# ORIGINAL RESEARCH PAPER

# COMPARATIVE STUDY OF ETOMIDATE AND PROPOFOL FOR INDUCTION OF GENERAL ANESTHESIA IN ELDERLY PATIENTS

KEY WORDS: Propofol,

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Etomidate, General anaesthesia

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	<b>Introduction:</b> An ideal induction agent for general anesthesia should have hemodynamic stability, minimal respiratory side effect and rapid recovery. Presently etomidate and propofol are popular rapid acting inducing agents. <b>Material and methods:</b> After obtaining informed written consent from patients this prospective, randomized, double blind			

ABSTRACT

Introduction: An ideal induction agent for general anesthesia should have hemodynamic stability, minimal respiratory
side effect and rapid recovery. Presently etomidate and propofol are popular rapid acting inducing agents. Materia
and methods: After obtaining informed written consent from patients this prospective, randomized, double blind
study was conducted in 100 patients of ASA grade 3 and 4 posted for elective surgeries under general anaesthesia. The
were divided into two groups of 50 in each group based on random number as group A and group B. The patients in
Group A given Inj. Propofol and the patients in Group B received Inj. Etomidate. Parameters such as heart rate, systolic
blood pressure, diastolic blood pressure, mean arterial pressure and spo2 were monitored continuously and recorded
Incidence and degree of pain of myoclonic movements were recorded. Result: Demographic variables such as age
gender, weight and ASA grade were comparable no significant difference existed between both the groups.Baseline
mean heart rate, mean systolic blood pressure and mean diastolic blood pressure were comparable in both the Groups
(P>0.05)Significant (P<0.05) fall in mean systolic blood pressure, mean diastolic pressure and mean arterial pressure
was observed immediately after induction, at 2, 5, 10 minutes up to 30 minutes in group A (propofol) compare to group H
(etomidate). After then no significant difference seen in mean systolic pressure, mean diastolic pressure and mean
arterial pressure. Conclusion: Etomidate was found ideal for its hemodynamic stability when compared to Propofo
along with less incidence of pain on injection, the only drawback being high incidence of myoclonus elderly patient.

### Introduction:

General anaesthesia is associated with various effects on the respiratory system, including the loss of airway patency, loss of protective airway reflexes and hypoventilation or apnoea. Airway management is the most important part of general anaesthesia and it is a skill of an anaesthetist to maintain proper airway without much sympathetic stimulation and with better haemodynamic stability.<sup>1</sup>

Laryngoscopy and endotracheal intubation produce reflex sympathetic stimulation and are associated with raised levels of plasma catecholamine, hypertension, tachycardia, myocardial ischemia, depression of myocardial contractility, ventricular arrhythmias and intracranial hypertension.<sup>2</sup>

Induction of anaesthesia is a complex process, and is referred to the period of transition from an awake to an anaesthetized state. Presently there are different types of induction agents available e.g. inhalational agent and intravenous agent. In modern day anaesthesia, intravenous agents are more commonly used to induce anaesthesia except in children where inhalational agents are prefered. The choice of an anaesthetic agent for induction of anaesthesia is based mainly on its pharmacodynamic properties. Until now, cardiovascular effects were the main factor in this decision. However, other factors, such as the depth of anaesthesia and effects on cortisol synthesis, can modify this simplistic view.<sup>3</sup>

Induction agents are drugs that, when given intravenously in anappropriate dose, cause rapid loss of consciousness. They are used to maintain anesthesia by intravenous infusion, as the sole drug for short procedures done under local anesthesia and also to provide conscious sedation in intensive care unit.An ideal induction agent for general anesthesia should have hemodynamic stability, minimal respiratory side effect and rapid recovery. Sudden hypotension has a deleterious effect on maintaining the circulation to vital organs. Presently etomidate and propofol are popular rapid acting inducing agents.

Etomidate is a carboxylate imidazole containing compound characterized by hemodynamic stability, minimal respiratory depression and cerebral protective effect. Its lack of effect of sympathetic nervous system, baroreceptor reflex regulatory system and its effect of increased coronary perfusion even on patient with moderate cardiac dysfunction makes it an induction agent of choice in all ischemic heart disease patients.<sup>4</sup>

Propofol is 2, 6-diisopropylphenol is one of the most popular induction agent with its favourable characteristics like rapid and smooth induction, recovery and decreased incidence of nausea and vomiting. Propofol decrease blood pressure, cardiac output and systemic vascular resistance due to inhibition of sympathetic vasoconstriction and impairment of baroreceptor reflex regulatory system.<sup>4</sup>

We conducted study to compare the effect of single induction dose of etomidate with single induction dose of propofol with regarding the changes of haemodynamic parameters such as a SBP,DBP,MAP,HR and SPO2 during and after the induction. The incidence of adverse effects such as myoclonus, nausea, vomiting are also compared.

### Material and Methods:

After obtaining institutional ethical committee approval,IEC No. "IEC/RESCH/03/2020" and informed written consent from patients this prospective, randomized, double blind study was conducted in 100 patients of ASA grade 3 and 4 posted for elective surgeries under general anaesthesia in the Department Of Anaesthesiology, Gujarat Adani Institute of Medical Sciences, BHUJ between April 2020-July 2021.

Based on below mentioned criteria patients were included in
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or excluded from the study.

# INCLUSION CRITERIA:

1. Patient with ASA grade 3 and 4.

2. Patient in age group of more than 60 years.

3. Patient posted for surgery under general anesthesia at GAIMS,Bhuj.

# EXCLUSION CRITERIA:

1.Patient refusal.

- 2. Patient allergic to any drug.
- 3. Patient with ASA grade 1 and 2.

Patients satisfying the above mentioned inclusion criteria were selected and counseled regarding the risks and benefits involved in the study. After obtaining due informed consent, 100 patients were included enrolled and analyzed in the study. They were divided into two groups of 50 in each group based on random number as group A and group B.

The patients in Group A given Inj. Propofol (2.5mg/kg of body weight) or till loss of eye reflex and the patients in Group B received Inj. Etomidate(0.3mg/kg of body weight) or till loss of eye reflex.

This study was designed as a prospective, comparative study. Patients were pre-operatively assessed on the previous day of surgery and screened for any associated medical illness like, major diseases in past, any eventful previous anaesthesia exposure or postoperative anaesthetic complications, drug allergy, family history, etc. Routine investigations were carried out and documented.Some specific investigation done in high risk patient. Patients were also assessed for vitals like temperature, pulse rate (PR), blood pressure (BP), and respiratory rate (RR). Respiratory System, cardiovascular System and Central Nervous System will be also assessed and any abnormality documented. Airway assessment will be done by malampatti gradation.

Procedures were explained in detail and written informed consent obtained. Preparation of patients included period of fasting for 6 hrs. Routine monitoring included ECG, Pulse-Oximetry, NIBP. Intravenous cannulation secured with 20G intravenous cannula in preoperative preparation room.

Premedication given with inj. Glycopyrrolate 4mcg/kg i.v, inj.ondasetrone 60mcg/kg i.v., inj.Midazolam 10mcg/kg i.v. Patient then were shifted to operation theatre and monitoring w i l l b e c o n t i n u e d a s E C G , P u l s e Oximetry,NIBP,ETCO2,RR,Temprature. After Preoxygenation for 5 minutes. Induction of anesthesia was done either with Propofol 2.5mg/kg or Etomidate 0.3mg/kg.loss of eye reflex was considered to be the end point. Myoclonic movements at induction, if occurred were recorded .Patient was intubated with appropriate sized cuffed oral endotracheal tube according to patient body weight after giving the intubating dose of Inj Succinylcholine (2mg/kg) I.VEndotracheal tube was secured after assuring equivalent bilateral breath entry by 5 point auscultatory method and positive pressure ventilation was initiated.

Anesthesia was maintained with oxygen and nitrous oxide (50:50), Isoflurane along with inj. Atracurium throughout the surgery. At the end of surgery, the residual neuromuscular block was reversed with Neostigmine (0.05 mg/kg) and Glycopyrrolate (0.008 mg/kg) I.V.Patient was extubated when patient was conscious, oriented, reflexes recovered, good muscle power, adequate respiration and with stable haemodynamics.

### METHOD OF COLLECTION OF DATA

100 patients were enrolled in the study who underwent elective surgeries under general anesthesia and had been assessed individually both intraoperatively and post-operatively.

The heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure and spo2 were monitored continuously and recorded before induction, at induction and laryngoscopy followed by 2nd, 5th, 10th,20th,30th lhour,6hour,12hour and 24hour after intubation.

Incidence and degree of pain of myoclonic movements recorded as

Grade 0=no myoclonic movements,

Grade 1=minor myoclonic movements, Grade 2=moderate myoclonic movements, Grade 3=major myoclonic movements.

### STATISTICAL ANALYSIS:

Descriptive statistics was done for all data and were reported in terms of mean values,SD and percentages. Suitable statistical tests of comparison were done.

Continuous variables were analyzed with the unpaired t test with usage of graph pad softwere.

Categorical variables were analyzed with the Chi-Square Test. Statistical significance was taken as P < 0.05. Statistically non significant was taken as p > 0.05.

### Results

Demographic data (Table 1) and vital parameters (Figure 1,2,3) were comparable between the two groups.

# Table 1: Comparison of the demographic data myconus grading and post oprative nausea vomiting between two groups

	Group A	Group B	P value
Age	70 ± 7.8	71 ± 6.3	0.4696.
Sex	27/23	26/24	0.8412
(male/female)			
Asa grade (3/4	26/24	27/23	0.8412
Weight	67 ± 6.9	68 ± 5.3	0.2358.
Myoclonus	50/0/0/0	10/27/10/3	<0.0001.
grading(0/1/2/3)			
Nausea/vomiting	10/12	12/11	0.6522.

P<0.05-statistically significant

### Figure 1: Comparison of Heart rate between two groups



# Figure 2: Comparison of systolic blood pressure between the two groups.



Figure 3: Comparison of diastolic blood pressure between the two groups.

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Figure 4: Comparison of mean blood pressure between the two groups



### Figure 5: comparison of spo2 between two groups

SPO2 LEVEL IN BOTH GROUP



### **Discussion:**

The induction of anesthesia can produce hemodynamic variation of mild to moderate degree depending upon many factors.

It was observed that Propofol (Group A) caused statistically significant hypotension and tachycardia at induction in comparison to Etomidate (Group B).Hypotension occurring with Propofol is mainly due to reduction of sympathetic activity causing vasodilation and by its effect directly on vascular smooth muscles.Sudden hypotension and tachycardia has deleterious effects on maintaining the circulation to vital organs in patients with coronary artery disease, Valvular stenosis, uncontrolled hypertension and shock.

On the other hand hemodynamic stability observed with Etomidate may be due to its unique lack of effect on the sympathetic nervous system and on baroreceptor function. Supriya Aggarwal, Vipin Kumar Goyal, Shashi Kala Chaturvedi, Vijay Mathur, Birbal Baj, Alok Kumar5studied etomidate was better agent for induction then the propofol in view of hemodynamic stability.

Etomidate does not have its limitation to normotensive patients for its hemodynamic peculiarity. In various studies, Etomidate has showed less cardiovascular depression and minimized the use of vasopressor agents than other induction agents in sepsis and critically ill patients. GOODING, JOHN M. DO\*; CORSSEN, GUENTER6 also conducted that etomidate have relatively stable cardiovascular response associated with administration of this new nonbarbiturate anesthesia induction agent.

In 2019, Rathore VS, Singh S et al, observed that decrease SBP, DBP and MAP after induction with propofol compare to etomidate and admixture of propofol and etomidate.<sup>7</sup>

In 2015, Shah SB, Chowdhury I et al observed that etomidate provide better hymodynamic stability compare to propofol for induction and intubation.<sup> $\circ$ </sup>

In 2018, Amit Kumar, Kamlesh Kanwar et al, conclude that etomidate was better agent for induction of anesthesia in hemodynamic unstable patient compare to propofol.9Single dose of etomidate can produce adrenalin insufficiency in post operative period.some study done for that. In 2008, Hildreth AN, Mejia VA, et al, observed that use of etomidate for RSI in trauma patients lid to chemical evidence of adrenocortical insufficiency and may have contributed to increased hospital and ICU lengths of stay and increased ventilator days.

In 2008,Cotton BA, Guillamondegui OD, Fleming SB, et al.observed that use of etomidate in severe injured person produce more adrenal insuffiency.<sup>11</sup>

In 2017, Du X, Zhou C, Pan L, Li C.observed that Dexmedetomidine can effectively prevent the incidence of etomidate-induced myoclonus and reduce the severity of etomidate-induced myoclonus.<sup>12</sup>

In 2007, Hüter, Lars MD; Schreiber, et al. Conclude that IV midazolam 0.015 mg/kg administered 90 s before induction of anesthesia with etomidate is effective in reducing myoclonic movements.<sup>13</sup>

In 2018, Wang, Jiang MB1; Li,et al.Studied that pretreatment with opioids before injecting etomidate was effective for preventing etomidate induced myoclonus and can reduce the intensity of myoclonus without any adverse effects.<sup>14</sup>

### **Conclusion:**

In conclusion, Etomidate was found ideal for its hemodynamic stability when compared to Propofol along with less incidence of pain on injection, the only drawback being high incidence of myoclonus.

The study suggests that Etomidate is a better option in patients particularly vulnerable to hemodynamic fluctuation during induction like uncontrolled hypertension, and patients with coronary artery disease.

This study showed significant p value in heart rate,SBP,DBP,MAP at induction,up to 30 minutes, pain on injection and incidence of myoclonus.

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