

**COMPARISON OF FIBEROPTIC BRONCHOSCOPE AND
AIRTRAQ FOR ANTICIPATED DIFFICULT AIRWAY- A
RANDOMIZED CLINICAL STUDY**

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Abstract:

Introduction: Anticipated difficult airway is a major concern for anaesthesiologists. Failure to secure airway may pose many problems which increases morbidity and mortality during anaesthesia. Sympathetic response with endotracheal intubation can be deleterious in patients who have co- morbid conditions like cardiac and neurological diseases.

Methods: The prospective randomized study was performed on 64 patients who were having difficult airway and divided into two equal groups, group F and group A. In group F fiberoptic bronchoscope was used and group A Airtraq optical laryngoscope was used in patients with anticipated difficult airway.

Results: Intubation parameters included vocal cord visualization time which was 30.98 ± 12.98 secs in group F and 14.15 ± 5.59 secs in group A and was found statistically significant with p value <0.01 . Group F vocal cord visualization time was significantly more compared to

group A. Tracheal intubation time was 37.02 ± 14.47 secs in group F and 18.98 ± 6.55 secs in group A and was statistically significant with p value <0.01 . Intubation time was higher in group F compared to group A. All patients were intubated in first attempt in group F and two patients were intubated in second attempt in group A.

Conclusion : Both the devices can be used in anticipated difficult airway. Fiberoptic bronchoscope needs skill and training in

performing the intubation and expensive compared to Airtraq. Vocal cord visualization time and tracheal visualization time was more in fiberoptic when compared to Airtraq optical laryngoscope.

Key words: Fiberoptic bronchoscope, Airtraq laryngoscope, difficult airway, General anaesthesia.

Running title-Fiberoptic bronchoscope and airtraq for anticipated difficult airway

Introduction:

Anticipated difficult airway is a major concern for anaesthesiologists. Failure to secure airway may pose many problems which increases morbidity and mortality during anaesthesia. Sympathetic response with endotracheal intubation can be deleterious in patients who have co-morbid conditions like cardiac and neurological diseases. During direct laryngoscopy with conventional blades, the tip of the blade is placed on the vallecula leading to sympathetic response causing tachycardia and hypertension.^[1] Before induction of anaesthesia there are difficult airway predictors to predict and to anticipate difficult airway. In spite of predictors regard to airway, difficult intubation is not known until the patient is induced with anaesthesia. Many airway devices and instruments are developed to overcome difficult airway and intubate successfully, thereby reducing mortality associated with difficult intubation^[2].

Flexible Fiberoptic bronchoscope (FOB) is considered standard technique for fiberoptic guided awake intubation in anticipated difficult airway. FOB is used in securing the airway in injuries of head, neck and cervical spine, this requires skill and ease to operate the device and secure airway. This technique has increased in anaesthesia practice for difficult airway and can also be used in anaesthetized patients for intubation^[3].

The Airtraq optical laryngoscope is a single use device designed to facilitate intubation in difficult and normal airway. It has a curve and optical system which is designed to help secure airway without altering the axis of different parts of airway. It has a width of 2.8cms and thickness of 1.8 cms. It provides a view of the glottis without the alignment of the airway axis which facilitates intubation^[4,5].

The Airtraq blade has side channels one of which will guide the endotracheal tube and the other which has optical system will aid in visualizing the glottis during intubation^[6].

Many studies are done on hemodynamic response to different types of laryngoscope blades but limited studies are present with comparison of Airtraq and FOB with regards to hemodynamic response during intubation.

Primary objective is to study and compare Airtraq optical laryngoscope and fiberoptic bronchoscope with respect to vocal cord visualization time, time of Intubation, Hemodynamic changes, number of attempts.

Secondary objectives are complications associated with the procedure.

Aim of our study is to compare Airtraq optical laryngoscope and Fiberoptic Bronchoscope in anticipated difficult airway for endotracheal intubation and hemodynamic response during intubation.

Material and methods:

Institutional ethical committee approval for the study was obtained before the study. This prospective randomized study was carried out in patients with, ASA Physical status I to III, patients predicted to have anticipated difficult airway as determined by clinical predictors: Mallampatti grade >3, mouth opening ≤ 3cms, and thyromental distance < 6cms, Atlanto occipital joint < 15° were measured. Patient undergoing elective surgical procedures under general anaesthesia in 64 patients between the age group of 18-60 years were included in the study. Patients with

uncontrolled hypertension, history of cardiac ailment, history of respiratory disease, coagulopathies, signs and symptoms of raised intracranial pressure, ASA Physical status IV and V, patients with morbid obesity, patients with history of difficult intubation or undergone cervical surgery were excluded from the study.

Patients were randomised using computer generated random numbers into two groups F and A, with 32 patients in each group.

After preoperative evaluation on the day prior to surgery, written informed consent was obtained. Previous night before surgery Tab Alprazolam 0.25mg was given. All patients were kept nil orally for 8hrs. Basal vital parameters were recorded in preoperative room. All Patients were monitored in the operating theatre with pulse oximeter, noninvasive blood pressure (NIBP) and capnograph (ETCO₂), electrocardiogram and monitoring continued through out the procedure. Devices for difficult intubation like Laryngeal mask airway, cricothyroidotomy were kept ready. After preoxygenation with 100% oxygen for 3mins, patients were premedicated with injmidazolam 0.03-0.05mg/kg, injondansetron 0.15mg/kg, injglycopyrolate 0.005mg/kg, inj fentanyl 2mcg/kg. Patients were induced with propofol 2mg/kg, After confirming mask ventilation, neuromuscular blockade was achieved with injatracurium 0.5mg/kg and inhalational with 1.5% isoflurane. Intubation was done with appropriate size endotracheal tube(ETT) by using either Fiberoptic bronchoscope in group F or Airtraq optical laryngoscope in group A.

In Group F, ETT was rail - roaded over the FOB scope. After glottis visualization, the FOB was further advanced to the trachea till carina visualization. The ETT was advanced over the scope and FOB was removed. The ETT was connected to the breathing circuit and bilateral air entry checked, ETT placement was confirmed by appearance of normal capnograph.

In Group A an appropriate size ETT was loaded in the channel of the Airtraq optical laryngoscope and introduced into the oral cavity till glottic opening was visible. ETT was advanced into the trachea under vision, scope was removed and ETT connected to the breathing circuit and checked for bilateral air entry. ETT placement was confirmed by appearance of a normal capnograph in group A. Vocal cord visualization time and tracheal intubation time were recorded in both the groups. Vocal cord visualization time was considered as time from introducing the scope in the mouth till the visibility of vocal cords. Tracheal intubation time was considered as time from introducing the device in the mouth until the tube passes the vocal cords. Heart rate and MAP were recorded before induction, after induction and for 1 min, 3 mins, 5 mins after intubation in both the groups. Standard anaesthesia technique with oxygen, nitrous oxide and isoflurane and controlled ventilation was followed in both the groups.

An attempt to endotracheal intubation was considered failed if the time exceeded 120 seconds or saturation dropped below 93%. Patients requiring more than 3 attempts for endotracheal were excluded from the study.

The primary outcome was intubation carried out successfully in first attempt.

Secondary outcomes was duration of endotracheal intubation, number of intubation attempts and incidence of adverse effects like oxygen desaturation, trauma, bleeding, bronchospasm, sore throat were observed in both the groups.

Statistical analysis:

On the basis of a study^[4] conducted the anticipated mean \pm sd of Fiberoptic bronchoscope vs Airtraq optical laryngoscope for anticipated difficult airway was 97.9 ± 1 and 98.75 ± 0.63 respectively. The sample size is 32 in

each group with 95% level of significance and 90% power. Total sample size is 64.

Data was analyzed using statistical program for social science (SPSS) Version 21.0.

Quantitative data were recorded as mean \pm SD. Qualitative data were recorded as frequency and percentage. To compare qualitative type of data between the two groups unpaired 't' test and for qualitative data Chi-square test was done. A $p < 0.05$ was regarded to be statistically significant.

Results: The study was performed on 64 patients who were having difficult airway and divided into two equal groups, group F and group A. In group F fiberoptic bronchoscope was used and group A Airtraq optical laryngoscope was used in patients with anticipated difficult airway. Demographic data of the patients included age, gender, weight and ASA physical status which were comparable in both the groups and were not significant (Table-1).

With regards to airway predictors both groups were comparable like mouth opening, Mallampatti grade and thyromental distance and were not statistically significant (Table-2).

Intubation parameters included vocal cord visualization time which was 30.98 ± 12.98 secs

In group F and 14.15 ± 5.59 secs in group A and was found statistically significant with

p value < 0.01 . Group F vocal cord visualization time was significantly more compared to

group A. Tracheal intubation time was 37.02 ± 14.47 secs in group F and 18.98 ± 6.55 secs in group A and was statistically significant with p value < 0.01 . Intubation time was higher in group F compared to group A. All patients were intubated in first attempt in group F and two patients were intubated in second attempt in group A (Table-3). Vital parameters

like Heart rate and MAP were recorded during the procedure and were compared in both the groups. Vital parameters were not significant in both the groups (fig-1 and fig-2) Minimal adverse effects were observed in both the groups which was not significant. None of the patients had oxygen desaturation during the procedure in both groups. Minimal trauma was noted in one patient in group A, none in group F. Traces of blood was observed in both groups with one patient in each group. Bronchospasm was not seen in both the groups. Incidence of sore throat was 30.33 ± 8.984 in group F and 31.40 ± 10.361 in Group A which was insignificant (Table-4).

Discussion:

Failure to intubate and oxygenate poses a challenge to anesthesiologists. Difficult airway needs multiple devices to reduce the complications associated with airway. Fiberoptic bronchoscopy is standard and versatile tool for difficult airway. It is used even in emergency departments and ICU for airway management^[7,8,9]. There are different clinical approaches like awake oral and nasal with local anaesthetics with or without sedation. FOB can also be used in anaesthetized patients for intubation. FOB is standard technique in difficult airway in anaesthesia practice. Various laryngoscopes were invented which has different shape and imaging system^[10,11,12]. In this study we compared fiberoptic bronchoscope and Airtraq optical laryngoscope for tracheal intubation in anticipated difficult airway. Tracheal intubation consists of vocal cord visualization and endotracheal tube insertion through the vocal cord. The main observation of our study was vocal visualization time and tracheal intubation time which was longer in FOB compared to Airtraq, this difference in time period may be due to difference in shape, insertion and intubation methods. In fiberoptic bronchoscope the scope is passed in the tube before and in airtraq tube there is a side channel in which tube can be preloaded. Airtraq has a complicated optical system, shape of blade is

unique which has a special curvature which aids in tracheal intubation without changing the airway axis which makes a desired device in patients with limited neck extension and obesity in whom intubation is difficult^[13,14,15,16].

Fiberoptic requires skill to perform tracheal intubation. A study^[4] compared fiberoptic bronchoscope and Airtraq with other blades like C-mac , D- blade they observed time to visualize vocal cord and time to tracheal intubation was higher in FOB compared to Airtraq which is similar to our study. Alvis BD et al^[17] compared rigid and flexible laryngoscope (RIFL) and FOB in patients with difficult airway for intubation. They observed that intubation time was significantly longer in FOB group compared to other group, which is similar to our study. Many studies compared Airtraq with other laryngoscope blades and found less vocal cord visualization time and less intubation time which coincides with airtraqgroup^[18, 19, 20,21]. All patients in group F were intubated in first attempt with manipulations in few patients. First attempt success rate was 100% in group F whereas success rate was 93.7 % in group A. Intubation was done in second attempt in two patients in group A.

There was no significant difference in HR, MAP in both the groups before induction, after induction, 1 min,3 mins and 5 mins after intubation. Similar observations were found in studies regarding MAP and HR and no variations before and after induction except at 1 min and 3 min post intubation were significantly higher in both the groups^[22,23,24,25]. Oxygen desaturation was not recorded in any of the cases in both the groups. In a study by Abdelmalak BB et al^[19] they observed hypoxemia in 5% of the patients these observations were found maybe due to selection of obese patients which were not included in our study. We found minimal bleeding and trauma in both the groups which was statistically insignificant and similar to the above study . Sore throat was seen in 17% of patients in their study. We observed sore throat in group F and group A which

was 30.33 ± 8.984 and 31.40 ± 10.361 but was not statistically significant. In our study there was no incidence of bronchospasm in either groups.

Limitations of our study – Obesity and patients with co-morbidities were not included in our study.

Conclusion: Both the devices can be used in anticipated difficult airway. Fiberoptic bronchoscope needs skill and training in performing the intubation and expensive compared to Airtraq. Vocal cord visualization time and tracheal visualization time was more in fiberoptic when compared to Airtraq optical laryngoscope.

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Tables

Table-1: Demographic data

	Group F	Group A	p value
	n=32	n=32	
Age (Yrs)			
<= 20	1(3.2%)	4(12.5%)	0.903*
21 - 30	4(12.5%)	12(37.5%)	
31 - 40	11(34.3%)	12(37.5%)	
41 - 50	4(12.5%)	4(12.5%)	
51+	12(37.5%)	4(12.5%)	
Gender			
Female	12(37.5)	13(40.6)	0.797*
Male	20(62.5)	19(59.4)	
Weight(kgs)			
Mean±SD	63.90±12.639	64.27±11.117	0.901*
ASA grading			
I	6(18.8%)	6(18.8%)	0.919*
II	14(43.7%)	15(46.9%)	
III	12(37.5%)	11(34.3%)	

Data is represented as numbers and n(%),*p value- <0.05 significant,
Group F- Fibreoptic Bronchoscope ,Group A-Airtraq optical
laryngoscope.

Table-2: Airway predictors

	Group F	Group A	p value
	n=32	n=32	

Mouth opening (cms)	3.69±0.43	3.65±0.28	0.638*
Mallampati grade			
I	6(18.75%)	5(15.7%)	0.919*
II	6(18.75%)	7(21.8%)	
III	20(62.5%)	20(62.5%)	
Thyromental distance (cms)	6.95±0.33	6.88±0.30	0.378*

Data is represented as numbers and n(%),*p value- <0.05 significant, Group F- Fibreoptic Bronchoscope,Group A- Airtraq optical laryngoscope.

Table-3: Intubation parameters

	Group F	Group A	p value
	n= 32	n=32	
Vocal cord visualization time (secs)	30.98 ± 12.98	14.15 ± 5.59	< 0.01*
Tracheal intubation time (secs)	37.02 ± 14.47	18.98 ± 6.55	<0.01*
Number of intubation attempts			
1	32(100%)	30(93.75%)	

2	0	2(6.25%)	
3	0	0	

Data is represented as numbers and n(%), *p value <0.05 significant,
Group F- Fibreoptic Bronchoscope, Group A-Airtraq optical laryngoscope.

Table- 4: Adverse effects

	Group F	Group A	p value
	n=32	n=32	
O2 desaturation	0	0	
Trauma	0	1(3.2%)	
Bleeding	1(3.2%)	1(3.2%)	
Bronchospasm	0	0	
Sore throat	30.33±8.984	31.40±10.361	0.66*

Data is represented as numbers and n(%), *p value <0.05 significant,
Group F- Fibreoptic Bronchoscope, Group A-Airtraq optical laryngoscope.

Figure legends:

Figure-1 –Mean heart rate

Figure-2- Mean arterial pressure

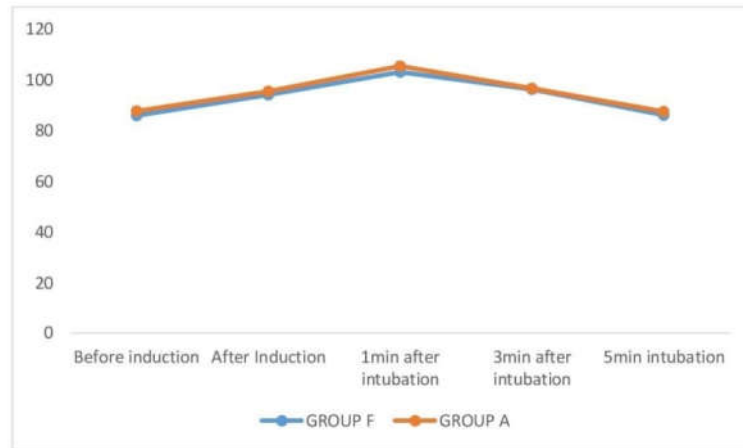


Fig-1: Mean heart rate: Heart rate is recorded before induction, after induction, 1 min, 3min and 5min after intubation; $p < 0.05$ is significant. Vertical axis represents heart rate reading and horizontal axis represents time of induction and intubation

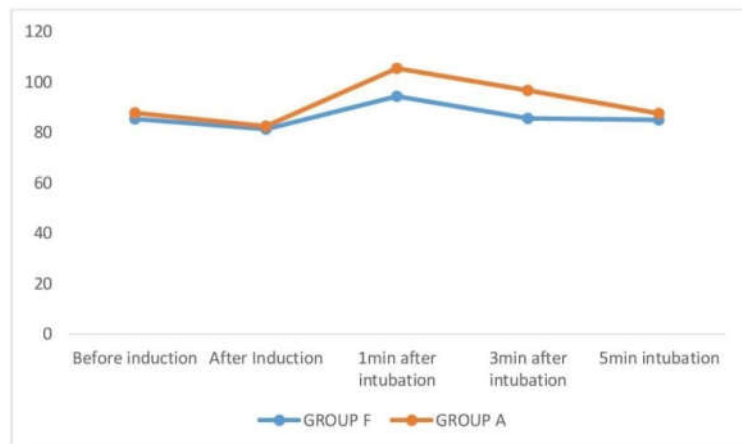


Fig-2: Mean arterial blood pressure(MAP) : MAP is recorded before induction, after induction, 1 min, 3min and 5min after intubation; $p < 0.05$ is significant. Vertical axis represents MAP reading and horizontal axis represents time of induction and intubation