ISSN 2515-8260 Volume 09, Issue 07, 2022

A Comparative Study of Propofol versus Etomidate on the Hemodynamic effects during Endotracheal Intubation in Controlled Hypertensive patients.

1. Dr. Urvashi Hasmukh Patel, 2. Dr Bharti Ramesh Rajani

3. Dr. Faizal Rafik Kureshi, 4. Dr. Shobhana Gupta

1. Senior Resident, Department of Anesthesiology, MP Shah Medical College Jamnagar. E-mail: uhpatel1991@gmail.com . Mo:9429473379

2. Associate Professor, Department of Anesthesiology, GMERS Medical College, Gandhinagar. E-mail: bhartirameshrajani@gmail.com . Mo :7016011425

3. Third year Resident, Department of Anesthesiology, GMERS Medical College, Gandhinagar. E-mail: dr.faizalkureshi@gmail.com . Mo:9409141979

4.Professor and Head of Department of Anesthesiology ,GMERS Medical College Gandhinagar. E-mail : deangmersmcg@gmail.com . Mo:91 99784 07067

INTRODUCTION

In General Anesthesia, airway management and patient safety are the most important aspects of the patient management.(1,2) Laryngoscopy and tracheal intubation lead to number of physiologic catecholamine releasing responses like hypertension, tachycardia, rise in Intracranial pressure and rise in Intraocular pressure due to sympathetic stimulation. The cardiovascular responses can have serious consequences like Myocardial Ischemia and cardiac arrest.(3) The usual pressor response due to laryngoscopy and intubation is much more exaggerated in hypertensive patients which leads to an increase in myocardial oxygen demand predisposing the already compromised myocardium to myocardial ischemia, infarction and arrhythmias.(4) An ideal induction agent for general anesthesia should have haemodynamic stability, minimal respiratory side effects and rapid clearance.

ISSN 2515-8260 Volume 09, Issue 07, 2022

Propofol, 2,6 di-isopropylphenol, is the most popular induction agent with rapid & smooth recovery. Major drawbacks are decrease in blood pressure, dose dependent depression of ventilation, pain on injection. Etomidate is a carboxylated imidazole derivative, achieves rapid intravenous induction with hemodynamic stability, cerebral protection and minimal respiratory depression.(5,6,7) It's the lack of effect on sympathetic nervous system, baroreceptor function(8) and it's effect of increased coronary perfusion even in patients with moderate cardiac dysfunction makes it favorable induction agent. (9,10) So the aim of this study was to compare the effects of Propofol versus Etomidate on the hemodynamic stability by comparing parameters like blood pressure, heart rate before, and after induction and post intubation.

MATERIAL AND METHODOLOGY

The study was conducted in the Department of Anesthesia , G.M.E.R.S Medical College and Hospital, Gandhinagar from October 2019 to March 2020, Gujarat, India after approval from Institutional Ethical Committee. From the previous study using details of Mean and SD of group 1 (81.1±7.1) and group 2 (85.5±7.3) in open epi software total sample size obtained was 88. Patients aged between 19-60 years of ASA-II and ASA-III, having controlled hypertension, undergoing various elective surgical procedures under general anesthesia with cuffed endotracheal intubation were included in the study. Detailed pre anesthetic check up was done on the day before surgery. Informed and written consent was obtained prior to surgery. A detailed questionnaire was administered to the selected patients, confidentiality was maintained. The patients were randomly divided into two groups of 44 each by closed enveloped method using coin toss for each patient. Inside the operation theatre baseline parameters of Heart rate, Blood pressure, Spo2 were recorded. All patients were pre-medicated with Inj. Midazolam 0.02 mg/kg iv, Inj. Fentanyl 2 mcg/kg iv. Patients were pre-oxygentaed with 100% for 3 minutes. The study drugs were

ISSN 2515-8260 Volume 09, Issue 07, 2022

prepared by anesthesia personnel who are not directly involved in the study. Data were collected by another anesthesiologist who was unaware of group allocation and study drugs. Volume of the study drugs were made equal. Anesthesia was induced with either Propofol 2 mg/kg iv or Etomidate 0.3 mg/kg iv, slowly over 30 seconds. Loss of eyelash reflex was considered as end point. Adequate muscle relaxation achieved with Inj. Succinylcholine 1.5 mg/kg iv. Laryngoscopy and endotracheal intubation was done by consultant anesthesiologist and tube position was confirmed by capnography, adequate chest expansion and auscultation. Patient was maintained with O2, N2O, and sevoflurane with intermittent Inj. Atracurium iv. Parameters were recorded before and after injection of induction drugs and after intubation at 1,3,5,10,15 minutes. Incidence of myoclonus and pain on injection was noted and treated as follows:

Myoclonus: 100% O2 + additional Inj. Midazolam iv

Pain on injection: Inj. Lignocaine 1.5 mg/kg iv, 3mins prior to Propofol.

After that all parameters were recorded every 15 minutes till the end of surgery Collected data was entered in the excel data sheet and data analysis was done with the help of Epi. Info.7.2 software.. Range, mean and standard deviation were calculated for continuous variables. Proportion and percentage were obtained for categorized variables. To know association between dependent and independent variable chi square and unpaired t-test were applied. $P < 0.05$ was taken as statistically significant value for this study.

RESULTS

The mean age in group P was **48.4 ± 8.7** years while the mean age is group E was **47.5 ± 9.3 years**. Group P had female preponderance (56.7% females vs 43.2% males), whereas group E also had female preponderance (63.3% females vs 36.4% males). BMI of patients in group P was 23.2 ± 1.6

kg/m^2, while mean BMI of patients in group E was 23.8 ± 1.5 kg/m^2**.** Both the groups were comparable in terms of age, gender distribution and BMI (P>0.05).

Table 1: Comparison of heart rate (per min) at various intervals in both the study groups. Group P (N=44), Group E (N=44)

Timeline (mins)	**Group P**		**Group E**		**P value**
	Mean	**SD**	**Mean**	**SD**	
Before induction T_0	88.3	8.8	89.7	11.0	0.59
At induction T_1	86.6	8.1	90.0	11.2	0.11
Post induction – 1 min T_2	85.5	7.8	88.5	9.9	0.12
Post intubation – 1 min T_3	83.3	8.3	91.3	12.3	**0.000***
Post intubation – 3 min T_4	81.2	8.5	93.1	10.1	**0.000***
Post intubation – 5 min T_5	80.5	8.7	90.8	10.6	**0.000***
Post intubation – 10 min T_6	78.9	8.6	89.8	11.1	**0.000***
Post intubation – 15 min T_7	80.7	8.3	88.3	10.7	**0.000***
***** Significant difference					

Table 2: Comparison of systolic blood pressure (mmHg) at various intervals in both the study groups. Group P (N=44), Group E (N=44)

Timeline (mins)	**Group P**		**Group E**		**P value**
	Mean	**SD**	**Mean**	**SD**	
Before induction T_0	121.2	8.5	122.8	10.4	0.54
At induction T_1	123.2	6.8	125.1	12.1	0.43
Post induction – 1 min T_2	119.6	7.0	122.8	10.9	0.15

Post intubation – 1 min T_3	120.9	7.4	127.6	11.7	**0.002***
Post intubation – 3 min T_4	117.2	8.1	125.4	10.3	**0.000***
Post intubation – 5 min T_5	115.7	8.9	123.4	9.4	**0.000***
Post intubation – 10 min T_6	111.5	7.8	122.4	11.1	**0.000***
Post intubation – 15 min T_7	109.9	9.8	119.7	10.8	**0.000***
* Significant difference					

Table 3: Comparison of diastolic blood pressure (mmHg) at various intervals in both the study groups

Timeline (mins)	**Group P**		**Group E**		**P value**
	Mean	**SD**	**Mean**	**SD**	
Before induction T_0	82.4	6.6	84.2	7.1	0.2
At induction T_1	80.3	7.1	82.4	6.9	0.13
Post induction – 1 min T_2	78.8	6.9	80.8	7.1	0.07
Post intubation – 1 min T_3	78.5	6.4	85.3	7.8	**0.000***
Post intubation – 3 min T_4	76.6	5.4	86.7	6.1	**0.000***
Post intubation – 5 min T_5	74.1	5.1	84.4	5.9	**0.000***
Post intubation – 10 min T_6	73.5	5.2	82.2	5.7	**0.000***
Post intubation – 15 min T_7	71.8	4.9	79.6	6.0	**0.000***
* Significant difference					

ISSN 2515-8260 Volume 09, Issue 07, 2022

Table 4 : Comparison of mean arterial pressure (mmHg) at various intervals in both the study groups

Timeline (mins)	Group P		Group E		P value
	Mean	SD	Mean	SD	
Before induction T_0	95.3	5.8	97.1	7.5	0.2
At induction T_1	94.6	5.1	96.6	7.1	0.16
Post induction – 1 min T_2	91.9	6.2	94.5	7.3	0.11
Post intubation – 1 min T_3	92.6	5.3	99.4	7.8	**0.000***
Post intubation – 3 min T_4	90.1	4.9	99.6	6.5	**0.000***
Post intubation – 5 min T_5	88.0	5.2	97.4	6.2	**0.000***
Post intubation – 10 min T_6	86.2	5.5	95.6	5.9	**0.000***
Post intubation – 15 min T_7	84.5	5.2	93.0	6.1	**0.000***
* Significant difference					

DISCUSSION

In this study, the mean age was comparable in both the groups (group P 48.4 ± 8.7 years and group E 47.5 ± 9.3 years). Both group P and group E had female preponderance (56.7% females and 63.3% females respectively), however the observed difference was found to be statistically non-significant. The difference was not statistically significant. The mean BMI was also comparable between the two study groups (23.2 ± 1.6 kg/m^2 in group P versus 23.8 ± 1.5 kg/m^2 in group E). Research studies conducted previously under similar settings showed that the Propofol group and Etomidate group were comparable with respect to age, sex, weight and

BMI.[11-17] Post induction 1 minute, group P showed decrease in heart rate as compared to group E, but it was not significant. Post intubation at 1, 3, 5, 10 and 15 minutes, the mean HR was significantly decreased in group P as compared to group E. The mean heart rate was maintained close to baseline in group E as compared to group P which is similar to previous study.[13] Our results corroborated with the study done by **M Das et al [18] ,** in which post induction at 1 minute, there was decrease in mean HR in group E (80+/- 5.27 per min) as compared to baseline (82+/-5.2 per min) which was statistically non significant. In contrast to our study, the decrease in mean HR (75+/- 5.3 per min) in post induction phase in group P was statistically significant. This is because Propofol causes impairment in baroreceptor reflex regulatory system.. However, **Rayamajhi M et al**[14] showed that at intervals of three, five and ten minutes of laryngoscopy and intubation, the decrease in heart rate from baseline was greater with Propofol than with Etomidate that similar to our findings. Results showed that post induction at 1 minute, mean SBP, mean DBP and MAP decreased in group P as well as in group E but it was not significant. Post intubation at 1, 3, 5, 10 and 15 minutes, mean SBP, mean DBP and MAP decreased significantly in group P as compared to group E. The mean SBP, mean DBP and MAP was maintained close to baseline in group E as compared to group P. Hemodynamic stability observed with Etomidate is due to its unique lack of effect on sympathetic nervous system and on baroreceptor functions[13,15]. **Meena K et al**[16] showed a significant decrease in arterial blood pressure after induction with Propofol which did not increase above baseline value after intubation while with Etomidate, there was a significant increase in arterial pressure following intubation, hence showing better hemodynamic condition with Etomidate as compared to Propofol. **Aggarwal S et al**[17] observed that Propofol caused significant hypotension and tachycardia at induction and intubation in comparison to Etomidate. This may be due to reduced dose of inj.

ISSN 2515-8260 Volume 09, Issue 07, 2022

Midazolam used as a premedication. This is in contrast to our study in which Propofol does not cause tachycardia but leads to sustained decrease in mean SBP, mean DBP and mean MAP as compared to baseline, post intubation at 1, 3, 5, 10 and 15 minutes. The changes with heart rate and cardiac output with Propofol is usually transient and insignificant in healthy patients [18.] Laryngoscopy and endotracheal intubation induces a sympathetic response resulting in rise in heart rate, blood pressure and serum catecholamine. This explains the rise in hemodynamic parameters at one minute after intubation. Thereafter as per the pharmacodynamics of the drugs used, we have seen a decrease in hemodynamic variables with Etomidate showing better hemodynamic stability.

CONCLUSION

To conclude, Etomidate showed lack of effects on sympathetic nervous system and baroreceptor functions during endotracheal intubation as opposed to Propofol. This resulted in changes in hemodynamic parameters (heart rate, systolic, diastolic and mean arterial blood pressure) which are not as significant as seen in Propofol group. This resulted in greater hemodynamic stability during endotracheal intubation in patients with controlled hypertension in Etomidate group, posted for elective surgery under general anesthesia.

LIMITATIONS

Present study was conducted at a single centre and included small number of patients. The age group in this study was 19-60 years, therefore, we could not assess the effects of the study drugs at the extremes of ages. In the present study, the hemodynamic parameters were observed in both the groups only till 15 minutes after endotracheal intubation.

ISSN 2515-8260 Volume 09, Issue 07, 2022

REFERENCES

1. Sakles JC, Laurin EG, Rantapaa AA, Panacek EA. Airway management in the emergency department: a one-year study of 610 tracheal intubations. Ann Emerg Med 1998;31: 325-332.

2. A Practice of Anesthesia, Wylie and Churchill-Davidson's, 7the, 2003, pg448.

3. Stoelting's Anesthesia and Co-existing diseases, Roberta L Hines, 7the, 2018,pg 188-189.

4. Mccollum J, Dundee J. Comparison of induction characteristics of four intravenous agents. Anaesthesia. 2007;41(10):995-1000.

5. Shah J, Patel I, Guha A. Comparative study of Propofol vs Etomidate as an induction agent to evaluate hemodynamic changes during induction of anesthesia in controlled hypertensive patients. Anaest Pain & Intensive Care 2018;22(3):361-367.

6. Golzari SE, Khan ZH, Ghabili K, Hosseinzadeh H, Soleimanpour H, Azarfarin R, et al. Contributions of medieval Islamic physicians to the history of tracheostomy. Anesth Analg 2013;116:1123-32.

7. Ebert TJ, Muzi M, Berens R, Goff D, Kampine JP. Sympathetic Responses to Induction of Anesthesia in Humans with Propofol or Etomidate. Anesthesiology. 1992;76(5):725-733.

8. Wagner C, Bick J, Johnson D, Ahmad R, Han X, Ehrenfeld J et al. Etomidate Use and Postoperative Outcomes among Cardiac Surgery Patients. Anesthesiology. 2014;120(3):579-589.

9. Budde A, Mets B. Pro: Etomidate is the ideal induction agent for a cardiac anesthetic. J Cardiothorac Vasc Anesth. 2013;27(1):180-183.

10. Niyogi S. A Comparison of Hemodynamic Effects of Propofol and Etomidate Induction in Patients Undergoing Lumbar Fixation Surgery Under General Anesthesia. EC Anaesthesia. 2019;5:252-60.

11. Hosseinzadeh H, Golzari SE, Torabi E, Dehdilani M. Hemodynamic changes following anesthesia induction and LMA insertion with Propofol, Etomidate, and Propofol+ Etomidate. Journal of cardiovascular and thoracic research. 2013;5(3):109.

12. Kumar J, Kumari S, Lata K, Sinha PK, Prasad BK, Gupta VK. Comparative study of hemodynamic changes during induction and LMA insertion: Propofol versus Etomidate. International Journal of Contemporary Medical Research 2017;4 (4):950-952.

13. Rayamajhi M, Thapa P, Khadka A, Amatya BR, Bajracharya U. Comparative Study of Propofol and Etomidate on the Hemodynamic Effects During Induction and Endotracheal Intubation. Medical Journal of Shree Birendra Hospital. 2019 Jul 12;18(2):7-15.

14. Sudha S., et al Comparative study of hemodynamic changes during induction of anesthesia between Etomidate and Propofol (2019) J Anesth Surg 6(1): 38-43.

ISSN 2515-8260 Volume 09, Issue 07, 2022

15. Kumar A, Shekhawat K, Sharma R, Mangwana PA. Comparison of Propofol and Etomidate as anaesthetic agents for elective non-cardiac surgery. International Journal of Research in Medical Sciences. 2018 Oct;6(10):3454.

16. Kumar Y. Comparison of Propofol and Etomidate in patients under general anaesthesia. International Journal of Contemporary Medical Research 2016;3(12):3488-3490.

17. Kumar J, Kumari S, Lata K, Sinha PK, Prasad BK, Gupta VK. Comparative study of hemodynamic changes during induction and LMA insertion: Propofol versus Etomidate. International Journal of Contemporary Medical Research 2017;4 (4):950-952.

18. Das M, Pradhan BK, Samantray RC. Comparative Study On Hemodynamic Responses During Intubation Using Etomidate, Propofol And Thiopentone In Laparoscopic Cholecystectomy Surgeries. Innovative Journal of Medical and Health Science. 2015;5(4):150-158.