Sri Lankan Journal of Anaesthesiology 20(1): 3 – 6 (2012)

CLINICAL INVESTIGATIONS

A comparative evaluation of conventional Macintosh laryngoscope and the Airtraq® in different intubation scenarios

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Keywords: Airway, Airtraq®, Macintosh laryngoscope

Background
The Airtraq® is an optical laryngoscope which has been shown to improve the ease of intubation in patients with normal and difficult airway.

Aims
A comparison between Macintosh and Airtraq® laryngoscope have been made in this study regarding the time taken, number of attempts required to intubate and complications in both normal and difficult intubation scenarios.

Method
50 adult patients of ASA grade I and II meant for routine surgical procedure were randomly divided into two groups of 25 patients each. The patients in both the groups received similar mode of anaesthesia and monitoring.

Result
The time required to intubate patients with different scenarios were significantly less when Airtraq® was used compared to the use of Macintosh laryngoscope($p<0.05$), number of attempts required to successfully intubate patients were significantly less for Airtraq® assigned group of patients compared to Macintosh group.

Conclusion
Airtraq® should be encouraged in difficult intubation scenarios with a mouth opening of more than 16mm for adult patients.

Securing the airway is always the first priority for an anaesthesiologist both in the operating room and in emergency medicine. Endotracheal intubation has been the gold standard for management of the airway, especially in traumatized patients. Inserting an endotracheal tube in the trachea does not complete the airway management scenario. The components which affect the sophisticated airway management in a trauma patient include- the equipment, the drugs, the technique, the circumstances and the patients profile itself. In fact, it is not the intervention which is important, rather it is the situation, skills and the performance of the attending doctor that do play a role in the patients outcome. The Airtraq® (Prodol Meditee, Vizcaya, Spain) with its specially designed curvature of the blade and the inbuilt optical system makes intubation easier especially in difficult intubation scenarios. However, in conditions when the ventilation gets difficult or impossible by facemask, the supragottic devices including laryngeal mask airway (LMA) and the oesophegealtracheal combitube have been proved to be very useful

options in managing a difficult airway because they are able to re-establish the patent airway and maintain adequate ventilation. Continued use of Airtraq® has proved that the performance of the Airtraq® is superior to Macintosh laryngoscope both in normal Mallampati I patients[1] as well in patients with difficult intubation situations including conditions in which MILS is required.[2] Not only the ease of visualising the glottic opening is there with the Airtraq® but also it has the added advantage of having less haemodynamic stimulation of these patients.[3] Recent reports have highlighted the utility of Airtraq® in many other difficult situations including morbidly obese patients[4] and failed conventional approaches to tracheal intubation.[5]

Material and Method

After approval from the institutional ethical committee and proper written consent, 50 adult patients of ASA grade I and II were randomly divided into two groups of 25 patients each (n=25).

Patients who were intubated with Macintosh blade were assigned as group M patients and those who were intubated with Airtraq® were assigned as group A patients. Patients with Malampatti IV were not excluded if they had a mouth opening of more than 16 mm. We had conducted a pilot study on 5 subjects in each group and found that an average of 48 sec was required to intubate group M patient whereas an average of 38 sec was required to intubate group A patients with an equal standard deviation of ±18sec for both the groups. The sample size required for the study was calculated keeping α = 0.05 and the power of the study to be more than 60%.

An independent observer recorded the duration for tracheal intubation as well as number of attempts by the two devices using a stopwatch. The time to secure the airway was defined as the time from introduction of the device between the incisors of the patient to connecting the endotracheal tube to the anaesthesia circuit. The percent glottis opening by the two devices was defined 100% when entire glottis opening was seen in linear fashion from the anterior commissure to the posterior cartilage and none when 0% of the glottis opening was seen.

If the first attempt failed then the patient was extubated and ventilated by bag and facemask with 100% oxygen to avoid desaturation and the duration of subsequent attempt added to the time required to secure the airway. In both the groups, all the patients were monitored with standard monitors including pulse oximeter, capnometer and cardioscope. Correct placement of the tube was confirmed by the appearance of $EtCO_2$ (end tidal CO_2) on the capnometer screen. Premedication, induction and maintenance of anaesthesia was identical for both the groups according to their weight. The time required for the instrumentation, the number of attempts until successful intubation and number of oesophageal intubations and airway trauma was recorded for each patient. Airway trauma was assumed when the blade of either intubating aid was stained with blood. Data were statistically analysed using Students't' test and Z test for different parameters. A p value<0.05 was regarded statistically significant.

Results

All the patients in this study had a similar demographic profile. The mean age (years) in the two groups M and A were 56±15 and 57±11 (p=0.313), the mean weight (kilogram) in the two groups M and A were 57±11 and 59± 12 (p=0.720) and height (centimeter) in the two groups M and A were 158± 8 and 160± 9 (p=0.790). (Table 1)

Table 1 Demographic data of the patients

Demographic data	Group M	Group A	p value
Age(yrs) ±SD	56 ±15	54 ±14	0.313
Weight(kg) ±SD	57 ±11	59 ± 12	0.720
Height(cm) ±SD	158± 8	160± 9	0.790

In the present study we can appreciate that the number of patients with Mallampati scoring(MP) I,II,III and IV were 10,7,5 and 3 in group M and 8,10,3 and 4 in group A respectively. As have been found in our study out of total patients (n=25), 16 patients were intubated in first attempt in group M where as 22 patients were intubated in first attempt in group A patients. Similarly 2 attempts were required to intubate patients successfully in 6 patients in group M whereas only

2 patients required second attempt to intubate in group A ($p<.05$). This difference in number of patients both for first attempt as well as for those who required second attempt to successfully intubate is statistically highly significant. Similarly only 1 patient required more than 2 attempts in group A patients whereas 3 patients required more than 2 attempts in group M which is statistically significant($p<.05$). Most of these patients who needed two attempts or more or who experienced airway trauma during intubation either belonged to MP class III and IV patients. Complications like oesphageal intubation and airway trauma were 1and 2 for group M patients vs none in group A patients.

Table 2: Tracheal intubation characteristics of the patients

	Group M	Group A
MP score I,II,III,IV	10, 7, 5, 3	8, 10, 3, 4
Durations (sec) ±SD	48 (SD 18)	36 (SD 16)*
% of glottic opening visible±SD	65% (SD 2)	97%(SD 3) *
One attempt to intubate (no of patients)	16	22*
Two attempt to intubate (no of patients)	6	2*
More than two attempt to intubate (no of patients)	3	1*
Airway Trauma	2	None
Oesophageal Intubation	1	None

* statistically significant difference ($p<.05$)

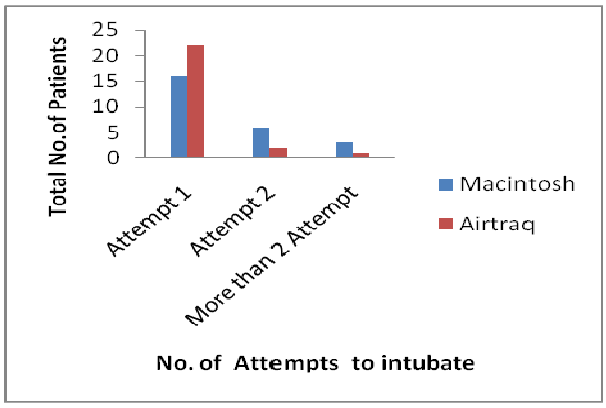

Figure 1: No. of attempts by Macintosh & Airtraq

Discussion

Difficulty in airway management has been associated with serious complications, especially when a failed intubation has occurred.[6] Sometimes there are situations in which the anaesthesiologists faces a condition in which he is unable to ventilate with a facemask, nor is he able to intubate, which is one of the most critical emergencies in clinical anaesthesia. If this situation is not promptly dealt with within few minutes, severe outcome like death may occur.[7] Our observation in the present study (Table II and figure I) shows that the Airtraq® optical laryngoscope provided better intubating conditions compared to Macintosh laryngoscope resulting in less consumption of time to secure airway and significantly less number of attempts to achieve successful intubation (Table II) and less complications compared to Group M. Since the Airtraq® has an especially designed blade curvature and an optical system, it needs minimal manipulation or even extension of the head at atlanto-occipital joint, requires less effort to introduce the Airtraq® in to the oral cavity and to push the tube into the trachea through the inbuilt conduit made in the Airtraq® itself, whereas Macintosh laryngoscope although quite widely used, requires more skill and is acknowledged to be a difficult skill from beginners to masters.[8] Since the Airtraq® requires significantly less time to intubate, less numbers of attempts in normal as well as in difficult scenarios like patients belonging to MP class III and MP class IV as well as in patients with any other similar difficult situations (Table II), it can be used by even those who get less frequent opportunity to intubate. It may be assumed that prehospital airway management can become even simpler by novice people using this piece of equipment compared to the use of standard Macintosh laryngoscope because this device does not need any alignment of oral, pharyngeal and laryngeal axes.

Close proximity of the indirectly visualised vocal cord and the guiding channel for tracheal tube placement plays a vital role in less frequent incidence of failed intubation and better intubating conditions in this group of patients (Group A). An experienced anaesthesiologist understands that there should be a minimum distance between the Airtraq tip and the vocal cord for the endotracheal tube to traverse and adopt a direction. Complications like oesophageal intubation, pulmonary aspiration and other major complications are reported to occur relatively

frequently during emergency tracheal intubation outside operating room.[9,10] The reason for less airway trauma in group A patients seem to be because this device does not need laryngoscopy like maneuver. However, prehospital intubation has been reported to improve survival in severe head injury patients.[11,12] In spite of many advantages added to Airtraq, few disadvantages of this device needs to be mentioned including acquiring a learning curve before its expert use and its availability in emergency situations.

Conclusion

Studies have been conducted on series of manikins to understand the performance of Airtraq® but little work has been done on live subjects; even then we may conclude with our experience that this device is easier to use after acquiring a learning curve, requires less time and number of attempts to intubate, no need to stabilize the head in cervical injury patients as it needs almost no head and neck manipulation and it causes minimal dental/ airway trauma.

Thus this intubating device should be considered as a part of the difficult airway cart. Further, a larger sample size needs to be evaluated for further recommendations.

Acknowledgement

We personally thank Dr Anees Ahmad, Assistant Professor, Dept of Community Medicine for helping in data analysis.

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