DOI: 10.37990/medr.1349191 Med Records 2023;5(Suppl 1):165-8

MEDICAL RECORDS-International Medical Journal

Research Article

Five-Years Intensive Care Percutaneous Tracheostomy Results

Murat Bicakcioglu

İnönü University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Malatya, Türkiye

Abstract

Aim: Tracheostomy is an interventional procedure frequently performed on critically ill patients in the intensive care unit (ICU). The purpose of this study is to report the characteristics of patients undergoing percutaneous tracheostomy in intensive care.

Material and Methods: Cases admitted to intensive care between 2018 and 2022 and subjected to percutaneous tracheostomy were included. Cases involving surgical tracheostomy were excluded. We scanned the patients' demographic and clinical characteristics, follow-up characteristics in intensive care, tracheostomy complications, and discharge characteristics. Patients were also divided into surviving and non-surviving groups and compared.

Results: One hundred seven patients were included in the study. Men represented 64.5% of the patients, and the mean age of the entire patient group was 61.5 years. Tracheostomies were most frequently performed due to prolonged endotracheal intubation. Neurological diseases were the most common diagnoses, and the most frequent complication was bleeding. The groups differed in terms of age, comorbidity, presence of tracheostomy at time of discharge from intensive care, and anticoagulant use. The mortality rate was 69.2%.

Conclusion: We think that percutaneous tracheostomy can be employed because it can be performed at the point of care in intensive care, and due its ease of application and low complication rate.

Keywords: Tracheostomy, percutaneous, intensive care

INTRODUCTION

Tracheostomy refers to the creation of an opening in the tracheal cavity with a cutaneous incision to the anterior wall of the trachea. It is known to have been performed by the ancient Egyptians, but surgical tracheostomy was first described by Jackson in 1909 (1). Tracheostomy has been a longstanding and frequently performed intervention for critical intensive care unit (ICU) patients. Percutaneous dilatational tracheostomy (PDT) over a guidewire was described by Ciaglia in 1985. Surgical tracheostomy involves the dissection of the pretracheal tissues, followed by an incision to the trachea and visual insertion of a tracheostomy cannula. In contrast, PDT involves blunt dissection of pretracheal tissues, followed by tracheal expansion with a guidewire and insertion of the tracheostomy cannula using the Seldinger technique (2). PDT has a low complication rate, does not require an operating room setting, and can be easily performed at the point of care (3).

Prolonged endotracheal intubation can involve complications such as laryngeal damage, vocal cord paralysis, glottic and subglottic stenosis, infection, and tracheal damage (tracheomalacia, tracheal dilatation, and tracheal stenosis) (4). PDT is frequently performed in intensive care for the purpose of avoiding these complications, facilitating airway maintenance, achieving a safer airway in patient mobilization and transfer, and to facilitate oral nutrition (5). However, despite all these advantages PDT is an invasive procedure, with complications ranging from minor bleeding to mortality (6).

The purpose of this study was to review tracheostomy procedures performed in the ICU and the characteristics of the patients involved in a retrospective manner, and to report our results.

MATERIAL AND METHOD

Following receipt of İnönü University Health Sciences

CITATION

Bicakcioglu M. Five-Years Intensive Care Percutaneous Tracheostomy Results. Med Records. 2023;5(Suppl 1):165-8. DOI:1037990/medr.1349191

Received: 24.08.2023 **Accepted:** 19.09.2023 **Published:** 11.10.2023

Corresponding Author: Murat Bicakcioglu, İnönü University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Malatya, Türkiye

E-mail: muratisin@msn.com

Non-Interventional Research Ethical Committee approval, patients aged over 18, admitted to the ICU between January 2018 and December 2022, and undergoing tracheostomies were screened. The patients' demographic data, diagnoses, comorbidities, lengths of hospitalization, APACHE II and SOFA scores, indications for tracheostomy opening, the time and day of tracheostomy opening, duration of mechanical ventilation, time spent tracheostomized, whether the patient was tracheostomized on departure from hospital, tracheostomy-related complications, anticoagulant use, and type of discharge from hospital were screened retrospectively and recorded. The patients were also compared by being divided into two groups, surviving and non-surviving. Surgically opened tracheostomies were excluded.

Candidates for tracheostomy in our unit are generally required to have routine activated thromboplastin and prothrombin times less than 1.5 times the control values, a platelet value above 50,000 (mm^3), and a normal tracheal and neck structure. Ultrasonographic assessment and airway examination are performed, and the intervention site is selected through ultrasonography (USG). Consultation for surgical tracheostomy is performed for cases that do not meet these criteria. Patients receive oxygenation with an FiO2 of 100% during tracheostomy. Anesthesia is administered with intravenous anesthetics such as midazolam and propofol. Analgesia is administered with an opioid analgesic, most commonly fentanyl. Local anesthesia is also used for analgesia. In addition, all patients are monitored throughout the procedure by means of electrocardiography, pulse oximetry, end-tidal carbon dioxide pressure, and invasive/non-invasive arterial pressure. Mechanical ventilation is performed in either volume- or pressure-controlled mode. The patient is first positioned, with a pillow beneath the head, after which PDT is performed using the Griggs technique. The endotracheal cuff is deflated, pulled beneath the vocal cord, and re-inflated. Tracheostomy is performed at an appropriate location determined by USG after the second tracheal ring. After the procedure, lung ventilation is assessed through auscultation, and chest X-rays are taken.

Biostatistical Data Analysis

The variables in the study were summarized as number (percentage) values. Normality of distribution of quantitative variables were evaluated using the Shapiro-Wilk test. Non-normally distributed quantitative data were summarized as median (minimum-maximum) values and normally distributed data as mean± standard deviation. The Mann-Whitney U test, independent sample t test, Pearson's chi-square test, the Yates corrected chi-square test, and Fisher's exact test were used as appropriate during statistical analyses. p values <0.05 were regarded as statistically significant. All analyses were performed on IBM SPSS Statistics version 26.0 for Windows software (NY, USA).

RESULTS

One hundred seven patients underwent percutaneous tracheostomy during the study period. Men represented 69 (64.5%) of the 107 patients, and the mean age of the entire patient group was 61.49±18.95 years. The patients' demographic and clinical characteristics are shown in Table 1.

Table 1. Patients' demographic and clinical data

	Mean±SD	Median (Min-Max)
Age (years)	61.49±18.95	63 (20-93)
Length of hospitalization (days)	71.15±59.9	57 (15-441)
APACHE	22.69±9.24	22 (2-59)
SOFA	4.93±2.61	4 (0-16)
Day of tracheostomy opening	21.79±9.58	21 (4-60)
Duration of MV (days)	67.57±55.69	54 (15-441)

The four most common diagnoses at the time of presentation were diseases of neurological origin (23.4%), return of spontaneous circulation after cardiac arrest (2.4%), infection (20.6%), and trauma (18.7%). Other conditions included cardiac conditions (3.7%), respiratory system diseases (4.7%), malignancy (1.9%), intoxications (2.8%), and post-surgical causes (1.9%). Comorbidity was present in 69 patients - respiratory diseases (17.8%), neurological disease (17.8%), hypertension (18.7%), coronary artery disease in (16.8%), diabetes mellitus (11.2%), chronic kidney failure (2.1%), and malignancy (0.9%). Late tracheostomy was performed in 89.7% patients, and re-intubation was observed in 19.6%. Anticoagulant use was present in 39.3% patients.

The most common indication for tracheostomy opening was prolonged intubation 78.5%, followed by prolonged mechanical ventilation requirements (16.8%) for reasons such as maxillofacial trauma. The most frequent complications were minor bleeding, observed in four (3.7%) patients, infection around the tube in 1.9%, subcutaneous emphysema in 0.9%, and trachea-esophageal fistula in 0.9%. The total complication rate was 7.4%. No procedure-related pneumothorax or mortality occurred in any patient. The patients' discharge status is summarized in Table 2.

Table 2. Patients' ICU discharge status

		n	%
Form of discharge	Transfer to the ward	2	1.9
	Transfer to intensive care	5	4.7
	Transfer to the palliative unit	4	3.7
	Discharge to home	22	20.6
	Exitus	74	69.2

Significant differences were determined between the surviving and non-surviving groups in terms of age (p=0.006), comorbidity (p=0.037), presence of tracheostomy at the time of discharge (p=0.001), and anticoagulant use (p=0.019), while the other parameters were similar between the groups (p<0.05) (Tables 3 and 4).

Table 3. A comparison of the surviving and non-surviving groups

	Group				
	Surviving		Non-surviving		
	Mean±SD	Median (Min-Max)	Mean±SD	Median (Min-Max)	p
Age (years)	53.79±17.93	53 (20-82)	64.92±18.49	67 (22-93)	**0.006***
Length of hospitalization (days)	82.45±75.38	66 (21-441)	66.11±51.34	53 (15-365)	0.125*
APACHE	21.24±6.95	21 (5-35)	23.34±10.07	23.5 (2-59)	0.281**
SOFA	4.21±1.87	4 (0-11)	5.24±2.84	5 (0-16)	0.053*
Day of tracheostomy opening (days)	21.91±11.2	21 (5-60)	21.74±8.85	21 (4-45)	0.853*
Duration of MV (days)	75.45±75.83	60 (19-441)	64.05±44.06	51 (15-270)	0.513*

SD: standard deviation, *: Mann Whitney U test, **: Independent samples t-test MV: Mechanical ventilation

Table 4. Comparison between the surviving and non-surviving groups

Variables	Group		p
	Surviving (n, %)	Non-surviving (n, %)	
Sex			
Male	22 (66.67)	47 (63.51)	0.923**
Female	11 (33.33)	27 (36.49)	
Comorbidity	16 (48.48)	53 (71.62)	**0.037****
Tracheostomy timing			
Early	5 (15.15)	6 (8.11)	0.309***
Late	28 (84.85)	68 (91.89)	
Re-intubation	4 (12.12)	17 (22.97)	0.298**
Tracheostomy on discharge from intensive care	23 (69.70)	73 (98.65)	**<0.001****
Anticoagulation	7 (21.21)	35 (47.30)	**0.019****

* Pearson chi square, ** Yates's correction chi-square test, ***: Fisher's exact chi square, CPR: Cardiopulmonary resuscitation

DISCUSSION

PDT is widely used in mechanically ventilated patients in the ICU, increasingly replacing surgical tracheostomy. PDT is performed for several reasons, including facilitation of weaning, facilitation of tracheobronchial cleansing, reducing the risk of aspiration, reducing sedation requirements, for airway protection in patients due to be mobilized, in cases of prolonged endotracheal intubation, and for patients requiring long-term mechanical ventilation. Yeşiller et al. reported prolonged mechanical ventilation and prolonged coma as the most frequent indications for tracheostomy opening (1). Yeniaras et al. reported that prolonged endotracheal intubation was the reason for tracheostomy in 104 (89%) out of 114 patients undergoing the procedure in the ICU (7). Tracheostomy was also most frequently performed due to prolonged endotracheal intubation in the present study. The second most common reason in this study was long-term mechanical ventilation, another reason being maxillofacial trauma.

Early tracheostomy is reported to reduce lengths of hospital stay (8). In the SETPOINT2 study, Bosel et al. examined the effect on prognosis of early tracheostomy in patients with severe stroke, but reported no improvement in functional outcomes. Early tracheostomy was performed after a median four days in that study, compared to a median 11 days in the standard group (9). In their meta-analysis, Andriolo et al. reported that there was insufficient evidence for the effect of early and late tracheostomy opening on mortality, and that on the basis of the current evidence, early tracheostomy could go no further than being a recommendation in terms of reducing mortality (10). The length of hospital stay in the present study was approximately 71 days, and the mean time to tracheostomy opening was 21.8 days. We concluded that early or late tracheostomy had no significant effect on mortality.

Tracheostomy is generally performed in intensive care patients due to respiratory and neurological diseases (3). In a retrospective study of 38 patients who underwent tracheostomy using the Griggs technique, Öncül et al. described neurological problems as the most frequent reason for tracheostomy opening, followed by respiratory causes (11). Neurological pathologies were the most frequent cause in Yeşiller et al.'s study, followed by respiratory causes (1). Neurological problems were also the most frequent cause in the present study, followed by patients with spontaneous return of circulation following cardiac arrest.

The tracheostomy stoma generally heals within one week. Complications arising within the first week are considered early, while those occurring later are

termed late. Complications include bleeding, infection, posterior wall damage, obstruction of the tracheostomy tube, subcutaneous emphysema, tube displacement, pneumothorax, and tracheal stenosis (12). Complications in the current study included infection, posterior wall damage, subcutaneous emphysema and, most frequently, bleeding.

Mortality rates in tracheostomized patients in the literature range between 40% and 90% (3,13). The mortality rate in the present study was 69.2%. We also observed differences between the groups in terms of patients' ages, comorbidities, presence of tracheostomy on discharge, and anticoagulant use. This variation shows the presence of a more sever manifestation in the non-surviving patient group.

The main limitation of our study was that it was retrospective. In addition, the fact that it is a single center and the study data were obtained from patient files can be listed as other limitations.

CONCLUSION

PDT has finally assumed its proper place in intensive care and has become a frequently performed technique. Although a high risk of complications and mortality may be expected in the light of the patient group to which it is applied, we think that PDT can be safely applied to patients in the ICU due to its low complication and mortality rate and the fact it can be performed at the point of care, and because it increases airway control and permits easier removal of tracheal secretions.

Financial disclosures: *The authors declared that this study has received no financial support.*

Conflict of Interest: *The authors declare that they have no competing interest.*

Ethical approval: *Before the study, ethical approval was obtained from the İnönü University Health Sciences NonInterventional Clinical Research Ethics Committee (No: 2023/4664).*

REFERENCES

1. Yesiller FI, Sendur UG. Our experiences of tracheostomy in intensive care unit. Aegean J Med Sci. 2018;2:1-5.
2. Mehta C, Mehta Y. Percutaneous tracheostomy. Ann Card Anaesth. 2017;20:S19-25.
3. Canakci E, Sahin EA, Kilic K. Percutaneous tracheostomy with Grigss dilating forceps technique: Retrospective analysis of 60 intensive care patients. Ege Journal of Medicine. 2016;55:184-9.
4. Whited RE. A prospective study of laryngotracheal sequelae in long-term intubation. Laryngoscope. 1984;94:367-77.
5. Ersoy A, Ali A, Unlu N, et al. 53 percutaneous tracheostomy cases performed with griggs method. Okmeydanı Med J. 2012;28:134-7.
6. Friedman Y. Percutaneous versus surgical tracheostomy: the continuing saga. Crit Care Med. 2006;34:2250-1.
7. Yeniaras E, Cebecik Teomete G, Karabag G et al. Percutan dilational tracheostomy; our experience. İstanbul Med J 2007;8:7-12.
8. Griffiths J, Barber VS, Morgan L et al. Systematic review and meta-analysis of studies of the timing of tracheostomy in adult patients undergoing artificial ventilation. BMJ. 2005;330:1243.
9. Bösel J, Niesen WD, Salih F et al.; SETPOINT2 and the IGNITE Study Groups. Effect of early vs standard approach to tracheostomy on functional outcome at 6 months among patients with severe stroke receiving mechanical ventilation: the SETPOINT2 randomized clinical trial. JAMA. 2022;327:1899-909.
10. Andriolo BN, Andriolo RB, Saconato H, et al. Early versus late tracheostomy for critically ill patients. Cochrane Database Syst Rev. 2015;1:CD007271.
11. Oncul S, Yilmaz M, Gaygusuz EA, et al. Our experience in percutaneous tracheostomy which performed by Griggs method: 38 cases. Kocaeli Med J. 2014;3:1-4.
12. Fernandez-Bussy S, Mahajan B, Folch E et al. Tracheostomy tube placement: early and late complications. J Bronchology Interv Pulmonol. 2015;22:357-64.
13. Cicek M, Gedik E, Yücel A et al. Our conclusions at percutaneous tracheostomy performed with griggs technique. İnönü Üniversitesi Tıp Fakültesi Dergisi. 2007;14:17-20.