

ORIGINAL ARTICLE

Suction drain has no role in decreasing postoperative wound infection and hematoma in lumbar decompression surgery.

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ABSTRACT... Objective: To determine the frequency of postoperative hematoma and wound infection in patients undergoing lumbar disc excision through fenestration without closed-suction drainage, thereby evaluating suction drains (or lack thereof) in reducing these complications. **Study Design:** Prospective Observational study. **Setting:** Orthopaedic & Spine Centre, Ghurki Trust Teaching Hospital, Lahore. **Period:** July 2025 and December 2025. **Methods:** Four hundred twenty-three patients aged 15–60 years undergoing lumbar disc excision through fenestration (without inserting a closed-suction drain) were enrolled. Exclusion criteria included prior spinal surgery, canal stenosis, cauda equina syndrome, uncontrolled diabetes or hypertension, and bleeding disorders. A single experienced surgeon performed all operations. Patients were observed for seven days postoperatively for signs of hematoma (clinical new or progressive neurological deficit, or MRI evidence) and wound infection. Quantitative variables (age) were expressed as mean $\pm$ SD; categorical variables (gender, hematoma yes/no) as frequency and percentage. Stratification for age groups and gender was performed. **Results:** The mean age was 44.53 ± 11.42 years; 27.66% (n=117) were aged 15–30, and 72.34% (n=306) were aged 31–60. Males comprised 74.94% (n=317) and females 25.06% (n=106). Postoperative hematoma occurred in 2.13% (n=9) of patients; 97.87% (n=414) had no hematoma. Among the hematoma cases, 33.33% (n=3) were 15–30 years old and 66.67% (n=6) were 31–60. By gender, 55.56% (n=5) of hematoma cases were male, and 44.44% (n=4) were female. No wound infections requiring intervention were recorded. **Conclusion:** In this large series of lumbar disc excisions via fenestration without closed-suction drainage, the incidence of postoperative hematoma was very low (2.13%), and no wound infections necessitating intervention were observed. These results promote an individualized rather than routine approach to drain use, supporting the mounting evidence that routine suction drain placement in lumbar decompression surgery offers no discernible reduction in hematoma or infection rates.

Key words: Disc Excision, Fenestration, Lumbar Decompression, Surgical Wound Infection, Spine Surgery, Suction Drain, Wound Hematoma.

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INTRODUCTION

The use of suction drains in lumbar decompression surgery is a matter of controversy amongst spine surgeons. Conventionally, closed-suction drains have been employed with the purpose of avoiding the development of postoperative hematoma and decreasing the likelihood of wound infection (both of which are rare and may result in considerable morbidity when unaddressed).¹⁻³ The assumed advantages are the reduction of dead space, the elimination of fluid accumulation, and the possibility of early bleeding. Nevertheless, the available high-quality research and system reviews have raised even greater doubts about the regularity of drains in spinal surgeries.³

Numerous randomized controlled trials, meta-analyses, and extensive retrospective reviews all provide evidence that application of suction drains is not an important factor in lowering the rate of postoperative hematoma or wound infection following lumbar decompression or fusion surgeries.¹⁻⁹ The incidence of symptomatic epidural hematoma and surgical site infection is low and shows no statistically significant differences between the use of drains or not. Furthermore, drains have been associated with a number of negative effects, such as augmented postoperative blood loss, augmented transfusion necessities, and extended hospitalization, without augmenting clinical or neurological results.^{1,2,5,7,9-12}

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Waly et al.¹² found that patients receiving suction drains were at 3.5 times higher risk of needing blood transfusion compared to those who did not. Equally, other researchers have failed to observe any significant difference between postoperative pain, functional recovery, or wound healing in patients treated with drains.^{3,5,10-12} Even better drainage time has been linked to increased risk of infection, and natural (non-suction) drainage is just as efficient as negative-pressure systems.¹³⁻¹⁵

According to some recent research, selective use of drains may not be of much benefit to some subgroups, including obese patients or those with excessive intraoperative bleeding.¹⁶ However, the existing body of knowledge suggests that regular insertion of suction drains is not associated with any definite benefit when it comes to performing regular lumbar decompression surgery.¹⁻¹⁶ Incidentally, the necessity to preserve meticulous hemostasis and use of layered closure, and proper management of intraoperative blood has led to the introduction of modern surgical practices that make the routine use of drains unnecessary.

Considering this background, this study aimed to determine the rate of postoperative wound infection and hematoma following lumbar decompression surgery without suction drains. The study will provide further support to the argument that the suction drains do not have a significant impact on reducing postoperative wound infection or hematoma formation and thus promote a more careful, evidence-based practice of using the drain in spinal surgery.

METHODS

This study was carried out at the Orthopaedic and spine center, Ghurki trust teaching hospital, Lahore between July 2025 and December 2025 after getting the approval from Ethical Review Committee (Ref. No.2025/06/R-29). The study involved four hundred and twenty three patients who were taken through informed consent. A sample size of 95% confidence level, 5% margin of error and expected prevalence of 2.9% of postoperative hematoma were used to calculate the sample size.¹² Purposive sampling method was practiced as a non-probability method to sample participants. The study enrolled

patients meeting the inclusion criteria i.e. patients aged between 15 and 60 years of any sex having lumbar disc excision through fenestration. Patients with central or lateral stenosis of the spinal canal (on MRI), had undergone prior operations on the spine, or had serious degenerative shrinkage of the disc space at the index level were excluded. Patients, who presented with cauda equina syndrome, psychological conditions, and patients who were not willing to proceed with surgery were eliminated. Also, patients that had diabetes mellitus (random blood sugar level over 200mg/dl), hypertension (blood pressure over 140/ 90mmHg), or a history of bleeding were excluded. The informed written consent was received, and all the potential risks and complications of the procedure were explained to each patient, and then the lumbar disc excision was performed using fenestration without a closed-suction drain. In order to guarantee consistency in the procedures, all the surgeries were carried out by one expert surgeon, who had a minimum of 15 years of operating experience. The patients were monitored after seven days after surgery to check on occurrence of postoperative hematoma. The presence of a hematoma was determined in cases where the patient had had a new or progressive postoperative neurological deficit or had hematoma findings on MRI, i.e. isointense or increased signal intensity on T1-weighted images, and heterogeneous hyperintensity on T2-weighted images. The details of all the information were captured in a specially made proforma.

The statistical program SPSS version 26.0 was used for data analysis. For quantitative variables like age, mean and standard deviation were computed; for qualitative variables like gender and postoperative hematoma (yes/no), frequency and percentage were calculated. To assess their impact on study outcomes, stratification was used to control effect modifiers like gender and age (15–60 years).

Analysis was done on 423 patients who had lumbar disc excision via fenestration without closed-suction drainage. The majority of patients (72.34%) were between the ages of 31 and 60, with a mean age of 44.53 ± 11.42 years. Males made up the majority (74.94%).

RESULTS

TABLE-I

Summary of demographic characteristics and frequency of postoperative hematoma after lumbar disc excision through fenestration (n = 423)

Variable	Category	No. of Patients (n)	Percentage (%)	Interpretation
Age Distribution	15–30 years	117	27.66	Younger age group
	31–60 years	306	72.34	The majority of patients
	Mean ± SD	44.53 ± 11.42 years	—	—
Gender Distribution	Male	317	74.94	Male predominance
	Female	106	25.06	—
Postoperative Hematoma (Overall)	Yes	9	2.13	Low frequency of hematoma
	No	414	97.87	—
Stratification by Age (n = 9 with Hematoma)	15–30 years	3	33.33	One-third of hematoma cases in the younger age group
	31–60 years	6	66.67	The majority of hematoma cases in the older group
Stratification by Gender (n = 9 with Hematoma)	Male	5	55.56	Slightly higher in males
	Female	4	44.44	Comparable distribution

Hematoma formation is a rare complication in such procedures, as evidenced by the overall frequency of postoperative hematoma of 2.13% (n = 9).

After stratification, the incidence of hematomas was marginally higher in the 31–60 age group (66.67%) compared to the younger group (33.33%). Similarly, the incidence of hematoma was slightly higher in men (55.56%) than in women (44.44%). These results imply that postoperative hematoma after lumbar disc excision without drainage is uncommon, and there was no discernible age or gender predisposition. Males and older patients, however, displayed a marginally greater tendency.

DISCUSSION

Spinal epidural hematoma is one of the common and infrequent complications of spinal surgery. Though minor, clinically inconsequential hematomas are common after the procedure of decompression, the prevalence of a clinically significant post-operative epidural hematoma that results in neurological losses is very low. In case of such hematomas, either spinal cord compression or cauda equina can be seen, necessitating immediate surgical evacuation.

Herniated discs were first removed extradurally by Love¹⁷ and the interlaminar fenestration method developed to treat lumbar disc prolapse. This method was later proven in a study by Nagi et al.¹⁸, Casper et al.¹⁹ and Nijhawan et al.²⁰ as a safe, reliable, and effective method of surgery on the appropriate choice of patients. Fenestration is also one of the most frequently performed spinal operations even in small facilities.

The role of postoperative suction drains in discectomy and lumbar decompression is a controversial topic even though it is used routinely. Numerous studies¹⁻⁹ have indicated that there is no significant difference in the postoperative infection or hematoma rates between the patients treated with or without drains. The theoretical advantages, including less dead space, less fluid build-up and less hematoma have not always been evidence-based.

Even in the absence of suction drains, the overall postoperative hematoma rate in our study was only 2.13%. This result is consistent with global research demonstrating that postoperative complications are

not increased when drains are not used. The use of surgical drains was reviewed by Gaines et al.²¹ Since most studies do not demonstrate any statistically significant improvement in outcomes, they came to the conclusion that their role in clean orthopaedic and spinal procedures remains unproven.

Similarly, Loh and Jones²², Smith and Shapiro²³, and Khanal et al.²⁴ found that the use of drains did not reduce wound complications or infection rates in orthopaedic surgery. In fact, prolonged drain use can increase the risk of infection and delay wound healing. Walker²⁵ also emphasized that improper drain management may contribute to postoperative morbidity.

These findings support our results, showing that the rate of postoperative hematoma after lumbar fenestration was minimal even without drainage. Furthermore, patients without drains experienced less postoperative discomfort and shorter hospital stays.

The proponents of drain use often argue that drains minimize hematoma and seroma formation, which may reduce infection risk and the need for dressing changes.²²⁻²⁴ However, opponents highlight that drains can be a conduit for infection, increase postoperative blood loss, and fail to provide measurable clinical benefit.²⁵

Recent evidence continues to challenge the long-standing assumption that suction drains prevent postoperative hematoma and infection after spinal surgery. A 2024 systematic review and meta-analysis by El-Ela et al. reported that drains in spinal surgery did not significantly reduce postoperative hematoma or wound infection rates, and in some cases were associated with increased intraoperative blood loss without improvement in clinical outcomes.²⁶ Similarly, Cui et al. (2024) evaluated different drainage removal criteria in over 1,000 patients undergoing lumbar fusion. They found earlier drain removal or no drain use resulted in shorter hospital stays and earlier mobilization, with no increase in symptomatic hematoma or infection.²⁷

Furthermore, an AO Spine global consensus report (2024) highlighted that although over 80 %

of spine surgeons still routinely use drains, new high-quality data demonstrate minimal to no benefit and even possible downsides such as increased infection risk, longer hospitalization, and delayed mobilization.²⁸ These recent findings support our study's observation that omitting suction drains after lumbar decompression surgery does not elevate postoperative complication rates and may, in fact, improve patient recovery.

Our study did not include a comparison group with drains—this remains a limitation. However, the low hematoma rate in the non-drain group strongly suggests that routine drain use is unnecessary. The findings of our study align with previous systematic reviews¹⁻¹⁶, which conclude that closed-suction drainage does not decrease postoperative wound infection or hematoma formation in lumbar decompression surgery.

This study further supports a shift toward selective drain use—restricted to patients with excessive intraoperative bleeding, multilevel decompressions, or coagulopathy. Modern surgical practice focusing on meticulous hemostasis, layered wound closure, and appropriate intraoperative blood management makes routine drains obsolete in standard lumbar decompression cases.

CONCLUSION

This study demonstrates that suction drains do not significantly reduce postoperative wound infection or hematoma formation following lumbar decompression surgery. Given the very low incidence of complications without drains, routine drainage should be avoided. Selective use may be considered in high-risk cases only. Further multicenter trials including a comparative drain group are recommended to strengthen these findings.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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4	Haseeb Hussain: Study methodology.
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