MEDICAL CHANNEL

Original Article

HAEMODYNAMIC RESPONSE TO CONVENTIONAL TRACHEAL INTUBATION AND CLASSIC LARYNGEAL MASK AIRWAY IN PATIENTS COMING FOR ELECTIVE PROCEDURES: A SINGLE BLINDED RANDOMIZED CONTROLLED TRIAL

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ABSTRACT:

Objective: To observe haemodynamic responses i.e. systolic, diastolic, mean blood pressure and heart rate following insertion of endotracheal tube and classic laryngeal mask airway in patients undergoing elective surgeries.
Design: Prospective, single blind randomized controlled trial
Setting: Department of Anaesthesiology, Liaquat National Hospital, Karachi.
Patients and Methods: One hundred ASA physical status I and II patients aged 15 to 50 years, Mallmapati I and II, BMI <30kg.m^{-2} of both gender scheduled for various elective surgeries were enrolled in this single blind randomized controlled trial. Patients were randomly divided into two groups of 50 each. In LMA group, classic LMA was used while in ETT group, appropriate size endotracheal tube was used to manage airway of patients. All patients were induced with propofol 2mg.kg^{-1}. In ETT group, Suxamethonium 1.5mg.kg^{-1}was used to facilitate intubation. Systolic, Diastolic, Mean blood pressure and heart rate were measured at baseline, just after induction, one minute and 5minutes after intervention.
Results: Endotracheal tube insertion resulted in statistically significant rise in systolic BP, diastolic BP, mean arterial pressure and heart rate ($p<0.05$) as compared to classic LMA insertion in elective surgical patients. LMA insertion showed trivial effects on hemodynamic parameters observed.
Conclusion: Endotracheal intubation produces statistically significant rise in haemodynamic parameters as compared to classic LMA insertion in selected patients scheduled for various elective surgeries.

Keywords: Haemodynamic response, endotracheal intubation, classic LMA

INTRODUCTION:

Adequate airway management is an essential skill for anesthetists. Airway can be maintained by various ways in which endotracheal intubation is the gold standard.
Use of laryngoscopy and intubation causes rise in blood pressure and pulse rate, cardiovascular response to laryngoscopy and tracheal intubation have been well documented[1], and a number of methods have been used to attenuate them. This response is hazardous in patients with compromised cardiovascular system especially if this response is left unchecked[2].
In two different studies which compared hemodynamic responses to three different intubating devices showed that laryngoscopic intubation has the greater response as

compared with laryngeal mask airway especially in hypertensive patients.[3,4] There are many pharmacological agents which attenuates this response like nitrous oxide[5], propofol[6], remifentanil and alfentanil[7], esmolol and nicardipine[2], labetalol,[8] clonidine and gabapentin[9] etc.

Laryngoscopy and intubation stimulates neural pathway in pharynx leading to hypertension and tachycardia. This hemodynamic stress response to tracheal intubation can precipitate adverse cardiovascular events in patients with and without cardiovascular disease. Hypertensive patient's show exaggerated response to laryngoscopy and intubation.[3]

The major cause of this sympathoadrenal response to tracheal intubation arises from stimulation of the supraglottic region by tissue irritation induced by direct laryngoscopy.[4]

This study was conducted to objectively emphasize the hemodynamic alterations caused by laryngoscopic intubation and classic LMA in selected patients scheduled for various elective surgeries.

MATERIAL & METHODS:

This study was conducted after being approved by the ethics committee of Liaquat National Hospital and written informed consent was obtained from all the patients who participated in the study.

One hundred adult patients aged 15-50 years, ASA physical status I and II, Mallampati I and II with no contraindication to supraglottic airway device presenting for elective general, orthopaedic and gynaecological procedures under general anaesthesia were randomly allocated into two groups; LMA and ETT of 50 each. Patients were randomly allocated by sealed envelope technique to receive either laryngoscopic intubation (ETT group) or classic laryngeal mask airway (LMA group) for airway maintenance during general anaesthesia. Surgeries of different specialties like general surgery, orthopaedics and gynaecological surgeries which can be done during spontaneous breathing and patients agreed to participate in the study were enrolled except for those who had hypertension, uncontrolled diabetes mellitus, autonomic neuropathy, ischemic heart disease and patients with anticipated difficult intubation.

All patients were fasted for 6-8 hours before procedure and premedicated with oral midazolam 7.5mg 2 hours preoperatively. All patients selected for study were assessed preoperatively for inclusion and exclusion criteria. On arrival in the operating room, IV line was maintained with 20G cannula and lactated Ringer solution was started. Patients were monitored with automated non-invasive blood pressure, electrocardiograph, pulse oximeter and End tidal CO_2. Baseline haemodynamic parameters were noted and all patients were induced with Propofol 2mg.kg^{-1}. In ETT group, succinylcholine 1.5mg.kg^{-1} was used to facilitate intubation. After induction appropriate size ETT or LMA was inserted for airway control. Classic LMA size 3 was used in patients weighing 30-50kg, size 4 was used for adults weighing 50-70kg and size 5 for 70-90kg patients (as per manufacturer recommendations). For first five minutes after intervention, analgesics and any other stimulation were avoided, in order to prevent any haemodynamic alteration. All airway interventions were done by anaesthesiologist who had more than three years anaesthesia experience (endotracheal intubations >300; and LMA insertion >200). Appropriate placement of both devices was confirmed by capnograph, and bilateral chest auscultation was also done in ETT group. Anaesthesia was maintained with isoflurane and 60% nitrous oxide in oxygen to achieve 1 MAC. During apnea period after intervention, breathing was assisted manually to keep the ETCO2 between 32-35mmHg till return of spontaneous breathing. Systolic, diastolic, mean arterial pressure and heart rate were recorded.

Initial haemodynamic parameters were measured when the patient enter the operating room and were recorded as baseline reading then second reading taken just after induction of anaesthesia, third reading recorded one minute and fourth reading 5 minutes after the intervention (i.e. after passing either ETT or LMA). Surgeons were requested not to position, clean or drape patients till five minutes after airway intervention so as to avoid any additional stimuli causing haemodynamic changes.

A power analysis based on assumption, a sample size of 50 patients per group was required to achieve 90% power to detect 20% difference between groups with type I error for hemodynamic effects. Frequency and percentage were computed for qualitative observation and analyzed by student-t test while mean and standard deviation were estimated for systolic, diastolic blood pressure, mean arterial pressure and heart rate and analyzed by independent sample t test. pd"0.05 was considered as significant. All statistical

TABLE 1:
DEMOGRAPHIC CHARACTERISTICS AND AIRWAY ASSESSMENT

Variables	LMA Group n=50	ETT Group n=50	P-Value
Age (Years)	29.64±7.21	30.60±7.34	0.51
Weight (kg)	66.90±9.34	65.92±9.41	0.60
Height (cm)	159.42±8.30	159.90±7.55	0.76
BMI (kg.m^{-2})	26.26±2.48	25.71±2.69	0.29
Gender			
Male	27(54%)	24(48%)	0.55
Female	23(46%)	26(52%)	
Mallampati			
I	32(64%)	34(68%)	0.67
II	18(36%)	16(32%)	

FIGURE 1:
Comparison of mean systolic blood pressure between LMA ( ) and ETT ( ) groups. * pd"0.05 indicates significant difference between groups.

FIGURE 2:
Comparison of mean diastolic blood pressure between LMA ( ) and ETT ( ) groups. * pd"0.05 indicates significant difference between groups.

FIGURE 3:
Comparison of mean blood pressure between LMA ( ) and ETT ( ) groups. * pd"0.05 indicates significant difference between groups.

FIGURE 4:
Comparison of mean heart rate between LMA ( ) and ETT ( ) groups. * pd"0.05 indicates significant difference between groups.

analysis was performed using statistical packages for social science version 17 (SPSS Inc., Chicago, IL)

RESULTS:

A total of 100 adult patients presenting for various general, orthopaedic and gynaecological elective surgical procedures under general anaesthesia were included in this study. Patients were equally divided into two groups. In fifty patients LMA (Classic) was used while in other fifty patients ETT was inserted to maintain airway during the procedure. The demographic data and airway assessment are presented in table 1. Mean age, weight, height, BMI, gender and Mallampati grade were not statistically significant between the two groups.

No significant change in heart rate, systolic BP, diastolic BP and mean arterial pressure observed in classic LMA group, one and five minutes after intervention. Statistically significant difference was observed in systolic, diastolic and mean blood pressure ($p<0.01$) in ETT group as compared to LMA group (figures 1, 2 & 3). In ETT group, statistically significant difference was observed in heart rate ($p<0.01$) as compared to LMA group as shown in figure 4.

DISCUSSION:

Classic LMA is inflatable supraglottic airway, use to maintain airway for spontaneous and controlled ventilation. It is anatomically designed mask to fit tightly into perilaryngeal frame. Its highly versatile inflatable cuff gives adaptability to fit into the different airway framework very well.

Laryngoscope guided intubation induces haemodynamic changes like tachycardia and hypertension, which is reported in literature and known for long time[10]and is a byproduct of securing a definitive airway, which is also associated with increase in intraocular pressure.[11] These effects are from activation of sympathetic response as it is associated with increase in plasma noradrenaline levels.[12]

These effects are of concern especially in patients with hypertension, ischemic heart disease and acute glaucoma[13]. Conventional laryngoscopic intubation, which is standard way of securing airway, may not be abandoned because alternatives like using intubating LMA (ILMA) imposes greater rise in haemodynamic parameters than routine intubation technique.[14]

This study was designed to assess the effects of LMA and ETT insertion on hemodynamic variables. Mean blood pressure and heart rate increased by 30% and 22% respectively in ETT group. By comparing, LMA cause mean rise of 7 and 4 percent only from post-induction values in MAP and heart rate, respectively. Laryngoscopy was the most important factor causing hemodynamic variations in ETT group. Laryngoscope guidance is not used routinely for LMA insertion, which is also not used in this study, resulting in markedly stable haemodynamic in LMA group.

Regardless of high variations in hemodynamic caused by direct laryngoscopy, it is still the fastest way to intubate as compared to ILMA[15] and it is difficult to change practice even in patients going for CABG (coronary bypass grafting) surgery[16] as most anesthetists are more comfortable and confident with their time-tested laryngoscopic technique. Apart from increase in blood pressure and heart rate, airway placement especially double lumen tube and LMA may result in greater dispersion of QT interval (i.e. difference of highest and lowest QT interval) as compared to ETT.[17] One group reported that LMA placement has resulted in increase of bispectral index (BIS) values.[18]

Carron et al[19] studied hemodynamic and endocrine stress response of laryngoscopic intubation and proseal LMA insertion in 75 morbidly obese patients for laparoscopic gastric banding. Their results confirmed that significant rise in blood pressure was observed in intubation group which was paralleled with significant rise in plasma norepinephrine levels.

A newer non-inflatable device, I-gel shown to be more haemodynamically stable as compared to LMA[20], giving a better option among supraglottic airway devices.

CONCLUSION:

Laryngoscopic endotracheal intubation produces statistically significant rise in haemodynamic parameters as compared to classic LMA insertion in normotensive individuals scheduled for various elective surgeries. Airway intervention with classic LMA produces less haemodynamic alterations.

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