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TIME TAKEN FOR LARYNGOSCOPY AND INTUBATION UNDER GENERAL ANAESTHESIA BY AIRTRAQ V/S MACINTOSH LARYNGOSCOPE

Anaesthesiology

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ABSTRACT

Objectives : Aim of the study is to evaluate and compare the Airtraq optical laryngoscope with the Macintosh for the ease of laryngoscopic intubation in terms of their time taken for intubation, number of attempts for successful intubation and hemodynamic parameters in peri-intubation period.
Methods : In this randomized observational study 60 patients were enrolled into two groups of 30 each in the airtraq and macintosh group respectively. A comparision was made between the two groups in patients deemed at low risk for difficult intubation .
Results : The Airtraq required less optimization maneuvers to improve glottis exposure, and resulted in less oral mucosal trauma as compared to Macintosh laryngoscope in patients with normal airway. There was no difference in the duration of intubation attempts or hemodynamic changes between the two groups.
Conclusion: There was no difference between groups in the duration of intubation attempts. In comparison to the Macintosh laryngoscope, the Airtraq resulted in modest improvements in terms of optimisation maneuvers. Tracheal intubation with the Airtraq resulted in less alterations in heart rate. These findings demonstrate the utility of the Airtraq laryngoscope for tracheal intubation in low risk patients.

KEYWORDS

INTRODUCTION

Endotracheal intubation remains one of the important skills in anesthesia. Complications arising from difficult and failed intubation remains a leading cause of morbidity and mortality[1-3]. Despite a number of factors and combination of factors identified to predict difficult intubation preoperatively no one is capable of predicting all difficult intubations[4]. Consequently many potential difficult intubation remains unrecognised until the induction of anesthesia.

Since minimising the risk of complications during intubation is as important as performing prompt and correct endotracheal intubation, the issue has stimulated research to develop novel laryngoscopes, which aim to reduce the difficulity of laryngeal visualisation, particularly in the setting of both anticipated and unanticipated difficult airway.

The Airtraq is a new optical laryngoscope which has an internal arrangement of optical components. The Airtraq optical laryngoscope is similar to the direct laryngoscope ,but consists of a body with two side by side channels. One channel acts as a conduit through which endotracheal tube can be passed, where as the other channel contains a series of lenses,prisms and mirrors that transfer the image illuminated tip to the proximal view finder [5].

Considering the unique features of the Airtraq laryngoscope vis-à-vis the Macintosh blade, a study is conceived comparing the two, in relation to the time taken for endotracheal intubation,heamodynamic changes and number of attempts for successful intubation in patients with normal airway.

METHOD :

Institutional scientific and ethical committee approval was obtained for this study and written informed consent obtained from the patients. Sixty patients were enrolled in this randomised observational study. The inclusion criteria for endotracheal intubation by Airtraq or Macintosh included patients of either sex in the age group of 18 to 70 years of ASA physical status 1 or 2 . The exclusion criteria included patients with ASA physical status 3 or 4, BMI >35 , coagulopathy or history of anti-coagulant use, Cervical spine injury, Raised intracranial pressure, Edentulous or absent upper and lower incisors and patients at risk of pulmonary aspiration(full stomach , emergency surgery , pregnant patients, surgery involving oral cavity , larynx , pharynx and neck)

Sixty patients satisfying the above criteria were enrolled into the study. They were randomised into two groups [n1-30 is Airtraq group] and [n2-30 is Macintosh group] using the sealed envelopes, which were not opened until patient consent had been obtained. All patients were pre-medicated with oral ranitidine 150mg,metoclopramide 10mg and alprazolam 0.5mg one hour prior to the induction of anaesthesia.

Patients airway assessed pre-operatively included mouth opening ,Thyromental distance,Temporomandibular joint mobility ,Neck movements ,Mandibular size and Mallampati grading.

On arrival into operating room , all patients were monitored with ECG , SPO2, Etco2 , NIBP and I/V access obtained. A standard technique were used for all the patients with induction using fentanyl 2mcg/kg, propofol 1.5 to 2 mcg/kg and atracurium 0.5mg/kg .

Patients were randomly assigned to one of the two groups .Patients with group 1 were intubated with Macintosh blade while as patients with group 2 underwent intubation with Airtraq laryngoscope. Entotracheal intubation was performed using 7.00mm internal diameter size ETT in females and 8.00mm internal diameter size ETT in males by one of the three experienced anaesthesiologists.

The time to intubation was measured by stopwatch from the time of insertion of laryngoscope into the patients mouth until the placement of ETT in the trachea was confirmed by the appearance of capnography. Failed intubation was considered if the trachea could not be intubated after three attempts, or if the first attempt required more than 120 seconds[6]

Following parameters were studied :

1. Number of attempts :The number of attempts for the correct positioning of the ETT was counted. One attempt is introduction of laryngoscope without placement of ETT. Every time the laryngoscope was taken out of the patients mouth , it would be counted as one attempt.
2. Laryngoscopic view (as per Cormack and Lehane grading).
3. BURP maneuver(yes/no)
4. Time taken for intubation {From the time of insertion of laryngoscope into the patients mouth until the placement of ETT in the trachea was confirmed by the appearance of capnography}
5. Monitoring of vitals during induction and intubation.

	Base line Pre-ind	Pre-intub	Soon after Intub	2 mins	4mins	6mins
HR						
NIBP						
SPO2						
ETco2						

6. Post-op complications : The occurance of the following post-op complications were looked for and recorded by observation and by interviewing the patient soon after extubation,in PACU {post Anaesthesia care unit} and in wards 6 Hours after extubation . These included bleeding on suction of endotracheal tube, bleeding from gums and lips , Sore throat , Broken teeth , Soft tissue edema ,Stridor and any other complications .

OBSERVATIONS AND RESULTS

STATISTICALANALYSIS

All the statistical analysis was done by using independent-T-test for quantitative parameters, all qualitative data was compared by Chi-square test and Fisher's Exact Test.

A total of 60 patients were entered into the study. Thirty patients were randomly allocated to undergo tracheal intubation using the Airtraq laryngoscope, thirty to undergo tracheal intubation using the Macintosh laryngoscope. The results obtained from the 60 subjects were tabulated and analysed using standard statistical principles and techniques. The results are summarized as follows:

All the groups were comparable in age, BMI, gender and ASA class characteristics of patients.

Table 1: Demographic characteristics of patients enrolled in the study

Table1 : Comparison of age based on group					
Group	Mean	SD	N	T	p
Macintosh	40.0	13.4	30	0.27	0.791
Airtraq	40.9	13.8	30		

Table 2Comparison of sex based on group

Sex	Macintosh		Airtraq		x^2	p
	Count	Percent	Count	Percent		
Male	11	36.7	12	40.0	0.07	0.791
Female	19	63.3	18	60.0		

Table 3 Comparison of BMI based on group

Group	Mean	SD	N	T	p
Macintosh	25.5	3.6	30	0.23	0.820
Airtraq	25.7	3.9	30		

Table 4Comparison of ASA based on group

ASA	Macintosh		Airtraq		x^2	p
	Count	Percent	Count	Percent		
1	17	56.7	21	70.0	1.15	0.284
2	13	43.3	9	30.0		

AIRWAY CHARACTERISTICS

Preoperative airway assessmentof the patients studied i.e.mouth opening (Table 5),thyromental distance (Table 6),temporomandibular joint mobility(Table 7), neck movements(Table 8), mandibular size(Table 9) and the Mallampati score(Table 10) were also noted and statistically analysed. The parameters were comparable between the two groups.

Table 5. Comparison of mouth opening based on group

Mouth opening	Macintosh		Airtraq		x^2	p
	Count	Percent	Count	Percent		
<5	1	3.3	2	6.7	0.8	0.670
5	14	46.7	16	53.3		
>5	15	50.0	12	40.0		

Table 6. Comparison of thyromental distance based on group

Thyromental distance	Macintosh		Airtraq		x^2	p
	Count	Percent	Count	Percent		
6	17	56.7	23	76.67	2.702	0.101
>6	13	43.3	7	23.33		

Table7. Comparison of temporomandibular joint mobility based on group

Temporomandibular joint mobility	Macintosh		Airtraq	
	Count	Percent	Count	Percent
Normal	30	100.0	30	100.0
Painful and restricted	0	0.0	0	0.0

Table8. Comparison of neck movement based on group

Neck movement	Macintosh		Airtraq	
	Count	Percent	Count	Percent
Normal	30	100.0	30	100.0
Painful/restricted	0	0.0	0	0.0

Table9. Comparison of mandibular size based on group

Mandibular size	Macintosh		Airtraq	
	Count	Percent	Count	Percent
Normal	30	100.0	30	100.0
Micrognathia	0	0.0	0	0.0

Table10. Comparison of mallampati class based on group

Mallampati class	Macintosh		Airtraq		x^2	P
	Count	Percent	Count	Percent		
1	13	43.3	7	23.3	5.48	0.064
2	15	50.0	23	76.7		
3	2	6.7	0	0.0		

DEVICE PARAMETERS :

Intubation was successful to all the patients enrolled in the study. The time required with Macintosh laryngoscope was slightly less 21.9sec(SD5.7) as compared to Airtraq22.4sec(SD8.9) which is statistically insignificant(table13). Twenty-seven patients intubated with the Airtraq had a Grade I Cormack-Lehane glottic view, compared to twenty five patients in the Macintosh group(table11) Optimizing manoeuvre was required in 8 patients with Macintosh and 2 patient with Airtraq, which is statistically significant $p<0.05$, (table12).

Twenty nine (96.7%) patients were intubated in first attempt with Airtraq while one patient required a second attempt, While in the Macintosh group 28(93.3%) patients were intubated in the first attempt while 2 patients required a second attempt (table14).

Table11. Comparison of cormack and Lehane view based on group

Cormack and Lehane view	Macintosh		Airtraq		x^2	P
	Count	Percent	Count	Percent		
1	25	83.3	27	90.0	1.22	0.543
2	4	13.3	3	10.0		
3	1	3.3	0	0.0		

Table12. Comparison of BURP based on group

Cricoid pressure	Macintosh		Airtraq		p#
	Count	Percent	Count	Percent	
Yes	8	26.7	2	6.7	0.040
No	22	73.3	28	93.3	

Table 13 Comparison of time taken for intubation in seconds based on group

Group	Mean	SD	N	T	p
Macintosh	21.9	5.7	30	0.26	0.796
Airtraq	22.4	8.9	30		

Table 14 Comparison of attempts for intubation based on group

Attempts for intubation	Macintosh		Airtraq		P#
	Count	Percent	Count	Percent	
1	28	93.3	29	96.7	0.500
2	2	6.7	1	3.3	

Table 15 Comparison of heart rate based on group

Heart rate	Macintosh			Airtraq			t	p
	Mean	SD	N	Mean	SD	N		
Pre induction	80.2	15.6	30	78.0	18.1	30	0.51	0.611
Pre intubation	73.3	13.7	30	73.3	12.7	30	0.01	0.992
Soon after intubation	86.2	14.3	30	82.2	15.0	30	1.06	0.296
2 min after intubation	81.8	13.2	30	81.0	15.2	30	0.2	0.842

4 min after intubation	75.8	12.7	30	74.7	16.5	30	0.3	0.767
6 min after intubation	73.9	12.5	30	73.6	18.6	30	0.07	0.948

Table 16 Comparison of MAP based on group

MAP	Macintosh			Airtraq			T	p
	Mean	SD	N	Mean	SD	N		
Pre induction	77.2	14.0	30	76.0	17.9	30	0.31	0.759
Pre intubation	77.2	14.0	30	76.0	17.9	30	0.31	0.759
Soon after intubation	97.2	18.9	30	98.3	16.6	30	0.24	0.812
2 min after intubation	91.0	20.9	30	85.4	15.7	30	1.17	0.245
4 min after intubation	78.9	13.3	30	79.4	12.2	30	0.16	0.875
6 min after intubation	75.2	12.9	30	76.5	13.2	30	0.4	0.691

Table 17 Comparison of heamoglobin saturation based on group

Heamoglobin saturation	Macintosh			Airtraq			T	p
	Mean	SD	N	Mean	SD	N		
Pre induction	99.1	1.3	30	99.1	1.1	30	0.11	0.914
Pre intubation	99.3	1.1	30	99.5	0.7	30	0.82	0.416
Soon after intubation	99.3	1.2	30	99.4	0.8	30	0.38	0.707
2 min after intubation	99.6	0.5	30	99.6	0.6	30	0.24	0.810
4 min after intubation	99.5	0.6	30	99.5	0.7	30	0.2	0.845
6 min after intubation	99.6	0.5	30	99.5	0.6	30	0.46	0.651

There was no difference between groups in the lowest oxygen saturation during these intubation attempts (Table 17)

COMPLICATIONS

Table 18Comparison of post-operative sore throat based on group

Post-operative sore throat	Macintosh		Airtraq		p#
	Count	Percent	Count	Percent	
Yes	5	16.7	1	3.3	0.097
No	25	83.3	29	96.7	

Table 19Comparison of post-operative broken teeth based on group

Post-operative broken teeth	Macintosh		Airtraq	
	Count	Percent	Count	Percent
Yes	0	0.0	0	0.0
No	30	100.0	30	100.0

Table 20Comparison of soft tissue edema based on group

Soft tissue edema	Macintosh		Airtraq		p#
	Count	Percent	Count	Percent	
Yes	4	13.3	0	0.0	0.056
No	26	86.7	30	100.0	

Table 21Comparison of post-operative oral bleeding based on group

Post-operative oral bleeding	Macintosh		Airtraq		p#
	Count	Percent	Count	Percent	
Yes	0	0.0	1	3.3	0.500
No	30	100.0	29	96.7	

Table 22Comparison of post-operative blood on endotracheal tube based on group

Post-operative blood on endotracheal tube	Macintosh		Airtraq		p#
	Count	Percent	Count	Percent	
Yes	7	23.3	2	6.7	0.073
No	23	76.7	28	93.3	

Table 23Comparison of post-operative stridor based on group

Post-operative stridor	Macintosh		Airtraq		p#
	Count	Percent	Count	Percent	
Yes	3	10.0	0	0.0	0.119
No	27	90.0	30	100.0	

There were seven cases of trauma as evidenced by blood on endotracheal tube in the Macintosh group, compared with two in Airtraq group (Table 22), however this did not reach statistical significance. There was no incidence of dental trauma with either laryngoscope. There were 5 incidences of sore throat in macintosh group, compared with one in Airtraq group (table18). There were 4 incidences of soft tissue edema in macintosh group, compared with none in Airtraq group (table20). Similarly there were 3 incidences of post-op stridor in macintosh group, compared with none in Airtraq group (table23).

DISCUSSION

Failure to intubate the trachea still is a leading cause of anesthetic morbidity and mortality both within and outside the operating theatre. [7]

The proper visualization of larynx is a major factor in determining the difficulty of intubation. Macintosh laryngoscope blade, which was first described in 1943, and remains the standard device for laryngeal visualisation, requires the alignment of oral, pharyngeal, and tracheal axes in order to obtain the direct view of the glottis. The Macintosh blade is designed as a device for suspension of the head and displacement of the tongue to allow laryngeal view. In recent years, advances in optical technologies have enabled the development of multiple novel indirect laryngoscopes. A common feature of these devices is that they visualize the laryngeal inlet by indirect mechanisms, obviating the need to align the oral, pharyngeal, and tracheal axes, thereby potentially making laryngeal visualization and subsequent tracheal intubation easier to perform.

During the last decade, several new video airway devices have been proved useful in adult airway management. In this prospective randomized study we compared the video laryngoscope Airtraq with the conventional Macintosh laryngoscope.[8]

We compared the two intubation devices, with respect to the intubation time, Cormack and Lehanne grading.[8] We also compared BURP, number of attempts for intubation, peri-laryngoscopy and intubation changes in heart rate and blood pressure, oxygen-heamoglobin saturation, and incidence of complications during and after intubation [9,10,11]

With Airtraq devices the larynx is visualised through an optical system following which intubation is performed. This requires hand-eye coordination. This differs from the regular Macintosh blade aided intubation[9,10,11]

The demographic profile of the patients (sex ratio, age, weight) and the Mallampatti class were comparable between both the groups. Hence these parameters probably did not influence our results.

Our study demonstrated that, the incidence of successful intubation was equal with both Airtraq and Macintosh laryngoscopes. We also found an improvement in Cormack and Lehanne grade in Airtraq in comparison to Macintosh (90% vs 83.3%). In our study, in the Airtraq group the BURP is needed only for 2 patients during intubation, while in the Macintosh group the BURP is needed for 6 patients, although in the Airtraq group MPscore 2 was present in 23 patients and in Macintosh group MP score 2 was in 15 patients and there were 2 patients with MP score of 3. It is statistically insignificant with (p=0.064)

Intubation time was calculated from introduction of laryngoscope into the patients mouth until the placement of Endotracheal tube in the trachea was confirmed by the appearance of capnography. Intubation time with Airtraq was slightly more 21.9sec(SD5.7) as compared to Macintosh 22.9(SD8.9) which is statistically insignificant. Our observation regarding time taken for intubation is contrary to previous studies. But in a few studies it has been found that Airtraq takes more or equal time than Macintoshe.g :Chalkeidis et al, in their comparative study between the Airtraq and Macintoshe laryngoscope for routine airway management showed that intubation by experienced anesthetist was performed more quickly with the conventional Macintoshe than Airtraq laryngoscope, however the difference between the groups was 5.9sec only.[9,10,11].

The effects of laryngoscopy and tracheal intubation on the mean arterial pressure and on heart rate were relatively modest. Heart rate increased slightly in both groups after tracheal intubation, but had returned to baseline within 6 min. There was no significant difference between Airtraq and Macintosh group for the means of heart rate and MAP in the preinduction values. While the heart rate in patients from both the groups appeared to have reached the baseline value or gone

even below by the sixth minute, the fluctuations were more evident in the first few minutes in both groups (soon after intubation and 2 min; statistically not significant: p>0.05).Even though heart rate increases more with Macintosh than Airtraq laryngoscope soon after intubation as seen In (table 15), it was statistically insignificant. The potential of the Airtraq to produce less stimulation of heart rate may be particularly advantageous in clinical situations such as coronary artery disease or arrhythmias.

There were seven cases with blood on ETT in the Macintosh group, compared with two in the Airtraq group(table22). No dental or other airway trauma with any laryngoscope was observed. In our study, we also found that post-operative soft tissue edema, sore throat and stridor incidence is more in the Macintosh group as compared to Airtraq group though these were not statistically significant. Minimising the risk of complications is as important as performing prompt and correct endotracheal intubation. Similarly other studies have also observed traumatic pharyngeal lesions more frequently with Macintosh[12]

LIMITATIONS

1. The study was not a double blind randomized control trial, as it is impossible to blind the operator to the device used. . Therefore, our study could have introduced operator bias.
2. The study was conducted in patients with normal airway and the result may not be extrapolated to patients with anticipated difficult airway.
3. While the study was conducted by operators familiar with both laryngoscopes, the level of experience with Macintosh was greater than that with the relatively novel Airtraq. This may have contributed to the duration of intubation attempt in the Airtraq group.
4. The relative efficacy of this device in comparison to other promising new devices has not been determined.

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