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A comparative study of haemodynamic response during LMA supreme insertion versus endotracheal intubation in paralysed patients during general anaesthesia

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Abstract

Introduction: LMA Supreme is a device which has recently been gaining popularity as an aid to airway management. During ETT intubation induces reflex sympathetic adrenal stimulation which is associated with raised levels of plasma catecholamines. This raised catecholamines induce hypertension and tachycardia. These effects should be avoided in patients with hypertension, ischemic heart disease, stenotic valvular heart disease, and raised intracranial tension, LMA Supreme can be used to overcome the sympathetic response.

Materials and Methods: 80 patients of either sex, aged 18 to 50 yrs posted for elective surgeries. Randomized to 2 groups N=40 each. We recorded HR, SBP, DBP, MAP, ETCO₂, SPO₂ at 0, 1, 5, 10 min and post extubation after LMA Supreme insertion, ET tube intubation and ease of insertion, no of attempts and post operative complications.

Results: LMA Supreme airway is a safe and effective mean of maintaining airway. Ease and the simplicity makes the device well tolerated and the pressure response is less than endotracheal intubation. In our study we have observed the ETT intubation had increased haemodynamic responses when compared with LMA-S insertion.

Conclusion: LMA Supreme can be suitable alternative to ETT intubation in elective adult surgeries. LMA-S with its unique design will help to expand Anaesthesiologist efficiency in the management of patients.

Keywords: LMA supreme, hemodynamic responses, tracheal intubations

Introduction

Airway management is an important aspect during general anaesthesia. So it is the responsibility of anaesthesiologists to secure airway and provide adequate ventilation to anaesthetized patients. So maintaining a patient airway is essential for adequate oxygenation and ventilation. Failure to do even for a brief period of time can be life threatening. The standard method of securing airway during general anaesthesia is endotracheal intubation. This provides effective ventilation and protect against aspiration.

Laryngoscopy and endotracheal intubation induces sympathomimetic adrenal stimulation which is associated with raised levels of plasma catecholamines. The stress responses to laryngoscopy and endotracheal intubation is centrally mediated sympathetic reflex. The stretching of the laryngeal and pharyngeal tissue during laryngoscopy, endotracheal intubation was the major cause of haemodynamic responses. This raised catecholamines induces hypertension and tachycardia. These effects should be avoided in patients with ischemic heart disease, hypertension, stenotic valvular heart disease and raised intracranial tension.

LMA Supreme is a second generation supraglottic airway device. LMA Supreme insertion is simple, atraumatic and does not require laryngoscopy. It is made of PVC and latex free. It has an anatomically shaped airway tube into which a separate drain tube has been incorporated and has a modified inflatable cuff.

Designed to offer higher airway seal pressure around laryngeal opening. This also incorporates an integral bite block and tab for adhesive tape fixation. The firm elliptical and anatomically shaped airway tube facilitates easy insertion, includes patented fins designed to prevent occlusion of airway by the epiglottis.

Hence purpose of this work is to study and compare LMA Supreme with endotracheal intubation in adult’s patients posted for elective surgeries with respect ease of insertion. number of attempts of insertion., Haemodynamic changes like heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean blood pressure (MBP).Oxygen saturation [Spo2], End tidal carbon dioxide [Eto2].

Materials and Methods

After institutional ethical committee clearance, The study was conducted in 80patients aged between 18 -50 years undergoing elective surgeries under general anaesthesia with controlled ventilation were selected.

A detailed pre anesthetic check up was done. Informed written consent was taken from patients/ parents/ relatives. Age<18 yrs and >50 yrs, ASA grade 3 and 4 Patient having any anatomical abnormality of the neck anticipated difficult airway. Upper respiratory tract infection History of Obstructive sleep apnea Obese patients with BMI >26 kg/m2 were excluded.

Method

80 Patients were divided into two groups, 40 patients in each group namely “S” and “E”.A detailed medical history, complete physical examination and preoperative investigations was done for all patients. Following arrival into the operation theatre intravenous access is established. Monitors were attached. Premedication with Inj. Ondansetron 0.15mg/kg, Inj Glycopyrrolate 0.01mg/kg, Midazolam 0.05mg/kg, analgesia was be provided with Inj.

Fentanyl 2ug/kg. Baseline values of HR, SBP, DBP, MBP, and SPO2 was recorded.

After pre-oxygenation for 3 minutes, patient was induced with Inj. Propofol 2mg/kg, was confirmed by loss of eyelash reflex. Patient was relaxed with succinylcholine 1.5mg/kg. For “S” group patients LMA Supreme of appropriate size was inserted after lubricating the dorsal surface of the device. For “E” group patients the trachea was intubated with an appropriate size endotracheal tube under direct laryngoscopy. The cuff of both devices was inflated and fixed. After connecting to breathing circuit, ventilation was checked.

If it’s not possible to insert the airway device or ventilate through it, 2 more attempts of insertion was allowed. If placement had failed after 3 attempts, the patient was intubated with endotracheal tube and this was taken as failed attempt.

After securing the airway, the anesthesia was maintained with oxygen+nitrousoxide+isoflurane+neuromuscular blockade with Inj. Vecuronium bromide 0.05mg/kg.the following parameters Heart rate [HR], Systolic blood pressure [SBP], Diastolic blood pressure [DBP], Mean blood pressure [MBP], oxygen saturation [SPO2], End tidal carbon dioxide [ETCO2] recorded at 0, 1, 5, 10 min of insertion and at the end of surgery after removal of device, Number of insertion of attempts. Ease of insertion will be described according to subjectiveness of single user aseasy, moderate, difficult or impossible were monitored.

Results

Table 1: Age distribution

Parameters	LMA-S (N=40)	ETT Tube (N=40)	Unpaired t Test		
			t Value	P Value	Significance
age	32.92 ± 12.52	34.17 ±11.45	-0.466	0.643	NS

Table 2: Number of insertion attempts

Number of insertion Attempts	LMA-S (N=40)	ETT Tube (N=40)	Chi Square Test
First	38	40	2.05, P<0.152, NS
second	2	0	2.05, P<0.152, NS
Third	0	0	
Abandoned	0	0	

In the LMA Supreme group, LMA insertion was placed correctly in the first attempt in 38 patients and was placed correctly in 2 patients. In the ETT group, ETT intubation

was done in first attempt in 40 patients. In both the groups, the number of attempts were statistically comparable and derived p value <0.152 which is not significant.

Table 3: Ease of insertion

Ease of Insertion Attempts	LMA-S (N=40)	ETT Tube (N=40)	Chi Square Test
Easy	34	30	1.25, P<0.264, NS
M Difficult	6	7	0.092, P<0.762, NS
Difficult	0	3	3.117, P<0.07, NS
Impossible	0	0	

In both groups the ease of insertion is statistically comparable and p value derived which is not significant.

Insertion of LMA S was comparatively easy when compared to ETT group.

Table 4: Heart rate comparison

HR	LMA-S (N=40)	ETT Tube (N=40)	Unpaired t Test		
			t Value	P Value	Significance
Basal	87.1 ± 9.51	87.65 ± 8.61	-0.271	0.787	NS
1 Min	85.9 ± 9.21	93.85 ± 11.07	-3.491	0.001	HS
5 Min	83.4 ± 9.39	96.85 ±12.06	-5.565	0.000	HS

10 Min	81.35 ± 8.73	99.55 ± 13.04	-7.337	0.000	HS
END	82.45 ± 9.21	100.25 ± 9.86	-8.270	0.000	HS
NS=Not Significant, HS= Highly Significant					

Comparison of heart rate in both the groups showed the following changes.

The heart rate was compared from baseline 0, 1, 5, 10 and post extubation. In the both groups the baseline heart rate was comparable statistically *i.e* 87.1 ± 9.51 and 87.65 ±

8.61 in ETT group with p value = 0.787 which was not significant. After insertion of LMA S and ETT, the heart rate was significantly higher in ETT group with p value derived which was significant.

Table 5: Mean blood pressure comparison

MBP	LMA-S (N=40)	ETT Tube (N=40)	Unpaired t Test		
			t Value	P Value	Significance
Basal	92.83 ± 9.58	91.03 ± 8.0	0.912	0.365	NS
1 Min	90.03 ± 9.72	98.8 ± 7.21	-4.463	0.000	HS
5 Min	86.7 ± 9.76	101.67 ± 7.08	-7.847	0.000	HS
10 Min	85.14 ± 9.48	104.11 ± 6.16	-10.605	0.000	HS
END	86.29 ± 9.56	105.08 ± 5.51	-10.769	0.000	HS
NS=Not significant, HS= Highly significant					

The MAP was compared in the both group at baseline with p value which was not significant. But MAP at 1, 5, 10 and

post extubation showed significant increase in ETT group with p value derived which showed significant.

Table 6: ETCO₂ Chart

ET CO ₂	LMA-S (N=40)	ETT Tube (N=40)	Unpaired t Test		
			t-Value	P-Value	Significance
Basal	35.15 ± 0.36	35.2 ± 0.45	-1.36	0.176	NS
1 Min	35.1 ± 0.30	35.12 ± 0.43	-1.778	0.079	NS
5 Min	35.12 ± 0.33	35.13 ± 0.42	-1.172	0.245	NS
10 Min	35.15 ± 0.36	35.15 ± 0.36	0.582	0.562	NS
END	35.15 ± 0.31	35.13 ± 0.50	-1.272	0.207	NS
NS=Not significant					

The End Tidal CO₂ concentration was recorded in the both groups the both groups were statistically compared at basal 1, 5, 10 and post extubation which was not significant.

Discussion

Dr Brain was first person to introduce the supraglottic airway device. The wide spread use of supraglottic airway has revolutionized in clinical practice. The laryngeal mask airway has been shown to be effective means of securing a airway during elective surgeries. Its insertion does not require penetration of larynx, there by making the placement less stimulating than endotracheal tube intubation.

There are several advantages of using LMA Supreme mainly the ease of insertion, minimal cardiovascular stimulation at insertion and minimal use of muscle relaxation.

Both the groups were comparable and there was no statistically significant difference with regards to mean age, sex, mallampati grading.

In our study, number of attempts and ease of insertion were compared. There was no significant difference we found that LMA Supreme was easily inserted in 34 patients and required lesser skill than ETT. This study was comparable by shashank chitanoor *et al.* in which also shows insertion of LMA Supreme was easy.

Factors affecting the ease of insertion of LMA Supreme also includes the methods of insertion by classical method as described by Dr. Brain by complete deflation of the mask. Cases of difficulty with LMA Supreme is due to wrong choice LMA size, difficulty in maneuvering through posterior curvature of pharynx.

In our study, we observed the haemodynamic changes like HR, SBP, DBP and MAP after LMA Supreme insertion and

ETT intubation. We found that increase in HR, SBP, DBP, MAP were significantly lower in LMA Supreme. We also noted that all haemodynamic parameters were significantly higher in ETT group. So minimal haemodynamic changes with LMA Supreme is clinically important in patients with hypertension, ischemic heart disease, stenotic valvular heart disease and raised intracranial pressure.

The study conducted by Balasubramanian S, Menaha R *et al.* showed the haemodynamic changes was significantly lower in LMA Supreme group. This was comparable to our study with regards to haemodynamic changes.

The study conducted by Sara.R.Barreira, Camila machado Souza concluded that LMA Supreme is a safe airway device with a advantage of attenuating haemodynamic response during its insertion and reducing the incidence of sore throat and dysphagia in postoperative period. This was also comparable to our study with regards to haemodynamic change.

Respiratory complications in the form of laryngospasm, bronchospasm during emergence and post operative complications like sore throat, cough are major concerns while choosing device for airway management. In our study we found 17 patients complained of cough and 8 patients complained of sore throat in ETT group and none were in LMA Supreme group.

The study conducted by Reza safaeian, Valiollah Hassini *et al.* noted sorethroat in 44 % and cough in 7 % in ETT group. Our results were similar to our studies.

Conclusion

We conclude that LMA Supreme and ETT are suitable for routine use during maintenance of anaesthesia. But LMA Supreme is easy to insert, successful insertion without haemodynamic changes.

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