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Randomized Comparative Study of Heamodynamic Responses to Insertion of Laryngeal Mask Airway and Endotracheal Tube

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Abstract:***Introduction:*** *The hemodynamic response associated with laryngoscopy and tracheal intubation may be harmful to certain patients. The laryngeal mask airway (LMA) avoids the need for laryngoscopy and allows positive pressure ventilation of the lungs in appropriate patients.****Materials and methods:*** *In a randomized controlled study, 80 adults patients were allocated to LMA insertion (*n *= 40) or ETT (*n *= 40) groups. IOP, systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR) were measured after insertion of the airway device every minute up to 5 min.****Results:*** *There were no significant differences between LMA and ETT groups in SBP, DBP, HR, and IOP immediately after airway instrumentation up to 5 min, except in 4th min in DBP, 2nd min in HR, and 5th min in IOP (7.9 ± 2.3 mmHg in LMA and 9.4 ± 2.5 mmHg in ETT group;* P *= 0.030). There was good surgeon satisfaction for providing acceptable surgical field in both groups (88% in LMA and 80% in ETT group;* P *= 0.702).****Conclusion:*** *Propofol combined with remifentanil provides good and excellent conditions for insertion of LMA or ETT with minimal hemodynamic disturbances in cataract surgery. Considering LMA insertion is less traumatic than ETT, using LMA may be better than ETT for airway securing in these patients.*

Keywords: *Cataract surgery, hemodynamic responses, laryngeal mask airway, propofol, remifentanil*

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I. Introduction:

Airway management is one of the most important skills in the field of anaesthesiology, and an inability to secure the airway can lead to catastrophic results. Endotracheal intubation for the purpose of providing anaesthesia was first described by William Mac Ewan in 1878 [1]. Before 1990, only the face mask and endotracheal tube were available. Since then, several supraglottic airway devices have been developed, of which the Laryngeal Mask Airway (LMA) has been very popular. LMA was conceived and designed by Dr. Archie Brain in UK in 1981 [2]. From then on, it has become an integral part of routine airway management and has proved to be extremely useful in managing the difficult airway.

Endotracheal extubation is done in lighter plane of anaesthesia which produces a significant increase in heart rate and blood pressure which persists into the recovery period [3-5]. Even this transient increase in heart rate and blood pressure is a matter of concern in patients with cardiovascular diseases as it may lead to left ventricular failure, cerebrovascular accidents and intracranial hypertension [6].

There are minimal complications with LMA during insertion as compared to endotracheal tube [7]. This study was carried out to look out for complications in the cardiovascular response with LMA and endotracheal tube extubation.

This study will go a long way in implementation of the technique with lower cardiovascular risk and thereby minimize the peri-operative morbidity and mortality among patients who undergo general anaesthesia.

II. Materials And Methods:

This study was carried out as a single blind Randomized Controlled Clinical Trial. The study was carried out by the Department of Anaesthesia of our medical college.All the patients who underwent surgery under general anaesthesia formed the study population.

Inclusion criteria
• ASA-1 patients
• 20-50 years
• Patients posted for elective surgeries; intra-abdominal and upper limb surgeries
Exclusion criteria
• Obese patients
• Pregnant women
• Diabetic patients

• Patients with history of Chronic Obstructive Pulmonary Disease
• Patients with existing cardiovascular diseases
• Anticipated difficult airway

Study period
The duration of the study was for a period of three months from November 2017 to February 2018.

Sample size
A study done by Mohamed M Abdul Fettah observed the mean heart rate at 1 min after removal was 79.8 ± 3.6 in the LMA group and 96.8 ± 6.2 in the endotracheal group [8]. Based on this, at 95% level of significance, and with a power of 80% and 20% error, the sample size was calculated as 54, with 27 in each group. The final sample size was rounded off to 60, with 30 participants in each group, after accounting 10% for non-response.

Randomization and blinding
A single blind randomization was done in this study. Before surgery patients were randomly allocated to the computer generated sequence into two equal groups. The sequence was generated as codes to which the study participants were allotted to. The investigator was provided with a sealed envelope consisting of the code specific for the intervention. In this study both the participants and the investigator were blind to the allocation of the participants into group A and group B. Group A consisted of LMA=40 patients while the group B consisted of ET tube extubation=40 patients.

III. Statistical Analysis

Data was entered and analyzed using SPSS ver.15 software. The hemodynamic changes were expressed as means, and Independent t test was used to test the statistical significance in the mean values between the two groups.

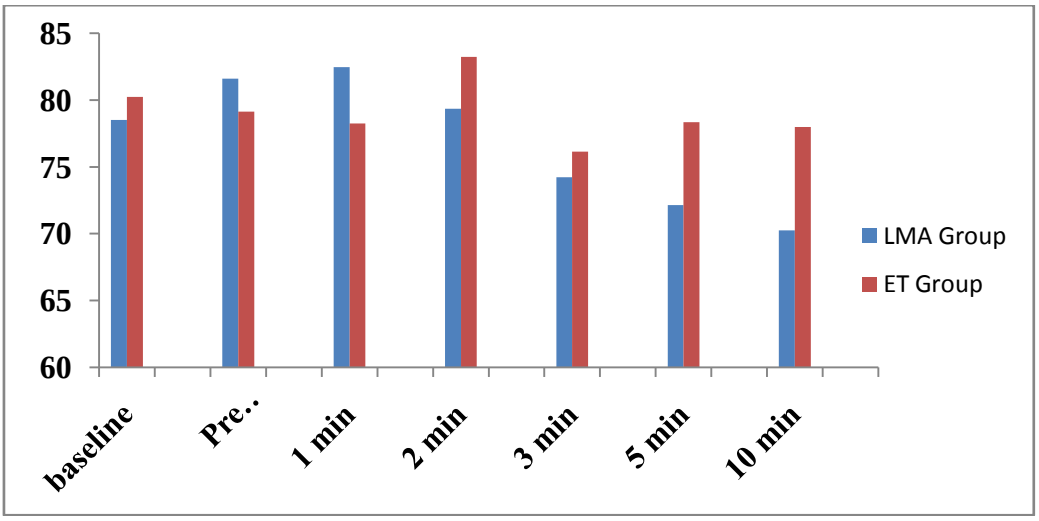
IV. Results:

S.No	Characteristic	LMA Group	ET Group
		Frequency (Percentage)	Frequency (Percentage)
1	Age (in years)		
	20-29	5 (12.5)	8(20)
	30-39	14(35)	9(22.5)
	40-49	18(45)	18(45)
	50-59	3(7.5)	5(12.5)
2	SEX		
	Males	18(45)	16(40)
	Females	22(55)	24(60)
3	Weight in KG		
	41-50	2(5)	5(12.5)
	51-60	26(65)	24(60)
	61-70	8(20)	6(15)
	71-80	4(10)	5(12.5)

Table 1: Patient demographic characteristics

S.No	Time points	LMA Group	ET Group
		Mean ±SD	Mean ±SD
1	baseline	78.5±3.12	80.23±1.45
2	Pre extubation/LMA removal	81.6±2.12	79.13±2.23
3	1 min	82.45±3.45	78.24±3.70
4	2 min	79.35±5.32	83.23±2.90
5	3 min	74.23±4.34	76.15±4.16
6	5 min	72.14±1.50	78.34±2.98
7	10 min	70.25±2.45	77.98±3.87

Table 2; Comparison of diastolic blood pressure between two treatment groups



Graph 1: Comparison of diastolic blood pressure between two treatment groups

S.No	Time points	LMA Group Mean ±SD	ET Group Mean ±SD
1	baseline	124.5±3.12	123.23±1.45
2	Pre extubation/LMA removal	126.6±2.12	120.13±2.23
3	1 min	130.25±3.45	128.24±3.70
4	2 min	129.35±5.32	123.23±2.90
5	3 min	124.23±4.34	126.15±4.16
6	5 min	122.14±1.50	128.34±2.98
7	10 min	120.25±2.45	127.98±3.87

Table 3: Comparison of between the heart rate between two treatment groups

V. Discussion

The laryngeal mask has been shown to be an effective means of securing a clean airway during elective surgeries. Its insertion does not require penetration of larynx, thereby making the placement less stimulating than tracheal tube insertion or extubation. As a result, there is less likelihood of pressor response with LMA. LMA has been in use in 30-60% of surgeries with general anaesthesia in the UK and USA. However, its use has been less than one percent in India. There are several advantages of using LMA, namely easy insertion, minimal cardiovascular stimulations at insertion, and minimal or no requirement of muscle relaxants. The potential disadvantage with endotracheal tube lies with the fact that an increase in arterial pressure associated with intubation can cause complications, such as cardiac failure, pulmonary oedema and cerebrovascular hemorrhage [8].

This study was done with an objective of comparing the hemodynamic responses between removal of LMA and extubation of endotracheal tube. Both the groups were similar with respect to background characteristics like age, sex and weight. The baseline hemodynamic parameters between the two groups were also similar and no significant difference was observed. With observations made between one and ten min of removal/extubation, there was a rise in all the hemodynamic responses namely heart rate, systolic blood pressure, diastolic blood pressure and rate pressure product. However, the mean increase in the values was significantly lower in the LMA group compared to endotracheal tube group. The differences were statistically significant.

VI. Conclusion:

In our study, it was observed that during extubation of endotracheal tube and removal of LMA, the heart rate, blood pressure and rate pressure product increased in both the groups. However, the rate of increase was significantly lower in the LMA group. Therefore, this study throws light on the advantages in the use of LMA over endotracheal tube, which in the long run would minimize the perioperative morbidity and mortality.

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