ORIGINAL RESEARCH PAPER
Volume-8 | Issue-11 | November - 2019 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

COMPARATIVE EVALUATION OF HEMODYNAMIC CHANGES DURING INDUCTION OF ANESTHESIA WITH PROPOFOL AND ETOMIDATE-LIPURO IN CONTROLLED HYPERTENSIVE PATIENTS

Anaesthesiology

Dr Kunal Sharma* Lecturer, Deptt of Anesthesia and Critical Care GMC, JAMMU *Corresponding Author

ABSTRACT

Background: The aim of this study was to compare propofol with etomidate- lipuro as an induction agent to evaluate hemodynamic changes during induction of anesthesia in controlled hypertensive patients.

Methods: A prospective randomized double blind study was conducted to evaluate sixty patients with ASA I and II who were randomly allocated into two groups i.e. Group P and Group E. Before anesthesia induction, all patients were premedicated. Anesthesia induction included Group P in which patients received propofol 2mg/kg and Group E in which patients received etomidate 0.3mg/kg. The hemodynamic changes including heart rate, systolic blood pressure, diastolic blood pressure and mean blood pressure were accessed at various time intervals. Any adverse event like pain during injection, myoclonus etc. were noted.

Results: Comparing the two groups it was seen that after induction the heart rate did not change significantly in etomidate group, but in propofol group it decreased significantly compared to the pre-induction value. The fall in blood pressure (SBP, DBP, MAP) after induction in Group-E was less than that seen in Group-P. In etomidate group SBP, DBP and MAP did not change significantly after induction as compared to pre-induction where as SBP, DBP and MAP decreased significantly post-induction in propofol group.

Conclusion: Incidence of hemodynamic change is significantly lower in group E as compared to Group P hence Etomidate is better than propofol in maintaining the heart rate and blood pressure in controlled hypertensive patients during induction of general anesthesia.

KEYWORDS

Diastolic blood pressure; Systolic blood pressure; Etomidate-lipuro; Propofol

INTRODUCTION

Since the introduction of general anesthesia no ideal induction agent has yet been discovered in terms of providing a stable hemodynamics. An ideal inducing agent for general anaesthesia should have minimal respiratory depression with hemodynamic stability, rapid clearance and minimal side effects. The commonest drugs currently in use can be classified according to their chemical structure and include barbiturates, opioids, imidazoles, phencyclidines and benzodi azepines.

Propofol is the most commonly used induction agent as it has rapid onset and early recovery due to short half life and rapid elimination from the blood circulation. Recommended dose of propofol for induction is 1-2.5 mg/kg. Unwanted complication associated with this drug is hemodynamic instability and cardiovascular complications. Propofol can lead to bradycardia by increasing the production and release of nitrous oxide [1-2]. Propofol is also associated with pain during induction which is sometimes very distressing to the patients[3].

Etomidate, carboxylated imidazole is characterized by hemodynamic stability, minimal respiratory depression and cerebral protective effects. Etomidate is a hypnotic agent which is cardiostable with no release of histamine. It is short acting drug, used for induction and maintenance of anesthesia[5]. Its lack of effect on sympathetic nervous system, baroreceptor reflex regulatory system and its effect of increased coronary perfusion even on patients with moderate cardiac dysfunction makes it an induction agent of choice in cardiac disease patients[4,5,6,7].Etomidate is used widely for RSI of anesthesia in the emergency department (ED) as a result of its relative cardiovascular stability[8,9].The MCT formulation Etomidate- Lipuro has been documented to be associated with lesser incidence of nausea and pain on injection[10].

This study was conducted to compare the hemodynamic changes of etomidate and propofol as an induction agent in controlled hypertensive patients and also to note the incidence of adverse effects such as pain during injection, myoclonus and nausea postoperatively.

MATERIAL AND METHODS

After obtaining approval from the Institutional Ethical Committee and written consent a prospective randomized double blind study was done in 60 patients undergoing surgeries under general anesthesia during august 2016 to march 2017.

Inclusion criteria were; age group 35 to 60 years, controlled blood pressure with anti-hypertensive drugs except beta blockers, BP ≤ 140/90 mmHg, a history of hypertension ≤ 5 years, American Society of Anesthesiologist grade I – II.

Exclusion criteria were; patients refusal, patients with end organ damage, patients undergoing emergency surgeries, patients having co-morbid conditions including any heart disease, (congenital or valvular), epilepsy, COPD, known primary or secondary adrenal insufficiency, pts on prolonged steroid medication and allergic to any study drug,

Every patient underwent preanesthetic check-up 1 day prior to surgery that included a detailed history, complete general physical and systemic examination and relevant investigations. Patients were given midazolam 7.5 mg, pantoprazole 40 mg via the oral route at bedtime on night prior to surgery and were kept fasting 8 h prior to surgery. Patients were randomly divided using a computer-generated randomization schedule, to compose two equal groups of 30 patients each.

- Group P - Propofol (2 mg/kg)
- Group E - Etomidate (0.3 mg/kg)

In the pre-operative room an IV line was secured using 18G cannula and ringer lactate was started. Injection pantoprazole 40 mg and Ondansetron 0.1mg/kg was given in pre operative room. All base line parameters i.e. heart rate, blood pressure (systolic, diastolic, mean arterial pressure), oxygen saturation were recorded on arrival in the operating room. Continuous monitoring of heart rate, blood pressure and saturation were done at regular intervals. In the operation theatre after preoxygenated with 5-7 L/min of oxygen for 3 min all patients received Injection Fentanyl 1 mcg/kg followed by propofol 2mg/kg in GROUP P and etomidate 0.3 mg/kg in GROUP E. Neuromuscular blockade was achieved with Injection Rocuronium 0.6mg/kg in both the groups, which was given after checking for ventilation and cuffed endotracheal tube of appropriate size was inserted after 3min of Injection Rocuronium. Patient's hemodynamic parameters, including systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MBP) and heart rate (HR) were recorded at following intervals ; before induction (baseline),1 min after study drug and then at 1, 3, 5, 10, 15 , 30 min and further time intervals. Any adverse event e.g. Pain during injection, myoclonus were noted during induction.

Anesthesia was maintained with N2O-02 in ratio of 66%:33% with isoflurane in varying concentration in both the groups.Rocuronium was used in dose of 0.15mg/kg to maintain neuromuscular blockade as and when required. Injection Diclofenac sodium 1.5mg/kg was also given by slow intravenous infusion intraoperatively.At the end of the surgery neuromuscular blockade was reversed with Injection neostigmine 0.05 mg/kg and glycopyrolate 0.01mg/kg body weight

intravenously. The extubation was performed after the patient was fully awake. The patient was monitored 24 hours for postoperative nausea and vomiting. The occurrence of pain on injection was recorded as no pain; verbal complaint of pain, or withdrawal of the arm or both. The incidence of myoclonic movements after loss of consciousness was noted. Monitoring of nausea and vomiting was done postoperatively using Verbal Rating Scale for next 24 hrs.

Statistical Analysis:

Qualitative data were expressed as percentages and proportions and quantitative data expressed as mean ± standard deviation. The differences between two groups with respect to continuous variables were analyzed using t-test while categorical variables were analyzed using chi-square test. All the statistical tests were performed in SPSS version 15 software. $P < 0.05$ was considered as statistically significant.

RESULTS

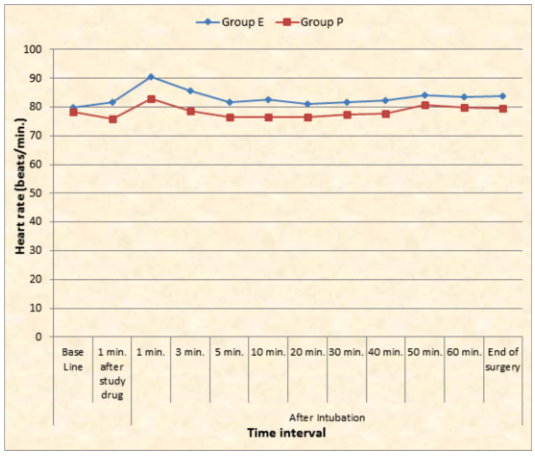
A total of 60 patients of ASA physical status I & II, between ages 35-60 years, were randomly assigned into two groups. There was no statistical difference ($p > 0.05$) between the two groups in terms of their Age and Sex, ASA, MPG and Weight status of the patients (TABLE 1)

TABLE 1.

	GROUP P	GROUP E
AGE(years)	44.5±9.01	48.8±8
SEX		
M	10	11
F	20	19
ASA		
I	20(66.67)	21(70.00)
II	10(33.33)	9 (30.00)
MPG		
I	16(53.33)	12(40.00)
II	14(46.67)	18(60.00)
WEIGHT	56.6±9.8	61.2±8.88

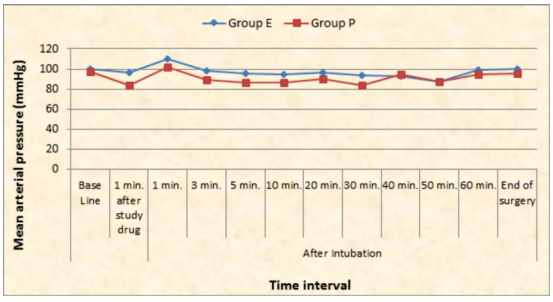
On comparing the effect of the propofol and etomidate on heart rate (Fig 1) it was seen that the baseline values in both the groups were comparable with no statistical difference among them ($p>0.05$). After-induction in etomidate group heart rate did not significantly change compared to pre-induction but after laryngoscopy and tracheal intubation there was a brief episodes of stable increase in heart rate. In propofol group there was a decrease in heart rate after induction, while the increase in heart rate after laryngoscopy and intubation was more in propofol group.

FIG-1



On comparing the effect of drugs on systolic, diastolic and mean arterial blood pressure Fig 2 between the groups it was seen that the baseline values in all the groups were comparable with no statistical difference among them ($p>0.05$).But 1 min after induction it was observed that there was no effect on systolic, diastolic and mean blood pressure in patients receiving etomidate where as patients who received propofol they had significant fall ($P<0.05$) in blood pressure. Similarly after laryngoscopy and intubation it was seen that there was a stable rise in systolic, diastolic and mean blood pressure in patients receiving etomidate.

FIG-2



On the comparison of oxygen saturation (SPO2) between the two groups it was seen that there was no significant effect ($p>0.05$) on SPO2 of the patients 1 min after the drugs were infused. Also following laryngoscopy and intubation the SPO2 was not effected ($p>0.05$) in any of the two groups at any interval of time.

DISCUSSION

The aim of our study was to compare the induction characteristics of propofol and etomidate . Etomidate is a short acting intravenous anesthetic agent used for the induction of general anesthesia. It has a very stable cardiovascular profile[11]

In our study we found that the heart rate was more stable in group E as compared to group P. The findings of our study corroborates with the study reports of Gooding JM et al(1977) who demonstrated stable cardiovascular response associated with administration of this new nonbarbiturate anesthesia induction agent [12]. Etomidate, maintains hemodynamic stability through preservation of both sympathetic outflow and autonomic reflexes. Etomidate does not blunt the haemodynamic response to laryngoscopy and tracheal intubation therefore brief episodes of stable increase in heart rate may be observed however this increase was within the base line values 10 min after laryngoscopy and intubation.

Paris et al (2003) in their study also reported the cardiovascular stability of etomidate during induction of anesthesia even in patients with cardiac disease[6].

Results of our study showed that on comparing the systolic,diastolic and mean blood pressure between the two groups, Propofol group was associated with significant fall in blood pressure as compared to Etomidate group. Propofol induced hypotension during induction is mediated by inhibition of the sympathetic nervous system and impairment of the baroreflex regulatory mechanism. Propofol may lead to a reduction in the systemic vascular resistance and cardiac output. Also propofol is considered to have a direct relaxant effect on venous smooth muscles and in this way an increase in venous capacitance may contribute to the hypotension in patients [13]. On the other side hemodynamic stability observed with etomidate may be due to its unique lack of effect on the sympathetic nervous system and on baroreceptor functions.[13,14,15,16]

Saricaoglu *et al* [17] after studying the hemodynamic effects of an induction dose of propofol and etomidate also found that propofol was associated with significant decreases in SBP and mean blood pressure. They attributed this hypotension to the negative inotropic effect of propofol.

Kaushal Kabir et al [18] did a prospective comparative study to compare cardiovascular response to laryngoscopy and intubation after induction of anesthesia by propofol and etomidate. There study concluded that etomidate had more stable cardiovascular response as compared to propofol during laryngoscopy and intubation Incidence of side effect like pain on injection was more when propofol was used as an induction agent where as patients in etomidate group did not complaint of any pain on injection probably because of use of etomidate Lipuro-an advanced formulation.We did not observed any incidence of myoclonus probably because of fentanyl premedication but review of literature shows that it is a common problem experienced during induction with etomidate. Etomidate causes depression of the cortex, which leads to transient disinhibition of the subcortical structure. Myoclonic movements can be a problem in full stomach patients, because of the risk of regurgitation and aspiration. In our study one patient in group E and none in group P had nausea associated with vomiting which was amenable to treatment.

CONCLUSION

We concluded from our study that the incidence of hemodynamic change is significantly lower in group E as compaired to Group P hence Etomidate-lipuro is better than propofol in maintaining the heart rate and blood pressure in controlled hypertensive patients during induction of general anesthesia.

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