ORIGINAL ARTICLE

A Comparison of Pressor Responses Following Laryngeal Mask Airway Vs Laryngoscopy and Endotracheal Tube Insertion

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ABSTRACT

Objective: To test the hypothesis that laryngeal mask airway (LMA) insertion is associated with less pressor response as compared to endotracheal intubation.

Study Design: A prospective, comparative study.

Place & Time Period: Department of Anaesthesiology, Intensive Care & Pain Management, Nishtar Medical Institution, Multan (Pakistan), from July 2007 to January 2008.

Patients and Method: 60 adult, ASA grades I and II patients undergoing elective general surgery of less than one hour duration were divided in two groups with 30 patients in each. These patients were operated under general anaesthesia and either endotracheal tube (Group I) or LMA (Group II) was used to maintain the airway. The rise in heart rate, systolic and diastolic blood pressure was recorded before induction of anaesthesia and at one, three, five and ten minutes after insertion of laryngeal mask airway or tracheal tube and the results compared in both groups.

Results: A statistically significant rise in heart rate, systolic blood pressure and diastolic blood pressure was seen in group-I while statistically significant rise in heart rate only was seen in group-II subsequent to their insertion. Mean maximum increase was statistically more after laryngoscopy and endotracheal intubation than after laryngeal mask airway insertion. The duration of pressor responses was also longer after endotracheal intubation.

Conclusion: Laryngeal mask airway is an acceptable alternative technique offering advantages in terms of haemodynamic stability compared to tracheal intubation.

Key Words: Laryngeal mask airway; endotracheal tube; pressor response.

INTRODUCTION

Laryngoscopy and endotracheal intubation is the commonest method of securing a definitive airway for administering anaesthesia. However, it is associated with tachycardia and hypertension.[1] the increase in blood pressure and heart rate occurring due to reflex sympathetic discharge in response to laryngotracheal stimulation, which in turn leads to increased catecholamine release.[2]

These hemodynamic changes are probably of little consequence in normal, healthy individuals, but may be more severe or even dangerous in patients with hypertension, myocardial insufficiency and cerebrovascular disease.[3] Many drugs and techniques have been utilized to attenuate the pressor responses following the insertion of endotracheal tube but no single technique has gained universal acceptance.[4] Pharmacological approach includes the use of lidocaine, esmolol, nitroglycerine, magnesium sulphate, verapamil, nicardipine and diltiazem[5-10] to attenuate the cardiovascular response to laryngoscopy and subsequent tracheal intubation. Use of laryngeal mask airway in place of endotracheal tube has been shown to have less hemodynamic responses after its insertion, as its insertion requires neither the visualization of cords nor the penetration of larynx, making the placement less stimulating than laryngoscopy and endotracheal tube insertion and it may provoke less sympathetic response and catecholamine release[11]. Therefore, during laryngeal mask airway insertion there is less likelihood of pressor responses than with conventional laryngoscopy and tracheal intubation.

Based on these facts we compared the hemodynamic responses to the insertion of laryngeal mask airway with endotracheal intubation in elective surgical procedures performed at Nishtar Hospital, Multan.

MATERIAL AND METHOD

Sixty ASA physical status I and II patients from both genders scheduled for elective general surgery were the subjects in this study. Patients having any of the contraindications of LMA use, e.g. obesity, pregnancy and esophageal reflux were excluded from the study.

Informed consent, ensuring confidentiality was taken after informing them that no risk was involved in the study. Every patient was assessed preoperatively to rule out exclusion criteria. Patients were randomly divided in two groups; I (ETT group) and II (LMA group). No patient in this study was premedicated. Baseline readings of heart rate, systolic and diastolic blood pressure were recorded prior to induction of anaesthesia.on operating table. All patients were pre-oxygenated anaesthesia was induced with 5 mg/kg of thiopentone sodium and vecuronium bromide 0.1 mg/kg. Patients were ventilated with Bain's coaxial circuit using a face mask for three minutes when laryngeal mask airway insertion or laryngoscopy and endotracheal tube insertion was performed. Anaesthesia was maintained with 66% nitrous oxide, oxygen and isoflurane. Heart rate, systolic and diastolic blood pressures were recorded again at one, three, five and ten minutes after insertion of laryngeal mask airway or tracheal tube. Surgery was allowed at the end of study. At the end of surgery, residual neuromuscular block was antagonized with appropriate dosage of neostigmine and atropine.

Data was entered and analyzed using computer programme SPSS version 10. Descriptive statistics was applied to calculate mean and standard deviations for heart rate, systolic and diastolic blood pressures. Student's t-test (paired sample test) was applied to compare the difference between base line values and after insertion of either ETT or LMA. Student's t-test (independent samples test) was applied to compare the differences between groups I and II.

P value less than 0.05 ($p < 0.05$) was considered as significant.

RESULTS

Both groups were comparable with respect to age. Number of females out numbered the males in both the groups. (Table 1)

Table 1: Demographic data

Group	No of Cases	Age (Years) Mean±SD	Sex	
			Male	Female
Group I (ETT)	30	34.73 ± 8.28	09 (30%)	21 (70%)
Group II (LMA)	30	36.00 ± 7.66	12 (40%)	18 (60%)

ETT: Endotracheal tube LMA: Laryngeal mask airway

A statistically significant rise in heart rate, systolic and diastolic blood pressure was seen in group-I after insertion. ($P < 0.05$) In group-II the rise in heart rate after insertion was statistically significant

Table 2: Comparison of base line and after insertion values.

Parameter	ETT group			LMA group		
	Base line value Mean±SD	After insertion value Mean±SD	P value	Base line value Mean±SD	After insertion value Mean±SD	P value
Heart rate	82.03 ± 7.70	107.70 ±7.80	< 0.05	82.13 ± 7.49	100.06 ±7.38	< 0.05
Systolic blood pressure	128.73 ±9.09	156.76 ±8.21	< 0.05	130.73 ± 9.08	129.23 ±6.62	0.340
Diastolic blood pressure	80.00 ± 6.65	88.80 ± 5.68	< 0.05	83.23 ± 5.00	83.46 ± 4.35	0.768

($P < 0.05$) while there was not much difference in rise in systolic and diastolic blood pressure. Rise in heart rate was more marked in group-I (ETT) in comparison to group-II (LMA) ($P < 0.05$). Baseline values of hemodynamic parameters were comparable in both the groups. The increase in heart rate was significantly more marked in ETT group than LMA group after insertion of devices and this increase remained significantly marked upto 5 minutes. ($P < 0.05$) (Table 3)

Changes in systolic and diastolic blood pressures were comparable before insertion in both the groups; however there was a significant increase in systolic as well as diastolic blood pressures in ETT group after insertion upto 5 minutes. ($P<0.05$) (Table 3) ($P<0.05$)

DISCUSSION

. The haemodynamic responses, manifesting as increase in heart rate and blood pressure, are due to reflex sympatho-adrenal discharge provoked by epilaryngeal and laryngotracheal stimulation subsequent to laryngoscopy and tracheal intubation.[12-14] Deleterious hemodynamic consequences in the form of increased heart rate and hypertension following laryngoscopy and endotracheal intubation is a matter of concern particularly in patients with hypertension, and ischemic heart disease. To attenuate such consequences during induction of anaesthesia various methods have been employed which include certain pharmacological agents like nifedipine, lidocaine, narcotic agents, sodium nitroprusside and beta adrenergic blockers.[15-19] Use of laryngeal mask airway in place of endotracheal tube has also been shown to have less hemodynamic responses after its insertion.[20]

Our study was designed to evaluate the hemodynamic responses following insertion of LMA and endotracheal tube. We observed a significant increase in heart rate in both the groups after insertion; however the increase in heart rate was more in endotracheal group. Similarly both systolic and diastolic blood pressures increased significantly in endotracheal group. The increase in these parameters was observed in LMA group also, but this was

Table 3: Changes in blood pressure in two groups at different stages.

Parameter	Diastolic BP (mm Hg)		Systolic BP (mm Hg)		Heart Rate/min		P value
	ETT n=30	LMA n=30	ETT n=30	LMA n=30	ETT n=30	LMA n=30	
Base Line	80.00 ± 6.65	83.23 ± 5.00	128.73 ± 9.09	130.73 ± 9.08	82.03 ± 7.70	82.13 ± 7.49	
Before Insertion	77.56 ± 5.75	80.56 ± 3.85	110.33 ± 12.45	110.36 ± 8.93	86.36 ± 7.97	85.13 ± 7.50	
After one min	88.80 ± 5.68	83.46 ± 4.35	156.76 ± 8.21	129.23 ± 6.62	107.70 ± 7.80	100.06 ± 7.38	< 0.05
After 3 min	86.30 ± 5.91	80.66 ± 3.94	131.60 ± 6.87	121.10 ± 6.15	101.86 ± 6.32	95.96 ± 5.78	< 0.05
After 5 min	81.96 ± 6.55	77.56 ± 3.04	118.73 ± 7.21	113.80 ± 6.86	94.56 ± 5.20	91.13 ± 4.15	< 0.05
After 10 min	78.93 ± 6.35	77.26 ± 4.14	114.70 ± 6.91	113.20 ± 6.76	88.36 ± 5.24	88.13 ± 4.19	> 0.05

ETT: Endotracheal tube LMA: Laryngeal mask airway

significantly less than after insertion of endotracheal tube. The findings of our study closely correlate with those of Braude et al[20] and Wilson et al[21] who also observed significant increase in hemodynamic variables after endotracheal intubation as compared to LMA insertion. Lamb K et al[22] carried out a similar study and demonstrated an attenuated response to hemodynamic. Akhtar TM et al[23] compared the use of LMA with endotracheal intubation, who observed that insignificant changes in heart rate, and mean arterial pressure were produced after the insertion of LMA or endotracheal tube. Our results are contrary to their study. Release of catecholamines in plasma has been incriminated to play a role in the development of abnormal cardiovascular responses to laryngoscopy and endotracheal intubation.[24] Attenuation of such responses with the use of LMA may be due to less catecholamine release as suggested by Lamb K et al. This could in turn be due to the fact that the LMA is relatively simple, less invasive and does not require laryngoscopy before insertion.

CONCLUSION

It is concluded from our study that ETT is associated with significantly marked increase in heart rate, systolic and diastolic blood pressure. Changes are significantly more than changes associated with LMA insertion. So LMA could be useful in situations where minimal changes in hemodynamics are desirable like patients with coronary artery disease having no contraindication for its use.

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