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Comparison of Haemodynamic Response to Tracheal Intubation Using Propofol versus Etomidate

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Abstract: ***Introduction: Propofol is one of the most widely used drug for induction of general anesthesia. Satisfactory recovery, short half-life, rapid elimination from the blood circulation, causing less sedative affect, and vomiting are the reasons for using this drug more commonly. Etomidate is a hypnotic agent with minimal effects on the cardiovascular system. Etomidate however is an anesthesia induction agent with minimal cardiovascular side effects making it especially useful for cardiac-compromised patients and for those in whom hypotension must be avoided during induction of anesthesia. Aims and Objective: To measure the hemodynamic response to tracheal intubation using propofol versus etomidate. Materials and Methodology: A total 50 adult patients were randomly chosen and divided into 2 groups with 25 patients in each group. Group I: Induction with Inj. Propofol (2.5 mg/kg) intravenous (iv). Group II: Induction with Inj. Etomidate (0.3 mg/kg)iv. Patients parameters were recorded before, at the time of induction, after 1 minute, 2 minute, 3 minute and 5 minute of induction. Result: The heart rate (HR) and systolic blood pressure(SBP) and MAP were normal at the time of induction and after 1min but started to rise after 2 min in group I while in group II HR and SBP rises at the time of induction and after 1 min of induction but return to normal after 2 min of induction. Conclusion: The current study shows that the use of propofol cause decrease in SBP and MAP as compared to etomidate after induction and increase in HR after induction while etomidate maintains the MAP almost stable. So etomidate can be preferred over propofol for induction.***

1. Introduction

Intense noxious stimuli such as laryngoscopy and endotracheal intubation activates the sympathetic nervous system and induce tachycardia and hypertension. The unavoidable effects of laryngoscopy and tracheal intubation includes dysrhythmia, hypertension, myocardial ischemia, infarction, hypoxia, hypercapnia, laryngospasm, and bronchospasm, and some rare side effects such as increased intracranial pressure and increased intraocular pressure. Controlling this post intubation pressor response is an important goal for modern anaesthesia.Using intravenous drugs such as Etomidate and Propofol is the most common procedure for induction of general anesthesia. [1,2,3]

Propofol is one of the mostwidely used drug for induction of general anesthesia. Satisfactory recovery, short half-life, rapid elimination from the blood circulation, causing less sedative affect, and vomiting are the reasons for using this drug more commonly. Etomidate is a hypnotic agent with minimal effects on the cardiovascular system. It does not cause histamine expression and has no analgesic properties. Etomidate's side-effects are primarily injection pain, myoclonus, superficial thrombophlebitis and a high incidence of nausea and vomiting. Etomidate however is an anesthesia induction agent with minimal cardiovascular side effects making it especially useful for cardiac-compromised patients and for those in whom hypotension must be avoided during induction of anesthesia.

1.1 Aims and Objectives

To measure the hemodynamic response to tracheal intubation using propofol versus etomidate.

1.2 Objectives

- Primary objective-To see the difference of hemodynamic variable.
- Primary variables: Heart Rate (HR), Systolic Blood Pressure (SBP), Mean Arterial Pressure (MAP)
- Secondary objective: To determine the difference in side effect.

2. Materials and Methodology

In our study 50 adult patients of either sex belonging to American society of anesthesia (ASA) grade I or II were selected. They were posted for elective surgery under general anesthesia. A total 50 adult patients were randomly chosen and divided into 2 groups with 25 patients in each group. Group I: Induction with Inj. Propofol (2.5 mg/kg) intravenous(i.v.).
Group II: Induction with Inj. Etomidate (0.3 mg/kg)iv.

Inclusion Criteria:
1) Age between 18 years to 60years
2) Genders: Both.
3) ASA grade I, II.
4) Elective surgery under general anaesthesia

Exclusion Criteria:
1) Patient refusal
2) ASA grade III and IV.
3) Emergency surgery.
4) Patient with history of hypersensitivity to Propofol/Etomidate.
5) Mouth opening <2.5cm.
6) Patients with cardiovascular diseases like ischemic heart disease or hypertension.

7) Bronchial asthma.
8) Mallampati grade 3 and4
9) Existence of considerable pathology in pharynx /larynx.
10) Patient with gastro-esophageal reflux disorder (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 patient's relatives. After the patient was shifted to the operation theatre, standard monitors like electrocardiography (ECG), non-invasive blood pressure (NIBP), and pulse oximetry were applied and baseline parameters Spo2, HR, SBP, 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 0.01mg/kgi.v.
Inj. Fentanyl 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.

Volume of medication and speed of injection (10 seconds) were equal in both 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. Patient was intubated with endotracheal tube(ETT). Monitoring Heartrate (HR), Systolic blood pressure (SBP), 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, 50 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 2 groups with 25 patients in each group.

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

The table no. 1, 2 and 3 shows the comparison of changes in mean HR, SBP , MAP respectively at various predetermined time interval and p-value of two groups to determine the significance of the changes in heart rate between two 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 induction on hemodynamic responses to end tracheal intubation.50 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 2 groups with 25 patients in each group.

Group I: Induction with Inj. Propofol (2.5 mg/kg) i.v. Group II: Induction with Inj. Etomidate (0.3 mg/kg) iv. Hemodynamic Parameters

(A) Heart Rate (HR): As shown in table 1 baseline and after premedication HR were comparable among both groups with no statistical significant differences (p>0.05)Heart rate increased 1minute after intubation in Group II (100.88±2.24). In group I no changes in heart rate (76.64±2.87) was seen. In group II maximum rise in heart rate was seen after 1 minute of intubation (Group II-100.88±2.24. 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 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 both groups at time interval (after induction and 1, 2, 3, 5 min after intubation).

(B) Systolic Blood Pressure (SBP) As shown in table 2, Baseline and after premedication values of mean SBP were comparable between the groups with no statistically significant difference (P>0.05).SBP increased in group II after 1 min of intubation and increase was maximum in group II (132.32±3.14) . In group I there was significant decrease in systolic blood pressure 1 min after intubation. In group II maximum rise in SBP was seen after 1 minute of intubation (Group II- 132.32±3.14).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. 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).

(C) Mean ArterialPressure(MAP):
As shown in table 3 Baseline and after premedication values of mean MAP were comparable between two 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) Maximum rise in MAP was seen 1 minute after intubation in group II(95.96±2.16).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. Between group I and group II changes in MAP was statistically significant after induction and till 5 minutes after intubation.(P<0.05).

5. Conclusion

The present study is carried out to compare the effect of intravenous propofol and etomidate induction on hemodynamic responses to laryngoscopy and endotracheal intubation on 50 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.

Following observations were made
1) The demographic profile of the patients in terms of age and sex ratio were comparable in both the groups.
2) There was increase in the heart rate during laryngoscopy and endotracheal intubation with etomidate and it started to return to normal after 5 minutes in group II. The increase was highly significant in group II compared to group Iafter induction.
3) There was decrease in systolic BP during laryngoscopy and endotrachealintubation after induction and it started to return to normal after 2 minutes in group II and 5 minutes in group I.
4) the MAP decreases with group I using propofol as induction agent as compared to group II using etomidate. While in group using etomidate as induction agent the MAP was almost stable.
5) No significant side effects or complications were found in any of the study groups.
6) So to conclude etomidate is better drug than propofol for induction.

Table 1: Comparison between heart rate between two groups

Time Interval	Group I	Group II	p-value
Baseline HR± S.D.	77.96 ± 3.66	77.44 ±3.58	0.6139
HR± S.D. After Premedication	88.08 ± 3.13	88.64 ±3.54	0.5563
HR± S.D. After induction	69.52 ± 3.97	87.12 ±3.47	0.0001
HR ± S.D. 1 minute After intubation	76.64 ± 2.87	100.88 ±2.24	0.000
HR± S.D. 2 min after intubation	80.48 ± 2.26	95.68 ± 3.35	0.0001
HR± S.D. 3 minute after Intubation	83.20 ± 1.83	93.36 ± 3.45	0.0001
HR± S.D. 5 minute After intubation	85.52 ± 1.94	91.52 ± 3.57	0.0001

Table 2: Comparison between systolic blood pressure between two groups

Time interval	Group I	Group II	p-value
Baseline SBP ± S.D.	129.7± 3.18	128 ± 2.70	0.0785
SBP ± S.D. after premedication	124.7± 2.93	122.8 ± 2.94	0.0265
SBP ± S.D. after induction	100.56± 2.04	117.92 ±3.39	0.0001
SBP ± S.D. after 1 min of induction	111.6± 3.16	132.32 ±3.14	0.0001
SBP ± S.D.. after 2 min of induction	115.76± 3.97	128.72 ±2.15	0.0001
SBP ± S.D.. after 3 min of induction	122.4± 2.38	125.2 ± 2.16	0.0001
SBP ± S.D.. after 5 min of induction	126.32± 1.6	122.08 ±2.970	0.0001

Table 3: Comparison between MAP in two groups

Time Interval	Group I	Group II	p-value
Baseline MAP± S.D	93.72 ± 2.95	92.48 ± 1.83	0.040
MAP± S.D After premedication	990.72 ± 1.86	89 ± 2.06	0.0616
MAP± S.D After induction	73.72 ± 1.48	84.92 ± 2.05	0.000
MAP± S.D After intubation 1 min	80.84 ± 1.8	95.6 ± 2.16	0.000
MAP± S.D After intubation 2 min	83.52 ± 1.44	90.04 ± 1.83	0.000
MAP± S.D After intubation 3 min	86.16 ± 1.24	89.96 ± 1.85	0.000
MAP± S.D After intubation 5 min	90.28 ± 1.30	88.24 ± 1.50	0.000