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A Prospective Observational Study to Compare Quality of Life Following Lichtenstein Hernia Repair Under Spinal Versus Local Anesthesia

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ABSTRACT

Introduction: Inguinal hernia is a common condition requiring surgical repair, with millions of procedures performed annually. The Lichtenstein tension-free technique is widely preferred for its effectiveness. The choice of anesthesia-spinal or local-significantly impacts recovery, complications, and quality of life. Spinal anesthesia offers deeper pain relief, while local anesthesia ensures faster recovery and fewer complications, influencing surgical outcomes. **Aim:** To evaluate the anesthesia method that provides superior patient tolerance in open mesh repair of inguinal hernia. **Materials and Methods:** This prospective, comparative observational study was conducted at AIIMS Bhopal from August 2022 to May 2024, involving 112 patients divided into two groups: Group A (spinal anesthesia, n=56) and Group B (local anesthesia, n=56). Parameters assessed included hospital stay, movement limitation, postoperative pain (VAS scores), quality of life (WHO-QOL domains), and complications over a six-month follow-up. Statistical analyses were performed to evaluate differences. **Results:** The local anesthesia group had significantly shorter hospital stays (3.20 ± 0.73 vs. 4.86 ± 1.15 days; p=0.01) and fewer movement limitations (1.71 ± 0.56 vs. 2.07 ± 0.46 days; p<0.01). Pain levels were comparable, with minor differences at 1 month (p=0.03). Quality of life was initially higher in the spinal group but improved significantly in the local group in later periods, particularly in psychosocial and environmental domains. Urinary retention was noted in 10.7% of spinal cases but was absent in the local group (p=0.02). Other complications were similar. **Conclusion:** Local anesthesia is a safe and effective option for inguinal hernia repair, providing advantages such as shorter hospital stays, fewer complications, and better postoperative quality of life. These results highlight its suitability for selected patients, promoting faster recovery and improved outcomes.

INTRODUCTION

Inguinal hernia is one of the most prevalent surgical conditions worldwide, with an estimated 20 million repairs conducted annually. In the United States alone, approximately 800,000 inguinal hernia repairs are performed each year [1]. The condition remains a major public health concern, given its high incidence and the need for effective treatment strategies. A key determinant in the success of hernia repair surgeries lies in the surgeon's understanding of the complex anatomy of the inguinal region and the pathophysiology underlying the development of hernias.

The inguinal region's anatomy is intricate and involves multiple layers and structures, which contribute to both the formation and repair of hernias. The abdominal wall comprises several layers[2], including the skin, subcutaneous tissue, fascia, and muscles, which serve as protective barriers against hernia formation. These layers are essential for maintaining abdominal integrity and preventing abnormal protrusions of abdominal contents through weak points in the wall [6]. Understanding this anatomy is crucial for performing successful inguinal hernia repairs,

especially in relation to the identification of weak zones such as Hesselbach's triangle and the myopectineal orifice of Fruchard, which are common sites of hernia development.

The myopectineal orifice of Fruchard, located in the pelvic region, represents an area of evolutionary weakness, exacerbated by the bipedal nature of humans. This area, marked by natural openings and structural stretches, is bounded by several key structures, including the conjoint tendon, the inguinal ligament, and the iliopsoas muscle. As such, it plays a crucial role in the pathogenesis of inguinal hernias, especially indirect ones that occur due to the descent of the gonads during fetal development. Similarly, Hesselbach's triangle, which is defined by the inferior epigastric vessels, rectus abdominis muscle, and inguinal ligament, is a prominent site for the development of direct inguinal hernias [2]. A deep understanding of these anatomical landmarks is essential for guiding surgical approaches and minimizing complications.

Inguinal hernias are classified into two major categories: direct and indirect. Direct hernias occur through the posterior wall of the inguinal canal, often due to the weakening of the transversalis fascia, while indirect hernias protrude through the deep inguinal ring, following the path of the spermatic cord [2]. The surgical approach to repair these hernias must take into account the unique anatomy of each type. The indirect hernia repair requires addressing the deep inguinal ring and often involves the mobilization of the spermatic cord, while direct hernia repair typically focuses on reinforcing the weakened transversalis fascia and floor of the inguinal canal.

Inguinal hernias can arise due to a variety of factors, including increased intra-abdominal pressure, congenital weaknesses, and acquired conditions such as obesity, chronic coughing, or straining. Activities like heavy lifting, prolonged constipation, and urinary issues (such as benign prostatic hyperplasia) are significant risk factors.[3] Additionally, certain genetic conditions like familial collagen disorders and Prune Belly Syndrome can predispose individuals to hernias. Understanding the underlying etiology of inguinal hernias is essential for both prevention and the development of tailored surgical interventions.

Surgical repair of inguinal hernias has a long history, with significant advancements made over the centuries. In ancient times, hernia management was rudimentary, and many procedures were fraught with high mortality and recurrence rates. Over the years, techniques have evolved significantly, with key contributions from figures such as Hesselbach, Cooper, and Lichtenstein [4]. Modern approaches to hernia repair now emphasize the use of prosthetic materials such as mesh, which provide superior outcomes compared to earlier tissue-based repairs. Mesh-based repairs, including the Lichtenstein tension-free hernioplasty introduced in 1984, have revolutionized hernia surgery by reinforcing the inguinal floor and reducing the risk of recurrence. These procedures have been shown to offer consistent, favorable results, regardless of the hernia size or type [6].

The choice of anesthesia is a critical factor in the success of inguinal hernia repair. Local anesthesia and spinal anesthesia are two common options, with each offering distinct advantages and potential drawbacks. Local anesthesia, which involves the infiltration of anesthetic agents into the tissue surrounding the surgical site, allows for a more focused and less invasive approach [7]. Spinal anesthesia, on the other hand, may provide deeper and more complete pain relief but is associated with a higher risk of complications. The decision between spinal and local anesthesia depends on various factors, including patient health, surgeon preference, and the complexity of the procedure.

The Lichtenstein repair, one of the most widely used techniques for inguinal hernia repair, involves the placement of a prosthetic mesh to reinforce the inguinal floor and prevent recurrence. The procedure is considered tension-free because it avoids the need to suture tissues under tension, thus minimizing the risk of postoperative complications. The repair involves creating a small incision, mobilizing the spermatic cord, and placing the mesh over the weakened areas. The mesh is then sutured in place, providing a durable, tension-free closure that promotes tissue integration and reduces the likelihood of recurrence.

Despite the widespread adoption of mesh-based repairs, there are still concerns related to complications such as infection, mesh rejection, and chronic pain. Furthermore, the choice of anesthesia plays a significant role in patient outcomes and satisfaction. Local anesthesia is increasingly being favored for its safety and effectiveness, offering the advantage of faster recovery times and lower rates of postoperative complications compared to general anesthesia or spinal anesthesia. In this context, the comparison of outcomes between spinal anesthesia and local anesthesia for Lichtenstein hernia repair has become an area of significant interest, as it could help optimize surgical practices and enhance patient care.

In this study, we aim to compare the outcomes and quality of life of patients undergoing Lichtenstein inguinal hernia repair under spinal anesthesia versus local anesthesia. By evaluating postoperative pain levels, recovery times, complication rates, and patient satisfaction, we hope to provide valuable insights into the most effective anesthesia technique for this common surgical procedure. This research is intended to contribute to the ongoing efforts to refine inguinal hernia repair techniques and improve the overall patient experience.

MATERIALS AND METHODS

This prospective, comparative observational study was conducted at AIIMS Bhopal from August 2022 to May 2024, evaluating outcomes of Liechtenstein tension-free hernia repair under spinal anesthesia (Group A) and local anesthesia (Group B). The study included adult patients undergoing open inguinal hernia surgery, excluding those

with complex hernias, serious comorbidities, or pregnancy. In Group A, spinal anesthesia was administered with a combination of hyperbaric bupivacaine and either clonidine or fentanyl. In Group B, local anesthesia was delivered through a stepwise infiltration technique using lidocaine with adrenaline. All patients provided informed consent and ethical committee approval were sought before the study. They were given the choice of anesthesia, with their outcomes compared across the two groups.

RESULTS

In this study, the demographics of patients undergoing spinal and local anaesthesia were compared, with 56 patients in each group. The mean age of patients in the spinal anaesthesia group was 44.43 ± 16.18 years, while in the local anaesthesia group, it was 38.14 ± 11.46 years, with a statistically significant difference ($p = 0.02$). Gender distribution was nearly identical in both groups, with 98.2% male patients in both groups, and only one female patient in each group (1.8%), showing no significant difference ($p = 1.0$). Regarding educational status, 10.7% of patients in the spinal group were illiterate compared to just 1.8% in the local anaesthesia group, although this difference was not statistically significant ($p = 0.11$). In terms of marital status, 75% of patients in both groups were married, with no significant difference between the two groups ($p = 0.82$). Overall, the groups were similar in gender and marital status, with differences only in age and educational level.

The duration of surgery was compared between the spinal anaesthesia and local anaesthesia groups. The mean duration of surgery in the spinal anaesthesia group was 88.07 ± 16.34 minutes, whereas in the local anaesthesia group, it was 93.96 ± 14.35 minutes. The difference in duration of surgery between the two groups was statistically significant, with a p-value of 0.04, indicating that the duration of surgery was significantly shorter in the spinal anaesthesia group.

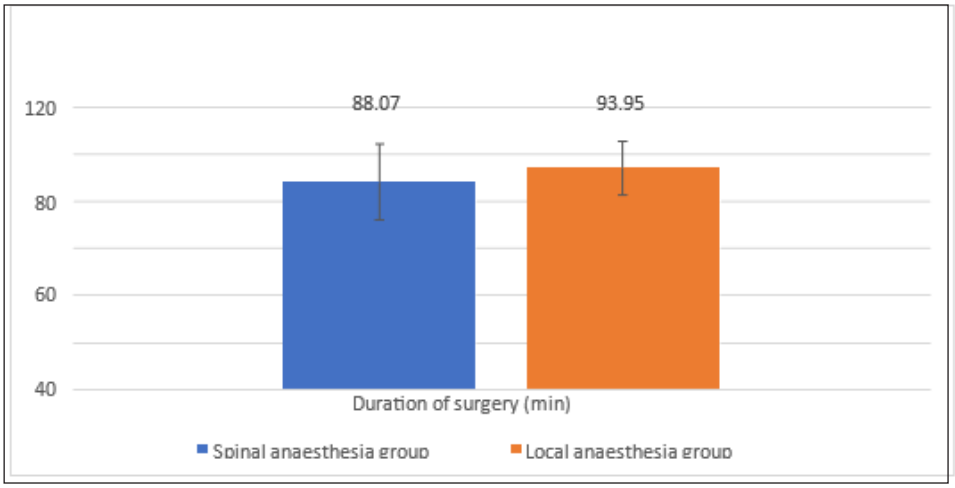

Figure 1: Comparison of Duration of Surgery between Spinal and Local Anaesthesia Group

The duration of hospital stay was significantly shorter in the local anaesthesia group compared to the spinal anaesthesia group. The mean duration of hospital stay in the spinal anaesthesia group was 4.86 ± 1.15 days, while in the local anaesthesia group, it was 3.20 ± 0.73 days. This difference was statistically significant, with a p-value of 0.01, indicating that patients in the local anaesthesia group had a significantly shorter hospital stay.

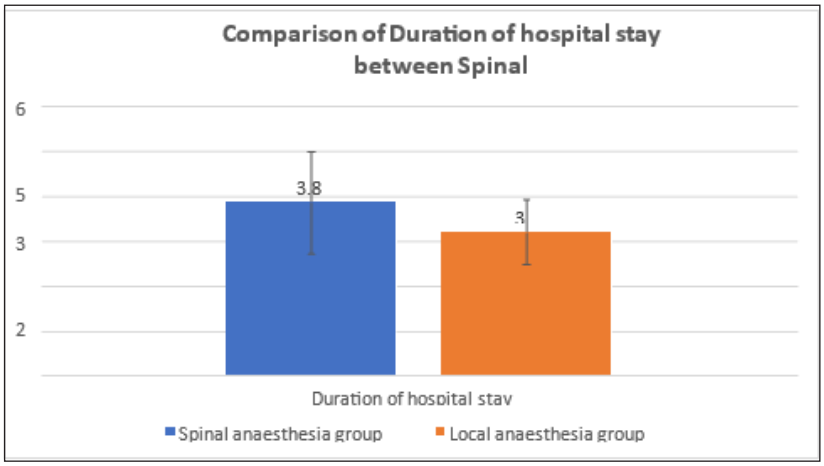

Figure 2: Comparison of Duration of Hospital Stay between Spinal and Local Anaesthesia Group

Post-operative parameters were compared between the spinal anaesthesia and local anaesthesia groups. The movement limitation was significantly lesser in the local anaesthesia group, with an average of 1.71 ± 0.56 days, compared to the spinal anaesthesia group, which had an average of 2.07 ± 0.46 days ($p < 0.01$). However, no significant

difference was found between the two groups regarding the return to daily activity, with both groups showing similar averages (spinal anaesthesia: 4.41 ± 1.47 days, local anaesth-esia: 4.38 ± 1.14 days; p = 0.61). Additionally, there was no significant difference in the foreign body sensation, as both groups had an average score of 2.04 ± 0.42 (p = 0.99).

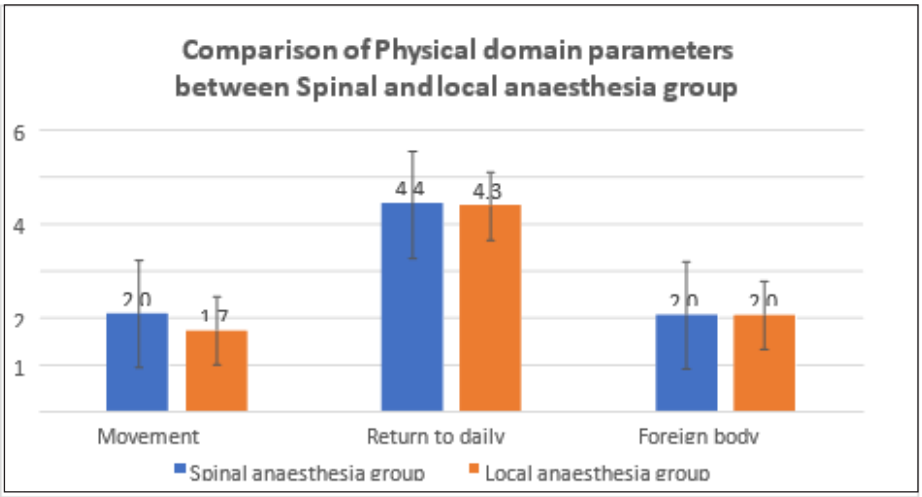

Figure 3: Comparison of Post-Operative Parameters between Spinal and Local Anaesthesia Group

The Visual Analog Scale (VAS) scores for post-operative pain were compared between the spinal anaesthesia and local anaesthesia groups at different time points. On Day 1, the VAS score was 3.09 ± 0.54 for the spinal anaesthesia group and 3.0 ± 0.60 for the local anaesthesia group, with no significant difference (p = 0.42). On Day 7, the scores were 2.0 ± 0.60 for the spinal anaesthesia group and 1.93 ± 0.57 for the local anaesthesia group (p = 0.51), again showing no significant difference. At 1 month, the spinal anaesthesia group had a score of 1.09 ± 0.28, while the local anaesthesia group had a score of 1.24 ± 0.42, with a significant difference (p = 0.03). At 3 months and 6 months, both groups reported a VAS score of 1.0 ± 0, with no significant difference (p = 1.0). Overall, there was no significant difference in post-operative pain between the two anaesthesia groups, except at the 1-month mark. (Table 1)

Table 1: Comparison of VAS Score between Spinal and Local Anaesthesia Group

VAS Score	Spinal Anaesthesia Group (N=56)	Local Anaesthesia Group (N=56)	P Value
Day 1	3.09±0.54	3.0±0.60	0.42
Day 7	2.0±0.60	1.93±0.57	0.51
1 month	1.09±0.28	1.24±0.42	0.03
3 months	1.0±0	1.0±0	1.0
6 months	1.0±0	1.0±0	1.0

The study compared sexual interest, sexual function, and ejaculation scores between spinal and local anaesthesia groups at multiple time points (Day 1, Day 7, 1 month, 3 months, and 6 months). No significant differences were found in any of the parameters across time. Both groups had identical sexual interest scores at all time points (p-values ranging from 0.82 to 1.0), and the sexual function scores were also similar (p-values between 0.80 and 0.84). Similarly, ejaculation scores showed no significant differences (p-values between 0.85 and 1.0). Overall, both spinal and local anaesthesia had comparable effects on sexual health, with no indication that one anaesthesia method had a greater impact on sexual outcomes post-operatively. (Table 2)

Table 2: Comparison of Sexual Interest and Sexual Function Scores between Spinal and Local Anaesthesia Groups

Parameter	Spinal Anaesthesia Group (N=56)	Local Anaesthesia Group (N=56)	P-Value
Sexual Interest			
Day 1	1.02 ± 0.13	1.02 ± 0.13	1.0
Day 7	1.86 ± 0.35	1.86 ± 0.35	1.0
1 Month	2.63 ± 0.48	2.63 ± 0.48	1.0
3 Months	3.68 ± 0.54	3.66 ± 0.58	0.95
6 Months	3.82 ± 0.47	3.82 ± 0.50	0.82
Sexual Function			
Day 1	1.0 ± 0	1.0 ± 0	1.0
Day 7	1.86 ± 0.35	1.86 ± 0.35	1.0
1 Month	2.63 ± 0.48	2.61 ± 0.49	0.84
3 Months	3.55 ± 0.60	3.52 ± 0.63	0.80
6 Months	3.84 ± 0.45	3.84 ± 0.49	0.80
Ejaculation			
Day 1	1.0 ± 0	1.0 ± 0	1.0
Day 7	1.93 ± 0.42	1.93 ± 0.42	1.0
1 Month	2.61 ± 0.49	2.61 ± 0.49	1.0
3 Months	3.68 ± 0.54	3.66 ± 0.58	0.95
6 Months	3.82 ± 0.47	3.82 ± 0.51	0.85

The comparison of WHO-QOL domains between the Spinal Anaesthesia and Local Anaesthesia groups revealed some significant differences in the immediate post-operative period, but overall, the two groups showed similar outcomes over time. In the Physical Domain, the spinal anaesthesia group reported a significantly higher score on Day 1 (80.93 vs. 76.02, p=0.02), indicating a better physical quality of life immediately after surgery. However, by Day 7 and at subsequent time points (1 month, 3 months, and 6 months), no significant differences were found, suggesting that the physical recovery between the two groups became comparable over time. For the Psychosocial Domain, the spinal anaesthesia group had a significantly higher score on Day 1 (82.73 vs. 76.26, p=0.01), reflecting better psychosocial well-being right after surgery. Interestingly, at 1 month, the local anaesthesia group showed a higher score (93.34 vs. 88.91, p=0.03), indicating better psychosocial outcomes later on. No significant differences were found in this domain after Day 1. In the Social Domain, the spinal anaesthesia group again showed better scores immediately post-surgery (Day 1: 85.86 vs. 79.54, p=0.05), but no significant differences were observed at later time points. Regarding the Environmental Domain, the spinal anaesthesia group scored significantly higher on Day 1 (85.26 vs. 77.90, p=0.01), indicating better environmental quality of life initially. However, by 3 months, the local anaesthesia group had a significantly higher score (93.24 vs. 88.11, p=0.03), suggesting better environmental outcomes over time. Overall, the results indicate that while there were transient differences in quality of life between the two anaesthesia groups immediately post-operation, these differences diminished over time, with both groups showing similar long-term outcomes. (Table 3)

Table 3: Comparison of WHO-QOL Domains between Spinal and Local Anaesthesia Groups

Domain	Time Point	Spinal Anaesthesia Group (N=56)	Local Anaesthesia Group (N=56)	P-Value
Physical Domain	Day 1	80.93±9.89	76.02±12.21	**0.02**
	Day 7	88.83±9.53	87.56±12.25	0.54
	1 month	91.03±9.66	93.62±9.88	0.16
	3 months	92.79±8.84	94.89±9.45	0.22
	6 months	95.53±7.94	95.53±9.78	1.0
Psychosocial Domain	Day 1	82.73±13.97	76.26±12.83	**0.01**
	Day 7	87.12±12.74	87.72±12.49	0.80
	1 month	88.91±12.56	93.34±9.68	**0.03**
	3 months	90.92±12.10	94.53±9.10	0.07
	6 months	94.94±10.35	96.09±7.74	0.50
Social Domain	Day 1	85.86±16.73	79.54±17.40	0.05
	Day 7	86.75±15.63	85.90±17.18	0.78
	1 month	88.09±13.47	90.90±13.91	0.28
	3 months	90.17±12.11	92.72±13.32	0.29
	6 months	94.04±12.58	93.63±13.79	0.87
Environmental Domain	Day 1	85.26±16.43	77.90±15.78	**0.01**
	Day 7	86.04±15.26	85.21±15.10	0.77
	1 month	86.66±15.12	90.94±12.46	0.10
	3 months	88.11±14.14	93.24±11.58	**0.03**
	6 months	93.13±11.99	94.42±11.50	0.56

The comparison of post-operative complications between the spinal and local anaesthesia groups, as classified by the Clavien-Dindo classification, showed no significant difference. Both groups had 73.2% of patients in Grade 1 (minor complications) and 26.8% in Grade 2 (moderate complications). The p-value of 1.0 indicates that the distribution of complications between the two groups was similar, suggesting that the type of anaesthesia did not influence the severity of post-operative complications. (Figure 4)

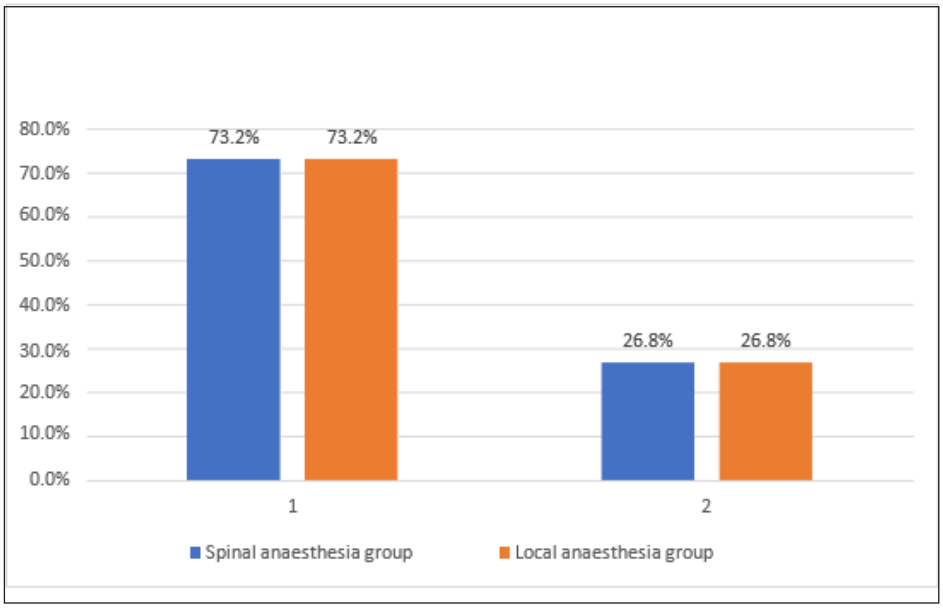

Figure 4: Comparison of Clavien Dindo Classification between Spinal and Local Anaesthesia Group

In terms of post-operative complications, no significant differences were observed in the rate of Surgical Site Infections (SSI) or Haematoma between the two anaesthesia groups. However, a significant difference was found in the incidence of Urinary Retention, with 10.7% of patients in the spinal anaesthesia group experiencing this complication, compared to none in the local anaesthesia group (p=0.02). This indicates that urinary retention is more common after spinal anaesthesia, whereas local anaesthesia did not result in this complication in any of the patients. The p-values for SSI and haematoma indicate no statistically significant difference between the two groups for these complications. (Figure 5)

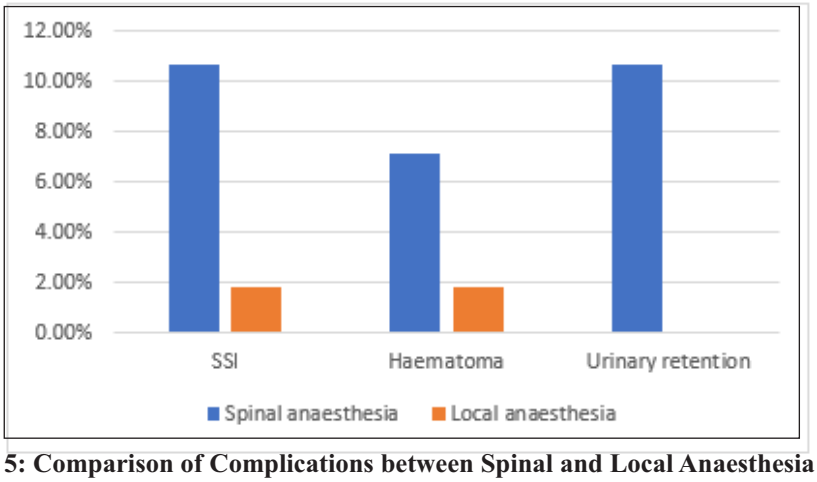

Figure 5: Comparison of Complications between Spinal and Local Anaesthesia Group

DISCUSSION

In this study, the patient group receiving local anesthesia was younger compared to the spinal anesthesia group. The duration of surgery was longer in the local anesthesia group than in the spinal anesthesia group. This is likely due to the additional local anesthetic required during the procedure and the time needed for the anesthetic to take effect. Moreover, since the abdominal muscles remain contracted under local anesthesia, it was more difficult to separate the cord from the cremasteric muscles. A study by Wellwood et al. reported that the time required for hernia repair under local anesthesia was longer compared to spinal anesthesia [7]. However, Bhedi et.al. found no significant difference in intraoperative time between the two anesthesia methods, although their study had a smaller sample size of only 30 participants per group [10].

The duration of hospital stay was longer for the spinal anesthesia group compared to the local anesthesia group. This is most likely due to the earlier mobilization of patients in the local anesthesia group. These findings are consistent with results from several other studies [8,9,10].

The local anesthesia group experienced less limitation in movement compared to the spinal anesthesia group. Contributing factors include the absence of lower limb numbness and the lack of a need for urinary catheterization. Similar results have been reported in other studies [11,12].

The time to return to daily activities and the sensation of foreign body discomfort were similar for both groups. However, existing literature reports a shorter return time, likely due to lesser limitation of movement observed in those studies [11,12].

There is limited literature comparing foreign body sensation between local and spinal anesthesia [11,12]. However, a study by M. Donat et al. found that foreign body sensation was similar between mesh and plug hernia repairs [13].

The postoperative pain, measured using the Visual Analog Scale (VAS), was found to be comparable between the spinal and local anaesthesia groups. However, intraoperative pain was more pronounced in the local anaesthesia group, particularly in patients with larger hernias. This is likely because the local anesthesia does not provide muscle relaxation, making the procedure more challenging and painful during surgery. Postoperative pain, on the other hand, depends on various factors such as the extent of dissection, size of the mesh, nerve injury during surgery, ligation of the hernia sac, periosteitis, and orchitis. Since these factors are largely related to the surgical technique itself rather than the type of anesthesia used, they were not influenced by whether spinal or local anesthesia was administered.

Despite these findings, existing literature suggests that both immediate and delayed postoperative pain tend to be less in patients who receive local anesthesia compared to spinal anesthesia [14,15,16,8]. This could be attributed to the less invasive nature of the technique and quicker recovery of patients under local anesthesia.

In terms of sexual function, no significant differences were found between the two groups. There is limited research comparing the impact of spinal and local anesthesia on sexual function specifically after inguinal hernia repair. However, other studies have shown that patients generally experience significant improvements in sexual function post-surgery compared to their preoperative state [17,18,19]. This suggests that the type of anesthesia used does not significantly affect sexual outcomes after hernia repair, with both groups potentially benefiting from the overall improvement in quality of life following the procedure.

In this study, the overall postoperative quality of life (QoL) was assessed using four domains: psychosocial, social, physical, and environmental. It was found that the spinal anesthesia group had a better quality of life on the immediate postoperative day (Day 1). This improvement could be attributed to the reduced movement limitations typically seen in patients who receive spinal anesthesia. On the other hand, the local anesthesia group showed better quality of life in the later postoperative days. This could be due to the earlier mobilization of patients in the local anesthesia group, as they experienced fewer restrictions in movement and no need for urinary catheterization, leading to quicker recovery and enhanced comfort.

There is an extensive body of research comparing postoperative quality of life between laparoscopic and open inguinal hernia repair, but there is a noticeable gap in studies that specifically compare the effects of spinal and local anesthesia on postoperative quality of life in hernia repair. However, the available literature indicates that quality of life improves significantly after hernia repair, especially in individuals who experienced preoperative pain. In the existing studies, the SF-36 scale has been used to assess quality of life 19,20, whereas this study employed the WHO-QOL scale, which also indicated an overall improvement in quality of life post-surgery, aligning with findings from other studies.

Postoperative complications were fewer in the local anesthesia group, which likely contributed to the improved quality of life in this group during the later postoperative period. Notably, urinary retention was a significant issue in the spinal anesthesia group, with 10.7% of patients experiencing it, while no patients in the local anesthesia group had this complication. This finding is consistent with previous studies comparing postoperative complications in inguinal hernia repair under spinal and local anesthesia, where local anesthesia generally led to fewer complications, such as urinary retention [8,15,21]. As a result, patients in the local anesthesia group had a more favorable recovery trajectory, leading to improved quality of life in the later postoperative period.

CONCLUSION

Inguinal hernia is a prevalent condition, with repair commonly performed via laparoscopic or open techniques. Open inguinal hernia repair can be conducted under general anesthesia (GA), spinal anesthesia, or local anesthesia. This study demonstrates that local anesthesia is a reliable alternative to spinal anesthesia, particularly in young patients with incomplete inguinal hernias. Notable advantages of local anesthesia include improved quality of life in the later postoperative days, reduced movement limitations, shorter hospital stay, and no urinary retention. These benefits make local anesthesia a viable and effective option for inguinal hernia repair in suitable patients.

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