ISSN: 0975-3583,0976-2833 VOL14, ISSUE 04, 2023

A PROSPECTIVE COMPARATIVE STUDY OF CARDIOVASCULAR RESPONSE TO LMA INSERTION AND ENDOTRACHEAL TUBE INTUBATION

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Abstract

Introduction: Airway management is the most important procedure during the delivery of general anaesthesia to the patients who are anaesthetized and are unable to maintain an adequate airway on their own and needs the artificial airway maintenance devices. The laryngeal mask airway (LMA) offers a much less invasive way of maintaining the airway as it does not pass through the glottis but is placed over the glottis. It does not require use of laryngoscope. It acts as an intermediate between the endotracheal tube and the oropharyngeal airway and offers some of the advantages of the endotracheal tube while surpassing the disadvantages like stimulation of the laryngopharyngeal reflex.

Materials and Methods: This was prospective observational study conducted in tertiary care teaching public hospital after obtaining informed written consent from the patients. The study was conducted over a period of one and a half years from December 2021 to May 2022. The study enrolled adult patients aged 18 to 60 years who presented American Society of Anaesthesiology (ASA) physical status I and II. Patient fulfilling the following inclusion criteria were enrolled.

Results: The present study was conducted on 92 patients aged between 18 & 60 years. In the ETT group endotracheal intubation was done using Macintosh laryngoscope while in LMA group laryngeal mask airway was inserted according to the manufacture's recommendation. The LMA group had 26 males and 20 females and the ETT group had 26 males and 20 females. The ages ranged from 18 to 49 years and 26 to 48 years in the LMA and ETT groups respectively. The range for duration of surgery was 45 to 90 minutes for both LMA and ETT groups. The two groups were comparable in terms of demographic data as there were no significant differences between the 2 groups in terms of age, sex, duration of surgery, ASA grades and MPC classification. ($P>0.01$)

Conclusion: This study demonstrated that there is a haemodynamic response consisting of an increase in Heart rate, SBP, DBP and MAP with ETT insertion as well as with LMA insertion. However, the response caused by ETT insertion is significantly greater than that caused by LMA insertion.

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Key Words: Airway management, American Society of Anaesthesiology, Heart rate, SBP, DBP and MAP.

INTRODUCTION

Airway management is the most critical technique performed during the administration of general anaesthesia to individuals who are unable to maintain an appropriate airway on their own and require artificial airway maintenance equipment.[1]

The laryngeal mask airway (LMA) is a significantly less intrusive means of maintaining the airway because it does not pass through the glottis but is placed over it. It is not necessary to use a laryngoscope.[2] It serves as a bridge between the endotracheal tube and the oropharyngeal airway, providing some of the benefits of the endotracheal tube while avoiding the downsides of the endotracheal tube, such as stimulation of the laryngopharyngeal reflex.[3]

In our scenario, laryngoscopy and endotracheal intubation are the primary methods of airway control during anaesthetic delivery. LMA, which has lately acquired favour as an airway management tool around the world, is not often employed in our environment. It has been found in trials conducted elsewhere in the world to generate less haemodynamic disturbance than the standard procedure of laryngoscopy and endotracheal intubation.[4] It has also been demonstrated that it is easier to insert a LMA than an endotracheal tube. Because it is the anesthetist's responsibility to ensure the safe delivery of anaesthesia, the necessity to develop new ways of improving the quality of care provided to our patients while minimising any unnecessary consequences cannot be overstated. As a result, it is critical to develop a better method of anaesthesia delivery for our population in order to avoid the haemodynamic reaction found with laryngoscopy and endotracheal intubation in patients with cardiovascular or cerebrovascular illness. To improve patient care and reduce morbidity associated with the traditional method of endotracheal intubation for anaesthesia delivery.[5]

LMA placement is useful in securing the airway. Its insertion does not necessitate Laryngoscopy, and its placement is less stimulating and causes less catecholamine release, resulting in no tachycardia, hypertension, or arrhythmias. The study's goal is to examine the cardiovascular response after LMA and ETT insertion.

MATERIALS AND METHODS

This was prospective observational study conducted in tertiary care teaching public hospital after obtaining informed written consent from the patients. The study was conducted over a period of one and a half years from December 2021 to May 2022. The study enrolled adult patients aged 18 to 60 years who presented American Society of Anaesthesiology (ASA) physical status I and II. Patient fulfilling the following inclusion criteria were enrolled.

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Inclusion criteria

1. Age group 18-60 years males and females
2. American Society of Anaesthesiologist (ASA) class I and II
3. Mallampatti Class (MPC) I and II
4. Cormack and Lehane (CL) Grade I and II
5. Scheduled for short elective surgical procedures less than 90 minutes.

Exclusion criteria

1. Pregnant and Lactating women
2. History of difficult intubation
3. Patient with predetermined difficult airway
4. History of angina, Myocardial Infarction, syncopal attacks
5. Hypertensive patient.

Patients were randomized according to computer-generated tables.

Group I: Airway was secured using LMA, Group II: Airway was secured using Endotracheal tube.

A total of 92 patients were included in the study. The identity and consent of the patient were confirmed prior to induction of anaesthesia. A standard protocol has been followed for all the patients. A detailed history and examination was taken and the procedure to be done had been explained to the patient and a written informed consent was obtained for the general anaesthesia to be given. Monitoring in the form of Electrocardiogram, Pulse-oximeter, Non-invasive Blood pressure (SBP, DBP, MAP) were instituted. All the patients were premedicated with I.V. inj. glycopyrollate 0.004mg/kg I.V. inj. Ondansetron 0.08mg/kg I.V, inj. midazolam 0.03 mg/kg I.V, inj. Fentanyl 2 micrograms/kg. Patient were pre-oxygenated for 3 mins with 100% oxygen. Patients were induced with. Inj. thiopentone 5mg/kg body weight and after confirmation of loss of eye lash reflex inj. Atracurium 0.5 mg/kg I.V. to facilitate endotracheal intubation 0r LMA insertion. Size of the device was decided by the qualified anaesthesiologist conducting the case based on the age, weight and manufacturers recommendation. Endotracheal intubation or Laryngeal mask airway (LMA) device was inserted by anaesthesiologist having at least 2 years' experience or at least 50 device insertions. Endotracheal tubes of size 7 for female and 8 for male patients or laryngeal mask size 3 for female and size 4 for male patients were used. Anaesthesia was maintained using oxygen/ nitrous and sevoflurane. At the end of the surgical procedure, the neuromuscular block (NMB) was reversed with neostigmine and glycopyrrolate. Heart rate, non-invasive blood pressure which included systolic, diastolic, mean arterial pressure and any dysrhythmias were monitored throughout the study and recorded at the following time points: Pre-operative, At intubation/insertion, One minute after intubation or insertion of laryngeal Mask, Three minutes after intubation or insertion of laryngeal mask, Five minutes after endotracheal intubation or insertion of laryngeal mask, Post extubation.

Statistical Analysis: Quantitative data was represented using Mean ± SD and Median & Interquartile range. Analysis of Quantitative data between quantitative variables such as

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 04, 2023

haemodynamic parameters like heart rate, non-invasive blood pressures with two Subgroups was done using unpaired t-test while within the group analysis was done using the paired t test. Continuous variables were described using mean ± standard deviation. P value of less than 0.05 was considered statistically significant.

RESULTS

The present study was conducted on 92 patients aged between 18 & 60 years. In the ETT group endotracheal intubation was done using Macintosh laryngoscope while in LMA group laryngeal mask airway was inserted according to the manufacture's recommendation.

The LMA group had 26 males and 20 females and the ETT group had 26 males and 20 females. The ages ranged from 18 to 49 years and 26 to 48 years in the LMA and ETT groups respectively. The range for duration of surgery was 45 to 90 minutes for both LMA and ETT groups. The two groups were comparable in terms of demographic data as there were no significant differences between the 2 groups in terms of age, sex, duration of surgery, ASA grades and MPC classification. (P>0.01)

Time of recording of Heart Rate	LMA	ETT	P value
	Heart rate		
	Mean ± SD	Mean ± SD	
Preoperative	90.55±5.80	93.10±7.20	0.205
At Insertion	98.80±6.12	113.12±8.10	0.01
1 minute after insertion	94.70±5.60	108.69±7.87	0.01
3 minute after insertion	91.10±6.15	101.82±7.85	0.01
5 minute after insertion	89.14±5.82	94.21±7.39	0.01
After Extubation	90.12±5.70	101.21±7.89	0.01

Table 1: Mean heart rate at different times among LMA and ETT study participants

Time of recording of Heart Rate	LMA	ETT	P value
	SBP		
	Mean ± SD	Mean ± SD	
Preoperative	116.10±5.32	120.30±4.10	0.15
At Insertion	126.10±5.34	146.20±5.20	0.01
1 minute after insertion	121.20±6.30	136.10±6.50	0.01
3 minute after insertion	115.16±5.40	128.13±5.80	0.01
5 minute after	117.31±5.30	121.36±4.10	0.01

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 04, 2023

insertion			
After Extubation	117.70±5.36	135.40±5.50	0.01

Table 2: SBP at different times among LMA and ETT study participants

Time of recording of Heart Rate	LMA	ETT	P value
	DBP		
	Mean ± SD	Mean ± SD	
Preoperative	73.80±4.40	76.10±4.10	0.61
At Insertion	82.34±4.30	92.10±4.13	0.01
1 minute after insertion	77.13±4.11	87.20±4.65	0.01
3 minute after insertion	74.30±4.10	82.12±5.20	0.01
5 minute after insertion	73.15±4.20	77.10±4.80	0.01
After Extubation	75.15±3.80	86.40±4.10	0.01

Table 3: DBP at different times among LMA and ETT study participants

Time of recording of Heart Rate	LMA	ETT	P value
	MAP		
	Mean ± SD	Mean ± SD	
Preoperative	73.80±4.40	76.10±4.10	0.61
At Insertion	82.40±4.30	92.11±4.15	0.01
1 minute after insertion	77.50±4.10	87.20±4.80	0.01
3 minute after insertion	74.52±4.15	82.31±5.20	0.01
5 minute after insertion	73.12±4.20	77.30±4.82	0.01
After Extubation	75.10±3.82	86.13±4.10	0.01

Table 4: MAP at different times among LMA and ETT study participants

DISCUSSION

In the ETT group of the study, the HR, SBP, DBP, and MAP were considerably higher after the endotracheal tube was inserted compared to pre-intubation readings. The rise lasted 5 minutes before the parameters recovered to their pre-intubation levels. These findings are comparable to those of Millar and colleagues, who discovered that in normotensive patients, laryngoscopy and tracheal tube insertion is immediately followed by an average increase in mean arterial pressure of 25 mmHg.[6]

The LMA group's hemodynamic alterations returned to pre-insertion values in about 3 minutes, while the ETT group's changes returned to pre-intubation values in around 5 minutes. Several other investigations have shown that the haemodynamic response to LMA is shorter than that to ETT. The bigger and longer-lasting alterations in cardiovascular parameters reported with ETT

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 04, 2023

versus LMA insertion are most likely due to higher catecholamine levels in the ETT group, as seen in prior investigations.[7]

The study by K. Montazari, Kh. Naghibi, and S.J. Hashemi was a hypothetical, randomised, double blind investigation that found that inserting the LMA generated a lesser increase in MAP and HR in healthy, normotensive patients than FM or ETT.[8]

According to the literature, we expected that inserting an LMA would result in a considerably smaller hemodynamic response than tracheal intubation.[9] The minimal hemodynamic responses to LMA insertion support the findings of Oczenski et al., Wilson et al., and Marietta et al., who reported that the cardiovascular responses induced by laryngoscopy and intubation were more than twice as high as those induced by LMA insertion.[10]

CONCLUSION

This study demonstrated that there is a haemodynamic response consisting of an increase in Heart rate, SBP, DBP and MAP with ETT insertion as well as with LMA insertion. However, the response caused by ETT insertion is significantly greater than that caused by LMA insertion.

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