

# Hemodynamic Profile of Laryngeal Mask Airway Insertion Compared to Laryngoscopy and Tracheal Intubation

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## Abstract

**Background:** Endotracheal intubation by laryngoscopy is one of the most famous and frequent methods for securing the airway. This study compares the modifications in hemodynamic parameters in hypertensive patients following laryngoscopic endotracheal intubation or laryngeal mask airway insertion. **Subjects and Methods :** Fifty patients between the ages of 35-70 years of either gender with a history of Hypertension of ASA grade II planned for elective surgery were selected. They were separated into 2 groups: group LMA and group ET. LMA insertion or tracheal intubation was executed following the induction of anesthesia with Propofol and succinylcholine. The heart rate, mean arterial pressure and rate pressure product were calculated after induction and instantly following insertion /intubation and then after 1, 3, 5 minutes. **Results:** The heart rate was augmented after induction and continued to be high for more than 3 minutes after LMA insertion and tracheal intubation. The increase in Heart rate was more in the ET group than the LMA group. The values remained high for 5 minutes in Group ET and only for 3 minutes in Group LMA. Group LMA had lower values at all times when compared to Group ET. **Conclusion:** Our study concludes that the insertion of the laryngeal mask airway grounds a lesser hemodynamic reaction than tracheal intubation in hypertensive patients.

**Keywords:** Endotracheal Intubation, Heart rate, Laryngoscopy, Laryngeal Mask

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## Introduction

Airway management is a crucial skill for clinical anesthesiologists. Airway management following general anesthesia allows ventilation and oxygenation as well as delivery of the anesthetic gases. Complications following airway management in the operating room are very rare but may be life-threatening.

General anaesthesia is usually done by securing a definitive airway. Endotracheal intubation by laryngoscopy is one of the most famous and frequent methods for securing the airway.<sup>[1]</sup> But the conduct of laryngoscopy and intubation of the trachea with endotracheal tube most of the time results in transient tachycardia, varied arrhythmias and hypertension due to sympathetic response and release of catecholamines.<sup>[2,3]</sup> This sympathetic response may not be desirable in patients who already have hypertension, myocardial ischemia or cerebrovascular disease.<sup>[4]</sup> Patients with existing hypertension have high baseline sympathetic nervous system activity and will suffer exaggerated hypertension and tachycardia to laryngoscopic endotracheal intubation.<sup>[5]</sup> This exaggerated

response may ensue in life-threatening complications such as pulmonary edema, intracranial bleed, acute myocardial infarction and biventricular failure.<sup>[6]</sup> Other methods of securing the airway like the usage of laryngeal mask airway (LMA) first introduced by Archie Brain, have been used frequently during General Anaesthesia.<sup>[7]</sup> The haemodynamic changes during insertion of LMA under General Anaesthesia are less than that of tracheal intubation.<sup>[8]</sup> This is because the visualization of glottis and opening of the glottis is not performed during the insertion of LMA.

This study compares the changes in haemodynamic parameters in hypertensive patients after laryngoscopic endotracheal intubation or laryngeal mask airway insertion.<sup>[9,10]</sup>

## Subjects and Methods

Following the agreement of the research protocol by our institutional committee, Fifty patients between the age of 35-70 years of either gender with a history of Hypertension of ASA grade II planned for an elective surgery that lasts for not

more than one hour were selected. The patients should have adequate control of hypertension with oral antihypertensives. A visit before the operation that was carried out one day before the surgery explained in a very detailed manner about anaesthesia and consent in the written form was obtained from the patients.

Patients with a systolic BP < 110 mm Hg measured in the supine position at least 3 occasions measured two hours apart were taken up for the study.

### 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

Oral antihypertensives were continued as per schedule till the last dose 4 hours before surgery. Premedication of pethidine 1 mg/Kg and promethazine 0.5 mg/Kg intramuscularly one hour previous to surgery was administered to each patient. At operation theatre, following 18-G venous cannula inserted and Ringer Lactate was in progress. The patients have separated arbitrarily into two groups: group ET and group LMA. Preoxygenation with 100% oxygen via an anatomical face mask for 5 minutes was administered to all patients in both groups. Anaesthesia was persuaded with Injection Propofol 2mg/Kg I.V followed by Injection succinylcholine 2mg/Kg I.V. After the disappearance of fasciculations, laryngoscopic endotracheal intubation with size 4 Macintosh laryngoscope and appropriate size endotracheal tube was done for patients in group ET. Laryngeal mask insertion with size 4 LMA was done for patients in group LMA. Lubrication was done with 2% lignocaine gel for both the LMA and Endotracheal tube cuffs. Anaesthesia was maintained with controlled ventilation using closed-circuit with oxygen, Nitrous Oxide and 2% Sevoflurane. Surgical incision or other painful stimulus was avoided during this period. Rate pressure product was derived as a product of heart rate and systolic blood pressure. After five minutes the anesthetic management continued according to surgical requirements.

### Statistical analysis

The data was analyzed using SPSS version 15. For all tests, confidence level and level of significance were set at 95% and 5% respectively.

## Results

The demographic data of two groups - Group ETT and Group LMA -were comparable within the age, gender and weight of the patients. The mean increases in heart rate for both the

groups were as shown in [Table 1]. The heart rate increased after induction and continued to be superior for more than 3 minutes after LMA insertion and tracheal intubation. The increase in Heart rate was more in the ET group than the LMA group. The mean increases in mean blood pressure for both the groups were as shown in [Table 2]. There was an increase in MAP both after intubation or LMA insertion. The values remained high for 5 minutes in Group ET and only for 3 minutes in Group LMA. Group LMA had lower values at all times when compared to Group ET. Increases in RPP were noted in both groups although the rise of values in Group LMA is far less in Group ET.

**Table 1: Comparison of mean heart rate**

Time of measurement	Group ET	Group LMA	P-value
Baseline	70.9±6.8	76.70±7.12	0.01*
After induction	76.15±6.2	86.12±9.8	0.002*
<b>After Intubation</b>			
Immediate	111.10±1	106.20±11.4	0.1
60 seconds	98.80±14	98.7±11.90	0.20
180 seconds	92.90±11	90.74±9.60	0.09
300 seconds	85.10±10	85.81±8.15	0.10

\* indicates statistically significant at  $p \leq 0.05$

**Table 2: Comparison of mean MA**

Time of measurement	Group ET	Group LMA	P-value
Baseline	112.62±6.90	109.10±7.1	0.02*
After induction	110.20±8.32	109.10±9.1	0.1
<b>After Intubation</b>			
Immediate	143±14.10	133.40±12	0.05*
60 seconds	135.09±12.60	129.30±12	0.3
180 seconds	122.84±9.50	115.51±6.1	0.02*
300 seconds	115.60±6.10	111.5±7.9	0.01*

\* indicates statistically significant at  $p \leq 0.05$

## Discussion

Various procedures for example rising the depth of anaesthesia, management of intravenous opioids, local anaesthetics, beta-blockers, and tracheal intubation by bendable fiberoptic laryngoscopy has been utilized to diminish hemodynamic responses, although nothing of them is perfect.<sup>[11]</sup>

An increase in heart rate, blood pressure and arrhythmia is caused by endotracheal intubation because of increased release of catecholamines and a marked rise in reflex sympathetic activity.<sup>[12,13]</sup> Though these effects are short-lived they produce significant hemodynamic effects in hypertensive patients making them vulnerable to adverse cardiovascular events like Myocardial infarction, CVA or end-organ damage.<sup>[14]</sup> The supraglottic airway devices like Laryngeal mask airway are designed to provide a patent airway and facilitate positive pressure ventilation while circumventing the disadvantages of endotracheal intubation. As these devices are not introduced into glottis they do not cause many haemodynamic changes.<sup>[15]</sup> In this study, following LMA insertion, the percentage change from the baseline in HR was 28.26% as compared to 38.23% following endotracheal intubation. The results were in parallel with a study done by Anita and a colleague.<sup>[16]</sup>

In our study in Group LMA showed there was markedly less increase in MAP values than Group ETT. The RPP values in group ET reached a mean peak increase of 19532.67, corresponding means peak increase in group LMA was 19081.80 which is parallel with the study done by Jayita Sarkar and colleagues.<sup>[17]</sup> Siddiqui et al found that the utilization of a laryngeal mask for intubation is connected with minimum hemodynamic changes; so, it can be utilized for patients in whom a noticeable pressor answer would be venomous.<sup>[10]</sup> From a diverse viewpoint, it appears that the assessment of laryngeal masks unaided with laryngoscopy and tracheal intubation may not offer an entirely alike circumstance for motivation response judgment. As tracheal intubation is the main influential affecter, who necessitates the earnest level of anesthesia.<sup>[18,19]</sup>

Hemodynamic responses to the introduction of the LMA were negligible which maintains the conclusion of Oczenski et al,<sup>[20]</sup> Wilson et al,<sup>[21]</sup> and Marietta et al,<sup>[22]</sup> who reported that the cardiovascular responses induced by laryngoscopy and intubation were more than twice as high as those produced by the insertion of an LMA. Kihara et al. had established that LMA insertion has no important haemodynamic consequence contrast to baseline.<sup>[23]</sup> In Md. Harun-Or-Rashid, et al,<sup>[24]</sup> study hemodynamic parameters and presence of any dysrhythmias were observed after 1,3,5 & 10 minutes after LMA insertion or ETT intubations.

There were statistically significant changes in pulse rate, systolic blood pressure, diastolic blood pressure and in group B patients while there was a fewer change in pulse rate, systolic blood pressure, diastolic blood pressure whose airway was preserved by LMA insertion. They found that LMA insertion reasons fewer Haemodynamic changes than that of endotracheal intubation.

From this study we infer that in hypertensive patients where intubation pressor response is desirably avoided, LMA can be

preferred over laryngoscopic intubation.

## Conclusion

Our study concludes that insertion of the laryngeal mask airway causes lesser haemodynamic response than tracheal intubation in hypertensive patients.

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