



A PROSPECTIVE RANDOMIZED CONTROL STUDY OF TRACHEAL INTUBATION USING AIRTRAQ AND COMPARING IT WITH THE LIGHTWAND IN ADULT PATIENT

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ABSTRACT

Endotracheal intubation is one of the commonest interventions performed by an anaesthesiologist. Our study was about comparing the ease of intubation using Airtraq and lightwand device in terms of duration of intubation, number of attempts, changes in hemodynamics and complications. Three hundred ASA 1-2 patients scheduled for elective surgery under general anaesthesia were randomly assigned to either the Airtraq (n = 150) or lightwand (n = 150). Intubation was performed by one of two anaesthetists experienced in the use of both devices. This study demonstrated that there was no difference in intubation time, success rate and haemodynamic variables and complications between the Airtraq and lightwand in patients without risk factors for intubation during routine airway management.

KEYWORDS : Airtraq, lightwand, intubation, hemodynamics.

INTRODUCTION

The Airtraq is a relatively new tracheal intubation device that has been developed for the management of normal and difficult airways. Compared with the traditional Macintosh laryngoscope, the Airtraq reduces the difficulty of tracheal intubation in patients at low risk for difficult laryngoscopy [1] and provides faster intubation in simulated difficult airways [2]. It is designed to provide a view of the glottis without using the classic sniffing position, which is needed to align the oral, pharyngeal, and tracheal axes for direct laryngoscopy with a Macintosh laryngoscope. This position requires head extension with cervical flexion and could result in neurological injury in patients with cervical spine injury. Recently the Airtraq has been reported to limit cervical spine movement compared with Macintosh laryngoscopy, without an increase in the intubation time [3].

The lightwand (Trachlight) is a simple technique that has long been proven to be effective in cases of difficult intubation [4-6]. In addition, its use has been reported to be associated with reduced cervical spine movement during tracheal intubation without an increase in intubation time [7]. The lightwand is a stylet with a light bulb at the end, that glows bright through the soft tissues of the anterior neck when it is placed inside the glottis. The tip of the wand is bent in a 'hockey stick' configuration before insertion with a jaw lift. After the confirmation of trans-illumination, the threaded tracheal tube can be passed blindly into the trachea. Our study compared the ease of intubation using Airtraq and lightwand device in terms of duration of intubation, optimizing manoeuvre, number of attempts, changes in hemodynamics and complications.

MATERIALS AND METHOD

Our study was a randomized prospective study consisting of 300 patients (accepting two sided alpha error and power of 90%, the total sample size is 300 i.e. 150 in each group.) posted for surgical procedures under general anaesthesia. The Ethics Committee approval was obtained to conduct the study. 300 patients were scheduled. They were randomly assigned to each group of intubation device by tossing: the Airtraq and the lightwand (LW) group. Patients in the age group of 18-65 years, ASA grade I and II, MPC grade I and II, and patients undergoing any elective surgical procedure under general anaesthesia with endotracheal intubation were included, whereas Patients refusal for consent for study, anticipated difficult intubation (MPC grade III and IV, thyromental

distance < 6cm or inter-incisor distance < 4 cm.), Patients at risk of pulmonary aspiration of gastric contents and with pathology in neck, upper respiratory tract, laryngeal pathology and upper alimentary tract as well as Anatomical abnormalities of the upper airway such as tumours, polyps, infection, foreign bodies or upper airway trauma (especially in case of Lightwand as it is a blind technique). And patient coming for emergency surgery were excluded.

All patients received a standardised general anaesthesia. Monitoring including ECG, non-invasive blood pressure, SpO₂, end-expiratory carbon dioxide (PE'CO₂) and volatile anaesthetic concentration in all patients. Anaesthesia was induced with inj propofol 2 mg/kg IV and inj. Pancuronium 0.1 mg/kg IV. Patient was oxygenated for 5 minutes with 100% oxygen. Adequate muscle relaxation and adequate depth of anaesthesia was achieved. Anaesthesia was maintained with Oxygen and Nitrous Oxide in 50:50 ratio and intermittent isoflurane agents (1 to 2%) with Intermittent boluses of Inj. Pancuronium.

For intubation using airtraq, the patient was kept in neutral position, and then the Airtraq device was inserted in patient's mouth in the midline, the tube was inserted in the trachea, confirmed by appearance of mist in the endotracheal tube, chest wall movement, auscultation and capnography. Similarly, intubation by lightwand was done by following process. The patient was kept in neutral position, the ambient light was dimmed. The lightwand was placed inside an endotracheal tube and the tube was lubricated with jelly, the tip of the lightwand was restricted to go beyond the tip of endotracheal tube to prevent trauma to soft tissue. Lightwand device was inserted from the base of the tongue till the glow of the bulb was seen on either side of thyroid prominence which was then withdrawn approximately till submental distance and rotated towards midline till glow was seen just above thyroid prominence and the endotracheal tube was inserted into the trachea and confirmed by appreciating the glow in trachea till suprasternal notch, appearance of mist in the endotracheal tube, chest wall movement, auscultation and capnography.

FAILED INTUBATION ATTEMPT:

Failure to intubate was defined as inability to place the tracheal tube into the trachea within 120 s; or more than three attempts required. An attempt in which patient was not

intubated or if more than 3 attempts were taken for intubating using either Airtraq or Lightwand then cross over of intubating device was done and patient was tried to intubate using lightwand in case of failed airtraq intubation and in case of failed lightwand airtraq was used. But in this cross over we only one attempt was given and if that also failed procedure was abandoned and routine laryngoscopy by macintosh was performed. In between attempts we will ventilate the patient with 100% oxygen for 1 min.

DURATION OF INSERTION OF AIRTRAQ TILL VISUALIZATION OF CORD:

T1 : The time taken from removal of face mask and insertion of Airtraq device between the teeth to visualization of vocal cords.

DURATION OF INTUBATION ATTEMPTS USING AIRTRAQ:

T2: The time taken from visualization of vocal cords and passing the endotracheal tube in the trachea and confirmation of its tracheal placement by appearance of mist in the endotracheal tube, chest wall movements, etc Total duration of intubation: T=T1 + T2(sec)

When tracheal intubation failed at the first attempt, but succeeded at the second attempt The sum of the time taken for the first time and the second attempt was noted. Similarly if succeeded at third attempt, the sum of the time taken for first, second and third attempt was noted (Excluding the Ventilation period between attempts which is giving 100% oxygen for 1 Min).

DURATION OF INSERTION OF LIGHTWAND TILL GLOW OF THE BULB IS SEEN ABOVE THYROID PROMINENCE:

T1 : The time taken from removal of face mask and insertion of Lightwand device from the base of the tongue till the glow of the bulb was seen on either side of thyroid prominence which was then withdrawn approximately till submentum and rotated towards midline till glow was seen just above thyroid prominence.

DURATION OF INTUBATION ATTEMPTS USING LIGHTWAND:

T2: The time taken from visualization of the glow of the bulb seen in midline just above thyroid prominence and passing the endotracheal tube in the trachea and confirmation by passing the glow in trachea till suprasternal notch also by appearance of mist in the endotracheal tube, chest wall movements, etc Total duration of intubation: T=T1 + T2(sec)

When tracheal intubation failed at the first attempt, but succeeded at the second attempt. The sum of the time taken for the first time and the second attempt is noted. Similarly if succeeded at third attempt, the sum of the time taken for first, second and third attempt is noted (Excluding the Ventilation period between attempts which is giving 100% oxygen for 1 Min).

DURATION OF INTUBATION BY CROSSING OVER IN CASE OF FAILED INTUBATION:

T1 : The time taken for removal of face mask and insertion of either of the device. mentioned as above.

T2 : Time taken from visualization of vocal cords and passing the endotracheal tube in the trachea OR The time taken from visualization of the glow of the bulb seen in midline just above thyroid prominence and passing the endotracheal tube in the trachea by using Airtraq and Lightwand respectively.

Total duration of intubation: T=T1 + T2(sec).

The following parameters were measured : number of attempts, duration of intubation, Hemodynamic response like

heart rate, systolic and diastolic blood pressure was recorded baseline, at device insertion, at intubation, and 10 min after intubation.

Complications like trauma to lips, gum trauma, tooth fall, tooth loosening, secretion, laryngospasm, bronchospasm, desaturation, sore throat will be noted and recorded. Optimisation manoeuvres, such as the jaw thrust by a second assistant, were allowed at each attempt if the vocal cords were not seen or the tip of the tracheal tube could not be passed in the Airtraq group, or when transillumination was not possible in the lightwand group.

OUTCOME MEASURES AND STATISTICAL ANALYSIS :

In our study, 300 patients were selected undergoing surgical procedure under general anaesthesia according to the inclusion and exclusion criteria. The statistical analysis of the study was carried out by SPSS and GraphPad Instat., Chi square test, students t test wherever applicable.

All quantitative data were expressed as mean ± standard deviation (SD). A P value less than 0.05 was considered statistically significant.

Table 1 : Comparison of Number of attempts required for intubation between the groups.

| No. of Attempts | AIRTRAQ (N = 150) | | LIGHTWAND (N = 150) | | P value |
|-----------------|-------------------|----|---------------------|-------|---------|
| | No. | % | No. | % | |
| 1 | 144 | 96 | 140 | 93.34 | 0.304* |
| 2 | 6 | 4 | 10 | 6.66 | |

Chi square TEST applied

In AIRTRAQ group 96% (144) patients were intubated in 1st attempt where as only 4% (6) required 2nd attempt and In LIGHTWAND group 93.34% (140) patients were intubated in 1st attempt where as only 6.66% (10) required 2nd attempt P VALUE was 0.304*, not statistically significant.

Table 2 : Comparison Between the Groups for Total duration:

| Groups | Mean Time (X̄ ± SD) Seconds |
|-----------|-----------------------------|
| AIRTRAQ | 32.08 ± 18.85 |
| LIGHTWAND | 30.80 ± 15.91 |

TOTAL DURATION

The mean duration of intubation was 32.08 ± 18.85 in AT group and 30.80 ± 15.91 in LW group

Table 3 OPTIMISING MANOEUVRE (%)

| OPTIMISING MANOEUVRE | Airtraq | Lightwand | P value |
|----------------------|----------|-----------|---------|
| Yes % | 4 2.7 | 5 3.3 | 0.735* |
| No % | 146 97.3 | 145 96.7 | |

PEARSON CHI SQUARE TEST applied

In AT GROUP 4/2.7% patients required optimising manoeuvre while In LW GROUP 5/3.3% patients required optimising manoeuvre.

P value WAS 0.735* P value is >0.05 and not statistically significant.

Table 4 : Comparison of changes in the mean pulse rate/min between the groups

| Period | Mean Pulse Rate/min (X̄ ± SD) Seconds | | P VALUE |
|---------------------|---------------------------------------|---------------|---------|
| | AIRTRAQ | AIRTRAQ | |
| Baseline | 75.33 ± 10.31 | 75.23 ± 10.16 | 0.933* |
| At device insertion | 96.70 ± 9.11 | 95.08 ± 9.0 | 0.122* |

| | | | |
|---------------|-------------|-------------|--------|
| At Intubation | 94.69±10.02 | 94.67±10.04 | 0.991* |
| After 10 min | 79.17±12.93 | 79.15±13.19 | 0.989* |

UNPAIRED T TEST applied

P value is 0.933', 0.122', 0.991' and 0.989' respectively .P value was >0.05 and not statistically significant.

Table 5: Comparison of changes in Mean Systolic Blood pressure (mmhg) between the group

| Period | Mean SBP(mmhg) ($\bar{X} \pm SD$) | | P VALUE |
|---------------------|--|--------------|---------|
| | AIRTRAQ | AIRTRAQ | |
| Baseline | 123.05±12.77 | 123.68±12.47 | 0.664* |
| At device insertion | 148.35±9.71 | 148.34±8.92 | 0.975* |
| At Intubation | 148.72±11.09 | 149.75±11.03 | 0.419* |
| After 10 min | 124.17±10.52 | 124.71±10.24 | 0.653* |

UNPAIRED T TEST applied

P value was 0.664', 0.975', 0.419' and 0.653' respectively .P value was >0.05 and not statistically significant.

Table 6: Comparison of changes in the mean diastolic blood pressure(mmhg) between the groups

| Period | Mean DBP(mmhg) ($\bar{X} \pm SD$) | | P VALUE |
|---------------------|--|------------|---------|
| | AIRTRAQ | AIRTRAQ | |
| Baseline | 75.18±8.22 | 75.58±8.28 | 0.675* |
| At device insertion | 83.33±7.16 | 84.11±6.80 | 0.330* |
| At Intubation | 82.44±8.38 | 83.09±7.91 | 0.492* |
| After 10 min | 73.38±6.54 | 73.89±6.81 | 0.506* |

UNPAIRED T TEST applied

P VALUE was 0.675', 0.33', 0.492', 0.506' respectively. P value is >0.05 and its not statistically significant..

Table 7 : Comparison of Complications between the groups

| Complications | AIRTRAQ | | LIGHTWAND | | P value |
|---------------|---------|------|-----------|------|---------|
| | No | % | No | % | |
| SORE THROAT | 3 | 2 | 3 | 2 | 0.698* |
| GUM TRUMA | 1 | 0.7 | 4 | 2.7 | |
| LIP TRUMA | 4 | 2.7 | 0 | 0 | |
| NIL | 142 | 94.7 | 143 | 95.3 | |

PEARSON CHI SQUARE TEST applied

AIRTRAQ group had only 3 patients with sore throat,one of them had gum trauma, 4 patients with lip trauma.

LIGHTWAND group had only 3patients with sore throat,4 patient with gum trauma, No patients with lip trauma.

p value WAS 0.698' not statistically significant.

DISCUSSION

In our study we compared tracheal intubation by using AIRTRAQ and LIGHTWAND and demonstrated that there was no difference in intubation time, success rate and haemodynamic variables and complications between the Airtraq and lightwand in patients without risk factors for intubation during routine airway management.

In this study, the heads of patients in both groups were kept in a neutral position and the success rate was 100% in both no crossover of intubating device or procedure got abandon . In AIRTRAQ group only 6 patients required 2nd attempt whereas In LIGHTWAND group 10 required 2nd attempt, which was not significant P VALUE is 0.304*our findings were similar to study done by E. Y. Park, Kim JY et al (2010)⁹ When we compared our study with C H Maharaj, Buckley et al study⁹ which had machintosh group, we found that airtraq and lightwand required less attempt as compared to machintosh. but here also p value was > 0.05 which is not statistically significant.

The mean duration of intubation was 32.08±18.85in AT group and 30.80±15.91 in LW group. There was no difference in success rates or intubation time. When we compared our study with E. Y. Park, Kim JY et al (2010)⁹, we found that time required in our study was more may be as the device is new and need expertization but the value of duration of intubation between groups was not statistically significant.p>0.05 and .Both groups are comparable among each other and to this study of E Y PARK⁹

In studies comparing either lightwand or airtraq with macintosh in routine intubation, duration of intubation was little more in macintosh group but it was not statistically significant.p>0.05

Our both groups needed optimisation manoeuvres, 5 patients in the lightwand group needed a second assistant for jaw thrust and 4 patient in the Airtraq group needed an optimisation manoeuvre. Our study was comparable with E Y PARK⁹ study. But we found that in studies including macintosh group optimizing manoeuvre requirement to get glottis veiw was more and was significant p<0.05 as compared to airtraq as airtraq gives direct glotic view.

Controversy exists on the haemodynamic response to tracheal intubation using the lightwand. A study comparing the lightwand and the Macintosh laryngoscope reported attenuation of the haemodynamic response to tracheal intubation with the lightwand in normotensive patients, but not in hypertensive patients [10], while another study reported the opposite result [11]. However, there are many studies comparing the lightwand and Macintosh laryngoscope in which no difference in haemodynamic response was observed [12-14]. Montes et al. concluded that direct stimulation of the trachea is a major cause of the haemodynamic changes associated with tracheal intubation [13]. On the other hand, a number of studies investigating the Airtraq reported fewer changes in blood pressure and heart rate compared with Macintosh laryngoscopy [1, 9]. In our study, we found no difference in heart rate and blood pressure between the Airtraq and lightwand groups. In study done by Matheus Felipe de Oliveira Salvalaggio, Rogério Rehme et al (2010)¹⁵ comparing lightwand and macintosh showed no significant difference between the groups with respect to heart rate .But in studies comparing airtraq and macintosh, by CH.Maharaj ,Buckley et al (2007)⁹ macintosh showed more significant increase in heart rate . p<0.05 which is statistically significant.

Regarding complications AIRTRAQ group had only 3 patients With sore throat,one of them had gum trauma, 4 patients with lip trauma.LIGHTWAND group had only 3 patients with sore throat , 4 patient with gum trauma.none of the patients with lip trauma .all studies showed no or minimal complications with both groups. p value is 0.698 .the difference was not statistically significant p>0.05 Our study was comparable to all above studies with respective to complication except for a study done by matheus¹⁵ where hoarseness was the only data that showed statistically significant differences in lightwand group.

LIMITATION

1. The major limitation of this study is the lack of a Macintosh laryngoscope group. The lightwand group was considered the control group.
2. Another limitation is the lack of an intubation difficulty score.To measure the intubation difficulty score for the lightwand, which is a blind technique, direct laryngoscopy would have been required to observe the structures around the vocal cords before the lightwand was inserted, which may have influenced the haemodynamics

3. OUR results can defer from the original study as the devices are new, technique is new ,skills of anaesthe siologist may defer and needs expertization and need futher evaluation.

CONCLUSION :

Airtraq and lightwand possess similar efficacy and usability in patients without risk factors for difficult intubation.

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