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ORIGINAL RESEARCH / *ÖZGÜN ARAŞTIRMA*

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Evaluation of the Clinical Course in Patients Discharged with Tracheostomy

Trakeostomi ile Taburcu Edilen Hastaların Klinik Seyirlerinin Değerlendirilmesi

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ABSTRACT *Objective:* The objectives of this study are to determine the problems of patients who underwent percutaneous tracheostomy opening in intensive care and then were discharged with a tracheostomy that had either spontaneous respiration or mechanical ventilation (MV) support, and decrease the morbidity and mortality of these patients by focusing on training their caregivers about potential problems.

Materials and Methods: The files of 90 patients, who were admitted to the intensive care unit (ICU) between 2017 and 2018 with a tracheostomy, were analysed. Twenty-nine patients were discharged. Patients were grouped as cerebrovascular disease (CVD), respiratory failure (RF), neuromuscular diseases and others (Alzheimer's, Parkinson's). Patients and their caregivers were interviewed face-to-face or by telephone to obtain information about patients. The reasons for hospitalisation, Glasgow coma scale (GCS) score, feeding patterns, MV support, life expectancy and problems at home were recorded.

Results: In 29 discharged patients, 14 of them were classified as CVD, five as RF, six as neuromuscular disease (NMD) and four as other. The mortality rates of patients with high GCS values (GCS-2) from ICU were found to be lower. The fatality rate for the NMD group (0%) was found to be significantly lower than that of CVD (64.3%) and RF (80%). Seven (50%) patients developed contracture or limited joint motion. Respiratory-related problems were the most common problems that patients experienced at home, and 12 (85.7%) had intense secretions. Constipation was the most common nutritional problem and was experienced by six patients (42.9%).

Conclusion: The home care of patients with a tracheostomy requires specific procedures and may lead to the development of specific complications. In this study, we determined that the respiratory problems of home care patients, particularly those involving intense secretions, plugged the tracheostomy and required the need for MV. Another important problem is that patients have limited joint motion. Thus, before discharge, patients should be trained consistently.

Keywords: Tracheostomy, patient treatment, mechanical ventilation

ÖZ *Amaç:* Yoğun bakımda perkütan yolla trakeostomi açılarak spontan solunum veya mekanik ventilatör (MV) desteği ile trakeostomili bir şekilde taburcu edilen hastaların bakımları esnasında yaşanılan problemlerin tespit edilmesi ve elde edilen veriler doğrultusunda hasta bakıcıların eğitiminde bu konulara ağırlık verilerek hastalarda oluşabilecek morbidite ve mortalitenin azaltılması amaçlandı.

Gereç ve Yöntem: Yoğun bakım ünitesine (YBÜ) 2017 ve 2018 yıllarında yatan ve trakeostomi açılan 90 hastanın dosyaları incelendi. Bu hastaların 29'u taburcu edildi. Hastalar serebrovasküler hastalık (SVH), solunum yetersizliği (SY), nöromüsküler hastalıklar (NMH) ve diğerleri (Alzheimer, Parkinson) olarak gruplandırıldı. Hastalar ve bakıcıları ile yüz yüze veya telefonla görüşülerek hastalar hakkında bilgi alındı. Hastaların yatış nedenleri, Glasgow koma skorları (GKS), beslenme şekilleri, mekanik ventilasyon (MV) desteği, evde yaşam süreleri ve yaşanılan sorunlar kaydedildi.

Bulgular: Taburcu edilen 29 hastanın 14'ü SVH, 5'i SY, 6'sı nöromüsküler hastalık, 4'ü diğerleri olarak sınıflandırıldı. YBÜ'den çıkış GKS değerleri (GKS-2) yüksek olan hastaların mortalitesi daha düşük olarak tespit edildi. NMH grubunun ex olma oranı (%0), SVH (%64,3) ve SY (%80) gruplarından istatistiksel olarak anlamlı düzeyde düşük bulunmuştur. Yaşayan hastaların 7'sinde (%50) kontraktür veya eklem hareket kısıtlılığı gelişmiştir. Evde yaşanılan sorunlar içerisinde en sık solunumsal problemler, bunların içerisinde de 12 hastada yoğun sekresyon (%85,7) görülmüştür. Beslenme problemleri olarak en sık kabızlık 6 hastada (%42,9) görülmüştür.

Sonuç: Trakeostomili hastaların evde bakımı özellik arz etmekte olup birtakım komplikasyonların gelişmesine yol açabilmektedir. Yaptığımız çalışmada evde bakım hastalarının en sık solunumsal problemlerle; yoğun sekresyon, tıkaç oluşumu ve MV ile ilgili problemler yaşadıklarını tespit ettik. Bir diğer önemli problem ise hastalarda oluşan eklem hareket kısıtlılığıdır. Bu nedenle bu hastaların taburculuğundan önce bu konularda daha yoğun bir eğitimin verilmesi gerekmektedir.
Anahtar Kelimeler: Trakeostomi, bakım hastası, mekanik ventilasyon

Introduction

Cerebrovascular diseases (CVD), chronic respiratory failure (RF) and neuromuscular diseases (NMD) cause prolonged hospitalization and mechanical ventilation (MV) durations in intensive care units (ICU). The main reason of opening tracheostomy is to prevent complications resulting from endotracheal intubation in intubated patients who cannot be detached from MV and cannot control deglutition and upper airway reflexes due to such clinical situations, and to facilitate discharging of these patients from intensive care (1). Long duration of intensive care causes an increase in infection and intensive care costs.

Some of these patients are discharged from the hospital with O_2 support in spontaneous respiration and some of them with home-type mechanical ventilators. Feeding is generally enteral [percutaneous endoscopic gastrostomy (PEG), nasogastric (NG), Oral. During home care, these patients encounter respiratory problems or clinical problems related to nutrition among other problems.

Patients reported that they mostly had negative experiences related to tracheostomy, speaking and communication, well-being and life quality, disfigurement and body image, stigmatization and social withdrawal, personal support and management (2).

Managing social effects of permanent tracheostomy is more difficult than that of other complications and family members should be included to play roles in this process (3).

Tracheostomy is one of the most commonly applied procedures in critically ill patients. However, life-threatening complications such as occlusion and displacement can be encountered even in temporary tracheostomy (4).

When a patient undergoes a long-term or permanent tracheostomy, assessment of home care needs and safety issues in discharge planning should be the main targets for the health team. The effectiveness of this process will ultimately determine the success of home care and will play an active role in preventing critical events or return to hospital (5).

The studies emphasized the importance of home care in terms of low cost, quality social support and increase in quality of life in the rehabilitation of long-term tracheostomy patients (6,7).

Detecting and solving the problems experienced by the patients who are discharged with tracheostomy require home care will improve the quality of life of the patients and their caregivers.

Materials and Methods

After obtaining the institutional and local ethics committee permissions (decision no: HNEAH-KAEK 2018/101, date: 11.02.2019) for our study, we evaluated 90 patients with tracheostomy who underwent operations in 2017 and 2018 in our ICU using Griggs method, with percutaneous dilatation technique. Twenty-nine of these patients were transferred to the palliative care unit after clinically appropriate conditions were met. In the palliative care unit, patients and their caregivers were discharged from home after they were given necessary training. Verbal consent was obtained by talking to the relatives of the patients on the phone.

Patients were the ones who needed MV support for a long time and were unable to maintain the airway due to swallowing difficulty or low Glasgow coma scale (GCS) (1).

Patients were grouped according to the reasons for hospitalization. group 1: CVD, group 2: RF, group 3: NMD, group 4: Others [Alzheimer, Parkinson, post-cardiopulmonary resuscitation (CPR)]. Patients' GCS values when they were admitted and discharged from intensive care, problems encountered during home care, other diseases and nutrition patterns were recorded.

From the palliative care unit, part of our patients was discharged with mechanical ventilator support and a part with spontaneous breathing O_2 support. The problems of our patients during home care were related with mechanical ventilator problems (ventilator failure, frequent

alarm warnings), problems with respiratory system (too many secretions, bleeding during aspiration, plugging in tracheostomy cannula), other problems (bed wounds, contracture) and the information pertaining to patients who died in the early period (first 3 months) and in the late period (after 3 months) was recorded by telephone or face to face communication with their relatives.

Statistical Analysis

When evaluating the findings obtained in this study, the IBM SPSS Statistics 22 (SPSS IBM, Turkey) software program were used for statistical analysis. In the evaluation of the study data, the fit of the parameters to normal distribution was evaluated by Shapiro-Wilks test. In evaluation, One-Way ANOVA test was used to compare descriptive statistical methods (mean, standard deviation, frequency) as well as the parameters of normal distribution in the intergroup comparison of quantitative data. The Kruskal-Wallis test was used for the intergroup comparison of the parameters that did not exhibit normal distribution, and the Mann-Whitney U test was used to determine the group which caused difference. The Mann-Whitney U test was used to compare the groups for parameters which did not exhibit a normal distribution. For comparing qualitative data the Fischer's Exact test, Fisher Freeman Halton test and Continuity (yates) adjustment were used. Lastly, Spearman's rho correlation analysis was used to investigate the relationship between parameters which were not in parallel with normal distribution. Significance level was accepted as $p<0.05$.

Results

The study was carried out with 29 cases among the 90 patients who underwent percutaneous tracheostomy opening in the intensive care unit during the 2-year period between 2017 and 2018. The ages of these patients are between 34 and 91 and 15 of them are male (51.7%) while 14 were female (48.3%). The age average of the cases is 67.86±14.56.

The ages of the cases ranged from 34 to 91, with a mean of 67.86±14.56. GCS-1 (ICU incoming) values ranged from 3 to 15, with a mean of 10.28±4.39 and a median of 10. GCS-2 (ICU outgoing) values ranged from 3 to 15, with a mean of 10.28±4.25 and a median of 10. ICU hospitalization times ranged from 1 to 65, with a mean of 31.24±16.2 and a median of 32. Home follow-up duration ranged from 90 to 540, with a mean of 299.75±190.16 and a median of 237.5.

51.7% of the cases were male and 48.3% were female. 51.7% died and 48.3% survived. 48.3% were hospitalized due to CVD, 20.7% due to NMD, 17.2% due to RF, 6.9% due to Alzheimer's, 3.4% due to Parkinson's +RF and 3.4% due to post-CPR.

Reasons of hospitalization were separated into four groups, namely CVD (48.3%), NMD (20.7%), RF (17.2%) and other reasons (13.8%). 48.3% of the cases exhibited no additional disease, while 51.7% of them did. Distribution of additional diseases is demonstrated in Table 1. 34.4% of the cases did not take MV support, while 65.5% did. Nutrition pattern of the 58.6% was PEG, 24.1% was in NG and 17.2% was oral (Table 1).

In terms of respiration, it was observed that 85.7% of the patients had secretion problems, while 21.4% had plug problems. In terms of nutrition, 42.9% of the patients had constipation, 14.3% had diarrhea and 14.3% had PEG dysfunction.

28.6% of the patients developed bed wounds and 50% had joint movement limitation (contracture). In terms of MV problems, 21.4% of the cases encountered device failures (Table 2).

There was no statistically significant difference among the mean age of hospitalization cause groups ($p>0.05$). There was no statistically significant difference in terms of sex distribution rates among hospitalization cause groups ($p>0.05$).

There was a statistically significant difference in terms of death rates among hospitalization cause groups ($p=0.024$; $p<0.05$). The fatality rate in the NMD group (0%) was found to be statistically significantly lower than that of the CVD (64.3%) and RF (80%) groups ($p_1=0.014$; $p_2=0.015$; $p<0.05$). There was no statistically significant difference among the other hospitalization cause groups in terms of fatality ($p>0.05$) (Table 3).

GCS-2 values of ex patients were found to be statistically significantly lower than alive patients ($p=0.005$; $p<0.05$). There was no statistically significant difference in terms of ICU duration between ex and alive patients ($p>0.05$).

71.4% of the ex patients and 60% of the alive patients received MV support and there were no statistically significant difference between them ($p>0.05$) (Table 4).

Table 1. Distribution of study parameters			
		Min-Max	Avg ± SD
Age		34-91	67.86±14.56
GCS-1 (median)		3-15	10.28±4.39 (10)
GCS-2 (median)		3-15	10.28±4.25 (10)
ICU duration (median)		1-65	31.24±16.2 (32)
Home follow-up duration (n=8) (median)		90-540	299.75±190.16 (23.5)
Gender n, %	Male	15	51.7
	Female	14	48.3
Mortality n, %	Ex	15	51.7
	Alive	14	48.3
Cause of hospitalization n, %	Alzheimer's	2	6,9
	NMD	6	20.7
	Parkinson's + RF	1	3.4
	Post CPR	1	3.4
	CVD	14	48.3
	RF	5	17.2
Group by cause of hospitalization n, %	CVD	14	48.3
	RF	5	17.2
	NMD	6	20.7
	Other	4	13.8
Additional diseases n, %	None	14	48.3
	DM	6	20.6
	HT	12	40.8
	AF	2	6.8
	CAD	2	6.8
	CKD	1	3.4
	Malignancy	2	6.8
	COPD+BPH	1	3.4
Existence of additional diseases n, %	None	14	48.3
	Yes	15	51.7
Those with MV support (n=29) n, %	None	10	34.4
	Yes	19	65.5
Nutrition pattern n, %	NG	7	24.1
	Oral	5	17.2
	PEG	17	58.6

CVD: Cerebrovascular disease, NMD: Neuromuscular disease, RF: Respiratory failure, GCS: Glasgow coma scale, GCS-1: Intensive care unit incoming GCS, GCS-2: Intensive care unit outgoing GCS, ICU: Intensive care unit, MV: Mechanical ventilation, CPR: Cardiopulmonary resuscitation, DM: Diabetes mellitus, HT: Hypothyroidism, AF: Atrial fibrillation, CAD: Coronary artery disease, CKD: Chronic kidney disease, COPD: Chronic obstructive pulmonary disease, BPH: Benign prostatic hyperplasia, NG: Nasogastric, PEG: Percutaneous endoscopic gastrostomy, Min: Minimum, Max: Maximum, Avg: Average, SD: Standard deviation

Table 2. The problems of alive patients during care (n=14)		
	n	%
Respiratory problem		
Secretion	12	85.7
Plug	3	21.4
Nutrition problem		
Constipation	6	42.9
Diarrhea	2	14.3
PEG dysfunction	2	14.3
Bed wounds	4	28.6
Joint movement restriction	7	50.0
MV problems		
Device failure	3	21.4
PEG: Percutaneous endoscopic gastrostomy, MV: Mechanical ventilation		

In alive patients, there is a statistically significant difference between hospitalization cause groups in terms of GCS-2 values (p=0.025; p<0.05). The GCS-2 values of the NMD group were found to be statistically significantly higher than those of CVD and other cause groups (p_1=0.011; p_2=0.009; p<0.05). There were no statistically significant differences in GCS-2 values among other hospitalization cause groups.

There was a statistically significant difference in GCS-2 values among the feeding patterns (p=0.018; p<0.05). GCS-2 values of PEG group were found to be significantly lower than those of NG and oral groups (p_1=0.034; p_2=0.021; p<0.05). There were no statistically significant differences between NG and oral nutrition patterns in terms of GCS-2 values (p>0.05) (Table 5).

Table 3: Evaluation of age, GCS-2, gender and mortality as causes of hospitalization					
	Cause of hospitalization group				p
	CVD	RF	NMD	Other	
	Avg ± SD	Avg ± SD	Avg ± SD	Avg ± SD	
Age	68.29±16.47	74.8±7.56	58.33±5.54	72±19.77	[1]0.265
Gender, n (%)					
Male	6 (42.9%)	2 (40%)	4 (66.7%)	3 (75%)	[2]0.640
Female	8 (57.1%)	3 (60%)	2 (33.3%)	1 (25%)	
Mortality, n (%)					
Ex	9 (64.3%)	4 (80%)	0 (0%)	2 (50%)	[2]0.024*
Alive	5 (35.7%)	1 (20%)	6 (100%)	2 (50%)	
[1]One-Way ANOVA test, [2]Fisher Freeman Halton test, *p<0.05 CVD: Cerebrovascular disease, NMD: Neuromuscular disease, RF: Respiratory failure, SD: Standard deviation, Avg: Average, GCS-2: Intensive care unit outgoing GCS, GCS: Glasgow coma scale					

Table 4. Evaluation of GCS-2, intensive care unit duration and mechanical ventilation support according to mortality			
	Mortality		p
	Ex	Alive	
	Avg ± SD (median)	Avg ± SD (median)	
GCS-2	8.07±4.1 (9)	12.64±3.03 (15)	[1]0.005*
ICU Duration	36±17.05 (32)	26.14±14.08 (28)	[1]0.176
Receives MV Support, n (%)			
None	4 (28.6%)	6 (40%)	[2]1.000
Yes	10 (71.4%)	9 (60%)	
[1]Mann-Whitney U test, [2]Fisher's Exact test, *p<0.05 MV: Mechanical ventilation, SD: Standard deviation, Avg: Average, ICU: Intensive care unit, GCS-2: Intensive care unit outgoing GCS, GCS: Glasgow coma scale			

Table 5. GCS-2 evaluation on alive patients according to hospitalization cause groups and nutrition patterns

		GCS-2
		Avg ± SD (median)
Cause of hospitalization group	CVD	10.8±2.95 (11)
	RF	15±0 (15)
	NMD	15±0 (15)
	Other	9±1.41 (9)
	p	0.025*
Nutrition pattern	NG	14.25±1.5 (15)
	Oral	15±0 (15)
	PEG	10±2.76 (9)
	p	0.018*

Kruskal-Wallis test, *p<0.05, Avg: Average, SD: Standard deviation, CVD: Cerebrovascular disease, RF: Respiratory failure, NMD: Neuromuscular disease, NG: Nasogastric, PEG: Percutaneous endoscopic gastrostomy, GCS-2: Intensive care unit outgoing GCS, GCS: Glasgow coma scale

Discussion

The most common indication for tracheostomy in ICU is long-term MV need (8). Tracheostomy can reduce the time spent in ICU and make it easier to transition the patient to further steps of treatment (9). Thanks to the advancement and accessibility of home ventilator technology, it is now easier to discharge tracheostomized patients for home care.

One of the most important points in preparing these patients for discharge is the training of the caregiver. For the caregiver, learning and mastering all the details about home care plays an important role in reducing morbidity and mortality.

Inadequate skills and experience of caregivers of tracheostomy patients may lead to low optimal care and morbidity (10).

The standard care provided by a specialized multidisciplinary tracheostomy team reduced the complications associated with tracheostomy (11). In the Marchese et al. (12) study, 67.5% of the tracheostomy patients were tracheotomized and 41% of these patients were discharged with MV support. Compared to our study, they had a higher discharge rate in patients with tracheostomy. This may be due to the low mortality rates (10%) of patients who underwent percutaneous tracheostomy opening. In the Doğan et al. (1) study discharge rates were (30.9%) similar to those of our study (32.2%) and the rate of home deaths were higher in the CVD group, as also was the case in our study. However, in this study, the rate of patients alive at home was found to be 23.3%. In our study this rate was 48.3%. We believe that the most important reason for this is that after intensive care, necessary training is given by a multidisciplinary team in the palliative care unit of our hospital for the home care of patients with tracheostomy.

In the study of Marchese et al. (13), which was conducted without a CVD group, shorter survival times were found due to respiratory diseases compared to neuromuscular diseases. In our study, mortality was found to be significantly lower compared to respiratory diseases in the group which was under observation for NMD. In addition, mortality was found to be significantly higher in the CVD group in our study.

The Golestanian et al (14). study, which focused on patients who suffered acute CVD, evaluated the facts that patients were fed by PEG opening and that an additional MV support is given as significant in terms of poor prognosis. In our study, it was determined that MV support and PEG opening have no statistically significant effect on mortality. In our view, mortality increase in CVD patients is associated with lower GCS values of patients in the CVD group during discharge rather than MV support and PEG opening.

In the Doğan et al. (1) study, the rate of excessive secretion and plug formation were observed at 16%, while our study observed excessive secretion in 12 patients (85.7%). Four (21.4%) of these patients developed plug formation, hence we believe that more time must be allocated for training focused on aspiration practices at home. In our study, 7 of our patients (50%), who were discharged home, developed contracture and limitation of joint motion. This shows that the patients who are discharged home should be provided with a higher level of support in terms of training for physical therapy.

In the Morris et al. (15) study on 35 patients, most of the patients (67%) stated that they were curious about other people's opinions on tracheostomy, 58% stated that they were not emotionally disturbed, 67% stated that they went on their social life normally and 58% thought that they did not disturb anybody. In our study, majority of the alive patients are from the neuromuscular disease group they retained their consciousness, and we believe that the psychological effect of tracheostomy on patients should be given more attention. Providing support for these patients with specialist psychologists during the preparation stage for discharge will facilitate adaptation to this process.

Teamwork is important in preparing patients for discharge. A statement from this team that they would always be with the patient and relatives of the patients, and that they would take an active role in the solution of all kinds of problems will reduce the anxiety and stress that may occur before discharge. Because the anxiety and stress in the patients' relatives can sometimes be so extreme that they can object to the patient's discharge. In our study, when we evaluated the feedbacks received from the relatives of the patients, we found that they have fears of being alone with the patient, being alone and not knowing what to do in case of a possible problem. Home care for ventilator-assisted individuals with progressive neuromuscular disease means a significant burden for caregivers at home (16). The van Kesteren et al. (17) study suggests that for cases involving patients who require invasive and non-invasive ventilation, actually a higher level of stress resides in family caregivers. A patient, who was discharged from the hospital with tracheostomy opening, will face problems related to secretion management, increased risk of infection, changes in body image and impaired vocalization (18). In addition, studies demonstrated that there is a lack of medical follow-up of patients with tracheostomy after discharge (19). We have also identified this shortcoming in our study. Therefore, we believe that patient follow-up should be performed within the framework of a specific program after discharge.

Conclusion

The patients with tracheostomy always have the possibility of having complication during homecare. In this study we determined the homecared patients problems about respiratory, the most common, intense secretion, plugging in tracheostomy and MV. Another important problem is that the patients have the limitation of joint motion. Thus, before the discharge of the patients,they sould be trained consistendly. The need of training about homecaring sould be provided by multidisciplinary team is one of the main issues to decrease mortality of homecared patients.

In the past, following discharge of these patients from ICUs, primary care was received at home, from caregivers. Specifically, palliative care units that have become widespread after 2012, training of these patients before their discharge and the awareness created for particularities of home care helped these patients to receive a higher quality of home care, and also made possible the decrease in mortality. They also play a key role in solving the problems encountered at home. Because hospitalization of these patients is easier at palliative units and their treatment is done more quickly. In order to reduce anxiety, stress and possible complications on the relatives of patients due to the home care, patients should be followed at regular intervals after discharge.

Ethics

Ethics Committee Approval: The study were approved by the Haydarpaşa Numune Training and Research Hospital of Clinical Research Ethics Committee (decision no: HNEAH-KAEK 2018/101, date: 11.02.2019).

Informed Consent: Verbal consent was obtained by talking to the relatives of the patients on the phone.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: A.S., Concept: A.S., O.E., Design: A.S., O.E., Data Collection and Process: A.S., Analysis or Interpretation: A.S., O.E., Literature Search: A.S., Writing: A.S., O.E.

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