

RISK FACTORS FOR RECURRENT LUMBAR DISC HERNIATION

Rony Louis¹, Lijo J Kollannur², Shaji U A³, Ranjith C G⁴

¹Assistant Professor, Department of Neurosurgery, Government Medical College, Thrissur, Kerala, India.

²Associate Professor, Department of Neurosurgery, Government Medical College, Thrissur, Kerala, India.

³Professor, Department of Neurosurgery, Government Medical College, Thrissur, Kerala, India

⁴Associate Professor, Department of Neurosurgery, Government Medical College, Thrissur, Kerala, India.

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Corresponding Author:

Dr. Rony Louis,
Email: drronylouis@gmail.com.

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Abstract

Background: Recurrent lumbar disc herniation (rLDH) is a major cause of post-operative morbidity and is predictive of poor outcomes after lumbar discectomy surgery. While studies describing risk factors for primary LDH are umpteen, very few studies attempted to delineate these risk factors of rLDH in our setting. Hence, the aim of this study is to evaluate the risk factors that could predict recurrent disc herniation in a patient population admitted and operated in a tertiary care hospital in Kerala, India. **Materials and Methods:** We retrospectively reviewed the medical records of all the patients who underwent lumbar discectomy for primary lumbar disc herniation, and patients who were admitted with rLDH requiring revision surgery, during the study period from January 2016 to December 2020 at Department of Neurosurgery, Government Medical College, Thrissur, India. Patients presenting with radicular pain for 6 weeks not responding to conservative management, with MRI showing lumbar disc herniation were considered for surgery and included in the primary group. This cohort was followed for a mean duration of 12 months to make sure they did not fall into the rLDH group. All patients with a recurrence of symptoms after a symptom free period of 6 months following lumbar discectomy with MRI findings suggestive of findings at the same side and level were included in the recurrent group. Age, gender, height, weight, BMI, history of smoking and alcohol consumption, Diabetes Mellitus and Hypertension were the variables studied **Results:** Mean age in the 2 groups were almost comparable 49.3±10.4years in the non-recurrence group vs 46.05±13.25years in the recurrence group. The male to female ratio of the non-recurrence cohort was 1.46:1, whereas in the recurrence cohort it was 1.75:1. Patients in the rLDH group had a higher average weight (73.77 ± 6.561 vs 69.57 ± 5.49) and higher BMI (26.35 vs 24.78) and were statistically significant. Only 36.9% of patients were smokers in the non-recurrence group in comparison to 40.9% in the recurrence cohort. 20.7% people in the non-recurrence group had diabetes mellitus when compared to 27.2% in the recurrence group. There was also a slightly higher incidence of hypertension (18.1% vs 12.6%) in the recurrence group. On comparing the occupational workload between the 2 groups, heavy workload had a significantly increased odds of rLDH (OR 13.39). **Conclusion:** Out of the variables studied gender, a higher average weight/BMI, heavy workload and smoking showed a statistically significant difference between the 2 cohorts.

INTRODUCTION

Lumbar discectomies done for disc herniation causing sciatica are one of the most commonly performed spinal surgeries in the world. There is a lot of research aimed at improving the outcome after this surgery. The results of this surgery are generally good

with satisfactory results reflecting patient contentment and functional improvement in 80 – 90% of patients. But recurrence following surgery is a cause of poor outcome with reported rates of 5 – 20%. Several studies have been conducted in foreign countries to determine the risk factors for recurrent lumbar disc herniation (rLDH). The commonly studied risk factors are age, history of smoking ,

gender, obesity, history of trauma, alcohol consumption etc. The aim of this study is to evaluate the risk factors in our setting for rLDH.

Among others, complications of lumbar discectomy are hematoma, infection, dural injury and nerve root injury.^[1] But, recurrent herniation is the most frequent of them all, and is a major contributor to debilitating pain, disability, and reoperation following primary surgery, and plays an important role in determining postoperative success.^[2] This complication invariably places an additional burden on the health care system and resources.

Hence identifying the robust risk factors for reherniation with a relevant effect size would be clinically beneficial, especially if those risk factors were modifiable “lifestyle” factors, such as smoking and body weight.^[3] Previously reported risk factors for recurrent disc herniation in global literature include constitutional weakness of the annular tissue, exposure to repetitive lifting or vibration, heavy lifting, advanced age, smoking, the preoperative size and level of the disc herniation and the appearance of the herniation at the time of surgery.^[4-8] Our study attempts to elucidate the same in an Indian population.

According to Swartz and Trost,^[9] reherniation is defined as the experience of another lumbar disc herniation more than six months after the index operation, at either ipsilateral or contralateral location.

MATERIALS AND METHODS

This was a retrospective cohort study, wherein we retrospectively reviewed the medical records of all the patients who underwent lumbar discectomy for primary lumbar disc herniation and all patients who were readmitted with rLDH, during the study period from January 2016 to December 2020 at Department of Neurosurgery, Government Medical College, Thrissur, India, after having obtained scientific and ethics committee approval. This hospital is a tertiary referral hospital and a centre for education and scientific research in South India. Patients were categorized into either of the 2 cohorts, those who sought treatment for primary lumbar disc herniation and did not have a recurrence at the end of a 12 month follow up and patients who sought treatment for recurrent LDH 6 months or more after having undergone surgery for primary disease in the same unit.

Inclusion and Exclusion Criteria

Patients presenting with radicular pain for 6 weeks not responding to conservative management with MRI showing lumbar disc herniation at a single level were considered for surgery and included in the primary group. All patients with a recurrence of symptoms after a symptom free period of 6 months following lumbar discectomy with MRI findings suggestive of findings at the same side and level were included in the recurrent group. Patients were

excluded if they had segmental spinal instability, spinal infections, and tumours involving vertebral bodies or history of prior surgery at another hospital. Patients with herniation recurrence at other levels, inability to undergo MRI exam (due to financial costs incurred), lost/died on follow up, incomplete medical records and neuropathic disease other than diabetes were excluded. All surgeries were performed by the same group of surgeons with similar technique of open laminectomy and discectomy.

Outcomes and Data Collection

Age, gender, height, weight, BMI, history of smoking, occupational load, Diabetes Mellitus and Hypertension were the variables studied. Weight and height measured preoperatively were collected and entered into the prospective patient registry. According to the WHO classification, overweight was defined as a BMI of 25.0 kg/m² or greater, and obesity was defined as a BMI of 30.0 kg/m² or greater.^[10] Smoking status was captured preoperatively from the existing medical database. “Non-smokers” included never-smokers and individuals who had ceased smoking at least 6 months preoperatively.

Statistical Analysis

All the analyses were performed applying SPSS statistical software version 13. Student T-tests were performed for continuous variables, whereas Chi square analyses and Fisher exact tests (contingency table analyses) were used for categorical variables depending on sample size. In the multivariate analysis, the difference among the two groups was tested with logistic regression for each variable separately. Two-sided P < 0.05 were considered significant.

RESULTS

The primary lumbar disc or the non-recurrence group had a total of 118 patients after excluding causes like spinal infections and tumours. Out of this 4 patients were lost to follow up and 3 did not have complete medical records (n=111). The recurrence group had 24 patients, not including patients whose primary surgery was done elsewhere or who had a recurrence at another vertebral level. But, 2 of them were dropped out of the study due to incomplete demographic data (n=22). The mean age in Group I was 49.3 years whereas it was 46.05 years in Group II and did not show a statistically significant difference. 59.4% of patients were males in the primary group in comparison to 63.6% in the recurrence group (p value 0.019), thus affirming that male gender was a risk factor for rLDH (OR = 1.193, 95% CI = 0.463-3.078). The average height in both the groups were same at 1.67 meters. By far the weight and BMI showed a statistically significant difference between the 2 cohorts (p value 0.002 and 0.003 simultaneously). The mean weight and therein the BMI was 69.57kg and 24.78 kg/m² in the first group in comparison to a higher mean weight of 73.77kg and a mean BMI of 26.36 kg/m² in the

second group. Only 36.9% people in the non-recurrence group were smokers when compared to 40.9% smokers in the recurrence group. The P value of smoking as a risk exposure for recurrence was statistically significant at 0.000 (OR = 9.676, 95% CI = 3.522-26.585).

The rates of diabetes and hypertension in group I was found to be 20.7% and 12.6% respectively. In group 2, this was 27.2% (diabetes) and 18.1% (hypertension). Hence, both diabetes and hypertension were not considered as significant risk

factors for reherniation after statistical analysis (p value 0.497 & 0.485 respectively).

Distribution of patients according to occupational load at the time of index visit was also done. It was found that only 25.2% (n=28) patients came under the category of heavy occupational load in the non-recurrence group, in comparison to 81.8% patients (n=18) in the recurrence group. The P value was found to be 0.000, with an OR of 13.339 (95% CI = 4.161-42.795) and was statistically significant

Table 1: Patients Socio-demographic Characteristics

| | Non-Recurrence (n=111) | Recurrence (n=22) | P Value |
|---------------|------------------------|-------------------|---------|
| Age (Mean±SD) | 49.3±10.455 | 46.05±13.250 | 0.205 |
| Gender (Male) | 66(59.4) | 14(63.6) | 0.019 |
| Height | 1.6768±0.0388 | 1.6727±0.04085 | 0.653 |
| Weight | 69.57±5.49 | 73.77±6.561 | 0.002 |
| BMI | 24.78±2.266 | 26.356±2.01 | 0.003 |
| Smoking | 41(36.9) | 9(40.9) | 0.000 |
| Diabetes | 23(20.7) | 6(27.2) | 0.497 |
| Hypertension | 14(12.6) | 4(18.1) | 0.485 |

Table 2: Distribution of Patients According to Occupational Load

| Occupational Work Load | Non-Recurrence | | Recurrence | | P Value |
|------------------------|----------------|------|------------|------|---------|
| | n | % | n | % | |
| Light | 83 | 74.8 | 4 | 18.2 | 0.000 |
| Heavy | 28 | 25.2 | 18 | 81.8 | |

Table 3: Predictors of Recurrent Lumbar Disc Herniation

| | OR | 95% CI | | P Value |
|------------|--------|--------|--------|---------|
| | | Lower | Upper | |
| Gender | 1.193 | 0.463 | 3.078 | 0.000 |
| Occupation | 13.339 | 4.161 | 42.795 | 0.000 |
| Smoking | 9.676 | 3.522 | 26.585 | 0.108 |

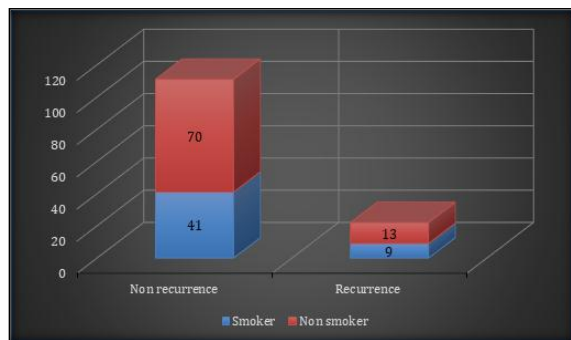


Figure 1: Smoking and recurrence

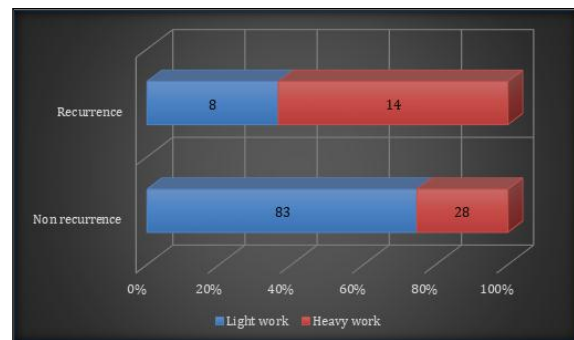


Figure 3: Type of work and recurrence

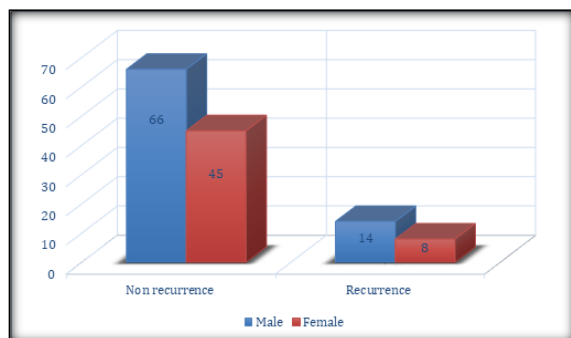


Figure 2: Gender and recurrence

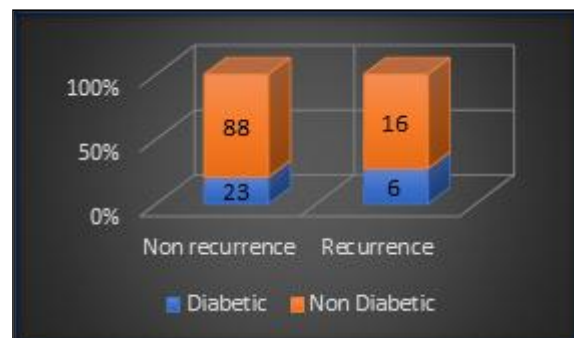


Figure 4: Diabetes and recurrence

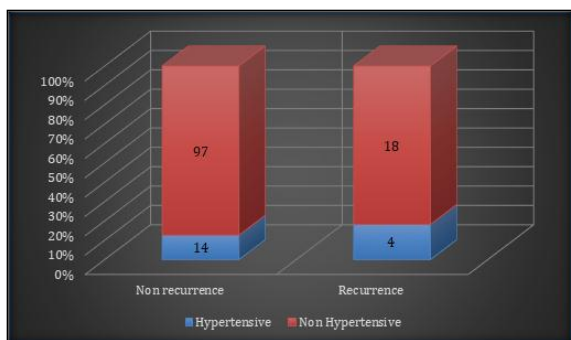


Figure 5: Hypertension and recurrence

DISCUSSION

Reherniation is the most common complication after lumbar discectomy and has a reported rate of 5 to 15%.^[9,11-14] Some of the risk factors reported across the globe for recurrent LDH are age, gender, type of lumbar disc herniation, smoking, alcohol consumption and length of restricted activities. We found a dearth of studies attempting to define these risk factors in an Indian population. In this retrospective cohort study we analysed the influence of factors like Age, gender, height, weight, BMI, history of smoking, occupational load, Diabetes Mellitus and Hypertension on rate of recurrence after primary microdiscectomy. Although radiologically identifiable factors, such as type of disc degeneration, disc height, and sagittal range of motion have also been shown to be related to spinal instability and consequently to rLDH^[15-17] this was beyond the scope of our study.

In our study we found that age at diagnosis was not a significant risk factor, but, male gender was a risk factor for rate of recurrence after surgery. This was similar to the study by Shimia et al.^[18] This was in contrast to the results published by Keskimaki and coworkers, who did not find any differences between genders, but patients younger than 50 years had a somewhat higher risk of reoperation than the older patients.^[19] Others like Swartz and Trost found that age, gender, smoking status, level of herniation, and duration of symptoms were not associated with rLDH.^[9] The higher incidence of recurrent herniation in young men has been explained by some authors with the annular incision made at primary surgery, which makes the operated disc more susceptible to sudden prolapse, explicitly under conditions of mechanical overload during sports activity or weightlifting.^[20,21]

It is shown that higher BMI and obesity is associated with recurrent LDH.^[22,23] which was also the case in our study. But, other studies by Shimia and coworkers & Kara and coworkers^[24] did not find any significance between BMI and LDH recurrence.

It has been proven that smoking not only accelerates disc degeneration and back pain.^[6,7] but also, is an important risk factor for recurrent disc herniation.^[18,25] The research by Miwa et al,^[18] revealed that the group of patients who was smoking

at the time of surgery showed 18.5% of recurrence rate, which was much higher than the recurrence rate in nonsmokers. On similar lines, our study also found smoking to be a prominent risk factor for rLDH. Though vaguely understood, the mechanisms by which smoking contributes to disc degeneration may be related to disc annulus nutrition and oxygenation,^[26] apart from high intradiscal pressure due to excessive coughing and vascular insufficiency as a result of atheromas.^[27,28] Very few studies in contrast have found no relation between smoking and LDH recurrence.^[22,24,29]

In a review of patients undergoing discectomy for LDH, Mobbs et al, reported higher rates of LDH recurrence and reoperation in diabetics (28%) compared with controls (3.5%).^[14] Though, biochemical factors can explain a weakened disc in diabetics, collaborated by histologic studies with concurrent findings, clinical studies have failed to demonstrate a relationship between Diabetes Mellitus and rLDH which was also the case in our study.^[18,30]

Primary symptomatic lumbar disc herniation has been independently associated with hypertension as it is known to cause occlusion of small calibre vessels arising from the distal

Aorta.^[31] Thus, we also hypothesized that hypertension could affect recurrent lumbar disc herniation; however, just like studies by Shimia et al.^[18], our results did not support this hypothesis and we could not arrive at a statistically significant difference between the 2 groups.

Another notable predictor of recurrent LDH is hard labour and heavy work. Occupations involving manual labour which in turn comprises repetitive lifting or vibration, has been shown to be proven predictors of recurrent LDH.^[6-8] Kara and coworkers^[24] observed that the occupation did not indicate so much significance as regular exercise post operatively for predicting recurrence. However, in our study, we found that heavy occupational load was significantly higher in patients with recurrent herniation and was a pronounced predictor of its occurrence. In other studies like the study of Meredith and coworkers^[22] being a manual labourer was not significantly associated with recurrent LDH.

CONCLUSION

Male gender, a higher weight and BMI, heavy workload and active smoking were found to be significant risk factors contributing for higher incidence of recurrent lumbar disc herniation in an Indian population from our study. These modifiable risk factors could be stressed upon to patients coming with primary lumbar disc herniation and lifestyle interventions like smoking cessation and weight reduction could prevent bad outcomes ie; resurgery after primary microdiscectomy.

Limitations

Main limitation of our study was its small sample size and concurrently the reduced power of the study. Moreover it is retrospective nature cannot rule out sampling errors. Stemming from a single centre catering to a certain strata of the society, it might not be representative of the general population in whole.

Declaration

The authors declare no conflict of interest.

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