ORIGINAL ARTICLE

Comparison of King Vision video laryngoscope with Macintosh laryngoscope in endotracheal intubation under general anesthesia: A randomized controlled study

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Background: The majority of intubations worldwide are still carried out using a conventional approach. However, alternative intubation systems with video, optical, or fiber-optic imaging that have several advantages over direct laryngoscopy have arisen in the recent time. The King Vision video laryngoscope is the newest gadget in a long series, which provides an "excellent vision" for intubation using video and digital technology. Therefore, we compared the efficiency of the King Vision video laryngoscope and the Macintosh laryngoscope, when used by experienced anesthesiologists on adult patients with varying intubating conditions, in a prospective randomized controlled clinical trial. **Methods:** A total of 80 patients with the American Society of Anesthesiologists grade of I, II, and III were included in the study. Out of 80 patients, two groups were created consisting of 40 patients in each group. Group K was intubated with King Vision video laryngoscope while Group M with Macintosh laryngoscope. Intubation success rate, time to intubation, ease of intubation, and hemodynamic parameters while intubation and complication related to intubation were analyzed in the study. **Results and Conclusion:** First-pass intubation success rates were similar for both groups ($P > 0.05$). The mean tracheal intubation time (time of tracheal intubation) was 26.3 s in the ML group and 24.75 s in the KVVL group. However, the difference in time to intubation was similar when unsuccessful intubation attempts were excluded ($P < 0.001$). Hemodynamically, there was no significant change between these two groups. The King Vision video laryngoscope is equally efficient and safe as Macintosh laryngoscope. With lower need for retreat, it provides a comprehensive panorama laryngeal assessment and less manipulation of the airway, King Vision video laryngoscope has a comparable safety profile with Macintosh laryngoscope.

KEY WORDS: King Vision video laryngoscope, Macintosh laryngoscope, hemodynamic changes, ease of intubation, time to intubate, intubation success rate

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INTRODUCTION

Airway management is the primary responsibility of anesthesiologists: Ensuring, preserving, and securing it during anesthesia. Failure to control airways can lead to disastrous results; death or worse; and brain damage. Most anesthesia mishaps occur in succession of anesthesia induction.[1]

The majority of intubations worldwide are still carried out using such a conventional approach despite fast progress in medical technology; nevertheless, direct laryngoscope angle is 15° and restricted by the patient's oropharyngeal structure, secretion, and location.[2] This method is a traditional procedure.

Since Kirstein originally detailed the procedure in 1895, the benefit of the right head-and-neck position for improved laryngeal vision was known. Inadequate placement can lead to protracted or failing intubation because of the improper imaging of the larynx.[3]

Alternative intubation systems with video, optical, or fiber-optic imaging that have several advantages over direct laryngoscopy have arisen.

The King Vision video laryngoscope is the newest gadget, which provides an "excellent vision" for intubation using video and digital technology. It consists of two blades, one with a channel and the other without a channel. The display is a diode emitting organic light (organic light-emitting diodes) design with a remarkable clarity and resolution.[4] The channel blade needs to open the mouth at least 1.8 cm, while the not channel blade needs to be open at least 1.3 cm.[5-8]

Therefore, we plan to compare the efficacy of indirect laryngoscopy by King Vision video laryngoscopy with direct laryngoscopy using the conventional Macintosh with regard to visualization of the laryngeal view, speed of intubation, and intubation success rate.

MATERIALS AND METHODS

After obtaining local Ethics Committee approval, a hospital-based prospective randomized clinical study was carried out in Rohilkhand Medical College and Hospital, Bareilly. Informed and written consent were taken from each patient before the procedure and 80 patients of the American Society of Anesthesiologists (ASA) Grade I and II posted for elective surgery under general anesthesia age group of 18–60 years were randomly distributed and allocated in two different Groups K and M.

Group M: These patients intubated using the conventional Macintosh blade number 3.

Group K: While these were intubated by KVVL.

A through systemic examination was carried out to detect the presence of any systemic disorder. All patients were maintained at nil per os for 6–8 h before the operation. Tablet 150 mg ranitidine and 0.25 mg alprazolam tablet were administered night before operation.

Patients were linked with standard monitors, including the electrocardiography, non-invasive blood pressure (BP), and pulsation oximeter, on arriving at the operation theater. All of them were exposed to the same anesthetic procedure. Fentanyl 1 μg/kg and propofol 1.5–2 mg/kg were used. Rocuronium 0.6 mg/kg was given before the orotracheal intubation. Orotracheal intubation was done using a chosen intubation system for each group with an endotracheal tube loaded over an endotracheal style and after complete muscle relaxation. Tracheal intubation was performed by consultant anesthesiologist who had learned and performed at least 20 intubations with the new device in clinical setting before the study.

For an easy intubation, we had scored it 1 while for difficult, we had scored it 2.

"The time for intubation (in seconds) was then measured from taking up the device to removing the laryngoscope after successful tracheal intubation. Heart rate (systolic, diastolic, and mean) SpO2 was measured at eight specified times, namely, T1 = Baseline before anesthesia induction, T2 = After anesthetic induction, T3 = Before laryngoscopy, T4 = Immediate after intubation, T5 = 1 min of intubation in the trachea; T6 = 3 min after intubating the endotracheal; T7 = 5 min after intubation; and T8 > after 10 min endotracheal intubation."

At the end of the surgery, reversal was done with inj. neostigmine 0.05 $mgkg^{-1}$/iv and inj. glycopyrrolate 0.008 $mgkg^{-1}$/iv. Pharyngotracheal suction was done. After the patient was able to keep his eyes open, elevate head, and breathe normally, he/ she was extubated and shifted to ward.

Statistics

Data were summarized as mean ± standard deviation with confidence interval of 95% or as percentages. Statistical analysis was performed by SPSS 22.0. Numerical variables were normally distributed and were compared by unpaired "*t*"-test. $P < 0.05$ was considered as statistically significant and <0.001 was considered as statistically highly significant.

RESULTS

Time to Intubate

Mean intubation time of patients in Group K was 24.75 s and in Group M was 26.3 s. There was a statistically significant difference in mean intubation time of patients among the two groups ($P = 0.3109$), as shown in Table 1.

Ease of Intubation

Ease of intubation was based on score 1 and 2 in both groups. Out of 40 patients in Group K, 34 patients scored 1 (easy intubation) and rest six scored 2 (difficult intubation) while in Group M, 32 patients scored 1 and rest eight scored 2, as shown in Table 2.

Table 1: Time to intubate

Parameter	Mean	Mean difference	P value	*t*-value
KVVL	24.75	1.55	0.3109	1.020
ML	26.3			

Intubation Success Rate

The successful intubation rate was 100% in both Group K and Group M. The 1st attempt success rate in Group K was 100% and 80 % in Group M. The 2nd attempt success rate was 100% in Group M. (40/40) Patients proceed in 1st attempts attempt in Group K and (32/40) patients proceed in 1st attempt and (8/40) in 2nd attempt in Group M. There was no statistically significant difference in successful number of attempts of patients in either group (P = 0.7462).

Hemodynamic Changes

Heart rate

Baseline heart rates, in both Groups K and M, were statistically insignificant, heart rates reduced after induction with propofol and before intubation but increased after intubation and at 1 min. Heart rate reduced below baseline after 5 and 10 min of intubation when the patient was in general anesthesia and the difference in heart rates in Groups K and M remained statistically insignificant throughout the intervals [Figure 1].

Systolic BP (SBP)

Baseline SBP, in both Groups K and M, was statistically insignificant, SBP reduced after induction with propofol and before intubation but increased after intubation and at 1 min. SBP reduced below baseline after 5 and 10 min of intubation when the patient was in general anesthesia and the difference in SBP in Group K and M remained statistically insignificant throughout the intervals [Figure 2].

Table 2: Ease of intubation

Parameter	Mean	Mean difference	*P* value	*t*-value
KVVL	1.18	0.02	0.821	0.226
ML	1.2			

Diastolic BP (DBP)

Baseline DBP, in both Groups K and M, was statistically insignificant, DBP reduced after induction with propofol and before intubation but increased after intubation and at 1 min. DBP reduced below baseline after 5 and 10 min of intubation when the patient was in general anesthesia and the difference in DBP in Groups K and M remained statistically insignificant throughout the intervals [Figure 3].

Mean arterial pressure (MAP)

Baseline MAP, in both Groups K and M, was statistically insignificant, MAP reduced after induction with propofol and before intubation but increased after intubation and at 1 min. MAP reduced below baseline after 5 and 10 min of intubation when the patient was in general anesthesia and the difference in MAP in Groups K and M remained statistically insignificant throughout the intervals [Figure 4].

DISCUSSION

The Macintosh laryngoscope is used for around 72 years for intubation and is considered to be the main standard in trachea cannulation. The latest device added to the competition is the King Vision video laryngoscope. One employs direct vision and another provides an indirect image with magnification. Macintosh requires uniocular view, whereas King Vision provides a convenient and binocular view.

This study was meant to assess laryngoscopes of Macintosh and King Vision in terms of efficacy and safety for the intubation

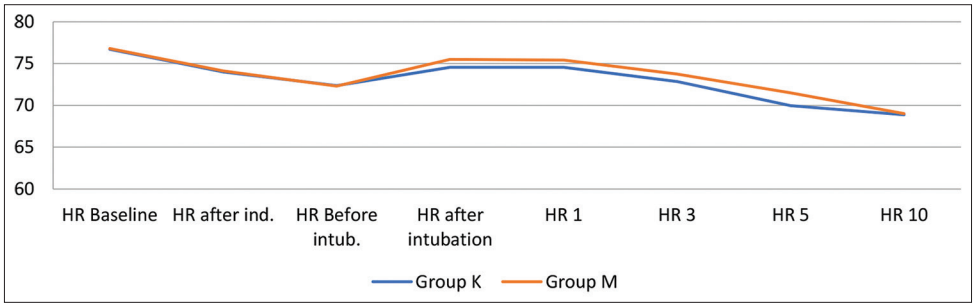

Figure 1: Heart rate

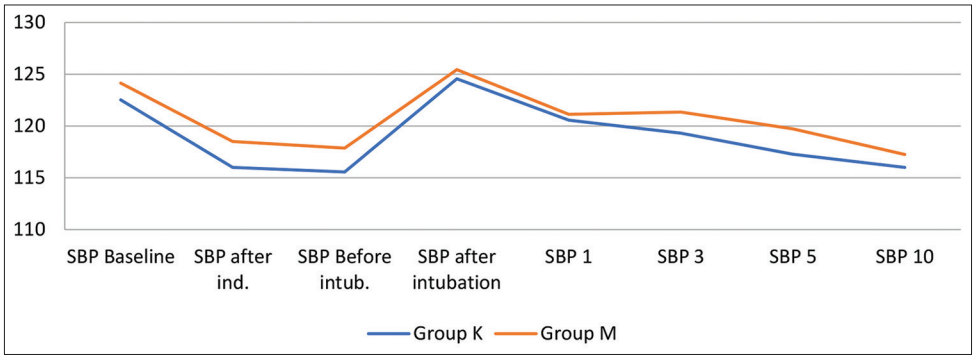

Figure 2: Systolic blood pressure

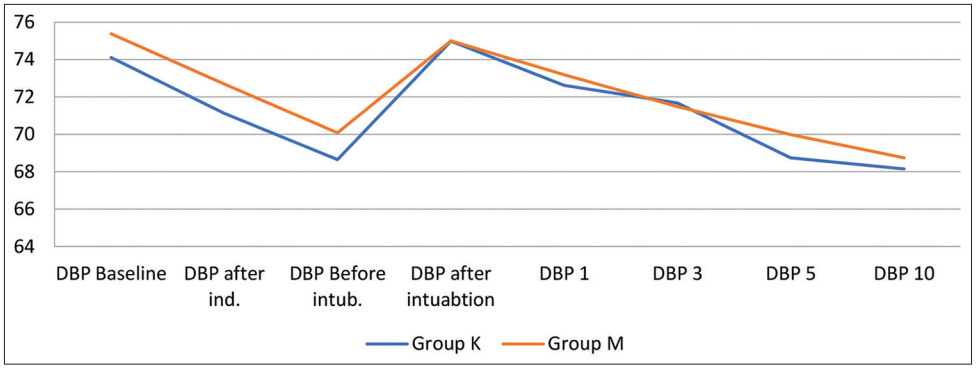

Figure 3: Diastolic blood pressure

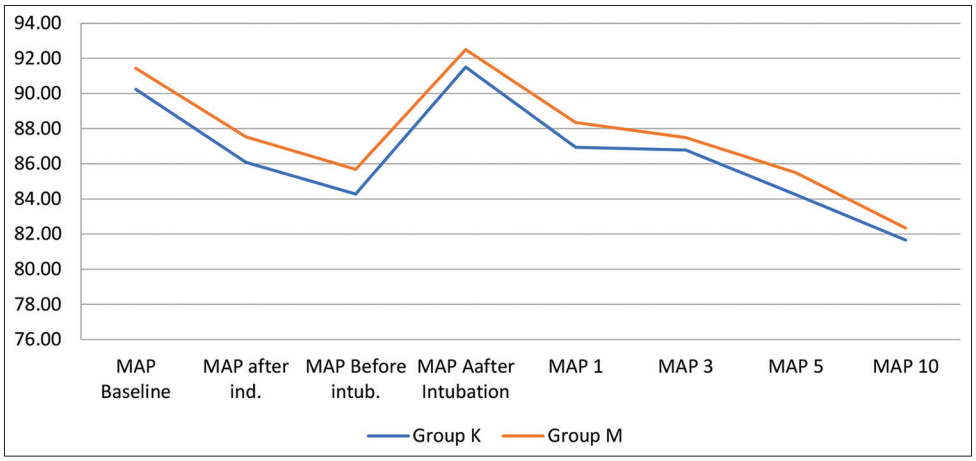

Figure 4: Mean arterial pressure

by experienced anesthesiologists of anticipated normal/difficult airways.

The mean tracheal intubation time was 26.3 s in the ML group and 24.75 s in the KVVL group. In general, the intubation time is longer with video laryngoscopes than direct Macintosh blade.

It was documented, by Murphy *et al.*, that intubation time on a manikin was 3.4 s quicker than ML with KVVL.[9] Jungbauer concluded a study and state that when video laryngoscopy compared with direct laryngoscopy for difficult intubations, provides a significantly better view of the cords, a higher success rate, faster intubations, and less need for optimizing maneuvers.

No. of Attempts

In the first attempt, however, all KVVL cases were intubated although eight ML patients required two success tries. While this is statistically not significant, but may be clinically significant, the reason is a poor visualization of the airway axes and the lack of alignment.

Ease of Intubation

We have used verbal numerical scale for assessing the ease of intubation [10-13]. The mean score is 1.2 with the ML and 1.18 with the KVVL groups. We have used verbal numerical scale for assessing the ease of intubation. Statistically both groups were insignificant. Although king vision video laryngoscope provide better view as compared to Macintosh.

Hemodynamic Changes

After premedication with fentanyl and midazolam, the heart rate in both groups decreased by basal values and decreased further after induction. Immediately following intubation in both groups practically grew to baseline value. The heart rate rose after intubation to a maximum of 1 min with ML and KVVL after intubation. Then, the induction value began to decline in both groups at around 3–5 min. Both groups were equivalent and did not show substantial importance.

For both groups, systolic, diastolic, and mean BP decreased from basal to pre-medicate and after induction to lower (lowest). After intubation, they all increased from the PT0 post-induction value to the PT1 peak to stabilize around 5 min after intubation. The two groups were comparable and neither of them was significant.

In support of our study, comparable results were shown with the King Vision video laryngoscope Group K Ali *et al*. in their study, where the heart rate and MAP were elevated after intubation and reverted to the baseline in 5 min. In favor of our study, similar results were also shown by Biswal *et al.*, Ahmad *et al.,* and Singhal *et al*.

CONCLUSION

The observation of the present study concludes that.

Although KVVL is a type of indirect laryngoscope and has a longer learning curve and more costly, it provides better laryngeal view as compared to conventional laryngoscope, it is helpful in condition where minimal neck manipulation is needed, as in case of cervical injury and instability.

SUMMARY

The King Vision video laryngoscope is equally efficient and equally safe in terms of safety for patients under general anesthesia with Macintosh laryngoscope.

However, the high purchase price for the equipment, the reduction of fragile optics, circuitry, and huge recurring cost to the jet blade can prevent its overall application.

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