CARDIOVASCULAR RESPONSE TO LARYNGOSCOPY VERSUS FIBER-OPTIC BRONCHOSCOPE DURING OROTRACHEAL INTUBATION IN PATIENTS UNDERGOING ELECTIVE SURGERY

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ABSTRACT

Objective: To compare the hemodynamic response between flexible fiber optic bronchoscope (FOB) and Macintosh laryngoscope during orotracheal intubation. The secondary objective was to calculate the time required for intubation between these two techniques

Study Design: Quasi experimental study.

Place and Duration of Study: Department of Anesthesia, Frontier Corps Hospital Quetta, from Oct 2016 to Apr 2017.

Methodology: Eighty patients fulfilling the inclusion/exclusion criteria were included in this study and were divided randomly into two groups. Group L was intubated with Macintosh laryngoscope (control group) whereas group F was intubated with Fiber optic bronchoscope. Mean arterial pressure and heart rate was recorded as baseline, pre-intubation and then every 01 minute for 03 minutes. Changes in heart rate and mean arterial pressure were recorded in the proforma by another anesthetist who was blinded to the procedure performed.

Results: The mean age in group L was 41.23 ± 8.37 years and in group F was 40.73 ± 9.77 years. The mean weight in group L was 69.63 ± 8.92 kg and in group F was 70.6 ± 9.20 kg. In group L, male to female ratio was 26:14 whereas in group F it was 28:12. Mean heart rate and mean arterial pressure did not show significant change over time between groups. Time required for intubation was significantly less (22.45 ± 4.12 secs) in laryngoscopy group versus Fiber-Optic Bronchoscope group (44.68 ± 5.88 secs).

Conclusion: In conclusion we can say that our study demonstrated that using laryngoscope or Fiber-Optic Bronchoscope for orotracheal intubation exhibits no difference in hemodynamic parameters and serves no added advantage in attenuating the stress response to intubation.

Keywords: Fiber optic bronchoscope, Hemodynamics, Intubation, Laryngoscopy, Stress response.

INTRODUCTION

The cardiovascular response to laryngoscopy and intubation has always been a concern to the anesthesiologists so that the airway is secured skillfully without any untoward adverse effects[1]. Manipulation of the oropharyngeal structures during intubation lead to stimulation of the sympathetic system which cause increase in heart rate and blood pressure[2]. This increase might not be that harmful in young ASA-1 patient but in patients with cardiac or cerebrovascular disease this could lead to increased morbidity and mortality. Therefore, it is advisable to use such a technique that causes minimal stress response while intubation[3]. Many methods have been studied, pharmacological and non-pharmacological to decrease the incidence of stimulation especially in patients with co morbid diseases or those undergoing neuro or ophthalmic procedures[4]. In our country not much studies have been done regarding the use of flexible fiber optic bronchoscope (FOB) as a tool to use in routine intubations to decrease the stress response to intubation owing to scarce availability FOB in our institutions because of its high purchasing and maintenance cost. Where available, FOB is used carefully in a select group of patients[5,6]. However we investigated that FOB can be useful in normal orotracheal intubations too. Adachi *et al*[7] also compared both methods of

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intubation using TV monitoring and showed no significant difference between the two methods in terms of cardiovascular response.

In one of the study by Shibata *et al*[8] oral route for fiber-optic intubation caused less increase in hemodynamic responses as compared to nasal route. Satomto *et al*[9] also compared both these techniques as in our study and found that significantly decreased hemodynamic response in FOB group although in the study fentanyl was additionally given to patients. Literature search shows that in patients with associated cardiac or neurological conditions no study was available in using FOB to decrease the stress response to intubation. Current literature advocates the use of FOB in difficult airway situations however it can also be utilized in normal airway patients[10].

The rationale of the study was to compare the effect of FOB versus conventional laryngoscopy on cardiovascular system in terms of hemodynamic response so as to decrease the adverse effects due to orotracheal intubation. Based on statistics it will help us prevent the unnecessary surges in blood pressure and heart rate in patients especially in those with limited cardiac reserve or neurosurgeries where elevation of hemodynamics is detrimental. The aim of the study was to investigate the hemodynamic response between flexible FOB and Macintosh laryngoscope during orotracheal intubation. The secondary objective was to calculate the time required for intubation between these two techniques.

METHODOLOGY

This quasi experimental study was carried out in the Department of Anesthesia, Frontier Corps Hospital Quetta, from October 2016 to April 2017. The sample size was calculated using WHO sample size calculator with power of study 80% and level of significance 5% from a previously published study (95 ± 13 vs 84 ± 13), which came out to be 44 however 80 patients were included in the study to cater for dropouts using probability sampling technique[11]. After getting approval from Hospital Ethical Committee number 002/10/16, Eighty patients undergoing elective procedures under general anesthesia with orotracheal intubation were included in the study. All patients were ASA I, II of either gender aged between 20 to 50 years. The exclusion criteria included ASA Physical status >II, history of asthma, COPD, cardiovascular disease, cerebrovascular disease, GERD, morbid obesity, drug use affecting heart rate or blood pressure, anticipated difficult airway, patient refusal and cervical spine pathology. Patients were randomly divided into two equal groups using lottery method. Group L: patients who were intubated by Macintosh laryngoscope Group F: patients who were intubated by Fiber optic bronchoscope. Before surgery patients were briefed in detail regarding both techniques and consent was taken. All patients before surgery were NPO for >8 hrs. In operation theater an IV line was secured and standard monitoring; SPO2, ECG, Heart rate, NIBP was attached to patient. After 10 min of stabilization period, Baseline Heart rate (HR) and Mean Arterial Pressure MAP were recorded. Pre – induction was done with Inj Metoclopramide (10mg), Inj Dexamethasone (8mg), Inj Glycopyrrolate (0.005mg/kg) and Inj Nalbuphine (0.1 mg/kg). After preoxygenation for 5 minutes, patients were induced by inj Propofol 2 mg/kg and muscle relaxation was achieved with Inj Atracurium (0.5 mg/kg) after confirming adequate bag mask ventilation. Deep plane of anesthesia was achieved by giving 1% Isoflurane along with 100% Oxygen. Any patient in which there was difficulty in BMV was excluded from the study. After 3 minutes, pre-intubation HR and MAP were recorded and orotracheal intubation was performed either with flexible fiber optic bronchoscope (Olympus, Japan) mounted with cuffed 7.5mm ID endotracheal tube or standard Macintosh laryngoscope using direct laryngoscopy technique. During FOB intubation, a geudal airway was inserted between teeth to keep mouth open with slight chin lift. Care was taken that the tip of FOB does not touch the carina. Tube position in both groups was confirmed by End Tidal CO2 concentration and bilateral auscultation. Anesthesia was maintained with isoflurane, oxygen and air. Values for HR

and MAP were recorded at baseline, pre-intubation and then every 1 minute for 3 minutes after intubation. The duration of tracheal intubation was also noted and defined as time taken from end of bag mask ventilation till start of ventilation through endotracheal tube. All patients were intubated by the same anesthesiologist. Patients requiring more than one attempt for intubation were excluded from the study. Data analysis was done using SPSS version 20. Demographic variables (Gender, age, weight) were analyzed using chi square. Hemodynamic variables (MAP, heart rate) and time to intubation were analyzed using independent samples t-test. A *p*-value less than and equal to 0.05 was considered as significant.

RESULTS

A total of eighty patients were studied with forty patients in each group. Intubation was successfully done in all patients in first attempt without occurrence of any airway or dental injury or any other complication. Oxygen saturation of all the patients remained more than Ninety-Four percent throughout the process of intubation and surgery.

Table-I shows the demographic data of patients along with intubation time. There was no statistical significant difference among groups on basis of age, weight and gender however intubation time was statistically more significant in FOB group (44.68 ± 5.88 secs) as compared to laryngoscopy group (22.45 ± 4.12 secs).

Table-I: Demographic data.

Parameter	Group Laryngoscope	Group Fiber optic Bronchoscope	*p*-value
(n)	40	40	-
Age (Years)	41.23 ± 8.37	40.73 ± 9.77	0.81
Weight (Kilograms)	69.63 ± 8.92	70.60 ± 9.20	0.68
Gender (Male: Female)	26 : 14	28:12	0.23
Intubation time (secs)	22.45 ± 4.12	44.68 ± 5.88	<0.05

Fig-1 & 2 show the mean MAP and Heart rate between the two groups measured over time period that is baseline, pre intubation and then every 1 minute for 3 minutes. Statistics analysis showed that there was no statistical significant change in heart rate (*p*=0.137) and mean arterial pressure (*p*=0.641) over time in both groups, similarly there was no statistical difference in hemodynamics between two groups when measured at

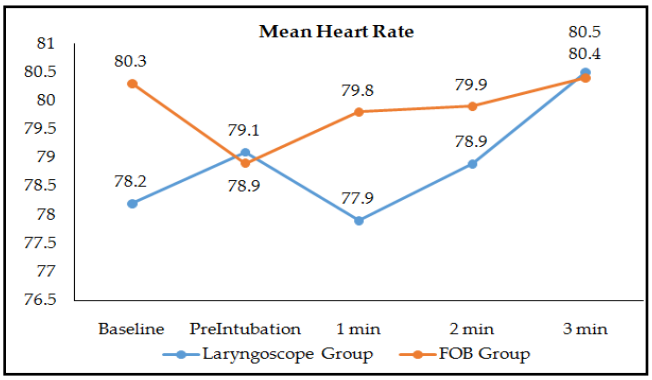

Figure-1: Mean Heart rate between the two groups measured over time.

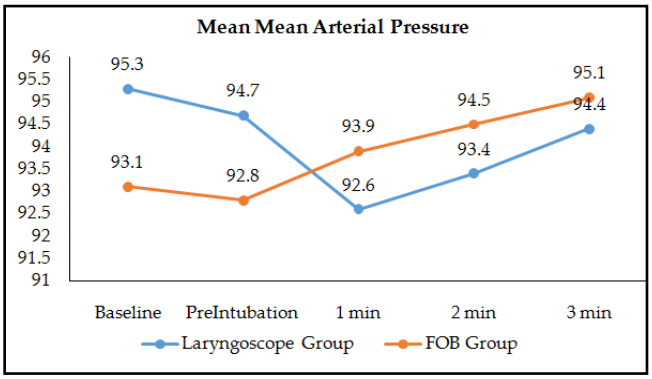

Figure-2: Mean MAP rate between the two groups measured over time.

one point of time (table-II & III) thus concluding that use of FOB or Laryngoscope do not have statistically significant effect on the hemodynamics of the patient.

DISCUSSION

Successful intubation without altering the hemodynamics of the patients is key for safe anesthesia as many complications could occur if proper attention is not paid at this time[12]. Induction of anesthesia causes a decrease in blood

pressure whereas intubation attempt by laryngoscopy causes a surge in these parameters[13]. Pharyngeal structures are richly supplied by sympathetic nerve endings and handling of these areas lead to increase in blood pressure and heart rate[14]. This response can be divided into two phases, one due to laryngoscopy and second due to intubation so by omitting laryngoscopy in certain group of patients we must be able to decrease the stress response[15]. Using a FOB has its own advantages, like we may be able to avoid touching the base of epiglottis and other receptors in the pharynx that are stimulated by laryngoscope. Many studies have proved that force and duration of laryngoscopy is the main cause for sympathetic stimulation. This study will also help us understand the role of laryngoscopy in causing the stress response. In this study we compared FOB and laryngoscope intubation technique. Our study showed that there was no statistically significant difference in hemodynamic response to FOB versus laryngoscopy. This could be due to decreased laryngoscopy time, insertion of geudal airway or chin lift maneuver during FOB or stimulation of trachea by FOB during insertion and pulling out. This could also be due to sliding and rotatory movement of the endotracheal tube over FOB during insertion as in contrast during laryngoscopy where no extra movements of endotracheal tube are required. Our study also revealed that the time required for intubation during laryngoscopy was significantly less as compared to FOB. This could be due to increased expertise of the anesthesiologist in performing laryngoscopy as compared to FOB intubation as well as technicalities involved during insertion of endotracheal tube by FOB. Similar results were seen in a study by Aghdaii *et al*[16] who compared FOB with direct laryngoscopy in patients undergoing cardiac surgery and found no difference in heart rate and blood pressure between the two groups however a significantly less time was required in laryngoscopy group as compared to FOB group.

Table-II: Mean Heart Rate (per minute).

	Baseline	Pre-Intubation	1 minute	2 minutes	3 minutes
Group Laryngoscopy	78.27 ± 7.65	79.08 ± 6.10	77.93 ± 4.27	78.93 ± 3.98	80.45 ± 4.99
Group Fiber optic Bronchoscope	80.25 ± 7.53	78.87 ± 6.68	79.75 ± 4.78	79.93 ± 3.12	80.48 ± 4.28
p-value	0.25	0.89	0.08	0.22	0.98

Table-III: Mean arterial pressure (mmHg).

	Baseline	Pre-Intubation	1 minute	2 minutes	3 minutes
Group Laryngoscopy	95.30 ± 5.56	94.65 ± 4.60	92.60 ± 8.51	93.40 ± 5.02	94.43 ± 4.85
Group Fiber optic Bronchoscopy	93.70 ± 6.61	94.00 ± 5.36	93.88 ± 7.31	94.53 ± 5.66	95.13 ± 5.05
p-value	0.25	0.56	0.47	0.35	0.53

Another study by Zhang *et al*[17] also showed the same result. They studied a total of fifty patients and found no significant difference in hemodynamics between the two groups thereby concluding that either of the two methods can be used without much difference in orotracheal intubation. In the same study, the time taken in laryngoscopy group was less as compared to FOB group which is similar to our study. Yet another study by Barak *et al*[11] yielded the same results. Similar number of patients were studied and no significant difference in the hemodynamics was seen in both groups and comparable stress response was noticed. However, the time difference was significant with FOB group requiring more time as compared to laryngoscopy group. Few studies however revealed a different result. Gill *et al*[18] compared FOB with McCoy Laryngoscope and recorded the data for stress response. The researchers observed that the increase in heart rate and blood pressure was significantly higher in laryngoscope group as compared to FOB group. However similar to our study the time required for intubation was longer in FOB group.

Their study concluded that using FOB was associated with a more patient safe approach as compared to laryngoscopy. Similar results were produced by Ali *et al*[19] in a study conducted in Pakistan comprising 160 subjects. They compared these two techniques and found the use of FOB was hemodynamically more stable than laryngoscopy during intubation.

Previously published work using FOB usually depicts this instrument for use in difficult airway situations or comparing it with newer intubation techniques[20-22]. Not much data is available in using FOB as an instrument for intubation used to decrease stress response. We tried to use FOB to remove laryngeal stimulus caused by laryngoscope thereby being a safer instrument in patients having cardiac or neurological issues and eye surgery patients. Limitation of our studies include that we studied limited number of patients with no comorbids. Some of the areas requiring further research are patients with comorbid conditions, addition of pharmacotherapy to these techniques and use of newer intubating equipment like Glideoscope, C-trach. In the future it is expected that more studies will be done to find different effective techniques in order to attenuate the sympathetic stimulation to laryngoscopy and intubation. The authors recommend that FOB or newer instruments and methods be studied so that the stress response due to laryngoscopy is decreased and patient safety is ensured.

CONCLUSION

In conclusion we can say that our study demonstrated no difference in hemodynamic parameters during orotracheal intubation when using laryngoscope or FOB and serves no added advantage in attenuating the stress response to intubation.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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