Original Article

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Assessment of Hemodynamic Effects of Etomidate versus Propofol in Elective Surgical Patients - A Clinical Study

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Abstract

Background: Hemodynamic stability during laryngoscopy and intubation with minimal side effects is the main objective of any anaesthetist. The present study was conducted to assess hemodynamic effects of etomidate versus propofol in elective surgical patients. **Subjects and Methods:** The present study was conducted on 48 patients planned for elective surgery of both genders. Patients were divided into 2 groups of 24 each. Group I patients were given propofol (P) and group II were given the etomidate. Parameters were recorded. **Results:** The mean height in group I patients was 165.2 cm and in group II was 166.7 cm, mean weight was 68.1 kg in group I and 65.2 kg in group II. Mean MAP (mm Hg) at T1 in group I was 118, T2 was 90, T3 was 102 and T4 was 106. In group II, T1 was 110, T2 was 94, T3 was 98 and T4 was 100. The difference was non- significant (P> 0.05). Mean HR (beats/min) at T1 in group I was 77.2, T2 was 79.4, T3 was 81.5 and T4 was 79.1. In group II at T1 was 75.4, T2 was 81.6, at T3 was 87.2 and at T4 was 84.3. No statistical significance was observed in between both the groups on comparing Heart Rate and Mean Arterial Pressure. **Conclusion:** Both Etomidate and Propofol are equally effective in terms of their hemodynamic effects.

Keywords: Etomidate, Hemodynamic, Propofol.

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Introduction

Hemodynamic stability during laryngoscopy and intubation with minimal side effects is the main objective of any anaesthetist.[1] Pressor response to laryngoscopy is due to receptors present at the tongue base that get stimulated, catecholamines rise in levels of adrenaline and nor-adrenaline, stimulation of the laryngeal and tracheal receptors.[2] The arterial pressure may rise to 20-25 mmHg and peak is usually seen 30-35 seconds after laryngoscopy. On one hand, laryngoscopy leads to sympathetic responses leading to tachyarrhythmias and hypertension increased intracranial tension and greater myocardial workload. On the other hand, induction agents cause vasodilation and obliteration of autonomic nervous system leading to hypotension.[3]

Etomidate is a carboxylated imidazole derivative, has a rapid onset (10-12sec) and a brief duration of action, and hydroxylases primarily in liver. It provides hemodynamic stability in both noncardiac and cardiac disease patients after dosage of 0.15 to 0.30 mg/kg. It directly inhibits 11-beta hydroxylation, which results in temporary reduction in biosynthesis of cortisol and aldosterone with serum concentrations in minimum limit of normal range.[4]

Propofol, an alkylphenol derivative, provides rapid onset and short duration of action. It causes considerable reduction in systemic vascular resistance and arterial pressure 15% to 40% after iv induction with 2mg/kg. Its effect on HR is variable. It causes direct myocardial depression at doses above 0.75mg/kg.[5] The present study was conducted to assess hemodynamic effects of etomidate versus propofol in elective surgical patients.

Subjects and Methods

The present study was conducted in the department of Anesthesia. It comprised of 48 patients planned for elective surgery of both genders. All were informed regarding the study. Ethical approval was obtained from institute prior to the study.

General information such as name, age, gender etc. was recorded. Patients were divided into 2 groups of 24 each. Group I patients were given propofol (P) and group II were given the etomidate. All patients were pre medicated with intramuscular injection of morphine 0.1 mg/kg and promethazine 0.5 mg/kg half hour prior to induction of anesthesia.

Patient was monitored with Heart Rate, pulse oximetry electrocardiogram (5-lead ECG), end tidal carbon- dioxide (EtCO2), Non-invasive blood pressure (NIBP). Anaesthetic agent for induction was prepared by an independent

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colleague. Anaesthesia was induced with either propofol (Diprivan, Astra Zeneca, Cheshire, United Kingdom) 2 mg/kg or etomidate (Etomidat-Lipuro 2%, B. Braun, Melsungen, Germany) 0.5 mg/kg. Endotracheal intubation was facilitated with rocuronium bromide (Roger, Cardilla health care, Mumbai) in the dose of 0.1 mg/kg in a single attempt less than 20 seconds. Mechanical ventilation was instituted to maintain eucapnia. Anesthesia was maintained with titrated doses of sevoflurane. Analgesia was attained with fentanyl up to a total dose of 10µg/kg. Parameters were recorded before induction (T1), after induction (T2), after intubation (T3), and 7 minutes after intubation (T4).
Hypotension (MAP ≤55 mm Hg) was treated with incremental doses of phenylephrine. Hypertension (MAP ≥100 mm Hg) was treated with fentanyl 1 µg/kg up to three times and then with a nitroglycerine infusion (10–100 µg/kg). Bradycardia (HR ≤40 min) was treated with atropine 0.5 mg up to three times, and thereafter with ephedrine 5 mg. Tachycardia (HR ≥90 min) was treated with fentanyl 1 µg/kg up to three times and thereafter with metoprolol 1 mg bolus dose. Parameters were recorded. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

Results

Table 1: Distribution of patients

Groups	Group I	Group II
Agent	Propofol	Etomidate
Number	24	24

[Table 1] shows that group I patients were given Propofol and group II patients were given Etomidate.

Table 2: Basic characteristics

Characteristics	Group I	Group II	P value
Height (cm)	165.2	166.7	0.25
Weight (Kg)	68.1	65.2	0.14
Gender ratio (M:F)	18:6	20:4	1.00

[Table 2], graph I shows that mean height in group I patients was 165.2 cm and in group II was 166.7 cm, mean weight was 68.1 kg in group I and 65.2 kg in group II. The difference was non- significant (P> 0.05).

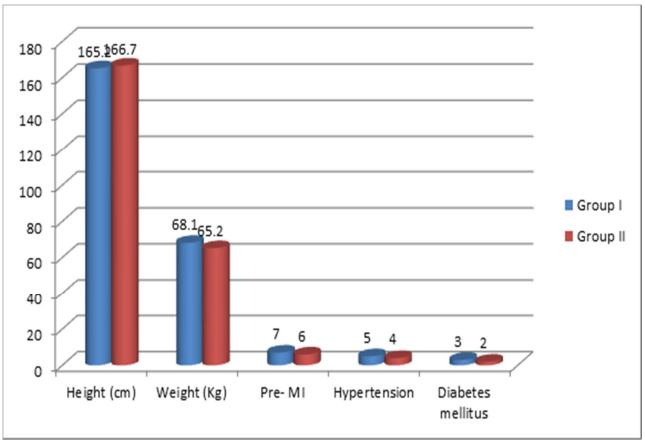

Figure 1: Basic characteristics

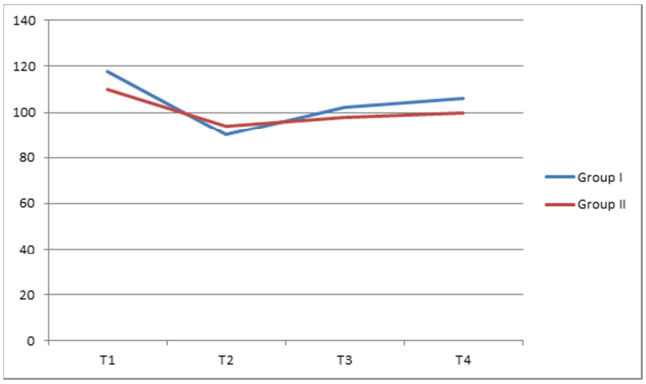

Figure 2: Comparison of MAP in both groups

[Figure 2] shows that mean MAP (mm Hg) at T1 in group I was 118, T2 was 90, T3 was 102 and T4 was 106. In group II, T1 was 110, T2 was 94, T3 was 98 and T4 was 100. The difference was non- significant (P>0.05).

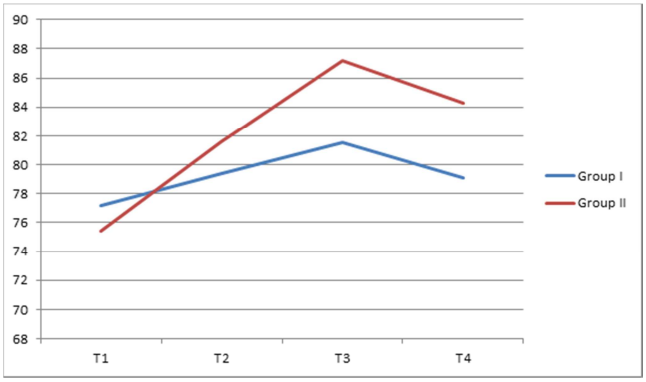

Figure 3: Comparison of Heart rate (HR)

[Figure 3] shows that mean HR (beats/min) at T1 in group I was 77.2, T2 was 79.4, T3 was 81.5 and T4 was 79.1. In group II at T1 was 75.4, T2 was 81.6, at T3 was 87.2 and at T4 was 84.3.

Discussion

More than 60% of all emergency airway interventions use etomidate as the bolus induction agent owing to its favourable hemodynamic properties and ease of dosing. Data from the National Emergency Airway Registry (NEAR) show that etomidate is the most commonly used induction agent for emergency airway intervention.[6] Benzodiazepines were used 18% of the time and were the next most common agents used. Hemodynamic changes are well tolerated in normal individuals but may be life threatening in cardiac patients and patients of increased intracranial pressure. Criado A et al,[7] studied the hemodynamic effects of etomidate induction in 36 patients. Their results showed SV (Stroke volume), MAP (Mean arterial pressure), and LVW (Left ventricular work) significantly reduced but the heart rate increased significantly. They concluded that although etomidate has a negative inotropic effect, the variables remained within acceptable limits. The present study was conducted to assess hemodynamic effects of etomidate versus propofol in elective surgical patients.

In this study, group I patients were given Propofol and group II patients were given Etomidate.

Bruessel et al[8] found that sixty patients in age group of 18-50 years of ASA grade I and II were divided randomly into two groups of thirty patients each. Hemodynamic data was observed and compared. Sample size was taken for convenience. Statistically significant difference was found in heart rate (p=0.000 at induction; p=0.0001 at 1 min after intubation) and MAP in both the groups at 0 min (p=0.0008) and after 1 minute (p=0.004) of induction with hemodynamic parameters significantly higher in etomidate group than the etofol group. There was no statistically significant difference at 2 mins, 5 mins, 10 mins, 20 mins, 30 mins and 60 mins between the two groups.

The mean height in group I patients was 165.2 cm and in group II was 166.7 cm, mean weight was 68.1 kg in group I and 65.2 kg in group II.

We found that mean MAP (mm Hg) at T1 in group I was 118, T2 was 90, T3 was 102 and T4 was 106. In group II, T1 was 110, T2 was 94, T3 was 98 and T4 was 100. The difference was non- significant. Ghafoor et al[9] reported the effects of etomidate on duration of mechanical ventilation. There was significant statistical heterogeneity in this comparison. They employed a random-effects model for meta-analysis, describing the MD and 95% CI. The pooled result of 315 patients receiving etomidate, compared to 306 patients receiving other induction agents, showed no significant difference in the duration of mechanical ventilation.

We observed that mean HR (beats/min) at T1 in group I was 77.2, T2 was 79.4, T3 was 81.5 and T4 was 79.1. In group II at T1 was 75.4, T2 was 81.6, at T3 was 87.2 and at T4 was 84.3. Bruder et al[10] reported the effects of etomidate on SOFA score. Statistical heterogeneity was not calculated. The pooled result of 234 patients receiving etomidate, compared to 235 patients receiving other induction agents, showed a significant difference in the SOFA score (MD0.70; 95% CI 0.01 to 1.39) favoring other induction agents over etomidate.

Conclusion

Both Etomidate and Propofol are equally effective in terms of their hemodynamic effects. Further studies are required for these drugs when used synergistically with adequate doses of opioids and benzodiazepines.

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