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Evaluation of aspiration, nebulization and oxygenization practices of patients with a tracheostomy[1]

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Abstract

Aim: The aim of the study is to determine the frequency of aspiration, nebulization and oxygenization practices and factors that affect these practices after tracheostomy operation in seven days period.

Method: This cross-sectional study was carried out in internal intensive care unit in a university hospital in Turkey. The sample of the study consisted of 60 patients with tracheostomy. Data was collected by using two forms. First one was patient descriptive characteristics form and second one was patient observation form about aspiration, nebulization and oxygenization practices.

Results. Mean of aspiration number was 9.9±1.3, and aspiration was carried out more frequently than oxygeniation (8.4±1.7) and nebulization (6.5±1.5) practices. Patients' age, their habit of cigarette smoking and having chronic disease situations affect aspiration, nebulization and oxygenization practices patients with tracheostomy ($p<0.001$).

Conclusions. The frequency of aspiration, nebulization and oxygenization practices was changed according to post-operation days and affected by some of patients' descriptive characteristics.

Keywords: Tracheostomy; Aspiration; Nebulization; Oxygenation; Nurses.

Introduction

The concept of tracheotomy is originated from Greek, and it means "cutting the trachea". Tracheotomy is defined as a surgical operation in order to ensure airway passage by creating space in alignment of the front wall of trachea on the 3rd or 4th cartilaginous ring and it is accepted as the oldest lifesaving method. Tracheotomy is usually temporary, and this opening can be closed when patient is capable of functioning normal respiration. However, the opening which is created by surgical operation is permanent in tracheostomy, and the patient has to ensure his/her air requirement from this opening in the rest of his/her life (1-4).

The number of tracheostomies being performed internationally is increasing and so nurses, who works especially in ear-nose-throat services and intensive care units, meeting patients with tracheostomy is increasing also(5-7). The process of patient care after tracheostomy operation contains adequate and balance nutrition, make communication, aspiration, inside cannula cleaning,

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regulating cuff pressure for cannulas with cuff system, moisturizing respiratory tract, stoma care, and emergency situations(4, 8-11). All of the practices which are mentioned above are vital, but moisturizing and keeping open respiratory tract is crucial to prevent possible fatal complications like airway obstruction (12-13). However, the studies show that nurses do not have enough knowledge and ability about aspiration, nebulization and oxygenization practices to patients with tracheostomy(14-16). It is thought that the studies about patients with tracheostomy care is needed, especially when we consider increasing ratio of encountering patients with tracheostomy for nurses in otorhinolaryngology services and intensive care units. It is thought that the results of this study will provide to increase quality of the nursing care patients with tracheostomy.

Study Aim

The aim of the study was to determine the frequency of the aspiration, nebulization and oxygenization practices that were applied to patients and factors that affect these applications after tracheostomy operation in a seven days period.

Methods

Participants

This cross-sectional research is was carried out in intensive care unit of internal medicine department in a university hospital between 1st October 2015 and 1st February 2016. The scope of the study contains patients who are between 18 and 65 age, and accepted to intensive care unit of internal medicine department, and did not take any operation due to any complication in 24 hours after the tracheostomy operation, and had normal vital signs. Purposeful sampling was made in the study. 60 patients with tracheotomy/tracheostomy opening were monitored in terms of aspiration, nebulization and oxygenization practices for seven days.

Ethical considerations

Approval was taken from the university Non-Invasive Ethics Committee in order to carry out the research. Written informed consent was taken from the patients who attend the research.

Data Collection Forms

1. Patient Descriptive Characteristics Form

This form consists of questions which were in purpose of detecting patients' age, sex, education level, social security, height, weight, medical diagnosis, reason of tracheostomy opening, tracheostomy cannule type, situation of cigarette smoking before hospitalization, and lastly situation of chronic disease and its duration.

2. Patient Observation Form

Patient observation form was created for monitoring patient's vital signs and frequency of aspiration, nebulization and oxygenization practices daily.

Data Collection

The patient was informed before the day from tracheotomy/tracheostomy operation about study and written informed consent is taken in the study. Then, patient descriptive characteristics form of patient is filled up together with patients before operation. Aspiration, nebulization and oxygenization practices which were applied to patients during seven days after operation was recorded from patients' files to patient observation form.

Data Analysis

The data which was obtained from study is evaluated in computer environment by using SSPS 16 (statistical package for social science) which is statistical package program. Descriptive statistics was used to evaluate patient characteristics form and frequency of aspiration, nebulization and oxygenization practices. Analysis of variances was made in order to evaluate change of frequency of aspiration, nebulization and oxygenization practices according to some characteristics (age, situation of cigarette smoking, situation of chronic disease) in repetitive measurements (ANOVA). A p value <0.05 was considered statistically significant.

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Results

Patient Characteristics

The reason of tracheostomy opening for the most of the patients who attended the study was upper respiratory cancers. The most of the patients were between 55 and 65 age and male. More than half of the patients who are evaluated in the scope of the study have normal body mass index. Usage of plastic (%78.3) and silicon (15.1) cannule was preferred for the most of the patients. The number of smokers (%48.3) and non-smokers (%51.7) is nearly equal. The half of the patients in the study had a chronic disease (hypertension, hyperlipidemia, diabetes mellitus) (Table 1).

Table 1 Distrubiton of Participants' Descriptive Characteristics

Characteristics (n=60)	n	%
Diagnosis		
Upper respiratory tract cancers *	23	38.3
Stenoses**	7	11.7
Others***	30	50.0
Total	**60**	**100.0**
Age groups		
18-33	14	23.4
34-49	11	18.3
50-65	35	58.3
Total	**60**	**100.0**
Gender		
Female	19	31.6
Male	41	68.4
Total	**60**	**100.0**
Education		
Illiteracy	2	3.3
Primary education	11	18.3
High school	38	63.3
University	9	15.1
Total	**60**	**100.0**
Body Mass İndex		
Underweight	7	11.6
Normal weightl	35	58.4
Overweight	11	18.4
Obesity	7	11.6
Total	**60**	**100.0**
Tracheostomy Cannula Type		
plastic cannula	47	78.3
silicon cannula	9	15.1
silver cannula	4	6.6
Total	**60**	**100.0**
Smoking Status		
Yes	29	48.3
No	31	51.7
Total	**60**	**100.0**
Chronic Disease Situation		
Yes*****	30	50.0
No	30	50.0
Total	**60**	**100.0**

* The larynx, pharynx, hypopharynx, oropharynx, nasopharynx and oral cavity cancers diagnoses.
**The larynx and subglottic stenosis.
*** The diagnoses of acute respiratory failure, cardiac arrest, neck incision, osteoblastoma, maxillary lymphoma and of schawano.
**** The diagnoses of hypertension, hyperlipidemia, diabetes mellitus.

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General Results About aspiration, Nebulization, Oxigenization

Mean aspiration number which was applied to patients is 9.9±1.3. Aspiration was applied more frequent than oxygenization (8.4±1.7) and nebulization (6.5±1.5) practices. The number of aspiration, nebulization and oxygenization practices have been decreased gradually in post-operational period (Table 2).

Table 2 Mean of aspiration, nebulization and oxygenization practices according to post-operation days

Post-operation days	Aspiration Mean Score/ Standard Deviation	nebulization Mean Score/ Standard Deviation	oxygenization Mean Score/ Standard Deviation
1th day	11.9±1.6	8.5±1.4	10.1±17
2th day	11.1±13	7.8±1.5	10.±1.9
3th day	10.4±12	7.2±1.7	9.0±1.7
4th day	11.1±13	6.2±1.7	8.5±1.4
5th day	8.9±1.3	5.9±1.1	7.4±1.7
6th day	8.4±1.2	5.1±1.8	7.0±1.7
7th day	7.9±1.1	4.8±1.5	6.8±1.6
Total	9.9±1.3	6.5±1.5	8.4±1.7

Aspiration Results

Mean score of aspiration practice for the patients who were between 50 and 65 is higher than other age groups. Also, the change in the number of aspiration practice according to age groups in post-operational days was statistically significant **(p<0.001).** Mean score of aspiration practices for the patients who regular smokers were higher than non-smokers and the change in the score of aspiration practices in post-operational days were statistically significant **(p<0.001).** Mean score of aspiration practices for the patients who had chronic diseases were higher than who didn't have chronic diseases. Also, the change in the score of aspiration practice in post-operational days was statistically significant **(p<0.001)**(Table 3).

Nebulization Results

Mean score of nebulization practice for the patients who were between the ages of 50 and 65 was higher than other age groups. Also, the change in the score of nebulization practice according to age groups in post-operational days were statistically significant **(p<0.001).** Mean score of nebulization practice for the patients who were regular smokers were higher than non-smokers. Also, the change in the score of nebulization practice in post-operational days was statistically significant **(p<0.001).** Mean score of nebulization practice for the patients who had chronic diseases were higher than who didn't have chronic diseases. Also, the change in the score of nebulization practice in post-operational days was statistically significant **(p<0.001)** (Table 3)**.**

Oxygenization Results

Mean score of oxygenization practice for the patients who were between 50 and 65 was higher than other age groups. Also, the change in the score of oxygenization practice according to age groups in post-operational days was statistically significant **(p<0.001).** Mean score of oxygenization practice for the patients who were regular smoker was higher than non-smokers. Also, the change in the score of oxygenization practice in post-operational days is statistically significant **(p<0.001).** Mean score of oxygenization practice for the patients who had chronic diseases were higher than who had no chronic diseases. Also, the change in the score of oxygenization practice in post-operational days was statistically significant **(p<0.001)** (Table 3).

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Table 3 Mean of aspiration, nebulization and oxygenization practices according to post-operation days and patient characteristics (n=60)

	Characteristics	1th day (mean±Sd)	2th day (mean±Sd)	3th day (mean±Sd)	4th day (mean±Sd)	5th day (mean±Sd)	6th day (mean±Sd)	7th day (mean±Sd)	p value
Aspiration	Age groups								
	18-33	11.7±1.1	10.8±0.7	10.1±0.9	9.0±0.9	8.6±0.9	8.0±1.1	7.6±0.8	**p<0.001**
	34-49	11.4±1.2	10.3±1.0	9.7±0.9	9.1±0.9	8.3±1.3	7.8±1.0	7.5±0.8	
	50-65	12.3±1.5	11.8±1.6	11.0±1.4	10.2±1.5	9.5±1.5	9.0±1.4	8.4±1.3	
	Smoking Status								
	Yes	12.0±1.4	11.4±1.4	10.8±1.3	10.1±1.3	9.2±1.3	8.8±1.3	8.2±1.2	**p<0.001**
	No	12.0±1.5	11.1±1.6	10.3±1.3	9.5±1.5	8.9±1.5	8.2±1.3	7.9±1.2	
	Chronic Disease Situation Yes								**p<0.001**
		12.3±1.5	11.8±1.5	11.0±1.4	10.3±1.4	9.5±1.4	9.0±1.3	8.4±1.2	
	No	11.7±1.3	10.8±1.2	10.0±1.1	9.3±1.2	8.7±1.3	8.0±1.2	7.7±1.1	
Nebulization	Age groups								
	18-33 yaş	7.2±1.0	6.3±0.8	5.9±1.2	4.6±1.2	4.3±0.9	3.6±1.2	3.6±1.20	**p<0.001**
	34-49 yaş	8.1±1.7	7.7±1.6	7.3±2.0	6.7±2.3	5.8±2.7	5.0±2.2	4.2±1.4	
	50-65 yaş	9.4±1.3	8.8±1.5	7.9±1.69	7.9±1.6	7.1±4.3	6.0±1.7	5.8±1.4	
	Smoking Status								
	Yes	8.6±1.2	8.1±1.3	7.1±1.6	6.4±1.5	6.7±4.9	5.5±1.7	5.3±1.3	**p<0.001**
	No	8.9±1.9	8.1±2.0	7.6±2.0	6.5±2.2	6.0±2.2	5.2±2.2	4.9±1.9	
	Chronic Disease Situation Yes								
		9.1±1.1	8.6±1.4	7.6±1.4	6.9±1.5	6.2±4.6	6.0±1.7	5.8±1.3	**p<0.001**
	No	8.3±1.9	7.5±1.8	7.1±2.1	5.9±2.0	5.4±2.2	4.6±2.0	4.3±1.7	
Oxygenization	Age groups								
	18-33 yaş	10.0±1.4	9.8±1.0	8.0±1.4	7.6±0.8	5.4±1.3	4.8±1.0	4.8±1.0	**p<0.001**
	34-49 yaş	10.0±2.1	10.0±2.1	8.4±1.1	8.0±1.4	6.8±1.7	6.0±1.2	6.0±1.2	
	50-65 yaş	10.3±1.7	10.5±2.1	9.9±1.9	9.3±1.5	8.5±1.7	8.5±1.7	8.5±1.6	
	Smoking Status								
	Yes	10.2±1.55	10.3±1.9	9.7±1.9	9.1±1.7	8.1±2.0	8.0±2.1	7.6±2.1	**p<0.001**
	No	10.3±2.0	10.3±2.3	9.1±2.1	8.7±1.4	7.7±1.9	7.3±2.0	7.1±2.0	
	Chronic Disease Situation Yes								
		7.1±2.0	10.7±2.0	10.1±1.7	9.3±1.5	8.6±1.7	8.5±1.7	8.1±1.6	**p<0.001**
	No	9.7±1.6	9.6±1.9	8.2±2.0	8.1±1.4	6.7±2.0	6.2±2.0	6.1±1.7	

Discussion

It is founded that the mean score of aspiration, nebulization and oxygenization practices for the patients who were between 50 and 65 was higher than other age groups in the study. In the literature, it is stated that one of the most significant indicator of requirement of aspiration is visible accumulation of secretion in the patient's stoma(1,8,9,17,18). According to Sevinç's study it is stated that loud respiration, accumulation of visible secretion in respiratory tract and cyanosis symptoms and sings are the most remarkable ones in order to determine aspiration requirement for the patients with tracheostomy by nurses(19). Also, decrease in the number of the cilia and slowness of movements of cilia in the patient's upper respiratory tract as physiological result due to aging has been seen(20,21). This situation blocks to push forward of mucous which is produced to oropharynx. When increase of the amount of secretion which excreted from respiratory system is observed as a result of defense mechanism of the body, these secretions are accumulated in respiratory tract and dumped from stoma(16,17). Although it is not indicated in the tables, because of the oxygen saturation and vital signs of patients who were in scope of the study and between 50 and 65 age are in normal range, there are excess quantity of secretion in their respiratory tract, aspiration practices to these individuals might be It is founded that average score of aspiration, nebulization and oxygenization practices for the patients who were regular smokers is higher than other non-smokers in the study. Because the substances which cigarette contains like nicotine, arsenic, cadmium and carbon make irritant effect to respiratory tract epithelium, growth in goblet cells on the epithelium occurs and secretion increasing occurs into respiratory tract. In addition to this, smoking causes decrease on cilia movements(22,23). Because secretion increase occurs depending on defense reaction against the operation for individuals with tracheostomy, excess quantity of secretion might cause blockage of respiratory tract. Thus, smoker patients need more aspiration practices than non-smokers. It might be thought that because frequency of aspiration practices is higher for these patients than non-smokers, frequency of nebulization and oxygenization practices is higher before the practice too.

It is seen that average score of aspiration, nebulization and oxygenization practices for the patients who had chronic disease is higher than patients who had no chronic disease in the study. The patients who attend our study had chronic diseases like hypertension, hyperlipidemia, diabetes mellitus which affect patients cardiovascular system. Although it is not indicated in the table, the most of the patients who had chronic diseases are between 50 and 65 age. Patients who were between 50 and 65 ages need a lot of aspiration depending upon their increase of amount of secretion as we explained earlier. In addition to this, because cardiovascular system is the most important system to regulate respiration, a problem in this system affects to meet patients' oxygen requirement. Thus, practicing oxygenization more frequent is important in order to obtain patients' respiratory tract patency before the aspiration practice.

Nebulization practice before aspiration practice makes secretions thinner and enables more efficient aspiration practice(1,9). On the other hand, oxygenization practice before aspiration practice is important to avoid breathing problems which can occur as a result of temporary closure of respiratory tract during the aspiration practice(8). In addition to this, oxygenization practice is more vital for old individuals than mature individuals, because of weaker pectoral muscles and diminishing capillary vessels(21). According to Demir's (2003) study, partial oxygen pressure is founded higher for the patients who were exposed to oxygenization practice for one minute before aspiration practice than who were not exposed to(24). Because smoking causes alveoli narrowing and alveolar collapse, diffusion area of gasses diminishes. Thus, the patient needs more oxygen(22). It can be thought that more oxygenization practice is conducted to smokers than non-smokers, because not only avoid breathing problem which is caused by aspiration practice but also provide the oxygen which is requirement of patient. Because nebulization and oxygenization practices are routine clinical practice before aspiration practice, frequency of nebulization and oxygenization practices increases depending upon increasing number of aspiration practices.

Conclusion

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The factors which affect the frequency of nebulization, oxygenization and aspiration practices are age, situation of being smoker, and situation of having chronic diseases according to results of the study. Aspiration, nebulization and oxygenization practices are applied more frequently to patients who were between 50 and 65 age. The score of aspiration, nebulization and oxygenization practices is higher in every post-operational day for regular smokers. Aspiration, nebulization and oxygenization practices are apllied more frequently to patients who had chronic diseases. It is suggested to the nurses who are in take care of post-operative patients with tracheostomy that age, situation of being regular smoker and having chronic diseases should be considered while planning their nebulization and oxygenization practices.

Limitation of the Study

The study was limited for 7 days because of the patients' who attended the study duration of clinical stay was limited. Also, there was no intervention to nurses about frequency of aspiration, nebulization and oxygenization in the study.

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