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A Comparative Evaluation of Two Vidolaryngoscopes, the Airtraq and King Vision as an Intubating Aid in Adult Patients

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Abstract

Introduction: Practice of videolaryngoscopy in anesthesia has been found to improve the ease of intubation in patients with normal and difficult airway both. Airtraq and King vision are two commonly available channelled videolaryngoscopes. Presently, very few data regarding comparison of these two videolaryngoscopes are available. *Materials and Methods:* After getting approval from the ethical committee, 60 ASA Grade I and II, adult patients posted for elective surgery under general anesthesia were randomly divided into two groups of 30 each. After induction with standard protocol, intubation was done using either Airtraq or King vision videolaryngoscope as per the group. The primary aim was to observe the intubation time and secondary aims included were quality of visualization of glottic aperture, number of attempts, manoeuvres required during intubation and complications. *Results:* The time required to intubate patients was shorter with King Vision video laryngoscope as compared to Airtraq (29.03 ± 1.84 vs 31.20 ± 4.08 seconds, p = 0.01). No difference was noted in number of attempts, quality of visualization or optimization manoeuvres during intubation for subjective device. *Conclusion:* Both the video laryngoscopes are suitable for intubation in routine clinical practice. Though, King vision gives faster view of glottis and rapid tube insertion into the glottis as compared to Airtraq, the clinical significance remained negligible.

Keywords: King Vision; Airtraq; Video laryngoscope; Intubation.

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Introduction

Unplanned airway management, occurring in the operating room is a high-stakes event with the potential for dire consequences for the patient, should intubation prove difficult or impossible. The advent of video laryngoscopes is undoubtedly one of the major advances in the direction of improving the rate of successful intubation in recent years. It creates a visual supremacy by effectively placing the clinician's eye at or near tip of the blade, beyond the obstructing anatomy of the upper airway.[1]

Airtraq (Prodol, Meditec SA, Vizcaya, Spain), is manufactured by Prodol, developed and patented by Dr Acha and introduced in clinical practice in 2005. It is a disposable, channelled, optical video laryngoscope with two parallel conduits, one optical and other a tube guiding channel. A low temperature battery operated light is present at

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the tip of blade which should be turned on *1 min* before use, to allow heating of the lens and prevent fogging. It has a warming element at the tip of the blade. The optical vision is received through a series of 5 lens and 2 mirrors placed in the interior of the device.[2–6] A specially designed clip-on wireless camera transmits images by radiofrequency at 5.8 GHz relays the image on a separate monitor screen has been commercialized for the Airtraq, improves ease of tracheal intubation.[7]

The King Vision (King Systems, Noblesville, Indiana, USA), is a latest, two-piece design video laryngoscope. It consists of reusable anti-reflective display with OLED (organic light emitting diode) screen of size 2.4 inch that attaches to a disposable blade which has anti-fogging coating on distal lens, must connect the two pieces together by simple sliding into each other. King Vision blades are wider and shorter. Anti-fogging coating on distal lens prevents blurring of vision.[2,3,8]

Plenty of literature available regarding comparison of video laryngoscopes like Airtraq and King Vision with conventional Macintosh laryngoscope for routine as well as difficult airway management but comparison of these two video laryngoscopes has not been done frequently.

So, we undertook this study to evaluate and compare the efficacy of King Vision and Airtraq video laryngoscopes in adults with the primary aim to compare intubation time. The secondary aims were number of attempts of intubation, quality of visualization of glottic aperture, optimization manoeuvres required, vital parameters and complications.

Materials and Methods

The study was conducted from *December 2016* to *December 2017*. After taking approval from institutional scientific and ethical research committee (Clinical trial number CTRI/2017/06/008940), total 60 adult patients of either sex, aged *18–60 years*, belonging to American Society of Anesthesia (ASA) status I and II, having mouth opening > *20 mm* and scheduled for elective surgical procedures under general anesthesia were selected for the study.

Patients having oropharyngeal pathology, thyromental distance < *6 cm*, sterno-mental distance < *12 cm*, neck circumference > *40 cm*, body mass index (BMI) ≥ 30, pregnancy, known case of gastro oesophageal reflux disease and not willing to participatein the study were excluded.

Sample size was estimated taking the parameter "duration of tracheal intubation" from the previous study.[8] With the help of MedCalc Software, considering α error = 0.05, confidence interval = 95% and power = 80%, 48 patients required to be studied. To make it round off, we have included 60 patients. The study population was randomly allocated to two groups using sealed envelope. In Group A, Airtraq (size 3 blade) and Group K, in which King Vision (size 3 blade) was used for intubation. Pre-anesthetic check up with thorough airway assessment was done on a visit before one day and routine laboratory investigations were carried out in all patients.

A written informed consent was taken and standard protocol for nil per oral status was followed. After taking patient inside the operation theatre, intravenous line secured, monitor was attached, and baseline vitals were noted. All patients were pre-medicated with inj. glycopyrrolate *0.2 mg* and inj. fentanyl *2 μg/kg* intravenously.

Videolaryngoscope was prepared as per grouping. In case of Airtraq video laryngoscope, the CMOS (complementary metal-oxide semiconductor) camera will be mounted on it and checked by watching the image on the monitor. For King Vision video laryngoscope, the blade will be mounted and the performance of the device will be checked once by pushing the on button and checking the image on monitor. For both the devices, the tube to be used,was lubricated with lignocaine jelly. The respective devices will be pre-loaded with appropriate size tube (7.5 in case of females and 8.5 in case of males) in tube guiding channel and smooth sliding of endotracheal tube through the channel was ensured.

After doing pre-oxygenation for *3 minutes*, induction of general anesthesia was done with injection Propofol *2 mg/kg* and adequate jaw relaxation achieved with injection Succinyl Choline. By keeping the head in neutral position, the Airtraq or King Vision with pre-loaded tube was advanced from centre of the tongue towards glottis into the trachea, by viewing on the screen of the monitor. Once tube insertion and cuff disappearance through vocal cords was confirmed, the device was removed and close circuit was attached. Tracheal intubation was confirmed by the square wave capnograph. All intubations were done by an anesthesiologist who was having experience of at least 25 intubations using King vision and Airtraq videolaryngoscopes.

Video laryngoscopy time [time taken from introduction of the device between two incisorsto the optimum view of glottis (T1)], tube insertion time [time taken from view of glottis to insertion

of endotracheal tube and the appearance of first wave of capnograph (T2)], and total duration of intubation [T1+T2] were noted. Quality of visualization of glottic aperture was assessed according to Cormack and Lehane grading as follows: Grade I: Visualization of entire vocal cords, Grade II: Visualization of posterior part of the laryngeal aperture, Grade III: Visualization of epiglottis and Grade IV: No glottic structure seen. Optimization manoeuvres like jaw thrust, external laryngeal pressure or use of bougie were used to assist the intubation and scored accordingly as 0-no manoeuvres required, 1-use of jaw thrust/external laryngeal pressure and 2-use of bougie required. Maximum two attempts with the selected video laryngoscope were allowed. Vital parameters like heart rate, mean arterial pressure, SpO_2, $EtCO_2$ were noted before, at the time of induction as well as at an interval of 1 and 5 *minutes* after intubation.

Failed intubation was defined as an attempt in which patient could not be intubated even with optimization manoeuvres or > *120 seconds* required to perform the procedure. In case of failure, the patient will be intubated with standard Macintosh laryngoscope and will be excluded from the study.

Intra-operatively, anesthesia was maintained according to standard protocol. After extubation, post-operative complications like minor tongue/lip trauma, sore throat or nausea/vomiting were noted.

All parametric variables were presented as mean ± SD and non-parametric data were presented as numerical and percentage. Statistical analysis of the data was done by using MedCalc, version 12.5.0.0 software. For parametric variables like videolaryngoscopy time, tube insertion time and total duration of intubation as well as vitals were calculated using student '*t*'-test. Chi-square test was used for non-parametric data like ASA grading, gender, optimization manoeuvres and number of attempts. The significance of statistical analysis was judged by p value and $p < 0.05$ was considered as significant.

Observation and Results

All 60 patients included in the study were analysed, displays in Fig. 1. The demographic and airway parameters were comparable in both the groups, as per Table 1 and 2.

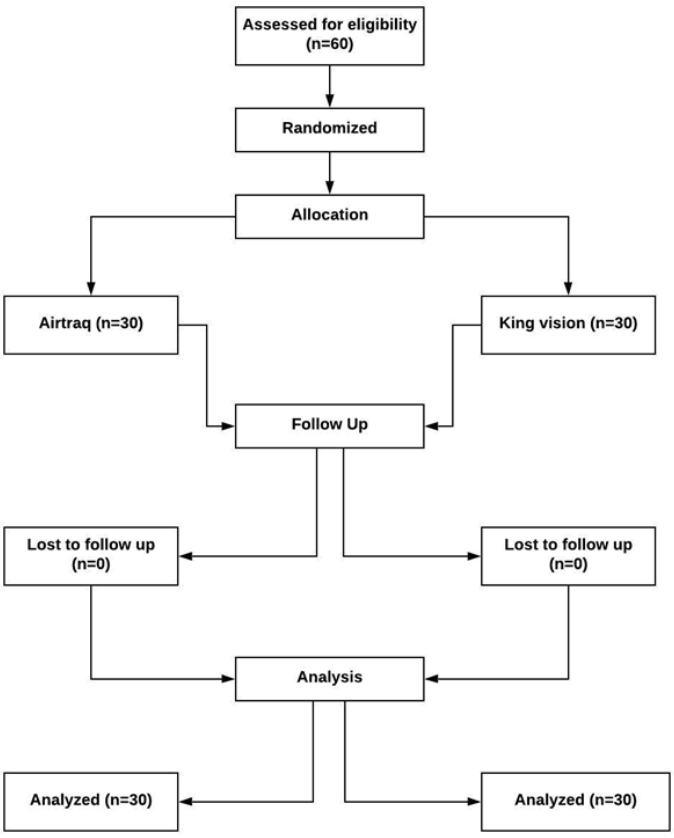


Fig. 1: Consort flow chart representing enrolment data

Table 1: Demographic data

Parameters	Group A	Group K
Age (*years*)	38.83 ± 9.86	39.14 ± 8.79
Sex M:F	11:19	14:16
Height (*cm*)	156.46 ± 7.51	159.56 ± 7.00
Weight (*kg*)	57.2 ± 7.03	57.86 ± 6.98
BMI (kg/m^2)	23.30 ± 2.69	22.78 ± 2.90
ASA grading ASA I:II	21:9	20:10

Table 2: Airway assessment

Parameters	Group A	Group K	*p* value
Mouth opening (*cm*)	3.16 ± 0.21	3.10 ± 0.20	= 0.261
Mallampatti Grading	1.75 ± 0.66	1.70 ± 0.65	= 0.699
Teeth (present: absent)	30:30	29:30	
Neck and Jaw Movement	*Normal*	*Normal*	
Thyromental distance (*cm*)	6.82 ± 0.50	6.93 ± 0.38	= 0.341
Neck circumference (*cm*)	38.6 ± 2.14	39.36 ± 1.68	= 0.131
Sternomental distance (*cm*)	12.01 ± 0.96	12.34 ± 0.93	= 0.181

Table 3: Intubation parameters

Parameters	Group A Mean ± SD	Group K Mean ± SD	p Value
Video laryngoscopy Time (sec)	15.93 ± 2.51	14.86 ± 1.33	= 0.044
Tube Insertion Time (sec)	15.26 ± 2.70	14.17 ± 1.17	= 0.047
Total Duration of Intubation Time (secs)	31.20 ± 4.08	29.03 ± 1.84	= 0.01
% of SpO_2 during intubation	99.33 ± 0.70	99.34 ± 0.47	= 0.948
First Attempt of intubation	28 (93.33%)	30 (100%)	= 0.471
Second Attempt of intubation	2 (6.67%)	0	= 0.471
Optimization manoeuvre score	0.50 ± 0.508	0.46 ± 0.507	= 0.761
Quality of visualization			
Grade I	24/30 (80%)	25/30 (83.3%)	= 0.997
Grade II	6/30 (20%)	5/30 (16.6%)	= 0.994
Grade III	0	0	
Grade IV	0	0	

Statistically significant difference was observed between two groups while comparing the video laryngoscopy time, tube insertion time and total duration of intubation, as shown in Table 3.

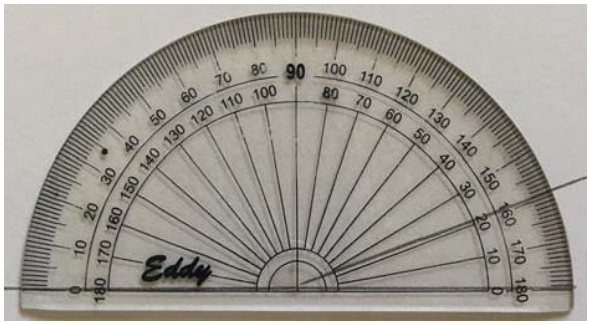
Both the groups were comparable with regard to attempts of intubation, quality of visualization and optimization manoeuvres, as shown in Table 3.

Discussion

Video laryngoscopy is the major technological advancement that attempts to produce a view of the laryngeal inlet independent of the line of sight and improves success of tracheal intubation. Asit obviates the need to align the oral, pharyngeal and tracheal axes, thereby, obtaining a better laryngeal view and subsequent tracheal intubation easier to perform.[10,11] Airtraq video laryngoscope is one of the second generation highly developed scopes, with its optical mirror image transfer while King Visionis relatively a new videolaryngoscope, with two-piece design, a reusable monitor which attaches to disposable blades. Till now, the Airtraq is being more extensively studied as compared to King Vision. Among the available literature comparing different types of videolaryngoscopes, majority included manikin studies.[12–15]

Video laryngoscopy, tube insertion and total

intubation times were significantly less with King Vision compared to Airtraq video laryngoscope. In comparison to Airtraq, angle of the blade of King Vision video laryngoscope is more deep which creates clear image viewing in a 160° panoramic field. This might have resulted in shorter time for intubation with King Vision in our study **(Photograph 1–3)**. The design requires minimal manipulation and less effort for blade introduction into the oral cavity and to push the tube into the trachea through the inbuilt conduit.[10]



Photograph 1: Angle of tip of blade of Airtraq

Photograph 2: Angle of tip of blade of King Vision

Photograph 3: Comparison of blades of Airtraq and King vision

Successful intubation with first attempt was observed in 93.33% and 100% cases with Airtraq and King Vision respectively. Both the groups were comparable regard to the view of glottis at laryngoscopy. Only jaw thrust manoeuvre was required in 50% of cases in both the groups to assist the intubation. Mona MM *et al.* and Maharaj CH *et al*. got successful intubation in 100% cases though, they didn't require any manoeuvre to improve the glottic visualization and tube insertion while using King Vision and Airtraq respectively.[16,4] While Numazi *et al.* reported less success rate (86%) at 1st attempt intubation with King Vision and had to use external laryngeal manipulation.[17]

Except two incidences of oesophageal intubation in the Airtraq group, no other complications were observed during the study. Q E Ali *et al.* observed airway trauma using King Vision and Airtraq in 1 and 2 cases respectively.[10]

Limitation of our study included being the small sample size; the clinical significance of the difference noted in the intubation time carries less importance. Secondly, we have compared these two video laryngoscopes for intubation in adults with normal airway anatomy. Further studies are required to compare both the devices in patients with difficult airway. Lastly, although we demonstrated equivalence between the King vision and Airtraq video laryngoscopes, our results may not apply to other video laryngoscopes with the similar morphology. (*e.g.*, Patwashahi, Pentax AWS).

Conclusion

We conclude that both the devices are useful for routine intubation in adult patients. Though, statistically faster intubation observed with King Vision compared to Airtraq video laryngoscope, it does not carry any clinical significance.

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