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Tension and pulse at Intubation before and after 5 minutes on Neurology Patients with General Anaesthesia

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Abstract

Background: General anesthesia is still the best choice for neurosurgery, even it must be maintained so that the airway remains open. Airway management measures that can be carried out in several ways include intubation using laryngoscopy. There may be an increase in the hemodynamic response, namely blood pressure and pulse rate starting from 5 seconds after intubation. However, it is still being debated by experts. The aim of this study was to determine blood pressure and pulse frequency after being given Fentanyl and after the 5th minute of intubation in neurosurgical patients under general anesthesia.
Method: An observational research design, 30 neurosurgical patients using fentanyl 2 mcg/kg BW and intubation techniques. The variables measured were blood pressure and pulse frequency after being given Fentanyl and after 5 minutes of intubation. The instruments used were an intra-anesthetic Hemodynamic Observation Sheet, a watch, and a bedside monitor. Data was analyzed using the independent T-test with a level of confidence 95%.
Results: The results showed that there was an increase in the average Systolic blood pressure (p value 0.009) and pulse frequency (before intubation) and after intubation at the 5th minute (p value 0,000).
Conclusion: The study can trigger anesthesia experts to look forward to this problem appropriately.

Keywords: Blood pressure; pulse; neurosurgery; fentanyl; intubation.

INTRODUCTION

Appropriate anesthesia in neurosurgery is to ensure that the surgical conditions, especially the brain, do not experience many side effects from the surgical procedure being carried out and without worsening the autoregulation (blood flow is maintained relatively constant) of the cerebral circulation. The choice of anesthesia for neurosurgical patients is to use general anesthesia, because general anesthesia is still the best choice for large operations and long duration (1). The thing that must be considered in general anesthesia is to keep the airway open and the airway's patency must be maintained. This requires appropriate and effective airway management (2).

Airway management measures that can be carried out in several ways include endotracheal intubation with an Endotracheal Tube (ETT) either orally or nasally (3) (4). Endotracheal intubation requires good preparation and skills to prevent any risk of complications from the intubation that could occur (5) (6). One of the risks of complications from intubation is that it often causes sympathoadrenal reflexes and (7) sympathetic reflexes due to painful stimulation or mechanical stimuli in the supraglottic area, resulting in hemodynamic changes. Hemodynamic disturbances in the form of increased blood pressure (hypertension) and heart rate (tachycardia)(8). Endotracheal intubation can stimulate the cough reflex, laryngeal spasm, and the sympathetic nervous system which increases blood pressure and pulse rate. The cough response occurs because the surface of the trachea is very sensitive, this causes increased intraocular, intracranial, myocardial infarction, hemodynamic changes and bronchospasm (9) On average, laryngoscopy and endotracheal

intubation can increase blood pressure by up to 40-50% and increase heart rate by up to 26-66% if there is no effort to prevent hemodynamic turmoil (5). Intubation carried out in the emergency unit (ER) has a side effect incidence of 12-26%. This shows that post-intubation hypertension must also be important to pay attention to (7)(10).

Fentanyl is often used during laryngoscopy and intubation procedures and as an intraoperative analgesic (4)because it is effective in reducing cardiovascular responses (11)(12). Fentanyl may attenuate increases in blood pressure and heart rate and is thought to blunt increases in intracranial pressure associated with laryngotracheal stimulation. By administering fentanyl injection, which is a strong opioid analgesic, no significant hemodynamic changes occurred after intubation(13). To reduce hemodynamic changes, it was found that fentanyl was 2 mcg/kg BW in non-hypertensive patients and 4 mcg/kg BW for hypertensive patients(14).

This increase in hemodynamic response can occur starting from 5 seconds after laryngoscopy (15), 30 seconds (5) and the peak is in the 1st minute and lasts for 5-10 minutes(15) (16). The increase in hemodynamic response did not differ significantly in the 1st, 3rd and 5th minute observations after laryngoscopy and intubation on the values of systolic blood pressure (TDS), diastolic blood pressure (TDD), heart rate (DJ), rate Pressure Product (RPP) and mean arterial pressure (TAR). These contradictory findings prompted researchers to conduct an observational study Blood pressure and pulse frequency after administration of Fentanyl (before intubation) and 5 minutes after intubation in neurosurgical patients using general anesthesia (5) (17).

METHOD

Quantitative research design with an observational approach. Respondents were patients who underwent neurosurgical surgery with general anesthesia using 2 mcg/kg BW fentanyl and underwent intubation techniques at Dr. Mohammad Suwandi Hospital, Surabaya. Inclusion criteria are age >17 years, BMI 18-30 kg/m², ASA physical status I-III, Mallampati Score I-IV, and patients who will undergo neurosurgery using general anesthesia with tracheal intubation. Exclusion criteria are patients who experience or have a history of heart and blood vessel disorders (Putri, 2022), as well as patients with a history of drinking alcohol. There were 30 patients who met the inclusion and exclusion criteria from February 26, 2024, to March 30, 2024.

The variables measured are the patient's blood pressure and pulse frequency. The blood pressure and pulse frequency referred to are the numbers that appear on the bedside monitor after administration of fentanyl (before intubation) and 5 minutes after intubation. These main variables were collected by the researcher with the assistance of the anesthesia nurse on duty at the time of the study. Apart from these main variables, the characteristics of the respondents were also collected, namely age, gender, Body mass Index, history of blood pressure, education and occupation. This data is collected and measured by researchers before the patient undergoes surgery. Apart from the primary data, secondary data was also collected including patient identity, diagnosis, ASA (American Society of Anesthesiologists) physical status, Mallampati score. This data was obtained from medical record documents.

Instruments used: Intra-anesthesia hemodynamic observation sheet, watch, and bedside monitor. The observation sheet is a sheet to record the respondent's identity, medical history, initial data or pre-operative condition (blood pressure and pulse rate) hemodynamic monitoring results after administration of 2 mcg/kg BB fentanyl (but before intubation) and after intubation. The watch is used to measure the time when fentanyl administration begins, after fentanyl administration until intubation is completed. The Bedside Monitor is a tool used to measure/monitor the patient's blood pressure and pulse rate during surgery, 5 minutes after administration of fentanyl and 5 minutes after intubation. This instrument is standard equipment in hospital operating rooms.

Research procedures: (a) The researcher enters into an agreement contract with the respondent, conveys the aims and objectives and research procedures. After the respondent was willing, the respondent was given informed consent before the operation was carried out, (b) The researcher collected primary data using interview techniques, including the patient's identity, date of birth, age, weight before the respondent entered the operating room, (c) The researcher paid attention to the time of use the instrument is a watch when fentanyl 2 mcg/kg BW is administered, (d) Researchers pay attention to hemodynamics (blood pressure and pulse rate) after administration of fentanyl 2 mcg/kg BB during the 5th minute of intubation. These results were written on the observation sheet that had been prepared. (d) The researcher observed hemodynamics (blood pressure and pulse rate) and 5 minutes after the respondent had been intubated.

The results are written on the observation sheet that has been prepared. (e) The researcher collects the measurement data and then proceeds to the data processing and data analysis stages. The data obtained were analyzed using the dependent t-test with a confidence level of 95%. This research has received approval from the ethics committee of the Yogyakarta Ministry of Health Polytechnic Number No.DP.04.03/e-KEPK.1/107/2024 dated January 30, 2024.

RESULTS

Characteristics of Respondents

The general characteristics of respondents in this study were age, gender, Body Mass Index (BMI), ASA physical status, and Mallampati score. The majority in the age range of 56-65 years were 11 respondents (36.7%), male, namely 16 respondents (53.3%), had a normal Body Mass Index (BMI) of 18.5-24.9kg/m2. 18 respondents, namely (60.0%), had ASA 3 physical status, namely 14 respondents (46.7%), and had Mallampati Score Grade II, namely 16 respondents (53.3%). More details can be seen in Table 1 and 2.

Table 1. Characteristics of Respondents

Variable	f	%
Ages		
17-25 Year	1	3.3
26-35 Year	4	13.3
36-45 Year	4	13.3
46-55 Year	7	23.3
56-65 Year	11	36.7
>65 Year	3	10.0
Gender:		
Men	16	53.3
Women	14	46.7
BMI (Body Mass Index)		
Less than normal standard (<18,5 kg/m2)	1	3.3
Normal (18,5-24,9 kg/m2)	18	60.0
More than normal standard (>24,9 kg/m2)	11	36.7
Total	30	100

Tabel 2. ASA State and Mallampati Score

Variabel	f	%
ASA State:		
ASA I	10	33.3
ASA II	6	20.0
ASA III	14	46.7
Mallampati Score:		
Mallampati Grade I	9	30.0
Mallampati Grade II	16	53.3
Mallampati Grade III	1	3.3
Mallampati Grade IV:	4	13.3
Total	30	100

Image of Blood Pressure and Pulse Frequency before and after Intubation.

Description of respondents' blood pressure after administering fentanyl (before intubation) systolic blood pressure >140 mmHg, originally 33.3% of respondents increased to 50% after intubation, diastolic blood pressure >90 mmHg, originally 10% of respondents increased to 16.7% after intubation, and the pulse frequency >100x/minute was originally 10% of respondents increasing to 33.3% after intubation. More details can be seen in Table 3.

Table 3. Blood pressure and pulse frequency of respondents after administration of fentanyl (before intubation) and after the 5th minute of intubation

Variables	Before intubation)		After Intubation	
	f	%	f	%
Systole <90 mmHg	0	0	0	0
Normal Systole 90-140 mmHg	20	66.7	15	50.0
Systole >140 mmHg	10	33.3	15	50.0
Diastolic <60 mmHg	0	0	0	0
Diastolic normal 60-90 mmHg	27	90.0	25	83.3
Diastolic >90 mmHg	3	10.0	5	16.7
Pulse<60x/minute	0	0	0	0
Normal Pulse 60-100x/minute	27	90.0	20	66.7
Pulse >100x/minute	3	10.0	10	33.3
Total	30	100	30	100

Average Blood Pressure and Pulse Frequency Figures Before and after 5 minutes of Intubation

The percentage increase in the number of patients whose systolic blood pressure was in the >140 mmHg category increased from 33% to 50% and the average number also increased from 133.73 to 140.60. After carrying out statistical tests, it turned out that this increase could be proven to be significant (p value 0.009). The percentage increase in the number of patients whose diastolic blood pressure was in the >90 mmHg category increased from 10% to 16.7% and the average figure also increased from 76.80 to 80.23. After carrying out statistical tests, it turned out that this increase was not proven to be significant (p value 0.093). The percentage increase in the number of patients whose pulse frequency was in the category >100x/minute increased from 10% to 33.3% and the average number also increased from 89.93 to 97.30. After carrying out statistical tests, it turned out that the increase was proven to be significant (p value 0.000). For more details, see Table 4

Table 4. Differences in blood pressure and pulse before and after the 5th minute of intubation

Variabel	Average score before Intubation)	Average score after Intubation	Gain scores	Normality test .p value	Independent T- test p value
Systolic Blood pressure l	133,73	140,60	6,87	0.348	0.009*
Diastolic Blood Pressure	76,80	80,23	3,43	0.693	0.093
Pulse	89,93	97,30	7,37	0.641	0.000*

* Level of significant .05

DISCUSSION

There are similarities and differences between the respondents of this study and previous studies. The majority of patients undergoing neurosurgical surgery who participated in this study were aged 56-65 years, different from those used in several previous studies, namely the age group of 30-45 years (5)(11); the majority gender is male, different from several previous studies, namely female(5); had a normal Body Mass Index (BMI) at the 5th minute of intubation, the same as several previous studies, namely still within the normal range, namely 20-22 Kg/m2 (5) (11); have an ASA physical status of 3, different from that used by several previous researchers, namely ASA physical status of 1 and 2 (11) and Mallampati score grade 2 is the same as previous research (11) (18).

Increased blood pressure (systole) and pulse frequency after the 5th minute of intubation due to laryngoscopy and endotracheal intubation can on average increase blood pressure by up to 40-50% and increase heart rate by up to 26-66% (5,19) can trigger reflexes sympathoadrenal and sympathetic reflexes due to pain stimulation (mechanical stimulus), specifically in the supraglottic area, this increases the sympathetic response and causes a hemodynamic response (20). The 5th intubation after administration of fentanyl showed a significant spike and difference in systolic blood pressure and pulse rate and no significant spike in diastolic blood pressure (21).This is because Fentanyl activates the sympathetic system and releases catecholamines from the adrenal medulla. The increase in sympathetic tone can be clinically seen by increasing the cardiovascular response in the form of blood pressure for systole by 22.9%, diastole by 27%(11) and pulse frequency (22).

In connection with the change /increase in systolic and diastolic blood pressure after the 5th minute of intubation because the increase can occur 30 seconds after intubation and last for approximately 10 minutes(5) (23,24). In this study, at the 5th minute of intubation there were no indications of complications with laryngoscopy and intubation, this can be seen from the normal Body Mass Index (BMI) and grade 2 Mallampati score. Judging from the age of most

respondents, they were in the 56-65 age group. years with ASA-3. This can affect blood pressure and pulse frequency because respondents with extreme ages have different anatomical airway conditions due to maturation and degeneration processes(25). When a laryngoscopy is performed, the greater the lifting force of the laryngoscope, the greater the cardiovascular response caused.

The study has limitations. Other complicating factors that are beyond control include the characteristics of the respondent (age and ASA physical status), the anatomy of the patient, even though they meet the Mallampati grade 1-2 criteria, there are still some patient conditions that are difficult to intubate. This is because the vocal plica is in an inferior position, the respondent has no teeth, the respondent's mouth is anatomically narrow, and the Adam's apple in male respondents sometimes makes the laryngoscopy pressure force greater. Even though the induction dose of fentanyl that has been determined by an anesthesiologist is the same, namely 2 mcg/kg BW, the method of administering fentanyl cannot be controlled, whether giving fentanyl at a slow rate or fentanyl with titration will affect hemodynamics.

CONCLUSION

There was an increase in blood pressure and pulse frequency after being given Fentanyl 2 mcg/kg BW (before intubation) and after intubation at 5 minutes in neurosurgical patients using general anesthesia.

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