

Original article :

Assessment of Hemodynamic Changes and Complications Occurring with Propofol and Etomidate During General Anaesthesia at a Tertiary Care Hospital

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Abstract

Background: Patient safety has always been a major concern for physicians of both ancient and modern eras. Propofol is a widely administered hypnotic agent that has unique advantages yet some disadvantages. Among general anesthesia induction drugs, etomidate is the only imidazole, and it has the most favorable therapeutic index for single bolus administration. Hence; the present study was conducted for assessing hemodynamic changes and complication occurring with propofol and etomidate during general anaesthesia.

Materials & Methods: 40 patients scheduled to undergo surgical procedure under general anesthesia were enrolled. Complete demographic and clinical details of all the patients were obtained. A Performa was made and the complete medical and personal history of all the patients was recorded. All the patients were divided into two study groups were 20 patients in each group as follows: Propofol group and Etomidate group. All the patients were given general anesthesia according to their respective study groups. Intraoperative hemodynamic profile and complications were recorded and compared.

Results: While comparing the heart rate and blood pressure, significant transient alteration and rise in the heart rate and blood pressure was seen among the patients of the propofol group. However, while comparing the complications in between the two study groups, non-significant results were obtained.

Conclusion: In comparison to propofol, etomidate was found to be a better anesthetic induction agent.

Keywords: Propofol, Etomidate, Hemodynamic.

INTRODUCTION

Patient safety has always been a major concern for the physicians of both ancient and modern eras.¹ Propofol is a widely administered hypnotic agent that is of unique advantages yet some disadvantages.²⁻⁴ Induction of anesthesia with propofol is associated with significant blood pressure reduction and hemodynamic instability especially in patients over 50 years old. Blood pressure instability in young patients due to

propofol administration at different stages of the operation may not have any clinical value, but in older patients and special surgeries it is of great importance to maintain stable hemodynamics both throughout and after the surgery.^{3,4}

Propofol (2, 6-diisopropylphenol) is a potent intravenous hypnotic agent which is widely used for the induction and maintenance of anesthesia and for sedation in the intensive care unit. Propofol is an oil at room temperature and insoluble in

aqueous solution. Present formulations consists of 1% or 2% (w/v) propofol, 10% soybean oil, 2.25% glycerol, and 1.2% egg phosphatide. Disodium edetate (EDTA) or metabisulfite is added to retard bacterial and fungal growth. Propofol is a global central nervous system depressant. It directly activates GABA(A) receptors. Recovery is rapid even after prolonged use. Propofol decreases cerebral oxygen consumption, reduces intracranial pressure and has potent anti-convulsant properties. It is a potent antioxidant, has anti-inflammatory properties and is a bronchodilator.⁵

Among general anesthesia induction drugs, etomidate is the only imidazole, and it has the most favorable therapeutic index for single bolus administration. It also produces a unique toxicity among anesthetic drugs-- inhibition of adrenal steroid synthesis that far outlasts its hypnotic action and that may reduce survival of critically ill patients. The major molecular targets mediating anesthetic effects of etomidate in the central nervous system are specific γ -aminobutyric acid type A receptor subtypes. Amino acids forming etomidate binding sites have been identified in transmembrane domains of these proteins. Etomidate binding site structure models for the main enzyme mediating

etomidate adrenotoxicity have also been developed.⁶ Hence; the present study was conducted for assessing hemodynamic changes and complication occurring with propofol and etomidate during general anaesthesia.

MATERIALS & METHODS

The present study was conducted for assessing hemodynamic changes and complication occurring with propofol and etomidate during general anaesthesia. A total of 40 patients scheduled to undergo surgical procedures under general anesthesia were enrolled. Complete demographic and clinical details of all the patients were obtained. A Performa was made and the complete medical and personal history of all the patients was recorded.

All the patients were divided into two study groups were 20 patients in each group as follows: Propofol group and Etomidate group. All the patients were given general anesthesia according to their respective study groups. Intraoperative hemodynamic profile and complications were recorded and compared. All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software.

Table 1: Comparison of Heart Rate at different time intervals

Time interval	Propofol group	Etomidate group	p-value
Baseline	82.7	80.3	0.99
10 mins	80.8	78.9	0.75
15 mins	80.9	77.8	0.16
30 mins	88.2	78.1	0.00*
45 mins	87.1	80.3	0.00*
60 mins	86.3	80.7	0.00*
At the end of surgery	79.3	79.3	0.29

*: Significant

Table 2: Comparison of SBP at different time intervals

Time interval	Propofol group	Etomidate group	p-value
Baseline	121.5	121.2	0.45
10 mins	120.2	120.3	0.74
15 mins	119.6	122.3	0.33
30 mins	131.1	121.7	0.00*
45 mins	130.8	122.8	0.00*
60 mins	130.3	120.3	0.00*
At the end of surgery	120.7	120.7	0.98

*: Significant

Table 3: Comparison of DBP at different time intervals

Time interval	Propofol group	Etomidate group	p-value
Baseline	80.3	81.1	0.69
10 mins	79.2	80.8	0.96
15 mins	82.3	82.1	0.37
30 mins	89.5	82.6	0.00*
45 mins	90.7	82.4	0.00*
60 mins	89.2	82.8	0.00*
At the end of surgery	82.3	81.3	0.11

*: Significant

RESULTS

Mean age of the patients of group propofol and etomidate group was 48.3 years and 45.9 years respectively. There were 12 males and 8 females in propofol group while there were 11 males and 9 females in etomidate group. While comparing the heart rate and blood pressure, significant transient alteration and rise in the heart rate and blood pressure was seen among the patients of the propofol group. However; while comparing the complications in between the two study groups, non-significant results were obtained.

DISCUSSION

Propofol (2,6-diisopropylphenol) is becoming the intravenous anesthetic of choice for

ambulatory surgery in outpatients. It is extensively metabolized, with most of the administered dose appearing in the urine as glucuronide conjugates. Favorable operating conditions and rapid recovery are claimed as the main advantages in using propofol, whereas disadvantages include a relatively high incidence of apnea, and blood pressure reductions. Etomidate has the advantage of rapid induction and low respiratory effects, but also the disadvantage of causing adverse effects such as myalgias, nausea, and vomiting due to inadequate analgesia. The mechanism of etomidate's effects on the adrenal axis is through a reversible and concentration-dependent blockade of 11 β -hydroxylase and, to a lesser extent, 11 β /18-hydroxylase (aldosterone synthase, CYP11B2) and the cholesterol side-chain cleavage enzyme known

as cholesterol desmolase, or P450sc.7-10 Hence; the present study was conducted for assessing hemodynamic changes and complication occurring with propofol and etomidate during general anaesthesia.

Mean age of the patients of group propofol and etomidate group was 48.3 years and 45.9 years respectively. There were 12 males and 8 females in propofol group while there were 11 males and 9 females in etomidate group. While comparing the heart rate and blood pressure, significant transient alteration and rise in the heart rate and blood pressure was seen among the patients of the propofol group. However; while comparing the complications in between the two study groups, non-significant results were obtained. de Grood PM et al compared propofol and etomidate in total intravenous anaesthesia for microlaryngeal surgery combined with jet ventilation. Two groups of 15 patients were studied. In group 1, propofol 2.0 mg/kg was used for induction. For maintenance a continuous infusion of 12 mg/kg/hour was used for the first 10 minutes, followed by 9 mg/kg/hour for the next 10 minutes and 6 mg/kg/hour thereafter. In group 2, the induction dose of etomidate was 0.3 mg/kg followed by continuous infusion of 1.8 mg/kg/hour for 10 minutes, 1.5 mg/kg/hour for the next 10 minutes and 1.0 mg/kg/hour thereafter. Alfentanil was given for analgesia and suxamethonium for muscle relaxation. The propofol group showed better surgical conditions, more stable anaesthesia and better recovery according to the Steward score. Recovery times to opening eyes on command were comparable for both groups.¹¹ Saricaoglu F et al compared etomidate-lipuro and propofol and 50%, (1:1) admixture of these agents at induction with special reference to injection pain, hemodynamic changes, and myoclonus. Ninety patients were assigned at random to three

groups in which induction was performed with either etomidate-lipuro, propofol or etomidate-lipuro-propofol admixture. After monitorization with bispectral index (BIS) all agents were given with infusion with a perfuser at a constant rate of 200 ml/min till the BIS values decreased to 40. Blood pressure and heart rate were measured every 30 s at this period. Patients were asked for pain at the injection site and observed visually for myoclonus. The time BIS values decreased to 40 (BIS 40 time) and total amounts of induction doses were measured. BIS 40 time measurements were $P > E > PE$. The hemodynamic (systolic, diastolic and mean blood pressures, heart rate) changes were minimal in group PE than other two groups ($P = 0.017$). The intensity of myoclonus was graded as mild in 9, moderate in 12, and severe in 5 patients in the group E (76.3%). Myoclonus was not observed in group PE and group P. There were no injection pain in group PE as the incidence were (83.8%) in group P and in (63.2%) group E. Incidence of hemodynamic changes, myoclonus, and injection pain is significantly lower in group PE. BIS 40 times is least in group PE. They concluded that 1:1 admixture of etomidate-lipuro and propofol is a valuable agent for induction.¹² Petrun AM et al compared the hemodynamic effects of a bispectral index (BIS)-guided etomidate and propofol infusion for anaesthesia induction in patients undergoing major abdominal surgery. Forty-six patients were randomly assigned to two groups based on the induction of anaesthesia, performed with a BIS value of 60 titrated infusion of etomidate (E group) or propofol (P group). Mean arterial pressure (MAP), cardiac index (CI), heart rate, and systemic vascular resistance index (SVRI) measurements were taken 1 min before induction and recorded at 1-min intervals for 20 min. Before intubation, no significant differences between the two groups regarding the hemodynamics were noticed. At

intubation and up to 7 min after intubation MAP (P=0.019) was significantly higher in the E group. CI was significantly higher in the E group with respect to the P group 2, 6, and 7 min after intubation. Twenty-three patients developed complications. The incidence of hypotension was higher in the P group than that in the E group, and the incidence of hypertension was significantly higher in the E group than that in the P group. Their study showed that the use of

propofol resulted in less hypertension and tachycardia at and after intubation than etomidate.¹³

CONCLUSION

Under In comparison to propofol, etomidate was found to be a better anesthetic induction agent. However; further studies are recommended.

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