Original Research Article

A comparative study of hemodynamic responses during short urological procedures between etomidate lipuro (0.2%) and propofol (1%)

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Abstract

Background: This prospective randomized clinical study was conducted to compare propofol and etomidate for their effect on hemodynamic and various adverse effects on patients scheduled for short urological procedures. **Methods:** 80 patients of ASA I and II of age group 20-60 years scheduled for short urological procedures were randomly assigned in two groups (n=40) receiving etomidate (0.3 mg/kg) in group E and propofol (2.0 mg/kg) in group P as an induction agent. Hemodynamic parameters were recorded at various time intervals. Any adverse effect pain on injection, myoclonus and respiratory depression were carefully watched. **Results:** Systemic BP, DBP and MBP were significantly decreased in propofol group at 1,2,3,4,and 5th minuet than the etomidate group. HR was significantly decreased from its baseline value in propofol group than the etomidate group. There was significant difference in the side effect of incidence of respiratory depression and pain on injection between groups (p value <0.05). There was increase incidence of myoclonus, nausea, vomiting and cough/ hiccough in etomidate group than the propofol group. **Conclusions:** We have concluded that 0.2% of Etomidate Lipuro in the dose of 0.3mg/kg body weight is more safe for short urological procedures than propofol.
Keywords: Etomidate, Propofol, Induction agent, Hemodynamic changes

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INTRODUCTION

Induction agents are frequently associated with changes in heart rate and blood pressure and various adverse effects. Since the introduction of general anaesthesia, no ideal induction agent has yet been discovered in term of providing a stable hemodynamic with fewer adverse effects. Propofol is an ultra-short-acting sedative-hypnotic agent with its favorable characteristics of smooth induction and rapid recovery are the reasons for using this drug more commonly[1]. Inducing anaesthesia with Propofol (2- 2.5 mg/kg) cause hypotension in all the patients regardless of any underlying conditions is due to the reduction of heart's preload and after load[2,3]. While other major drawbacks of propofol are pain on injection and dose dependent depression of ventilation[4]. Etomidate, a carboxylated imidazole is characterized by hemodynamic stability, minimal respiratory depression and commonly used for induction and maintenance of anesthesia and induction agent of choice in patients with moderate cardiac dysfunction due to its lack of effect on sympathetic nervous system.[1,5] However some adverse effects of etomidate are myoclonus, pain on injection and suppression of steroid production by reversible inhibition of 11-beta-hydroxylase enzyme[6,7] Present prospective

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randomized study was done to compare propofol and etomidate for their effect on hemodynamic parameters such as change in blood pressure and heart rate were taken as the primary outcome variables and and pain on injection, myoclonus and respiratory depression as a secondary outcome variables during the short urological procedures.

METHODS

This prospective randomized controlled study was conducted in the Department of Anaesthesia, Dr. S. N. Medical College and associated group of hospitals. In this study 80 healthy patients of age between 20-60 years and ASA Grade I and II scheduled for short urological procedures were included. After taking written informed consent from patients and permission from ethical committee of college, they divided randomly into two groups, each group comprising of 40 patients

Sample size calculated α level 0.05, β 0.2 and study power of 80% assuming standard deviation of residual four induction time to loss of consciousness of 30 minutes and minimum different to be detected of 20min. Sample size thus obtained come to 40 patients in each group.

A) Inclusion criteria for patients: Patients of either sex, Age between 20 and 60 years, Body weight 30 to 80 kg, Patient belonging to ASA grade I and II, Patient undergoing short urological procedure (< 30 minutes), Patients receiving no narcotics or sedative drugs before the anaesthesia, Hemodynamically stable before the anaesthesia.

B) Exclusion criteria for patients: Patient refusal to participate in the study, Uncooperative patient, H/o convulsions, allergy to the drug used, bleeding disorders, severe neurological deficit., Patient with h/o respiratory, cardiac, hepatic or renal disease., ASA Grade III, IV patients, Surgery duration more than 30 minutes.

Patients were randomly divided into two groups each of 40 persons by randomly both groups received premedication of Midazolam (0.02mg/kg) and Fentanyl (2µg/kg). Speed of injection was 30 seconds.

Group I was given 0.3mg/kg body weight of etomidate IV.

Group II was given 2.0 mg/kg body weight of propofol IV.

Maintenance of anaesthesia was achieved with 100% oxygen (6-8 Lit/Min) and sevofluarane (2% mac) through spontaneous ventilation with tight fitting face mask breathing system by bain circuit.

Systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial blood pressure (MAP) and heart rate (HR) were recorded as baseline values. The patients SBP, DBP, MAP and HR parameters were measured one minute before premedication and after induction every minute for first five minutes and at 10 minutes.

Procedure

Patients were kept fasting, consent, PAC was checked and intravenous access was secured using an 18/20 G cannula. All monitoring equipments were attached (NIBP, pulse oximetry, ECG). Preloading of Inj. Ringer lactate 10ml/kg was given before the surgery and 2ml/kg/hr was given during procedure. Pre-operative vitals were recorded. The patients were preoxygenated with 100% 02 for at least 3 minutes with oxygen at flow rate of 6-8 L/min on Bain circuit. Both groups of patients received premedication fentanyl (2µg/kg) and midazolam (0.02 mg/kg) IV before the induction with either etomidate or propofol. Thereafter group I received intravenous etomidate in the doses of 0.3 mg/kg of body weight while group II patients received intravenous propofol in the doses of 2 mg/kg body weight over 30 seconds. If Patients who were not anaesthetized with the mention doses were injected with higher doses of drugs, but were excluded from the study.

Patients was observed visually for myoclonus, and when present, myoclonus severity will be graded according to following grading scale (Fatma Saricaoglu *et al* study 2011 study)[8]

0 = no myoclonus

1 =mild myoclonus [short movement of body segment e.g. finger or shoulder]

2 = Moderate myoclonus (slight movement of two different muscles or muscle groups of the body)

3 = Severe myoclonus (intense clonic movements in two or more muscle groups of the body e.g. fast abduction of a limb)

Pain was measured by using four grading scale (Nyman Y *et al* study 2006)[9]

0= no pain

1= verbal complain of pain

2= withdrawal of arm

3= both verbal complain and withdrawal of arm

STATISTICAL ANALYSIS METHOD

Repeated measure ANOVA and student T test for hemodynamic changes and to analyzed difference between induction and time to loss of consciousness. Proportion of side effect was analyzed with the help of Fisher Exact Test / CHI ¬Square. P-value less than 0.05 is considered significant.

RESULTS

Table 1: Demographic profile

Demographic profile	Group(E) (n=40)	Group(P) (n=40)	P Value
Mean age (years)	37.5 ± 13.37	38.9 ± 13.58	>0.05
Mean Weight (Kg)	64.5 ± 9.2	60.8 ± 8.6	>0.05

Table-1, shows that there was no significant difference of the mean age and mean body weight between etomidate and propofol group. (p value > 0.05)

Table-2: Comparison of hemodynaemic parameters

Time And group	HR Etomidate	Propofol	P value(b/w groups)	SBP Etomidate	Propofol	P value(b/w groups)	DBP Etomidate	Propofol	P value(b/w groups)	MAP Etomidate	Propofol	P value(b/w groups)
Baseline	89.2±9.9	86.6±11.1	.2695	129.8±12.7	130.3±10	0.8301	87.5±5.1	85.1±7	0.087	103.1±7.4	100.1±7.3	0.0803
1 min	91±13.3	78.5±10.12	0.0001	126.9±13.1	123.15±8.89	0.1381	86.4±6.6	81.7±7.3	0.0034	99.2±5.1	96.6±7.5	0.073
2 min	86.3±10.1	75.7±10.5	0.0001	125.8±10.5	115.3±11.2	0.0001	85.2±5.3	76.7±7.1	0.0001	98.7±12.2	88.7±7.7	0.0001
3 min	87.3±10.1	71.8±10	0.0001	126.8±10.8	106.6±11.4	0.0001	86.2±5.1	70.9±6.8	0.0001	99.7±8.1	82.8±7.7	0.0001
4 min	89.2±9.8	69±9.3	0.0001	128.7±10.8	100.6±11.2	0.0001	80±4.9	67.3±6.5	0.0001	101.6±5.2	78.4±7.6	0.0001
5 min	89.4±9.5	69.5±8.3	0.0001	128.8±10.7	102.3±8.2	0.0001	88.3±5	69.9±5.6	0.0001	101±5.2	80.7±5.5	0.0001
10 min	86.4±11.4	73.9±9	0.0001	116.3±12.5	106.1±7.6	0.0001	78±5.2	74.8±6.5	0.0173	90.8±6.6	82.5±5.8	0.0001

Table- 3: Incidence of myoclonus and pain on injection site

Myoclonus Grade	Etomidate	Propofol	P value
0	37	40	
1	1	0	
2	2	0	0.2460
3	0	0	
Total	**40**	**40**	

This table shows the Myoclonus present in 3 patients out of 40 patients in etomidate group and absent in all patients in propofol group and p value between groups is (0.2460) which is insignificant.

Table-4: Incidence of Pain on Injection

Pain scoring	Etomidate	Propofol
0	38	30
1	1	6
2	1	3
3	0	1
	40	40

Incidence of pain on injection present in 2 patients out of 40 patients of etomidate group and 10 patients out of 40 patients in propofol group and P value (0.025) is significant

Table-5: Incidence of Respiratory Depression in both groups

	Etomidate	Propofol
Present	12	27
Absent	28	13
Total	**40**	**40**

Incidence of apnoea present in 12 patients out of 40 patients of etomidate group and 27 patients out of 40 patients in propofol group and P value (0.0007) is significant.

DISCUSSION

Anaesthesia induced hemodynamic fluctuations are a matter of concern for anesthesiologists. The main aim of the present study was to confirm the hemodynamic profile of propofol and etomidate and their adverse effects such as pain on injection and myoclonus, respiratory depression etc. in patients undergoing short urological procedures. Haemodynamic instability of various degrees depending upon many factors like age, gender, body weight, dose and cardiac output. Table-1, shows there was no significant difference of the mean age and mean body weight between etomidate and propofol group (p value > 0.05). There was no significant difference in heart rate from baseline heart rate in etomidate group (p value >0.05) but in propofol group, there was significant difference in heart rate from baseline heart rate (p value <0.05). Masoudifar M, Beheshtian E *et al*. who did Comparison of cardiovascular response to laryngoscopy and tracheal intubation after induction of anaesthesia by propofol and etomidate and found that there was no significant difference among groups in terms of heart rate (P>0.05)[10]. There was no significant difference in systolic blood pressure in etomidate group (p value >0.05) but in propofol group there was significant difference in systolic blood pressure (p value <0.05). there was significant difference in systolic blood pressure between groups (P value < 0.05). Song JC, Lu ZJ, *et al* compared etomidate with propofol anaesthesia during ERCP and concluded that average percent change to baseline in MBP was 8.4±7.8 and 14.4±9.4 (P = 0.002) decreased significantly in propofol group compared to etomidate group (P< 0.05)[11]. In a study by Möller *et al* who used propofol and etomidate in anaesthesia induction accompanied by BIS monitoring, the MAP, cardiac index (CI) and systemic vascular resistance index (SVRI) values were compared and found that propofol significantly reduced the MAP and delayed and inhibit the sympatho-excitation[12]. Aono H *et al* compared sympathetic nerve activity and baroreflex sensitivity in thiopental, propofol and etomidate groups. They observed patient who received propofol have more hypotension due to reduce sympathetic activity which caused vasodilatation of vascular smooth muscles whereas hemo-dynamic stability seen with etomidate is due to its lack of effect on the sympathetic nervous system and on baroreceptor functions[13]. Ray DC, *et al*. observed hemodynamic stability of etomidate group not only limited to normotensive patients and also had less cardiovascular depression and minimize use of vasopressor agents than other induction agent in critically ill patients[14]. Doenicke AW, Roizen MF *et al* has been reported incidence of myoclonus in 50 to 80 percent patients who did not receive any premedication with etomidate[15]. Ebru Kelsaka *et al* observed myoclonus in 2 vs. 30 patients with propofol and etomidate group and concluded that incidence of myoclonus can be reduced to about 8 to 40 percent by using opoids like fentanyl, remifentanil as pre-medication with etomidate[16]. In present study myoclonus present in 3 patients out of 40 patients in etomidate group and absent in all patients in propofol group and p value between groups is (0.2460) which is insignificant. Pain on Injection is a bad experience for patient and significant clinical problem with propofol and etomidate use. Incidence of pain on injection present in 2 patients out of 40 patients of etomidate group and 10 patients out of 40 patients in propofol group and P value (0.025) is significant (Table-4). pain on injection can be reduced by pretreatment with lidocaine and new (medium chain triglyceride and soya bean) emulsion formulation. M. Mayer *et al* compared propofol and etomidate lipuro as induction agent and found that pain on injection was significantly more with propofol[17]. As per Table-5, Incidence of apnoea present in 12 patients out of 40 patients of etomidate group and 27 patients out of 40 patients in propofol group and P value (0.0007) is significant. Hosseinzadeh *et al* 16 found that the duration of apnoea in etomidate group was a (8.67 ± 6) minute, where as it was (18.1 ± 6.25) longer in propofol group[18]. Toklu *et al* observed that mean respiratory rate in the propofol-remifentanil group was lower than etomidate-remifentanil group (P <0.05). The incidence of respiratory depression was significantly lower in the etomidate group (P < 0.001)[19].

CONCLUSION

Anaesthesia induced hemodynamic fluctuations are a matter of concern for anaesthesiologists. Propofol and etomidate are most frequently used intravenous induction agents with similar onset and duration of action and to some extent different adverse effects. This assumption has been confirmed by results of our study which showed that etomidate is a safe, effective induction agent, could be preferred over propofol in terms of superior hemodynamic stability, causes minimal respiratory depression and less pain on injection for patients undergoing short urologic procedures.

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