Journal of Anesthesia and Clinical Research

Arafa and El-Sayed, J Anesth Clin Res 2018, 9:9
DOI: 10.4172/2155-6148.1000858

Research Article Open Access

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

Sherif Kamal Arafa* **and Amir Abouzkry El-Sayed**

Department of Anesthesia, Faculty of Medicine, Aswan University, Egypt

***Corresponding author:** Sherif Kamal Arafa, Department of Anesthesia, Faculty of Medicine, Aswan University, Egypt, Tel: 002-01005714014; E-mail: sherifarafa1020@gmail.com

Received date: September 17, 2018; **Accepted date:** September 24, 2018; **Published date:** October 01, 2018

Abstract

Objectives: A prospective randomized study to demonstrate the ease of intubation between Airtraq, King Vision video laryngoscope, and Macintosh laryngoscope, to compare the different laryngeal views and the need for assisted maneuvers, and hemodynamic changes during intubation in patients scheduled for one level cervical discectomy.

Materials & Methods: Ninety patients ASA I&II scheduled for one level cervical discectomy were randomly assigned into three groups to perform endotracheal intubation with Airtraq (group I; 30 patients), King Vision laryngoscope (group II; 30 patients), and Macintosh laryngoscope (group III; 30 patients). Intubation time and success rate for intubation were recorded. Also, observation and recording of vocal cord visualization using Cormack-Lehane grading and intubation difficulty score (IDS), complications and hemodynamic changes occurred with each aid.

Results: There were statistically significant differences between the three groups as regard the time needed for successful intubation, the need for assist maneuvers, quality of glottis view, and the incidence of complications during airways manipulations, with better results (less time taken for intubation, better glottis view, less IDS and less complications with more stable hemodynamics during intubation) for king Vision group compared with Airtraq and Macintosh laryngoscope groups.

Conclusion: King Vision laryngoscope had advantages of short time for intubation, almost, no complications occurred with it contrary to Airtraq or Macintosh laryngoscope and almost, no significant alterations in hemodynamics during intubation. It might give self-confidence to the anesthesiologist to use it easily, ensures intubation and permits many assistant doctors or trained residents to visualize the field during intubation.

Keywords: Cervical discectomy; Airtraq; King vision; Macintosh; Laryngoscope; Endotracheal intubation

Introduction

Cervical discectomy is a surgical procedure to manage nerve root or spinal cord compression by decompressing the spinal cord and nerve roots of the cervical spine. Careful airway assessment is critical in patients enrolled for cervical spine surgery. Difficult intubation may be anticipated if there is diminished neck movement, neck swelling or deformity. So, appropriate equipment and skilled staff must be made available [1,2]. There are many alternative methods for management of difficult intubation as direct laryngoscope with elastic stylet, airway scope, McCoy laryngoscope, fiberoptic laryngoscope, C-trach, intubating laryngeal mask, Bullard laryngoscope, C Mac D blade video laryngoscope and king vision video laryngoscope [3,4]. Direct laryngoscope could stimulate a noxious stimulus disturbing cardiovascular and respiratory systems [5]. The changes that occur during intubation in heart rate and blood pressure with short brief (1 min or 2 min) can be tolerated in patients with no history of any systemic diseases. While in patients with elevated blood pressure, coronary artery diseases and cerebrovascular insufficiency, there are risky unwanted side effects like increase in heart rates and hypertension which may lead to increase in myocardial O_2 demand and decrease in O_2 supply causing myocardial ischemia, cardiac dysrhythmias and cerebrovascular accidents [6]. King Vision video laryngoscope is the fastest and newest device that could produce perfect view for intubation through use of video and digital technology [7]. It provides a view of the glottis without alignment of the oral, pharyngeal and tracheal axes [8]. Both ordinary and king vision laryngoscopes consist of a handle and blade; however there is a video camera that is fitted at the end of the blade of the video laryngoscopy, facilitating approximate vision to glottis indirectly on a screen. Direct laryngoscope may be associated with intubation failure when laryngeal view couldn't be apparent due to restricted view of the airway structures. On the other hand; king vision overcomes this problem by improving laryngeal view [9]. Enhancement of laryngeal view is obligatory for successful intubations [10]. Airtraq is a recent device that was discovered before the King Vision [11,12]. It could enhance

the vision of larynx with less force needed than direct laryngoscope and less hemodynamic stress response to intubation [13].

Aim of Work

This is a prospective randomized study to demonstrate the time taken for intubation between Airtraq, King Vision video laryngoscope, and Macintosh laryngoscope, to compare the different laryngeal views and the need for assisted maneuvers to help for intubation, and hemodynamic changes during intubation in patients scheduled for one level cervical discectomy.

Materials and Methods

After approval of Institutional Ethical Committee, all patients included in the study signed written fully informed consent. This prospective single blinded randomized study was carried out on 90 patients scheduled for one level cervical discectomy under general anesthesia from April 2017 to April 2018. Patients included in this study were American Society of Anesthesiologists (ASA) I and II, aged 30-70 years. Patients with mallampati grade III and IV were also included in the study especially if they have mouth opening more than 18 mm. Patients excluded from this study were those at risk of gastric aspiration, coagulopathy, hepatic disorders with bleeding tendency, with history of any cardiac disorders, neck flexion deformity and patients with mouth opening less than 18 mm for males and 16 mm for females. Patients who refused the study protocol were also excluded from the study. Manual in-line stabilization of both head and neck was considered in all cases to prevent neurological damage during intubation.

Patients were randomly divided into three equal groups (30 patients for each group):

Group I

Intubation was done by Airtraq.

Group II

Intubation was done using king vision video laryngoscope.

Group III

Intubation was done using Ordinary laryngoscope (Macintosh blade).

Randomization was done using computer generated codes that were concealed in numbered opaque sealed envelopes. All patients were blinded to their intubation choice and each patient randomly chose the envelope that determined the group of assignment. A nurse not included in our study made group allocation and anesthesia teamwork were blinded also until the patient transferred to operating room and concealed envelops were opened. Intubation of trachea was done by one of three of anesthesiologists who were experienced for intubation at least 30 intubations with the new devices before the study.

Patients were premedicated with 7.5 mg midazolam oral tablet with sip of water and ondansetron 0.15 mg/kg intravenously before shift to operating room. In operating room, standard monitoring was attached as electrocardiogram, pulse oximetry and non-invasive blood pressure, and capnography was connected immediately after intubation to confirm correct placement of endotracheal tube together with chest auscultation. Pre-oxygenation with 100% O_2 for 5 min, then induction of anesthesia started with fentanyl 2 μg/kg, propofol 2 mg/kg body weight, muscle relaxant was given using succinylcholine 1.5 mg/kg intravenously, laryngoscopy was performed 60 sec after succinylcholine was given and endotracheal intubation was carried out depending on the group to which the patients were allocated. Anesthesia was maintained with isoflurane 1%-2% in an equal mixture of air and oxygen with atracurium and fentanyl as required. After intubation any changes occurred in hemodynamics were treated with fentanyl 50 μg and increasing the inhalational anesthetic concentrations. No any medication or steps or lignocaine spray used or performed during the 5 min data collection period after intubation. After successful best visualization of glottis two different anesthesiologist were employed to record the vocal cord visualization using the Cormack-Lehane grading (grade 1-4) [14].

If visualization of glottis was still not apparent for preceding the intubation; manipulations were performed as prescribed in the manual instruction of the device. The appropriate sized endotracheal tube (7.0 mm for women, 8.0 mm for men) was introduced under vision. Lastly the scope was removed and the anesthetic circuit was connected.

Confirmation of correct endotracheal tube insertion and appropriate ventilation were confirmed by the waves of capnography and auscultation of the chest bilaterally. Once intubation was achieved, lungs were mechanically ventilated during the procedure and anesthesia was continued. If first trial of intubation was proceeded unsuccessfully, a second trial was performed after mask ventilation for one minute provided that good oxygen saturation was maintained. In each group, tracheal intubation was considered a failure if it could not be completed in 3 trials.

Patients after three trials failure of intubation was planned to be excluded from the study, a laryngeal mask to be inserted then, planned to wake up the patient for a planned awake fiberoptic intubation later on. All trials should be done by anesthesiologists who were experienced before with the devices.

Study Design

Primary outcome was the time taken for intubation (defined as the time taken for placement of laryngoscope blade between incisors till confirmation of tube placement by capnography).

Secondary outcomes were the number of intubation trials, the number of optimization maneuvers required (use of stylet, laryngeal manipulation, change in blade sizes, external pressure) to help in tracheal intubation, the intubation difficulty score (IDS) [15]. If IDS more than 5, this indicated major difficulty for intubation, IDS range from 1-5 indicated slight difficult intubation, IDS equal zero indicated easy intubation and percentage of successful intubation trials. Also, the incidence of complications as sore throat, mucosal, lip, tongue trauma, misdirection of tube into esophagus, dental injury or bleeding, incidence of arrhythmia, hypertension, decrease O_2 saturation and failure to intubate (failed intubation was considered if any trial for intubation taken >120 sec or inability to intubate) were also recorded. Haemodynamics parameters (heart rate, mean blood pressure) and oxygen saturation were also recorded at baseline, post induction before insertion of endotracheal tube, immediately after intubation and at 3, 5, 8 minutes post intubation.

Power of Study

The time taken for intubation, upon which the calculation of the sample size was done. Based on the results of a previous study [16], the mean time for intubation with the Macintosh blade was 41.22 sec, so, 25 patients were needed to detect a significant difference in the intubation time of 5 sec with a standard deviation of 4.72 sec at α error of 0.05 and power of study of 95%. We enrolled 30 patients per group to compensate for possible dropouts.

Statistical Analysis

The statistical software SPSS 16 (SPSS Inc., Chicago, IL, USA) was utilized for statistical analysis. The Kolmogorov-Smirnov test was performed to check the assumption of normality. The Quantitative data were expressed as mean ± standard deviation (SD) and analyzed utilizing One-way ANOVA with post hoc Turkey's HSD Test. Qualitative data were expressed as frequency and percentage and were analyzed utilizing the Chi-square test. Within each group, the numerical data were compared utilizing repeated measures analysis of variance while the non-parametric data were analyzed utilizing the Freidman test. P value<0.05 was considered significant.

Results

One hundred and ten patients were scheduled for our study. Twelve patients did not meet our inclusion criteria and eight patients declined to participate (Figure 1), so our study was proceeded on 90 patients (30 for each group), the results were scheduled and organized in tables and figures manners to each patients exposed in our study. Demographically, categories showed no significant differences as regard age, sex, body mass index (BMI), ASA parameters and Mallampati classification between studied groups (Table 1).

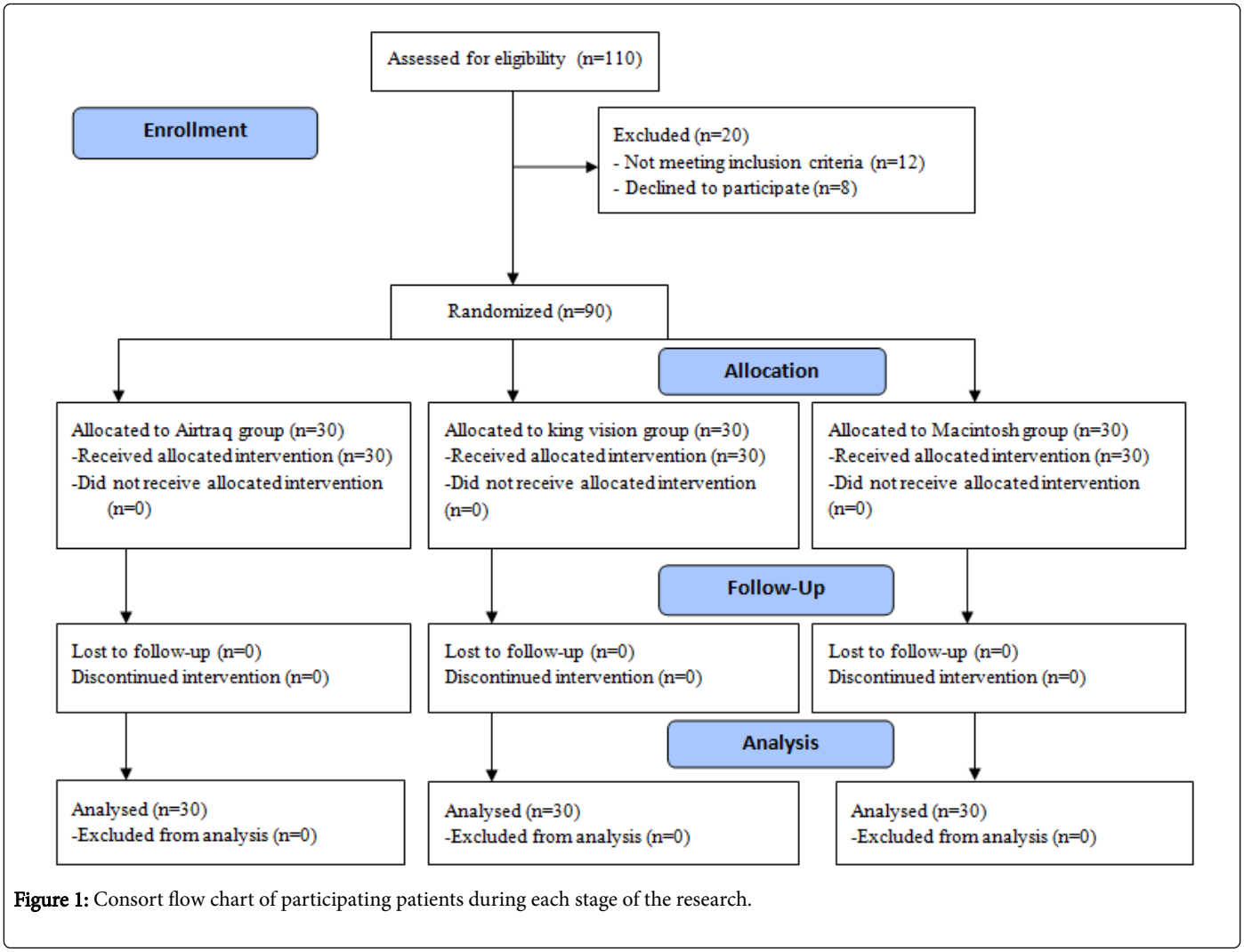

Figure 1: Consort flow chart of participating patients during each stage of the research.

There were significant differences between studied groups as regard time taken for intubation in seconds (Figure 2) and number of trials for intubation between studied groups with less time taken for intubation, better percentage, intubation done from the first time with king vision laryngoscope group in comparison with other two groups (group II>group I>group III). There was no statistically significant difference between groups as regard percentage of successful intubation trials (Table 2).

With more expectation of difficulty and more precise assessment of airway view there was the Cormack and Lehane glottis view with different grades, there was no statistically significant difference between studied groups with better view of glottis and scores in group

II (king vision laryngoscope) in comparison with other groups. Grade I; there was 56.7% of patients with Airtraq, 66.6% of patients with king vision and 50% with Macintosh. Grade II; there was 30% of patients with Airtraq, 26.7% of patients with king vision, 30% of patients with Macintosh. Grade III; there was 13.3% of patients with Airtraq, 6.7% of patients with king vision and 20% of patients with Macintosh (group II>group I>group III) (Figure 3).

		Airtraq	King vision laryngoscope	Macintosh Laryngoscope	p-value
Age	Mean ± SD	39.24 ± 10.95	37.49 ± 11.28	38.74 ± 10.76	0.485
BMI	Mean ± SD	29.6 ± 3.49	28.68 ± 5.23	30.49 ± 4.97	0.317
Sex	Male (%)	14 (46.7%)	18 (60%)	22 (73.3%)	0.108
	Female (%)	16 (53.3%)	12 (40%)	8 (26.7%)	
ASA	I	17 (56.7%)	19 (63.3%)	21 (70%)	0.563
	II	13 (43.3%)	11 (36.7%)	9 (30%)	
Mallampati classification	I	16	13	20	0.603
	II	9	10	7	
	III	4	5	3	
	IV	1	2		

Table 1: Demographic data as regard age, Body mass index (BMI), Sex, ASA categories and Mallampati classification between Airtraq, King vision laryngoscope and Macintosh laryngoscope. Data presented as mean ± SD or patients numbers and percentages.

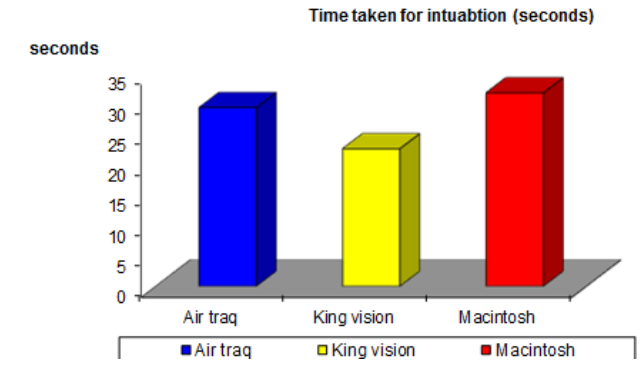

Figure 2: Intubation time in seconds between studied groups.

		Air traq (n=30)	King vision (n=30)	Macintosh (n=30)	p-value
Time taken for intubation (seconds)		29.41 ± 7.85	22.63 ± 5.61	31.84 ± 7.42	0.001*
Number of trials for intubation	**1**	23 (76.7)	28 (93.3%)	18 (60%)	0.014*
	2	7 (23.3%)	2 (6.7%)	9 (30%)	
	3	0 (0%)	0 (0%)	3 (10%)	
Successful intubation		30 (100%)	30 (100%)	30 (100%)	1

Table 2: Time taken for intubation in seconds, number of trials for intubation and percentage of successful intubation between studied groups. Data presented as mean ± SD or patients numbers and percentages. * Denoted statistically significant difference (P<0.05).

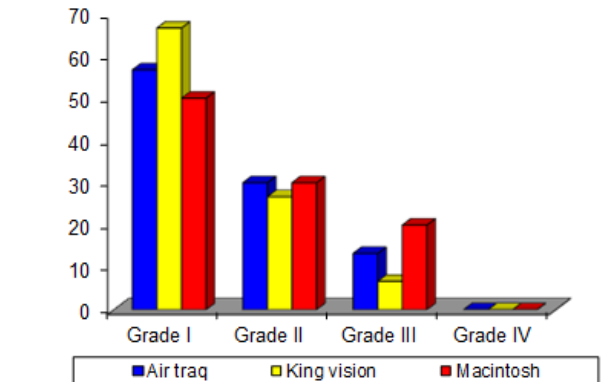

Figure 3: The Cormack and Lehane score during 1st trial with each group.

Intubation difficulty score	Degree of intubation difficulty	Airtraq		King vision laryngoscope		Macintosh laryngoscope	
		N	%	N	%	N	%
0	Easy	15	50%	22	73.30%	9	30%
1-5	Slight difficulty	9	30%	6	20%	11	36.70%
>5	Moderate to major difficulty	6	20%	2	6.70%	10	33.30%
Chi-square	X^2	12.582					
	P-value	0.014*					

Table 3: Intubation difficulty score between Airtraq group, king vision laryngoscope group and Macintosh laryngoscope group. Data presented as patients numbers and percentages. *Denoted statistically significant difference (P<0.05).

Focusing on intubation difficulty score, there was statistically significant differences between group I (Airtraq), group II (king vision laryngoscope) and group III (Macintosh laryngoscope). With less difficulty score in group II when compared to the other groups, as with score 0 (easy intubation), there was 50% of patients with Airtraq, 73.3% of patients with king vision and 30% of patients with Macintosh laryngoscope. While in score 1-5 (slight difficult intubation), there was 30% of patients with Airtraq, 20% of patients with king vision and 36.7% with Macintosh laryngoscope. With more than 5 of the score (moderate to major difficult degree of intubation), there was 20% with

Airtraq, 6.7% with king vision and 33.3% with Macintosh laryngoscope (Table 3).

Focusing upon assisted maneuvers used during manipulation, there was significant differences between three groups. No need for assisted maneuvers used for easing intubation in king vision group as compared with other two groups (group II>group I>group III) (Figure 4).

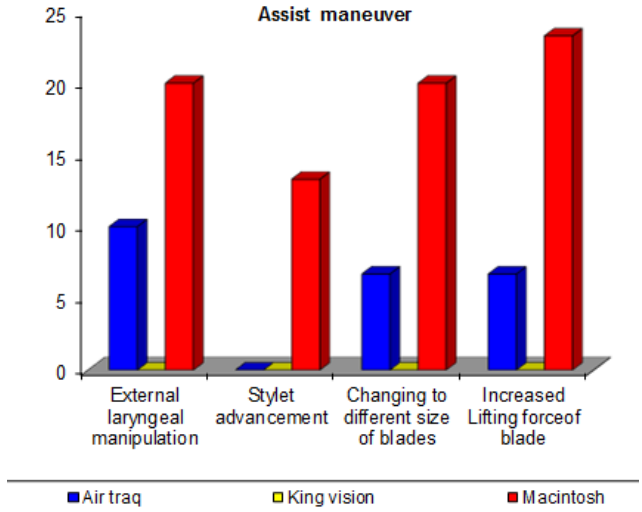

Figure 4: Assisted maneuvers during manipulation between studied groups.

With more attention to complications of each device during manipulation, there were less or no complications with king vision laryngoscope in comparison with other two groups with no statistically significance difference between studied groups (group II>group I>group III) (Table 4).

Complications	Group I		Group II		Group III		X^2	P-value
	N	%	N	%	N	%		
Airway Injury/ Sore throat	3	10%	1	3.30%	6	20%	4.273	0.118
Esophageal intubations	0	0	0	0	0	0	-	-
Decrease Oxygen saturation	0	0	0	0	0	0	-	-
Failure to intubations	0	0	0	0	0	0	-	-
Incidence of hypertension and arrhythmia	2	6.70%	1	3.30%	4	13.30%	2.172	0.338

Table 4: Complications of each device during manipulation between studied groups. Data presented as patients numbers and percentages.

Oxygen saturation was measured at different times with each device enrolled in our study; there was no significant difference between three groups at base line time, post induction before intubation, immediately after intubation and after 8 min; while after 3, 5 min of intubation there was significant differences between three groups with better proof with group II than other two groups (Figure 5 and Table 5).

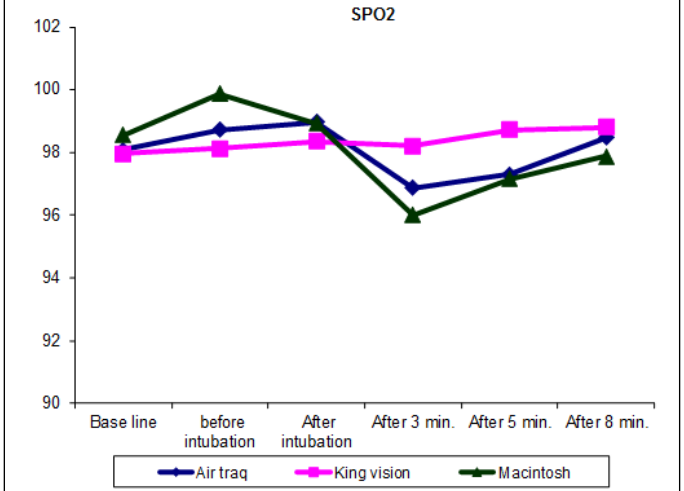

Figure 5: Oxygen saturation at different times between studied groups.

SPO2	Air traq (n=30)	King vision (n=30)	Laryngoscope (n=30)	p-value
Base line	98.08 ± 0.70	97.96 ± 0.61	98.56 ± 0.51	0.409
Post induction before intubation	98.72 ± 0.46	98.12 ± 1.05	99.88 ± 0.33	0.361
Immediately after intubation	98.96 ± 0.79	98.36 ± 0.81	98.92 ± 0.86	0.327??
After 3 min	96.88 ± 0.46	98.21 ± 0.65	96.00 ± 0.94	0.005*
After 5 min	97.30 ± 0.47	98.72 ± 0.54	97.16 ± 0.65	0.019*
After 8 min	98.47 ± 0.61	98.80 ± 0.70	97.88 ± 0.72	0.124

Table 5: Oxygen saturation at different times between studied groups.

Heart rate measured at different times with each device involved in study; showed no significant differences between three groups at base line measurement up to time of 3 min after intubation; otherwise there was increase in heart rate at 5 min with Macintosh group other than two groups with significant differences between studied groups, after that at 8 min heart rate regain to decrease with no significant differences between studied groups as shown in (Table 6). The same with mean arterial blood pressure no significant differences were observed between three groups from base line time up to 3 min after intubation; while at 5 min after intubation there was increase in mean arterial blood pressure in Macintosh group other than two groups with significant differences between three groups; while at 8 min after intubation mean blood pressure regain to be lowered in all groups with no significant differences between studied groups (Table 6).

	Vital signs	Air traq (n=30)	King vision (n=30)	Macintosh Laryngoscope (n=30)	p-value
Base line	HR	79.60 ± 7.08	79.88 ± 7.78	79.94 ± 4.23	0.462
	MBP	86.04 ± 5.56	85.96 ± 6.72	86.64 ± 5.81	0.367
Post induction before intubation	HR	79.72 ± 3.54	80.48 ± 6.53	80.28 ± 6.88	0.411
	MBP	90.60 ± 5.55	89.48 ± 5.67	89.92 ± 3.82	0.319
Immediately after intubation	HR	88.44 ± 3.53	88.03 ± 6.99	89.72 ± 6.01	0.394
	MBP	96.04 ± 4.12	95.96 ± 6.59	96.80 ± 2.35	0.213
After 3 min	HR	86.28 ± 6.17	86.12 ± 6.11	86.80 ± 5.33	0.152
	MBP	94.48 ± 4.93	94.00 ± 5.94	95.72 ± 3.29	0.209
After 5 min	HR	85.60 ± 3.65	80.64 ± 4.25	85.76 ± 4.96	0.001*
	MBP	93.08 ± 3.91	88.52 ± 2.20	94.52 ± 4.22	0.001*
After 8 min	HR	81.64 ± 4.69	80.26 ± 6.01	81.84 ± 6.34	0.218
	MBP	86.48 ± 2.76	85.24 ± 1.89	86.92 ± 4.78	0.198

Table 6: Heart rate (HR) and Mean arterial blood pressure (MBP) at different times between studied groups. Data presented as mean ± SD. * Denoted statistically significant difference (P<0.05).

Discussion

There were many problems still enrolled in anesthesia stepwise, the most challenges that facing the anesthesiologist was that of difficult intubation especially if it was unexpected from the first time. The present study was designed to compare the efficiency of alternative techniques available for intubation in adult patients scheduled for one level cervical discectomy. The aim of our study is to check which aid can help to achieve a faster time for intubation to attenuate the hemodynamic changes that may be occurred during intubation to help to preclude the myocardial ischemia, cardiac unwanted effects and other traumatic complications which have hazardous print to the patients. We were scheduled and organized the patients to undergo intubation by new and recent techniques that may overlap the difficulty of intubation and attenuates the hemodynamic changes that may be occurred with ordinary or old techniques. Devices that represented in our study were Airtraq® and king vision video laryngoscopes compared with Macintosh laryngoscope.

No statistical differences could be detected as regard demographic parameters as age, sex, Body mass index (BMI) and ASA classification of patients as no changes occurred on patients stability during endotracheal intubation ; this was in alignment with Ralph et al. [17] who documented the study on cardiac patients with ASA physical status class III.

In our study short time was required for intubation with King Vision in contrast with Airtraq and Macintosh laryngoscope. While as regard number of trials to proceed to successful intubation, it was found that king vision laryngoscope was the best in relation to the other groups and made significant differences between groups. While with air traq® it was more than king vision (as regard number of trials to proceed to successful intubation) but better than Macintosh laryngoscope.

As regard to percentage of successful intubation, it was 100% in all groups. Our results were on the contrary with DA Sun et al. [8] that had illustrated that average time was longer with glide scope in comparison with ordinary laryngoscope for elective surgery because of many techniques needed to manipulate the tube; while our results were coincided with study by Marrel et al. [18] that illustrated short time for intubation with video laryngoscope compared to others groups.

According to Cormack and Lehane scale; there was better view of glottis with king vision laryngoscope in comparison with other two groups (Airtraq and Macintosh group). This was in line with a study conducted with Valencia et al. [19] that reported a significant improvement of glottic view in patients without predictors of difficult airway with king vision laryngoscope versus ordinary laryngoscope.

Focusing on Intubation difficulty scale that range from zero to five, our study was in line with a study for Andersen et al. [20] that documented that intubation difficulty scale was lower with king vision in comparison with Macintosh laryngoscope, this was attributed to best view of glottis and less lifting force required on the laryngoscope.

Our study results as regarding complications of each device used for intubation; there were almost no complications occurred with king vision laryngoscope except one patient only with sore throat and one patient with elevated blood pressure and arrhythmia, all were much less than other groups. This was in line with study by Ali et al. [21] that documented that less airway complications with king vision laryngoscope. While controversy with our result was that study by Jagannathan et al. [22] that viewed complications was not different between devices when king vision laryngoscope compared with Miller laryngoscope. Also in contrast with our study was the study by Soliman et al. [5] who found that trauma and bleeding of oral cavity during intubation was with high score with glide scope than with ordinary laryngoscope.

In our study with respect to assisted maneuvers; in king vision laryngoscope no need for external laryngeal manipulation, and not essential to apply force on laryngoscope to increase the force of elevation to best view of glottis. This make statistically significant differences between the three groups with better outcomes with king vision laryngoscope only in comparison with other two devices. While in Airtraq group there was less need for assisted maneuvers during intubations than in Macintosh laryngoscope group with statistical significant difference between Airtraq and Macintosh laryngoscope groups. These results of our study were in line of study by Elhadi et al. [10] that documented that less assisted techniques maneuvers with king vision laryngoscope compared with Macintosh laryngoscope that it presented easier way for intubation. On the contrary to our study was study by Michael et al. [9] that approved in his study that use of a gum elastic stylet or external manipulation were less needed with ordinary laryngoscope. Also controversy to our study was the study by Andersen et al. [20] that showed less need for more lifting force applied on ordinary laryngoscope. Also, an opposite study to our study was done by Sarkilar et al. [23] that documented that study on king vision and ordinary laryngoscope approved the view of glottis was better using king vision laryngoscope but the use of bougie, external manipulation and attempts of intubation were the same with both king vision and ordinary laryngoscope.

Focus on hemodynamic changes (Heart rate and mean arterial blood pressure) during manipulation of airways; there were minimal changes occurred during king vision laryngoscope in comparison with other devices used in this study with no statistical differences between

them. (Significant statistical differences between the three groups as regard hemodynamic changes occur only 5 min after intubation, with minimal changes in king vision group than other two groups (Airtraq and Macintosh groups); may be due to pressor response after intubation which was much less in king vision group than other two groups (Airtraq and Macintosh groups) may be due to short time of intubation and less number of trials required to proceed to successful intubation). These results coincide with study by Elhadi et al. [10] that showed maintenance of hemodynamic stability during manipulation of airway by king vision laryngoscope. In other side with our study, there was study by Kanchi et al. [24] who reported that no significant alteration between king vision, Airtraq and Macintosh as regarding the hemodynamic changes during airway manipulation for intubation and also his study conducted that video laryngoscope did not offered any advantages in hemodynamic responses to tracheal intubation and uses of laryngoscope.

Conclusion

King vision laryngoscope appears to be the simplest and easy maneuver to be used after having experience in its use. It has advantages of short time for intubation, no need for more trials, almost no complications occurred with it like Airtraq or Macintosh laryngoscope and no significant alterations in hemodynamics in response to intubation. Even King vision laryngoscope gives the trust and self-confidence to the anesthesiologist to use it easily, ensures the intubation and permits many assistant doctors or trained residents to visualize the field during intubation at the same time.

Limitations of the Study

These alternative devices for difficult cases of intubation are a part of safety and efficiency methods for patients and doctors, so there were some limitation of our study; first, restricted range of cases of different intubations. Second, larger sample size required to be evaluated for efficiency of alternative techniques. Future studies were recommended for more assessment and achieving more promising value of these alternative techniques.

Conflict of Interest

The authors declare no conflict of interest, financial or otherwise.

References

1. Manninen PH, Jose GB, Lukitto K, Venkatraghavan L, El Beheiry H (2007) Management of the airway in patients undergoing cervical spine surgery. J Neurosurg Anesthesiol 19: 190-194.
2. Hart RA, Tatsumi RL, Hiratzka JR, Yoo JU (2008) Perioperative complications of combined anterior and posterior cervical decompression and fusion crossing the cervico-thoracic junction. Spine 33: 2887-2891.
3. Bilgin H, Bozkurt M (2006) Tracheal intubation using the intubating laryngeal mask airway, C- Trach or McCoy laryngoscope in patients with simulated cervical spine injury. Anesthesia 61: 685-691.
4. Henderson (2010) Airway management in the adult. Miller's Anesthesia 7th (edn) Philadelphia: Churchill Livingstone.
5. Soliman R, Mofeed M, Alamoudy O, Farouk A (2015) Prospective randomized study between Macintosh and Glide scope in adults' patients undergoing cardiac surgery. Egypt J Cardiothoracic Anesth 9: 8-13.
6. Vanilla Chopra VG, Lone AQ, Naqash IA (2017) Comparison of hemodynamic changes in responses to endotracheal intubation and laryngeal mask airway in controlled hypertensive patients a randomized study. J Evolution Med Dent Sci 6: 1313-1316.
7. Paolini JB, Donati F, Drolet P (2013) Review article: Video- laryngoscopy: another tool for difficult intubation or a new paradigm in airway management? Can J Anesth 60: 184-191.
8. Sun DA, Warriner CB, Parsons DG, Klein R, Umedaly HS, et al. (2005) The glideScope video laryngoscope: Randomized clinical trial in 200 patients. Br J Anaesth 94: 381-384.
9. Aziz MF, Dillman D, Fu R, Brambrink AM (2012) Comparative effectiveness of the videolaryngoscopy versus direst laryngoscopy in the setting of the predicted difficult airway. Anaesthesiology 116: 629-636.
10. Elhadi SM, Rady WK, Elfadly AM (2016) A comparative study between the Macintosh laryngoscopy and the king vision laryngoscopy in endotracheal intubation. Res Opin in Anaesth Intens Care 3: 168.
11. Ehsan AQ, Obaid AS, Hussain AS, Nesar AM (2010) Awake Airtraq intubation in an immobile neck--a case report. Acta Anaesthesiol Belg 63: 135-137.
12. Ali QE, Siddiqui OA, Amir SH, Ahmed ZS (2012) Airtraq® optical laryngoscope for tracheal intubation in patients with severe ankylosing spondylitis: A report of two cases. Indian J Anaesth 50: 142-153.
13. Ali QE, Siddiqui OA, Amir SH, Azhar AZ, Ali K (2012) Airtraq® optical laryngoscope for tracheal intubation in patients with huge lipoma at the nape- a case report. Rev Bras Anaesthesiol 62: 736-740.
14. Cormac RS, Lehane J (1984) Difficult intubation in obstetrics. Anaesthesia 39: 1105-1111.
15. Adnet F, Borron SW, Racine SX, Clemessy JL, Fournier JL, et al. (1997) The intubation Difficulty Scale (IDS): Proposal and evaluation of a new score characterizing the complexity of endotracheal intubation. Anaesthesiology 87: 1290-1297.
16. Das B, Bhandari G, Shahi KS, Mitra S, Kumar AA (2015) 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. J Anaesth Crit Care 1: 10448.
17. Ralph LJ, Pieters BG, Maathuis MA, Sarroyen JJ, Marco MN, et al. (2012) Endotracheal intubation using video-laryngoscopy causes less cardiovascular responses compared to classic direct laryngoscopy. Acta Anaesthesiology Belg 634: 181-186.
18. Marrel J, Blanc C, Frascarolo P, Magnusson L (2007) Video laryngoscopy improves intubation condition in morbidly obese patients. Eur J Anaesthesiol 24: 1045-1049.
19. Valencia JA, Pimienta K, Cohen D, Benitez D, Romero D, et al. (2016) A comparison of king vision laryngoscopy and direct laryngoscopy as performed by residents: A randomized controlled trial. J Clin Anaesth 35: 571-575.
20. Andersen LH, Rovsing L, Olsen KS (2011) Glide Scope video-laryngoscope versus Macintosh direct laryngoscope for intubation of morbidity obese patients: a randomized trial. Acta Anaesthesiology Scand 55: 1090-1097.
21. Ali QE, Amir SH, Jamil S, Ahmed S (2015) A comparative evaluation of Airtraq and king vision video laryngoscope as an intubating aid in adult patients. Acta Anaesthesiology Belg 66: 81-85.
22. Jagannathan N, Hajduk J, Sohn L, Huang A, Sawardekar A, et al. (2017) Randomized equivalence trials of the king vision a blade video laryngoscope with the Miller direct laryngoscope for routine tracheal intubation in children <2 years of age. Br J Anaesth 118: 932-937.
23. Sarkilar G, Sargin M, Saritas TB, Borazan H, Gok F, et al. (2015) Hemodynamic responses to endotracheal intubation performed with video and direct laryngoscopy in patients scheduled for major cardiac surgery. Int J Clin Exp Med 8: 11477-11483.
24. Kanchi M, Nair HC, Banakal S, Murthy K, Murugesan C (2011) Hemodynamic response to endotracheal intubation in coronary artery diseases: Direct versus video laryngoscopy. Indian J Anaeth 55: 260-265.