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Original Article

Comparison between Channeled versus Non-Channeled Blade of King Vision Video Laryngoscope in General Surgical Procedures

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Abstract

Background and Aims: Direct laryngoscopy remains the gold-standard technique as an effective means for securing the airway by placing an endotracheal tube into the glottis called endotracheal intubation. It is a complicated technical skill. It has a variable learning curve requiring training, experience, and regular practice. King Vision Video Laryngoscope (KVVL) has revolutionized the skill of difficult airway management. The present study was carried out to investigate laryngoscopic view and intubation success using the channeled and non-channeled blade of KVVL in anaesthetized patients as these laryngoscopes can be used effectively by junior residents for emergency intubation in patients with respiratory tract infections with minimal exposure.

Materials and Methods: After proper pre-anesthetic checkup, prospective randomized clinical trial involving 80 patients with ASA physical status I-II, in the age group of 18–60 years, was carried out dividing the patients into two groups; Group [I] - patients intubated with non-channeled blade of KVVL and Group [II] - patients intubated with channeled blade of KVVL. Time for visualization of the glottis, intubation time, success rate of intubation, and number of attempts were noted.

Results: Time for visualization of glottis was significantly shorter with non-channeled blade (group I) as compared to channeled (Group II) but intubation time was significantly shorter in Group II as compared to Group I. Success rate and number of attempts were not statistically different. Both groups achieved Cormack–Lehane Grade I in all the patients.

Conclusion: The time to glottis visualization is longer but intubation time is shorter when using channeled blade as compared to non-channeled blade.

Key words: Channeled King Vision Video Laryngoscope, Cormack–Lehane grade, Non-channeled King Vision Video Laryngoscope

INTRODUCTION

Laryngoscopy is a procedure performed by anesthesiologists for the purpose of placing an endotracheal tube into the airway (trachea) of anesthetized patients to secure the airway. Direct laryngoscopy (DL) is a gold-standard technique but requires a number of manipulations for optimal glottic visualization. These manipulations of the airway have adverse implications such as significant hemodynamic disturbance, cervical instability, injury to oral and pharyngeal tissues, and dental damage.[1] Due to certain limitations of DL, videolaryngoscopy has gained a strong foothold in routine anesthesia practice and becomes a recommended alternative technique in cases of expected difficult airway situations.[2] It has increased first pass success in difficult airway situations and has less peri-intubation complications by reducing the amount of intubation attempts and shortening its time.[3,4]

The King Vision™ Video Laryngoscope (KVVL) is a new novel device developed to aid the anesthesiologist in managing the difficult as well as routine airways quickly and safely.[5] It has two types of blades: Channeled and non-channeled.[6] King vision is a portable device which

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consists of two parts, i.e., stem and blade. The stem of the laryngoscope is reusable.[7] It has a colored video screen and a battery housing. The blade of the laryngoscope is disposable and for single use only. It has L-shaped blade. VL must be held in the left hand and the endotracheal tube (ETT) has to be steered independently with the right hand.

The non-channeled blade of King Vision did not allow simultaneous manipulation of ETT and VL. Moreover, it required the use of malleable stylet for insertion of ETT. The difficulties encountered in non-channeled version were overcome when channeled blade came into practice. Channeled blades have a channel for loading ETT for easier passage through glottis once larynx is visualized.

In this prospective, randomized, single center investigation, we aimed to compare time required for glottic visualization and duration of successful intubation of channeled vs. non-channeled versions of commercially available KVVL. The study was conducted in Guru Nanak Dev hospital attached to Government Medical College, Amritsar, after taking written informed consent of patients in vernacular language and approval from Institutional Ethics Committee (IEC). It was conducted on 80 patients, aged 18–60 years of ASA Grades I and II, scheduled to undergo elective surgery under general anesthesia.

MATERIALS AND METHODS

Following the approval of IEC, and after obtaining a written informed consent, 80 patients with ASA physical status I–II, in the age group of 18–60 years, of both sexes, scheduled for elective surgeries under general anesthesia with endotracheal intubation (ETI) were included. The trial was registered with clinical trial registry-India [Table 1].

In the preparation room, intravenous (I.V) cannula 20 gauges were inserted. Injection midazolam 0.02–0.03 mg/kg and injection glycopyrrolate 0.2 mg were given I.V to all patients.

Table 1: Demographic parameters

Parameter	Group I (*n*=40)	Group II (*n*=40)	*P*-value (NS)
Mean age (in years.)	36.18±13.18	38.45±12.76	0.221
Sex			0.644
Male	26	24	
Female	14	16	
Mean BMI	25.70±1.39	25.43±1.21	0.387
ASA grade			0.495
I	25	22	
II	15	18	
Wilson score			0.898
0	13	12	
1	13	12	
2	14	16	

Then, the patients were transferred to the operating room, standard monitors were applied (non-invasive blood pressure, pulse oximeter, electrocardiogram) before, and capnography after induction of anesthesia. Patients were pre-oxygenated through antistatic mask for 3 min. General anesthesia was induced using propofol 1.5–2 mg/kg. After assessing adequate ventilation, neuromuscular blocking agent was given in the form of succinylcholine 1.5 mg/kg. The patients were given intermittent positive pressure ventilation. Then, intubation was performed using non-channeled blade of KVVL in Group I and using channeled blade of KVVL in Group II.

We measured and recorded the characteristics of laryngoscopy and intubation:

- Time taken for visualization of glottis and duration of intubation was measured using a stopwatch
- Success rate was calculated for each group. Intubation was considered a failure if it takes more than 3 attempts to intubate the patient or time taken more than 120 s
- Number of attempts - an intubation attempt was defined insertion of laryngoscope blade into the oropharynx, regardless of whether an attempt was made to pass the endotracheal tube.
- Ease of laryngoscope insertion was assessed. It was graded as easy, slightly difficult, or difficult
- Quality of visualization was assessed using Cormack and Lehane grading
- Hemodynamic variables
- Assisted maneuvers - if any assisted maneuvers were required for successful intubation which include external laryngeal manipulation, aided by bougie, changing blade size, any lifting force required, redirecting the laryngoscope was recorded and noted
- Any airway injury was recorded - it was assessed by any blood from lips, mucosa, in the oropharyngeal passage or blood on the ETT when patient was extubated.

Duration of intubation was taken as the outcome measure of interest for the purpose of sample size calculation. Sample size was calculated keeping in view at most 5% risk, with minimum 80% power and 5% significance level (significant at 95% confidence interval). Data were recorded in a Microsoft excel spreadsheet and analyzed using the Statistical Package for the IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp., Chicago. Exact *P*-values were computed and $P < 0.05$ was considered as statistically significant.

RESULTS

A total of 80 patients were analyzed [Table 1]. Patient baseline characteristics with respect to age, gender

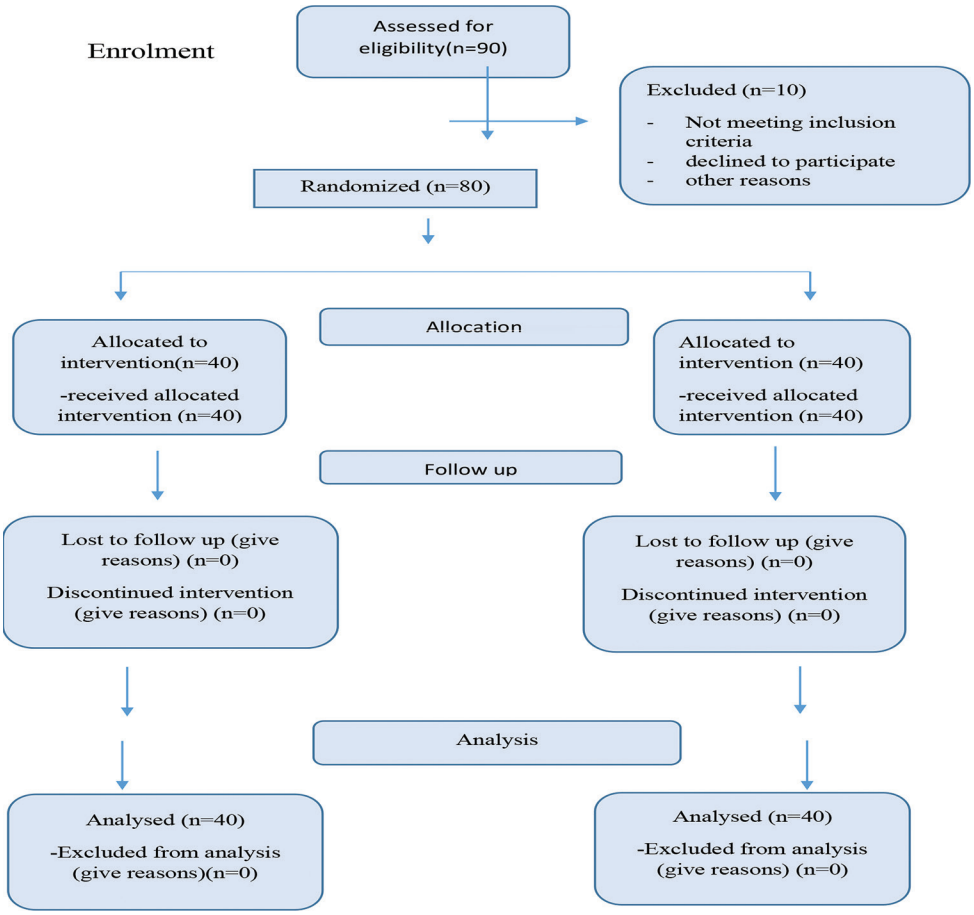

Figure 1: Consort flow diagram

distribution, BMI, and Wilson score were similar in the two groups. There was also no statistically significant difference in the distribution of patient's Mallampati grades and ASA class distribution [Figure 1].

Time to Visualization of Glottis

The time to glottis visualization was significantly shorter when using non-channeled blades as compared to channeled blades. The mean time taken for visualization of glottis in Group I was 6.09 ± 0.72 s and the mean time taken in Group II was 10.57 ± 2.20 s. The groups showed a highly statistically significant difference ($P < 0.03$). The grade of glottis visibility and number of insertions were similar [Figure 2].

Duration of Intubation

The total duration of intubation was significantly longer using non-channeled blade compared to channeled blade. The mean time taken in Group I was 30.24 ± 6.28 s and in Group II was 19.26 ± 3.42 s. The duration of intubation is shorter in Group II than in Group I. The groups showed a highly statistically significant difference ($P < 0.03$) [Figure 3].

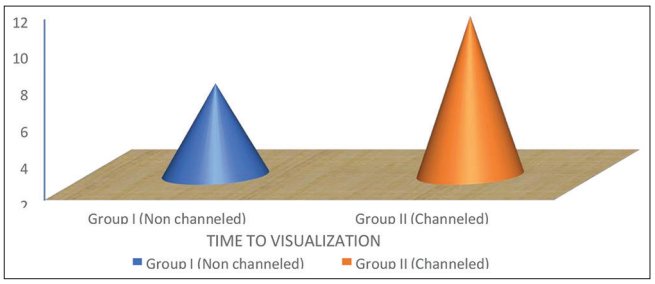

Figure 2: Time to visualization of glottis

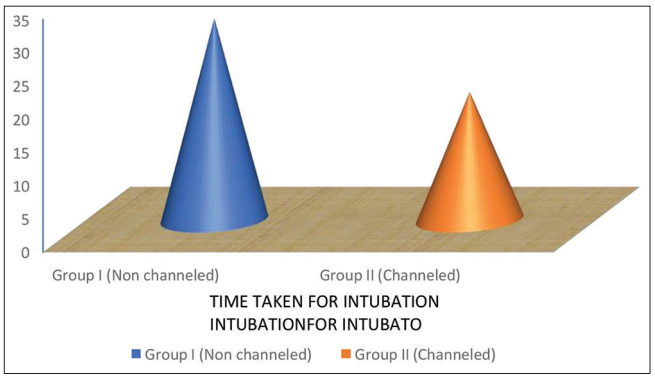

Figure 3: Time taken for intubation

The results of number of attempts, ease of laryngoscope insertion, quality of visualization, and hemodynamic variables were comparable in both the groups [Table 2].

Airway injury was noted in 4 patients in Group I and 2 patients in Group II. The difference in airway injuries was statistically non-significant in both the groups ($P > 0.05$). Assisted maneuver was required in 4 patients in Group I and 1 patient in Group II. The difference was statistically non-significant in both the groups ($P > 0.05$) [Table 3].

DISCUSSION

The prime responsibility of an anesthesiologist is to secure and maintain a patent airway. Complications such as hypoxic brain damage could happen from delayed intubation, misplaced tracheal tube, or airway trauma.[8,9] Laryngoscopy is a procedure performed by anesthesiologists for the purpose of placing an endotracheal tube into the airway of patients to secure airway or administer inhalational drugs during surgery and suctioning of secretions. DL remains gold-standard technique for securing airway but with advancement in technology, videolaryngoscopy has become widely accepted method in both emergency medicine and clinical anesthesia. It has become an alternative technique in cases of anticipated difficult airway situations.

King Vision is a new device; it has two blades: Non-channeled and channeled blades. Minimum of 18-mm mouth opening is required in one with channel while minimum 13 mm mouth opening is required in one without channel.[10] Non-channeled blades are generally thinner, easier to insert, and provide good quality view to the vocal cords even in case of significantly limited mouth opening. Their main disadvantage is that insertion of tracheal tube needs a special angulated introducer and there may be risk of trauma to oro-pharyngeal soft tissues. The channeled blade provides a more reliable direct guide for tracheal tube insertion but may be more difficult to insert in case of limited mouth opening, intra-oral swelling, and large tongue due to its bulkiness.

Table 2: Intubation characteristics

Parameters	Group I	Group II	*P*-value
Success rate			
1st pass success rate	36	39	0.165
2nd pass success rate	4	1	
Number of attempts			
1	36	39	0.165
2	4	1	
Ease of laryngoscope insertion			
Easy	35	32	0.367
Slightly difficult	5	8	
Difficult	0	0	
Quality of visualization			
1	40	40	1
2a	0	0	
2b	0	0	
3	0	0	

Table 3: Complication

Complications	Group I (%)	Group II (%)	*P*-value
Airway injuries	4 (10)	2 (5)	0.398
Assisted maneuvers	4 (10)	1 (2.5)	0.165

The findings of our study suggest that, the mean time taken in Group I was 6.09 ± 0.72 s which is shorter than mean time taken in Group II which was 10.57 ± 2.20 s. The result was statistically highly significant ($P < 0.03$). The reason for longer time in Group II that is patient intubated with channeled blade of King Vision is due to larger width of tip of blade and its bulkiness which makes it slightly difficult to insert it in patient's mouth.

Similar results in context to our findings were reported by Biro and Schlaepfer.[11] In their study, they compared tracheal intubation with channeled versus non-channeled video laryngoscope blades in patients undergoing elective urological surgeries. The authors found that the time to larynx visualization was significantly shorter when non-channeled blade (5 s [4–8 s]) was used compared to channeled blade (11 s [7–14 s]).

Our results also coincide with study conducted by Shah *et al*.[12] They conducted a study on comparison of channeled blade with non-channeled blade of KVVL for oro-tracheal intubation. The laryngeal exposure time was 5.27 ± 3.2 s in non-channeled group whereas it was 7.84 ± 9.01 sec in channeled group.

A similar study was performed by Bajpai that compared intubation performance between channeled and non-channeled blade of King Vision in orotracheal intubation.[13] The time for glottis visualization was 8.5 ± 3 s for Group C (channeled) and 7 ± 2 s for Group NC (non-channeled). These results are in concordance with our study.

Our study also recorded total duration of intubation. Our findings suggest that, the mean duration of intubation in Group II was 19.26 ± 3.42 s compared to 30.24 ± 6.28 s in Group II which was statistically highly significant ($P < 0.03$). The reason for faster intubation time despite slower larynx recognition time is because the channeled blade makes more demanding steering of ETT and omits the blind phase during advancement of ETT.

The results of our study are comparable with study conducted by Shah *et al*. in which they found that the time to

successful intubation was 15.24 ± 10.6 s in channeled blade whereas it was 28.57 ± 14.09 s in non-channeled blade. The time taken was significantly less with channeled blade.

Our results also coincide with study conducted by Biro and Schlaepfer where the time to successful intubation was significantly longer when using non-channeled blade [29s [25–51 s]) compared to channeled blade (17 s [12-27]).

A similar study was performed by Bajpai that compared intubation performance between channeled and non-channeled blade of King Vision in orotracheal intubation. The duration of intubation was found to be shorter when using channeled (24 ± 8.5 s) blade as compared to non-channeled blade (44 ± 5 s) of King Vision.

Both the laryngoscope blades included in our study showed 100% success rate. The 1st pass success rate was 90% in Group I and 97.50% in Group II. 100% patients were intubated in the second pass in both the groups. The difference in the success rate in both the groups was found to be statistically non-significant ($P > 0.05$). No intubation failure was recorded in any of the patients in both the groups.

The success rate findings of VL channeled blade of our study were in concordance to study conducted by Ali *et al*. in which a comparative evaluation of KVVL (channeled blade), McCoy, and Macintosh laryngoscopes for tracheal intubation in patients with immobilized cervical spine. Similarly, the findings of success rate for ETT insertion were comparable to study conducted by Kleine-Brueggeney *et al*. in which evaluation of three non-channeled video laryngoscopes and the Macintosh laryngoscope in patients with a difficult airway was done. Primary outcome was first attempt orotracheal intubation success.[7,14]

The number of attempts, ease of laryngoscope insertion, quality of visualization, hemodynamic variables, oxygen saturation, and end-tidal Co_2 showed no statistically significant difference.

Assisted maneuvers were stated as any external laryngeal manipulation, aided by bougie, changing blade size, any lifting force required, or any redirection of blade. It was noted that patients had some form of impingement in the case of the both the blades. Impingement with the channeled blade occurred over the right aryepiglottic fold. Anticlockwise rotation of the endotracheal tube as it slides off the dedicated slot redirects it toward left overcomes the impingement on the right aryepiglottic fold.

In the case of non-channeled blade, impingement occurred at various places such as epiglottis and anterior subglottic area including the right aryepiglottic fold. Withdrawal of the stylet endotracheal tube and redirection toward the center was done most of the time to facilitate passage of the tube toward the glottic opening.

The reason for impingement at right aryepiglottic fold was central insertion of device. The reasons behind impingement to the anterior glottic structures, especially in the case of the non-channeled blade, could be due to the hyperangulated stylet required to position the endotracheal tube. However, the difference was statistically non-significant in both the groups ($P > 0.05$).

In a similar study conducted by Shah *et al*.,[12] comparing channeled blade versus non-channeled blade of the King Vision™, various impingements which occurred at the laryngeal inlet were observed and maneuvers used to accomplish intubation were noted. Impingement of the endotracheal tube at the glottic inlet was similar in both the groups.

Injury to the airway was assessed by looking for signs of blood lips, mucosa, in oropharyngeal passage, on laryngoscope blades, or endotracheal tube when removed during extubation. There was no statistically significant difference between two groups.

CONCLUSION

The following conclusions are drawn from our study:

- Both the blades of KVVL showed promising results with respect to successful intubation
- The time taken to visualize the glottis by King Vision non-channeled blade was shorter as compared to channeled blade of King Vision
- Although time taken to visualization of glottis was shorter with non-channeled blade, time to intubation was shorter with channeled blade of King Vision
- There was no significant difference in number of attempts and quality of visualization of glottis with both the blades of King Vision
- There was no statistically significant difference in hemodynamic changes in both the groups
- There was also no statistically significant difference with respect to assisted maneuvers and injury to airway in both the groups.

We conclude with our study that the time to video laryngoscopic glottis recognition is longer when using a channeled blade, but time to intubation and the total time to secure the airway are shorter. King Vision channeled blade is better compared to non-channeled blade for laryngoscopy and ETI in general surgical procedures.

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