



Retrospective Analysis of Patients with Percutaneous Dilatational Tracheostomy in Intensive Care Unit

Yoğun Bakım Ünitelerimizde Perkütan Dilatasyonel Trakeostomi Açılan Hastaların Retrospektif Analizi

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Abstract

Aim: Tracheostomy is a method frequently applied in intensive care units with the indication of prolonged intubation.[1] Our aim in this study is to retrospectively analyze the percutaneous dilatational tracheostomy (PDT) cases performed in our clinic within 1 year.

Material and Method: It's analyzed the patients who underwent PDT in Sakarya Training and Research Hospital, Anesthesia Intensive Care Unit between January 2019 and December 2019. Each patient's age, gender, diagnosis of intensive care admission, use of anticoagulant drugs, and APACHE II score were recorded. Then, the day of tracheostomy procedure, complications, total intensive care unit stay, and the patient's discharge from the intensive care unit were evaluated.

Results: A total of 79 patients were found to have undergone PDT. It was observed that the mean age of the patients was 66.56±17.83 and 48 (60.8%) were male. It was observed that 25(31.6%) of the patients were admitted to the intensive care unit with the diagnosis of postresuscitation syndrome, 17 (21.5%) cerebrovascular accident, and 15(19%) pneumonia. The mean APACHE II scores of the patients were 24.1±6.2, and 16(20.3%) patients were discharged. The median PDT procedure day was 19.5[12-30]. It was determined that only 2 of the patients had minor and 1 major and 3 (3.9%) patients did not develop any other complications apart from the bleeding related complication.

Conclusion: In our study, although 66 (83.6%) of the patients who underwent PDT procedure received anticoagulant-antiaggregant treatment, postoperative bleeding rates were observed to be quite low in accordance with the literature.

Keywords: Intubation, percutaneous tracheostomy, intensive care

Öz

Amaç: Trakeostomi yoğun bakım ünitelerinde uzamış entübasyon endikasyonu nedeniyle sıklıkla uygulanan bir yöntemdir. Entübasyon süresinin 7 günden uzun olması sonucu larengeal hasar, glottik-subglottik stenoz ve vokal kord paralizileri görülebilmektedir. Bu çalışmadaki amacımız kliniğimizde 1 yıl içinde uygulanmış olan perkütan dilatasyonel trakeostomi (PDT) olgularını retrospektif olarak analiz etmektir.

Gereç ve Yöntem: Ocak 2019 ile Aralık 2019 yılları arasında Sakarya Eğitim ve Araştırma Hastanesi, Anestezi Yoğun Bakım Ünitesi'nde PDT işlemi uygulanan hastalar incelendi. Her hastanın yaş, cinsiyet, yoğun bakıma yatış tanısı, antikoagülan ilaç kullanımı, APACHE II skoru kaydedildi. Daha sonra trakeostomi açılma günü, gelişen komplikasyonlar, toplam yoğun bakım yatış günü ve hastanın yoğun bakımdan taburculuğu değerlendirildi.

Bulgular: Toplamda 79 hastaya PDT işlemi uygulanmış olduğu saptandı. Hastaların yaş ortalamasının 66,56±17,83 olduğu ve 48 (%60,8)'inin erkek olduğu gözlemlendi. Hastaların, 25(%31,6)'inin postresüsitasyon sendromu, 17(%21,5)'inin serebrovasküler olay ve 15(%19)'inin pnömoni tanısı ile yoğun bakıma kabul edildiği gözlemlendi. Hastaların ortalama APACHE II skorları 24,1±6,2 olup 16(%20,3) hastanın taburcu edildiği saptandı. Hastalara ortalama trakeostomi açılma günü 19,5[12-30] olup hastaların pek çoğunun antikoagülan tedavi aldığı gözlemlendi. Hastalardan sadece 2 sinde minör 1 inde majör olmak üzere 3(%3,9) hastada gelişen kanama ile ilgili komplikasyon dışında başka komplikasyon gelişmediği saptandı.

Sonuç: Perkütan yolla uygulanan trakeostomi işlemine bağlı ciddi komplikasyonlar gelişebilmektedir. Bizim çalışmamızda PDT işlemi uyguladığımız hastaların 66 (%83,6) tanesi antikoagülan-antiagregan tedavi almasına rağmen postoperatif kanama oranlarının literatüre uygun olarak oldukça az olduğu gözlemlendi.

Anahtar Kelimeler: Entübasyon, perkütan trakeostomi, yoğun bakım



INTRODUCTION

Tracheostomy is a method frequently applied in intensive care units due to the indication of prolonged intubation.^[1] Laryngeal damage, glottic and subglottic stenosis, and vocal cord paralysis can be seen with prolongation of the intubation period for more than 7 days.^[2] With tracheostomy, aspiration of the airways is facilitated, a safe airway is provided, the patient's dryness and opening of the mouth are closed, the patient can be fed by the oral route, patient comfort increases, and airway resistance decreases. Absolute contraindications for percutaneous tracheostomy are cervical instability, coagulopathy, and infection at the surgical site. Relative contraindications are short neck, morbid obesity, minimal neck extension or tracheal deviation, and lung disease that cannot tolerate the apnea period.^[3] Early complications of the percutaneous tracheostomy procedure are bleeding, incorrect placement of the tracheostomy tube, and obstruction. Bleeding is usually self-limiting and occurs as a result of the inability to discontinue the use of anticoagulants in intensive care patients.^[4]

The tracheostomy procedure has been practiced since the 1930s, and the percutaneous dilatational tracheostomy technique was developed in the 1990s. In our clinic, percutaneous tracheostomy is performed with the technique described by Grigg et al.^[5] accompanied by fiberoptic bronchoscopy. Our aim in this study is to retrospectively analyze the percutaneous tracheostomy procedures performed in our clinic in the last three years, and to analyze the success and complications of the procedure.

MATERIAL AND METHOD

Our study is a cross-sectional descriptive study and the approval of Sakarya University Faculty of Medicine Non-interventional Clinical Research Ethics Committee (Date: 09.11.2020, Decision No: 610) was obtained. The data of patients in the Anesthesiology Intensive Care Unit of Sakarya University Training and Research Hospital between January 2019 and December 2019 were analyzed retrospectively.

Inclusion criteria for the study were determined as patients aged 18-80 years who had tracheostomy during hospitalization in the anesthesia intensive care unit. Patients who had a tracheostomy procedure performed by another service or who had a tracheostomy on admission to the intensive care unit were excluded from the study.

Age, gender, diagnosis of intensive care admission, anticoagulant drug use, Acute Physiology, Assessment and Chronic Health Evaluation (APACHE II) score at admission to the intensive care unit were recorded for each patient. Then, the day of tracheostomy opening, the complications of the procedure, the total day of hospitalization in the intensive care unit, and the patient's discharge status from the intensive care unit were recorded. The final state of the patient was evaluated by dividing it into two as discharged and excitus.

Percutaneous dilatational tracheostomy is performed in our clinic with the method described by Grigg et al. in 1990. PDT procedure "Percutaneous tracheostomy kit" (Portex) set was used. The patient's shoulder was supported and the neck was extended. The FiO₂ was set to 100% in the mechanical ventilator, and the patient's peripheral oxygen saturation, blood pressure, and heart rate were closely monitored throughout the procedure. The patient was administered 1-2 mcg/kg fentanyl, 0.1 mg/kg midazolam and 0.6 mg/kg rocuronium. The surgical area was cleaned with an antiseptic solution and covered with perforated green covers. The area to be operated was determined and local anesthetic injection was performed. The intubation tube was pulled to the level of the vocal cord. Then, the fiberoptic bronchoscope was advanced through the intubation tube and the trachea was viewed from the inside throughout the procedure. Stabilizing the trachea with a nondominant hand 1.-2. Or 2.-3. Trachea was entered with a 14 G iv cannula at the appropriate place from the tracheal rings. The location of the needle was confirmed by aspiration of air, and a guide wire was inserted through the cannula. The periphery of the guide wire was dilated by visualizing the inside of the trachea with bronchoscopy. A tracheostomy tube was inserted over the guide and the cuff was inflated. The location of the tracheostomy was confirmed by bronchoscopy.

Statistical Analysis

SPSS 20 package program was used for statistical analysis of the data. Qualitative data were expressed as numbers and percentages. While quantitative data with normal distribution were expressed as mean and standard deviation, data with non-normal distribution were given as median and interquartile range. $p < 0.05$ was considered significant.

RESULTS

The data of the patients who were hospitalized in the Anesthesia Intensive Care Unit of Sakarya University Training and Research Hospital between January 2019 and December 2019 were analyzed retrospectively, it was determined that a total of 79 patients underwent percutaneous dilatational tracheostomy. It was observed that 31 (39.2%) of these patients were female, 48 (60.8) were male, and the mean age was 66.56 ± 17.83 . When the diagnosis of intensive care hospitalization of the patients was evaluated, it was seen that the majority of them consisted of 25 (31.6%) postcardiopulmonary arrest patients and 17 (21.5%) patients who had had a cerebrovascular accident. Apart from these, 15 (19%) patients due to pneumonia, 9 (11.4%) patients due to trauma, 6 (7.6%) patients due to malignancy, and postoperative 4 (5.1%) patients were followed in the intensive care unit and percutaneous dilatation was performed.

The median value for hospitalization in the intensive care unit was 53.5 [32-121] days, and the patients' admission glasgow coma scale was 5 [3-8]. The mean APACHE score of the

patients was 24.1±6.2, and the expected death rate was found to be as high as 55.3±20.6% on average. When the outcome of intensive care hospitalization of the patients was evaluated, it was seen that the mortality was 63 (79.7%) and only 16 (20.3%) patients were discharged (**Table 1**).

Table 1. Demographic Data of Patients Who Had Percutaneous Dilatational Tracheostomy (n=79)

Age (years)	66.56±17.83
Gender, n(%)	
Female	31 (39.2)
Male	48 (60.8)
Hospitalization diagnosis, n(%)	
Post CPR	25 (31.6)
Cerebrovascular event	17 (21.5)
Pneumonia	15 (19)
Trauma	9 (11.4)
Malignancy	6 (7.6)
Postoperative	4 (5.1)
Other*	3 (3.9)
Intensive care day	53.5 (32-121)
Glasgow coma scale	5 (3-8)
APACHE II score	24.1±6.2
Expected death rate	55.3±20.6
Final state, n(%)	
Excitus	63 (79.7)
Discharge	16 (20.3)

*: neuroleptic malignant syndrome, Chronic renal failure, acute renal failure. Mean±SD, Median [Q1-Q3], n (%).

The PDT procedure was evaluated, it was seen that the median application day was 19.5 [12-30]. INR, PT, APTT and platelet counts, which are among the bleeding parameters evaluated on the day of the procedure, were found to be at normal levels. Before the procedure, 54 (68.4%) of the patients were using enoxaparin, 12 (15.2%) acetylsalicylic acid and 6 (7.6%) clopidogrel. 7 (8.9%) of the patients were not using any anticoagulant. Minor bleeding developed in 2 (2.6%) patients and stopped spontaneously, major bleeding developed in 1 (1.3%) patient, and bleeding control was achieved with surgical cauterization. It was observed that only 1 patient encountered a granulomatous mass during bronchoscopy during the procedure and the procedure was terminated (**Table 2**).

Table 2. Drugs used by the patients, laboratory parameters and complications

Tracheostomy procedure day	19.5 (12-30)
Anticoagulant use, n(%)	
Enoxaparin	54 (68.4)
Acetylsalicylic acid	12 (15.2)
Clopidogrel	6 (7.6)
No	7 (8.9)
INR	1.2 (1-1.2)
PT	14.4±2.7
APTT	28.9 (25-33)
Platelet count	274±121
Complication, n(%)	
Minor Bleeding	2 (2.6)
Major Bleeding	1 (1.3)
Failed operation	1 (1.3)

Mean±SD, Median [Q1-Q3].

DISCUSSION

In our study, we retrospectively analyzed 79 patients who underwent PDT procedure within 1 year. It was observed that the patients had high APACHE scores, expected death rates and ages, and were mostly composed of patients with post-cardiac arrest syndrome. The median PDT day of the patients was 19.5 [12-30], while the total intensive care unit hospitalization day was 53.5 [32-121].

While the bleeding parameters of the patients were found to be normal before the procedure, it was observed that most of them were using anticoagulants. It was found that only 1 (1.3%) of the patients had severe bleeding and 1 (1.3%) of them failed. According to the study conducted by Kirca et al., which included 442 patients, it was determined that the most common complication was early bleeding and its frequency was 1.8%.^[6] In an internationally published article, bleeding rates after PDT were found to be even lower (0.6–5.0%).^[7] In our study, although 66 (83.6%) of the patients who underwent PDT procedure received anticoagulant-antiaggregant treatment, postoperative bleeding rates were observed to be quite low (1.3%) in accordance with the literature.

PDT is frequently performed in patients hospitalized in the intensive care unit due to the indication of prolonged intubation. Although there is no consensus regarding the application day of the PDT procedure, it is generally recommended to open a tracheostomy for intubations longer than 14 days. Since major complications such as tracheal stenosis and ventilator-associated pneumonia may develop as a result of late tracheostomy opening after prolonged intubation, this period is tried to be kept short.^[8,9]

However, this period is longer than expected due to both the process of obtaining consent from the relatives of the patient and the weaning attempts of the patient. In our study, the procedure day of tracheostomy was determined as 19.5 [12-30]. In a study conducted in our country on this subject, the opening day of tracheostomy was reported as 18±8 days, and the authors mentioned similar problems related to the prolongation of the PDT procedure.^[10] On this subject, the nationwide PDT procedures performed by Gucyetmez et al, in 2018 were examined, and they reported that although PDT was applied in the 2nd and 3rd weeks of hospitalization, PDT could be applied in 15% of the patients after the 3rd week.^[11] In addition, coronary angiography and stenting procedures were applied to the patients who were being followed up in our intensive care unit with the diagnosis of postresuscitation syndrome after myocardial infarction, and patients were using both ASA and clopidogrel. In these patients, the PDT application day was determined to be long, since 30 days could be waited and the PDT procedure could be applied later.

Although bleeding is the most common complication of the tracheostomy procedure, the most feared complication is the development of a tracheoesophageal fistula. In applications performed with fiberoptic bronchoscopy, posterior wall penetration is very rare, since the needle is inserted by

observing the posterior tracheal wall. When the studies reported in the literature were examined, it was reported that complications such as misplacement and airway obstruction were also encountered.^[12] However, nowadays, PDT is recommended to be performed with bronchoscopy, and the incidence of mortal complications such as tracheoesophageal rupture has decreased considerably.^[13]

There are also applications of PDT accompanied by ultrasonography, and one of the largest studies in the literature on this subject is the TRACHUS study, which included approximately 4,900 patients.^[14] In the study, PDT procedures performed under ultrasound guidance and bronchoscopy were examined, and it was concluded that both techniques were not superior to each other. However, ultrasound-guided PDT application is more complex than bronchoscopy-guided application and the learning curve has been found to be wider.^[15]

The limitation of our study is that ultrasound was not used in our study.

CONCLUSION

PDT is a procedure that is frequently applied in intensive care units due to its low complication rates and the fact that it can be performed at the bedside without the need for patient transport. Complication rates were further reduced with bronchoscopy-guided application.

ETHICAL DECLARATIONS

Ethics Committee Approval: Approval of Sakarya University Faculty of Medicine Non-interventional Clinical Research Ethics Committee (Date: 09.11.2020, Decision No: 610)

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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