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Original Research Article

A Prospective Randomised Study To Compare And Evaluate Macintosh Laryngoscope And King Vision Video Laryngoscope For Routine Intubation In Adults Scheduled For Elective Surgeries.

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ABSTRACT:

Background: The essence of anaesthesia practice in every case is uneventful laryngoscopy and intubation. The current study compared the King Vision Video Laryngoscope (KVVL) channelled blade to the Macintosh laryngoscope (ML) in terms of laryngoscopic view, laryngoscopic time, and time required to complete tracheal intubation with the head in neutral position. We aimed to see if there were any drawbacks to using the King Vision Video Laryngoscope in routine clinical practice in terms of hemodynamics.

Methods: Eighty patients undergoing elective surgery requiring general anaesthesia and tracheal intubation were randomly assigned to receive either the King Vision Video Laryngoscope or the Macintosh laryngoscope for tracheal intubation. Data were collected during and after laryngoscopy and endotracheal intubation which included laryngoscopic view, time and side effects after a standardised general anaesthetic.

Results: The average tracheal intubation time (TTI) for the King Vision Video Laryngoscope and the Macintosh laryngoscope were 24.9 and 26.5 seconds, respectively (p =0.596). The mean duration of laryngoscopy (DOL) for the King Vision Video Laryngoscope and the Macintosh laryngoscope was 46.5 and 46.4 seconds, respectively (p = 0.925). Only 37.5% of the ML group had a Cormack Lehane grade 1 glottic view, whereas all of the KVVL group had a grade 1 glottic view. For KVVL and ML, the percentages of patients who did not require optimisation manoeuvres were 72.5% and 27.5%, respectively. Both groups experienced comparable changes in hemodynamic profile.

Conclusion: The King Vision Video Laryngoscope has comparable efficacy in terms of intubation time, laryngoscopy duration, success rate, and ease of intubation. Although King Vision provided a higher percentage of the best laryngoscopic view with fewer optimization manoeuvres eventhough without statistical significance, it provides no additional benefit in

terms of hemodynamic response to intubation. The need for a sniffing position is not needed in KVVL group. As a result, we conclude that the King Vision Video Laryngoscope can be used for tracheal intubation in routine clinical practice.

Keywords: anaesthesia. intubation, laryngoscope, king vison

INTRODUCTION:

In anaesthesia practise, it is critical to secure and maintain the airway and respiration in a safe and appropriate manner. This covers both regular and difficult intubations, whether the difficulty being expected or unexpected. The significant proportion of regular tracheal intubations is simple depending on the anesthesiologist's experience, techniques, the available equipment, and airway manipulations. Difficult airway can be avoided with adequate preoperative evaluation, which can be accomplished through different parameters of anatomical landmarks or non-invasive clinical tests including the use of ultrasound. However, the effectiveness of such evaluation is confined, and complicated tracheal intubation continues to occur in 1.5%-8.5% of general anaesthetics, resulting in the most serious complication like hypoxemic brain damage and death. Endotracheal intubation is traditionally performed with a Macintosh laryngoscope, which requires alteration, deformation, and modification of anatomical structures to accomplish an appropriate glottis view. Nonetheless, intubation difficulties occur in 1%-4% of cases, and failure occurs in 0.05%-0.35% of cases[1-4]. The current study compared the King Vision Video Laryngoscope (KVVL) channelled blade to the Macintosh laryngoscope (ML) in terms of laryngoscopic view, laryngoscopic time, and time required to complete tracheal intubation with the head in neutral position. We aimed to see if there were any drawbacks to using the King Vision Video Laryngoscope in routine clinical practice in terms of haemodynamics.

MATERIAL AND METHODS:

Study Primer:

It is a prospective randomised study with patients scheduled for elective surgery under general anaesthesia at a tertiary care hospital in South India. Patients were explained about the study and informed consent was taken. Care givers who participated in the study were experienced anaesthesiologists and anaesthesiology residents. All of them had done at least 100 successful airway intubations with conventional laryngoscope and had minimum of 2 years of experience in handling direct laryngoscope. Caregivers cannot be blinded to the intervention. The study was done after ethical committee approval (5694/IEC/2015/PG/Salem) and accordance with declaration of Helsinki.

Sample Size Determination:

Time to intubation was considered as the primary outcome for the purpose of sample size calculation. To be able to detect a mean difference of at least 2 minutes difference between the two study groups, with an alpha error of 0.05 and 80% power of study, with population variance of 10, the required sample size was calculated using the following formula.

Sample size $n = (Z_{\alpha/2}+Z_{\beta})^2 * 2 * \sigma^2 / d^2$,

Where $Z_{\alpha/2}$ is the critical value of the Normal distribution at α of 0.05 = 1.96
Z_{β} is the critical value of the Normal distribution for 80% power (at β=0.2) = 0.84
σ^2 is the population variance= 10 and
d is the different you would like to detect. = 2

By using the above-mentioned parameters, the required sample size would be 40 subjects in each of the two study groups. Hence 40 subjects were included in each group in the final analysis.

Randomization:

Patients were randomly allocated to one of two groups (n=40 for each) namely, Macintosh, (ML) King Vision, (KVVL) by drawing sequentially numbered sealed opaque envelopes that contained a software-generated randomization code before general anaesthesia. Subjects were blinded to the intervention.

Study Groups:

Group ML: Intubation done using Standard Macintosh Laryngoscope (n=40)

Group KVVL: Intubation done using King Vision Video Laryngoscope with Channelled blade (n=40)

Inclusion Criteria And Exclusion Criteria:

American Society of Anesthesiologists physical status class I-II: Patients aged 18-65 years: Scheduled for elective surgery under general anesthesia: Mallampati Class I & II airway

Expected or known difficult airway: Mallampati Class III/IV airway: History of cervical spine injury: Previous throat surgery: distorted anatomy and emergency surgeries.

Assessment And Preparation:

All patients were assessed in pre-assessment clinic well before surgery. Careful history taking, general and systemic examinations were done to rule out severe comorbidities. BMI calculations were made. A meticulous airway assessment with mouth concept[5] was done to exclude patients with difficult airway by giving attention to Inter Incisor gap, Modified Mallampatti airway classification, Neck movements, Thyromental distance, Sternomental distance and examination of dentition.

Procedure:

The investigator gave the allotted laryngoscope to the intubator before premedication and took the role of recording the observations and data entry.

In the operation theatre, the operating table was levelled to the umbilicus of the intubating person and the patients were placed in supine position without head pillow so that the head was placed in neutral position. Electrocardiograph, Non-invasive Blood Pressure, Pulse Oximeter and Capnograph monitors were connected and basal Heart rate, Systolic and Diastolic blood pressure readings were recorded. The data was collected by an independent investigator.

Patients were premedicated with Inj. Fentanyl 2mcg/Kg IV and Inj. Midazolam 30mcg/Kg IV and preoxygenation was carried out using 100% oxygen using closed circuit with 7 litres of total gas flow. Three minutes after premedication Heart rate and Blood pressure were recorded as Post Premedication (PP) values.

All patients were given intravenous Inj. Propofol 2 mg/kg for induction of anaesthesia until loss of consciousness. Inj. Vecuronium 0.1 mg/kg was administered after loss of verbal response as intubating muscle relaxant. Anaesthesia was maintained using 1% Halothane in seven litres flow of oxygen via a bag-mask for 4 minutes before attempted on endotracheal intubation.

Three minutes after Propofol the Post induction (PI) values of heart rate and blood pressure were recorded and the measuring interval was set to one minute gap. The investigated device and stopwatch were prepared at this point and intubation was carried out with the respective device.

ML Group

Macintosh Laryngoscope was held in left hand by the intubator and the stopwatch was started by the investigator. After opening the mouth by scissoring technique the scope was passed in to the right

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corner of mouth and at once the blade tip was advanced to the base of the tongue, the tongue was lateralised by the flange so that the blade was in the midline creating a good working space to view the pharynx. On advancing once the epiglottis was in view lower jaw was retracted anterior and the blade tip was placed in the vallecula and the jaw was lifted up enabling the view of glottis. The best view of glottis was graded according to Cormack Lehane grading system and the endotracheal tube (7.5 size) was threaded into the trachea. Poor or non glottic visualisation required optimising manoeuvres like peep in/down, bent back/down by the intubator; application of external laryngeal pressure, head extension, and neck flexion by the supporting staff or use of stillette or bougie for intubation.

KVVL group

King Vision connected with channelled blade was preloaded with 7.5 size endotracheal tube without lubrication, switched on and held in left hand along with timer started. Mouth was split open by scissoring technique and the distal blade tip was introduced in mid line. Mild traction of lower jaw allowed the channel portion of the blade inside the mouth. By looking on to the display the scope was gently advanced along the curvature of the tongue judiciously until the epiglottis come into view. Tip of the blade was kept in the vallecula and the scope was lifted gently superiorly to view the entire glottic aperture. The image of the glottis was placed at the center of the display with care taken not to get a very close view which would produce difficulty in passing the tube because of arytenoid catch. Then the endotracheal tube was threaded down in to trachea. Up and down; medial to lateral: right to left tilt: in and out; and inward and outward rotation of the scope were done to get obtain optimal image. Elevation or depression of larynx were done by the supporting staff to align the image. Anticlockwise /clockwise proximal twist of ETT was done to facilitate passage and slip in of the tube.

Immediate post intubation (PT) hemodynamic parameters were recorded as PT0 values and thereafter as PT (time) values up to fifteen minutes at two minute intervals. Values at PT 30 minutes were also recorded.

Intubation time more than 180 seconds or desaturation to less than 93% was considered as failed attempt.

MEASURED OUTCOMES:

Time to tracheal intubation, defined as the time when the study device passes the central incisors to the time when the tip of the tracheal tube passed through the glottis was noted in seconds.

The duration of laryngoscopy, defined as the time from holding of the scope to the appearance of as the first upward deflection on the capnograph, was recorded in seconds.

The best view obtained during laryngoscopy using modified Cormack and Lehane classification was recorded.

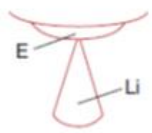
Original Cormack and Lehane system	1 Full view of the glottis	2 Partial view of the glottis or arytenoids		3 Only epiglottis visible	4 Neither glottis nor epiglottis visible
View at laryngoscopy					
Modified system	1 As for original Cormack and Lehane above	2a Partial view of the glottis	2b Arytenoids or posterior part of the vocal cords only just visible	3 As for original Cormack and Lehane above	4 As for original Cormack and Lehane above

Fig. 1 Cormack Lehane grading of glottic view (Yentis modification)

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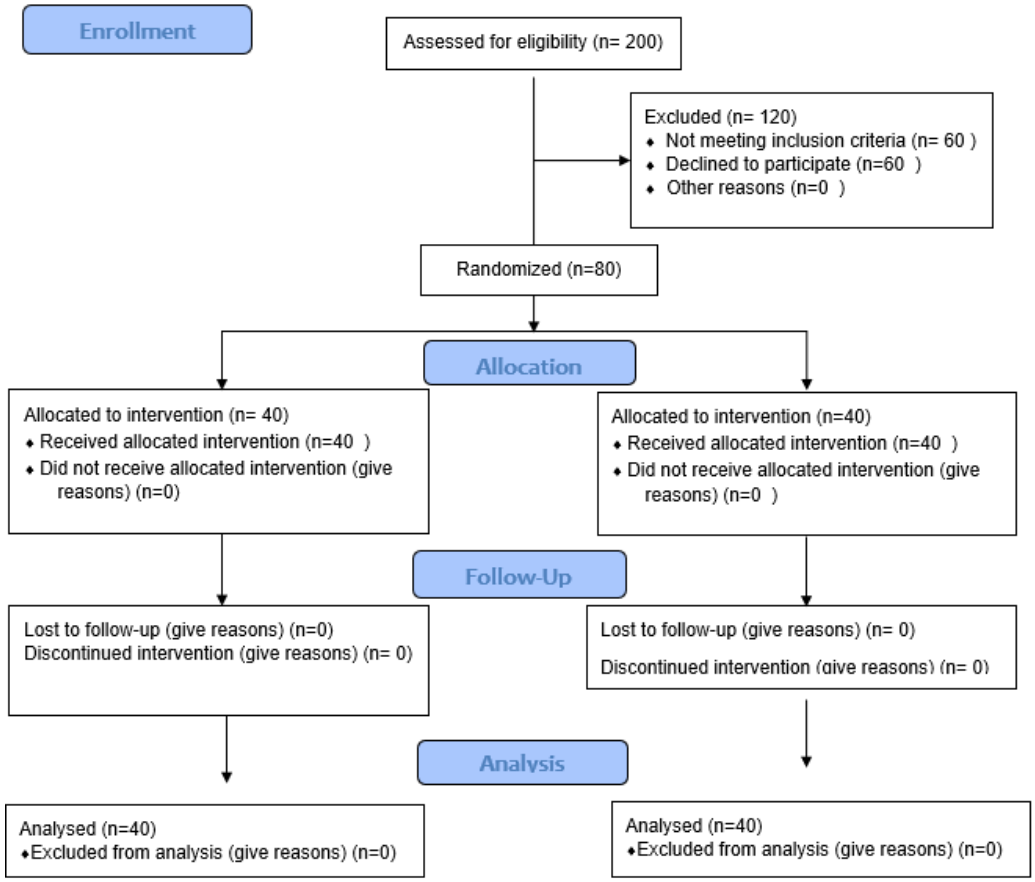
Number of attempts needed to cannulise the trachea were recorded.
The anaesthesiologists rated the ease of intubation using a 100 mm, 11point visual analog scale.

0	10	20	30	40	50	60	70	80	90	100
Very easy < ---------- >Extremely difficult										

Change in hemodynamic parameters (heart rate, systolic diastolic and mean blood pressures) were recorded pre and post intubation.

STATISTICAL ANALYSIS:
Type of laryngoscope used for intubation was the explanatory variable. Various procedure related and hemodynamic parameters were considered as primary outcome variables. Socio-demographic variables of the study subjects, intubator's experience etc. were considered as potential confounders. Initially the socio demographic parameters were compared between the two study groups, using frequencies and percentages for categorical variables, mean and standard deviation for quantitative variables. The association between type of laryngoscope and the outcome variables was assessed by calculating the percentage or mean differences. The statistical significance of the differences was assessed by using chi square test or independent sample student t-test, as appropriate.95% CI of the parameters was also presented. IBM statistics, version 21 and Microsoft Excel 2013 were used for statistical analysis.

fig 2 : CONSORT 2010 Flow Diagram



RESULTS:

All the 80 participants completed the study. The baseline socio demographic and anthropometric parameters were compared between the two treatment groups. There was no statistically significant difference in proportion of males or females between the two study groups. (Table 1)

Table 1 showing demographic variables:

Parameter	Mean	Mean Difference	p Value	95% CI	
				Lower	Upper
I. Age					
ML	40.70	2.250	.357	-2.587	7.087
KVVL	38.45				
II. Weight					
ML	62.68	0.075	.962	-3.013	3.163
KVVL	62.60				
III. Height					
ML	164.48	0.000	1.000	-2.331	2.331
KVVL	164.48				
IV. BMI					
ML	23.12	0.036	.927	-0.744	0.816
KVVL	23.08				

Regarding the outcome measures, the groups were similar. (table 2)

Parameter	Mean	Mean Difference	p Value	95% CI	
				Lower	Upper
Tracheal Intubation Time (TTI) in Seconds					
ML	26.58	1.675	.596	-4.596	7.946
KVVL	24.90				
Duration of Laryngoscopy (DOL) in seconds					
ML	46.48	0.925	.793	-6.079	7.929
KVVL	45.55				
No of Attempts					
ML	1.05	0.050	.156	-0.019	0.119
KVVL	1.00				
Ease of Intubation Score					
ML	24.00	8.000	.065	-0.512	16.512
KVVL	16.00				

There was no difference in the major outcome measures between the two groups. The ease of intubation scores was less in KVVL group without statistical significance. The mean heart rate and the mean arterial pressure increased after the procedure; the increase was similar between the groups. There was no significant difference between the groups regarding haemodynamics. All the patients completed the surgery and anaesthesia without any major events and discharged in due course.

DISCUSSION:

All the eighty patients completed the study. Jarvis JL et al.[6] performed a retrospective analysis of electronic medical records to determine first pass success, overall success, and success per attempt using a King Vision video laryngoscope and a Macintosh laryngoscope. This interpretation of 514 patient records revealed that the KV group had 74.2% first pass success, 91.5% overall success, and 71.2% success per attempt, particularly in comparison to 43.8%, 64.9%, and 44.4% for the direct laryngoscopy group. This demonstrated King Vision's supremacy for tracheal intubation by paramedics in a suburban setting where chances of success were historically as in evidence, low. In our study, it was similar which is against the above findings. In another study[7] found that in a normal airway, the Macintosh laryngoscope was the most effective and had the highest success rate,

while the C-MAC and Glidescope performed well in a difficult airway. In both normal and difficult airways, the McGrath laryngoscope had the lowest success rate. It is important to note that this study involved a small sample of participants who had previous experience with the direct laryngoscope but were not experienced with the video laryngoscopes. It may be that with more training and experience, the performance of the other video laryngoscopes could improve. Additionally, it is worth noting that different laryngoscopes may be more suitable for different types of patients and clinical situations, so it is important to consider factors such as the specific needs of the patient and the experience and preferences of the healthcare provider when selecting a laryngoscope. compared to Macintosh laryngoscope, but the difference in intubation time between the two scopes was not significant in normal airway scenarios. Murphy et al[8] in their study proved that the percentage of visualising glottic opening was also found to be higher with King Vision compared to Macintosh laryngoscope, especially in difficult airway scenarios. The study suggests that King Vision channelled blade may be a useful alternative to Macintosh laryngoscope, especially in difficult airway situations. However, it's important to note that this study was conducted in a simulated setting and the results may not necessarily be generalizable to real-life clinical situations. It is to stressed that our cases were also done in normal airways. McGrath MAC video laryngoscope had better outcomes compared to the King Vision video laryngoscope in the study you described. The mean time for successful intubation was shorter for the McGrath MAC group, and the first attempt success rate was higher for that group as well. There were also no cases of desaturation in the McGrath MAC group, while three patients in the King Vision group had desaturation episodes. However, both groups had similar outcomes in terms of the achievement of a good glottic view, number of attempts required for success, and manoeuvres necessary for optimization[9]. These results were similar to our results. Mishra et al[10] in their study found that the King Vision video laryngoscope is as effective as the TruView PCD video laryngoscope for nasotracheal intubation. The intubation time and the use of additional manoeuvres were not statistically significant between the two groups, and there were no serious complications in either group. This suggests that the King Vision video laryngoscope can be a suitable alternative for nasotracheal intubation. It is worth noting that this study only included 80 patients and further research with a larger sample size may be needed to confirm these findings. Priyanka et al[11] in their work found that King Vision and Truview video laryngoscopes provide good laryngoscopic views and similar levels of patient comfort. However, the Truview video laryngoscope may have an advantage in terms of the time it takes to visualize the vocal cords and rate vocal cord movement during extubation. This information is useful for clinicians when deciding which video laryngoscope to use for a particular patient or procedure. It's worth noting that the choice of video laryngoscope may also depend on other factors such as the specific clinical scenario, the preference of the clinician, and the availability of the different devices.

Limitations: The study was in a single centre with experienced anaesthesiologists with normal airways. It is difficult to extrapolate in all clinical settings.

CONCLUSION:

The purpose of the study was to compare the King Vision Video Laryngoscope (KVVL) with the Macintosh laryngoscope (ML) in terms of laryngoscopic view, laryngoscopic time, and time required to complete tracheal intubation with the head in a neutral position, and to see if the KVVL has any disadvantages in terms of haemodynamics in routine clinical practice. The study found that the KVVL had a slightly shorter tracheal intubation time and duration of laryngoscopy compared to the ML, but these differences were not statistically significant. The KVVL provided a better laryngoscopic view in all cases and required fewer optimization manoeuvres, but without statistical significance, but did not have any significant impact on hemodynamic response. The need for a sniffing position is not needed in KVVL group. The authors concluded that the KVVL may be used in routine clinical practice for tracheal intubation.

Conflict of interest – Nil for all authors.
Ethical issues – IEC approval – Yes
Patient consent 0- Yes
Financial aid – NIL

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