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The Effect of Sevofluran and Isoflurane Inhalation Anesthesia on Hemodynamic Changes in Operational Patients at Rsup Dr. M. Djamil Padang

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Abstract:- Inhalation anesthesia is an anesthetic technique that is often used during surgery. The main concern in anesthesia is patient safety and security, one of the factors is hemodynamic stability during anesthesia. The use of inhalation anesthetics can change the hemodynamic status of the patient. The most commonly used inhalation anesthetics are sevoflurane and isoflurane. This is the background of the authors to determine the effect of inhalation anesthetics sevoflurane and isoflurane on hemodynamic changes in surgical patients. The method used in this research is analytic observational using a cross sectional approach. Samples were taken by consecutive sampling technique, after the sample met the exclusion and inclusion criteria, the study sample consisted of 60 patients who were divided into 2 groups, 30 patients using sevoflurane inhalation anesthetic and 30 patients using isoflurane inhalation anaesthetic. The results were analyzed using the Annova and Kruskall Walis tests. Based on the results of data processing, it was found that the inhalation anesthetics of sevoflurane and isoflurane affected changes in systolic blood pressure 5 minutes, 15 minutes and 60 minutes after anesthesia. There was no effect of anesthetic sevoflurane and isoflurane on diastolic blood pressure 5 minutes after anesthesia and there was an effect at 15 minutes and 1 hour after anesthesia. There was no effect of sevoflurane and isoflurane anesthesia on the patient's heart rate 5 minutes and 15 minutes after anesthesia and there was an effect after 1 hour after anesthesia. There was no effect of anesthetic sevoflurane and isoflurane on oxygen saturation percentage at 5 minutes, 15 minutes and 1 hour after anesthesia.

Keywords:- *Inhalation Anesthesia; Sevoflurane; Isoflurane; Hemodynamics.*

I. INTRODUCTION

Anesthesiology is a branch of medical science that underlies various actions including anesthesia, care for patients undergoing surgery, provision of basic life support, intensive treatment of critically ill patients, inhalation therapy and chronic pain management. Anesthesiology service is a medical action which is a team collaboration led by an anesthesiology specialist with members participating in the anesthesiology education program and/or other doctors and anesthesia nurses.[1]

Not only pain is relieved by anesthesia but fear also needs to be removed to create optimal conditions for surgery. Optimal conditions include several components including loss of consciousness, muscle relaxation and inhibition of vegetative reflexes. For this reason, it is necessary to choose rational drugs and appropriate anesthetic techniques for patients [2]. One form of anesthesia is inhalation anesthesia, this anesthetic has the advantage of high potency and concentration that can be controlled via a machine with dose titration to produce the desired response [3].

Inhalation anesthetics are drugs in the form of volatile gases or liquids, which are administered through the patient's breath. The mixture of gas or anesthetic drug and oxygen enters following the inspired air flow, fills the entire lung cavity, then undergoes diffusion from the alveoli to the pulmonary capillaries according to the physical properties of each gas. The minimal concentration of anesthetic gas or vapor fraction in the alveoli that has already caused an analgesia effect is used as a unit of potency for inhalation anesthetics called Minimal Alveolar Concentration/MAC [2].

Some examples of inhalation anesthetics are sevoflurane, isoflurane, halothane and desflurane. Sevoflurane is a halogenated ether that has the fastest induction and maintenance process compared to existing inhalation anesthetics. Sevoflurane is relatively stable and does not cause arrhythmias during anesthesia. Vascular resistance and cardiac output decreased slightly so that blood pressure decreased slightly . Isoflurane is a halogenated ether that causes minimal cardiac depression. Cardiac output is maintained by increasing heart rate through partial maintenance of the carotid baroreflex. It can be said that the use of sevoflurane is more stable than the use of isoflurane [2].

The main concern in anesthesia is patient safety and security, one of the factors is hemodynamic stability during anesthesia. The use of anesthesia with sevoflurane and isoflurane can change the hemodynamic status of the patient. This is the background of the authors to determine the effect of inhalation anesthetics sevoflurane and isoflurane on hemodynamic changes in surgical patients.

II. RESEARCH METHOD

The research method used in this research is analytic observational using a cross sectional approach. Samples were taken prospectively with consecutive sampling technique, after the samples met the inclusion criteria, namely patients aged 15 – 59 years with the American Society of Anesthesiolologist (ASA) ASA I and ASA II criteria who underwent surgery at Dr. RSUP. M. Djamil Padang. Exclusion criteria from this study were patients with heart disease, a history of hypertension and patients with hypothermia and hyperthermia.*Maintaining the Integrity of the Specifications*

The sample size based on the comparative numerical analytical research sample formula for two unpaired groups, the minimum number of samples for each group was 15 for each treatment group so that the sample consisted of 60 patients who were divided into 2 groups using inhalation anesthetics of sevoflurane and isoflurane. Each treatment group consisted of anesthesia using premedication and non-premedication.

Statistical analysis used the Kolmogorov Sminov test, Annova, Kruskal Walis. The data is presented in the mean and standard deviation and then analyzed using the statistical product and service solution (SPSS) 18.0 for windows program. Research subjects received premedication drugs in the form of midazolam and pethidine and received sevoflurane and isoflurane during anesthesia. The research data collected were blood pressure, heart rate and oxygen saturation before premedication, after premedication, 5 minutes, 15 minutes and 60 minutes after induction of anesthesia.Some Common Mistakes

III. DISCUSSION

A. The characteristics of the research object based on the variables of age, weight, height and gender were well distributed

Characteristics	Kelompok					
	Sevofluran			Isofluran		
	Mean ± SD	Min	Mak	Mean ± SD	Min	Mak
Age (years)	40,6 ± 14,2	18,0	59,0	39,4 ± 12,4	17,0	59,0
Body weight (kg)	57,5 ± 8,1	42,0	70,0	56,2 ± 10,0	23,0	74,0
Height (cm)	159,0 ± 7,6	150,0	170,0	159,4 ± 8,7	145,0	175,0

Table 1:- Distribution of Patients Based on Characteristics in Each Group

Variable	**N**	**Mean ± SD**	**p value**
Systolic blood pressure			
• 5 minutes after anesthesia	60	113,2 ± 12,4	0,100
• 15 minutes after anesthesia	60	106,9 ± 10,7	0,349
• 60 Minutes after anesthesia	60	106,6 ± 9,2	0,752
Diastolic blood pressure			
• 5 minutes after anesthesia	60	68,0 ± 9,8	0,332
• 15 minutes after anesthesia	60	63,8 ± 8,8	0,618
• 60 Minutes after anesthesia	60	66,1 ± 9,1	0,882
Heart Rate			
• 5 minutes after anesthesia	60	72,1 ± 7,4	0,588
• 15 minutes after anesthesia	60	70,1 ± 8,0	0,741
• 60 Minutes after anesthesia	60	69,1 ± 7,5	0,229
SpO2			
• 5 minutes after anesthesia	60	99,0 ± 0,9	0,001
• 15 minutes after anesthesia	60	99,0 ± 0,9	0,001
• 60 Minutes after anesthesia	60	98,9 ± 1,1	0,001

Table 2:- Data Normality Test

The results of the Kolmogorov Sminorv statistical test using a 95% confidence level found that the distribution of data on systolic blood pressure, diastolic blood pressure and heart rate was normally distributed ($p>0.05$) while for oxygen saturation (SpO2) the distribution of data was not normally distributed. ($p < 0.05$; Table 2

Based on the results of statistical tests obtained p value <0.05, which means at alpha 5% it can be concluded that there is an effect of giving inhalation anesthetics sevoflurane and isoflurane on systolic blood pressure of patients 5, 15, and 60 minutes after inhalation anesthesia.

The results of this study showed that inhalation anesthetics sevoflurane and isoflurane affect changes in systolic blood pressure 5 minutes, 15 minutes and 60 minutes after anesthesia. There was no effect of anesthetic sevoflurane and isoflurane on diastolic blood pressure 5 minutes after anesthesia and there was an effect at 15 minutes and 1 hour after anesthesia. There was no effect of sevoflurane and isoflurane anesthesia on the patient's heart

rate 5 minutes and 15 minutes after anesthesia and there was an effect after 1 hour after anesthesia. There was no effect of anesthetic sevoflurane and isoflurane on oxygen saturation percentage at 5 minutes, 15 minutes and 1 hour after anesthesia.

In this study, both sevoflurane and isoflurane administration of premedication were successful in reducing blood pressure. Premedication is the initial action before anesthesia by giving preliminary drugs consisting of anti-cholinergic, sedative, and analgesic drugs. In this study, the drugs given were midazolam and pethidine. The purpose of giving this premedication is to create a sense of comfort, reduce glandular secretion and suppress the vagus reflex, facilitate induction, reduce the dose of anesthetic drugs, and reduce postoperative pain and anxiety. These results are in line with research conducted by Matana et al (2013) which found that midazolam premedication has shown a significant reduction in systolic blood pressure. Systolic blood pressure indicates the pressure in the arteries when the heart contracts (heart rate) or the maximum pressure in the arteries at a time. Normal systolic blood pressure is 90-120 mmHg [4][10].

This decrease in blood pressure may be due to the direct effect of midazolam causing vasodilation. The mechanism underlying vasodilation involves the role of disruption of the transmembrane by influx of Ca++ currents. This mechanism is similar to that of Ca++ antagonist and increased nitric oxide synthesis in the endothelium. The negative effect of inotropes involving midazolam is due to the inhibition of the L-Type Ca++ channel. Therefore, some authors caution that midazolam should be used with caution in patients with hypovolemia or impaired left ventricular function. Different mechanisms, however, will exert their own effects on several tissue types [5][11].

In this study, diastolic blood pressure in both sevoflurane and isoflurane decreased after premedication. This is probably due to the premedication given. Midazolam as a premedication causes minimal cardiovascular depression (arterial hypotension and myocardial depression). This is due to peripheral vasodilation and decreased blood pressure, this effect is more pronounced in patients with hypovolemia [6][7].

Diastolic blood pressure is the pressure on the walls of arteries and blood vessels due to the relaxation of the ventricular muscle of the heart (pressure during relaxation). The average diastolic blood pressure is 60-90 mmHg. Both anesthetics, both sevoflurane and isoflurane, decreased diastolic blood pressure. This is in line with the research of Mata et al (2003) which resulted in a decrease in diastolic blood pressure in patients with premedication. After anesthesia the diastolic blood pressure of patients with sevoflurane and isoflurane both with premedication and without premedication was in a stable condition in the range of 60-90 mmHg up to 1 hour after premedication, but from the changes it can be seen that in sevoflurane anesthesia with premedication and without premedication the pressure Diastolic blood of patients with sevoflurane with premedication was more stable up to 1 hour after anesthesia than sevoflurane without premedication.

The decrease in heart rate after anesthesia is caused by direct depression of the myocardium during anesthesia and the increase in heart rate after 1 hour after anesthesia may be due to the working period of anesthesia being almost exhausted, so that the stability of the heart rate is maintained [8].

In the study, it was found that the stability of the oxygen saturation presentation in all groups of patients was maintained within normal limits, but the stability was more maintained in patients with premedication sevoflurane anesthesia because the oxygen saturation percentage was in the range of 98-99% from before anesthesia to 1 hour after anesthesia. Increased oxygen supply is the result of increased cardiac output and decreased coronary vessel resistance, so that oxygen bound to the blood increases [9].

These results are in accordance with Setiawan (2012) who found there was no significant difference in changes in oxygen saturation between the isoflurane and sevoflurane anesthetic groups in the induction phase, 5 minutes after incision, 15 minutes after incision. Oxygen saturation with sevoflurane anesthesia is more stable than isoflurane anesthesia in the intubation phase up to 15 minutes after instituting.

IV. CONCLUSION

From this study we can conclude that the average systolic blood pressure of patients after anesthesia has decreased and the decrease in systolic blood pressure is within normal limits. The average patient's diastolic blood pressure up to 1 hour after anesthesia was most stable in patients who were given sevoflurane anesthesia with premedication. The patient's mean heart rate up to 1 hour after anesthesia was most stable in sevoflurane patients on premedication. The average percentage of oxygen saturation up to 1 hour after anesthesia was most stable in patients given premedication sevoflurane anesthesia.

There was an effect of sevoflurane and isoflurane anesthesia on systolic blood pressure 5 minutes, 15 minutes and 1 hour after anesthesia. There was no effect of anesthetic sevoflurane and isoflurane on diastolic blood pressure 5 minutes after anesthesia and there was an effect at 15 minutes and 1 hour after anesthesia. There was no effect of sevoflurane and isoflurane anesthesia on the patient's heart rate 5 minutes and 15 minutes after anesthesia and there was an effect after 1 hour after anesthesia. There was no effect of anesthetic sevoflurane and isoflurane on oxygen saturation percentage at 5 minutes, 15 minutes and 1 hour after anesthesia.

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