

ORIGINAL ARTICLE

Comparative Study of Efficacy and Safety of Conventional Laryngoscope Compared with Video Laryngoscope for Intubation in Adult Patients

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ABSTRACT

Background: The failure of direct laryngoscopy to provide an adequate glottic visualization, coupled with a major pressor response, has led to the development of newer intubation devices. Present study was planned to find out the efficacy and safety of conventional laryngoscope compared with video laryngoscope for endotracheal intubation in adult patients.

Material and Methods: Present study was Hospital based prospective randomized single blinded study, conducted in patients of age 18 to 60 years, either gender, ASA grade 1 & 2, weight 50-70 kg, Mallampatti grade 1 & 2, underwent general anaesthesia, Patients were allocated as group DL (intubated with conventional Laryngoscope) & group VL (intubated with Video Laryngoscope).

Results: Number of attempts required for intubation for Group DL single in 80% as against 100% for Group VL. This difference was statistically significant ($p < 0.05$). Optimization maneuver used for intubation for Group DL single in 100% as against 10% for Group VL. This difference was statistically significant ($p < 0.05$). We observed that mean SBP in Group DL was significantly higher as compared to Group VL after intubation 10 and 15 minutes as well as up to post operatively 30 minutes.

Conclusion: Video laryngoscope is a superior device than the conventional direct laryngoscope (Macintosh). It can be used as a teaching tool for novice intubators and offers approach to tracheal intubation.

KEYWORDS

• Video laryngoscope • Conventional direct laryngoscope • Useful device

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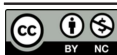
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INTRODUCTION

Airway management is one of the essential skills in anesthesia for patient safety and to avoid anesthesia-related complications. Direct laryngoscopy has been the standard technique for tracheal intubation since its introduction in the early 19th century.¹ Predictors for difficult laryngoscopy are Long upper incisors, Inability to protrude mandible, Mallampati classification III or IV, High arched palate, Short thyromental distance, Short thick neck, Limited cervical mobility, etc.²

The failure of direct laryngoscopy to provide an adequate glottic visualization, coupled with a major pressor response, has led to the development of newer intubation devices. Video laryngoscope is one such intubation device with advantages of a higher success rate, better glottic visualization, safer intubation, faster learning curve, and the opportunity for dynamic interaction during airway management.³

The advancement in digital technology has led to a number of video laryngoscopes (VLs) being developed for clinical use. The VLs have now become a widely accepted method of the airway management as it facilitates easy visualization of the glottis without the need of proper alignment of the oral, pharyngeal, and laryngeal axes.^{4,5,6} The short learning curve of VL makes it an attractive choice in inexperienced hands.⁷ Present study was planned to find out the efficacy and safety of conventional laryngoscope compared with video laryngoscope for endotracheal intubation in adult patients.

MATERIAL AND METHODS

Present study was Hospital based prospective randomized single blinded study, conducted in department of Anaesthesiology, at XXX Medical College & Hospital, India. Study duration was of 2 years (October 2020 to November 2022). Study was approved by institutional ethical committee.

Inclusion criteria

- Patients of age 18 to 60 years, either gender, ASA grade 1 & 2, weight 50-70 kg, Mallampatti grade 1 & 2, underwent endotracheal intubation, willing to participate in present study

Exclusion criteria

- ASA grade 3, 4 & 5
- Mallampatti grade 3 & 4
- Risk of gastric aspiration
- Patients with laryngeal & thyroid surgery
- Hypertensive & Ischemic heart disease patients

Study was explained to participants in local language & written informed consent was taken. Data was collected such as history of patients, complaints, medical fitness, drug history, personal history, past history and surgical history of the patients. Physical examination: general and systematic examination & airway assessment were done. Baseline investigation CBC, urine examination was done in every patient. Special investigations such as: LFT, KFT, RBS, ECG, CXR, HIV, HBsAg, as per disease conditions. Patients were undergoing randomization using random number table & divided in 2 groups of 30 in each group, making total of 60 population.

- Group DL: 30 patients intubated with conventional Laryngoscope
- Group VL: 30 patients intubated with Video Laryngoscope

Patients were pre-oxygenated with 100% oxygen for 3-5 mins. Premedication were given with inj. Midazolam 0.02mg/kg and inj. Fentanyl 2ug/kg and inj. Ondansetron 0.08 mg/kg. Patients were induced with inj. Propofol 2-2.5 mg/kg and after confirming mask ventilation, muscle relaxant inj. Vecuronium 0.1 mg/kg was given.

Trachea intubated with appropriate size of endotracheal tube by an anaesthesiologist according to group allocation of patient. Placement of endotracheal tube was confirmed by capnography and chest auscultation. Anaesthesia was maintained with intermittent positive pressure ventilation, with 50% oxygen and 50% nitrous oxide and inj. Vecuronium 0.02 mg/kg and inhalation agent isoflurane. After the end of the surgery, muscle relaxation was antagonized with IV Neostigmine 0.05 mg/Kg & Glycopyrrolate 0.004 mg/Kg, anaesthetic gases were discontinued to 0% and will be replaced with O₂ 100%. Endotracheal tube was removed when the patient is awake and then the patients were transferred to the recovery room for monitoring of vital signs till transfer to the ward.

Patients were evaluated according to time taken for intubation, safety parameters and also post operatively. Intraoperatively and post operatively Heart Rate, Systolic BP, Diastolic BP, MAP, SpO₂, ECG will be maintained before intubating the patient and after intubation, then every 10 minutes till the patient extubated and also postoperatively every 10 minutes in recovery room for 2 hours, the patient will be observed for side effects like hypotension, bradycardia, fall in oxygen saturation, hoarseness of voice, sore throat.

Data was collected by using a structure proforma. Data entered in MS excel sheet and analysed by using SPSS 24.0 version IBM USA. Qualitative data was expressed in terms of proportions. Quantitative data was expressed in terms of Mean and Standard deviation. Association between two qualitative variables was seen by using Chi square/ Fischer's exact test. Comparison of mean and SD between two groups was done by using unpaired t test to assess whether the mean difference between groups is significant or not. Descriptive statistics of each variable was presented in terms of Mean, standard deviation, standard error of mean. A p value of <0.05 was considered as statistically significant whereas a p value <0.001 was considered as highly significant.

RESULTS

We included total 60 subjects in our study. Group DL included 30 and Group VL included 30 cases. Out of 30 cases from Group DL, majority were from 41-50 years (50%) while from Group VL, majority were from 41-50 and 20-30 years (40%). Distribution of age, gender & ASA grade was comparable among two groups & difference was statistically not significant ($p>0.05$).

Table 1: General characteristics

Characteristics	Group DL (percentage)	Group VL (percentage)	P value
Age group (in years)			
20-30	12 (40%)	12 (40%)	0.51, Not significant
31-40	3 (10%)	6 (20%)	
41-50	15 (50%)	12 (40%)	
Gender			
Male	18 (60%)	18 (60%)	1.0, Not significant
Female	12 (40%)	12 (40%)	

Characteristics	Group DL (percentage)	Group VL (percentage)	P value
ASA grade			
Grade I	24 (80%)	27 (90%)	0.28, Not significant
Grade II	6 (20%)	3 (10%)	

40% from Group DL had MPC grade 1 as against 70% had Group VL. 60% from Group DL had ASA grade 1 as against 30% had Group VL, difference was statistically significant ($p<0.05$).

Table 2: Distribution according to MPC grade

MPC grading	Group DL (percentage)	Group VL (percentage)	P value
Grade 1	12 (40 %)	21 (70 %)	0.02, Significant
Grade 2	18 (60 %)	9 (10 %)	

In present study, 60% from Group DL had Cormack-Lehane (CL) grade 1 as against 80% had Group VL, difference was statistically significant ($p<0.05$).

Table 3: Distribution according to Cormack-Lehane (CL) grade

Cormack-Lehane (CL) grade	Group DL (percentage)	Group VL (percentage)	P value
Grade 1	18 (60%)	24 (80%)	0.01, Significant
Grade 2	9 (30%)	6 (20%)	
Grade 3	3 (10%)	0	

Number of attempts required for intubation for Group DL single in 80% as against 100% for Group VL. This difference was statistically significant ($p<0.05$).

Table 4: Distribution according to Number of attempts at intubation

Number of attempts	Group DL (percentage)	Group VL (percentage)	P value
One	24 (80%)	30 (100%)	0.01, Significant
Two	6 (20%)	0	

Optimization maneuver used for intubation for Group DL single in 100% as against 10% for Group VL. This difference was statistically significant ($p<0.05$).

Table 5: Distribution according to optimization maneuver used

Optimization maneuver used	Group DL (percentage)	Group VL (percentage)	P value
No	21 (70 %)	27 (90 %)	0.05, Significant
Yes	9 (10 %)	3 (10 %)	

Mean age of the cases from Group DL and Group VL was 36.30±10.18 and 35.30±10.90 years. This difference in the mean age was statistically significant (p>0.05). Mean weight of the cases from Group DL and Group VL was 68.20±10.19 and 67.80± 10.93 kg. This difference in the mean weight was statistically significant (p>0.05).

Mean POGO score of the cases from Group DL and Group VL was 80±24.91 and 90±20.34. This difference in the mean POGO score was statistically non-significant (p>0.05). Mean ET insertion time of the cases from Group DL and Group VL was 16.30±2.23 and 18±2.03 seconds. This difference in the mean ET insertion time was statistically significant (p>0.05).

Table 6: Comparison of variables between Group DL and Group VL

Characteristics	Group DL (Mean ± SD)	Group VL (Mean ± SD)	P value
Age	36.30 ± 10.18	35.30 ± 10.90	0.715
Weight in kg	68.20 ± 10.19	67.80 ± 10.93	0.884
POGO score	80.00 ± 24.91	90.00 ± 20.34	0.094
ET Tube Insertion Time in seconds	16.30 ± 2.23	18.00 ± 2.03	0.003

We compared the heart rate between two groups. It was observed that mean heart rate in Group DL was significantly less as compared to Group VL after intubation 0, 5, 10, 15, 30

minutes as well as up to post operatively 30 minutes.

Table 7: Comparison of heart rate between Group DL and Group VL

Characteristics	Group DL (Mean ± SD)	Group VL (Mean ± SD)	P value
Baseline	77.80 ± 6.20	75.00 ± 5.32	0.066
After premedication	75.40 ± 5.31	73.40 ± 5.07	0.141
After induction	73.80 ± 6.27	71.40 ± 5.90	0.132
After giving muscle relaxant	71.80 ± 5.64	72.00 ± 5.61	0.891
After intubation 0 min	87.00 ± 7.68	92.20 ± 4.31	0.002
After intubation 5 min	91.40 ± 7.50	97.40 ± 3.76	0.0001
After intubation 10 min	86.00 ± 7.77	89.40 ± 3.02	0.029
After intubation 15 min	79.40 ± 7.05	82.40 ± 4.15	0.049
After intubation 30 min	75.40 ± 6.24	78.80 ± 4.38	0.018
Post op immediately	83.60 ± 5.59	86.60 ± 4.27	0.023
Post op 30 minutes	75.60 ± 4.34	78.20 ± 5.49	0.047

We compared the SBP between two groups. It was observed that mean SBP in Group DL was significantly higher as compared to Group VL after intubation 10 and 15 minutes as well as up to post operatively 30 minutes.

Table 8: Comparison of SBP between Group DL and Group VL

Characteristics	Group DL (Mean ± SD)	Group VL (Mean ± SD)	P value	Inference
Baseline	125.00 ± 10.89	124.60 ± 7.39	0.868	Not significant
After premedication	122.00 ± 10.92	122.00 ± 7.39	1.000	Not significant
After induction	118.60 ± 11.62	121.80 ± 7.80	0.215	Not significant
After giving muscle relaxant	117.00 ± 11.69	119.60 ± 7.97	0.319	Not significant
After intubation 0 min	140.60 ± 9.05	138.80 ± 9.15	0.447	Not significant
After intubation 5 min	146.20 ± 8.46	143.80 ± 8.46	0.276	Not significant
After intubation 10 min	138.60 ± 7.78	133.40 ± 7.72	0.001	Highly significant
After intubation 15 min	131.60 ± 7.92	126.00 ± 4.55	0.001	Highly significant
After intubation 30 min	122.80 ± 7.73	120.80 ± 4.29	0.220	Not significant
Post op immediately	133.40 ± 7.05	126.60 ± 2.88	0.001	Highly significant
Post op 30 minutes	122.40 ± 6.61	119.60 ± 5.81	0.087	Not significant

We compared the DBP between two groups. It was observed that difference in the mean DBP in

Group DL and Group VL at all the time intervals was statistically non-significant (p>0.05)

Table 9: Comparison of DBP between Group DL and Group VL

Characteristics	Group DL (Mean ± SD)	Group VL (Mean ± SD)	P value	Inference
Baseline	78.60 ± 6.750	78.60 ± 6.750	1.000	Not significant
After premedication	75.20 ± 7.289	75.20 ± 7.289	0.290	Not significant
After induction	73.60 ± 7.815	73.60 ± 7.815	0.265	Not significant
After giving muscle relaxant	73.40 ± 8.340	73.40 ± 8.340	0.573	Not significant
After intubation 0 min	89.00 ± 7.570	89.00 ± 7.570	0.810	Not significant
After intubation 5 min	93.20 ± 7.568	93.20 ± 7.568	0.492	Not significant
After intubation 10 min	88.00 ± 7.221	88.00 ± 7.221	0.093	Not significant
After intubation 15 min	82.60 ± 7.393	82.60 ± 7.393	0.010	Highly significant
After intubation 30 min	78.20 ± 6.895	78.20 ± 6.895	0.650	Not significant
Post op immediately	85.00 ± 5.772	85.00 ± 5.772	0.668	Not significant
Post op 30 minutes	77.00 ± 4.920	77.00 ± 4.920	0.163	Not significant

We compared the MAP between two groups. It was observed that mean MAP in Group DL was significantly higher as compared to Group VL after intubation 10 and 15 minutes (p<0.05)

Table 10: Comparison of MAP between Group DL and Group VL

Group	Group DL (Mean ± SD)	Group VL (Mean ± SD)	P value	Inference
Baseline	94.00 ± 8.09	93.90 ± 5.29	0.955	Not significant
After premedication	90.70 ± 8.34	91.90 ± 4.44	0.489	Not significant
After induction	88.60 ± 8.97	90.90 ± 4.87	0.222	Not significant
After giving muscle relaxant	87.90 ± 9.38	89.40 ± 5.76	0.458	Not significant
After intubation 0 min	106.10 ± 7.86	105.20 ± 6.33	0.627	Not significant
After intubation 5 min	110.80 ± 7.68	110.90 ± 6.69	0.957	Not significant
After intubation 10 min	104.70 ± 6.67	101.20 ± 5.71	0.033	Significant
After intubation 15 min	98.90 ± 6.96	94.00 ± 5.09	0.003	Significant
After intubation 30 min	92.90 ± 6.68	91.80 ± 5.64	0.493	Not significant
Post op immediately	101.10 ± 5.78	98.50 ± 3.87	0.045	Significant
Post op 30 minutes	92.20 ± 5.38	89.90 ± 5.29	0.100	Not significant

We compared the SPO2 between two groups. It was observed that difference in the mean SPO2 in Group DL and Group VL at all the time intervals was statistically non-significant (p>0.05).

Table 11: Comparison of SPO2 between Group DL and Group VL

Characteristics	Group DL (Mean ± SD)	Group VL (Mean ± SD)	P value
Baseline	97.90 ± 0.84	98.20 ± 0.76	0.154
After premedication	100.00	100.00	-
After induction	100.00	100.00	-
After giving muscle relaxant	99.80 ± 0.41	100.00	0.9

Characteristics	Group DL (Mean ± SD)	Group VL (Mean ± SD)	P value
After intubation 0 min	100.00	100.00	-
After intubation 5 min	100.00	100.00	-
After intubation 10 min	100.00	100.00	-
After intubation 15 min	100.00	100.00	-
After intubation 30 min	100.00	100.00	-
Post op immediately	100.00	100.00	-
Post op 30 minutes	97.40 ± 0.67	97.30 ± 0.79	0.601

DISCUSSION

Failures during intubation during emergency or unanticipated situation has almost accounted for 1.5-8.5%.⁷ In difficult situation, many rescue maneuvers are employed which includes techniques like use of bougie, BURP maneuver etc. though, even these techniques are not fully effective in difficult scenarios and sometimes leads to failed intubation even after using all the techniques available. To overcome these technical difficulties, various video laryngoscopes has been brought into practice.⁸

In our study, 60% from Group DL had Cormack-Lehane (CL) grade 1 as against 80% had Group VL. with respect to Cormack-Lehane (CL) grade was statistically not significant ($p > 0.05$).

Elhadi SM *et al.*,⁹ reported that according to the laryngoscopic view, 15 patients who were intubated with the ML had grade 1 Cormack and Lehane glottic view, 18 had grade 2a, 10 grade 2b and five had grade 3a, in comparison with 30 patients who were intubated with the KVVL having grade 1, 15 with grade 2a, four with grade 2b and one with grade 3a. Therefore, there was a significant difference between both groups.

Upasana Gupta *et al.*,¹⁰ reported that on comparing the Cormack-Lehane grades using the TruView EVO2 and Macintosh blade, we observed that the median Cormack-Lehane grade I in Group VL was 43.3% and grade II in 36% whereas CL grade I was seen in only 20% in Group M and median CL grade was II. It was statistically significant and showed that TrueView EVO2 improved the glottic view by at least one Cormack-Lehane grades as compared with Macintosh blade.

Similar studies done by Barak *et al.*,¹¹ showed that the TruView blade provided a better laryngoscopic view than the Macintosh

blade, that is, in 100% patients with anticipated difficult intubation in TrueView Group the Cormack-Lehane grade was I, whereas in Macintosh Group only 14.2% of the patients had Cormack-Lehane grade I and 28.5% and 57.14% of the patients had Cormack-Lehane grades II and III, respectively.

Timanayakar *et al.*,¹² found that in patients with MPG III TrueView provided Cormack-Lehane Grade I in 68.48% cases, whereas Macintosh blade provided grade I in 22.22% of the cases. In patients with MPG IV no patients had Cormack-Lehane grade III/IV in TrueView Group while 50% patients in Macintosh Group had Cormack-Lehane III/IV.

Li *et al.*,¹³ also observed that MPG determined prior to laryngoscopy was significantly related to the view of the glottis for both the Groups. Tutuncu *et al.*,¹⁴ found that only 3.3% of the patients in TrueView Group had Cormack-Lehane Grade III, whereas 33.3% of the patients in Macintosh Group had Cormack-Lehane Grade III.

Singh *et al.*,¹⁵ stated that 93.75% of the patient's showed improvement in glottic view by one Cormack-Lehane grade, whereas 76.47% of the patient's showed improvement by two. In our study we achieved a success rate of 100% in both the group and were not significant. Similarly, Malik *et al.*,¹⁶ Singh *et al.*,¹⁵ Barak *et al.*,¹¹ Timanayakar *et al.*,¹² & Li *et al.*,¹³ and found in their studies that there was no difference in both the techniques with respect to success rate of intubation.

We observed that mean heart rate in Group DL was significantly less as compared to Group VL after intubation 0, 5, 10, 15, 30 minutes as well as up to post operatively 30 minutes. We observed that mean SBP in Group DL was significantly higher as compared to Group VL after intubation 10 and 15 minutes as well as up

to post operatively 30 minutes. We observed that difference in the mean DBP in Group DL and Group VL at all the time intervals was statistically non-significant ($p > 0.05$). We observed that mean MAP in Group DL was significantly higher as compared to Group VL after intubation 10 and 15 minutes ($p < 0.05$).

Sonavane SR *et al.*,¹⁷ reported no significant difference was found in the baseline heart rate and the heart rate before laryngoscopy in both the groups of our study, there was a significant difference in the heart rate immediately after laryngoscopy and 10 minutes after intubation in both the groups with p value < 0.0001 . Similarly, the baseline MAP and the MAP before laryngoscopy in both the groups had no significant difference. There was, however, a significant difference in the MAP immediately after laryngoscopy and 10 minutes after intubation in both the groups with a p value < 0.0001 .

Upasana Gupta *et al.*,⁹ reported that in Group ML there was increased hemodynamic changes attributed to the handling and manipulation. It was less in Group VL, but the increased duration of time taken for intubation made it insignificant in comparison with group VL.

Mogahed *et al.*,¹⁸ compared the efficacy of intubation with Macintosh, C-MAC D blade, and KVVV in controlled hypertensive patients. They observed that there was a statistically significant difference in the heart rate and MAP between the Macintosh group on one side, with no significant difference between the C-MAC D blade and the KVVV group. Sonavane SR *et al.*,¹⁷ also reported that the mean SpO₂ was maintained (99%) in both the Macintosh and KVVV groups throughout the procedure.

In general, most VL devices offer the advantages such as unnecessary to align airway axes (oral-pharyngeal-laryngeal) to achieve line of sight; improved glottic visualization, especially in scenarios with limited mouth opening or neck mobility; higher ETI success rate with non-expert, and possibly expert, laryngoscopists; allows others to view the screen and/or help facilitate ETI (e.g., redirect cricoid pressure, acquire other airway devices); an effective tool for those who infrequently intubate as well as students learning to intubate; less cervical manipulation; possible awake assessment/intubation; and can provide an official record.

Some disadvantages of using VL devices are difficulty in passing ETT despite improved glottic visualization (especially with angulated blade); possible increased intubation time; variable learning curve; potential weakening in development/maintenance of DL skill set, especially in nonexperts of airway management; potential for false sense of security and lack of preparation for difficult airway; two-dimensional view with loss of depth perception; obscured view by fogging.¹⁹

CONCLUSION

Video laryngoscope is a superior device than the conventional direct laryngoscope (Macintosh). It can be used as a teaching tool for novice intubators and offers approach to tracheal intubation. These findings also demonstrate the efficacy of indirect laryngoscope in this clinically important group of patients and add to the evolving body of knowledge regarding this potentially useful device.

Conflict of Interest: None to declare

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