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Comparison Of Local Versus Spinal Anesthesia In Elective Lichtenstein Inguinal Hernia Repair: A Randomized Controlled Trial

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ABSTRACT

Objective

To compare the outcomes of local versus spinal anaesthesia in inguinal hernia repair among patients presenting to a tertiary care hospital.

Design

The study design is randomized controlled trial.

Place & duration of study

The study was conducted at Department of General Surgery, Jinnah Postgraduate Medical Centre, Karachi over a period of six months.

Methodology

Patients aged 20–60 years with unilateral inguinal hernia were randomly allocated into two equal groups using a computer-generated sequence. Lichtenstein mesh hernioplasty was performed under local anesthesia in Group A, and under spinal anesthesia in Group B. Postoperative pain was assessed using Visual Analog Scale at 6, 12, and 24 hours as primary outcome, and length of hospital stay was recorded as the secondary outcome. Data were analyzed using IBM SPSS Statistics version 20. An independent-samples t test was used to compare groups for the primary and secondary outcomes. A p-value ≤0.05 was considered as statistically significant.

Results

A total of 60 patients were included, with 30 in each group. The local anesthesia group had slightly lower postoperative pain scores at all assessed time points, although the difference was not statistically significant. Hospital stay was significantly shorter with local anesthesia than spinal anesthesia (2.21 vs. 2.94 days; $p< 0.05$).

Conclusion:

Local anesthesia for Lichtenstein inguinal hernia repair is associated with a shorter hospital stay when compared with spinal anesthesia. Postoperative pain outcomes remain comparable between the two techniques.

Keywords: Local anesthesia; Spinal anesthesia; Inguinal Hernia; Postoperative pain.

Introduction

An inguinal hernia is the protrusion of abdominal contents through the inguinal canal and represents one of the most common conditions encountered in general surgical practice. Globally, hernias affect an estimated 223 million people and contribute substantially to the surgical disease burden worldwide (1).

In Pakistan, inguinal hernias account for approximately 70–76% of all abdominal wall hernias and occur predominantly in males, with reported male-to-female ratios ranging from 3.3:1 to 4.7:1; the condition is most frequently observed in adults over 40 years of age (2). Although comprehensive national epidemiological data are limited, approximately 300,000 individuals in Pakistan are estimated to be affected by hernias (3). Emergency inguinal hernia repair is associated with higher morbidity than elective surgery (4). Inguinal hernia also constitutes a considerable proportion of the surgical workload, accounting for approximately

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10–12% of patients presenting to outpatient surgical clinics (5).

Hernia repair is a fundamental component of surgical training in Pakistan and is one of the most commonly performed general surgical procedures. Several operative techniques have been developed over time, including laparoscopic approaches however, the Lichtenstein tension-free mesh repair remains one of the most widely performed open techniques (6). Because of its favourable outcomes and low recurrence rates, it is recommended by the European Hernia Society for open inguinal hernia repair (7). This procedure can be performed under general, spinal or local anaesthesia, and no anesthetic approach is universally preferred (5).

The choice of anesthesia may influence postoperative recovery and patient outcomes. A meta-analysis comparing local and spinal anaesthesia for inguinal hernia repair reported lower postoperative pain scores among patients receiving local anaesthesia than among those receiving spinal anaesthesia (8). Similar findings have been reported in other studies, although differences in hospital stay have not always reached statistical significance (9). Regional and local anaesthetic techniques have also been associated with stable intraoperative conditions and may facilitate early postoperative mobilization (6). In a large observational study from Denmark that included more than 1,000 patients, the use of local anesthesia was associated with reduced hospital costs, earlier discharge and high patient satisfaction(10).

In Pakistan, inguinal hernia repair is commonly performed under spinal anaesthesia, and the use of local anesthesia remains relatively limited in many institutions. At our teaching hospital, elective inguinal hernia repair is performed under both local and spinal anesthesia. Given the increasing surgical workload and resource constraints in public-sector hospitals, evaluating anesthetic techniques that may facilitate recovery and optimize resource utilization is of clinical relevance. This study was therefore conducted to compare local and spinal anaesthesia in patients undergoing elective Lichtenstein inguinal hernia repair.

Material and method

This randomized controlled trial was conducted in the Department of Surgery (Ward 21), Jinnah Postgraduate Medical Centre, Karachi, from 31 May 2021 to 30 November 2021. Ethical approval was obtained from the Institutional Review Board of Jinnah Postgraduate Medical Centre before commencement of the study, and written informed consent was obtained from all participants.

The sample size was calculated using OpenEpi version 3.0 on the basis of previously reported post-operative pain scores at 12 hours following inguinal hernia repair under local and spinal anesthesia (3.32 ± 1.14 and 4.32 ± 1.18, respectively) (11). At 95% confidence level and 80% power of test ,sixtyparticipants were recruited by using consecutive non-probability sampling technique. A total of sixty participants were randomly allocated toeither of the group A and group B. Each participant was randomly allocated into two equal groups using a computer-generated sequence, hence thirty participants allocated to each group. Lichtenstein mesh hernioplasty was performed under local anesthesia in Group A, and under spinal anesthesia in Group B.

Patients of either sex aged 20–60 years with a unilateral inguinal hernia (direct or indirect) who provided written informed consent were included. Patients with recurrent or bilateral hernias, complicated hernias (irreducible, obstructed or strangulated), bleeding disorders, ongoing anticoagulant therapy, severe renal, cardiac or hepatic insufficiency, or a known allergy to local anaesthetic agents were excluded.

Baseline demographic and clinical characteristics, including age, sex, weight, height, body mass index (BMI), hernia type and hernia side, were recorded. Routine pre-operative investigations were performed according to institutional protocols. The Visual Analogue Scale (VAS) was explained to all participants before surgery in order to standardize pain assessment.

Eligible patients were randomly assigned in a 1:1 ratio to local anaesthesia (Group A) or spinal anaesthesia (Group B) using a computer-generated randomization sequence. Allocation was concealed in sealed, opaque, sequentially numbered envelopes that were opened only after eligibility and fitness for surgery had been confirmed. Randomization was performed one day before surgery.

Following routine pre-anesthetic assessment, patients in Group A underwent surgery under local anesthesia using a mixture of 20 mL of 2% lignocaine hydrochloride, 20 mL of 0.5% bupivacaine hydrochloride and 20 mL of sterile saline, infiltrated into the inguinal region. Patients in Group B received spinal anaesthesia under aseptic conditions using 3 mL of 0.5% hyperbaric

bupivacaine (15 mg) administered into the subarachnoid space at the L3–L4 level through a 26-gauge spinal needle. Standard intraoperative monitoring, including pulse rate, blood pressure, respiratory rate and oxygen saturation, was maintained throughout the procedure.

All patients underwent tension-free Lichtenstein mesh hernioplasty performed by the principal investigator and senior registrars under consultant supervision. Postoperative analgesia consisted of paracetamol 500–1000 mg every six hours, together with diclofenac administered according to institutional protocol. Pain was assessed using the VAS at 6, 12 and 24 hours and on postoperative day 8 by personnel who were not involved in the surgery.

Patients were discharged when they were haemodynamically stable and ambulatory, were tolerating oral intake, had adequately controlled pain and had no surgical or anesthetic complication requiring continued admission. Length of hospital stay was calculated from completion of surgery until discharge. Pain, wound status and overall recovery were assessed at the day 8 follow-up visit.

No patient was required conversion from the assigned anesthetic technique. Any patient requiring conversion was to be managed with the alternative anesthetic technique and excluded from the final analysis.

Data wereanalysed using IBM SPSS Statistics version 20.0. Continuous variables were expressed as mean ± standard deviation and categorical variables as frequencies and percentages. Normality was assessed using the Shapiro–Wilk test. Postoperative pain scores and length of hospital stay were compared between the groups using the independent samples t-test. A p-value of ≤0.05 was considered as statistically significant.

Results

A total of 60 patients with a unilateral inguinal hernia were included and equally allocated to the local anaesthesia group (n=30) and the spinal anaesthesia group (n=30). All 60 patients completed the assigned intervention and the day 8 follow-up, and all were included in the final analysis. Baseline demographic and clinical characteristics are presented in Table 1. Mean age was comparable between the two groups (48.71 ± 8.01 years in the local anaesthesia group vs. 47.25 ± 7.91 years in the spinal anaesthesia group), and height, weight, BMI, sex distribution and hernia type were also similar. A higher proportion of patients in the spinal anaesthesia group had a left-sided hernia (73.3% vs. 40.0%).

Postoperative pain scores at the different follow-up intervals are presented in Table 2. The local anaesthesia group had lower mean pain scores during the early postoperative period, although none of the differences was statistically significant (all p-values >0.05). At 6 hours, mean pain scores were 4.61 ± 1.17 and 5.06 ± 1.55; at 12 hours, 3.29 ± 1.16 and 3.48 ± 1.29; and at 24 hours, 2.51 ± 0.99 and 2.62 ± 1.11 in the local and spinal anaesthesia groups, respectively. By postoperative day 8, pain scores were comparable between the groups (1.80 ± 0.70 vs. 1.75 ± 0.63).

The mean duration of hospital stay was significantly shorter in the local anesthesia group than in the spinal anesthesia group (2.21 ± 0.65 vs. 2.94 ± 0.75 days; mean difference −0.73 days; 95% CI −1.09 to −0.37; p=0.001), as shown in Table 3.

Table 1. Baseline Characteristics of Study Participants

Variable	Spinal Anaesthesia (n=30)	Local Anaesthesia (n=30)
Age (years), mean ± SD	47.25 ± 7.91	48.71 ± 8.01
Height (cm), mean ± SD	161.16 ± 5.70	159.90 ± 5.17
Weight (kg), mean ± SD	70.12 ± 11.21	71.01 ± 13.14
BMI (kg/m²), mean ± SD	29.41 ± 3.71	30.69 ± 2.35
Male, n (%)	20 (66.7)	18 (60.0)
Female, n (%)	10 (33.3)	12 (40.0)
Left-sided hernia, n (%)	22 (73.3)	12 (40.0)
Right-sided hernia, n (%)	8 (26.7)	18 (60.0)
Direct hernia, n (%)	20 (66.7)	18 (60.0)
Indirect hernia, n (%)	10 (33.3)	12 (40.0)

Table 2. Comparison of Postoperative Pain Scores

Time Point	Spinal Anaesthesia	Local Anaesthesia	p-value
6 hours	5.06 ± 1.55	4.61 ± 1.17	0.21
12 hours	3.48 ± 1.29	3.29 ± 1.16	0.55
24 hours	2.62 ± 1.11	2.51 ± 0.99	0.69
1 week	1.75 ± 0.63	1.80 ± 0.70	0.77

Table 3. Length of Hospital Stay

Outcome	Spinal Anaesthesia	Local Anaesthesia	p- value
Length of hospital stay (days)	2.94 ± 0.75	2.21 ± 0.65	0.001

Discussion

In this randomized controlled trial, we compared the outcomes of Lichtenstein inguinal hernia repair performed under local anesthesia (Group A) with those of repair performed under spinal anesthesia (Group B). The primary outcome was postoperative pain and the secondary outcome was duration of hospital stay. Postoperative pain scores were slightly lower in the local anesthesia group during the early postoperative period, but the differences between the two groups were small and were neither clinically nor statistically significant at any assessed time point. A statistically significant reduction in hospital stay was, however, observed in patients who received local anesthesia.

Postoperative pain is one of the most important determinants of early recovery after inguinal hernia repair. In the present study, pain scores at 6, 12 and 24 hours showed a marginal trend towards lower values in the local anesthesia group, but this difference remained minimal and did not reach statistical significance. By postoperative day 8, pain levels were almost identical in the two groups, indicating comparable longer-term comfort regardless of the anesthetic technique used. These findings suggest that both local and spinal anesthesia provide adequate analgesia for Lichtenstein repair, with neither technique showing clear superiority in postoperative pain control.

The findings of the present study are consistent with those reported by Iqbal et al., who evaluated postoperative pain following Lichtenstein inguinal hernia repair in 150 patients (3). They observed a progressive decline in pain scores from 4.0 ± 0.45 at 6 hours to 2.8 ± 0.31 at 24 hours, 2.1 ± 0.17 at 48 hours and 1.8 ± 0.12 at one week postoperatively. Their study demonstrated gradual pain reduction over time. In our study, a similar pattern was seen in both anesthesia groups, with pain scores decreasing steadily from the early postoperative period to the first postoperative week. Although the absolute pain scores differed slightly between the two studies, the overall trend of progressive improvement was comparable. Furthermore, while Iqbal et al. evaluated pain levels after Lichtenstein repair irrespective of the anesthetic technique, our study specifically compared local and spinal anesthesia and found no significant difference in postoperative pain between the two groups. These findings suggest that the postoperative pain trajectory after Lichtenstein hernia repair is favourable regardless of the anesthetic approach used, and that both techniques provide acceptable postoperative pain control (12-14).

Riaz et al. conducted a randomized controlled trial comparing Lichtenstein inguinal hernia repair with and without mesh fixation, and reported significantly lower postoperative pain scores in patients undergoing repair without mesh fixation than in those who received mesh fixation (3.23 ± 0.77 vs. 3.98 ± 0.76; p=0.0001) (5). Their findings highlight the importance of technical and perioperative factors that influence postoperative pain outcomes after inguinal hernia repair. In contrast, our study evaluated the impact of the anesthetic technique rather than the surgical technique, and we found that postoperative pain scores were comparable between the local and spinal anesthesia groups at all assessed time points. Nevertheless, both studies emphasize the importance of optimizing perioperative management in order to improve postoperative recovery and patient comfort after Lichtenstein hernia repair (14).

The duration of hospital stay emerged as a more consistent and clinically relevant outcome in our study. Patients in the local anaesthesia group had a shorter mean duration of hospital stay than those in the spinal anaesthesia group (2.21 vs. 2.94 days), and this difference was statistically significant. This finding is clinically important in the context of high patient turnover, limited bed availability and

resource constraints in public-sector hospitals such as the one in which this study was conducted (15). Early mobilization and faster recovery after local anaesthesia are more likely to contribute to earlier discharge, thereby reducing the overall healthcare burden (16, 17).

Our findings regarding hospital stay are in agreement with those reported by Sandhu et al., who compared local and spinal anaesthesia in patients undergoing inguinal hernia repair (18). They found that a significantly greater proportion of patients in the local anaesthesia group were fit for discharge within the first 8 hours after surgery compared with the spinal anaesthesia group (87.8% vs. 65.9%; p=0.003). Similarly, at 12 hours postoperatively, only 2.4% of patients in their local anaesthesia group remained admitted, compared with 24.4% in the spinal anaesthesia group (p=0.001). By 24 hours, all patients in the local anaesthesia group had been discharged, whereas 4.9% of patients in the spinal anaesthesia group required continued hospitalization because of postoperative complications. These findings align closely with the results of the present study, in which patients who received local anaesthesia had a significantly shorter mean hospital stay than those who received spinal anaesthesia (2.21 vs. 2.94 days). Collectively, these studies suggest that local anaesthesia facilitates earlier patient recovery and discharge, which in turn reduces hospital bed occupancy and may improve resource utilization in busy surgical units (19).

The findings of this study support the feasibility of local anaesthesia as an effective alternative to spinal anaesthesia for elective inguinal hernia repair. This benefit is particularly important in terms of optimizing the hospital resource utilization (20). The lack of a difference in pain outcomes, combined with a shorter hospital stay, highlights its potential advantage in high-volume surgical settings, as indicated by earlier studies (21-23). In resource-constrained healthcare systems such as Pakistan, where surgical wards often experience a high patient burden and limited bed availability, even modest reductions in hospital stay can translate into improved patient turnover and more efficient utilization of healthcare resources. Earlier ambulation and discharge may also reduce indirect costs for both hospitals and patients, including expenditure related to prolonged hospitalization and loss of productivity (24). Furthermore, the use of local anaesthesia may facilitate the wider adoption of day-case or short-stay hernia surgery programmes, which have been associated with improved patient satisfaction and cost-effectiveness in several healthcare settings (25). Local anaesthesiatherefore represents a practical and potentially sustainable option for elective inguinal hernia repair for institutions aiming to maximize efficiency without compromising patient outcomes.

The study hascertain limitations. The sample size was relatively small and the study was conducted at a single centre, which may limit the generalizability of findings. Pain scores reported by patients are subjective and may introduce variability despite the use of a standardized scale. Furthermore, longer-term outcomes such as recurrence rates and patient satisfaction were not assessed. We recommend future multicentre studies with larger sample sizes to validate these findings.

Conclusion

Local anesthesia for elective Lichtenstein inguinal hernia repair is associated with a significantly shorter hospital stay than spinal anaesthesia. However, postoperative pain outcomes remain comparable between the two techniques at all assessed time points. Local anesthesia may therefore serve as an effective alternative to spinal anaesthesia, particularly in resource-limited, high-volume surgical settings in which early discharge is beneficial.

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Rashid Ali: Conceptualization, study design, manuscript drafting, critical revision of the manuscript
Manal Afzal: Data collection, patient recruitment, data entry, literature review, manuscript drafting
Ashfaq hussain: Surgical procedures, patient management, data acquisition, manuscript review
Hamra afridi: Data collection, follow-up assessment, data verification, manuscript review, and final approval of the version to be published
Surrendar dawani: Study supervision, methodological guidance, critical revision of the manuscript for important intellectual content
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