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ORIGINAL ARTICLE

Tracheal intubation is not difficult with flexible bronchoscopy guidance

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Abstract

We aimed to evaluate the efficacy and safety of flexible bronchoscopy-guided tracheal intubation during difficult airways. We retrospectively evaluated the hospital records of intubated patients with the assistance of a flexible bronchoscope during 5 years-period, (between January 2015 to 2020). All patients were intubated under general anesthesia. A total of 67 patients were enrolled in the study. The majority of the patients were male (n=42, 62.7%). The mean age was 55.5±15.3 years. *Mallampati* classification was revealed frequently in class IV in 76.1% of cases. Only one patient with class II is evaluated as having a difficult airway because of obesity. The most frequent 3 indications for endotracheal tube (ETT) insertion (intubation) with the help of a bronchoscope were limitation of the mouth opening (40.3%), obesity (20.9%), and cervical-vertebrate fracture (11.9%). The intubation route was preferred as the oral way in 53 patients and the nasal way in 14 patients. The mean duration for ETT intubation via bronchoscopy guidance was 3.38 minutes. There was no severe complication other than transient oxygen desaturation (SaO2) below 90% (n=8, 11.9%) and epistaxis (n=2, 3%) in the complication records of all patients. Intubation with the help of a flexible bronchoscope is an effective, practical, and safe method in patients with a difficult airway.

Keywords: Bronchoscopy, difficult airway, endotracheal intubation, nasal intubation, nasotracheal intubation

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Introduction

The difficult airway is depicted as the clinical situation in which a trained physician (e.g. anesthetist, emergency medicine specialist, pulmonologist, and intensive care specialist) encounters difficulty with mask ventilation and tracheal intubation via laryngoscopic examination of the upper airway [1]. Consequences of a difficult airway encompass more severe outcomes such as respiratory failure (Type 1 and Type 2), airway perforation due to the compulsive effort, metabolic alterations, neurological sequelae, and even decease of the patient [2]. The incidence of difficult intubation varies from 1.5% to 10% of cases taken up for surgery under general anesthesia or mechanical ventilation in intensive care units [2,3]. There are some devices (e.g. classical laryngoscope, videolaryngoscope) and procedures like retrograde intubation for achieving successful tracheal intubation. Unlike these procedures, fiberoptic bronchoscope-guided intubation is a very common and effective method. In this study, we aimed to evaluate the efficacy and safety of fiberoptic flexible bronchoscope-guided tracheal intubation.

Materials and Methods

The study was designed as a retrospective cross-sectional study. All patients who were intubated with the help of fiberoptic flexible bronchoscopy during 5 years' period (between January 2016 to 2020) were enrolled in this study. This study was approved by the Clinical Investigations Ethical Committee of Afyonkarahisar Health Sciences University with the number of 2021/383.

Patient Selection

Difficult airway diagnosis and patient selection were made depending on American Society of Anesthesiologists guidelines. Data of patients including age, gender, modified *Mallampati* classification score (Figure 1) (Class I: soft palate, fauces, uvula, pillars; Class II: soft palate, fauces, uvula; Class III: soft palate, base of uvula; Class IV: soft palate not visible at all [4,5], indications of intubation, type and size of intubation tube, efficacy, and complications were collected from hospital medical records.

Intubation Procedure via Bronchoscopy:

All patients were intubated with the help of a fiberoptic flexible bronchoscope by an experienced bronchoscopist. During the intubation procedure, the bronchoscopist stood at the head side of the patients who were lying down in the supine position. Sedation for all patients was achieved by midazolam (0.02-0.05 mg/kg, intravenous (IV)), rocuronium (0.5 mg/kg, IV, just before the insertion of the bronchoscope into the airway) and propofol (as need, 1-2 mg/kg, IV). Oxygen saturation (SpO2) was maintained above 90% by oxygen supplementation. After lubrication of the outer surface of the distal end of the bronchoscope (Olympus® fiberoptic

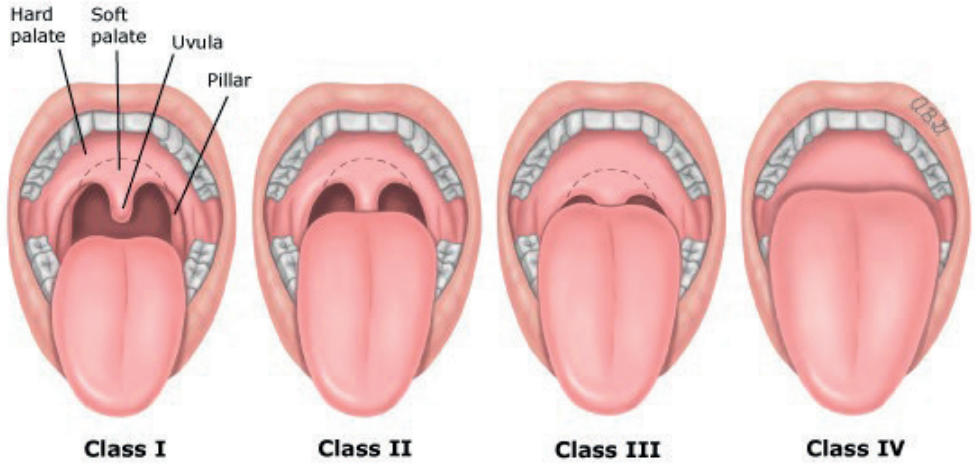

Figure 1. Modified *Mallampati* Classification [4].

bronchoscope (BF-1T30) with an external diameter of 4.9 mm), an endotracheal tube (ETT) was slipped over the bronchoscope till to the proximal end. According to the operation type or ventilation needs bronchoscope was inserted through the nasal or oral route to the larynx and then the trachea. During these passages, topical anesthesia of the oropharynx and larynx was performed with the instillation of 1% lidocaine via the working channel of the bronchoscope. After reaching the distal part of the tracheal rings, ETT was advanced over the bronchoscope to the trachea and placed 2 or 3 cm proximally from the main carina. Subsequently, the cuff was inflated to stabilize the ETT to the trachea. All video records of the bronchoscopy-guided intubation procedures were recorded via MedGate® MobilStation. Duration time of intubation was obtained and noted in the bronchoscopy report after re-watching the video record starting from the entrance of the passage (oral or nasal) to advancing the ETT through the tracheal lumen.

Data Collection

All patients' data including, age, gender, indications for difficult intubations, emergency situation, *Mallampati* Classification, intubation route, size and type of ETT, duration, and complications of the procedures were collected from hospital medical records and bronchoscopy reports.

Statistical Analysis

All data were collected, analyzed using Microsoft for Excel version 2013, and tabulated. Data were presented using descriptive statistics. Continuous variables were expressed as mean ± standard deviation (SD) and categorical variables were given as a number (n) and percentage (%).

Table 1. Demographic data, indications of difficult airway and surgical branches (n=67 patients)

	n	%
Gender		
Male	42	62.7
Female	25	37.3
Age, years, Mean±Standard Deviation (min-max)	55.5 ± 15.3 (18-86)	
Implementation Place		
Operation room	62	92.5
Intensive care unit	3	4.5
Emergency room	1	1.5
Bronchoscopy suit	1	1.5
***Mallampati* Classification**		
Class II	1	1.5
Class III	15	22.4
Class IV	51	76.1
Indication for difficult airway		
Limitation of the mouth opening	27	40.3
Obesity	14	20.9
Cervical vertebrate fracture	8	11.9
Facial trauma(maxillary or mandibular fractures)	5	7.5
Cervical immobility/ankyloses	3	4.5
Retropharyngeal abscess	2	3
Temporomandibular joint ankylosis	2	3
Larynx tumor	2	3
Tracheal compression (Huge goiter/mediastinal mass)	2	3
Mandibular mass/abscess	1	1.5
Bronchial rupture	1	1.5
Surgical branches, N=64		
Neurosurgery	14	21.9
General Surgery	13	20.3
Obstetrics and Gynecology	10	15.6
Orthopedics	9	14.1
Otorhinolaryngology	8	12.5
Thoracic Surgery	4	6.3
Orthognathic (Jaw) Surgery	4	6.3
Plastic Surgery	2	3.1

Results

A total of 67 patients were intubated with the help of flexible fiberoptic bronchoscopy during the study period. Of these 67 patients, 12 (17.9%) patients were emergency intubation or intubation following the failure of routine laryngoscopy-guided intubation. The male gender was frequent in this study (n=42 (62.7%)). The mean age was 55.5±15.3 years ranging between 18 and 86 years. Intubations were performed frequently in the operation room (92.5%). The majority of the patients' *Mallampati* score was class IV (76.1%). Only one patient with class II is evaluated as having a difficult airway because of obesity. The most frequent 3 indications for ETT with the help of a bronchoscope were limitation of the mouth opening (40.3%), obesity (20.9%), and vertebrate-cervical fracture (11.9%), in diminishing order. The order of surgical branches and other rare

Table 2. Information about performed tracheal intubations of the patients

	n	%
Intubation route		
Orotracheal intubation	53	79.1
Nasotracheal intubation	14	20.9
Emergency situation		
Yes	9	13.4
No	58	86.6
Size of ETT		
7	14	20.9
7.5	49	73.1
8	4	6
Type of ETT		
Standard ETT	55	82.1
Silicone reinforced spiral ETT	12	17.9
Duration of procedure, minute	3.4±1.9	
Complications		
Desaturation	8	11.9
Epistaxis	2	3

ETT: Endotracheal intubation tube

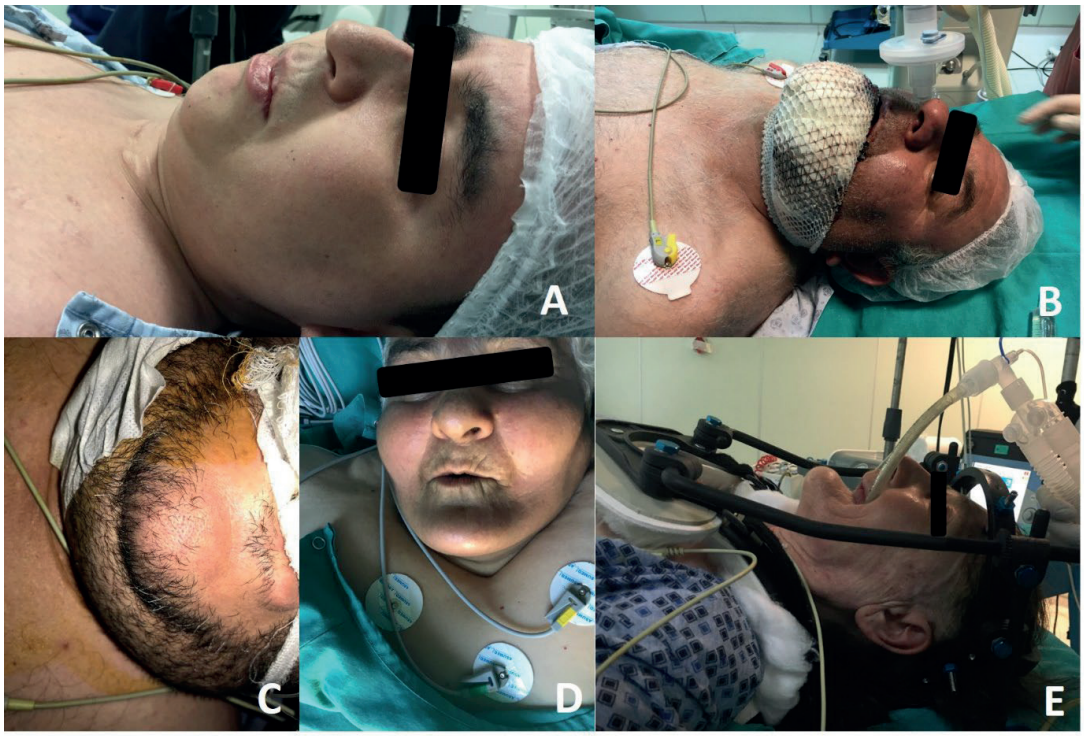

Figure 2. Different types of indications of the difficult airway **(A-E)**

indications were listed in Table 1.

The most preferred intubation route was orotracheal intubation (n=53, 79.1%). Nasotracheal intubation was preferred in 14 cases (20.9%) according to the operation type (Table 2). Emergency intubation was present in 9 cases (13.4%), the rest of them was elective cases. The most frequently used ETT size was 7.5 mm (n=49 (73.1%)) and the most frequently used ETT was standard ETT. Silicone-reinforced ETT was preferred especially for nasal intubations to decrease complications for nose bleeding. The mean duration for ETT via bronchoscopy guidance was 3.38 minutes (ranging between 1-8 minutes). The most frequently seen complication was transient oxygen desaturation below 90% in 8 patients (11.9%). All oxygen desaturations were reversible after initiating mechanical ventilation. Self-limiting epistaxis was reported in only 2 cases (3.0% of all cases and 14.3% of nasotracheal intubations). No other severe complications were reported during our study (Table 2). After all intubation procedures, patients were successfully ventilated.

Discussion

A "difficult airway" is the most important and prevalent condition that may be predicted or not during preoperative anesthesia consultation, especially with the examination of the patients. Sometimes it may not be possible to predict until examination with the laryngoscope. Unsuccessful endotracheal intubation may have resulted in more severe outcomes including respiratory failure, airway edema, bleeding or perforation, neurological sequelae, and death of the patients. So, it is very crucial to intubate a patient with a rapid attempt with the help of a bronchoscope. In the present study, we retrospectively analyzed the data of 67 patients who were successfully intubated with the guidance of the flexible fiberoptic bronchoscope. More than 75% of them were classified as the highest *Mallampati* classification. The most frequent indications

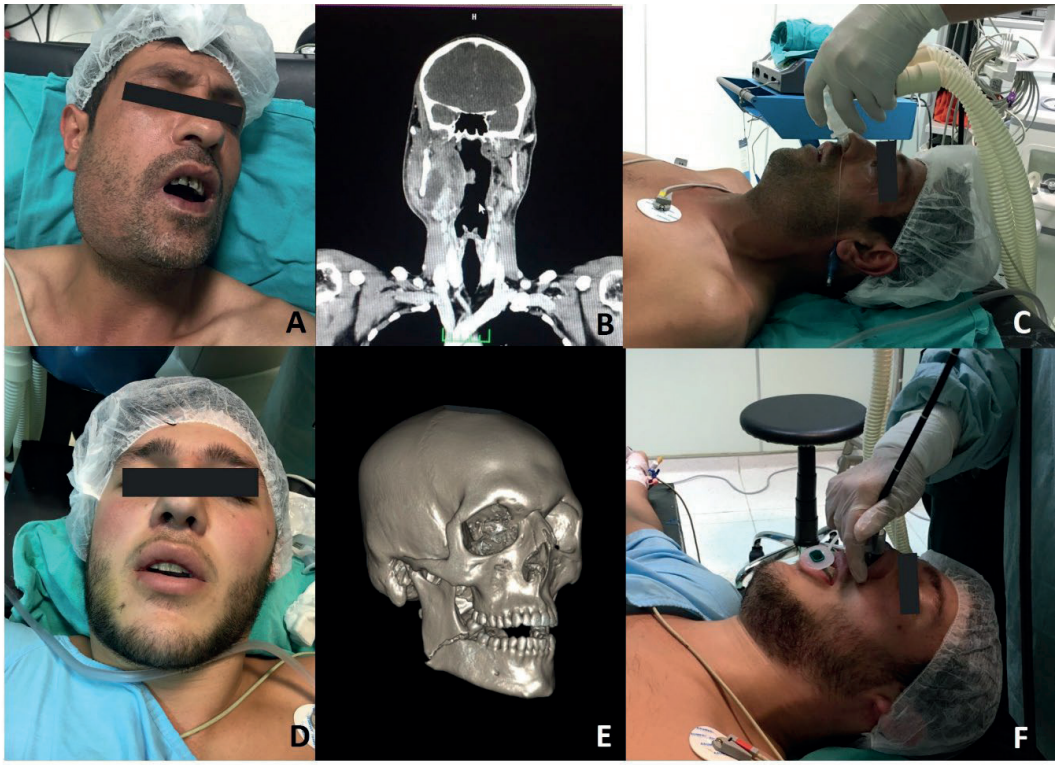

Figure 3. Right-sided mandibular swelling that prevents the opening of the mouth **(A),** Coronal section of the Computed Tomography (CT) scan reveals a right-sided, 6x3 cm in diameter mandibular lesion with necrosis that extends from the inferior corpus to the superior ramus **(B),** Successful nasotracheal intubation with the help of flexible fiberoptic bronchoscope **(C)**, Decreased opening of the mouth due to mandibular fracture **(D),** CT scan revealed complete mandibular fracture along with the right mandibular angle **(E),** Nasal route intubation was preferred for the operation **(F).**

for the bronchoscopy-guided ETT insertion were mouth-opening limitation, obesity, and fracture of cervical vertebrates (Figure 2). A great majority of the intubation route was orotracheal intubation. Only about 20% of the patients were intubated by the nasotracheal route (Figure 3). The most frequently reported complication was desaturation in 11.9% of the cases and epistaxis was the other complication in 3% of all patients during nasotracheal intubation. There was no failure to intubate during bronchoscopy guidance.

During this study period, in the hospital records, 12 patients who were intubated during elective intubation with higher preoperative Mallampati grade (III or IV class) were intubated with conventional laryngoscopy guidance. A bronchoscopist was ready to help with intubation procedures during these laryngoscopy-guided intubation attempts.

In the literature, there are many studies suggesting awake intubation with the guidance of fiberoptic bronchoscopy as the golden standard [6-9]. Induction anesthesia is supposed to promote respiratory insufficiency in case of failure of mask ventilation. Peterson et al. reported that during difficult airway intubation the risk of mortality and morbidity (including brain damage, airway injury, aspiration pneumonitis, etc.) was higher, especially in emergencies and induction of anesthesia [10]. Fortunately, although we performed all intubation procedures under the induction of general anesthesia, we did not encounter any of these severe incidents. Similarly, Ajay et al. also reported that fiberoptic bronchoscopy-aided intubation is a safe procedure under the induction of general anesthesia [3]. During this study, we encountered 2 cases of epistaxis during nasal intubation. These cases were intubated with standard ETTs. After these 2 cases, we started to use silicone-reinforced spiral ETT to encounter this complication. In this study, we calculated the mean duration of bronchoscopy-assisted ETT as 3.4±1.9 minutes ranging between 1 to 8 minutes. To our knowledge, this information is the first presented data in English literature.

The main limitation of this study was its retrospective design. We do not know the exact information about the patients intubated traditionally with higher Mallampati scores during the study period. The second limitation is the absence of other data to put forward an algorithm for anticipated difficult airway, e.g. body mass index, neck circumference, sternomental distance, thyromental distance, comorbid disease including sleep apnea, and previous intubation history. The third is the small sample size to evaluate the efficacy of bronchoscopy-guided intubation procedures within the older and younger age groups. The last limitation is the absence of a control group with other intubation methods (for example intubation via videolaryngoscope guidance).

Conclusion

In conclusion, flexible fiberoptic bronchoscopy-guided endotracheal intubation is a successful and safe method during a "difficult airway". It can be also performed under general anesthesia without any severe complications if it is applied by a professional bronchoscopist.

Funding

No financial support was received for this study.

Conflict of Interest

The all authors declare that they have no conflict of interest.

Data Availability Statement

All data set is available if required.

References

1. American Society of Anesthesiologists Task Force on Management of the Difficult Airway Practice guidelines for management of the difficult airway: An updated report by the American Society of Anesthesiologists Task Force on Management of the Difficult Airway. Anesthesiology 2003;98:1269-77.
2. George E, Haspel KL. The difficult airway. Int Anesthesiol Clin. 2000;38(3):47-63. doi: 10.1097/00004311-200007000-00005.
3. Ajay S, Singhania A, Akkara AG, Shah A, Adalja M. A study of flexible fiberoptic bronchoscopy aided tracheal intubation for patients undergoing

elective surgery under general anesthesia. Indian J Otolaryngol Head Neck Surg. 2013;65(2):116-9. doi: 10.1007/s12070-012-0576-8.

4. https://www.uptodate.com/contents/image?imageKey=EM%2F75229 (Last accessed date: 02/12/2022).
5. Samsoon GL, Young JR. Difficult tracheal intubation: A retrospective study. Anaesthesia. 1987;42(5):487-90. doi: 10.1111/j.1365-2044.1987.tb04039.x.
6. Rodrigues AJ, Scordamaglio PR, Palomino AM, Oliveira EQ, Jacomelli M, Figueiredo VR. Difficult airway intubation with flexible bronchoscope. Braz J Anesthesiol. 2013;63(4):358-61. doi: 10.1016/j.bjane.2012.05.001.
7. Lim WY, Wong P. Awake supraglottic airway guided flexible bronchoscopic intubation in patients with anticipated difficult airways: A case series and narrative review. Korean J Anesthesiol. 2019;72(6):548-57. doi: 10.4097/kja.19318.
8. Abdellatif AA, Ali MA. GlideScope videolaryngoscope versus flexible fiberoptic bronchoscope for awake intubation of morbidly obese patient with predicted difficult intubation. Middle East J Anaesthesiol. 2014;22(4):385-92.
9. Gómez-Ríos MÁ. Can fiberoptic bronchoscopy be replaced by video laryngoscopy in the management of difficult airway? Rev Esp Anestesiol Reanim. 2016;63(4):189-91. doi: 10.1016/j.redar.2015.11.008.
10. Peterson GN, Domino KB, Caplan RA, Posner KL, Lee LA, Cheney FW. Management of the difficult airway: A closed claims analysis. Anesthesiology. 2005;103(1):33-9. doi:10.1097/00000542-200507000-00009.