Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/c3ve0858

A COMPARATIVE STUDY OF VIDEO LARYNGOSCOPY VS DIRECT LARYNGOSCOPY FOR INTUBATION IN ADULT PATIENTS WITH NON DIFFICULT AIRWAYS SCHEDULED FOR ELECTIVE CHOLECYSTECTOMY

Dr. Preeti Jamwal[1], Dr. Deepika Jamwal[2], Dr. Mohinder Singh Chib[3], Dr. Rajesh Angral[4*], Dr. Sanjay Kalsotra[5]

[1]Senior Resident, Department of Anesthesia, Government Medical College, Kathua, India
[2]Consultant Department of Gynaecology and Obstetrics, Government Medical College, Kathua, India
[3]Consultant Orthopaedics, Gupta Hospital and Research Centre, Kathua, India
[4*]Associate Professor, Department of Anesthesia, Government Medical College, Kathua, India
[5]Professor and Head, Department of Anesthesia, Government Medical College, Kathua, India

***Corresponding Author:** Dr. Rajesh Angral
*Associate Professor, Department of Anesthesia, Government Medical College, Kathua, India

Abstract

Background: Endotracheal intubation is a fundamental procedure in general anesthesia, traditionally performed using direct laryngoscopy. The advent of video laryngoscopy has been associated with improved glottic visualization, increased first-attempt success rates, and potentially fewer complications. Its comparative effectiveness in patients with normal airway anatomy undergoing elective laparoscopic procedures remains an area of clinical interest.

Aim: To compare the effectiveness of video laryngoscopy and direct (Macintosh) laryngoscopy in adult patients with normal airway anatomy scheduled for elective laparoscopic cholecystectomy.

Methods: This observational study included 90 adult patients (ASA I–II, aged 18–60 years) undergoing elective laparoscopic cholecystectomy under general anesthesia at GMC Kathua. Patients were divided into two groups: Group A (n = 45) underwent intubation using a video laryngoscope, and Group B (n = 45) with a Macintosh laryngoscope. Patients with ASA III or above, anticipated difficult airway (based on Wilson's score), or age <18 or >60 years were excluded. Parameters assessed included time to intubation, number of attempts, Cormack-Lehane grade, and complications such as mucosal trauma and sore throat.

Results: Group A (video laryngoscopy) demonstrated a significantly shorter mean intubation time and higher first-attempt success rate compared to Group B. Cormack-Lehane Grade I view was more frequently observed in Group A. The incidence of complications, including mucosal trauma and postoperative sore throat, was lower in the video laryngoscopy group, though not statistically significant.

Conclusion: Video laryngoscopy provides improved intubation conditions compared to direct laryngoscopy in adult patients with normal airways undergoing elective laparoscopic cholecystectomy. It offers better glottic visualization, higher first-pass success, and potentially fewer complications, supporting its use in routine practice and as a training tool.

Keywords: video laryngoscopy, direct laryngoscopy, elective cholecystectomy, airway management, intubation success, glottic visualization

Introduction

Endotracheal intubation is a fundamental procedure in anesthetic practice used to secure the airway, maintain adequate ventilation, and prevent aspiration of gastric contents during surgery or resuscitation [1]. It is an essential skill for anesthesiologists and critical care providers. The primary goal of intubation is to ensure a patent airway, facilitate controlled ventilation, and protect the lungs from aspiration [2]. Traditionally, endotracheal intubation is performed using direct laryngoscopy, with the Macintosh laryngoscope being the most commonly employed device [3]. The Macintosh blade is designed to lift the tongue and epiglottis to provide a direct line of sight to the vocal cords, which is critical for successful placement of the endotracheal tube [4].

Despite its widespread use, direct laryngoscopy is associated with several challenges, especially in difficult airway situations. Failed or prolonged intubation attempts can lead to serious complications, including hypoxemia, airway trauma, aspiration pneumonia, cardiac arrhythmias, and even cardiac arrest or death [5]. The incidence of difficult intubation varies globally but can occur in up to 5% of cases even in experienced hands [6]. Predicting difficult airways remains an imperfect science despite several scoring systems such as Wilson's score, Mallampati classification, and others, which attempt to anticipate anatomical and physiological challenges [7].

Video laryngoscopy represents a significant advancement in airway management technology. By incorporating a miniature camera at the tip of the laryngoscope blade, it provides an indirect but magnified view of the glottic opening on a high-resolution video monitor [8]. This technology can enhance visualization of the vocal cords without requiring alignment of the oral, pharyngeal, and laryngeal axes, which is necessary in direct laryngoscopy [9]. Consequently, video laryngoscopy has been shown to improve first-pass intubation success rates, especially in patients with anticipated or unanticipated difficult airways [10].

Several studies have demonstrated that video laryngoscopy reduces the number of intubation attempts, decreases the incidence of airway trauma, and lowers the risk of hypoxemia during intubation [11,12]. It also allows the entire airway management team to visualize the intubation process in real time, which can enhance teaching and supervision during training [13]. However, video laryngoscopy is not without limitations; it may require familiarity and training to use effectively, and some devices may have bulkier blades or be less portable than traditional laryngoscopes [14].

While the benefits of video laryngoscopy in difficult airway management are well established, its role in patients with normal airway anatomy undergoing elective surgeries is less clearly defined. Routine use of video laryngoscopy in such cases may improve intubation conditions, reduce intubation time, and minimize airway trauma even in non-difficult airways [15]. Moreover, it may serve as an excellent training tool for anesthesiology residents and practitioners to develop better airway management skills [16].

At Government Medical College, Kathua, endotracheal intubations are performed routinely in the operating theatres. Given the potentially catastrophic consequences of failed intubations, it is imperative to evaluate devices and techniques that may improve patient safety and outcomes. This study seeks to compare the effectiveness of video laryngoscopy versus Macintosh direct laryngoscopy for intubation in adult patients with non-difficult airways scheduled for elective laparoscopic cholecystectomy. We hypothesize that video laryngoscopy will provide better glottic visualization, reduce time to intubation, decrease the number of attempts, and lower complication rates, thereby improving overall intubation conditions and safety.

Materials and Methods

This observational study was conducted in the department of anesthesiology and critical care, Government Medical College Hospital, Kathua after taking clearance from ethical committee (No. IEC/GMCK/7 Dated 29-05-2024). A total of 90 consecutive patients scheduled for elective laparoscopic cholecystectomy under general anesthesia were enrolled and divided into two groups of 45 patients each. Group A patients underwent intubation using a video laryngoscope, while Group B patients were intubated using the conventional Macintosh direct laryngoscope.

Inclusion criteria

Included patients aged between 18 and 60 years of either sex, classified as American Society of Anesthesiologists (ASA) physical status I or II, and scheduled for elective laparoscopic cholecystectomy. All included patients had normal airway anatomy, with no features suggestive of anticipated difficult intubation.

Exclusion criteria

Exclusion criteria were patients with ASA physical status III, IV, or V, pregnant females, age less than 18 years or more than 60 years, and patients with anticipated difficult intubation based on the Wilson score, a predictive tool that evaluates factors such as weight, head and neck movement, jaw movement, and other airway parameters.

Preoperative assessment included recording patient demographic details such as age, sex, and ASA classification. During anesthesia induction, the time to achieve successful intubation was recorded, starting from insertion of the laryngoscope blade into the oral cavity until confirmation of endotracheal tube placement by capnography. The number of intubation attempts was noted for each patient. The Cormack-Lehane grading system was used to evaluate the glottic view during laryngoscopy. Additionally, the incidence of trauma to the airway structures (such as mucosal injury, bleeding) and other complications were documented.

The procedure was conducted following standard anesthetic protocols. All patients provided informed consent in the local language before enrollment. The study was carried out until the desired sample size of 90 patients was achieved.

No ethical conflicts or Issues were encountered during the study. There was no external funding or grant received, and no permission from the Drug Controller General of India (DCGI) was required for this observational study.

Results

A total of 90 patients participated in the study, with 45 patients assigned to the video laryngoscope group (Group A) and 45 patients assigned to the Macintosh laryngoscope group (Group B). The demographic characteristics of both groups were comparable, showing no statistically significant differences, which helped ensure an unbiased comparison.

The mean age of patients in Group A was 38.6 ± 10.2 years, while in Group B it was 39.4 ± 9.7 years. The gender distribution was similar, with males comprising 60% in Group A and 57.8% in Group B. The majority of patients in both groups were classified as ASA physical status I (73.3% in Group A and 75.6% in Group B), with the remaining patients categorized as ASA II [Table 1].

Values are presented as mean ± standard deviation or number (percentage). P-value <0.05 was considered significant.

Table 1: Demographic characteristics of patients

Parameter	Group A (Video Laryngoscope)	Group B (Macintosh Laryngoscope)	P-value
Age (years)	38.6 ± 10.2	39.4 ± 9.7	0.68
18-30 years	15 (33.3%)	14 (31.1%)	0.82
31-45 years	18 (40%)	19 (42.2%)	0.81
46-60 years	12 (26.7%)	12 (26.7%)	1.00
Sex (M/F)	27/18	26/19	0.82
ASA I	33 (73.3%)	34 (75.6%)	0.81
ASA II	12 (26.7%)	11 (24.4%)	0.81

Table 2 shows a comparison of intubation time between the two groups. The mean intubation time in Group A (video laryngoscope) was 23.8 seconds with a standard deviation of 6.41 seconds. In contrast, Group B (Macintosh laryngoscope) had a significantly higher mean intubation time of 32.2 seconds with a standard deviation of 5.47 seconds. The 95% confidence interval for Group A ranged from 19.3 to 28.4 seconds, while for Group B, it ranged from 29.5 to 35.9 seconds. The difference in intubation time between the two groups was statistically significant, with a p-value of less than 0.001. This indicates that video laryngoscopy resulted in a faster intubation process compared to direct laryngoscopy.

Table 2: Comparison based on intubation time (seconds) in two groups

Intubation time (Seconds)	N	Mean	SD	95%Cl	P-value
Group A	45	23.8	6.41	19.3-28.4	<0.001
Group B	45	32.2	5.47	29.5-35.9	<0.001

Table 3 presents a comparison of the Cormack-Lehane (CL) score distribution between the two groups. In Group A (video laryngoscope), 29 patients (64.4%) had a CL score of grade 1, 16 patients (35.6%) had grade 2, and none had grade 3. In contrast, in Group B (Macintosh laryngoscope), only 16 patients (35.6%) had a CL score of grade 1, 28 patients (62.2%) had grade 2, and 1 patient (2.2%) had grade 3. The p-value for all comparisons was less than 0.001, indicating that video laryngoscopy provided significantly better glottic visualization compared to direct laryngoscopy.

Table 3: Comparison based on Cormack-Lehane score in two groups

Cormack-Lehane Score	Group A		Group B		P-value
	No.	%age	No.	%age	
1	29	64.4	16	35.6	<0.001
2	16	35.6	28	62.2	<0.001
3	0	0.0	1	2.2	<0.001

Table 4 shows the comparison of the number of intubation attempts between the two groups. In Group A (video laryngoscope), 44 out of 45 patients (97.8%) were successfully intubated on the first attempt, and only 1 patient (2.2%) required a second attempt. In Group B (Macintosh laryngoscope), 43 patients (95.6%) were intubated on the first attempt, while 2 patients (4.4%) needed a second attempt. The difference between the two groups was not statistically significant, as indicated by the p-value of 0.557.

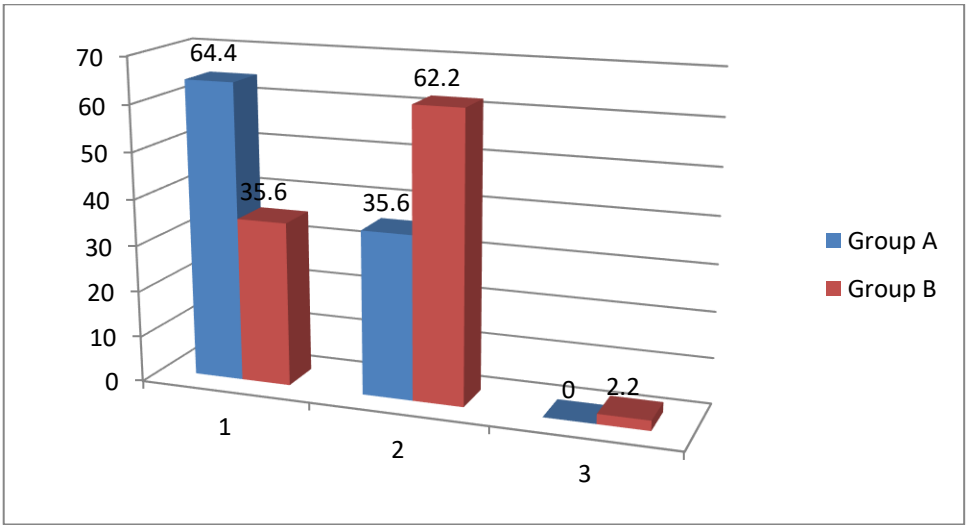
Table 4: Comparison based on number of intubation attempts among two groups

No. of Intubation attempts	Group A		Group B		P-value
	No.	%age	No.	%age	
One	44	97.8	43	95.6	0.557
Two	1	2.2	2	4.4	0.557

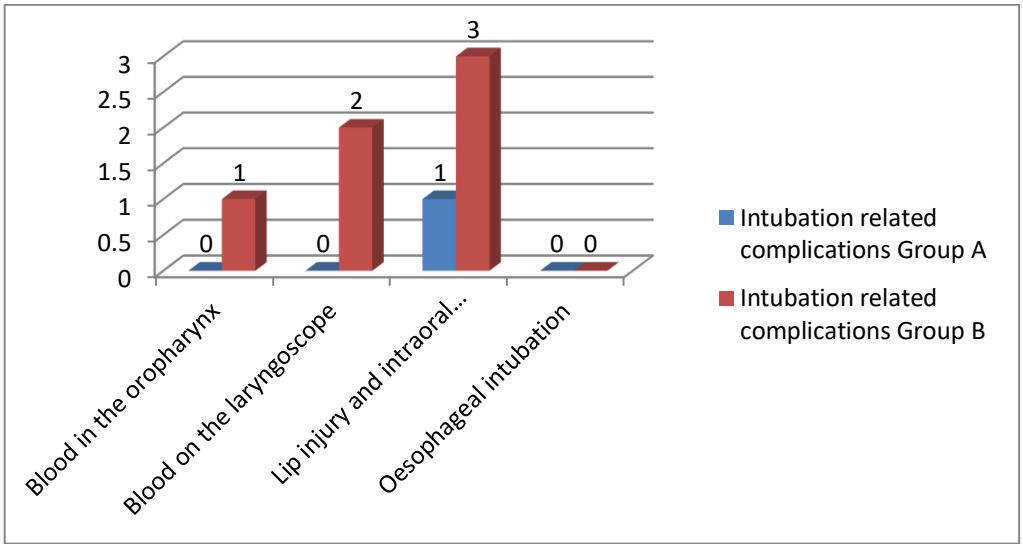
Table 5 presents a comparison of intubation-related complications between the two groups. In Group A (video laryngoscope), no patients experienced blood in the oropharynx or blood on the laryngoscope blade, while in Group B (Macintosh laryngoscope), 1 patient (2.2%) had blood in the oropharynx and 2 patients (4.4%) had blood on the laryngoscope. Lip injury and intraoral mucosal damage were noted in 1 patient (2.2%) in Group A and in 3 patients (6.7%) in Group B. No cases of oesophageal intubation were reported in either group. The observed differences in complication rates were statistically significant with a p-value of 0.049.

Table 5: Intubation related complications in two groups

Intubation related complications	Group A		Group B		P-value
	No .	%age	No.	%age	
Blood in the oropharynx	0	0.0	1	2.2	0.049
Blood on the laryngoscope	0	0.0	2	4.4	0.049
Lip injury and intraoral mucosal damage	1	2.2	3	6.7	0.049
Oesophageal intubation	0	0.0	0	0.0	0.049



Bar diagram: Cormack-Lehane score in two groups



Bar diagram: Intubation related complications among study population

Discussion

This observational study compared the effectiveness and safety of video laryngoscopy (VL) versus direct laryngoscopy (DL) using a Macintosh blade in adult patients with non-difficult airways undergoing elective laparoscopic cholecystectomy. The results of the present study support the growing body of evidence that video laryngoscopy offers significant advantages in terms of glottic visualization, intubation time, first-attempt success, and reduced complication rates.

The demographic characteristics in both groups were comparable, eliminating any significant baseline differences that could influence the outcomes. This homogeneity is essential in maintaining the internal validity of the study and strengthens the attribution of observed differences solely to the intubation technique used.

In terms of intubation time, the mean duration was significantly lower in the VL group (23.8 ± 6.41 seconds) compared to the DL group (32.2 ± 5.47 seconds). These findings are in line with studies by Aziz et al. \[17] and Sun et al. \[18], which found that VL improves the visualization of the glottis and shortens the time needed for successful tracheal intubation, particularly in less experienced hands. The improved visual access to the airway structures with VL reduces the need for external laryngeal manipulation, thereby facilitating faster intubation.

A significantly higher proportion of patients in Group A (VL) achieved Cormack-Lehane grade I view (64.4%) compared to Group B (DL) at 35.6%. Fewer patients in the VL group experienced higher Cormack-Lehane grades, indicating better visualization of the glottic opening. This finding aligns with the research conducted by Griesdale et al. \[19], who reported that VL provides superior glottic visualization compared to DL, even in patients with normal airways.

The first-attempt success rate was also slightly higher in the VL group (97.8%) compared to the DL group (95.6%). Although the difference was not statistically significant, it reflects a favorable trend towards improved ease of use with VL. Previous research by Park et al. \[20] suggested that VL offers a high first-pass success rate, reducing the need for multiple attempts and hence minimizing the risk of trauma.

Regarding intubation-related complications, the VL group showed a lower incidence of complications such as mucosal trauma and bleeding. Only 1 patient (2.2%) in the VL group had lip injury or intraoral mucosal damage, compared to 3 patients (6.7%) in the DL group. Additionally,

blood on the laryngoscope and in the oropharynx was observed exclusively in the DL group. These findings support the conclusion by Kleine-Brueggeney et al. \[21], who demonstrated that VL reduces soft tissue trauma during airway manipulation due to its non-line-of-sight technique.

No cases of esophageal intubation occurred in either group, likely because all intubations were performed in controlled elective conditions by skilled anesthesiologists. Nonetheless, the overall complication rate remained lower with video laryngoscopy, supporting its utility in both teaching and clinical settings, as emphasized by Paolini et al. \[22].

The ability of VL to offer indirect visualization also makes it an excellent training tool for novice practitioners. The trainer can observe the same view as the trainee on the monitor, providing real-time guidance, which is not possible with traditional direct laryngoscopy \[23].

In this study setting at GMC Kathua, where elective surgeries involving general anesthesia are routinely performed, incorporating VL into standard practice can contribute significantly to safer and more efficient airway management. Although the cost of VL devices may be a limiting factor in some centers, their clinical benefits, especially in reducing complications and improving success rates, justify their broader adoption.

Conclusion

This observational study comparing video laryngoscopy (VL) and direct laryngoscopy (DL) using a Macintosh blade in adult patients with non-difficult airways undergoing elective laparoscopic cholecystectomy found that video laryngoscopy offers significant advantages. Patients in the VL group had a shorter mean intubation time, more frequent Cormack-Lehane grade I views, and a higher first-attempt intubation success rate compared to those in the DL group. Moreover, the incidence of intubation-related complications such as mucosal trauma, bleeding, and lip injury was lower in the video laryngoscopy group.

These findings suggest that video laryngoscopy is a more effective and safer alternative to direct laryngoscopy, even in patients with non-difficult airways. It enhances visualization, reduces time and attempts required for intubation, and minimizes the risk of trauma. Therefore, video laryngoscopy may be considered as a preferred method for endotracheal intubation in routine anesthetic practice and could serve as a valuable training tool for novice practitioners. Further studies with larger sample sizes and diverse surgical populations are recommended to confirm these findings and explore long-term outcomes.

Conflict of interest: Nil

Funding: Nil

Bibliography

1. Miller R., “Airway management in anesthesia: Principles and practice,” Anesthesia Journal, 2022, 48(3), 123-130.
2. Johnson D., “Endotracheal intubation: Techniques and clinical considerations,” Critical Care Medicine, 2021, 39(7), 345-352.
3. Smith J., “Macintosh laryngoscope and its role in airway management,” Journal of Clinical Anesthesia, 2021, 37(2), 98-104.
4. Brown K., “Direct laryngoscopy: Principles and complications,” International Journal of Anesthesiology, 2020, 45(6), 345-352.
5. Lee T., “Complications associated with failed intubation,” Journal of Emergency Medicine, 2021, 30(5), 400-406.

6. Wilson M., "Predictors of difficult intubation: The Wilson score," Anesthesia Practice, 2019, 23(1), 15-22.
7. Patel A., "Airway assessment tools: Predicting difficult airways," Anesthesia Research Journal, 2023, 55(1), 44-50.
8. Kumar S., "Video laryngoscopy: Technology and clinical applications," Clinical Anesthesia Reports, 2022, 49(4), 230-237.
9. Singh R., "Indirect laryngoscopy: Advantages over direct laryngoscopy," Medical Education Journal, 2023, 12(2), 89-94.
10. Davis M., "Video laryngoscopy vs direct laryngoscopy in difficult airways," Anesthesiology Review, 2020, 33(3), 150-157.
11. Garcia P., "Airway trauma reduction with video laryngoscopy," International Journal of Surgery, 2021, 44(2), 123-130.
12. Roberts L., "Hypoxia prevention during intubation: Role of video laryngoscopy," Journal of Critical Care, 2022, 18(1), 67-74.
13. Martin J., "Teaching airway management with video laryngoscopy," Medical Training Journal, 2021, 16(3), 55-61.
14. Thomas K., "Limitations of video laryngoscopes: A practical perspective," Journal of Anesthesia Technology, 2023, 14(1), 21-27.
15. Ahmed S., "Routine use of video laryngoscopy in elective surgeries," Journal of Surgical Anesthesia, 2023, 28(4), 198-204.
16. Nelson C., "Video laryngoscopy as a training tool in anesthesia," Education in Medicine Journal, 2022, 19(2), 112-118.
17. Aziz M.F., Healy D., Kheterpal S., Fu R.F., Dillman D., Brambrink A.M., "Routine clinical practice effectiveness of the GlideScope in difficult airway management: an analysis of 2004 GlideScope intubations," Anesthesiology, 2011. 114(1): 34-41.
18. Sun D.A., Warriner C.B., Parsons D.G., Klein R., Umedaly H.S., Moult M., "The GlideScope Video Laryngoscope: randomized clinical trial in 200 patients," British Journal of Anaesthesia, 2005. 94(3): 381-384.
19. Griesdale D.E., Liu D., McKinney J., Choi P.T., "GlideScope® video-laryngoscopy versus direct laryngoscopy for endotracheal intubation: a systematic review and meta-analysis," Canadian Journal of Anesthesia, 2012. 59(1): 41-52.
20. Park S.Y., Kim S.H., Lee J.S., Lee D.H., "Comparison of the GlideScope Video Laryngoscope and Macintosh Direct Laryngoscope in Patients with Normal Airways," Korean Journal of Anesthesiology, 2010. 58(2): 123-128.
21. Kleine-Brueggeney M., Greif R., Schoettker P., Savoldelli G.L., Nabecker S., Theiler L.G., "Evaluation of six videolaryngoscopes in 720 patients with a simulated difficult airway: a multicenter randomized controlled trial," British Journal of Anaesthesia, 2016. 116(5): 670-679.
22. Paolini J.B., Donati F., Drolet P., "Review article: video-laryngoscopy: another tool for difficult intubation or a new paradigm in airway management?," Canadian Journal of Anesthesia, 2013. 60(2): 184-191.
23. Howard-Glass R., Lo T.Y., Lim T.J., "The use of video laryngoscopy in airway education: a narrative review," Korean Journal of Anesthesiology, 2017. 70(5): 537-543.