



Evaluation of Intubating Parameters in Patients with Difficult Airway Using King Vision and Endolite

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Abstract

Background: Airway management is often considered one of the most challenging tasks encountered in anaesthesia practice. When a conventionally trained anesthesiologist experiences difficulty with mask ventilation of upper airway or difficulty with intubation, it is termed difficult airway²³. Any failure to intubate the trachea can cause morbidity and is the leading cause of mortality in anaesthesia. The incidence of failed intubation is 0.13-0.3% in the operating rooms²⁴.

Objective: to compare the overall success of intubation in King Vision and Endolite groups, in difficult airway management and also compare number of attempts taken for intubation and time taken for intubation.

Methods: this is a study of randomized comparative study, with sixty patients with predicted difficult airway are recruited into the study. The patients are randomly allotted into group KV and group EL with 30 patients in each group. A standard anaesthesia technique is employed to intubate the patients. The overall success of intubation of each device is noted. Along with it success at first attempt, time taken for intubation and optimization maneuvers are noted and analysed.

Results: Data of sixty patients are analysed. The overall success of intubation by both devices is 100%. However, the success at first attempt in KV group was 96.66%(29/30), and that of EL group was 73.33%(22/30). The p-value was 0.026 and was said to be statistically significant. The time taken for intubation in this study was 22.44± 3.74 s in KV group and 22.9±4.18 s in EL group, the p-value was 0.65.

Conclusion: this study demonstrated that both king vision laryngoscope and endo lite stylet can be safely used in patients with difficult airway. Endo lite has taken more number of attempts to intubate than king vision, because of the inherent semiblind technique of intubation. There is no significant difference in intubation time between both the groups.

Introduction

Fiberoptic intubation was a well-established and resourceful tool for managing airway in patients with suspected or known difficult airway¹. Obtaining and preparing FOB was more laborious and time consuming, and operating a FOB² was skill demanding. To overcome these

disadvantages alternative techniques of intubation were looked into.

In view of the advantages like simple technique of usage, precise visual control, shorter intubation time and easy learning curve, video laryngoscopes gained popularity and led to the development of a plethora of video laryngoscopes since 2000³. King

vision[®] is a newer tracheal intubation device, which comes under the section of video laryngoscope. It consists of a side channel to pre mount the endotracheal tube and a video screen on which the glottis is visualized.

Other alternative techniques of intubations were also developed over years. One such alternative was light guided intubation using the principle of transillumination. Several lighted stylets came into existence, that were used as instruments for tracheal intubation. The Endolite comes under the category of stylets and bougies. It consists of a handle and a malleable stylet with a light bulb at its distal end⁴. The endotracheal tube is pre-mounted on the stylet with the help of a latch.

In the studies conducted by Maharaj et al⁵ and Prajakta et al⁶, both Airtraq and Lightwand were found to be superior to the conventional laryngoscope in normal airway intubations, independently. Maharaj et al⁷ and P. Biro et al⁸ compared Airtraq and Lightwand with conventional laryngoscope in simulated difficult airways, and similar results were observed. Park et al⁹ and Priyanka Moon et al¹⁰ did studies comparing Airtraq vs Lightwand intubations in normal airways, where they did not find any significant difference between the two instruments.

As most of the previous studies were manikin studies or simulated difficult airway studies, this study was designed to be conducted in adult patients with predicted difficult airways to find out whether there was any significant difference between Endolite and King vision intubations, especially in terms of safety and efficacy.

Aim of the Study

This study aims to compare King Vision intubations and Endolite intubations, in terms of safety, efficacy, ease of intubation.

Objectives

1. The primary objective of the study is to compare the overall success of intubation

in King Vision and Endolite groups, in difficult airway management.

2. The secondary objectives are to study the success at first attempt, the intubation time and number of insertion attempts between King Vision and Endolite intubations.

Materials and Methods

A cross-sectional, randomized comparative study was conducted at King George Hospital, Visakhapatnam, after the approval from the Institutional Ethics Committee. Written informed consent was obtained from the patients selected for the study.

A total of sixty adult patients were taken up for the study. Patients aged 18 to 60 years, belonging to American Society of Anesthesiologists (ASA) I and II physical status, scheduled to undergo elective surgery under general anaesthesia were included in the study.

Patients with a previous history of difficult intubation, and any one of the predictors of difficult airway like Mallampati class II or III, Thyromental distance < 60mm, limited mouth opening with Inter incisor distance < 30 mm, head and neck movement < 80° were selected for the study. The above patients were randomly assigned to two groups. The above patients were randomly assigned to two groups.

Group KV: 30 patients were intubated using the King vision video laryngoscope intubation technique.

Group EL: 30 patients were intubated using the Endolite guided intubation technique.

The study was conducted between January 2019 and December 2019, in the elective operation theatres of King George Hospital, Visakhapatnam. The sample size was based on the article by Manish Jain et al.¹¹. Twenty-eight patients were required per group to detect a mean difference of 4.5 s in intubation time and a standard deviation of 0.45s. Considering any dropouts and to provide a power of 80% and an alpha error of 5%, the sample size was determined to be 30 in each group.

Patient refusal, patients posted for emergency cases, patients with respiratory tract pathology (intrinsic laryngeal abnormalities), inability to cooperate with adequate airway assessment, history of cardiovascular, hepatic, renal and coagulation diseases, pregnancy, risk of regurgitation and aspiration were excluded from the study.

Methodology

All the patients recruited for the study were admitted the day before surgery and assessed. The technique of anaesthesia was standardized for both the groups. All patients were pre-medicated with tablet Alprazolam 0.25 mg and tablet Ranitidine 150 mg with sips of water, the night before surgery. Patients were instructed to be on fasting for at least 6 hours for solid food and 2 hours for clear fluids.

In the operating room, a 18-G intravenous cannula was secured on either of the hands and a continuous infusion of Ringer lactate started. All the standard monitors like Pulse oximeter, Continuous ECG monitoring, ETCO₂, NIBP monitor were connected to the patient and parameters like non-invasive blood pressure(NIBP),heart rate(HR), peripheral oxygen saturation(SpO₂) and end tidal carbon dioxide were continuously monitored.

Each patient was kept in a supine position. Trial ventilation was conducted in the operation theatre. The patients were then pre-medicated with Glycopyrrolate(0.005mg/kg),

Midazolam(0.05mg/kg), Fentanyl(2mcg/kg) and anaesthesia was induced with Thiopentone sodium(5-7mg/kg). Patients' lungs were manually ventilated with bag and mask and pre oxygenated with 100% oxygen for three minutes. Intubation was facilitated with Succinylcholine 2mg/kg. With the head in a neutral position, each patient was intubated with either of the instruments. Correct placement of tube was confirmed by five point auscultation and ETCO₂ levels. Immobilization techniques like Manual in-line stabilization, and optimization manoeuvres like head extension or jaw thrust, were used after each

failed attempt. After intubation, the lungs were mechanically ventilated using closed-circuit controlled ventilation along with end-tidal Sevoflurane 0.2-1%, and 66% of Nitrous in oxygen mixture for maintenance and timed Vecuronium doses.

The primary endpoint was a successful placement of ET tube in the trachea. The secondary endpoints were the duration of intubation, success at first attempt and number of attempts required. An attempt was defined as the withdrawal of the device from the mouth followed by repositioning. Failure to intubate was defined asoesophageal intubation, inability to place the tracheal tube into the trachea within 120 s or more than three attempts required. The duration of the intubation attempt was defined as the time taken from the insertion of the intubation device between the teeth to the time when the device was removed from the oral cavity.

Statistical Analysis

The categorical variables in the study were recorded as frequency, and percentage analysis. The continuous variables were recorded as mean and standard deviation. The qualitative data of the study was analysed using the Chi-square test. For analyzing quantitative data, the Mann-Whitney U-test was utilised. The duration for intubation attempts was analysed using unpaired T-test. All the data was recorded in Microsoft excel data sheets, and data analysis was performed using SPSS software version 20. A p-value of less than 0.05 was taken as the level of significance.

Observation and Results

A total of 60 patients were enrolled in the study. The study population was randomly assigned into two groups KV and EL group using computer generated numbers. 30 patients were to undergo tracheal intubation with King vision and 30 were to undergo intubation using Endolite.

Table 1: Demographic data of study population

Parameter	KV group	EL group	p-value	Significance
Age(yrs) (mean+SD)	33.40±11.92	34.33±10.24	0.74	NS (Not significant)
Weight(kgs) (mean+SD)	56.03±10.52	58.40±12.33	0.42	NS (Not significant)
Sex ratio	13/17	14/16	1.00	NS (Not significant)
ASA status I	21	24	0.84	NS (Not significant)
ASA status II	9	6	0.57	NS (Not significant)

p- value >0.05, not significant

There were no significant differences in demographic data between two groups as the p-value is more than 0.05.

Table 2: Airway measurements

Parameter	KV group	EL group	p-value	Significance
Inter Incisor Distance(cm)	2.2±0.39	2.3±0.43	0.34	NS (Not significant)
Thyromental Distance(cm)	6.2±0.84	5.9±0.62	0.12	NS (Not significant)
MPG II	11(37%)	10(33%)	1.00	NS (Not significant)
MPG III	19(63%)	20(67%)	1.00	NS (Not significant)

p- value >0.05, not significant

The baseline airway parameters between the two groups were comparable, but not statistically significant as the p-value is more than 0.05.

Table 3: Intubation parameters with each device King vision and Endolite

Parameter	KV group	EL group	p-value	Significance
Overall success of intubation	30(100%)	30(100%)	1.00	NS
Success at first attempt	29	22	0.026	S*
Time taken for intubation(s)	22.9±4.18	22.44±3.47	0.65	NS
Number of optimization manoeuvres	1	7	0.05	NS

p-value <0.05 significant

All cases in KV and EL group were successfully intubated. There were no cases of failed intubation in either groups.

29 cases in KV group were intubated in first attempt. Only one case required a second attempt. This was because of the occlusion of glottic vision by secretions.

22 cases in EL group were intubated in first attempt and 8 cases required a second attempt. In two cases, difficulty was faced in advancing the stylet after tracheal trans illumination was seen. In three cases, because of thick skin over the front of the neck, tracheal trans- illumination was not clearly visualized, hence required a second attempt with dimming the OR lights. In three cases difficulty in introducing the tube was

observed because of resistance offered by large tongue, a moderately large thyroid goiter and short neck. **The p-value was <0.05, hence the difference was statistically significant.**

The time taken for intubation was almost same in both groups. There was no significant difference between both groups in terms of time taken for intubation, as the p-value was 0.655, which was >0.05.

One case in KV group and seven cases in EL group required optimization manoeuvres. But there was no significant difference between the groups.

Discussion

The primary objective of the study was to successfully intubate the patient, with either of the two instruments. The time taken for intubation was counted from the time the instrument was inserted between the teeth, to the time it was withdrawn from the oral cavity. The number of attempts required to intubate the patient was noted down. **In this present study, all the cases in both the KV group and EL group were successfully intubated, with an overall success rate of 100% in both groups. The success at first attempt in KV group was 96.66%(29/30), and that of EL group was 73.33%(22/30). The p-value was 0.026 and was said to be statistically significant.**

One case in KV group could not be intubated in the first attempt because of occlusion of vision due to fogging of the optical piece and also due to secretions. This was rectified with adequate suctioning and cleaning the optical piece with savlon.

Eight cases in EL group could not be intubated in first attempt, of which, three cases had difficulty in advancing the tube because of resistance offered by the large tongue, a moderately large thyroid goiter and short neck. Two cases in EL group could not be intubated in the first attempt because of difficulty in advancing the stylet after tracheal transillumination was seen. In three cases, due to thick skin over the front of the neck, tracheal transillumination was not clearly visualized, hence required a second attempt, with dimming the OR lights.

E Y Park et al.⁹; compared Airtraq and Lightwand and concluded that all the cases in both groups were successfully intubated in the first attempt, with an intubation success rate of 100%. However, this study was conducted in normal airways.

Priyanka Moon et al.¹⁰; compared Airtraq and Lightwand in adults in normal airways. The results were a 100% success rate in both groups. In the Airtraq group, six patients required a second attempt, whereas in the LW group, second attempt

was required in ten patients. Although the number was high in the LW group, the result was not statistically significant.

In the study of Padmaja Durga et al¹², a comparison of Airtraq and Mc Coy laryngoscope in patients with cervical immobilisation was done. 93.3% of patients in the Airtraq group were intubated in the first attempt, and in Laryngoscope group, 76.7%. There were also published reports that Airtraq was superior in laryngoscopy in both normal airways⁵ as well as in simulated difficult airway scenarios¹³.

Cai-Neng Wu et al¹⁴ stated in their study that the overall intubation success rate in Lightwand group was 80% (24/30), in comparison with Direct laryngoscope 96.7%(29/30). The success at first attempt in Lightwand group was 63.3%(19/30) and in Direct laryngoscope group was 83.3%(25/30). The current study is similar to the studies of Park et al⁹, Priyanka Moon et al¹⁰, in terms of overall success rate. This study supports the findings of Priyanka Moon et al¹⁰, Padmaja et al¹² that the success rate of Airtraq in the first attempt is higher. This study also supports the findings of Wu CN et al¹⁴ that the success at first attempt in LW group is comparatively less.

King Vision provided superior intubating conditions in the normal airway when compared to Macintosh laryngoscope⁵. It has an exaggerated curvature of the blade with an internal arrangement of the optical prisms, that help in viewing the glottis structure without the need for aligning the oral, pharyngeal and tracheal axes¹². It reduces the difficulty in intubation in patients with cervical immobilization¹⁵ and also has a higher success rate¹⁶ of intubation. One problem with King Vision is fogging of lens, which can reduce the quality of the image when intubating¹². Incidence of impaired vision due to blood and mucus can range from 1-3%. The arrangement of the optical components of Airtraq allows intubation in patients with reduced mouth opening. King Vision can be used to visualise glottis without hyperextension, displacement of the tongue and requires minimal force to elevate

the epiglottis. Hence it has an added advantage when used in predicted difficult airway¹⁷.

The Endolite is often preferred to use because of its ease of technique, safety and less cervical movement when compared to direct laryngoscopy¹⁸. Endolite is little affected by the factors like a limited mouth opening and restricted neck extension, as it is a slender stylet like device¹⁹. As it is a semi-blind technique, the overall success rate of intubation can be lower than the conventional laryngoscope²⁰. As the epiglottis is in contact with the pharyngeal wall, it becomes difficult for it to advance further²¹. When combined with an instrument that can lift off the epiglottis from the posterior pharyngeal wall like a laryngoscope or LMA, this Endolite can improve the vision of hypopharynx and transillumination can aid in tracheal intubation¹⁴. The combination will assist in guiding the tip of Endolite to pass through the glottis. The addition of a video monitor has also increased the success of intubation of Endolite in comparison with Endolite used alone²². It can be assumed that the combination with Endolite can lead to a higher success rate, and reduce the hypoxia-related complications if one device inadvertently failed¹⁴. In conditions where blood or pharyngeal secretions obscure the vision of glottis, the ETT can be advanced with the help of a glow in the midline²². One of the main limitations of Endolite technique is that its use is precluded in cases with any anomaly in airway anatomy or pathology of the neck that prevents tracheal transillumination⁴.

The time taken for intubation in this study was 22.44± 3.74 s in KV group and 22.9±4.18 s in EL group, the p-value was 0.65. This states that there was no statistical significance between KV and EL in terms of time taken for intubation.

In the study by Park et al⁹, the duration of intubation for Airtraq was 13.5 s and for Lightwand was 14.2 s. There was no statistically significant difference in intubation time between both groups.

The mean duration of intubation was 32.08±18.85 s in the Airtraq group, and 30.80±15.91 s in Lightwand group in the study by Priyanka Moon et al¹⁰. There was no statistically significant difference between the groups.

Limitations of the study

It was a comparative study without any control group, hence comparison with conventional techniques was not done. Further, this study was done in a limited number of subjects and for a shorter period of time. The results may vary if done in a large number of subjects. Observer could not be blinded for obvious reasons, so the chances of observer bias was high

Conclusion

This study concludes that both King vision and Endolite can be used successfully to secure airway in patients with predicted difficult airways. Endolite can be used as an additional tool for intubation along with other conventional methods of intubation.

Future Scope

This study can be extrapolated to study the intubating parameters in emergency airways as well as in pediatric airways. The effect of both instruments on hemodynamics and post-operative sore throat, can also be studied.

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