Medical Journal of Bakırköy

Med J Bakirkoy 2022;18:456-462
DOI: 10.4274/BMJ.galenos.2022.2022.8-14

Research

The Comparison of Video Fiberscope and DCI Video Laryngoscope Performed by Two Practitioners in Patients with an EGRI Score of >4: A Single-blind, Prospective, Randomized Study

Video Fiberskop ile DCI Video Laringoskop Kullanımının EGRI skoru >4 Hastalarda İki Uygulayıcı Tarafından Karşılaştırılması: Tek kör, Prospektif, Randomize Çalışma

Halil Cebeci[1], Güneş Comba Cebeci[2], Ersin Köksal[3]

[1]University of Health Sciences Türkiye, Bakırköy Dr. Sadi Konuk Training and Research Hospital, Clinic of Anesthesiology and Reanimation, İstanbul, Türkiye
[2]Eyüpsultan State Hospital, Clinic of Anesthesiology and Reanimation, İstanbul, Türkiye
[3]Ondokuz Mayıs University Faculty of Medicine, Department of Anesthesiology and Reanimation, Samsun, Türkiye

ABSTRACT

Objective: Endotracheal intubation is central to the practice of general anesthesia. Complications can be prevented by using alternative airway devices in difficult intubation cases. In this study, we compared the results of endotracheal intubation with video fiberscope and direct-coupled interface (DCI) video laryngoscope devices performed by an experienced (E) and inexperienced (H) practitioner.

Methods: This single-blind, prospective, randomized study included 60 patients with an El-Ganzouri risk index score of >4 and American Society of Anesthesiologists score of <4 who were operated between October 1, 2018 and March 1, 2019, in the operating room of the Ondokuz Mayıs University Medical Faculty Hospital. Endotracheal intubation was performed by two practitioners using two different devices (video fiberscope and DCI video laryngoscope). Intubation times, a number of attempts, failed attempts, postoperative complications and haemodynamic responses were recorded.

Results: There were no significant differences between demographic data, the number of attempts, unsuccessful attempts, postoperative complications and haemodynamic data between the groups. In the DCI video laryngoscope group, time to intubation was significantly shorter by the E practitioner than that the H practitioner (p=0.047). The E practitioner performed intubation DCI video laryngoscope in a statistically significantly shorter time than using a video fiberscope (p=0.014).

Conclusion: In our study, unlike other studies in the literature, endotracheal intubation was performed with two different devices by two E and H practitioners in difficult intubation cases. We saw that the E practitioner provided endotracheal intubation in a shorter time with the DCI video laryngoscope compared to the video fiberscope and in a shorter time than the H practitioner. We believe that the comparison of two devices under different difficult intubation conditions by different practitioners may give a different perspective to the studies in the literature.

Keywords: DCI video laryngoscope, EGRI score, intubation, video fiberscope

ÖZ

Amaç: Endotrakeal entübasyon genel anestezi uygulamalarında önemli yer tutmaktadır. Önceden tespit edilmiş güç entübasyon olgularında alternatif hava yolu araç-gereçleri kullanılarak komplikasyonların önüne geçilebilmektedir. Çalışmamızda deneyimli (E) ve deneyimsiz (H) iki farklı hekimin video fiberskop ile direct-coupled interface (DCI) video laringoskop cihazları ile endotrakeal entübasyon uygulamalarının sonuçlarını karşılaştırmayı amaçladık.

Presented in: It was given as an oral presentation at Anesthesiology Reanimation Specialists' Society ARUD2021 Balkan States Anesthesia Days VII.

Address for Correspondence: Halil Cebeci, University of Health Sciences Türkiye, Bakırköy Dr. Sadi Konuk Training and Research Hospital, Clinic of Anesthesiology and Reanimation, İstanbul, Türkiye
E-mail: halilcebeci55@gmail.com ORCID ID: orcid.org/0000-0003-1875-6685

Cite as: Cebeci H, Comba Cebeci G, Köksal E. The Comparison of Video Fiberscope and DCI Video Laryngoscope Performed by Two Practitioners in Patients with an EGRI Score of >4: A Single-blind, Prospective, Randomized Study. Med J Bakirkoy 2022;18:456-462

Received: 05.09.2022
Accepted: 06.12.2022

Gereç ve Yöntem: Randomize, prospektif ve tek kör nitelikteki çalışmamıza Ondokuz Mayıs Üniversitesi Tıp Fakültesi Hastanesi ameliyathanesinde, 1 Ekim 2018 ve 1 Mart 2019 tarihleri arasında opere edilen, 18-65 yaş arası, El-Ganzouri risk indeksi skoru >4, Amerikan Anestezi Derneği skoru <4 olan 60 hasta dahil edildi. İki uygulayıcı tarafından iki farklı cihazın (video fiberskop ile DCI video laringoskop) kullanımı ile endotrakeal entübasyon uygulamaları gerçekleştirildi. Entübasyon süreleri, girişim sayıları, başarısız girişimler, postoperatif komplikasyonlar ve hemodinamik yanıtlar kaydedildi.

Bulgular: Hastaların demografik verileri, uygulayıcıların girişim sayıları, başarısız girişimleri, postoperatif komplikasyonları ve hemodinamik veriler arasında anlamlı fark bulunamadı. DCI video laringoskop kullanımında E uygulayıcısının H uygulayıcısına göre istatistiksel olarak anlamlı şekilde kısa sürede entübasyonu gerçekleştirdiği görüldü (p=0,047). E uygulayıcısının DCI video laringoskop ile entübasyonu video fiberskop kullanımına göre istatistiksel olarak anlamlı şekilde daha kısa sürede gerçekleştirdiği görüldü (p=0,014).

Sonuç: Çalışmamızda literatürdeki diğer çalışmalardan farklı olarak güç entübasyon olgularında deneyimli ve deneyimsiz iki uygulayıcı tarafından iki farklı cihazla endotrakeal entübasyon gerçekleştirildi. E uygulayıcının DCI video laringoskopla hem video fiberskopla yapılanlara göre daha kısa sürede hem de H uygulayıcıdan daha kısa sürede endotrakeal entübasyonu sağladığını gördük. Farklı entübasyon güçlüğü koşullarında iki cihazın yine deneyimleri farklı uygulayıcılar tarafından karşılaştırılmasının literatürdeki çalışmalara farklı bakış açısı kazandırabileceğini düşünmekteyiz.

Anahtar Kelimeler: DCI video laringoskop, EGRI skoru, entübasyon, video fiberskop

INTRODUCTION

Endotracheal intubation is critical to maintain a patent airway, control airway and respiration, secure breathing effort and airway control during resuscitation, decrease dead space and aspiration risk, and surgical comfort for the surgeon by eliminating the need for an anesthesiologist and surgical equipment. However, it is a time-consuming procedure and requires experience and skills in difficult cases and is associated with certain complications (1). As the number of intubation attempts with classical laryngoscope increases, the complication rate increases (2). Therefore, the American Society of Anesthesiologists (ASA) recommends to avoiding repetitive attempts in difficult airway cases and to use alternative techniques (3). Recently, there has been a growing interest in developing alternative methods and devices.

In the literature, there are several studies compared the success rates, number of attempts, and time to successful endotracheal intubation of video laryngoscopes versus video fiberscopes (4,5). Many studies have shown that the results vary depending on the anesthesiologist's experience and skills (4).

In 1996, el-Ganzouri et al. (6) developed the El-Ganzouri risk index (EGRI), which is a multivariate model for stratifying the risk of difficult endotracheal intubation. Patients with an EGRI score of >4 should be considered difficult intubation cases and necessary precautions should be taken preoperatively.

In this study, we compared the results of endotracheal intubation with video fiberscope and direct-coupled interface (DCI) video laryngoscope devices performed by an experienced (E) and inexperienced (H) practitioner in patients with an EGRI score of >4.

METHODS

Study Design and Study Population

This single-center, single-blind, prospective, randomized study was approved by the Ondokuz Mayıs University Clinical Research Ethics Committee (decision no: OMÜ KAEK 2018/362, date: 27/07/2018). The study was conducted in accordance with the principles of the CONSORT guidelines and the Declaration of Helsinki. The study was registered at ClinicalTrials.gov (NCT05243758).

The study included 114 patients aged between 18 and 65 years with an EGRI score of >4 and ASA score of <4 who were operated in the operating room of the Ondokuz Mayıs University Medical Faculty Hospital between October 1st, 2018, and March 1st, 2019. In the power analysis to determine the number of patients to be included in the study, when the article by Abdellatif and Ali (4) 'GlideScope® videolaryngoscope versus flexible fiberoptic bronchoscope for intubation of morbidly obese patient with predicted difficult intubation' was taken as reference, the number of samples for each group is at least 30 with 95% confidence and 99.9% test power. All patients were informed about the study and written informed consent was obtained. Exclusion criteria were as follows: being unwilling to give consent, having cerebrovascular event such as cerebral ischemia, hemorrhage or stroke, having carotid artery stenosis or a history of coronary artery disease, neurological disorders such as chronic head pain, epilepsy or previous head injury, alcohol or psychoactive drug abuse, severe heart and/or lung disease, hepatic and/or renal failure, uncontrolled diabetes and/or hypertension, dental abscess, <1.5 cm mouth opening, known bleeding disorder, pregnancy, mental retardation, and hypersensitivity to anesthetic agents. Finally, 60 patients were enrolled. The study flow chart is shown in Figure 1. EGRI is used to assess mouth opening, thyromental distance, Mallampati (oropharyngeal)

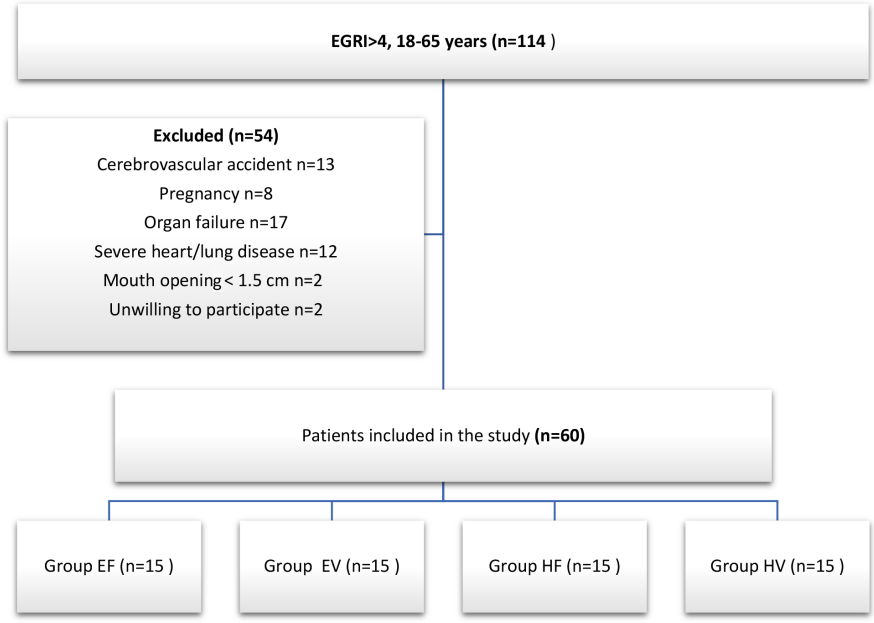

Figure 1. Study flowchart
EF: E practitioner using video fiberscope, HF: H practitioner using video fiberscope, EV: E practitioner using DCI video laryngoscope, HV: H practitioner using DCI video laryngoscope,EGRI: El-Ganzouri risk index

classification, neck movement, ability to prognath, body weight, and history of difficult tracheal intubation (Table 1) (6). We compared the success of both devices and practitioners with different experiences by using a DCI video laryngoscope and a video fiberscope in cases where difficult intubation is expected.

Endotracheal intubation was performed by an experienced anesthesiologist with a 10-year experience (E) or an inexperienced anesthesiologist who was in the last year (5th year) in Anesthesiology and Reanimation Residency Program (H).

Randomization

Randomization was performed using sealed envelopes. The randomization list was created in the electronic format and the groups were formed using the following initials: E practitioner using video fiberscope (EF), E practitioner using DCI video laryngoscope (EV), H practitioner using video fiberscope (HF), or H practitioner using DCI video laryngoscope (HV).

- Group EF (n=15): Patients undergoing endotracheal intubation using video fiberscope by the E practitioner.

- Group EV (n=15): Patients undergoing endotracheal intubation using DCI video laryngoscope by the E practitioner.

- Group HF (n=15): Patients undergoing endotracheal intubation using video fiberscope by the H practitioner.

Table 1. El-Ganzouri risk index

Mouth opening		**Ability to prognathy**	
>4 cm	0	Yes	0
<4 cm	1	No	1
Thyromental distance		**Body weight**	
>6.5 cm	0	<90 kg	0
6-6.5 cm	1	90-110 kg	1
<6 cm	2	>110 kg	2
Mallampati classification		**History of difficult intubation**	
1	0	No	0
2	1		
3	2	Suspicious	1
4	2	Known	2
Neck movement			
>90°	0	**Total score**	
80-90°	1		
<80°	2		

Total score >4 indicates a difficult intubation risk

- Group HV (n=15): Patients undergoing endotracheal intubation using DCI video laryngoscope by the H practitioner.

Before endotracheal intubation, the sealed envelopes were prepared by an independent individual who was excluded in the study and the practitioner and endotracheal intubation device were selected by another individual who was excluded in the study. Both practitioners and devices were kept prepared at the side of the patient.

Operation Technique

After a minimum 6-h fasting, the patients were placed in the rapid airway management position on the operating theater table and the intravenous route was created using a 22-gauge needle. Physiological saline (0.9%) was infused at a dose of 2 mL/kg/h. No premedication was administered. Systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean blood pressure (MBP) were measured. All patients were monitored using electrocardiography and peripheral oxygen saturation (SpO_2).

Before induction, preoxygenation was applied and the end-tidal oxygen was maintained at >80%. Following intravenous lidocaine administration (0.5 mg/kg), propofol was infused at a dose of 1.5 mg/kg. For intraoperative analgesia, remifentanil 0.05 to 0.2 µg/kg/min was infused via the intravenous route. Manual ventilation was applied via an anesthesia mask and neuromuscular block was maintained using intravenous rocuronium bromide at a dose of 0.6 mg/kg. Three minutes later, endotracheal intubation was performed using the DCI video laryngoscope or a video fiberscope.

During endotracheal intubation, the average size of the tube for an adult female was 7.0 to 7.5 and an adult male was 8.0 to 8.5 which was made of polyvinyl chloride with a sharp-edged Murphy eye and rounded atraumatic edges and low cuff pressure. During video laryngoscopy, a soft distal-tip, atraumatic, plastic aluminum probe was used. Using video fiberscope, sterile lubricant gel was applied to ensure that the intubation tube could pass through the device. Using the DCI video laryngoscope, sterile lubricant gel was also used to retrieve the probe from the intubation tube.

Data Collection and Outcome Measures

Data including age and sex of the patient, body weight, height, body mass index, ASA score, previous surgeries, concomitant chronic diseases and drugs, EGRI score, time to reach the glottis (defined as the time from the device reaching the anterior incisors to reaching vocal cords in min), and duration of intubation (defined as the time elapse between the visualization of the vocal cords and advancing the intubation tube through the vocal cords in min) were recorded. Successful intubation was defined as passing the fiberscope camera through the vocal cords for a video fiberscope and passing of the intubation tube through the vocal cords for a DCI video laryngoscope.

Cormack-Lehane score: In the patients undergoing DCI video laryngoscope, endotracheal intubation tube was visualized before passing the vocal cords. The localization of the intubation tube was confirmed using capnography and a stethoscope by auscultation of the apex and base of both lungs from the mid-axillary line. If endotracheal intubation failed after three consecutive attempts and if the intubation duration was >3 min with a SpO_2 of <90%, endotracheal intubation was considered unsuccessful. In such cases, ventilation was applied using the anesthesia mask until a SpO_2 of 100% was achieved and alternative airway devices were used.

After the procedure, the patient was extubated and throat pain and/or aphonia was evaluated at 2 h. Pulse (bpm), SBP (mmHg), DBP (mmHg), MBP (mmHg), and SpO_2 were measured before induction (at baseline), during intubation, and at 1, 2, and 5 min. after intubation.

Statistical Analysis

Statistical analysis was performed using the SPSS for Windows version 22.0 software (IBM Corp., Armonk, NY, USA). Descriptive data were presented in mean ± standard deviation or number and frequency, where applicable. The Shapiro-Wilk test was used for normality check. The Levene test was used for homogeneity assumption. Binary comparisons were performed using the independent t-test. A p-value of <0.05 was considered statistically significant at 95% confidence interval.

RESULTS

There was no statistically significant difference in the demographic characteristics of the patients (Table 2).

Table 2. Demographic characteristics of the patients

	Practitioner	n	Mean	Standard deviation	Standard error mean
Age	E	30	45.23	15.58	2.84
	H	30	53.56	12.84	2.34
BMI (kg/m^2)	E	30	33.70	10.16	1.85
	H	30	34.23	8.19	1.49

BMI: Body mass index

Table 3. EGRI scores of patients

	EGRI score 5	EGRI score 6
EF	12	3
HF	11	4
EV	11	4
HV	12	3

Group EF (n=15): Patients undergoing endotracheal intubation using video fiberscope by the E practitioner; group EV (n=15): Patients undergoing endotracheal intubation using DCI video laryngoscope by the E practitioner; group HF (n=15): Patients undergoing endotracheal intubation using video fiberscope by the H practitioner; group HV (n=15): Patients undergoing endotracheal intubation using DCI video laryngoscope by the H practitioner.

EGRI: El-Ganzouri risk index, EF: E practitioner using video fiberscope, HF: H practitioner using video fiberscope, EV: E practitioner using DCI video laryngoscope, HV: H practitioner using DCI video laryngoscope, DCI: Direct-coupled interface

According to the EGRI scores, 12 patients in the EF group had a score of 5, while 3 patients in the EF group had a score of 6. In the HF group, 11 patients had a score of 5 and 4 patients had a score of 6. In the EV group, 11 patients had a score of 5 and 4 patients had a score of 6. In the HV group, 12 patients had a score of 5 and 3 patients had a score of 6 (Table 3).

There was no statistically significant difference in the mean time to reach the glottis using the DCI video laryngoscope between the two practitioners; however, the E practitioner performed the endotracheal intubation using the video laryngoscope in a statistically significantly shorter time than the H practitioner (p=0.047) (Table 4).

Furthermore, there was no statistically significant difference in the mean time to reach the glottis using the video fiberscope or DCI video laryngoscope between the EF and EV groups. However, endotracheal intubation was performed in a statistically significantly shorter time using DCI video laryngoscope by the E practitioner (p=0.014) (Table 5).

DISCUSSION

Endotracheal intubation is a common procedure used in the anesthesiology practice to secure the airway and respiration during surgical interventions. Difficult mask ventilation and difficult endotracheal intubation cases should be identified before anesthesia induction and necessary precautions should be taken. Therefore, various complications ranging from a simple dental infection to devastating conditions can be prevented. There are several methods to identify difficult mask ventilation and/or difficult endotracheal intubation cases (7). The EGRI score, which was developed in 1996, is one of these methods. An EGRI score of >4 indicates difficult intubation, while an EGRI score of >7 indicates severe intubation difficulty (8,9).

In difficult endotracheal intubation cases, video laryngoscope and video fiberscope can be used rather than a classical laryngoscope. Using these devices, laryngeal and tracheal structures can be visualized on a wide screen before and during intubation, which provides comfort for the practitioner. It also provides comfort for the patient, as no

Table 4. Time to reach glottis and duration of intubation using DCI video laryngoscope according to the practitioners

	Group	Mean	SD	t	p-value
Time to reach glottis (sec)	EV	9.53	2.53	1.988	0.57
	HV	7.33	3.45		
Duration of intubation (sec)	EV	13.66	2.25	-2.179	**0.047**
	HV	28.60	26.44		

t: Two independent samples t-test. Group EV (n=15): Patients undergoing endotracheal intubation using DCI video laryngoscope by the E practitioner; group HV (n=15): Patients undergoing endotracheal intubation using DCI video laryngoscope by the H practitioner.EV: E practitioner using DCI video laryngoscope, HV: H practitioner using DCI video laryngoscope, DCI: Direct-coupled interface, SD: Standard deviation

Table 5. Time to reach glottis and duration of intubation using different device by the E practitioner

	Group	Mean	SD	t	p-value
Time to reach glottis (sec)	EF	9.66	7.27	0.67	0.947
	EV	9.53	2.53		
Duration of intubation (sec)	EF	26.80	19.26	2.62	**0.014**
	EV	13.66	2.25		

t: Two independent samples t-test. Group EF (n=15): Patients undergoing endotracheal intubation using video fiberscope by the E practitioner; group EV (n=15): Patients undergoing endotracheal intubation using DCI video laryngoscope by the E practitioner. EF: E practitioner using video fiberscope, EV: E practitioner using DCI video laryngoscope, DCI: Direct-coupled interface, SD: Standard deviation

head extension is required in difficult intubation candidates or patients with cervical spine instability. Additionally, these devices facilitate learning during training.

Although alternative methods have been widely used for anesthesia and airway management recently, endotracheal intubation is still the cornerstone of daily practice in anesthesiology and other medical fields. General anesthesia preparations should be performed for both cases, which require general and regional anesthesia. In difficult intubation cases, alternative airway devices and plans should be readily available. In the literature, there are several studies comparing the classical laryngoscope and video laryngoscope and a fiberoptic bronchoscope.

Many studies have shown that the results vary depending on the practitioner's experience and skills. In our study, we compared the DCI video laryngoscope and video fiberscope performed by an E and H practitioner in difficult intubation cases (EGRI score >4). We found no statistically significant difference in the mean time to reach glottis between both devices; however, intubation was performed in a statistically significantly shorter time by the E practitioner than by the H practitioner (p=0.047). In their study including 64 difficult intubation patients, Abdellatif and Ali (4) performed a fiberoptic bronchoscope and video laryngoscope for intubation in an awaken state and reported that intubation was maintained in a shorter time using a video laryngoscope, although it did not reach statistical significance. The lack of statistical significance can be attributed to the fact that the practitioners were not blinded to the intubation devices and all operations were performed by experienced anesthesiologists. Platts-Mills et al. (10) also compared the Glidescope® video laryngoscope and direct laryngoscope in the emergency setting in 233 patients. In both groups, the success rate of the first attempt was similar (81% vs. 84%, respectively). However, the success rate of the first attempt of the third- and fourth-grade residents was statistically significantly higher than the second-grade residents using direct laryngoscope. This can be explained by the higher number of endotracheal intubations using a classical laryngoscope than the video laryngoscope and the increased experience during residency training. Considering these data, our study showed that the success rate was associated with the experience of the practitioner (less attempts and/or shorter time).

In this study, there was no statistically significant difference in the mean time to reach the glottis using the DCI video laryngoscope in the EF and EV groups; however, the E practitioner performed endotracheal intubation using the video laryngoscope in a statistically significantly shorter time than the H practitioner (p=0.014). In a study, Aziz et al. (11) compared the C-MAC video laryngoscope and direct laryngoscope in difficult intubation cases. The success rate of the first attempt was significantly higher with the C-MAC video laryngoscope. However, direct laryngoscope provided endotracheal intubation in a significantly shorter time (33 sec vs. 46 sec, respectively). Additionally, the C-MAC group required less Gum-elastic bougie and/or external laryngeal manipulation (24% vs. 37%, respectively). There was no significant difference in the complication rate between the groups. In a meta-analysis including eight studies with 429 difficult intubation cases, Alhomary et al. (7) compared five video laryngoscope devices (Glidescope, Bullard, McGrath, C-MAC D Blade, Pentax AWS) and two fiberoptic bronchoscopy devices (Karl Storz and Olympus) in an awaken state. Despite heterogeneity among the studies, video laryngoscope ensured a significantly shorter time for intubation than fiberoptic bronchoscope. In another study, Moore et al. (12) compared the Glidescope® video laryngoscope and fiberoptic bronchoscope in 36 patients undergoing bariatric surgery under sedation by two experienced practitioners (both practitioners experienced more than 40 cases with both devices). In the aforementioned study, endotracheal intubation was performed in a significantly shorter time via video laryngoscope, consistent with our study. This can be attributed to the fact that video laryngoscopes have a design similar to conventional laryngoscopes with a relatively easy-to-use system. The video laryngoscope is a rigid system, that provides certain advantages such as visualization of the oral soft tissues and capability of the removal of secretion and blood from the camera.

In a study including 75 patients with obesity, Abdelmalak et al. (13) compared the Glidescope® video laryngoscope and flexible fiberoptic bronchoscope with the assumption that Glidescope® provided intubation in a shorter time. The authors found no significant difference in the intubation duration, number of attempts, and complications between the two devices after general anesthesia induction. In this study, endotracheal intubation was associated with the experience of the practitioner. Additionally, endotracheal intubation failed with both devices and alternative devices were used. The authors recommended that anesthesiologists to be skilled in more than one device. Similary, in our study, the E practitioner performed endotracheal intubation using a DCI video laryngoscope in a significantly shorter time than video fiberscope, which can be attributed to the fact that the video laryngoscope can be inserted into the mouth similar to the classical laryngoscope with a high level of practice in

using these devices by the practitioners; however, the video fiberscope is placed through a mouthpiece while observing an oral airway with a relatively slow attempt with a careful hand, eye, and body cooperation.

The current study provides an additional contribution to the literature, as it compares the DCI video laryngoscope and video fiberscope by two practitioners. As in all fields of medicine, it is a life-saving strategy to recognize case and device diversity in the field of anesthesiology, which is critical for human life. However, there are some limitations to our study. Difficult intubation is a stressful situation for anesthesiologists. In patients with an EGRI score >4, identifying patients in this life-threatening process, determining an intubation plan and recording patients data are among the limitations of our study.

CONCLUSION

In conclusion, the lack of significant differences in the hemodynamic parameters before and during endotracheal intubation between the DCI video laryngoscope and video fiberscope suggests that both devices can be promising alternatives to the classical laryngoscope in patients with hemodynamic instability. Both devices facilitate endotracheal intubation in patients with an EGRI score of >4. Although we included difficult intubation cases (EGRI score of >4) and adult patients in our study, we believe that our attempt to compare E and H practitioners in using these devices will provide a better understanding and insight into the literature on this subject.

*The work entitled "Video Fiberskop ile DCI Video Laringoskop Kullanımının EGRI Skoru >4 Hastalarda İki Uygulayıcı Tarafından Karşılaştırılması: Tek Kör, Prospektif, Randomize Çalışma" is being produced by one of the authors Dr. Halil Cebeci's dissertation.

ETHICS

Ethics Committee Approval: This study was approved by the Ondokuz Mayıs University Clinical Research Ethics Committee (decision no: OMÜ KAEK 2018/362, date: 27/07/2018). The study was registered at ClinicalTrials.gov (NCT05243758).

Informed Consent: All patients were informed about the study and written informed consent was obtained.

Authorship Contributions

Surgical and Medical Practices: H.C., E.K., Concept: H.C., Design: H.C., G.C.C., Data Collection or Processing: H.C., G.C.C., Analysis or Interpretation: H.C., Literature Search: H.C., Writing: H.C., G.C.C., E.K.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

REFERENCES

1. Kayhan Z. Endotrakeal Entübasyon Klinik Anestezi. Üçüncü baskı ed. İstanbul: Logos Yayıncılık; 2004. p: 243-73.
2. Mort TC. Emergency tracheal intubation: complications associated with repeated laryngoscopic attempts. Anesth Analg 2004;99:607-13, table of contents.
3. Apfelbaum JL, Hagberg CA, Caplan RA, Blitt CD, Connis RT, Nickinovich DG, et al. 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 2013;118:251-70.
4. 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;22:385-92.
5. Salama A, Hemy A, Raouf A, Saleh N, Rady S. C-MAC Video laryngoscope versus flexible fiberoptic laryngoscope in patients with anticipated difficult airway: a randomized controlled trial. J Anesth Pati Care 2015;1:1-7.
6. el-Ganzouri AR, McCarthy RJ, Tuman KJ, Tanck EN, Ivankovich AD. Preoperative airway assessment: predictive value of a multivariate risk index. Anesth Analg 1996;82:1197-204.
7. Alhomary M, Ramadan E, Curran E, Walsh SR. Videolaryngoscopy vs. fibreoptic bronchoscopy for awake tracheal intubation: a systematic review and meta-analysis. Anaesthesia 2018;73:1151-61.
8. Caldiroli D, Cortellazzi P. A new difficult airway management algorithm based upon the El Ganzouri Risk Index and GlideScope® videolaryngoscope. A new look for intubation? Minerva Anestesiol 2011;77:1011-7.
9. Cortellazzi P, Minati L, Falcone C, Lamperti M, Caldiroli D. Predictive value of the El-Ganzouri multivariate risk index for difficult tracheal intubation: a comparison of Glidescope videolaryngoscopy and conventional Macintosh laryngoscopy. Br J Anaesth 2007;99:906-11.
10. Platts-Mills TF, Campagne D, Chinnock B, Snowden B, Glickman LT, Hendey GW. A comparison of GlideScope video laryngoscopy versus direct laryngoscopy intubation in the emergency department. Acad Emerg Med 2009;16:866-71.
11. Aziz MF, Dillman D, Fu R, Brambrink AM. Comparative effectiveness of the C-MAC video laryngoscope versus direct laryngoscopy in the setting of the predicted difficult airway. Anesthesiology 2012;116:629-36.
12. Moore A, El-Bahrawy A, El-Mouallem E, Lattermann R, Hatzakorzian R, LiPishan W, et al. Videolaryngoscope or fibreoptic bronchoscopy for awake intubation of bariatric patients with predicted difficult airways–a randomised, controlled trial. Anaesthesia 2017;72:538-9.
13. Abdelmalak BB, Bernstein E, Egan C, Abdallah R, You J, Sessler DI, et al. GlideScope® vs flexible fibreoptic scope for elective intubation in obese patients. Anaesthesia 2011;66:550-5.