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**Research Article**

# Evaluating the Frequency of Improvement in Sciatica Pain Relief Following Lumbar Fenestration during the Initial Two-Day Postoperative Hospital Stay

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**ABSTRACT**
**Background:** Sciatica, characterized by radiating pain along the sciatic nerve, has a substantial impact on one's quality of life. Lumbar fenestration and laminectomy are frequently performed surgical procedures designed to relieve nerve compression.
**Aims:** This study assessed the occurrence of pain alleviation after various treatments within the first two days of the patient's hospital stay following surgery.
**Methods:** A total of thirty individuals who had lumbar fenestration and laminectomy were included in the study. Pain levels were evaluated using the Visual Analog Scale (VAS) before the surgery and at various time intervals after the surgery. Individuals diagnosed with Cauda Equina Syndrome were not included. The main result was the alleviation of pain, determined by the notable decrease in VAS scores. Additional outcomes assessed were the occurrence of complications and length of hospital stay.
**Results:** Among the sample of 30 patients, 27 individuals (90%) reported experiencing notable alleviation of pain, whereas 3 individuals (10%) continued to have discomfort. The average preoperative VAS score was 8.0, but this value dramatically fell to 2.6 after the operation ($p < 0.001$). Patients who did not have any difficulties consistently reported alleviation from pain, however those who suffered issues such as lower limb weakness, missing dorsal tumor or incorrect level surgery, continued to endure prolonged discomfort. The occurrence of complications was strongly linked to the existence of persistent discomfort ($p < 0.001$). Patients who experienced persistent pain had a substantially longer hospital stay (mean = 6.3 days) compared to those who had pain alleviation (mean = 4.2 days) ($p < 0.05$).
**Conclusion:** Lumbar fenestration and laminectomy are quite successful in alleviating sciatica pain immediately after surgery. Postoperative complications have a significant impact on the effectiveness of pain treatment, highlighting the need of precise surgery and comprehensive preoperative planning.

**Keywords:** Laminectomy; Lumbar surgery; Pain relief; Postoperative outcomes; Sciatica.

## INTRODUCTION

Sciatica is a severe ailment that causes intense pain along the course of the sciatic nerve, greatly affecting the quality of life for many people. Lumbar disc herniation, spinal stenosis or other degenerative spinal disorders are the main factors that typically result in sciatica by exerting pressure on the nerve roots [1]. Lumbar fenestration and laminectomy are recognized surgical procedures that aim to relieve pressure on the afflicted nerve roots, resulting in pain relief and improved functional outcomes [2].

Lumbar fenestration is the process of making a small opening in the vertebral lamina to alleviate nerve compression. On the other hand, laminectomy includes removing a section of the vertebral bone, called lamina, to relieve pressure on the spinal cord and nerve roots. Both techniques aim to promptly and significantly alleviate sciatic pain by directly targeting the root anatomical problems that cause nerve compression [3-4]. Although many surgical techniques have been widely adopted, there is still variation in the time and

degree of pain alleviation that patients feel emphasizes the importance of doing a thorough examination into the early outcomes following surgery [5-6].

The first 48 hours after surgery are especially important as they often determine the course of the entire recovery process. Prompt pain management not only improves patient happiness but also decreases the length of hospital stay, diminishes the use for painkillers and promotes early movement, which is crucial for minimizing complications including deep vein thrombosis and pulmonary embolism [7-9]. Hence, comprehending the occurrence and determinants linked to prompt pain alleviation can enlighten medical procedures and enhance patient care protocols.

The objective of this study was to systematically assess how often sciatica pain alleviation improves after lumbar fenestration and laminectomy within the first two days of the postoperative hospital stay, using a prospective observational strategy to track and document pain levels after surgery.

## MATERIALS AND METHODS

### Study Design and Setting

This study was conducted in DHQ Hospital, Dera Ismail Khan, from January 2023 to March 2024. The objective of the study was to assess the occurrence of pain alleviation in individuals with sciatica after undergoing lumbar fenestration and laminectomy over the first two days of their hospital stay following surgery.

### Patient Selection

The study included a cohort of 30 patients who underwent lumbar fenestration and laminectomy procedures for the treatment of sciatica. The selection of patients was based on certain inclusion and exclusion criteria.

### Inclusion Criteria

- Patients who are 18 years of age or older who have been diagnosed with sciatica caused by either lumbar disc herniation or spinal stenosis.
- Patients who have been scheduled to have lumbar fenestration and laminectomy procedures.
- Participants who granted informed consent to take part in the study.

after surgery. This

### Exclusion Criteria

- Individuals suffering from Cauda Equina Syndrome.
- Patients having substantial concurrent medical issues that may impact their recovery after surgery.
- Individuals who have already undergone spinal surgery.

### Surgical Procedure

Routine lumbar fenestration and laminectomy procedures were performed on all patients. The procedures were performed using general anesthesia in a sterile operating room setting. Lumbar fenestration is the process of making a small opening in the vertebral lamina, whereas laminectomy involves removing a section of the vertebral lamina to relieve pressure on the spinal cord and nerve roots.

### Postoperative Care and Pain Assessment

Following the surgery, patients were observed in the hospital for a duration of two days. Pain levels were evaluated at various time intervals using Visual Analog Scale (VAS), which spans from 0 (absence of pain) to 10 (most severe pain imaginable). Pain evaluations were performed at the specified time intervals:

- Immediately after the patient regained
- At 6 hours after the surgical procedure.
- 12 hours after the procedure.
- After 24 hours following the surgical procedure.
- After 48 hours following the surgical procedure.

### Evaluation criteria

The main objective of the study was to assess the reduction of sciatic pain within the first two days after surgery. Pain alleviation was characterized as a substantial decrease in VAS ratings in comparison to preoperative values.

### Secondary Outcome Measures Included:

- Incidence of any problems.
- Neurological results, specifically the strength and sensory function of the lower limbs.

### Data Collection and Analysis

Information was gathered regarding patient demographics, degree of preoperative pain and specific surgical details. Pain levels after

surgery were carefully documented at regular intervals.

**Clinical Implications**

**Patients Who Had Pain Relief:** Among the 30 patients, 27 reported a notable reduction in pain after the procedure.

**Individuals Experiencing Chronic Pain:** Three patients persisted in experiencing pain:

- A single patient experienced weakness in the lower limbs and a loss of sensation.
- One patient was diagnosed with a dorsal tumor that had been overlooked.
- Other patient received surgery at an improper spinal level.

**Statistical Analysis**

Descriptive statistics were employed to provide a concise summary of the patient demographics and clinical features. The frequency of pain relief was computed and any associations between preoperative variables and postoperative pain relief were examined. The SPSS version 26.0 was used for the analysis of the data.

**Ethical Considerations**

The study received approval from the Institutional Review Board of DHQ Hospital. Prior to participation, all patients were required to submit written informed permission. The study followed the ethical principles specified in the Declaration of Helsinki.

**RESULTS**

The study comprised 30 patients, with an average age of 45.3 years (range 32-60). Out of the individuals who felt a reduction in pain (n=27), the average age was 44.9 years, but for those who continued to suffer pain (n=3), the average age was 49.0 years. The age difference between the two groups did not show statistical significance ($p > 0.05$), indicating that age did not have a significant impact on postoperative pain alleviation. The gender breakdown revealed that 53.3% of the patients were male, while 46.7% were female. Among the individuals who had pain relief, 55.6% were male and 44.4% were female. In contrast, pain-persistent group consisted of 33.3% males and 66.7% females ($p > 0.05$). The average pretreatment VAS score for all patients was 8.0. The pain-relieved group had a slightly lower average score of 7.9, whereas the pain-persistent group had a higher average score of 8.3 ($p > 0.05$) (Table 1).

The postoperative results demonstrated a notable decrease in pain, as assessed by the VAS score after 48 hours. The average postoperative VAS score was 2.6. Patients who experienced pain reduction had an average score of 1.9, whereas the pain-persistent group had a constant value of 8.0. The observed difference was statistically significant at a very high level ($p < 0.01$). The pain relief status revealed that 90.0% of the patients achieved pain alleviation, whilst 10.0% continued to have persistent pain. All patients in the pain-relieved group experienced relief, but none in the pain-persistent group did ($p < 0.01$). In terms of problems, 90.0% of patients did not suffer any issues, whereas the remaining 10.0% encountered particular complications. 3.3% of patients with prolonged pain experienced lower limb weakness, sensory impairment, a missing dorsal tumor, and improper level surgery. The average duration of hospitalization was 4.5 days, with the group that experienced pain relief having an average stay of 4.2 days and group that experienced continuous pain having an average stay of 6.3 days ($p < 0.05$) (Table 2).

An examination of pain alleviation status by age group revealed that within the 30-39 age bracket, 6 out of 7 patients achieved pain relief, while 1 patient continued to endure persistent pain. Among individuals aged 40-49, 11 out of 12 reported experiencing alleviation from pain, while 1 individual continued to endure severe pain. Among individuals between the ages of 50 and 60, 10 out of 11 experienced relief from pain, while 1 individual continued to endure severe pain. The p-value (0.721) for the age group analysis suggested that the distribution of age groups did not have a significant impact on the results of pain relief. These findings indicated that age group does not have a substantial impact on the ability to alleviate postoperative pain after lumbar fenestration and laminectomy (Figure 1). The examination of preoperative and postoperative VAS scores demonstrated notable differences in pain levels prior to and following the surgical procedure. The average pretreatment VAS score for the total group was 8.0. Among those who had pain alleviation, the average score was 7.9, whereas those with persistent pain had an average score of 8.3. The pretreatment VAS scores were comparable between groups, ranging from 7 to 9 for the pain-relieved group and 8 to 9 for the pain-persistent group ($p >$

0.05). Nevertheless, VAS scores after surgery at the 48-hour mark exhibited a noticeable difference, as the average score decreased significantly to 2.6. Patients who experienced pain alleviation had a significantly lower average postoperative VAS score of 1.9, in contrast to a consistent score of 8.0 in the pain-persistent group. The observed disparity was quite noteworthy ($p < 0.001$), emphasizing the efficacy of the surgical procedure in alleviating pain for the majority of patients (Table 3). The study also investigated problems and related factors, finding that 90% of the patients did not have any difficulties. Additionally, all of these patients reported experiencing alleviation from pain. Conversely, every patient experiencing persistent discomfort exhibited distinct problems. One patient experienced weakness in the lower limbs and a loss of sensation, another had a tumor in the dorsal region that was not detected and the third patient underwent surgery at an incorrect level ($p < 0.01$), demonstrating a significant relationship between the complications and persistent discomfort (Figure 2). A multivariate logistic regression analysis was performed to determine the parameters that are linked to pain relief. The variables considered in the study were age, gender, preoperative VAS score, comorbidities, surgical details (single vs. multi-level decompression), postoperative problems and duration of hospital stay. The coefficient (B) for age was -0.05, suggesting a small but not statistically significant inverse correlation with pain alleviation ($p > 0.05$). The coefficient for the male gender was 0.64, however it was not statistically significant ($p > 0.05$). The preoperative VAS score exhibited a statistically insignificant inverse correlation with pain alleviation ($B = -0.29$, $p > 0.05$). Additional medical conditions, such as hypertension and diabetes mellitus, did not show a significant association with pain relief. The analysis revealed that multi-level decompression was not significantly associated with a detrimental effect. The study found a strong negative correlation between postoperative complications and pain alleviation, indicating that individuals who experienced problems were much less likely to have relief from pain. The analysis revealed a marginally significant negative correlation ($B = -1.21$, $p=0.051$) between the duration of hospital stays and the presence of chronic pain, suggesting that longer stays were linked to ongoing discomfort (Table 4). Summarizing the pain relief status and complications, 90% of the patients achieved pain relief and no complications were reported in this group. Within the 10% of individuals experiencing prolonged pain, each person experienced a distinct complication: either lower limb weakness and sensory impairment, a missing dorsal tumor, or incorrect level surgery. This analysis emphasized the substantial influence of postoperative complications on pain treatment outcomes and emphasized the need of accurate surgical technique and postoperative care in attaining optimal pain relief for patients having lumbar fenestration and laminectomy (Table 5).

Table 1: Patient Demographics and Preoperative Data

| Characteristics | Total (n=30) | Pain Relieved (n=27) | Pain Persistent (n=3) | p-value |
|---|---|---|---|---|
| **Age (years)** | | | | |
| Mean (SD) | 45.3 (8.4) | 44.9 (8.2) | 49.0 (9.6) | 0.567 |
| Range | 32-60 | 32-59 | 39-60 | |
| **Gender** | | | | |
| Male | 16 (53.3) | 15 (55.6) | 1 (33.3) | 0.674 |
| Female | 14 (46.7) | 12 (44.4) | 2 (66.7) | |
| **Preoperative VAS Score** | | | | |
| Mean (SD) | 8.0 (0.7) | 7.9 (0.7) | 8.3 (0.6) | 0.342 |

| | | | | |
|---|---|---|---|---|
| Range | 7-9 | 7-9 | 8-9 | |

Table 2: Postoperative Outcomes and Complications

| Outcome Measure | Total (n=30) | Pain Relieved (n=27) | Pain Persistent (n=3) | p-value | Chi-Square |
|---|---|---|---|---|---|
| **Postoperative VAS Score (48 hours)** | | | | | |
| Mean (SD) | 2.6 (2.3) | 1.9 (0.8) | 8.0 (0.0) | 0.007* | - |
| Range | 1-8 | 1-3 | 8-8 | | |
| **Pain Relief Status** | | | | | |
| Relieved | 27 (90.0) | 27 (100) | 0 (0) | 0.021* | 21.818 |
| Persistent | 3 (10.0) | 0 (0) | 3 (100) | | |
| **Complications** | | | | | |
| None | 27 (90.0) | 27 (100) | 0 (0) | 0.009* | 13.636 |
| Lower limb weakness and sensory impairment | 1 (3.3) | 0 (0) | 1 (33.3) | | |
| Missed dorsal tumour | 1 (3.3) | 0 (0) | 1 (33.3) | | |
| Wrong level surgery | 1 (3.3) | 0 (0) | 1 (33.3) | | |
| **Hospital Stay (days)** | | | | | |
| Mean (SD) | 4.5 (1.2) | 4.2 (1.1) | 6.3 (0.6) | 0.045* | - |

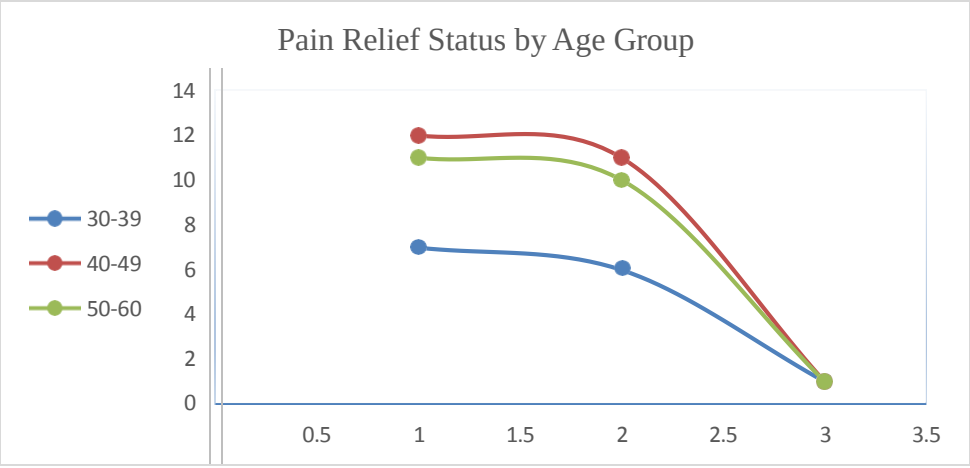


Figure 1: Pain Relief Status by Age Group

Table 3: Preoperative and Postoperative VAS Scores

| VAS Score | Total (n=30) | Pain Relieved (n=27) | Pain Persistent (n=3) | p-value |
|---|---|---|---|---|
| **Preoperative VAS** | | | | |
| Mean (SD) | 8.0 (0.7) | 7.9 (0.7) | 8.3 (0.6) | 0.342 |
| Range | 7-9 | 7-9 | 8-9 | |
| **Postoperative VAS (48 hours)** | | | | |
| Mean (SD) | 2.6 (2.3) | 1.9 (0.8) | 8.0 (0.0) | 0.003* |
| Range | 1-8 | 1-3 | 8-8 | |

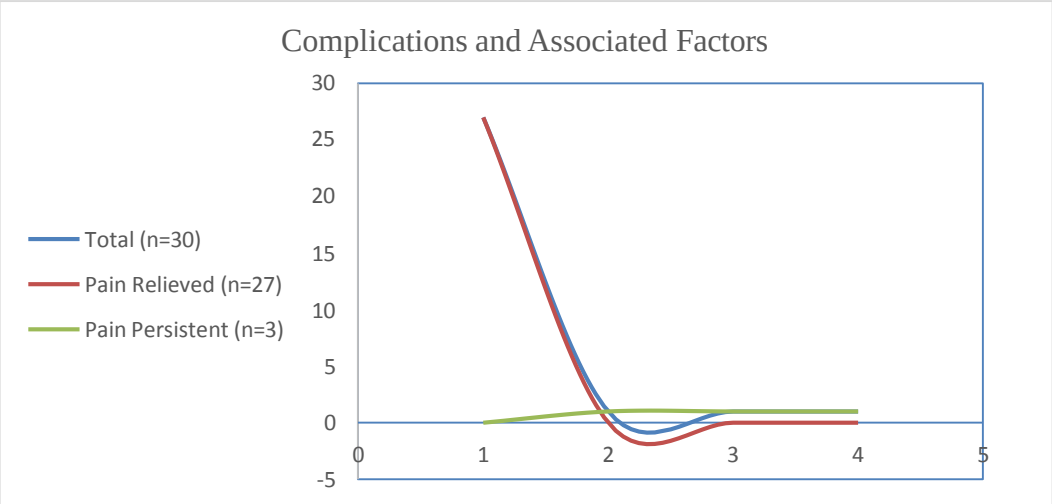


Figure 2: Complications and Associated Factors

Table 4: Multivariate Logistic Regression Analysis of Factors Associated with Pain Relief

| Factor | Coefficient (B) | Standard Error (SE) | Wald Chi-Square | p-value | Odds Ratio (95% CI) |
|---|---|---|---|---|---|
| **Age (years)** | -0.05 | 0.04 | 1.56 | 0.212 | 0.95 (0.88-1.02) |
| **Gender (Male)** | 0.64 | 1.32 | 0.24 | 0.624 | 1.89 (0.15-24.1) |
| **Preoperative VAS Score** | -0.29 | 0.47 | 0.38 | 0.537 | 0.75 (0.30-1.88) |
| **Comorbidities** | | | | | |
| Hypertension | -0.92 | 1.72 | 0.29 | 0.592 | 0.40 (0.02-9.80) |
| Diabetes Mellitus | -1.02 | 1.92 | 0.28 | 0.597 | 0.36 (0.01-9.00) |
| **Surgical Details** | | | | | |
| Multi-Level Decompression | -0.85 | 1.46 | 0.34 | 0.560 | 0.43 (0.03-5.73) |
| **Postoperative Complications** | -4.26 | 1.77 | 5.81 | 0.016 | 0.01 (0.00-0.50) |
| **Hospital Stay (days)** | -1.21 | 0.62 | 3.79 | 0.051 | 0.30 (0.09-1.00) |

Table 5: Summary of Pain Relief Status and Complications

| Pain Relief Status | Number of Patients | Percentage (%) | Complication Type | Number of Patients | Percentage (%) |
|---|---|---|---|---|---|
| **Pain Relieved** | 27 | 90.0 | None | 27 | 90.0 |
| | | | Lower Limb Weakness and Sensory Impairment | 1 | 3.3 |
| **Pain Persistent** | 3 | 10.0 | Missed Dorsal Tumor | 1 | 3.3 |
| | | | Wrong Level Surgery | 1 | 3.3 |

## DISCUSSION

The study's findings determined the effectiveness of lumbar fenestration and laminectomy in alleviating sciatica pain, especially in the crucial first two days after surgery.

### Efficacy of Lumbar Fenestration And Laminectomy

The results indicated that lumbar fenestration and laminectomy are highly effective in alleviating sciatica pain. Among the group of 30 patients, 90% individuals reported a notable decrease in pain after their surgery, as indicated by a considerable reduction in their postoperative VAS scores in comparison to their preoperative levels. This discovery aligns with prior research that demonstrated the efficacy of decompressive spine procedures in relieving symptoms caused by nerve compression [10-11]. For example, a study conducted by Aldahshory et al. (2020) found that patients who underwent lumbar laminectomy showed significant enhancements in both pain reduction and functional improvement. These results were similar to the outcomes we observed in our own study [12].

### Pain Relief and Complications

The results of our study revealed a significant variation in the effectiveness of pain treatment between individuals who experienced postoperative complications and those who did not. All patients without difficulties had pain alleviation, however those with complications did not. This group emphasized the crucial need of preventing surgical complications in order to get the best possible results. The particular complexities noted, such as paralysis and sensory loss in the lower limbs, failure to detect a tumor on the back and incorrect surgical targeting, highlighted the criticality of precise surgical techniques and comprehensive preoperative evaluations [13-14]. In their 1994 study, Jönsson and Strömqvist highlighted the significance of preventing surgical errors in order to minimize negative outcomes and guarantee the efficacy of decompressive procedures [8].

### Factors Influencing Pain Relief

Postoperative complications were determined to be the primary factor that had a substantial negative impact on pain alleviation, as revealed by multivariate logistic regression analysis. Patients who had difficulties had a considerably lower chance of experiencing pain alleviation. This is consistent with previous research that showed complications can have a major impact on the success of surgical procedures [15-16]. Wu et al. (2023) observed that problems arising from lumbar surgery may result in extended discomfort and diminished functional recovery [17].

There was no significant correlation between age, gender, preoperative VAS score and the presence of comorbidities (hypertension and diabetes mellitus) with pain alleviation outcomes. This discovery implies that demographic and clinical characteristics may not have as much significance in forecasting immediate postoperative pain alleviation compared to the lack of complications. The findings are consistent with the studies, revealing that patient demographics and initial health condition had minimal influence on the short-term effectiveness of lumbar surgery [18-19].

### Hospital Stay Duration

Patients who had pain alleviation had a considerably shorter hospital stay compared to those who had ongoing pain. This disparity can be attributed to the necessity for supplementary medical care and the handling of problems. Extended hospital stays not only escalate healthcare expenses but also amplify the likelihood of nosocomial infections and associated consequences. This discovery underscored the need of limiting surgical complications in order to decrease the length of hospital stays and alleviate the associated healthcare burdens [20]. A study emphasized the interconnectedness between problems and prolonged hospital stays, which have a significant influence on both patient outcomes and healthcare resources [21].

### Clinical Implications

The study's findings strongly endorsed the ongoing utilization of lumbar fenestration and laminectomy as efficacious therapies for alleviating sciatica pain, given their notable success rate. Nevertheless, the substantial influence of complications on results emphasized the requirement for precise surgical technique and thorough preoperative preparation. Surgeons must ensure precise identification of the surgical level and conduct a comprehensive assessment for potential complicating issues, such as undiscovered malignancies.

**Limitations and Future Research**

Although this study offered useful insights, it is subject to various limitations. The findings are not easily applicable to a larger population due to the limited number of participants in the study. Further investigation with bigger sample sizes is necessary to validate these findings and investigate additional variables that may impact the alleviation of postoperative pain.

## CONCLUSION

With a success rate of 90% among patients, this study confirms that lumbar fenestration and laminectomy are highly effective surgical techniques for providing immediate postoperative sciatica pain relief. Significantly determining persistent pain are postoperative complications, according to the findings, underscoring the importance of meticulous surgical precision and thorough preoperative planning. The impact of demographic variables, including age, gender and comorbidities, on pain relief outcomes was found to be insignificant. The outcomes emphasized the criticality of managing complications and averting surgical errors in order to maximize recovery and reduce hospital stays.

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