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Differences in the Incidence of Urinary Retention in Spinal Anesthesia Between Lidocaine 2% 60mg and Buvipacaine 0.5% 10 Mg in Postoperative Patients at RS PKU Muhammadiyah Gamping

Reinascita Nurcartenzia[1*], Yosy Budi Setiawan[2]
Muhammadiyah University of Yogyakarta, Indonesia
Email: reinascitanurcartenzia@gmail.com, dr.yosibudi@gmail.com

Abstract
The most common regional anesthesia procedure used in various operations, especially operations on the lower abdomen and lower extremities, is spinal anesthesia. Urinary retention is a urination disorder, where the flow of urine is weak, not flowing smoothly, and there is a feeling of something remaining and dissatisfaction when urinating, resulting in discomfort. Urinary retention is one of the common complications that occurs after spinal anesthesia. This study aims to determine the comparison of the incidence of urinary retention after spinal anesthesia with lidocaine 2% 60mg and bupivacaine 0.5% 10mg. the test results showed that the p-value = 0.500 (p>0.05), so H1 was rejected and H0 was accepted, which means there is no significant relationship between the incidence of urinary retention and the anesthetic drugs lidocaine or bupivacaine. There is no significant difference regarding the incidence of urinary retention during spinal anesthesia between lidocaine 2% 60 mg and bupivacaine 0.5% 10 mg in postoperative patients at PKU Muhammadiyah Gamping Hospital.
Keywords: Spinal anesthesia, Lidocaine, Bupivacaine, Urinary retention.

Introduction

Anesthesia is a medical process to relieve pain or pain during surgery and various other procedures that cause pain to the body, can be defined as the loss of taste or sensation (Ghafoor et al., 2023). Regional anesthesia which is most often used in various operations, especially operations on the lower abdomen and lower extremities, is spinal anesthesia (Lee et al., 2021). Many anesthesiologists and surgeons prefer spinal anesthesia over general anesthesia because of its rapid onset and lower incidence of complication (Breton et al., 2021). A study conducted in stated that the use of spinal anesthesia was the most widely used anesthesia procedure, which was around 51.9% (Ramos et al., 2021). Another survey conducted in Nigeria showed that about 92.9% of anesthesiologists used spinal anesthesia, only 15% used epidural anesthesia (Irowa et al., 2024)

Drug selection for spinal anesthesia can be influenced by several factors, especially the duration of action of the drug (Yu et al., 2021). Buvipacaine is one of the longest-acting drugs often used for anesthesia in hip and knee surgical procedures (Kinjo et al., 2024). The duration of motor inhibition time of this drug ranges from 2.5 to 3 hours and the side effect profile is favorable (Hakami, 2021). Alternatively, shorter duration anesthetics such as mepivacaine (approximately 1.5 to 2 hours) and lidocaine (approximately 1 to 1.5 hours) can speed up the recovery process, such as mobilization and postoperative urination, allowing patients to urinate earlier.

Urinary retention is one of the complications that often occurs after spinal anesthesia procedures, with incidence rates ranging from 50-70% based on research conducted by (Dana et al., 2023). According to Olsfaruger (1999) spinal anesthesia is significantly more at risk of causing urinary retention compared to other anesthetic techniques, the study showed that 44% of postoperative patients with spinal anesthesia had a bladder volume exceeding 500 ml. The results of a preliminary study at Santa Anna Kendari Hospital in December 2021 found that of 35 patients who received spinal anesthesia, 28 patients

experienced urinary retention (da Silva Coelho et al., 2021).

Urinary retention is a micturition disorder, such as weak urine output, not smooth, and a sense of remaining and dissatisfaction, can be accompanied by a feeling of wanting to strain or apply pressure to the suprapubic when micturition (Takahashi et al., 2021). Patients undergoing spinal anesthesia often have impaired perception of a full bladder and lose the ability to control the bladder (Kim et al., 2023). Spinal anesthesia can make patients unable to feel the need to micturate and possibly the bladder and sphincter muscles are also unable to respond to the urge to micturate (Schwengel et al., 2024). Patients who are still under anesthesia may only feel pressure in the bladder area, but patients who are awake will experience severe pain due to bladder distension that exceeds normal capacity (Hadi Shalan et al., 2024)

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يٰٓاَيُّهَا النَّاسُ قَدْ جَاۤءَتْكُمْ مَّوْعِظَةٌ مِّنْ رَّبِّكُمْ وَشِفَاۤءٌ لِّمَا فِى الصُّدُوْرِۙ وَهُدًى وَّرَحْمَةٌ لِّلْمُؤْمِنِيْنَ.

Meaning: "O people, verily there has come to you from your Lord mauizah (teaching and warning, i.e. the Qur'an), a cure for that which is in the breast, and guidance and mercy for the believers."

Based on this background, researchers are interested in examining the difference in the incidence of urinary retention in spinal anesthesia between lidocaine 2% 60mg and buvipacaine 0.5% 10mg in postoperative patients at PKU Muhammadiyah Gamping Hospital.

Research Methods

This study used an analytical observation design, using a cross sectional design method, which aims to determine the difference in the incidence of urinary retention with spinal anesthesia using lidocaine 2% 60mg and bupivacaine 0.5% 10mg in postoperative patients at PKU Muhammadiyah Gamping Hospital.

The target population in this study were all patients who would undergo mild to moderate surgery with spinal anesthesia using lidocaine 2% 60mg and bupivacaine 0.5% 10mg at PKU Muhammadiyah Gamping Hospital Yogyakarta. The sample selection in this study was all of the total population who met the criteria in the study. The sampling technique used was consecutive sampling, there were several criteria in this study.

The sample technique that will be used in this study is consecutive sampling. Consecutive sampling is a non-probability sampling technique that is very similar to probability sampling, which takes samples that meet certain criteria until a number of samples are obtained. The formula used to determine the sample is using the Lemeshow formula. The Lemeshow formula is used to determine the number of samples when the total population is not known with certainty. To calculate the number of samples in an unknown population condition, you can use the Lemeshow formula, as follows:

$$n = \frac{z^{2}_{1-\alpha/2}\ p(1-p)}{d^2}$$

Description:
n = Number of samples
z = Z score at 95% confidence = 1.98
P = Maximum estimated population 15% = 0.15 d = Error Rate
The sample calculation is :

$$n = \frac{1{,}98^2\ 0{,}15(1 - 0{,}15)}{0{,}1^2}$$

$$n = \frac{3{,}9204\ x\ 0{,}1275}{0{,}01}$$

$$n = 49{,}98 \approx 50$$

A sample size of 50 respondents was obtained, and there was a tolerance for error or trial and error of 10%. The technique for collecting samples in this study is consecutive sampling, because the target population taken has an age range of 16 to 75 years.

Data Analysis

This research is quantitative research, so the data analysis technique is the stage after the implementation of the research or after all the data has been collected. This data analysis technique uses statistical calculations. Several stages in performing data analysis techniques are Normality Test, Homogeneity Test, And T-Test.

Results and Discussion

Respondent Characteristics

The study on the Difference in the Incidence of Urinary Retention in Spinal Anesthesia between Lidocaine 2% 60mg and Buvipacaine 0.5% 10mg in Postoperative Patients at PKU Muhammadiyah Gamping Hospital, was conducted from September to December 2024 using primary data (observation) with a total of 50 samples consisting of 25 samples of patients with lidocaine spinal anesthesia drugs and 25 samples of patients with bupivacaine spinal anesthesia drugs collected by consecutive sampling method. The selection of research subjects was carried out looking at the inclusion and exclusion criteria set by the researcher. Characteristics of respondents in the form of a table below:

Table 1. Respondent Characteristics

Respondent Characteristics	Frequency (n)	Percentage (%)
Age (years)		
17-25	5	10
26-45	11	22
46-65	23	46
66 and above	11	22
Gender		
Female	17	34
Male	33	66
Dope		
Lidocaine	25	50
Bupivacaine	25	50
Operation Type		
General surgery	23	46
Orthopedic surgery	22	44

Based on table 1 based on the type of anesthetic, surgery patients with spinal anesthesia used lidocain as many as 25 respondents (50.0%) and bupivacaine 25 respondents (50%). The types of surgery performed were general surgery as many as 23 operations (46%) and orthopedic surgery as many as 22 operations (44%). The majority of research respondents were in the range of 46-65 years as many as 23 respondents (45%). Respondents with an age range of 26-45 years were 11 respondents (22%). Respondents with an age range of 66 years and over were 11 respondents (22%) and respondents with an age range of 17-25 years were 5 (10%). The research respondents were dominated by male gender

totaling 33 respondents (66%), and male gender totaling 17 respondents (34%).

Incidence of Postoperative Urinary Retention in Patients with Lidocaine 2% 60 Mg and Bupivacaine 0.5% 10Mg.

The results of the study of the incidence of postoperative urinary retention in patients with lidocaine 2% 60mg and bupivacaine 0.5% 10mg anesthetic drugs at PKU Muhammadiyah Yogyakarta Hospital that have been carried out are described as follows:

Table 2. Frequency distribution of POUR based on drugs (N=50).

	POUR Events				Number of Respondents	
	No Urinary Retention		Urinary Retention			
Type of medicine	n	%	n	%	n	%
Bupivacaine	23	92	2	8	25	50
Lidocaine	21	84	4	16	25	50
Total	44	90,3	6	9,7	50	100

Based on table 2 from a total of 50 respondents, the majority of 44 respondents (90.3%) did not experience urinary retention, while only 6 respondents (9.7%) experienced urinary retention. Bupivacaine users showed that 23 respondents (92%) did not experience urinary retention, while 2 respondents 8%) experienced urinary retention. Whereas in lidocain users, 21 respondents (84%) did not experience urinary retention, and 4 respondents (16%) experienced urinary retention. Overall, the distribution of respondents for each drug group was 25 respondents (50%) for bupivacaine and 25 respondents (50%) for lidocaine.

Frequency Distribution of Postoperative Urinary Retention with Lidocaine 2% 60mg and Bupivacaine 0.5% 10mg by Age.

The results of the study of the incidence of postoperative urinary retention in patients with lidocaine 2% 60mg and bupivacaine 0.5% 10mg anesthetic drugs at PKU Muhammadiyah Yogyakarta Hospital seen from the distribution of age that has been carried out are described as follows:

Table 3. Frequency Distribution of *Lidocaine* POUR - Age (N=25).

Type of medicine		POUR Events				Number of Respondents	
		No Urinary Retention		Urinary Retention			
	Age	**n**	**%**	**n**	**%**	**n**	**%**
Lidocaine	17-25	1	100	0	0	1	4
	26-45	7	100	0	0	7	28
	46-65	10	83.3	2	16.7	12	48
	66 and above	3	60	2	40	5	20
Total		21	84	4	16	25	100

Table 3 shows the distribution of POUR in patients using lidocaine based on age. A total of 25 respondents, 21 respondents (84%) did not experience urinary retention, while 4 respondents (16%) experienced urinary retention. Based on age grouping, in the age group 17-25 years, all respondents, namely 1 respondent (100%) did not experience urinary retention. The same thing also happened in the age group 26-45 years, where all respondents, namely 7 respondents (100%) did not experience urinary retention. In the 46-65 years age group, 10 respondents (83.3%) did not experience urinary retention, while 2 respondents (16.7%) experienced urinary retention.

For the age group of 66 years and above, 3 respondents (60%) did not experience urinary retention, while 2 respondents (40%) experienced urinary retention.

Table 4. Frequency Distribution of *Bupivacaine* POUR - Age (N=25).

Type of medicine	POUR Events				Number of Respondents	
	No Urinary Retention		Urinary Retention			
	Age	n	%	n	%	n	%
Bupivacaine	17-25	10	83.3	2	16.7	12	48
	26-45	6	100	0	0	6	24
	46-65	7	100	0	0	7	28
	66 and above	0	100	0	0	0	
Total		23	92	2	8	25	100

Table 4 shows the distribution of POUR in patients who were given bupivacaine based on age. In the age group of 17-25 years, there were 12 respondents, where 10 respondents (83.3%) did not experience urinary retention, while 2 respondents (16.7%) experienced urinary retention. In the age group of 26-45 years, all respondents did not experience urinary retention, as well as in the age group of 66 years and above. Overall, out of a total of 25 respondents, 23 respondents (93%) did not experience urinary retention, while 2 respondents (8%) experienced urinary retention.

Frequency Distribution of Postoperative Urinary Retention with Lidocaine 2% 60mg and Bupivacaine 0.5% 10mg by Gender.

The results of the study of the incidence of postoperative urinary retention in patients with lidocaine 2% 60mg and bupivacaine 0.5% 10mg anesthetic drugs at PKU Muhammadiyah Yogyakarta Hospital seen from the gender that has been carried out are described as follows:

Table 5. Frequency Distribution of Postoperative Urinary Retention with *Lidocaine* by Gender (N=25).

Type of medicine	POUR Events					Number of Respondents	
	No Urinary Retention			Urinary Retention			
	Gender	n	%	n	%	n	%
Lidocaine	Male	17	89.5	1	5.3	18	72
	Female	14	57.1	3	42.9	7	26.9
Total		21	84	4	16	25	100

The table above shows data on the incidence of POUR in respondents who were given lidocaine, with details based on gender. The total number of respondents with male gender was 21 respondents, of which 17 respondents (89.5%) did not experience urinary retention, while 1 respondent (5.3%) experienced urinary retention. While in female respondents with a total of 18 respondents, 14 respondents (57.1) did not experience urinary retention, and 3 respondents (42.9%) experienced urinary retention. Overall, out of 25 respondents who received lidocaine, 21 respondents (84%) did not experience urinary retention, while 4 respondents (16%) experienced urinary retention.

Table 6. Frequency Distribution of Postoperative Urinary Retention with *Bupivacaine* by Gender (N=25).

Type of medicine		POUR Events				Number of Respondents	
		No Urinary Retention		Urinary Retention			
	Gender	n	%	n	%	n	%
Bupivacaine	Male	10	83.3	2	16.7	12	48
	Female	13	100	0	0	13	52
Total		23	92	2	8	25	100

The table above shows data on the incidence of POUR in respondents with bupivacaine, based on gender. Based on 23 male respondents, 10 respondents (83.3%) did not experience urinary retention, while 2 respondents (16.7%) experienced urinary retention. Overall, out of 25 respondents who received bupivacaine, 23 respondents (92%) did not experience urinary retention, while 2 respondents (8%) experienced urinary retention.

Frequency Distribution of Postoperative Urinary Retention with Lidocaine 2% 60mg and Bupivacaine 0.5% 10mg Based on BMI.

The results of the study of the incidence of postoperative urinary retention in patients with lidocaine 2% 60mg and bupivacaine 0.5% 10mg anesthesia at PKU Muhammadiyah Yogyakarta Hospital based on BMI that has been carried out are described as follows:

Table 7. Frequency distribution of postoperative urinary retention with lidocaine based on BMI (N=25).

Type of medicine		POUR Events				Number of Respondents	
		No Urinary Retention		Urinary Retention			
	BMI	n	%	n	%	n	%
Lidocaine	Under weight	0	0	0	0	0	0
	Normal	15	83.33	3	16.67	18	69.2
	Over weight	6	85.71	1	14.26	7	26.92
	OB I	1	100	0	0	1	3.85
	OB II	0	0	0	0	0	0
	OB III	0	0	0	0	0	0
Total		22	92	4	8	25	100

The table illustrates the distribution of POUR events in patients receiving lidocaine, based on Body mass index (BMI) categories. In the underweight category, there were no cases of urinary retention or non-retention of urine (0%). In the normal weight category with a total 18 respondents, 15 respondents (83.33%) did not experience urinary retention, while 3 respondents (16.67%) experienced urinary retention. Whereas in the overweight category with a total of 7 respondents, 6 respondents (85.71%) did not experience urinary retention, while 1 respondent (14.26%) experienced urinary retention. In the OB I category, there was 1 respondent (100%) who did not experience urinary retention, with no cases of urinary retention. Meanwhile, in the OB II and III categories, there were no respondents who experienced or did not experience urinary retention (0%).

Table 8. Frequency distribution of postoperative urinary retention with bupivacaine based on BMI (N=25).

Type of medicine	POUR Events				Number of Respondents	
	No Urinary Retention		Urinary Retention			
	BMI	%	n	%	n	%
Bupivacaine	Under weight	0	0	0	0	0	0
	Normal	15	88.24	2	11.76	17	68
	Over weight	6	100	0	0	6	24
	OB I	2	100	0	0	2	8
	OB II	0	0	0	0	0	0
	OB III	1	100	0	0	1	4
Total		24	92	2	8	25	100

The table presents the distribution of Postoperative Urinary Retention (POUR) based on Body Mass Index (BMI) in patients who received spinal anesthesia using Bupivacaine. Of the total 25 respondents, 24 respondents (92%) did not experience urinary retention, while only 2 respondents (8%) experienced urinary retention. Based on BMI category, in the Normal group, there were 17 respondents (68%), with 15 respondents (88.24%) not experiencing urinary retention and 2 respondents (11.76%) experiencing urinary retention. In the underweight, overweight, OB I, OB II, and OB III groups, each respondent did not experience urinary retention, showing a percentage of 100% no incidence of urinary retention in these categories. This data suggests that the incidence of urinary retention is more common in the normal BMI group compared to the other groups, although the overall incidence of urinary retention is low.

Comparison of the Incidence of Urinary Retention in Postoperative Patients with Lidocaine and Bupivacaine.

The following is a data normality test analysis to determine the distribution as follows:

Table 9. Shapiro-Wilk Test Results

Tests of Normality				
		Shapiro-Wilk		
	DRUGS	Statistic	df	Sig.
retention_urine	lidocaine	.445	25	.000
	bupivacaine	.493	25	.000

Table 9 shows the data normality test analysis, resulting in a p-value of <0.05 indicating that the data distribution is not normal, so the analysis continued with the Chi-Square test.

The following is a Chi-Square test analysis of the data to determine the distribution of the data as follows:

Table 10. Chi-Square Test Results

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.136[a]	1	.713		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.136	1	.713		
Fisher's Exact Test				1.000	.500
Linear-by-Linear Association	.133	1	.716		
N of Valid Cases	50				

*2 cells (50.0%) have expected count less than 5. The minimum expected count is 4.50

Based on data analysis, 2 cells (50%) have an expected count < 5, which means that in the contingency table analysis results, there are 2 cells that have an expected count frequency value of less than 5, so the Fisher's Exact Test is used and the results obtained p-value = 0.500 (p>0.05), so $H_{(1)}$ is rejected and H_0 is accepted, which means that there is no significant relationship between the incidence of urinary retention with lidocaine or bupivacaine anesthetic drugs.

Discussion

Comparison of incidence of urinary retention in administered drugs

The study showed that there was no significant difference between the incidence of urinary retention with lidocaine and buvipacaine spinal anesthesia drugs based on Chi-Square analysis with a p value <0.05, which can be concluded that the results are not meaningful.

The results of this study are different from the research of Slaven et al (2022) which states that there are significant differences in the use of different drugs. The study stated that Bupivacaine more significantly increased the incidence of postoperative urinary retention compared to lidocaine and mevipacaine.

Differences can occur due to several factors such as differences in the concentration of drugs used. The study by Slaven et al (2022) used bupivacaine with a concentration of 0.75% while this study used buvipacaine with a concentration of 0.5%. This difference in concentration may affect the pharmacological effects, including the duration of anesthesia and the possibility of urinary retention. Higher drug concentrations have a stronger effect on bladder muscle relaxation, thus increasing the incidence of urinary retention, compared to the lower concentration of 0.5% used in this study.

Bupivacaine has a longer-acting and stronger effect than lidocaine, causing more significant muscle relaxation, including the muscles of the bladder (Jankovic, 2022). Some studies have shown that the use of higher concentrations of bupivacaine can increase the relaxation of the dereceptor muscles and external sphincter, and increase the risk of urinary retention (Suzuki S et al., 2019). In contrast, bupivacaine with a concentration of 0.5% in this study produced a shorter and weaker effect, which may explain why the incidence of urinary retention did not show a significant difference compared with lidocaine, which has a shorter drug duration.

In addition, there are differences in the duration of observation and monitoring of patients, in a study conducted by Slaven et al (2022) only monitored the incidence of urinary retention for 6 hours postoperatively, while this study conducted monitoring for up to 8 hours.

The longer duration of observation in this study allows detection of urinary retention events that may occur after 6 hours, so that it can provide more comprehensive results. This suggests that observation time has an influence in identifying urinary retention events that appear at a later postoperative phase.

Differences in the characteristics of the population studied may influence the results of the study. Several factors such as gender, age, nutritional condition of the patient, history of diseases such as diabetes mellitus, and functional status of the patient's bladder can modify the response to spinal anesthesia and increase the susceptibility to urinary retention (Y. Chang et al., 2021). Therefore, differences in research results may occur.

Research difficulties and shortcomings

This study faced several challenges and limitations that need to be considered. Among them, the number of patients undergoing mild-moderate surgery with spinal anesthesia is uncertain and relatively limited. This is due to variations in the types of surgeries that exist, which affect the anesthesia techniques used. So that researchers find it difficult to estimate the vulnerability of sampling time which causes the study to be conducted consecutively.

Conclusion

The results of the study on the difference in the incidence of urinary retention in spinal anesthesia between lidocaine 2% 60 mg and bupivacaine 0.5% 10 mg in postoperative patients at PKU Muhammadiyah Gamping Hospital showed no significant difference, as the p-value = 0.500. This indicates that the p-value > 0.05, leading to the rejection of H1 and acceptance of H0. The findings suggest that there is no significant difference in the incidence of urinary retention between the two anesthetic agents, lidocaine 2% and bupivacaine 0.5%, in the postoperative setting. This implies that both drugs may have similar effects in terms of urinary retention, which is an important consideration for anesthesiologists when choosing an anesthetic for spinal procedures. These results may inform clinical practices, providing evidence that either lidocaine or bupivacaine could be used without significantly affecting the incidence of urinary retention in patients post-surgery. Future research could investigate additional factors that may influence the incidence of urinary retention, such as the patient's age, gender, or underlying health conditions, to provide a more comprehensive understanding of the issue. Researchers may also consider conducting studies with larger sample sizes or different dosages of the anesthetic agents to explore whether variations in these factors could produce significant differences. Furthermore, examining the impact of other postoperative care factors, such as hydration levels or bladder management strategies, could help provide more insights into the prevention and management of urinary retention.

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