Original Article

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The i-view^{TM} Video Laryngoscope - the Most Recent of all Video Laryngoscopes: An Observational study Analysing Performance

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Abstract

Background: The spectrum of video laryngoscopes appears ever-expanding with the advent of newer and newer devices. In a span of fewer than 20 years, beginning with the first device, the Glidescope in 2001, plenty of devices are now at our disposal. The i-view^{TM} video laryngoscope, the most recent introduction to the family in 2018, has not reportedly been evaluated yet for its performance. The **o**bjective is to evaluate the performance of the i-view video laryngoscope in terms of intubation characteristics, a prospective observational study. **Subjects and Methods:** The study included 60 patients undergoing laryngoscopy and intubation using the i-view video laryngoscope for nonemergency surgery requiring general anaesthesia. The primary outcome was intubation time. Modified Cormack-Lehane (CL) view, adjustment maneuvers and hemodynamic responses were also noted as secondary outcome measures. **Results:** Sixty patients were enrolled in the study. After exclusions, 56 patients underwent video laryngoscopy with the device. The mean intubation time was 30.3 $\pm$ 5.1 seconds. Thirty-seven patients (66.07%) had a CL view 1, and 17 patients (30.35%) 2a. Forty patients were intubated without any adjustment maneuver, 12 needed one adjustment and 2 patients needed $\geq$ 2 maneuvers. There were 2 cases of failed intubation even in three attempts. The variations in haemodynamic parameters were found to be statistically insignificant. No complication related to the device could be documented. **Conclusions:** The new video laryngoscope, i-view is found to be at least at par with its older congeners, if not better. Larger, multicentric, comparative trials may be needed to establish the same.

Keywords: Intubation time, I-view, Video laryngoscope.

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Introduction

Recently, the use of video laryngoscopy has become a widely accepted method in both emergency, routine and clinical anesthesia.[1,2] The ease of handling, a higher success rate in patients with normal as well as difficult airways and a steep learning curve makes these devices very popular among physicians.[3,4] Video laryngoscopes have now been included among the first aid devices for the management of difficult situations by the Difficult Airway Society (DAS).[5]

Even after excluding patients in whom difficult tracheal intubation may be anticipated, poor vision at laryngoscopy (grade 3-4) is a relatively common finding (10%). In quite a few patients, there arises a need for more than 3 laryngoscopy attempts (1.9%) and a failed direct laryngoscopy may also occur, though it is a rare event (0.1%).[6]

Video laryngoscopes are indirect laryngoscopes that evade the need for alignment of the larynx to the direct line of sight. The larynx and cords are seen on a screen through a video system, with a camera on the blade and no intervening fiber optic components. This is in contrast to the conventional direct laryngoscope which aids in visualizing the larynx and cords in the direct line of sight. Video laryngoscopes offer several advantages, including a better view of the glottic opening but, a good laryngeal view does not guarantee easy or successful tracheal intubation.[7]

Sharing of information among the team is also feasible, others can see and help; thus, a higher success rate may be anticipated especially in difficult airway situations.

The enormous development in computer software technology has led to the development of more ergonomic, smaller and less expensive video laryngoscopes with more efficient video

camera resolution imaging.

The i-view^{TM} video laryngoscope is amongst the latest video laryngoscope (VL) in current anesthetic practice. A product of the intersurgical company, it is ready to use seconds after removing from packaging; a single-use, fully disposable video laryngoscope.[8] By incorporating a Macintosh blade, the i-view can also be used for direct laryngoscopy. The technique for insertion is more familiar and instinctive than for devices with a hyper-angulated blade. The ergonomic design ensures it is easy to use and the integrated LCD screen provides an optimal view in a variety of light conditions.

The new i-View^{TM} laryngoscope [Figure 1], like its congeners, claims the benefit of lesser airway manipulation and better glottic exposure. However, there is no reported trial or review analysing its efficacy.

Hence, this observational study was undertaken to assess the performance of the i-view^{TM} video laryngoscope in terms of intubation time. Modified Cormack-Lehane (CL) view, adjustment maneuvers and hemodynamic responses were also noted as secondary outcome measures.

Subjects and Methods

Study Design and Subjects

After due clearance from the Institutional Ethics Committee (D.No. 66, dated 23.10.2020) and a written and informed consent, sixty patients requiring routine surgery under general anesthesia were included in this observational study. These patients were of age between 20 to 60 years of either sex, weighing between 45 to 70kg and ASA I and II. All mallampati (MP) grades were included-in the study. The exclusion criteria consisted of the previous history of multiple/failed intubation, head and neck surgery, valvular heart disease, CAD, uncontrolled hypertension, presence of raised intracranial pressure, cervical spine injury, pathology of the oral cavity that could obstruct device insertion and a mouth opening <2.5cm. Potentially full stomach patients (trauma, morbid obesity, pregnancy, history of regurgitation and heartburn) and at risk of gastro-oesophageal reflux (hiatus hernia) were also excluded.

Pre-procedure preparation

All the patients underwent a detailed pre-anesthetic evaluation and those fulfilling the study criteria were included. 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 anaesthesiologist felt comfortable with the use of the device.

Intervention

All patients were kept nil per-orally (NPO) for 8 hours and a standard anesthetic technique comprising of a standard premedication, intravenous administration of dexamethasone 0.1mg/kg, midazolam 0.03mg/kg and fentanyl 1.5mcg/kg. Anesthesia induction with carried out with 2mg/kg propofol intravenously in all patients. After adequate muscle relaxation with intravenous vecuronium 0.1 mg/kg, intubation was carried out with the i-view^{TM} VL.

Intubation time was calculated from the time of introduction of the device into the mouth till confirmation by capnography tracing. Adjusting maneuvers like readjustment of head position, external laryngeal manipulation, jaw thrust and/or use of malleable stylet were all accounted for. CL view and hemodynamic parameters were noted. A maximum of three attempts with the device was permitted after which it was declared a failed intubation attempt.

Surgery was allowed to commence only after the collection of the last hemodynamic data 10 minutes post-intubation. The recorded hemodynamic data included pulse rate, mean arterial blood pressure (MABP) and oxygen saturation (SpO_2) recorded at baseline (before induction of anesthesia – T0), immediately after intubation (Ti), 1 minute after intubation (T1), 3 minutes after intubation (T3), 5 minutes after intubation (T5) and 10 minutes after intubation (T10).

Anesthesia was maintained with 60% nitrous oxide in oxygen, propofol, vecuronium (intermittently) with or without isoflurane (as per requirement).

Upon completion of the surgery, residual neuromuscular blockade was reversed with a combination of intravenous neostigmine (40mcg/kg) and glycopyrrolate (10mcg/kg). After ensuring adequate reversal of neuromuscular blockade, the endotracheal tube was removed. Monitoring and oxygen support were carried out within the operating room for 10 minutes; thereafter, the patients were shifted to the post-anesthesia care unit (PACU).

Post-procedure Assessment

The endotracheal tube was inspected after removal for the presence of bloodstains, indicating any laryngeal trauma. Sore throat, defined as an unpleasant sensation in the throat (not previously present), was also noted just prior to discharge from the recovery room and 24 hours later.

Data Analysis

Normally distributed data were expressed as mean (standard deviation, SD). Time changing quantitative parameters, hemodynamic changes, were compared using one way repeated

measures ANOVA (analysis of variance) test. For analyses of these, the pre-induction values, rather than pre intubation values, were considered as baseline.

If a statistically significant difference was found in ANOVA, an appropriate post -hoc test (LSD/Bonferroni) was used to assess statistical significance.

A 'p' value < 0.05 was considered statistically significant. The SPSS 24.0 for windows (IBM SPSS Inc., Chicago, IL, U.S.A.) software was used for statistical analyses.

Results

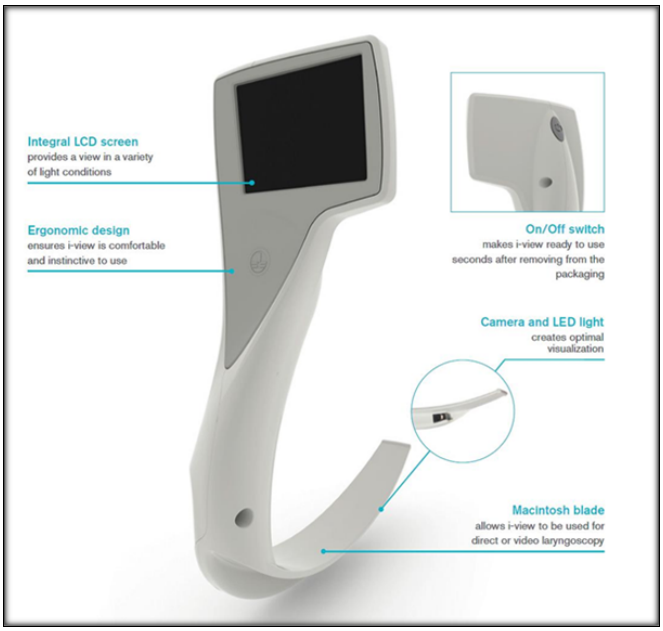

Figure 1: The i-view^{TM} video laryngoscope

Subject Characteristics

Sixty patients were enrolled in the study. After exclusions, 56 patients underwent video laryngoscopy with the device (figure 2). The demographic profile (age, weight, height, the ratio of males to females, ASA grading) of the patients is as depicted in table 1.

Intubation time, Adjustment maneuvers and CL grading

The mean intubation time was found to be 30.3 ± 5.1 seconds. Forty patients (71.43%) were intubated without any adjustment maneuver, 12 (21.43%) needed one adjustment and 2 (3.57%) patients needed ≥ 2 maneuvers.

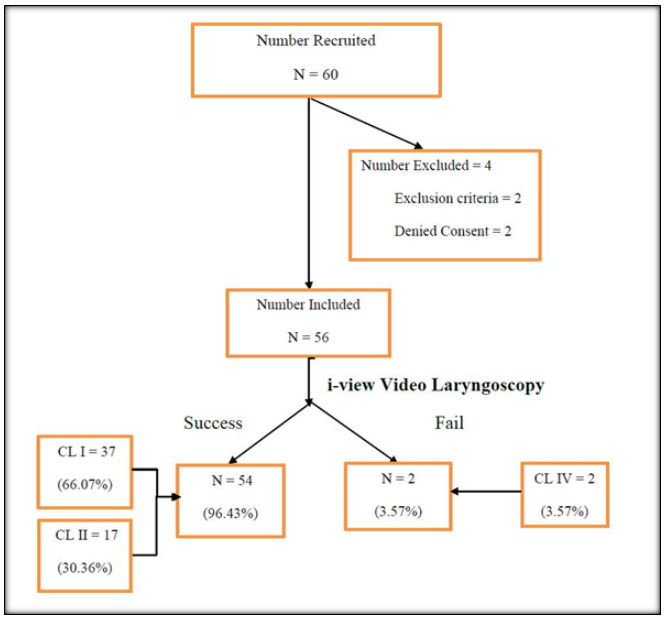

Figure 2: Study Design and Participant Flowchart

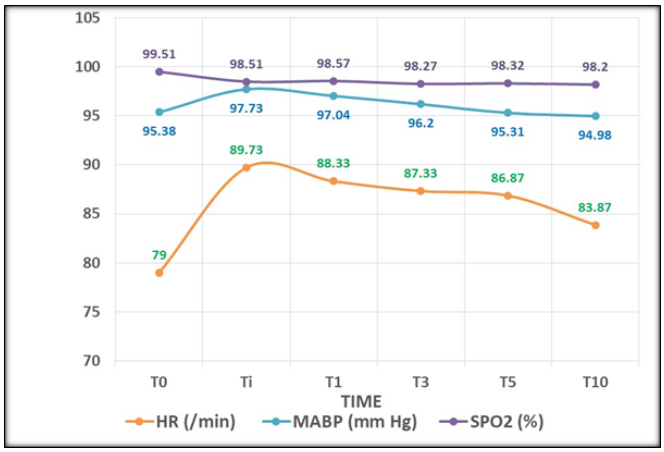

Figure 3: Variation in Hemodynamic parameters

Thirty-seven patients (66.07%) had a CL view 1, and 17 patients (30.35%) II (table 2).

There were 2 (3.57%) cases of failed intubation.

Safety Analysis

The variations in hemodynamic parameters were found to be statistically insignificant (table 3, figure 3). No blood stain was found on any of the endotracheal tubes after extubation. There was also no reporting of any incidence of sore throat or hoarseness of voice. Hence, no complications related to the

Table 1: Demographic Profile

S.No.	Demographic Characteristic	n = 56 Mean ± SD
1.	Age (yrs)	40.82 ± 10.56
2.	Sex (M : F)	29 : 27
3.	Weight (kg)	59.24 ± 10.02
4.	ASA Physical Status (I/II)	31 / 25

Table 2: Glottic View & Intubation Characteristics

S.No.	Characteristic	n = 56
1.	MP grading (I/II/III/IV) % (I/II/III/IV)	20/27/5/4 35.72/48.22/8.92/7.14
2.	CL grading (I/II/III/IV) % (I/II/III/IV)	37/17/0/2 66.07/30.36/0/3.57
3.	Intubation time (seconds)	30.3 ± 5.1
4.	Adjustment maneuvers (0/1/≥2) (0/1/≥2) %	40/12/2 71.43/21.43/3.57
5.	Intubation Results (Success/Failure)	54 / 2 96.43/3.57

Table 3: Hemodynamic Response & SpO_2 variations

Time (min)	HR (/min) (Mean ± SD)	MABP (mm Hg) (Mean ± SD)	SPO2 (%) (Mean ± SD)
Pre-induction (T0)	79 ± 11.25	95.38 ± 8.04	99.51 ± 0.22
Immediate post intubation (Ti)	89.73 ± 11.38	97.73 ± 6.43	98.51 ± 0.22
1 min Post Intubation (T1)	88.33 ± 9.20	97.04 ± 5.69	98.57 ± 0.44
3 mins Post Intubation (T3)	87.33 ± 9.24	96.20 ± 6.36	98.27± 0.69
5 mins Post Intubation (T5)	86.87 ± 9.18	95.31 ± 6.59	98.32 ± 0.63
10 mins post intubation (T10)	83.87 ± 9.73	94.98 ± 6.70	98.20 ± 0.61
P value	0.095	0.201	0.67

device could be documented.

Discussion

This prospective observational study analysed the i-view^{TM} video laryngoscope, the most recent in the family of video laryngoscopes, introduced in the year 2018. No study analysing the performance of this device has been reported to date. [8]

A total of 60 patients undergoing elective surgery were intubated using the device. The intubation time was found to be 30.3 ± 5.1 seconds, which seems similar to other video laryngoscopes. A total of 71.43% were intubated without any adjustment maneuver, 21.43% needed one adjustment and only 3.57% needed ≥ 2 maneuvers. A Cormack Lehane view 1 was observed in 66.07% of patients and 30.35% showed a grade 2A view. The remaining 3.57% cases were failed intubation, rescued with a supraglottic device.

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. Also, no complication related to the device, laryngeal trauma, sore throat or hoarseness of voice, could be documented.

The mean time of intubation observed with this new VL was 30.3 ± 5.1 seconds. This was slightly less than that of McGrath VL (34.7 ± 5.1 seconds) as reported-by Toker MK and colleagues in their study on comparison of conventional Macintosh laryngoscope and McGrath VL. [9] A comparative study of GlideScope Cobalt VL versus conventional-laryngoscopy-by Faden et al, [10] found the average time to intubate by the VL as 21.7 ± 9.61 which is much less than that observed in this study on i-view VL.

A randomised trial in super-obese patients comparing McGrath Mac VL and the i-view VL, the only trial reportedly conducted and published on the i-view VL, showed that the POGO scoring was better with McGrath when compared to i-view, the use of intubation stylet was similar in both groups. [11] The hemodynamic response to video laryngoscopy was similar between groups.

In the trial by Toker and colleagues, the distribution of CL grading of patients with McGrath VL was observed to be I in 32% patients, II in 64% patients and III in the remaining 4% of patients. [9] Analysing the findings of the current study and the study by Toker, it may be anticipated that the i-view VL may be better than McGrath VL at visualising the larynx and the cords. Yet, the findings of Gaszynski[11] contradict, showing a better POGO scoring with McGrath Mac VL when compared with the i-view^{TM}. This may be due to the better ergonomics of McGrath Mac VL as compared to the old member McGrath VL in the series.

An analysis in a predicted difficult airway condition showed that adjustment maneuvers like the use of a gum-elastic bougie and/or external laryngeal manipulation were required less often in the C-MAC intubations (24%, 33/138) compared with direct laryngoscopy (37%, 46/124, P = 0.020). [12] These findings with C-Mac VL appear coherent with the data obtained with i-view ^{TM}VL in this study, 25% (14/56) patients requiring adjustment maneuvers to facilitate endotracheal intubation with the device.

As with other video laryngoscopes, the device used in the current study showed minimal, insignificant hemodynamic alterations. Altun et al, [13] 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. Also, the hemodynamic changes observed with this device were statistically insignificant as compared to the baseline values. Correlating this with the current study, the i-view^{TM} VL may be similar to McGrath VL in terms of hemodynamic stability.

Another study on hemodynamic response to intubation with King Vision VL and C-Mac VL showed no significant changes in either pulse rate or blood pressure with any of the two devices; the findings coinciding with the data obtained with i-view VL in the current study. [14]

A set of characteristics have been enlisted for an ideal video laryngoscope by Hurford WE. [15] These include intuitiveness to one trained with conventional direct laryngoscopy, a single device useful for oral or nasal intubation, in both adults and children, and permit the use of special-purpose tubes such as double-lumen endobronchial tubes, large separate view screen for teaching, training as well as sharing information, inexpensive, lightweight, low profile, and easy to maneuver, anti-fog property, image storage capability and a long-lasting rechargeable battery with an alternative power source.

Of these, the i-view^{TM} VL, though lacking in quite a few desirable properties, it incorporates a number of ideal features. The presence of a macintosh blade enhances the ease of skill acquisition, and the absence of a channel makes it suitable for both oral and nasal intubation, also permitting the use of specialised tubes. Though a single device is not suitable for both adults and children, this instrument is certainly inexpensive (disposable device, alleviating the maintenance charges), 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.

Though reports and studies have quoted complications associated with the use of video laryngoscopes, the incidence reported is low. However, in this study, no device-related complication could be documented.

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-MAC^{TM} D blade, 14.16% with GlideScope^{TM}, 2.5% with McGrath^{TM}, 12.5% with Airtraq^{TM} and 10.83% with KingVision^{TM}. [16] There were 3.57% cases of failed intubation with the device in this study; though, too small an analysis for deriving any inference.

Conclusion

The new member of the video laryngoscope family, the i-view^{TM} video laryngoscope, appears to be an easy to handle, easy to use the device. A device apparently at par with its congeners, if not ahead of them. Larger, multicentre, randomised trials and comparative analyses may be needed to establish the same.

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