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Original Article

Comparison of Local and Spinal Anesthesia in Elective Open Repair Primary Unilateral Inguinal Hernia in Rattanakaburi Hospital

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Abstract

Background and Objective: Inguinal hernia is a common surgical condition, and surgery is considered the most effective treatment. This study compares the outcomes of inguinal hernia surgery performed under local and spinal anesthesia at Rattanakaburi Hospital.

Methods: This study is a retrospective cohort study involving patients diagnosed with inguinal hernia who underwent treatment at Rattanakaburi Hospital. The sample size is 33 patients per group. Data were analyzed using descriptive and inferential statistics, including the chi-square test, *T*-test, and repeated ANOVA.

Results: In the elective open repair primary unilateral inguinal hernia surgery study, 66 cases were analyzed, with 33 patients performed under local anesthesia and 33 patients under spinal anesthesia. In the group that received local anesthesia, one case (3.03%) experienced a complication of bradycardia during surgery. However, no complications were reported in the spinal anesthesia group during surgery. Regarding post-surgery complications within the first week, the local anesthesia group reported one case of seroma (3.03%). In contrast, the spinal anesthesia group had three cases of wound hematoma (9.09%), one case of seroma (3.03%), and three cases of urinary retention (9.09%). When comparing the surgical results using pain scores measured on the Visual Analog Scale (VAS), the average VAS pain scores at 6 hours, 24 hours, and 48 hours significantly differ between the two groups. During the one-month follow-up, both groups showed no need for treatment of recurrent cases. The average treatment cost for the local anesthesia group was 13,182.42 baht, while the spinal anesthesia group had an average price of 20,872.18 baht. The average cost difference between the two groups was 7,689.75 baht (*p*-value < 0.01). Patient satisfaction did not significantly differ between the two groups.

Conclusion: Inguinal hernia surgery performed with local anesthesia is a safe procedure with few complications and lower costs. A hospital stay is unnecessary, and postoperative pain levels are lower than those observed in the spinal anesthesia group, especially after 6 hours.

Keywords: Inguinal hernia, Local anesthesia, Hernia Surgery

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INTRODUCTION

Inguinal hernia represents a prevalent surgical pathology, constituting the majority, at 78%, of all hernia cases. The established therapeutic approach entails surgical intervention involving the application of MESH Graft, performed under general anesthesia (spinal block) or local anesthesia, as determined by the individual patient's clinical status. Several critical factors influence the management of inguinal hernia, including patient co-morbidities and the surgical expertise of the operating surgeon.^{1,2} Surgical intervention in asymptomatic patients substantially reduces complications and mortality rates,³ with reported decreases of up to 3% and 60-70%, respectively. Additionally, it is worth noting that many patients prefer general anesthesia (GA) primarily due to preoperative anxiety and apprehension regarding the surgical procedure.⁴ The research conducted in Scotland revealed that the patients mostly selected General anesthesia at 91%, followed by Spinal anesthesia at 5% and local anesthesia at 3% respectively.⁵ Regarding the anesthesia method or spinal anesthesia (spinal block), the patient must prepare before surgery at the hospital. After surgery, the patient will have to stay in the hospital for observation and monitoring for complications from anesthesia and analgesia. There are costs for hospital stays and travel expenses for patients and relatives. As for hernia surgery, local anesthesia is beginning to be applied in operation more. This surgery method allows effective treatment results, is safe, and has less post-operative wound pain. The patient can go home after the surgery with fewer complications from anesthesia and spinal anesthesia and save on hospital admission costs and relatives' travel. The research by Chawalit Songkhramyot⁶ stated that elective open repair primary unilateral inguinal hernia using local anesthesia can be performed with fewer complications. The average hospital stay in the local anesthesia group was 26.48 hours, and the average spinal block was 45.98 hours. Besides, the average treatment cost in the regional anesthesia group was 7,951.65 baht. In contrast, the spinal anesthesia group was 10,020.08 baht, which was found to be a statistically significant difference.

The patient's pain after the surgery was compared and observed. After surgery, the results were assessed using a visual analog scale (VAS), which stated that during the first 12 hours after surgery, patients who had surgery with local anesthesia had less pain since they received spinal anesthesia. However, the pain in both groups was no different after 24 hours.⁶ When comparing the duration

of surgery, postoperative complications, and recurrence, there is no difference between both patient groups who received local anesthesia and spinal anesthesia.⁷

This hospital is in Surin Province, with a 120-bed community healthcare facility. The hospital has received surgical patient referrals from neighboring Sanom Hospital and Nonnarai Hospital. Over the past three years (2018-2020), they observed 17, 19, and 10 cases of hernia per 100,000 population. Due to the absence of a dedicated surgeon, all cases were referred to Surin Center Hospital. In response to the need for prompt and efficient treatment, this hospital has initiated inguinal hernia surgeries, employing spinal and local anesthesia techniques performed by a single surgeon. The researcher is collecting data to compare the outcomes of these surgeries, aiming to provide effective and safe treatment to patients.

RESEARCH OBJECTIVE

Primary objective

Compare postoperative pain severity using the Visual Analog Scale (VAS) at 6, 24, 48, 72 hours, and 7 days in patients undergoing elective open repair primary unilateral inguinal hernia surgery using local and spinal anesthesia.

Secondary objective

Compare intraoperative and postoperative complications in patients undergoing elective open repair primary unilateral inguinal hernia surgery using local and spinal anesthesia.

To study the surgical outcome, such as returning to daily life after surgery, length of stay in hospital, and cost of medical care in patients undergoing elective open repair primary unilateral inguinal hernia surgery using local and spinal anesthesia.

MATERIALS AND METHODS

This research is a retrospective cohort study in patients undergoing elective open repair primary unilateral inguinal hernia surgery using local and spinal.

Population and Sample group (Selection criteria)

The inclusion criteria: patients diagnosed with an inguinal hernia on one side and not had surgery before, patients aged 18 years or older who have been diagnosed with an inguinal hernia on one side, and surgery consent.

The exclusion criteria: patients with inguinal hernias on both sides, patients who have had an inguinal hernia on one side and have undergone surgery before and have re-occurred, patients with hydrocele, femoral hernia, or lipoma of cord, patients who are allergic to local anesthetics and NSAID painkillers, patients who bleed easily stop taking medication (coagulopathy), patients who cannot inject spinal anesthesia or unable to inject local anesthesia, patients who refuse treatment/refuse surgery and did not come to the appointment.

Surgery procedures

1. Prepare anesthetic by mixing 1% Xylocain 20 cc with 0.5% Bupivacaine 20 cc.

2. Start ilioinguinal-iliohypogastric nerve blocks by injecting anesthetic 2-2.5 centimeters inside and above the anterior pelvic bone, injecting with the tip of the needle under the external oblique aponeurosis, 10 cc, as shown in [Figure 1](#).

3. Inject anesthetic into the surgical wound. Starting from the pubic tubercle, draw a straight line to the midpoint of the inguinal ligament, which is the position of the inguinal ring. Then, inject the anesthetic into the skin layers.

4. To apply the surgical wound to the skin and subcutaneous layers, use a knife and scissors. A blood vessel ligation is used instead of cutting the tissue with an electrocautery. When reaching the Scarpa fascia layer, anesthetic is injected into this layer again because this layer is a barrier to the anesthetic from descending, and there are often nerves penetrating this layer, and external oblique aponeurosis comes out.

5. Inject anesthetic under the external oblique aponeurosis to push the ilioinguinal nerve at the top of the spermatic cord.

6. Cut open the external oblique aponeurosis with care not to injure the ilioinguinal and Ilihypogastric nerve, as shown in [Figure 2](#).

7. Dissect the spermatic cord from the surrounding tissue.

8. Look for the hernia sac, then inject anesthetic around the hernia sac. Be careful of pulling on the hernia sac too much, which may cause the patient to have discomfort at the umbilicus. Cut up to the neck of the hernia sac (Neck of hernia sac), as shown in [Figure 3](#).

9. Sew the lower edge of the mesh, starting from the inside, beyond the pubic tubercle, at least 2 centimeters, beginning from the rectus sheath area. Sew a continuous

running suture through the pubic tubercle to the internal ring, as shown in [Figure 4](#).

10. Prepare space for placing the mesh between the external oblique aponeurosis and internal oblique aponeurosis and sew the mesh.

11. Sew the external oblique aponeurosis to close the inguinal canal. Sew it to close layer by layer to the skin.



Figure 1



Figure 2

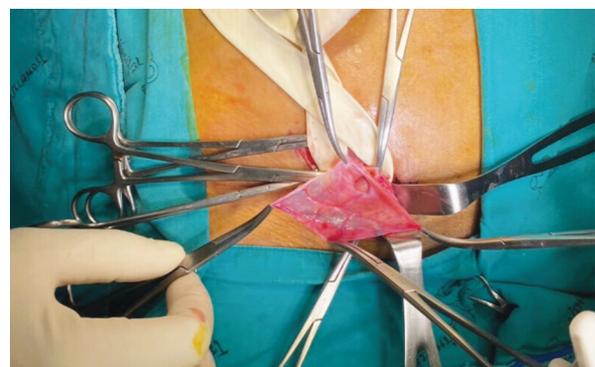


Figure 3



Figure 4

Example size

This sample size calculator is used for a study that compares continuous outcomes between two independent groups from Zamani-Ranani's research.⁷

The mean VAS at 3 hours period after surgery of the LA group was 22.00, SD = 4.19; the mean VAS at 3 hours period after surgery of the SA group was 31.33, SD = 13.08, Alpha = 0.01, Z (0.99), Beta = 0.10, Z (0.90), Sample size: LA group = 33, SA group = 33.

Sampling

All patients diagnosed with inguinal hernia were included in the study through a simple random sampling method. We utilized computer-generated random number tables to select participants based on the calculated sample size.

Data collection

The researcher designed a comprehensive data recording form for the study. Information was gathered through a questionnaire that covered various variables, including age, congenital diseases, vital signs, weight, height, body mass index, anesthesia method, blood loss during surgery, intraoperative and postoperative complications, postoperative pain levels assessed via the Visual Analog Scale (VAS) at 6, 24, 48, 72 hours, and 7 days after surgery, as well as the length of hospital stay.

Data analysis

The researcher uses the STATA program version 10.1 for processing and analyzing data.

1. Utilize statistical methods to describe data. When the data follows a normal distribution, present the mean and standard deviation; for data distributed non-normally,

provide the median, interquartile range, maximum, and minimum values.

2. Apply inferential statistics, such as the chi-square or Fisher's exact test for categorical variables, and employ independent *t*-tests and Mann-Whitney U tests for quantitative variables following normal and non-normal distributions, respectively.

3. Conduct a comparative analysis of postoperative pain levels, assessed using the Visual Analog Scale (VAS) at 6, 24, 48, 72 hours, and 7 days, in patients undergoing inguinal hernia surgery with either local anesthesia or spinal anesthesia. Perform a repeated measures analysis using repeated measures ANOVA.

RESULTS

From a study of 33 cases of local anesthesia and 33 cases of spinal anesthesia, the average age was 64.42 and 67.66, respectively (p -value 0.22). Most of the 33 cases were male (100%) and 31 cases (93.94%), respectively (p -value 0.15). The most indirect type was found, 19 cases (57.58%) and 21 cases (63.64%), respectively (p -value 0.21). Most were on the right side, 24 cases (72.73%) and 20 cases (60.61%), respectively (p -value 0.29), mean BMI of is 22.78 and 22.31, respectively (p -value 0.51), mean SBP 131.36 and 128.15, respectively (p -value 0.10), mean DBP 82.63 and 77.72 respectively (p -value 0.01), mean BT ($^{\circ}$ C) 36.75 and 36.80 respectively (p -value 0.32), mean HR (bpm) 85.75 and 84.78 respectively (p -value 0.59), mean RR (/min) 19.75 and 19.87 respectively (p -value 0.39) The majority of ASA status was at level 2, the most being 21 cases (63.64%) and 28 cases (84.85%), respectively (p -value 0.07), mean blood loss (ml) 4.63 and 4.0, respectively (p -value 0.05), as shown in Table 1.

When comparing complications of inguinal hernia surgery using local anesthesia and spinal anesthesia, Bradycardia complication was found in 1 case (3.03%) during surgery in the group using local anesthesia. In contrast, the spinal anesthesia group had no complications during surgery. As for complications after surgery within 7 days, it was found that the group using local anesthesia found 1 seroma (3.03%), while the spinal anesthesia group found wound hematoma 3 cases (9.09%), seroma 1 case (3.03%) and urinary retention 3 cases (9.09%), as shown in Table 2.

When comparing the results of inguinal hernia surgery using local and spinal anesthesia, the average operation time was 69.39 minutes and 48.12 minutes (p -value < 0.01).

Table 1 Characteristics of patients

	Local anesthesia (n = 33)	Spinal anesthesia (n = 33)	p-value
Age (mean ± SD)	64.42 ± 11.71	67.66 ± 9.92	0.22
Gender (%)			0.15
Male	33 (100)	31 (93.94)	
Female	0 (0)	2 (6.06)	
Types of Inguinal hernia (%)			0.21
Indirect	19 (57.58)	21 (63.64)	
Direct	1 (3.03)	4 (12.12)	
Combine	13 (39.39)	8 (24.24)	
Side (%)			0.29
Left	9 (27.27)	13 (39.39)	
Right	24 (72.73)	20 (60.61)	
BMI (kg/m²)	22.78 ± 2.88	22.31 ± 2.97	0.51
SBP (mmHg)	131.36 ± 7.62	128.15 ± 8.43	0.10
DBP (mmHg)	82.63 ± 5.82	77.72 ± 7.95	0.01
BT (°C)	36.75 ± 0.25	36.80 ± 0.21	0.32
HR (bpm)	85.75 ± 7.13	84.78 ± 7.46	0.59
RR (/min)	19.75 ± 0.66	19.87 ± 0.48	0.39
ASA status (%)			0.07
1	3 (9.09)	0 (0)	
2	21 (63.64)	28 (84.85)	
3	9 (27.27)	5 (15.15)	
Anesthetic amount (ml)	37.27 ± 6.74		
Blood loss (ml)	4.63 ± 1.29	4.0 ± 1.29	0.05

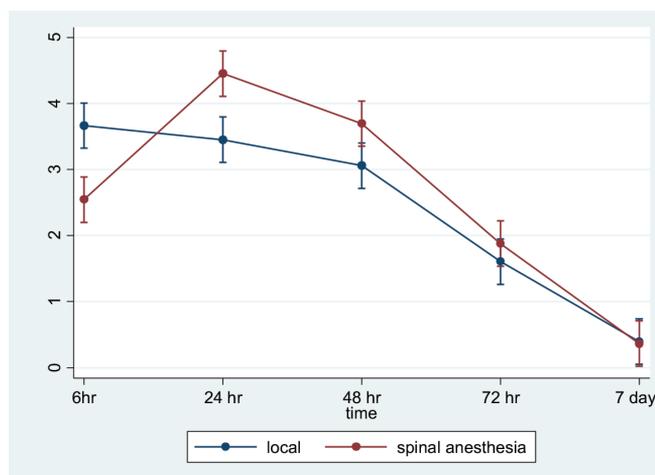
Table 2 Comparing complications of elective open repair primary unilateral inguinal hernia surgery using local anesthesia and spinal anesthesia

	Local anesthesia (n = 33)	Spinal anesthesia (n = 33)
Intraoperative (%)		
Arrhythmias	0	0
Anaphylaxis	0	0
Pain needing sedation	0	0
Hypotension	0	0
Bradycardia	1 (3.03)	0
Postoperative Complications (%)		
Wound infection	0	0
Wound hematoma	0	3 (9.09)
Seroma	1 (3.03)	1 (3.03)
Testicular pain/swelling	0	0
Urinary retention	0	3 (9.09)
Headache	0	0
Respiratory complication	0	0

Table 3 Comparing the result of elective open repair primary unilateral inguinal hernia surgery using local anesthesia and spinal anesthesia

	Local anesthesia (n = 33)	Spinal anesthesia (n = 33)	p-value
Operation time (mins)	69.39 ± 19.87	48.12 ± 14.89	< 0.01
VAS			
6 hr.	3.66 ± 0.92	2.54 ± 1.82	< 0.01
24 hr.	3.45 ± 0.90	4.45 ± 0.97	< 0.01
48 hr.	3.06 ± 1.17	3.69 ± 1.13	0.02
72 hr.	1.60 ± 0.60	1.87 ± 0.78	0.11
7 days	0.39 ± 0.49	0.36 ± 0.48	0.80
Length of stay (hours)	6.12 ± 1.02	82.18 ± 52.31	< 0.01
Recurrence (0-1 month)	0	0	
Hospital cost	13,182.42 ± 4,394.06	20,872.18 ± 7,278.49	< 0.01
Patient satisfaction (5 scores)			0.30
4	3 (9.09)	1 (3.03)	
5	30 (90.91)	32 (96.97)	

The average VAS pain scores at 6 hours were 3.66 ± 0.92 and 2.54 ± 1.82 , respectively. The researcher also found that the spinal anesthesia group had less pain and was significantly different (p -value < 0.01). The mean VAS scores at 24 hours were 3.45 ± 0.90 and 4.45 ± 0.97 , respectively. Besides, the local anesthesia group had less pain and was significantly different (p -value < 0.01). The mean VAS scores at 48 hours were 3.06 ± 1.17 and 3.69 ± 1.13 , respectively. The local anesthesia group had less pain and was significantly different (p -value = 0.02). The mean VAS scores at 72 hours were 1.60 ± 0.60 and 1.87 ± 0.78 , respectively. It was found that the two groups were not significantly different. (p -value = 0.11) The mean VAS scores at 7 days were 0.39 ± 0.49 and 0.36 ± 0.48 , respectively. It was found that there were no statistically significant differences. (p -value = 0.80) As for the days of hospital stay in the local anesthesia group, there will be no hospital stay but will stay there for 6.12 ± 1.02 hours, which is different from the spinal anesthesia group. It was found that the average hospital stay was 82.18 ± 52.31 hours. In addition, the follow-up treatment results within 1 month found that both groups had not returned to treatment again. When comparing treatment costs, it was found that the local anesthesia group had an average cost of 13,182.42 baht, and the spinal anesthesia group had an average cost of 20,872.18 baht. It was found to be a statistically significant difference. (p -value < 0.01) There was no difference in patient satisfaction between the two groups, as shown in Table 3.

**Figure 5** The results of the comparison of pain severity scores between 2 groups of patients

DISCUSSION

Inguinal hernia surgery performed under local anesthesia has witnessed growing popularity. Patients anticipate a swifter recovery, enabling them to promptly return to their daily routines and normal occupational activities.⁸ Return to daily activities and normal occupations faster.⁸ Local anesthesia (LA) is frequently used, and this method causes pain during surgery. 85% of patients experience pain during surgery, but the majority still prefer this method.⁹ The most used anesthesia technique is injecting anesthesia into the spinal block, which has the advantage of avoiding paralytic agents and endotracheal intubation.¹⁰

However, postoperative complications, such as patients with urinary retention, can often be found after the surgery. Local anesthesia has fewer postoperative complications. The results of this study found that the data from Table 1 from the general evaluation of the primary data, for the most part, were similar between the local anesthesia and anesthesia groups. In spinal studies, where group baseline tabulations indicate genuine or significant differences between groups, selecting covariates based on significance tests for baseline differences may lead to omitted variables. However, no differences were found between the 2 groups in this study.

In comparing complications arising from inguinal hernia surgery conducted under local anesthesia and spinal anesthesia, postoperative complications were lower using local anesthesia. This finding aligns with a study conducted by Courtney J. Balentine and colleagues,¹¹ which demonstrated that the utilization of local anesthesia resulted in a 0.6% reduction in postoperative complications among patients aged 75 years and older, with a 95% confidence interval of -0.11 to -1.13. This study underscores the advantages of using local anesthesia in patients undergoing inguinal hernia surgery, as it reduces the likelihood of postoperative complications. Among the group that underwent surgery with spinal anesthesia, there were notable instances of complications, including three cases of wound hematoma (all in patients aged 70 years or older), one case of seroma (in a 61-year-old patient), and three cases of urinary retention (all among the elderly individuals). Urinary retention is a common post-surgery complication, possibly exacerbated by the prevalence of inguinal hernias in older individuals who often experience urinary incontinence.¹² Furthermore, previous research has indicated that using short-acting lidocaine for spinal anesthesia mitigates the issue of urinary retention.¹⁰ Consequently, further studies are warranted to comprehensively examine urinary retention incidence in this context.

When comparing the outcomes of inguinal hernia surgery performed under local anesthesia and spinal anesthesia, a notable disparity in mean operation times emerged, with durations of 69.39 minutes and 48.12 minutes, respectively (p -value < 0.01). This finding diverges from the results reported in the meta-analysis conducted by Lin Li et al.⁴ and the randomized controlled trial (RCT) conducted by RN van Veen et al.,¹³ both of which demonstrated significantly shorter overall surgery times in the local anesthesia group (p < 0.001). However,

it is worth noting that this contrasts with the findings of the meta-analysis by Deepali Prakash et al.,¹⁴ encompassing an RCT with 1,379 patients, which indicated no significant difference in surgery times between the two groups. In the current study, the extended duration of hernia surgery under local anesthesia may be attributed to the time required for the anesthetic to take effect and potential communication challenges, especially among patients with hearing impairments necessitating ongoing communication during the procedure. These factors introduce certain time constraints and limitations to the surgical process.

In comparing inguinal hernia surgeries under local anesthesia and spinal anesthesia, a significant disparity in mean operation times was noted, with durations of 69.39 minutes and 48.12 minutes, respectively (p -value < 0.01). These findings deviate from the results reported in Lin Li et al.'s meta-analysis⁹ and RN van Veen et al.'s randomized controlled trial (RCT),¹³ both of which indicated significantly shorter overall surgery times in the local anesthesia group (p < 0.001). However, this contrasts with the findings from Deepali Prakash et al.'s meta-analysis,¹⁴ which encompassed an RCT involving 1,379 patients and showed no significant difference in surgery times between the two groups. In this study, the prolonged duration of hernia surgery under local anesthesia could be attributed to the waiting time for the anesthetic to take effect and challenges in communication, particularly among patients with hearing impairments necessitating during the procedure. These factors introduce time constraints and limitations to the surgical process.

The findings of this study compared pain scores among patients undergoing inguinal hernia surgery with local anesthesia and spinal anesthesia. At the 6-hour mark, the average pain score (VAS) was 3.66 ± 0.92 for the local anesthesia group and 2.54 ± 1.82 for the spinal anesthesia group, the spinal anesthesia group reporting less pain, signifying a statistically significant difference (p -value < 0.01), but 24-hour mark, with mean VAS scores of 3.45 ± 0.90 and 4.45 ± 0.97 , the local anesthesia group reporting less pain signifying a statistically significant difference (p -value < 0.01). At 48 hours, the local anesthesia group had less pain, with mean VAS scores of 3.06 ± 1.17 compared to 3.69 ± 1.13 in the spinal anesthesia group (p -value = 0.02). However, at 72 hours and 7 days, no statistically significant differences were found (p -value = 0.11 and p -value = 0.80, respectively). These results align with the meta-analysis conducted by Deepali Prakash et al.,¹⁴

encompassing RCTs with 1,379 patients, demonstrating that patients in the local anesthesia group experienced less pain than those in the spinal anesthesia group. A long-acting local anesthetic (bupivacaine) lasting 4-6 hours might explain the reduced pain immediately after surgery. This study did not collect data on postoperative oral analgesic medications taken at home, which could be confounding. During 1-month follow-up, both groups showed no readmissions, aligning with findings from Kent Grosh and colleagues,¹⁵ who observed no significant differences in mortality, morbidity, or readmissions within 30 days when comparing local anesthesia (LA) and spinal anesthesia (SA) to general anesthesia (GA). Regarding treatment costs, patients receiving local anesthesia had an average cost of 13,182.42 baht. In comparison, the spinal anesthesia group incurred an average cost of 20,872.18 baht, representing a statistically significant difference (p -value < 0.01). This aligns with a study by Kamol Kanyaprasit,¹⁶ which found that spinal anesthesia was associated with three to four times higher costs than local anesthesia. However, patient satisfaction has no significant difference between the two groups.

LIMITATION

The significant limitations of the study were that it is a single-center retrospective study and the sample size was relatively small.

CONCLUSION

The study's findings indicate that inguinal hernia surgery can be effectively performed under local anesthesia, offering several advantages. Notably, there were fewer postoperative complications, reduced pain levels after 6 hours, and lower costs associated with local anesthesia. Although the surgery may take longer, patients can safely return home without requiring a hospital stay. These findings suggest surgeons may consider opting for local anesthesia over spinal anesthesia when performing inguinal hernia surgeries.

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