Section: Anaesthesia

Original Research Article

TO COMPARE THE EFFICACY OF USING VIDEOLARYNGOSCOPE AGAINST AIRTRAQ LARYNGOSCOPE FOR INTUBATION IN PATIENTS BY SIMULATING CERVICAL STABILISATION

Jeff Varghese[1], Mathews. P. Oommen[2], Dhipu Mathew[3], Thomas Mathew[4]

[1]Assistant Professor, Department of Anaesthesia , Mt. Zion Medical College, Chayalode, Adoor, Kerala, India.
[2]Assistant Professor, Department of Anaesthesia, Mt. Zion Medical College, Chayalode, Adoor, Kerala, India.
[3]Associate Professor, Department of Pulmonology, Mt. Zion Medical College, Chayalode, Adoor, Kerala, India.
[4]Assistant Professor, Department of General Medicine, Mt. Zion Medical College, Chayalode, Adoor, Kerala, India.

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Corresponding Author:

Dr. Jeff Varghese
Email: jeffv786@gmail.com

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Abstract

Background: Airway management is a crucial responsibility of the anesthesiologists. During direct laryngoscopy, proper positioning of the head and neck is essential for optimal laryngeal visualisation which requires flexion of cervical spine and extension of the atlanto-occipital joint for the alignment of oral, pharyngeal and laryngeal axes. This position is also known as sniffing position. **Materials and Methods:** The study was carried out at Mount. Zion Medical College, Chayalode, Adoor, and includes 50 adult patients belonging to ASA physical status I and II, Aged 18–50 years, of either sex. Patients will be randomly allocated into two equal groups (25 patients each) using the closed envelope method: Group A: 25 patients will receive general anaesthesia with endotracheal intubation using Airtraq laryngoscope. Group V: 25 patients will receive general anaesthesia with endotracheal intubation using Video Laryngoscopy. After obtaining local Ethics Committee approval and informed written consent from each patient, all patients will be properly assessed preoperatively. **Results:** This prospective, randomized, single blind (subject), case controlled study compared the intubating conditions with Airtraq laryngoscope and Macintosh laryngoscope and evaluated the advantages and safety, effective airway time, airway trauma and hemodynamic response. All data were collected and tabulated. 50 patients were randomly selected and included in this study. Twenty five patients were randomly assigned to undergo tracheal intubation with Airtraq laryngoscope (group A) and twenty five underwent tracheal intubation with Video Laryngoscopy (group VL). 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. **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. These findings demonstrate the efficacy of the Airtraq in many clinically relevant contexts and adds to the evolving body of knowledge regarding this potentially useful device.

INTRODUCTION

Airway management is a crucial responsibility of the anesthesiologists. During direct laryngoscopy, proper positioning of the head and neck is essential for optimal laryngeal visualisation which requires flexion of cervical spine and extension of the atlanto-occipital joint for the alignment of oral, pharyngeal and laryngeal axes. This position is also known as sniffing position.[1]

In patients with cervical spine injury, airway management poses a bigger challenge due to risk of neurological damage related to neck movements; thus manual-in-line stabilisation is commonly

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applied to minimise neck movement during tracheal intubation. Such immobilisation can render intubation under direct laryngoscopy more difficult.[2] Difficulties in airway management increases the risk of hypoxia, which can also lead to devastating neurological outcomes. These issues have prompted the development of number of alternatives to Macintosh laryngoscope such as Videolaryngoscopes, fiberoptic larngoscopy, Airtraq®, etc. These laryngoscopes do not require the alignment of pharyngeal, laryngeal and oral axis and thus do not require sniffing position.[3]

Video laryngoscopes comprises a Macintosh blade connected to a video unit. The familiarity of the Macintosh blade, and the ability to use the videolaryngoscope as a direct or indirect laryngoscope, may be advantageous. (VLs) have been shown to enhance intubation success rates of tracheal intubation, in patients with difficult airways and hence have a definite role in difficult airway management.[4]

The Airtraq optical laryngoscope (AOL) improves the view of the larynx and outperforms the Macintosh for accuracy, success, response time, and number of attempts to intubate, both in normal and difficult airways. It was designed using optic laryngoscopy technology, which lacks some of the useful features of videolaryngoscopy.[5]

This study is being designed to determine the effectiveness of Videolaryngoscope when compared with Airtraq laryngoscope when performing tracheal intubation in adult patients using manual-in-line stabilisation simulating cervical spine injury.

Primary Objective

To compare the efficacy of using Videolaryngoscope against Airtraq laryngoscope for intubation in patients by artificially simulating cervical stabilization (manual in-line stabilization and/or application of a cervical collar to limit mouth opening and neck movement)

To compare the ease and success rate of intubation with Videolaryngoscopy as assessed by

a. total intubation time
b. number of attempts

Secondary Objective

To compare the glottic view, need for external laryngeal manoeuvres, hemodynamic changes and airway morbidity in the two groups.

MATERIALS AND METHODS

The study was carried out at Mount. Zion Medical College, Chayalode, Adoor and includes 50 adult patients belonging to

a. ASA physical status I and II
b. Aged 18–50 years, of either sex scheduled for elective surgery under general anaesthesia with endotracheal intubation.

Patients included in the study will have the following airway criteria

1. Modified Mallampati classes I, II, III & IV
2. Modified Cormack- lehane grades I, II, III & IV

Patients will be randomly allocated into two equal groups (25 patients each) using the closed envelope method:

Group A: 25 patients will receive general anaesthesia with endotracheal intubation using Airtraq laryngoscope.

Group V: 25 patients will receive general anaesthesia with endotracheal intubation using Video Laryngoscopy.

After obtaining local Ethics Committee approval and informed written consent from each patient, all patients will be properly assessed preoperatively.

The patients with cervical spine injury often require the use of semi-rigid cervical collar or manual in-line stabilization to prevent neck movements, which may lead to poor laryngeal view on direct laryngoscopy and lead to difficulty with intubation. In this study, as we hope to simulate similar difficult airway scenario for cervical spine immobilization, we will be providing manual in-line stabilisation and also fixing a cervical collar to further restrict mobilisation.

On arrival to the operating room, patients will be connected to the standard monitors, including ECG, noninvasive arterial blood pressure and pulse oximeter. They will all be subjected to the same anaesthetic protocol. Pre-oxygenation with 100% oxygen for 3 minutes will be done. Induction will be performed using midazolam 0.03mg/kg, fentanyl 1µg/kg and propofol 1.5–2mg/kg. The pillow will be removed, and the neck immobilized using MILS applied by an experienced individual holding the sides of the neck and the mastoid processes, thus preventing flexion/extension or rotational movement of the head and neck.

Orotracheal intubation is facilitated with vecuronium 0.1 mg/kg, following which orotracheal intubation is performed using the selected intubation device for each group with the endotracheal tube after ensuring full muscle relaxation.

Trachea will be intubated using an appropriate sized endotracheal tube. Placement of ETT should be confirmed by bilateral chest auscultation and EtCO2 waveform and tube will be secured.

Haemodynamic variables such as SBP, DBP, and HR will be documented at first, third and fifth minute following endotracheal intubation.

Assessment of laryngoscopy and intubation procedure

1. Number of trials to successful intubation.
2. Manoeuvres during laryngoscopy.

A. BURP manoeuvre ‘backward, upward, rightward and posterior external laryngeal pressure’.

B. Using an intubating stylet in the second trial of laryngoscopy.

3. Endotracheal tube insertion time will be calculated from the time of introducing the laryngoscope blade through the patient’s mouth until successful intubation confirmed by the normal capnogram waveform.
4. Success/failure rate.

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5. Complications like airway injury, bronchospasm, technical failure of the videolaryngoscope, or a reduction of oxygen saturation below 90%.

RESULTS

This prospective, randomized, single blind (subject), case controlled study compared the intubating conditions with Airtraq laryngoscope and Macintosh laryngoscope and evaluated the advantages and safety, effective airway time, airway trauma and hemodynamic response. All data were collected and tabulated.

50 patients were randomly selected and included in this study. Twenty five patients were randomly assigned to undergo tracheal intubation with Airtraq laryngoscope (group A) and twenty five underwent tracheal intubation with Video Laryngoscopy (group VL). 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: Age and BMI comparison

Parameter	Group A (AirtraQ)		Group V Video Laryngoscopy		P Value
	Mean	SD	Mean	SD	
Age in years	36.63	13.91	37.4	12.82	0.825
BMI	25.302	4.375	24.66	3.37	0.527

Table 2: gender distribution

Parameter assessed	Group	N	Mean	SD	P Value
Duration	Group A (AirtraQ)	25	11.03	6.071	<0.0001
	Group V Video Laryngoscopy	25	17.2	5.047	

Table 4: Preinduction

Parameters	Group	N	Mean	SD	P Value
Heart rate	Group A (AirtraQ	25	83.03	12.944	
	Group V Video Laryngoscopy	25	88.73	16.613	0.144
Systolic BP	Group A (AirtraQ	25	120.50	15.431	
	Group V Video Laryngoscopy	25	127.20	17.878	0.126
Diastolic BP	Group A (AirtraQ	25	79.20	9.792	
	Group V Video Laryngoscopy	25	83.13	12.889	0.118
MAP	Group A (AirtraQ	25	93	11.277	
	Group V Video Laryngoscopy	25	97.63	14.129	0.166
Spo2	Group A (AirtraQ	25	100	0	
	Group V Video Laryngoscopy	25	100	0	-

Table 5: Preintubation

Parameters	Group	N	Mean	SD	P Value
Heart rate	Group A (AirtraQ	25	86.87	10.734	
	Group V Video Laryngoscopy	25	88.83	14.697	0.556
Systolic BP	Group A (AirtraQ	25	111.50	15.13	
	Group V Video Laryngoscopy	25	115.13	18.25	0.405
Diastolic BP	Group A (AirtraQ	25	74.17	11.61	
	Group V Video Laryngoscopy	25	73.87	11.57	0.921
MAP	Group A (AirtraQ	25	86.57	12.22	
	Group V Video Laryngoscopy	25	87.67	13.47	0.749
Spo2	Group A (AirtraQ	25	100	0	
	Group V Video Laryngoscopy	25	100	0	-

Table 6: 1 min Post intubation

Parameters	Group	N	Mean	SD	P Value
Heart rate	Group A (AirtraQ	25	102.07	17.648	
	Group V Video Laryngoscopy	25	116.43	14.115	0.001
Systolic BP	Group A (AirtraQ	25	129.00	18.118	
	Group V Video	25	150.80	18.430	

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	Laryngoscopy				0.001
Diastolic BP	Group A (AirtraQ	25	88.67	11.842	
	Group V Video Laryngoscopy	25	100.50	13.354	0.001
MAP	Group A (AirtraQ	25	102.03	13.520	
	Group V Video Laryngoscopy	25	117.30	14.707	<0.001
Spo2	Group A (AirtraQ	25	99.90	.548	
	Group V Video Laryngoscopy	25	99.80	.761	0.001

Table 7: 3 min Post intubation

Parameters	Group	N	Mean	SD	P Value
Heart rate	Group A (AirtraQ	25	92.30	14.003	0.004
	Group V Video Laryngoscopy	25	103.40	14.483	
Systolic BP	Group A (AirtraQ	25	120.43	16.913	0.006
	Group V Video Laryngoscopy	25	133.57	18.578	
Diastolic BP	Group A (AirtraQ	25	80.83	11.546	0.018
	Group V Video Laryngoscopy	25	88.43	12.506	
MAP	Group A (AirtraQ	25	94.07	12.881	0.008
	Group V Video Laryngoscopy	25	103.60	14.036	
Spo2	Group A (AirtraQ	25	100	.000	
	Group V Video Laryngoscopy	25	99.97	.183	0.312

Table 8: 5 min Post intubation

Parameters	Group	N	Mean	SD	P Value
Heart rate	Group A (AirtraQ	25	84.80	10.506	
	Group V Video Laryngoscopy	25	90.30	13.899	0.089
Systolic BP	Group A (AirtraQ	25	112.73	12.188	
	Group V Video Laryngoscopy	25	120.70	15.825	0.033
Diastolic BP	Group A (AirtraQ	25	75.07	10.123	0.435
	Group V Video Laryngoscopy	25	77.20	10.867	
MAP	Group A (AirtraQ	25	87.53	10.644	
	Group V Video Laryngoscopy	25	91.70	12.349	0.167
Spo2	Group A (AirtraQ	25	100	0	
	Group V Video Laryngoscopy	25	100	0	-

Table 9: Airway Trauma

Group	Trauma		P value
	Yes	No	
Group A (AirtraQ)	1 (6.67)	24(93.33%)	0.64
Group V Video Laryngoscopy	2 (10%)	23 (90%)	

Table 10: Operator grading

Operator grading	Group		P Value
	Group A (AirtraQ)	Group V Video Laryngoscopy	
1	23 (93.33%)	16 (66.67%)	0.033
2	1 (3.33%)	6 (23.33%)	
3	1 (3.33%)	3(10%)	
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. Unfortunately, despite all the information

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currently available, no single factor reliably predicts these difficulties.[6]

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 30-450 from the horizontal axis and the oral axis almost perpendicular to the laryngeal axis.[7]

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.[8]

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.[9]

The mean time to intubate with the Airtraq group was 11.03 seconds and in the Macintosh group it was 17.2 seconds and it was found to be statistically significant when computed with Levene's test for equality of variances.[10]

In the test conducted by Chrisen Maharaj et al in Ireland in live patients it was 20.3 seconds with Macintosh and 13.2 seconds with the Airtraq laryngoscopes.

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. These findings demonstrate the efficacy of the Airtraq in many clinically relevant contexts and adds to the evolving body of knowledge regarding this potentially useful device.

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