Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.69980/vha63m47

A COMPARATIVE STUDY OF VIDEO LARYNGOSCOPE VERSUS DIRECT LARYNGOSCOPE IN PATIENTS WITH ANTICIPATED DIFFICULT AIRWAY: A PROSPECTIVE OBSERVATIONAL STUDY

Dr. Ankur Mehra[1], Dr. Gautam Bhardwaj[2], Dr. Rajesh Garg[3]

[1]Assistant Professor, Department of Anaesthesiology, IQ City Medical College & Hospital, Durgapur, West Bengal, India. (**akmehta432@gmail.com**)
[2]Assistant Professor, Department of Anaesthesiology, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, Uttar Pradesh, India. (**gautambhardwaj98@gmail.com**)
[3]Assistant Professor, Department of Anaesthesiology, IQ City Medical College & Hospital, Durgapur, West Bengal, India. (**drrajeshgarg12@gmail.com**)

***Corresponding Author:** Dr. Gautam Bhardwaj
* Department of Anaesthesiology, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, Uttar Pradesh, India.

ABSTRACT

Background: Airway management remains a critical aspect of anesthetic practice, particularly in patients with anticipated difficult airway. Direct laryngoscopy has been the conventional method for endotracheal intubation; however, video laryngoscopes have emerged as an advanced alternative offering improved visualization.

Objectives: To compare video laryngoscope and direct laryngoscope in patients with anticipated difficult airway with respect to glottic visualization, intubation success rate, number of attempts, time taken for intubation, and associated complications.

Methods: This prospective observational study was conducted in a tertiary care hospital over a period of one year (February 2016 to January 2017). A total of 90 patients with anticipated difficult airway undergoing elective surgery under general anesthesia were included, with 45 patients in each group. Patients were intubated using either video laryngoscope or direct laryngoscope. Parameters assessed included Cormack-Lehane grade, first-attempt success rate, number of attempts, time to intubation, use of adjuncts, and complications. Statistical analysis was performed using SPSS version 20.0, with $p<0.05$ considered significant.

Results: Baseline characteristics were comparable between the two groups. Video laryngoscopy provided significantly better glottic visualization (84.4% Grade I–II vs 57.8%, p=0.006) and higher first-attempt success rate (86.7% vs 66.7%, p=0.028). The mean number of attempts and requirement of adjuncts were significantly lower in the video laryngoscope group. However, time taken for intubation was significantly longer with video laryngoscopy (28.6 ±6.4 vs 24.9 ±5.8 seconds, p=0.004). Complications were lower in the video laryngoscope group but did not reach statistical significance.

Conclusion: Video laryngoscopy is superior to direct laryngoscopy in anticipated difficult airway due to improved visualization and higher success rates, despite a slightly longer intubation time. Its use can enhance airway management and patient safety.

Keywords: Video laryngoscope; Direct laryngoscope; Difficult airway; Intubation; Cormack-Lehane grade; Airway management

INTRODUCTION

Difficult airway management remains one of the most critical challenges in anesthesiology, contributing significantly to perioperative morbidity and mortality worldwide. Failure to secure the airway can result in hypoxia, brain injury, or even death, making effective airway management a cornerstone of safe anesthesia practice. The incidence of difficult intubation varies between 1–10% in the general surgical population, while failed intubation occurs in approximately 0.05–0.35% of cases [1,2]. Anticipated difficult airway, identified through preoperative assessment, provides an opportunity to plan and utilize advanced airway devices to improve success rates and reduce complications.

Direct laryngoscopy (DL), traditionally performed using the Macintosh laryngoscope, has been the standard technique for tracheal intubation for decades. However, it requires alignment of the oral, pharyngeal, and laryngeal axes, which may be difficult or impossible in patients with anatomical variations, obesity, cervical spine immobility, or other predictors of difficult airway [3]. In such situations, repeated attempts at direct laryngoscopy may increase the risk of airway trauma, hypoxemia, and hemodynamic instability [4].

In recent years, video laryngoscopes (VL) have emerged as an important advancement in airway management. These devices incorporate a camera at the blade tip, allowing indirect visualization of the glottis without the need for alignment of airway axes. Several studies have demonstrated that video laryngoscopy improves glottic visualization, increases first-attempt success rates, and reduces the need for multiple intubation attempts, particularly in patients with difficult airway [5,6]. Additionally, VL may be associated with reduced airway trauma and improved training outcomes for less experienced operators [7].

Despite these advantages, the superiority of video laryngoscopes over direct laryngoscopy in anticipated difficult airway scenarios remains a subject of ongoing debate. While some studies report significantly improved laryngeal view and intubation success with VL, others suggest that improved visualization does not always translate into easier or faster intubation due to challenges in tube navigation [8]. Furthermore, the availability, cost, and learning curve associated with video laryngoscopes may limit their widespread use, especially in resource-constrained settings such as many tertiary care hospitals in developing countries [9].

In the Indian context, where patient diversity and varying levels of healthcare infrastructure exist, it is essential to evaluate the effectiveness of newer airway devices in real-world clinical settings. Limited local data comparing video laryngoscopy and direct laryngoscopy in anticipated difficult airway cases necessitates further research to guide clinical practice. Understanding the comparative performance of these devices can aid anesthesiologists in selecting the most appropriate technique, thereby improving patient safety and outcomes.

Therefore, this study aims to compare the efficacy of video laryngoscope versus direct laryngoscope in patients with anticipated difficult airway in terms of glottic visualization, intubation success rate, number of attempts, and associated complications in a tertiary care hospital setting.

METHODOLOGY

Study Design: This study was designed as a prospective observational comparative study, conducted to evaluate and compare the performance of video laryngoscope and direct laryngoscope in patients with anticipated difficult airway, following the STROBE guidelines for observational studies.

Study Setting: The study was conducted in the Department of Anaesthesiology at a tertiary care hospital, where a wide spectrum of elective surgical procedures requiring general anesthesia and endotracheal intubation are routinely performed.

Study Duration: The study was carried out over a period of 1 year from February 2016 to January 2017.

Study Population: The study population comprised adult patients scheduled for elective surgeries under general anesthesia who were identified preoperatively as having an anticipated difficult airway based on standard airway assessment parameters.

Inclusion Criteria
• Patients aged 18–65 years
• Patients of either gender
• Patients posted for elective surgery under general anesthesia with endotracheal intubation
• Patients with anticipated difficult airway, defined by one or more of the following:
◦ Mallampati grade III or IV
◦ Thyromental distance <6 cm
◦ Inter-incisor distance <3 cm
◦ Limited neck mobility
• Patients who provided written informed consent

Exclusion Criteria
• Patients requiring emergency surgery
• Patients with unanticipated difficult airway
• Patients with upper airway pathology (tumors, trauma, infection)
• Patients at risk of aspiration (full stomach, GERD)
• Patients with severe cardiopulmonary instability
• Pregnant patients

Sample Size: A total of 90 patients were included in the study, with 45 patients in each group (video laryngoscope group and direct laryngoscope group). The sample size was determined based on feasibility and patient availability during the study period, while ensuring adequate representation for comparative analysis in a single-center observational study.

Sampling Technique: A consecutive sampling technique was used. Eligible patients meeting the inclusion criteria during the study period were enrolled sequentially and allocated into two groups based on the laryngoscopic technique used during intubation.

Data Collection Tools & Procedure: All patients underwent a thorough pre-anesthetic evaluation including detailed airway assessment. Standard monitoring (ECG, non-invasive blood pressure, pulse oximetry) was applied in the operating room. After preoxygenation, patients were induced using a standardized anesthesia protocol, including intravenous induction agents and neuromuscular blockade. Patients were intubated using either a video laryngoscope (VL group) or a direct laryngoscope with Macintosh blade (DL group) by experienced anesthesiologists. The choice of device was based on operator preference and availability.
During intubation, the following parameters were recorded:
• Cormack-Lehane (CL) grading of glottic view
• Number of intubation attempts
• Time taken for successful intubation (from insertion of laryngoscope to confirmation of tube placement)

• Use of adjuncts (e.g., stylet, bougie)
• Intubation success rate
• Complications such as airway trauma, desaturation (SpO_2 <90%), dental injury, or hemodynamic changes
All observations were recorded in a predesigned structured proforma.

Study Variables: The independent variable in this study was the type of laryngoscope used (video laryngoscope vs direct laryngoscope). The dependent variables included parameters reflecting intubation performance and safety, such as glottic visualization (Cormack-Lehane grade), intubation success rate (first attempt and overall), number of attempts, time taken for intubation, use of adjunct devices, and incidence of complications (hypoxia, airway trauma, hemodynamic instability).

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 20.0. Continuous variables were expressed as mean ±standard deviation and compared using the Student's t-test. Categorical variables were expressed as frequencies and percentages and analyzed using the Chi-square test or Fisher's exact test, as appropriate. A p-value <0.05 was considered statistically significant.

Ethical Considerations: Written informed consent was obtained from all participants prior to enrollment. Confidentiality of patient data was strictly maintained. The study adhered to the ethical principles outlined in the Declaration of Helsinki, ensuring respect for autonomy, beneficence, non-maleficence, and justice.

RESULTS

A total of 90 patients with anticipated difficult airway were included and equally distributed into video laryngoscope and direct laryngoscope groups. The baseline demographic characteristics, including age, gender, BMI, and Mallampati grading, were comparable between the two groups, with no statistically significant differences (Table 1).

Table 1: Baseline Characteristics of Study Participants (n = 90)

Variable	Video Laryngoscope (n=45)	Direct Laryngoscope (n=45)	p-value
Age (years), Mean ± SD	42.3 ± 10.5	44.1 ± 11.2	0.45
Gender (M/F)	26 / 19	24 / 21	0.65
BMI (kg/m²), Mean ± SD	27.8 ± 3.2	28.1 ± 3.5	0.72
Mallampati Grade (III/IV)	30 / 15	28 / 17	0.64

The video laryngoscope group demonstrated significantly better glottic visualization, with a higher proportion of patients having Cormack-Lehane Grade I–II views compared to the direct laryngoscope group (84.4% vs 57.8%, p=0.006) (Table 2).

Table 2: Glottic View (Cormack-Lehane Grade)

CL Grade	Video Laryngoscope (n=45)	Direct Laryngoscope (n=45)	p-value
Grade I–II	38 (84.4%)	26 (57.8%)	0.006*
Grade III–IV	7 (15.6%)	19 (42.2%)	

*Statistically significant

First-attempt intubation success was significantly higher in the video laryngoscope group (86.7%) compared to the direct laryngoscope group (66.7%) (p=0.028). The mean number of intubation

attempts was also significantly lower in the video laryngoscope group. Additionally, the need for adjuncts such as bougie or stylet was significantly reduced when using video laryngoscopy (Table 3).

Table 3: Intubation Characteristics

Parameter	Video Laryngoscope (n=45)	Direct Laryngoscope (n=45)	p-value
First Attempt Success	39 (86.7%)	30 (66.7%)	0.028*
Overall Success Rate	45 (100%)	43 (95.6%)	0.15
Number of Attempts (Mean ± SD)	1.13 ± 0.34	1.36 ± 0.58	0.012*
Use of Adjunct (Bougie/Stylet)	10 (22.2%)	18 (40.0%)	0.048*

*Statistically significant

However, the time required for intubation was significantly longer in the video laryngoscope group compared to the direct laryngoscope group (28.6 ±6.4 seconds vs 24.9 ±5.8 seconds, p=0.004) (Table 4).

Table 4: Time Taken for Intubation (seconds)

Parameter	Video Laryngoscope (n=45)	Direct Laryngoscope (n=45)	p-value
Time (Mean ± SD)	28.6 ± 6.4	24.9 ± 5.8	0.004*

*Statistically significant

Regarding complications, although the incidence of desaturation, airway trauma, and dental injury was lower in the video laryngoscope group, these differences were not statistically significant (Table 5).

Table 5: Complications During Intubation

Complication	Video Laryngoscope (n=45)	Direct Laryngoscope (n=45)	p-value
Desaturation (SpO_2 <90%)	2 (4.4%)	6 (13.3%)	0.13
Airway Trauma	1 (2.2%)	5 (11.1%)	0.09
Dental Injury	0 (0%)	2 (4.4%)	0.15

Overall, video laryngoscopy was associated with improved glottic view and higher first-attempt success rates, albeit with a slightly longer intubation time compared to direct laryngoscopy.

DISCUSSION

The present prospective observational study compared the performance of video laryngoscope (VL) and direct laryngoscope (DL) in patients with anticipated difficult airway. The key findings of this study demonstrate that video laryngoscopy significantly improves glottic visualization, enhances first-attempt intubation success, reduces the number of attempts, and decreases the need for adjuncts. However, it was associated with a slightly longer time to intubation. The incidence of complications was lower with VL, although not statistically significant.

One of the most important findings of this study was the significantly better glottic view achieved with video laryngoscopy, as reflected by a higher proportion of Cormack-Lehane Grade I–II views. This is consistent with previous studies that have shown superior laryngeal visualization with VL due to indirect visualization without the need for alignment of airway axes [5,6]. Griesdale et al. in their meta-analysis reported that video laryngoscopy significantly improves glottic view compared to direct laryngoscopy, particularly in difficult airway scenarios [6]. Similarly, Aziz et al. demonstrated improved laryngeal exposure and higher success rates with the GlideScope in routine and difficult

intubations [5]. These findings support the growing preference for VL in anticipated difficult airway cases.

The present study also found a significantly higher first-attempt success rate with VL compared to DL. This is clinically important, as multiple intubation attempts are associated with increased risk of hypoxemia, airway trauma, and adverse outcomes [4]. The improved first-pass success with VL observed in this study aligns with findings by Nouruzi-Sedeh et al., who reported higher success rates even among less experienced operators using video laryngoscopy [7]. Improved visualization likely contributes to better tube placement and reduced need for repeated attempts.

Another notable observation was the reduced requirement for adjuncts such as bougie or stylet in the VL group. This finding indicates that VL facilitates easier intubation despite difficult airway anatomy. Malik et al. also reported reduced reliance on adjuncts with video laryngoscopy due to improved visualization of the glottis [9]. However, it is important to note that in some cases, despite a good glottic view, tube negotiation may still require adjuncts due to the angulated blade design of VL devices.

In contrast, the time taken for intubation was significantly longer in the VL group. This finding is consistent with previous literature suggesting that although VL improves visualization, it may increase intubation time due to the learning curve, need for hand-eye coordination, and difficulty in directing the endotracheal tube [8]. Sun et al. reported similar findings, where improved visualization did not necessarily translate into faster intubation [8]. In the present study, the slightly prolonged intubation time with VL is unlikely to be clinically significant, especially when weighed against the benefits of improved success rates and safety.

Regarding complications, although the VL group demonstrated a lower incidence of desaturation, airway trauma, and dental injury, the differences were not statistically significant. This may be attributed to the relatively small sample size. Nevertheless, the trend toward fewer complications with VL is clinically relevant and has been supported by previous studies [6]. Reduced airway trauma with VL can be explained by less forceful manipulation and better visualization during intubation.

From a clinical perspective, the findings of this study suggest that video laryngoscopy is a valuable tool in the management of anticipated difficult airway. It enhances safety by improving visualization and increasing first-attempt success, thereby reducing the risk of complications associated with repeated attempts. However, factors such as cost, availability, and operator experience must be considered, particularly in resource-limited settings. In such environments, training in both techniques remains essential.

The strengths of this study include its prospective design, standardized data collection, and focus on anticipated difficult airway, which reflects real-world clinical challenges. However, certain limitations must be acknowledged. First, the study was conducted in a single center with a relatively small sample size, which may limit generalizability. Second, allocation was not randomized, introducing the possibility of selection bias. Third, operator experience and familiarity with devices could have influenced the outcomes. Lastly, blinding was not feasible due to the nature of the intervention. The findings of this study are consistent with existing literature and reinforce the role of video laryngoscopy as an effective alternative to direct laryngoscopy in anticipated difficult airway management.

CONCLUSION

This prospective observational study demonstrates that video laryngoscopy offers significant advantages over direct laryngoscopy in patients with anticipated difficult airway. The use of video laryngoscope was associated with improved glottic visualization, higher first-attempt intubation success rates, fewer intubation attempts, and reduced need for adjunct devices. Although the time required for intubation was slightly longer with video laryngoscopy, this difference is clinically acceptable in view of the improved safety profile. The incidence of complications such as desaturation, airway trauma, and dental injury was lower in the video laryngoscope group, though not

statistically significant. These findings suggest that video laryngoscopy enhances overall intubation conditions and may reduce airway-related morbidity. Incorporating video laryngoscopy into routine airway management, especially in anticipated difficult airway cases, can improve patient outcomes. However, adequate training, cost considerations, and device availability must be addressed for wider implementation. Further large-scale, randomized studies are recommended to strengthen the evidence base.

DECLARATIONS

Funding: None

Conflict of Interest: The authors declare no conflict of interest.

Consent: Written informed consent was obtained from all participants prior to inclusion in the study.

Acknowledgment: The authors acknowledge the support of the Department of Anaesthesiology and all participants involved in the study.

REFERENCES

1. Biebuyck JF, Benumof JL. Management of the difficult adult airway with special emphasis on awake tracheal intubation. Anesthesiology. 1991 Dec 1;75(6):1087-110.
2. Rose DK, Cohen MM. The airway: problems and predictions in 18,500 patients. Canadian Journal of Anaesthesia. 1994 May;41(5):372-83.
3. Adnet F, Borron SW, Racine SX, Clemessy JL, Fournier JL, Plaisance P, Lapandry C. The intubation difficulty scale (IDS): proposal and evaluation of a new score characterizing the complexity of endotracheal intubation. Anesthesiology. 1997 Dec 1;87(6):1290-7.
4. Peterson GN, Domino KB, Caplan RA, Posner KL, Lee LA, Cheney FW. Management of the difficult airway. Anesthesiology. 2005 Jul 1;103(1):33-9.
5. Aziz MF, Healy D, Kheterpal S, Fu RF, Dillman D, Brambrink AM. Routine clinical practice effectiveness of the Glidescope in difficult airway management: an analysis of 2,004 Glidescope intubations, complications, and failures from two institutions. Anesthesiology. 2011 Jan 1;114(1):34-41.
6. Griesdale DE, Liu D, McKinney J, Choi PT. Glidescope® video-laryngoscopy versus direct laryngoscopy for endotracheal intubation: a systematic review and meta-analysis. Canadian Journal of Anesthesia/Journal canadien d'anesthésie. 2012 Jan;59(1):41-52.
7. Nouruzi-Sedeh P, Schumann M, Groeben H. Laryngoscopy via Macintosh blade versus GlideScope: success rate and time for endotracheal intubation in untrained medical personnel. Anesthesiology. 2009 Jan;110(1):32-7.
8. Sun DA, Warriner CB, Parsons DG, Klein R, Umedaly HS, Moult M. The GlideScope Video Laryngoscope: randomized clinical trial in 200 patients. Br J Anaesth. 2005 Mar;94(3):381-4.
9. Malik MA, Maharaj CH, Harte BH, Laffey JG. Comparison of Macintosh, Truview EVO2®, Glidescope®, and Airwayscope® laryngoscope use in patients with cervical spine immobilization. British journal of anaesthesia. 2008 Nov 1;101(5):723-30.