International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2018): 7.426

Comparison of Haemodynamic Response to Intubation Using Propofol versus Etomidate versus their Combination for Anaesthesia Induction

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Abstract: ***Endotracheal intubation is commonly required to conduct various surgeries under general anesthesia. The present prospective, randomized study is designed to compare the effect of Propofol, Etomidate and combination of Propofol +ETOMIDATE induction on hemodynamic responses to end tracheal intubation in elective surgery.***

Keywords: Comparison of Haemodynamic, Intubation, Propofol, Etomidate, Combination for Anaesthesia Induction

1. Introduction

Endotracheal intubation is commonly required to conduct various surgeries under general anesthesia. The pressor response to laryngoscope and end tracheal intubation has been recognized since long.

Tracheal intubation causes a reflex increase in sympathetic activity that may result in hypertension, tachycardia, and arrhythmias if no specific measures are taken to blunt hemodynamic response to laryngoscope. The heart rate can increase from 20% to 45% and systolic blood pressure can increase from 36% to 45% depending on the method of induction.

Etomidate is an IV anesthetic induction agent used prior to laryngoscope and end tracheal intubation. It possesses unique desirable properties such as rapid onset and short duration of action, relative cardiovascular and respiratory stability, as well as neuroprotective effects, making it an attractive induction agent to facilitate intubation.

Propofol is an ultra-short- acting sedative-hypnotic agent that provides rapid induction and recovery depress airway reflexes and is used for sedation and anesthesia; In past many studies have compared different anesthetic induction agents, but studies regarding combination of Propofol and etomidate are only few.

Hence, the present prospective, randomized study is designed to compare the effect of Propofol, Etomidate and combination of Propofol +ETOMIDATE induction on hemodynamic responses to end tracheal intubation in elective surgery.

1.1 Hypothesis

Null hypothesis (H0)-There is no significant difference in hemodynamic response to tracheal intubation using Protocol versus Etomidate versus Etomidate- Protocol combination for anesthesia induction"

Alternate hypothesis (H1)-There is significant difference in hemodynamic response to tracheal intubation using Protocol versus Etomidate versus Etomidate-Protocol combination for anesthesia induction.

1.2 Aims and Objectives

To Measure the Haemodynamic Response to Tracheal Intubation Using Propofol Versus Etomidate Versus Etomidate-Propofol combination In Anaesthesia Induction

Objectives:
Primary objective-To see the difference of hemodynamic variable
Primary variables:-
Heart Rate (HR)
Systolic Blood Pressure (SBP)
Diastolic Blood Pressure (DBP)
Mean Arterial Pressure (MAP)
SPO2

Secondary objective: To determine the difference in side effects, if any.
Nausea & vomiting
Myoclonus

2. Materials and Methodology

- In our study 75 adult patients of either sex belonging to ASA grade I or II were selected. They were posted for elective surgery under general anesthesia.
- A total 75 adult patients were randomly and divided into 3 groups with 25 patients in each group.
- Group I: Induction with Inj. Protocol (2.5 mg/kg)i.v.
- Group II: Induction with Inj. Etomidate (0.3 mg/kg)iv.
- Group III: Induction with Inj. Protocol (1 mg/kg) plus Inj. Etomidate (0.2mg/kg)i.v.

Inclusion Criteria
- Age between 18 years to 60years
- Genders: Both
- ASA physical status I, II.
- Elective surgery under general anaesthesia

Exclusion Criteria

- Patient refusal
- ASA physical status III and IV.
- Emergency surgery.
- Patient with history of hypersensitivity to Protocol/Etomidate.
- Mouth opening <2.5cm.
- Patients with cardiovascular diseases like ischemic heart disease or hypertension.
- Bronchial asthma.
- Mallampati grade 3 and4
- Existence of considerable pathology in pharynx /larynx.
- Patient with GERD.

The patients were electively kept nil by mouth for 6 hours before surgery and prior to operation patients were explained about the procedure and informed consent were taken from patients' relatives. After the patient was shifted to the operation theatre, standard monitors like ECG, NIBP, and pulse oximetery were applied and baseline parameters [Spo_2, Heart rate (HR), Systolic blood pressure (SBP), Diastolic blood pressure (DBP), Mean arterial pressure (MAP)] were recorded. Two intravenous lines with 18/20 gauge cannula were secured and intravenous fluid was started.

Patients were premeditated with:

- Inj. Ondansetron 0.15 mg/kgi.v.
- Inj. Glycopyrrolate 4µg/kgi.v.
- Inj. Fontanel 2µg/kgi.v.

Preoxygenation

All patients were preoxygenated with 100% oxygen for 5 minutes.

Induction

Group I: Induction with Inj. Propofol (2.5 mg/kg) i.v.
Group II: Induction with Inj. Etomidate (0.3 mg/kg) iv.
Group III: Induction with Inj. Propofol (1 mg/kg) plus Inj. Etomidate (0.2mg/kg)i.v.

Volume of medication and speed of injection (10 seconds) were equal in all three groups. After induction of anesthesia, hemodynamic variables were recorded. Later 60 seconds after of loss of consciousness, which was confirmed by inability to respond to verbal commands and loss of eyelash reflex. Inj. succinylcholine (2mg/kg) was given, Laryngoscopy and endotracheal intubation was done. Duration of laryngoscopy was kept less than 10 seconds. Trachea was incubated with adequate.

Monitoring

- Heartrate (HR)
- Systolic blood pressure (SBP)
- Diastolic blood pressure (DBP)
- Mean arterial blood pressure (MAP)
- Pulseoximetry (Spo2)

All parameters were recorded at following stages:

- Baseline
- Afterpre-medication
- After induction.
- At 1, 2, 3 and 5mins after intubation.

Statistical Analysis

The obtained data were analyzed using SPSS 16; descriptive data was compared and presented as Mean ± SD for continuous variables and as no and percentage for nominal variable. The various categorical variables studied during observation period were compared using Chi-square test. The various hemodynamic variable parameters studied during observation period were compared using ANOVA test and inter group comparison of hemodynamic variable were made by post hoc test. The critical value of '*p*' indicating the probability of significant difference was taken as <0.05 for comparison.

3. Observations and Result

In the present study, 75 patients aged between 18 years to 60 years of either sex belonging to ASA class I and II posted for various elective surgeries under general anesthesia at our institute and they were randomly selected and divided into 3 groups with 25 patients in each group.

Group I: Induction with Inj. Protocol (2.5 mg/kg) i.v.
Group II: Induction with Inj. Etomidate (0.3 mg/kg) iv.
Group III: Induction with Inj. Protocol (1 mg/kg) plus Inj. Etomidate (0.2mg/kg)i.v.

This table shows the comparison of changes in mean heart rate at various predetermined time interval and P value of three groups to determine the significance of the changes in heart rate between three groups.

4. Discussion

Cardiovascular response to laryngoscope and end tracheal intubation has always been a challenge for anesthetists. Cardiovascular response may occur in form of hypertension, tachycardia and different types of arrhythmias. These effects may prove disastrous in patients of hypertension, myocardial insufficiency, pre-eclampsia, eclampsia, cerebral hemorrhage etc.

In our study, we compared the effect of propofol, etomidate and propofol + etomidate induction on hemodynamic responses to end tracheal intubation.75 patients aged between 18 years to 60 years of either sex belonging to ASA class I and II posted for various elective surgeries under general anesthesia at our institute were randomly selected and divided into 3 groups with 25 patients in each group.

Group I: Induction with Inj. Protocol (2.5 mg/kg) i.v. Group II: Induction with Inj. Etomidate (0.3 mg/kg) iv.
Group III: Induction with Inj. Protocol (1 mg/kg) plus Inj. Etomidate (0.2mg/kg)i.v.

Hemodynamic Parameters

(A) Heart Rate (HR):

As shown in table 3 and 4 baseline and after premedication HR were comparable among all three groups with no statistical significant differences (p>0.05)Heart rate

increased 1minute after intubation in Group II and Group III and increase was maximum in group II (100.88±2.24) and minimum in group III (92.16±3.36). In group I no changes in heart rate (76.64±2.87) was seen. In group II and III maximum rise in heart rate was seen after 1 minute of intubation (Group II-100.88±2.24, Group III- 92.16±3.36).In Group I maximum increase in heart rate was seen 5 minutes after intubation. Heart rate started to return to baseline values after 5 minutes in group II and group III whereas in group I heart rate started increasing after 2 minutes. Inter group comparison showed that there are significant differences ($p<0.05$) in heart rate among all three groups at time interval (after induction and 1, 2, 3, 5 min after intubation). Thus our study suggests that the combination of etomidate plus Propofol provides better attenuation of heart rate than etomidate alone or Propofol alone.

(B) Systolic Blood Pressure (SBP)

As shown in table 5 and 6, Baseline and after premedication values of mean SBP were comparable between three groups with no statistically significant difference ($P>0.05$).SBP increased in group II and group III after 1 min of intubation and increase was maximum in group II (132.32±3.14) and minimum in group III (129.52±2.66).In group I there was significant decrease in systolic blood pressure 1 min after intubation. In group II and group III maximum rise in SBP was seen after 1 minute of intubation (Group II-132.32±3.14, Group III-129.52±2.66).While in group I maximum rise in SBP was seen 5 minutes after intubation. SBP started to return to baseline values after 2 minute in group II and group III. In group I SBP started to return to baseline 5 minutes after intubation. Between group I and group II changes in SBP was statistically significant after induction and till 5 minutes after intubation ($P<0.05$). Between group II and group III changes in SBP was statistically significant 1 minute after intubation and till 2 minutes after intubation ($P<0.05$)..Between group I and group III changes in SBP was statistically significant after induction and till 5 minutes after intubation ($P<0.05$).Thus our study suggests that the combination of etomidate plus Propofol provides better control of systolic blood pressure than etomidate alone or Propofol alone and, thus the combination is significantly better than either Propofol or etomidatealone.

(C) Diastolic Blood Pressure (DBP):

As shown in table 7 and 8, Baseline and after premedication values of mean DBP were comparable between three groups with no statistically significant difference ($P>0.05$).DBP increased in group II 1 minute after intubation (77.76±2.84). In group I DBP was significantly lower than baseline 1 min after intubation (65.44±1.95) and in group III it remained stable 1 minute after intubation (73.6±3.1) Maximum rise in DBP was seen 1 minute after intubation in group II (77.76±2.84) whereas there was no rise in group III. In group I maximum rise was seen 5 minutes after intubation (72.24±1.66) DBP started to return to baseline values after 5 minute in group I, after 2 minutes in group II and was stable in group III. Between group I and group II changes in DBP was statistically significant after induction and till 5 minutes after intubation. ($P<0.05$).Between group II and group III changes in DBP was statistically significant 1 minute after intubation and till 2 minutes after intubation ($P<0.05$) Between group I and group III changes in DBP was statistically significant after induction and till 5 minutes after intubation. ($P<0.05$) Thus our study suggests that the combination of etomidate plus Propofol provides better control of diastolic blood pressure than etomidate alone or Propofol alone

(D) Mean Arterial Pressure (MAP):

As shown in table 9 and 10 Baseline and after premedication values of mean MAP were comparable between three groups with no statistically significant difference ($P>0.05$).MAP increased in group II 1 minute after intubation (95.96±2.16). In group I MAP was significantly lower than baseline 1 min after intubation (80.84±1.8) and in group III it remained stable 1 minute after intubation (92.2±2.41).Maximum rise in MAP was seen 1 minute after intubation in group II (95.96±2.16) whereas there was no rise in group III.In group I maximum rise was seen 5 minutes after intubation (90.28±1.30). MAP started to return to baseline values after 5 minute in group I, after 2 minutes in group II and was stable in group III. Between group I and group II changes in MAP was statistically significant after induction and till 5 minutes after intubation. ($P<0.05$).Between group II and group III changes in MAP was statistically significant 1 minute after intubation and till 3 minutes after intubation ($P<0.05$) Between group I and group III changes in MAP was statistically significant after induction and till 5 minutes after intubation. ($P<0.05$).Thus our study suggests the combination of etomidate plus Propofol provides better control of diastolic blood pressure than etomidate alone or Propofol alone and, thus the combination is significantly better than either Propofol or etomidate alone.

5. Conclusion

The present study is carried out to compare the effect of intravenous propofol, etomidate and Propofol plus etomidate induction on hemodyanic responses to laryngoscopy and enotracheal intubation on 75 patients scheduled for various surgical procedures under general anaesthesia.

Group I: Induction with Inj. Propofol (2.5 mg/kg) i.v.
Group II: Induction with Inj. Etomidate (0.3 mg/kg) iv.
Group III: Induction with Inj. Propofol (1 mg/kg) plus Inj. Etomidate (0.2mg/kg)i.v. Following observations were made

1) The demographic profile of the patients in terms of age and sex ratio were comparable in all the groups.
2) There was increase in the heart rate during laryngoscopy and endotracheal intubation in all the groups except group I and it started to return to normal after 5 minutes in group II and group III. The increase was highly significant in group II compared to group Iain group II the heart rate increased after 2 minutes of intubation. Thus combination of Propofol and etomidate induction produces more significant attenuation of rise in heart rate as compared to Propofol alone or etomidate alone.
3) There was increase in systolic BP during laryngoscopy and endotrachealintubation in all group except group I and it started to return to normal after 2 minutes in group II and group III and 5 minutes in group I. The increase was highly significant in group II compared to group III. Thus Propofol and etomidate induction produces more

significant attenuation of rise in systolic blood pressure as compared to Propofol or etomidatealone.

4) There was increase in DBP during laryngoscopy and endotracheal intubation in group II In group I there was decrease in DBP and in group III it was stable. It started to return to normal after 5 minutes in group I and 2 minutes in group II. It was stable throughout in group III. Thus Propofol and etomidate induction produces more
5) No significant side effects or complications were found in any of the study groups. From present study it is concluded that combination of etomidate plus Propofol induction provides significantly better hemodynamic stability than etomidateor propofolalone

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Table: Changes in Mean heart rate± S.D. in beats/minute

Time Interval	Group I	Group II	Group III	f-value	p-value
Baseline HR± S.D.	77.96 ± 3.66	77.44 ±3.58	77.44 ± 3.98	0.16	0.8518
HR± S.D. After premedication	88.08 ± 3.13	88.64 ± 3.54	87.68 ± 2.92	0.563	0.572
HR± S.D. After intubation	69.52 ± 3.97	87.12 ± 3.47	81.36 ± 3.55	149.63	0
HR ± S.D. 1 minutes After intubation	76.64 ± 2.87	100.88 ± 2.24	92.16 ± 3.36	460.095	0
HR± S.D. 2 minutes After intubation	80.48 ± 2.26	95.68 ± 3.35	90.56 ± 2.97	178.289	0
HR± S.D. 3 minutes After intubation	83.20 ± 1.83	93.36 ± 3.45	89.92 ± 3.48	99.192	0
HR± S.D. 5 minutes After intubation	85.52 ± 1.94	91.52 ± 3.57	88.80 ± 2.65	28.782	0

This table shows the comparison of changes in mean heart rate at various predetermined time interval and P value of three groups to determine the significance of the changes in heart rate between three groups.

Table: Intergroup Comparison of Heart Rate

Time Interval	Group I *vs.* II	Group II *vs.* III	Group I *vs.* III
Baseline	0.306	0.478	0.316
After premedication	0.278	0.150	0.321
After induction	0.000	0.000	0.000
1 min after intubtion	0.000	0.000	0.000
2 min after intubtion	0.000	0.000	0.000
3 min after intubtion	0.000	0.000499	0.000
5 min after intubtion	0.000	0.0018	0.000

Inter group comparison showed that there are significant differences ($p<0.05$) in heart rate among all three groups at time interval (after induction and 1, 2, 3 and 5min after intubation).

Table: Comparison of changes in Mean SBP (SYSTOLIC BLOOD PRESSURE) ± S.D. between three groups

Time Interval	Group I	Group II	Group III	f- value	p-value
Baseline SBP± S.D	129.7 ± 3.18	128 ± 2.70	127.84 ±3.82	2.653	0.077
SBP ± S.D after premedication	124.7 ± 2.93	122.8 ± 2.94	124.96 ± 4.04	2.88	0.062
SBP± S.D After intubation	100.56 ± 2.04	117.92 ± 3.39	119.12 ± 3.51	288.69	0
SBP± S.D 1 minutes After intubation	111.6 ± 3.16	132.32 ± 3.14	129.52 ± 2.66	338.6	0
SBP± S.D 2 minutes After intubation	115.76 ± 3.97	128.72 ± 2.15	125.84 ± 2.075	140.58	0
SBP± S.D 3 minutes After intubation	122.4 ± 2.38	125.2 ± 2.16	124.72 ± 2.07	11.496	0
SBP± S.D 5 minutes After intubation	126.32 ± 1.6	122.08 ± 2.970	122.64 ± 3.14	18.687	0

This table shows the comparison of changes in mean SBP (Systolic Blood Pressure) at various predetermined time interval and P value of all groups to determine the significance of the changes in SBP between three groups.