Original Research Article

A comparative study of hemodynamic response with Laryngoscopic endotracheal intubation and laryngeal Mask airway insertion in hypertensive patients

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Abstract

Background: The hemodynamic response which has been associated with laryngoscopy and tracheal intubation may be harmful to certain patients. The laryngeal mask airway decreases the need for laryngoscopy and provides positive pressure ventilation in appropriate patients.**Aim:**This is a comparative study of hemodynamic response with laryngoscopy and endotracheal intubation and LMA insertion in hypertensive patients.**Materials and Methods**:60 Hypertensive patients aged between 40 to 60 years of either sex of ASA grade II were randomly allotted into two groups of 30 each, group ET and group LMA. LMA insertion or tracheal intubation was performed after inducing with propofol and muscle relaxation with succinyl choline. Anesthesia was maintained with isoflurane, oxygen and nitrous oxide, the heart rate, SBP, DBP, mean arterial pressure were measured after induction and immediately after insertion / intubation and then after 1, 3, 5 minutes.**Results**:There was a significant difference ($p < 0.000$) in mean increase in heart rate (38.23% in group ET versus 28.26% in group LMA). The increase in arterial pressure was also significant. The SBP increased 40.16% in group ET compared with 37.60% in group LMA ($p< 0.000$). The DBP was also increased by 22.73% and 14.23% in group ET and group LMA respectively. The MAP values were maximum after airway instrumentation. However, we found that the values after LMA insertion were significantly low compared to tracheal intubation for the first 3 minutes.**Conclusion:**The data suggest a similar, but attenuated response associated with mask insertion in comparison to laryngoscopy and intubation. Hence use of LMA may offer some advantage over tracheal intubation in anesthetic management of patients where avoidance of pressure response is of particular concern.

Keywords: hemodynamic,SBP

Introduction

Laryngoscopy and tracheal intubation after induction of anesthesia are frequently associated with transient hypertension, tachycardia and arrhythmias. Although these haemodynamic responses are probably responsible for little consequences in healthy individuals, they may be severe and hazardous in hypertensives. Laryngoscopic stimulation of oropharyngeal and laryngeal structures may be an important factor responsible for haemodynamic response associated with tracheal intubation[1]Various non laryngoscopic intubation devices have provided conflicting evidence of an attenuated haemodynamic response. In general, techniques that avoid or minimize oropharyngeal and laryngeal stimulation may attenuate the haemodynamic stress response. The laryngeal mask airway is intermediate in design and fills a niche between oropharyngeal airway and endotracheal tube. The laryngeal mask airway is designed primarily as a means of offering some of the advantages of endotracheal tube while avoiding its fundamental disadvantages, since the vocal cords need to be neither visualized nor forced upon. In this study, stress response to tracheal intubation and use of laryngeal mask airway in hypertensive patients were evaluated

Materials and methods

Study Design: Observational study

Study Setting: Hypertensive patients undergoing elective surgery in Alluri Sita Ramaraju Institute of Medical Sciences, Eluru.

Duration of study: 12 months.

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Detailed Description of the group:

Group A : Group A or ETT Group consists of hypertensive patients undergoing elective surgeries not lasting for more than 2-3 hours with an endotracheal tube after laryngoscopy in order to secure airway during general anaesthesia in operation theatre complex of ASRAM, Eluru.

Group B : Group B or LMA Group consists of hypertensive patients undergoing elective surgeries not lasting for more than 2-3 hours with a Laryngeal mask airway insertion without laryngoscopy in order to secure airway during general anaesthesia in operation theatre complex of ASRAM, Eluru.

Sample size of each group: 30

Total sample size of the study: 60

Procedure

Sixty hypertensive patients with good control of BP aged 40-60 years of either sex of ASA grade II on oral anti hypertensives were selected for the study. Exclusion criteria included patients with history of pulmonary, central nervous system or cervical spine disease, difficult intubation, gastro oesophageal reflux and head and neck surgery. Each patient underwent preoperative assessment, procedures were explained and informed written consent was obtained. Blood pressure readings were taken on 3 occasions two hours apart in supine position and patients with systolic BP < 180 mm Hg and diastolic < 110 mm Hg were taken up for the study. Investigations like cbc, rft's,ure, chest x-ray and ECG were done. Patients were advised to take oral antihypertensives as per schedule with the last dose 6 hours prior to surgery. Each patient was premedicated with pethidine 1 Mg/Kg and phenergan 0.5Mg/Kg IM one hour prior to surgery.[2-5]The patients were randomly allotted into two groups (of 30 patients each) group ET and group LMA. A macintosh blade(size 3 or 4) with an appropriate size endotracheal tube was used for patients of group ET and LMA(size 4) was used for patients in group LMA.Intravenous

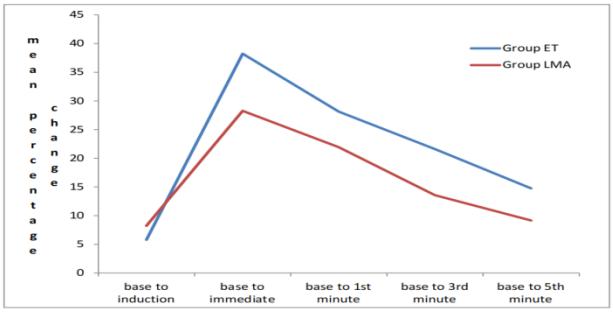
line was secured with an 18 G Cannula after arrival in the anaesthetic room. Pulse oximeter, non-invasive BP apparatus were connected to the patient in the OT. After a stabilization period for 5 minutes, the baseline values of HR, systolic AND diastolic BP and MAP were recorded.Patients in both groups were preoxygenated with appropriate face mask for 5 minutes and induced with propofol 2 Mg/Kg I.V, succinylcholine 2Mg/Kg I.V was given for endotracheal intubation or LMA insertion. After the disappearance of fasciculations, endotracheal intubation was done in group ET and LMA was inserted using the standard technique in group LMA. Lubrication with 2% xylocaine gel was used for both the endotracheal tube cuff and LMA cuff. Air was injected into the endotracheal tube or LMA cuff as recommended.Anaesthesia was maintained with IPPV using bain's circuit with N2O 4L/Min and O2 2 L/Min and 1% isoflurane[6-8]The values of HR, SBP, DBP, MAP were recorded after induction, immediately after intubation or insertion and at 1min, 3min and 5min. At the end of 5 minutes the anesthetic management was deferred as per surgical requirements. Any painful stimulus including surgical incision was not allowed while the readings were recorded.Patients on whom more than one attempt of either intubation or LMA insertion was tried were excluded from the study, complications like leakage, laryngospasm, gastric distension after airway instrumentation did not occur during the study.All the values were expressed as mean + standard deviation. Statistical analysis was performed by student paired and unpaired t-test and chi-square test. P value of >0.05 was considered to be statistically not significant, P value of <0.001 as statistically very highly significant[9-11]

RESULTS

INTERPRETATION OF RESULTS FOR HEART RATE

Fig 1a):Comparison of mean heart rate **b): Percentage change from the base line**

Time of measurement	Group ET	Group LMA	p value
Baseline	71.8±7.327	77.67±7.836	0.004**
After induction	77.60±6.831	85.90±9.241	0.000***
After intubation			
Immediate	110.03±14.69	105.93±12.53	0.25
60 Seconds	99.93±15.256	99.6±12.21	0.926
180 Seconds	93.40±12.94	91.23±8.74	0.451
300 Seconds	86.57±11.81	86.83±8.73	0.921

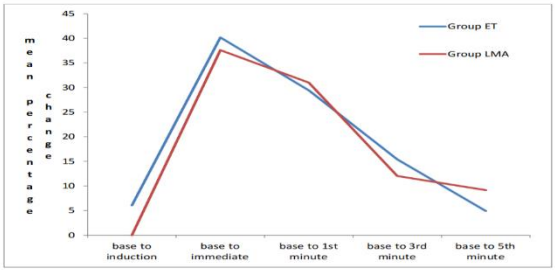


Heart rate increased post induction and remained elevated for more than 3 minutes in both the groups, after LMA insertion and tracheal intubation. The mean increase in heart rate for both the groups were almost similar.

INTERPRETATION OF RESULTS FOR SYSTOLIC BP

Fig 2 a):Comparison of mean SBP **b):Percentage change from the base line**

Time of measurement	Group ET	Group LMA	p value
Baseline	150.63±11.60	142.37±11.56	0.008**
After induction	144.57±11.04	142.37±13.169	0.486
After intubation			
Immediate	190.80±13.67	179.97±19.32	0.015*
60 Seconds	180.07±13.43	173.37±17.51	0.102
180 Seconds	166.03±12.28	154.4±11.09	0.000***
300 Seconds	155.57±10.92	147.87±11.61	0.010*

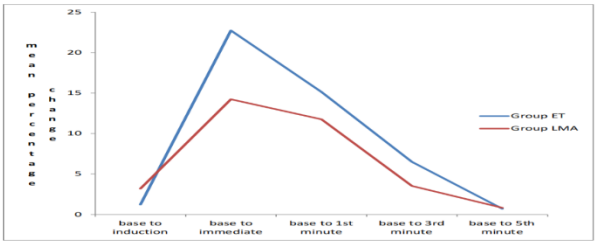


Very highly significant increase in the systolic BP after intubation when compared to insertion of LMA. Also the SBP remained elevated for 1st 3 minutes in both the groups. Hence there was a significant difference in the percentage increase in the SBP between both the groups. The percentage change of SBP from the base line was highly significant in group ET[12-14]

INTERPRETATION OF RESULTS FOR DIASTOLIC BP

Fig 3a):Comparison of mean DBP **b):Percentage change from the base line**

Time of measurement	Group ET	Group LMA	p value
Baseline	96.3±6.32	94.13±7.43	0.229
After induction	95.07±8.41	90.93±9.19	0.074
After intubation			
Immediate	119.03±19.043	108.37±11.18	0.010*
60 Seconds	111.43±18.013	105.90±12.018	0.167
180 Seconds	102.80±8.957	97.67±6.32	0.013*
300 Seconds	97±5.99	94.97±8.389	0.285

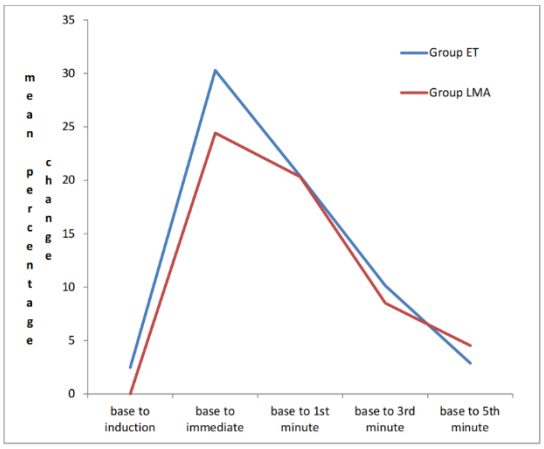


The mean DBP remain elevated for 3 minutes in Group ET and for 1 minute in Group LMA after airway instrumentation. The values for mean increase in the DBP was significantly high in Group ET than Group LMA. The percentage change of DBP from baseline was significantly high in Group ET for 1,3,5 minutes whereas for Group LMA, it was comparatively low .

INTERPRETATION OF RESULTS FOR MEAN ARTERIAL PRESSURE

Fig 4a):Comparison of mean MAP **b):Percentage change from the base line**

Time of measurement	Group ET	Group LMA	p value
Baseline	113.71±7.55	108.07±8.79	0.010*
After induction	111.2s2±7.39	108.07±9.57	0.159
After intubation			
Immediate	144±15.20	132.54±11.85	0.002**
60 Seconds	134.08±13.73	128.38±11.04	0.082
180 Seconds	123.85±8.55	116.57±6.59	0.000***
300 Seconds	116.59±6.28	112.6±8.24	0.039*



The MAP values increased in both the groups after intubation or LMA insertion. The values remained elevated for upto 5 minutes in Group ET and for upto 3 minutes in Group LMA. Group LMA had lower values at all times when compared to Group ET.The percentage increase from baseline of mean DBP reached its peak after endotracheal intubation and insertion of LMA. Although values were comparatively higher in Group ET.

Discussion

Airway management by direct laryngoscopy and endotracheal intubation during conduct of general anesthesia induces clinical changes in hemodynamic variables. Tracheal intubation causes variation in concentrations of catecholamine and a reflex rise in sympathetic activity causing hypertension, arrhythmia and tachycardia. Hypertensive patients, patients with ischaemic heart disease or cerebrovascular disease may be vulnerable to adverse cardiovascular events like myocardial infarction, CVA or end organ damage due to the significant but short lived hemodynamic effects of laryngoscopy and intubation. The Laryngeal mask airway belongs to class of supraglottic airway devices that are designed to facilitate positive pressure ventilation and maintain a patent airway while circumventing the disadvantages of an endotracheal intubation like passing through the vocal cords. Situations where LMA is contraindicated are full stomach patients, decreased compliance of the airway and hematological disorders that can increase the chances of bleeding. Large observational studies have reported high success rates and low complication rates when the LMA was used for airway management during general anesthesia.[15-18]The study included 60 patients with comparable demographic parameters like weight, gender and age. There was no statistically significant difference in the baseline parameters of HR, SBP, DBP, MAP, RPP between both groups. In our study post induction, the heart rate increased and again after endotracheal intubation or insertion of LMA. The values remained elevated for up to 5 minutes when compared with the baseline. From our study we found out that, in both the groups, the mean HR increased to a similar extent. But following LMA insertion, the percentage change from the baseline in HR was 28.26 % as compared to 38.23 % following endotracheal intubation. This difference is statistically significant with a p value < 0.000*. This disparity can be explained by the fact that LMA stimulates both cardiac acceleratory and vagal fibres whereas the cardioacceleratory fibres is much more prominent on endotracheal intubation. The results were in parallel with Anita and collegues where while inserting LMA there was no significant increase (P > 0.05) in mean pulse rate but after intubation with ET tube there was a significant rise (P < 0.05) in PR which remained high until 1 minute after intubation [

9% in Group LMA and 11% in Group ETT]. Although the mean PR returned to baseline value after 3 min which can be attributed to depth of anesthesia achieved with the use of volatile anesthetics until 3 minutes of insertion and intubation. After induction, SBP and DBP reduced in both our study groups, but airway instrumentation produced a marked rise in SBP and DBP following induction in both groups. These came to 40.16% in group ET and by 37.6% in group LMA. As seen from these values, Group LMA had less rise in SBP and DBP than the ET group. This may be due to decreased total stimulation of afferent fibres in LMA group and ongoing stimulation due to the endotracheal tube present in situ[19-23]Similarly a 22.73% and 14.23% increase in diastolic BP was seen in group ET and group LMA respectively, which was significantly more in Group ET. Our results corresponded to the study conducted by Ali Abdulhamed Mohammed collegues where the rise in diastolic blood pressure was significantly high ($p < 0.05$) {86±4 in ETT Group and 78±7 in LMA Group immediately after insertion}.

Our study was associated with decreased stress response for LMA insertion in comparison with ET tube insertion. This is probably because of the glosso epiglottic fold stimulation during laryngoscopy or insertion of LMA which is considered as a major cause for haemodynamic response. Shribman and colleagues concluded that the tension on the supraglottic tissues is caused the sympatho-adrenal response. But in LMA Group, this lateral pressure on the pharyngeal mucosa by the LMA cuff was transient and when the mask was insitu, there was only a reduced pressure transmission as explained by Marjot et al.There was an increase in MAP value after both LMA insertion and laryngoscopy with intubation. Group LMA showed markedly lesser increase in MAP values than Group ETT which was like the other hemodynamic parameters. Our study results were in co-ordination with the study conducted by Jindal puja et all, Laryngoscopy and intubation were accompanied by a rise in MAP that remained above pre insertion levels even by 5 min. LMA insertion in contrast was associated with rise in MAP that fell to pre insertion values after 1st min (20.59% increase over the basal value in group ETT and 2.31% over basal value Group LMA) ($P < 0.05$). [24,25]Apart from the individual patient's responses and discrepancies in the number of patients studied the other possible explanation for the differences among the study results could be because the patients were on different groups of antihypertensive drugs and were treated for variable duration. The observations of our study were not done beyond 5 min due to possible return of neuromuscular conduction. Even though the intervals selected to record the haemodynamic response was closely related to maximum changes that could occur after stimulation of airway, the absence of continuous monitoring in our study might have a role in altering the results. From this study we can assume that in situations where intubation pressor response is desirably avoided as in hypertensive patients and so LMA should be preferred for selected surgeries.

Conclusion

Our study concludes that, insertion of the LMA causes lesser haemodynamic response than tracheal intubation in hypertensive patient.

Summary

Hypertensive patients are at an increased risk of adverse cardiovascular events due to the stress response of laryngoscopy and intubation. This can be attenuated to an extent by using an LMA, which provides positive pressure ventilation and a patent airway for selected surgeries.

Our study examined the difference between the degree of stress response to intubation as compared to LMA insertion in hypertensive patients.

Hence we infer the following:

• A very highly significant difference in maximum increase in heart rate from baseline between the two groups.

• LMA insertion also causes some stress response but to lesser degree as compared to endotracheal intubation.

• Notable variations of values between the two groups in systolic B.P, diastolic B.P and Mean Arterial Pressure after immediate insertion of LMA or ET.

Therefore, in hypertensive patients it is advisable to avoid endotracheal intubation and maintain the airway with an LMA, so as to attenuate stress response.

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