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Comparison of haemodynamic responses to insertion of Classic LMA and endotracheal tube: A randomized controlled study in adult patients posted for elective surgery under general anaesthesia

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Abstract

Aim: The purpose of this study is to compare the effects of Classic LMA insertion and Endotracheal intubation on heart rate,systolic and diastolic blood pressure and mean arterial blood pressure during elective surgeries under general anaesthesiain paralyzed patients.

Material and Methods: Eighty patients of American Society of Anaesthesiology Physical Status I or II undergoing general anaesthesia for General Surgery and ENT surgery procedures were randomly allocated in twogroups of 40 patients each. Group E had laryngoscopy and endotracheal intubation done for their airway managementand Group I underwent insertion of classic LMA . Both the groups were compared for haemodynamic parameters atinduction of anaesthesia, then immediately after insertion or intubation, and subsequently at 1 minute, 3 minutes and 5minutes after introduction of Classic LMA or Endotracheal tube.

Observations and Results: The increase in heart rate with Classic LMAinsertion was significantly less than endotracheal intubation till 3 minutes ($p<0.0001$). The increase in systolic bloodpressure on comparison between the two groups immediately after insertion of device, 1 min, 3 min and 5 min afterinsertion of respective devices, was less with Classic LMA ($p < 0.05$). The diastolic blood pressure increased more in Group E ascompared to Group I ($p<0.05$) and the rise in the mean arterial blood pressure was also lower in Group I.

Conclusion: Both Endotracheal intubation and Classic LMA insertion produced increase in heart rate, systolic blood pressure, diastolic bloodpressure and mean arterial blood pressure, however the increase was less with insertion of Classic LMA. Hence, Classic LMA insertionhas better haemodynamic stability compared to laryngoscopy and endotracheal intubation.
Key Words: Endotracheal tube, Classic LMA, laryngoscopy, haemodynamic response.

INTRODUCTION

Administration and maintenance of general anaesthesianecessitates tracheal intubation in most of the cases butthe procedure is not without adverse effects. Induction ofgeneral anaesthesia is known to induce clinically relevantchanges in hemodynamic variables probably generated bydirect laryngoscopy and endotracheal intubation whichappear to be attenuated by alternative airwaymanagements. Tracheal intubation causes a reflexincrease in sympathetic activity that may result inhypertension and tachycardia. Though in the majority ofpatients undergoing anaesthesia, these responses aretransient and probably of little consequence, they may beharmful to some patients, mainly those with myocardial or cerebrovascular diseases1. The extent of the reaction isaffected by many factors: the technique of laryngoscopyand intubation and the use of various devices, liketracheal tube, laryngeal mask airway(LMA) supraglotticairway devices. The laryngeal mask airway (LMA) wasdesigned as an alternative to tracheal intubation to maintain a patent airway during anaesthesia with minimalmorbidity. Since the development of the LMA in 1983 byArchie I.J Brain, several other supraglottic devices havebeen introduced for management of airway, aiming tooffer simple and effective alternatives to trachealintubation[2]. We are hypothetizing that there will be lesshemodynamic response with Classic LMA insertion as comparedto endotracheal tube intubation and therefore plan toconduct a prospective, randomized study to examine thehemodynamic changes produced by inserting anClassic LMA orendotracheal tube in consenting healthy normotensiveanaesthetized patients after their approval forparticipating in the study.

MATERIAL AND METHODS

Following approval by the Board of Thesis/Researchcommittee, Department of Anaesthesiology, and Ethicalcommittee, at our institution, 80 patients posted forelective surgeries of specialities like general surgery andENT surgery, belonging to ASA grade I or II of eithersex, aged 18-60 yrs, weighing 50-80 kg and Mallampaticlass I or II were recruited for this study.The study was done from 2020 to 2021. Patients whorefused for procedure, had probability of difficultintubation, Mallampati class>II, emergency surgery, fullstomach, obesity (BMI>30kg/m2), cardiovasculardiseases and uncontrolled hypertension, high intra

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cranialpressure (ICP) and patient's with contraindications forinsertion of supraglottic devices were excluded from thestudy. The patients were randomly divided into twogroups: Group "I" and "E" with 40 patients in each group.In Group I, proper sized Classic LMA was used, while in Group E,endotracheal tube of appropriate size was used to managethe airway of the patient. All patients were kept nil peroral night before surgery and received Tab Ranitidine150mg and Tab Alprazolam 0.25mg orally in night. Onthe day of surgery, intravenous drip was started 30 minbefore surgery and Inj. Glycopyrrolate 0.2mg was given.After shifting the patient to the operating room, monitorswere attached and baseline readings were taken. Patientswere premedicated with Inj. Ranitidine 50 mg, Inj.Ondansetron 4 mg, InjButyrophenol 1mg. Induction wasdone with propofol 2.5mg kg-1 and succinylcholine1.5mg kg-1 and heart rate, systolic blood pressure,diastolic blood pressure and mean arterial blood pressurewere recorded. Intubation was done with either propersize Classic LMAsupraglottic device or appropriate sizedendotracheal tube. Confirmation of ventilation was done by adequate chest rise and auscultation. Patient wasconnected to ventilator with closed circuit. Heart rate,systolic blood pressure, diastolic blood pressure and meanarterial blood pressure was recorded after induction, thenimmediately after insertion or intubation, and subsequently at 1 minute, 3 minutes and 5 minutes afterintroduction of Classic LMA or Endotracheal tube. Theseparameters were recorded by an accompanyinganaesthetist. In case of laparoscopic surgeries, theparameters were recorded before creation ofpneumoperitoneum. Maintenance was done with O2 andN2O in the ratio 40:60 and 1% Isoflurane was started. Bolus dose of vecuronium (0.08- 0.1mg kg-1) was givenafter intubation. 1mg of vecuronium was given as top upduring surgery. Ventilator setting of Tidal Volume andRespiratory Rate was adjusted to keep the EtCO2 30-35mmHg. Respiratory rate was kept between 12 to 14breaths per min. At the end of the surgery reversal wasdone with neostigmine 0.05mg kg-1 and glycopyrolate0.008mg kg-1. After pharyngo-tracheal suction,extubation was done.

Statistical Analysis: Data was summarized as mean ±standard deviation with confidence interval of 95% or aspercentages. Statistical analysis was performed using bySPSS version 26. Numerical variables were normallydistributed and compared by unpaired 't' test. Paired ttest was performed for comparing mean percentage ofimprovement in the groups. A p value less than 0.05 wasconsidered as statistically significant.

RESULTS

No statistically significant difference between the two groups was seen with respect to age, sex, weight, ASA status andMallampati class (p>0.05).

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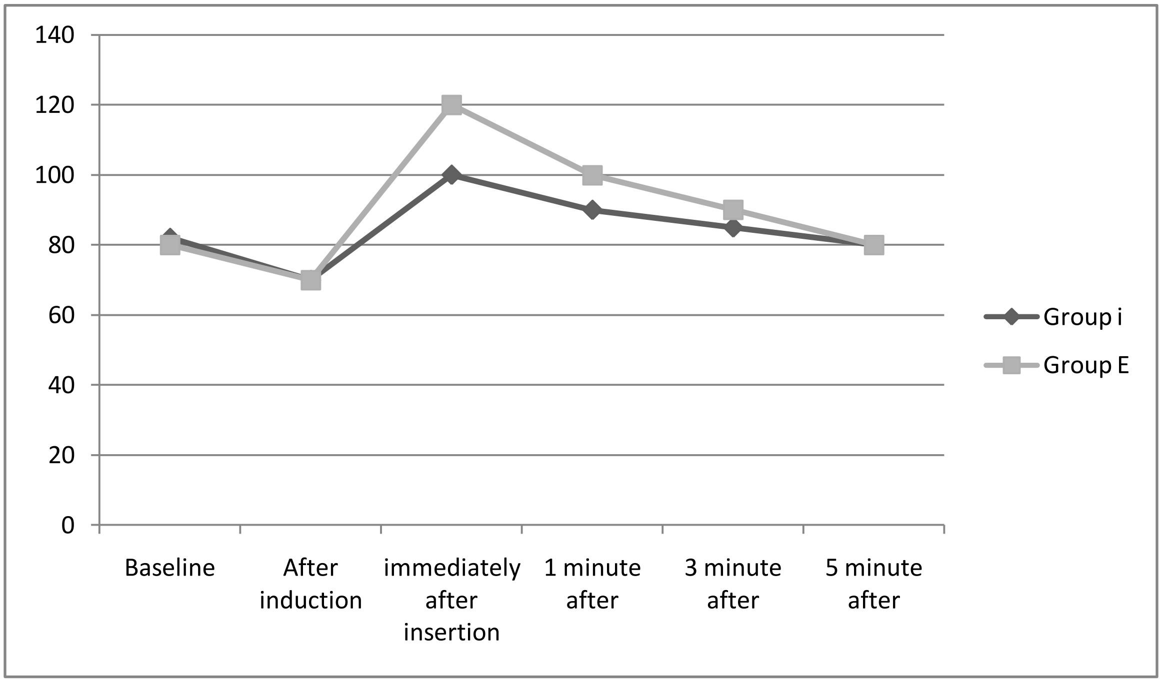

Figure 1: Comparison of mean heart rate;

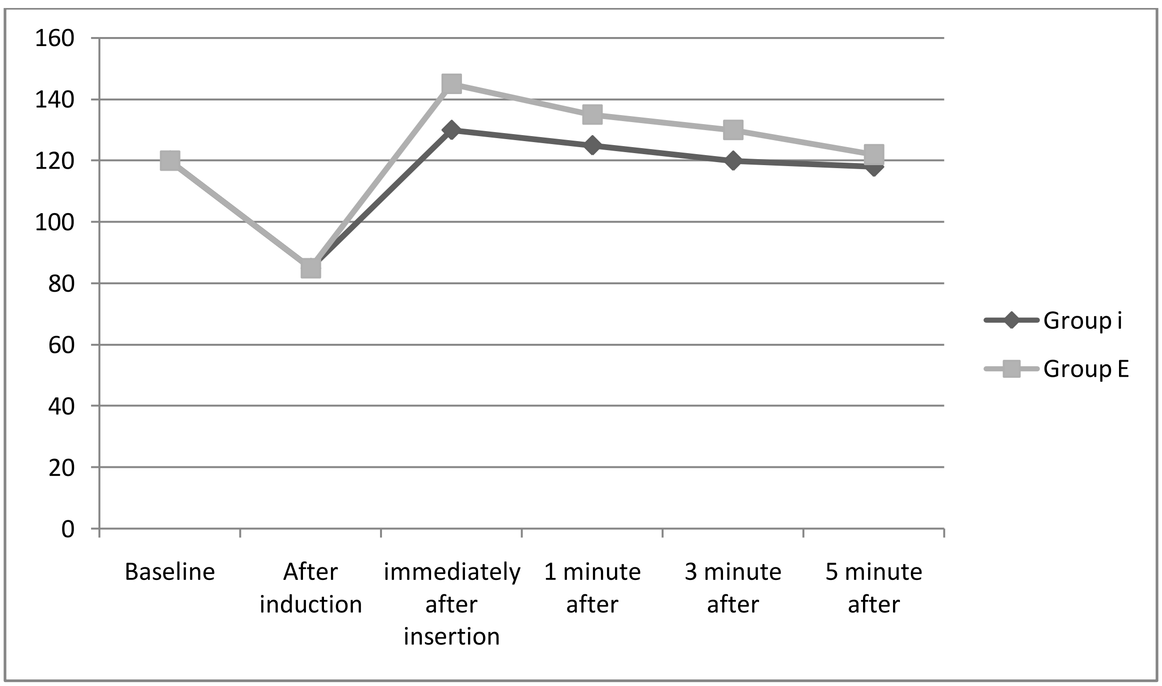

Figure 2: Comparison of Mean Systolic Blood Pressure;

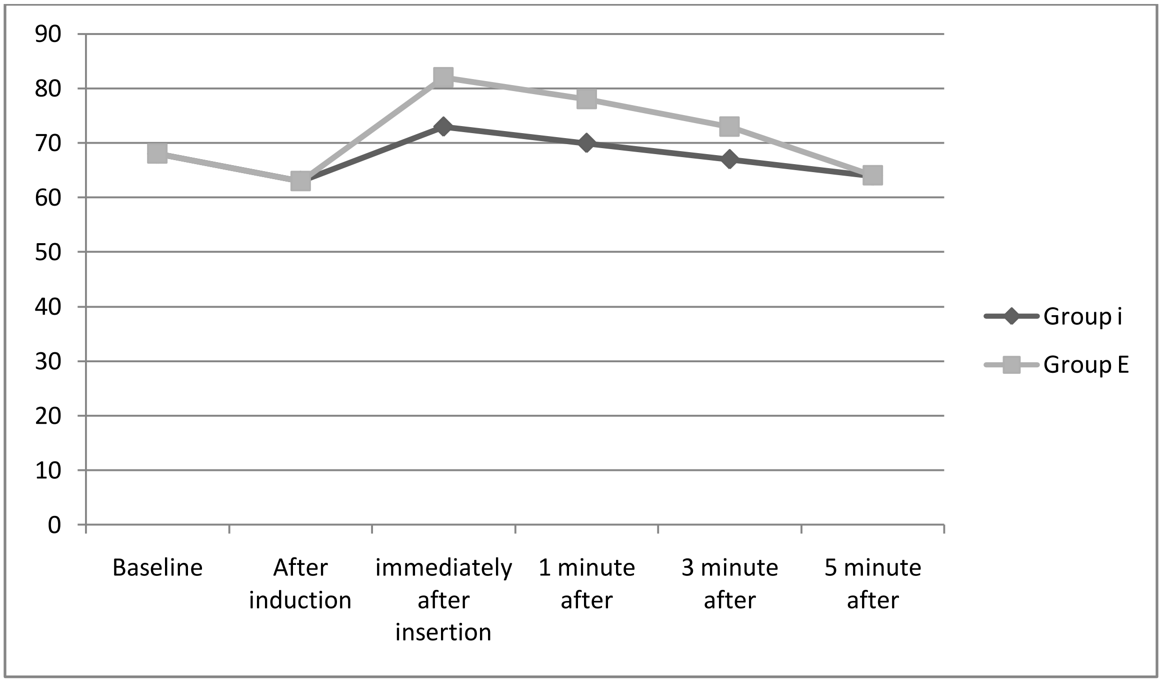

Figure 3: Comparison of Mean DiastolicBlood Pressure;

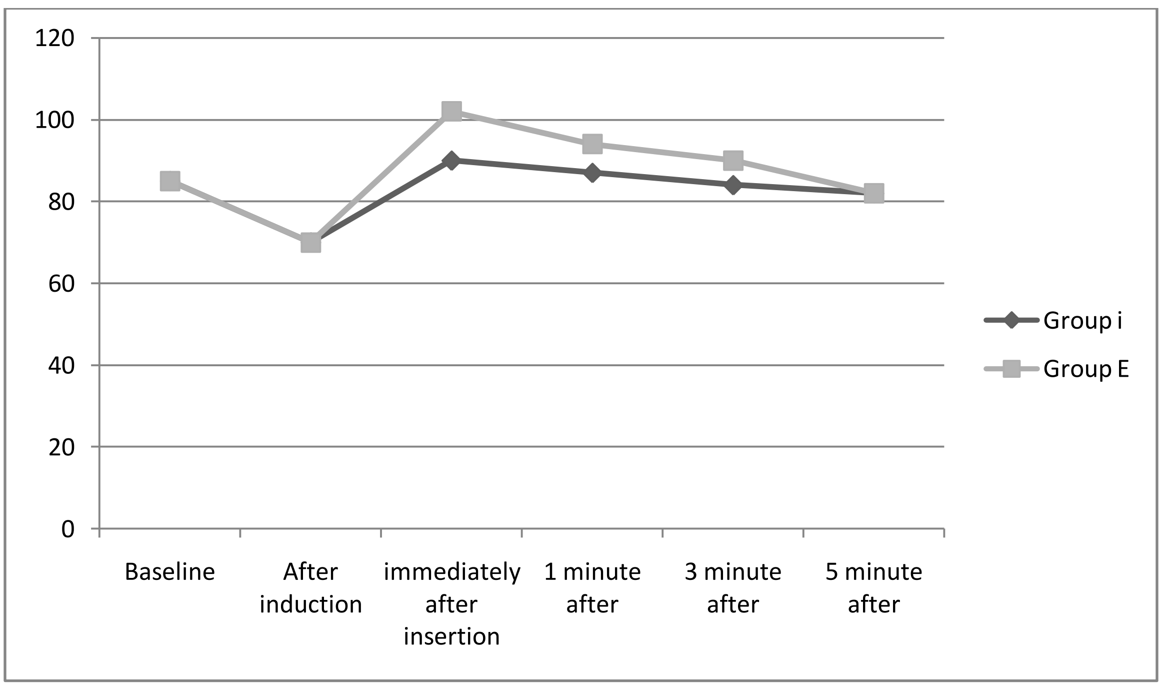

Figure 4: Comparison of Mean Arterial Blood Pressure

Figure 1, In our comparative study, changes in heart ratewere seen in both the groups after insertion of Classic LMA orendotracheal intubation. The mean heart rate remainedelevated for up to 3 minutes in both group I and group E.However, the increase in values were statisticallysignificantly lower in group I immediately after insertion,1 min and 3 min after as compared to group E($p<0.0001$).

Figure 2, In our comparative study, changes in meansystolic blood pressure were seen in both the groups afterClassic LMA insertion/ endotracheal intubation. The meansystolic blood pressure was statistically highly significantbetween the two groups immediately after insertion, 1 min and 3 min ($p<0.0001$) and statistically significant at 5min ($p=0.0029$).

Figure 3, In our comparative study, changes in meandiastolic blood pressure were seen in both the groups afterClassic LMA insertion or endotracheal intubation. The meandiastolic blood pressure was statistically highlysignificant between the two groups immediately afterinsertion and 1 min ($p< 0.0001$), while it was statisticallysignificant at 3 min ($p=0.0002$). The mean diastolic bloodpressure changes between the two groups becameinsignificant at 5 min ($p=0.6976$).

Figure 4, In our comparative study, changes in meanarterial blood pressure were seen in both the groups afterairway instrumentation. The increase in mean arterialblood pressure was statistically highly significantbetween the two groups immediately after insertion, 1min and 3 min after ($p< 0.0001$), while it becamestatistically insignificant at 5 min ($p=0.079$).

DISCUSSION

Laryngoscopy and endotracheal intubation has been themost widely accepted safest technique to secure theairway in patients under general anaesthesia. Thehaemodynamic response during laryngoscopy andendotracheal intubation is the result of oropharyngeal andtracheal stimulation. The possible complications includetransient hypertension, tachycardia and arrhythmia. Mostpatients with normal heart functions may tolerate suchchanges without serious complications while in patientswith altered cardiac reserves, these haemodynamic turbulences may be hazardous5. There was nosignificant difference in the age, sex, weight, ASAgrading and Mallampati class between the two groups.

Haemodynamic parameters:

The cause and effect relationship that the induction agentmight have had on the haemodynamic changes can bediscounted owing to the use of similar premedication and induction agents and muscle relaxants in both the twogroups.In our study we found that there was no significantdifference between the two groups at the baseline.However, on insertion of the respective airway device,change in mean heart rate was seen which remainedelevated for up to 3 minutes in both Group I and Group E.The increase in values was statistically significantly lowerin Group I immediately after insertion, 1 and 3 minutesafter insertion as compared to Group E (p less than0.0001 in all the three time intervals). At 5 minutes after insertion, the increase in heart rate in the two groups wasnot statistically significant ($p=0.4974$).

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This was similarto the studies done by Ismail *et al*[6], Badheka*et al*[7] and Das *et al*[8]. In our study, we found that changes in systolicblood pressure in Group I was less than Group E. Thesystolic blood pressure increased from baseline in boththe groups and remained elevated for up to 3 minutes inboth Group I and Group E. However, the increase in values was statistically highly significantly lower inGroup I immediately after insertion, at minutes 1 and 3 ascompared to Group E (p less than 0.0001 in all threeintervals) which was in agreement with study conductedby Jindal*et al*[9]. In our study, it was seen that the diastolic blood pressure was increased from baseline in both the groups, but the increase was statistically more significantin Group E compared with Group I immediately afterinsertion, 1 min and 3 min but comparable in both thegroups at the 5th min, similar to Jindal*et al*[9] and Atef*etal*[10].In our study, we noted that the increase in MAP frombaseline values similar to Dhanda*et al*11 and Zanfaly*etal*[12].Contrary to our study, Elgebaly*et al*[13] did notdocument a significant change in haemodynamicparameters between the endotracheal tube and Classic LMA which could be due to administration of fentanyl.However, they did report a larger requirement of fentanylin the endotracheal tube group. The transient increase in haemodynamic parameters as seen in our study can beattributed to the increased sympathetic nerve activityresulting in release of catecholamine which have a shorthalf life of 10 seconds to 1.7 minutes and are quicklydegraded by catechol-O-methyltransferase or monoamine oxidase[14]. The lack of mechanical stimulation caused bylaryngoscopy and ETT intubation during insertion of igel is a major reason for the attenuated haemodynamicresponses[15]. The mechanical stimulation duringlaryngoscopy is transmitted by the trigeminal,glossopharyngeal and vagus nerves to the vasomotorcentre in the brain which stimulates sympathoadrenal axis6. Supraglottic airway devices are generally thoughtto cause minimal stress responses; however, this mightnot be true in some supraglottic devices which have largeoropharyngeal cuffs.

CONCLUSION

The present comparative study concluded that Classic LMAcauses less haemodynamic changes (HR, SBP, DBP, andMAP) in anaesthetized patients compared tolaryngoscopy and endotracheal intubation. Hence, weconclude that the Classic LMA is a suitable and safe alternative tocuffed Endotracheal tube for airway management inelective fasted adult patients undergoing surgeries undergeneral anaesthesia.

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