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A Comparative Study of Local Versus Spinal Anaesthesia in Lichtenstein Inguinal Hernioplasty: A Prospective Randomized Controlled Trial

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ABSTRACT

Introduction: Inguinal hernia repair is among the most common surgical procedures globally, with Lichtenstein mesh hernioplasty being the standard technique due to its simplicity and low recurrence rate. However, the choice of anaesthesia—local or spinal—plays a pivotal role in influencing intraoperative and postoperative outcomes. While spinal anaesthesia (SA) is widely used in India, local anaesthesia (LA) is gaining attention for its potential benefits, especially in day-care surgery.

Aim and Objective: This study aims to compare the clinical outcomes of Lichtenstein inguinal hernioplasty performed under local versus spinal anaesthesia, focusing on intraoperative difficulties, postoperative pain, complications, hospital stay, and overall recovery.

Materials and Methods: A prospective randomized controlled trial at J.A. Group of Hospitals, Gwalior (June 2023–December 2024), included 94 male patients with unilateral, reducible inguinal hernia. They were randomly divided into two groups: local anaesthesia (Group A) and spinal anaesthesia (Group B), with 47 patients each. Key outcomes assessed included intraoperative pain (VAS), operative duration, postoperative pain at various intervals, complications such as urinary retention, headache, infections, and total hospital stay. All data were statistically evaluated for comparison between the groups.

Results: Both groups were similar in demographics, hernia type, intraoperative pain, and operative time. Postoperative pain was significantly lower in the local anaesthesia group. Urinary retention and headache were more frequent in the spinal anaesthesia group. Hospital stay was shorter in the local group, indicating faster recovery and improved postoperative outcomes.

Conclusion: Local anaesthesia is a safe, effective, and economical alternative to spinal anaesthesia for inguinal hernioplasty, offering superior postoperative recovery, fewer complications, and reduced hospital stay.

INTRODUCTION

A hernia occurs when an internal organ or part of it pushes through a weakness or defect in the surrounding muscle or connective tissue that usually holds it in place. The term originates from Latin and Greek, where it denotes a rupture or protrusion of a structure through its enclosing barrier. Among the different types of hernias, inguinal hernia is by far the most frequently encountered. It accounts for nearly three-fourths of all abdominal wall hernias and is significantly more prevalent in males than females. Epidemiological data suggest that the lifetime risk of developing an inguinal hernia is about 27% in men, compared to just 3% in women. Moreover, in males, the incidence pattern displays two prominent peaks — one during infancy and another after the age of 40, highlighting a bimodal distribution [1,2].

The surgical treatment of inguinal hernias has evolved significantly over the centuries, closely following advances in the field of operative medicine. With the development of anesthesia, antiseptic techniques, and a better understanding of surgical anatomy, inguinal hernia repair has become a routine and standardized procedure performed across the globe. Among the various operative options available, the Lichtenstein tension-free mesh repair is currently the most widely accepted technique due to its relatively low recurrence rate, ease of execution, and good long-term outcomes. This technique involves placing a synthetic mesh

over the inguinal canal to reinforce the weakened area, thereby preventing future herniation. It has become the cornerstone of modern hernia surgery and is regarded as a benchmark procedure in most surgical guidelines [3].

One of the important considerations in performing hernioplasty is the choice of anesthesia. The procedure can be carried out using general anesthesia, spinal or epidural anesthesia, or local anesthesia. Each method has its advantages and limitations, and the selection is often influenced by multiple factors such as the patient's health status, the surgeon's preference and skill, anesthetic availability, cost, and institutional practices. Spinal anesthesia is frequently employed in many parts of the world, including India, mainly due to its simplicity, rapid onset, and reliable analgesia. However, it is not without its risks. Some of the commonly observed complications following spinal anesthesia include hypotension, nausea, vomiting, post-dural puncture headache, urinary retention, and, though rarely, more severe neurological issues. These side effects, although generally self-limiting, can cause discomfort and delay in postoperative recovery [4].

In contrast, local anesthesia has gained attention as a potentially safer and more cost-effective option, especially in the context of elective, uncomplicated hernia repairs. Initially popularized in the original Lichtenstein method, local anesthesia offers several potential advantages. It avoids systemic side effects associated with regional or general anesthesia, facilitates faster postoperative recovery, and reduces the need for prolonged monitoring and hospital stay. Furthermore, it is particularly suitable for elderly or medically unfit patients who may not tolerate spinal or general anesthesia well. Nonetheless, concerns about inadequate analgesia, patient discomfort during surgery, and the need for greater technical expertise in administering local blocks have limited its widespread adoption [5].

Various comparative studies have been conducted to evaluate the outcomes of Lichtenstein hernioplasty under spinal versus local anesthesia. These studies have assessed multiple parameters such as intraoperative pain control, surgical field visibility, duration of surgery, postoperative pain, recovery time, complication rates, and patient satisfaction. The results, however, have been inconsistent, with some studies favoring local anesthesia for its faster recovery and fewer side effects, while others have found no significant difference between the two approaches. A major limitation of existing literature is that most of these studies have been conducted in Western countries, leading to a lack of region-specific data from India. The variations in patient population, health infrastructure, and surgical practices necessitate the generation of indigenous data to validate the applicability of findings in the Indian context [6].

Inguinal hernia, if left untreated, can progress to more severe forms such as obstruction or strangulation, leading to life-threatening complications. Early diagnosis and timely surgical intervention can prevent such adverse outcomes. In elective settings, especially for reducible and uncomplicated hernias, performing the repair under local anesthesia may offer a safer and more efficient alternative. Moreover, intraoperative factors such as anatomical clarity, muscle relaxation, and ease of dissection are crucial for a smooth surgical procedure. These factors can be influenced by the type of anesthesia used, thereby impacting the surgeon's experience and operative time [7].

Surgeon-related intraoperative challenges, such as difficulty in achieving adequate cauterization, poor visualization due to muscle tone, or anatomical distortion, are important considerations in evaluating the suitability of local anesthesia. A pain-free and relaxed operative field is not only essential for surgical precision but also for minimizing postoperative complications. Given these concerns, the anesthetic technique must ensure both adequate analgesia and optimal surgical conditions [8].

In recent years, there has been a renewed interest in the use of local anesthesia for hernia surgeries, particularly in the setting of ambulatory or day-care procedures. With growing emphasis on patient safety, shorter hospital stays, and cost-effective healthcare, local anesthesia has emerged as a promising alternative. Several studies have reported that surgeries conducted under local anesthesia are associated with quicker mobilization, reduced postoperative pain, and higher levels of patient satisfaction. These findings have important implications for health systems like India's, where surgical resources and bed availability are often limited [9].

Despite its potential benefits, local anesthesia remains underutilized for hernioplasty in India, where general and spinal anesthesia continue to dominate due to established clinical practices, surgeon familiarity, and hesitation to adopt less conventional methods. However, with the rising number of hernia cases and the need for cost-effective, safe surgical care, evaluating the role of local anesthesia becomes essential. This study compares Lichtenstein hernia repair under local and spinal anesthesia, focusing on intraoperative difficulties, postoperative pain, recovery, complications, and overall satisfaction. The findings aim to enhance Indian data and support broader acceptance of local anesthesia in suitable hernia cases [10].

This study aims to compare Lichtenstein hernioplasty performed under spinal versus local anesthesia to determine the more suitable option based on clinical outcomes. Key parameters include duration of hospital stay, intraoperative and postoperative pain, and complications such as recurrence, hemorrhage, surgical site infections, seroma, scrotal swelling, urinary retention, and postoperative headaches. The objective is to evaluate which technique offers a safer, more effective, and painless approach for inguinal hernia repair.

MATERIALS AND METHODS

This prospective randomized controlled trial was conducted in the Department of Surgery, J.A. Group of Hospitals, Gwalior, from June 1, 2023, to December 23, 2024, on 94 patients with uncomplicated, reducible, unilateral inguinal hernias aged 18–60 years who gave written informed consent. Patients were randomly assigned to local or spinal anesthesia groups (47 each) using sealed opaque envelopes. Inclusion criteria were age 18–60 years, unilateral reducible hernia, and willingness to participate. Exclusion criteria included complicated, bilateral, recurrent hernias, refusal to consent, and age below 18 or above 70. Ethical approval was obtained from the Institutional Ethics Committee.

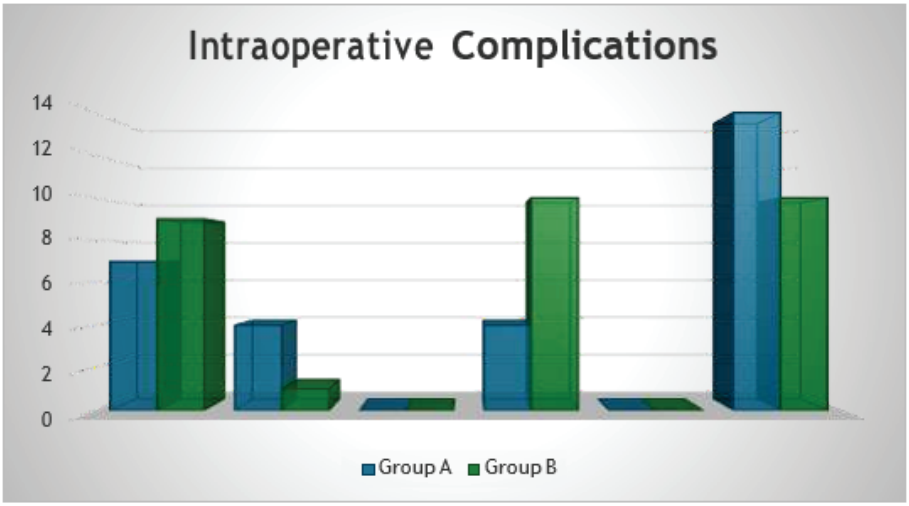
RESULTS

The comparison of age distribution between Group A and Group B showed no statistically significant difference (p = 0.8571), indicating that both groups were age-matched. Similarly, the distribution of hernia types revealed that indirect inguinal hernia was more common in both groups, though direct hernia was relatively higher in Group B; however, this difference was also not statistically significant (p = 0.124). These findings suggest that the groups were comparable in terms of both age and hernia type, reducing potential confounding in further outcome analysis.

Table 1: Intraoperative Pain Score in Inguinal hernioplasty

Intra-operativepain	GroupA		GroupB	
	Number N	Percentage %	Number N	Percentage %
NoPain (VAS-0)	35	74.47%	31	65.96%
Mildpain (VAS=1-3)	8	17.02%	11	23.40%
Moderatepain (VAS=4-6)	3	6.38%	4	8.51%
Severepain (VAS=>7)	1	2.13%	1	2.13%
FischerexacttestP value		0.84		

The intraoperative pain scores revealed that the majority of patients experienced no pain, with 74.47% in Group A and 65.96% in Group B. Mild to moderate pain was slightly higher in Group B, while severe pain was equally rare in both groups at 2.13%. The difference in pain distribution between the groups was not statistically significant (Fisher's exact test p = 0.84), indicating that both anaesthetic methods offered comparable intraoperative pain control.



Graph1:Intraoperativecomplicationsin Inguina lhernioplasty

The graph shows that intraoperative complications were observed in both groups, with higher frequencies in Group A for most categories. Complications like bleeding and testicular cord handling were more common in Group A, while bowel handling was notably higher in Group B. Minor complications such as vomiting and shivering were present in both but slightly more in Group A. Overall, Group A experienced a higher burden of intraoperative complications compared to Group B.

Table 2: Duration of the surgery in Inguinalhernioplasty

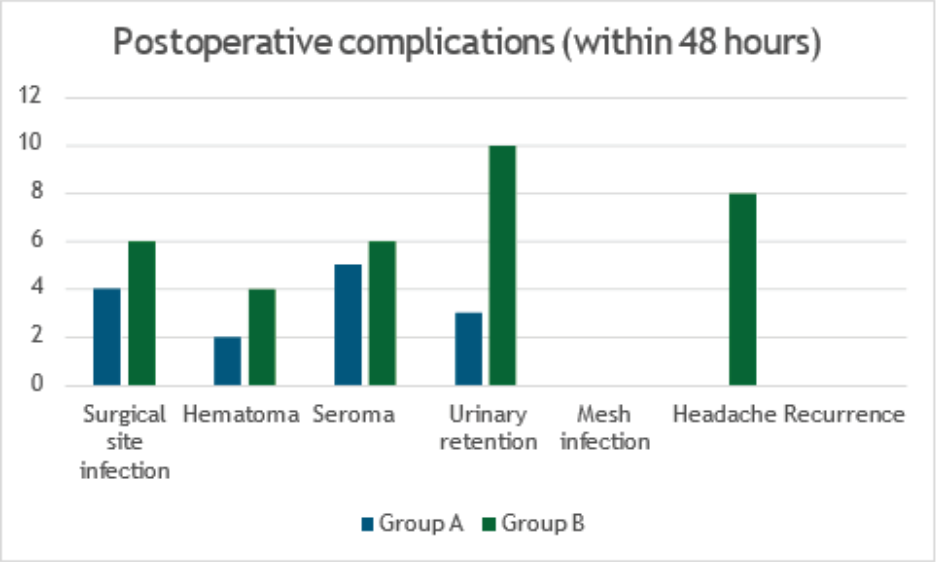
Duration (inminutes)	GroupA		GroupB	
	Number N	Percentage %	Number N	Percentage %
21-30	1	2.13%	1	2.13%
31-40	11	23.40%	10	21.28%
41-50	16	34.04%	18	38.30%
51-60	12	25.53%	14	29.79%
61-70	4	8.51%	2	4.26%
71-80	2	4.26%	1	2.13%
81-90	1	2.13%	1	2.13%
91-100	0	0.00%	0	0.00%
>100	0	0.00%	0	0.00%
FischerexacttestPvalue		0.7861		

The duration of surgery was comparable between Group A and Group B, with most procedures completed within 31–60 minutes in both groups. The 41–50-minute range was the most common, accounting for 34.04% in Group A and 38.30% in Group B. Very few surgeries exceeded 70 minutes in either group, and none exceeded 100 minutes. The difference in surgical duration was not statistically significant (Fisher's exact test p = 0.7861), indicating similar operative times across groups.

Table 3: Early Postoperative pain (VAS) in Inguinal hernioplasty

Postoperativepain (VAS)	GroupA		GroupB	
	Mean (VAS)	Standard deviation	Mean (VAS)	Standard deviation
1hour	1.89	2.55	2.34	2.57
6 hours	2.04	2.22	2.12	2.24
12hours	1.81	1.56	1.96	1.85
24hours	1.46	1.30	1.49	1.52
48hours	0.42	0.76	0.95	1.52
FischerexacttestP value		0.0003		

Postoperative pain scores measured by VAS were consistently lower in Group A compared to Group B at all time intervals (1, 6, 12, 24, and 48 hours). Group A showed a more rapid decline in pain levels, reaching minimal pain by 48 hours (VAS 0.42 vs. 0.95 in Group B). The difference in early postoperative pain between the groups was statistically significant (Fisher's exact test p = 0.0003), suggesting better pain control in Group A.



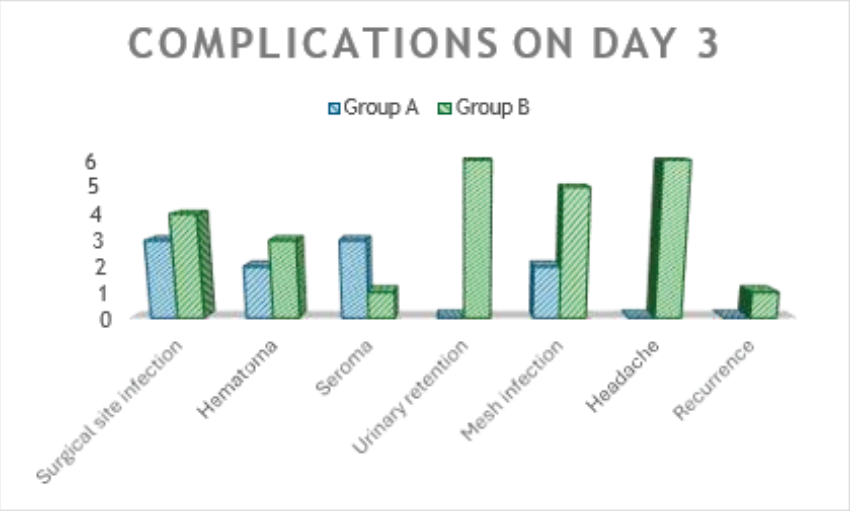
Graph2:Postopcomplicationswithin48hours

Postoperative complications within 48 hours were more frequently observed in Group B compared to Group A. Urinary retention and headache were notably higher in Group B, with 10 and 8 cases respectively, while Group A had fewer cases across all categories. Surgical site infections, seroma, and hematoma occurred in both groups but remained slightly higher in Group B. These findings suggest that Group A experienced fewer early postoperative complications than Group B.

Table 4: Pain on day 3 in Inguinalhernioplasty

Painonday 3	GroupA		GroupB		Fischer exacttest p value
	Number N	Percentage %	Fischer exacttest p value N	Percentage %	
NoPain (V A S - 0)	39	82.98%	34	72.34%	0.0012
Mildpain (VAS=1-3)	6	12.77%	8	17.02%	0.4351
Moderate pain (VAS=4-6)	2	4.26%	3	6.38%	1
Severepain (VAS=>7)	0	0.00%	2	4.26%	2.3751

On postoperative day 3, a higher proportion of patients in Group A reported no pain (82.98%) compared to Group B (72.34%), and this difference was statistically significant (p = 0.0012). Mild and moderate pain were slightly more frequent in Group B, while severe pain was reported only in Group B (4.26%) and not at all in Group A. These findings indicate better pain control and recovery in Group A by the third postoperative day.



Graph3:Complicationsonday3inInguinalhernioplasty

On postoperative day 3, complications were more frequent in Group B compared to Group A. Mesh infection, headache, and recurrence were noticeably higher in Group B, while surgical site infection, hematoma, and seroma were comparable between the groups. Urinary retention and mesh-related issues remained minimal in Group A. These findings suggest that Group A had fewer and less severe complications on day 3, indicating a better short-term postoperative outcome.

Table 5: Complication on day 7 in Inguinalhernioplasty

Complications on day 7	GroupA		GroupB		Fischer exact test p value
	Number N	Percentage %	Number N	Percentage %	
Surgicalsite infection	4	8.51%	6	12.77%	0.6734
Hematoma	1	2.13%	2	4.26%	1.0
Seroma	3	6.38%	3	6.38%	0.3618
Urinary retention	0	0.00%	2	4.26%	0.5362
Meshinfection	0	0%	0	0%	
Headache	0	0.00%	3	6.38%	0.5257
Recurrence	0	0.00%	0	0.00%	

On postoperative day 7, complications were generally low in both groups, with slightly higher rates in Group B. Surgical site infection and headache were more frequent in Group B, while seroma rates were equal, and urinary retention occurred only in Group B. No mesh infection or recurrence was reported in either group. None of the differences were statistically significant ($p > 0.05$), indicating comparable complication profiles by day 7.

Table 6: Number of days of hospital stay in Inguinalhernioplasty

Numberofdays ofhospitalstay	GroupA		GroupB	
	Number N	Percentage %	Number N	Percentage %
<1days	3	6.38%	0	0.00%
2days	16	34.04%	3	6.38%
3days	17	36.17%	13	27.66%
4days	6	12.77%	13	27.66%
5days	3	6.38%	9	19.15%
6days	2	4.26%	6	12.77%
7days	0	0.00%	3	6.38%
Fischer'sexacttestpvalue		0.0002		

The number of hospitals stay days was significantly shorter in Group A compared to Group B. Most patients in Group A were discharged within 2–3 days (70.21%), while a larger proportion in Group B required 4 or more days of hospitalization. Longer stays of 5–7 days were notably higher in Group B. The difference was statistically significant (Fisher's exact test $p = 0.0002$), indicating faster recovery and earlier discharge in Group A.

DISCUSSION

This study compared local anaesthesia (LA) and spinal anaesthesia (SA) for inguinal hernioplasty, highlighting significant differences in postoperative outcomes, complications, and operative efficiency. The findings suggested that LA is a viable alternative to SA, with reduced postoperative pain, fewer complications, and faster recovery, making it particularly beneficial for certain patient groups.

The majority of patients in the present study were aged 41–60 years, consistent with Anurag Jain et al. [11], while Balentine et al. [12] reported a higher median age (71 years), possibly due to broader inclusion criteria. Indirect inguinal hernias were more common in both groups, matching trends seen in Saxena et al. [13] and Shafique et al. [15], although Besra S et al. [14] reported a more balanced distribution. The prevalence of indirect hernias in younger patients is likely related to congenital predispositions.

Pain assessment using the Visual Analogue Scale (VAS) revealed that LA provided acceptable intraoperative analgesia, with most patients reporting no or mild pain. This was comparable to Bhardwaj S et al. [16], though they reported complete analgesia in SA cases. Anurag Jain et al. [11] and Besra S et al. [14] also found LA effective, especially with adequate technique and counselling. Our findings showed slightly more pain in LA, likely due to challenges with large or adherent hernia sacs, a phenomenon supported by Song et al. [17] and Amid et al. [18], who noted intraoperative conversions due to pain.

Postoperative pain scores were consistently lower in the LA group across all time points (Day 3, 7, and 30), aligning with Jain et al. [11], O'Dwyer PJ et al. [19], Besra S et al. [14], and Bhardwaj S et al. [16], who emphasized better pain control and faster recovery with LA. The regional nerve anatomy and blockade in LA, targeting the ilioinguinal, iliohypogastric, and genitofemoral nerves, contributed to superior postoperative analgesia [16].

Operative time showed no significant difference between groups. Our findings were supported by Bhardwaj S et al. [16] and Jain et al. [11], though Van Veen et al. [20] reported shorter times in LA due to faster recovery and minimal systemic effects. Sedation requirements were higher in SA ($p = 0.04$), consistent with Jain et al. [11]. Arrhythmias were

more common in LA (8.51%) but not statistically significant, paralleling Jain et al.'s observations [11].

Hypotension occurred significantly more in SA (21.28%, p = 0.001), a known effect of sympathetic blockade, as echoed by Bhardwaj S et al. [16]. Urinary retention, headache, and sedation were also more frequent in SA, findings corroborated by Van Veen et al. [20], Ozgun et al. [21], and Young et al. [22]. LA allowed early ambulation, lower complication rates, and fewer systemic effects.

Postoperative complications, including surgical site infections (SSIs), were higher in SA (12.77%) than LA (8.51%) (p = 0.0001), supporting Bhardwaj et al. [16] and Jain et al. [11]. Hematoma and urinary retention were also more prevalent in SA (p = 0.0019 and p = 0.0041, respectively). Seroma rates were similar between groups (6.38%), in line with previous findings.

Hospital stay was significantly longer in SA (p = 0.0002), with more patients requiring extended admissions. Besra S et al. [14] reported shorter stays, possibly due to institutional variations. No cases of mesh infection or mortality occurred, supporting findings by Kark et al. [23] and Gianetta et al. [24].

CONCLUSION

This prospective randomized controlled study at G.R. Medical College, Gwalior, evaluated 94 male patients undergoing elective mesh hernioplasty under either local anaesthesia (Group A) or spinal anaesthesia (Group B). Group A demonstrated significantly better intraoperative pain control, fewer postoperative complications such as urinary retention and headache, and shorter hospital stays compared to Group B. Although both groups had similar operative durations and no recurrence or mesh infections, postoperative pain scores and recovery were consistently better in the local anaesthesia group. These findings suggest that local anaesthesia is a safe, effective, and economical alternative to spinal anaesthesia for inguinal hernia repair.

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