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Head-up Position did not Correlated with the Recovery Time of Lower Extremity Motor Function in Spinal Anesthesia Patiens

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Abstract

Patients who are delayed in recovery after spinal anesthesia will be transferred to the post anesthesia care unit (PACU) which can lead to increased service costs and patient dissatisfaction. Lower extremity motor function recovery time after spinal anesthesia is the time it takes for patients to be able to move from the recovery room to the patient's original room. The purpose of this study was to determine the correlation of Head-up position to the recovery time of lower extremity motor function in spinal anesthesia patients in the recovery room. The design of the study was correlation with a "cross-sectional" approach. The population was post-spinal anesthesia patients in the recovery room who meet the criteria. The study used "purposive sampling" with 96 post-spinal anesthesia patients. The independent variable was the head-up position, while the dependent variable was the recovery time of lower extremity motor function. The analysis test used the Pearson correlation test. The results of the correlation test showed no correlation between head-up position and recovery time of lower extremity motor function in spinal anesthesia patients with p-value = 0.099 (>0.05). This was due to the longer the duration of surgery, the faster the effect of spinal anesthesia drugs will run out. It is recommended to apply the results of this study as a review of SOPs related to the intervention of giving a head-up position to post-spinal anesthesia patients in the recovery room.

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INTRODUCTION

Two methods to reduce pain during surgical procedures are general and regional anesthesia (Rehatta et al., 2019). The use of spinal anesthesia in spine surgery with conscious patients, which can speed up postoperative recovery (Wilson et al., 2024) .The amount of time a patient spends in the recovery room depends on various factors, including the type of surgery, the length of the surgery, the method of anesthesia, and the level of complications (Fitria et al, 2019). The length of recovery of patients post spinal anesthesia is greatly influenced by the dose of drugs administered, where higher doses tend to slow down the recovery process due to longer-lasting anesthetic effects, while lower doses allow for faster recovery and reduce the risk of side effects (Mahan et al., 2019).

Patients with delayed recovery after spinal anesthesia or failing to achieve bromage score will be transferred to the post-anesthesia care unit (PACU). Length of stay in PACU may lead to increased service costs and patient dissatisfaction (Ego et al., 2022). One indicator of post-anesthesia motor response is bromage score. In the assessment, full limb movement scores 0; limb extension scores 1, and knee bending scores 2, and ankle flexion scores 3 (Finucane et al., 2017). Patients can be transferred to the recovery room when they reach a Bromage score of 2 (Fitria et al, 2019). After spinal anesthesia, patients can achieve a Bromage score of 2 within 60-90 minutes (Misal et al,2016). Research by Rismawati (2023) shows that the time to achieve a Bromage score ≤ 2 takes ≥ 2 hours as much as 50.8%. The length of time to achieve Bromage score ≥ 4 hours was 42.5% (Fitria et al, 2019).

Delayed recovery after spinal anesthesia is due to the lower position of the head and shoulders. This causes the anesthetic block to rise to the upper region and is not eliminated immediately (Fitria et al, 2019). The use of drugs for spinal anesthesia can pose a risk of toxicity to the heart and central nervous system, especially if the drug suddenly enters the bloodstream. Studies have shown that the drug has the potential to cause toxicity to the heart, characterized by the occurrence of cardiac fibrillation. The use of spinal anesthesia drugs requires very close supervision (Situmeang et al, 2022). The effects of delayed recovery from spinal anesthesia can cause several complications including hypotension, bradycardia, nausea and vomiting, headache, neurological disorders, and urinary retention (Dwiputra, 2023). Delayed recovery after spinal anesthesia may also increase the risk of urinary retention (Liu et al., 2024). The influence of post-spinal anesthesia position on sensory and motor blockade is due to gravitational flow. This is due to the flow of gravity, where a position higher than the head allows anesthetic drugs to move faster and be eliminated from the body (Kim et al., 2013). Early detection of motor weakness and prompt surgical intervention are necessary not only to improve the functional status and quality of life of patients, but also to increase their survival (Park et al., 2022).

The 30° Head-upposition after anesthesia can circulate breathing and provide comfort for the patient. This position aims to optimize oxygenation and help cerebral blood flow. An adequate supply of oxygenation can make patients feel comfortable and relaxed, reducing the patient's dizziness during post-surgery. In addition, this position can also increase patient awareness, thereby speeding up the postoperative recovery process (Eldiana et al., 2024).Anesthetic drugs will move caudally when Head-up after spinal anesthesia, decreasing anesthetic block (Rehatta et al, 2019). Oxygenation and vascularization processes return to normal if the anesthetic block does not rise to the upper region. This allows organs such as the kidneys, ureters, bladder, and urethra to function better (Zuliani et al., 2021). An optimally working urinary organ can accelerate the elimination process of anesthetic drugs to be more optimal (Haniya, 2022).

Postoperative position is not among the factors that affect post-anesthesia recovery. Although postoperative position does not directly affect recovery, other factors such as the patient's condition, the type of anesthesia used, and the duration of surgery can have a significant impact (Permatasari et al., 2017).The correlation of position to recovery from spinal anesthesia was not influenced by drug dose. Motor blockade in post-

spinal anesthesia patients tends to occur faster in those in the supination position than those in the Head-up position (Alsaeid & Sayed, 2019). Different body positions can cause changes in tissue perfusion. This should be considered in patient follow-up along with the perfusion index (Tapar et al., 2018).

Based on the above statement, the head-up position after spinal anesthesia is still not proven to affect the recovery of motor function, so research is needed regarding the correlation between the head-up position and the recovery time of lower extremity motor function in spinal anesthesia patients in the recovery room of RSUD dr. Soedono Madiun.

METHODS

This study was conducted at RSUD Dr. Soedono Madiun, East Java for 2 months. This design of the study used correlation with a "cross-sectional" approach and uses purposive sampling. The study was conducted to see if there was a correlation between 2 variables. The population in this study were post-spinal anesthesia patients in the recovery room of RSUD Dr. Soedono Madiun, approximately 1261 patients. The sample in this study was 96 respondents. The independent variable in this study was the head-up position. The dependent variable in this study was the recovery time of lower extremity motor function. The instruments used by researchers in carrying out this study were a degree ruler (goniometer) and recovery time (minutes). The researcher was filled the Bromage score observation sheet. The data from this study were processed with the Pearson correlation test. In this case, the normality test and homogeneity test have previously been carried out with normal and homogeneous results. Pearson's correlation test was conducted to see if there was a correlation between the Head-up position and the recovery time of lower extremity motor function. This study had been ethically approved by Komite Etik Penelitian RSUD dr. Soedono under the ethical clearance certificate number of 400.14.5.4/50343/102.9/21-12-2023.

RESULTS

The distribution of general data from the characteristics of respondents is described in the following:

Table 1. Frequency Distribution Based on Characteristics of Respondents at the RSUD Dr.Soedono in February-March 2024

Category			General Data	
			f	%
1	**Age**	17-25	14	14,6
		26-35	7	7,3
		36-45	75	78,1
2	**Gender**	Male	67	69,8
		Female	29	30,2
3	**Criteria ASA**	1	85	88,5
		2	11	11,5
4	**Operation Type**	Turb	12	12,5
		Turp	12	12,5
		Obgyn	8	8,3
		Acl	1	1,0
		Urology	11	11,5
		Orthopedics	52	54,2
5	**Body Mass Index**	18,0-21,0	17	17,7
		21,1-25,0	79	82,3

Source: *Primary Data*

Based on Table 1 demographic characteristics of respondents in the recovery room of RSUD Dr. Soedono in February-March 2024 based on age most (78.1%) were 36-45 years old, based on gender respondents more than half (69.8%) were male, based on ASA criteria most (88.5%) were ASA 1, based on the type of surgery more than half (54.2%) the type of surgery was orthopedic and based on B most (82.3%) had an IMT of 21.1-25.0.

Table 2. Distribution and correlation between Head-up position and recovery time of lower extremity motor function in respondents in the recovery room of RSUD Dr. Soedono in February-March 2024

Variable	Mean	Standard deviation	Min	Max	Sig. (2-tailed)	Pearson Correlation
Head-up position	17,79	5,843	5	30	0,099	-0,169
Lower extremity motor function recovery time	68,07	32,921	10	120		

Source: *Primary Data*

Based on Table 2 regarding the distribution of The frequency of head-up positions in respondents in the recovery room of Dr. Soedono Hospital in February-March 2024 the lowest head-up position was 5° and the highest was 30°, the mean value was 17.79 and the standard deviation was 5.843.

Regarding the distribution of The frequency of recovery time of lower extremity motor function in respondents in the recovery room at RSUD Dr. Soedono in February-March 2024, the fastest time for respondents to reach Bromage score 2 was within 10 minutes, the longest time for respondents to reach Bromage score 2 was within 120 minutes and a standard deviation of 32.921.

Bivariate analysis of head-up position on the recovery time of lower extremity motor function in spinal anesthesia patients in the recovery room of RSUD Dr. Soedono Madiun obtained a 2-tailed sig significance level of 0.099 (>0.05) which means there is no significant correlation between head-up position and lower extremity motor function recovery time in spinal anesthesia patients in the recovery room of RSUD dr. Soedono Madiun. The correlation value between head-up position and recovery time of lower extremity motor function in spinal anesthesia patients in the recovery room of RSUD Dr. Soedono Madiun is -.0169 (p<0.00) which means that the two variables have a very weak correlation or correlation level.

DISCUSSION

Based on Table 2, It was found that the frequency of head-up positions in respondents in the recovery room of Dr. Soedono Hospital in February-March 2024, the lowest head-up position was 5° and the highest was 30°, the most respondents were given Head-up position 20°, mean value 17.79, median value 19.00 and standard deviation 5.843. Giving the Head-up position is done when the patient arrives in the recovery room by raising the patient's bed to the desired tilt angle. Giving Head-up position after spinal anesthesia causes anesthetic drugs to move faster in the bloodstream and eventually be eliminated from the body more efficiently (Kim et al., 2013). The impact is that post-spinal anesthesia recovery becomes more effective due to the faster elimination process of anesthetic drugs. The head-up position reduces the risk of anesthetic spreading in unwanted directions. This can produce the desired degree of anesthetic blockade, as well as facilitate the elimination of anesthetic drugs from the body (Lee et al., 2015). Head-up positioning has no effect on the recovery of motor function in spinal anesthesia patients. This is due to the dose of drugs used, which

block sensory, motor, and bladder function. The greater the dose of drugs administered, the longer the recovery process of post-spinal anesthesia patients will take (Alsaeid & Sayed, 2019).

Based on table 2, shows the frequency of recovery time of lower extremity motor function in respondents in the recovery room of RSUD Dr. Soedono in February-March 2024 most respondents reached bromage score 2 within 120 minutes, the fastest time the respondent reached bromage score 2 within 10 minutes, the longest time the respondent reached bromage score 2 within 120 minutes the mean value was 66.19, the median value was 60.00 and the standard deviation was 31.644. The longest time to achieve Bromage score 2 was at the age of 40-45 years, male gender, ASA criteria 1, BMI 21.1-25.0, and type of orthopedic surgery. Motor movements are movements that involve certain parts of the body and are performed by small muscles, such as using fingers and toes (Pangestika & Setiyorini, 2015). The recovery time of the patient's motor function was calculated from the time the volatile was closed on the last suture of the skin until the patient reached Bromage score 2 (Sommeng, 2019).Bromage score is a method to evaluate the progression of leg movement after surgery under spinal anesthesia, usually achieved within 2-3 hours after the surgical procedure (Juniardi et al., 2022). Post-spinal anesthesia, patients often experience changes in their sensation and motor levels. In certain cases, they can reach a Bromage score of 2 within about 60 to 90 minutes after the surgical procedure (Misal et al, 2016).

The study showed that in the context of achieving a Bromage score ≤ 2 after spinal anesthesia, the data showed that most patients required a considerable amount of time to reach this level. A total of 50.8% of patients took at least 2 hours or more to achieve the bromage score (Rismawati, 2023). Another research shows that most patients need a long time to reach a certain level of Bromage score after spinal anesthesia. In the study, 42.5% of patients needed at least 4 hours or more to achieve the desired bromage score (Fitria, 2019).

Based on Table 2, shows that analysis of the correlation between the Head-up position and the recovery time of lower extremity motor function in spinal anesthesia patients in the recovery room of RSUD Dr. Soedono Madiun using the Pearson test showed that the p-value was 0.099 ($p>0.05$), which means that there is no significant correlation between the head-up position and the recovery time of lower extremity motor function in spinal anesthesia patients. The results of the correlation coefficient analysis on the two variables obtained the result -0.169 ($p<0.00$) which means that the two variables have a very weak correlation or correlation level.

Sitting and supine positions have similar effects on motor block onset and postoperative recovery in patients with spinal anesthesia (Samuel et al., 2025). The position of the patient after surgery does not affect recovery after anesthesia. This is because other factors such as the patient's health condition, type of anesthesia used, and duration of surgery can have a significant impact on patient recovery after spinal anesthesia (Permatasari (2017). The patient's condition, including his general health and medical history, plays a significant role in the recovery process. In addition, the type of anesthesia chosen also has a significant influence, with each type of anesthesia having different effects on the body. The duration of the surgery is also an important factor, as the longer the surgery lasts, the greater the stress placed on the patient's body and the longer the recovery time required.

Motor blockade in post-spinal anesthesia patients tends to occur faster in those in the supination position than those in the Head-up position. This difference is due to the dose of drug used, which blocks sensory, motor, and bladder function. The larger the dose of drugs administered, the longer the patient's recovery process after spinal anesthesia will take. Thus, monitoring the dose of drugs administered is very important in determining the success of the procedure and minimizing the impact of excessive motor blockade (Alsaeid & Sayed, 2019).

The influence of post-spinal anesthesia position on sensory and motor blockade is due to the flow of gravity. Head elevation position has an important role in post-spinal anesthesia recovery. Compared to the supine position without head elevation, head elevation can accelerate the recovery process. This is due to the flow of gravity, where the higher position of the head allows anesthetic drugs to move faster and be eliminated from the body. Thus, recovery after spinal anesthesia in the head elevation position can be more efficient because the elimination process of anesthetic drugs becomes faster (Kim et al., 2013).

Head elevation can decrease spinal anesthesia blockade. The provision of head-up positioning in patients undergoing spinal anesthesia has significant benefits in preventing the spread of anesthesia to the cephalic region within the subarachnoid space. Giving a head-up position that is higher than the body, gravity helps to reduce the risk of anesthetic spread in unwanted directions. This can produce the desired degree of anesthetic blockade, as well as facilitate the elimination of anesthetic drugs from the body. Thus, the head-up position not only helps optimize the anesthetic effect but also minimizes the risk of complications associated with the spread of the anesthetic beyond the targeted area. Overall, the understanding and application of the head-up position is an important strategy in the effective and safe management of spinal anesthesia (Lee et al., 2015).

The study has shown that postoperative head-up positioning under spinal anesthesia has no significant correlation with recovery time of lower limb motor function in patients. The head-up position has been considered to provide benefits in various aspects of postoperative recovery, such as reducing symptoms of nausea and vomiting, improving oxygen saturation, and increasing comfort. Giving a head-up position can increase venous blood return, which causes increased blood flow to the atria and ventricles (Muti, 2020) . This increased venous return affects the basal metabolic rate and also leads to increased metabolism and secretion of residual anesthetic agents. The increased metabolism and secretion of residual anesthetic agents lead to the return of hypothalamic function that was previously impaired due to anesthesia. The return of hypothalamic function causes CVC tissue perfusion to improve and stops the hyperexcretion of mucus and saliva, resulting in a decrease in PONV (Arif, 2022).

CONCLUSION

Based on the results of this study, it can be concluded that there is no significant correlation between head-up position and recovery time of lower extremity motor function in spinal anesthesia patients in the recovery room of RSUD Dr. Soedono Madiun.

SUGGESTION

It is recommended that RSUD Dr. Soedono Madiun apply the results of this study as a review of SOPs related to the intervention of giving a head-up position to post-spinal anesthesia patients in the recovery room. This is because not all post-spinal anesthesia patients in the recovery room are given a head-up position according to the SOP, which is 15-30°.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest. Other funders than the authors had no role in the data collection, data analysis, and also in the writing of the manuscript.

AUTHOR CONTRIBUTIONS

BSB, responsible in the research concept, research data tabulation, writing a draft manuscript and analysis. RH, wrote and revised the manuscript

with support from another author, team coordination. TA performed the statistical analysis and interpreted the data; AB verified the method and design of this study. All the authors agreed to the arrangement of authors in this study. All authors have read and approved the final version of the manuscript, we agreed to be accountable for all aspects of the world.

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