

Original Research Article

A Hospital Based Comparative Study to Evaluate the Intubating Conditions with Airtraq Laryngoscope and Macintosh Laryngoscope in Elective Adult Surgical Patients

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Abstract

Background: Endotracheal intubation is considered to be the “Gold Standard” for airway management during administration of general anaesthesia. The aim of this study to compare the intubating conditions with Airtraq laryngoscope and Macintosh laryngoscope in elective adult surgical patients. **Materials & Methods:** A hospital based prospective study was conducted on 50 adult patients satisfying inclusion criteria were enrolled in the study after obtaining informed consent in department of anaesthesia in Ananta Institute of Medical Sciences, Rajsamand, Rajasthan. After assessment patient shifted to operating room. Line started and monitors connected. Patient allotted to either Airtraq or Macintosh group by way of sealed envelopes. Cook’s modification of Cormack and Lehane grading⁷ and Intubation Difficulty Score were noted. If intubation with Airtraq failed and saturation maintained, Macintosh blade was used for intubation and if the saturation decreased, mask ventilation with 100% oxygen followed by intubation with Macintosh laryngoscope. **Results:** Our study showed that the mean age, sex distribution and Body Mass Index of the patients in both the group were compared and there were no statistically significant differences between the groups. Mean duration of intubation with the Airtraq group was 11.07 secs in the Macintosh group it was found to be 17.19 secs. It was computed using Levene’s T test and was found to be statistically significant. 2 patients in the Airtraq group and 3 patients in the Macintosh group experienced trauma to the airways and all the injuries were to the soft tissues. Cormack and Lehane grade of both the group of patients were compared to grade the laryngeal view. 92% of patients in the Airtraq group had a CL grade of 1, compared to 44% of patients in the Macintosh group. **Conclusion:** In conclusion, the Airtraq laryngoscope offers a new approach to tracheal intubation of patients with anticipated and unanticipated difficult airway. The Airtraq reduced the difficulty of tracheal intubation and the degree of hemodynamic stimulation compared with the Macintosh laryngoscope.

Keywords: Laryngoscope, Airtraq, Macintosh, Intubation

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Introduction

Endotracheal intubation is considered to be the “Gold Standard” for airway management during administration of general anaesthesia and in critical care setting because of its advantages, which allows delivery of anaesthetic gases and oxygen via positive pressure ventilation without inflation of stomach, permits access to trachea bronchial tree for pulmonary hygiene and drug administration, isolation of respiratory tract from gastro-intestinal system hence minimizing the risk of gastric content aspiration and improves surgical access to head and neck[1]. In 1936, Sir Ivan Magill recommended placing a pillow under the occiput to raise the head and then to extend it to achieve the best laryngeal exposure. He was the first to describe the optimal head position for direct laryngoscopy (DL) as the position the head assumes when one wishes to sniff the air[2]. Proper preparation should include airway assessment, assembling and checking airway equipment and finally achieving sniffing position. Positioning the height of the table at the level of laryngoscopist’s naval helps to achieve a straight line between the operator’s eye and the patient’s upper airway. The history of the laryngoscope can be traced to the middle of the eighteenth century; it is only since the early decades of the twentieth

century that visualization of the vocal cords has been important in anaesthesia. First laryngoscope was invented in 1854 by Manuel Patricio Rodriguez Garcia. In the early 1870s, Trendelenburg from Germany performed the first endotracheal anaesthesia in man. In 1941, Robert Miller designed a blade with a curve on the bottom and a curved distal tip, which is now known as the Millerblade[3]. Modifications over the years have been made to both the blades for the purpose of providing more optimal intubating conditions. The Macintosh blade should be held with the left hand while the right thumb and index finger open the mouth. On deeper entry into the oral cavity, the blade tip is positioned between the base of the tongue and the pharyngeal surface of the epiglottis (vallecula). At that stage the tongue and pharyngeal soft tissues are lifted to expose the glottis opening. The design of Airtraq laryngoscope is such as to provide a view of the glottis without alignment of the oral, pharyngeal and tracheal axes. The Airtraq is inserted in the midline into the oral cavity. The blade is then slid around the tongue into the posterior pharynx; optimum depth of insertion is determined by the vallecula. Before the Airtraq’s main body reached the vertical plane, visualization of laryngeal structures is attempted. The blade is occasionally slightly elevated against the dorsal face of the tongue with minimum upward pressure for indirectly lifting the epiglottis[3]. Airway management is important in anaesthesia because adverse respiratory events are responsible for 75% of ASA closed claims[4]. Of these inadequate ventilation is the main culprit(38%), followed by oesophageal placement of tracheal tube(17%) and difficult

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intubation(18%). Approximately 600 patients[5] die each year in the developed world from complications related to airway management and the scenario in the underdeveloped world is much grimmer. The aim of this study to compared the intubating conditions with Airtraq laryngoscope and Macintosh laryngoscope in elective adult surgical patients.

Materials & Methods

A hospital based prospective study was conducted on 50 adult patients satisfying inclusion criteria were enrolled in the study after obtaining informed consent in department of anaesthesia in Ananta Institute of Medical Sciences, Rajsamanad, Rajasthan.

Inclusion Criteria

- ASA physical status 1,2&3.
- Age \geq 18 years of age.
- Who have given valid informed consent

Exclusion Criteria

- Severe cardiovascular, hepatic or renal disease, mental illness
- Are unconscious or very severely ill, ASA physical status IV
- Need for nasal intubation

Methods

Samson and Young modification of Mallampatti grading[6]:

The patient kept in sitting position with maximal mouth opening, protruding tongue, without phonation and the observer's eye in level with patient's mouth, the degree to which the faucial pillars, uvula, soft palate, and hard palate were visible were recorded and classified as follows:

Grade I: Faucial pillars, uvula, soft palate and hard palate visible

Grade II: Uvula, soft palate and hard palate visible

Grade III: Base of uvula or none, soft palate and hard palate visible

Grade IV: Only hard palate visible.

After assessment patient shifted to operating room. Line started and monitors connected. Patient allotted to either Airtraq or Macintosh group by way of sealed envelopes.

Heart rate, blood pressure and SpO₂ measured (preinduction). Inj. Glycopyrrolate 0.2 mg and Inj. Fentanyl 2 mcg/kg given as

premedication. Then preoxygenated with 100% oxygen at 6 ltr/min for 3 min. Induction done with Inj. Thiopentone 5mg/kg + NDP neuromuscular blocker. Ventilated with face mask for 3 min. Cook's modification of Cormack and Lehane grading⁷ and Intubation Difficulty Score were noted. If intubation with Airtraq failed and saturation maintained, Macintosh blade was used for intubation and if the saturation decreased, mask ventilation with 100% oxygen followed by intubation with Macintosh laryngoscope.

Results

Our study showed that the mean age, sex distribution and Body Mass Index of the patients in both the group were compared and there were no statistically significant differences between the groups (table 1). Distribution of patients according to Mallampatti grading in table no. 2.

Cormack and Lehane grade of both the group of patients were compared to grade the laryngeal view. 92% of patients in the Airtraq group had a CL grade of 1, compared to 44% of patients in the Macintosh group. In the Airtraq group 8% of patients had a CL grade of 2 compared to 48% of patients in the Macintosh group. No patient in the Airtraq group had a CL grade of 3 or 4, whereas 8% in the Macintosh group had a CL grade of 3 and none with a grade of 4. The differences between the two groups were statistically significant (table 3).

Mean duration of intubation with the Airtraq group was 11.07 secs in the Macintosh group it was found to be 17.19 secs. It was computed using Levene's T test and was found to be statistically significant (table 4).

2 patients in the Airtraq group and 3 patients in the Macintosh group experienced trauma to the airways and all the injuries were to the soft tissues (table 5).

The operator graded the ease of intubation in an increasing grade of difficulty from grade 1 to grade 5. 28 patients in the Airtraq group had a grade 1 ease of intubation, compared to 16 patients in the Macintosh group. In the Airtraq group 1 patient had a grade 2 ease of intubation, compared to 6 patients in the Macintosh group (table 6).

Table 1: Demographic variables in group A and Group B

Parameter Assessed	Group A(AIRTRAQ)		Group B(MACINTOSH)		P value
	Mean	SD	Mean	SD	
Age, yr	35.78	13.24	36.56	12.72	>0.05
Body Mass Index	25.36	4.311	24.82	3.314	>0.05

Table 2: Distribution of patients according to Mallampatti grading

Mallampatti Classification	Group A(AIRTRAQ)	Group B(MACINTOSH)	P value
1	10 (40%)	17 (68%)	>0.05
2	14 (56%)	8 (32%)	
3	1 (4%)	0 (0%)	
4	0 (0%)	0 (0%)	

Table 3: Distribution of patients according to Cormack and Lehane grading

Group	CL 1	CL2	CL3	CL4	P value
Airtraq(N=25)	23 (92%)	2(8%)	0(0%)	0(0%)	<0.0001
Macintosh (N=25)	11(44%)	12(48%)	2(8%)	0(0%)	

Table 4: Duration of Intubation

Parameter assessed	Group	N	Mean	S.D	P value
Duration	Airtraq	25	11.07	6.056	<0.0001
	Macintosh	25	17.19	5.052	

Table 5: Airway Trauma

Group	Trauma		P value
	Yes	No	
Airtraq (N=25)	2(8%)	28(92%)	>0.05
Macintosh (N=25)	3(12%)	22 (88%)	

Table 6: Operator Grading

Operator Grading	Group		P value
	Airtraq	Macintosh	
1	28(92%)	16 (64%)	<0.05
2	1(4%)	6(24%)	
3	1(4%)	3(12%)	
4	0(0%)	0(0%)	
5	0(0%)	0(0%)	

Discussion

Expert airway management is an essential skill of an Anaesthesiologist. Difficulties with tracheal intubation are mostly caused by difficult direct laryngoscopy with impaired view to the vocal cords[8]. Unfortunately, despite all the information currently available, no single factor reliably predicts these difficulties[9]. Consequently, many difficult intubations will not be recognized until after induction of anaesthesia. Unanticipated difficult intubation can lead to critical situations, especially in those patients who are at risk for gastric regurgitation, who are difficult to ventilate by mask or who have limited cardiopulmonary reserves. When a person is in supine position and head in neutral position, the laryngeal axis is almost horizontal. The pharyngeal axis is approximately 30 – 45° from the horizontal axis and the oral axis almost perpendicular to the laryngeal axis[10]. Successful direct laryngoscopy for the exposure of the glottis opening requires the alignment of oral, pharyngeal and laryngeal axes. Elevation of head about 10 cm with pads below the occiput aligns the laryngeal and pharyngeal axes. Intubation difficulty score was used to evaluate intubating conditions. It was developed by Adnet et al in 1997[11]. It is a blend of subjective and objective criteria that permit a qualitative and quantitative approach to the progressive nature of the difficulty in intubation and appears to be the best indicator till date.

In this scale, the value of IDS is '0' if full visualization of the laryngeal aperture is possible during laryngoscopy and vocal cords are seen to be nicely abducted. Each variation from this defined 'ideal' intubation increases the degree of difficulty, the overall score being the sum of all variations from the definition. It was generally easy to insert the Airtraq laryngoscope, to obtain a full view of the glottis, and to intubate the trachea without major complications. In this device, the tracheal tube can be attached to the side of the blade and the tip of the tube is visible on the viewfinder. Once the glottis was positioned in the centre of the viewfinder, it was easy to advance the tube into the trachea. There was one difficulty though. Inserting the Airtraq too close to the glottis will only allow the initial posterior movement of the tube and result in a failure to intubate. The 'back and up manoeuvre' which involves withdrawing the device away from the glottis and lifting the device up before attempting to intubate helps to overcome this problem. In the study conducted by Chrisen H. Maharaj, Elma Buckley, Brian H. Harte and John G. Laffey[12] titled "Endotracheal intubation in patients with cervical spine immobilization-A comparison of Macintosh and Airtraq laryngoscopes" it was found that 14 out of the 20 in Macintosh group had an IDS score of 1 or more, compared with 1 in the Airtraq group. In the Macintosh group 4 patients had an IDS score of 5 or greater, indicating moderate to severe intubation difficulty. These findings are comparable to our study. The laryngoscopic view was graded by Cormack and Lehane classification. Cormack and Lehane score (1,2,3,4) with Airtraq was (23,2,0,0) and with Macintosh blade was (11,12,2,0). The difference was statistically significant when analysed with Pearson chi square test and paired T test.

This result is comparable to the study titled "Endotracheal intubation in patients with cervical spine immobilization – A comparison of Macintosh and Airtraq laryngoscopes" conducted by Chrisen H. Maharaj et al at the University College Hospital, Galway, Ireland in which 19 out of the 20 patients intubated with Airtraq had a Cormack and Lehane grade of 1 and 1 patient had a grade of 2 when compared

to 6,7,7 patients with CL grade of 1,2 and 3 respectively in the Macintosh group[13]. Mean duration of intubation with the Airtraq group was 11.07 secs in the Macintosh group it was found to be 17.19 secs. It was computed using Levene's T test and was found to be statistically significant in our study. In the test conducted by Chrisen Maharaj et al[13] in Ireland in live patients it was 20.3 seconds with Macintosh and 13.2 seconds with the Airtraq laryngoscopes. In a different study conducted by Maharaj et al[12] in manikins it was found that the time for intubation with the macintosh group was 14.2 seconds and in the Airtraq group it was 9.5 seconds. In a study conducted by S.K.Ndoko et al[14] in the Jean Verdier Public University Hospital, France in 106 morbidly obese patients the mean time to intubate using Airtraq was 24 seconds and with Macintosh laryngoscope was 56 seconds. Minor degree of airway trauma was noted in 2 out of the 25 patients in the Airtraq group and 3 out of the 25 patients in the Macintosh group. All injuries were to the soft tissues. These findings were not statistically significant. In the study conducted by Maharaj et al it was found that intubation attempts with Airtraq significantly reduced the incidence of airway trauma in Laerdal Airway Trainer and SimMan Manikin in easy and simulated difficult airway scenarios when compared to Macintosh laryngoscope[12].

Conclusion

In conclusion, the Airtraq laryngoscope offers a new approach to tracheal intubation of patients with anticipated and unanticipated difficult airway. The Airtraq reduced the difficulty of tracheal intubation and the degree of hemodynamic stimulation compared with the Macintosh laryngoscope.

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