ORIGINAL RESEARCH PAPER

Volume-8 | Issue-8 | August - 2019 | PRINT ISSN No. 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

COMPARISON OF ETOMIDATE AND PROPOFOL AS INDUCTION AGENT IN G.A.

Anaesthesiology

Kanhaiya Lal Kishnani* Associate Professor Department of Anaesthesiology, Peoples College of Medical Sciences and Research Centre Bhanpur Bhopal *Corresponding Author

Shailesh Mishra Junior Resident Department of Anaesthesiology, Peoples College of Medical Sciences and Research Centre Bhanpur Bhopal

Sanjay. P. Dave Professor and HOD Department of Anaesthesiology, Peoples College of Medical Sciences and Research Centre Bhanpur Bhopal

ABSTRACT

Introduction: Presently Etomidate and Propofol are widely used as induction agents. Propofol has hemodynamic instability. The decrease in blood pressure, cardiac output and systemic vascular responses are not synchronized with patient compensatory responses. These are intensified in higher doses and more intense in hypovolumic and elderly patients.

Etomidate has hemodynamic stability. There is no significant effect on the peripheral and pulmonary vascular bed and on myocardium. The possibility of aspiration with Etomidate is more due its side effect of nausea and vomiting.

Material and Methods: Total 100 patients of ASA Grade I and II between age of 30 and 65 years undergoing surgery under general anaesthesia were studied. Patients were divided into 2 groups of 50 patients each. Etomidate group (n=50): received Inj. Etomidate 0.3 mg/kg intravenously. Propofol group (n=50): received Inj. Propofol 2.0 mg/kg intravenously.

Results: Propofol produced decrease in arterial pressure at 1 to 3 minutes after induction which failed to come to baseline reading after laryngoscopy and intubation while Etomidate produced less fall just after induction and showed slight rise after laryngoscpy. The heart rate changes were almost similar in both the groups. The incidence of pain at injection site was more in Propofol group. There was high incidence of Myoclonus in Etomidate group.

Conclusion: In present study we find that Propofol causes decrease in arterial pressure at induction which fails to return to baseline after laryngoscopy and intubation while Etomidate produces less degree of fall with slight rise after laryngoscpy. There is no difference in heart rate changes in both groups. The incidence of pain was more in Propofol group than in Etomidate group. There was a higher incidence of Myoclonus in Etomidate group; this was not observed in Propofol group.

KEYWORDS

Etomidate, Propofol, Induction agents

INTRODUCTION

The ideal induction agent should have the property of smooth onset of anaesthesia, minimal or no respiratory depression, stable hemodynamic status of patient, minimal stress response of patient to laryngoscopy and intubation and rapid clearance. Unfortunately no presently available drug fits completely in this criterion. However Etomidate and Propofol are very near to these requirements. These are very popular and are widely used induction agents.

Dreaded side effect of Propofol is hemodynamic instability. Propofol decreases blood pressure, cardiac output and systemic vascular resistance due to inhibition of sympathetic vasoconstriction and impairment of baro-receptor reflex. This decrease is not synchronized with patient compensatory responses and is intensified with higher dose and increased speed of injection of drug. The decrease is more intense in hypovolumic and elderly patients. Pain at the site of injection is another drawback with Propofol. The pain is reduced in intensity by adding Lignocaine to Propofol solution but still the incidence is unacceptably high.

The Etomidate has advantage of hemodynamic stability. Stability of cardiovascular function indicates lack of its effect on sympathetic nervous system and baroreceptor reflex regulatory system. There is no significant effect on the peripheral and pulmonary vascular bed and also on myocardium.

With this advantage Etomidate is considered more suitable in patients having cardio-vascular disease and having reduced left ventricular function. Etomidate is also preferred in patients with raised intracranial pressure, respiratory airway diseases and patients in shock. The chances of aspiration appear more due to its side effect of nausea and vomiting. The epileptic patients may have focal epileptogenic activity due to its myoclonic activity. This activity can be decreased by use benzodiazepines, Magnesium sulphate, opioids and rocuronium. It is known to cause reduction of cortisol level by inhibition of 11-betahydroxylase enzyme. This reduction may last up to 24 hours after single dose; hence adequate precautions are to be observed.

Aim of this study was to compare the induction characteristics, hemodynamic effects and side effects of these two drugs

MATERIAL AND METHODS

After approval of Institutional Ethics committee and written informed consent from patients were obtained; we studied 100 patients of ASA status I and II, between the age group of 30 to 65 years of age who were planned to undergo elective surgery under General Anaesthesia.

Patients were divided into 2 groups of 50 patients each. The drugs were prepared by separate Anaesthesiologist and were given by separate Anaesthesiologist not involved in study.

Etomidate group (n=50): received Inj. Etomidate 0.3 mg/kg intravenously and Propofol group (n=50): received Inj. Propofol 2.0 mg/kg intravenously.

Exclusion Criteria: Patients with known allergy to any of the drugs used in the study, history of soya bean / egg allergy, patients with significant cardiac, respiratory, hepatic or renal dysfunction, anticipated difficult airway, hypotension, history of seizure disorder, presence of primary and secondary steroid deficiency or on steroid medication, were excluded.

After complete pre-anaesthetic assessment, the procedure was explained to the patients and written informed consent was taken before surgery. The patients of both the groups were preloaded with intravenous 15 ml/Kg body weight Ringer Lactate solution before induction of anaesthesia. Premedication with Inj. Glycopyrrolate 0.2mg intravenous + Inj. Fentanyl 1micro-gm/kg intravenous was given 15 minute before induction of anaesthesia. The patients were monitored for ECG, peripheral oxygen saturation (SPO_2) and non-invasive arterial blood pressure (NIBP) when they arrive in operating room and these parameters were recorded.

All patients were pre-oxygenated for 3 minutes with 100% oxygen. Patients were induced either with Inj. Etomidate or Inj. Propofol. Appropriate size endotracheal tube was inserted after giving Inj.

Succinylcholine 1-1.5mg/kg.

In both the groups, pain, myoclonus and hemodynamic parameters (heart rate, systolic blood pressure, diastolic blood pressure, mean arterial blood pressure , oxygen saturation i.e. SpO2 were recorded at baseline (T0) and then at T1 to T6 as below, where-
T0= baseline (on arrival in O.T.)
T1= at the time of induction
T2= 1 min post-induction
T3= 3 min post- induction
T4= 1 min after laryngoscopy
T5= 3 min post – intubation
T6 = 5 min post-intubation

Parameters were monitored at every 5 minute intervals for first 20 minutes after intubation and then at every 15 minutes in intra-operative period until the end of surgery. Vital signs were recorded every 20 minutes in the Post Anaesthesia Care recovery room.

Maintenance of anaesthesia was done with Oxygen (O2), Nitrous oxide (N2O) in 1:1 ratio, Isoflurane and Vecuronium 0.06mg/kg bolus followed by 0.02 mg/kg as per need with controlled ventilation.

After completion of surgical procedure, reversal of residual neuromuscular blockage was achieved with Inj. Neostigmine (40 micro-gm/kg) and Inj. Glycopyrrolate (6 micro-gm/kg) and patients were extubated. Patients were observed for 2 hours in recovery room for any post operative signs and symptoms like nausea, vomiting, hypotension, bradycardia, respiratory depression, agitation and arrhythmias etc. The treatment if required was given.

The pain assessment was done by VAS scoring from 0 to 10 scale, where "No pain" at 0 and "worst pain" at 10 at other end of scale. The patients were briefed about this assessment in the beginning. The patients were asked to mark the intensity on scale where pain lies.
The patients were observed for appearance of Myoclonus. The intensity of Myoclonus was graded as: -

Grade 0= No myoclonus
Grade 1= Mild Myoclonus (Movements at fingers or wrist only)
Grade 2= Moderate Myoclonus (Movements involving face and legs)
Grade 3= Severe Myoclonus (Generalised response/Movements in more than one extremity)

RESULTS

Both the groups were comparable in demographic characteristics; the baseline hemodynamic characteristics were also similar. We observed the sharp fall in arterial blood pressure in Propofol group as compared to Etomidate group. The return to base line reading was not achieved in Propofol group after laryngoscopy and intubation, while we observed rise in Etomidate group.

Myoclonus was mild in 20% patients, moderate in 6% and it was severe in 2% of Etomidate group. No myoclonus was observed in any patient of Propofol group in our study

Pain at the site of injection was observed in both the groups. It was mild in 28% of patients in Propofol group while it was in 10% of patients in Etomidate group. It was of moderate variety in 8% of patients in Propofol group and nil in Etomidate group. It was of severe variety in 2% of patients in Propofol group and no patient in Etomidate group complained of pain of this degree in Etomidate group. The overall incidence of pain was 38 % in Propofol group.

Table 1: Demographic characteristics

	Etomidate Group		Propofol Group	
	Mean	**± SD**	***Mean***	**± SD**
Age (yrs)	45.40	4.3	45.24	5.24
Sex (male: female)	22:28		20:30	
Weight (Kgs)	60.06	10.14	62.14	10.08
ASA Grade (I:II)	33:17		28:22	

Table 2: Comparison of Mean Heart Rate in Etomidate and Propofol Groups

Mean Heart rate at	Etomidate Group(Rate/Min)		Propofol Group (Rate/Min)	
	Mean	**± SD**	**Mean**	**± SD**
Base line (T0)	88.22	7.50	88.12	9.24
At the time of induction (T 1)	86.10	10.50	85.00	12.34
1 min post-induction (T2)	88.52	12.40	86.32	14.02
3 min post- induction(T3)	82.04	9.22	80.48	10.24
1 min After laryngoscopy (T4)	98.20	8.08	98.40	9.08
3 min post- intubation (T5)	93.00	8.06	92.00	12.10
5 min post- intubation (T6)	90.42	8.20	84.30	12.92

Table 3: Comparison of Mean Arterial Pressure in Etomidate and Propofol Groups

Mean Arterial Pressure at	Etomidate group		Propofol group	
	Mean	**± SD**	**Mean**	**± SD**
Base line (T0)	95.68	9.68	98.22	8.28
At the time of induction (T1)	96.28	9.20	97.83	9.12
1 min post-induction (T2)	94.96	8.56	81.62	8.45
3 min post- induction (T3)	2.52	8.66	79.45	8.08
After laryngoscopy (T4)	100.20	8.44	80.52	8.50
3 min post- intubation (T5)	95.18	8.46	82.54	8.26
5 min post- intubation (T6)	96.20	7.66	84.62	8.28

Table 4: Incidence of Myoclonus between Etomidate and Propofol Groups.

	Mild		**Moderate**		**Severe**	
Group	Number of Patients	%	Number of Patients	%	Number of Patients	%
Etomidate Group	10	20	3	6	1	2
Propofol Group	0		0		0	

Table 5: Incidence of Pain in Etomidate and Propofol Groups

	Mild (<3)		**Moderate (3-6)**		**Severe (>6)**	
Group	Number of Patients	%	Number of Patients	%	Number of Patients	%
Etomidate Group	5	10	Nil	0	Nil	0
Propofol Group	14	28	4	8	1	2

DISCUSSION

Induction agent should have the property of rapid and smooth onset of anaesthesia, minimal or no respiratory depression, hemodynamic stability, minimal laryngoscopy and intubation stress response of patient and rapid clearance from system with absence of side effects. No drug fulfils the entire criteria of expectations due to its own pharmacological effects. The search for ideal drug for induction is still going on.

The dreaded side effect of Propofol is hemodynamic instability which is not synchronized with compensatory patient responses. It is intensified by higher dose and speed of injection; moreover this is more intense in hypovolumic and elderly patients. The pain at injection site is another drawback.

Etomidate has side effect of Myoclonus.

The present study was conducted to compare hemodynamic parameters of Propofol and Etomidate and pain at injection site.

In our study the variable demographic characteristics like age, sex, weight, gender ratio and ASA grade were similar in both the groups.

The changes in the heart rate in comparison to base line were similar in both groups. Similar findings were observed in study conducted by Siedy J. et al [1], Ghafoor et al [2] and Kaur et al [3]. There was unacceptably high rise in heart rate in Etomidate patients in the study done by Ulsamer et al [4] and Moffet et al [5]. While Shah et al [6] reported sustained rise in heart rate in patients induced with Propofol.

Hypotension induced by Propofol is due to vasodilatation by reduction in sympathetic drive, direct effect on intracellular calcium mobilisation and reduction of prostaglandin synthesis.

Etomidate does not affect sympathetic system and baroreceptor function. It has capacity to bind and stimulate peripheral alpha 2-b adrenergic receptors leading to vasoconstriction. This is the reason of

hemodynamic stability.

In present study there was more decrease in blood pressure (Systolic, diastolic and mean) in Propofol group than in Etomidate group at various time intervals indicating better hemodynamic stability with Etomidate. These findings of our study are similar to the findings observed by Siedy J et al [1],Kaur et al [3], Shah et al [6], Masoudifar and Beheshtian [7], Agarwal et al [8], , Kaushal et al [9] Ebert TJ et al [10] Saricaoglu F [11] and Pandey A [12].

In our study the incidence of Myoclonus was higher in Etomidate group than in Propofol group. The findings are similar to previous studies by Kaur et al [3], Agarwal S [8], Nyman Y et al [14], Ma Y-H et al [15]. The Myclonus was observed in 28% of patients in Etomidate group in our study while no such sign was observed in Propofol group. Previous studies have shown reduction of myoclonus with premedication with opioids as concluded in studies by Isitemiz I et al [16] and EbruKelsaka et al [17]. It also shows reduction with premedication with Midazolam.

Pain at the site of injection was reported more by patients in Propofol group in awake stage. The incidence of pain was 10 % in Etomidate and 38 % in Propofol group. Injection of Lignocaine prior to injecting Propofol or mixing of lignocaine with propofol has been practised to reduce or alleviate pain at the injection site of Propofol. The incidence of pain was also lower in studies performed by Sowinski et al [18] and Kaur et al [3] in Etomidate group.

Although incidence of nausea and vomiting is reported higher in Etomidate in previous studies, we did not find any significant nausea and vomiting in our both groups.

We did not find any other complication in both the groups.

CONCLUSION

In conclusion, results derived from present study suggest that Propofol causes decrease in arterial pressure at 1 to 3 minutes after induction which failed to come to baseline reading after laryngoscopy and intubation while Etomidate produced less decrease of fall just after induction and shown slight rise after laryngoscpy. The heart rate changes were almost similar in both the groups. The incidence of pain at injection site was more in Propofol group than in Etomidate group. There was a high incidence of Myoclonus in Etomidate group while this was not reported in Propofol group.

We conclude with these characteristics, Etomidate is better than Propofol as an induction agent in terms of hemodynamic stability.

REFERENCES

1. Siedy J, Knapik P, Saucha W, GrossM. Comparison of propofol and etomidate anaesthesia for elective electrical cardioversion. Kardiol Pol 2010; 68:1249-55Ulsamer B, Raps M. Induction of anesthesia using propofol in comparison with etomidate. Anaesthesist.1988;37(8):517–521
2. H. Ghafoor, G. Afshan and R. Kamal, "General Anesthesia with Laryngeal Mask Airway: EtomidateVS Propofol for Hemodynamic Stability," Open Journal of Anesthesiology, Vol. 2 No. 4, 2012, pp. 161-165. doi
3. Kaur S, Kataria AP, Kaur G, Kaur M, Attri JP, Mohan B. Comparison of induction characeristics of propofol lipuro and Etomidate lipuro in cardiac patients in non cardiac surgery. Int J Sci Study 2014;2(6): 66-72.
4. Ulsamer B, Raps M. Induction of anesthesia using propofol in comparison with etomidate. Anaesthesist.1988;37(8):517–521
5. Moffat A, Cullen PM. Comparison of two standard techniques of general anaesthesia for day care cataract surgery. Br J Anaesth 1995; 74: 145–8
6. Shah S, Chowdhury I, Bhargava A et al. Comaparison of hemodynamic effects of intravenous etomidate versus propofol during induction and intubation using entropy guided hypnosis levels J AnaesthesiolClin Pharmacol 2015: 31 (2) 180-185.
7. Masoudifar M, Beheshtian E. Comparison of cardiovascular response to laryngoscopy and tracheal intubation after induction of anaesthesia by Propofol and Etomidate. J Res Med Sci. 2013;
8. Aggarwal S, Goyal VK, Chaturvedi SK, Mathur V, Baj B, Kumar A. A comparative study between propofol and etomidate in patients under general anesthesia. Braz J Anesthesiol 2016; 66: 237-41.
9. Kaushal RP, Vatal A , Pathak R. Effect of etomidate and propofol induction on haemodynamic and endocrine response in patients undergoing coronary artery bypass grafting/ mitral valve and aortic valve replacement surgery on cardiopulmonary bypass. Annals Cardiac Anaesth 2015; 18:172-77
10. Ebert TJ, Muzi M, Berens R, et al. Sympathetic responses to induction of anesthesia in humans with propofol or etomidate. Anesthesiology 1992;76:725-733.
11. Ebert TJ, Muzi M, Berens R, et al. Sympathetic responses to induction of anesthesia in humans with propofol or etomidate. Anesthesiology 1992;76:725-733.
12. Pandey A, Makhija N, Chauhan S, Das S, Kiran U, Bisoi A, Lakshmy R. The Effects of Etomidate and Propofol Induction on Haemodynamic and Endocrine response in Patients undergoing Coronary Artery Bypass Graft Surgery on Cardiopulmonary bypass. World J Cardiovas Surg, 2012; 2(3) : 48-52.
13. Nyman Y, Hoften KV, Palm C, Eksborgs, Lonnqvist PA. Etomidate-RLipuro is associated with considerably less injection pain in children compared with propofol with added Lidocaine. Br J. Anaesth 2006; 97(4):536-9.
14. Ma Y-H, Li Y-W, Ma L, Cao C-H, Liu X-D. Anesthesia for stem cell transplantation in autistic children: A prospective, randomized, double-blind comparison of propofol and etomidate following sevoflurane inhalation. Experimental and Therapeutic Medicine. 2015;9(3):1035-1039.
15. Isitemiz I, Uzman S, Toptas M, et al. Prevention of etomidate induced myoclonus : which is superior : fentanyl, midazolam or a combination ? A reprospective comparative study. Med Sci Monit 2014; 20:262-67.
16. EbruKelsaka, Deniz Kara kaya, Binnur Sarihasan et al. Remifentanil pretreatment reduces myoclonus after etomidate. Journal of clinical anesthesia 2006;18:83-86.
17. Sowinski P, Symonides M, Jarosz J, Lukaszenska A, Pawlowisch M. Less apnoea with etomidate ipuro than with propofol (with a titrated dose regimen) in outpatient anaesthesia. Eur J Anaesthesiology 2000;17:14