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A COMPARITIVE STUDY OF ETOMIDATE-LIPURO AND PROPOFOL-LIPURO INDUCTION CHARACTERISTICS IN CARDIAC PATIENTS FOR NON-CARDIAC SURGERY

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ABSTRACT

Background: For cardiac patients, the induction of anesthesia is a crucial stage. For these patients, the anesthetic induction methods are typically chosen with hemodynamic stability and minimizing the stress response during intubation. In order to compare the hemodynamic parameters during induction and recovery using etomidate-lipuro and propofol-lipuro in cardiac patients, this study was conducted.

Materials and Methods: A prospective, randomized, double-blind study, 60 cardiac patients of either sex who were scheduled for elective non-cardiac surgery between the ages of 40-70 of American Society of Anesthesiologists Grade II and III classifications were split into two groups of 30 each. The premedication consisted of injections of fentanyl, midazolam, and glycopyrrolate. Inj. propofol-Lipuro (2 mg/kg) were used for induction in Group A, while Inj. etomidate-Lipuro (0.3 mg/kg) were used in Group B. Inj. Rocuronium hydrobromide (0.6 mg/kg) were then administered for intubation, and anesthesia was maintained with 40% oxygen, 60% N2O, and 0.5-2% isoflurane. Two groups were compared with respect to pain on injection, the induction time, myoclonus and apnea. Hemodynamics, Bispectral index scale, $ETCO_2$, SPO_2 and electrocardiography were monitored before induction of anesthesia, immediately after induction, at intubation, at 1,3,5 mins, and every 10 mins interval till the end of surgery.

Results: Incidence of apnea, pain on injection and induction time was less, but myoclonus and post-operative nausea and vomiting was more in Group B as compared to Group A. The mean heart rate was comparable in the two groups. The mean systolic blood pressure measured up to 15 mins was on the lower side in Group A as compared to Group B.

Conclusion: Both intravenous induction agents are useful for anesthetizing cardiac patients; however, etomidate demonstrated superior hemodynamic stability, faster induction, and a lower incidence of apnea and injection pain when compared to propofol.

Keywords: Cardiac surgery, Propofol, Etomidate.

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INTRODUCTION:

Hemodynamic stability, the impact on the supply and demand of oxygen in the heart, and the reduction of the intubation stress response are typically taken into account when choosing anesthetic induction techniques for cardiac patients.1,2 A constant search has been conducted over time for an improved and safer intravenous agent. Propofol is a derivative of alkyphenol that acts quickly and lasts for a short duration.3-6 It significantly lowers the resistance of the systemic arteries and arterial pressure, which consequently causes moderate to severe pre-intubation and post-induction hypotension.3-5,7,8 .

Etomidate is a hypnotic that has a very stable hemodynamic profile and releases very little histamine. The most frequent adverse effects are myoclonus and pain on injection.9,10 The new etomidate-lipuro fat emulsion (medium chain triglycerides and soyabean) has eliminated pain on injection, venous irritation, and hemolysis; however, it did not lessen the occurrence of myoclonus.11 The depth of anesthesia, which is linked to notable variations in heart rate and mean arterial pressure, is measured using the Bispectral index scale (BIS).12 Propofol and etomidate were used in the majority of earlier studies on cardiac patients undergoing heart surgeries.9, 14, 13, where either no premedication was given or only benzodiazepines or opioids were used.

Minimal amount of literature is available where these drugs were used for non-cardiac surgeries. After reviewing the previous studies, the present study was done to compare the hemodynamic responses, induction and recovery characteristics of propofol and etomidate in cardiac patients posted for non-cardiac surgeries.

MATERIALS AND METHODS:

60 cardiac patients with coronary artery disease, hypertension, or treated arrhythmias of American Society of Anesthesiologists (ASA) Grade II and III in the age range of 40–70 years of either sex who were scheduled to undergo non-cardiac surgery under general anesthesia were included in the prospective, randomized, double-blind study with approval from the institution's ethical and scientific committee. Exclusions from the study included patients with valvular heart disease, persistent arrhythmias, immunosuppression, known adrenal insufficiency, history of steroid use in last six months, allergy to study medications, pregnancy, nursing mothers, and epilepsy. Written and informed consent were obtained from every patient involved in the study.

The patients were split into two groups of 30 each using computer-generated random numbers. For induction, Group A (n = 30) received an Inj. propofol-lipuro (2 mg/kg) and Group B (n = 30) received an Inj. etomidate-lipuro (0.3 mg/kg). Another anesthesiologist prepared the coded syringes, which contained 20 ml of either propofol-lipuro or etomidate-lipuro, respectively, to ensure appropriate blinding.

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The current study's data was methodically gathered, assembled, and statistically examined in order to derive pertinent findings. "Chi-square tests" were used to analyze the non-parametric patient characteristics, and the "unpaired t-test" was used to compare the parametric data between groups. In the end, the P value was calculated to assess the significance levels. P values less than 0.05 were deemed significant at the 5% significance level, P values less than 0.01 at the 1% significance level, and P values less than 0.001 at the highly significant level. The power obtained was 95.66%, taking alpha error probability 0.05 into account when calculating the effect size, which also took into account the induction time, incidence of apnea, and incidence of pain during injection.

RESULTS:

In the present study, two groups were comparable with respect to age, sex, weight, ASA grade, duration and type of surgery and baseline vitals(Table1).Open cholecystectomy was the most commonly performed surgery in both the groups. During the induction, pain on injection occurred in 8 (26.7%) patients in Group A and in 2 (6.7%) patients in Group B but the difference was statistically non-significant(P=4.320). Apnea was observed in 27(90%) patients in Group A and in 20(66.7%) patients in Group B (P=4.812). More patients had involuntary movements after giving etomidate injection (16.7%) as compared to propofol injection (0%) P =5.455. None of the patient had cough, laryngospasm, bronchospasm and cyanosis during induction of anesthesia.

Mean induction time in Group A was 72.00±2.60s and in Group B was 69.83±2.019s and the difference was statistically significant (P=0.001) Figure1. Mean heart rate measured at various time intervals was comparable in the two groups (P > 0.05) as in Figure 2.

The mean SBP and DBP measured before induction was stable and comparable in two groups(P>0.05). Immediately after induction, SBP and DBP decreased in both the groups but fall was significantly more in the propofol group as compared to etomidate group. After intubation, blood pressure increased slightly in both groups but remained on the lower side in the propofol group as compared to etomidate group. Later on at 1,3 and 5mins after intubation SBP remained significantly low in the propofol group than in the etomidate group (P = 0.000). At 1 min after intubation DBP was significantly low in Group A as compared to Group B (P = 0.36). After that SBP and DBP remained stable and were comparable in both the groups till the end of the procedure as shown in Figure 2.

After completion of surgery, recovery was assessed by Stewardrecovery score. Score was comparable in both groups. All patients achieved score of six at 15 and 30mins post operatively in both groups. Mean recovery time in both groups was comparable in Group A was 14.57±1.006 mins and in Group B was 14.60±0.855 mins (P=0.891) and patients had smooth recovery in both groups. Five patients in the propofol group and seven patients in the etomidate group had nausea and vomiting in the post-operative period and difference was statistically non-significant(P>0.05).

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Figure 1: Induction characteristics of Group A (propofol) and Group B(etomidate)

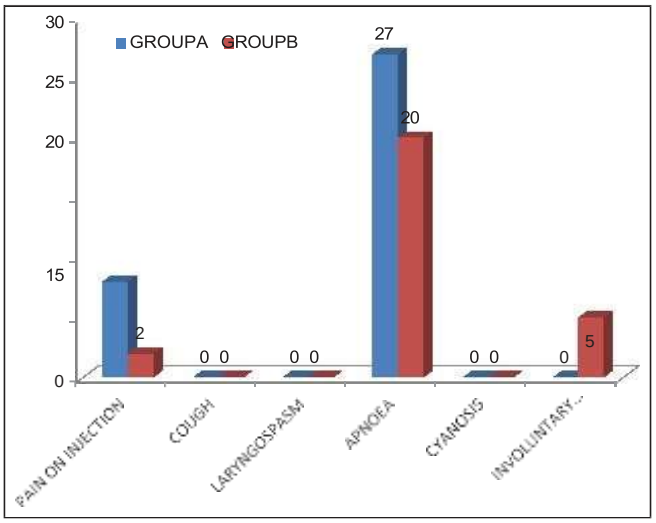

Table 1: Demographic profile of patients in Group A (propofol) and Group B (etomidate)

Patient profile	GROUP A N-30	GROUP B N=30	P value	Significance level
Age in years	53.90	54.00±7.022	0.957	NS
Male	4	6 (20)	0.480	NS
Female	26(86.7)	24(80)		NS
Weight in kg	65.90±14.209	65.67±10.350	0.942	NS
II	24(80)	25(83.3	0.111	NS
III	6 (20)	5 (16.7)		NS
Surgery duration in mins	46.83±2.451	46.50±2.330	.333	NS

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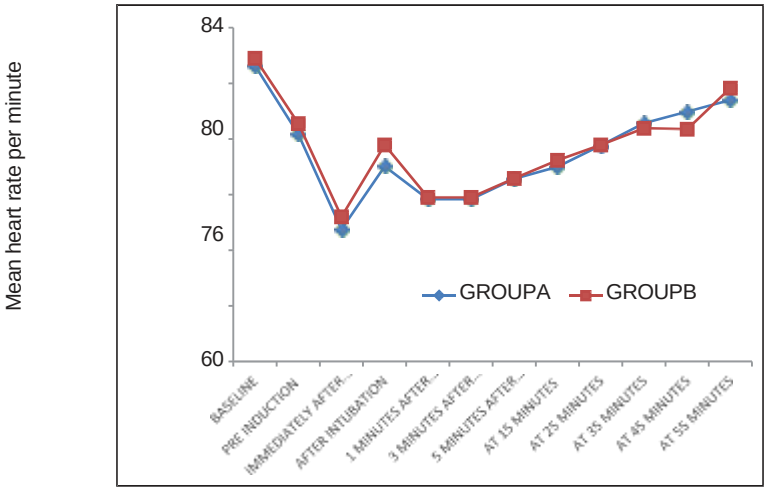
Figure 2Mean heart rate measured in various time interval in Group A (propofol) and Group B(etomidate)



DISCUSSION:

For cardiac patients, the induction of anesthesia is a crucial stage. It is common that anesthetic agents can have harmful effects on patients with cardiac conditions 13. The demographic profile, type and duration of surgery, and baseline hemodynamic parameters were similar for both groups in the current study. One important quality that is desired in an ideal induction agent is rapid induction without any significant side effects. The primary outcomes of this investigation demonstrated that, when etomidate was used instead of propofol, there was a greater incidence of myoclonus and post-operative nausea and vomiting, but less pain during injection, apnea, and induction time. In the present study, the induction time in Group A was 72.00±2.600s and in Group B was 69.83±2.019s. In a study done by Zhang and Sun.,18 using fentanyl and etomidate for induction, the time to loss of consciousness was 70.0 ± 15.6 s.

In a similar study done by Wilhelm*etal*.,19 using fentanyl as premedication with propofol land etomidate, the induction time was 74.9±20s in the propofol group and 72.3±24.0s in the etomidate group. Results of the present study were consistent with the above studies. Pain on injection was observed more in the propofol group as compared to etomidate group.

These results were consistent with the study done by Sowinskiet al.,20 where pain on injection occurred in 4.5% patients in the etomidate group and in 27% patients in the propofol group.

Ayusoetal.,21 also observed that the incidence of pain on injection was 27% with the use of propofol-lipuro. Nyman et al.,17 also found that the pain on injection occurred

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in 5% patients with etomidate-lipuro and in 47.5% patients with propofol and lidocaine. Incidence of apnea during induction was more in the propofol group (90%) as compared to etomidate group (66.7%)

In a study, Miner et al.,22 observed that in non premedicated patients when induction was done with either etomidate 0.1mg/kg or propofol 1 mg/kg body weight, subclinical respiratory depression occurred in 43.3% patients in the etomidate group and 42.4% patients in the propofol group. Higher incidence of apnea in the present study could be due to the use of fentanyl and midazolam as premedication and also the doses of etomidate and propofol used were higher than this study. During the induction phase, involuntary movements were noted in 5 (16.7%) of the etomidate group patients but not in any of the propofol group patients.

According to Miner et al.22, the etomidate group (20% of patients) had a higher incidence of myoclonus compared to the propofol group (1.8% of patients). Similar findings were made by Sowinski et al. (20) who showed that etomidate use increased the incidence of myoclonus. Carlos and Innerarity (16) used atropine and fentanyl as premedication prior to etomidate induction and saw a decrease in the frequency of involuntary movements.

Involuntary movements were observed in 5 (16.7%) of the patients in the etomidate group during the induction phase, but not in any of the patients in the propofol group. The incidence of myoclonus was higher in the etomidate group (20% of patients) than in the propofol group (1.8% of patients), as reported by Miner et al. 22.

Sowinski et al. (20) reported similar results, demonstrating that the use of etomidate with increased incidence of myoclonus. When atropine and fentanyl were used as premedication before etomidate induction, Carlos and Innerarity (16) observed a reduction in the frequency of involuntary movements. These findings align with the earlier research.26, 25, 26

Skinner et al. (2005) found that after induction, the propofol group's SBP significantly decreased, while the etomidate group's SBP significantly increased following intubation. The current study's lower rise in SBP after intubation may be because fentanyl was used as premedication, which blunts the hemodynamic responses to intubation. When comparing the propofol group to the etomidate group, the propofol group's mean DBP, measured at different intervals up to 5 minutes, was on the lower side.

When etomidate (0.45 mg/kg) was administered to patients who were not on medication, Criado et al., 26 observed a significant drop in DBP three and ten minutes after induction. Mean respiratory rate, mean end-tidal carbondioxide and mean saturation of oxygen was comparable in both groups at various time intervals. BIS at all measured intervals was comparable in both groups. Results are consistent with the results of the study done by Shah and Harris27 and Kim et al.12

Incidence of nausea and vomiting was more in the etomidate group which was almost similar to the results of the study done by St.Pierreetal.28 Steward recovery score at 3,6,10,15 and 30mins was comparable in both the groups. The mean recovery time in Group A (propofol) and in Group B (etomidate) was comparable, and all patients had a quiet recovery. No complication and side effects were observed in both groups in the post-operative period.

CONCLUSION:

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The present study observed a significant increase in the SBP of the etomidate group and a significant decrease in the SBP of the propofol group. Given that fentanyl was used as premedication, which blunts the hemodynamic responses to intubation, the current study's lower rise in SBP following intubation may be explained by this. Measured at various intervals up to 5 minutes, the mean diastolic blood pressure (DBP) of the propofol group was lower than that of the etomidate group. DBP significantly decreased 3 and 10 minutes after induction when etomidate (0.45 mg/kg) was given to patients who were not taking any medication.

LIMITATION OF THIS STUDY:

The variations in blood cortisol levels throughout the post-operative phase were not examined in this investigation. One should not be concerned about the potential adrenal suppression caused by a single dose of etomidate as there is only a temporary drop in serum cortisol levels following the medication.29,

FINANCIAL SUPPORT AND SPONSORSHIP:

Nil.

CONFLICTS OF INTEREST:

There are no conflicts of interest

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