aged 31 to 40 years (26%), 30 patients were aged 41 to 50 years (30 %), 10 patients were aged 51 to 60 years (21 %) and 8 were aged above 60 years (8 %). The youngest patient was aged 21 years and the eldest patient was aged 67 years with a mean age of 44.25 ± 3.20 years. Out of 100 patients 56 / 100 (56 %) were males and 44 / 100 (44 %) were females with a male to female ratio of 1.29:1 (Table 1).

Age in years	No of patients	Percentage
21-30 years	15	15
31-40 years	26	26
41-50 years	30	30
51-60 years	21	21
>60 years	8	8

Table 1: Age distribution

Gender	No of patients	Percentage
Male	56	56
Female	44	44

Table 2: Gender distribution

Dural tear was observed exclusively in Laminectomy and Hemilaminectomy group, out of 9 / 32 (29.68 %) patients whereas recurrent disc prolapse was observed in 3 / 29 (08.62 %) patients of MIS group and 2 / 20 (09.70 %) patients of Microlumbar discectomy group. This observation was found to be statistically significant ($p < 0.001$).

Type of Surgery	21-30 years	31-40 years	41-50 years	51-60 years	>60 years
Laminectomy and discectomy - 32 Number Percentage	1 1%	4 4%	10 10%	11 11%	6 6%
Hemilaminectomy & discectomy -19 Number Percentage	2 2%	6 6%	6 7%	5 6%	0 0
Micro lumbar discectomy - 29 Number Percentage	5 5%	8 8%	12 12%	3 3%	1 1%
Minimally invasive discectomy - 20 Number Percentage	8 8%	10 10%	1 1%	1 1%	0 0
P-Value	0.001				

Table 3: Type of Surgery Adopted in Different Age Groups of the Subjects (n = 100)

Variable	21-30 years	31-40 years	41-50 years	51-60 years	>60 years
Mean weight in kg	66.45 ± 1.30	71.60 ± 2.05	74.45 ± 1.65	74.25 ± 3.10	69.15 ± 3.10
Mean Body Mass Index Kg / m	31.27 ± 0.63	33.12 ± 2.15	32.12 ± 2.50	33.10 ± 1.56	31.20 ± 2.51

Smoking (19)	4	4	5	3	3
Herniation type					
Protrusion (40)	7	11	13	7	2
Extrusion (45)	7	12	15	10	3
Sequestration (15)	3	3	2	4	3
Diabetes (19)	0	3	5	6	5
Spinal level Herniation					
L2-L3-2	0	1	1	0	1
L3-L4-10	2	4	2	1	1
L4-L5-61	5	13	15	5	11
L5-S1-27	3	6	6	2	3

Table 4: Incidence of Risk Factors among the Subjects

Complications	Laminectomy and discectomy	Hemilaminectomy and discectomy	Microlumbar discectomy	Minimally Invasive Discectomy	P-Value
Dural tear	8 (8%)	2 (2%)	0 (0)	0 (0)	0.001
Dural tear + CSF Leak,	1 (1%)	1 (1%)	1 (1%)	0 (0)	
Discitis	1 (1%)	1 (1%)	0 (0)	0 (0)	
Recurrent disc prolapse	0 (0)	0 (0)	2 (2)	2 (2)	
No Complications	22 (22%)	15 (15%)	26 (26%)	18 (18%)	
Total	32	19	29	20	

Table 5: Correlation between Type of Surgery and Complications in the Study

Variable	Excellent		Good		Fair		Poor		P Value
	N	%	N	%	N	%	N	%	
21-30 years	15	15%	1	1%	0	0	1	1%	0.001
31-40 years	17	17%	6	6%	1	1%	1	1%	
41-50 years	22	22%	5	5%	1	1%	1	1%	
51-60 years	10	10%	11	11%	0	0	0	0	
>60 years	1	1%	5	5%	2	2%	0	0	

Table 6: Demographic Profile Influencing the Surgical Outcome MAC NAB Outcome Scale

Risk factors	Excellent		Good		Fair		P Value
	N	Percentage	N	Percentage	N	Percentage	
Smoking							0.296
Yes	12	12%	4	4%	2	2%	
No	51	51%	24	24%	2	2%	
Diabetes mellitus							
Yes	9	9%	7	7%	1	1%	
No	55	55%	21	21%	3	3%	

Table 7: Correlation between MAC NAB Outcome Scale and Risk Factors in the Surgical Outcome of LDH

Variable	Excellent		Good		Fair		Poor	
	N	%	N	%	N	%	N	%
Laminectomy and discectomy	12	12%	17	17%	1	%	1	%
Hemilaminectomy And discectomy	12	12%	5	5%	1	%	1	%
Microlumbar discectomy	22	22%	4	4%	1	%	1	%
Minimally invasive discectomy	17	17%	1	%	1	%	1	%

Table 8: Surgical Interventions Influencing the Outcome in Different Types of Surgeries Performed in the Study Using MAC NAB Outcome Scale

DISCUSSION

The present study was done to assess the risk factors influencing surgical outcome in patients with lumbar disc herniation. Mean age of the patients was 44.25 ± 3.20 years. The maximum numbers of patients were in the age group 41-50 years, i. e., 30 cases (30%). Sidram et al, found the mean age of his patients was 45.9 years and they belonged to 40 - 49 years (33 %). Akbar et al, found the majority of their patients were aged between 31 and 45 years. In this study 56 / 100 (56%) were males and 44/ 100 (44 %) were females with a male to female ratio of 1.29:1.⁶

In the study by Sidram et al male to female ratio was 1.56, 61 %. Male to female ratio was 2.6:1 in the study done by Akbar et al. In the present study out of 100 patients 19 % were diabetics and 19 % were smokers. In the present study majority of patients had involvement of L4 - L5 (61 %), followed by L5 - S1 (27.5 %) involvement. L3 - L4 was involved in 10 % and least involvement in L2 - L3 level (1.5 %). In study by Sidram et al, L4 - L5 interspace was involved in 138 cases (68.0 %), L5-S1 in 52 cases (26.0 %), L3-L4 in 9 patients (4.5 %), and upper levels in 03 patients (1.5 %). Akbar et al observed that L4 - L5 in 48 patients (50 %), L5 - S1 in 35 (36.4 %),

L3 - L4 in 10 (10.4 %) and L2 - L3 in 3 cases (3.1%). In the present study, 45.5 % had extruded discs. Protruded disc was present in 40.5 %. The least was sequestered type 14 %.^{7,8} In study by Sidram et al the disc was protruded 54 % of the cases, extruded in 28 % of the cases, sequestered in 12 % of the cases and no bulge was observed in 6 % of the cases. In the present study, 1.5 % had lumbarization of vertebra and 11 % had sacralisation was observed. Surgical intervention was done in all; 64 / 200 patients underwent Laminectomy and discectomy (32 %).⁹

Hemilaminectomy and discectomy was done in 18.5 %, microlumbar discectomy in 29 % and MIS in 20.5 %. A statistically significant association was observed between type of surgery and age of the patient ($p < 0.001$). MIS was done mainly in younger age groups. In MIS group 46 % were of 31 - 40 age group, 41.5 % of 21 - 30 age and only two patients were aged > 50 years, which show statistically significant difference ($p < 0.001$). Microlumbar Discectomy was done mainly in 41-50 age groups (41.4 %). Laminectomy and Hemilaminectomy was preferred in elderly patients. In the Laminectomy group 34.4 % were of the 51-60 age group. Out of 52 Laminectomy cases only 10 patients were < 40 years. Hemilaminectomy was done mainly in the 41 - 50 age group (35.1 %) and 51 - 60 age group (35.1 %).¹⁰

CONCLUSION

Lumbar Disc Herniation was commonly observed in the middle age with a male predilection. Risk factors like age, overweight, high BMI and diabetes mellitus had poor outcomes. Surgery for LDH was safe with a success rate of (92.5 %). Minimally invasive surgery is the best procedure for the younger age group. The surgical outcome was influenced by age of the patient, level of lesion, type of disc and surgical technique.

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