International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 14, No. 2, February 2025 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.2.2025.67

ORIGINAL RESEARCH

Comparative evaluation of king vision video laryngoscope, airtraq & macintosh laryngoscope in simulated difficult laryngoscopy using rigid neck collar

[1]Dr.Md. Mohsin, [2]Dr. Md. Nasrul Bari, [3]Dr. Anand Alok

[1]Associate Professor, [2]Assistant Professor, [3]Senior Resident, Department of Anaesthesiology, Katihar Medical College, Katihar, Bihar, India

Corresponding Author
Dr. Md. Nasrul Bari
Assistant Professor, Department of Anaesthesiology, Katihar Medical College, Katihar, Bihar, India
Email:nasrulbari67@gmail.com

Received: 10 January, 2025 Accepted: 30 January, 2025 Published: 13 February, 2025

ABSTRACT

Background: Even the most skilled anesthesiologists have always found it difficult to intubate patients whose cervical spine movement is restricted or undesirable. When head and neck are restrictedoral, pharyngeal, and laryngeal axis cannot align, and patients with cervical spine fractures are more likely to experience difficult intubation. Cervical collars can be used to simulate difficult intubation. The current study simulates a difficult airway in patients wearing rigid cervical collars in order to assess and compare the effectiveness of the King Vision Video, Airtraq, and Macintosh laryngoscopes.**Methods:**This was a prospective, single blind study conducted in a teaching hospital in Bihar. 120 Patients, ASA I and II, aging 18-60 years, undergoing elective surgery under general anaesthesia were enrolled in three groups. Group K (King Vision Video laryngoscope), Group A (Airtraq laryngoscope) and Group M (Macintosh laryngoscope). Time for intubation, POGO score, IDS, number of attempts were compared.**Results:**The mean number of attempts in group M was 1.77, in group A was 1.2 and in group K was also 1.2, (p-value=0.00). Mean intubation difficulty score was 3.77 in group M, 2.98 in group A and 1.25 in group K. Mean percentage of glottic opening was 53.18 in group M, 62.28 in group A and 78 in group K, (P-value=0.00). 80% had successful intubation during first attempt in group A and group K and 40% in group M.**Conclusion:**The King Vision Laryngoscope is the easiest maneuver to use. Its benefits include a quick intubation time, minimal need for additional trials, almost no difficulties compared to Airtraq or Macintosh laryngoscopes, and no notable changes in hemodynamics following intubation.

Key words: Difficult intubation, Video laryngoscopes, King Vision Video laryngoscope, Airtraq laryngoscope, rigid collar

INTRODUCTION

Even the most skilled anesthesiologists have always found it difficult to intubate patients whose cervical spine movement is restricted or undesirable. Approximately 8% of tracheal intubations are problematic.[1] When the head and neck are restricted, the oral, pharyngeal, and laryngeal axis cannot align, and patients with cervical spine fractures are more likely to experience difficult intubation, which can reach 20% [2]. There are limits to using bedside screening measures to predict problematic intubation [3,4]. According to reports, 1.5% to 8.5% of anesthetic cases involve an unexpected difficult intubation [5,6]. Ignoring a slight restriction of head and neck movements is a major contributor to unexpectedly difficult intubation.

Direct laryngoscopy, which involves flexion of the cervical spine and atlanto-occipital extension to align the oral, pharyngeal, and laryngeal axes and establish a direct line of vision from the mouth to the vocal cords, is reserved for situations in which the cervical spine is immobile or unstable. Two opposing objectives should be met by tracheal intubation in individuals with suspected neck injuries: adequate laryngeal exposure and minimal cervical spine movement. To avoid aggravating spinal cord damage, intubation must be carried out with cervical spine immobilization because the former requires movement of the cervical vertebrae. As a result, intubation is performed in a straight line and in a neutral neck posture in these situations.

DOI: 10.69605/ijlbpr_14.2.2025.67

The use of a rigid collar, forehead tape and manual-in-line stabilization (MILS) are protective measures to prevent damaging compression forces on the spinal column.

Cervical collars can be used to simulate difficult intubation, such as in cases of cervical spine injury, and may also minimize motions of the cervical spine. In addition to stimulating neutral neck position, or in a straight line, it also narrows the mouth aperture, making laryngoscopy challenging [7]. Additionally, the neck collar tips the larynx anteriorly and raises the chin [8,9]. The current study simulates a difficult airway in patients wearing rigid cervical collars in order to assess and compare the effectiveness of the King Vision Video, Airtraq, and Macintosh laryngoscopes. Therefore, the study will assist us in selecting the device that will work best in real-world scenarios when airway management in a neutral head position is necessary (such as spinal cord damage, cervical spine injury, or ankylosing spondylitis).

METHODS

Study design: A prospective, single blind study.

Place of study: This was a tertiary care teaching hospital based study done in Department of general anesthesia at Katihar Medical College, Katihar, Bihar.

Study population: Patients undergoing elective surgery under general anesthesia at Department of general anesthesia at Katihar Medical College, Katihar, Bihar.

Sample size: 120 Patients, ASA I and II, aging 18-60 years, undergoing elective surgery under general anaesthesia.

Method of randomization:

Computer generated randomization codes were used to allot patients into 3 groups.

Method of allocation concealment: Closed opaque envelopes.

Study period: From January 2023 to September 2024.

Inclusion Criteria:

1. Age 18-60years
2. American Society of Anaesthesiologist Grade I &II
3. Mallampatti grade I andII
4. Adult male andfemale
5. BMI<30kg/m^2

Exclusion Criteria:

Patients with anticipated difficult airway

- Patient refusal for general anaesthesia.
- Mallampatti grade 3 and 4
- Mentohyoid distance (MHD) < 3cms.
- Thyromental distance (TMD) <5cms.
- Sternomental distance (SMD) <10CMS
- Neck circumference > 42cms
- Obese (Body Mass Index > 30)patients
- Patients with risk of pulmonary aspiration of gastriccontents
- Pregnantpatients
- Airway distortion ortrauma

METHODOLOGY

After getting approval from institutional ethical committee, written informed consent wasobtainedfromallpatientswhofulfilledtheinclusioncriteria.The patients(n=120) were dividedinto3groupsof40patientseach.

Group K (King Vision Video laryngoscope, n=40),
Group A (Airtraq laryngoscope, n=40) &
Group M (Macintosh laryngoscope, n=40).

Patientsscheduledforelectivesurgicalproceduresundergeneral anaesthesia with controlled ventilation, were included in thisstudy.

All intubations were done using Kings Vision Video laryngoscope, Airtraq, and Macintosh. The trachea was intubated with a 7.0 mm tracheal tube in females and 7.5 mm tracheal tube in males.

The intubation time was noted for three laryngoscopes. An assistant not involved in laryngoscopy and intubation, recorded the time with stop watch.

Ifintroductionoftheintubatingdevicewasnotpossibleorthereweremorethanthree attempts for intubation or intubation time was more than 120 seconds, it was considered to be failure.TheIDSscorebeforeabandoningthetechniquewasnoted.Incaseoffailuretointubate, Cervical collar was then be removed and intubation was proceeded. Failure to intubate (> 3 attempts or > 120 seconds) and episodes of desaturation (SpO2 < 90%) during intubation was noted.

A modified Intubation Difficulty Score (IDS) described by Adnet and colleagues[8]to suit King Vision Video laryngoscope and Airtraq and Macintosh aided intubation was noted. All the maneuvers and devices used for intubation were included in the modified IDS.

POGO score [9] was assessed by the anesthesiologist who was doing the laryngoscopy and intubation.

Recording of Parameters

1. Time taken for successful placement: This was from passing the tip of devicebetween the incisor teeth to appearance of square wave capnograph tracing.
2. Number of insertion attempts: A maximum three attempts was allowed. An intubation attempt was defined as "the introduction of endotracheal tube past the patient'steeth."
3. Intubation Difficulty Score[IDS] [8]:
4. Percentage of Glottic Opening [POGO score] and grading of laryngeal view: It represented the portion of the glottis visualized. The score ranged from 0% when none of the glottis is seen to 100% when the entire glottis including the anterior commissure is seen. Laryngeal view was graded

DOI: 10.69605/ijlbpr_14.2.2025.67

as 1, 2, 3 and 4 according to POGOscore [9].

DATA ANALYSIS

The data collected was entered in Microsoft Excel sheet (version 22). The data analysis was done using SPSS version 23. The quantitative data was expressed in form of mean and standard deviation. The categorical data was expressed in form of proportion and percentages. The mean value of two groups were compared using Independent t-test and the proportion of two groups were compared using Chi-square test. The statistical tests were performed at Confidence interval of 95%. The p-value <0.05 was considered statistically significant. The graphs were made using both Microsoft excel and SPSS.

Ethical considerations

The written informed consent was taken from each participant before enrolment in the study. Personal details were kept anonymous at all points in the study. The ethical permission for conduction of the study was taken from Institutes Ethical Committee.

RESULTS

In our study, total 129 participants were enrolled. Out of this, 9 patients had failed intubation and rest 120 had successful intubation. The sociodemographic parameters were taken for all 129 participants while the intubation related parameters were obtained for 120 patients.

Table 1: Comparison of continuous variable among three groups of participants.

Parameter	Group	N	Mean	Std. Deviation	95% Confidence Interval for Mean		p-value
					Lower Bound	Upper Bound	
Age (years)	M	40	36.38	9.125	33.46	39.29	0.15
	A	40	36.18	13.343	31.91	40.44	
	K	40	40.58	11.629	36.86	44.29	
	Total	120	37.71	11.580	35.62	39.80	
Height (cm)	M	40	159.36	6.675	157.20	161.52	0.24
	A	40	161.43	5.948	159.52	163.33	
	K	40	161.53	6.687	159.39	163.66	
	Total	120	160.78	6.467	159.61	161.96	
BMI (kg/sq.m)	M	40	22.6	1.4	22.1	23.143	0.27
	A	40	22.18	1.37	21.74	22.62	
	K	40	22.37	1.06	22.03	22.7	
	Total	120	22.4	1.32	22.16	22.64	
TOI	M	40	41.33	2.069	40.66	42.00	0.00
	A	40	37.48	2.511	36.67	38.28	
	K	40	27.08	4.969	25.49	28.66	
	Total	120	35.24	6.942	33.98	36.50	

The participants in KV group were referred as Group K, in Airtraq as Group A and in Macintosh as Group M.

The mean age of participants in group M was 36.38 years, in group A was 36.18 years and in group K was 40.58 years. The age of participants was similar across all the three groups (p-value=0.15). The mean time of intubation in group M was 41.33 s, in group A was 37.48 s and group K was 27.08s. The difference in mean intubation time was statistically significant across the groups. The mean time of intubation in group K was least, followed by group A and group M.

In our study, 68.2% patients were females and 31.8% were males.

Table 2: Comparison of intubation parameters among three groups of participants.

Parameter		N	Mean	Std. Deviation	95% Confidence Interval for Mean		p-value
					Lower Bound	Upper Bound	
NOA	M	40	1.77	.583	1.58	1.96	0.00
	A	40	1.20	.405	1.07	1.33	
	K	40	1.20	.405	1.07	1.33	
	Total	120	1.39	.539	1.29	1.48	
IDS	M	40	3.77	.931	3.47	4.07	0.00
	A	40	2.98	1.025	2.65	3.30	
	K	40	1.25	.707	1.02	1.48	
	Total	120	2.66	1.380	2.40	2.91	
POGO	M	40	53.18	16.654	47.78	58.58	0.00
	A	40	62.28	3.566	61.13	63.42	
	K	40	78.00	5.064	76.38	79.62	
	Total	120	64.58	14.415	61.96	67.20	

DOI: 10.69605/ijlbpr_14.2.2025.67

The mean number of attempts in group M was 1.77, in group A was 1.2 and in group K was also 1.2. Statistically significant difference was observed in mean number of attempts in group M as compared to group A and group K (p-value=0.00)

Mean intubation difficulty score was 3.77 in group M, 2.98 in group A and 1.25 in group K. Statistically significant difference was observed in mean intubation difficulty score in group M as compared to group A and group K (p-value=0.00).

Mean percentage of glottic opening was 53.18 in group M, 62.28 in group A and 78 in group K. Statistically significant difference was observed in mean POGO in group M as compared to group A and group K (p-value=0.00).

Table 3: Cross tabulation showing number of attempts with study participants according to intervention.

NOA		group			Total	p-value
		M	A	K		0.00
	1	12	32	32	76	
	2	25	8	8	41	
	3	3	0	0	3	
Total		40	40	40	120	

The number of attempts taken for a successful intubation had statistically significant relationship with the type of laryngoscope used in the study.

80% of the patients had successful intubation during first attempt in both group A and group K. Rest 20% had successful intubation at second attempt in both group A and group K. However, only 40% had successful intubation during first attempt in group M.

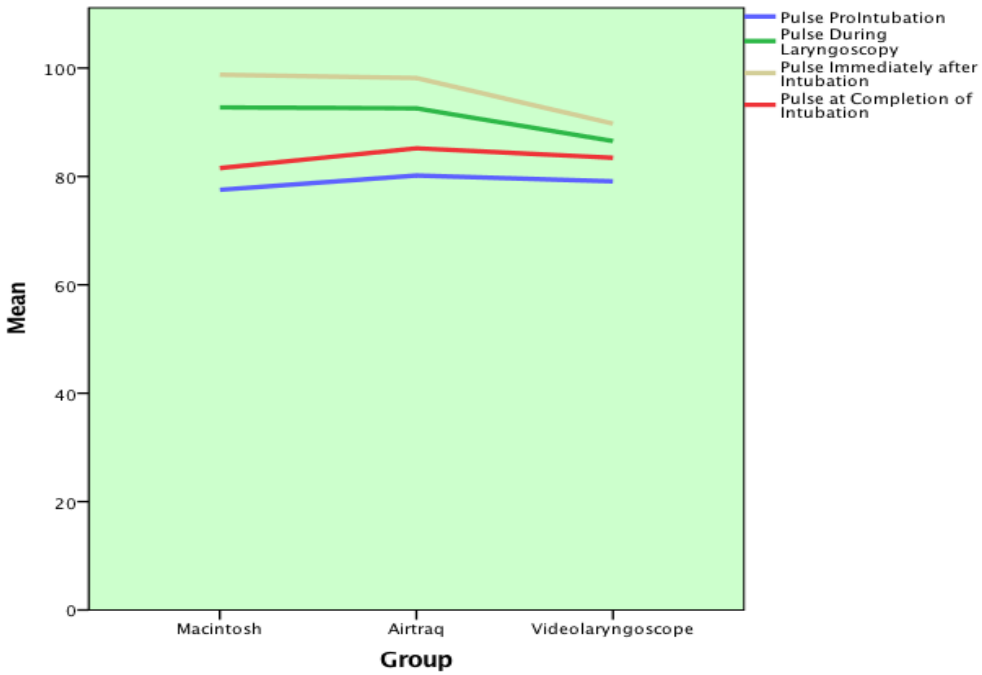

Figure 1: Line diagram showing trend of pulse rate at different intervals in the study

In the line diagram, it is evident that the pulse rate immediately after intubation was in maximum range across the three groups. The baseline pulse rate before intubation was lowest followed by pulse rate at completion of intubation.

DOI: 10.69605/ijlbpr_14.2.2025.67

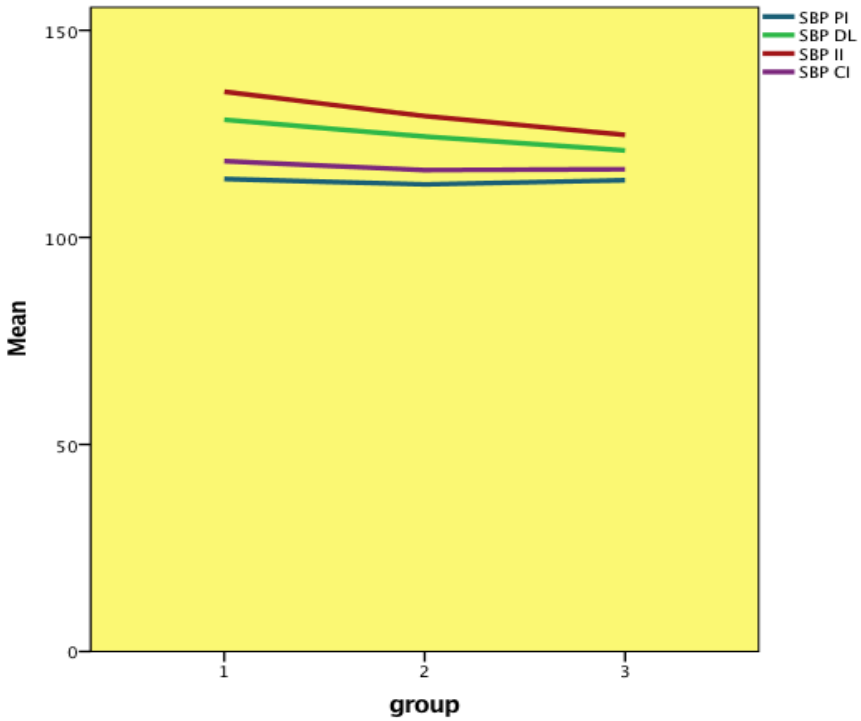

Figure 2: Line diagram showing trend of systolic blood pressure at different intervals in the study

In the line diagram, it is evident that the SBP immediately after intubation was in maximum range across the three groups. The baseline pulse rate before intubation was lowest followed by pulse rate at completion of intubation.

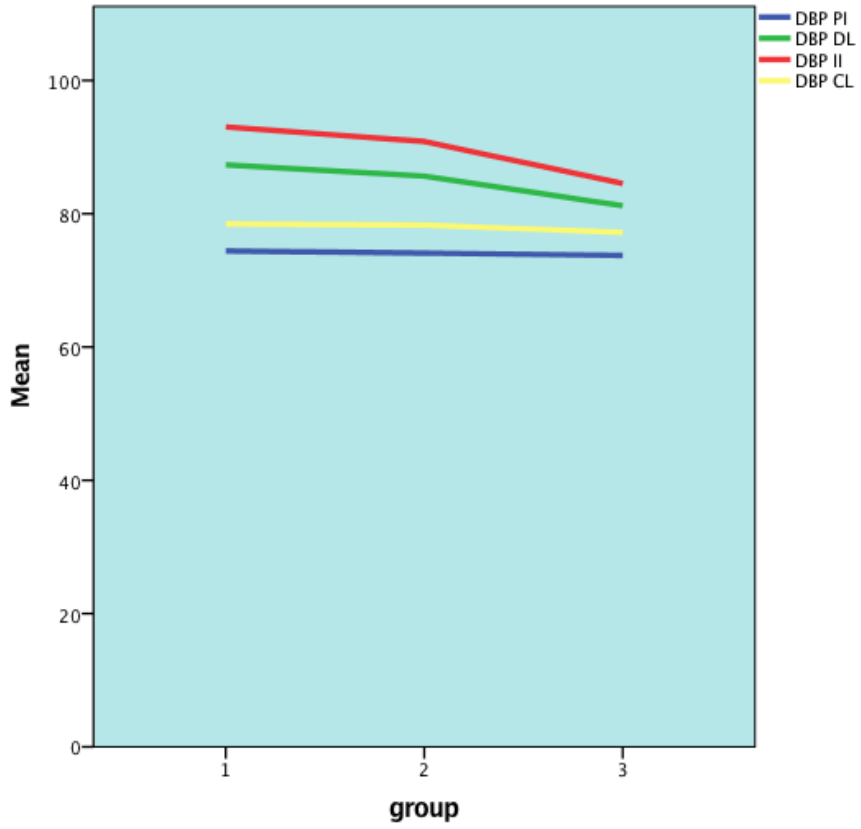

Figure 3: Line diagram showing trend of diastolic blood pressure at different intervals in the study

DOI: 10.69605/ijlbpr_14.2.2025.67

In the line diagram, it is evident that the DBP immediately after intubation was in maximum range across the three groups. The baseline pulse rate before intubation was lowest followed by pulse rate at completion of intubation.

Table 4: Cross tabulation showing successful intubation attempts with study participants according to intervention.

Group	Successful intubation	Failure	Total	p-value
M	40	5	45	0.28
A	40	3	43	
K	40	1	41	
Total	120	9	129	

The cross tabulation depicts number of failures during intubation in three intervention groups. The proportion of failed intubation were statistically similar across the three groups (p-value=0.28). The maximum number of failures were seen in group M followed by group A and minimum number in group K.

Table 5: Cross tabulation showing airway trauma with study participants according to intervention.

AIRWAY TRAUMA			group			Total	p-value
			M	A	K		0.00
	No	Count	21	26	33	80	
		%	46.7%	60.5%	80.5%	62.0%	
	Yes	Count	24	17	8	49	
		%	53.3%	39.5%	19.5%	38.0%	
Total		Count	45	43	41	129	
		%	100.0%	100.0%	100.0%	100.0%	

The magnitude of airway trauma was significantly related to the intervention received. Those patients in group K had least proportion of cases with airway trauma. More than half cases in group M had airway trauma in the study. About 40% cases in group A and 20% cases in group K had airway trauma while intubation.

DISCUSSION

The study evaluated and compared the intubation related parameters like changes in physiological parameters, number of successful intubations, time taken for intubation, POGO, IDS scores, airway trauma during intubation with Macintosh, Airtraq and Kings Vision laryngoscopes. Total 129 participants were enrolled, out of which 9 patients had failed intubation and rest 120 had successful intubation.

The parameters studies across the intervention groups in the study were compared with other existing literature for establishing validity of the study which are mentioned below.

The mean age of participants in current study was 40.58 in group K, 36.38 in group M and 36.18 in group A. This finding was similar to the findings in previous literature [10,11]. However, the study by Kleine-Brueggeney et al [12], Suzuki K et al [13] and Erdivanli B et al [14] employed participants with higher mean age with respect to our study, many of which were undertaken in emergency setting [12,13].

The mean BMI in our study was 22.37 in group K, 22.6 in group M and 22.18 in group A. The findings of BMI distribution was similar to Ali QE et al [10], Shweta et al [15], Suzuki K et al [13], Erdivanli B et al [14], Das B et al [16] and Singhal V et al [17]. Few studies have taken obese patients due to which the mean BMI in their studies is higher as compared to our study [11,18].

The MP classification was presented as mean or proportion across different grade. In our study, the participants belonged to grade I and II only. This was similar to previous studies [15-17]. However, in other studies, all grades of MPS were taken [10,12,14]. In our study the participants from ASA grade I and II were enrolled across three groups. This was similar to few previous studies [10,11,14]. Few studies have also incorporated patients with ASA III and higher [12].

Distribution of % of successful intubation across different studies. The percentage of successful intubation in our study in Kings vision group was 97.5% which was similar to findings of Singhal V et al [17] and Erdivanli B et al [14]. Few studies have reported 100% successful intubation with Kings vision laryngoscopes [10,11,15,20]. In study by Kleine-Brueggeney et al [12], the intubation success rate in Kings vision group was only 92% which was 1% lower than Airtraq group. In the Airtraq group, 93% had successful intubation in our study similar to findings of Kleine-Brueggeney et al [12] and Singhal V et al [17]. The intubation success with Airtraq was 100% in study by Shweta et al [15] and 97.5% in study by Das B et al [16], which was higher than our study. The percentage of successful intubation in Macintosh group was 88.88% in our study, which similar to findings of Das B et al [16] and less than other studies [10,11,14,20].

The mean number of successful attempts in Kings vision group was 1.2, in Airtraq group was 1.2, in Macintosh group was 1.77. In study by Singhal V et al [17], the mean attempts were 1.21 in Kings vision

DOI: 10.69605/ijlbpr_14.2.2025.67

group similar to our study but in Airtraq group it was higher than our study. In maximum studies, majority intubations were successful in the first attempt only like our study finding [10,11,15,20].

The mean intubation time in our study was 27.08 s in Kings vision group, 37.48 s in Airtraq group and 41.33 s in Macintosh group. There was significant difference in mean time across the groups in our study. The findings of our study were similar to findings of Singhal V et al [17] and Shweta et al [15], and Arafa et al [11].

On an average the mean intubation time ranged from 15-25 s in other studies [20,21]. The mean intubation time was higher in emergency intubation scenarios [12].

Across the studies, the mean intubation time by Macintosh was found to be more than Airtraq [11,16,21] and Kings vision laryngoscope [10,11,17] similar to the findings of our study. The mean intubation time in Airtraq group was also more than Kings vision group in other studies [12,15,17] like our study. Only one study has demonstrated that mean intubation time was least in Airtraq group [21].

The intubation was easier and required less time with the King's Vision Videolaryngoscope compared with the other laryngoscopes in our study. These results are consistent with that of a study by Ali et al [10] who found that time required to intubate patients was significantly lesser with the King's Vision Videolaryngoscope than with the Airtraq ($p<0.05$). The decreased time for intubation in Kings vision group may be attributed to majority first intubation success and the improved glottic viewing with the King's Vision Videolaryngoscope helped to pass the ETT in a shorter period compared with the other laryngoscopes similar to other studies [17,19].

The mean percentage of glottis opening was 78% in Kings vision group in our study similar to findings by Rendeki et al [21] and Singhal V et al [17]. In Airtraq group the mean POGO score in our study was 62.28% which was similar to study by Singhal V et al [17]. However, the POGO score was higher in Airtraq group in other studies [16,21]. Another study by Avula et al,[22] stated that the King's Vision Videolaryngoscope provides a superior view of the glottis without the need to align the oral, pharyngeal, and laryngeal axes, but it is associated with longer intubation time. The POGO score was lowest in Macintosh group in our study which was more than findings by other studies [16,21]. Only one study showed POGO score in Macintosh more than our study [18].

The prevalence of airway trauma was 53% in Macintosh group, 40% in Airtraq group and 20% in Kings vision group. This observation was more than the findings by other studies [11,21] and similar to the findings of Singhal V et al [17]. This was in line with study by Ali et al. [10] that documented that less airway complications with king visionlaryngoscope.

The King Vision video laryngoscope's blunted hemodynamic response indicates that less force and laryngeal manipulations are needed during intubation, which lowers the possibility of hemodynamic stimulation.. Significant statistical differences between the three groups in terms of hemodynamic changes only happen right after intubation, and the King Vision group experienced fewer changes than the other two groups (Airtraq and Macintosh groups). This could be because the King Vision group's pressor response following intubation was significantly lower than that of the other two groups (Airtraq and Macintosh groups), possibly as a result of the short intubation period and fewer trials required for intubating successfully similar to our findings [20,11].

CONCLUSION

After using it for a while, the King Vision Laryngoscope seems to be the most straightforward and uncomplicated maneuver to use. Its benefits include a quick intubation time, minimal need for additional trials, almost no difficulties compared to Airtraq or Macintosh laryngoscopes, and no notable changes in hemodynamics following intubation. Even the King Vision Laryngoscope ensures intubation, allows numerous assistant physicians or trained residents to view the field simultaneously during intubation, and offers the anesthesiologist the confidence and trust to operate it with ease. In terms of the number of attempts and short intubation time, Airtraq has been shown to be comparable to the Kings Vision laryngoscope.

REFERENCE

1. Adnet F, Racine SX, Borron SW, Clemessy JL, Fournier JL, Lapostolle F, et al. A survey of tracheal intubation difficulty in the operating room: A prospective observational study. Acta Anaesthesiol Scand. 2001;45:327–32.
2. Calder I, Calder J, Crockard HA. Difficult direct laryngoscopy in patients with cervical spine disease. Anaesthesia. 1995;50:756–63.
3. Shiga T, Wajima Z, Inoue T, Sakamoto A. Predicting difficult intubation in apparently normal patients: A meta-analysis of bedside screening test performance. Anesthesiology. 2005;103:429–37.
4. Nørskov AK, Rosenstock CV, Wetterslev J, Astrup G, Afshari A, Lundstrøm LH. Diagnostic accuracy of anaesthesiologists' prediction of difficult airway management in daily clinical practice: A cohort study of 188 064 patients registered in the Danish Anaesthesia Database. Anaesthesia. 2015;70:272–81.
5. Williams KN, Carli F, Cormack RS. Unexpected, difficult laryngoscopy: A prospective survey in routine general surgery. Br J Anaesth. 1991;66:38–44.
6. Crosby ET, Cooper RM, Douglas MJ, Doyle DJ, Hung OR, Labrecque P, et al. The unanticipated difficult airway with recommendations for management. Can J Anaesth. 1998;45:757–76.
7. Goutcher CM, Lochhead V (2005) Reduction in mouth opening with semirigid cervical collars. Br J Anaesth 95:344-348.

DOI: 10.69605/ijlbpr_14.2.2025.67

8. Adnet F, Borron SW, Racine SX, Clemessy JL, Fournier JL, Plaisance P, etal. The intubation difficulty scale (IDS): Proposal and evaluation of a new score characterizing the complexity of endotracheal intubation. Anesthesiology 1997;87:1290-7.
9. Levitan RM, Ochroch EA, Kush S, Shofer F, Hollander JE. Assessment of airway visualization: validation of the percent of glottic opening (POGO) scale. Academic Emergency Medicine 1998; 5: 919±23.
10. Ali, Q.E., Amir, S.H. and Ahmed, S., 2017. A comparative evaluation of King Vision video laryngoscope (channelled blade), McCoy, and Macintosh laryngoscopes for tracheal intubation in patients with immobilized cervical spine. Sri Lankan Journal of Anaesthesiology, 25(2), pp.70–75. DOI: http://doi.org/10.4038/slja.v25i2.8200
11. Arafa SK, El-Sayed AA (2018) Alternative Airway Means for Endotracheal Intubation in Adult Patients for Cervical Discectomy. Comparison between Airtraq, King Vision Video Laryngoscope and Macintosh Laryngoscope: A Prospective Randomized Study. J AnesthClin Res 9: 858. doi:10.4172/2155-6148.1000858
12. Kleine-Brueggeney, M., Greif, R., Schoettker, P., Savoldelli, G. L., Nabecker, S., & Theiler, L. G. (2016). Evaluation of six videolaryngoscopes in 720 patients with a simulated difficult airway: a multicentre randomized controlled trial. British Journal of Anaesthesia, 116(5), 670–679. doi:10.1093/bja/aew058
13. Suzuki K, Kusunoki S, Tanigawa K, et al. Comparison of three video laryngoscopes and direct laryngoscopy for emergency endotracheal intubation: a retrospective cohort study. BMJ Open 2019;9:e024927. doi:10.1136/bmjopen-2018-024927.
14. ErdivanliBasar, Sen Ahmet, BatcikSule, KoyuncuTolga, KazdalHizir. Comparison of King Vision video laryngoscope and Macintosh laryngoscope: a prospective randomized controlled clinical trial. Rev. Bras. Anestesiol. [Internet]. 2018 Oct [cited 2020 Oct 09] ; 68(5): 499-506. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0034-70942018000500499&lng=en. https://doi.org/10.1016/j.bjane.2018.04.008.
15. Shweta, Devyani Desai, M. R. Upadhyay. A Comparative Evaluation of Two Vidolaryngoscopes, the Airtraq and King Vision as an Intubating Aid in Adult Patients. Indian J AnesthAnalg. 2019;6(6 Part - I):1930-1935.
16. Das B, Bhandari G, Shahi KS, Mitra S, Kumar A (2015) A Comparison of Tracheal Intubation with the Macintosh, McCoy or the Airtraq Laryngoscope in Simulated Difficult Laryngoscopy using Rigid Neck Collar: A Randomized, Controlled Clinical Trial. AnethsteCriti Care 1:10448.
17. Singhal V, Bhandari G, Shahi KS, Chand G. Comparative Study of Mccoy, Airtraq and King's Vision Videolaryngoscope in Simulated Difficult Laryngoscopy Using Rigid Neck Collar. Ann. Int. Med. Den. Res. 2020; 6(4):AN05-AN09.
18. Akbarzadeh SR, TaghaviGillani M, Tabari M, Morovatdar N. Comparative Analysis of the Usefulness of the GlideScope®, Macintosh, and McCoy Laryngoscopes for Endotracheal Intubation in Patients with Obesity: A Randomized, Clinical Trial. Anesth Pain Med. 2017;7(6):e57913. Published 2017 Dec 25. doi:10.5812/aapm.57913
19. Ahmad S, Ali Q, Jamal K, Kamal S, Pal K. A Prospective Randomized Study to Compare and Evaluate King Vision Video Laryngoscope and McCoy Laryngoscope as Intubating Devices in Adult Patients. JMSCR 2017;05:19319-26.
20. Elhadi SM, Rady WK, Elfadly AM. A comparative study between the macintosh laryngoscope and the king vision video laryngoscope in endotracheal intubation. Res OpinAnesth Intensive Care 2016;3:168-7
21. Rendeki, S., Keresztes, D., Woth, G., Mérei, Á., Rozanovic, M., Rendeki, M., … Nagy, B. (2017). Comparison of VividTrac®, Airtraq®, King Vision®, Macintosh Laryngoscope and a Custom-Made Videolaryngoscope for difficult and normal airways in mannequins by novices. BMC Anesthesiology, 17(1).doi:10.1186/s12871-017-0362-y
22. Avula RR, Vemuri NN, Tallapragada R. A prospective crossover study evaluating the efficacy of king vision video laryngoscope in patients requiring general anesthesia with endotracheal intubation. Anaesth Essays Res 2019; 13 : 36-39