



## Hemodynamic Response in Hypertensive Patients with Endotracheal intubation and Laryngeal mask airway- A Comparative study

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### Abstract

*The haemodynamic 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. This study compared the haemodynamic response of tracheal intubation with that of mask insert ion in hypertensive patients. Sixty hypertensive patients between 40-60 years of either sex of ASA grade II were randomly allotted to one of the two groups of 30 each (group ET vs group LMA). LMA insert ion or tracheal intubation was performed after induct ion of anaesthesia with thiopentone, and muscle relaxation with succinylcholine. The heart rate, systolic BP, diastolic BP, mean arterial pressure (MAP) and rate pressure product (RPP) were measured after induct ion, immediately after intubation or insert ion and at minute 1, 3 and 5. There was a very highly significant difference ( $P < 0.001$ ) in mean peak increase in heart rate (59.2% in group ET vs 36% in group LMA). The increase in arterial pressures were very similar. The systolic BP increased by 29.5% in group ET compared with 27% in group LMA and diastolic BP increased by 15.2% and 16.2% in group ET and group LMA respectively. The MAP and RPP reached maximum values immediately after airway instrumentation. However, the values after LMA insert ion were significantly lower compared to tracheal intubation after one minute. Use of LMA may therefore offer some limited advantages over tracheal intubation in the anaesthetic management o f patients where the avoidance of the pressure response is of particular concern.*

**Keywords:** Include at least 5 to 6 keywords or phrases.

### Introduction

Laryngoscopy and tracheal intubation after induction of anaesthesia are frequently associated with transient hypertension, tachycardia and arrhythmias. Although these haemodynamic responses are probably of little consequence in

healthy individuals, they may be more severe and more hazardous in hypertensives<sup>[1]</sup>. Laryngoscopic stimulation of oropharyngolaryngeal structures maybe an important factor in the haemodynamic response associated with trachea l intubation. Various non laryngoscopic intubation devices have provided conflicting evidence of an attenuated

haemodynamic response. In general, techniques that avoid or minimize oropharyngolaryngeal stimulation might attenuate the haemodynamic stress response. The laryngeal mask airway has proved to be a popular addition to the range of equipment available for airway management. The laryngeal mask airway is intermediate in design and fills a niche between oropharyngeal airway and endotracheal tube. The laryngeal mask airway is designed primarily as a means of offering some of the advantages of endotracheal tube while avoiding its fundamental disadvantages, since the vocal cords need to be neither visualized nor forced upon<sup>[2]</sup>.

In this comparative study, the haemodynamic stress response to laryngoscopic tracheal intubation and laryngeal mask airway insertion in hypertensive patients were evaluated

### Materials and Methods

Sixty hypertensive patients with hypertension under control between 40-60 years of either sex of ASA grade II on oral anti hypertensives were selected for the study. The patients were undergoing elective surgeries lasting for not more than one hour. Exclusion criteria included history of pulmonary, central nervous system or cervical spine disease, difficult intubation, gastro oesophageal reflux and head and neck surgery. Each patient was visited preoperatively when the procedures were explained and informed written consent was obtained. Blood pressure was recorded in the supine position on 3 occasions two hours apart and patients were taken up for the study with systolic BP < 180 mm Hg and diastolic 110 mm Hg. Patients were advised to take oral anti hypertensives as per schedule with the last dose 6 hours prior to surgery. Each patient received pethidine 1 Mg/Kg and phenergan 0.5 Mg/Kg intramuscularly one hour prior to surgery as premedication. The patients were randomly allotted to one of the two groups (of 30 patients each) group ET and group LMA. The patients in group ET were intubated using macintosh laryngoscope. The patients in group LMA received laryngeal mask insertion. A size 4 macintosh blade with an appropriate size endotracheal tube was used in

patients of group ET and size 4 LMA was used in all patients in group LMA.

Intravenous access was established with an 18 G Cannula after arrival in the anaesthetic room. Pulse oxymeter and non invasive BP apparatus were connected to the patient in the operation theatre. After stabilization period of 5 minutes, the baseline values of heart rate, systolic, diastolic BP and MAP were recorded. Patients in both groups received pre-oxygenation via a face mask for 5 minutes. Anaesthesia was induced with thiopentone sodium 5 Mg/Kg I.V and after confirming loss of the eye lash reflex, succinylcholine 2Mg/Kg Intravenous was given for endotracheal intubation or LMA insertion. After the disappearance of fasciculations, tracheal intubation was performed in group ET and LMA was inserted blindly using the standard technique in group LMA. 2% xylocaine gel was used as a lubricant for both the Endotracheal tube cuff and LMA cuff. Air was injected into the endotracheal tube or LMA cuff as per recommendation. Anaesthesia was maintained with intermittent positive pressure ventilation using bain's circuit with N<sub>2</sub>O 4 L/Min and O<sub>2</sub> 2 L/Min and 0.5% halothane. The values of heart rate, systolic BP, diastolic BP, MAP were recorded after induction, immediately after intubation or insertion and at minute 1,3 and 5. Rate pressure product which is a product of systolic BP and heart rate was derived at all the intervals. At the end of five minutes the anaesthetic management deferred as per surgical requirements. Any kind of painful stimulus including surgical incision was not allowed while the readings were recorded.

Patients on whom more than one attempt at either intubation or LMA insertion was tried were excluded from the study, complications like leakage, coughing, gagging, laryngospasm, gastric distension after airway instrumentation did not occur during the study.

All the values were expressed as mean + standard deviation. Statistical comparison were performed by students paired and unpaired t -test and chi-square test. P value of >0.05 was considered to be statistically not significant, a value of <0.05 as

statistically significant, a P value of <0.01 as statistically highly significant and a P value of <0.001 as statistically very highly significant.

**Results**

The present study was conducted on 60 consenting patients aged between 40-60 years. All were hypertensives receiving various types of oral antihypertensives for variable periods of time. Group ET consisted of patients in whom endotracheal intubation was done using macintosh laryngoscope. Group LMA consisted of patients in whom laryngeal mask was inserted.

**Table 1: Demographic Data**

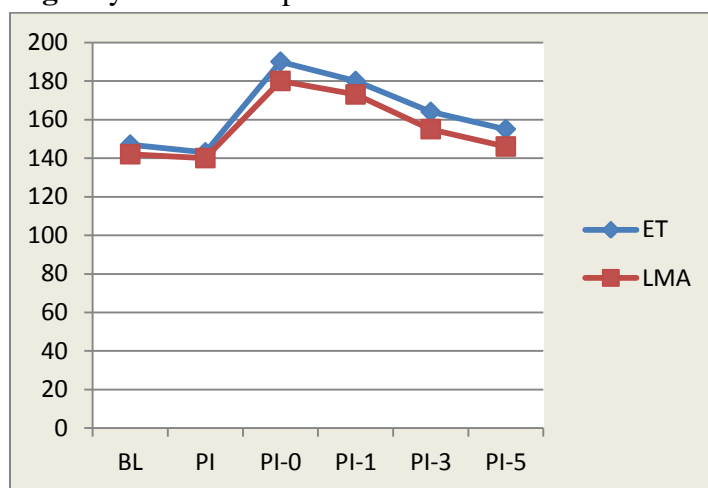
Parameter	ET	LMA
Male / Female	17/13	20/10
Age (Years)	46.32	46.95
Weight (Kgs)	51.02	50.93
<b>Antihypertensives Drugs</b>		
Ace Inhibitors	7	5
Angiotensin Antagonist	2	3
β - Blockers	7	9
Calcium Channel Blocker	14	13

The heart rate increased after induction and remained elevated for more than 5 minutes after both tracheal intubation and LMA insertion. The increase in mean heart rate were similar when the two groups were compared. P >0.05

**Table 2 : Comparison of Mean Heart Rate**

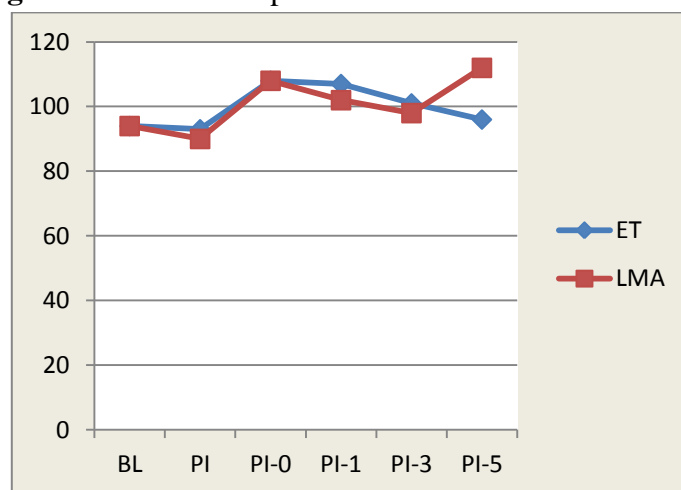
Time of Measurement	Group ET	Group LMA
Baseline	70.53 + 6.23	73.07 + 9.11
Post Induction	78.43 + 6.33	81.40 + 7.66
<b>Post Intubation/Insertion</b>		
Immediate	111.00+17.19	103.80 + 12.80
Minute 1	101.10 + 16.35	98.40 + 11.52
Minute 3	94.67 + 13.50	91.50 + 8.70
Minute 5	86.70 + 11.41	86.93 + 8.55

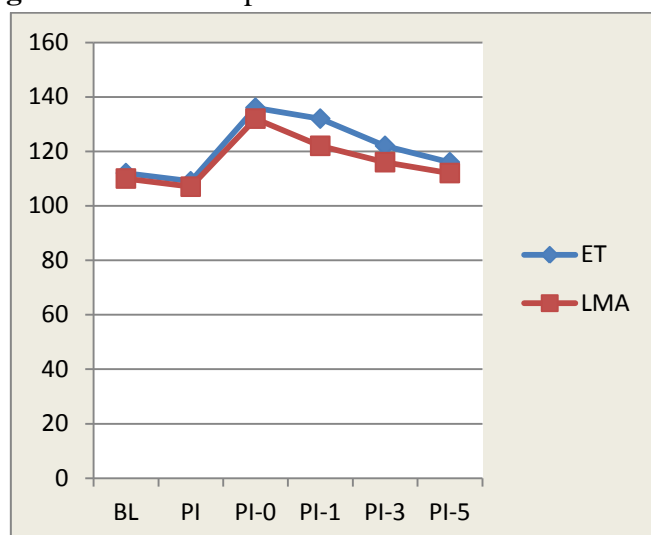
**Fig 1.Systolic blood pressure**



The mean systolic BP increased after both intubation and LMA insertion. Even though the values remained elevated in both the groups at the end of minute 5 they were significantly lower in group LMA compared to group ET. (P<0.05). The maximum increase in systolic B.P. was 29.5% in group ET and 27% in group LMA (P=0.512). The mean diastolic BP remained elevated for 3 minutes in group ET and for 1 minute in group LMA after airway instrumentation. The values were significantly lower in group LMA compared to group ET at minute 1 and 3 (P<0.05). The maximum increase in diastolic B.P. was 15.2% and 16.2% in group ET and group LMA respectively (P =0.806).

**Fig 2: Diastolic blood pressure**



**Fig.3:** Mean arterial pressure

The MAP values increased in both the groups after intubation or LMA insertion. The values remained elevated for up to 5 minutes in group ET. In group LMA the values were high for upto 3 minutes. The values were significantly lower in group LMA at minutes 1,3, and 5.

The percentage increase from baseline of mean systolic BP, diastolic BP, MAP and RPP reached its peak immediately after endotracheal intubation or insertion of LMA. In group LMA, the values of systolic, diastolic BP were significantly lower ( $P < 0.05$ ) at minute 1 and 3 compared with group ET. The MAP achieved significance at minute 3 in group LMA compared to group ET. Whereas the RPP values in group LMA were lower compared to intubation group from immediately after airway instrumentation up to minute five with  $P < 0.001$  which is very highly significant.

### Discussion

The present study was conducted on 60 consenting patients aged between 40-60 years. All were hypertensives receiving various types of oral antihypertensives for variable periods of time. Group ET consisted of patients in whom endotracheal intubation was done using macintosh laryngoscope. Group LMA consisted of patients in whom laryngeal mask was inserted.

Endotracheal intubation has a long history as one of the most widely accepted techniques in anaesthetic practice. The haemodynamic response to

laryngoscopy and tracheal intubation reflect the increase in response to oropharyngeal and tracheal stimulation. The possible complications include transient hypertension, tachycardia and arrhythmias. Although these complications are of little significance in normotensive subjects it may be harmful to patients with hypertension, ischaemic heart disease or cerebrovascular disease<sup>[1,3]</sup>. The laryngeal mask airway has proved to be a popular addition in the range of equipment available for airway management. The laryngeal mask was designed primarily as a means of offering some of the advantages of endotracheal intubation while avoiding its fundamental disadvantage. The laryngeal mask appears to be more suitable where concern about the haemodynamic response exists. In our study the heart rate increased after induction and again after endotracheal intubation or insertion of LMA.

The values remained elevated for up to 5 minutes when compared with the baseline. These results were very similar to those of Yoshitaka Fujii and colleagues<sup>[3]</sup>. This difference was probably because insertion of LMA produced a balanced stimulation of vagal and cardiac accelerator fibres but intubation of trachea produced lesser vagal stimulus. There was a fall in both systolic and diastolic BP after induction in both the groups of our study. This was followed by a very highly significant increase in both systolic and diastolic BP after airway instrumentation in both the groups. However the values in group LMA were significantly lower compared to group ET, after one minute. This reflects a smaller degree of total afferent stimulation in group LMA and a continued effect of tracheal tube.

The results of our study support the findings of Wilson et al.<sup>[4]</sup> who found that insertion of the laryngeal mask airway produced a small but not significant increase in both systolic and diastolic arterial pressure. However, this increase was considerably less and significantly so, in comparison with that associated with laryngoscopy and tracheal intubation. Similar to our study results Hickey et al.<sup>[5]</sup> found that insertion of LMA was

associated with significant increase in arterial pressure and heart rate. But the changes were short-lived.

The findings of our study corresponded with Braude et al.<sup>[6]</sup> who found increase in systolic and diastolic BP associated with mask insertion were proportionately similar to those that resulted from laryngoscopy and intubation. Griffin and associates<sup>[7]</sup> also had similar findings with identical changes in haemodynamic variables between the two groups.

Shribman<sup>[8]</sup> and colleagues concluded that stimulation of the supraglottic region by tissue tension is the major cause of the sympathoadrenal response. However, the short lived nature of this response in group LMA was explained by Marjot et al.<sup>[9]</sup> who found that lateral pressure of the LMA cuff on the pharyngeal mucosa was not a sustained one and the fact that transmitted pressure decreased during the time mask was insitu. Studies by Anita N. Shetty et al.<sup>[10]</sup> also found an attenuated haemodynamic response after insertion of laryngeal mask airway compared to endotracheal intubation. The results of our study were similar to the study of Yoshitaka Fujii<sup>[3]</sup> and colleagues who found that MAP values increased after airway instrumentation in both the groups with an attenuated response in group LMA. Our results suggest that insertion of LMA is associated with attenuated haemodynamic response compared with tracheal intubation and may be useful in situation where the pressor response to intubation should be avoided as in hypertensive states.

Comparative study of haemodynamic response with laryngoscopic endotracheal intubation and laryngeal mask airway insertion in hypertensive patients concludes that insertion of the laryngeal mask airway causes lesser haemodynamic response

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