Original Research Article

COMPARATIVE STUDY OF VIDEO LARYNGOSCOPY AND DIRECT LARYNGOSCOPY IN ADULT PATIENTS WITH PREDICTED DIFFICULT AIRWAY

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ABSTRACT

Background: Airway management remains a major concern in anaesthetic practice, particularly in patients with a predicted difficult airway. Direct laryngoscopy has traditionally been the standard technique for endotracheal intubation; however, difficulty in obtaining an adequate glottic view may lead to repeated attempts, increased intubation difficulty, hemodynamic stress, and airway-related complications. Video laryngoscopy has emerged as an alternative technique that may improve visualization of the glottis and facilitate successful intubation in such patients. The aim is to compare video laryngoscopy and direct laryngoscopy in adult patients with predicted difficult airway in terms of glottic visualization, intubation difficulty, intubation performance, hemodynamic response, and peri-intubation complications.

Materials and Methods: This hospital-based comparative observational study was conducted in the Department of Anaesthesiology at a tertiary care hospital. A total of 102 adult patients with predicted difficult airway were included and divided into two groups: Video Laryngoscopy group (n=51) and Direct Laryngoscopy group (n=51). Preoperative airway assessment included Modified Mallampati grading, inter-incisor distance, thyromental distance, sternomental distance, neck mobility, and other predictors of difficult airway. Intubation was performed by experienced anaesthesiologists using either video laryngoscope or Macintosh direct laryngoscope. Parameters evaluated included Cormack–Lehane grading, Intubation Difficulty Scale score, time to successful intubation, number of attempts, success rate, requirement of adjuncts and optimization maneuvers, hemodynamic response, and peri-intubation as well as postoperative complications. Data were analyzed using SPSS version 27.0.

Results: Baseline demographic and airway assessment parameters were comparable between the two groups. Video laryngoscopy provided significantly better glottic visualization, with Cormack–Lehane Grade I view in 54.90% patients compared to 31.37% in the direct laryngoscopy group. The mean Intubation Difficulty Scale score was significantly lower in the video laryngoscopy group (2.14 ± 1.08 vs 4.38 ± 1.72). Time to successful intubation was shorter with video laryngoscopy (28.64 ± 6.25 seconds vs 36.78 ± 8.14 seconds), and first-attempt success was higher (88.24% vs 66.67%). The need for bougie/stylet, external laryngeal manipulation, and head repositioning was significantly lower in the video laryngoscopy group. Hemodynamic responses during laryngoscopy and intubation were significantly less pronounced with video laryngoscopy.

Conclusion: Video laryngoscopy was superior to direct laryngoscopy in adult patients with predicted difficult airway. It offered better glottic visualization, easier and faster intubation, higher success rates, improved hemodynamic stability, and fewer complications. Video laryngoscopy may therefore be

considered a safer and more effective option for airway management in such patients.
Keywords: Video laryngoscopy; Direct laryngoscopy; Difficult airway; Endotracheal intubation; Cormack–Lehane grading.

INTRODUCTION

Securing the airway is one of the most fundamental responsibilities of the anesthesiologist, and tracheal intubation remains the standard method for protecting the airway during general anesthesia. Despite advances in monitoring, pharmacology, and airway equipment, difficult laryngoscopy and difficult intubation continue to be important causes of perioperative morbidity. Failure to obtain a clear glottic view, repeated attempts at intubation, prolonged airway manipulation, and delayed oxygenation can rapidly lead to hypoxemia, airway trauma, hemodynamic instability, aspiration, and, in extreme situations, catastrophic airway loss. For this reason, identification of patients with a predicted difficult airway before induction of anesthesia remains a central part of perioperative assessment and planning.[1] A predicted difficult airway is usually recognized through a combination of bedside clinical findings rather than any single test alone. Commonly used predictors include higher Modified Mallampati class, limited mouth opening, reduced thyromental or sternomental distance, decreased neck mobility, obesity, craniofacial abnormalities, prominent incisors, receding mandible, and a previous history of difficult intubation. However, the performance of traditional bedside tests is imperfect, and no single screening tool can reliably predict all difficult laryngoscopies. Recent work has emphasized that difficult airway prediction should be viewed as a multimodal process combining physical examination, structured scores, and, in selected cases, imaging-based methods such as airway ultrasound.[2] Direct laryngoscopy with the Macintosh blade has long been regarded as the conventional technique for endotracheal intubation. Its effectiveness depends on alignment of the oral, pharyngeal, and laryngeal axes to obtain a direct line of sight to the glottis. In patients with restricted cervical movement, reduced mouth opening, obesity, altered upper airway anatomy, or other predictors of difficult laryngoscopy, achieving this line of sight may be challenging. Multiple optimization maneuvers such as external laryngeal pressure, repositioning of the head and neck, or use of introducers may therefore become necessary. Even in experienced hands, direct laryngoscopy can be associated with repeated attempts and increased airway stimulation when anatomical visualization is suboptimal.[3] Video laryngoscopy has emerged as a major development in airway management because it provides an indirect magnified view of the glottis without requiring the same degree of axis alignment as direct laryngoscopy. The camera positioned near the blade tip can improve laryngeal visualization, especially in patients with anticipated difficult airway anatomy. In addition to facilitating glottic exposure, video laryngoscopy offers educational and team advantages because the airway view can be shared on a screen, allowing assistants to anticipate maneuvers and supervisors to guide less experienced operators. These features have led to increasing incorporation of video laryngoscopes into difficult airway algorithms, routine practice, and training programs.[4] Recent airway guidelines have also reflected this shift in clinical practice. Contemporary recommendations increasingly support the early use of videolaryngoscopy in patients with anticipated difficult intubation and emphasize having a preformulated airway plan, limiting repeated attempts, and escalating promptly to alternative techniques when initial laryngoscopy is not satisfactory. The latest practice guidance has reinforced the importance of planning for failure, optimizing oxygenation throughout airway management, and selecting airway equipment according to predicted difficulty and operator expertise. Awake tracheal intubation also remains an essential option in selected high-risk patients, highlighting that difficult airway management is not device based alone but depends on preparation, judgment, and rescue planning.[5] Although video laryngoscopy is often assumed to be superior, the clinical picture is more nuanced. Different videolaryngoscope designs, such as Macintosh-style and hyperangulated blades, have different learning curves and may not perform identically in all scenarios. A better laryngeal view does not always guarantee easy tube delivery, and some devices may require stylets, modified tube shaping, or altered hand-eye coordination. Furthermore, airway management outcomes may vary according to whether the setting is an elective operating room, emergency department, or intensive care unit. As a result, comparison between video laryngoscopy and direct laryngoscopy remains clinically relevant, particularly in adults with predicted difficult airway undergoing elective surgery under controlled conditions. Another important aspect is the physiologic response to laryngoscopy and intubation. Sympathetic stimulation during airway instrumentation may produce tachycardia and hypertension, which can be undesirable in patients with cardiovascular or cerebrovascular risk. In addition, repeated attempts and prolonged manipulation may increase the likelihood of mucosal trauma, bleeding, dental injury, sore throat, hoarseness, esophageal intubation, and oxygen desaturation. If video laryngoscopy can reduce the force required for laryngeal exposure, shorten the duration of intubation, and improve first-pass success, it may confer benefits beyond visualization alone. These potential procedural and physiologic advantages justify continued evaluation of video laryngoscopy in difficult-airway populations.[6]

MATERIALS AND METHODS

This hospital-based comparative observational study was conducted in the Department of Anaesthesiology at a tertiary care hospital. The study was designed to compare the performance of video laryngoscopy and direct laryngoscopy in adult patients with predicted difficult airway undergoing elective surgical procedures under general anaesthesia requiring endotracheal intubation. A total of 102 adult patients with predicted difficult airway were included in the study. Patients were allocated into two groups comprising 51 patients in the Video Laryngoscopy group and 51 patients in the Direct Laryngoscopy group. All eligible patients were assessed preoperatively and enrolled after fulfilling the selection criteria.

Inclusion criteria:

Adult patients aged 18 years and above, of either sex, scheduled for elective surgery under general anaesthesia with endotracheal intubation, and identified as having a predicted difficult airway were included in the study. Prediction of difficult airway was based on standard pre-anaesthetic airway assessment parameters such as Modified Mallampati grading III or IV, thyromental distance less than 6.5 cm, reduced mouth opening, sternomental distance, limited neck extension, obesity, and history suggestive of difficult intubation.

Exclusion criteria:

Patients who refused consent, those requiring emergency surgery, patients with an unanticipated need for rapid sequence induction, severe maxillofacial trauma, upper airway pathology, cervical spine instability, or patients in whom awake intubation was planned were excluded from the study. Patients with contraindications to general anaesthesia or those with incomplete clinical data were also excluded.

Methodology

All patients underwent detailed pre-anaesthetic evaluation prior to surgery. Demographic parameters such as age, sex, body mass index, and ASA physical status were recorded. Airway assessment included Modified Mallampati classification, inter-incisor distance, thyromental distance, sternomental distance, neck mobility, presence of buck teeth, receding mandible, and history of snoring or obstructive sleep symptoms. Routine clinical examination and relevant investigations were performed as per institutional protocol.

Grouping and airway intervention: The enrolled patients were divided into two groups based on the laryngoscopic technique used for endotracheal intubation. In one group, tracheal intubation was performed using a video laryngoscope, while in the other group, intubation was carried out using a direct laryngoscope with Macintosh blade. All intubations were performed by anaesthesiologists experienced in both techniques to reduce operator-related bias and ensure uniformity of procedure.

Anaesthetic technique: All patients were kept fasting according to standard preoperative fasting guidelines. In the operating room, baseline parameters including heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, respiratory rate, and peripheral oxygen saturation were recorded. Standard monitoring was established using electrocardiography, non-invasive blood pressure monitoring, pulse oximetry, and capnography. Intravenous access was secured and premedication was administered as per institutional practice. General anaesthesia was induced using standard intravenous agents, followed by administration of an appropriate muscle relaxant to facilitate endotracheal intubation. Adequate mask ventilation was confirmed before proceeding with laryngoscopy and intubation.

Study parameters: The primary objective of the study was to compare the effectiveness of video laryngoscopy and direct laryngoscopy in adult patients with predicted difficult airway. The parameters assessed included Cormack–Lehane laryngoscopic view, Intubation Difficulty Scale score, time taken for successful intubation, number of intubation attempts, success rate of first attempt intubation, need for external laryngeal manipulation, use of adjuncts such as stylet or bougie, and overall success of tracheal intubation. Haemodynamic responses including heart rate and blood pressure were recorded at baseline, during laryngoscopy, immediately after intubation, and at defined intervals thereafter. Complications such as mucosal trauma, bleeding, dental injury, oxygen desaturation, oesophageal intubation, and postoperative sore throat or hoarseness were also noted.

Statistical analysis: The collected data were entered into Microsoft Excel and analyzed using SPSS version 27.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequency and percentage. Comparison of continuous variables between the two groups was performed using the independent sample t-test or appropriate non-parametric test where required. Categorical variables were compared using the Chi-square test or Fisher's exact test. A p-value of less than 0.05 was considered statistically significant.

RESULTS

[Table 1] Demographic and Baseline Clinical Profile

The demographic characteristics of patients in both groups were comparable, indicating good baseline homogeneity. The mean age in the video laryngoscopy group was 46.32 ± 12.14 years, while in the direct laryngoscopy group it was 47.05 ± 11.89 years, with no statistically significant difference (p = 0.74). Gender distribution was also similar, with males comprising 58.82% in the video laryngoscopy group and 56.86% in the direct laryngoscopy group ($p = 0.84$). The mean body mass index (BMI) was comparable between the groups (27.18 ± 3.45 vs 26.94 ± 3.62 kg/m^2; $p = 0.68$). Regarding ASA physical status, the majority of patients in both groups belonged to ASA II (60.78% vs 64.71%), with no significant difference ($p = 0.79$). Additionally, predictors of difficult airway such as history of snoring or obstructive sleep apnea symptoms (21.57% vs 25.49%), receding mandible (15.69% vs 17.65%), and buck teeth (13.73% vs 15.69%) were evenly distributed between the groups (all p-values > 0.05).

[Table 2] Preoperative Airway Assessment Parameters

Preoperative airway assessment parameters were similar between the two groups, ensuring uniformity in predicted airway difficulty. The majority of patients had Modified Mallampati Grade III (62.75% in video vs 58.82% in direct group), while Grade IV was seen in 37.25% and 41.18%, respectively, with no statistically significant difference ($p = 0.68$). Other predictors such as reduced inter-incisor distance (<3 cm), decreased thyromental distance (<6.5 cm), reduced sternomental distance, and limited neck extension were also comparable between the groups (all p-values > 0.05). Obesity as a predictor of difficult airway was present in 31.37% of the video laryngoscopy group and 35.29% of the direct laryngoscopy group ($p = 0.67$). Similarly, a prior history of difficult intubation was reported in a small proportion of patients in both groups (9.80% vs 11.76%; $p = 0.75$).

[Table 3] Laryngoscopic View and Intubation Difficulty

The laryngoscopic view was significantly better in the video laryngoscopy group. A Cormack–Lehane Grade I view was achieved in 54.90% of patients in the video laryngoscopy group compared to 31.37% in the direct laryngoscopy group ($p = 0.01$). Conversely, higher grades indicating poorer visualization (Grade III and IV) were more common in the direct laryngoscopy group (29.41% combined) compared to the video laryngoscopy group (9.80% combined). The mean Intubation Difficulty Scale (IDS) score was significantly lower in the video laryngoscopy group (2.14 ± 1.08) compared to the direct laryngoscopy group (4.38 ± 1.72), indicating easier intubation ($p < 0.001$). Easy intubation (IDS = 0) was achieved more frequently with video laryngoscopy (37.25% vs 15.69%; $p = 0.01$). Moreover, moderate to major difficulty (IDS >5) was significantly higher in the direct laryngoscopy group (23.53% vs 3.92%; $p = 0.003$).

[Table 4] Intubation Performance Parameters

Video laryngoscopy showed superior performance in terms of intubation efficiency and success rates. The mean time required for successful intubation was significantly shorter in the video laryngoscopy group (28.64 ± 6.25 seconds) compared to the direct laryngoscopy group (36.78 ± 8.14 seconds; $p < 0.001$). First-attempt success rate was significantly higher with video laryngoscopy (88.24% vs 66.67%; $p = 0.01$), while more patients in the direct laryngoscopy group required second and third attempts. Notably, third attempt intubation was required only in the direct laryngoscopy group (7.84%; $p = 0.04$). Overall intubation success was 100.00% in the video laryngoscopy group, compared to 92.16% in the direct laryngoscopy group, with a small but significant failure rate observed only in the latter (7.84%; $p = 0.04$). Adjunct use such as bougie or stylet was significantly lower in the video laryngoscopy group (19.61% vs 47.06%; $p = 0.003$). Similarly, the need for external laryngeal manipulation (15.69% vs 50.98%; $p < 0.001$) and head repositioning (11.76% vs 37.25%; $p = 0.002$) was significantly reduced with video laryngoscopy.

[Table 5] Hemodynamic Response During Laryngoscopy and Intubation

Baseline hemodynamic parameters were comparable between the groups, with no significant differences in baseline heart rate (82.46 ± 8.12 vs 81.94 ± 7.85 bpm; $p = 0.74$) or mean arterial pressure (91.26 ± 7.14 vs 90.88 ± 6.96 mmHg; $p = 0.78$). However, during laryngoscopy and intubation, the direct laryngoscopy group exhibited a significantly greater hemodynamic response. Heart rate during laryngoscopy (99.82 ± 10.46 bpm) and immediately after intubation (104.36 ± 11.25 bpm) was significantly higher compared to the video laryngoscopy group (91.28 ± 9.34 and 94.12 ± 9.88 bpm, respectively; both $p < 0.001$). Similarly, mean arterial pressure increased significantly more in the direct laryngoscopy group during laryngoscopy (108.42 ± 9.36 mmHg) and after intubation (110.24 ± 9.72 mmHg) compared to the video laryngoscopy group (98.84 ± 8.22 and 100.16 ± 8.64 mmHg; $p < 0.001$). A clinically significant rise (>20% from baseline) in heart rate and MAP was observed more frequently in the direct laryngoscopy group (43.14% vs 17.65% and 39.22% vs 15.69%, respectively; $p < 0.01$).

[Table 6] Peri-intubation and Postoperative Complications

The incidence of complications was significantly lower in the video laryngoscopy group. Mucosal trauma occurred in 5.88% of patients in the video group compared to 19.61% in the direct group ($p = 0.03$). Oral bleeding was also significantly less frequent (3.92% vs 15.69%; $p = 0.04$). Oxygen desaturation (<92%) and esophageal intubation were observed only minimally in the video laryngoscopy group (3.92% and 0.00%, respectively), whereas higher rates were noted in the direct laryngoscopy group (15.69% and 7.84%; $p = 0.04$). Postoperative complications such as sore throat (11.76% vs 27.45%; $p = 0.04$) and hoarseness of voice (7.84% vs 21.57%; $p = 0.05$) were also more common with direct laryngoscopy. Although dental injury occurred only in the direct laryngoscopy group (3.92%), the difference was not statistically significant ($p = 0.15$).

Table 1: Demographic and Baseline Clinical Profile

Parameter	Video Laryngoscopy (n=51)	Direct Laryngoscopy (n=51)	p-value
Age (years, mean ± SD)	46.32 ± 12.14	47.05 ± 11.89	0.74
Male	30 (58.82%)	29 (56.86%)	0.84
Female	21 (41.18%)	22 (43.14%)	
BMI (kg/m², mean ± SD)	27.18 ± 3.45	26.94 ± 3.62	0.68
ASA I	20 (39.22%)	18 (35.29%)	0.79
ASA II	31 (60.78%)	33 (64.71%)	
History of snoring/OSA symptoms	11 (21.57%)	13 (25.49%)	0.64
Receding mandible	8 (15.69%)	9 (17.65%)	0.79
Buck teeth	7 (13.73%)	8 (15.69%)	0.78

Table 2: Preoperative Airway Assessment Parameters

Parameter	Video Laryngoscopy (n=51)	Direct Laryngoscopy (n=51)	p-value
Mallampati Grade III	32 (62.75%)	30 (58.82%)	0.68
Mallampati Grade IV	19 (37.25%)	21 (41.18%)	
Inter-incisor distance <3 cm	14 (27.45%)	16 (31.37%)	0.66
Thyromental distance <6.5 cm	18 (35.29%)	20 (39.22%)	0.68
Sternomental distance reduced	13 (25.49%)	15 (29.41%)	0.66
Limited neck extension	12 (23.53%)	13 (25.49%)	0.82
Obesity as predictor of difficult airway	16 (31.37%)	18 (35.29%)	0.67
History of difficult intubation	5 (9.80%)	6 (11.76%)	0.75

Table 3: Laryngoscopic View and Intubation Difficulty

Parameter	Video Laryngoscopy (n=51)	Direct Laryngoscopy (n=51)	p-value
Cormack–Lehane Grade I	28 (54.90%)	16 (31.37%)	0.01
Cormack–Lehane Grade II	18 (35.29%)	20 (39.22%)	
Cormack–Lehane Grade III	5 (9.80%)	12 (23.53%)	
Cormack–Lehane Grade IV	0 (0.00%)	3 (5.88%)	
Intubation Difficulty Scale score (mean ± SD)	2.14 ± 1.08	4.38 ± 1.72	<0.001
Easy intubation (IDS 0)	19 (37.25%)	8 (15.69%)	0.01
Slight difficulty (IDS 1–5)	30 (58.82%)	31 (60.78%)	
Moderate to major difficulty (IDS >5)	2 (3.92%)	12 (23.53%)	0.003

Table 4: Intubation Performance Parameters

Parameter	Video Laryngoscopy (n=51)	Direct Laryngoscopy (n=51)	p-value
Time to successful intubation (sec, mean ± SD)	28.64 ± 6.25	36.78 ± 8.14	<0.001
First attempt success	45 (88.24%)	34 (66.67%)	0.01
Second attempt success	6 (11.76%)	13 (25.49%)	
Third attempt required	0 (0.00%)	4 (7.84%)	0.04
Overall successful intubation	51 (100.00%)	47 (92.16%)	0.04
Failed intubation	0 (0.00%)	4 (7.84%)	0.04
Use of bougie/stylet	10 (19.61%)	24 (47.06%)	0.003
External laryngeal manipulation	8 (15.69%)	26 (50.98%)	<0.001
Need for change in head position	6 (11.76%)	19 (37.25%)	0.002

Table 5: Hemodynamic Response During Laryngoscopy and Intubation

Parameter	Video Laryngoscopy (n=51)	Direct Laryngoscopy (n=51)	p-value
Baseline heart rate (beats/min, mean ± SD)	82.46 ± 8.12	81.94 ± 7.85	0.74
Heart rate during laryngoscopy	91.28 ± 9.34	99.82 ± 10.46	<0.001
Heart rate immediately after intubation	94.12 ± 9.88	104.36 ± 11.25	<0.001
Baseline MAP (mmHg, mean ± SD)	91.26 ± 7.14	90.88 ± 6.96	0.78
MAP during laryngoscopy	98.84 ± 8.22	108.42 ± 9.36	<0.001
MAP immediately after intubation	100.16 ± 8.64	110.24 ± 9.72	<0.001
HR increase >20% from baseline	9 (17.65%)	22 (43.14%)	0.005
MAP increase >20% from baseline	8 (15.69%)	20 (39.22%)	0.006

Table 6: Peri-intubation and Postoperative Complications

Parameter	Video Laryngoscopy (n=51)	Direct Laryngoscopy (n=51)	p-value
Mucosal trauma	3 (5.88%)	10 (19.61%)	0.03
Oral bleeding	2 (3.92%)	8 (15.69%)	0.04
Dental injury	0 (0.00%)	2 (3.92%)	0.15
Oxygen desaturation (<92%)	2 (3.92%)	8 (15.69%)	0.04
Esophageal intubation	0 (0.00%)	4 (7.84%)	0.04
Postoperative sore throat	6 (11.76%)	14 (27.45%)	0.04
Hoarseness of voice	4 (7.84%)	11 (21.57%)	0.05

DISCUSSION

In the present study, both groups were well matched at baseline, with no significant differences in age, sex, BMI, ASA status, or preoperative difficult-airway predictors such as snoring/OSA symptoms, receding mandible, buck teeth, Mallampati grade, reduced mouth opening, short thyromental distance, reduced sternomental distance, limited neck extension, obesity, and prior difficult intubation. This baseline homogeneity strengthens the internal validity of the comparison and suggests that the better performance of video laryngoscopy was device related rather than due to group imbalance. A broadly similar anticipated difficult-airway population was studied by Jungbauer et al (2009),[7] who randomized 200 patients with Mallampati grade III or IV airways to video or direct laryngoscopy, thereby also ensuring that both techniques were tested in genuinely difficult laryngoscopy conditions rather than routine airways. Our findings of improved intubation conditions with video laryngoscopy in a predicted difficult airway are in line with the large comparative study by Aziz et al (2012).[8] In our study, first-attempt success was higher with video laryngoscopy than direct laryngoscopy (88.24% vs 66.67%), overall success was 100.00% versus 92.16%, and failed intubation occurred only in the direct laryngoscopy group (7.84%). Aziz et al reported more successful first-attempt intubations with video laryngoscopy than with direct laryngoscopy in predicted difficult airways, specifically 138/149 (93%) versus 124/147 (84%). The superiority of video laryngoscopy in glottic visualization in our study was evident from the higher frequency of Cormack–Lehane grade I view (54.90% vs 31.37%) and the markedly lower proportion of grade III–IV views (9.80% vs 29.41%). This translated into a lower mean Intubation Difficulty Scale score (2.14 ± 1.08 vs 4.38 ± 1.72), more easy intubations (37.25% vs 15.69%), and fewer moderate-to-major difficulty cases (3.92% vs 23.53%). These findings compare favorably with Taylor et al (2013),[9] who studied a simulated difficult airway and found that a Cormack–Lehane grade 1 or 2 view was achieved in all patients with the McGrath videolaryngoscope, compared with only 45 of 88 patients (51%) using the Macintosh laryngoscope. They also reported mean percentage of glottic opening values of 82% with McGrath versus 13% with Macintosh and successful tracheal intubation in all patients with McGrath versus only 26 patients (59%) with Macintosh. Their results, like ours, indicate that improved glottic visualization is a major mechanism by which video laryngoscopy reduces intubation difficulty. The present finding that video laryngoscopy improved laryngeal view is also consistent with pooled evidence from Griesdale et al (2012).[10] In our series, grade I visualization was obtained in 54.90% with video laryngoscopy compared with 31.37% with direct laryngoscopy, while poorer grade III–IV views were far more frequent with direct laryngoscopy. They did not find an overall difference in first-attempt success or time to intubation across all settings, but did observe better first-attempt success (RR 1.8) and shorter intubation time in nonexpert operators. This helps explain why our study, conducted in predicted difficult airways with experienced anesthesiologists, still demonstrated a clinically meaningful visualization advantage that likely contributed to better performance outcomes.

In contrast to some newer device-specific studies, our study showed not only better visualization but also faster and easier intubation with video laryngoscopy. The mean time to successful intubation was significantly shorter with video laryngoscopy than with direct laryngoscopy (28.64 ± 6.25 s vs 36.78 ± 8.14 s), and the need for adjuncts and optimization maneuvers was markedly lower, including bougie/stylet use (19.61% vs 47.06%), external laryngeal manipulation (15.69% vs 50.98%), and head repositioning (11.76% vs 37.25%). Kim et al (2023),[11] in adults with a simulated difficult airway, similarly found better glottic view with the McGRATH device but did not observe a significant improvement in success within 30 seconds, reporting 44/50 (88.0%) versus 36/45 (80.0%) and no shortening of intubation time. Our first-pass results differ from the negative ICU trial by Lascarrou et al (2017),[12] and that contrast is important when interpreting the literature. In our operating-room difficult-airway cohort, first-attempt success was significantly higher with video laryngoscopy (88.24%) than with direct laryngoscopy (66.67%). By contrast, Lascarrou et al reported that video laryngoscopy did not improve first-pass orotracheal intubation in ICU patients, with success rates of 67.7% versus 70.3% for direct laryngoscopy, and video laryngoscopy was associated in post hoc analysis with more severe life-threatening complications, 17/179 (9.5%) versus 5/179 (2.8%). On the other hand, our first-attempt success data closely resemble the large multicenter DEVICE trial by Prekker et al (2023).[13] In our study, first-pass success with video laryngoscopy was 88.24% compared with 66.67% using direct laryngoscopy, and grade I laryngeal view was achieved in 54.90% versus 31.37%. Prekker et al reported successful intubation on the first attempt in 600/705 patients (85.1%) in the video-laryngoscope group and 504/712 patients (70.8%) in the direct-laryngoscope group, while a grade 1 Cormack–Lehane view was seen in 76.3% versus 44.7%, respectively. The close agreement between our study and DEVICE strengthens the conclusion that, when used in environments where airway control is protocolized and video devices are familiar to clinicians, video laryngoscopy can meaningfully improve both glottic view and first-pass success. Hemodynamic stress during laryngoscopy and intubation was lower with video laryngoscopy in our study. Although baseline heart rate and MAP were similar, the direct laryngoscopy group showed significantly greater increases during laryngoscopy and immediately after intubation, and clinically important rises of more than 20% from baseline were more frequent with direct laryngoscopy for both heart rate (43.14% vs 17.65%) and MAP (39.22% vs 15.69%). This suggests that video laryngoscopy may have reduced lifting force and airway stimulation in our patients. However, literature on this issue is mixed. Tempe et al (2016),[14] comparing Truview, McGrath, and Macintosh laryngoscopes in coronary artery bypass grafting patients, found that heart rate and diastolic pressure increased at 0 and 1 minute after intubation in all groups, mean arterial pressure increased at intubation in the videolaryngoscope groups and at 1 minute in all groups, and they concluded that video laryngoscopes did not demonstrate a clear hemodynamic advantage in normal-airway CABG patients. Therefore, our hemodynamic benefit may be more relevant to predicted difficult airways than to routine or cardiac surgical populations. The complication profile in our study further supports the clinical usefulness of video laryngoscopy in predicted difficult airway. Mucosal trauma (5.88% vs 19.61%), oral bleeding (3.92% vs 15.69%), oxygen desaturation (3.92% vs 15.69%), esophageal intubation (0.00% vs 7.84%), postoperative sore throat (11.76% vs 27.45%), and hoarseness of voice (7.84% vs 21.57%) were all lower with video laryngoscopy, while dental injury was infrequent and not significantly different. These findings are consistent with the updated systematic review by Hansel et al (2022),[15] which concluded that videolaryngoscopy likely results in fewer failed intubations, with risk ratios of 0.41 for Macintosh-style devices, 0.51 for hyperangulated devices, and 0.43 for channelled devices, along with higher first-attempt success, better glottic views, and fewer hypoxaemic events.

CONCLUSION

In conclusion, video laryngoscopy was superior to direct laryngoscopy in adult patients with predicted difficult airway. It provided better glottic visualization, lower intubation difficulty, shorter intubation time, and higher first-attempt as well as overall intubation success. Video laryngoscopy also required fewer optimization maneuvers and adjuncts, produced less hemodynamic disturbance during laryngoscopy and intubation, and was associated with fewer peri-intubation and postoperative complications. Therefore, video laryngoscopy may be considered a more effective and safer option than direct laryngoscopy for airway management in such patients at a tertiary care hospital.

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