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Tracheostomy Preferences of Anesthesiology and Reanimation Specialists in Türkiye

Türkiye'deki Anesteziyoloji ve Reanimasyon Uzmanlarının Trakeostomi Tercihleri

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ABSTRACT

Objective: There has been a trend toward percutaneous tracheostomy in recent years, as anesthesiologists have been interested in this and learned the techniques. We aimed to investigate the perspectives of anesthesiology and reanimation specialists in our country regarding tracheostomy.

Methods: A survey was conducted on Anesthesiology and Reanimation specialists, which included questions of tracheostomy experience, preferences. Chi-square or Fisher tests were used for analysis.

Results: A total of 213 people (51.2% women) participated, where 29% preferred tracheostomy within the two weeks of intubation, while 66% preferred it later. While 87% of the participants preferred percutaneous tracheostomy, 11% preferred surgical technique. For the specialists who preferred tracheostomy within the first two weeks of intubation, the rate of working in a university hospital was significantly higher (p=0.034). Of those who preferred surgical tracheostomy 91.3% had 0-10 times tracheostomy experience. While 89% of the participants preferred needle, 7% preferred scalpel cricothyrotomy.

Conclusion: Tracheostomy is a commonly used procedure by anesthesiologists and intensivists. Bronchoscopy and ultrasonography are frequently used auxiliary tools. University hospital physicians often prefer tracheostomy within the first two weeks of intubation. Those with more tracheostomy experience mostly use the percutaneous method. Contrary to the current guidelines, needle method is preferred for cricothyrotomy in our country.

Keywords: Complication, experience, percutaneous, surgery, tracheostomy

ÖZ

Amaç: Son yıllarda anestezistlerin bu konuya ilgi duyması ve teknikleri öğrenmesi ile perkütan trakeostomiye doğru bir eğilim olmuştur. Ülkemizdeki anesteziyoloji ve reanimasyon uzmanlarının trakeostomiye bakış açılarını araştırmayı amaçladık.

Yöntem: Anesteziyoloji ve Reanimasyon uzmanlarına trakeostomi deneyimi ve tercihleri ile ilgili soruları içeren bir anket uygulandı. Analiz için ki-kare veya Fisher testleri kullanıldı.

Bulgular: Toplam 213 kişinin (%51,2'si kadın) katıldığı çalışmada, katılımcıların %29'u entübasyondan sonraki iki hafta içinde trakeostomiyi tercih ederken, %66'sı daha sonra tercih etmiştir. Katılımcıların %87'si perkütan trakeostomiyi tercih ederken, %11'i cerrahi tekniği tercih etmiştir. Entübasyondan sonraki ilk iki hafta içinde trakeostomiyi tercih eden uzmanların üniversite hastanesinde çalışma oranı anlamlı şekilde yüksekti (p=0.034). Cerrahi trakeostomiyi tercih edenlerin %91,3'ü 0-10 kez trakeostomi deneyimine sahipti. Katılımcıların %89'u iğne, %7'si skalpel krikotirotomiyi tercih etmiştir.

Sonuç: Trakeostomi, anestezistler ve yoğun bakım uzmanları tarafından yaygın olarak kullanılan bir prosedürdür. Bronkoskopi ve ultrasonografi sıklıkla kullanılan yardımcı araçlardır. Üniversite hastanesi hekimleri genellikle entübasyonun ilk iki haftası içinde trakeostomiyi tercih etmektedir. Trakeostomi deneyimi daha fazla olanlar çoğunlukla perkütan yöntemi kullanmaktadır. Güncel kılavuzların aksine ülkemizde krikotirotomi için iğne yöntemi tercih edilmektedir.

Anahtar sözcükler: Komplikasyon, deneyim, perkütan, cerrahi, trakeostomi

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INTRODUCTION

Tracheostomy is one of the oldest known surgical applications. It is possible to find traces of tracheostomy even on Egyptian tablets from 3600 BC (1,2). Tracheostomy gained popularity with the introduction of the standardized open surgical technique by Chevalier Jackson at the beginning of the twentieth century (2). In 1955 Shelden et al. defined the technique of percutaneous placement of the tracheostomy tube as an alternative to the surgical technique (3). With time different percutaneous dilatational tracheostomy (PDT) techniques such as Ciaglia, Griggs, Fantoni, percutwist and balloon dilation techniques have been developed (4).

Tracheostomy indications can mainly be divided into two broad classes: relief of upper airway obstruction and an alternative method to prolonged intubation. Other indications can be listed as increased comfort and mobilization during mechanical ventilation, severe obstructive sleep apnea, bilateral vocal cord paralysis and respiratory failure due to neuromuscular disease (1). It can also be life-saving in emergency situations where airway control is lost and standard techniques such as balloon-valve-mask, laryngeal mask or endotracheal intubation fail. In these cases, surgical tracheostomy or surgical incision of the cricothyroid membrane, called cricothyrotomy, are more appropriate approaches instead of PDT (5). Although PDT can be applied in emergency situations as well, it is usually performed under more controlled conditions.

In the case of prolonged intubation, tracheostomy has advantages over endotracheal intubation. With the tracheostomy application, the patients' mobilization and comfort increase, their oral hygiene improves, and they have the chance to eat and talk (6). There are studies demonstrating less need for sedative medication, shorter sedation times, and less unplanned extubation with tracheostomy application (7,8). However, there is no evidence yet to show positive effects on outcome measures such as ventilator-associated pneumonia and patient mortality (1).

Auxiliary tools such as ultrasonography or bronchoscopy are used in the PDT procedure. Ultrasonographic anatomy of the airway has been known since 1995, and Sustic et al. performed the first ultrasound-guided PDT procedure in 1999 (9). The use of ultrasonography has advantages such as detecting pretracheal vascular structures, determining the appropriate puncture site, selecting the appropriate tube size, and provision of real-time display of the needle. Bronchoscopy is another frequently used auxiliary tool during PDT. Many clinics use it routinely. There are studies demonstrating that the process is shortened with the use of bronchoscopy (10).

Complications of tracheostomy include bleeding, wound infection, subcutaneous emphysema, pneumothorax, tube obstruction, incorrect lumen placement, and esophageal injury. In addition, arrhythmia, and especially with long procedures hypoxemia may develop during the procedure, which can eventually result in cardiac arrest. Long-term complications are dysphagia, tracheomalacia, tracheo-innominate artery fistula, tracheo-esophageal fistula, granuloma formation and tracheal stenosis. Bleeding rates are reported to be between 0.6-5%, which are mostly minor (11). Another complication presenting with massive bleeding is tracheo-innominate artery fistula. Although rare, it usually presents with self-limiting mild and then severe bleeding that develops after 1-3 weeks after the tracheostomy procedure. Placement of the tracheostomy tube in the lower levels of the trachea, high cuff pressure and repetitive head movements of the patient are risk factors for this fistula formation. Anesthesiologists should well know the management of this complication. The tracheostomy tube should be removed, the patient should be intubated orally, and the cuff of the tube should be inflated distal to the bleeding area. If necessary, hemostasis should be achieved by applying finger pressure through the stoma, while the patient is transferred to the operating room for surgical repair (1). The high cuff pressure we mentioned above (i.e., over 20-25 mmHg) leads to another long-term complication, tracheal stenosis. When we look at studies comparing surgical and percutaneous techniques in terms of tracheal stenosis development, it seems that there are similar rates with both techniques (12). Another complication is infection. Compared with surgical tracheostomy, PDT has been shown to have a lower rate of infectious complications such as peristomal infection and cellulitis (13). Although it has many advantages over surgical tracheostomy, complications such as tracheal laceration, aortic damage and esophageal perforation may also develop with PDT. Subcutaneous emphysema and pneumothorax are among other complications (4). The rates of these complications differ with surgical and percutaneous dilatational techniques.

Our aim in this study was to learn the tracheostomy preferences of Anesthesiology and Reanimation specialists working in our country. We aimed to elicit which method they prefer, surgical or percutaneous; on which day of intubation they perform tracheostomy; what they use as auxiliary tools; what complications they encounter; and which method they use for cricothyrotomy as well. We also aimed to investigate the relationship of these preferences with the institution, seniority, and tracheostomy practice experience.

MATERIAL and METHODS

For this descriptive study Anesthesiology and Reanimation specialists in different cities of our country were contacted after obtaining approval from the Marmara University Faculty of Medicine Clinical Research Ethics Committee (Date:

05.03.2021 / Protocol No: 09.2021.334). The participants were contacted by sending a questionnaire via an e-mail or similar messaging services. An online survey platform (https://tr.surveymonkey.com) was used for the survey, and at the beginning of the survey the participants were informed that the information they provide will be used to contribute to the scientific literature. The identity information of the participants was not asked.

The survey consisted of the questions of the demographics of the participants; institutions where they work; expertise and tracheostomy experience; tracheostomy timing, method preferences and auxiliary devices that they use; complications they encounter; and cricothyrotomy technique preferences (Appendix 1).

SPSS 27.0 (Statistical Package for the Social Sciences, IBM, USA) software was used for statistical analysis. Frequency and ratio values were used in the descriptive statistics of the data. Chi-square test was used in the analysis of qualitative independent data, and Fisher's test was used when the chi-square test conditions were not met. A $p<0.05$ was considered significant.

RESULTS

A total of 213 people, 109 of whom were women (51.2%), participated in our study. The demographic characteristics of the participants, institutions they work, their seniority in Anesthesiology and Reanimation, tracheostomy practice experience, tracheostomy timing and method preferences, the auxiliary equipment they use, cricothyrotomy method preferences and the complications they encounter are presented in Table I. Of the participants 40% were from a university hospital and 8% from a private hospital. In terms of tracheostomy application experience, approximately one third of the participants had 0-10, and one third had >50 tracheostomy applications. Twenty-nine percent of the participants stated that they preferred tracheostomy within the two weeks of intubation; while 66% preferred after the two weeks, and 5% stated that they decided according to the patient's condition. While 87% of the participants preferred percutaneous tracheostomy, 11% were in favor of surgical tracheostomy; and four participants stated that they make decisions based on the patient's anatomical features or the urgency of the situation. In terms of the cricothyrotomy method, 89% preferred needle, 7% preferred scalpel cricothyrotomy, and 4% stated that they had never done this procedure. In terms of auxiliary tool use, 62% of the participants stated that they use bronchoscope and a quarter of them stated that they use ultrasonography. In terms of complications, 69% of the participants pointed to bleeding, and 4.7% stated that they had not experienced any complications.

When the participants were grouped as before or after the second week of intubation according to their tracheostomy timing preference; there was no difference in terms of age, gender, seniority, tracheostomy experience and complications; however, a significant difference was found in terms of the institution they worked, Table II. While there was no

Appendix 1: Survey Form

1) Age
2) Gender
3) Institution
   a. University hospital
   b. Training and research hospital
   c. City Hospital
   d. Public Hospital
   e. Private Hospital
4) The time you worked as an Anesthesiology and Reanimation specialist
5) What is your tracheostomy practice experience?
6) What is your preference for tracheostomy timing?
   a. Within the first week
   b. Between 1-2 weeks
   c. Between 2-3 weeks
   d. Between 3-4 weeks
   e. After 4 weeks
   f. Other
7) What is your preference for tracheostomy method?
   a. Surgical
   b. Percutaneous
   c. Other
8) Which of the cricothyrotomy techniques do you prefer?
   a. Needle
   b. Scalpel
   c. Other
9) Are there the auxiliary tools that you use during the tracheostomy application?
   a. Fiberoptic/video bronchoscope
   b. Ultrasonography
   c. Illuminated stylet
   d. Other
10) What are the most common complications you encounter?
   a. Bleeding
   b. Pneumothorax
   c. Hypoxemia
   d. Arrhythmia
   e. Cardiac arrest
   f. Wound infection (late stage)
   g. Tracheal stenosis (late stage)
   h. Subcutaneous emphysema
   i. Esophageal injury
   j. Other

Table I: Demographic Data of the Participants, Institutions They Work, Seniority, Tracheostomy Experience, Tracheostomy Timing and Method Preferences, Auxiliary Tool They Use, Cricothyrotomy Method Preferences and Complications They Encounter

		n	%
Age (years)	20-29	15	7.04
	30-39	76	35.68
	40-49	61	28.64
	50-59	57	26.76
	≥60	4	1.88
Gender	Male	104	48.83
	Female	109	51.17
Institution	University hospital	85	39.91
	Public hospital	110	51.64
	Private hospital	18	8.45
Seniority (years)	0-5	52	24.41
	5-10	36	16.90
	10-15	40	18.78
	15-20	33	15.49
	20-25	27	12.68
	25-30	21	9.86
	>30	4	1.88
Tracheostomy experience (times)	0-10	76	35.67
	10-20	35	16.43
	20-30	19	8.92
	30-40	8	3.76
	40-50	8	3.76
	>50	67	31.46

		n	%
Tracheostomy timing preference	<2 weeks	62	29.1
	>2 weeks	140	65.74
	Other	11	5.16
Tracheostomy method preference	Surgical	23	10.8
	Percutaneous	186	87.32
	Other	4	1.88
Cricothyrotomy method preference	Needle	190	89.2
	Scalpel	15	7.04
	Other	8	3.76
Auxiliary tool use	Bronchoscopy	132	61.97
	Ultrasonography	53	24.88
	Lighted stylet	28	13.15
	None	35	16.43
Complications	Bleeding	148	69.48
	Pneumothorax	6	2.82
	Hypoxemia	23	10.80
	Arrhythmia	9	4.23
	Wound infection	12	5.63
	Tracheal stenosis	36	16.90
	Subcutaneous emphysema	43	20.19
	Esophageal injury	8	3.76
	None	10	4.69

Note: Data are presented as numbers and percentages. **n:** number of participants.

Table II: Data of Participants with a Preference for Tracheostomy Before or After the Two Weeks of Intubation

		Tracheostomy Timing Preference		P
		<2 weeks	>2 weeks	
Age (years)	20-29	6 (9.7)	9 (6.4)	0.440
	30-39	18 (29)	55 (39.3)	
	40-49	15 (24.2)	43 (30.7)	
	50-59	21 (33.9)	31 (22.1)	
	≥60	2 (3.2)	2 (1.4)	
Gender	Male	37 (59.7)	63 (45.0)	0.054
	Female	25 (40.3)	77 (55.0)	
Institution	University hospital	32 (51.6)	50 (35.7)	0.034*
	Public hospital	25 (40.4)	78 (55.8)	0.216
	Private hospital	5 (8.1)	12 (8.6)	0.905
Seniority (years)	0-5	15 (24.2)	35 (25.0)	0.914
	5-10	6 (9.7)	28 (20)	
	10-15	13 (21)	27 (19.3)	
	15-20	6 (9.7)	23 (16.4)	
	20-25	13 (21)	14 (10)	
	25-30	8 (12.9)	10 (7.1)	
	>30	1 (1.6)	3 (2.1)	

Table II: Cont.

		Tracheostomy Timing Preference		P
		<2 weeks	>2 weeks	
Tracheostomy experience (times)	0-10	25 (40.3)	49 (35)	0.255
	10-20	10 (16.1)	24 (17.1)	
	20-30	2 (3.2)	16 (11.4)	
	30-40	1 (1.6)	6 (4.3)	
	40-50	1 (1.6)	6 (4.3)	
	>50	23 (37.1)	39 (27.9)	
Complications	Bleeding	39 (62.9)	103 (73.6)	0.126
	Pneumothorax	4 (6.5)	2 (1.4)	0.073
	Hypoxemia	8 (12.9)	12 (8.6)	0.342
	Arrhythmia	4 (6.5)	5 (3.6)	0.360
	Wound infection	2 (3.2)	9 (6.4)	0.355
	Tracheal stenosis	6 (9.7)	24 (17.1)	0.169
	Subcutaneous emphysema	15 (24.2)	28 (20)	0.502
	Esophageal injury	2 (3.2)	6 (4.3)	0.722

Note: Data are presented as numbers and percentages. Chi-square test was used for the analysis. *p<0.05.

statistically significant difference for those working in public and private hospitals, the rate of being from a university hospital was significantly higher for specialists who preferred tracheostomy in the first two weeks (32/62, 51.6% vs 50/140, 35.7%, p=0.034).

When the participants were grouped according to their tracheostomy method preference; there was no difference in terms of age, gender, institution, seniority, and complications; however, a significant difference was found in terms of tracheostomy application experience (p<0.001), Table III. Of the specialists who preferred surgical tracheostomy 91.3% had 0-10 tracheostomy experience.

When the participants were grouped according to their cricothyrotomy method preference, no difference was observed in terms of age, gender, institution, seniority, and tracheostomy experience Table IV.

DISCUSSION

This study was conducted to show the perspectives of Anesthesiology and Reanimation specialists in our country on tracheostomy. Specialist physicians in the disciplines of anesthesiology and/or intensive care, from their late twenties to their seventies, from various parts of our country working either in educational institutions or private hospitals participated in our study. The main results of our study were that the anesthesiologists with more tracheostomy experience preferred the percutaneous tracheostomy method and those working in university hospitals tended to open tracheostomy before the 14th day of intubation.

The American College of Chest Physicians guidelines recommended that at least 20 procedures should be performed initially, and then 10 procedures per year for proficiency in PDT practice (14). The multi-society accreditation committee of Interventional Pulmonology also recommended that at least 20 PDT procedures should be performed for proficiency certification (15). Percutaneous dilatational tracheostomy has the advantage of being applied at the bedside. Thus, the risks that may arise by transporting the patients who receive multi-drug therapy and are monitored in the intensive care unit to the operating room are avoided (16). In addition, PDT performed at the bedside is less costly than surgical tracheostomy performed in the operating room (17). Of the participants in our study 87% preferred percutaneous tracheostomy, while 11% favored surgical tracheostomy. Others stated that they make decisions based on the patient's anatomical features or the urgency of the situation.

Timing of tracheostomy is still a matter of debate. A multicenter study involving 600 patients in Italy in 2010 showed a tendency to decrease, although not significantly, the incidence of ventilator-associated pneumonia with early (6-8 days after intubation) tracheostomy, compared to late (13-15 days after intubation) (7). However, early tracheostomy did not have a positive effect on survival. Another multicenter study of 909 patients in UK in 2013 found no difference between early (within the first 4 days of intubation) and late (after the 10th day of intubation) tracheostomy regarding neither intensive care unit (ICU) and hospital stay, nor short- and long-term mortality (8). Many meta-analyses have shown that the timing of tracheostomy has no effect on mortality (18,19). In

Table III: Data of Participants According to Tracheostomy Method Preference

		Tracheostomy Method Preference		P
		Surgical	Percutaneous	
Age (years)	20-29	4 (17.4)	11 (5.9)	0.895
	30-39	6 (26.1)	68 (36.6)	
	40-49	6 (26.1)	55 (29.6)	
	50-59	6 (26.1)	49 (26.3)	
	≥60	1 (4.3)	3 (1.6)	
Gender	Male	13 (56.5)	88 (47.3)	0.404
	Female	10 (43.5)	98 (52.7)	
Institution	University hospital	9 (39.1)	74 (39.8)	0.952
	Public hospital	10 (43.4)	98 (52.7)	0.942
	Private hospital	4 (17.4)	14 (7.5)	0.112
Seniority (years)	0-5	5 (21.7)	45 (24.2)	0.413
	5-10	7 (30.4)	29 (15.6)	
	10-15	2 (8.7)	38 (20.4)	
	15-20	4 (17.4)	29 (15.6)	
	20-25	4 (17.4)	23 (12.4)	
	25-30	0 (0)	19 (10.2)	
	>30	1 (4.3)	3 (1.6)	
Tracheostomy experience (times)	0-10	21 (91.3)	53 (28.5)	<0.001*
	10-20	1 (4.3)	33 (17.7)	
	20-30	0 (0)	19 (10.2)	
	30-40	0 (0)	8 (4.3)	
	40-50	0 (0)	8 (4.3)	
	>50	1 (4.3)	65 (34.9)	
Complications	Bleeding	15 (65.2)	130 (69.9)	0.646
	Pneumothorax	2 (8.7)	4 (2.2)	0.132
	Hypoxemia	2 (8.7)	20 (10.8)	0.762
	Arrhythmia	0 (0)	9 (4.8)	0.602
	Wound infection	1 (4.3)	11 (5.9)	1.000
	Tracheal stenosis	2 (8.7)	33 (17.7)	0.273
	Subcutaneous emphysema	6 (26.1)	36 (19.4)	0.447
	Esophageal injury	0 (0)	8 (4.3)	0.602

Note: Data are given as numbers and percentages. Chi-square test was used for the analysis. *p<0.05.

a prospective study by Rumbak et al., PDT performed within the first 48 hours was shown to be associated with shorter mechanical ventilation time, shorter intensive care unit stay, less pneumonia and lower mortality compared with prolonged intubation (20). A meta-analysis of nine randomized clinical trials involving a total of 2.072 patients demonstrated that early tracheostomy had no positive effects on clinical outcomes (short- and long-term mortality, ventilator-associated pneumonia, duration of mechanical ventilation, length of ICU stay) compared with late tracheostomy or prolonged intubation (21). Two recent meta-analyses suggest the superiority of early tracheostomy (22,23). The decision for timing of tracheostomy should be patient-based. The etiology of respiratory failure, the estimated time for mechanical ventilation, the risks of prolonged endotracheal intubation, and the risks associated with tracheostomy should be considered when making a clinical decision. Certain patient groups (e.g., neurological patients requiring prolonged mechanical ventilation support) may benefit from early tracheostomy. Looking at these results, it seems reasonable to delay tracheostomy for two weeks, both to avoid its inherent complications and to give a chance to those who will recover from their disease.

Table IV: Data of Participants According to Cricothyrotomy Method Preference

		Cricothyrotomy Method Preference		P
		Needle	Scalpel	
Age (years)	20-29	15 (7.9)	0 (0)	0.276
	30-39	70 (36.8)	4 (26.7)	
	40-49	49 (25.8)	8 (53.3)	
	50-59	52 (27.4)	3 (20.0)	
	≥60	4 (2.1)	0 (0)	
Gender	Male	91 (47.9)	10 (66.7)	0.162
	Female	99 (52.1)	5 (33.3)	
Institution	University hospital	74 (38.9)	7 (46.6)	0.556
	Public hospital	100 (52.7)	7 (46.6)	0.104
	Private hospital	16 (8.4)	1 (6.7)	1.000
Seniority (years)	0-5	51 (26.8)	1 (6.7)	0.869
	5-10	32 (16.8)	2 (13.3)	
	10-15	32 (16.8)	5 (33.3)	
	15-20	29 (15.3)	3 (20.0)	
	20-25	21 (11.1)	4 (26.7)	
	25-30	21 (11.1)	0 (0)	
	>30	4 (2.1)	0 (0)	
Tracheostomy experience (times)	0-10	67 (35.3)	7 (46.7)	0.818
	10-20	31 (16.3)	3 (20.0)	
	20-30	17 (8.9)	1 (6.7)	
	30-40	7 (3.7)	1 (6.7)	
	40-50	7 (3.7)	0 (0)	
	>50	61 (32.1)	3 (20.0)	

Note: Data are given as numbers and percentages. Chi-square test was used for the analysis. *p<0.05.

Indeed, many centers prefer to wait 10-14 days before opening a tracheostomy. As a result of our study, only 29% of the participants preferred to open a tracheostomy within the first 14 days of intubation. Specialists working at the university hospital were more inclined to do tracheostomy within the two weeks of intubation.

Auxiliary tools such as ultrasonography, bronchoscopy and stylet are frequently used in PDT applications. Prospective studies have been conducted comparing ultrasonography with bronchoscopy in practice. Dinh et al. observed higher midline puncture success in the ultrasonography group (72.7% vs. 8.3%) (24). Chacko et al., on the other hand, did not detect any difference between the use of ultrasonography and bronchoscopy in terms of procedural success and complications, while they observed a longer procedure time and more oxygen desaturation in the bronchoscopy group (25). Ultrasonography can be very helpful, especially in patients who are morbidly obese and have difficult airway anatomy. Rudas et al. demonstrated higher first pass rates and tracheal puncture successes with the use of real-time ultrasound during PDT (26). Another two trials comparing ultrasonography and bronchoscopy for PDT showed no significant difference in procedure time or complications (27,28). Furthermore, Klotz et al. (29) mentioned that bronchoscopy may reduce the safety of the PDT procedure. Both of these techniques are frequently used in many clinics. In fact, some clinics routinely use both techniques together to increase the success of the procedure. Ultrasonography can be considered to have no side effects as long as it is used 'clean'. The use of bronchoscopy can display the tracheal lumen directly, indicating cannulation as a kind of gold standard. However, an important thing to remember is that the patient's ventilation may be affected, especially in prolonged use, and accordingly, problems such as hypoxia, hypercarbia, arrhythmia and increased intracranial pressure may occur. In our study, 62% of the participants stated that they benefited from bronchoscope and a quarter of them benefited from ultrasonography. Thirteen percent stated that they prefer lighted stylets. There is a need for studies on the use of illuminated stylets in tracheostomy.

Surgical and percutaneous tracheostomy techniques have their own complication rates. A meta-analysis of studies involving a total of 3.512 surgical and 1.817 percutaneous tracheostomies revealed that percutaneous technique is more associated with perioperative and surgical technique is more associated with postoperative complications. Another meta-analysis showed that PDT resulted in a shorter procedure time, less perioperative bleeding, and less postoperative stomal infection compared to surgical tracheostomy (13). In another meta-analysis including 1.212 patients comparing PDT and surgical tracheostomy, lower rates of wound infection, bleeding and mortality were shown with PDT. Klotz et al. performed a meta-analysis including a total of 1.795 procedures comparing PDT and surgical tracheostomy (29). In their study they found no difference between the two techniques regarding life-threatening events such as loss of airway control, misplacement of the cannula, tracheal/esophageal injury, major bleeding, pneumothorax/pneumomediastinum, subcutaneous emphysema, and gastric aspiration. They have demonstrated more technical difficulties with PDT than with surgical tracheostomy. They also observed no difference in mortality between PDT and surgical technique. In fact, no difference was found in terms of mortality in the subgroup analyzes of different PDT methods. Stomal inflammation and infection were observed more frequently in the surgical technique than in PDT. There was no difference between PDT and surgical tracheostomy in terms of late complications such as tracheal stenosis, tracheomalacia and tracheoesophageal fistula. Considering the answers given by the participants in our study, bleeding complications were noteworthy with a rate of 69%. Although minor bleeding is usually observed during the procedure, it is necessary to be alert for the above-mentioned possible complications in cases of delayed or massive bleeding. The management of these massive hemorrhages often requires a multidisciplinary approach, and it is important for practitioners to be able to properly manage these cases. It should be noted that the answers given do not naturally reflect the frequency of complications; they are only the answers given to the "most common complication" question.

We mentioned that PDT is not suitable for emergencies. Considering that surgical tracheostomy itself is performed under operating room conditions, it may not be appropriate in the scenario of cannot intubate, cannot ventilate. In this case cricothyrotomy is the right option. Various techniques have been described, such as the standard, scalpel, Seldinger, rapid four-step technique. Canadian Airway Focus Group and Difficult Airway Society guidelines recommend using the scalpel method for cricothyrotomy (30). The answers we obtained in our study showed that 89% of the specialists preferred the needle technique and only 7% preferred the scalpel technique. The rest stated that they had never used the cricothyrotomy. In fact, these numbers may not reflect the truth. The question was asked as which one they prefer. Therefore, the physicians who have not performed the cricothyrotomy procedure must have specified which one they would apply "if necessary". The fact that half of the specialists participating in the study had less than 20 and even one-third of them had less than 10 tracheostomy applications suggests that these physicians are very unlikely to perform a cricothyrotomy. Therefore, the answers given for cricothyrotomy may not reflect the truth. The fact that nine out of ten physicians preferred the needle technique in their responses is probably due to the Seldinger technique, with which they are more familiar. We believe that up-to-date guideline information and recommendations should be followed in this regard.

Our study had several limitations. As in the cricothyrotomy example described above, responses sometimes reflected not what was actually done, but which option they would choose if they faced. The timing of tracheostomy may also differ for a single practitioner. In some patients, they may prefer early, and in others late tracheostomy. Specifying this with different options in a question would have provided more valuable information.

In conclusion, tracheostomy is a frequently used procedure by anesthesiologists and intensive care physicians. Bronchoscopy and ultrasonography are frequently used auxiliary tools. Although there are different practices regarding timing, most of the physicians performing tracheostomy within the first two weeks of intubation were physicians working at a university hospital. Those with more tracheostomy experience prefer the percutaneous method. Contrary to the current guideline recommendations, the needle method is preferred for cricothyrotomy.

AUTHOR CONTRIBUTIONS

Conception or design of the work: RA, TU, AS
Data collection: RA, YK, GC, TU, AS
Data analysis and interpretation: RA, YK, GC, TU, AS
Drafting the article: RA, YK, AS
Critical revision of the article: RA, AS
Other (study supervision, fundings, materials, etc): RA, YK, GC, TU, AS
The author (RA, YK, GC, TU, AS) reviewed the results and approved the final version of the manuscript.

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