International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

Comparative Evaluation of Local and Spinal Anesthesia in Elective Open Inguinal Hernia Repair: A Prospective Observational Study

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Received: 20-02-2026
Accepted: 08-03-2026
Available online: 20-03-2026

ABSTRACT

Background: Inguinal hernia repair is one of the most commonly performed surgical procedures worldwide. The choice of anesthesia plays a significant role in perioperative safety, postoperative recovery, and patient comfort. Local anesthesia and spinal anesthesia are widely used for open inguinal hernia repair, yet their comparative outcomes remain a subject of clinical interest.
Methods: This prospective comparative observational study was conducted in the Department of General Surgery at a tertiary care teaching hospital. A total of 96 adult patients with unilateral primary inguinal hernia were enrolled and equally divided into two groups: local anesthesia (n = 48) and spinal anesthesia (n = 48). All patients underwent tension-free Lichtenstein mesh hernioplasty.
Results: Patients in the local anesthesia group demonstrated significantly lower postoperative pain scores, earlier ambulation, and shorter hospital stay compared to the spinal anesthesia group. Hemodynamic stability was superior in the local anesthesia group, while postoperative urinary retention was more common following spinal anesthesia. Surgical site complications were comparable between both groups.
Conclusion: Local anesthesia is a safe, effective, and patient-friendly alternative to spinal anesthesia for open inguinal hernia repair. It offers superior postoperative recovery, early mobilization, and reduced hospital stay, making it particularly suitable for day-care surgery and resource-limited settings.

Keywords*: Inguinal hernia, Local anesthesia, Spinal anesthesia, Lichtenstein repair, Postoperative outcomes.*

INTRODUCTION

Inguinal hernia is one of the most common conditions requiring elective surgical intervention in general surgery and represents a significant burden on surgical services worldwide. The condition occurs due to protrusion of abdominal contents through a weakened area of the inguinal canal and is more prevalent in males because of anatomical and physiological factors related to testicular descent and canal structure. The lifetime risk of developing an inguinal hernia has been reported to be as high “as 27% in men, compared with approximately 3% in women [1]. Untreated hernias may lead to complications such as incarceration, obstruction, or strangulation, making surgical repair the definitive and recommended treatment.

Open tension-free mesh hernioplasty, particularly the Lichtenstein technique, has become the most widely accepted method for inguinal hernia repair owing to its simplicity, reproducibility, low recurrence rates, and applicability in varied clinical settings [2]. While surgical technique is a critical determinant of outcome, perioperative anesthesia plays an equally important role in influencing intraoperative stability, postoperative pain, early mobilization. The choice of anesthesia thus directly affects patient satisfaction, recovery trajectory, and overall healthcare resource utilization.

Spinal anesthesia has traditionally been the preferred anesthetic technique for open inguinal hernia repair. It provides reliable sensory blockade, excellent muscle relaxation, and optimal operating conditions for the surgeon. However, spinal

anesthesia is associated with several well-documented adverse effects, including postoperative urinary retention, delayed ambulation, nausea, headache, and prolonged hospital stay [3]. These effects may be particularly problematic in elderly patients and those with cardiovascular, respiratory, or metabolic comorbidities.

Local anesthesia has gained increasing acceptance as an alternative to spinal anesthesia for open inguinal hernia repair. Local infiltration or block anesthesia offers targeted analgesia at the operative site, preserves hemodynamic stability, avoids neuraxial blockade, and allows early ambulation and discharge [4]. In addition, local anesthesia reduces the need for extensive postoperative monitoring and may be particularly advantageous in resource-limited settings.

Despite accumulating evidence favoring local anesthesia, spinal anesthesia continues to be widely practiced in many institutions, particularly in developing countries. Comparative data evaluating surgical outcomes under local versus spinal anesthesia remain limited, and institutional practices often depend on surgeon preference rather than evidence-based protocols. In the Indian context, where surgical volume is high and optimization of hospital resources is essential, there is a need for well-designed comparative studies to guide anesthetic choice. This study was therefore undertaken to compare surgical outcomes, postoperative recovery parameters, and complication profiles in patients undergoing open inguinal hernia repair under local and spinal anesthesia.

MATERIALS AND METHODS

This prospective comparative observational study was conducted in the Department of General Surgery at a tertiary care teaching hospital over a period of 24 months.

A total of 96 patients were included in the study.

Patients aged 18 years and above with clinically diagnosed unilateral primary inguinal hernia and deemed fit for elective surgery under either local or spinal anesthesia were included. Patients with bilateral or recurrent hernias, irreducible or strangulated hernias, those requiring emergency surgery, patients with contraindications to spinal or local anesthetic agents, pregnant patients, individuals with coagulopathies, severe cardiopulmonary disease, neurological disorders, or spinal deformities were excluded from the study.

In the local anesthesia group, anesthesia was administered using a point block technique with a combination of lignocaine and bupivacaine within safe dosage limits under strict aseptic precautions. In the spinal anesthesia group, standard intrathecal spinal anesthesia was administered using recommended doses of local anesthetic agents. Continuous intraoperative monitoring of vital parameters was performed in all patients.

Outcome measures assessed included intraoperative comfort, duration of surgery, postoperative pain assessed using the Visual Analog Scale (VAS), time to ambulation, postoperative urinary retention, surgical site complications, and length of hospital stay. Postoperative pain scores were recorded at predefined intervals, and patients were monitored until discharge. Data were recorded using a structured proforma.

Statistical analysis was performed using appropriate statistical software SPSS 25.0.

RESULTS

A total of 96 patients with unilateral primary inguinal hernia were included in the study, with 48 patients each allocated to the local anesthesia group (Group L) and spinal anesthesia group (Group S). All patients successfully underwent elective open Lichtenstein mesh hernioplasty. No case required conversion of anesthesia or surgical technique.

Table 1. Demographic and Baseline Clinical Characteristics of Study Participants (n = 96)

Variable	Local Anesthesia (n = 48)	Spinal Anesthesia (n = 48)	Total (n = 96)
Mean age (years ± SD)	48.54 ± 12.90	43.13 ± 11.55	—
Age 18–30 years	6 (12.5%)	10 (20.8%)	16 (16.7%)
Age 31–40 years	9 (18.8%)	13 (27.1%)	22 (22.9%)
Age 41–50 years	15 (31.3%)	14 (29.2%)	29 (30.2%)
Age 51–60 years	12 (25.0%)	8 (16.7%)	20 (20.8%)
Age 61–70 years	6 (12.5%)	3 (6.3%)	9 (9.4%)
Male sex	48 (100%)	48 (100%)	96 (100%)
Right-sided hernia	24 (50.0%)	27 (56.3%)	51 (53.1%)
Left-sided hernia	24 (50.0%)	21 (43.7%)	45 (46.9%)
ASA I	25 (52.1%)	23 (47.9%)	48 (50.0%)
ASA II	23 (47.9%)	25 (52.1%)	48 (50.0%)

Table 1 demonstrates that the two study groups were well matched with respect to baseline demographic and clinical characteristics. The mean age was slightly higher in the local anesthesia group (48.54 ± 12.90 years) compared to the spinal anesthesia group (43.13 ± 11.55 years), but the overlapping standard deviations indicate comparable age distribution. All participants were male, reflecting the known male predominance of inguinal hernia. Right-sided hernias were marginally more common overall, with similar laterality distribution between groups. Equal distribution of ASA physical status grades I and II in both groups indicates comparable preoperative fitness. This demographic homogeneity minimizes confounding and strengthens the validity of comparative outcome analysis.

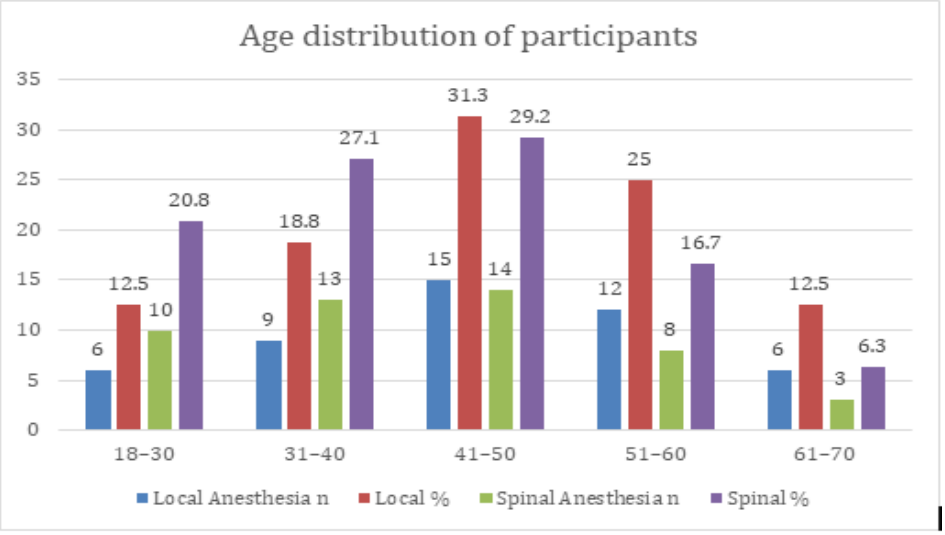

Table 2. Distribution of Comorbidities

Comorbidity	Local Anesthesia n (%)	Spinal Anesthesia n (%)
Hypertension	14 (29.2%)	16 (33.3%)
Type 2 Diabetes Mellitus	12 (25.0%)	13 (27.1%)
COPD	4 (8.3%)	5 (10.4%)
BPH (≤ Grade 1)	1 (2.1%)	2 (4.2%)
No comorbidity	17 (35.4%)	15 (31.3%)

Table 2 shows that the prevalence of associated medical comorbidities was comparable between the local and spinal anesthesia groups. Hypertension was the most frequent comorbidity, followed by type 2 diabetes mellitus in both groups. Chronic obstructive pulmonary disease and benign prostatic hyperplasia were present in smaller proportions, while approximately one-third of patients in each group had no comorbid illness. The similarity in comorbidity profiles suggests that systemic health status was evenly balanced between groups. This comparability ensures that differences in perioperative and postoperative outcomes are more likely attributable to the anesthetic technique rather than underlying medical conditions.

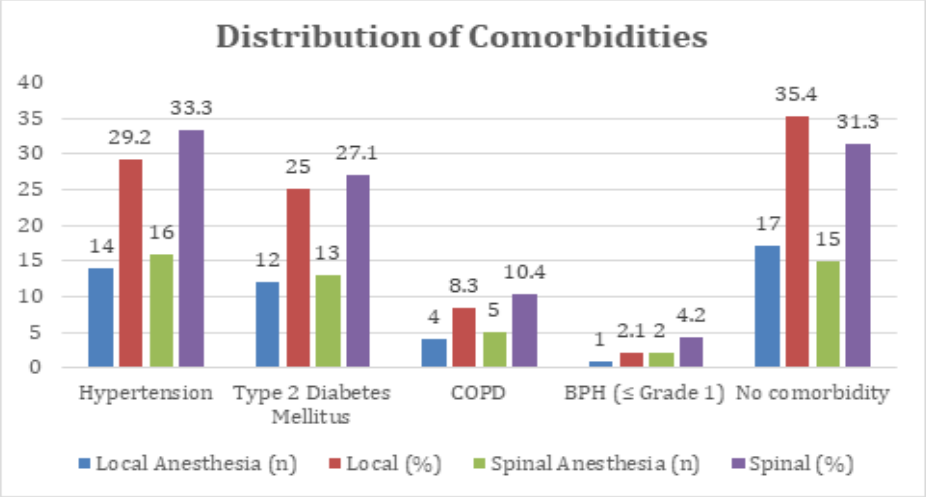

Table 3. Duration of Surgery and Intraoperative Blood Loss

Parameter	Local Anesthesia	Spinal Anesthesia
Surgery duration 30–45 min	4 (8.3%)	18 (37.5%)
Surgery duration 45–60 min	20 (41.7%)	24 (50.0%)
Surgery duration 60–90 min	24 (50.0%)	6 (12.5%)
Mean blood loss (mL ± SD)	6.87 ± 3.12	7.64 ± 3.41

Table 3 highlights a statistically significant difference in operative duration . This difference may be attributed to better muscle relaxation and surgical field exposure under spinal anesthesia. Despite this variation in duration, intraoperative blood loss was minimal and comparable in both groups, with no patient experiencing blood loss exceeding 20 mL. These findings indicate that while spinal anesthesia may improve operative efficiency, both techniques offer equally safe intraoperative hemostatic outcomes.

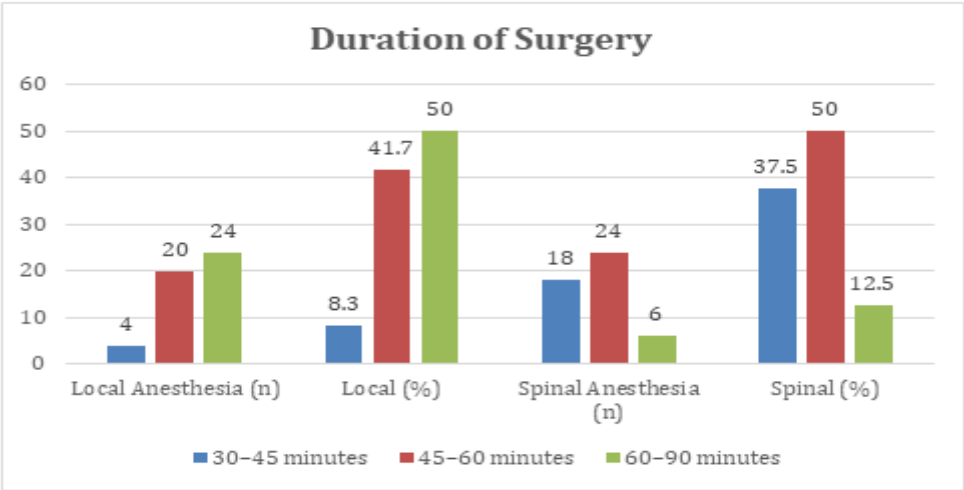

Table 4. Postoperative Pain Scores (VAS)

Time Interval	Local Anesthesia (Mean ± SD)	Spinal Anesthesia (Mean ± SD)
2 hours	2.90 ± 0.54	0
6 hours	3.14 ± 0.54	3.14 ± 0.86
12 hours	2.10 ± 0.62	2.12 ± 0.63
24 hours	1.13 ± 0.66	1.99 ± 0.59

Table 4 illustrates the temporal variation in postoperative pain between the two anesthesia techniques. Spinal anesthesia provided complete analgesia in the immediate postoperative period due to residual neuraxial blockade. At 6,12 and 24 hours, pain scores were comparable between groups.

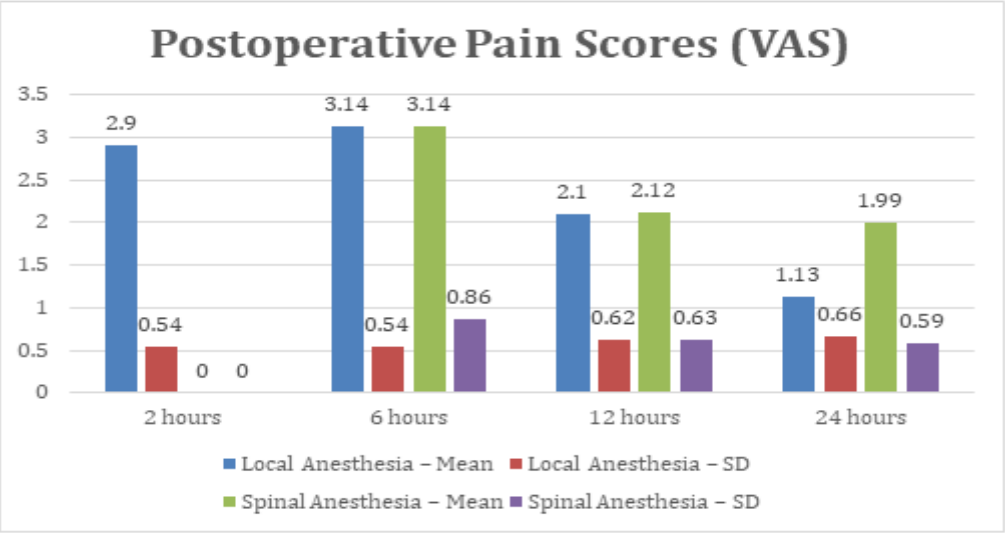

Table 5. Postoperative Recovery Parameters

Parameter	Local Anesthesia	Spinal Anesthesia
Ambulation < 6 hours	48 (100%)	0
Ambulation 6–12 hours	0	40 (83.3%)
Ambulation > 12 hours	0	8 (16.7%)
Mean time to first micturition (hours ± SD)	4.35 ± 0.83	12.13 ± 2.27
Urinary retention	0	12 (25.0%)

Table 5 demonstrates marked differences in functional recovery between the two groups. All patients in the local anesthesia group ambulated within 6 hours of surgery, with none experiencing delayed mobilization. In contrast, the majority of spinal anesthesia patients ambulated between 6–12 hours, and a subset required more than 12 hours.

Table 6. Postoperative Complications

Complication	Local Anesthesia n (%)	Spinal Anesthesia n (%)
No complication	41 (72.9%)	24 (39.6%)
Headache	0	2 (4.2%)
Headache + vomiting	0	6 (12.5%)
Seroma	5 (10.4%)	4 (8.3%)
Urinary retention	0	8 (16.7%)
Wound infection	1 (2.1%)	2 (4.2%)

Table 6 reveals a higher overall postoperative morbidity in the spinal anesthesia group. Anesthesia-related complications such as headache, vomiting, and urinary retention were observed exclusively in the spinal anesthesia group. Surgical site complications, including seroma and wound infection, occurred at comparable frequencies in both groups. These findings suggest that while surgical safety remains similar, local anesthesia is associated with fewer anesthesia-related adverse events, contributing to a smoother postoperative recovery.

Table 7. Length of Hospital Stay

Hospital Stay	Local Anesthesia	Spinal Anesthesia
1 day	45 (93.8%)	0
2 days	3 (6.2%)	27 (56.3%)
> 2 days	0	21 (43.7%)
Mean stay (days ± SD)	1.00 ± 0.00	1.56 ± 0.50

Table 7 clearly demonstrates a significant reduction in hospital stay among patients receiving local anesthesia. Nearly all patients in the local anesthesia group were discharged within one day, whereas none of the spinal anesthesia patients achieved same-day discharge. More than half of the spinal anesthesia group required a hospital stay of two days, and a substantial proportion stayed longer than two days. The prolonged hospitalization in the spinal anesthesia group can be attributed to delayed ambulation and urinary complications. These results highlight the economic and logistical advantages of local anesthesia, particularly in day-care and high-volume surgical settings.

DISCUSSION

The present prospective comparative study evaluated the effects of local anesthesia and spinal anesthesia on intraoperative parameters, postoperative pain, recovery profile, complications, and hospital stay in patients undergoing elective open inguinal hernia repair. The findings demonstrate that while both anesthetic techniques are safe and effective, each offers distinct advantages at different perioperative stages. Spinal anesthesia provided superior immediate postoperative analgesia and shorter operative duration, whereas local anesthesia was associated with better overall postoperative recovery, fewer anesthesia-related complications, and shorter hospital stay. These observations are consistent with previously published comparative studies [4,7,10].

The demographic profile of the study population showed a marked male predominance, which is consistent with the established epidemiology of inguinal hernia [1,15]. The comparable age distribution, hernia laterality, ASA physical status, and comorbidity profile between the two groups ensured baseline homogeneity, thereby minimizing confounding factors and strengthening the internal validity of the study. Similar demographic comparability has been reported in earlier studies evaluating anesthetic techniques for inguinal hernia repair [7,10].

With regard to intraoperative parameters, the present study demonstrated a significantly shorter duration of surgery in the spinal anesthesia group. A greater proportion of patients in this group completed surgery within 60 minutes compared to the local anesthesia group, where half of the procedures required 60–90 minutes. This finding can be attributed to better muscle relaxation and optimal surgical field exposure achieved with neuraxial blockade, which facilitates faster dissection and mesh placement [3,9]. Similar observations have been reported by other authors, who noted improved operative efficiency under spinal anesthesia [7]. Despite this difference in duration, intraoperative blood loss was minimal and comparable between both groups, indicating that the choice of anesthesia did not compromise surgical safety or hemostasis [2].

Postoperative pain analysis revealed a time-dependent variation between the two anesthetic techniques. Spinal anesthesia provided complete or near-complete analgesia in the immediate postoperative period due to the residual effect of neuraxial blockade [8]. At intermediate time points, pain scores were comparable between the two groups. Similar findings have been reported in previous studies, supporting the role of local anesthetic infiltration in reducing prolonged postoperative nociceptive input [4,5].

One of the most clinically significant findings of the present study relates to postoperative recovery parameters. All patients in the local anesthesia group ambulated within six hours of surgery, whereas ambulation was significantly delayed in the spinal anesthesia group. Early ambulation is a cornerstone of enhanced recovery protocols, as it reduces the risk of thromboembolic events, improves patient comfort, and facilitates early discharge [13]. Delayed ambulation following spinal anesthesia is primarily related to residual motor blockade and hemodynamic effects, as documented in earlier anesthetic outcome studies [9].

Urinary retention occurred exclusively in the spinal anesthesia group, necessitating catheterization and prolonged observation. This complication is a well-recognized adverse effect of neuraxial anesthesia due to sacral nerve blockade [8]. The absence of urinary retention in the local anesthesia group represents a major clinical advantage, particularly in elderly patients and those with prostatic enlargement, and has been similarly emphasized in previous comparative studies [10].

Postoperative complication analysis further supports the superiority of local anesthesia in terms of recovery profile. A substantially higher proportion of patients in the local anesthesia group experienced an uncomplicated postoperative course. Anesthesia-related complications such as headache, vomiting, and urinary retention were observed exclusively in the spinal anesthesia group, which is consistent with known side effects of spinal anesthesia [3,8]. Surgical site complications, including seroma and wound infection, occurred at comparable frequencies in both groups, indicating that anesthetic technique did not influence wound healing or surgical outcomes [2,6].

Length of hospital stay is an important outcome measure with significant economic and logistical implications. In the present study, the majority of patients in the local anesthesia group were discharged within 24 hours, whereas none of the patients in the spinal anesthesia group achieved same-day discharge. Prolonged hospitalization in the spinal anesthesia group can be attributed to delayed ambulation, urinary retention, and anesthesia-related complications. Similar reductions in hospital stay with local anesthesia have been reported by Chhabda et al. and Hakeem et al., who emphasized the suitability of local anesthesia for true day-care hernia surgery [7,10]. These findings reinforce the role of local anesthesia in optimizing healthcare resource utilization.

Overall, the present study demonstrates that spinal anesthesia offers advantages in terms of intraoperative comfort, muscle relaxation, and immediate postoperative analgesia, making it a reliable option in selected patients. However, these benefits are offset by higher rates of anesthesia-related complications, delayed functional recovery, and longer hospital stay. In

contrast, local anesthesia provides a superior overall recovery profile, characterized by early ambulation, no urinary retention, fewer complications, better sustained pain control, and reduced hospitalization. These findings align with existing literature and support the preferential use of local anesthesia for elective open inguinal hernia repair, particularly in day-care and enhanced recovery settings [4,7,13].

CONCLUSION

Both local anesthesia and spinal anesthesia are effective and safe techniques for elective open inguinal hernia repair, each offering distinct advantages. Spinal anesthesia provides superior immediate postoperative analgesia and shorter intraoperative duration due to better muscle relaxation and surgical field exposure. However, these benefits are offset by higher rates of urinary retention, delayed ambulation, anesthesia-related complications, and longer hospital stay.

Local anesthesia demonstrated a superior overall postoperative recovery profile, characterized by earlier ambulation, absence of urinary retention, fewer anesthesia-related complications and significantly shorter hospital stay. Surgical site complications were comparable between both groups.

In conclusion, while spinal anesthesia remains advantageous for immediate postoperative comfort and operative efficiency, local anesthesia emerges as a safer, patient-centered, and resource-efficient modality for elective open inguinal hernia repair, particularly suited for day-care surgery and enhanced recovery protocols.

LIMITATIONS

Despite providing clinically relevant and statistically significant findings, the present study has certain limitations that should be acknowledged. First, this was a single-center study conducted at a tertiary care teaching hospital, which may limit the generalizability of the results to other institutions with different patient populations, surgical expertise, or perioperative protocols. Multicentric studies would enhance external validity.

Second, although the sample size was adequate to demonstrate significant differences between local and spinal anesthesia, a larger cohort would permit more robust subgroup analyses based on age, comorbidities, and risk stratification. The study population consisted predominantly of male patients, reflecting the epidemiology of inguinal hernia; however, inclusion of a larger female cohort could provide additional insights into sex-specific outcomes.

Third, the study focused primarily on short-term perioperative and early postoperative outcomes. Long-term outcomes such as chronic groin pain, recurrence rates, and long-term patient satisfaction were not assessed. Evaluation of these parameters would provide a more comprehensive understanding of the sustained benefits of local anesthesia.

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