COMPARISON OF MOTOR BLOCK ONSET, SENSORY BLOCK, HEMODYNAMIC CHANGES, SIDE EFFECT OCCURRENCE, AND RECOVERY TIME BETWEEN 2% HYPERBARIC PRILOCAINE SPINAL ANESTHESIA COMPARED TO 5% HYPERBARIC LIDOCAINE IN UROLOGICAL SURGERY

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Objectives: Spinal anesthesia is an anesthesia technique to facilitate lower abdominal, gynecological, lower extremity and urological surgeries. Lidocaine and prilocaine are local anesthetics that have a rapid onset and intermediate duration of action that are well used as spinal anesthesia for short operations. Prilocaine is a new drug introduced in Indonesia since 2022. The purpose of this study was to analyze the effectiveness and incidence of side effects of spinal anesthesia with 2% hyperbaric prilocaine compared to 5% hyperbaric lidocaine in urological surgery at Dr. Soetomo General Hospital.

Methods: Analytical study, experimental single blind randomized control trial. Total of 40 subjects aged 18-65 years, PS ASA I-II who underwent urological surgery under spinal anesthesia were involved in this study, which were randomly divided into two groups group A which received 75 mg of 5% hyperbaric lidocaine and group B which received 60 mg of 2% hyperbaric prilocaine. There were 2 subjects from each group who experienced block failure. Subjects involved in this study were monitored for vital signs before and during surgery, measurement of motor block onset, block height, adverse events and motor recovery time after spinal anesthesia.

Results: There were no significant differences in motor block onset, sensory block height, systolic blood pressure changes, diastolic blood pressure changes, incidence of side effects of bradycardia, shivering, IONV, TNS, block failure and motor recovery time after spinal anesthesia in both groups. In statistical tests using the t test, there was a significant difference in MAP changes (prilocaine group 13.53 ± 7.98 vs 19.84 ± 9.668 lidocaine group p 0.035) and chi square test on the incidence of hypotension obtained a significant difference (prilocaine group 3 (15.7%) vs 9 (47.3%) in the lidocaine group p 0.036).

Conclusion: While the onset of motor block, sensory block height, systolic and diastolic blood pressure, and heart rate did not significantly differ between the two groups, the change in mean arterial pressure (MAP) was lower in the prilocaine group compared to the lidocaine group. The incidence of hypotensive side effects was also lower in the prilocaine group. Both groups experienced side effects of bradycardia, shivering, and IONV, but TNS was only reported in the lidocaine group, with no significant difference between the groups. Motor block recovery time in the prilocaine group was longer than in the lidocaine group but not statistically significantly different.

Keywords: Spinal Anesthesia, Lidocaine, Prilocaine, Transient Neurological Symptoms

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INTRODUCTION

Spinal anesthesia, also known as subarachnoid block (SAB), is referred to as intradural or intrathecal spinal block. Spinal anesthesia is a regional anesthesia technique that involves injecting a local anesthetic drug into the subarachnoid space between the L2-L3, L3-L4, or L4-L5 vertebrae. Spinal anesthesia induces temporary inhibition of autonomic, sensory, and motor nerves (Butterworth et al., 2013; Pardo and Miller, 2018).

The data obtained at Integrated Surgical Center (GBPT) of Dr. Soetomo General Hospital in 2015 showed that there were 288 patients who underwent short-duration surgeries (30-60 minutes) with the SAB anesthesia technique, which increased to 314 patients in 2016. This data indicates that SAB is one of the frequently used anesthesia modalities for lower abdominal and lower extremity surgeries at Dr. Soetomo General Hospital (Sumartono,

Sulistiawan dan Johansyah, 2017).

Urological surgery is often performed with a short duration such as double J (DJ) stent insertion, urethrocystoscopy, nephroscopy, transurethral resection of prostate (TURP) is very common using regional anesthesia techniques, especially spinal anesthesia techniques. Local anesthetic agents that can be used in spinal anesthesia techniques include hyperbaric bupivacaine and hyperbaric lidocaine. Hyperbaric bupivacaine has a good level of safety, low incidence of transient neurological symptom (TNS), but on the other hand has a long duration so that it can further extend the patient's recovery time and increase treatment time in the recovery room (Widyana et al., 2023).

Lidocaine is a local anesthetic that has intermediate potency and duration characteristics with a fast onset of action. Lidocaine 5% has been introduced and approved for spinal anesthesia since 1960. Currently, hyperbaric 2% lidocaine has been introduced in Indonesia since 2022. Lidocaine is reported to have characteristics similar to lidocaine but with a lower incidence of TNS (Transient Neurologic Symptoms), making it a potential substitute for lidocaine (Manassero et al., 2017).
Prilocaine has been studied by various research centers, and the findings indicate that prilocaine offers several advantages compared to lidocaine as a spinal anesthesia agent. Prilocaine is a novel medication that has not been previously used at Dr. Soetomo Hospital. Therefore, researchers were interested in conducting a study to compare the onset of motor block, sensory block, hemodynamic changes, side effects, and recovery time between spinal anesthesia with 2% hyperbaric prilocaine and 5% hyperbaric lidocaine in urological surgeries. This study is expected to provide an overview of the effectiveness profile and side effects of prilocaine compared to lidocaine as a standard drug that is often used. This study aims to analyze the effectiveness and incidence of side effects of spinal anesthesia with 2% hyperbaric prilocaine compared to 5% hyperbaric lidocaine in urological surgery at Dr. Soetomo Regional General Hospital.

LITERATURE REVIEW

Spinal Anesthesia

Spinal anesthesia is performed by inserting a spinal needle between the L2-L3, L3-L4, or L4-L5 vertebrae into the subarachnoid space, where a local anesthetic is then injected, mixing with cerebrospinal fluid. This local anesthetic will inhibit nerves in the spinal cord, including motor, sensory, and autonomic nerves. Motor nerve blockade leads to paralysis, sensory nerve blockade results in anesthesia, and autonomic nerve blockade causes changes in vascular tone, which can lead to hypotension, bradycardia, heat loss leading to shivering, and intraoperative nausea and vomiting. These nerve blockades are reversible, and the loss of motor blockade can be assessed using the Bromage score. Transient neurological symptoms occur due to the neurotoxic effects of the local anesthetic on nerve tissue (Butterworth et al., 2013; Chin Adrian & Zundert Andre van, 2022; Pardo & Miller, 2018)

Local Anesthesia

Local anesthesia consists of three components: a lipophilic aromatic ring, an ester or amide linkage, and a tertiary amine. These structural differences categorize local anesthesia into two types: the ester and amide groups. Local anesthesia works by inhibiting the influx of sodium ions through sodium channels in neuronal cell membranes, preventing nerve depolarization. Under normal conditions, sodium channels are closed at rest, preventing sodium ions from entering the cell. When a neuron is stimulated, sodium channels are activated and opened, allowing sodium ions to enter the cell, leading to depolarization. After depolarization occurs, sodium ion channels close, inhibiting the influx of sodium ions. Through the Na-K-ATPase pump, sodium ions are pumped out of the cell into the extracellular space, and potassium ions are pumped back into the intracellular space, resulting in membrane repolarization. Local anesthesia has a higher affinity for neurons in depolarized and repolarized states compared to the resting state. Neurons that undergo depolarization more frequently are more susceptible to local anesthesia. Smaller nerve fibers also exhibit greater sensitivity to local anesthesia. Consequently, autonomic nerve fibers are more sensitive to local anesthesia, followed by sensory and motor nerve fibers. Patients undergoing spinal anesthesia will experience motor recovery first, followed by sensory recovery, and finally, autonomic function (Becker et al., 2012).

Prilocaine

Prilocaine is an amide group local anesthetic with characteristics that include intermediate potency, rapid onset of action, and a relatively quick duration. Unlike lidocaine, which is a tertiary amine, prilocaine is a secondary amine. This distinction gives prilocaine the best clearance among all amide group local anesthetics, with prilocaine having a clearance rate twice as good as lidocaine. Prilocaine also has a large volume of distribution, which results in lower plasma levels of prilocaine compared to lidocaine or mepivacaine after regional anesthesia, reducing the likelihood of prilocaine reaching toxic levels (Manassero and Fanelli, 2017)

Lidocaine

Lidocaine is the most commonly used amide group local anesthetic. The potential for neurotoxicity with lidocaine is frequently reported, especially when administered epidurally and spinally. TNS (Transient Neurological

Symptoms) is one of the commonly reported neurotoxic effects of lidocaine (Bahar and Yoon, 2021).

Urological Surgery

Urological procedures are commonly encountered in the practice of anesthesia. Patients undergoing genitourinary procedures typically span a wide age range, from the very young to the elderly, often with comorbid conditions, especially renal disorders (Jaffe, Schmiesing and Golianu, 2009). Urological surgeries can include diagnostic procedures such as cystoscopy, ureteroscopy, nephroscopy, biopsies, renal pyelography, as well as therapeutic procedures like transurethral resection of the prostate, transurethral resection of the bladder, fulguration, and the placement of a double-J stent to address ureteral obstructions.

Most patients prefer to be asleep during the procedure. Anesthesia with a laryngeal mask airway (LMA) can be an option because cystoscopy, in general, is of short duration. Oxygen saturation should be closely monitored, especially in obese patients or elderly patients with limited pulmonary reserve (Butterworth et al., 2013).

Both epidural and spinal anesthesia provide effective anesthesia for cystoscopy. However, most anesthesia experts opt for spinal anesthesia when choosing regional anesthesia. This is because spinal anesthesia is quicker (5 minutes) compared to epidural anesthesia, which takes 15-20 minutes to achieve nerve blockade. Sensory blockade at the level of Th 10 is usually sufficient for patient and operator comfort during cystoscopy (Butterworth et al., 2013).

RESEARCH METHODS

This research design is an experimental study randomized controlled clinical trial single blind where this study aims to analyze the comparison of effectiveness and side effects of spinal anesthesia with hyperbaric prilocaine 2% compared to hyperbaric lidocaine 5% as a standard drug at Dr Soetomo Hospital. This study was conducted at the Integrated Surgical Center of Dr. Soetomo Hospital in Surabaya from June 2023 to September 2023, following ethical approval granted by the Dr. Soetomo Hospital Ethics Committee with the reference number 0706/KEPK/VII/2023.

The study population consists of patients undergoing elective urological surgery with spinal anesthesia. If they meet the inclusion and exclusion criteria, they will be selected as samples. Samples are collected using consecutive sampling and are then randomly divided into two groups: Group A, which receives 5% hyperbaric lidocaine, and Group B, which receives 2% hyperbaric prilocaine.

The sample size for the study was calculated using the formula provided by the Sample Size Calculator (clincalc.com). For a research design comparing the effects of therapy on two groups with the variable being investigated in the form of means or averages, the following formula was used:

$$k = \frac{n2}{n1} = 1$$

$$n1 = \frac{(\sigma 1^2 + \sigma 2^2/k)\left({}^{z_{1-\alpha}}/_{2} + z_{1-\beta}\right)^2}{\Delta^2}$$

$$n1 = \frac{(46^2 + 46^2/1)(1.96 + 0.84)^2}{44^2}$$

$n1 = 17$ and $n2 = k * n1 = 17$

Where:

$\Delta = |\mu 2 - \mu 1| =$ difference between the two means

$\sigma 1, \sigma 2$ = variation between the mean of group 1 and group 2

$n1 =$ sample size for group 1

$n2 =$ sample size for group 2

$\alpha =$ probability of type 1 error (0.05)

$\beta =$ probability of type 2 error occurrence (0.2)

$z =$ the critical Z value based on the power of α or β

k = the ratio of the sample size of group 2 and group 1

Using a significance level of 95% (α = 0.05) and a power level of 80% (β = 0.20), with the observed outcome being the difference in motor recovery time between the lidocaine group (153) and the prilocaine group (197) with a difference of Δ = |μ2-μ1| = (197-153) = 44 (based on G. ØSTGAARD, et al., 2000), the estimated minimum sample size required for each group is 17 patients. Assuming a 15% dropout rate, the minimum required sample size becomes 19.55, rounded up to 20 patients for each group.

Inclusion and Exclusion Criteria

The study's inclusion criteria encompass individuals aged between 18 and 65, categorized as ASA PS 1-2, denoting American Society of Anesthesiologists Physical Status classification. It requires cooperative patients undergoing elective urological procedures with short durations, such as double-J stent placement, cystoscopy, BPH, and nephroscopy. Additionally, candidates should lack a medical history involving cerebrovascular and cardiovascular ailments, heart valve irregularities, spinal anomalies, blood clotting issues, and diabetes mellitus. An essential component involves patients' willingness to provide informed consent for their participation in the research.

The exclusion criteria for this study involve several factors. Firstly, patients who have contraindications for spinal anesthesia, such as those with infections at the insertion site, spinal abnormalities, or blood clotting disorders, are excluded from participation. Additionally,

individuals with a Body Mass Index (BMI) exceeding 40 are not considered eligible. Patients with a medical history of blood disorders, including G6PD deficiency, sickle cell anemia, or congenital methemoglobinemia, are also excluded from the study. Finally, individuals with a documented history of allergies to local anesthetics (specifically lidocaine and prilocaine) and drug solvents are not included in the research, ensuring a specific and well-defined patient population for the study. Meanwhile, the dropout criteria for this research involve instances where participants choose to voluntarily withdraw from their participation in the study.

In this research, various variables are considered to examine the effects of different local anesthetics. The independent variable is the type of local anesthetic (prilocaine and lidocaine). On the other hand, there are several dependent variables that are assessed, including the onset time of motor block, the level of sensory block achieved, changes in blood pressure (both systolic, diastolic, and mean arterial pressure), alterations in heart rate, and the incidence of side effects such as hypotension, bradycardia, Intraoperative Nausea and Vomiting (IONV), shivering, and Transient Neurological Symptoms (TNS). Additionally, the time required for motor block recovery is also examined as a dependent variable.

Randomization and Blinding Method

The research subjects were divided into two groups: Group A, receiving 5% hyperbaric lidocaine spinal anesthesia, and Group B, receiving 2% hyperbaric prilocaine spinal anesthesia. The allocation of groups was performed by the researcher without the subjects' knowledge. This was done by selecting 40 pieces of paper placed inside a closed container. These pieces of paper consisted of 20 labeled as A and 20 labeled as B. The treatment for each subject was determined after the subject's agreement to participate in the study.

This research followed a single-blind design, meaning the research subjects were unaware of whether they belonged to Group A, receiving spinal anesthesia with 5% hyperbaric lidocaine, or Group B, receiving spinal anesthesia with 2% hyperbaric prilocaine. The researcher was privy to the treatment assigned to each subject.

Data Processing and Analysis

Data were collected through data collection forms, and the gathered data were processed using computer software (SPSS 26). To assess the normality of the data distribution, the Shapiro-Wilk test was applied. If the data was found to be normally distributed, parametric statistical tests such as the independent t-test were used for parametric data, while Chi-square tests were performed for categorical data. In cases where the Chi-square test assumptions were not met, the Fisher test was utilized.

Specifically, the data on onset time of motor block, changes in systolic blood pressure, changes in diastolic blood pressure, changes in Mean Arterial Pressure (MAP), and changes in heart rate were subjected to independent t-tests. The level of sensory block and motor block recovery time were assessed using the Mann-Whitney U test. Incidences of side effects like hypotension, shivering, and Intraoperative Nausea and Vomiting (IONV) were examined with the Chi-square test. The occurrences of bradycardia, IONV, and Transient Neurological Symptoms (TNS) were analyzed using the Fisher test.

RESULTS

Subject Characteristics

Demographic Characteristics of Research Subjects

The demographic characteristics in this study are based on age, body weight (BW), height (Ht), Body Mass Index (BMI), gender, ASA PS classification, type of surgery, and comorbidities. Homogeneity tests were conducted on each variable in both groups, and statistical tests showed that all demographic characteristic variables had p-values > 0.05, indicating homogeneity between the two groups.

Table (1) Demographic Characteristics

racteristics		**Group**		**Total**	**p Value**
		Hyperbaric Prilocaine 2% (n = 20)	**Hyperbaric Lidocaine 5% (n = 20)**		
Age (years) (Mean ± SD)		44.05 ± 10.18	50.65 ± 10.80	47.35 ± 13.5	0.054[a]
Body weight (kg) ± SD)		57.85 ± 15.29	54.25 ± 9.74	56.05 ± 12.79	0.381[a]
Height (cm) Median (Min – Max)		156.5 (147 – 168)	155 (148 – 165)	156.05 ± 6.62	0.375[b]
BMI (kg/m^2) (Mean ± SD)		23.38 ± 6.32	22.57 ± 3.61	22.97 ± 5.10	0.625[a]
Gender	Woman	12 (70%)	16 (80%)	28 (70%)	0.168[c]
	Man	8 (30%)	4 (20%)	12 (30%)	
ASA	1	2 (10%)	2 (10%)	4 (10%)	0.698[c]

	2	18 (90%)	18 (90%)	16 (90%)	
Type of Surgery	Cystoscopy	3 (15%)	5 (25%)	8 (20%)	0.166[b]
	DJ stent	9 (45%)	10 (50%)	19 (47,5%)	
	Urethroscopy	3 (15%)	4 (20%)	7 (17,5%)	
	TURP	1 (5%)	1 (5%)	2 (5%)	
	Other	4 (20%)	0 (0%)	4(10%)	
Comorbid	Hypertension	4	6		
	Malignancy	8	13		
	Renal Disorders	4	6		
	Anemia	6	3		
	Allergies	1	3		
	Hypoalbumin	3	5		

[a] t test
[b] Man Whitney - U test
[c] chi square test

The research subjects in this study had an average age of 47.35 years, with a notable difference in the average age between the prilocaine group at 44.05 ± 10.18 years and the lidocaine group at 50.65 ± 10.80 years. There is approximately a 6-year age difference, with subjects in the prilocaine group being younger, but statistically, there is no significant difference. Variables such as body weight (BW), height (Ht), Body Mass Index (BMI), gender, and ASA PS classification had p-values > 0.05, indicating that the demographic characteristics of both study groups were homogenous.

Characteristics of vital signs before induction
Both groups of research subjects underwent an examination of vital signs before spinal anesthesia was administered. These vital signs included systolic blood pressure, diastolic blood pressure, mean arterial pressure (MAP), pulse rate, and tympanic temperature, which were then recorded as the blood pressure before induction. Both groups received a crystalloid fluid loading of 10 ml/kg body weight within 10-20 minutes to prevent the possibility of hypovolemia before spinal anesthesia. Vital signs after the administration of crystalloid fluid were recorded as post-loading conditions.

The initial systolic blood pressure characteristics in the prilocaine group (130.5 ± 19.94 mmHg) were 12.3 mmHg lower than those in the lidocaine group (142.8 ± 20.89 mmHg), but this difference was not statistically significant (p 0.064). Similarly, diastolic blood pressure and MAP were lower in the prilocaine group compared to the lidocaine group, but these differences were not statistically significant. The pulse rate in the prilocaine group was higher than in the lidocaine group, but it was also not statistically significant. These characteristics were found to be the same in the post-loading vital signs conditions after the administration of 10 ml/kg body weight of crystalloid fluid.

Table (2) Characteristics of vital signs before induction and after crystalloid fluid administration

Subject Characteristics	**Group**		**p Value**
	Hyperbaric Prilocaine 2% (n = 20)	**Hyperbaric Lidocaine 5% (n = 20)**	
Systolic Blood Pressure (mmHg) (Mean ± SD)	130.5 ± 19.94	142.8 ± 20.89	0.064[a]
Diastolic Blood Pressure (mmHg) ± SD)	80.5 ± 11.74	83.5 ± 9.23	0.375[a]
MAP (mmHg) Median (Min - Max)	94.5 (80 – 130)	103.5 (85 – 123)	0.101[b]
Pulse Rate (per minute) (Mean ± SD)	95.4 ± 18.06	88.3 ± 13.83	0.168[a]
Temperature (°C) Median (Min - Max)	36.6 (36.3 – 36.9)	36.7 (36 - 36.8)	0.235[b]
Systolic Blood Pressure *post loading* (mmHg) Median (Min - Max)	133.6 ± 19.13	142.5 ± 17.27	0.076[b]
Diastolic Blood Pressure *post loading* (mmHg)	78.5 ± 10.98	83.1 ± 7.57	0.131[a]

(Mean ± SD)			
MAP post loading (mmHg) (Mean ± SD)	96.8 ± 12.60	103.0 ± 9.81	0.088[a]
Pulse Rate post loading (per minute) (Mean ± SD)	93.9 ± 16.83	87.9 ± 13.17	0.217[a]

[a] t test
[b] Mann-Whitney U test

Bivariate Statistical Analysis

1. Comparison of characteristics after spinal anesthesia in both groups

In this study, the research subjects decreased from 40 subjects to 38 subjects because two subjects experienced block failure, and therefore, variable analysis after spinal anesthesia was not conducted on these two subjects. The two samples that experienced block failure were still followed and recorded as incidents of side effects.

Table (3) Comparison of motor onset, anesthesia block height, hemodynamic changes, temperature changes and recovery time between spinal anesthesia of the two groups

Dependent Variable	Group		p Value
	Hyperbaric Prilocaine 2% (n = 19)	Hyperbaric Lidocaine 5% (n = 19)	
Motor Onset (seconds) (Mean ± SD)	143.68 ± 43.51	152.53 ± 31.07	0.429[a]
Sensory Block Height (Thoracic dermatome level) Median (Min - Max)	6 (5-10)	6 (5- 8)	0.976[b]
Δ Systolic Blood Pressure Change (mmHg) (Mean ± SD)	19.95 ± 8.631	29.21± 18.65	0.061[a]
Δ Diastolic Blood Pressure Change (mmHg) (Mean ± SD)	15.42 ± 8.591	16.47 ± 8.630	0.709[a]
Δ MAP (mmHg) (Mean ± SD)	13.53 ± 7.982	19.84 ± 9.668	**0.035[a]**
Δ Pulse Rate Change (per minute) (Mean ± SD)	18.84 ± 12.061	19.32 ± 12.932	0.908[a]
Δ Temperature (°C) Median (Min – Max)	0.1 (0.1 – 0.3)	0.1 (0.0 – 0.3)	0.380[b]
Duration of Surgery (minutes) Median (Min – Max)	60 (30 – 130)	50 (20 – 123)	0.364[b]
Recovery Time (minutes) Median (Min – Max)	130 (110 – 218)	120 (97 – 180)	0.135[b]

[a] independent t test
[b] Mann Whitney – U test

The prilocaine group has a faster motor onset time compared to the lidocaine group, but this difference is not statistically significant. The sensory block height in both groups has the same median, which is at the level of T6 dermatome. When tested using the Mann-Whitney U test, there was no statistically significant difference found.

The changes in systolic and diastolic blood pressure in both groups before and after spinal anesthesia are also lower in the prilocaine group compared to the lidocaine group, although this difference is not statistically significant. However, the average decrease in systolic blood pressure of up to 9.26 mmHg is clinically significant.

The change in mean arterial pressure (MAP) in the prilocaine group is also lower than in the lidocaine group, with a statistically significant difference of 6.31 mmHg when tested with an independent t-test. This indicates that the prilocaine group has a lower decrease in MAP compared to the lidocaine group.

The tympanic temperature difference data in both groups are not different, with the same median of 0.1, and there is no statistically significant difference. In this study, no subjects experienced hypothermia during the research procedure.

The duration of surgery data in the prilocaine group has a median of 60 minutes (ranging from 30 to 130 minutes), while the lidocaine group has a median of 50 minutes (ranging from 20 to 123 minutes). The duration of surgery in both groups is short and consistent with the working time of prilocaine and lidocaine.

The recovery time data, which is the time in minutes required from spinal anesthesia to achieving Bromage 0 (the ability to lift the legs without hindrance), is longer in the prilocaine group compared to the lidocaine group. There is a 10-minute longer recovery time in the prilocaine group, although it is not statistically significantly different.

2. Comparison of Side Effects Occurrence Between the Two Groups

Subjects who have undergone spinal anesthesia will be observed for possible side effects. Some common side effects that occur after spinal anesthesia include hypotension, bradycardia, shivering, PONV (postoperative nausea and vomiting), and TNS (transient neurologic symptoms). In this study, the occurrence of side effects between the two groups can be seen in Table 4.

Table (4) Comparison of side effects occurrence after spinal anesthesia between the two groups

	Hyperbaric Prilocaine 2% (n = 19)	**Hyperbaric Lidocaine 5% (n = 19)**	**p value**
Hypotension	3 (15.8%)	9 (47.4%)	**0.036[a]**
Bradycardia	1 (5.3%)	1 (5.3%)	0.757[b]
Shivering	9 (47.3%)	5 (26.3%)	0.179[a]
PONV (Postoperative Nausea and Vomiting)	3 (15.8%)	2 (10.5%)	0.50[b]
Transient Neurological Symptoms (TNS)	0 (0 %)	3 (15.8%)	0.115[b]

[a] = statistical test of comparison with chi square
[b] = statistical test of comparison with Fisher test

The incidence of hypotension is when systolic blood pressure drops after spinal anesthesia below 90 mmHg or drops as far as 30% of basal systolic blood pressure. In the prilocaine group, the incidence of hypotension was lower than in the lidocaine group and with statistical testing using the chi square test, the P value <0.05 was obtained, indicating that the incidence of side effects was lower in the prilocaine group than the lidocaine group.

The side effect of bradycardia between the two groups was the same - both occurred in 1 subject and because the test requirements with chi square were not met, the test was continued with the fisher test and the results showed no significant difference.

The incidence of side effects of shivering in this study occurred in 14 subjects (36.8%). The prilocaine group had a higher incidence of side effects than the lidocaine group, although statistically there was no significant difference between the two groups.

The incidence of IONV side effects occurred in 3 subjects in the prilocaine group while in the lidocaine group it was found in 2 subjects, statistically there was no significant difference in the incidence of IONV between the prilocaine group and the lidocaine group. No PONV events were found in both study groups.

Side effects of transient neurological symptoms (TNS) which is defined as pain in the gluteus region that radiates to the thigh area which is reversible after spinal anesthesia which is monitored for 7 days after spinal anesthesia. TNS was not found in the prilocaine group while in the lidocaine group there were 3 (15.8%) subjects who experienced TNS complaints. Statistical test with fisher test showed no significant difference between the two groups.

3. Comparison of Factors That Can Affect Hemodynamic Changes, Temperature Decrease, and Shivering Incidence

Administration of high-dose sedation can lead to

hypotension. Some research subjects who experience anxiety or discomfort when awake during the surgical procedure will be sedated with midazolam.

Table (5) Comparison of sedation administration in both groups

	Midazolam Sedation	Without Sedation	p Value
Hyperbaric pyridocaine 2%	9 (47.4%)	10 (53.7%)	0.087
Hyperbaric lidocaine 5%	4 (21.1%)	15 (78.9%)	

Statistical test using the chi-square test

There were 13 (34.2%) research subjects from both study groups who received sedation with midazolam, and it was more common in the prilocaine group compared to the lidocaine group, but there was no statistically significant difference as determined by the chi-square test.

Table (6) Comparison of sedation administration with the occurrence of hypotension

	Hypotension	No hypotension	p Value
Sedation	4 (10.5%)	9 (23.6%)	0.619
Without Sedation	8 (21%)	17(44.7%)	

Statistical test using chi-square

Table 6 shows that among the subjects who received sedation, 4 (10.5%) subjects experienced hypotension, while 9 (23.6%) did not. Among the subjects who were not given sedation, 8 (21%) subjects experienced hypotension, and 17 (44.7%) did not. The statistical test indicates that there is no difference in the occurrence of hypotension among all subjects, whether they received sedation or not, regardless of the local anesthetic used.

A significant factor affecting shivering in research subjects is room temperature and the temperature of irrigation fluid. Therefore, a comparison of the room temperature, irrigation fluid temperature, and tympanic temperature between the two study groups was conducted to eliminate the possibility of shivering due to factors other than the type of local anesthetic used.

Table (7) Comparison of irrigation fluid temperature, room temperature, and tympanic temperature between the two groups

	Mean ± SD	p Value
The temperature of the irrigation fluid for surgery with Hyperbaric 5% Lidocaine Spinal Anesthesia (SAB).	26.684 ± 0.853	0.528[a]
The temperature of the irrigation fluid for surgery with Hyperbaric 2% Prilocaine Spinal Anesthesia (SAB).	26.832 ± 0.536	
	Median (Minimum - Maximum)	p Value
The room temperature for surgery with Hyperbaric 5% Lidocaine Spinal Anesthesia (SAB).	21 (17.7 – 22.5)	0.558[b]
The room temperature for surgery with Hyperbaric 2% Prilocaine Spinal Anesthesia (SAB).	21.1 (17.7 – 24.2)	
	Median (Minimum - Maximum)	p Value
The tympanic temperature of patients undergoing Spinal Anesthesia with Hyperbaric 5% Lidocaine.	36.7 (36 – 36.9)	0.201[b]
The tympanic temperature of patients undergoing Spinal Anesthesia with Hyperbaric 2% Prilocaine.	36.6 (36.2 – 36.9)	

[a] = Comparison test with independent t-test

[b] = Comparison test with Mann-Whitney U test

In both groups, the room temperature, irrigation fluid temperature, and initial tympanic temperature of the patients showed no significant differences, both quantitatively and statistically.

Table (8) Time of shivering occurrence after spinal anesthesia in both groups

	Hyperbaric Prilocaine 2%	Hyperbaric Lidocaine 5%	p Value
Shivering	9 (47%)	5 (26%)	0.179[a]
Time of Shivering Occurrence (minutes)	25.6 ± 15.59	25.8 ± 16.64	0.988[b]

[a] = chi square test
[b] = t test

The occurrence of shivering as a side effect in the prilocaine group happened at an average of 25.6 ± 15.59 minutes, while in the lidocaine group, shivering occurred at an average of 25.8 ± 16.6 minutes. Statistical testing showed no significant difference in the time of shivering occurrence between the two groups.

4. Comparison between the occurrence of hypotension and IONV (Intraoperative Nausea and Vomiting)

In the study, there were 4 cases of hypotension accompanied by IONV, while there was only one case without hypotension that also experienced IONV. Statistical testing using the chi-square test resulted in a p-value of 0.027, indicating a significant difference between hypotension and non-hypotension in relation to the occurrence of IONV in all research subjects, regardless of the type of local anesthetic used.

Table (9) Comparison of hypotension and non-hypotension in the occurrence of IONV

	IONV	No IONV	p Value
Hypotension	4 (10.5%)	8 (21%)	0.027
No Hypotension	1 (2.6%)	25 (65.7%)	

Analysis of Subject Characteristics

A total of 40 patients who met the inclusion and exclusion criteria were observed in this study. The chosen surgical procedures included urological surgeries such as DJ stent placement, cystoscopy, ureteroscopy, TURP, and other procedures like renal pyelography, prostate biopsy, and fulguration. These surgeries are of short duration and can be performed under spinal anesthesia. In the study, the median duration of surgery was 60 minutes in the prilocaine group and 50 minutes in the lidocaine group. The duration of surgery is consistent with the use of prilocaine or lidocaine, which have intermediate working times.

From the general sample characteristics data, it was found that gender, age, body weight, height, Body Mass Index (BMI), PS ASA, and comorbidities between the two groups of subjects have a p-value > 0.05, indicating no statistically significant differences, thus considered homogeneous or equivalent.

The characteristics of age, body weight, and height in this study are similar to the research conducted by Martinez-Bourio et al. (1998). However, there is a difference in gender, as this study has a higher number of female subjects compared to the Martinez-Bourio et al. study. The higher number of female subjects in this study is due to the most common short-term operation being the placement of a DJ stent, which is often performed on female subjects with ovarian or cervical carcinoma to prevent ureteral obstruction caused by the pressure of gynecological tumor masses.

Comparison Analysis of Motor Block Onset

In this study, the mean and standard deviation of motor block onset in the prilocaine group were 143.68 ± 43.51 seconds, while in the lidocaine group, it was 152.53 ± 31.07 seconds. A statistical test was conducted using an independent t-test, which yielded a p-value of 0.429, indicating no significant difference between the two groups. This result differs from the study conducted by (Ibrahim et al., 2022), where they also found mean onset times of 3.10 (190 seconds) ± 0.36 minutes for the lidocaine group and 3.30 (210 seconds) ± 0.47 minutes for the prilocaine group. This difference could be attributed to the dosages used in the study by Ibrahim et al., where prilocaine and lidocaine were administered at doses of 40-50mg, while in this study, prilocaine was given at a dose of 60mg and lidocaine at a dose of 75mg. This is supported by the research conducted by (Karnina et al., 2022), where they demonstrated that higher doses of local anesthetics lead to a faster onset of motor block.

Comparison Analysis of Sensory Block Height

In this study, the median, minimum, and maximum values of sensory block height in the prilocaine group were found to be at VT 6 (range: 5 - 10), while in the lidocaine group, it was at VT 6 (range: 5 - 8). This shows that there is no median difference in sensory block height between the two groups. The sensory block height following spinal anesthesia with 60mg of prilocaine in the study conducted by Aguirre et al. (2015) indicated a median sensory height of T5 (range: 4-7). This study also differs from the research conducted by Camponovo et al. (2010), where a comparison of hyperbaric 2% prilocaine and plain 20% prilocaine showed a block height of T10 with a dose of 60mg prilocaine. The variation in sensory block height between this study and other studies can be explained by the research conducted by Huang & Chang (2021), which

stated that one of the factors affecting block height is gender. In female subjects, the block height can be higher than in male subjects. This study has a higher number of female subjects compared to the study conducted by Camponovo et al. (2010), which had more male subjects. Not only gender but also height, body weight, BMI, and the injection speed of a local anesthetic can influence the block height after spinal anesthesia.

The sensory block height in the lidocaine group receiving hyperbaric 5% 75mg lidocaine was found to have a median height of T6 (T5-T8), which differs from the study conducted by Østgaard et al. (2000), where the sensory block height was achieved at T10 with plain 80mg lidocaine. The difference between this study and Østgaard's study can be attributed to the different baricity of the drug and other factors such as the height of the subjects undergoing spinal anesthesia.

Despite the prilocaine dosage in this study being 60 mg with a local anesthetic volume of 3ml, while the lidocaine group received a dosage of 75mg with a volume of 1.5ml, there was no difference in sensory block height between the two groups.

Comparison Analysis of Blood Pressure and Heart Rate Changes

In this study, the changes in systolic blood pressure, diastolic blood pressure, and heart rate before spinal anesthesia and during intraoperative monitoring in the prilocaine group were not different from the lidocaine group. However, the changes in mean arterial pressure (MAP) before spinal anesthesia and after spinal anesthesia in the prilocaine group had a lower average compared to the lidocaine group.

Spinal anesthesia, in general, causes a decrease in systolic blood pressure due to the blockade effect on the preganglionic sympathetic nerves in the thoracolumbar segments. The changes in blood pressure depend significantly on the level of the nerve block. The spinal cord has three types of nerves: motor, sensory, and autonomic. Due to differences in size and myelin sheath, autonomic nerves, which are smaller, will be blocked first, followed by sensory and motor nerves. There is a difference in the level of nerve blockade, where typically autonomic nerves are blocked 2 segments higher than sensory nerves, and sensory nerves are blocked 2 segments higher than motor nerves (Butterworth et al., 2013).

The autonomic nerves in the thoracolumbar region are preganglionic sympathetic nerves. Therefore, spinal anesthesia results in the blockade of sympathetic nerves. This sympathetic nerve blockade leads to vasodilation of vascular blood vessels and causes hypotension. The blockade of sympathetic nerves can also lead to bradycardia when it reaches the cardiac accelerator located in segments T1-T4 (Ferré et al., 2020). In this study, two subjects who experienced bradycardia had a sensory block height as high as VT 5, indicating that the autonomic blockade had already reached VT 3. This explains that the occurrence of bradycardia is more influenced by the height of the spinal anesthesia block than the type of local anesthetic used.

Hypovolemia can exacerbate hypotension; therefore, in this study, patients were administered 10ml/kg body weight of fluid before spinal anesthesia. Changes in systolic blood pressure, diastolic blood pressure, mean arterial pressure (MAP), and heart rate occurred in both groups, but all of these changes were lower in the prilocaine group compared to the lidocaine group. Statistical analysis showed that only the change in MAP was significantly different between the two groups.

In both groups, each local anesthetic was supplemented with adrenaline at a concentration of 1:200,000. This was done to extend the duration of action and reduce the systemic absorption of the local anesthetic, which could lead to systemic toxic effects. A study conducted by Rahmah et al. (2020) showed no difference in blood pressure between patients undergoing spinal anesthesia with lidodex 5% with or without adrenaline. This study supports the idea that there is no hemodynamic effect when adrenaline is administered intrathecally as an adjuvant to local anesthesia.

The height of the block also influences how many segments of autonomic nerves are blocked. In this study, both the prilocaine and lidocaine groups had the same median sensory block height at T6, indicating that there was no difference in block height that could affect the hemodynamic changes between the two groups.

A study conducted by Reisli et al. (2003) showed that the use of 60mg prilocaine for spinal anesthesia and continuous epidural anesthesia did not result in significant hemodynamic changes in elderly patients undergoing urological surgery. This study supports the findings of the current study, where the prilocaine group had lower changes in systolic and diastolic blood pressure, MAP, and heart rate compared to the lidocaine group.

Analysis of Side Effects

During the research procedure, there were two subjects (one from the lidocaine group and one from the prilocaine group) who experienced incomplete spinal anesthesia. In both cases, after waiting for 15 minutes, there was no motor block, as indicated by a Bromage score of 3 (inability to move the lower extremities), and there was no sensory block. Anesthesia for both subjects was continued with general anesthesia using a laryngeal mask airway (LMA).

The occurrence of hypotensive side effects in this study was found to be less frequent in the prilocaine group compared to the lidocaine group. This aligns with the changes in systolic and diastolic blood pressure, as well as MAP, which were indeed less pronounced in the prilocaine group compared to the lidocaine group. Hypotension following spinal anesthesia occurs due to vascular vasodilation, leading to venous pooling that reduces preload. A study by Hartono Sinaga et al. (2022) showed that the pulsation index (PI) represents the vasodilation of blood vessels, and higher PI indicates greater vasodilation and a higher occurrence of hypotension. Local anesthetics have different vasodilatory effects, as demonstrated by a study conducted by (Lindorf, 1979), which showed that prilocaine has a lower vasodilatory effect compared to lidocaine in the vascular mouth area after local anesthetic infiltration. This may explain why the incidence of hypotension was lower in the prilocaine group compared to the lidocaine group. However, there is no study comparing the vasodilatory effects of spinal anesthesia with prilocaine versus lidocaine.

The administration of sedation in this study did not lead to hypotensive events, which is consistent with the findings of a study conducted by Permanasari & Saleh (2011). Their study showed that sedation with midazolam or dexmedetomidine did not affect hemodynamic changes, which is also applicable to this research conducted on gynecological surgery patients.

In both groups, bradycardia occurred in one subject each. Bradycardia events in both subjects occurred at a measured sensory block height of T5 with a pinprick test, and the autonomic block height occurred 2 levels above the sensory nerve segment or at the level of T3. This had an impact on the cardiac accelerator, leading to bradycardia with a heart rate below 45 beats per minute. This condition quickly improved with the administration of intravenous atropine sulfate at a dose of 0.5 mg.

The occurrence of shivering as a side effect was slightly higher in the prilocaine group compared to the lidocaine group, but this difference was not statistically significant. All subjects experiencing shivering were provided with additional warming blankets and given 50mg of intravenous pethidine to reduce shivering. If necessary, patients were sedated with midazolam to reduce oxygen demand. Shivering events in the prilocaine group occurred at an average of 25.6 minutes, while in the lidocaine group, they occurred at an average of 25.8 minutes. In this study, the occurrence of shivering is in line with the findings presented by Amsalu et al. (2022), which stated that a decrease in core body temperature mainly occurs 30 minutes after spinal anesthesia.

The autonomic nervous system maintains core body temperature between 36.5-37.5°C physiologically and responds to changes in external environmental temperatures. Anesthesia, especially regional anesthesia, leads to a decrease in core body temperature, primarily 30 minutes after spinal anesthesia. Shivering is defined as involuntary tremors due to muscle contractions and is a physiological response to raise core body temperature. However, shivering can have several consequences, including increased oxygen demand, increased CO2 production, triggering myocardial ischemia, increased pain, delayed wound healing, and interference with monitoring the patient's vital signs. The primary factors causing shivering are a cold operating room, the administration of non-warmed intravenous fluids, systemic pyrogen release, pain, and impaired vascular tone (Amsalu et al., 2022; Luggya et al., 2016).

The research conducted in this study showed a relatively high incidence of shivering, occurring in 14 (36%) of the subjects. This aligns with the findings by Luggya et al. (2016), which reported a prevalence of shivering of around 50-80% after spinal anesthesia. There were no differences in operating room temperature or irrigation fluid temperature between the two groups, indicating that room temperature and irrigation fluid temperature can be considered homogeneous in this study.

The tympanic temperature in both groups did not experience a significant decrease, and there was no difference between the two groups. None of the study subjects experienced hypothermia (<35°C), even though the room temperature and irrigation fluid temperature were not isothermic with body temperature. This differs from the research conducted by Tenggara & Rahardjo (2005), which showed a significant decrease in temperature after TURP surgery with irrigation fluid temperature lower than body temperature.

Shivering was more frequent in the prilocaine group compared to the lidocaine group, although there was no statistically significant difference between the two groups. A study conducted by Camponovo et al. (2010) showed that 2 out of 22 (9%) subjects receiving prilocaine experienced shivering, while 1 out of 22 (4.5%) subjects receiving lidocaine experienced shivering, with no statistically significant difference in that study either.

The intravenous administration of pethidine in cases of shivering can reduce the occurrence of shivering. Pethidine has an antishivering effect by activating μ-opioid receptors in the hypothalamus and K receptors in the spinal medulla. The activation of these receptors, especially the K receptors, raises the shivering threshold to twice its normal level (Parsa et al., 2007).

A study conducted by Nasution et al. (2022) showed a

relationship between the pulsation index (PI) in the group that experienced shivering (PI of 2.8) compared to the group that did not (PI of 5.2). A lower PI indicates vascular vasodilation, suggesting that vasodilation is associated with shivering in the study subjects.

In this study, there were 3 subjects (15.8%) in the prilocaine group who experienced intraoperative nausea and vomiting (IONV), and 2 subjects (10.5%) in the lidocaine group who experienced IONV. IONV is often associated with hypotension, as a sudden drop in blood pressure can lead to cerebral hypoperfusion, resulting in nausea and vomiting (Magni et al., 2016). The blockade of sympathetic nerves can also lead to an increase in parasympathetic nerves, which enhances gastrointestinal motility and can contribute to the occurrence of nausea and vomiting.

Both too low and too high block heights can lead to nausea and vomiting (Ashagrie et al., 2020), which, in this study, can be ruled out because the conditions of failed blocks were not included in the study, and the median sensory block height between the two groups was T6, which is sufficient for urological surgery.

There was a significant difference between the group that experienced hypotension and the group that did not regarding the occurrence of intraoperative nausea and vomiting (IONV). Therefore, it can be concluded that the occurrence of IONV is more dependent on hypotension events rather than the type of anesthetic drug.

Subjects who have undergone spinal anesthesia will be evaluated in the recovery room and then transferred to the post-operative care area. Subjects will be asked about complaints of transient neurological symptoms (TNS), which include discomfort or pain in the gluteal area radiating to the thigh and leg. Subject complaints will be followed up for up to 7 days post-surgery. If the patient has already been discharged from the hospital, follow-up will be conducted through telephone interviews. TNS occurred in 3 subjects (15.7%) who received lidocaine, while no subjects in the prilocaine group experienced TNS. Statistical analysis yielded a p-value of 0.231, indicating that there was no significant difference in the occurrence of TNS between the two groups.

The subjects who experienced transient neurological symptoms (TNS) all had symptoms occurring on the first day after anesthesia. Their complaints included discomfort and a feeling of thickness in the left buttock, with a pain scale of 2-3. The pain did not worsen with activity and did not improve with rest. These complaints improved on the following day. The subjects who experienced TNS included one 60-year-old male and two females aged 53 and 55. All of these subjects underwent lithotomy position surgery, received spinal anesthesia with a 26G needle, underwent a paramedian approach, and did not experience paresthesia during the spinal anesthesia procedure. The pain scale for patients with TNS in this study ranged from 2-3, which is different from the study conducted by Østgaard et al. (2000), which showed subjects with TNS had pain scales of up to 5-8. This difference could be due to the fact that in this study, all three patients received metamizole therapy at a dose of 1 gram every 8 hours for post-operative pain management. The administration of nonsteroidal anti-inflammatory drugs (NSAIDs) is one of the reversible management approaches for TNS (Zaric & Pace, 2009).

The incidence of transient neurological symptoms (TNS) in the lidocaine group was 15.7%, which is similar to the TNS incidence in the study conducted by (Østgaard et al., 2000), where TNS occurred in 7 out of 49 subjects (14.2%) following spinal anesthesia with lidocaine. In the prilocaine group, TNS occurred in 2 out of 50 subjects (4%), which is different from the current study where no subjects experienced TNS following spinal anesthesia with prilocaine.

Research conducted by Kishimoto et al. (2002) indicated that lidocaine has a higher neurotoxicity effect compared to other local anesthetics. Another study by Johnson (2000) stated that lidocaine has a neurotoxic effect when administered as both spinal and epidural anesthesia, with a higher risk when given epidurally.

Comparison of Motor Block Recovery Time

After the surgery is completed in the recovery room, consciousness will be evaluated until the motor blockade effect from spinal anesthesia disappears, as indicated by a Bromage score of 0 (motor block has disappeared, and the subject can move their legs freely). The time required from spinal anesthesia to Bromage 0 is recorded in minutes and is referred to as the motor block recovery time.

The recovery time in the prilocaine group was 130 (110 - 218) minutes, and in the lidocaine group, it was 120 (97 - 180) minutes. The prilocaine group took longer to achieve motor recovery with a median of 130, but statistical analysis using the Mann Whitney - U test yielded a p-value of 0.135, indicating that there is no significant difference in motor block recovery time between the two groups.

The motor recovery time in this study is faster compared to a previous study Østgaard et al. (2000). Østgaard et al. (2000) study showed motor recovery times of 153 minutes for lidocaine and 197 minutes for prilocaine groups. The difference in motor recovery time in this study compared to Østgaard's study is attributed to the fact that Østgaard used isobaric lidocaine and prilocaine, while this study used hyperbaric lidocaine and prilocaine. Research conducted by Helmi et al. (2014) indicates that isobaric local anesthetics have longer recovery times compared to

hyperbaric local anesthetics when used as a local anesthetic.

According to Manassero and Fanelli (2017), hyperbaric 2% prilocaine has a shorter recovery time, typically around 90 minutes. This is different from the findings in this study, where hyperbaric 2% prilocaine required 130 minutes for motor recovery to reach Bromage 0. This difference can be attributed to the addition of 1:200,000 adrenaline in this study. As is known, the addition of adrenaline to local anesthesia reduces systemic absorption and prolongs the duration of action of a local anesthetic.

Hyperbaric 5% lidocaine generally has a working time ranging from 60-90 minutes, but in this study, the motor recovery time for hyperbaric 5% lidocaine ranged around 120 minutes. This discrepancy could be due to the addition of adrenaline, which is known to extend the duration of action of the local anesthetic (Butterworth et al., 2013).

Limitations of the Study

This study is not without limitations. Firstly, the use of adrenaline as an adjuvant in this research may have affected the measured recovery time, making it not entirely reflective of the true recovery time for prilocaine or lidocaine. Secondly, the occurrence of shivering in this study was relatively high, which could be attributed to the use of non-isothermic irrigation fluids. Therefore, shivering incidents might not solely be attributed to the effects of the administered local anesthesia.

CONCLUSION

Based on the statistical results and research discussions, several conclusions can be drawn from this study:

1. The onset of motor block in spinal anesthesia with 2% hyperbaric prilocaine is not significantly different from 5% hyperbaric lidocaine.
2. The level of sensory block achieved in spinal anesthesia with 2% hyperbaric prilocaine is not significantly different from 5% hyperbaric lidocaine.
3. Changes in systolic blood pressure, diastolic blood pressure, and heart rate following spinal anesthesia with 2% hyperbaric prilocaine are not significantly different from 5% hyperbaric lidocaine. However, the change in Mean Arterial Pressure (MAP) in the 2% hyperbaric prilocaine group is lower than that in the 5% lidocaine group.
4. The incidence of hypotension as a side effect in spinal anesthesia with 2% hyperbaric prilocaine is lower than that in the 5% lidocaine group. However, other side effects such as bradycardia, Intraoperative Nausea and Vomiting (IONV), shivering, failed block, and Transient Neurological Symptoms (TNS) do not significantly differ between the two groups.
5. The time required for motor block recovery after spinal anesthesia with 2% prilocaine is not significantly different from 5% hyperbaric lidocaine.

In order to improve service, based on the research findings, the following recommendations are made:

1. This study used the addition of adrenaline as an adjuvant to reduce toxicity and extend the action duration of local anesthetics. It is recommended to conduct further research without the use of adrenaline as an adjuvant to understand the characteristics of the recovery time of local anesthesia without the influence of adrenaline.
2. The occurrence of shivering after spinal anesthesia is still high in both groups, which may be due to the use of irrigation fluid that is not warmed during the surgical procedure. It is recommended to use isothermic (37°C) irrigation fluid, warm blankets, and intravenous fluid warmers to reduce the occurrence of shivering during surgery.
3. The occurrence of Transient Neurological Symptoms (TNS) found in three subjects receiving lidocaine and none receiving prilocaine, while not statistically significant, could be attributed to the small sample size. The researcher suggests conducting multicenter research to gain a better understanding of TNS incidence.
4. The occurrence of Postoperative Urinary Retention (POUR) in this study could not be evaluated as all research subjects used postoperative urinary catheters. The researcher recommends conducting further research with study samples that can assess the return of urinary function.
5. 2% hyperbaric prilocaine, as a new drug in Indonesia, can be used as one of the local anesthetics for spinal anesthesia in short-duration surgeries. It exhibits characteristics similar to lidocaine but with lower changes in MAP and hypotension incidence compared to lidocaine.

AUTHORS' CONTRIBUTION

WK, BPS, EDO: Concept and design, data acquisition, interpretation, drafting, final approval, and agree to be accountable for all aspects of the work. AIR, HSP & ATI: Data acquisition, interpretation, drafting, final approval and agree to be accountable forall aspects of the work.

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