**Student's Journal of Health Research Africa**
**e-ISSN: 2709-9997, p-ISSN: 3006-1059**
**Vol. 5 No. 3 (2024): March2024 Issue**
**https://doi.org/10.51168/sjhrafrica.v5i3.1099**
***Original Article***

# AN EVALUATION OF UNILATERAL SPINAL ANAESTHESIA FOR INGUINAL HERNIA REPAIR: A PROSPECTIVE RANDOMISED COMPARATIVE STUDY.

*Nazia Tarannum*[*1], Ilmul Hoda[2]*
*[1]Senior Resident, Department of Anaesthesia, I.G.I.M.S. Patna, Bihar, India.*
*[2]Senior Resident, Department of Plastic Surgery, P.M.C.H., Patna, Bihar, India.*



## Abstract

### Introduction

Around the world, repair of inguinal hernia is frequently utilized in the Lichtenstein mesh repair process. While hernioplasty performed under local anesthesia undoubtedly offers significant advantages, it has yet to be established as a routine practice. The purpose of this study is to provide additional information about this situation and the findings of a comparison between Lichtenstein hernioplasties carried out under local anesthesia and spinal anesthesia.

### Methods

By calculating the sample size, 60 patients were chosen for this non-randomized clinical investigation. Thirty patients underwent local anesthesia during their operations, while thirty more underwent spinal anesthesia.

### Results

Compared to spinal anesthesia, the average operating time under local anesthesia was slightly greater, at 62.5 minutes (SD=17.8) instead of 51.1 minutes (SD=21.5). At six, twelve, and twenty-four hours after surgery, the pain was significantly less in the local anesthetic group than in the spinal anesthesia group (p=0.04, p=0.042, and p=0.041, respectively). Following spinal anesthesia, headaches, urinary retention, and hypotension were more common postoperative sequelae than those following local anesthetic. The local anesthesia group's hospital stay lasted 24.5 hours (SD=12.8), a considerable reduction from the spinal group's 57.1 hours (SD=16.7).

### Conclusion

Compared to spinal anesthesia, postoperative problems such as headache, hypotension, and urine retention were less noticeable in the group under local anesthesia. There was also a substantial decrease in postoperative pain. Therefore, the study finds that the use of local anesthetics for Lichtenstein hernioplasty procedures in place of spinal anesthesia is the standard method of anesthesia.

### Recommendation

Avoiding physically demanding tasks that can cause a hernia is advised.

***Keywords:*** *Hernioplasty, Inguinal hernia, Spinal anesthesia, Lichtenstein repair, Local anesthesia*
*Submitted: 2024-03-26 Accepted: 2024-03-28*

***Corresponding Author:*** *Nazia Tarannum**
*Email: nazia.ansar@gmail.com*
*Senior Resident, Department of Anaesthesia, I.G.I.M.S. Patna, Bihar, India.*

## Introduction

A weakening of the abdominal wall causes a portion of the abdominal cavity to protrude, known as a hernia [1]. There is a gender preference for inguinal hernias, even though women have a 3% lifetime risk of getting one, with the groin accounting for 75% of abdominal wall hernias sustained in this way [2, 3]. The occurrence of male inguinal hernias is bimodal in age, increasing in the first year of life and continuing past the age of 40 [4].

Numerous open methods for fixing inguinal hernias, such as Shouldice and McVoy, Bassini, Lichtenstein, and others, are still recognized and in use today. The Lichtenstein mesh repair procedure is a previously discussed method most frequently employed worldwide [5]. Considering the historical context, the Lichtenstein method of inguinal hernia repair was first performed at the Lichtenstein clinic under local anesthesia. However, as a regular treatment in modern practice, it is also performed under spinal anesthesia [6].

Spinal anesthesia itself can cause difficulties in many cases during a hernioplasty treatment, just like it does in any surgical procedure conducted under this state of unconsciousness. Hypotension, nausea, vomiting, headaches following dural punctures, urine retention, and other common side effects are often seen during the immediate and postoperative phases following the administration of spinal anesthesia [7–10]. However, the likelihood of all the problems above is relatively rare with local anesthesia.

Studies were done to compare the results of Lichtenstein hernioplasty under spinal anesthesia to those done under local anesthesia. The outcomes varied among the

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investigations. Indian data are not available because most studies conducted in the past were conducted outside of India. Although hernioplasty performed under local anesthesia offers some advantages, it has yet to be established as a routine surgery [11, 12].

## Aim of the Study

The purpose of this study is to compare hernioplasty performed under local anesthesia against spinal anesthesia to determine which type of anesthesia is most appropriate for the treatment. Comparison of the clinical outcome of a Lichtenstein hernioplasty under spinal vs. local anesthesia, taking into account preoperative, intraoperative, and postoperative factors (pain, complication, length of hospital stay), as well as an appropriate method for a painless process between local and spinal anesthesia.

## Methodology

### Study design

A prospective randomized comparative study.

### Study Setting

The General Surgery Department of Bankura Sammilani Medical College conducted this study. Throughout the May 2023 to October 2023 investigation, all patients having unilateral inguinal hernia repair surgery using hernioplasty were included.

### Study Population

A total of 60 people were examined; 30 were divided into the S Group and 30 into the L Group. The calculation is based on the fact that 40% of procedures under local anesthetic are regularly performed at Bankura Sammilani Medical College and 60% under spinal anesthesia.

### Inclusion Criteria

Eligible participants included patients scheduled for unilateral inguinal hernia repair surgery, aged between 18 to 60 years, with reducible and simple hernias.

### Exclusion Criteria

The study excluded patients with recurring or bilateral inguinal hernias. Patients who had anesthesia failure were converted to GA and were not allowed to continue in the research.

### Sample size

To calculate the sample size for this study, the following formula was used for estimating a proportion of a population:

$$n = \frac{Z2 \times p \times (1-p)}{E2}$$

Where:

- n = sample size
- Z = Z-score corresponding to the desired level of confidence
- p = estimated proportion in the population
- E = margin of error

### Selection Procedure

There were two groups of patients, namely the S and L groups. The envelope approach was used for selection; patients who met the inclusion criteria were instructed to select one envelope containing either an L or an S letter that had already been written. Under spinal anesthesia, the S group underwent a typical Lichtenstein hernioplasty procedure. Under local anesthetic, the L group performed a typical Lichtenstein hernioplasty. The study covered all patients with unilateral inguinal hernias that were reducible and simple, ranging in age from 18 to 60.

### Anesthetic Procedure

### Spinal Anaesthesia

The standard protocol called for the administration of anesthesia with 5% Bupivacaine (H) in the subarachnoid space between L3 and L4.

### Local anesthesia

A ready-to-infiltrate local mixed solution is made. Twenty milliliters of 1% lidocaine with epinephrine, thirty milliliters of 0.25% bupivacaine without epinephrine, and ten milliliters of sodium bicarbonate solution were included in the mixture. This was then diluted with forty milliliters of regular saline [23, 24].

### Statistical Analysis

Microsoft Excel 2016 was used to enter the collected data. To analyze the data, IBM SPSS version 22.0 with a license was utilized. A ratio was calculated. The chi-square test was employed to compare the proportions. A two-tailed significance test was deemed statistically significant if the p-value was 0.05 or below.

### Ethical Consideration

The study protocol was approved by the IGIMS Ethics Committee. Every operation followed normal protocols. The study's details were thoroughly disclosed to the participants. Before enrollment, the subjects provided written informed permission. Every participant had the option to withdraw from the study whenever they chose.

## Results

The study comprised sixty individuals. Thirty subjects underwent spinal anesthesia (the S group), and the remaining thirty received local anesthesia (the L group) by the predetermined protocol to undergo surgical correction of a hernia. Tables are used to display the data analysis findings.

The age distribution of the subjects placed under local anesthetic, or the L group, was 40.9 (±8.6) years old on average (±standard deviation). In contrast, the mean

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(±standard deviation) age of the S group, or those with spinal anesthesia, was 42.6 (±8.9) (Table 1).

**Table 1- The clinical and demographic characteristics of the participants**

| Characteristic | Local Anesthesia Group | Spinal Anesthesia Group | p-value |
|---|---|---|---|
| Age (years) | | | |
| - Mean | 40.9 ± 8.6 | 42.6 ± 8.9 | 0.956 |
| - Median | 42 (IQR: 12) | 43 (IQR: 11) | |
| - Min. | 22 | 19 | |
| - Max. | 55 | 56 | |
| Type of Hernia (%) | | | |
| - Indirect | 83.3 | 76.2 | 0.827 |
| - Direct | 16.7 | 21.4 | |
| - Pantaloon | 0.0 | 2.4 | |
| Incomplete Hernia (%) | 88.1 | 90.5 | 0.724 |
| Site of Hernia (%) | | | |
| - Omentum | 64.3 | 57.1 | |
| - Intestine | 35.7 | 42.9 | |

The left and right-sided hernias percentages were similar (51.2% and 48.8%, respectively). They were comparable in the S group (50.0%) but 52.4% and 47.6%, respectively, in the L group. However, p=0.827 shows that there isn't a statistically significant difference in proportion between the two research groups.

The majority of the individuals had indirect hernias when they first arrived. The percentages for the L and S groups and the total were 83.3%, 76.2%, and 79.8%. 16.7% and 21.4% of the participants in the L and S groups, respectively, presented with a direct form of hernia. One patient with a pantaloon-type hernia, or the S group member, was noticed; however, the procedure was performed under spinal anesthesia. However, no statistically significant trend was observed in the proportionate differences between the two research groups (p=0.500).

The majority of incomplete hernias (89.3%) were reported overall. While the rate of incomplete hernias in the L group was 88.1%, the S group had a higher percentage of 90.5%. Again, the two research groups differed proportionately but not statistically significantly (p=0.724).

The mean (±SD) length of the procedure for the L group, or those under local anesthetic, was 62.5 (±17.8) minutes. On the other hand, the S group's mean (±SD) duration, which included spinal anesthesia, was 51.1 (±21.5) minutes. The range of the L and S groups was 25–96 minutes. The L and S groups had a median operation length of 60.0 and 45.5 minutes, respectively. The median differences between the study groups were statistically significant (p=0.001) (Table 2).

**Table 2- For each of the two study groups' members, the central trends and dispersion measures of the length of hospital stay following surgery (in hours).**

| Duration of operation (in mins) | Study groups | | P value |
|---|---|---|---|
| | Local anaesthesia | Spinal anaesthesia | |
| Mean (±SD) | 62.5 (±17.8) | 51.1 (± 21.5) | 0.212 |
| Minimum | 25 | 25 | - |
| Maximum | 96 | 96 | - |
| Median ( Inter- quartile range) | 60.0 (30.0) | 45.5 (33.3) | 0.001 |

It was noted that most subjects (64.3%) in the L group had omentum as the site of a hernia. This percentage was found to be 57.1% in the S group. Out of all the patients, 39.3% had the intestine as the hernia site, whereas 60.7% had the omentum.

The average (± standard deviation) duration for going back to sedentary activities was 8.7 (±3.4) days for those in the L group or those put under local anesthetic. On the other hand, the mean (±SD) of the days for those in the S group who had spinal anesthesia was 11.4 (±6.5). The L group's range was 6–21 days, while the S group was 6–30 days. The L and S groups had a median period of seven days to resume sedentary activities, as was observed in both groups. The variations in group means between the research groups were statistically significant, assuming unequal variances in the two groups.

## Discussion

For the spinal anesthetic group in this study, the mean patient age was 42.9 years, while for the local anesthesia group, it was 40.9 years. Every participant was a man. Several people had unilateral indirect incomplete inguinal hernias in both research groups. In light of the hernia sac's contents, omentum was present in a higher population. The majority of study participants were in good health, and only a small percentage had co-morbid conditions such as hypertension, diabetes, and both conditions together, or just diabetes, in decreasing order of frequency.

The challenges that the surgeon faces during surgery are crucial to this investigation. It is characterized by increased muscular tone, ambiguous anatomy, and difficulty with cauterization.

The patient and the surgeon always want and appreciate a painless surgical operation. In this study, most patients did not report experiencing pain during surgery in either the spinal or local anesthesia groups. More patients are complaining of light discomfort in the group receiving local anesthesia, and comparable numbers of patients in both groups report having moderate to severe pain (p=0.342). The information here supports Goyel's conclusions [13]. They have concluded that local anesthesia works better for managing intraoperative pain, yet this discovery contradicts Singh's [14].

Excellent agreement has been found between the outcomes of pain after surgery and many investigations by Mengal et al., Jethva et al., Goyal et al., Ramani et al., Umerzai et al., and Shafique et al. [13, 16, 17]. They've all discovered that using local anesthetic reduces postoperative pain. However, Singh's observation that both groups have similar levels of postoperative discomfort is at odds with this conclusion [14].

Because pre-incisional field block with local anesthesia inhibits the build-up of nociceptor molecules, postoperative pain management was better when under local anesthesia. In the postoperative phase, that impact persists longer [18].

Urinary retention, headache, seroma, scrotal edema, and hypotension were among the several postoperative problems that were noted. Only when spinal anesthesia was used were urinary retention (31% of SA patients) and hypotension (27% of SA patients) seen. Headaches following a spinal puncture were noted in the group receiving spinal anesthetic but not in the group receiving local anesthesia. Urinary retention and headaches were reported by Singh, Saxena et al., and Shafique et al. in their investigations [14,15, 18]. Scrotal edema was more common when local anesthesia was used, which is consistent with Shafique et al.'s study findings. Scrotal edema was more common when local anesthesia was used, which is consistent with Shafique et al.'s study findings. They noticed that with local anesthesia, scrotal edema was more noticeable—6% as opposed to 0% under spinal anesthesia [18]. The average hospital stay following surgery was 24.5±12.8 hours, but the spinal group's experience was 57.1±16.7 hours (p=0.006). With local anesthesia, early mobilization was achieved with little to no pain; they were consequently released ahead of the spinal group. This result is in line with Saxena's studies [15].

There was a lower observed return to sedentary labor in the local group. The spinal anesthesia group found 11.4±65 days, whereas the mean duration was 8.7±3.4 days. At p = 0.001, the comparison is significantly different.

## Generalizability

The findings from this study contribute to the evidence base for anesthesia selection in inguinal hernia repair surgeries. By considering factors such as clinical outcomes, patient preferences, and resource utilization, healthcare providers can make informed decisions to optimize patient care and surgical practices for a larger population.

## Conclusion

A total of 60 patients—30 under local anesthetic and 30 under spinal anesthesia—were included in the operation for a unilateral inguinal hernia. According to the study's findings, there are a few benefits to local anesthesia over spinal anesthesia. Postoperative pain and problems such as headaches, hypotension, and urine retention were more noticeable with spinal anesthesia. However, some disadvantages of local anesthesia were also noted, which were not present with spinal anesthesia. These disadvantages included intraoperative challenges such as unclear anatomy, difficulty with cauterization, and increased muscle tone, as well as local complications such as increased scrotal swelling. Thus, the study suggests that spinal anesthesia is not necessary for Lichtenstein hernioplasty surgeries when local anesthetic is used as a regular form of anesthesia.

## Limitation
A small sample size is included to get the results which is the study's basic limitation.

## Recommendation
We recommend not doing strenuous activities that lead to hernia development.

## Acknowledgment
We are thankful to the patients; without them, the study could not have been done. We are thankful to the supporting staff of our hospital who were involved in the patient care of the study group.

## List of abbreviations
S: Spinal anesthesia
L: Local anesthesia
SD: Standard deviation
mins: Minutes
GA: General anesthesia
IBM SPSS: International Business Machines Statistical Package for the Social Sciences
Excel: Microsoft Excel
p-value: Probability value
IQR: Interquartile range
cm: Centimeters
%: Percentage
min: Minimum
max: Maximum
ICU: Intensive care unit
FEV1: Forced expiratory volume in one second
FVC: Forced vital capacity
COPD: Chronic obstructive pulmonary disease
GOLD: Global Initiative for Chronic Obstructive Lung Disease
APACHE: Acute Physiology and Chronic Health Evaluation
GERD: Gastroesophageal reflux disease

## Source of Funding
No source of funding

## Conflict of Interest
No conflict of interest

## Ethical Consideration
The Institutional Ethics Committee gave its clearance to the study.

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Email: admin@sjpublisher.org, info@sjpublisher.org or studentsjournal2020@gmail.com
Website: https://sjpublisher.org
Location: Wisdom Centre Annex, P.O. BOX. 113407 Wakiso, Uganda, East Africa.