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PROSPECTIVE ANALYTICAL OBSERVATIONAL STUDY OF HAEMODYNAMIC STABILITY OF INJECTION ETOMIDATE AND INJECTION PROPOFOL FOR INDUCTION OF GENERAL ANAESTHESIA IN ELECTIVE SURGERIES

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ABSTRACT

Introduction: Etomidate produces dependable, fast onset of anaesthesia and is perceived as having a favourable haemodynamic profile, making it a commonplace preference for patients vulnerable to hypotension, or wherein hypotension is undesirable. This study was conducted to evaluate the effect of injection Etomidate and injection Propofol on haemodynamics during and after induction of general anaesthesia. **Methods:** After taking approval from institutional ethics committee and written informed consent from all patients, 70 ASA I-II class patients, 18-85 years old, both male and female posted for elective surgeries were included in the study. Standard noninvasive monitors were attached. Inj glycopyrolate 4mcg/kg iv, inj midazolam 0.02mg/kg iv and inj pantazocine 0.3mg/kg iv. were given. Preoxygenation was done for 3 min and patients were randomly divided into group E induced with injection Etomidate(0.3mg/kg) iv and group P induced with injection Propofol (2mg/kg) iv. After loss of eyelash reflex, inj succinylcholine 1.5mg/kg was given iv and intubation done after 60 secs. Heart rate(HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial blood pressure (MAP) were recorded at baseline, 0min(intubation), 1min, 2min, 3min, 5min, and 10min and changes were compared in both the groups. Percentage increase or decrease was calculated by (Baseline value – Values at specific intervals)*100/ Baseline value.Chi-square test was used as test of significance for qualitative data.Independent t test was used as test of significance for quantitative variables. P value of <0.05 was considered as statistically significant. **Results:** The mean HR, percentage increase of HR was significantly higher in group P from 0-10min. The mean SBP, DBP and MAP were significantly lower in P at 5 to 10 min, 3 to 10min and 3 to10 min after intubation respectively and the mean percentage change in SBP, DBP and MAP was significantly lower in P from 3 to 10 min, 2 to 10min and 2 to 10 min respectively indicating significant hypotension in this group. **Conclusion:** Injection Propofol at 2mg/kg iv caused significant hypotension and tachycardia as compared to 0.3mg/kg iv of inj Etomidate making Etomidate the better choice as compared to propofol for induction of general anaesthesia in terms of hemodynamic stability.

KEYWORDS: etomidate, induction agent, hemodynamic stability.

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 anaesthesia, as the sole drug for short procedures, to maintain anaesthesia for longer procedures by intravenous infusion, to provide conscious sedation during procedures undergoing in local anaesthesia and intensive care unit. Induction is a critical phase of anaesthesia, especially in patients who have limited coronary reserve. Hence induction agents should alleviate the stress response and cause minimal haemodynamic changes.[1] An ideal inducing agent for general anaesthesia should have haemodynamic stability, rapid clearance and minimal respiratory side effects. An ideal anaesthetic agent should have rapid induction and recovery. It should not cause pain on injection, involuntary movements, nausea and vomiting, laryngospasm and should be free from any hypersensitivity reactions. A pleasant rapid induction is essential before we administer drugs for intubation so that the patient will not experience a feeling of losing control on oneself and experience difficulty to breath as paralysis sets in and patient merges into sleep. A number of pharmacological agents are used for induction of general anaesthesia. Some agents are associated with haemodynamic instability which is characterized by: - elevation of heart rate (HR), a drop-in blood pressure (BP), depression of the myocardium and vasodilation of the capacitance vessels. These changes can be detrimental to the elderly, hypovolemic patients and patients with poor cardiac reserve. Since the introduction of general anaesthesia, no ideal induction agent has yet

been discovered in term of providing a stable haemodynamics during endotracheal intubation. The quest for an ideal inducing anaesthetic agent still continues. One of the most definitive methods of providing general anaesthesia is by securing airway with endotracheal tube. However, laryngoscopy and intubation are not devoid of ill effects. They violate the patient's airway reflexes, resulting in reflex autonomic activation and lead to hypertension and tachycardia in adults whereas autonomic activation may result in bradycardia in infants and children.[2] This reflex has been termed as 'pressor response' and has been attributed to sudden release of catecholamines during direct laryngoscopy and intubation.[3] Etomidate is a carboxylated imidazole derivative used as an intravenous induction agent. Etomidate is a hypnotic agent which is cardiostable with no release of histamine. It is short acting drug, used for induction and maintenance of anaesthesia.[4] It is highly protein bound (75% bound to albumin), highly lipid soluble and exist largely in a non-ionized fraction at physiological pH. Induction of anesthesia by Etomidate would lead to a stable haemodynamic condition for performing laryngoscopy and endotracheal intubation. [5,6,7] It is considered a safer alternative with regard to hemodynamic stability. Propofol is the one commonly used drug for induction of general anaesthesia. Propofol is a non-opioid, non-barbiturate, sedative hypnotic agent with rapid onset and short duration of action. Unwanted complication associated with this drug is haemodynamic instability and cardiovascular complications. Propofol can lead to bradycardia.[8,9,10] It causes dose dependent hypotension especially in patients above 50 years and with pre-induction hypotension. [11,12] It also causes pain at injection site [13,14] This study aims at an attempt to compare haemodynamic stability of injection Etomidate and injection Propofol, during and after induction of general anaesthesia.

MATERIALS AND METHODS

Patients of either sex belonging to ASA I-II belonging to age group of 18-85 years were studied after approval from Institutional Ethical Committee and written informed consent taken. Pre-anaesthetic evaluation was done before the surgery with the special consideration to rule out

- History of Hypertension, Diabetes Mellitus, Bronchial Asthma, Tuberculosis
- History of Dyspnea, chest pain, palpitation
- Cough, cold, fever
- Convulsion
- Previous anaesthetic and surgery history
- Drug sensitivity
- A routine pre-anaesthetic examination was conducted assessing,
- General condition of the patient
- Airway assessment using Mallampatti Classification (MPC)
- Nutritional status and body weight of the patient

Systemic examination

- Cardiovascular system
- Respiratory system
- Central nervous system
- Per Abdomen

The following investigations were done before taking the patient for surgery

- Hemoglobin estimation (Hb), Complete blood count (CBC), Total leukocyte count (TLC), Differential Leukocyte count (DLC).
- Blood grouping
- Blood sugar level (BSL)
- Serum electrolytes
- Serum Creatinine, Blood urea level
- Liver Function test
- Chest x-ray
- Standard 12-lead Electocardiogram
- HIV
- HbsAg

Patients were kept fasting overnight. They were given Tablet Ranitidine 150mg oral on day before surgery. Heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, SpO2 were noted before giving any premedication and pre-induction. After securing intravenous access, intravenous fluid was started for all the patients. Monitors like Electrocardiogram (ECG), Non- invasive blood pressure monitor (NIBP) and pulse oximeter, were connected to the patients. Pre induction baseline vital parameters like heart rate, blood pressure (systolic, diastolic and MAP), SpO2 were recorded. All the patients were pre medicated with injection Glycopyrrolate 4 mcg/kg iv as antisialogouge, injection Midazolam 0.02mg/kg iv for anxiolysis and injection Pentazocine 0.3mg/kg iv as analgesic. Induction of anaesthesia was done in supine position. Patients were preoxygenated with 100% O2 by mask for 3 minutes. They were divided into two groups. After preoxygenation patient in Group E were induced with injection Etomidate (0.3mg/kg) iv and patients in Group P were induced with injection Propofol (2mg/kg) iv. Loss of eyelash reflex was considered as the end point. This was followed immediately by neuromuscular blockade with injection Succinylcholine (1.5mg/kg) iv after confirmation of effective mask ventilation. Laryngoscopy was performed 60 seconds later with Macintosh laryngoscope blade and trachea was intubated with appropriate size cuffed endotracheal tube by senior anesthesiologist. After confirmation of correct placement of endotracheal tube, the endotracheal tube was connected to Bains circuit and intermittent positive airway pressure ventilation was continued till the completion of surgery. Anaesthesia was maintained with Oxygen (50%), Nitrous oxide (50%) and Sevoflurane (0.2-1%) and injection Atracurium 0.5mg/kg iv was given for neuromuscular blockade. After the surgery was completed reversal was done with injection Neostigmine (0.05 mg/kg) iv and injection Glycopyrrolate (10mcg/kg)

iv. Extubation was performed after the patient was fully awake. All the haemodynamic changes were monitored before induction with either Injection Etomidate (0.3 mg/kg iv) or Injection Propofol (2mg/kg iv) at 0 min which is intubation, and 1 min, 2 min, 3 min, 5 min and 10 min after intubation. These changes were compared in the two groups.

Parameters observed were

- Heart rate
- Systolic Blood pressure
- Diastolic Blood pressure
- Mean arterial pressure
- ECG
- SpO2

The patients were observed intraoperatively and post operatively for any side effects of either of the drugs used like nausea, vomiting, myoclonus, pain on injection, apnea, etc. and it was noted.

RESULTS

Mean age of subjects in Etomidate group was 44.34 ± 16.74 years and in Propofol group was 39.54 ± 19.02 years. There was no significant difference in mean age between two groups (Table 1, FIG.1).

Table 1: Mean Age Comparison between two groups

	Group				P Value
	Etomidate		Propofol		
	Mean	SD	Mean	SD	
Age	44.34	16.74	39.54	19.02	0.266

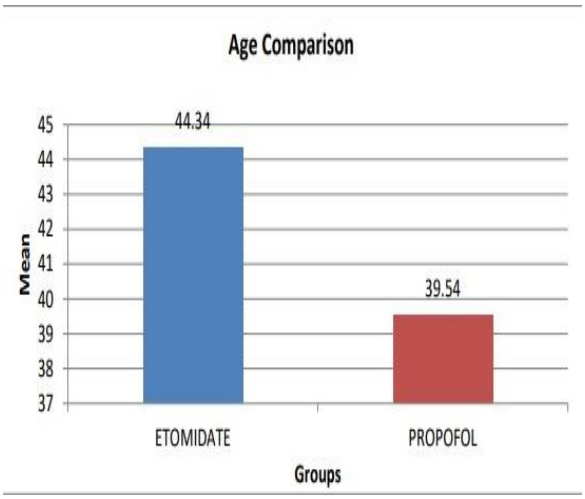

Figure 1: Bar Diagram Showing Mean Age Comparison between two groups.

Mean weight in Etomidate group was 63.09 ± 4.78 Kgs and in Propofol group, was 60.46± 5.16 Kgs. There was significant difference in mean weight between two groups. (Table 2, FIG 2).

Table 2: Mean Weight Comparison between two groups

	Group				P Value
	Etomidate		Propofol		
	Mean	SD	Mean	SD	
Weight	63.09	4.78	60.46	5.16	61.77

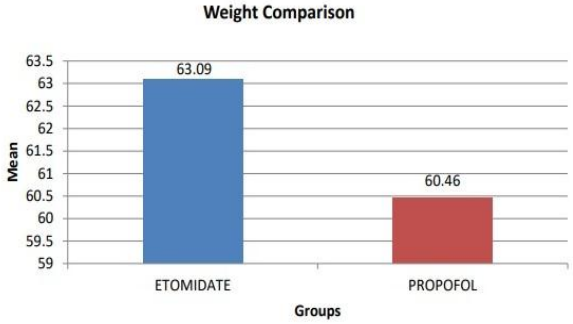

Figure 2: Bar Diagram Showing Mean Weight Comparison between two groups

In Etomidate group, 65.71% were female and 34.29% were males and in Propofol group, 57.14% were females and 42.86% were males. There was no significant difference in sex distribution between two groups. (Table 3).

Table 3: Sex Distribution between two groups.

	Group						
	Etomidate			Propofol			Total
	Count	%	Count	%	Count	%	
Sex	Female	23	65.71%	20	57.14%	43	61.43%
	Male	12	34.29%	15	42.86%	27	38.57%

χ 2 = 0. 543, df = 1, p = 0.461

In Etomidate group, 20% had ASA grade I and 80% had ASA grade II and in Propofol group, 31.43% had ASA grade I and 68.57% had ASA grade II. There was no significant difference in ASA grade between two groups. (Table 4, FIG 3)

Table 4: ASA Distribution between two groups.

		Group					
		Etomidate		Propofol		Total	
		Count	%	Count	%	Count	%
AS	1	7	20.00%	11	31.43%	18	25.71%
A	2	28	80.00%	24	68.57%	52	74.29%

χ 2 = 1.197, df = 1, p = 0.247

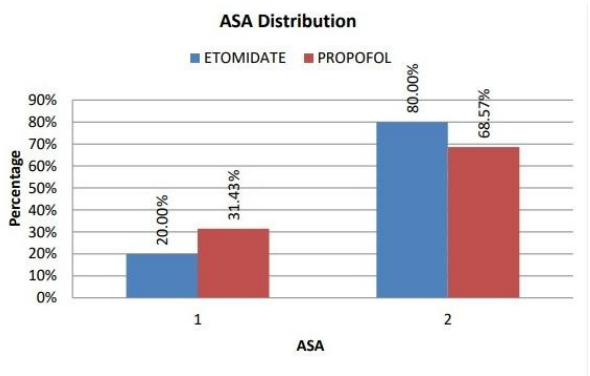

Figure 3: Bar Diagram Showing ASA Distribution between two groups.

In the study there was significant difference in mean Heart rate between two groups from 0 min (Intubation) to 10 min after intubation. At these intervals mean heart rate was significantly high in Propofol group compared to Etomidate group. **(**Table 5, FIG 4)

Table 5: Mean Heart Rate Comparison between two groups at different time intervals.

Heart rate		Group								P Value
		Etomidate			Propofol			Total		
		Mean	SD	P valuewith inGroup	Mean	SD	P value with in Group	Mean	SD	
Pre-Induction		80.77	8.72		84.09	7.66		82.43	8.32	0.096
Intubation	0 min	86.57	8.46	< 0.001*	99.34	9.48	< 0.001*	92.96	11.00	< 0.001*
	1 min	85.89	8.06	0.003*	98.31	9.00	0.050	92.10	10.54	< 0.001*
After Intubation	2 min	84.60	8.16	< 0.001*	96.26	9.15	< 0.001*	90.43	10.42	< 0.001*
	3 min	83.03	8.04	< 0.001*	94.49	8.77	< 0.001*	88.76	10.15	< 0.001*
	5 min	81.83	7.98	0.007*	92.23	9.12	< 0.001*	87.03	9.99	< 0.001*
	10min	80.20	8.00	0.149	90.46	9.32	< 0.001*	85.33	10.05	< 0.001*

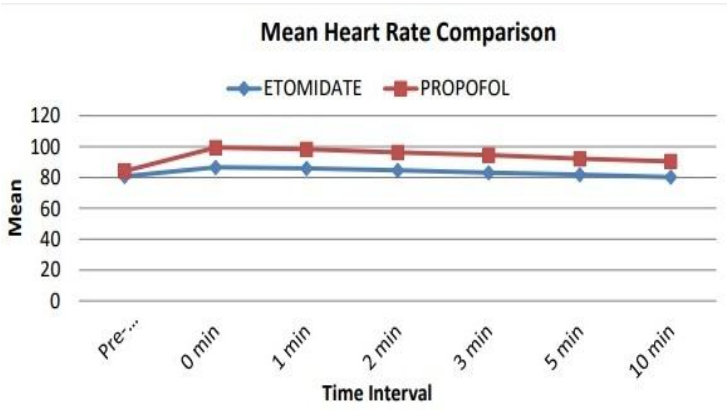

Figure 4: Line Diagram Showing Mean Heart Rate Comparison between two groups at different time intervals.

Heart rate percentage increase compared to baseline at 0 min, 1 min, 2 min, 3 min, 5 min and 10 min was higher in Group P compared to Group E. (Table 6, FIG 5)

Table 6: Rate of change in mean heart rate at different intervals of time among two groups.

	GROUP				P Value
	Group E		Group P		
	Mean	SD	Mean	SD	
HR 0 min	-7.31	2.29	-18.19	4.83	< 0.001*
HR1 min	-6.50	2.33	-16.99	4.61	< 0.001*
HR 2 min	-4.88	2.69	-14.54	5.48	< 0.001*
HR 3 min	-2.93	2.49	-12.48	5.74	< 0.001*
HR 5 min	-1.45	2.82	-9.81	6.92	< 0.001*
HR 10 min	0.59	2.92	-7.70	7.61	< 0.001*

Minus sign indicates: Increase in HR compared to baseline, + sign indicates decrease compared to baseline in HR.

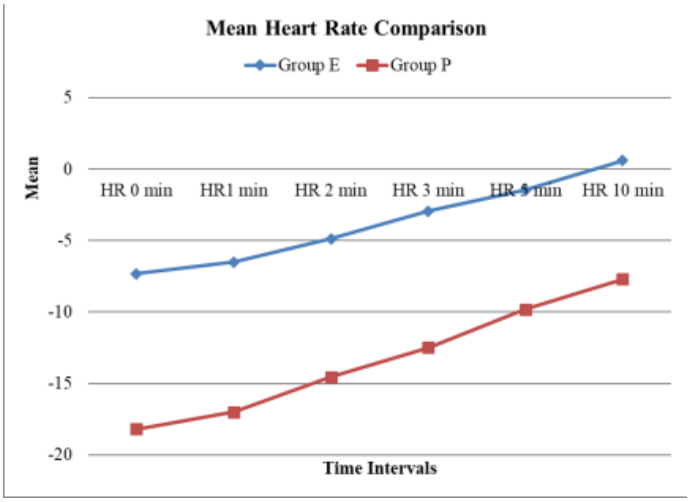

Figure 5: Line Diagram Showing Rate of change in mean heart rate at different intervals of time among two groups.

Table 7: Mean SBP Comparison between two groups at different time intervals.

		Group								P Value
		Etomidate			Propofol			Total		
		Mean	SD	P valuewith in Group	Mean	SD	P valuewith in Group	Mean	SD	
Pre-Induction		122.97	8.28		123.89	9.25		123.43	8.73	0.665
Intubation	0 min	130.06	8.44	< 0.001*	141.71	10.06	< 0.001*	135.89	10.93	< 0.001*
After Intubation	1 min	129.66	8.27	< 0.001*	139.89	9.18	< 0.001*	134.77	10.09	< 0.001*
	2 min	126.46	7.53	< 0.001*	128.23	10.41	< 0.001*	127.34	9.06	0.418
	3 min	124.00	7.81	0.077	119.83	9.90	0.001*	121.91	9.09	0.054
	5 min	121.89	7.71	0.045*	111.71	9.12	< 0.001*	116.80	9.82	< 0.001*
	10 min	120.34	7.96	< 0.001*	107.94	8.80	< 0.001*	114.14	10.41	< 0.001*

There was significant difference in mean SBP between two groups at 0 min (Intubation), 1min, 5 min and 10 min after intubation. Initially SBP was high in Propofol group, but from 5 min to 10 min after intubation, mean SBP was low in Propofol group indicating more hypotension compared to Etomidate group. (Table 7, FIG 6).

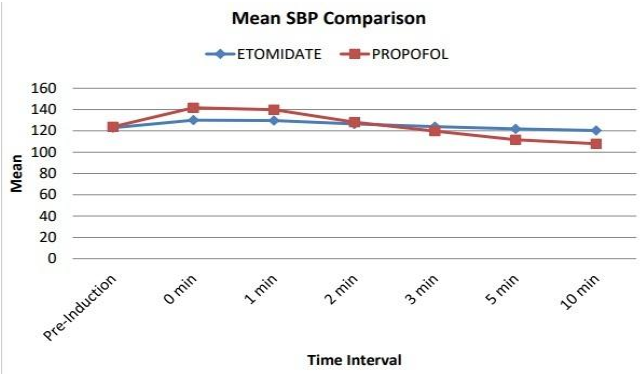

Fig. 6: Mean SBP Comparision.

Table 8: Rate of change in mean SBP at different intervals of time among two groups.

	GROUP				P Value
	Group E		Group P		
	Mean	SD	Mean	SD	
SBP 0 min	-5.79	1.64	-14.56	5.92	< 0.001*
SBP 1 min	-5.47	1.83	-13.12	5.66	< 0.001*
SBP 2 min	-2.92	2.56	-3.58	5.29	< 0.001*
SBP 3 min	-.90	2.70	3.19	5.52	< 0.001*
SBP 5 min	.83	2.45	9.74	4.99	< 0.001*
SBP 10 min	2.09	2.84	12.79	4.61	< 0.001*

From 3 min to 10 min, there was significant decrease in Mean percentage change in SBP between two groups. Decrease was higher in Group P compared to Group E. (Table 8)

Table 9: Mean DBP Comparison between two groups at different time intervals.

		Group								P Value
		Etomidate			Propofol			Total		
		Mean	SD	P valuewith in Group	Mean	SD	P valuewith in Group	Mean	SD	
Pre-Induction		81.54	5.47		83.14	6.33		82.34	5.93	0.262
Intubation	0 min	86.46	5.18	< 0.001*	93.71	6.23	< 0.001*	90.09	6.76	< 0.001*
After Intubation	1 min	84.86	4.61	< 0.001*	90.91	5.77	< 0.001*	87.89	6.01	< 0.001*
	2 min	82.51	5.34	0.111	82.91	7.00	0.813	82.71	6.19	0.789
	3 min	80.46	5.38	0.103	76.69	5.96	< 0.001*	78.57	5.95	0.007*
	5 min	79.89	4.34	0.010*	71.89	5.44	< 0.001*	75.89	6.33	< 0.001*
	10min	79.03	4.61	< 0.001*	67.37	5.50	< 0.001*	73.20	7.74	< 0.001*

In the study there was significant difference in mean DBP between two groups at 0 min (Intubation), 1min, 3min, 5 min and 10 min after intubation. Initially DBP was high in Propofol group but from 3 min to 10 min after intubation, mean DBP was low in Propofol group indicating more hypotension compared to Etomidate group. (Table 9, fig 8).

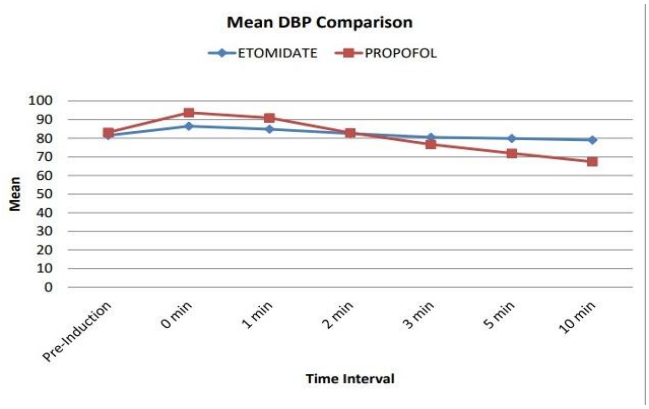

Fig. 8: Mean DBP Comparision.

From 2 min to 10 min, there was significant decrease in Mean percentage change in DBP between two groups. Decrease was higher in Group P compared to Group E. (Table 10).

Table 10: Rate of change in mean DBP at different intervals of time among two groups.

	GROUP		Mean	SD	P Value
	Group E Mean	Group P SD			
DBP 0 min	-6.11	2.62	-12.96	6.31	< 0.001*
DBP 1 min	-4.20	3.39	-9.59	5.87	< 0.001*
DBP 2 min	-1.30	4.38	0.11	6.97	< 0.001*
DBP 3 min	1.22	4.72	7.51	7.00	< 0.001*
DBP 5 min	1.86	4.45	13.25	7.09	< 0.001*
DBP 10 min	2.92	4.70	18.75	6.43	< 0.001*

There was significant difference in mean MAP between two groups at 0 min (Intubation), 1min, 3min, 5 min and 10 min after intubation. Initially MAP was high in Propofol group from 0 min (Intubation) to 2 min, but from 3 min to 10 min after intubation, mean MAP was low in Propofol group indicating more hypotension compared to Etomidate group. (Table 11)

Table 11: Mean MAP Comparison between two groups at different time intervals.

	Group									
	Etomidate			Propofol			Total			
	Mean	SD	P value with in Group	Mean	SD	P value with in Group	Mean	SD	P Value	
Pre-Induction	95.46	4.82		96.77	6.35		96.11		5.64	0.333
Intubation After Intubation		0m in 100.83 4.74		< 0.001*	109.74 6.67		< 0.001*	105.29 7.29		< 0.001*
	1 min	99.80	4.30	<0.001*	107.31 6.02		<0.001*	103.56 6.43		<0.001*
	2 min	97.11	4.80	< 0.001*	97.51	7.47	0.448	97.31	6.24	0.791
	3 min	95.03	4.66	0.347	91.06	6.73	<0.001*	93.04	6.08	0.005*
	5 min	94.03	4.43	0.002*	85.11	5.92	<0.001*	89.57	6.86	<0.001*
	10min	92.77	4.27	< 0.001*	80.86	5.98	<0.001*	86.81	7.91	<0.001*

From 2 min to 10 min, there was significant decrease in Mean percentage change in MAP between two groups. Decrease was higher in Group P compared to Group E.(Table 12).

Table 12: Rate of change in mean MAP at different intervals of time among two groups

	GROUP				P Value
	Group E		Group P		
	Mean	SD	Mean	SD	
MAP 0 min	-5.66	2.14	-13.55	5.21	< 0.001*
MAP 1 min	-4.60	2.00	-11.05	4.71	< 0.001*
MAP 2 min	-1.78	2.64	-0.86	6.05	< 0.001*
MAP 3 min	0.41	2.72	5.81	5.51	< 0.001*
MAP 5 min	1.45	2.63	11.92	5.24	< 0.001*
MAP 10 min 2.76		2.42	16.38	4.45	< 0.001*

In the study there was no significant difference in mean SpO2 or ECG between two groups at allthe intervals. In Etomidate group, 5.71% had Myoclonus and 2.86% had nausea and in propofol group, 0% had Myoclonus and 8.57% had nausea. There was no significant difference in adverse effect between two groups.

DISCUSSION

An ideal intravenous induction agent should produce minimal disturbances of respiratory and cardiovascular functions, should induce sleep in one brain arm circulation time, should chemically be stable, non-inflammable, non-toxic and easy to

administer. Haemodynamic variations characterized by increase in heart rate, decrease in blood pressure, vasodilatation of capacitance vessels are associated with induction of anaesthesia due to various factors. Laryngoscopy and intubation violate the patient's airway reflexes, resulting in reflex autonomic activation and lead to hypertension and tachycardia in adults whereas autonomic activation may result in bradycardia in infants and children.[2] Sudden hypotension is known to have deleterious effect on maintaining the circulation to vital organs in conditions like systemic hypertension, Ischemic heart disease, shock and valvular heart disease.

Hypotension is known to occur with propofol. This is due to reduction of sympathetic activity causing vasodilatation, direct effect on intracellular calcium mobilization, inhibition of prostaglandin synthesis etc.

Etomidate on the other hand is observed to have haemodynamic stability partly due to its unique lack of effect on sympathetic nervous system and baroreceptor function. However, it lacks analgesic effect, may not totally ablate sympathetic response to laryngoscopy and intubation.

Many studies have been conducted to study the haemodynamic stability between the two drugs and their results will be discussed briefly and compared with the present study. In this study we used injection Etomidate (0.3mg/kg) iv and injection Propofol (2mg/kg) iv as inducing agents to determine their haemodynamic stability with respect to heart rate and blood pressure changes. 70 patients in the age group of 18-85 years posted for elective surgeries fulfilling the inclusion criteria and who gave informed consent were studied.

When the mean age, sex, weight, ASA status between the Etomidate group and Propofol group were compared, there was no statistical difference in the mean age between the two groups (p value >0.05).

Heart Rate Changes

Independent -t test was used to compare the mean heart rates at respective time intervals for intergroup comparison of Group E and Group P. It was found that there was significant difference in mean Heart rate between two groups from 0 min (Intubation) to 10 min after intubation. The mean heart rate in Etomidate group pre-induction (baseline value) was 80.77 +/- 8.72. This value increased to about 86.57 +/- 8.46 (7%) at 0min (intubation).

Whereas in Propofol group the mean heart rate pre induction (baseline value) was 84.09 +/- 7.66 which increased to 99.34 +/- 9.48 (18%) at 0 min (intubation). Thus, the increase in mean heart rate in Propofol group was significantly higher during intubation as compared to Etomidate group which can be due to stress response to laryngoscopy and intubation. Then from 1 min to 5 min after intubation Etomidate group showed increase in mean heart rate (6% at 1min, 5% at 2 min, 3% at 3 min and 1% at 5min) but the mean heart rate reached near the baseline value at 10 min after intubation.In the Propofol group the mean heart rate was significantly higher at all intervals, from 18% increase in heart rate at 0 min(intubation), 17% increase in heart rate at 1 min ,14% at 2 min, 12% at 3 min,9% at 5 min to 7% increase in heart rate at 10 min after intubation. Thus, we conclude that there was increase in mean heart rate in both the groups but Propofol group showed greater increase in heart rate compared to Etomidate group, whose value reached near baseline at 10 min post intubation.

In 1940, Reid and Brace, first described a hemodynamic response to laryngoscopy and intubation.[19]It leads to an average increase in blood pressure by 40-50% and 20% increase in heart rate.[20]

John M. Gooding in 1977 found 10% increase in heart rate after induction with Etomidate 0.3mg/kg suggesting relatively stable cardiovascular response which was similar to our study (7% increase in our study).[21]

Gauss et al in1991 noticed increase in heart rate after Propofol injection but not with Etomidate injection whereas in our study both Etomidate and Propofol group showed increase in heart rate but the increase in heart rate was significantly higher in Propofol group which can be because of stress response to laryngoscopy and intubation and also we did not use fentanyl which was used in study by Gauss.[25]

Yogesh Kumar in his study in 2016 observed that there was increase in heart rate from baseline value in both the groups Etomidate as well as Propofol at induction and laryngoscopy but the increase was higher in Propofol group as compared to Etomidate group. These results are similar to the one seen in our study.[40]

Mean Systolic Blood Pressure Changes

Independent -t test was used to compare the mean systolic blood pressure at various time intervals from pre induction to 10 min after intubation for intergroup comparison of Group E and Group P. It was observed that the mean Systolic blood pressure in Etomidate group pre -induction (baseline value) was 122.97 +/- 8.28 which increased to about 130.06 +/- 8.44 (6% increase) at 0 min (intubation). Whereas in Propofol group the pre-induction (baseline value) of mean Systolic blood pressure was 123.43 +/- 9.25 which significantly increased to 141.71 +/- 10.0 (14% increase) at 0 min (intubation). This increase can be attributed to stress response to laryngoscopy and intubation.

In Etomidate group there was increase in mean systolic blood pressure at 1min (5% increase) and 2 min (3% increase) after intubation. At 3 min there was no statistically significant change in the values but the values decreased slightly at 5min(1% decrease) and 10

min (2% decrease) after intubation. This could be because of use of inhalational anaesthetic sevoflurane.

In Propofol group there was increase in mean systolic blood pressure at 1 min (13% increase) and 2 min (4% increase) after intubation, but hypotension was observed from 3min to 10 min after intubation which was significant statistically. At 3 min there was 3% decrease, at 5 min 9% decrease and at 10 min 12% decrease in SBP was seen.The hypotension observed in Propofol group was significantly more than in Etomidate group.

Thus, in the study there was significant difference in the mean systolic blood pressure between the two groups at 0 min (intubation), 1 min, 5 min and 10 min after intubation (p value < 0.05). Initially the mean systolic blood pressure was higher in Propofol group, but from 3 min to 10 min after intubation the mean systolic blood pressure was significantly lower in Propofol group. So, hypotension occurred more in Propofol group compared to Etomidate group. Thus, Etomidate showed better haemodynamic stability as compared to propofol with respect to mean systolic blood pressure changes.

Colvin et al 1979 studied cardiorespiratory effects of Etomidate in 2 groups of 6 patients with aortic or mitral valve disease. There was a statistically significant decrease in systolic blood pressure of 19% in the first four minutes following induction with Etomidate (0.3mg/kg). In our study there was statistical increase in systolic blood pressure from 0 min(intubation) to 2 min after intubation which could be because of stress response to laryngoscopy and intubation and slight decrease was observed at 5 min and 10 min which may be because of use of inhalational anaesthetic. Also, we studied patients without any cardiovascular disease.[22]

Mayer M et al in 1996 also observed that there was greater decrease in blood pressure after Propofol induction which is similar to our study.[28]

Anil K. Pandey, et al in 2012 conducted a study on in patients undergoing coronary artery bypass graft surgery. The values were recorded before induction and 5 min after intubation. They observed that there was decrease in systolic blood pressure in both the groups 5 min after intubation but the decrease was significantly more in Propofol group. Similar results are observed in our study where there is decrease in systolic blood pressure 5 min after intubation in both the groups but hypotension is more pronounced in Propofol group.[35]

Mean Diastolic Blood Pressure Changes

Independent -t test was used to compare the mean diastolic blood pressure at various time intervals from pre induction to 10 min after intubation for intergroup comparison between the two groups. The pre-induction value of mean diastolic blood pressure in Etomidate group was observed to be 81.54 +/- 5.47 which increased to about 86.46 +/- 4.61 (6% increase) at 0 min(intubation). In the Propofol group the pre-induction value of mean diastolic blood pressure was 83.14 +/- 6.33 which increased to about 93.71 +/- 6.23 (13% increase) at 0min (intubation). Thus, the rise in blood pressure was more in Propofol group and that may because of stress response to laryngoscopy and intubation. At 1 min after intubation Etomidate group showed rise in mean diastolic blood pressure (4% increase) from baseline value, but there was no significant change statistically in mean diastolic blood pressure at 2 min post intubation. Same was observed for Propofol group. There was increase in mean diastolic blood pressure at 1 min post intubation (14% increase) but no significant statistical difference was observed at 2 min after intubation. At 3min post intubation Etomidate group did not show any significant change in mean diastolic blood pressure, but for Propofol group there was slight decrease in mean diastolic blood pressure (7% decrease). At 5 min(2% decrease) and 10min (3% decrease)post intubation was observed in Etomidate group and in Propofol group there was 13% decrease at 5 min and 18% decrease at 10 min after intubation. This could be because of the use of inhalational anaesthetic post intubation. But more hypotension was observed in Propofol group compared to Etomidate group.

Thus, in the study there was significant statistical difference between the two groups at 0 min (intubation), 1 min, 3 min, 5 min and 10 min post intubation with more haemodynamic variation observed in Propofol group compared to Etomidate group.

Batra R.K et al in 1984 concluded in his study that Etomidate comparatively maintained stable cardiovascular system means blood pressure remained stable throughout the procedures, whereas Propofol gave rise to hypotension which was similar to our study.[24]

Gauss et al in 1991 studied the hemodynamic effects of etomidate (0.2mg/kg) and propofol (2mg/kg) in 30 patients belonging to ASA I and II. He did not find any change in diastolic blood pressure in any of the groups whereas in our study there was increase in mean diastolic blood pressure in both the groups initially because of stress response to laryngoscopy and intubation and then hypotension was seen which may be due to use of inhalational anaesthetic sevoflurane. The changes observed were more in Propofol group.[25]

Anil K. Pandey, et al in 2012 conducted a study on in patients undergoing coronary artery bypass graft surgery. The values were recorded before induction and 5 min after intubation. They observed that there was decrease in diastolic blood pressure in both the groups 5 min after intubation but the decrease was significantly more in Propofol group. Similar results are observed in our study where there is decrease in diastolic blood pressure 5 min after intubation in both the groups but hypotension is more pronounced in Propofol group.[35]

Mean Arterial Pressure Changes

Independent -t-test was used to compare mean arterial pressure between the two groups. In the Etomidate group (Group E) the pre-induction value of mean arterial pressure was 95.46 +/- 4.82 .This value increased to about 100.83 +/- 4.74 (5% increase) at 0 min (intubation) and in Propofol group (Group P) the pre induction value of mean arterial pressure was 96.77 +/- 6.35 which increased to about 109.74 +/- 6.67 (13% increase)at 0 min (intubation). Thus, Propofol group showed greater rise in mean arterial pressure compared to Etomidate group. At 1 min (4% increase) and 2 min (2% increase) was seen in mean arterial pressure post intubation in Etomidate group but Propofol group did not show any statistically significant change in mean arterial pressure at 2 min post intubation. At 3 min after intubation Etomidate group did not show any significant change in the value but there was decrease in mean arterial blood pressure in Propofol group (6% decrease). Later at 5min and 10min after intubation the mean arterial pressure decreased in both the groups which could be because of use of inhalational anaesthetic. In Etomidate group there was 1% decrease at 5 min and 3% decrease at 10 min after intubaion and in Propofol group there was 12% decrease at 5 min and 16% decrease in MAP at 10 min after intubation. But hypotension observed was significantly greater in Propofol group compared to Etomidate group. Thus from 3 min to 10 min after intubation Propofol Group showed significant decrease in mean arterial pressure as compared to Etomidate group. Thus showing more haemodynamic stability with injection Etomidate as compared to injection Propofol.

Supriya Aggarwal et al in 2016 studied the effects of propofol and etomidate on hemodynamics and various side effects in 100 patients under general anaesthesia. They observed that patients in Etomidate group showed little change in mean arterial pressure (MAP) compared to Propofol which is similar to our study.

Thus, concluding that Etomidate is better agent for induction than propofol in view of haemodynamic stability.[44]

Yogesh Kumar in 2016 compared propofol and etomidate as inducing agent in 60 patients under general anaesthesia. He observed that the mean arterial pressure (MAP) decreased at induction in Propofol group but later increased at laryngoscopy whereas in Etomidate group MAP slightly decreased at induction but increased at laryngoscopy. But a significant decrease in MAP from baseline at induction with propofol was observed as compared to etomidate. These results are similar to our study where there is increase in MAP at laryngoscopy.[40]

Thus, it was observed that Propofol group (Group P) showed greater haemodynamic changes with respect to heart rate, systolic, diastolic and mean arterial pressure as compared to Etomidate group (Group E). Thus, we conclude that Injection Etomidate is haemodynamically more stable than Injection Propofol as an inducing agent from the above discussion and results.

CONCLUSION

From the results of our study we concluded that injection Propofol caused significantly greater amount of tachycardia and hypotension as compared to injection Etomidate. This indicated that injection Etomidate maintained the haemodynamic stability as compared to injection Propofol. Thus, Etomidate is better choice for induction of general anaesthesia as compared to Propofol in terms of haemodynamic stability. Incidence of myoclonus was observed with injection Etomidate and post- operative nausea was observed more with injection Propofol.

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