Section: Anaesthesiology

Original Research Article

COMPARISON BETWEEN VIDEO LARYNGOSCOPY AND DIRECT LARYNGOSCOPY FOR ADULTS UNDERGOING ENDOTRACHEAL INTUBATION: A RANDOMISED STUDY

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ABSTRACT

Background: The study was done to compare the efficacy of Video laryngoscopy with direct laryngoscopy among adults undergoing endotracheal intubation.

Materials and Methods: Patients undergoing elective surgery under general anaesthesia were randomly allocated into two groups. Group VL underwent endotracheal intubation by a video laryngoscope (King Vision®) and group DL underwent endotracheal intubation by a direct laryngoscope (Macintosh). Success rates, number of attempts, duration of laryngoscopy, incidence of hypoxia and dental trauma, oesophageal intubation, Percentage of Glottic Opening (POGO), instances of failed intubation and hemodynamic parameters were assessed in both groups.

Results: The mean number of intubation attempts was slightly higher in the DL group, but there was no significant variation between the two groups. (DL - 1.33 vs VL – 1.2, p = 0.231) Similarly, there was no statistically significant difference in the mean duration of laryngoscopy between the two groups. (DL – 26±4.2670 seconds vs VL – 24.83±4.0350 seconds, p = 0.28). One patient in the DL group experienced hypoxia, and another patient in the same group suffered dental trauma. A statistically significant difference was observed in oesophageal intubation rates between the two groups. (DL - 11 vs VL – 3, p = 0.01) Additionally, there was a significant variation in the mean POGO score between the DL and VL groups. (DL - 38.43±27.6402 vs VL – 58.7±34.8110, p = 0.01).

Conclusion: In the operating room setting, video laryngoscopy enhanced intubation success rates and offered a clearer view of the larynx, although the improvement was not statistically significant. Additionally, it effectively reduced the incidence of oesophageal intubation compared to direct laryngoscopy.

Keywords: Endotracheal Intubation,Laryngoscopy, POGO Score, Hemodynamic Parameters.

INTRODUCTION

Endo tracheal intubation (ETI) is a routine procedure in the operating room, emergency department, and ICU settings.[1] Direct laryngoscope (DL) is commonly used in facilitating intubation. Difficult intubation can have unwanted effects like pulmonary aspiration, hypoxia, arrhythmias, sudden cardiac arrest, and death.[2-3] Factors that increase the probability of failure include, difficult airway, the location in which the person undergoes intubation, and the expertise of the person performing the intubation.[4-7]

The American Society of Anaesthesiologists (ASA) defined difficult endotracheal intubation as 3 attempts of endotracheal intubation when an average laryngoscope is used or if endotracheal intubation takes 10 min or more.[8]DL has been considered a 'gold standard' device for direct laryngoscopy and endotracheal intubation since its discovery by Foregger in the 1940s.[9] Laryngoscopy and passage of the endotracheal tube through the larynx causes mild sympathetic stimulation, causing a change in hemodynamic parameters and it is related to the degree of manipulation during the procedure.

Video laryngoscopes (VLs) primarily rely on video technology to transmit images from the distal part of the laryngoscope to the eyepiece or monitor, facilitating visualization during intubation. They come in flexible or rigid forms, reducing the risk of trauma or failure. These devices offer clear glottic visualization without the need for a direct line of sight. Some hospitals have already embraced the universal use of VLs for all intubations.[10-11] VL can serve as an alternative method to direct laryngoscopy (DL) for endotracheal intubation, allowing for indirect assessment of the glottic structure using a small camera mounted on the laryngoscope blade tip. Previous studies exploring various VL devices,[12] in emergency rooms,[13]intensive care units,[14]or operating rooms,[15] have yielded conflicting findings. A meta-analysis by De Jong A et al,[16] encompassing diverse cohort studies and three randomized trials, demonstrated significantly higher endotracheal intubation success rates associated with VL. Conversely, another meta-analysis by Jiang J et al,[17]focused solely on randomized trials, found no significant difference in endotracheal intubation success between VL and DL. The present study aims to contribute to the existing literature, potentially confirming or shedding further light on these previous findings.

The study is to compare the efficacy of Video laryngoscopy with direct laryngoscopy among adults undergoing endotracheal intubation.

MATERIAL AND METHODS

Ethical considerations: Approval from the institutional ethics committee was taken before conducting the study. (Ref: Ethical committee registration number:(IEC/64/23). We have taken permission for data collection and publication.

2.1 Study site type and source of patients: This randomized double-blinded study was done in the Department of Anaesthesiology at MIMS, Vizianagaram, Andhra Pradesh, India.

Study duration: 6 months: March 2023 to August 2023

Inclusion Criteria

1) Patients above the age of 18 scheduled for elective surgery under general anaesthesia.
2) ASA classes I and II
3) Patients with MPG III

Exclusion Criteria

1) Age < 18 years.
2) Severe life-threatening injury requiring immediate surgical intervention.
3) MPG I, II and IV

Sample size: 60 patients were included.

Groups: Patients were randomized by using Random allocation software®into group VLand group DL.

group VL: Endotracheal intubation was done by a video laryngoscope (King Vision®)

group DL: Endotracheal intubation was done by a direct laryngoscope (Macintosh)

Methodology

After the approval from the ethics committee, 60 patients who fit the inclusion criteria were randomized into two groups VL and DL. The clinical information and blood reports of the patients were entered into the case proforma. Demographic and clinical information were gathered. The examination's general and systemic findings were noted.

Demographics

Age, Gender,

BMI, ASA status,

Parameters

1) Successful first attempt at tracheal intubation
2) Number of attempts of intubation
3) Mean duration of laryngoscopy
4) Incidence of hypoxia and dental trauma
5) Oesophageal intubation
6) Percentage of glottic opening
7) Incidence of failed intubation
8) Hemodynamic parameters.

POGO - percentage of glottic opening

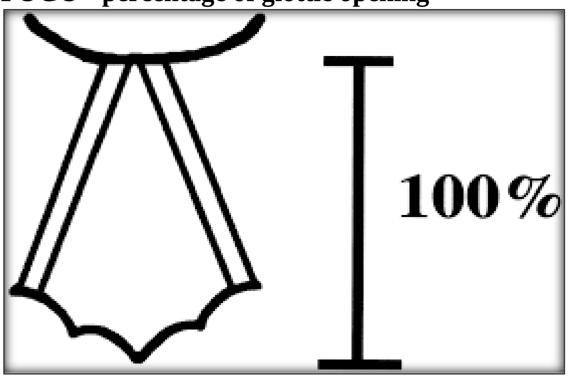

Figure 1: Glottic opening18

2.7. Statistical analysis

Results were expressed as frequency, percentage, mean, and SD. Statistical analysis was done using Epi info software. p value below 0.05 is considered statistically significant. T-test and chi-square tests were used to know the difference between numerical parameters and categorical parameters between the two groups.

DEMOGRAPHICS:

4.1 Mean age

Table 1 shows the mean age of patients in both groups. The mean age was 40.43 years in group DL patients and 42.4 years in group VL. There is no significant variation in the mean age of patients of two groups, as per T test. Age of patients ranged from 20 to 58 years in group DL and 19 to 59 years in group VL. [Table 1]

4.2 Gender of patients: 50% of the patients were males in this study.

Figure 2 shows the gender of patients included in the study. 16 patients were females in DL group and 18 patients were females in the VL group. 18 patients were male in the DL group and 12 male patients in the VL group. There was no significant variation in gender between two groups, as per chi square analysis (p=0.60).

4.3 Mean BMI

Table 2: The mean BMI of patients in group DL was 21.9 kg.m2 and the mean BMI of patients in group VL was 22.03 kg/m2. There is no significant variation in the mean BMI of patients of two groups as per T test (p=0.87). [Table 2]

4.4 ASA status of patients

Figure 3 shows the ASA status of patients. 33 patients belonged to ASA status I. 18 patients in group DL and 15 patients in group VL belonged to ASA status I. 27 patients belonged to ASA II. 12 patients in group DL and 15 patients in group VL belonged to ASA status I There is no significant variation in the ASA status of patients of both groups as per chi-square analysis (p=0.43).

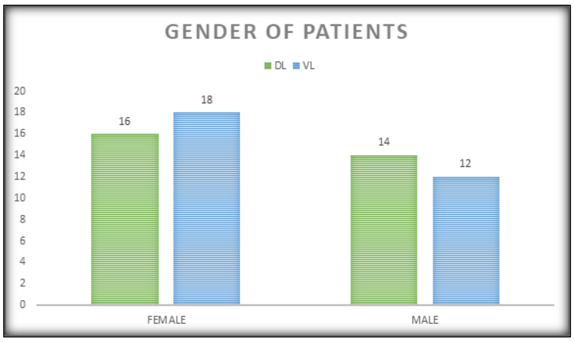

Figure 2: Gender of patients

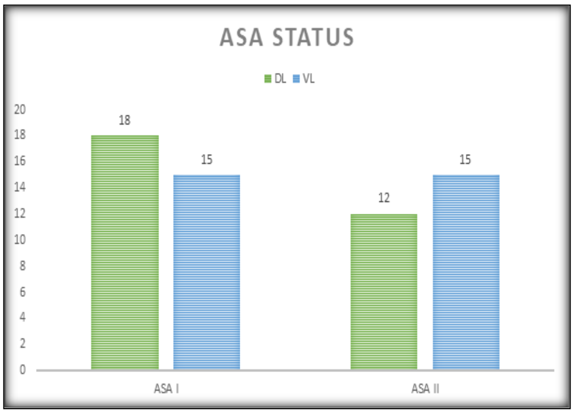

Figure 3: ASA status of patients

Table 1: Mean age of patients

Group	**Mean**	**Variance**	**Std Dev**	
DL	40.4333	99.0816	9.954	
VL	42.4667	144.258	12.0107	
T-Test				
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	58	-0.71	0.4781

Table 2: Mean BMI of patients of two groups

Mean BMI				
Group	**Mean**	**Variance**	**Std Dev**	
DL	21.9333	5.9264	2.4344	
VL	22.0333	5.2057	2.2816	
T-Test				
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	58	-0.16	0.8702

RESULTS

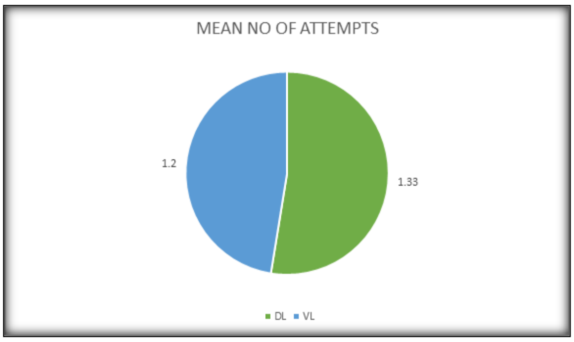

Figure 4: Mean no of attempts

Figure 4 shows the mean no of attempts of intubation. It was slightly more in group DL patients. But there is no significant variation between the two groups, as per the T-test (p=0.231).

4.6 Successful rate of intubation during 1st time: 1st-time successful intubation is more commonly seen with videolaryngoscopy but there is no significant difference between the two groups.

Table 3 shows that1sttime-successful intubation is more commonly seen with video laryngoscopy but there is no significant difference between two groups. [Table 3]

4.7 Mean duration of laryngoscopy

Table 4 shows the duration of laryngoscopy. There was no statistically significant variation between the two groups (p= 0.28) concerning the mean duration of laryngoscopy. The mean duration was 26 sec in group DL patients and 24.83 sec. in group VL patients. [Table 4]

4.8 Hypoxia

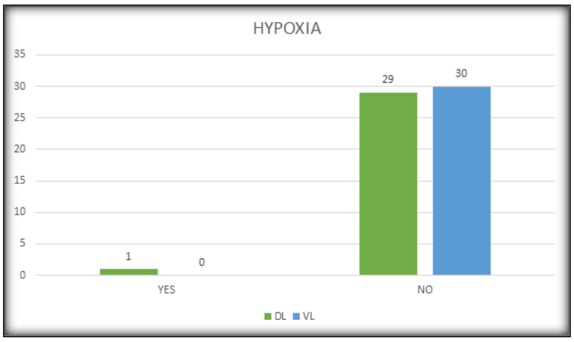

Figure 5: Hypoxia

Figure 5 shows Hypoxia in both groups. 1 patient in group DL had hypoxia and no patient in group VL had hypoxia. There was no significant variation in the incidence of hypoxia between the two groups as per chi square analysis (p=0.31).

4.9 Dental trauma

Table 5 shows the incidence of dental trauma. 1 patient in group DL had dental trauma. There is no significant variation in the incidence of dental trauma in between two groups, as per chi sqaure analysis. (p=0.31). [Table 5]

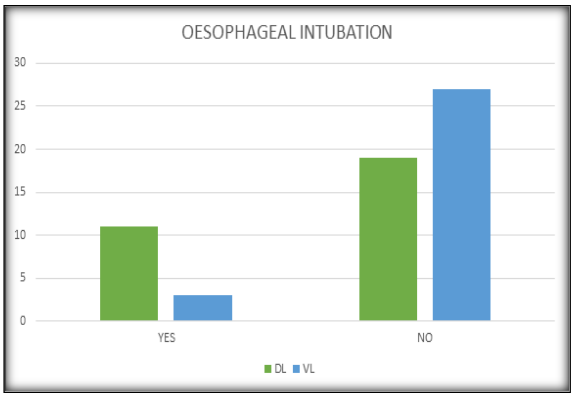

Figure 6: Oesophageal intubation

Figure 6 shows oesophageal intubation in both groups. There was a statistically significant variation in oesophageal intubation between the two groups (p= 0.01).

4.12: Mean POGO score

Table 6 shows a significant variation in the mean POGO score between the two groups. (p=0.01) The mean score was significantly higher in patients of the VL group compared to the DL group. This indicates that glottis visualization is more through video laryngoscopy compared to direct laryngoscopy. [Table 6]

4. 13 Hemodynamic parameters

Table 6 shows that there is no significant difference in the mean arterial pressure, heart rate and oxygen saturation at baseline, 2 min and 5 min after intubation in between two groups.

Table 3: Successful rate of intubation during 1st time

	Group	
1ST ATTEMPT INTUBATION	**DL**	**VL**
Yes	22	25
%	73.33%	83.33%
No	8	5
%	26.67%	16.67%

Statistical Tests	**Chi-square**	**2-tailed p**
Chi-square - uncorrected	0.8838	0.3471638018

Table 4: Mean duration of laryngoscopy

Mean duration of laryngoscopy			
Group	Mean	Variance	Std Dev
DL	26.0000	18.2069	4.2670
VL	24.8333	16.2816	4.0350

T-Test				
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	58	1.09	0.2811

Table 5: Dental trauma

	Group	
DENTAL TRAUMA	**DL**	**VL**
Yes	1	0
%	6.67%	0.00%
No	29	30
%	93.33%	100.00%

Table 6: Mean POGO score in two groups

Mean POGO Score			
Group	**Mean**	**Variance**	**Std Dev**
DL	38.4333	763.9782	27.6402
VL	58.7000	1211.8034	34.8110

T-Test				
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	58	-2.50	0.0154

Table 6: Hemodynamic parameter comparison between two groups

Parameters	Group D	Group V	P value
Heart rate at baseline	75.8	74.8	0.36
Heart rate at 2 min	75.2	75.26	0.9
Heart rate at 5 min	75.46	75.03	0.50
MAP at baseline	83.7	85.6	0.49
MAP at 2 min	85.6	87	0.99
MAP at 5 min	85.2	83.9	0.31
SPO2 at baseline	97.5	97.9	0.41
SPO2 at 2 min	98.4	97.8	0.10
SPO2 at 5 min	97.8	98	0.44

DISCUSSION

Today various types of video laryngoscopes are available to perform endotracheal intubation. 19-21

Patients are commonly hemodynamically unstable during endotracheal intubation or may exhibit the signs of hypoxia, and may have physical anomalies like distorted anatomy or associated with tough intubation.[22,23,24]

In the current study we compared direct laryngoscope with video laryngoscope.

The study comprised 60 patients, divided into two groups. T-test analysis of average age revealed no significant difference, ensuring absence of age-related bias. Chi-square analysis for gender distribution (Figure 2) indicated no significant variation, ruling out gender-related bias. Mean BMI showed no statistically significant difference, confirming consistency between groups (Table 2). ASA status analysis demonstrated no significant variation (Figure 3), affirming similar demographic characteristics at the study's initiation.

Concerning the mean number of intubation attempts (Figure 4), a slightly higher value was observed in group DL patients, but statistical analysis revealed this difference to be no significant. Similarly, data on successful intubation during the first attempt (Table 3) showed no significant distinction between the two groups. Notably, Mosier et al,[25] demonstrated a higher first-attempt success rate in the VL group (78.6%; 95% CI 72.8 to 83.7)compared to the DL group(60.7%; 95% CI 46.8 to 73.5). In Matthew et al.'s,[26] study, successful intubation on the first attempt occurred in 85% of patients in the VL group and 70% in the DL group. Furthermore, Baek et al,[27] found that the first-attempt intubation success rate was higher among experienced operators(83%; 266/319) compared to inexperienced operators(62%; 398/639, p < 0.001)., with a higher rate in the VL group(79%; 391/493) compared to the DL group (59%; 273/465, p < 0.001).

The duration of laryngoscopy (Table 4) showed no statistically significant variation between the two groups. Notably, in the study by Panwar et al,[28] the time required for laryngoscopy was reported to be higher in video laryngoscopy (15.9 ± 6.7 seconds) compared to direct laryngoscopy (7.8 ± 3.7 sec, p < 0.001). However, this study found no significant difference in the ease of intubation between the two methods. In another study by Sedeh P,[29]the mean intubation time was significantly shorter in the Glidescope group (63±30 s)compared to direct laryngoscopy (89± 35 s, p < 0.01) during easy airway intubation. Additionally, Pournajafian et al,[30]reported a significantly longer mean time for intubation in the Glide Scope group(45.7033 ± 11.649 s) compared to the Macintosh laryngoscopy group(27.773 ± 5.122 s, p < 0.0001).

Regarding the occurrence of hypoxia (Figure 5), no cases were observed in group VL, whereas one patient in group DL experienced hypoxia, and another patient in group DL suffered dental trauma. In a review conducted by Hansel et al,[31] the authors concluded that Macintosh-styled video laryngoscopy reduced the incidence of hypoxia(RR 0.72, 95% CI 0.52 to 0.99; 16 studies, 2127 participants).In a study by Maharaj CH et al., 32they found a significant degree of desaturation with the Macintosh laryngoscope(p = 0.047).

The presence of oesophageal intubation (Figure 6) did exhibit a significant difference between the two groups.In contrast, the review by Hansel et al,[31] found no significant variation in the rates of oesophageal intubation(RR 0.51, 95% CI 0.22 to 1.21; 14 studies, 2404 participants).

A significant variation in the mean POGO score was observed, with the VL group displaying a significantly higher score compared to the DL group. This indicates that glottis visualization is superior with video laryngoscopy compared to direct laryngoscopy in this study. Consistent with these findings, Serocki et al,[33] discovered that the Glidescope provided a better view(C&L >or= III: 1.6%, p < 0.001)than direct laryngoscopy.

Finally, there was no significant difference in the hemodynamic response between the two groups (Table 6). A study conducted by Cengiz S et al,[34]similarly found that the hemodynamic response behaved similarly in all groups(p>0.05, for all).

CONCLUSION

In the OT setting, video laryngoscopy showed more successful intubation although the difference is insignificant, along with improved grade of laryngoscopic view. It also reduced the chance of oesophageal intubation rate compared to direct laryngoscopy.

Recommendation: We would recommend multicentric studies involving more patients and more varities of video laryngoscopes.

Conflict of Interest: None

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