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Original Article

Comparison of Airtraq Laryngoscope and Macintosh Laryngoscope in Patients Undergoing Tracheal Intubation with Simulated Cervical Spine Immobilization

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ABSTRACT

Introduction: Cervical spine immobilization using cervical collar is part of the recognized protocol of managing patients with actual or suspected cervical spine injury. The Airtraq laryngoscope makes it possible to intubate the airway with minimal optimization manoeuvre. This study sought to assess and compare tracheal intubation using Airtraq and Macintosh laryngoscopes in patients with simulated cervical spine immobilization. **Methodology:** This was a randomized single blind prospective study among 58 consenting adults with ASA I and II scheduled for elective surgeries requiring intubation in Jos University Teaching Hospital (JUTH). Patients who had cervical collar were randomized into two equal groups; one group had tracheal intubation using Macintosh laryngoscope and the other with Airtraq laryngoscope. Duration of laryngoscopy and intubation, ease of intubation, haemodynamic response and complications were noted. Data was analysed using SPSS with students t-test and Chi square being statistical tests of choice. Significance was set at p=0.05. **Results:** The study groups were comparable in characteristics. No significant statistical difference in intubation difficulty scale (IDS) between groups (p=0.08) with ease in intubation of 93.1% and 72.4% patients in Macintosh and Airtraq groups respectively. The duration of laryngoscopy and intubation was shorter in the Macintosh group compared with the Airtraq group (p=0.001). The intergroup differences in the haemodynamic responses to laryngoscopy was not statistically significant as well as the recorded complications between the study groups. **Conclusions:** This study found comparable ease of intubation between Airtraq and Macintosh laryngoscopes with the experience of the laryngoscopist influencing the ease of intubation. The fact that haemodynamic responses and complications were similar between patient groups intubated with Macintosh or Airtraq Macintosh laryngoscopes means that either can be used where proficiency is not in doubt.

Keywords: Airtraq, Macintosh, Laryngoscope

INTRODUCTION

Cervical spine is the most commonly injured segment of the spinal cord in Nigeria especially when injuries are associated with head injuries accounting for about 53 – 55% of spinal cord injuries. A multicentre analysis in Southeast Nigeria has shown that cervical spine injury (CSI) accounted for 55% of all injuries to the spinal cord.[1,2] Cervical spine immobilization using cervical collar is part of the recognized protocol of managing patients with actual or suspected cervical spine injury.[3,4] Immobilization during intubation can be achieved using either manual in-line axial stabilization (MIAS) or by leaving the cervical collar in place. Failure to immobilize the neck can lead to devastating neurological outcome.[5] A key concern however, is the fact that with the cervical spine immobilized, it becomes more difficult to visualize

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the larynx using conventional direct laryngoscopy.[6, 7] Inability to visualize the larynx may lead to failure to intubate the trachea and secure the airway which remains the leading cause of morbidity and mortality in the practice of anaesthesia.[8, 9] The Airtraq laryngoscope is meant to be a single use optical laryngoscope designed to facilitate tracheal intubation in patients with either normal or difficult airways.[10] It makes it possible to intubate the airway with minimal optimization manoeuvre and without the patient being in the 'sniffing-air' position. The Airtraq has shown some advantages compared with the Mcintosh laryngoscope in simulated difficult intubation scenarios, including reduced cervical spine mobility in manikins and when used by both novice and experienced users.[11-13]

This study therefore sought to assess and compare the ease, duration, haemodynamic changes and complications of tracheal intubation using Airtraq and Macintosh laryngoscopes in patients with simulated cervical spine immobilization. We hypothesize that there will be no difference in the intubating conditions using Airtraq laryngoscope compared with Macintosh laryngoscope in patients with cervical spine immobilization using cervical collar.

METHODOLOGY

This was a randomized single blind prospective study carried out in a tertiary health institution in North-central Nigeria. Patients included for this study were all American Society of Anesthesiologists (ASA) physical status I and II patients, aged 18 – 60 years, scheduled to undergo elective surgical procedures that required tracheal intubation. Patients with risks factors for gastric aspiration and/or predicted difficult intubation (Mallampati class III or IV, thyromental distance less than 6.5cm, inter-incisor gap less than 4cm), and actual or suspected cervical spine injuries were excluded from the study. The sample size for this study was estimated from the formula for experimental study design incorporating two equal groups.[14] A 95% confidence interval and 80% power of the study were considered which corresponded to $Z_{\alpha} = 1.96$ and $Z_{\beta} = 0.84$. P1 and P2 were assumed from a previous study to be 83.4% and 46.7% respectively.[15] This gives a sample size of 29 patients per group with a 10% attrition rate included. Sampling of patients who met the inclusion criteria for this study was done through the purposive sampling techniques and randomization was done using the balloting method into groups A and M representing Airtraq group and Macintosh group respectively. All patients were visited a day before surgery for pre-operative assessment including airway assessment and informed consent was obtained. They all had routine investigations including packed cells volume (PCV), electrolytes, urea, creatinine and any other investigations that were deemed necessary were reviewed. Patients were fasted before surgery according to standard fasting guidelines. Demographic data such as age, sex, weight and height were collected during the pre-operative visit. Anxiolytic premedication (oral diazepam 10mg) was given to all patients the night before surgery at bed time.

On the morning of the surgery, patients were randomly assigned to either Airtraq or Macintosh groups as described earlier. Patients were blinded to their group. Standard monitoring for pulse rate, non-invasive blood pressure, electrocardiography (ECG), pulse oximeter and capnogragh was done and baseline values recorded using the GE DASH 4000 multi-parameter monitor. Before induction of anaesthesia, intravenous access was secured and all patients were premedicated using 0.01mg/kg of intravenous glycopyrrolate and intravenous pentazocine at 0.5mg/kg. The patients were then pre-oxygenated with 100% oxygen for 3 minutes and mask ventilation was tested before induction of general anaesthesia. Intravenous propofol (2-3mg/kg) was administered until loss of verbal contact. Isoflurane 1.5-2% was introduced and then intravenous atracurium 0.5mg/kg was given to facilitate tracheal intubation. After 3 minutes of atracurium administration, the neck was immobilized using an appropriate-sized cervical collar.

In group Macintosh, direct laryngoscopy and tracheal intubation was carried out by the researcher who is an experienced senior registrar in anaesthesia using appropriate-sized Macintosh laryngoscope blade and ETT. Laryngoscopy was carried out and the ETT was passed and then connected to the breathing circuit; an attached capnogragh was used to confirm correct placement. The chest was auscultated for bilateral air entry and the ETT adjusted accordingly and secured. In group Airtraq, the Airtraq video laryngoscope was used for laryngoscopy and intubation by the researcher who is an experienced senior registrar in anaesthesia using appropriate-sized ETT, but has limited exposure with the airtraq. The Airtraq device was switched on 1 minute before the intubation to activate the antifogging system. It was then connected to a wireless display monitor.

Appropriate-sized ETT was lubricated and pre-loaded into the ETT channel. Airtraq laryngoscope was held by the left hand and then passed into the mouth in the midline over the centre of the tongue keeping the tip at the vallecula and elevating the blade thereby lifting the epiglottis. When the glottis was in the centre of view, the ETT was passed from its position in the channel through the vocal cords. The ETT was connected to the breathing circuit which was already attached to a capnogragh and correct placement was confirmed.

The duration of intubation was defined as the time taken from insertion of the laryngoscope tip between the teeth to the appearance of square wave on the capnograph. An attempt was considered 'failed' if it exceeded 120 seconds or if there was drop in oxygen saturation below 92%. If an intubation attempt failed, the patient was gently mask ventilated for 1 minute using 100% oxygen and isoflurane 1.5% - 2% and a second attempt with the primary device was performed. In case of failure of second attempt, a third attempt was performed with the alternate device (using Airtraq in group Macintosh or using Macintosh in group Airtraq). If the third attempt failed, cervical collar would be removed and conventional laryngoscopy and intubation in sniffing position was done.

The following parameters were observed and recorded: duration of laryngoscopy, duration of laryngoscopy and intubation, ease of intubation was assessed using intubation difficulty scale (IDS) score and presence of soft tissue or dental trauma was noted. Also, haemodynamic response to laryngoscopy like changes in heart rate, systolic blood pressure, diastolic blood pressure and mean arterial blood pressure were recorded. Duration of laryngoscopy was measured using a stopwatch and recorded as T1. Duration of laryngoscopy and intubation was measured using a stopwatch and was recorded as T-total. Duration of laryngoscopy was defined as time from introduction of the laryngoscope into the oral cavity till observation of the best glottic view with or without optimal external laryngeal manipulation (OELM); while the duration of intubation was defined as the time taken from insertion of the laryngoscope tip between the teeth to the appearance of square wave on the capnograph. Oxygen saturation was monitored continuously from beginning to the end of the study. The complication associated with laryngoscopy was noted and graded as well. Ease of intubation was assessed using the intubation difficulty scale (IDS) score as developed by Adnet et al.[16] Degree of difficulty was considered easy, slightly difficult, moderate to major difficult or impossible intubation according to values of IDS which included both objective and subjective parameters.[16]

The data was analysed using SPSS 20.0 version. The categorical data were expressed in terms of rates, ratios and percentages while continuous data were expressed as mean ± standard deviation. Significance was tested with allowable error of 5%. Student's t-test was used to find the significance of the study parameter on continuous scale between groups. Chi-square test was used to find association between classes of variables. A probability value ($p \leq 0.05$) at 95% confidence interval was considered statistically significant. Ethical clearance was obtained from the institutional Ethical committee, and a written informed consent of each participant was obtained.

RESULTS

A total of 58 patients were randomly assigned to undergo endotracheal intubation using either the Macintosh laryngoscope (n=29) or the Airtraq laryngoscope (n=29). All the 58 enrolled patients were included in the final analysis. The study participants comprised of more females (58.6%) than males (41.4%). The mean age of the study participants was 39.2±13.0 years. The study groups were comparable in all assessed characteristics except in height which

Table I Characteristics of Study Participants between groups

Characteristics	Airtraq	Macintosh	Total		p-value
Gender (number/percent)				X^2	
Male	11(37.9)	13(44.8)	24(41.4)		
Female	18(62.1)	16(55.2)	34(58.6)	0.284	0.595
ASA status				X^2	
I	15(51.7)	19(65.5)	34(53.6)		
II	14(48.3)	10(34.5)	24(41.4)	1.137	0.286
Age (mean±SD)				t -test	
	39.1±12.6	39.2±13.6	39.2±13.0	0.020	0.984
Anthropometric				t -test	
Weight (kg)	63.9±6.5	65.3±7.3	64.6±6.9	0.741	0.462
Height (m)	1.65±0.05	1.62±0.05	1.63±0.05	2.392	0.020
BMI (kg/m^2).	23.5±1.9	23.80±2.1	23.7±2.0	0.588	0.559
TMD (cm).	8.9±1.1	9.3±1.2	9.1±1.1	1.161	0.251
IIG (cm).	6.0±0.2	6.0±0.0	6.0±0.1	1.000	0.322
Mallampati (number/percent)				X^2	
I	15(51.7)	16(55.2)	31(53.4)		
II	14(48.3)	13(44.8)	27(46.6)	0.069	0.792

Table II Ease of Laryngoscopy between study groups

IDS Score (number/percent)	Airtraq	Macintosh	Total	Fishers p-value
0	21(72.4)	27(93.1)	48(82.8)	
1-5	7(24.1)	2(6.9)	9(15.5)	
Infinity	1(3.4)	0(0.0)	1(1.7)	0.079

Table III Duration of Laryngoscopy and Intubation between study groups

Characteristics	Airtraq	Macintosh	Overall	t-test	Fishers p-value
Duration of Laryngoscopy (sec)	18.5±8.3	9.5±2.4	64.6±6.9	5.613	<0.001
Duration of Laryngoscopy and Intubation (sec)	32.0±17.4	17.1±4.4	1.6±0.05	4.461	<0.001

Table IV Mean Haemodynamic changes between study groups at baseline and first five minutes post-intubation

Characteristics	Airtraq	Macintosh	t-test	p-value
Heart Rate (beats/min)				
0	85.55± 13.81	80.90±12.41	1.350	0.183
1	109.71±26.31	97.17±15.48	0.342	0.733
2	108.43± 23.52	98.28±0.50	0.506	0.615
3	108.61± 23.27	96.90±15.31	0.960	0.341
4	105.64± 21.42	92.83±16.09	0.769	0.445
5	104.39± 19.78	92.28±16.54	0.665	0.509
Systolic Blood Pressure (mmHg)				
0	128.3± 19.60	131.55±10.49	1.227	0.123
1	126.39± 20.93	127.55±18.39	0.342	0.733
2	127.39± 17.30	126.04±14.55	0.506	0.615
3	123.04± 14.52	122.83±12.73	0.960	0.341
4	118.96± 13.02	121.66±16.09	0.769	0.445
5	116.75± 11.18	118.21±10.85	0.665	0.509
Diastolic Blood Pressure (mmHg)				
0	78.90± 9.76	79.45±10.58	0.208	0.836
1	78.14± 14.57	75.76±13.25	0.647	0.520
2	78.36± 11.19	74.59±10.50	1.313	0.195
3	71.93± 11.40	69.28±8.87	0.983	0.330
4	70.61± 11.00	69.45±9.29	0.430	0.669
5	67.61± 10.03	66.79±8.47	0.330	0.742
Mean Arterial Pressure, MAP (mmHg)				
0	94.55± 9.84	96.48±10.23	0.732	0.467
1	95.14± 15.73	92.97±14.35	0.546	0.587
2	94.36± 11.17	91.35±11.19	1.017	0.314
3	89.00± 10.18	87.07±9.19	0.752	0.455
4	85.93± 10.45	86.48±7.70	0.228	0.820
5	83.71± 7.61	83.83±8.09	0.054	0.957
Oxygen Saturation, SpO2 (percent)				
0	98.41± 0.95	98.21±1.40	0.660	0.512
1	99.36± 0.62	99.41±0.63	0.342	0.733
2	99.64± 0.62	99.72±0.59	0.506	0.615
3	99.64± 0.62	99.79±0.56	0.960	0.341
4	99.64± 0.62	99.76±0.56	0.769	0.445
5	99.64± 0.73	99.76±0.58	0.665	0.509

Table V Complications associated with Laryngoscopy between study groups

Complications (number/percent)	Airtraq	Macintosh	Total	Fishers p-value
None	22(75.9)	27(93.1)	49(84.5)	
Mild	6(20.7)	2(6.9)	8(13.8)	
Moderate	1(3.4)	0(0.0)	1(1.7)	0.144

showed a statistically significant different with p=0.020 (Table I). With regards to ease of intubation, Table II shows that 93.1% of the patients in

Macintosh study group had easy intubation compared with 72.4% in Airtraq study group. Mild difficulty with laryngoscopy was seen in 20.7% of the patients in Airtraq group while mild difficulty was seen in 6.9% of the patients in Macintosh group. There was, however, no significant difference in the intubation difficulty scale between the two study groups (p = 0.079).

Table III shows that the duration of laryngoscopy was shorter in Macintosh group compared with Airtraq group. This difference was significant statistically (P value <0.001). The total duration of laryngoscopy and intubation was also significantly shorter in the Macintosh study group compared with Airtraq study group (P value <0.001).

The inter-group differences in heart rate, mean systolic, mean diastolic and mean arterial blood pressures, mean SPO_2 at all points of measurement were not statistically significant (Table IV).

Table V shows that 75.9% of the patients in Airtraq group had no complication while 93.1% of the

patients in Macintosh group had no complications. Mild complication (defined as blood stains on the laryngoscope) was seen in 20.7% of the patients in Airtraq group and 6.9% of the patients in Macintosh group. In all the difference in complications following laryngoscopy between the two study groups was not significant statistically (p=0.144).

DISCUSSION

In this study, 58 patients were randomly assigned to undergo intubation using either Airtraq or Macintosh. The groups were comparable in demographic characteristics (sex and age) and in tests for predicting difficult tracheal intubation (Mallampati, thyro-mental distance, inter-incisor gap and body mass index).

Our study found that the ease of endotracheal intubation in patients with cervical spine immobilization using cervical collar was comparable for Airtraq and Macintosh laryngoscopes. The difference in the ease of intubation as assessed by the IDS score between the two study groups was not statistically significant. These findings are similar to those found by some authors.[10, 17, 18] However, other authors had different

findings.[11, 13, 15] As suggested by Maharaj and colleagues[19] in their study on manikins, the skill level of the operator may be the main factor in determining the efficacy of endotracheal intubation. We agree with this opinion and acknowledge that despite demonstrations on manikin, proficiency of the intubators in the present study was not sufficiently established. In another study by Maharaj and colleagues,[10] they observed that the Airtraq performed significantly superior to the Macintosh in patients with cervical spine immobilization. In their study, each participating anaesthetist had performed at least 50 intubations with the Airtraq in manikins and 50 intubations with the Airtraq in humans. This is contrary to the current study in which the researcher performed only 5 intubations with the Airtraq in patients and less than 5 intubations in manikins prior to data collection. For the same reason, Vlatten et al[20] working in Canada on paediatric airway observed that the Macintosh laryngoscope had 100% first attempt success rate (FASR) while the Airtraq laryngoscope had 83% FASR. In all, there were four failed intubations in the Airtraq group compared with zero in the Macintosh group. In their work, the anaesthetists who performed the intubations had limited manikin experience and only 5 human experiences with the Airtraq laryngoscope compared with years of experience with the Macintosh laryngoscope. Findings of the present study indicates that either of the Airtraq or Macintosh laryngoscopes can be used for tracheal intubation in situations of cervical spine immobilization, given that the laryngoscopist has sufficient experience. Anaesthetists therefore need to familiarize themselves with these techniques to be able to surmount the challenges of securing the airway in the event of cervical spine injuries and immobilization.

With respect to duration of intubation, the current study has shown that the duration of intubation was significantly shorter with the conventional Macintosh laryngoscope compared with the Airtraq video-laryngoscope in patients with cervical spine immobilization using cervical collar. The duration of laryngoscopy and intubation is of concern in the setting of cervical spine immobilization because the longer this duration is, the more likely the patient will desaturate. The duration and degree of hypoxaemia during tracheal intubation is one of the major causes of morbidity and mortality in anaesthesia. Therefore, any device that can shorten the duration of intubation will be invaluable. Previous works on duration of laryngoscopy and intubation with respect to Airtraq and Macintosh laryngoscopes have not been conclusive. The result of the present work is in keeping with results from the works of three groups of researchers.[16, 20, 21] The result, however, contradicts the findings of other workers.[10-13, 22, 23] The lack of experience of the laryngoscopists with the Airtraq laryngoscope may be responsible for the poor performance of the Airtraq in the present study. In the study by Maharaj et al[11] the laryngoscopists were not just experienced in the use of Macintosh laryngoscope but also in the use of Airtraq. Each anaesthetist used in their study had performed at least 500 intubations using the Macintosh laryngoscope and at least 50 intubations using the Airtraq in manikins, and 50 intubations using the Airtraq in patients. This may be responsible for the superior performance of Airtraq over the Macintosh laryngoscope. The level of experience of the laryngoscopists in these studies is in sharp contrast with that of the current study in which the researcher did just 5 intubations with the Airtraq in patients and less than 5 in manikin prior to the study. Similarly, Vlatten et al[20] used anaesthetists who were not experienced in the use of Airtraq laryngoscope. Prior to participation in the study, each anaesthetist viewed a training video produced by the Airtraq manufacturer and performed three intubations on paediatric manikin and five intubations on anaesthetized children using the Airtraq laryngoscope. They found that duration of intubation was significantly shorter with the Macintosh laryngoscope compared with the Airtraq laryngoscope. Furthermore, difficulty in introducing the Airtraq blade into the oral cavity could also be responsible for the findings in the current study. The researcher experienced difficulty in 9 patients during the introduction of the Airtraq into the oral cavity due to restricted mouth opening. The mouth opening may be restricted at the angle of the mandible because of the presence of the cervical collar. The Airtraq laryngoscope blade has a thickness of 1.8 cm and a width of 2.8 cm. Therefore, patients with mouth opening of less than 3 cm may result in difficulty during the introduction of the Airtraq into the oral cavity. This delay may have contributed to the increase in the duration of intubation in the Airtraq group. Vijayakumar et al[21] and Dhonneur et al[24] have also experienced difficulties in introducing the Airtraq into the oral cavity in their studies. They, therefore, suggested that the Airtraq should be inserted at 90º to the usual direction when difficult laryngoscopy is expected because of a short chin-to-sternum distance,

augmented tongue volume or when the neck is fixed in flexion.

The present study did not find any significant difference between the Airtraq and the Macintosh laryngoscopes in haemodynamic response to laryngoscopy and intubation. Excessive blood pressure elevations following laryngoscopy and intubation are undesirable. Hypertension, particularly in association with tachycardia, can precipitate or exacerbate pre-existing myocardial ischaemia and can even lead to heart failure.[25] In the current study, the mean heart rates for the two groups were comparable at baseline. In the Airtraq group, the heart rate increased following laryngoscopy and intubation and peaked at 3 minutes before decreasing while in the Macintosh group, the heart rate peaked at 2 minutes before decreasing. The differences between the two groups at all points of measurement were not significant. McElwain and Laffey[23] also observed that the heart rate increased in all groups after tracheal intubation but all values returned to baseline values within 5 minutes in both groups. On the other hand, Rayavarapu and Dhorigol[26] observed that at 1- and 5-minutes post intubation the heart rate was significantly higher in Macintosh group compared with Airtraq group. The current study did not demonstrate a significant difference in MAP between Macintosh group and Airtraq group at 1, 2, 3, 4 and 5 minutes post intubation. In both groups, the MAP peaked at 2 minutes post intubation before declining to pre-intubation values. This is contrary to findings by both Marahaj et al[10] and Rayavarapu and Dhorigol[26] who observed that the Macintosh laryngoscope stimulated more significant increase in blood pressure than the Airtraq laryngoscope. One of the major causes of cardiovascular response to laryngoscopy and intubation is mechanical stimulation of the upper airway.[27,28] When performing tracheal intubation with the Macintosh laryngoscope, the tongue and epiglottis should be displaced by the blade with an upward lifting force to align the oral, pharyngeal and tracheal axes, in order to achieve optimal visualization. The force exerted at the base of the tongue can be as high as around 30 to 50 N when the Macintosh laryngoscope is used.[29-32] On the other hand, the force exerted is much lower with the Airtraq, which enables glottis visualization without alignment of the anatomical axes. The result of the current work does not follow the principle outlined above and is not in keeping with the results of the studies by other researchers.[10, 26, 33] However, there could be other reasons why the patients in Airtraq group had increased response to laryngoscopy. Gill et al[34] have shown that when the duration of intubation is less than 30 seconds, there is no effect on the cardiovascular system. In the current work, the mean duration of intubation was 32 seconds in the Airtraq group and 17.1 seconds in Macintosh group. This effect of prolonged duration of intubation may have cancelled the expected effect of Macintosh laryngoscope to stimulate more haemodynamic response, hence the observation that the two devices were comparable. Laryngoscopy and tracheal intubation should therefore be performed by experienced and competent personnel. This is to ensure that only short duration of time is utilized to avoid the effect of laryngeal stimulation on haemodynamic responses with its inherent complications.

As for complications associated with laryngoscopy, the current study found that 75% of the participants in Airtraq group had no complication compared with 93% in Macintosh group. This means more patients had complications with Airtraq compared with the Macintosh Laryngoscope. This difference, though not significant statistically, may be important clinically. Many complications can happen in the course of laryngoscopy and intubation. Such complications may include: mal-positioning of the tube, airway trauma, post-extubation laryngeal spasm, oedema, and tracheal stenosis. The present study focused on airway trauma resulting from laryngoscopy and majority of the patients did not have any. Blood stains on the laryngoscope was noticed in 20% of the patients in Airtraq group and 6.9% of the patients in Macintosh group. Minor laceration of the oral mucosa was seen in 1 patient in Airtraq group while no patient had it in Macintosh group. No patient in the two groups had dental trauma. The reason for having more complications in the Airtraq group may be due to the researcher's non-familiarity with the Airtraq laryngoscope. Also, the number of attempts at laryngoscopy was more in the Airtraq group compared with the Macintosh group. In all, 4 patients in Airtraq group were intubated after the second attempt while all patients in Macintosh group were intubated at first attempt. The results of the present work with regard to complications of laryngoscopy agree with the results of other authors.[8-10, 35, 21-23] Bhandari et al[22] assessed post-operative sore throat and hoarseness of the voice in addition to airway trauma, and observed no statistical difference between the two devices. Similarly, Ferrando et al[35] despite having unskilled anaesthetists who performed laryngoscopy,

recorded no incident of lip laceration or dental trauma in any of the patients in both the Macintosh and Airtraq study groups. Furthermore, McElwain and Laffey[23] did not observe statistical difference between the groups with respect to complications of laryngoscope. Minor lacerations were, however, noticed in 1 patient in the Airtraq group and 2 patients in Macintosh group. This underscores the fact that Macintosh laryngoscope may be associated with less complications at laryngoscopy and tracheal intubation with its inherent clinical implication.

CONCLUSION

The study did show that there was no significant difference in the ease of laryngoscopy and intubation when Airtraq was compared with Macintosh laryngoscope in patients with cervical spine immobilization using cervical collar. However, durations of laryngoscopy and intubation were significantly shorter in Macintosh study group compared with the Airtraq study group. The Airtraq and Macintosh laryngoscopes were found to be comparable in terms of complication associated with their use and haemodynamic changes to intubation in patients with cervical spine immobilization using cervical collar.

Recommendations

From our findings, the choice of device depends on the operator's experience with either of them. Availability and frequent use of the Airtraq device may greatly improve familiarity and ultimately ease of intubation with the device.

Limitations of the Study

There was potential for bias as it was impossible to blind the researcher to the device that was used for laryngoscopy and intubation.

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Authors Contribution

- SIN, HYE and ESI reviewed the study proposal.
- SIN, GBB, HYE and ESI conceptualized and designed the study.
- GBB collected, collated, entered, analysed and interpreted the data.
- YMU wrote initial draft of the manuscript.
- All authors read through and approved the final version of the manuscript.

Disclosures

The authors declare no conflict of interest.

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