ORIGINAL ARTICLE

King Vision Videolaryngoscopy Versus Direct Laryngoscopy in Patients Requiring Endotracheal Intubation for General Anaesthesia: A Comparative Study

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Abstract

With new advances in technology, intubation using video laryngoscopy has been gaining popularity, particularly in patients with difficult airways or as rescue devices in failed intubation attempts. This study was done to compare the effectiveness of King Vision video laryngoscope (KVL) and Macintosh laryngoscope when performing tracheal intubation under general anesthesia Eighty patients requiring endotracheal intubation during general anaesthesia were randomly assigned into two groups to undergo tracheal intubation using either a King Vision video laryngoscope (n=40) or Macintosh laryngoscope (n=40). The primary outcomes were the time of intubation and Cormack-Lehane grading and secondary outcomes were number of attempts and optimisation manoeuvres required and complications related to laryngoscopy and intubation. King Vision video laryngoscope was found to be significantly better than the Macintosh laryngoscope in terms of Cormack and Lehane grading, requirement of optimisation manoeuvres and need of second attempt for intubation except time of intubation which was comparable between the two groups.

Key Words

King Vision video laryngoscope, Videolaryngoscopy, Macintosh laryngoscope

Introduction

The most critical step during general anaesthesia is securing the patient's airway by endotracheal intubation. The skill needed for a successful direct laryngoscopic intubation is complex as the individual anaesthesiologists all over the world agree to a plan of difficult airway management which improves outcome. Guidelines by the Difficult Task Force recommend that a video laryngoscope should be available as a first attempt or rescue device for all patients being intubated.

Videolaryngoscopy is a newly developed technique to improve tracheal intubation success. It was made to bypass the need of directly visualising the glottic inlet. These devices are advantageous as there is no need of aligning the laryngeal, pharyngeal and oral axes for a clear view, thus making intubation easier and faster (1).

The King Vision Video Laryngoscope is a novice Video Laryngoscope that is portable and easy to use; providing an indirect view of the glottis. It consists of a reusable anti-reflective display and a single use ergonomic blade/handle. Currently there are two available blade designs: channelled blade and standard blade.

This present study, evaluates and compares the efficacy of King Vision video laryngoscope and Macintosh laryngoscope with respect to time to intubation, Cormack-Lehane grading, number of attempts, optimisation manoeuvres required and the complications related to laryngoscopy and intubation.

Material and Methods

After obtaining approval from the Institutional Ethic Committee, the present study was conducted in the Post-Graduate Department of Anaesthesiology and Intensive

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care, Acharya Shri Chander College of Medical Sciences and Hospital, Jammu over a period of one year. Eighty patients undergoing elective surgery requiring tracheal intubation were randomly assigned to undergo intubation using King Vision or Macintosh laryngoscope. All intubation were performed by a senior anesthesiologist who has experience of at least 40 intubation in patients using VL.

After obtaining informed written consent from patients, they were allocated into one of the 2 study groups randomly according to a computer-generated table of randomisation, each group comprising of 40 patients.

Group I (n=40): Patients in this group were intubated using King Vision video laryngoscope standard (non-channeled) blade.

Group II (n=40): Patients in this group were intubated using Macintosh laryngoscope.

The inclusion criteria were patients of either sex, in between the age of 20-70 years, ASA grade I and II and MPG 1, 2, 3, 4. Patients excluded in this study were those who refused for the study, Age < 20 and > 70 years, ASA III and IV.

All patients underwent a pre-anaesthetic check-up one day prior to surgery which included a detailed history, general physical as well as systemic examination and airway assessment of all patients. All routine investigations and any other specific investigations deemed necessary for the patient were undertaken. Demographic profile like age, sex, weight was noted. All the patients were kept fasting eight hours prior to surgery and received a dose of tab alprazolam 0.25mg & tab pantoprazole 40mg orally night prior to surgery.

On the morning of surgery in the preoperative room intravenous access with an 18 G or 20 G cannula was secured and I.V. fluid Ringer Lactate was started at 60ml/hr. The patients were then shifted to the operation theatre. In the operation theatre, standard monitoring was done using Continuous ECG (lead II), Spo2, Non- invasive BP and ETCO2.

The patients were administered injection ondansetron 0.1mg/kg iv and injection pantoprazole 40mg intravenously prior to induction. After adequate pre-oxygenation, standard general anaesthetic techniques were followed in both groups using injection Fentanyl 1microgram/kg and injection Propofol 2mg/kg intravenously. Muscle relaxation was achieved with injection Succinylcholine 1mg/kg intravenously. Intubation was attempted after 60 seconds of giving injection Succinylcholine. All the intubation were done by the same experienced anaesthesiologist and the head was kept in "neutral position". Stylet was used for intubation in both groups. Size 3 of Macintosh and King Vision standard (non-channelled) blade were used for patients upto 50 kg. Size 4 of Macintosh blade and size 3 King Vision standard (non-channelled) blade were used for patients having more than 50kg weight.

After successful intubation anaesthesia was maintained with 33% Oxygen & 66% Nitrous Oxide mixture & varying concentrations of Isoflurane (1-1.5%). Neuromuscular blockade was maintained by Injection Rocuronium 0.15 mg/kg. After completion of the surgery neuromuscular blockade was reversed with – Injection Neostigmine 0.05mg/kg and Injection Glycopyrrolate 0.01mg/kg.

Following parameters were recorded intra operatively:

- ***Time to intubation***- time elapsed from insertion of the blade between the dental arches to the first deflection on capnography
- ***Evaluation of Glottic view using Cormack-Lehane grading:***

Grade I: Visualization of entire vocal cords

Grade II: Partial view of glottis

Grade III: Only epiglottis seen, none of glottis visible

Grade IV: Neither glottis nor epiglottis visible

- ***Number of attempts and optimization maneuvers required.***

An attempt was defined as the time from introduction of laryngoscope into the oral cavity until its removal. Three attempts of intubation were allowed for each group. "Failure to Intubate" was defined as the inability to intubate after 3 attempts or which requires more than 60 seconds to perform. "Alternative Technique" were used in case of failure as per the direction of the anesthesiologist. "Optimization manoeuvres required"- like use of bougie, cricoid pressure and second assistant were recorded.

- ***After intubation & post extubation***- blade of the laryngoscopes was checked for blood staining; along with inspection of any trauma to tongue, teeth or soft tissues.

Statistical Analysis

At the end of the study all the data was compiled and analyzed statistically. Comparison of mean value among the two groups was done using students t-test and percentage comparison was done using the chi square test. To compare more than two variables ANOVA test was used. The P value of less than 0.05 was considered statistically significant.

Results

Demographic data including variables of gender, age, ASA grade and MPG were comparable between the two groups *(Table 1).*

Table 1: Demographic Data of the Patients

Demographic Parameters	King Vision	Macintosh
Age (years) Mean ± SD	39.65 ± 11.51	41.22 ± 9.24
M: F Ratio	1.22:1	1.24:1
ASA I/II	26/14	24/16
MPG I/II/III/IV	23/9/7/1	2/14/4/1

The mean time of intubation was 8.95 sec for King Vision group and 9.7 sec for the Macintosh group *(Fig. 1).* It was not significant between the two groups (8.95 VS 9.7 sec; $p = .138$). The difference in Cormack and Lehane grading was statistically significant between the two groups ($p = .02$) *(Fig. 2).* Intubation was successful in the first attempt in 38 (95%) patients in the King Vision group and 33 (82.5%) patients in the Macintosh group *(Fig. 3).* Statistically, the difference of number of attempts was significant between the two groups ($p < .05$). Use of optimization manoeuvres like bougie, cricoid pressure and second assistant was required in 4 (10%) patients in King Vision group and 14 (35%) patients in Macintosh group *(Fig. 4).* Statistically, the King Vision group performed better with respect to optimization manoeuvres compared to Macintosh group ($p < .05$). None of the patient in King Vision group observed any trauma whereas trauma was observed in six patients of Macintosh group *(Fig. 5).*

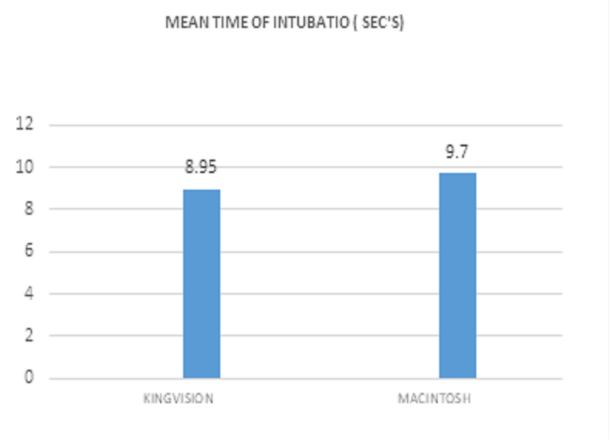

Figure 1: Mean Time of Intubation

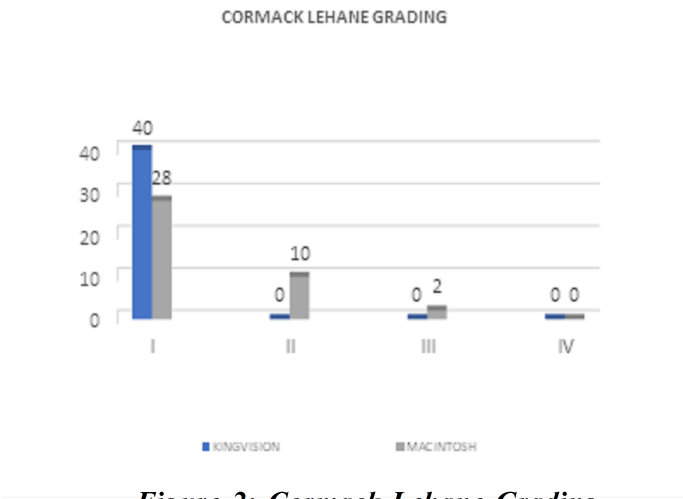

Figure 2: Cormack-Lehane Grading

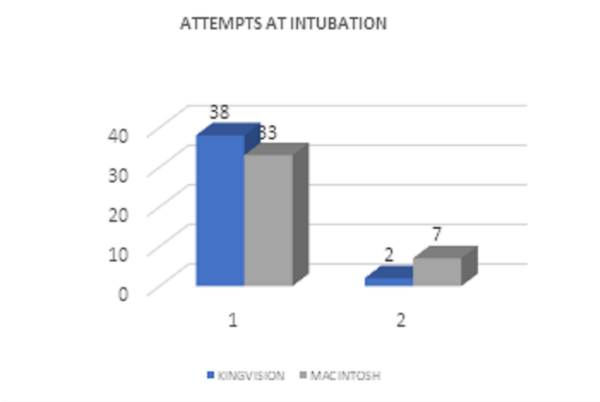

Figure 3: Number of Attempts at Intubation

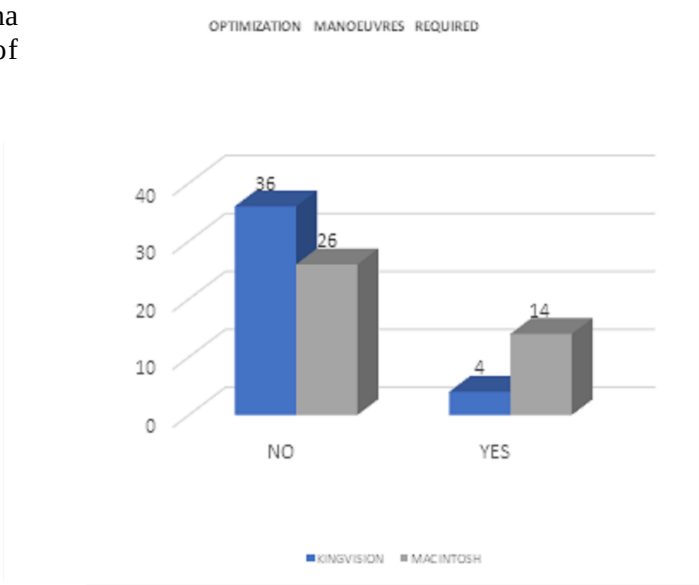

Figure 4: Optimization Manoeuvres Required

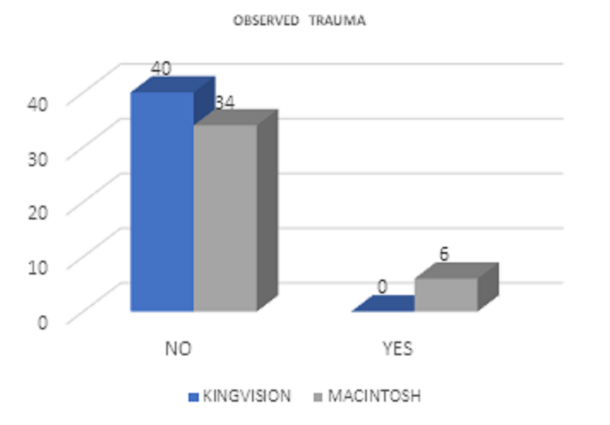

Figure 5: Observed Trauma

Discussion

Endotracheal intubation is the safest method to secure the airway and administer general anaesthesia. The most commonly used laryngoscope since its introduction is the Macintosh laryngoscope although over time various advances have been made resulting in development of laryngoscopes of different designs (2,3). Video laryngoscopes have been recently developed and become popular as new tools to combat unanticipated difficult airway. Various types of video laryngoscopes have been developed till date. The King Vision Video Laryngoscope (KVVL) was introduced into practice in 2010.

In this study there was no difference between the two groups with regard to mean age, ASA physical status and Mallampati grade. All grades of Mallampati classification were included in the study as single usage would have limited the discriminative power for difficult intubation.

The mean time of intubation was found to be comparable between the King Vision and Macintosh group (8.95 VS 9.7 sec; $p = .138$). Although the duration of intubation was comparably lesser in the King Vision group than the Macintosh group, it was not statistically significant ($p > .05$).

A study by Murphy *et al.* and Zhu Haozhen *et al.* found that time to intubation was faster with the KVVL in the difficult cadaver airway scenario as compared to direct laryngoscopy but that was not true in our study (4,5). Few other studies found that intubation time was longer using King Vision video laryngoscope as compared to Macintosh laryngoscope (6-8). The reason cited was that although videolaryngoscopes offer superior visualisation of the glottis; a good laryngeal view does not guarantee easy or successful tracheal tube insertion. This is because the laryngeal axes are not aligned in videolaryngoscopy, and the tip of the tracheal tube must therefore pass around a relatively acute angle to enter the larynx. This phenomenon is linked to video laryngoscopes with hyper angulated blades, unlike the traditional Macintosh blade (9). Although Cormack-Lehane grade I was achieved in majority of patients undergoing intubation with video laryngoscopes but less space is created for tube insertion when using the King Vision as the pharyngeal tissues are not displaced far anteriorly.

In the present study, decrease in the Cormack-Lehane grading was statistically significant between the King Vision and Macintosh groups ($p = .02$). This is because video laryngoscopes provide better glottis exposure when compared to direct laryngoscopy. The reason is due to presence of a camera at the tip of the blade of a video laryngoscope that eliminates need of aligning the laryngeal, pharyngeal and oral axes (2,10-12).

Intubation success rate in first attempt was seen in 38 (95%) patients in the King Vision group and 33 (82.5%) patients in the Macintosh group. Statistically, the difference of number of attempts was significant between King Vision and Macintosh group ($p < .05$). It was found that King Vision video laryngoscope improves the intubation success rate (100%) (13-15).

Use of optimization manoeuvres like bougie, cricoid pressure and second assistant was required in 4 (10%) patients in King Vision group, 5 (12.5%) and 14 (35%) patients in Macintosh group. Statistically, King Vision group performed better with respect to optimization manoeuvres compared to Macintosh group ($p < .05$). This is because video laryngoscopes provide an indirect view of vocal cords on an LCD screen the tube needs to be blindly inserted until it can be seen on the video laryngoscope screen, so some manipulation may be required. While in case of direct laryngoscope the oral, laryngeal and pharyngeal axes need to be in a straight line for which much more manipulation may be required. Also, the manipulation needs to be continued until the passage of the endotracheal tube to maintain the glottis view. Thus, more patients require the specific manoeuvres in Macintosh group. Few studies have reported that use of King Vision video laryngoscope reduced the number of optimisation manoeuvres as compared to Macintosh as seen in our study (16,17).

In the present study trauma was observed in six patients in the Macintosh group. No patient underwent

any trauma in the King Vision group. Statistically, King Vision group performed better in comparison to Macintosh ($p < .05$) regarding the occurrence of trauma during laryngoscopy. The reason cited is that direct laryngoscopy might require putting an undue pressure on gums, teeth and periglottic structures for maximum exposure of vocal cords causing trauma. So, the use of video laryngoscopes might lower tissue trauma rates (18).

The main limitation in our study is the anesthesiologist performing the intubation could not be blinded to the devices used in the study. Secondly, the experience of direct laryngoscopy of the anesthesiologist performing the laryngoscopy is more than video laryngoscopy

Conclusion

Although, the use of King Vision video laryngoscope provided a better glottic view (Cormack-Lehane Grading) and higher success rate in first attempt at intubation as compared to Macintosh laryngoscope; but the duration of intubation was comparable in both the groups. Further, the videolaryngoscope group performed better in relation to the optimisation manoeuvres required and was associated with lesser complications during intubation.

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