RESEARCH ARTICLE

Tracheostomy: Complications and Causes of Complications

Fahimeh Hoseini[1], Shahla Mohammadeh Zadeh Zarankesh[2], Ebrahim Alijanpour[3,4], Mohammad Gholizadeh Gerdrodbari[5]

[1]Department of Nursing, IA University of Tehran Medical Branch, Babol, Iran, [2]Department of Nursing and Midwifery, Tehran Medical Sciences Branch, Islamic Azad, [3]Clinical Research Development Center, Ayatollah Rouhani Hospital, Babol University of Medical Sciences, Babol, IR. Iran, [4]Department of Anesthesiology, School of Medicine, Babol University of Medical Sciences, Babol, IR. Iran, [5]Department of Intensive Care Nursing, Faculty of Nursing and Midwifery, Sabzevar University of Medical Sciences, Sabzevar, Iran

Abstract

Background: Tracheostomy is one of the critical surgical procedures in the case of airway obstruction and in patients with long-term intubation; on the other hand, it has complications, that some of which are common. **Objectives:** The aim of this study was to determine the complications and their underlying causes in patients admitted to the intensive care unit (ICU). **Methods:** This descriptive, analytical study was performed on 107 patients eligible to participate in the research in ICU wards of Babol hospitals, in northern Iran, in 1394. Patients were evaluated for 16 common Tracheostomy complications immediately after tracheostomy, up to 1 month after removal of the tracheal tube, using the checklist for 4 months. The underlying causes of complications were determined by assessed the causes of admission, the method of tracheostomy, the history of diseases affecting complications and the quality of nursing care from tracheostomy through a standard care checklist. **Results:** The highest percentage of units (21.5%) was experienced one complication, 19.6% units were two complications, and 5.6% had no complication and 0.9% of the units showed most complications (11). The most common complications were infections and redness (46.7%(, swelling (43.9%), and bleeding and air leakage from tracheostomy (33.6%), respectively. Patients with diabetes and high blood pressure, patients with a surgical tracheostomy, and patients with ischemic heart disease, experienced the most complications, respectively. The quality of nursing care was determined 66.4% in average grade. **Conclusions:** Tracheostomy is a way to continue the patient's respiration, in spite of inevitable complications. The method of stoma formation, underlying diseases and the quality of nursing care has a direct relationship with its complications. It is suggested that nurses improve the quality of nursing care to reduce the complications.

Key words: Complications, intensive care unit, nursing staff, percutaneous dilatational tracheostomy#, risk factor, tracheostomy

BACKGROUND

Tracheostomy is one of the most common and critical surgeries in emergency departments and intensive care unit (ICU), which is necessary for maintaining an airway during occlusion and storage the larynx in patients with long-term intubation.[1] Tracheostomy is accompanied with complications and dangers that vary according to the method of tracheostomy, intra- and post-operative care, duration of intubation and medical conditions of the patient. Among the complications of tracheostomy, tracheostomy tube duct obstruction by the tracheal wall, duct obstruction by Secretion, bleeding from the cut site, subcutaneous emphysema, infection, tracheostomy tube accidental withdrawal (extubation), and the formation of a fistula between the trachea and esophagus are the most common complications.[2] The overall incidence

Percutaneous dilator tracheostomy

Address for correspondence:
Ebrahim Alijanpour, Clinical Research Development Center, Shahid Beheshti Hospital, Sargord Ghasemi Street, Shahid Keshvari Square, Babol, Mazandaran.
Tel.: +981132256285. Fax: +981132256285
E-mail: dralijanpour@yahoo.com

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of tracheostomy complications was 49%, and the death rate was 2 %.[3] Several factors contribute to these complications, some of which are intubation; some are related to the patient's condition, and some with care are preventable. Patient care and attention have been proven necessary to reduce complications.[2] During our several days after tracheostomy, problems and complications arise which in many cases can be prevented using appropriate techniques and equipment, careful consideration in the treatment and examination of the patient. The most important part in treating a patient under tracheostomy is post-operative care. Cardone and Lepe (2010) write that in many conditions, tracheostomy is unavoidable and has complications that are somewhat preventable. Tracheostomy complications are divided into three categories: Immediate, early, and delayed.[4] Shafi *et al*. (2014) reported in a study entitled "traditional tracheostomy, a survey of its indications and complications" in a hospital in India that pre-operative complications are 42.62%, early post-operative complications are 36%, and late post-operative complications are 21.3%. The author considered several effective factors, including the method of performing tracheostomy, in the incidence of complications.[5] Mofateh and Mosavi, in 2010, reported a 22% incidence of complications in patients with tracheostomy so that post-operative bleeding and tube traumatic complications were the most common complications.[2] About 95% of the severe bleeding is due to rupture of the innominate artery.[4] Tracheal stenosis due to cuff pressure is another complication that the nursing times journal wrote about that: Patients who are discharged with tracheostomy need to full and empty their tracheostomy tube cuff. If this pressure is not monitored and is not maintained at 25 centimeters of water, it can damage the mucus membrane cause the tracheal stenosis. This report stated that of 58 patients, 55 of them had continuous full cuff. The overall incidence of tracheostomy complications was 31.2%, with 8% post-operative complications, and 9% late complications. In emergency tracheostomy, the most complicated is the loss of airway.[6] Tracheostomy can be performed surgically in the operating room and often for patients with airway anomalies or by dilatation technique in the patient's bedside and intensive units.[1] For decades, the standard method of tracheostomy was open surgical technique (ST). However, over the past 20 years, the use of percutaneous dilatational tracheostomy (PDT) has increased.[7] In this method, the skin is cut in a small size and dilated, so the risk of bleeding is less.[8] Susarla *et al*. did not find a significant difference between the two groups in the survey of 17 studies regarding PDT complications compared to ST.[7] In a study in 1999, Gysin *et al*. stated that the incidence of complications in PDT and ST is the same, and the probability of complications in both methods is more related to the surgeon's experience and skills than the type of tracheostomy.[9] Moreover, in his study in 2007, Lucas concluded that while PDT is faster than ST and each method has its own specific benefits and disadvantages, the incidence of PDT complications is greater than that of ST.[10] In addition to the many potential benefits of PDT, this is accompanied by a number of very serious complications, including the insertion of the tube outside the trachea, rupture of trachea, perforation of the esophagus, pneumothorax, and subsequent loss of airway. These complications are unusual in tracheostomy with surgery.[1] In 2004, Hassani stated that 40% of the patients he was studying had tracheostomy complications, and none of the 20% deaths that occurred in patients with tracheostomy were related to tracheostomy. Investigator stated underlying diseases such as head trauma, vascular events, and exacerbation of chronic obstructive pulmonary disease (COPD) are related in their deaths.[11] Today, the main responsibility for the care of tracheostomy lies with specialist nurses.[12] Lucas 2007 considered the experience and skills of nursing staff to be effective in the incidence of complications in each type of tracheostomy.[10] Simon *et al*., 2013, commented on tracheostomy complications, suggesting that half of the traumatic complications of tracheostomy occur in the first 7 days after that. For example, 75% of bleeding occurs in the first 5 days.[13] Proper care by nurses is essential in reducing complications. Therefore, nurses, whether in general or specialized departments, should be trained and retrained to provide proper care to patients with tracheostomy. The implementation of specialized services using nurses trained to care for patients with tracheotomy tube significantly reduced the number of patients transferred from ICU to the general population with site tracheostomy.[14] Personnel who care for patients with tracheostomy should have the competence to identify and manage the complications, in particular, the knowledge and skills regarding the methods of dampening, and the understanding of the importance of controlling cuff pressure and cleaning the internal cannula of the tracheostomy tube, and the parts that accept patients with tracheostomy they must have full readiness in terms of facilities.[6] The purpose of this study was to evaluate the incidence of tracheostomy complications and the factors affecting their incidence.

Objectives

The aim of this study was to determine the complications and their underlying causes in patients admitted to the ICU.

METHODS

The present study is a descriptive analytical that descriptive study examines the incidence and analytical aspects of the causes of tracheostomy complications in Babol University of Medical Sciences Hospitals in northern Iran. In this research, the samples were selected by a simple method to reach the sample size (107) from the research community, and the sample size with a probability of complications was 50% P =, accuracy = 10%, and confidence level 95%. The units under study were between 18 and 80 years of age, requiring respiratory support and tracheostomy. For reasons such as multiple injuries to the

head, chest, and CVA[1], or after surgery, they were admitted to ICU, and their first-degree fellows were satisfied with the study. Exclusion criteria were no need for auxiliary ventilation and tracheostomy, discharge from the ICU, under CPR[2], and withdrawal from the companions of the patient's presence in the study. Tracheostomy was performed by the relevant specialists and with all the criteria for the patients in need.

Study tool

Data were collected by reviewing patient records, observation, and assessment of patients' status and recorded in the datasheet and observation checklist. Demographic characteristics, cause of hospitalization, method, and duration of tracheostomy, and ventilator specification, as well as data from tracheostomy status assessment of patients, were included in the datasheet. A checklist was used to record complications after tracheostomy, assess nursing care from tracheostomy and investigate the presence of related diseases. Patients were evaluated for 16 commonly occurring tracheostomy complications (referring to resources) immediately after tracheostomy followed by removal of the tracheal tube 1 month later. The nursing care of the tracheostomy was considered by researcher immediately after the operation until the patient was hospitalized in the ICU, taking into account the 7 care items. Having some underlying illnesses could have an effect on the complications of which the patients' information was recorded in the checklist for their presence or absence. To record the evaluation of the complications and illnesses, the choice was yes and no. In assessing nursing care, five grades (never zero, sometimes 1, most often 2, most of the times 3, and always 4) were used. Because the zero number did not score in any case, this score was eliminated, and the other four score in the seven care items were multiplied, and the number 28 was the maximum score. The minimum score for nursing care was considered to be half the maximum and 14 were considered. Moreover, care scores in the form of 0-4-0 poor care, 15–21 average, and 28–22 well. The instrument reliability coefficient was obtained using the test-retest (80.6).

RESULTS

This study was performed on 107 patients undergoing tracheostomy with an average age of 49.81 years. 83.2% of patients were men. Multiple traumas were the most common cause of admission (38.3%). The average hospitalization days were 28 days. For patients, on average, from the 14th day after the admission, tracheostomy was placed. This was about 60% of the PDT type. Patients had tracheostomy for 21–98 days with an average of 37 days, and 37.17 of patients experienced tracheostomy tube replacement during admission, which was the main cause of these replacements, the obstruction of the tube by secretion (29%). The highest percentage of underlying diseases in the studied units was diabetes (35.5) and high blood pressure (29.9). According to the content of Table 1, of 16 tracheostomy complications that were studied in patients, 5.6% of patients did not experience any complications; and 21.5% of patients had at least one complication, and 19.6% had 2 complications, and 14% had at least 3 complications, and 11.2% had 4 complications. <1% (0.9) showed 11 complications.

Based on the findings of Table 2, among the 11 complications seen in these patients, the most common complication was infectious secretion and redness (46.7%) and then

Table 1: Absolute and relative frequency of number of complication in tracheostomy

Number of complications	*n* (%)
0	6 (5.6)
1	23 (21.5)
2	21 (19.6)
3	15 (14)
4	12 (11.2)
5	8 (7.5)
6	8 (7.5)
7	6 (5.6)
8	3 (2.8)
9	2 (1.9)
10	2 (1.90
11	1 (./9)
Total	361 (100)

Table 2: Absolute and relative frequency of complication of tracheostomy

Complications of tracheostomy	*n* (%)
Bleeding	36 (33.6)
Hematoma	10 (9.3)
Redness	50 (46.7)
Swelling	47 (43.9)
Infectious secretion	50 (46.7)
Air leakage	36 (33.6)
Accidental extubation	11 (10.3)
Tracheal stenosis	5 (4.7)
Emphysema	12 (11.2)
Obstruction	32 (29.9)
Fistula	4 (3.7)
Dysphagia	20 (18.7)
Hypoxia	14 (13.1)
Decannulation	14 (13.1)
Tracheal rupture	1 (./9)
Total	342 (319.4)

1 Cerebrovascular accident
2 Cardiopulmonary resuscitation

swelling (43.9%), followed by bleeding and air leakage from tracheostomy (33.6%). Moreover, in the next category is tracheostomy obstruction. The least complication of tracheostomy in patients was trachea rupture (0.9%) and fistula (3.7%), respectively.

In determining the relationship between complications of tracheostomy and admission [Table 3], the findings show that patients who were hospitalized for internal illness had the highest complications including the highest percentage of bleeding, air leakage, infectious secretion, hypoxia, redness, hematoma, accidental extubation, fistula, and trachea rupture. In patients with head trauma (50%), redness, and in patients with multiple injuries (36.6%) and in post-operative (47.6%) infections are the most commonly reported complications. Table 4 shows the type of tracheostomy and the incidence and type of tracheostomy complications. In ST tracheostomy, the severity of complications such as bleeding, swelling, air leakage, infection, and redness is greater. Redness is the most commonly reported tracheostomy complication in PDT.

In this study, it was found that in patients with underlying illnesses of the type of ischemic heart disease (IHD) there were more complications such as bleeding, air leakage, emphysema, and tracheal rupture. According to Table 5, in patients with underlying problems such as diabetes, hypertension (HTN), pneumonia, COPD[3], and IHD[4], bleeding and swelling were higher than other complications. In fact, bleeding is significantly associated with diabetes, heart disease, HTN, and chronic respiratory illness. Hematoma is associated with diabetes, infectious secretion with diabetes and HTN, air leakage with heart disease, obstruction with diabetes mellitus and chronic respiratory disease, and hypoxemia with hypertension and chronic respiratory illness. Results show that the highest percentage of nurses (55.1%) rarely had sterile suctioning and 40.2% of nurses performed tracheostomy dressing in most often by sterile technique. In 56% of cases, tracheostomy tube cuff pressure is most of the times maintained in the right range. Moreover, they always routinely control the cuff every 8 h. Most of the times, the number of washing and dressing is increased as the infection was seen by the nurse. Nurses tracking the infection in 41.1% of cases were done most of the time. Moreover, the adjustment of the cuff of the tracheostomy was observed at most feeding times with the highest percentage (89.8%). According to the above findings and according to Table 6, more than half of the nurses (66.4%) were in the moderate level in terms of quality of care provision.

3 Chronic obstructive pulmonary disease
4 Ischemic heart disease

DISCUSSION

The prevalence of tracheostomy complications is high due to the various underlying conditions prevailing in the ICU. Our study also examines and tracks 107 tracheostomy patients admitted to ICUs and shows the incidence of tracheostomy complications is high, so that one-fifth of the patients undergoing tracheostomy experienced at least one type of complication of tracheostomy. A total of 361 complications were recorded in the entire study and of the

Table 3: Absolute and relative frequency of complication of tracheostomy in different admission causes

Complication	Diagnosis, *n* (%)			
	Head trauma	Multiple trauma	After operation	Internal patient
Bleeding	6 (23.1)	11 (26.8)	6 (28.6)	13 (68.4)
Hematoma	0 (0)	4 (9.8)	3 (14.3)	3 (15.8)
Redness	13 (50)	14 (34.1)	8 (38.1)	15 (78.9)
Swelling	10 (38.5)	14 (34.1	9 (42.9)	14 (73.7)
Infectious secretion	13 (50)	15 (36.6	10 (47.6)	12 (63.2)
Air leakage	7 (26.9)	12 (29.3)	4 (19)	13 (68.4)
Accidental extubation	2 (7.7)	3 97.3)	2 (9.5)	4 (21.1)
Tracheal stenosis	2 (7.7)	1 (4.2)	1 (4.8)	1 (5.3)
Emphysema	0 (0)	8 (19.5)	2 (9.5)	2 (10.5)
Obstruction	6 (23.1)	12 (29.3)	9 (42.9)	5 (26.3)
Fistula	1 (3.8)	2 (4.9)	0 (0)	1 (5.3)
Dysphagia	6 (23.1)	8 (19.5)	4 (19)	2 (10.5)
Hypoxia	3 (11.5)	4 (9.8)	0 (0)	7 (36.8)
Decannulation	2 (7.7)	7 (17.1)	2 (9.5)	3 915.8)
Tracheal rupture	0 (0)	0 (0)	0 (0)	1 (5.3)
Total	71 (273.1)	115 (282.3)	60 (285.7)	96 (505.3)

11 types of complications seen in all tracheostomy patients, about 60% of patients experienced between 2 and 6 types of complications. 7.5% of the patients suffered from at least 8 types of tracheostomy complications, of which the high number of complications in one patient is only possible in the ICU due to the underlying condition of the complication. Most of the illnesses and deaths after surgery in the ICUs are the result of post-operative complications, especially in patients with high risks.[15] Various complications of tracheostomy have been reported in several studies which are consistent with the results of this study.[3,5] Of course, in Shafi's study of the 266 patients, 26% of the cases had tracheostomy complications. However, in the present study, of a total of 107 patients, more than 90% experienced at least one complication. This high rate of complications in this study in compared to Shafi's study can be attributed to this condition that in Shafi's study, patients with multiple systemic diseases, such as HTN , coagulation disorders, and blood disorders, did not enter.

Table 4: Absolute and relative frequency of complication of tracheostomy in two type of tracheostomy

Type of complication	Type of surgery	
	PDT	ST
Bleeding	4 (6.3)	32 (74.4)
Hematoma	2 (93.1)	8 (18.6)
Swelling	18 (928.1)	29 (67.4))
Air leakage	2 (3.1)	34 979.1)
infection	19 (29.5)	31(72.2)
redness	27 (42.2)	23 (53.5)
Tracheal stenosis	3 (4.7)	2 (4.7)
Emphysema	5 (7.8)	7 (16.3)
Tracheal rupture	0 (0)	1 (2.3)
Dysphagia	15 (23.4)	5 (11.6)
Fistula	0 (0)	4 (9.3)
total	95 (148.2)	176(409.4)

PDT: Percutaneous dilatational tracheostomy, ST: Surgical tracheostomy

Our study showed that the highest complications of tracheostomy were infection and redness (46.7%). Of course, with regard to infectious secretion, this was expected due to the fact that the suction method was not properly performed in sterile and correct technique in half of the patients. Redness is usually one of the consequences of infectious diseases. The third most common complication in the current study was bleeding (33.6%), which was significantly higher in patients undergoing open tracheostomy (ST) (74.4% vs. 6.3%) that is confirmed in other studies.[13,16-18] Meanwhile, bleeding has been reported as one of the most important causes of mortality and life-threatening factors in tracheostomy patients.[6,19] The most common complication of tracheostomy in the study of Toutounchi *et al*. was bleeding (25.7%).[20] In his study, Mofateh and Mosavi also described the most common complication of tracheostomy as bleeding (23.1%).[2] Although bleeding as an important complication of tracheostomy was in the third place in our study, it should be given special attention because of its importance, especially with regard to the incidence of tracheal obstruction and hypoxia due to blood clotting. The least tracheostomy complications were tracheal rupture (0.9%) and fistula (3.7%). Moreover, with regard to the fact that nurses' performance in controlling cuff pressure was at a desirable level, rupture and fistula of the trachea appeared to be the lowest. In our study, 5 patients

Table 5: The relationship between risk factors and the incidence of tracheostomy complications

Complication	Disease				
	DM	IHD	HTN	COPD	Pneumonia
Bleeding	./001	./005	./012	./015	./242
Hematoma	./005	./247	./280	./145	./247
redness	./059	./124	./152	./058	./055
Swelling	./000	./095	./019	./150	./229
Infectious secretion	./001	./114	./000	./178	./232
Air leakage	./034	./005	./063	./166	./089
Tracheal stenosis	./186	./516	./315	./413	./516
Emphysema	./134	./123	./166	./194	./123
Obstruction	./049	./188	./144	./006	./249
Fistula	./320	./591	./267	./387	./338
Tracheal rupture	./355	./121	./701	./841	./879
Dysphagia	./180	./294	./057	./021	./056
Hypoxia	./190	./162	./017	./036	./306
Decannulation	./112	./162	./245	./233	./322

IHD: Ischemic heart disease, DM: Diabetes mellitus, HTN: Hypertension, COPD: Chronic obstructive pulmonary disease

Table 6: Absolute and relative frequency of level of nursing care quality in tracheostomy

Nursing quality	*n* (%)
Weakness: 0–14	15 (14)
Moderate: 15–21	71 (66.4)
Good: 22–28	21 (19.6)
Total	107 (100)

(4.7%) had 107 patients with tracheal stenosis. In the pursuit of discharged patients, only one needs to repair the trachea and undergo surgery. This patient was tracheostomy with ST technique. Carvandian also reported in his study that tracheal stenosis was significantly more in the ST group than in the PDT group (0.002).[17] Clinical significance of the complication of tracheal stenosis is very significant in relation to the patient's weaning from the ventilator device.[19] In the Epstein study, only 3–12% of patients with tracheal stenosis caused by tracheostomy, required intervention. Of course, it's important to note that in his study Dollner stated that with clinical observation, he did not find any cases of stenosis. However, when he used laryngotracheoscopy to find tracheal stenosis, 63% of patient experienced the tracheal stenosis over10%.[21] Moreover, since we did not routinely use laryngotracheoscopy in our study, it is possible that there would be more patients with chest stenosis.

Interestingly, patients who were hospitalized for internal illness had the highest rate of complications in most of the complications of tracheostomy. Complications such as hemorrhage, infectious secretion, hypoxia, redness, and hematoma occurred at the highest rates in internal patients due to widespread homeostasis disorders. In a study in 2013, Simon *et al*. stated that 57.7% of patients who died due to tracheostomy suffered from internal disorders such as heart, nervous, respiratory and vascular disorders and traumatic patients, and surgical patients were included 12.7% and 5.6% of deaths respectedly. He also reported in his review study that 77.8% of patients, who died due to hemorrhage because of tracheostomy, had at least one risk factor such as coagulation disorders, obesity, previous surgery, and radiotherapy.[13] In the patients with multiple traumas, the most complication was infectious secretion (36.6%). These patients were difficult to separate from the ventilator due to multiple organ involvement, especially chest trauma. Moreover, that is why the duration of attachment to the device has, therefore, increased, resulting in more interventions such as suctioning on the patient and leading to more infections. The only tracheal rupture also occurred in the internal patient group. One of the best ways to prevent tracheal rupture during tracheostomy is to use bronchoscopes to minimize damage.[22]

Regarding the type of tracheostomy, the present study suggests that complications such as hemorrhage, hematoma, infection, and air leakage in patients with ST tracheostomy are much higher than patients with PDT-type tracheostomy. In most studies of tracheostomy, the PDT method is preferred on the ST method.[8,17,23,24] However, in some studies, no significant difference was found between these two methods of tracheostomy.[7,9,11] In this study, the tracheal stenosis due to tracheostomy was equal in both PDT and ST groups. Raghuraman *et al*., of course, stated in his study that tracheal stenosis because of PDT, occurs earlier than the ST method, and the restoration is harder due to being under the glottis.[25] In our study, air leak was the most common complication of patients with ST tracheostomy (34 cases). In the Crofts's study, both airway leakages were associated with ST tracheostomy. In fact, due to the greater incision of ST tracheostomy, it increases the probability of leakage from the tracheostomy site.[26] Of the 107 patients who participated in the study, 9.3% (4 cases) tracheoesophageal fistulas occurred due to tracheostomy, all of which occurred in ST tracheostomy. The most important sign was the return of food from the stomach to the tracheostomy tube. In the study, Carvandian reported a significant difference in the incidence of more fistulas in ST than PDT (0.05).[17] This can be evidenced by the fact that in patients with ST-type tracheostomy, the type of surgical incision results in instability of the tube and cuff tracheostomy, and provides the basis for the onset of ischemia and traumatic injury, and ultimately fistula.[27] Tracheoesophageal fistula can lead to severe and fatal pulmonary complications.[28] No tracheo-innominate artery fistula was seen in our study. It's incidence./1% up to 1% reported.[29] An innominate artery fistula to the trachea after tracheostomy results in severe bleeding, which is often fatal.[30] The incidence of fistula in the tracheostomy site is between./3% reported. That 75% of cases is due to tracheostomy cuff or tracheal tube trauma.[31] Control of cuff pressure and insertion of the endotracheal tube in the proper position can be the most important factor in the prevention of tracheoesophageal and tracheo-innominate fistula.[17] The incidence of bleeding was significantly increased in patients with diabetes, increased blood pressure, COPD and IHD, and underlying diseases had the greatest impact on bleeding. Of course, increased levels of infectious secretions were also seen significantly in diabetic and HTN[5] patients. Very few studies have been conducted on the relationship between underlying diseases and tracheostomy complications, and more studies are needed in this regard. Of course, diabetes, hypotension, and poor general status are tree factors associated with the occurrence of tracheostomy and esophageal fistula in patients with tracheostomy.[31] In diabetic patients, the occurrence of infectious conditions is Justifiable due to bleeding problems.

Regarding the quality of nursing care in patients with tracheostomy, the performance of most nurses (86.1%) was moderate to good. Nursing care was properly performed in the control of cuff pressure, it's inflating at feeding time, as well as controlling the presence of infection and it's reporting. However, in half of the patients suctioning with sterile

5 hypertension

technique and correct technique was failed. And probably, for this reason, infectious secretion was one of the most common tracheostomy complications in our study (46.7%). Due to the many risk factors in the ICUs, nursing care can play an important role in reducing post-operative complications and improving outcomes in patients at risk.[15] Nemati *et al*. in his study reported the low quality of nursing care associated with tracheostomy. In his study, in 44.8% of the patient's cuff did not fill with proper pressure. Moreover, in more than half of the patients, dressing was not done.[32] Careful care of tracheostomy patients requires constant cooperation and awareness among doctors, nurses, and ICU staff. Careful monitoring of the surgical technique, careful care in the field of nursing of the patient in the ICU and their knowledge in the field of care and follow-up can result in the prevention of occurrence of many complications.[2]

CONCLUSION

Tracheostomy is a way to continue the patient's breathing, which in spite of having complications in most cases, is inevitable. The method of stoma formation, underlying illnesses, and the quality of nursing care are directly related to its complications. It is suggested that sufficient precision and skill be taken in the tracheostomy. Increasing community health and the prevention and control of internal diseases that can cause complications in accidents and crises. Nurses will reduce their complications by increasing the quality of nursing care.

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