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Original Research Paper

Anesthesiology

COMPARISON OF PROPOFOL, ETOMIDATE AND PROPOFOL-ETOMIDATE COMBINATION AS INDUCTION AGENT ON HAEMODYNAMIC PARAMETRES DURING ENDOTRACHEAL INTUBATION IN PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT

Background: Endotracheal intubation during general anaesthesia has been associated with change in haemodynamic parameters such as pulse rate and blood pressure. In this study we have compared propofol, etomidate and propofol-etomidate combination as induction agent in patients undergoing laparoscopic cholecystectomy.

Material & Methods: After approval from the institutional ethical committee and informed written consent, prospective randomised double blind study was done with ASA physical status I and II. Three groups propofol(P),etomidate(E) and propofol-etomidate combination(PE) including 30 patients in each group were assigned. Haemodynamic parameters heart rate(HR), systolic blood pressure(SBP), diastolic blood pressure(DBP),mean bood pressure(MBP),side effects and complications were seen just before induction, at 0 hr soon after intubation, than from 1min to 7min and at 10 min after intubation.

Result: There was no significant differences in HR,SBP,DBP,MBP after intubation and post intubation in etomidate group as compared to propofol-etomidate and propofol group.

Conclusion: Etomidate has better haemodynamic stability than etomidate-propofol combination alone at 1 min after intubation, though propofol-etomidate combination was equally stable.

KEYWORDS : Propofol, Etomidate, Propofol-Etomidate, Endotracheal intubation, Laparoscopic cholecystectomy,SBP,DBP,MBP,HR.

INTRODUCTION

The primary role of anaesthesiologists is to secure and maintain a patent airway. Tracheal intubation is one of the best methods of securing a patent airway.

Laparoscopic cholecystectomy involves the removal of gallbladder through a laparoscopic approach. This procedure uses several small cuts instead of one large one. Major advantage of this operation is early ambulation of patients and for cosmetic purposes.

In general anaesthesia manipulation of airway by laryngoscopy, endotracheal intubation, and others (e.g., placement of a nasopharyngeal or oropharyngeal supralaryngeal airway) causes haemodynamic changes in physiology of cardiovascular system. Serious outcome can occur with underlying coronary artery disease, reactive airways or intracranial neuropathology[1,2,3].

Propofol and Etomidate are most common anaesthetic intravenous induction agent used nowadays.

Propofol belong from the alkylphenol group with molecular formula 2,6-diisopropylphenol . Propofol is used as induction in anaesthesia for its short half life , mild sedation and antiemetic property.[4] The most important side effects of this drug are hemodynamic instability and cardiovascular complications, such as hypotension and bradycardia.[5]

Etomidate is an imidazole derivative intravenous anaesthetic induction agent remarkable for its minimal haemodynamic effects, rapid onset of action and short elimination $t_{1/2}$ life.[6]Cardiovascular stability, i.e. small rise in heart rate and little or no fall in blood pressure or cardiac output with no release of histamine, after induction is a major advantage of etomidate.[7] Despite these, its side effects are primarily injection pain, myoclonus, nausea and vomiting.[8]

Considering the common use of Propofol and Etomidate for induction of anaesthesia, the objective of this study was to compare cardiovascular response to endotracheal intubation using propofol, etomidate and propofol plus etomidate combination in anaesthesia induction in laparoscopic cholecystectomy surgeries.

MATERIAL AND METHODS

After approval from the institutional ethical committee and informed written consent, prospective randomised double blind study was conducted in the department of anaesthesia Rajendra Institute of Medical sciences, Ranchi. The patients were randomly assigned into three groups including 30 patients in each group using "closed envelope method".

1. **Group P (n=30 patients): - Inj. Propofol (2.5 mg/kg i.v.)**
2. **Group E (n=30 Patients): - Inj. Etomidate (0.3 mg/kg i.v.)**
3. **Group PE (n=30 Patients): - Inj. Propofol (1 mg/kg i.v.) + Inj. Etomidate (0.2mg/kg i.v.)**

Inclusion criteria-

Patient's consent, age group between: - 18 to 50 years , weighing between 50-70 kg and ASA physical status I & II.

Exclusion criteria-

Emergency surgeries, Presence of co-morbidities like severe anaemia, abnormal coagulation profile, obese patient, cardiovascular disorder, etc., Mallampati grade III & IV, Bronchial asthma, Hepato-renal disorder,Pregnant & lactating mother,Pathology in larynx & pharynx,Mouth

opening <2.5cm,H/O hypersensitivity to Propofol & Etomidate.

PRE-ANAESTHETIC EVALUATION

Thorough pre-anaesthetic evaluation were done.

DRUGS AND EQUIPMENTS USED FOR THE STUDY

inj. Propofol 2.5 mg/kg IV, inj. Etomidate 0.3 mg/kg IV, inj Propofol 1 mg/kg IV + inj Etomidate 0.2 mg/kg IV,Endo-Tracheal Tube ,Laryngoscope.

PREMEDICATION

Patients were advised to be nil orally from 10pm onwards and were pre-medicated with tab. Alprazolam (0.25 mg) & tab. Ranitidine (150mg) orally on the previous night before surgery On the day of surgery, 18G intravenous (IV) cannula were secured in non-dominant hand and ringer lactate infusion were started. All patients were premedicated with inj. Ranitidine (50mg),inj. Glycopyrrolate (0.25mg), inj. Metoclopromide (10mg), inj Butorphenol (1mg) intravenously 30 minutes before induction.

PROCEDURE

On arrival at Operation Theatre, standard anaesthesia monitors including electrocardiogram (ECG), non-invasive blood pressure (NIBP) and pulse oxymetry were attached and haemodynamic parameters were recorded. Preoxygenation was done with 100% oxygen for 5 minutes. For induction,

- Group P were induced with inj. Propofol (2.5 mg/kg iv).
- Group E with inj. Etomidate (0.3 mg/kg iv).
- Group PE with inj. Propofol (1mg/kg iv) plus inj. Etomidate (0.2 mg/kg iv)

Volume of medication and speed of injection (10 seconds) were equal in all three groups. After induction of anaesthesia, haemodynamic variables were recorded. Later 60 seconds after loss of consciousness, which were confirmed by inability to respond to verbal commands and loss of eyelash reflex, inj. succinylcholine (1.5 mg/kg iv) was administered and when no responses were obtained to the train-of-four (TOF) stimulus with the TOF-guard device, laryngoscopy and orotracheal intubation was done. Duration of laryngoscopy was kept less than 20 seconds. Trachea was intubated with adequate size endotracheal tube (ET). Proper placement of endotracheal tube was confirmed by capnography and bilateral auscultation of chest. Following successful placement of ET tube, patients were put on closed circuit with ventilator support and maintained by isoflurane (1-1.5%) and equal mixtures of oxygen-nitrous oxide (4 L/min). Bolus dose of vecuronium (0.04 mg/kg iv) initially followed with intermittent bolus dose of vecuronium (0.01mg/kg iv) were administered.
At the end of the surgery after adequate spontaneous respiratory effort patients were reversed with inj. neostigmine (0.05 mg/kg, iv) and inj. glycopyrrolate (0.01 mg/kg, iv) followed by extubation when the patients were awake.

OBSERVATION

The following parameters were continuously monitored and recorded just before induction, at 0 hr soon after intubation, than from 1min to 7min and at 10 min after intubation. Heart Rate (HR), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Mean Arterial Blood Pressure (MAP), Side-effect and complication, if any, were monitored.

STATISTICAL METHODS

Data obtained in the study were analysed with SPSS software. The various categorical variables studied during observation period were compared using Chi-square test. The various haemodynamic variable parameters studied during observation period were compared using analysis of variance (ANOVA) test and inter-group comparison of haemodynamic variable were made by post hoc test. The critical value of 'p' indicating the probability of significant difference were taken as ≤0.05 for comparison.

RESULTS

Study was conducted on 90 patients .There as no statistically significant difference among age, sex, weight, ASA grade as shown in table 1.

Figure 1 shows mean heart rate of patients at various time interval in group P, E and PE. Baseline, pre-induction and post induction were comparable among all three groups with no statistical differences(p>0.05).

In inter group comparison of mean heart rate there were no statistical differences p>0.05.

Table 1

	Group-P n=30	Group-E n=30	Group-PE n=30	P value
AGE	35.43±8.83	37.8±9.86	33.67±10.06	0.25
M/F	4/26	6/24	5/25	
WEIGHT	57.43±7.30	61.07±7.38	56.60±6.16	0.03
ASA(I/II)	24/6	28/2	28/2	

Fig 1
Histogram showing mean heart rate at various time interval

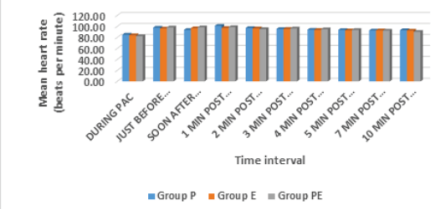


Figure 2. shows mean systolic blood pressure of patients at various time interval in group P, E and PE. Baseline and pre-induction SBP were comparable among all three groups with no statistical differences(p>0.05). But SBP of three groups after induction and at 1,2,3,4,5 minute after intubation were different both clinically and statistically, with p value <0.05.

In intergroup comparison of SBP revealed significant differences among various groups at different points of time except that among group E and group PE. Between group E and group PE there was significant difference only at 1 min and 2 min after intubation.

Fig-2
Histogram showing mean systolic blood pressure at various time interval

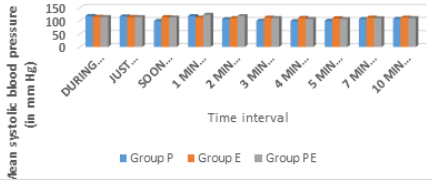


Figure 3. shows. Baseline and pre-induction DBP were comparable among all the three groups with no statistical differences (p>0.05). But DBP of three groups after induction at 0 hr ,3 min,5 min after intubation were different both clinically and statistically with p value <0.05.

There were significant differences (p<0.05) in intergroup comparison of DBP among group P and PE. But there were significant differences at only 0 hr and 3 min after intubation in group P and PE. There were significant differences at only 1min and 7 min after intubation were seen in group E and PE.

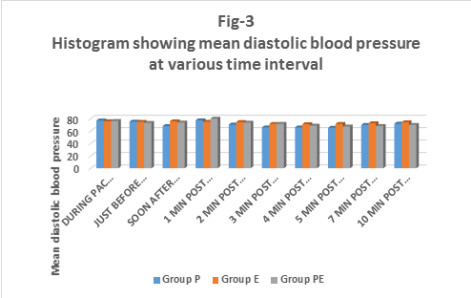
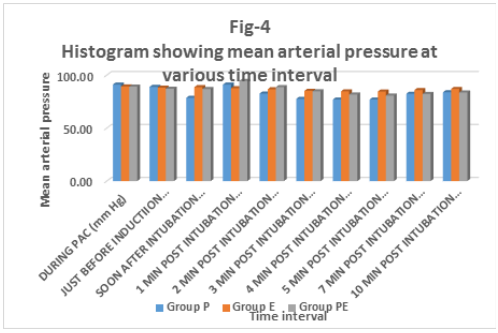


Figure 4 shows. Baseline and pre-induction MAP were comparable among all the three groups with no statistically significant differences ($p>0.05$). Significant differences were seen in MAP of three groups after intubation at 0 hr and 1, 3, 4, 5 minutes with p value <0.0

Intergroup comparison of MAP revealed significant differences among various groups at different points of time $p<0.05$ except that among group E vs group PE. Between groups E vs group PE, there was significant difference only at 1 min after intubation.



No side effects and complications were seen.

DISCUSSION

Laryngoscopy and endotracheal intubation during general anaesthesia leads to great changes in haemodynamic parametres such as HR,SBP,DBP,MBP associated with complications. Various study has been done regarding attenuation during laryngoscopy by premedication,volatile anaesthetics, intravenous induction agent.

Our result demonstrated no statistical differences($p>0.05$) in mean heart rate of patients at various time interval in group P, E and PE during baseline, pre-induction and post induction.There was no statistical differences in inter group comparison of mean heart rate ($p>0.05$). Baseline and pre-induction mean arterial pressure were comparable among all the three groups with no statistically significant differences($p>0.05$). Significant differences were seen in mean arterial pressure of three groups after intubation at 0 hr and 1, 3, 4, 5 minutes with p value <0.05. Intergroup comparison of MAP revealed significant differences among various groups at different points of time $p<0.05$ except that among group E versus PE. Between groups E and PE, there was significant difference only at 1 min after intubation.

The result of our study was similar to **Gauss A. et al (1991)**[10] who compared the haemodynamic effects of propofol, etomidate and thiopentone and **E. Beheshtian et al (2013)**[11] who compared the cardiovascular response to laryngoscopy and tracheal intubation after induction of anaesthesia by Propofol and Etomidate . They observed stable haemodynamics in etomidate group than propofol.

In another study **Mousumi Das et al (2015)**[12] conducted and compared haemodynamic responses during intubation using etomidate, propofol and thiopentone in laparoscopic cholecystectomy surgeries. Haemodynamic changes return to baseline value first in case of etomidate, then propofol, then thiopentone. In our study also, there was stable haemodynamics in etomidate group than propofol.

In another study **Shagun Bhatia Shah et al (2015)**[13] studied haemodynamic responses during induction and intubation between propofol and etomidate using entropy guided hypnosis. Better haemodynamic stability with etomidate than propofol. Our study has similar finding.

Özgür Yağan et al (2015)[14] and **Kavita Meena et al (2016)**[15] - compared the haemodynamic responses to tracheal intubation using propofol, etomidate and etomidate - propofol combination in anaesthesia induction. More stable haemodynamic condition was obtained with the drug combination. But in our study, we found both etomidate and propofol-etomidate combination as haemodynamic stable among which propofol-etomidate combination has significant difference only at 1 min after intubation in mean arterial pressure.

CONCLUSION

- Etomidate has better haemodynamic stability than etomidate-propofol combination alone at 1 min after intubation, though propofol-etomidate combination was equally stable.

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