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Anesthesia management of open tracheostomy patients: A single center experience

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Abstract

The purpose of the present study of ours was to evaluate anesthesia management and complications in open technique tracheostomy cases. This study was conducted in 105 patients who underwent tracheostomy. The patients were retrospectively screened. The demographic data, anesthesia management, length of hospital stay, Intensive Care Unit stay, mortality, perioperative, postoperative, and early complications of the patients were evaluated. The average age of the patients was 20-91 (60±14.92) years. ASA scores were as follows: 54 cases (51.4%) were ASA II; 45 cases (42.8%) were ASA III; and 6 cases (5.7%) were ASA IV. The most common complaints of the patients were as follows: Head-neck tumor in 75 cases (71.4%). The anesthesia methods were as follows: General anesthesia in 92 cases (87.6%), and sedoanalgesia in 13 cases (12.4%). The most common complications were as follows: Bleeding in 5 patients (4.7%) in the perioperative period; and respiratory failure in 19 patients (18.1%) in the postoperative period. Postoperative mortality was seen in 6 cases (5.7%). There was a statistically significant difference between the mortality rates, hospital stay, and age (P: 0.008) (P<0.0001). In the present study of ours, it was shown that hospital stay and age factor had a significant effect on mortality in tracheostomy cases. We believe that sedoanalgesia, which preserves.

Keywords: Anesthesia management, open tracheostomy, mortality

Introduction

Nowadays, tracheostomy, which is a well-known surgical intervention, is most commonly used for prolonged airway support purposes [1].

The time of the prolonged endotracheal intubation is associated with serious complications. In respiratory failure cases, tracheostomy has many advantages over endotracheal intubation. These are the decrease in dead space, ventilator resistance, sedation requirement, larynx and oral ulcers. In addition to the decrease in the need for mechanical ventilation, and shorter Intensive Care Unit (ICU) stays, there are other important advantages like secretion management, establishing better communication, mobilization and oral nutrition [1-3].

As well as many advantages, the open technique tracheostomy has some disadvantages as well. Complication rate is accepted to be 9-47% [4,5]. These are; intraoperative hemorrhage, pneumothorax, esophageal damage, subcutaneous emphysema, air leakage and aspiration. In the postoperative period, the most common complications are hemorrhage, tracheal stenosis, vocal cord damage, decanulation, mucus plaques, fistula and infection [5-7].

In some cases who undergo open technical tracheostomy under general anesthesia, anesthesia management is important because of the need for urgent surgery, the satiety of the cases, and comorbidities. The difficulties in airline management make it necessary for the surgery team and the experienced anesthesia team to work in close cooperation.

In this study of ours, the purpose was to evaluate the anesthesia management, demographic data, hospital and intensive care unit stays, mortality, peroperative and postoperative early complications in patients who underwent tracheostomy in our hospital in a retrospective way.

Material and Methods

Study Protocol

Following the approval of the Local Ethics Committee (Protocol no: 2019/8-3), 105 patients, who underwent urgent or elective anesthesia for open tracheostomy at Inonu University, Medical Faculty, Anesthesiology and Reanimation Clinic between January 2010 and February 2019, were analyzed retrospectively. This study was prepared in line with the Consolidated Standards of Reporting Trials (CONSORT) [8].

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Study Participants
The tracheostomy patients, who were over 18 years of age, were included in the study. The cases that had lacking information in anesthesia patient follow-up forms and hospital medical information system records, and the cases that did not provide informed consent were excluded from the study.

Preoperative Procedures
The Heart Rate (HR), Noninvasive Blood Pressure (NIBP), Electrocardiogram (ECG), End-Tidal Carbon Dioxide (EtCO2), and Peripheral Oxygen Saturation (SpO2) standardized monitoring were applied routinely to the patients who were admitted to the surgery room.

Anesthesia Management
In patients who were scheduled to undergo general anesthesia, anesthesia was induced with propofol (0.5-2 mg/kg) or sodium thiopental 5 mg/kg, rocuronium (0.4-0.6 mg/kg) or suxamethonium (1 mg.kg-1), fentanyl (0.1 µg/kg) or remifentanil, intravenously (IV). MAC:1 sevoflurane or desflurane inhalation was applied in 0.5 O2 oxygen-air mixture to maintain the anesthesia.

Postoperative Management
Following the completion of the surgical procedure, and after the general anesthesia maintenance was terminated, atropine (0.01-0.02 mg/kg) i.v. and neostigmine (0.05 mg/kg) i.v. or sugammadex (4mg/kg) i.v. were administered to reverse the residual muscle relaxation.

The patients, who opened their eyes with stimuli, whose spontaneous breathing was regular, whose respiratory rate was 12-20/minute, and whose oxygen saturation was higher than 94%, were extubated, and were then taken to the recovery room. Those who were not extubated, and those who were not stable in hemodynamic and respiratory terms, were transferred directly to the Intensive Care Unit. The patients were transferred to the ward when they achieved a Modified Aldrete's Score of 9 or bigger (a score of 9 on a 0-12 scale indicates recovery sufficient for the patient to be transferred from PACU to the ward) [9]. All the patients received a standard postoperative analgesics regime of paracetamol (1g) and tramadol (1-2 mg/kg) i.v.

Procedure Data
In addition to the demographic data of the patients, their anesthesia management data and anesthesia and surgical times were also recorded. The complications that developed peroperatively (bradycardia, hypotension, bleeding pneumothorax, esophageal damage, subcutaneous emphysema); and the complications that developed postoperatively (hemorrhage, vocal cord injury, decanulation, mucus plaques, and nausea and vomiting) were evaluated. The Intensive Care Unit and hospital stays were recorded. The mortality rates were evaluated.

Outcome measures
The anesthesia duration was defined as the time from the induction of anesthesia to the patient until the time when the patient was taken to the postoperative care unit. Surgical time was defined as the time that passed from the first incision in the anatomical area to the last suture. Laryngospasm was defined as the glottal closure that was characterized by retractions preventing pulmonary ventilation. Bronchospasm was defined as long-term expiratory phase wheezing and the desaturation that developed with it. Bradycardia was defined as the heart rate being below 60. Desaturation was defined as SpO2 being lower than 94 for more than 15 seconds. Mucosal bleeding was defined as the hemorrhage that developed during the surgical procedure. Intensive Care Unit stay was defined as the time that was spent from the admission of the patient to the Intensive Care Unit in the postoperative period to the transfer to the relevant ward. Length of hospital stay was defined as the time that was spent from the admission of the patient to the hospital to the discharge. Mortality was defined as the rate of death that was associated with anesthesia or surgery during the period of hospitalization.

Statistical Analyses
All statistical analyses were conducted using the Statistical Package for the Social Sciences program (SPSS 22.0, Chicago, USA). Quantitative data were presented as the mean or standard deviation, and categorical data were shown as numbers or percentages. The differences between groups were evaluated by Mann-Whitney U test. P value<0.05 was considered statistically significant.

Results

In the present study, the average age of the patients was 20-91 (60±14.92) years. A total of 69 (65.7%) of the cases were male, and 36 (34.3%) were female. The Intensive Care Unit stay of the cases was 0-54 (3.25±8.97); and the duration of discharge was 2-91 (10.28±11.87) days. The ASA scores were as follows; 54 cases (51.4%) were ASA II; 45 cases (42.8%) were ASA III; and 6 cases (5.7%) were ASA IV. The demographic characteristics of the patients are given in Table 1.

The most common complaints of the patients, who were operated for open technique tracheostomy, were as follows: Head-neck tumor in 75 cases (71.4%); vocal cord paralysis in 12 cases (11.4%); respiratory failure 6 cases (5.7%); multispace infections in 5 cases (4.8%); maxilla-facial trauma in 4 cases (3.8%); and angioedema in 3 cases (2.8%) (Figure 1).

The anesthesia methods that were applied to the cases were as follows: General anesthesia in 92 cases (87.6%), and sedoanalgesia in 13 cases (12.4%) (Table 1). In anesthesia induction, propofol was used in 61 cases (58.1%), sodium thiopental was used in 31 cases (29.5%), ketamine+midazolam was used in 13 cases (12.4%). The maintenance of the anesthesia was provided with sevoflurane in 68 cases (64.8%), desflurane in 31 cases (29.5%), and propofol infusion in 6 cases (5.7%).

Remifentanil was used in 68 cases (64.7%), and fentanyl was used in 37 cases (35.3%) as opioids. Neuromuscular blockage was carried out in 83 patients. Rocuronium was used in 53 cases (64%), succinylcholine was used in 16 cases (19%), and vecuronium was used in 14 cases (17%). No antidotes were used to reverse the neuromuscular block in 72 cases (68.6%), neostigmine-atropine was used in 18 cases (17.1%), and sugammadex was used in 15 cases (14.3%). When the airway devices used were evaluated, it was determined that ETT was used in 91 cases (86.7%), and no airway device was used in 13 cases (12.4%). LMA was used in 1 patient (0.9%) (Table 1).

The complications were seen in 14 cases (18.4%) in the peroperative period, and in 37 cases (40%) in the early postoperative period in our study. No complications were seen in 91 patients (86.6%) in the peroperative period. Bleeding was seen in 5 cases (4.7%), bradycardia in 4 cases (3.8%), hypotension+bradycardia in 2 cases (1.9%), hypotension in 2 cases (1.9%), and subcutaneous emphysema in 1 case (0.9%).

When the cases were evaluated in terms of early postoperative complications, it was seen that there was respiratory failure in 19 (18.1%) cases; bradycardia in 6 cases (5.7%), bleeding in 6 cases (5.7%), nausea and vomiting in 5 cases (4.8%), mucous plaques in 3 cases (2.9%), hypertension in 2 cases (1.9%), and cardiac arrest in 1 case (0.95%). No complications were observed in 63 (60%) patients (Table 2).

Table 1. Patient characteristics

Variable	Tracheostomy (n=105)	
	Range	Mean ± SD or n(%)
Age, years	20-91	60±14.92
Gender, male/female	-	69 (65.7%) / 36 (34.3%)
Weight, kg	48 – 90	67.2 ±9.01
ASA, n		
II	-	54
III	-	45
IV	-	6
Airway Device		
None	-	13
ETT	-	91
LMA	-	1 (0.95%)
Anesthesia method		
General anesthesia	-	92
Sedoanalgesia	-	13
Emergency versus Planned		
Emergency	-	57
Planned	-	48
Mortality	-	6
Smoking, n (%)	-	31
Duration of Anesthesia, min	30-180	52.29±18.42
Duration of Surgery, min	20 – 165	40.95±16.67
Length of stay in ICU, day	0 - 54	3.25±8.97
Discharge time, day	2 - 92	10.28±11.87

ASA: American Society of Anesthesiology, ETT: endotracheal tube, ICU: intensive care unit, kg: kilogram, LMA: laryngeal mask airway; min: minutes, n: number, SD: Standard Deviation

When the services from which the cases were referred were examined, it was determined that 75 (71.4%) cases were from ENT, 14 (13.3%) cases were from emergency department, 9 (8.6%) cases from reanimation unit, 2 (1.9%) from internal diseases unit, 2 (1.9%) from neurology unit, 1 patient (0.9%) from radiation oncology, 1 patient from chest diseases unit (0.9%), and 1 patient (0.9%) from the adult burns Intensive Care Unit.

A total of 78 (74.3%) patients were transferred to the Intensive Care Unit (ICU) in the postoperative period. It was determined that mechanical ventilation was applied to 53 (68%) of the patients who were taken to the ICU.

A total of 57 (54.3%) of the patients who underwent tracheostomy were operated under urgent conditions, and 5 of them were operated electively. A total of 4 patients were re-operated due to hemorrhage in the first 24 hours, and hemostasis was achieved.

Postoperative mortality was seen in 6 of the cases (5.7%). There were statistically significant differences between mortality and hospitalization stays (P:0.008) and age (P<0.0001) (Table 3).

Table 2. Complications of procedure

Variable	Perioperative complications	
	n	%
None	91	86.6
Bleeding	5	4.7
Bradycardia	4	3.8
Hypotension	2	1.9
Bradycardia	2	1.9
Bradycardia+ hypotension	1	1
Subcutaneous emphysema	-	-
Laryngospasm	-	-
Bronchospasm	-	-
Esophageal injury	-	-
Pneumothorax	-	-
Variable	**Postoperative complications**	
	n	**%**
None	63	60
Respiratory distress	19	18.1
Bradycardia	6	5.7
Bleeding	6	5.7
Nausea and vomiting	5	4.7
Hypertension	2	1.9
Mucous plug	3	2.9
Cardiac arrest	1	0.95
Laryngospasm	-	-
Bronchospasm	-	-

n: number

Table 3. Relationship between mortality and patients characteristics

Variable	Mortality				
	Absent		Absent		
Patients characteristics	**Range**	**Median**	**Range**	**Median**	**p value**
Age, year	20-91	60	20-61	38	<0.0001*
Duration of Anesthesia, min	30-180	50	35-60	45	>0.05
Duration of Surgery, min	20-165	40	25-50	35	>0.05
Length of stay after tracheostomy in ICU, day	0-54	0	2-42	23	0.008*
Discharge time, dayy	2-93	6	4-21	8	>0.05

ASA: American Society of Anesthesiology, ETT: endotracheal tube, ICU: intensive care unit, kg: kilogram, LMA: laryngeal mask airway; min: minutes, n: number, SD: Standard Deviation

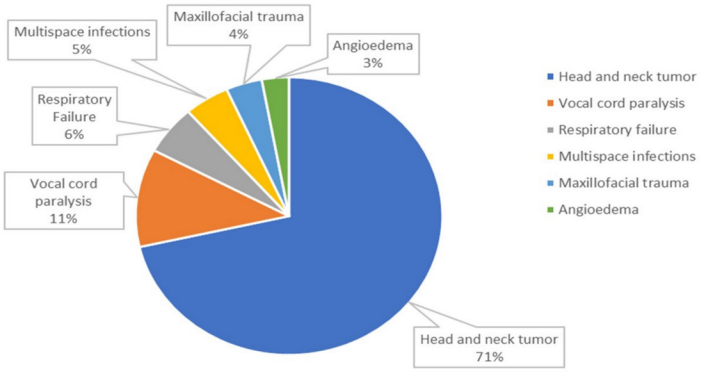

Figure 1. Indications for tracheostomy

Discussion

It was determined in the present study, in which the anesthesia management, peroperative and postoperative complications were compared in tracheostomy cases, that the most common complaints of the patients were head-neck tumors (71.4%). Bleeding was the most common complication in the postoperative period; and in the postoperative period, respiratory failure was the most common complication. Head and neck tumor surgeries are carried out in our center frequently. For this reason, head and neck tumors were the most common indications in our study.

There may be difficulties in mask ventilation and intubation because of comorbidities in tracheostomy surgery [10]. For this reason, a good airway evaluation is necessary in the preoperative period. In this study, 7 patients could not be intubated with direct laryngoscopy due to a space-occupying mass in the upper airway. For this reason, intubation was carried out in 4 cases by using Videolaryngoscope, and SE Flexible Bronchoscope in 3 cases.

Tracheostomy is a safe method, which is carried out in cooperation with the patient, the surgery team, and the anesthesia team in big masses that obstruct the upper airway (supraglottic), and is supported with sedoanalgesia and spontaneous breathing [11]. In the present study, tracheostomy was carried out in 13 cases under sedoanalgesia while preserving spontaneous respiration.

After the tracheostomy cannula was inserted, each of the intravenous or inhalation techniques can be safely used. In a previous study that compared the airway irritant effects of sevoflurane and desflurane, it was reported that desflurane was more irritant [12]. The most sensitive area where the airway reflex is at the highest point is the larynx and small airways. The larynx is by-passed in tracheostomy cases. Erkalp et al. reported that they could not detect any significant differences between the groups in terms of protective airway reflexes like cough, desaturation, and bronchospasm in their study in which they compared desflurane and sevoflurane in tracheostomy cases [13]. In the maintenance of anesthesia in our study, sevoflurane was used in 64.8% of the cases, desflurane in 29.5% cases, and propofol in 5.7% cases.

The complication rates in open technique tracheostomy surgery are reported to be between 7-58% in the literature [14]. In our study, the complications were observed in 58.4% of the cases. Hemorrhage was the most common complication in the peroperative period (4.7%), whereas respiratory failure was seen in 18.1% patients in the early postoperative period. In their study that included 100 cases, Spatora et al. reported a complication rate of 47% in line with our results, which also show that there is a statistically significant relation between tracheostomy-related complications and comorbidities and hospital stays [4]. The mortality rate is between 6-22% after tracheostomy [4,15].

In the present study, postoperative mortality was determined in 5.7% cases. There were statistically significant differences between mortality and hospitalization stays. Tracheostomy decreases ventilation dependence and the infection incidence, allowing oral nutrition and mobilization. As a result, it also shortens the hospital and Intensive Care Unit stays [16].

As a result, it was shown in the present study of ours that hospitalization time and age factor have a significant effect on mortality in tracheostomy cases. In addition to general anesthesia, we believe that sedoanalgesia, which preserves spontaneous respiration, is also a reliable anesthetic method.

Conflict of interest
The authors declare that there are no conflicts of interest.

Financial Disclosure
All authors declare no financial support.

Ethical approval
Consent of ethics was approved by the local ethics committee.

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