

The Effectiveness of Respiratory Tracts in the Post-Inhalation General Anesthesia In Smoking and Non-Smoking Patients in the Recovery Room

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Abstract

Background. The objective of the research was to analyze the difference in the effectiveness patients' respiratory tracts in the post-inhalation general anesthesia in smoking and non-smoking patients in the Recovery Room. The effectiveness of respiratory tract in the post-anesthesia, especially inhalation general anesthesia, is highly influenced by the health system of lungs. Respiratory system disorder includes respiratory tract obstruction or some conditions which cause it, such as respiratory tract infection, emphysema and chronic bronchitis. One of the factors which is believed to be the cause of respiratory system disorder is smoking. Design of this study is cross sectional design. The research used descriptive analytic method. **Results.** The result of the research showed that 21 non-smoking respondents (56.8%) underwent secretion accumulation of < 10 cc, and 7 smoking respondents (18.9%) who smoked > 20 cigarettes a day underwent secretion accumulation of > 10 cc. It could be concluded that there was the difference in the secretion accumulation in the respondents of the post-inhalation general anesthesia in smoking and non-smoking patients of 10.2916. The result of independent t-test showed that there was significant difference in the effectiveness of respiratory tract in the post-inhalation general anesthesia in smoking and non-smoking patients at $p\text{-value}=0.000$ ($\alpha<0.05$). It is recommended that the effectiveness of respiratory tract in the post-inhalation general anesthesia in smoking and non-smoking patients be monitored in order to forestall the incidence of complication in the respiratory tract obstruction. **Conclusion.** It was conducted in the Recovery Room of RSUD dr. Pirngadi, Medan from January until October, 2016. The population was 217 patients in the post-inhalation general anesthesia, and 37 of them were used as the samples in which 16 respondents were smokers and 21 respondents were non-smokers, taken by accidental sampling technique, at the significance level of 95%.

Keywords: Effectiveness of Respiratory Tract, Anesthesia, Inhalation, Smokers

Acknowledgements

We really appreciate the help from Nursing Department of Health Polytecnic Medan, Indonesia and Dr. Pirngadi General Hospital. The researcher's deepest thanks go to the director of Health Polytecnic Medan who help the financial support of this study. General anesthesia or general narcosis is removing pain centrally, followed by reversible unconsciousness (Munaf, 2008). It is usually used for big operation which needs a patient's unconsciousness during the long duration of operation. However, because it can affect all organs, it can be hazardous, either during the use of it or after it has been used. (Nainggolan, 2011). The effectiveness of respiratory tract in the post-anesthesia, especially inhalation general anesthesia, is highly influenced by the condition of pulmonary health system. Some disorders in respiratory system such as respiratory tract obstruction or conditions which can cause respiratory tract obstruction, respiratory tract infection, and other disorders can also cause obstruction in gas changing, emphysema, and chronic bronchitis.

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Therefore, they should be anticipated and handled properly in order to forestall respiratory emergency. One of the factors which is believed to be the cause of respiratory system disorder such as chronic bronchitis and pulmonary emphysema is smoking. Patients' smoking habit in pre-anesthesia should be reviewed. It is recommended that smoking patients stop smoking for 1-2 weeks before anesthesia is done. It is intended to remove nicotine which affects cardio-circulation system. It is also recommended that in the post-anesthesia, patients not smoke in order that cilia can be active again in the respiratory tract and sputum production can be reduced (Latief, 2007).

Background

The increase in the prevalence of smokers becomes a serious problem since the number of smokers throughout the world is more than one billion which consist of 800 million men and 200 million women (Ericksen, 2012). In the developing countries like Indonesia, there were 34.2% of ≥ 15 year- old smokers in 2007 (Depkes RI, 2007); the prevalence increased to 34.7% in 2010 (Kemenkes RI, 2010), and increased again in 2011. According to GATS in 2011, the number of smokers who were 15 years old was 34.8% with the prevalence of 67% of male smokers and 2.7% of female smokers (WHO, 2013). Indonesia ranks the third in the large number of smokers in the world after The People's Republic of China and India and ranks the fourth in population which indicates that the number of smokers is more than those in the United States

Since the number of smokers is big in Indonesia, it becomes an interesting phenomenon to be analyzed and studied. Chemical substance in cigarettes which are inhaled by most of smokers can cause bad effect on health, especially the health of lungs. The mainstream of cigarette smoke comprises 4,000 kinds of chemical substance (Sitepoe, 2008) which are divided into particular phase and gas phase. In the particular phase, the produced substances are nicotine, nitrosamine, nitrosonornicotine, polycyclic hydrocarbons, heavy metals, and carcinogenic amine, while in gas phase there are carbon monoxide, carbon dioxide, benzene, ammonia, formaldehyde, hydro cyanide, etc.

Chemical substances contained in cigarettes are toxins which affect nerves, increase blood pressure, cause coronary disease and pulmonary disorders. Pathologically, gas phase of cigarettes is related to mucous gland hyperplasia and squamous epithelium metaplasia of respiratory tract which can cause acute and chronic bronchitis and emphysema. These two types of disease would be discussed profoundly in this research since 85% of the people suffered from these diseases are smokers (Sitepoe, 2008). Giving anesthesia, inhalation general anesthesia in particular, to smokers will bring about high risk for the effectiveness of respiratory tract due to excessive mucous production, coughing, bronchial spasm, and breathless caused by inflammation in the respiratory tract.

Kumanda (2015) points out that there is significant correlation between smoking and the incidence of mucous hyper secretion of intra anesthesia. Haerna (2013) also points out that there is the correlation of health status in smoking and non-smoking patients with the effectiveness of respiratory tract.

Viewed from the problems and the data above, the research problem could be formulated as follows: how about the difference in the effectiveness of respiratory tract in the post-inhalation general anesthesia in smoking and non-smoking patients in the Recovery Room. Post-anesthesia is a phase which will cause serious problem, and when it is not handled seriously, it will bring about death. Complication which occurs in post-anesthesia is very intricate. Of course, with modern anesthetic technique today, complication in post-anesthesia can be curbed, but it is imprudent or unwise to ignore it. Complication in post-anesthesia includes vomiting, pulmonary complication, tromboemboli, carbon dioxide retention, mechanical trauma, and slow toxic effect of anesthesia.

Risk factors of anesthesia

1. Anesthesia can cause death

Death caused by anesthesia may be caused by hypoxia and the stop of heartbeat which are interrelated to each other. In this case, death can be caused by disturbance in the supply of oxygen to the brain and to the heart; primarily, it is caused by respiratory hypoxia and secondary, it is caused by the stop of circulation after the stop of heartbeat (Muhiman, 2001). Another risk factor of anesthesia which can bring about death is acute anaphylaxis by the use of medicine in anesthesia and malignant hyperthermia.

2. Respiratory hypoxia or anoxia during anesthesia

Hypoxia and anoxia which occur during anesthesia are partially or totally caused by the failure or obstruction of oxygen supply to the brain. This condition can occur in all spots, starting from the source of oxygen supply, anesthetic machine, the upper and lower respiratory tracts, lungs, from the main to capillary blood vessel, and the shifting of oxygen into cells. Some cells will recover from hypoxia or even from anoxia within a few minutes, but there will be irreversible damage in the brain after lacking of oxygen in 4-6 minutes and the stop of heartbeat (Muhiman, 2001).

The main thing which makes alarm to those who are handling anesthesia is the acute obstruction of respiratory tract during or immediately after anesthetic induction. It is difficult to distinguish laryngospasm from breath holding which can occur as the response to mild anesthesia, especially when respiratory tract is stimulated by the steam of anesthetic irritant or foreign materials which include secretion and gastric acid content. Failed intubation can be a nightmare and can be gastric acid such as obstetric patients and unprepared emergency.

Failed breathing, especially in the post-surgery phenomenon is usually caused by the combination of occurrences. Muscle weakness after the recovery from inadequate relaxant, central depression with opioids and anesthetic substance, coughing obstruction and inadequate secondary alveolus ventilation toward wound pain combined to cause restrictive failed breathing with CO₂ retention, and CO₂ narcosis, especially when PO₂ is maintained by giving oxygen. A sudden respiratory disorder which causes convalescence is usually caused by secondary pulmonary embolism after the release of thrombus from vena pelvis or calf. Vena profunda thrombus in limbs can be detected when patients complain about intumescences (swelling) or compressive pain in calf muscles (Muhiman, 2001). Pulmonary embolism can act as hemoptysis or as generalization collapse, resembling major myocardial infarction which is hardly differentiated.

Handling respiratory ventilation is the priority in the post-inhalation general anesthesia. Patients in the post-anesthesia are often moved to the Recovery Room with installed end tracheal tubes. However, most of them have been removed in the operating room. The assessment of the effectiveness of respiratory tract can be done by find out whether there are the signs of obstruction in it.

Signs of Obstruction in Respiratory Tract

Stridor or harsh or grating sounds like snoring is caused by supraclavicular, suprasternal, intercostal, and epigastriun retractions during inspiration. Paradoxical breath occurs when chest wall becomes sunken/flat during inspiration. Breathing becomes difficult by the work of supplementary respiratory muscles and cyanosis which is the symptom of hypoxemia. It is caused by the obstruction of the upper respiratory tract with the tongue falls into hypopharynx, excessive phlegm in the respiratory tract, vomit, bleeding, foreign objects, false teeth, and bronchial spasm or larynx.

Smoking Habit

A person is called a smoker when he has smoked at least 100 cigarettes. Smoking is harmful to our health, and it is a reality. There are a lot of illnesses which are caused by smoking, either directly or indirectly. Tobacco or cigarettes are very harmful to human health. It is generally acknowledged that smoking is one of the causes of death throughout the world. On the average, men smoke because of some factors: psychologically, it includes social stimulation through mouth, people's rituals, showing manhood, escaping from anxiety, and self-pride. Physiologically, it includes bodily addiction to the substance contained in cigarettes such as nicotine, or it is usually called being addicted to nicotine (Sitepoe, 1997)

A passive smoke is a person who does not smoke but inhales the smoke of a cigarette smoked by someone else. The smoke of a cigarette is pollutant for human being and its environment. It is more harmful for a passive smoker than for an active one. It is most probably more dangerous for those who do not smoke than the smokers themselves, especially in a closed area. Smoke from a cigarette which is inhaled by a passive smoker contains carbon monoxide five times and tar and nicotine four times more than that inhaled by an active smoker (Wardoyo, 1996).

An active smoker, according to Bustan, M.N. (2000), is a person whose cigarette smoke is inhaled by himself (mainstream). From the opinion above, it can be concluded that an active smoker is a person who smokes and directly inhales the cigarette smoke which can endanger himself and other people. A mild smoker is a person who smokes less than 10 cigarettes a day, a moderate smoker is a person who smokes 10 to 20 cigarettes a day, and a chain smoker smokes more that 20 cigarettes a day (Bustan, M.N., 2000).

When a cigarette is smoked in ten times of inhalation, in a year he will undergo 70,000 times of inhalation of cigarette smoke (if he smokes 20 cigarettes a day). Some chemical substances in a cigarette which is harmful to health is cumulative; one day, the dosage of its poison will reach its toxin point so that the symptom begins to appear (Sitepoe, 1997).

Substances in Cigarettes

1. Nicotine

Nicotine is a substance or pyrrolidine compound found in *Nicotiana Tabacum*, *Nicotiana Rusatica*, and other species which synthesis is addictive and can cause addiction. This nicotine can poison bodily nerves, increase blood pressure, constrict peripheral vascular, and cause addiction and dependence to its users. The amount of nicotine inhaled is influenced by some factors such as the quality of cigarettes, the amount of tobacco in each cigarette, the depth of inhalation, the length of inhalation, and with or without filter.

2. Carbon Monoxide

Carbon monoxide inhaled by smokers will not cause to be poisoned by CO because CO inhaled by smokers will gradually, but positively, has negative influence on their respiratory tracts. Gas of carbon monoxide which is toxic contradicts oxygen in its transportation or in its use. There are 2%-6% of CO in a cigarette during the smoking, while the lowest amount of CO inhaled by smokers is 400 ppm (parts per million) which is able to increase carboxyhemoglobin in blood in an amount of 2%-6% (Sitepoe, 1997).

3. Tar

Tar in a cigarette is polynucleotide hydrocarbon aromatics compound which is carcinogenic. This toxic chemical compound can damage pulmonary cells and causes various kinds of disease. Besides that, it can also adhere to respiratory tract which will eventually cause cancer. It is a body of thousands of chemical substances in the respiratory tract so that it can cause cancer. It is also a body of thousands of chemical substances in a solid component of cigarette smoke. When a cigarette is inhaled, tar comes into oral cavity as solid fume of cigarette smoke. After it is cold, it becomes solid and forms chocolate deposit on dental surface, respiratory tract, and lungs. This deposit varies from 3 mg to 40 mg per cigarette, while the content in it is in the neighborhood of 24-45 mg. Meanwhile, a cigarette which uses filter can decrease 5 mg to 15 mg; however, even though a cigarette uses filter, the carcinogenic effect is always able to enter lungs when it is inhaled deeply and frequently and the number of cigarettes is increasing (Sitepoe, 1997).

4. Plumbum (Pb)

A cigarette can yield 0.5 micro gram of plumbum (Pb). A pack of cigarettes (containing 20 cigarettes) smoked in one day yields 10 micro grams of plumbum (Pb). The threshold of plumbum which enters the body is in the neighborhood of 20 micro grams per day. It can be imagined that when a chain smoker smokes 2 packs of cigarettes a day, how many harmful substances enter his body (Sitepoe, 1997).

According to Bustan, M.N. (2000), the duration a person smokes can be classified as less than 10 years or more than 10 years. The earlier a person begins to smoke, the more difficult for him to quit. A cigarette also has dose-response effect which means that the younger a person begins to smoke, the bigger its influence. When smoking is started in adolescence, smoking cigarettes can be correlated with the level of atherosclerosis. A lot of cigarettes and beginning to smoke in early age will increase the risk for death (Smet, B., 1994). Smoking a cigarette a day will increase systolic pressure 10-25 mmHg and heart beats 5-20 times per minute.

The impact of cigarettes will begin to be felt 10 to 20 years after they have been smoked. The impact is not only on active smokers but also on passive ones. Even though it takes 10 to 20 years, it is obvious that smoking brings about 80% of pulmonary cancer and 50% of the incidence of heart attack, impotence, and reproductive disorder (Sitepoe, 1997).

Research Method

The research used descriptive analytic method with cross sectional design. It was conducted in the Recovery Room of RSUD dr. Pirngadi, Medan, from January until October, 2016.

The population was 217 patients in the post-inhalation general anesthesia, and 37 of them were used as the samples, taken by using accidental sampling technique. The respondents were divided into two groups: 16 respondents were smokers and the other 16 respondents were non-smokers, at the significance level of 95%.

Data Analysis

The data were processed statistically by using an SPSS software program.

1. Univariate analysis was used to process the existing variables descriptively by presenting them in the distribution tables.
2. Bivariate analysis was used to find out whether there was the difference in the effectiveness of respiratory tract in the post-inhalation general anesthesia in smoking and non-smoking patients. It was done by using independent t-test in order to find out the mean difference in secretion production between smokers and non-smokers.

Result of the Research

The result of the research done in the Recovery Room of RSUD dr. Pirngadi, Medan, showed that

Univariate Analysis

Table 1. Respondents' Frequency Distribution Based on Sex

Sexes	F	%
Male	17	45.9
Female	20	54.1
Total	37	100.0

Based on Table 1 above, it could be found that 20 respondents (54.1%) were females

Table 2. Respondents' Frequency Distribution Based on Smoking Habit

Smoking Habit	F	%
Not smoke	21	56.8
1-9 Cigarettes/Day	4	10.8
10-19 Cigarettes/Day	4	10.8
>20 Cigarettes/Day	8	21.6
Total	37	100.0

Based on Table 2 above, it was found that 8 respondents (21.6%) had the habit of smoking > 20 cigarettes per day.

Table 3. Respondents' Frequency Distribution Based on the Age when They Begin to Smoke

Age Beginning to Smoke	F	%
Not Smoke	21	56.8
15-24 years	7	18.9
25-34 years	8	21.6
>35 years	1	2.7
Total	37	100.0

Based on Table 3 above, it was found that 8 respondents (21.6%) began to smoke when they were 25-34 years old.

Table 4 Respondents' Frequency Distribution Based on Secretion Accumulation

Secretion Accumulation	F	%
A little (<10cc)	23	62.2
A lot of (>10cc)	14	37.8
Total	37	100.0

Based on Table 4 above, it was found that of the 37 respondents, 23 of them (62.2%) underwent a little secretion accumulation (<10 cc),

Bivariate Analysis

Table 5. Respondents' Distribution Based on Cross Tabulation between Smoking Habit and Secretion Accumulation

Smoking Habit	Explanation				Ttl	%
	<10 cc	%	>10 cc	%		
Not Smoke	21	56.8	0	.0	21	56.8
1-9 Cigarettes/Day	0	.0	4	10.8	4	10.8
10-19 Cig./Day	1	2.7	3	8.1	4	10.8
>20 Cig./Day	1	2.7	7	18.9	8	21.6
Total	23	62.2	14	37.8	37	100.0

From Table 5 above, it could be found that 21 respondents (56.8%) were non-smokers with secretion accumulation of < 10 cc, and 7 respondents (18.9%) smoked > 20 cigarettes a day with secretion accumulation of > 10 cc.

Table 6. Respondents' Distribution Based on Cross Tabulation between the Age Beginning to Smoke and Secretion Accumulation

Age Starting to Smoke	Secretion Accumulation				Ttl	%
	<10cc	%	>10cc	%		
Not Smoke	21	56.8	0	.0	21	56.8
15-24 years	2	5.4	5	13.5	7	18.9
25-34 years	0	.0	8	21.6	8	21.6
35-44 years	0	.0	1	2.7	1	2.7
Total	23	62.2	14	37.8	37	100.0

From Table 6 above, it could be found that 8 respondents (21.6%) with secretion accumulation of > 10 cc began to smoke when they were 25-34 years old.

Table 7. Difference in the Effectiveness of Respiratory Tract between Smoking and Non-Smoking Respondents in Post-Inhalation General Anesthesia in the Recovery Room of RSUD dr. Pirngadi Medan, in 2016

Groups	Mean Difference	P
Smokers - Non-Smokers	10.2916	0,000

Based on Table 7 above, it was found that, after statistical test was done, the difference in secretion accumulation in the respondents in the post-inhalation general anesthesia was 10.2916, and based on the statistic independent t-test, it was found that the difference in the cleansing of respiratory tracts of the inhalation general anesthesia between smoking and non-smoking patients was p-value = 0.000 ($\alpha < 0.05$).

Discussion

The result of the research showed that 20 respondents (54.1%) were females, 8 respondents (21.6%) began to smoke when they were 25-34 years old, and 8 respondents (21.6%) had the habit of smoking > 20 cigarettes a day. This finding was in accordance with the theory which stated that the highest rate of smokers, based on age, was 25-64 years old with the range of 37% - 38.2%, while 15-24 years old with the range of 18.6%. History of anesthesia undergone by patients can become the source of information for the health care providers who handle anesthesia. Patients' habit of smoking before undergoing anesthesia should be reviewed. If they smoke, they have to be advised to stop smoking within 1-2 weeks prior to anesthesia in order to remove nicotine which affects circulation system from the body. In the post-anesthesia, patients are still advised to stop smoking in order to reactivate cilia in respiratory tract and to reduce sputum production (Latief, 2007).

There were 23 respondents (62.2%) who underwent a little secretion accumulation (< 10 cc), while 14 respondents (37.8%) underwent a lot of secretion (> 10 cc). The cleansing of respiratory tract in the post-anesthesia, especially inhalation general anesthesia, is influenced by the condition of pulmonary health system. Some respiratory system disorders, such as respiratory tract obstruction, or condition which causes it, respiratory tract infection, and other disorders can obstruct the exchange in gas, emphysema, and chronic bronchitis. This condition should be anticipated and handled properly to avoid breath emergency. One of the factors which is believed to influence respiratory system disorder is smoking.

There were 21 respondents (56.8%) who did not smoke had secretion accumulation of < 10 cc, and of the 14 respondents who had secretion accumulation of > 10 cc, 7 of them (18.9%) smoked > 20 cigarettes a day, while 8 respondents (21.6%) who had secretion accumulation of > 10 cc began to smoke when they were 25-34 years old. Chemical substances in cigarettes are toxic on nervous tissues, increase blood pressure, cause coronary heart disease, and bring about various pulmonary diseases. Pathologically, the phase of cigarette gas is related to mucus plug hyperplasia, and squamous epithelium metaplasia of respiratory tract (Sitepoe, 2008). This finding was in accordance with the research done by Kumada, et. al., (2013) which stated that there was significant correlation of smoking and non-smoking with the incidence of mucous intra Anesthesia hyper-secretion ($p=0.017$) with the prevalence of hyper-secretion would increase 2.593 times in patients who smokes, compared with those who did not smoke. In non-smoking patients, the effectiveness of respiratory tract was better because their secretion accumulation was < 10 cc, while in smoking patients who smoked > 20 cigarettes a day, their secretion accumulation was > 10 cc.

The result of this research was also supported by the theory which stated that patients with history of chain smokers (above 20 cigarettes a day) could slow down induction and there was the increase in mucous production, cough, and larynx spasm in inhalation anesthesia. It was also in line with another theory which stated that smoking more than two packs of cigarettes a day is considered as a signal of the existence of chronic bronchitis; when there was no good preparation there would be coughing and the increase in secretion production in respiratory tract during the inhalation general anesthesia. Patients with history of chain smokers could cause coughing stimulation, breathlessness, the decrease in oxygen saturation, the decrease in the cleansing of respiratory tract, especially the increase in mucous production which could trigger the incidence of pharynx spasm, atelectasis, and pneumonia not only in the intra anesthesia but also in the inhalation general anesthesia.

Sputum production in a normal adult is 100 ml/day. When it has excessive production, the cleansing process might not be effective anymore so the sputum will be accumulated in the respiratory tract. This sputum production is carried away and secreted toward pharynx by the movement of fine hair or cilia which border respiratory tract. Excessive sputum production can be caused by physical or chemical disturbance or infection in mucous membrane. In a smoker, inhaled tobacco smoke will cause chronic inflammation in respiratory tract, and the number of inflammation cells will increase twofold until fourfold. Cigarette smoke can directly damage lung tissues, cause cytotoxic effect in macrophage in lungs and disturb or damage cilia in lungs which can disturb the cleansing process of lungs and respiratory tract, the change in respiratory tract epithelium and the narrowing of respiratory tract. Immunoglobulin E (IgE) content can also increase 4-5 times higher in smokers, and the number of goblet cells in respiratory tract undergoes metaplasia as the result of inhaled cigarette smoke which causes mucous accumulation in respiratory tract.

This research was in accordance with the theory which stated that smoking could cause some sicknesses which causes mucous hyper-secretion reaction, chronic irritation in respiratory tract because of cigarette smoke. The loss or the decrease in the level of consciousness in unconscious patients or the influence of anesthesia, and the existence of lesion in mucociliary are some factors which obstruct the function of lungs in normal persons. Mucous hyper-secretion can cause productive and chronic cough and dysfunction of cilia in the process of mucous secretion and obstruction in respiratory tract.

The difference in secretion accumulation of the respondents in post inhalation general anesthesia in smoking and non-smoking patients was 10.2916. The result of statistic independent t-test showed that there was significant difference in the effectiveness of respiratory tract in post-inhalation general anesthesia in smoking and non-smoking patients at $p\text{-value} = 0.000$ ($\alpha < 0.05$).

Conclusion

The result of the research showed that there was the difference in secretion accumulation in smoking and non-smoking respondents in post-inhalation general anesthesia of 10.2961, and the of statistic independent t-test showed that there was significant difference in the effectiveness of respiratory tract in post-inhalation general anesthesia in smoking and non-smoking patients at $p\text{-value} = 0.000 (\alpha < 0.05)$.

Suggestion

The monitoring on the effectiveness of respiratory tract in the post-inhalation general anesthesia in smoking and non-smoking patients was expected to be the main nursing intervention in the Recovery Room in order to be able to prevent from the incidence of complication of obstruction in respiratory tract in the post-inhalation general anesthesia.

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