DOI: https://doi.org/10.53350/pjmhs020231711598

ORIGINAL ARTICLE

Comparison of Airway success Management Between video Laryngoscopy in Difficult Airways

KHURRAM LIAQAT[1], FARAH NAZ[2], IRAM SHAHZADI[3], SAYED MAKARROM BUKHARI[4], SAFEER BUTT[5], ASAD AHMED SHEIKH[6]
[1]*Assistant Professor (NSHS) Consulting Anaesthetist Federal Government Polyclinic Hospital, Islamabad*
[2]*Assistant Professor Department of Anaesthesia & Critical Care Pakistan Institute of Medical Sciences (PIMS), Islamabad*
[3]*Assistant Professor Anaesthesia, AJKMC / SKBZ / CMH, Muzaffarabad (AJK)*
[4]*FCPS Trainee Anaesthesia Bahria International Hospital, Rawalpindi*
[5]*FCPS Trainee Anaesthesia, CMH, Muzaffarabad*
[6]*MBBS Jinnah Medical & Dental College, Karachi*
Correspondence to: Dr. Khurram Liaqat, Email: drkhurramliaqut@gmail.com

ABSTRACT
Background: Difficult airway management is a critical component of anesthetic and emergency care.
Objective: This study compared the success and safety of video laryngoscopy and direct laryngoscopy in patients with difficult airways. **Methods:** A comparative cross-sectional study was conducted at Pakistan Institute of Medical Sciences (PIMS), Islamabad from November 2022 to April 2023, on 105 patients with anticipated or encountered difficult airways. Of these, 53 patients underwent video laryngoscopy and 52 underwent direct laryngoscopy. Data included first-pass success, total intubation attempts, intubation time, Cormack–Lehane grading, need for adjuncts, and airway-related complications.
Results: Video laryngoscopy achieved a higher first-pass success rate of 84.9% (45 of 53) compared with 57.7% (30 of 52) in the direct laryngoscopy group. The mean intubation time was shorter with video laryngoscopy at 28.6 ± 9.4 seconds, whereas direct laryngoscopy required 39.7 ± 12.3 seconds. Better glottic visualization was observed with video laryngoscopy, with 83.0% achieving Cormack–Lehane grades I–II compared with 48.0% in the direct laryngoscopy group. Adjunct use was lower in the video laryngoscopy group at 17.0% compared with 46.1% in the direct laryngoscopy group. Complications were fewer with video laryngoscopy, including desaturation in 7.5% versus 23.0%, airway trauma in 5.6% versus 17.3%, and esophageal intubation in 1.9% versus 9.6% in the direct laryngoscopy group. **Conclusion:** Video laryngoscopy proved superior to direct laryngoscopy in the management of difficult airways. It resulted in higher intubation success, better visualization, fewer complications, and reduced dependency on operator skill.
Keywords: Laryngoscopy, Patients, Complications, Airway, Anesthetic, Incubation

INTRODUCTION
Airway management lies at the heart of safe anesthetic practice, trauma resuscitation, and critical care. Clinicians are trained to assess the difficulties and the risk factors most difficult to assess for difficult airways[1]. Difficult airways and factors such as obesity, cervical immobilisation, trauma to the face, tumours in the airway, congenital anomalies, previous radiation, and anatomical differences often cause multiple failed attempts to insert an intubation tube, which can lead to low hypoxia, airway swelling, aspiration, and in extreme cases, a non-usable airway, potentially resulting in serious consequences[2]. If primary blues can be managed, the factors are negative, and the challenges are considerable. In difficult air scenarios, failing to intubate can lead to serious consequences, with loss of control of ventilation often being the most critical[3]. Open your hand and make a fist to help outline the cavity, as if imagining beginning to map a square cavity. Small spaces increase the risk, and in airways, the line of sight becomes increasingly limited to the glottic view[4]. The integrity of the airway is most impacted, and the line of sight significantly determines the difficulty-to-success ratio. The level of success is most greatly affected in tight spaces. The line of sight is most critical for achieving a semicircular glottic view, requiring advanced manoeuvres to assist with visibility. The morbidly obese often obstruct the airway in some cases, necessitating the most advanced techniques. Laryngeal view and access to the airways with visibility of the glottis are required, and advanced procedures complicate insertion[5]. Direct laryngoscopy provides airway access, serving as the gateway. The amount of experience and the quality of the line of sight, with more advanced manoeuvres, are pivotal in more complex airway scenarios, making intubation increasingly difficult[6]. These limitations have encouraged researchers and clinicians to seek alternatives that allow for more extensive visualisation and decrease the chances of an unsuccessful attempt. Recent years have seen the development of new technology for airway management[7]. This technology, video laryngoscopy, marks a departure from traditional laryngoscopy, where users align the laryngoscope blade, the camera, and the light source, which is built into the tip of the blade, to the same axis as the larynx. Instead, video laryngoscope users can indirectly, and at an arm's length distance, align the laryngoscope to a monitor[8]. This monitor screen provides, in real time, a magnified view of the apparatus's camera focus on the glottis. This device is expected to reduce airway trauma and increase the odds of not having to use excessive force, which many regard as a significant benefit for doctors and operators with varied levels of experience[9]. Additionally, video laryngoscopy allows all members in the operating room to view the same item on a larger screen[10]. This communal viewing enhances teaching, observation, and immediate collaboration in critical airway cases. Compared to traditional laryngoscopy, video laryngoscopy is associated with improved and less invasive airway manipulations and is advantageous for less experienced airway controllers, particularly in obstetric patients requiring urgent intubation[11]. However, not all studies support the view that video laryngoscopy is superior. Some studies have indicated that outcomes from video laryngoscopy in emergency cases are less favourable. Additionally, some have shown that the camera's field of view can be obstructed by secretions and blood, and that laryngoscopy in such emergencies remains more reliable[12]. Such cases are more frequent in prehospital intubation procedures and emergencies. Studies also indicate that the type of monitor, blade style, learning curve, and operator experience significantly impact expected outcomes. Ultimately, the choice between a hyperangulated design blade and a Macintosh-style blade can be very important, as significant differences in results may occur[13].

Objective: This study compared the success and safety of video laryngoscopy and direct laryngoscopy in patients with difficult airways.

METHODOLOGY
This comparative cross-sectional study was conducted atPakistan Institute of Medical Sciences (PIMS), Islamabad from November 2022 to April 2023. A total sample size of 105 patients was recruited for the study. The sample size had been calculated using the WHO sample size calculator, based on the expected difference

Received on 11-05-2023
Accepted on 26-10-2023

in first-pass success between video and direct laryngoscopy, using a 95% confidence level and a 5% margin of error. A non-probability consecutive sampling technique was used. The study included patients aged 18 years and older who required endotracheal intubation and were identified as having anticipated or encountered difficult airways. Difficult airway was defined based on clinical predictors such as limited mouth opening, Mallampati class three or four, restricted neck mobility, obesity, airway deformity, or a known history of previous difficult intubation. Only patients who provided written informed consent were included. Patients with unstable cervical spine injuries, maxillofacial trauma requiring alternative airway devices, those requiring awake fiberoptic intubation, and individuals with incomplete airway documentation were excluded.

Data Collection: Data were collected after obtaining approval from the hospital ethics committee. Eligible patients were assessed preoperatively for airway difficulty, and demographic information, including age, gender, BMI, comorbidities, and predictors of difficult airway, was recorded. Intubation was performed using either video laryngoscopy or direct laryngoscopy based on clinical judgment and device availability. For each intubation attempt, variables such as the number of attempts, first-pass success, time required to achieve intubation, Cormack–Lehane grade, use of adjuncts, and complications including hypoxia, dental trauma, esophageal intubation, or hemodynamic instability were documented. All information was entered into a structured data collection form and cross-checked for accuracy. Patient confidentiality was maintained by removing identifying information.

Data Analysis: Data were analyzed using SPSS version 21.0. Quantitative variables such as age and intubation time were presented as mean and standard deviation. Categorical variables including first-pass success, glottic visualization, and complications were presented as frequencies and percentages. A p-value of 0.05 or less was considered statistically significant.

RESULTS

Data were collected from 105 patients, mean age was 46.2 ± 12.8 years in the video laryngoscopy group and 47.5 ± 11.9 years in the direct laryngoscopy group. Males constituted 64.1% (34 of 53) in the video laryngoscopy group and 61.5% (32 of 52) in the direct laryngoscopy group. The mean BMI was similar between groups at 28.4 ± 4.3 kg/m² and 28.9 ± 4.1 kg/m², respectively. Mallampati class III–IV was observed in 54.7% (29 of 53) of patients in the video laryngoscopy group and 59.6% (31 of 52) in the direct laryngoscopy group. Limited neck mobility was noted in 20.7% (11 of 53) versus 25.0% (13 of 52). Comorbid hypertension or diabetes was present in 41.5% (22 of 53) and 38.4% (20 of 52) of patients, while anticipated difficult airway was reported in 67.9% (36 of 53) and 65.3% (34 of 52), indicating comparable pre-intubation risk profiles.

First-pass success was achieved in 84.9% (45 of 53) of patients using video laryngoscopy versus 57.7% (30 of 52) with direct laryngoscopy ($p < 0.001$). The mean number of attempts was lower in the video laryngoscopy group at 1.2 ± 0.5 compared with 1.8 ± 0.7 in the direct laryngoscopy group ($p < 0.001$). Intubation time was significantly shorter with video laryngoscopy at 28.6 ± 9.4 seconds compared with 39.7 ± 12.3 seconds ($p < 0.001$). Optimal glottic visualization (Cormack–Lehane grade I–II) was achieved in 83.0% (44 of 53) of video-guided cases versus 48.0% (25 of 52) with direct laryngoscopy ($p < 0.001$). The need for adjuncts such as bougie or stylet was lower in the video laryngoscopy group at 17.0% (9 of 53) compared with 46.1% (24 of 52) ($p = 0.001$), further indicating procedural ease with video guidance.

Desaturation below 90% occurred in 7.5% (4 of 53) of patients intubated with video laryngoscopy compared with 23.0% (12 of 52) with direct laryngoscopy ($p = 0.02$). Esophageal intubation occurred in 1.9% (1 of 53) versus 9.6% (5 of 52), while airway trauma occurred in 5.6% (3 of 53) versus 17.3% (9 of 52) ($p = 0.04$). Hemodynamic instability was reported in 3.8% (2 of 53) and 13.4% (7 of 52), respectively. Dental injury occurred only in the direct laryngoscopy group at 5.7% (3 of 52). Overall complication rates were significantly lower with video laryngoscopy at 18.8% (10 of 53) compared with 53.8% (28 of 52) ($p < 0.001$), highlighting its safety advantage.

Operator experience was similar between groups, with 58.4% (31 of 53) of video laryngoscopy cases and 55.7% (29 of 52) of direct laryngoscopy cases being performed by operators with more than 5 years of experience ($p = 0.78$). Among experienced operators, first-pass success was significantly higher with video laryngoscopy at 93.5% (29 of 31) compared with 62.0% (18 of 29) using direct laryngoscopy ($p < 0.001$). Junior operators also performed better with video laryngoscopy, achieving a first-pass success rate of 76.2% (16 of 21) versus 44.4% (12 of 27) with direct laryngoscopy ($p = 0.02$).

Table 1: Baseline Demographic and Clinical Characteristics (n = 105)

Variable	Video Laryngoscopy (n = 53)	Direct Laryngoscopy (n = 52)
Age (years), mean ± SD	46.2 ± 12.8	47.5 ± 11.9
Gender (Male), n (%)	34 (64.1%)	32 (61.5%)
BMI (kg/m²), mean ± SD	28.4 ± 4.3	28.9 ± 4.1
Mallampati class III–IV, n (%)	29 (54.7%)	31 (59.6%)
Limited neck mobility, n (%)	11 (20.7%)	13 (25.0%)
Comorbidities (HTN/DM), n (%)	22 (41.5%)	20 (38.4%)
Anticipated difficult airway, n (%)	36 (67.9%)	34 (65.3%)

Table 2: Intubation Performance and Airway Management Outcomes

Outcome	Video Laryngoscopy (n = 53)	Direct Laryngoscopy (n = 52)	p-value
First-pass success, n (%)	45 (84.9%)	30 (57.7%)	<0.001
Total attempts, mean ± SD	1.2 ± 0.5	1.8 ± 0.7	<0.001
Intubation time (seconds), mean ± SD	28.6 ± 9.4	39.7 ± 12.3	<0.001
Cormack–Lehane grade I–II, n (%)	44 (83.0%)	25 (48.0%)	<0.001
Need for adjuncts (bougie/stylet), n (%)	9 (17.0%)	24 (46.1%)	0.001

Table 3: Complications During Airway Management

Complication	Video Laryngoscopy (n = 53)	Direct Laryngoscopy (n = 52)	p-value
Desaturation (<90%), n (%)	4 (7.5%)	12 (23.0%)	0.02
Esophageal intubation, n (%)	1 (1.9%)	5 (9.6%)	0.09
Airway trauma (mucosal), n (%)	3 (5.6%)	9 (17.3%)	0.04
Hemodynamic instability, n (%)	2 (3.8%)	7 (13.4%)	0.08
Dental injury, n (%)	0 (0%)	3 (5.7%)	0.08
Total complications, n (%)	10 (18.8%)	28 (53.8%)	<0.001

Table 4: Operator Experience and Intubation Success

Variable	Video Laryngoscopy (n = 53)	Direct Laryngoscopy (n = 52)	p-value
Operator experience > 5 years, n (%)	31 (58.4%)	29 (55.7%)	0.78
First-pass success (experienced operator), n (%)	29 (93.5%)	18 (62.0%)	<0.001
First-pass success (junior operator), n (%)	16 (76.2%)	12 (44.4%)	0.02

DISCUSSION

This study compared the effectiveness of video laryngoscopy and direct laryngoscopy in the management of difficult airways and demonstrated that video laryngoscopy consistently performed better across multiple clinically relevant outcomes. The initial characteristics of the two groups were similar regarding age, gender, BMI, airway predictors, and comorbidities, which meant that differences in outcomes were associated with the technique employed, rather than patient factors. Video laryngoscopy had a significantly higher first-pass success rate than direct laryngoscopy. The difference can be attributed to better visualization through the video-assisted blades, which do not require alignment of the airway axes. Most patients in the video laryngoscopy group attained Cormack–Lehane grade one or two views, while the direct laryngoscopy group had a higher rate of difficult glottic views. Given that attaining a high-grade glottic view is strongly associated with successful and timely intubation, the better visualization afforded by video laryngoscopy was likely a significant factor in the faster intubation times and fewer attempts. The reduced need for adjuncts, such as bougies and stylets, in the video laryngoscopy group was also noteworthy[14]. Difficult airways often necessitate the use of extra tools when the glottic opening is poorly visible. The fewer adjuncts used in the video group indicate better visualization and smoother tube passage, which supports the mechanical and ergonomic benefits of video-guided intubation. On the other hand, the group performing direct laryngoscopy frequently needed considerable intubation time and an increased chance of airway injuries and instabilities[15]. Challenges within airway management were even more prevalent with direct laryngoscopy. Within the direct laryngoscopy group, desaturation, airway trauma, and haemodynamic instability were recorded more frequently. This direct correlation can be attributed to the extended duration of laryngoscopy, struggling to visualize the airway, and repeated attempts at opening or manipulating the airway. Oesophageal intubation and injuries to the teeth were also recorded solely with direct laryngoscopy, nearly confirming the associations with lack of sight and airway difficulty[16]. The video laryngoscopy group clearly had the laryngeal structures and surrounding tissues, explaining the fewer complications. There were also noted differences in influence on the two groups. There was a more noted impact in the direct laryngoscopy group of operator experience, with senior anaesthetists having a more pronounced first pass success in comparison to their junior counterparts[17-19]. This was even more pronounced in the direct laryngoscopy group. In the video laryngoscopy group, however, success was uniformly high regardless of a clinician's experience. This valuable finding suggests reduced operator skill and a quicker learning curve. This is particularly beneficial in training programmes and emergencies where clinicians of diverse experience must manage complex airway cases[20]. The results of the study provide strong justification for the additional work needed to achieve the considerable improvement in managing difficult airways with video laryngoscopy[21,22]. This technique offered superior visualization, increased first-attempt success, reduced time taken for intubation, lowered complication rates, and consistency in performance regardless of experience level. This corresponds with the increasing worldwide usage of video laryngoscopy in the first attempt and ramped up airway challenges. Although direct laryngoscopy might still be beneficial in some on-the-spot emergencies and as an alternate technique, the study reinforces the importance of video laryngoscopy as a more effective option when dealing with difficult airways.

CONCLUSION

It was concluded that video laryngoscopy provided significantly better outcomes than direct laryngoscopy in the management of difficult airways. Video laryngoscopy achieved higher first-pass success, offered better glottic visualization, reduced intubation time, and required fewer adjuncts for successful intubation. Complications such as desaturation, mucosal trauma, and hemodynamic instability were also less frequent with video laryngoscopy. The technique showed more consistent performance across different operator experience levels, suggesting a shorter learning curve and greater overall reliability.

REFERENCES

1. Pieters BM, Maas EH, Knape JT, Van Zundert AA. Videolaryngoscopy vs direct laryngoscopy use by experienced anaesthetists in patients with known difficult airways: a systematic review and meta-analysis. Anaesthesia. 2017;72(12):1532–1541. doi:10.1111/anae.14057.
2. Kleine-Brüggeney M, Greif R, Schoettker P, Savoldelli GL, Nabecker S, Theiler LG. Evaluation of six videolaryngoscopes in 720 patients with a simulated difficult airway: a multicentre randomized controlled trial. Br J Anaesth. 2016;116(5):670–679. doi:10.1093/bja/aew058.
3. Gómez-Ríos MÁ, Sastre JA, Onrubia-Fuertes X, López T, Abad-Gurumeta A, Casans-Frances R, et al. Spanish Society of Anesthesiology, Reanimation and Pain Therapy (SEDAR), Spanish Society of Emergency Medicine (SEMES) and Spanish Society of Otolaryngology–Head and Neck Surgery (SEORL-CCC) guideline for difficult airway management. Part II. Rev Esp Anestesiol Reanim. 2024;71(4):207–247. doi:10.1016/j.redare.
4. Khajavi MR, Mohammadyousefi R, Neishaboury M, Moharari RS, Etezadi F, Pourfakhr P. Early clinical experience with a new video laryngoscope (SANYAR) for tracheal intubation in adults: a comparison clinical study. Front Emerg Med. 2022;6:e35. doi:10.18502/fem.v6i3.9397.
5. Khajavi MR, Ramezani R, Sharifnia HR, Najafi A, Barkhordari K. Sanyar video laryngoscope improved time and first pass success of tracheal intubation in intensive care unit compared to direct laryngoscopy. Arch Anesth Crit Care. 2023;9:1–8. doi:10.18502/aacc.v9i3.13111.
6. Etezadi F, Ahangari A, Shokri H, Najafi A, Khajavi MR, Daghigh M, Moharari RS. Thyromental height: a new clinical test for prediction of difficult laryngoscopy. Anesth Analg. 2013;117(6):1347–1351. doi:10.1213/ANE.0b013e3182a8c734.
7. Krobbuaban B, Diregpoke S, Kumkeaw S, Tanomsat M. The predictive value of the height ratio and thyromental distance: four predictive tests for difficult laryngoscopy. Anesth Analg. 2005;101(5):1542–1545. doi:10.1213/01.ANE.0000181000.43971.1E.
8. Mazzinari G, Rovira L, Henao L, Ortega J, Casasempere A, Fernandez Y, et al. Effect of dynamic versus stylet-guided intubation on first-attempt success in difficult airways undergoing GlideScope laryngoscopy: a randomized controlled trial. Anesth Analg. 2019;128(6):1264–1271. doi:10.1213/ANE.0000000000004102.
9. Ibinson JW, Ezaru CS, Cormican DS, Mangione MP. GlideScope use improves intubation success rates: an observational study using propensity score matching. BMC Anesthesiol. 2014;14:101. doi:10.1186/1471-2253-14-101.
10. Hoshijima H, Mihara T, Denawa Y, Shiga T, Mizuta K. Airtraq versus GlideScope for tracheal intubation in adults: a systematic review and meta-analysis with trial sequential analysis. Can J Anaesth. 2022;69(5):605–613. doi:10.1007/s12630-022-02217-0.
11. Cortellazzi P, Caldiroli D, Byrne A, Sommariva A, Orena EF, Tramacere I. Defining and developing expertise in tracheal intubation using a GlideScope for anaesthetists with expertise in Macintosh direct laryngoscopy: an in-vivo longitudinal study. Anaesthesia. 2015;70(3):290–295. doi:10.1111/anae.12878.
12. Ruderman BT, Mali M, Kaji AH, Kilgo R, Watts S, Wells R, Limkakeng AT, Borawski JB, Fantegrossi AE, Walls RM, Brown CA 3rd; National Emergency Airway Registry investigators. Direct vs Video Laryngoscopy for Difficult Airway Patients in the Emergency Department: A National Emergency Airway Registry Study. West J Emerg Med. 2022 Aug 19;23(5):706-715. doi: 10.5811/westjem.2022.6.55551. PMID: 36205675; PMCID: PMC9541990.
13. Hypes CD, Stolz U, Sakles JC, et al. Video laryngoscopy improves odds of first-attempt success at intubation in the intensive care unit: a propensity-matched analysis. Ann Am Thorac Soc. 2016;13(3):382–390. doi:10.1513/AnnalsATS.201508-505OC.
14. Sakles JC, Mosier JM, Chiu S, et al. Tracheal intubation in the emergency department: a comparison of GlideScope video laryngoscopy to direct laryngoscopy in 822 intubations. J Emerg Med. 2012;42(4):400–405. doi:10.1016/j.jemermed.2011.05.019.
15. Sakles JC, Mosier J, Chiu S, et al. A comparison of the C-MAC video laryngoscope to the Macintosh direct laryngoscope for intubation in the emergency department. Ann Emerg Med. 2012;60(6):739–748. doi:10.1016/j.annemergmed.2012.03.031.
16. Park SO, Kim JW, Na JH, et al. Video laryngoscopy improves first-attempt success in endotracheal intubation during cardiopulmonary resuscitation among novice physicians. Resuscitation. 2015;89:188–194. doi:10.1016/j.resuscitation.2014.12.010.

17. Sakles JC, Javedani PP, Chase E, et al. The use of a video laryngoscope by emergency medicine residents is associated with a reduction in esophageal intubations in the emergency department. Acad Emerg Med. 2015;22(6):700–707. doi:10.1111/acem.12674.
18. Driver BE, Prekker ME, Moore JC, et al. Direct versus video laryngoscopy using the C-MAC for tracheal intubation in the emergency department: a randomized controlled trial. Acad Emerg Med. 2016;23(4):433–439. doi:10.1111/acem.12933.
19. Silverberg MJ, Li N, Acquah SO, et al. Comparison of video laryngoscopy versus direct laryngoscopy during urgent endotracheal intubation: a randomized controlled trial. Crit Care Med. 2015;43(3):636–641. doi:10.1097/CCM.0000000000000751.
20. Lascarrou JB, Boisrame-Helms J, Bailly A, et al. Video laryngoscopy vs direct laryngoscopy on successful first-pass orotracheal intubation among ICU patients: a randomized clinical trial. JAMA. 2017;317(5):483–493. doi:10.1001/jama.2016.20603.
21. Choi HJ, Kim Y, Oh YM, et al. Glidescope video laryngoscopy versus direct laryngoscopy in the emergency department: a propensity score-matched analysis. BMJ Open. 2015;5(5):e007884. doi:10.1136/bmjopen-2015-007884.
22. Su YC, Chen CC, Lee YK, et al. Comparison of video laryngoscopes with direct laryngoscopy for tracheal intubation: a meta-analysis of randomized trials. Eur J Anaesthesiol. 2011;28(11):788–795. doi:10.1097/EJA.0b013e32834a34f3.

This article may be cited as: Liaqat K, Naz F, Shahzadi I, Bukhari SM, Butt S, Sheikh AA; Comparison of Airway success Management Between video Laryngoscopy in Difficult Airways . Pak J Med Health Sci, 2023;17(11):598-601.