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Annals of Clinical and Analytical Medicine
Original Research

Comparison of endotracheal intubation success using two different video laryngoscopes

Video laryngoscopes and intubation success

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Abstract

Aim: An anesthesiologist needs to have the expertise and ability to perform intubation with video-assisted approaches when conventional approaches are unsuccessful. This study compared McGrath and Truview video laryngoscopes with respect to intubation success, intubation time, and early postoperative complications, while hemodynamic changes were evaluated as secondary outcomes.

Methods: This retrospective observational study included 123 patients aged 18–65 years with American Society of Anesthesiologists physical status classes I–III who underwent elective surgery under general anesthesia. Patient data were obtained from preoperative assessment forms. Patients intubated using McGrath (MG) (n = 63) and Truview video laryngoscopes (TW) (n = 60) were divided into Groups MG and TW, respectively. The same premedication and anesthesia induction protocol was applied to all patients. The number of intubation attempts, intubation duration, and early postoperative complications were evaluated retrospectively.

Results: First-attempt endotracheal intubation was achieved in 59 patients (93.7%) in the MG group and in 51 patients (85%) in the TW group, with no significant difference between the groups. However, the duration of intubation was significantly shorter in the MG group compared with the TW group (14 vs. 36 seconds, $P < .001$). At least one postoperative complication occurred in 19% of patients in the McGrath group and 35% in the Truview group, indicating a statistically significant difference ($P < .05$).

Conclusion: Video laryngoscopes enhance intubation by providing ergonomic handling and better anatomical visualization. Furthermore, they improve patient comfort by minimizing early postoperative complications. In this study, McGrath video laryngoscopes were associated with shorter intubation duration and fewer early postoperative complications related to laryngoscopy and endotracheal intubation.

Keywords

laryngoscopy, video laryngoscopes, endotracheal intubation, postoperative complications

DOI: 10.4328/ACAM.23046 Ann Clin Anal Med 2026;17(11):00
Received: 27.12.2025 Accepted: 09.03.2026 Published Online: 31.03.2026 Printed: 01.11.2026
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Introduction

Airway management, which includes a range of procedures to secure the airway, is widely recognized as a critical component of anesthesia care. Despite comprehensive preoperative assessments, studies show that a considerable proportion of challenging airway cases are unpredictable.[1] It has been shown in studies that video laryngoscopes in all designs reduce the risk of potential failed intubation, improve glottic visualization, allowing for successful intubation on the first attempt, and may be safer than direct laryngoscopy.[2,3] The video laryngoscope is an appropriate alternative and should be available for facing the ever-challenging, difficult airway patient.[4] In fact, video laryngoscopes can be used both as first-line tools and as rescue options when conventional direct laryngoscopy is unsuccessful or contraindicated.

In classical direct laryngoscopy, it is necessary to hyperextend the patient's neck, apply a force to displace the tongue using a blade, and obtain a direct view of the patient's oral axis. However, various video laryngoscope designs have been shown to enhance visualization of laryngeal structures and provide clearer images by integrating camera systems at the tip of the blade, eliminating the need for direct alignment of the oral, pharyngeal, and laryngeal axes. This technique provides better orientation to anatomical structure, increases the probability of intubation success, and shortens the time required for intubation.[5] Less force also reduces the risk of dental damage and soft tissue trauma. Furthermore, the absence of the need to extend the neck during intubation makes video laryngoscopes advantageous for trauma patients, particularly those with cervical injuries. For these reasons, video laryngoscopes have a significant position among intubation strategies in difficult airway algorithms.[6,7]

Numerous studies have been conducted to highlight the advantages and disadvantages of video laryngoscopes, and most importantly, to compare intubation success rates. These studies primarily aim to compare video laryngoscopes with the classical Macintosh laryngoscopes. This study aims to compare intubation success, intubation time, and early postoperative complications between McGrath and Truview video laryngoscopes, with secondary assessment of hemodynamic responses.

Materials and Methods

This study was conducted with 123 patients aged between 18 and 65 who had elective surgery requiring endotracheal intubation in the operating rooms, classified as American Society of Anesthesiologists (ASA) physical status I-III. The hospital's electronic medical record system, preoperative examination forms, and anesthesia follow-up forms were scanned to systematically record demographic information, preoperative airway assessment scores, and types of laryngoscopes used. Patients with missing data, whose operations were classified as emergency, had dementia or similar cognitive dysfunction, were using beta-blockers, had major pathology that significantly altered airway anatomy, were hemodynamically unstable, were pregnant, or had gastroesophageal reflux disease or delayed gastric emptying were excluded from the study. Patients intubated with the McGrath video laryngoscope (MG) were labeled as Group MG, and those intubated with the Truview video laryngoscope (TW) were labeled as Group TW.

All patients included in the study underwent a standard premedication, anesthesia induction protocol, and intubation by anesthesiologists with similar seniority (2 years or more). Patients' heart rate, noninvasive blood pressure, number of intubation attempts with McGrath and Truview video laryngoscopes, and intubation time (standardized as the time from laryngoscope insertion into the mouth to display of the end-respiratory carbon dioxide graph) were recorded from the anesthesia observation form. Early postoperative complications such as nausea, vomiting, chills, sore throat, or hoarseness were documented from the post-anesthesia care unit (PACU) standard checklist.

Ethical Approval

This study was approved by the Ethics Committee of Ankara University Faculty of Medicine (Date: 23.05.2016, Decision No: 10-429-16).

Statistical Analysis

Statistical analysis of the data was performed using the SPSS v16.0 (Statistical Package for the Social Sciences) program. A power analysis was conducted before the study, determining a minimum sample size of 60 per group at a 95% confidence level. Descriptive statistics were used for count data as frequency (percentage), while measurement data were expressed as mean ± standard deviation and median (minimum–maximum), as appropriate. The independent two-sample t-test and chi-square test were employed for comparing quantitative data. A *P* value of <0.05 was considered to be statistically significant.

Reporting Guidelines

This study was reported in accordance with the STROBE guidelines.

Results

This study examined 123 patients, 63 of whom were intubated using the McGrath video laryngoscope and 60 using the Truview video laryngoscope. When the demographic data of the patients in both groups were compared, no statistically significant difference was found, indicating that the groups were homogeneously distributed. In addition, no statistically significant difference was found between the two groups in Mallampati scores, which are one of the parameters predicting potential risks of difficult airway and difficult intubation (Table 1).

The rate of successful intubation on the first attempt was found to be 93.7% (59 patients) in Group MG and 85% (51 patients) in Group TW, with no statistically significant difference between the two groups (*P* = .119) (Table 2). Intubation time for Group MG was 14 seconds, while Group TW took 36 seconds. When the time needed to perform intubation was determined, it was found to be significantly shorter in patients intubated with the McGrath video laryngoscopes compared to those intubated with the Truview laryngoscopes (*P* < .001) (Table 2).

There were no statistically significant differences in heart rate between the groups at pre-induction and at the 3rd, 5th, and 10th

Table 1. Demographic Data of Groups MG and TW

Characteristics	Group MG (*n* = 63)	Group TW (*n* = 60)	*P* value
Age, y	38 (18-60)	40 (18-74)	.371
Body weight, kg	77 (43-135)	75 (50-100)	.618
Height, cm	165 (148-182)	165 (140-190)	.323
Sex, M/*F*	32/31	27/33	.64
Mallampati score	2 (1-4)	2 (1-3)	.420
Class I (*n*)	25	26	
Class II (*n*)	23	24	
Class III (*n*)	13	10	
Class IV (*n*)	2	0	

All data are presented as mean (min-max).

Table 2. Key Intubation Outcomes in Groups MG and TW

Outcome	Group MG	Group TW	*P* value
Intubation success at first trial, *n* (%)	59 (93.7)	51 (85)	.119
Duration of intubation (sec), mean (min–max)	14 (5–60)	36 (20–80)	< .0001
Any complication (%)	19	35	.046

minutes after induction ($P > .05$). However, heart rate measured immediately after induction was significantly higher in Group MG compared to Group TW ($P = .005$). No statistically significant difference was found between groups at pre-induction, and at 10 minutes post-induction, mean arterial pressure ($P > .05$). However, the mean arterial pressure values measured at third- and fifth-minute post-induction were statistically significantly higher in Group TW compared to Group MG ($P < .05$). Detailed hemodynamic changes, including heart rate and mean arterial pressure measurements at predefined time points, are presented in Supplementary Table 1.

At least one postoperative complication occurred in 19% of patients in the McGrath video laryngoscope group and 35% of patients in the Truview video laryngoscope group. The difference between the two groups in the frequency of early postoperative complications was statistically significant ($P = .046$) (Table 2). A sore throat was the most common early postoperative complication in both groups. The distribution of specific postoperative complications is detailed in Supplementary Table 1.

Discussion

Airway management remains a cornerstone of anesthetic practice, and the continuous evolution of video laryngoscopy has significantly reshaped strategies for managing both routine and difficult airways. In the present study, we compared McGrath and Truview video laryngoscopes in terms of intubation success, duration of intubation, hemodynamic responses, and early postoperative complications. Our findings demonstrated that both devices provided high first-attempt success rates; however, McGrath was associated with significantly shorter intubation times and fewer postoperative complications. These results demonstrate that design differences between video laryngoscopes can significantly affect intubation performance and patient outcomes. These findings highlight the importance of device selection, particularly in clinical settings where rapid and non-traumatic intubation is vital.

In a study conducted by Gurleen Kaur et al., the intubation time for patients intubated with the McGrath video laryngoscope (6.55 seconds) was shorter than that for patients intubated with the Truview video laryngoscope (6.67 seconds) and the Macintosh laryngoscope (7.15 seconds), but the difference was not statistically significant. Also, the laryngoscopy times for McGrath were found to be shorter than the others.[8] A study involving 1000 patients observed that the intubation time for patients intubated with the McGrath video laryngoscope was shorter than that with direct laryngoscopy.[9] Maassen et al. reported that in morbidly obese patients, the intubation time was shorter with the Storz video laryngoscope compared to the Glidescope and McGrath video laryngoscopes (17, 33, and 41 seconds, respectively).[10] Zundert et al. also found that the intubation time with the Storz V-Mac was shorter than with the Glidescope and McGrath video laryngoscopes (18, 34, and 38 seconds, respectively).[11]

In our study, which included patients for whom difficult intubation was not anticipated, the intubation time for Group MG was 14 seconds, and for Group TW, 36 seconds. It was statistically significant that patients intubated with the McGrath video laryngoscope had a shorter duration compared to those intubated with the Truview laryngoscope ($P < .001$). This result is thought to be due to differences in blade angle and camera positioning between the video laryngoscopes.

Studies have shown that the success rate of intubation on the first attempt is crucial in preventing post-intubation complications in patients.[5] A large-scale randomized controlled trial comparing McGrath video laryngoscopy with direct laryngoscopy demonstrated an improved first-attempt intubation success rate in the McGrath group (94% versus 82%).[9] In this study, among the 123 patients included, 110 were intubated on the first attempt and 13 on the second attempt. In the McGrath video laryngoscope group, 59 out of 63 patients (93.7%) were intubated on the first attempt, while in the Truview group, 51 out of 60 patients (85%) achieved first-attempt intubation. No statistically significant difference was found between the two groups in terms of the number of attempts required for endotracheal intubation.

It is known that the force applied during laryngoscopy, intubation duration, number of attempts, and mechanical stimulation of the airway can lead to hemodynamic changes and post-intubation complications.[12] Therefore, it is important to note that the choice of laryngoscope significantly affects the hemodynamic response, with video laryngoscopes reducing hemodynamic responses and leading to fewer complications.[13] Xue et al. investigated the hemodynamic responses to endotracheal intubation using the GlideScope video laryngoscope and Macintosh direct laryngoscope in 57 patients. They found no statistically significant differences between the two groups.[14] In our study, however, the average blood pressure of patients intubated with Truview was found to be statistically higher than that of the patients intubated with McGrath at the 3rd and 5th minutes post-intubation, though this difference did not reach a clinically significant level.

Barak et al. compared the Truview EVO2 video laryngoscope with the Macintosh blade laryngoscope regarding complications, reporting more soft palate injuries and bleeding with the Macintosh blade.[15] Jones et al. compared the GlideScope video laryngoscope with the Macintosh blade laryngoscope in 70 patients planned for nasal intubation under general anesthesia, finding less moderate and severe postoperative throat pain in the video laryngoscope group.[16] Our study found that 19% of the McGrath group and 35% of the Truview group experienced at least one postoperative complication, with a statistically significant difference ($P < .05$). A sore throat was identified as the most common early postoperative complication in all groups. The reduced complication rate with McGrath can be attributed to the ergonomic blade design and the lower force required to visualize the larynx. These findings highlight the importance of device-related factors in improving patient comfort and reducing adverse postoperative outcomes.

It should also be noted that the duration of endotracheal intubation, the number of attempts, and the hemodynamic response to intubation are related to the experience of the anesthesiologist as well as the method used.[17]

Limitations

The most important limitations of this study are its retrospective design and single-center nature. Since the choice of laryngoscope during endotracheal intubation was physician-dependent, this

may have introduced selection bias. Only the Mallampati score, which is commonly used to predict a difficult airway, was recorded as a preoperative airway assessment parameter. Other airway evaluation measures, such as thyromental distance or Cormack–Lehane grading, were not available in the medical records, which may limit a more comprehensive assessment of airway difficulty. Despite these limitations, this study reflects real-world clinical practice and provides meaningful comparative data on the performance of different video laryngoscopes.

Conclusion

The ergonomic use of video laryngoscopes and their improvement of anatomical visualization facilitate the user experience. Furthermore, video laryngoscopes also reduce early postoperative complications, so they enhance patient comfort. This study demonstrates that the McGrath video laryngoscope was associated with shorter intubation time than the Truview video laryngoscope and with fewer early postoperative complications related to laryngoscopy and endotracheal intubation.

Declarations

Animal and Human Rights Statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed Consent

Informed consent was waived.

Data Availability

The datasets used and/or analyzed in the current study are not publicly available due to patient privacy concerns but are available from the corresponding author upon reasonable request.

Conflict of Interest

The authors declare no conflict of interest.

Funding

None.

Author Contributions (CRediT Taxonomy)

Conceptualization: P.K.B., M.Ö., K.S.Ç.T., Z.A.
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Data Curation: P.K.B.
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Writing – Original Draft: P.K.B.
Writing – Review & Editing: P.K.B., M.Ö., K.S.Ç.T., Z.A.
Supervision: Z.A.

AI Usage Disclosure

Artificial intelligence tools were not used in the design, data collection, analysis, or interpretation of this study. AI-based tools were used only for minor language editing and grammar improvement.

Abbreviations

ASA: American society of anesthesiologists
HR: Heart rate
MAP: Mean arterial pressure
MG: Mcgrath video laryngoscope
PACU: Post-anesthesia care unit
SPSS: Statistical package for the social sciences
STROBE: Strengthening the reporting of observational studies in epidemiology
TW: Truview video laryngoscope

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How to Cite

Pınar Karabak Bilal, Keziban Sanem Çakar Turhan, Menekşe Özçelik, Zekeriyya Alanoğlu. Comparison of endotracheal intubation success using two different video laryngoscopes. Ann Clin Anal Med 2026;17(11):Article in Press. doi:10.4328/ACAM.23046