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Original Research Article

COMPARING THE EFFICACY OF LOCAL VS. GENERAL ANESTHESIA IN INGUINAL HERNIA REPAIR: POSTOPERATIVE PAIN AND RECOVERY

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Abstract

Background: This study aims to compare the efficacy of local anesthesia (LA) and general anesthesia (GA) in open inguinal hernia repair, focusing on postoperative pain, recovery parameters, complications, and patient satisfaction. **Materials and Methods:** This prospective, randomized controlled trial was conducted at a tertiary care hospital, enrolling 100 adult patients diagnosed with unilateral primary inguinal hernia. Patients were randomly assigned to the LA group (n=50), receiving local infiltration with 0.5% bupivacaine and 1% lidocaine, or the GA group (n=50), receiving intravenous induction with propofol and fentanyl followed by inhalational maintenance. All patients underwent open inguinal hernia repair using the Lichtenstein technique. Postoperative pain was assessed using the Visual Analog Scale (VAS) at multiple time points, and recovery parameters included time to ambulation, oral intake, hospital stay duration, and return to normal activities. The incidence of complications and patient satisfaction scores were also recorded. **Result:** Both groups had comparable baseline characteristics. Total anesthesia time was significantly shorter in the LA group (50.1 ± 6.2 minutes) than in the GA group (68.5 ± 7.4 minutes, $p<0.001$). The LA group reported significantly lower postoperative pain scores at all time points (VAS 3.2 ± 1.5 vs. 5.8 ± 1.7 immediately postoperatively, $p<0.001$). Recovery was faster in the LA group, with earlier ambulation (3.2 ± 1.1 hours vs. 6.5 ± 1.4 hours, $p<0.001$), shorter hospital stays (12.5 ± 3.4 hours vs. 18.3 ± 4.1 hours, $p<0.001$), and earlier return to normal activities (6.8 ± 2.2 days vs. 9.2 ± 2.5 days, $p<0.001$). Postoperative complications such as nausea (10% vs. 30%, $p=0.02$) and urinary retention (2% vs. 14%, $p=0.04$) were significantly lower in the LA group. Patient satisfaction was also higher in the LA group (4.6 ± 0.5 vs. 3.9 ± 0.7, $p<0.001$). **Conclusion:** Local anesthesia was associated with lower postoperative pain, faster recovery, fewer complications, and higher patient satisfaction compared to general anesthesia in open inguinal hernia repair. These findings support the broader use of LA, particularly in ambulatory settings, to improve patient outcomes and optimize healthcare resource utilization.

INTRODUCTION

Inguinal hernia repair is one of the most commonly performed surgical procedures worldwide, with millions of cases treated annually. It occurs when soft tissue, typically part of the intestine, protrudes through a weak spot in the lower abdominal muscles, resulting in discomfort, pain, and potential complications if left untreated. Surgical intervention remains the standard approach for definitive treatment, with the Lichtenstein tension-free mesh repair being the most widely used technique. Despite advancements in surgical methods, the choice of anesthesia remains a crucial factor in determining patient outcomes, particularly in terms of postoperative pain, recovery, and overall patient satisfaction.[1] Anesthesia plays a vital role in ensuring patient comfort during surgery and has a significant impact on postoperative recovery. Traditionally, general anesthesia (GA) has been the preferred choice for many surgical procedures, including inguinal hernia repair, due to its ability to

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provide complete unconsciousness, muscle relaxation, and airway control. However, local anesthesia (LA) has gained increasing attention as a viable alternative, particularly in ambulatory and day-case surgeries. Unlike GA, which requires endotracheal intubation and systemic administration of anesthetic agents, LA involves the infiltration of anesthetic agents directly into the surgical site, allowing patients to remain awake during the procedure while achieving adequate pain relief. The decision between local and general anesthesia for inguinal hernia repair has been a topic of debate among surgeons and anesthesiologists. Each approach has distinct advantages and limitations that influence clinical decision-making. General anesthesia ensures a completely pain-free experience during surgery and is often preferred for complex cases or in patients with high levels of preoperative anxiety. However, it is associated with certain risks, including postoperative nausea and vomiting (PONV), respiratory complications, prolonged recovery time, and potential cognitive dysfunction, particularly in elderly patients. Additionally, GA requires a longer induction and recovery period, often leading to extended hospital stays and increased healthcare costs.[2] On the other hand, local anesthesia offers several advantages, particularly in terms of reducing postoperative pain, minimizing complications, and expediting recovery. Patients undergoing inguinal hernia repair under LA typically experience less pain in the immediate postoperative period and require lower doses of analgesics compared to those receiving GA. Moreover, LA avoids the systemic side effects associated with GA, such as nausea, vomiting, and respiratory depression, leading to a smoother and faster recovery. In many cases, patients receiving LA can be discharged on the same day, making it an ideal option for outpatient and ambulatory surgery settings. Additionally, LA has been shown to reduce the risk of urinary retention, a common postoperative complication associated with GA.[3] Despite the advantages of LA, its use is not without challenges. One of the primary concerns is the potential for inadequate pain control during surgery, particularly in anxious patients or those with a low pain threshold. Unlike GA, where patients are completely unconscious, patients undergoing surgery under LA remain awake, which may contribute to discomfort or psychological distress. Furthermore, the effectiveness of LA is highly dependent on the skill and experience of the surgeon and anesthesiologist in administering the anesthetic and ensuring adequate nerve blockade. In some cases, additional infiltration of local anesthetic may be required to maintain adequate pain control, prolonging the duration of the procedure. Another critical factor in the choice of anesthesia is patient selection. Not all patients are suitable candidates for LA, particularly those with complex or recurrent hernias, high levels of preoperative anxiety, or an inability to tolerate being awake during the procedure. Conversely, GA may not be the best option for patients with significant comorbidities, such as chronic obstructive pulmonary disease (COPD) or cardiovascular disease, who may be at higher risk of GA-related complications. Therefore, individualized patient assessment and shared decision-making between the patient, surgeon, and anesthesiologist are essential in selecting the most appropriate anesthesia technique.[4] In addition to its impact on postoperative pain and recovery, the choice of anesthesia can also influence long-term outcomes, such as the incidence of chronic pain following inguinal hernia repair. Chronic postoperative pain is a well-recognized complication that affects a subset of patients, significantly impacting their quality of life. Studies suggest that the type of anesthesia used during surgery may play a role in the development of chronic pain, with some evidence indicating that LA may be associated with a lower risk of persistent pain compared to GA. The mechanisms underlying this association remain unclear but may be related to the reduced inflammatory response and lower nerve irritation observed with LA.[5] The economic implications of anesthesia choice cannot be overlooked. In many healthcare systems, cost-effectiveness is a major consideration, particularly in high-volume surgical procedures such as inguinal hernia repair. LA has been shown to be a more cost-effective option compared to GA due to reduced anesthesia-related costs, shorter hospital stays, and lower rates of postoperative complications. In settings with limited healthcare resources, optimizing the use of LA could contribute to more efficient utilization of hospital facilities and improved patient throughput. As healthcare moves towards a more patient-centered approach, patient preference is becoming an increasingly important factor in surgical decision-making. Some patients may prefer GA due to fear of being awake during surgery, while others may opt for LA to avoid the risks and side effects associated with GA. Educating patients about the benefits and limitations of both anesthesia techniques is crucial in ensuring informed decision-making and optimizing patient satisfaction.[6] Given the growing interest in optimizing anesthesia techniques for inguinal hernia repair, it is essential to critically evaluate the comparative efficacy of LA and GA in terms of postoperative pain, recovery, complications, and patient outcomes. While multiple studies have explored this topic, variability in study designs, patient populations, and outcome measures makes it challenging to draw definitive conclusions. More high-quality, randomized controlled trials are needed to establish evidence-based guidelines for anesthesia selection in inguinal hernia repair. This study aims to compare the efficacy of local versus general anesthesia in inguinal hernia repair, with a specific focus on postoperative pain and recovery outcomes. By analyzing pain scores, time to ambulation, hospital stay duration, complication rates, and patient satisfaction, this study seeks to provide valuable

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insights into the optimal anesthesia choice for inguinal hernia repair.

MATERIALS AND METHODS

This study was a prospective, randomized controlled trial conducted at tertiary care hospital. Ethical approval was obtained from the Institutional Review Board, and written informed consent was acquired from all participants before enrollment. A total of 100 adult patients diagnosed with unilateral, primary inguinal hernia and scheduled for elective open inguinal hernia repair were enrolled in the study. Inclusion and exclusion criteria were as follows:

Inclusion Criteria

- Age 18–75 years.
- American Society of Anesthesiologists (ASA) physical status I–III.
- No prior history of inguinal hernia repair.
- Patients consenting to participate in the study.

Exclusion Criteria

- Recurrent or bilateral inguinal hernia.
- History of coagulopathy or bleeding disorders.
- Severe cardiopulmonary disease precluding general anesthesia.
- Allergy to local anesthetics.
- Patients unable to provide informed consent.

Randomization and Group Allocation

Patients were randomly assigned into two groups (n = 50 per group) using a computer-generated randomization sequence:

1. Local Anesthesia Group (LA Group) – Patients received local infiltration anesthesia with a mixture of 0.5% bupivacaine and 1% lidocaine at the surgical site.
2. General Anesthesia Group (GA Group) – Patients received standard general anesthesia with intravenous induction using propofol (2 mg/kg) and fentanyl (2 mcg/kg), followed by endotracheal intubation and maintenance with sevoflurane or isoflurane in oxygen/air.

Surgical Technique

All patients underwent open inguinal hernia repair using the Lichtenstein technique, performed by the same team of experienced surgeons to minimize surgical variability. Prophylactic antibiotics (cefazolin 1g IV) were administered preoperatively in all cases. In the Local Anesthesia Group, a field block technique with local anesthetic infiltration was used before the incision, while in the General Anesthesia Group, standard intubation and ventilation were maintained throughout the procedure. Postoperative pain and recovery outcomes were assessed at multiple time points: immediately after surgery, at 6 hours, 24 hours, and 7 days postoperatively. Pain levels were evaluated using the Visual Analog Scale (VAS) ranging from 0 (no pain) to 10 (worst pain), and analgesic consumption (paracetamol or tramadol) within the first 24 hours was recorded. Recovery parameters included the time to first ambulation, time to first oral intake, length of hospital stay, and the incidence of postoperative complications such as nausea, vomiting, and urinary retention. Additionally, patient satisfaction was assessed using a Likert scale (1–5).

Statistical Analysis

All data were analyzed using SPSS version 25.0. Continuous variables were expressed as mean ± standard deviation (SD) and compared using the Student's t-test. Categorical variables were analyzed using the chi-square test or Fisher's exact test where appropriate. A p-value of <0.05 was considered statistically significant.

RESULTS

Demographic and Baseline Characteristics

The baseline characteristics of patients in both groups were comparable, ensuring that differences in outcomes could be attributed to the type of anesthesia rather than pre-existing factors. The mean age of patients was similar in both groups (55.3 ± 10.2 years in the local anesthesia group vs. 54.8 ± 9.8 years in the general anesthesia group, p=0.75). The male predominance was also comparable, with 90% in the local anesthesia group and 92% in the general anesthesia group (p=0.78). BMI values were nearly identical, indicating no significant differences in body composition between groups (p=0.52). ASA classification was also well-balanced, with most patients classified as ASA II (50% in the local group vs. 54% in the general group, p=0.73).

Intraoperative Parameters

The duration of surgery was comparable between both groups (45.6 ± 8.4 minutes for local anesthesia vs. 46.8 ± 9.1 minutes for general anesthesia, p=0.62). However, total anesthesia time was significantly shorter in the local anesthesia group (50.1 ± 6.2 minutes) compared to the general anesthesia group (68.5 ± 7.4 minutes, $p<0.001$), reflecting the additional preparation time required for general anesthesia induction and recovery. Blood loss was slightly higher in the general anesthesia group (22.1 ± 6.3 ml) compared to the local anesthesia group (20.3 ± 5.8 ml), but this difference was not statistically significant (p=0.48). Notably, no patients in the local anesthesia group required conversion to general anesthesia, though 16% required additional infiltration of local anesthetic for adequate pain control.

Postoperative Pain Scores (VAS)

Postoperative pain levels were consistently lower in the local anesthesia group at all measured time points. Immediately after surgery, patients in the local anesthesia group reported significantly lower pain scores (3.2 ± 1.5) compared to the general anesthesia group (5.8 ± 1.7, $p<0.001$). This trend continued at 6 hours (2.5 ± 1.3 vs. 4.2 ± 1.5, $p<0.001$) and 12 hours (2.0 ± 1.2 vs. 3.5 ± 1.4, $p<0.001$). Even at 24 hours and 48 hours, the local anesthesia group maintained lower pain scores ($p<0.001$). By 7 days and 14 days, both groups showed significant reductions in pain, but the local anesthesia group continued to report

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lower pain scores (p=0.02 at 7 days, p=0.05 at 14 days).

Recovery Parameters

Patients in the local anesthesia group experienced significantly faster postoperative recovery. The time to first ambulation was shorter in the local anesthesia group (3.2 ± 1.1 hours) compared to the general anesthesia group (6.5 ± 1.4 hours, p<0.001). Similarly, time to first oral intake was significantly shorter in the local anesthesia group (2.8 ± 0.9 hours) than in the general anesthesia group (5.2 ± 1.2 hours, p<0.001). Hospital stay duration was also shorter for the local anesthesia group (12.5 ± 3.4 hours vs. 18.3 ± 4.1 hours, p<0.001). Additionally, patients in the local anesthesia group resumed normal activities earlier (6.8 ± 2.2 days) than those in the general anesthesia group (9.2 ± 2.5 days, p<0.001). Return to work was also significantly faster in the local anesthesia group (10.3 ± 3.1 days vs. 14.6 ± 3.8 days, p<0.001).

Postoperative Complications and Patient Satisfaction: The incidence of postoperative complications was lower in the local anesthesia group. Nausea and vomiting were significantly more common in the general anesthesia group (30% nausea and 20% vomiting) compared to the local anesthesia group (10% nausea and 4% vomiting, p=0.02 and p=0.03, respectively). Urinary retention was also higher in the general anesthesia group (14%) than in the local anesthesia group (2%, p=0.04), likely due to the use of anesthetic agents that affect bladder function. Wound infections and seroma formation were slightly more common in the general anesthesia group, though these differences were not statistically significant (p=0.27 and p=0.41, respectively). Chronic pain at 3 months was reported in 20% of patients in the general anesthesia group compared to 8% in the local anesthesia group (p=0.05), suggesting a potential long-term benefit of local anesthesia in reducing chronic postoperative pain. Readmission rates were low in both groups, with no significant difference (p=0.29). Patient satisfaction scores were significantly higher in the local anesthesia group (4.6 ± 0.5) compared to the general anesthesia group (3.9 ± 0.7, p<0.001), reflecting the overall benefits in terms of pain control, recovery time, and fewer complications.

Table 1: Demographic and Baseline Characteristics.

Characteristic	Local Anesthesia (n=50)	General Anesthesia (n=50)	p-value
Age (years, mean ± SD)	55.3 ± 10.2	54.8 ± 9.8	0.75
Male (%)	45 (90%)	46 (92%)	0.78
BMI (kg/m², mean ± SD)	26.4 ± 3.2	25.9 ± 3.5	0.52
ASA I (%)	20 (40%)	18 (36%)	0.65
ASA II (%)	25 (50%)	27 (54%)	0.73
ASA III (%)	5 (10%)	5 (10%)	1.00
Smoker (%)	15 (30%)	17 (34%)	0.69
Diabetes Mellitus (%)	10 (20%)	12 (24%)	0.58
Hypertension (%)	18 (36%)	20 (40%)	0.41
Previous Abdominal Surgery (%)	12 (24%)	14 (28%)	0.62

Table 2: Intraoperative Parameters

Parameter	Local Anesthesia (n=50)	General Anesthesia (n=50)	p-value
Surgery Duration (min, mean ± SD)	45.6 ± 8.4	46.8 ± 9.1	0.62
Total Anesthesia Time (min, mean ± SD)	50.1 ± 6.2	68.5 ± 7.4	<0.001
Blood Loss (ml, mean ± SD)	20.3 ± 5.8	22.1 ± 6.3	0.48
Conversion to General Anesthesia (%)	0 (0%)	N/A	-
Need for Additional Local Anesthetic (%)	8 (16%)	N/A	-

Table 3: Postoperative Pain Scores (VAS)

Time Point	Local Anesthesia (VAS, mean ± SD)	General Anesthesia (VAS, mean ± SD)	p-value
Immediate Post-op	3.2 ± 1.5	5.8 ± 1.7	<0.001
6 Hours	2.5 ± 1.3	4.2 ± 1.5	<0.001
12 Hours	2.0 ± 1.2	3.5 ± 1.4	<0.001
24 Hours	1.8 ± 1.1	3.0 ± 1.2	<0.001
48 Hours	1.2 ± 0.9	2.4 ± 1.1	<0.001
7 Days	0.5 ± 0.7	1.1 ± 0.8	0.02
14 Days	0.2 ± 0.4	0.7 ± 0.6	0.05

Table 4: Recovery Parameters

Parameter	Local Anesthesia (n=50)	General Anesthesia (n=50)	p-value
Time to First Ambulation (hours, mean ± SD)	3.2 ± 1.1	6.5 ± 1.4	<0.001
Time to First Oral Intake (hours, mean ± SD)	2.8 ± 0.9	5.2 ± 1.2	<0.001
Hospital Stay (hours, mean ± SD)	12.5 ± 3.4	18.3 ± 4.1	<0.001
Return to Normal Activity (days, mean ± SD)	6.8 ± 2.2	9.2 ± 2.5	<0.001
Return to Work (days, mean ± SD)	10.3 ± 3.1	14.6 ± 3.8	<0.001

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Table 5: Postoperative Complications and Patient Satisfaction

Complication/Parameter	Local Anesthesia (n=50)	General Anesthesia (n=50)	p-value
Nausea (%)	5 (10%)	15 (30%)	0.02
Vomiting (%)	2 (4%)	10 (20%)	0.03
Urinary Retention (%)	1 (2%)	7 (14%)	0.04
Wound Infection (%)	2 (4%)	5 (10%)	0.27
Seroma Formation (%)	3 (6%)	6 (12%)	0.41
Chronic Pain at 3 Months (%)	4 (8%)	10 (20%)	0.05
Readmission within 30 Days (%)	1 (2%)	3 (6%)	0.29
Patient Satisfaction Score (Likert Scale, mean ± SD)	4.6 ± 0.5	3.9 ± 0.7	<0.001

DISCUSSION

This study compared local anesthesia (LA) and general anesthesia (GA) in inguinal hernia repair, focusing on postoperative pain, recovery parameters, complications, and patient satisfaction. The demographic characteristics were comparable between the two groups, ensuring that differences in outcomes were due to anesthesia type rather than patient variability. The mean age of participants was similar (55.3 ± 10.2 years for LA vs. 54.8 ± 9.8 years for GA, p=0.75), with male predominance in both groups (90% vs. 92%, p=0.78). BMI, ASA classification, smoking status, and comorbidities were evenly distributed, similar to previous studies that found no baseline demographic impact on postoperative outcomes in hernia repair under different anesthesia types (Beard et al., 2020).[7] The surgical duration was similar between groups (45.6 ± 8.4 minutes for LA vs. 46.8 ± 9.1 minutes for GA, p=0.62), consistent with findings from a study by Song et al. (2021), which reported no significant difference in operative time between anesthesia modalities.[8] However, the total anesthesia time was significantly shorter in the LA group (50.1 ± 6.2 min vs. 68.5 ± 7.4 min, p<0.001), likely due to the prolonged induction and recovery associated with GA. Additionally, while intraoperative blood loss was slightly higher in GA patients, this difference was not statistically significant (p=0.48). Notably, no conversions to GA were required in the LA group, though 16% required additional infiltration of local anesthetic. This aligns with findings from Aasvang et al. (2017), who reported that additional infiltration is sometimes necessary but does not negatively impact overall outcomes.[9] Pain scores were significantly lower in the LA group at all time points, with immediate postoperative pain scores of 3.2 ± 1.5 in the LA group versus 5.8 ± 1.7 in the GA group (p<0.001). At 6 and 12 hours postoperatively, LA patients continued to experience significantly lower pain levels (p<0.001). By day 7, pain remained lower in the LA group (0.5 ± 0.7) compared to GA (1.1 ± 0.8, p=0.02), and by day 14, pain was nearly absent in both groups. These results are consistent with those of Bay-Nielsen et al. (2018), who reported that LA is associated with superior early pain control in hernia repair.[10] Additionally, lower postoperative pain in LA patients may be due to the prolonged analgesic effect of local anesthetics, as previously documented in studies on multimodal analgesia (Kumar et al., 2019).[11] The LA group demonstrated significantly faster recovery. Time to first ambulation was shorter (3.2 ± 1.1 hours vs. 6.5 ± 1.4 hours, p<0.001), and time to first oral intake was also reduced in LA patients (2.8 ± 0.9 hours vs. 5.2 ± 1.2 hours, p<0.001). The mean hospital stay was shorter in the LA group (12.5 ± 3.4 hours) compared to the GA group (18.3 ± 4.1 hours, p<0.001). These findings are supported by the study by Sanjay et al. (2020), which demonstrated that LA facilitates earlier ambulation and hospital discharge in elective hernia repair. Faster recovery may be attributed to the avoidance of GA-related adverse effects, such as delayed gastric emptying and residual sedation, which can prolong recovery time.[12] The overall complication rate was lower in the LA group, particularly regarding nausea, vomiting, and urinary retention. Nausea occurred in only 10% of LA patients versus 30% in the GA group (p=0.02), while vomiting was reported in 4% of LA patients compared to 20% in GA (p=0.03). The incidence of urinary retention was significantly lower in the LA group (2% vs. 14%, p=0.04), consistent with previous findings by Bischoff et al. (2016), which showed that LA significantly reduces the risk of postoperative urinary retention in outpatient surgeries.[13] Wound infections and seroma formation were slightly more common in the GA group, though these differences were not statistically significant. Importantly, chronic pain at three months was reported in 8% of LA patients versus 20% in the GA group (p=0.05), supporting the hypothesis that LA may reduce the risk of long-term pain, as suggested by Fränneby et al. (2018).[14] Patient satisfaction was significantly higher in the LA group (4.6 ± 0.5 vs. 3.9 ± 0.7, p<0.001), likely due to better pain control, faster recovery, and fewer complications. This aligns with the study by Kulacoglu et al. (2019), who found that patient-reported satisfaction was significantly greater in those who underwent hernia repair under LA compared to GA. A higher satisfaction rate may also be attributed to the reduced need for opioids and earlier discharge from the hospital, which have been shown to enhance the overall perioperative experience.[15] The findings of this study align with previous research supporting the use of LA in inguinal hernia repair. A meta-analysis by Sajid et al. (2020) concluded that LA is associated with lower postoperative pain scores, reduced complications, and shorter recovery time compared to GA.[16] Similarly, Nordin et al. (2018) reported that LA patients experience faster recovery and fewer adverse

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effects, reinforcing the safety and efficacy of LA in hernia surgery. While GA remains a common practice, these studies highlight the advantages of LA in enhancing perioperative outcomes and patient satisfaction.[17] The results of this study provide strong evidence supporting the use of LA in elective open inguinal hernia repair. Given its benefits in pain reduction, faster recovery, and lower complication rates, LA should be considered the preferred anesthesia modality, especially in patients with multiple comorbidities or those undergoing ambulatory surgery. However, proper patient selection is critical, as patients with high anxiety levels or anticipated technical difficulties may not be ideal candidates for LA. While this study provides valuable insights, it has some limitations. The sample size was relatively small, and the study was conducted at a single center, which may limit generalizability. Additionally, factors such as surgeon experience and patient anxiety levels were not explicitly assessed, both of which can influence outcomes.

CONCLUSION

This study demonstrates that local anesthesia (LA) is a superior alternative to general anesthesia (GA) for inguinal hernia repair, offering significant benefits in terms of lower postoperative pain, faster recovery, fewer complications, and higher patient satisfaction. Patients in the LA group experienced shorter hospital stays, reduced analgesic requirements, and a lower incidence of postoperative nausea and urinary retention compared to those in the GA group. These findings support the broader adoption of LA, particularly in ambulatory surgical settings, to enhance patient outcomes and optimize healthcare resources.

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