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To Compare and Evaluate Hemodynamic Effect of Propofol and Etofol as Induction Agents in Elective Surgeries

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Abstract

Introduction: Various intravenous induction agents like propofol, ketamine and etomidate are available now a day to the anaesthetist but they also cause attenuation of axis leading to a decrease in heart rate and blood pressure. To achieve haemodynamic stability during induction is one of the major challenge and goal of the anaesthetist. *Aims and objectives:* To evaluate the hemodynamic effect of propofol and etofol as induction agents in elective surgeries under general anaesthesia . *Material and Methodology:* Sixty (60) ASA grade I and II patients of age group (18-60 years) were divided randomly into two study groups of thirty patients each, as follows:

Group I-Propofol 2 mg/kg was given intravenously as induction agent

Group II-Etofol (0.15mg/kg etomidate and 1mg/kg propofol) was given intravenously as induction agent.

Results: In group II (Etofol) lesser fall in haemodynamic parameters at induction and upto 60 minutes ($p>0.05$)of induction as compared to group I (Propofol). *Conclusion:* Etofol is more haemodynamically stable than propofol alone during induction.

Keywords: Propofol; Etomidate; Etofol; Haemodynamic; Induction.

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Introduction

During induction the anaesthesiologist is mainly concerned with attenuating the stress response and maintaining haemodynamic stability. The concentration of catecholamines like adrenaline and noradrenaline are increased in response to the stimulus of laryngoscopy and intubation [1]. Laryngoscopy and intubation produces the stress response which leads to haemodynamic changes especially in patients with various risk factors like hypertension and ischaemic heart disease [2]. A wide range of intravenous induction agents is now available to the anaesthetist like ketamine, thiopentone, etomidate, propofol and etofol. They are used to lower the stress response to laryngoscopy and intubation and to maintain better hemodynamic stability at the time of induction and during surgery. Inductionagentshave side effects like vasodilation, myoclonic seizures, nausea, vomiting and attenuation of Autonomic Nervous System thereby decreasing blood pressure. Each intravenous anaesthetic induction agent affects hemodynamic changes differently. Propofol a non opioid,non barbiturate is a sedative agent which has a rapid

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onset and short duration of action with adverse effects like hypotension and injection pain [3,4]. It also leads to bradycardia by increasing the production and release of nitrous oxide [5]. Etomidate is a potent ,short acting anaesthetic which causes minimal histamine release and produces stable haemodynamics.But most common side effects with this drug are pain on injection, excitatory events and myoclonus [6]. The use of etofol as an induction agent are rare and studies which compare propofol and etofol as induction agent are also very few.

Aims and Objectives

To evaluate and compare the efficacy of propofol and admixture of propofol and etomidate (etofol) as induction agent in maintaining haemodynamic stability in elective surgery under general anesthesia.

Material and Methods

This prospective randomised double blind study was conducted in the Department of Anaesthesiology at our centre in India, after approval from the Ethical Committee on 60 patients of 18 to 60 years age, of either sex, of ASA grade I and II posted for elective surgeries lasting for approximately 2 hrs under general anesthesia. Patient having cardiac disease, hypertension, respiratory disease, cereberovascular disease, Mallampati grade III-IV, epilepsy and pregnancy were not included in the study. All patients were kept fasting for 8 hours prior to surgery and an informed consent was taken from the patients. In the operation theatre standard anaesthesia monitors were attatched. An 18 G intravenous cannula was secured and I/V fluid was started. Injection Midazolam 0.025 mg/kg i/v and Injection Nalbuphine 0.1mg/kg i/v were given as premedication. Patients were randomly divided in two groups and randomization was done by computer generated random number tables. Considering 95% of confidence interval and power of the test as 80%, sample size was calculated as 30 in each group. Group I received injection Propofol 2mg/kg i/v and group II injection Etofol (0.15mg/kg etomidate and 1mg/kg propofol) i/v for induction. All study drugs were prepared by the anaesthesiologist who was blinded to the details of the study. Injection Rocuronium 1.2mg/mg i/v was given as muscle relaxant. Laryngoscopy and endotracheal intubation was done by an experienced anaesthesiologist and duration of laryngoscopy was kept to less than 10 seconds. Proper placement of ETT was confirmed by capnography and bilateral auscultation of the chest. Anaesthesia was maintained with Isoflurane 1%-1.5% and equal mixture of Oxygen-Nitrous Oxide. Injection Rocuronium was given as intermittent boluses as and when required. The various haemodynamic parameters like heart rate, systolic blood pressure, diastolic blood pressure, mean arterial blood pressure were measured before induction, at induction (i.e 0 minute) and at 1,2,5,10,20,30 and 60 minutes after induction by an anaesthesiologist who was blinded to the study.

Statistical Analysis

Data was analysed by computer software package SSPS version 20.0 for windows. Categorial data like gender was presented as number. Age, weight, heart rate and blood pressure as Mean ± Standard Deviation (S.D). Inter group comparison of blood pressure and heart rate was done using ANOVA. p value of <0.05 was considered to be statistically significant.

Results

The two groups were comparable in terms of age,weight and sex. (Table 1). The mean heart rate (H.R) atbaseline was 81.5±12.3 beats per minute in group I and in group II it was 81.2±11.8 which were comparable to each other and statistically non significant. The heart rate in group I decreased to 69.2±10.5 and in group II to 74.4±9.1 at 1 minute post induction.This difference was statistically significant ($p<0.05$). Statistically non significant difference was observed at 0 min and from 2 min till 60 minutes of induction (p-value >0.05) (Table 2). The mean systolic blood pressure (SBP) at baseline in Group I was 137.9±4.3, in group II it was 134.8±9.1 which were comparable to each other and statistically non significant (p value=0.122). Statistically significant fall in SBP was observed in group I at 0 minute (at time of induction) and at 1min, 2min, 5min,10min, 30min and 60 minutes of induction (p-value=0.000). In group I versus group II a significant fall in SBP at 0 min,1 min, 2 min, 5min, 10min, 30 min, and 60 minutes of induction (p value 0.000). (Table 3). The mean diastolic blood pressure (DBP) at baseline in Group I was 87.4±4.0, in group II it was 88.1±3.3 which were comparable to each other and statistically non significant (p value=0.539). Statistically significant fall in SBP was observed in group I versus group II at 0 minute, 1min, 2min, 5min, 10min, 30min and 60 minutes of induction (p-value=0.00) (Table 4). The baseline mean bloodpressure (MBP) in Group I was 104.3±3.9,and in group II it was 103.6±4.4 which were comparable to each other and statistically non

significant (p value=0.504). Statistically significant fall in MBP was observed in group I versus group II at 0 min, 1min, 2min, 5min, 10min, 30min and 60 minutes of induction. (p-value=0.000) (Table 5).

Discussion

General anesthetic induction agents cause hypotension via cardio vascular depression and suppression of the autonomic nervous system. On the other hand laryngoscopy and endotracheal

Table 1: Comparison of Demographic variables of patients in both the groups

Variables	Group I	Group II	P value	Statistical significance
Age (years)	37.62±9.06	37.60±9.64	0.265	NS
Gender (male/female)	20/10	18/12	0.279	NS
Weight (kg)	58.2±1.6	58.1±1.8	0.900	NS

Table 2: Comparison of Heart Rate between both the groups

Time	Group I (n=30)	Group II (n=30)	P value	Statistical Significance
Baseline	81.5±12.3	81.2±11.8	0.910	NS
O minute	73.0±11.4	75.8±9.2	0.273	NS
1 minute	69.2±10.5	74.4±9.1	0.035	S
2 minute	79.0±8.5	78.7±8.3	0.887	NS
5 minute	76.5±9.0	76.5±7.8	1.000	NS
10 minute	75.2±10.2	75.5±7.6	0.898	NS
30 minute	74.5±10.3	74.9±7.4	0.871	NS
60 minute	74.6±9.7	74.3±7.5	0.899	NS

Table 3: Comparison of Systolic Blood Pressure (SBP) between both the groups

Time	Group I (n=30)	Group II (n=30)	P value	Statistical Significance
Baseline	137±4.3	134.8±9.1	0.122	NS
O minute	102.2±8.1	126.4±10.1	0.000	S
1 minute	94.2±9.4	122.3±10.7	0.000	S
2 minute	94.8±7.4	128.8±5.6	0.000	S
5 minute	95.7±6.4	124.7±6.3	0.000	S
10 minute	96.7±6.5	125.0±6.5	0.000	S
30 minute	98.5±5.3	126.8±8.8	0.000	S
60 minute	99.6±5.5	125.8±7.0	0.000	S

Table 4: Comparison of Diastolic Blood Pressure (DBP) between both the groups

Time	Group I (n=30)	Group II (n=30)	P value	Statistical Significance
Baseline	87.4±4.0	88.1±3.3	0.539s	NS
O minute	58.1±6.2	81.4±5.4	0.000	S
1 minute	56.2±5.7	76.2±7.2	0.000	S
2 minute	57.7±5.5	81.0±5.2	0.000	S
5 minute	57.0±4.6	80.8±4.8	0.000	S
10 minute	56.5±4.2	80.0±4.7	0.000	S
30 minute	58.5±5.1	79.5±5.2	0.000	S
60 minute	58.0±4.4	81.3.±6.0	0.000	S

Table 5: Comparison of Mean Blood Pressure (MBP) between both the groups

Time	Group I (n=30)	Group II (n=30)	P value	Statistical Significance
Baseline	104.3±3.9	103.6±4.4	0.504	NS
O minute	72.4±6.4	97.3±5.6	0.000ss	S
1 minute	68.4±6.3	92.1±7.4	0.000	S
2 minute	69.6±5.1	97.4±4.4	0.000	S
5 minute	69.5±4.7	96.1±4.5	0.000	S
10 minute	69.6±4.1	95.7±3.5	0.000	S
30 minute	70.9±4.7	95.6±5.4	0.000	S
60 minute	71.6±3.8	96.0±4.7	0.000	S

intubation produces a vasopressor response like increase in the blood pressure and heart rate. Various attempts have been made to over come and attenuate hemodynamic instability during induction, larynoscopy, and intubation. In many studies induction agents, either alone or in combination have been used to achieve minimum cardiovascular effects. Now a days Propofol is preferred as an induction agent. Etomidate is used because it is haemodynamically stable intravenous induction agent. Recently Hacettepe University, reported that etofol which is a combination of etomidate and propofol can be used as an induction agent.

In our study there was a statistically significant fall in heart rate at 1 minute in group I versus group II. Propofol causes bradycardia due to release of nitrous oxide. In 2012 Pandey AK et al. did a study to compare the haemodynamic effects of propfol and etomidate at induction and also compared the serum cortisol levels in patients undergoing coronary artery bypass graft surgery. Patients were allocated randomly to receive either propofol or etomidate for induction and anaesthesia was maintained in both the groups with sevoflurane, vecuronium and fentanyl upto a total dose of 20μgm/kg.They found that etomidate is more haemodynamically stable in terms of heart rate, systolic blood pressur and diastolic blood pressure than propfol at induction,The serum cortisol levels in the propofol group increased more than two times and in the etomidate group decreaed to fifty percent on weaning from cardiopulmonary bypass [7]. In 2014 Supriya A et aldid a study comparing propofol and etomidate in patients undergoing general anaesthesia and found that patients who received etomidate showed little change in mean arterial pressure and heart rate in comparison to those who received propofol from the baseline value ($p>0.05$) [8]. Hosseinzadeh H et al. (2013) did a study comparing the effects of propofol, etomidate and etofol as a induction agents on haemodynamic stability after LMA insertion in elective surgeries on 90 patients of ASA grade I and II. In group P (propfol 2.5mg/kg), Group E (Etomidate 0.3mg/kg) and Group P+E (propfol 1mg/kg plus etomidate 0.2mg/kg). Heart rate, systolic blood pressure, diastolic blood pressure were measured before induction and 30 seconds after induction and found that there was a significant fall in systolic blood pressure in group1 (Propofol) in comparison to group II (Etomidate) and group III (Etofol) (p-value < 0.05). They found etomidate plus propfol as an effective alternative to profol and etomidate for facilitating LMA insertion with the added advantage lack of cardiovascular depression [9]

In our study statistically significant decrease ($p<0.05$) SBP, DBP, MBP in propofol group at induction and upto 60 minutes as compared to Etofolgroup. Propofol is used in dose of 1-2.5mg/kg. Etomidate is an imidazole ester used as an induction agent in dose of 0.3mg/kg. It causes less cardiovascular depression than propofol and a small reduction in cardiac output and blood pressure. But has adverse effects like myoclonus and adrenal suppression. The combination of propofol and etomidate helps to balance the decrease in haemodynamic variables caused by propofol alone as etomidate is more haemodynamically stable and the dose of propofol required is also less. Meena et al. (2016) compared the efficacy of three different anaesthesia induction agents (Propofol ,Etomidate and Propfol and Etomidate) in haemodynamic stability during induction and following endotracheal intubation in elective surgery. The patients were randomly placed into three groups.GroupI was induced with Propofol (2.5 mg/kg), Group II with Etomidate (0.3mg/kg) and Group III with Propofol 1mg/kg plus Etomidate 0.2mg/kg. There was significant fall in systolic blood pressure in group I (Propofol) as compared to group II (Etomidate) and group III (Etofol). Etofol was haemodynamically more stable as compared to propofol or etomidate alone at 1 minute of induction [10] Findings of our study are comparable with the studies of Hosseinzadeh H et al and Meena et al. OzgurYagan et al. in 2015did a study on 90 patients which were randomly divided into three groups of 30 patients each.Group P received propofol 2.5mg/kg, group E received Etomidate 0.3mg/kg and group PE received Propofol 1.5mg/kg plus etomidate 0.15mg/kg as induction agents and compared the various haemodynamic parameters and found etomidate propofol combination can be better alternative to either propofol and etomidate [11]. Findings of our study are comparable with OzgurYagan et al. Finding of our study are consistent with the study of Criado A et al in which significant reduction in stroke volume, cardiac output and MBP was found at various time intervals [12]. Moller et al. in their study on 48 patients used propofol or etomidate for induction of general anaesthesia and compared the MAP, cardiac index (CI) and systemic vascular resistance (SVR). The MAP was significantly higher in the etomidate group as compared to propofol group after induction [13]. The findings of our study are also consistent to the studies of Moller et al.

Etofol use as an induction agent is limited because it has to be prepared by combining propfol and etomidate and a readymade solution of etofol is not

available for use in patients . We did not measure the plasma cortisol levels and adrenal corticotropin levels in our study which was a limiting factor in our study.

Summary and Conclusion

The combination of propofol and etomidate (Etofol) has better hemodynamic stability than propofol alone. Thus Etofol can be preferred over propofol alone for induction of anaesthesia .

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