

Comparison of Direct Laryngoscopy and Video Laryngoscopy Success After Standardized Manikin Training in Medical Students

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Abstract

Objective: Endotracheal intubation is essential for emergency airway management, assisting ventilation and oxygenation by allowing airway patency. As an alternative to direct laryngoscopy (DL), the use of video laryngoscopy (VL) is now advocated by many operators, especially to manage the difficult airway (DA). This study aimed to compare DL and Scoper® VL in normal and DAs.

Materials and Methods: We conducted a crossover trial comparing DL and VL in difficult and normal airway (NA). Twenty volunteer medical students from the University of Health Sciences Türkiye Hamidiye Faculty of Medicine who had not received intubation training before enrolled. After the training sessions, the volunteers performed at four different independent stations (DL on normal and DA scenarios, VL on normal and DA scenarios) in a completely randomized manner on the next day. The primary outcome was the first-pass success rate, with secondary outcomes of time to intubation, number of intubation attempts, user satisfaction, and procedural difficulty by visual analog scale.

Results: Twenty volunteers were included in the study. When the first-pass success rate was examined, the highest success rates were found with VL. No statistically significant difference was detected in terms of time to intubation, user satisfaction with the intervention, or procedural difficulty. No other statistically significant differences were found between the four scenarios in other pairwise comparisons ($p < 0.05$).

Conclusion: Although the first-pass success rates were better with VL, it was not superior to DL. Further studies should be planned involving Scoper® in conjunction with other video laryngoscopes to evaluate efficacy.

Keywords: Video laryngoscopy, direct laryngoscopy, difficult airway, Scoper®, intubation, manikin

Introduction

Endotracheal intubation (ETI) is essential for emergency airway management, assisting ventilation and oxygenation by allowing airway patency. Direct laryngoscopy (DL) allows us to perform this procedure by visualizing the glottis and vocal cords. Video laryngoscopy (VL) includes an integrated high-resolution camera and video monitor to facilitate glottic visualization and ET tube placement [1]. The use of VL, especially to manage difficult airway (DA), is now advocated by many operators [2]. A DA is defined as a clinical situation in which there is expected or unexpected difficulty or failure by a physician trained in

anesthetic care [3]. Vomit, secretions, or blood may obstruct the view of the glottis. Cervical spine immobilization and distorted airway anatomy due to swelling or trauma can make it challenging to obtain a direct view of the glottis. Insufficient mouth opening, enlargement of the tongue, and obesity also lead to DA [4]. Meta-analyses of randomized controlled trials comparing VL and DL in patients with DA have reported better laryngeal visualization, a higher frequency of successful intubation, and a higher first-attempt successful intubation [5,6]. In studies using scoring systems to evaluate intubation difficulty, the use of VL has been shown to be easier than DL, reducing difficult views and intubation difficulty [7,8].



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The theoretical advantages of VL make it attractive for the management of patients requiring emergency orotracheal intubation. However, despite improved glottic visualisation with VL, this may not translate into a higher success rate for successful intubation on the first attempt or decreasing time to intubation, as tracheal intubation under indirect vision may be more difficult [7,9-12]. It has been reported that video laryngoscopes increase the success rate of intubation in novice practitioners without prior experience in airway management [13].

In the literature search, there was no published article on Scoper® VL. This study aimed to compare DL and VL in difficult and normal airway (NA). The primary outcome was the first-pass success rate, with secondary outcomes of time to intubation, user satisfaction, and procedural difficulty level.

Materials and Methods

The study was approved by the University of Health Sciences Türkiye Hamidiye Scientific Research Ethics Committee (decision number: 2/17, date: 14.01.2022).

Study Design and Setting

We conducted a crossover trial comparing DL and VL in normal and DA scenarios. Following written informed consent, 20 volunteer medical students from the University of Health Sciences Türkiye Hamidiye Faculty of Medicine who had not received intubation training before enrollment. Before the start of the study, all participants were given a 2-hour theoretical training session followed by practical training where they could practice on a manikin with the devices. Each participant had at least 10 successful intubation attempts per laryngoscope during the practice session. The volunteers performed at four different independent stations (DL on normal and DA scenarios, VL on normal and DA scenarios) in a completely randomized manner on the next day. We recorded parameters such as time to intubation and number of intubation attempts. In addition, we assessed user satisfaction and procedural difficulty using the visual analog scale (VAS). The scale, a line 0-100 mm, the word “least satisfied/easy” was described on the left side of the line, and “most satisfied/difficult” on the right side. The intubation time was calculated as the time from the volunteer holding the laryngoscope blade visualize the tube passing through the vocal cords. If the patient failed within 30 seconds, they were instructed to withdraw the tube and start again, and if the airway could not be established within 2 min, it was recorded as a failed airway. Each attempt was recorded as the number of attempts.

The manikin used in the practice session and trial was the same (Resusci Anne, Leardal®, Stavenger, Norway). By attaching a cervical collar (Perfit ACE; Ambu Inc, Linthicum, MD) to the manikin, a DA was created. DL was performed

using a standard Macintosh blade 4. VL was performed using a Scoper® (Technomedicare Medical Company, Ankara, Türkiye) with blade 4. The tracheal tube size was a 7.0 mm (internal diameter) (Figure 1).

Statistical Analysis

All statistical analyses were conducted using IBM SPSS Statistics 26.0 (IBM Corp, Armonk, NY). We determined the sample size to detect a reduction in time-to-intubation by comparing the DL with VL of 10 seconds, a standard deviation of 15, type 1 error =0.05, power 80%. This gave a sample size of 17, which was rounded to 20 participants. We used the Shapiro-Wilk test to determine the normal distribution of data. The results are reported as mean ± standard deviation for normally distributed continuous variables. Median and interquartile range were used for non-normally distributed variables, and frequency and percentage were used for categorical variables. Between-group comparisons for continuous data with abnormal distributions were tested using the Wilcoxon test. A p-value of <0.05 was set as statistically significant.

Results

Twenty medical students were included in this study. Nine of the volunteers were female, whereas 11 were male. The mean age of the participants was 20.95 ± 1.024 . No statistically significant difference was detected in terms of time to intubation between DL and VL in normal and DA scenarios. Furthermore, no statistically significant difference was found for time to intubation in DL normal and DAs, and the same was the case in VL ($p > 0.05$) (Table 1).

The first-pass success rate was determined to be 85% for DL in the NA, 95% for DL in the DA, 100% for VL in the NA, and 95% for VL in the DA. Although the highest success rates were found with VL, no statistically significant difference was found (Table 1).



Figure 1. Video laryngoscopy in the normal airway

When user satisfaction with the intervention was evaluated, no statistically significant difference was detected among the groups in terms of VAS scores. Similarly, no statistically significant difference was revealed when the procedural difficulty VAS scores were analyzed (Table 1). No other statistically significant differences were found between the four scenarios in other pairwise comparisons ($p < 0.05$).

Discussion

In this study, we designed four different scenarios for tracheal intubation and compared the performances of DL and VL. Contrary to our hypothesis, we did not observe superiority of VL over DL in terms of time to intubation. We believe that despite providing visual comfort, VL requires more practice to ensure ease of use. We suggest a higher learning curve when passing the endotracheal tube using VL rather than DL. Similar findings have been found in a previous study with novice medical students, in which the intubation time was parallel for both laryngoscopes [13]. In a meta-analysis evaluating 3,050 intubations, there was no difference between the use of DL and VL in terms of time to intubation [9].

Although there was no statistically significant difference, we observed that the first-pass success rate increased with VL. In a study simulated DA with manual in-line stabilization were found to be similar in the first-pass success rate and the number of ETI attempts between the VL and DL groups [8]. However, in a trial comparing first-pass success in ETI among novice emergency physicians during cardiopulmonary resuscitation,

which can indirectly cause DA, they achieved a higher success rate in VL than DL (91.8% vs. 55.9%) [14].

User satisfaction was similar between the groups in our study, but we encountered contradictory data on this subject in the literature. Pieters et al. [15] reported that devices with Macintosh-type blade laryngoscopes scored the highest in user satisfaction. In contrast, Rendeki et al. [16] stated that operator satisfaction was significantly better with VL.

The evaluation of procedural difficulty revealed no statistically significant difference between VL in the NA and VL in the DA. In a study evaluating intubation difficulty using VAS score in DA, it was reported as 20 for VL, whereas it was 10 for DL [8]. A recent meta-analysis performed by Lewis et al. [7], which used the intubation difficulty score, stated that VL was easier to use when compared with DL.

Study Limitations

First, we used the cervical collar as our difficult intubation setting; however, there are many other difficult situations, such as trauma or obesity. Second, the study was conducted in a simulated scenario.

Conclusion

The first-pass success rate was examined, and the highest success rates were found with VL in normal and DAs. Further studies should be planned involving Scoper® in conjunction with other video laryngoscopes to evaluate efficacy.

Table 1. Comparison of data between direct laryngoscopy and video laryngoscopy using

	Group	n	Median	IQR	25 th	75 th	p
Time to intubation	1	20	11.77	4.97	9.50	14.46	0.236
	2	20	11.32	4.13	9.36	13.50	
	3	20	13.97	6.34	10.66	17.00	
	4	20	13.61	7.22	10.45	17.67	
Procedural difficulty	1	20	13.50	23.50	7.00	30.50	0.297
	2	20	28.50	24.50	17.75	42.25	
	3	20	21.00	14.50	16.00	30.50	
	4	20	29.50	29.25	14.50	43.75	
User satisfaction	1	20	97.50	9.50	90.50	100.00	0.412
	2	20	97.00	19.00	81.00	100.00	
	3	20	98.50	8.50	91.50	100.00	
	4	20	93.00	19.75	79.50	99.25	
Number of intubation attempts	1	20	1.00	0.00	1.00	1.00	0.531
	2	20	1.00	0.00	1.00	1.00	
	3	20	1.00	0.00	1.00	1.00	
	4	20	1.00	0.00	1.00	1.00	

1: Direct laryngoscopy in the normal airway, 2: Direct laryngoscopy in the difficult airway, 3: Video laryngoscopy in the normal airway, 4: Video laryngoscopy in the difficult airway

IQR: Interquartile range

Ethics

Ethics Committee Approval: The study was approved by the University of Health Sciences Türkiye Hamidiye Scientific Research Ethics Committee (decision number: 2/17, date: 14.01.2022).

Informed Consent: Informed written consent was obtained from all participants.

Authorship Contributions

Surgical and Medical Practices: H.A., N.Ş., Z.K., S.N.A., S.B., Concept: E.Ç., H.K.E., Design: E.Ç., M.E., Data Collection or Processing: H.A., N.Ş., Z.K., S.N.A., S.B., Analysis or Interpretation: E.Ç., M.E., Literature Search: H.A., H.K.E., Writing: H.A., E.Ç.

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