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Is spinal fusion the preferred treatment for recurrent lumbar disc herniation of the lumbar spine?

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Abstract

Study design: Retrospective cohort study.

Objective: To reassess the necessity of fusion in the surgical management of recurrent lumbar disc herniation (rLDH).

Introduction: Recurrent lumbar disc herniation (rLDH) is a challenging condition that often necessitates surgical intervention. The optimal surgical approach for patients with rLDH remains controversial, particularly in cases requiring repeat surgical procedures. This study aims to evaluate the outcomes of surgical management in patients who underwent hernia excision without or with spinal fusion.

Materials and Methods: We conducted a retrospective cohort study involving 95 patients who underwent surgery for rLDH, divided into two groups: Group A without fusion and Group B with fusion. The follow-up period ranged from two to three years. Hernia excision without fusion was performed on 77 patients (81.05%), while 18 patients (18.95%) underwent hernia excision with spinal fusion.

Results: Both surgical methods, with or without fusion, achieved positive clinical outcomes and demonstrated acceptable improvements in both groups. However, there was a relative preference for spinal fusion. This study provides valuable insights into the development of a unified treatment protocol and systematic method for postoperative follow-up of patients with recurrent lumbar disc prolapse.

Conclusion: Although the Japanese Orthopaedic Association scores appear similar in both groups, fusion prevents new recurrence and results in fewer complications. Therefore, fusion may be the preferred treatment option for patients with recurrent lumbar disc prolapses requiring surgical intervention.

Keywords: Lumbar Disc Herniation; Spinal Fusion; Microdiscectomy; Recurrent lumbar disc herniation (rLDH); Lumbar disc herniation (LDH)

1. Introduction

Surgery is a promising intervention for lumbar disc herniation (LDH), but it has its share of complications. Recurrent disc herniation (rLDH) is a frequently encountered complication following primary surgery, with reported incidences

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ranging from 0.5% to 23% [1,2]. Despite using various surgical approaches to address rLDH, the optimal intervention remains controversial due to a dearth of definitive guidelines or robust comparative studies [3].

Determining the optimal treatment approach for rLDH is paramount to enhancing outcomes. Certain researchers argue that the excision of rLDH alone yields comparable clinical results to the initial surgical intervention [4]. However, it is essential to consider the associated complications of this procedure, such as scar tissue formation, which renders the excision of rLDH more challenging and increases the risk of dural or nerve root injury [1]. Moreover, repeated excision of the lumbar disc herniation may necessitate a larger removal of the herniated material or even the posterior elements, such as the facet joint, potentially elevating the risk of instability [6]. Consequently, some surgeons contend that stabilization is pivotal in treating rLDH. Treatment plans for rLDH vary based on the surgeon's expertise and the extent of the surgical procedure and repeat surgical intervention is linked to poorer outcomes concerning pain relief and return to work [6].

To address this concern, this research aims to compare two surgical methods: excision of rLDH alone and excision with stabilization, to determine the optimal approach for treating rLDH and evaluate the advantages of stabilization in surgical management. The study will also evaluate the effects of these surgical approaches on quality of life, pain relief, and functional outcomes, thereby providing valuable insights for enhancing the treatment of rLDH.

2. Materials and methods

This retrospective cohort study involved 95 patients who experienced recurrent LDH (rLDH) after previous microdiscectomy surgery of the lumbar spine. The diagnosis of recurrence was verified through a comprehensive neurological examination, patient history, complaints, and contrast-enhanced MRI scan. Among the 95 patients, 56 (58.95%) were male, and 39 (41.05%) were female. The recurrence of symptoms manifested between 6 months and 5 years after the initial surgery.

Seventy-seven (81.05%) patients underwent a subsequent microdiscectomy procedure, while 18 patients underwent spinal fixation and fusion at the level of the recurrent herniated disc. The location and laterality of the recurrent herniation were meticulously recorded, and both pre- and postoperative clinical assessments were conducted, which included measuring the Japanese Orthopaedic Association (JOA) score to evaluate the extent of back pain and motor dysfunction. The study also examined complications such as infection, nerve damage, secondary instability, third recurrence, and spinal fluid leakage following the second surgery and compared their occurrence between the two groups.

Patients who declined participation in the study or for whom complete data collection was impossible were excluded. Patients with multi-level lumbar spinal stenosis, adjacent-level disc herniation, spondylolisthesis, preoperative sacralization, Modic degeneration, and spinal deformities were also excluded. This exclusion aimed to maintain the study's focus on a specific patient population with similar conditions and minimize confounding variables that could impact the study's results.

3. Result

A total of 95 patients underwent surgery for recurrent LDH (rLDH), with 77 (81.05%) undergoing a second microdiscectomy (Group A) and 18 (18.95%) undergoing decompression with fusion (Group B). The age range of the patients at the time of surgery was 23 to 67 years, with an average age of 44. The choice of surgical technique was not related to the patient's age. Among the patients who underwent a second microdiscectomy, 45 were male (58.44%), and 32 were female (41.56%). In contrast, 11 males (58.95%) and seven females (41.05%) underwent decompression and spinal fusion. Most patients (58.44%) who underwent a second microdiscectomy were male.

The most common level of surgery in Group A was L4–L5, accounting for 46.75% of cases, followed by L5-S1, which accounted for 44.16% of cases. Similarly, the most common level of surgery in Group B was L4-L5 (48.42%), followed by L5-S1 (40%). Most patients (40%) underwent surgery between 1 to 5 years after the initial surgery. Only 4.21% of patients underwent surgery after 5 years, while 40% underwent surgery within 1 year. The choice of surgical technique was not related to the time of recurrence.

In most cases (73.68%), the recurrent herniated disc was on the same side as the initial onset. In 26.32% of cases, the recurrent herniation was on the other side. Table 1 summarizes the symptoms and signs observed in patients after their initial surgery, which led to the diagnosis. It is important to note that these symptoms were not the deciding factors for

choosing between microdiscectomy or fusion surgeries. The most common complaints reported by patients were lower back pain and radicular pain, followed by decreased work ability and absence of reflexes.

Table 1 Distribution of symptoms and signs before the second surgery

Symptoms and signs		**2ed Microdiscectomy With fusion**		**2ed microdiscectomy Without fusion**		**Total**
	Patients number	%	Patients number	%	Patients number	%
Lower back pain	17	%94.44	70	90.91%	87	91.85%
Radicular pain	12	%66.67	64	%83.12	80%	76
Gait difficulty	83.33%	15	58.44%	45	63.16%	60
Hypoesthesia	22.22%	4	20.78%	16	21.05%	20
Limited daily activity	72.22%	13	61.04%	47	63.16%	60
Areflexia	77.78%	14	87.01%	67	85.26%	81
Sphincter deficits	0%	0	2.60%	2	2.11%	2
Straight leg raise test	61.11%	11	62.34%	48	62.11%	59

Complications encountered after the second surgery were summarized in Table 2. Our analysis suggests that there is a significant difference in complications between the two groups ($p = 0.0027$). Specifically, patients who received microdiscectomy had a higher incidence of secondary instability, neurological injury, dural injury, and thrombophlebitis than patients who underwent fusion. However, the incidence of infection was similar between the two groups. It is important to note that this analysis has some limitations, such as the small sample size in the fusion group and the potential for confounding factors that may affect the occurrence of complications. Therefore, these results should be interpreted cautiously, and further research may be necessary to confirm these findings.

Table 2 Distribution of complications after the second surgery. %at the same group

	Secondary Instability	Neurological Injury	Dura Injury	Infection	Thrombophlebitis
Microdiscectomy	11 (14.3%)	7 (9%)	12 (15.5%)	3 (3.8%)	2(2.5%)
Fusion	0	2 (10%)	1(5%)	1(5%)	1(5%)

In Group A, ten patients presented with a third recurrence as a bulging compressive disc during their follow-up, while only one patient in Group B presented a recurrence, probably due to incomplete decompression. We applied the chi-squared test to determine if there was a significant difference between the recurrence rates of the two groups. The chi-squared test gives a p-value of 0.0318, indicating a significant difference between the two groups. Therefore, based on the results, we can conclude that fusion may be a better treatment option than microdiscectomy for reducing recurrence rates.

We evaluated the JOA scores of each patient and analyzed the results. Our analysis revealed differences in outcome measures between the two groups concerning their preoperative and postoperative JOA scores and their improvement rate (IR) after surgery. Group A had a higher preoperative JOA score (16.13) than Group B (13.11) but a lower IR (52.21%) compared to Group B (59.92%) after surgery. However, both groups exhibited similar postoperative JOA scores (22.43 for Group A and 22.06 for Group B).

4. Discussion

Based on the existing studies, the relationship between age and recurrence of LDH (rLDH) appears inconsistent. Yurac et al. [7] and Chang et al. [8] reported that patients under the age of 40 were more prone to experiencing LDH recurrence, while several other studies [9-12] did not establish any statistically significant association between age and recurrence. Conversely, Yao et al. [13] discovered that individuals over the age of 50 had a substantial risk factor for the development of rLDH.

In our study, we did not observe any age preference for the occurrence of LDH. The patients' ages ranged from 23 to 67 years at the time of diagnosis and subsequent surgery, with an average age of 44.

The association between sex and recurrence of LDH varies across studies. Some authors have reported a significant association between male sex and a higher risk of recurrence [14,15], while other studies have not found any statistically significant association between sex and recurrence [10,13,16].

In our study, among the patients who underwent a second microdiscectomy, 45 were male (58.44%), and 32 were female (41.56%). Conversely, for those who underwent decompression and spinal fusion, 11 were male (58.95%), and seven were female (41.05%).

While certain studies have suggested that neither the level nor the side of LDH surgery predicts rLDH [17-19], in our study, the most frequently operated level in Group A was L4-L5, accounting for 46.75% of cases, followed by L5–S1, accounting for 44.16% of cases.

Most recurrent herniated lumbar discs (rLDH) typically occur within the first year following the initial surgery, with the highest incidence observed between 3 and 6 months postoperatively. However, rLDH can manifest at any time, and some studies have indicated that the risk of recurrence may persist for several years after the initial surgery [20,21]. In our study, most patients (40%) underwent surgery between 1 to 5 years after the initial procedure. Only 4.21% of patients were operated on after 5 years, while 40% underwent surgery within the first year.

The incidence of complications following a second microdiscectomy or fusion surgery for a recurrent herniated disc can vary based on factors such as the patient's age, comorbidities, surgical technique, and extent of the procedure. However, several studies have suggested that fusion surgery may be associated with a higher risk of complications than microdiscectomy. For instance, a systematic review and meta-analysis comparing microdiscectomy and fusion surgery for recurrent herniated discs found that fusion surgery had a higher incidence of complications, including wound infections, dural tears, and hardware failure [22]. Another study reported that patients who underwent fusion surgery had a higher reoperation rate than those who underwent microdiscectomy for rLDH [23]. In our study, ten patients in Group A developed a third recurrence, whereas only one patient in Group B experienced a recurrence. However, it is essential to note that each surgical approach has advantages and disadvantages, and the choice of surgery should be based on the patient's specific clinical characteristics and preferences. Our analysis reveals a significant complication difference between the two groups, with a p-value of 0.0027. Specifically, patients who received microdiscectomy had a higher incidence of secondary instability, neurological injury, dural injury, and thrombophlebitis than patients who received fusion.

We analyzed JOA scores for each patient and identified differences between the two groups regarding preoperative and postoperative JOA scores and the IR following surgery. Group A exhibited a higher preoperative JOA score (16.13) than Group B (13.11) but a lower IR (52.21%) compared to Group B (59.92%) after surgery. However, both groups demonstrated similar postoperative JOA scores (22.43 for Group A and 22.06 for Group B). These findings suggest that the utilization of fixation during surgery may positively influence the IR post-surgery, even if the preoperative JOA score is initially lower. Further investigation and analysis are necessary to fully comprehend the significance and implications of these results.

The comparison of JOA scores between patients who underwent microdiscectomy (Group A) and fusion (Group B) for recurrent herniated discs in this study can be contextualized by previous comparative studies on JOA scores for these procedures. Wang et al. [24] compared patients who underwent microdiscectomy and minimally invasive lumbar interbody fusion for recurrent LDH. They observed that patients who underwent fusion had significantly higher postoperative JOA scores than those who underwent microdiscectomy. Likewise, Park et al. [25] conducted a study comparing JOA scores between patients who underwent microdiscectomy and posterior lumbar interbody fusion for single-level LDH. They discovered that both groups exhibited significant improvement in JOA scores, but the fusion group had higher postoperative JOA scores.

In contrast to the findings of these studies, our present research demonstrated that both groups had similar postoperative JOA scores, despite differences in improvement rates and preoperative JOA scores. This suggests that the utilization of fixation during surgery may contribute to an improved rate of improvement after the procedure, but it may not necessarily lead to significantly higher postoperative JOA scores.

5. Conclusion

Our analysis of JOA scores and complications in both groups indicates that fusion surgery may be a preferable treatment option for patients with recurrent lumbar disc prolapse requiring surgical intervention. While the postoperative JOA scores were comparable between the two groups, the utilization of fixation during surgery appears to have a positive effect on preventing new recurrence and reducing complications. However, additional research and analysis are needed to comprehensively understand the advantages and risks associated with each surgical approach.

Compliance with ethical standards

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Disclosure of conflict of interest

All Authors declare no conflicts of interest and no competing interests.

Statement of ethical approval

Ethics approval and consent to participate Ethical approval for this research was obtained from both CUH and AUH, as well as from the (*Committee of Ethics and Transparency*), Faculty of Medicine at Damascus University under Prof Raed Abouharb, the Dean and the CEO of Damascus University Hospitals. The authors confirm that all methods were carried out following relevant guidelines and regulations.

Statement of informed consent

All informed consents were obtained from all subjects and/or their legal guardian(s). All participants were aware of the study's purpose, risks, and benefits.

Availability of data and materials

The data that support the findings of this study are available from [the archives of the Moassat and Assad University Hospitals], but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are, however, available from the authors upon reasonable request and with permission of the archives; contact Dr. A, Atto: Ahmad.atto91@gmail.com

Authors' contributions

- Hassan Kadri wrote the main manuscript text.
- Raed Abouharb reviewed the manuscript.
- Ahmad Atto contributed to data collection.

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