



## Original Article

## Comparison of Discectomy versus Sequestrectomy in Lumbar Disc Herniation: A Retrospective Cohort Study

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## ABSTRACT

Lumbar disc herniation is a common spinal condition characterized by the protrusion or extrusion of intervertebral disc material. This extruded or protruded disc material compresses the spinal nerves causing various symptoms such as low back pain radiculopathy and functional limitation. **Objective:** To assess and compare the outcomes of pain relief as well as functional improvement among patients who underwent Discectomy and Sequestrectomy. **Methods:** A retrospective cohort study was conducted at the neck and surgery department, Combined Military Hospital (CMH), Quetta. A total of 80 patients were included in the study, 26 (32.5%) patients underwent Sequestrectomy while microdiscectomy was done in 54 (67.5%) patients. The data collection proforma consisted of demographic information, baseline clinical characteristics, description of surgical procedures, pre and postoperative VAS scores, and functional outcomes assessed by the Oswestry disability index. The statistics used in this study were independent t-test and paired t-tests. **Results:** The study results showed no significant differences in the baseline characteristics between the groups. Both procedures showed a significant improvement in pain levels, in terms of lowered VAS scores and ODI scores. **Conclusions:** The procedure of sequestrectomy has shown significant improvements in postoperative pain relief and functional outcomes as compared to microdiscectomy.

## INTRODUCTION

Lumbar intervertebral disc herniation is an anatomical abnormality, characterized by the extrusion of the nucleus pulposus, a soft middle portion of an intervertebral disc, through a tear in the outermost disc fibrous ring called the annulus fibrosus. A disc herniation is a general term for a series of problems involving disc protrusion outside of the interstitial space, including bulges, extrusion, and sequestration [1]. WHO indicates that lumbar disc herniation is the most frequent cause of back discomfort condition. An estimated 619 million people worldwide suffer from back pain, with a rising trend to 843 million by 2050, driven by population growth and aging [2]. Surgical interventions are commonly indicated when conventional treatments do not relieve the pain or if the patient develops neurological deficits [3]. The two major surgical

intervention types for LDD are discectomy and sequestrectomy. They differ in terms of surgical technique used and goals pursued. The surgical treatment of choice for symptomatic LDD-causing radiculopathy is microdiscectomy with an interlaminar approach. The technique consists of partial removal of particular bone structures, such as the facet joints and ligamentum flavum, after which the intervertebral disc material is extracted. Hence, microdiscectomy is the most effective and primary "gold standard" choice in meeting the surgical needs of such patients [4]. The reason for this aggressive approach is that as long as degenerated disc material is left in the intervertebral space, the probability of developing reherniation rises significantly. When this occurs, the exogenic disc material can compress the root nerve,

causing the symptoms to reoccur. Hence, surgeons tend to remove exogenic disc material quite aggressively and substantially. Nevertheless, there is a growing body of evidence indicating that the postoperative reduction in disc height can lead to intervertebral instability [5, 6]. A reduction in intervertebral disc height corresponds with the relaxation of ligaments and articular capsules, potentially leading to segmental instability and ultimately hastening the development of spondylosis. This condition could contribute to the occurrence of “failed back syndrome”. Thus, causing further pain and disability [7, 8]. Williams in 1978 presented a breakthrough minimally invasive spine technique called Sequestrectomy. He reported that conservative surgery might be implemented in the presence of primary herniated lumbar discs. The method was implemented by the direct puncture of the fibrous ring. No incisions or the curettage of the disc space were required [9]. Recently, conservative surgery has been a topic of research to perform minimalistic removal of intradiscal material. One of the solutions is microscopic sequestrectomy, allowing for the removal of only the disc fragments in the present cases of herniation of the disc. The literature includes studies documenting a considerable positive outcome with no significant increase in re-herniation rates [10-12]. The importance of selecting the appropriate surgical procedure for this condition is widely acknowledged in achieving optimal pain relief, functional improvement, and overall positive patient outcomes. It is crucial to have sufficient evidence on the most effective surgical techniques for managing lumbar disc herniation. This will greatly enhance the quality of care and help clinicians make informed decisions. The aim of the study was to assess the clinical effectiveness of discectomy and sequestrectomy in terms of pain relief and functional outcomes.

## METHODS

This study was done as a retrospective cohort to assess and compare the outcomes of two surgical interventions on patients who went through a discectomy or sequestrectomy as surgical management for the treatment of lumbar disc herniation at CMH Hospital, Quetta for a specified period. The study lasted for one month, from 1 February 2023 to 29 February 2024. Participants were included in the study during their follow-up appointments at the spine surgery department. Inclusion criteria comprised patients of any age and gender, diagnosed with lumbar disc herniation (unilateral single level, between L1 and S1) confirmed through clinical examination, imaging (MRI/CT scan), and indication for surgical intervention. Patients who had undergone previous lumbar disc surgery at the same level, had longstanding spinal stenosis, presented with

extraforaminal disc herniation, showed multilevel extensive lumbar spine degeneration, had incomplete medical records, or had undergone surgery at another hospital were excluded from the study. Out of the initial pool of 150 potential patients, 60 were lost to follow-up, and 10 did not meet the inclusion criteria. As a result, 80 patients were successfully recruited for the study. Patient data were extracted from medical records, including demographics (age, gender), preoperative characteristics (symptom duration, pain severity, functional limitations), surgical details (type of surgery, surgical approach), and postoperative outcomes (pain relief, functional improvement, complications, length of hospital stay). The main focus of this study was to evaluate the level of pain relief experienced by patients. This was measured using Visual Analogue Scale (VAS) scores at different time points, including before the surgery and during the follow-up period. Oswestry Disability Index (ODI) was used to assess the functional outcome in the preoperative period and follow-up visits. Analysis of data was done by SPSS Version 26.0. Discectomy and sequestrectomy cohorts' subject demographics and clinical profiles were summarized concerning the dependent variable. Using means  $\pm$  S.D or median with interquartile range for continuous variables and frequencies and percentages for categorical variables. Group comparisons were performed regarding appropriate statistical tests such as t-tests and paired tests for varying continuous outcomes. Ethical consideration: the authors were able to follow ethical procedures in research and obtain an IRB, in addition to confidentiality in patient information, keeping all the data anonymous.

## RESULTS

The comparative study between the Sequestrectomy group (26 patients) and the Microdiscectomy group (54 patients) revealed notable findings. Gender distribution and mean age did not significantly differ between the groups ( $p = 0.08$  and  $p = 0.09$ , respectively). Follow-up duration also showed no significant difference ( $p = 0.06$ ). These results indicate that there were no statistically significant differences between these groups based on the baseline data. However significant differences were observed in surgical levels, particularly at L4-5 ( $p = 0.04$ ) and L5-S1 ( $p = 0.05$ ), indicating variations in surgical approaches between the groups table 1.

**Table 1:** Demographic Characteristics of the Study Sample

Variables	Sequestrectomy Group (n=26)	Microdiscectomy Group (n=54)	p-Value
Gender (Male, Female Ratio)	17:9	39:15	0.08
<b>Demographic and Clinical Characteristics N (%)</b>			
Age	41.7 (6.2)	39.2 (10.4)	0.09
Follow-Up Duration (Months)	6.2 (6.8)	7.3 (8.3)	0.06
Hospital Stays (Days)	15.3 (7.1)	17.9 (9.0)	0.06

Level of Surgery (%)			
L2-3	4	13	0.10
L3-4	5	10	0.06
L4-5	8	19	0.04*
L5-S1	9	12	0.05

\*=P<0.05

The analysis of outcomes measures in the Sequestrectomy group (26 patients) and the Microdiscectomy group (54 patients) revealed significant improvements in pain relief and functional outcomes following surgical intervention for lumbar disc herniation. Pre-operatively, both groups exhibited high VAS scores, with the Sequestrectomy group at  $7.9 \pm 3.24$  and the Microdiscectomy group at  $8.3 \pm 2.56$ , which significantly decreased post-operatively to  $1.5 \pm 0.9$  and  $1.9 \pm 1.4$ , respectively (p-value = 0.00 for both groups). Similarly, pre-operative ODI scores were markedly reduced post-operatively in both groups, with the Sequestrectomy group showing an improvement from  $70.1 \pm 12.9$  to  $15.8 \pm 17.2$  and the Microdiscectomy group from  $69.3 \pm 20.1$  to  $21.3 \pm 11.9$  (p-value = 0.00 for both groups). These findings demonstrate that both Sequestrectomy and Microdiscectomy procedures led to significant reductions in pain intensity and improvements in functional outcomes, highlighting the efficacy of both surgical interventions in enhancing patient well-being and quality of life.

**Table 2:** Pre and Postoperative VAS and ODI Score Comparison

Outcomes Variables	Sequestrectomy Group (n=26) (Mean ± S.D)	Microdiscectomy Group (n=54) (Mean ± S.D)	p-Value
Pre-Operative VAS Score	$7.9 \pm 3.24$	$8.3 \pm 2.56$	0.05
Post-Operative VAS Score	$1.5 \pm 0.9$	$1.9 \pm 1.4$	0.04*
p-Value	0.00*	0.00*	-
Pre-Operative ODI	$70.1 \pm 12.9$	$69.3 \pm (20.1)$	0.06
Post-Operative ODI	$15.8 \pm 17.2$	$21.3 \pm 11.9$	0.03*
p-Value	0.00*	0.00*	-

Intragroup: Paired T-test, Intergroup: Independent T-test, \*= P< 0.05

## DISCUSSION

The usual method for neural decompression during microdiscectomy involves removing the herniated disk material, cutting out as much intervertebral tissue as possible, and scraping the endplates [13]. This approach was designed with the assumption that increasing the amount of removed disk tissue will reduce the likelihood of re-herniation [14]. The belief in the issue faced no resistance since it lacked scientific validity. The total elimination of all herniated disk material is unattainable. When this system was applied, it was inevitable that repetitive processes would occur. On the other hand, performing a forceful removal of the intervertebral disc may depend on a reduction in the height between the vertebrae. This drop is often associated with instability in

the spinal segment and the advancement of spondylitis [15, 16]. This might potentially lead to a substantial rise in the occurrence of failed-back surgery syndrome and delayed complications of disk surgery after periods of no symptoms. While there is a lack of long-term studies to assess these consequences, research has shown that patients who do not have endplate curettage have a lower incidence of low back pain [17, 18]. The growing interest in conservative surgery, specifically microscopic sequestrectomy or free fragmentectomy, has led to limited clearing of intradiscal material in certain cases of disc herniations. This procedure involves a simple excision of disc fragments in a targeted subpopulation. Existing literature has reported success rates exceeding 90% without an increase in reherniation rates. Comparing these findings with our study, both Sequestrectomy and Microdiscectomy procedures yielded significant improvements in pain relief and functional outcomes post-operatively, as evidenced by substantial decreases in VAS scores and improvements in ODI scores. The success rates observed in our study align with the reported success rates in the literature for conservative surgical approaches, further supporting the efficacy of these procedures in managing lumbar disc herniation [17-19]. Both groups showed significant improvements in pain relief and functional outcomes post-surgery. Pre-operatively, high VAS scores decreased significantly in both groups, Sequestrectomy (7.9 to 1.5), Microdiscectomy (8.3 to 1.9), as did ODI scores, Sequestrectomy (70.1 to 15.8), Microdiscectomy (69.3 to 21.3). These improvements were statistically significant (P=0.00). These findings underscore the efficacy of both Sequestrectomy and Microdiscectomy in reducing pain intensity and enhancing functional outcomes in patients with lumbar disc herniation. Current findings are consistent with previous literature which shows similar findings when comparing outcomes in both surgical techniques [14-21]. Multiple studies have shown that both discectomy and sequestrectomy procedures yield similar clinical results within the initial 4 to 6 months after surgery [22, 23]. Nevertheless, it is important to mention that although these positive outcomes continue for a duration of 2 years after sequestrectomy, there is a certain level of deterioration in self-assessed clinical results after microdiscectomy. The drop is seen in the notable superiority of sequestrectomy in key metrics such as overall outcome, health-related quality of life (including physical and social functioning), and the utilization of analgesics. The findings from prior research are consistent with the conclusions of the present study, which further supports the idea that sequestrectomy may provide benefits in terms of long-term clinical results and patient

welfare when compared to microdiscectomy [17-24]. Nevertheless, a randomized control experiment conducted by Barth *et al.*, has presented contradicting findings. The research compared lumbar microdiscectomy with sequestrectomy and concluded that there was no significant difference in the rates of reherniation throughout the 2-year follow-up period [25]. It is worth noting that long-term outcomes, particularly those beyond 5 years of postoperative follow-up, have not been assessed in any prospective or retrospective comparison studies. Therefore, to draw comprehensive and long-term comparative conclusions, prospective cohort studies must be conducted within regional contexts, considering potential variations in patient demographics, healthcare practices, and environmental factors. Based on a thorough analysis of the existing research, it appears that fragmentectomy may lead to a reduced hospital stay and therefore, expedite the recovery process. The results of the current study are consistent with this observation, providing additional evidence that fragmentectomy is linked to shorter hospital stays and faster recovery [12-19]. Huang *et al.*, reported in their meta-analysis that the duration of hospital stays in the sequestrectomy and microdiscectomy groups varied from 0.9 to 6.4 days to between 1.17 and 6.94 days, respectively. It is worth noting that the findings are significantly below their comparison with our findings [25]. Nonetheless, there's a possible explanation for the extended length of hospital stays detected in this study. Indeed, the literature review incorporated sources from multiple countries, including China. Secondary to existing differences in the health care systems, and the practices used, the four articles in the meta-analysis and the current study could have used different standards of care. In particular, hospital protocols, postoperative care, access to resources, and clinical discharge criteria might have varied. Also, individual patient variability such as other medical conditions, complications, and differing postoperative recovery rates might have impacted the hospital stay. Conducting research on these factors and a comparison of the practices between the nations might provide more information regarding the observed discrepancies.

## CONCLUSIONS

Both surgical approaches resulted in a statistically significant improvement in pain and functional outcomes post-surgery. The reduction in VAS rate and increase in ODI score was statistically significant in both groups, demonstrating that both surgical procedures are effective in improving a patient's general well-being and quality of life. In comparison between the two methods, the Sequestrectomy group ( $P=0.04$ ) had a higher increase in result values than the Microdiscectomy group ( $P=0.03$ ). In

our study, the hospital stay duration was longer than that of the previous studies.

## Authors Contribution

Conceptualization: AUM

Methodology: AUM, MT, WA

Formal analysis: MS, SAQ, SI

Writing, review and editing: MS, SAQ, AUM

All authors have read and agreed to the published version of the manuscript.

## Conflicts of Interest

The authors declare no conflict of interest.

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