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Analysis of Performance and Evaluation of The Ease of Intubation with Hugemed VL3R Video Laryngoscope: An Observational Study

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Abstract

Background: It is challenging to intubate despite good visualization with hyperangulated blade of video laryngoscope. VL3 video laryngoscope with field angle 66° can save intubation time. We aim to evaluate performance of VL3 video laryngoscope in terms of intubation characteristics.

Subjects and Methods: Ours is a prospective observational study. After Institutional Ethics Committee approval, 35 patients were recruited for intubation using VL3 video laryngoscope for nonemergency surgery. The primary outcome was intubation time while ease of intubation in terms of Intubation Difficulty Scale, POGO score and hemodynamic responses were noted as secondary outcomes. Inclusion criteria: Ages 18- 60 years, either sex, weight- 45-70 kg, ASA I and II, all MPC grades. Exclusion criteria: past history of failed intubation, Ischaemic Heart Disease, Hypertension, raised ICP, spine /oral pathology, GE reflux.

Results: The mean intubation time was 24.742 seconds. 20 patients (57.142%) had a IDS of 0 (easy) .and 30 patients had a POGO score of 1- (85.714%). There were 0 cases of failed intubation even in three attempts. The variations in haemodynamic parameters were found to be statistically insignificant.

Discussion and Conclusion: Our mean intubation time was lesser than that of Toker MK2 et al with minimal haemodynamic variations. The VL3 video laryngoscope is an effective device for easy and quick intubation.

Keywords: Intubation time, VL3 video laryngoscope, POGO score

Introduction

Videolayngoscopes may improve the view of glottis, [1] and help to reduce peri-intubation complications and cardiovascular stress responses by reducing the force and time used for visualization of the glottis and intubation compared to Macintosh blade standard laryngoscope. [2,3] Videolaryngoscopes use video camera technology which differ between devices producing different image quality and possible different visualization of glottis. It can sometimes be challenging to place an endotracheal tube (ETT) in front of the glottis and advance it despite good visualization on the monitor, especially when a video laryngoscope (VL) with a hyper-angulated blade is used.[4,5] This phenomenon (great view but unable to intubate) is linked to VL blades that are, unlike the traditional Macintosh blade, hyperangulated.[6] The new challenge is now to also bring the tip of the ETT to the level of the glottis, pass the glottis and advance the tube inside the trachea. However, ETT placement is often associated with a prolonged time for intubation [7]. The success of a Video laryngoscope assisted intubation depends on multiple factors, such as blade design (acute angled or Macintosh like; channeled or non-channeled); quality of the image on the monitor, as well as the experience of the intubator.

Hence we hypothesize for the same reasons mentioned above that the VL3 video laryngoscope could be comparable to the other non-channeled devices in terms of easy and quick intubation time due to certain features as follows-the blade has a field of view angle of 66°, anti-fog function, without preheating, it has three LED light source for more clear vision

Also, more importantly the intubation procedure with VL3R is same as the conventional Macintosh laryngoscope, hence lending a feel of familiarity with the device.

Aim

To evaluate the performance of VL3 video laryngoscope in terms of intubation time and quality in adult patients scheduled for elective surgery.

Objectives

The Primary outcome: Intubation time.

The Secondary outcome: Ease of intubation based on IDS and POGO score and hemodynamic responses

Material and Methodology:

Study design: Prospective, Observational

Sample Size: 35 adult patients undergoing elective surgery

Place of study: Following approval by the Board of Studies, Department of Anaesthesiology and Institutional Ethical Committee, the study was conducted in a tertiary care hospital on 35 patients during August 2023 to August 2024 undergoing elective surgery under general anaesthesia.

Inclusion criteria

1. Age: 18- 60 years
2. Either sex
3. Weight- 45-70 kg
4. ASA I and II
5. All MPC grades.

Exclusion criteria

1. Past history of failed intubation
2. Ischaemic Heart Disease
3. Hypertension

4. Raised ICP
5. Spine /oral pathology
6. GE reflux.

Device Description

VL3R video laryngoscope: 1) 3.5" high-resolution display;2) handle with recording button for pictures and videos; 3) Reusable blade with a 66° field angle; 4) 2-megapixel camera with an antifog lens.

Fig 1: VL3R videolaryngoscope

Data Collection:

The learning curve was achieved before the start of the study by doing 15 intubations with the device on manikins and 15 intubations on live subjects, or when the anesthesiologist felt comfortable with the use of the device. Due clearance was obtained from the Institutional Ethics Committee (No-1137 dated 15/07/2023.After detailed pre-anesthetic evaluation and NPO of 8 hours, standard premedication of IV Inj. Ondansetron 0.1 mg/kg, midazolam 0.03mg/kg and fentanyl 1.5mcg/kg was given. Preoxygenation was done with 100 percent oxygen for 3 minutes. Heart rate and Blood pressure were recorded for baseline and after premedication values. IV Inj. Propofol 2 mg/kg for induction, IV Inj Succinylcholine 1.5 mg/kg administered, intubation done with VL3 video laryngoscope, air entry was confirmed by capnography and chest auscultation. If attempt of first intubation failed, next intubation was made only after 1 minute of mask ventilation. Failure of intubation was considered if it could not be done in 3 attempts. A rescue device, in the form of supraglottic airway device was kept ready. Following intubation, data was collected for 10 minutes after which the surgery was allowed to commence. Meanwhile, anesthesia was maintained with 60% N_2O in Oxygen, Inj. Propofol, Inj. Vecuronium, Isoflurane as per requirement. The residual neuromuscular blockade at the end of surgery was reversed using Inj. Neostigmine (40 mcg/kg) and Inj. Glycopyrrolate (10 mcg/kg).

Recording of Parameters

Intubation Time: The intubation time defined when the blade tip passed the incisors to the point until confirmation of the first wave of CO2 of the capnometer.

Base Line Monitoring: Included heart rate, systolic, diastolic and mean blood pressure and Spo2 at 1,3,5 and 10 minutes after successful intubation. All the data was analyzed.

Intubation Difficulty Scale: Has 7 parameters which aims at assessing the ease of intubation – Number of intubation attempts, number of assistants required, number of different techniques used. Glottic exposure as explained by the Cormack grade minus one, lifting force given during laryngoscope, External laryngeal pressure, Vocal cords position during intubation.

Accordingly, the degree of difficulty is graded as 0 being the easy intubation, 1-5 being slightly difficult and >5 being difficult intubation.

Pogo /Laryngeal View Score: By using the video laryngoscope, the grading of the laryngeal view was done as percentage of glottic opening visualized

Grade I-full view of the glottis/100%

Grade II- posterior commissure/Partial view-50%

Grade III - only arytenoids/none- 0%

Data Analysis

Descriptive statistics in the study were Mean, Standard Deviation and frequency. The Kolmogorov-Smirnov test was used to determine the normalcy of the variables. Time changing quantitative parameters, hemodynamic changes, were compared within the various time frames using one-way repeated measures ANOVA (analysis of variance) test. The SPSS 24.0 for windows (IBM SPSS Inc., Chicago, IL, U.S.A.) software was used for statistical analyses.

Patient identity has been kept confidential.

Observation and Results

Demographic characteristics

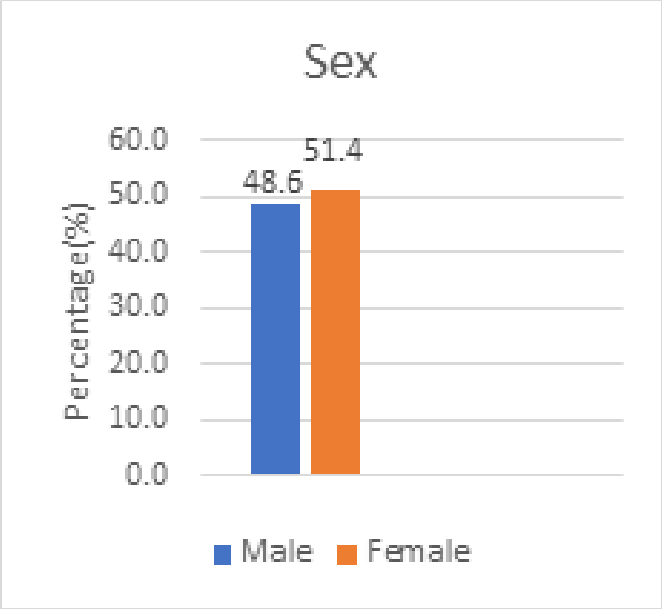

Fig. 2: Sex distribution

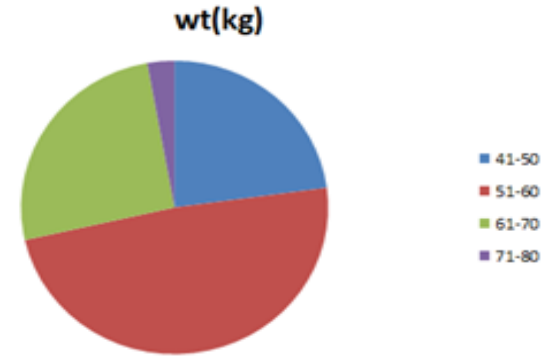

Fig. 3: Weight distribution

Fig. 4: ASA physical status

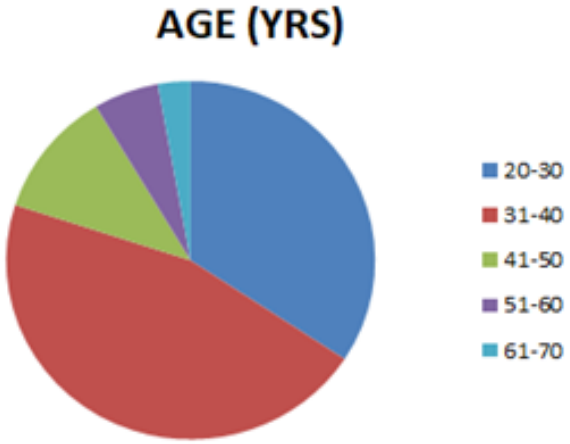

Fig. 5: Age distribution

The above figures illustrate the distribution of demographic charecteristics as in gender, weight, ASA grade and age. A normal distribution of demographic data is observed.

Sn.	Demographic Profile	N=35 .Mean+/- SD
1	Age (Yrs)	35.49 +/- 10.49
2	Weight(Kg)	58.85 +/-7.56
3	Sex (M:F)	17:18
4	ASA- physical status	I/II 23:12

Table 1: Demographic characteristics

Intubation Characteristics

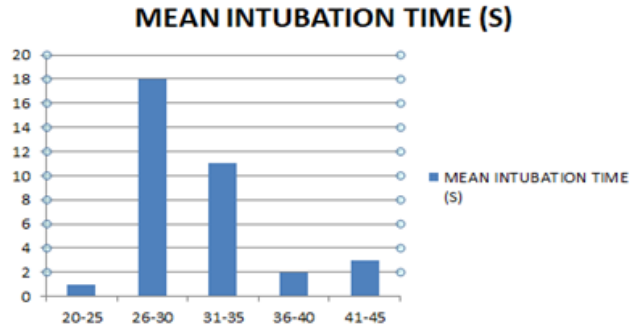

Fig. 6: Mean Intubation time in seconds

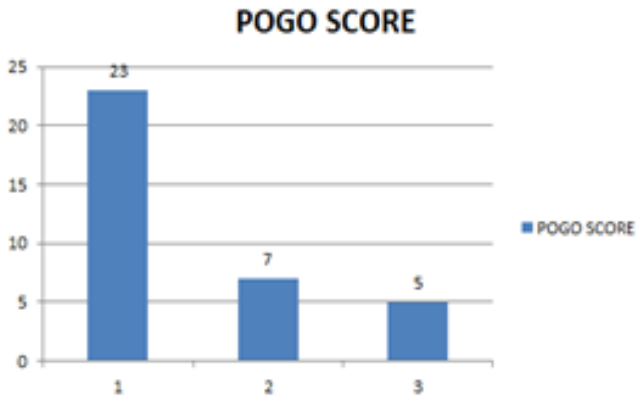

Fig. 7: POGO score

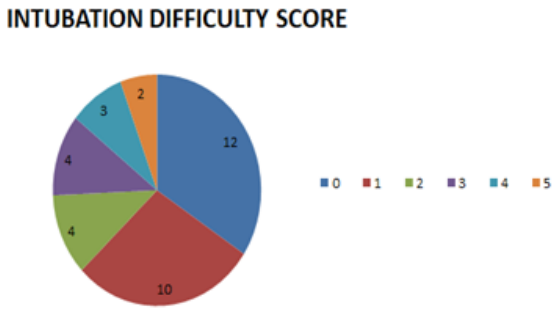

Fig. 8: IDS scoring

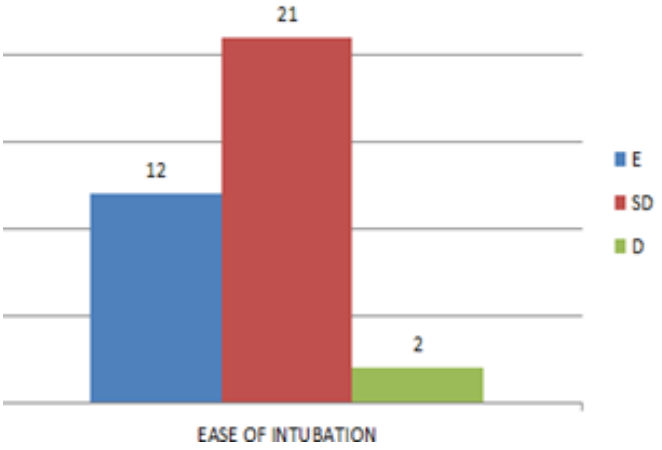

Fig. 9: Ease of intubation

S.NO	Intubation characteristics	n = 35
1	Intubation Time (secs)Mean+/-SD	24.74+/-7.38
2	IDS(no &%) 0,1,2,3,4,5	20,9,3,1,1,1 57.14,25.71,8.57,2.85,2.85,2.85
3	POGO score(no&%) 1,2,3	30,3,2 85.71,8.57,5.71

Table 2: Intubation Characteristics in terms of Mean Intubation time, Intubation Difficulty Scale and POGO score

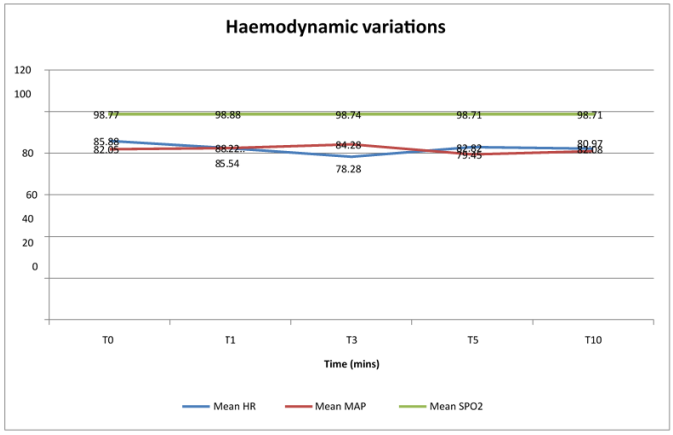

Fig. 10: No significant difference observed from T0 to T10 for Haemodynamic variables

Time (min)	Pre-induction (T0)	Immediate Post insertion (T1)	Diff.T0-T1	t value, Significance & P value
T0-T1	84.29 ± 11.01	85.89 ± 10.50	1.60 ± 7.83	t=1.2,NS,P=0.2
T0-T3	84.29 ± 11.01	85.69 ± 4.19	1.40 ± 11.98	t=0.7,S,P=0.5
T0-T5	84.29 ± 11.01	86.40 ± 4.24	2.11 ± 10.24	t=1.2,NS,P=0.2
T0-T10	84.29 ± 11.01	85.69 ± 4.19	1.40 ± 11.98	t=0.7,NS,P=0.5

Table 3: Data of difference in Heart Rate from T0 to T10. Student t test was applied. No significant difference was found

Time (min)	Pre-induction (T0)	Immediate Post insertion (T1)	Diff.T0-T1	t value, Significance & P value
T0-T1	87.83± 8.09	88.51 ± 7.38	0.68 ± 4.01	t=1.0,NS,P=0.3
T0-T3	87.83± 8.09	88.26 ± 5.50	0.43 ± 5.22	t=0.5,NS,P=0.6
T0-T5	87.83± 8.09	89.83 ± 5.65	2.00 ± 6.31	t=1.9,NS,P=0.07
T0-T10	87.83± 8.09	89.97 ± 5.03	2.14 ± 6.55	t=1.9,NS,P=0.07

Table 4: Data of difference in MAP from T0-T10. Student's paired t test was applied. Conclusion: No significant difference in Mean Arterial Pressure between T0 - T1,T0-T5 & T0-T10.

Time (min)	Pre-induction (T0)	Immediate Post insertion (T1)	Diff.T0-T1	t value, Significance & P value
T0-T1	98.77 ± 0.81	99.89± 0.83	0.15 ± 1.00	t=0.6,NS,P=0.5
T0-T3	98.77 ± 0.81	98.74 ± 0.89	0.03± 0.86	t=0.5,NS,P=0.6
T0-T5	98.77 ± 0.81	98.71 ± 0.83	0.06 ± 1.02	t=0.3,NS,P=0.7
T0-T10	98.77 ± 0.81	98.71 ± 1.05	0.06 ± 1.02	t=0.2,NS,P=0.8

Table 5: Data of difference of Spo2 from T0-T10. Student's paired t test was applied. Conclusion: No significant difference found in Spo2 between, T0-T1, T0-T5 and T0-T10.

Observations

1.Normal distribution observed in the demographic data.

2. Mean intubation time- 24.742 s

3. 20 patients had IDS of 0 (57.142%), 30 patients had POGO score of 1 (85.714%). There were 0 cases of failed intubation.

Discussion

Out of total of 35 patients, the mean intubation time was found to be 24.742 seconds, a total of 20 patients had IDS of 0 (57.142%) and 30 patients had POGO score of 1 (85.714%). There were 0 cases of failed intubation. It was observed that the hemodynamic changes during laryngoscopy and intubation with this device were minimal, so much so that no significant difference could be found from the baseline values. The mean time of intubation was much lesser than that of McGrath VL (34.7+/-5.1 seconds) as reported-by Toker MK et al in their study on comparison of conventional Macintosh laryngoscope and McGrath VL.[7], but slightly more than a comparative study of GlideScope Cobalt VL versus conventional laryngoscopy-by Faden et al,[8] as 21.7 +/-9.61 .

Analysing the findings of the current study, it may be anticipated that the VL3 may be better at visualising the larynx and the cords.

As with other video laryngoscopes, the device used in the current study showed minimal, insignificant hemodynamic alterations. Altun et al, [9] compared 4 laryngoscopes in terms of their hemodynamic response, the conventional Macintosh laryngoscope, McCoy, C-Mac VL and McGrath VL. It was observed in their study that McGrath was associated with the least pulse rate and blood pressure changes with laryngoscopy as compared to the other devices. Likewise, the hemodynamic changes observed with this device were statistically insignificant as compared to the baseline values.

In a large multicentre randomised controlled trial on 720 patients with a simulated difficult airway, the incidence of failed intubation with the common devices was found to be 4.16% with C-MACTM D blade, 14.16% with GlideScopeTM, 2.5% with McGrathTM, 12.5% with AirtraqTM and 10.83% with KingVisionTM [10], mostly linking them to the hyperangulation, which as was already hypothesized as great view, but unable to negotiate. There were 0 cases of failed intubation with the device in this study; though, too small an analysis for deriving any inference.

All above findings may be attributed to VL3 design as lightweight, low profile and easy to maneuver. The device incorporates a small screen mounted on the handle, making it less cumbersome at the cost of some limitation to teaching, training and information sharing properties. Also, the blade curvature as well as technique being akin to the Macintosh blade might be hugely responsible for a relative ease of intubation as these are important factors as compared to hyperangulated blades [11,12]

Conclusion

The VL3 video laryngoscope appears to be a quick and easy to handle device without any undue haemodynamic variations and so apparently at par with its congeners. However, larger, multicentre, randomised trials and comparative analyses may be needed to establish the same.

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