

Comparison between Propofol and Etomidate for Induction of General Anaesthesia

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Abstract: Introduction: During induction of general anaesthesia, there is a possibility of haemodynamic variabilities especially in patients with cardiovascular risk factors and those with haemodynamic instability. So, a safe induction agent with fewer adverse effects is desirable. In the present study we intend to compare propofol and etomidate for their effect on haemodynamic response to laryngoscopy and intubation and other adverse effects. METHODS: 80 patients in the age group 20 to 60 years, ASA class I and II, posted for elective surgeries were divided into two groups (group P and group E) of 40 each. Group P received propofol 2mg/kg and group E received etomidate 0.3mg/kg for induction. Haemodynamic parameters at induction, laryngoscopy and then upto 5 minutes post intubation were recorded and compared. Pain on injection and myoclonus were also observed in both groups. RESULTS: Baseline parameters were comparable for both groups. In the etomidate group, less variability in heart rate and blood pressure measurements from baseline was seen as compared to propofol group. Pain on injection was more in propofol group, while myoclonic movements were seen only in etomidate group. CONCLUSION: This study concludes that etomidate is a more favourable induction agent than propofol with less pain on injection, particularly in haemodynamically unstable patients and those with cardiovascular disorders.

Key Words: Propofol, etomidate, induction agent, laryngoscopy, endotracheal intubation.

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I. Introduction:

Patient safety during general anaesthesia has always been the major concern for anaesthesiologists. Anaesthesia induction is a critical part of anaesthetic practice and endotracheal intubation is the gold standard for protecting the airway.^{1,2} Laryngoscopy and endotracheal intubation lead to a stress response that insults haemodynamic changes, especially in patients with cardiac risk factors like ischaemic heart disease and hypertension.³ Sudden hypotension and collapse can be life threatening following induction of anaesthesia in patients who are haemodynamically unstable.⁴ An ideal induction agent providing stable haemodynamics during induction, laryngoscopy and endotracheal intubation is yet to be discovered.

Propofol, the commonly used agent for induction has its desirable features like rapid and smooth induction and recovery with less incidence of nausea and vomiting^{5,6} while decrease in blood pressure, depression of ventilation, pain on injection are the unfavourable effects.^{7,8,9}

Etomidate as an anaesthesia induction agent is characterised by haemodynamic stability, minimal respiratory depression and cerebral protective effects. Etomidate is especially useful for cardiac compromised patients and in cases where hypotension is not desirable during induction of anaesthesia.^{10,11,12} Adverse effects are pain on injection and myoclonus.^{13,14} Etomidate has been known to cause adrenal insufficiency in septic and critically ill patients, but the clinical consequences of this effect are still unclear.⁴

This study is designed to evaluate and compare the effects of propofol and etomidate for induction of anaesthesia and the response to laryngoscopy and endotracheal intubation using haemodynamic parameters as change in blood pressure and heart rate as primary outcome and pain on injection and myoclonic movements as secondary outcome.

II. Materials And Methods:

A total of 80 patients of ASA class I and II between 20 and 60 years of age of either sex, posted for elective surgical procedures under general anaesthesia with endotracheal intubation were taken for the study. After approval from the institutional ethical committee, written and informed consent was obtained from all the patients.

Patients were randomly assigned to two groups, group P and group E, with 40 patients in each group. Group P received Propofol 3mg/kg as the inducing agent and group E received Etomidate 0.3mg/kg for induction of anaesthesia.

Inclusion criteria:

1. Age group of 20 to 60 years.
2. ASA class I and II.
3. Patients posted for elective surgeries.

Exclusion criteria:

1. History of seizure disorders.
2. Hypertension, hypotension, ischaemic heart disease.
3. Emergency surgery.
4. Potential difficult airway.

All patients were fasted according to fasting guidelines. I.V. line was secured using 18 gauge cannula in all patients. Multi-channel monitor was attached in all patients which included pulse oximeter, non-invasive blood pressure, electrocardiogram, end-tidal CO₂ and temperature monitoring. Midazolam 0.3mg/kg I.V. and fentanyl 2mcg/kg I.V. was given to all patients 2 minutes before giving inducing agent. For induction, either propofol 2mg/kg or Etomidate 0.3mg/kg was given as per the group allocation. Atracurium 0.5mg/kg was given as muscle relaxant. Intubation was done after 3 minutes following muscle relaxant. Anaesthesia was maintained with O₂, N₂O (1:1) and sevoflurane (1.5-2%). Reversal agent neostigmine and glycopyrolate was given at the end of the procedure.

The parameters observed were the following: heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure at baseline, just after induction, 1 minute, 2 minutes, 3 minutes and 5 minutes after intubation. Any adverse effects like bradycardia, myoclonus and pain on injection were also looked for.

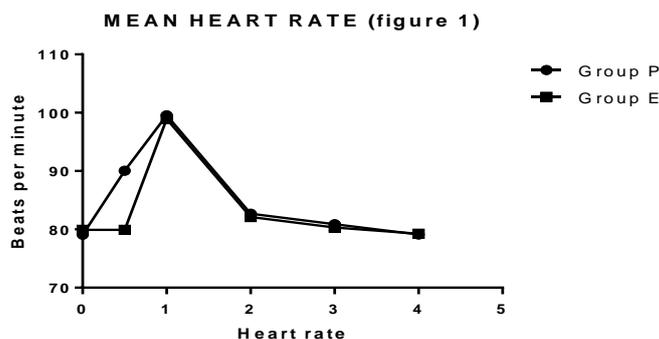
III. Results:

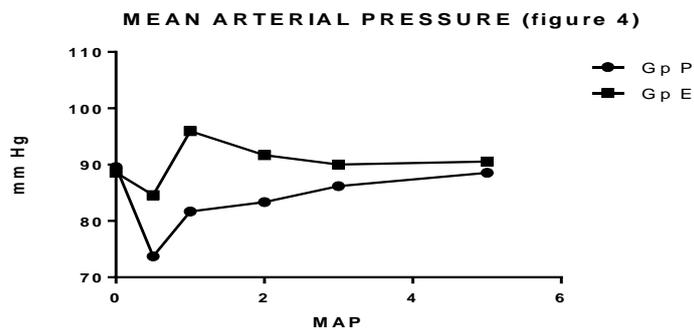
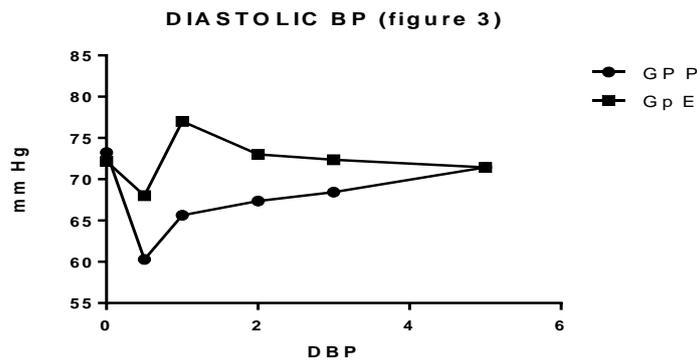
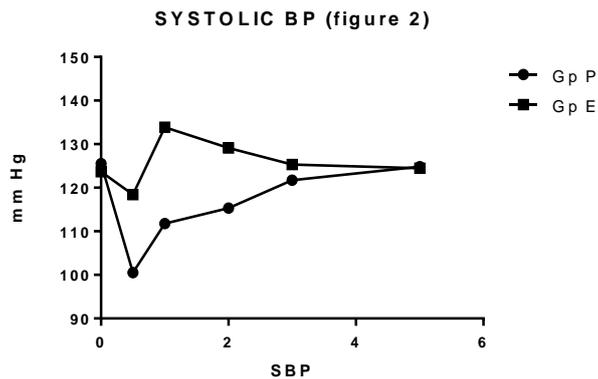
The two groups, group P and group E were comparable in terms of demographic variables i.e; age, gender and weight and showed no significant difference ($p > 0.05$) as shown in table 1.

Variable	Group P	Group E
Gender (females/males)	26/14	21/19
Age (years) +/- SEM	41.95 +/- 6.72	41.70 +/- 6.28
Weight (kg) +/- SEM	68.48 +/- 8.98	67.00 +/- 9.73

Table 1: Demographic variables

In both the groups, preoperative vitals including heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure were comparable between the two groups. After induction, group P showed significant increase in heart rate and decrease in blood pressure as compared to group E which did not show a significant deviation from baseline. Post intubation, the heart rate was increased and comparable in both the groups which reached baseline at 5 minutes after intubation as shown in figure 1. Systolic, diastolic and mean arterial pressure showed the same trend. There was a significant decrease in blood pressure in group P after induction as compared to group E. One minute post intubation, blood pressure increased in group P but was still less than the baseline values whereas in group E blood pressure increased above the baseline one minute post intubation. Five minutes after intubation, the systolic, diastolic and mean arterial pressure in both the groups reached near the baseline (Figure 2,3,4).





Pain on injection was seen in 20(50%) patients in group P and only in 2(5%) patients in group E. Myoclonic movements were seen in 10(25%) patients in group E whereas none of the patients in group P showed myoclonic movements.

IV. Discussion:

Both propofol and etomidate are well known as intravenous anaesthetic induction agents. In the present study we compared the two drugs with respect to haemodynamic parameters on induction and intubation in adult patients posted for elective surgical procedures. Also the two groups were compared for pain on injection and myoclonic jerks following injection of the inducing agents. The results of our study show a significant drop in blood pressure and increase in heart rate from baseline following induction with propofol as compared to etomidate. Immediately post intubation, blood pressure increased in both groups but more in the etomidate group. The incidence of pain on injection was significantly higher in propofol group, while myoclonic jerks were seen in some patients from the etomidate group only.

A study was performed by Moller et al¹⁵ using propofol and etomidate in general anesthesia induction. They used BIS monitoring, mean arterial pressure, cardiac index and systemic vascular resistance index values of 48 patients. They found a significantly high incidence of hypotension in propofol group and a significantly high incidence of hypertension in etomidate group. In comparison to etomidate, propofol was determined to have caused less hypertension and tachycardia after intubation. In our study, the mean arterial pressure values after induction in the propofol group were significantly lower than those of etomidate group. Following intubation,

the mean arterial pressure values of etomidate group were higher than those of propofol group, but the heart rate remained almost comparable after intubation. Mehrdad et al¹⁶ conducted a study in adult patients comparing etomidate (0.3mg/kg) and propofol (2-2.5mg/kg) for induction of anaesthesia. They concluded that patients receiving etomidate have more stable hemodynamic conditions and if there are no contraindications, it can be preferable over propofol for general anaesthesia. Our study got similar results of better hemodynamic conditions with etomidate as compared to propofol.

Saricaoglu et al¹⁷ conducted a study comparing the hemodynamic effects of propofol and etomidate on induction of anaesthesia and found that propofol was associated with significant decreases in systolic and mean blood pressure. This hypotension was attributed to negative inotropic effect of propofol. Our study also showed that propofol group had significantly decreased systolic, diastolic and mean blood pressure after induction as compared to etomidate group. Shah et al¹⁸ in their study comparing haemodynamic effects of intravenous etomidate and propofol during induction and intubation using entropy guided hypnosis levels, concluded that etomidate is more cardiostable than propofol at equipotent doses.

Pain on injection of anaesthetic agents gives a very uncomfortable experience to patients. In our study, the etomidate group showed very low incidence of this pain in comparison with propofol group. Same results were also shown by Saricaoglu et al¹⁷ as well as Aggarwal et al.⁴ In our study myoclonic jerks were noted in 25% patients in the etomidate group while none of the patients in propofol group showed such features. Aggarwal et al⁴ also showed same kind of results with 36% patients in etomidate group having myoclonic movements.

V. Conclusion:

In this study we conclude that in view of haemodynamic stability and low incidence of pain on injection, etomidate is a more favourable agent than propofol for induction of general anaesthesia, particularly in patients with haemodynamic instability or associated cardiovascular disorders.

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