



## Observation Study To Compare The Effects of Etomidate and Propofol for Induction in General Anaesthesia in Patients With Cardiac Disease

### KEYWORDS

Hemodynamic parameters, pain on injection, myoclonus

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**ABSTRACT** Aim :To observe the effect of inj etomidate 0.3 mg/kg and inj propofol 2.5mg/kg during induction in patients with cardiac disease for non cardiac surgery in view of hemodynamic parameters, pain on injection, myoclonus and other side effects.

**Methods:** 60 Patients randomly divided in 2 groups, P and E, for propofol and etomidate 30 each of ASA III,IV. Premedicated with glycopyrrolate ,ondansetron and fentanyl.Induced with propofol or etomidate over 60 secs, maintained with O<sub>2</sub>, N<sub>2</sub>O, inhalation agent and muscle relaxant. Heart rate and blood pressure recorded at preinduction, 0secs, 60 secs, 80 secs,100secs and120 secs.Pain on injection and myoclonus compared according to grades assigned.

**Results:** Heart rate and blood pressure were more stable with less pain on injection with etomidate. Myoclonus was less with propofol.

**Conclusion:** Etomidate is hemodynamically stable with less pain on injection and high incidence of myoclonus than propofol.

### INTRODUCTION

Induction agents are drugs that, when given intravenously in an appropriate dose, cause a rapid loss of consciousness. Induction agents are used to induce anesthesia prior to other drugs being given to maintain anesthesia, as the sole drug for short procedures, to maintain anesthesia for longer procedures by intravenous infusion, to provide conscious sedation during procedures undergoing in local anesthesia and intensive care unit.

An ideal induction agent for general anesthesia should have hemodynamic stability, minimal respiratory side effects and rapid clearance. Presently Etomidate and Propofol are popular rapid acting inducing agents.<sup>1</sup>

Propofol, 2,6-diisopropylphenol is most popular induction agent with its favourable characteristics of rapid and smooth induction and recovery however, decreases blood pressure, cardiac output and systemic vascular resistance<sup>2,3</sup> due to inhibition of sympathetic vasoconstriction and impairment of baroreceptor reflex regulatory system<sup>1,4</sup>. This effect may be exaggerated in hypovolemic and elderly patients with compromised left ventricular function due to coronary artery disease. It produces dose dependent depression of ventilation.

Etomidate is a carboxylate imidazole-containing compound characterized by hemodynamic stability, minimal respiratory depression and cerebral protective effects<sup>1</sup>and does not trigger histamine release. Its lack of effect of sympathetic nervous system, baroreceptor reflex regulatory system<sup>1,5</sup> and its effect of increased coronary perfusion

even on patients with moderate cardiac dysfunction makes it an induction agent of choice.

However the adverse effects such as pain on injection, thrombophlebitis and myoclonus for both the agents have been corrected by premedicating with the fentanyl, an opioid<sup>6</sup>. This study is an attempt to compare hemodynamic parameters and other effects of both the drugs so that we can choose a safe induction agent in patients with the history of cardiac disease.

### AIMS AND OBJECTIVES

To compare the effect of inj etomidate 0.3 mg/kg & inj propofol 2.5mg/kg IV as an induction agent in patients with cardiac disease posted for non cardiac surgery in veiw of-

- Hemodynamic parameters.
- Incidence of pain on injection.
- Incidence of myoclonus.
- Other side effects and complication.

### MATERIAL AND METHODS

After permission and clearance from the ethical committee ,this study was conducted in Dhiraj general hospital in Department of Anesthesiology. We studied on 60 patients of Grade III and IV of American Society Of Anesthesiologist's (ASA) classification who were admitted for elective surgeries. The study was reterospetive in nature. All the patients participating in the study were explained clearly about the purpose and nature of the study in the language they could understand. They were included in the study

only after obtaining a written informed consent . A cross sectional analysis was made at the time of presentation. We collected the data for 1 year and analyzed the data statistically .

**Inclusion criteria:**

Patients between the age group of 20 and 60 years of both sex belonging to American society of anesthesiology grade III and IV undergoing elective surgery under general anaesthesia with cardiac disease, valvular heart disease, coronary artery disease.

Patients will be randomly divided into 2 groups of 30 each

- Group P(30 patients) induced with propofol 2.5mg/kg
- Group E(30 patients) induced with etomidate 0.3mg/kg

**Exclusion criteria:**

1. Patient refusal
2. American society of anaesthesiology grade I and II
3. Patients allergic to any drugs or egg products.
4. History of major neurological disease or advanced respiratory disease.
5. Presence of primary and secondary steroid deficiency or on steroid medication.

**PRE OPERATIVE CHECK UP**

A routine pre-operative examination of all the patients included in the study were assessed on the previous day of surgery as follows:

1. History of allergy to any medication, latex or egg.
2. General examination including mouth opening with complete airway assessment.
3. Weight.
4. Examination of CVS, CNS, RS and per abdomen
5. Complete Haemogram , Total and Differential count, RBS ,BT, CT ,URINE routine and Microscopic , RFT, ECG, Chest X-Ray, echocardiogram, HIV, HbSAg.

Selected patients were posted for surgery after complete cardiac workup and cardiologist review. They were kept nil by mouth for 8 hrs. Inform written consent were taken.

**PROCEDURE**

Patients were shifted to OT. An IV line was secured with 18 gauge vasofix, a slow infusion of lactated Ringer's solution was started. All resuscitation equipments were kept ready.

- Patients were connected to the monitors and the pre-induction systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), and oxygen saturation (SpO<sub>2</sub>) were recorded.

Patients were premedicated with inj.glycopyrrolate 0.2 mg iv ,inj ondansetron 4mg iv and inj.fentanyl 1mcg/kg iv ten minutes before induction and were randomized into two groups , P and E, for patients receiving propofol and etomidate respectively,after preoxygenating with 100% oxygen for 5 mins. Induction of anaesthesia was either with propofol 2.5 mg/kg or etomidate 0.3 mg /kg over 60 secs followed by inj succinylcholine 2mg/kg,then 100% oxygen was given through bag and mask and patient was intubated. Pain on injection and incidence of myoclonus were checked.

After confirming the proper positon of endotracheal tube, it was connected to anaesthesia machine. Patient was ven-

tilated with 50% O<sub>2</sub> and 50% N<sub>2</sub>O with inhalation agent and muscle relaxant.

At the end of the surgery,neuromuscular blockade was reversed by using intravenous neostigmine 0.05mg/kg and glycopyrrolate 8 mcg/kg. After adequate recovery of reflexes, proper suctioning was done and patient was extubated.

**Parameters monitored: The recordings was taken one minute before premedication, 0 secs , 60 secs , 80 secs, 100secs and 120 secs.**

- Heart rate.
- Blood pressure: systolic, diastolic and mean arterial pressure.
- Oxygen saturation
- Myoclonus was elicited while giving the agent in both groups according to the following grades.

**Severity of myoclonus was graded as follows**

0 = no myoclonus;

1 = minor myoclonus;

2 = moderate myoclonus;

3 = severe myoclonus.

Pain on injection was elicited in both groups using four-graded scale

0: no pain,

1: verbal complain of pain,

2: withdrawal of the arm,

3: both verbal complain and withdrawal of the arm

**RESULTS AND OBSERVATION DEMOGRAPHIC DATA**

	AGE	SEX	WEIGHT	ASA
GROUP P	34.1±9.02	15:15	59.4 ± 11.3	3.3 ± 0.48
GROUP E	35.3 ± 10.3	17:13	60.8 ± 13.9	3.3 ± 0.48
P VALUE	0.627[NS]		0.67[NS]	1[NS]

[table:1]

Samples are matched with p > 0.05. There was no significant difference in demographic data between the two groups.

**HEART RATE**

TIME	GROUP P	GROUP E	P VALUE
PRE INDUC-TION	74.1 ± 3.5	71.3 ± 2.25	0.10( NS)
0 sec	73 ± 4.12	76.43 ±3.35	0.05( NS)
60 sec	64.3 ± 4.47	80.3 ± 3.65	0.01(SS)
80 sec	69.1 ± 5.37	84.3 ± .4.22	0.01(SS)
100 sec	87.4 ± 5.4	74.8 ±7.22	0.01(SS)
120 sec	92.3 ±3.38	110± 6.01	0.0001(SS)

[ table:2 ]

Samples showed p<0.05 at 60 secs and 80 secs. There

was statistical significant difference in heart rate between the two groups.

**SYSTOLIC BLOOD PRESSURE**

TIME	GROUP P	GROUP E	P VALUE
PRE INDUC-TION	130.6 ± 3.27	118 ± 6.01	0.15 (NS)
0 sec	126 ± 4.47	116 ± 5.82	0.10(NS)
60 sec	119.8 ± 4.71	116.2 ± 5.46	0.04(SS)
80 sec	113.29 ± 5.57	117.06 ± 5.05	0.01(SS)
100 sec	112.2 ± 4.26	113.9 ± 9.18	0.4(NS)
120 sec	113.0 ± 2.76	112.06 ± 5.58	0.48(NS)

[ table:3]

Samples showed p<0.05 at 60 secs and 80 secs. There was statistical significant difference in systolic blood pressure between the two groups.

**DIASTOLIC BLOOD PRESSURE**

TIME	GROUP P	GROUP E	P VALUE
PRE INDUC-TION	68.1 ± 4.61	70.8 ±5.58	0.04 [SS]
0 sec	69.1 ± 4.47	70.8 ± 5.6	0.19[NS]
60 sec	68.13 ± 3.94	72.8 ± 5.4	0.0007[SS]
80 sec	66.06 ±7.01	71.2 ± 5.19	0.0001[SS]
100 sec	60.4 ± 6.36	67.2 ± 7.4	0.4[NS]
120 sec	67.8 ± 0.42	69.1 ± 1.81	0.29[NS]

[ table:4]

Samples showed p<0.05 at 60 secs and 80 secs. There was statistical significant difference in diastolic blood pressure between the two groups

**OXYGEN SATURATION**

TIME	GROUP P	GROUP E	P VALUE
PRE INDUC-TION	99.8 ± 0.3	100.3 ± 1.81	0.1[NS]
0 sec	99.9 ± 0.42	100.3 ± 7.3	0.214[NS]
60 sec	99.8 ± 0.45	98.8 ± 3.5	0.45[NS]
80 sec	99.8 ± 17.6	99.9 ± 0.6	0.44[NS]
100 sec	99.8 ± 17.8	99.9 ± 24.7	0.33[NS]
120 sec	99.9 ± 0.5	97.3 ± 0.47	0.42[NS]

[ table:5]

Samples are matched with p > 0.05. There was no significant difference in oxygen saturation data between the two groups

**INCIDENCE OF PAIN ON INJECTION**

GRADES	GROUP P(n=30)	GROUP E	P value
0	1 (3.3%)	10(33.3%)	0.0001
1	9(30%)	20(66.6%)	
2	18(60%)	0	
3	0	0	

[ table:6]

Samples showed p<0.05. There was statistical significant difference in incidence of pain on injection between the two groups.

**INCIDENCE OF MYOCLONUS**

GRADES	GROUP P(n=30)	GROUP E(n=30)	P VALUE
0	18 (60%)	0	0.0001
1	12 (40%)	14 (46.6%)	
2	0	16(53.3%)	
3	0	0	

[ table:7]

P VALUE: 0.0001[EXTREMELY SIGNIFICANT]  
 Samples showed p<0.05. There was statistical significant difference in incidence of pain on injection between the two groups.

**POST OPERATIVE COMPLICATIONS**

	GROUP P(n=30)	GROUP E(n=30)
NAUSEA	4(13.4%)	2(6.7%)
VOMITING	1(3.3%)	1(3.3%)
ALLERGIC REAC-TION	0	0

[ table:8]

**No significant difference in post operative complication between the two groups.**

**DISCUSSION**

In this study , dose 0.3 mg/kg etomidate had no myocardial depression with inj ondansetron 4 mg iv and inj fentanyl 1mcg/kg iv for premedication in all cases.

The salient properties of etomidate are like hemodynamic stability , minimal respiratory depression , and favourable pharmacokinetics enabling rapid recovery after a single dose. This makes etomidate an ideal induction agent specially for cardiac patients and small short term surgeries by Stolting Robert <sup>1</sup> et al and Reves JG <sup>7</sup> et al

There was no significant difference in demographic data between the two groups. Samples are matched with p > 0.05. <sup>1,2</sup> ( table 1)

As per our study, propofol causes sustained decrease in heart rate compared to etomidate with P value < 0.05 at 60 and 80 secs. Prys-roberts <sup>8</sup> reported that propofol resets the baroreflexes to allow slower hearts at lower arterial pressures. Hugo van aken et al <sup>3</sup> suggested, the combination of propofol and fentanyl, however,induced a

significant decrease in heart rate at beginning. Etomidate has minimal effects on heart rate, stroke volume, cardiac output and ventricular filling pressures as supported by Nahid Aghdaei et al.<sup>9</sup>

The dose of etomidate utilized by various studies ranges from 0.2 to 0.4mg/kg. Thomas J Ebert et al stated<sup>5</sup>, the doses at higher end of spectrum for etomidate may cause direct myocardial depression.

The hemodynamic effects of an induction dose of propofol and etomidate found that propofol was associated with significant decrease in SBP and DBP with p value < 0.05 at 60 and 80 secs. Fatma saricoaglu et al,<sup>10</sup> stated that hypotension in propofol is due to the negative inotropic effect. The hemodynamic stability seen with etomidate may be due to its unique effect of both sympathetic nervous system and baroreceptor function. Singh R et al.<sup>11</sup> suggested decrease in systemic blood pressure after inj propofol is dependent on both vasodilation with reduced preload and afterload and myocardial depression in patients with coronary artery disease and left ventricular function with decrease in 30-40% cardiac index.

Arterial pressure is minimally affected by etomidate. It may decrease by upto 20% in patients at cardiac risk by M.P Colvin et al.<sup>12</sup>

Thus Etomidate does not affect sympathetic activity or baroreflex function. It confers reliable hemodynamic stability in patients with or without cardiac disease. The myocardial oxygen supply demand ratio is maintained. Etomidate is safest agent for patients with significant hypovolemia or blood loss stated by Zindler M. et al.<sup>13</sup> and provide better safety during induction in patients at risk of cardiac disease by John M. et al,<sup>14</sup> with less cardiovascular depression than propofol.<sup>2</sup>

There was no significant difference in oxygen saturation data between the two groups.

#### Samples are matched with p > 0.05.

Use of propofol was associated with increased pain on injection than etomidate with p value 0.0001. Omid Azimaraghi, Yasaman Aghajani et al<sup>15</sup> stated that pre treatment with iv ondansetron significantly reduces the pain on injection of etomidate as ondansetron possesses antinoceptive properties.

Use of etomidate was associated with high incidence of myoclonus than propofol with p value 0.0001. Stockham RJ, Stanley TH, Pace NL<sup>16</sup> et al and R.carlos.<sup>6</sup> stated that pretreatment with iv fentanyl blunts the pharyngolaryngeal reflex on intubation and decrease the incidence of myoclonus associated with etomidate.

There was no significant difference in post operative complications between the two groups such as nausea, vomiting and other allergic reaction.

#### CONCLUSION

Etomidate is better for its hemodynamic stability over propofol along with less pain on injection. Only drawback was, high incidence of myoclonus. We therefore suggest that etomidate is a better option in patients prone to hemodynamic fluctuation at induction in patients with history of cardiac disease.

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