

Haemodynamic Changes During Airway Management in Hypertensive Patients Undergoing Abdominoplasty Surgery

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ABSTRACT:

BACKGROUND:

Avoidance of haemodynamic changes in hypertensive patients receiving general anesthesia is a goal including patients undergoing abdominoplasty surgery.

OBJECTIVE:

To compare haemodynamic responses to use of a classic laryngeal mask airway (LMA) versus endotracheal tube (ETT) in hypertensive females undergoing abdominoplasty surgery.

PATIENT AND METHODS:

Place and Duration of study: Al-Amaal private hospital from march. 2012 to march 2014.

Fifty hypertensive female patient undergoing abdominoplasty surgery were randomly distributed into two equal groups using alternate patient technique endotracheal tube(ETT) and laryngeal mask airway (LMA) (n=25 each). Patients in both groups were received general anaesthesia using standard anesthetic technique.

Patients in ETT group underwent laryngoscopy and ETT intubation, whereas patients in LMA group received LMA without laryngoscopy for their airway maintenance. Haemodynamic variables, (pulse, systolic, diastolic and mean arterial pressures) were measured using non-invasive monitoring technique at various intervals before and after intubation or LMA placement , before and after extubation or LMA removal.

CONCLUSION:

Laryngeal mask airway provide more stable haemodynamics parameter than endotracheal tube during intubation and removal in hypertensive patients receiving general anesthesia for abdominoplasty surgery.

KEYWORDS: haemodynamic response, endotracheal intubation (ETT), classic laryngeal mask airway(LMA).

INTRODUCTION:

Airway management in morbid obesity is not necessarily difficult, especially when surgery is elective, the patients are healthy in other respects . In contrast, when the morbidly obese patients present to elective surgery and have severe co-existing medical conditions as hypertension ,in such cases hypertension may increase perioperative morbidity due to altered cardio vascular physiology. Anaesthetic techniques to minimize cardiovascular stress should be investigated and practiced and adequate airway management is an essential skill for anesthetists⁽¹⁾ Airway can be maintained by various ways in which endotracheal

intubation is the gold standard .Use of laryngoscopy and intubation causes rise in blood pressure and pulse rate,cardiovascular response to laryngoscopy and tracheal intubation have been well documented ⁽²⁾, and a number of methods have been used to attenuate them. This response is hazardous in patients with compromised cardiovascular system specially if these responses left unchecked ⁽³⁾ . Endotracheal tube (ETT) intubation is indicated for airway management in obese patients undergoing general anaesthesia, particularly when there is risk of aspiration⁽⁴⁾. Laryngoscopy and ETT intubation

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after induction of anaesthesia offers maximum stress to the patient^(5,6) and is frequently associated with transient hypertension, tachycardia and arrhythmias^(7,8). This transient response may, probably, be of little consequence in a healthy individual but it may be more severe and more hazardous in hypertensive patients^(5,7). Hypertensive patients due to vascular hyper reactivity show exaggerated response to stress, which can be avoided by avoiding laryngoscopy⁽⁵⁾ in addition to physical and pharmacological interventions⁽⁹⁾. Laryngeal mask airway (LMA) is being increasingly used for maintenance of airway with an important role in rescue ventilation in difficult airway management⁽¹⁰⁾. Insertion of LMA causes less haemodynamic changes than ETT intubation⁽¹¹⁾. LMA is technically easier to insert, causes less coughing, straining and an attenuated pressor response⁽¹²⁾.

Haemodynamic changes at ETT extubation are even higher than during intubation^(5,13). LMA removal is associated with less cardiovascular changes than ETT extubation⁽¹⁴⁾. Studies have shown that use of LMA is safe and effective for both spontaneous and controlled ventilation^(15,16).

PATIENTS AND METHOD:

An informed consent was taken at the time of pre anaesthesia assessment. Fifty hypertensive patients 39-44 years of age, females only of American society of Anesthesia class I or class II with history of essential hypertension on drugs other than angiotensin converting enzyme inhibitor ACEI to treat hypertension were not included in this study. Patients with history of angina, previous history of ECG or Echo evidence of myocardial infarction, patients suffering from metabolic disorders as hyperthyroidism, diabetes mellitus, history of steroid use, history of Chronic Obstructive Pulmonary Disease, pregnant patients, patients on contraceptive pills were not included in the study. Twenty five patients were enrolled randomly in each group (n=25). Applying alternate patient sequence, the first patient and all odd numbered patients were placed in ETT group, while second patient and all even numbered patients were placed in LMA group

Haemodynamic variables (pulse, systolic, diastolic and mean arterial pressure) were observed using non invasive method at various intervals and compared at ETT intubation or LMA placement and at ETT extubation or LMA removal among the

ETT and LMA groups to assess if significant difference was present.

Routine dose of ACEI medication was given with a little of water after midnight orally. No patient received any anxiolytic medication before surgery. After patient's arrival in operation theatre monitoring was commenced with ECG lead II for heart rate monitoring. Non Invasive Blood Pressure (NIBP) cuff was applied to monitor blood pressure at desired intervals. Pulse oximeter probe on finger was used to monitor SPO₂. Baseline haemodynamic variables were measured. All patients were anaesthetized using same anaesthetic technique Fentanyl 1.5 microgram / kg 3minutes before induction, Propofol 2.5mg / kg body weight IV. Patients lungs were ventilated with 100 % oxygen with 2% Isoflurane Once it was certain that patient can be ventilated with face mask, Vecuronium 0.1 mg / kg was given. Intermittent positive pressure ventilation with Bain circuit was done for three minutes by face ask then the ETT or LMA mask insertion done accordingly. pre intubation haemodynamic variable were recorded.

Patients on ETT group underwent direct laryngoscope with macintosh tracheal intubation with ETT size 7.5, patients in LMA group did not undergo laryngoscopy and their airway was secured using Laryngeal Mask Airway Device size 3 or 4. The LMA was inserted according to the recommended guidelines. Bilateral air entry was confirmed. Patients were ventilated with a tidal volume of 8-10 ml/kg with ventilatory rate of 12-15 breaths per minute to achieve end tidal CO₂ of normal value. Haemodynamic variables (heart rate, systolic, diastolic and MAP) were recorded at 1, 3, 5 and 10 minute after ETT intubation or LMA placement. At the end of surgical procedure, neuromuscular block was antagonized with Injection Neostigmine 0.03 mg/kg and Injection Atropine 1mg. Patients then breathed 100% oxygen. One minute pre extubation variables were recorded. Gentle pharyngeal suctioning was performed followed by ETT extubation or LMA removal. Haemodynamic variables were then recorded at 1, 3 and 5 minute after ETT extubation or LMA removal .

RESULTS:

Both the groups were comparable with respect to age($p > 0,05$), where as gender was absolutely females (Table-1).

Table 1: Demographic data of patient in the study.

GROUP	NO. of cases	AGE { years } Mean	Gender	
			Males	Females
Group 1 { ETT }	25	41.7	0%	100%
Group 2 { LMA }	25	39.50	0%	100%

After laryngoscopy and ETT intubation, mean pulse in ETT group increased from 69±9 to 75±8 per minute whereas in LMA group it increased from 67±2 to 68±1 per minute (p<0.05). After ETT intubation, MAP in ETT group increased from 89±10 to 104±4 mm Hg, whereas in LMA group MAP increased from 89±1 to 94±2 mm Hg (p<0.05). All haemodynamic variables in LMA group remained lower as compared to ETT group even 10 minutes after intubation or LMA placement (Table-2)

Table 2 : Pressor response variables at ETT intubation & LMA insertion ETT = Endotracheal tube LMA= Laryngeal mask airway.

Parameter	Heart rate			Systolic blood pressure			Diastolic blood pressure			Mean blood pressure		
	ETT	LMA	P.value	ETT	LMA	P.value	ETT	LMA	P.value	ETT	LMA	P.value
Onset												
Border line	77±6	78±8		142±8	142±8		88±6	89±7		106±6	106±7	
1 min before airway insertion	69±9	67±2		124±14	123±5		72±8	72±8		89±1	89±1	
Immediately after airway insertion	75±8	68±1	HS	142±5	127±11	HS	86±4	78±7	HS	104±4	94±2	HS
3 minutes after airway insertion	74±8	69±8	HS	139±6	125±1	HS	87±7	77±6	HS	104±7	93±7	HS
5 minutes after airway insertion	73±6	68±5	HS	137±6	124±9	HS	82±1	76±7	HS	100±8	92±8	HS
10 minutes after airway insertion	72±5	67±6	HS	132±7	122±9	HS	82±6	73±7	HS	92±8	88±8	HS

HS = HIGHLY SIGNIFICANT (P<0.05)

On ETT extubation or LMA removal, all haemodynamic variables were significant (p<0.05) in LMA group when compared to patients in ETT group. Patients in ETT group on extubation, showed a increase in mean pulse from 76±9 to 77±5 per minute and an increase in MAP from 107±9 to 108±5 mm Hg. Patients in LMA group, on LMA removal showed a mean pulse decrease

from 73±10 to 69±7 per minute and an increase in MAP from 93±9 mm Hg pre extubation to 95±9 mm Hg 1 minute after extubation. Two, three and five minutes after extubation or LMA removal, patients in ETT group displayed persistent increased mean pulse, systolic, diastolic and MAP (p<0.05) (Table-3).

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Table 3: Pressor response variables at ETT extubation & LMA removal.

Parameter Onset	Heart rate			Systolic blood pressure			Diastolic blood pressure			Mean blood pressure		
	ETT	LMA	P value	ETT	LMA	P value	ETT	LMA	P value	ETT	LMA	P value
1 minute before extubation or removal	76±9	73±1		143±15	125±12		89±6	78±5		107±9	93±9	
1 minute after extubation or removal	77±5	69±7	HS	142±13	127±12	HS	91±6	80±7	<0.05	108±5	95±9	HS
3 minutes after extubation or removal	75±2	70±6	HS	135±19	124±12	HS	81±5	75±5	<0.05	99±6	93±7	HS
5 minutes after extubation or removal	73±2	69±6	HS	132±9	123±10	HS	83±5	72±6	<0.05	99±6	92±7	HS

HS = HIGHLY SIGNIFICANT (P<0.05)

No patient in either group had failed ETT intubation, failed LMA placement or failure to achieve IPPV. There was no incidence of hypoxia or evidence of aspiration in both groups.

DISCUSSION:

Most of the patients undergoing abdominoplasty surgery are obese, hypertensive or border line hypertensive, therefore they have increased risk of adverse haemodynamic responses for airway manipulation. ETT may be associated with tachycardia, hypertension. LMA insertion is less traumatic than ETT and may provoke less sympathetic stimulation, therefore, during insertion of the LMA, there is less likelihood of a blood pressure response or coughing than with conventional tracheal intubation⁽¹⁷⁾.

Laryngoscope guided intubation induces haemodynamic changes like tachycardia and hypertension, which is reported in literature and known for long time⁽¹⁸⁾, and is a byproduct of securing a definitive airway. These effects are from activation of sympathetic response as it is associated with increase in plasma noradrenaline levels⁽¹⁹⁾, and these effects are of concern especially in patients with hypertension, ischemic heart disease⁽²⁰⁾. Conventional laryngoscopic intubation, which is standard way of securing airway, may not be neglected because alternatives like using laryngoscope to insert LMA imposes greater rise in haemodynamic parameters than routine intubating technique⁽²¹⁾ and this technique was not used in our study.

This study was designed to assess the effects of classical LMA and ETT insertion on haemodynamic variables. Mean blood pressure and heart rate increased by 22% and 20% respectively in ETT group. By comparing, LMA cause rise of mean blood pressure 6% and 3% for heart rate only, from post-induction values in MAP and heart rate, respectively. Laryngoscopy was the most important factor causing haemodynamic variations in ETT group. Laryngoscope guidance is not used routinely for LMA insertion, which is also not used in this study, resulting in markedly stable haemodynamic in LMA group. Regardless of high variations in haemodynamic caused by direct laryngoscopy, Carron et al⁽²²⁾ studied haemodynamic and endocrine stress response of laryngoscopic intubation and proseal LMA insertion in 75 morbidly obese patients for laparoscopic gastric banding. Their results confirmed that significant rise in blood pressure was observed in intubation group which was paralleled with significant rise in plasma norepinephrine levels. LMA is well tolerated and causes less stress response during return of consciousness and awake removal is a safe technique⁽²³⁾. In our study, before ETT or LMA removal, patients in LMA group showed, significant lower pulse, systolic, diastolic and

MAP, also patients in LMA group were less irritable and well tolerated presence of LMA when compared to patients in ETT group.

On ETT extubation increase in heart rate, systolic, diastolic and MAP was larger ($p < 0.05$) when compared to LMA removal. This increase persisted even 5 minutes after ETT removal. This finding was inconsistent to the study by Fuji⁽¹⁶⁾, who evaluated cardiovascular responses to ETT extubation or LMA removal in normotensive and hypertensive patients and showed that in hypertensive patients increase in haemodynamic responses to ETT extubation or LMA removal were observed for up to 5 minutes and these responses were greater in ETT extubation as compared to LMA removal.

CONCLUSION AND RECOMMENDATIONS:

Its concluded from our study that ETT is associated with significantly increase in heart rate, systolic, diastolic and mean blood pressure. Changes are obviously more than that associated with LMA.

So LMA is useful where minimal pressor effect required like patient with hypertension, coronary artery disease, and no contraindication in its usage.

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