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RESEARCH ARTICLE

“STUDY OF THE EFFECT OF PROPOFOL & ETOMIDATE AS AN INDUCTION AGENT ON HAEMODYNAMIC CHANGES DURING INDUCTION & ENDOTRACHEAL INTUBATION”

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Manuscript Info

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Abstract

Introduction: Laryngoscopy and subsequent tracheal intubation cause a fugitive tachycardia and hypertension as a result of sympathoadrenal stimulation. Careful selection of anesthetic is thus required, as cardiovascular reserve is decreased in certain patients, so as to avoid undue depressions of cardiac and circulatory function

Aims And Objectives: This randomized double blind prospective study had been designed for comparative evaluation of inj propofol 2.5 mg/kg, inj Etomidate 0.3 mg/kg an induction agent on haemodynamic changes such as HR, SBP, DBP, MAP and oxygen saturation during induction and tracheal intubation and also to study the adverse effects the two drugs under study

Material And Methods: After approval from medical ethics committee, Dr D Y Patil Medical College and Hospital, Pune, the study was carried out on sixty (60) patients undergoing elective surgeries under standard general anesthesia. ? All patients were premedicated with Ondansetron 0.1mg/kg i.v., inj midazolam 0.02mg/kg and inj fentanyl 2 mcg/kg i.v. ? All patients pre-oxygenated with 100% oxygen for 3 min, all vital parameters recorded (T1) ? Group P received inj. propofol 2.5 mg/kg i.v. and group E received Etomidate 0.3mg/kg i.v. over 30 sec and vital parameters recorded as (T2) ? Inj succinylcholine as muscle relaxant given after administering induction agent, laryngoscopy and tracheal intubation attempted with appropriate sized endotracheal tube. All vital parameters recorded during laryngoscopy(T3), periodic monitoring of vital parameters carried out at 1,2,3,5 and 10 minutes intervals post intubation ? Further the patient was maintained on O₂ /N₂O / Isoflurane and Vecuronium i.v. top-ups as and when required ? At the end of surgery, patient reversed with inj. Glycopyrrolate 0.008mg/kg i.v. along with inj. Neostigmine 0.05mg/kg intravenously and extubated after gaining consciousness and adequate power ? Patient shifted to recovery room observed for any side effects such as nausea, vomiting,

Result: The demographic profile was comparable. There was no statistically considerable difference between the two study groups with respect to baseline parameters of HR, SBP, DBP, MAP and SpO₂. There was decrease in mean heart rate seen in group P compared to group E at post induction (T2), after intubation 1 min, 2min, the values were statistically significant with P value <0.05, and decrease in mean

SBP, mean DBP AND MAP in group P compared to group E at post induction (T2), after intubation 1,2 3, 5 min values were statistically significant with p value <0.05 Pain on injection was more in group P 26 out of 30(86.7%) than group E, which was statistically significant with p value <0.05 Incidence of myoclonus was more in group E 23 patients out of 30(76.7%) compared to group P which was statistically significant with p value <0.05. In group P 2 out of 30 patients (6.7%) had vomiting and in group E 3 out of 30 patients (10%) had vomiting, difference was statistically insignificant with p value >0.05

Conclusion: • Both, Propofol and etomidate are safe induction agents • Etomidate maintains better haemodynamic stability than propofol as induction agent • Pain on injection was more with propofol. However, myoclonus was more with etomidate • Both drugs were associated with no significant side effects/complication.

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Introduction:-

These transient changes of hypertension and tachycardia although present for short interval of two to seven minutes can lead to increase in intracranial pressure or myocardial ischemia.⁶ These hemodynamic changes can lead to complications, that includes left ventricular dysfunction,^{3,7} hypertensive crisis,⁸ pulmonary oedema,⁸ cardiac dysrhythmias,^{9,10} myocardial ischemia,^{11,12} and myocardial necrosis.

Intubation results in increase in mean arterial pressure and plasma noradrenaline level. Adrenaline and dopamine concentrations do not increase significantly following intubation. This result suggests a predominant sympathetic response during intubation and the need of prophylaxis in patients at risk¹³. Pharmacological approaches including lidocaine, esmolol, fentanyl, clonidine, nitroglycerine, verapamil, and nicardipine have been used to prevent the pressor response to laryngoscopy and tracheal intubation.

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

Propofol, 2,6 diisopropylphenyl, is the most popular induction agent with its favorable characteristics of rapid and smooth induction and recovery, decreased incidence of nausea and vomiting etc.^{14,15}. While on the other side it decreases blood pressure, cardiac output, and systemic vascular resistance^{16,17} due to inhibition of sympathetic vasoconstriction and impairment of baroreceptor reflex regulatory system^{18,19}.

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. Its lack of effect on sympathetic nervous system, baroreceptor reflex regulatory system and its effect of increased coronary perfusion even on patients with moderate cardiac dysfunction makes it an induction agent of choice in cardiac disease patients^{[15],[20],[21],[22]}.

Considering the common use of Propofol and Etomidate as an induction agent, this study is conducted to compare the effects of these two drugs on hemodynamic responses during induction and endotracheal intubation in a patient undergoing elective surgery under general anesthesia.

Aim And Objectives:-

Aim:

Comparative evaluation of Propofol and Etomidate as an induction agent on hemodynamic changes during induction and endotracheal intubation.

Objectives:-

1. To compare haemodynamic changes like heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure, oxygen saturation in the two study groups during induction and intubation
2. To compare time of induction to choose the better induction agent.
3. To study adverse effects of the two drugs, if any.

Material And Methods:-**Type of study:**

Prospective randomized double-blind study.

Place of study:

Department of Anesthesiology and Critical care, Dr. D.Y. Patil medical college, hospital and research centre, Pimpri, Pune.

Period of study:

September 2018 to September 2021

Period required for data collection:

2.5 years

Period required for data analysis and reporting:

6 months

Sample Size:

The study was conducted in 60 patients randomly divided into two groups of 30 each of either sex in age group of 18-65 years posted for elective surgery under general anesthesia.

Sample size was calculated by using open Epi software. In the study by Katarzyna Zgoła et al⁵¹ the difference in mean arterial pressure (MAP) was 93.9 ± 13.1 vs 81.1 ± 16.1 in both study groups. Taking confidence interval 95%; power of study 80%; to get difference as in above mentioned study minimal sample size required is 42 (21 for each group). But considering the dropout rate and for effective study, we choose sample size as 30 per group, making total sample size as 60.

The institute ethics committee clearance was obtained before the start of study.

All subjects were subjected through pre-anesthetized evaluation and relevant laboratory investigations.

Informed written consent was obtained from all patients.

Inclusion Criteria:

1. Age between 18 to 65 years of either sex
2. ASA grade I and II
3. Patients posted for elective surgeries under general anesthesia requiring intubation
4. Willing to be part of study.

Exclusion Criteria:

1. Patients with anticipated difficult intubation/Laryngoscopy duration > 15 sec.
2. Patients posted for emergency procedures.
3. History of allergies to any of drugs under study.
4. Unwilling patients.
5. Pregnant patients.
6. Patients with heart diseases.

Material Required:

1. Standard anesthesia machine (Boyle's apparatus)

2. Intravenous cannula 20 G
3. Intravenous fluids-crystalloids and colloids
4. Monitoring equipment's pulse oximeter, ECG monitor, non-invasive blood pressure (NIBP) apparatus.
5. Disposable syringes.
6. Anesthesia Trolley with normal saline, gauze pieces, iv stickings
7. Drugs for pre-medication: midazolam, ondansetron and fentanyl.
8. Drugs for general anesthesia-Propofol, Etomidate, Succinylcholine, Vecuronium, and inhalational agent Isoflurane
9. Equipment necessary for resuscitation, laryngoscope with blades of various sizes and endotracheal cuffed tubes of various sizes for intubation
10. Drugs for reversal: Glycopyrrolate and Neostigmine.

Randomization:

Institutional ethics committee approval was taken prior to the commencement of the study. 60 patients undergoing elective surgeries under general anesthesia were selected randomly using computer generated random number table after applying already mentioned stringent inclusion and exclusion criteria. The patients were divided into two groups of 30 each. Randomized, double blinded method was used for grouping the patients. The patients and investigator were not aware of the drugs given. Drugs were prepared and administered by the theatre anaesthesiologist who was not part of data collection or analysis.

1. Group P:(n-30) received 2.5mg/kg Propofol iv given slowly for induction
2. Group E:(n-30) received 0.3mg/kg Etomidate iv given slowly for induction

Evaluation Of Parameters:

All patients were thoroughly evaluated pre-operatively. All the necessary and relevant laboratory and other investigations were carried out.

General Anesthesia Technique

The patients were kept nil per orally for 8 hrs. prior to surgery. On arrival in operation theatre standard anesthesia monitors including pulse oximeter, NIBP, ECG, etc. connected to the patient. Baseline vital parameters such as heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial blood pressure (MAP), and SPO₂ recorded. (T₀)

After securing good intravenous line using 20G cannula an infusion of fringer lactate started slowly.

Premedication:

Patient was premedicated with Ondansetron 0.1 mg/kg i.v., inj. Midazolam 0.02 mg/kg i.v. and inj. Fentanyl 2 mcg/kg i.v.

Preoxygenation

Patient was pre-oxygenated with 100% oxygen for 3 minutes. All vital parameters were recorded again (T₁).

Induction Of General Anesthesia

For induction group P received Inj. Propofol 2.5mg/kg i.v. and group E received Inj. Etomidate 0.3mg/kg i.v. given over 30 sec. After induction of anesthesia hemodynamic parameters were recorded (T₂). Time of induction was taken as period between time of start of study drug till loss of eyelash reflex. The choice of muscle relaxant will be Inj. succinylcholine (2mg/kg) given after administering induction agent. Laryngoscopy and tracheal intubation attempted with appropriate size of endotracheal tube. All vital parameters will be recorded again during Laryngoscopy. (T₃) Proper placement of endotracheal tube was confirmed by capnography and bilateral auscultation of chest. Periodic monitoring of vital parameters carried out at 1, 2, 3, 5 and 10 minute intervals post intubation.

Parameters Observed

Induction Time in seconds

HR, SBP, DBP, MAP and Spo₂ at following time interval

T₀-Baseline

T₁-Before Induction

T2-Post Induction

T3 -During Laryngoscopy

After Intubation -At 1min,2min,3min,5min and 10 min

Maintenance Of General Anesthesia

Anesthesia maintained with Oxygen, Nitrous oxide (33:66) and Isoflurane, along with intermittent boluses of muscle relaxant inj. vecuronium i.v. 0.1mg/kg as and when required throughout the surgery.

During surgery continuous monitoring was done as follows:

1. Continuous Heart rate monitoring SBP, DBP, Mean BP and SPO₂.
2. At the end of surgery, patient will be reversed with inj. Glycopyrrolate 0.008 mg/kg i.v. along with Inj. Neostigmine methyl sulphate 0.05mg/kg intravenously. Patient was finally be extubated after gaining consciousness and adequate power. pt was shifted to recovery room.

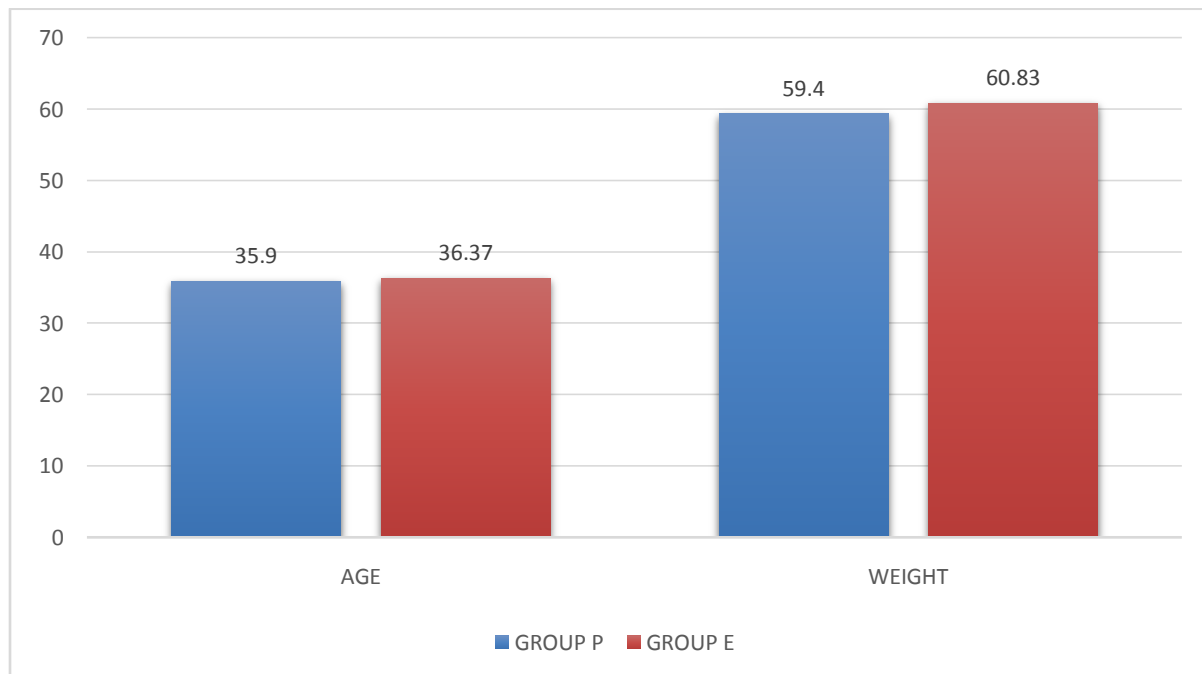
Statistical Analysis:

Data collected, compiled and tabulated. The statistical analysis done by using parametric test and final interpretation by using 'Z' test (standard normal variant) with 95% significance. Quantitative data was analysed by student 't' test and qualitative data by Chi square test. P value <0.05 is considered as significant.

Observations And Results:-

Table No.1:- Age And Weight.

VARIABLE	GROUP P MEAN + SD	GROUP E MEAN + SD	P VALUE
AGE	35.9 + 10.39	36.37 + 9.525	0.857
WEIGHT	59.4 + 11.56	60.83 + 14.14	0.669



Graph 1:- Bar graph showing comparison of mean age and weight between two groups.

Table no.1 and graph 1 shows mean age and weight among two groups. There was no statistically considerable difference in two study groups.

Table No. 2:- Gender.

			GROUP		Total
			GROUP P	GROUP E	
SEX	FEMALE	Count	15	13	28
		%	50.0%	43.3%	46.7%
	MALE	Count	15	17	32
		%	50.0%	56.7%	53.3%
Total		Count	30	30	60
		%	100.0%	100.0%	100.0%

CHI SQUARE = 0.067, P VALUE = 0.706

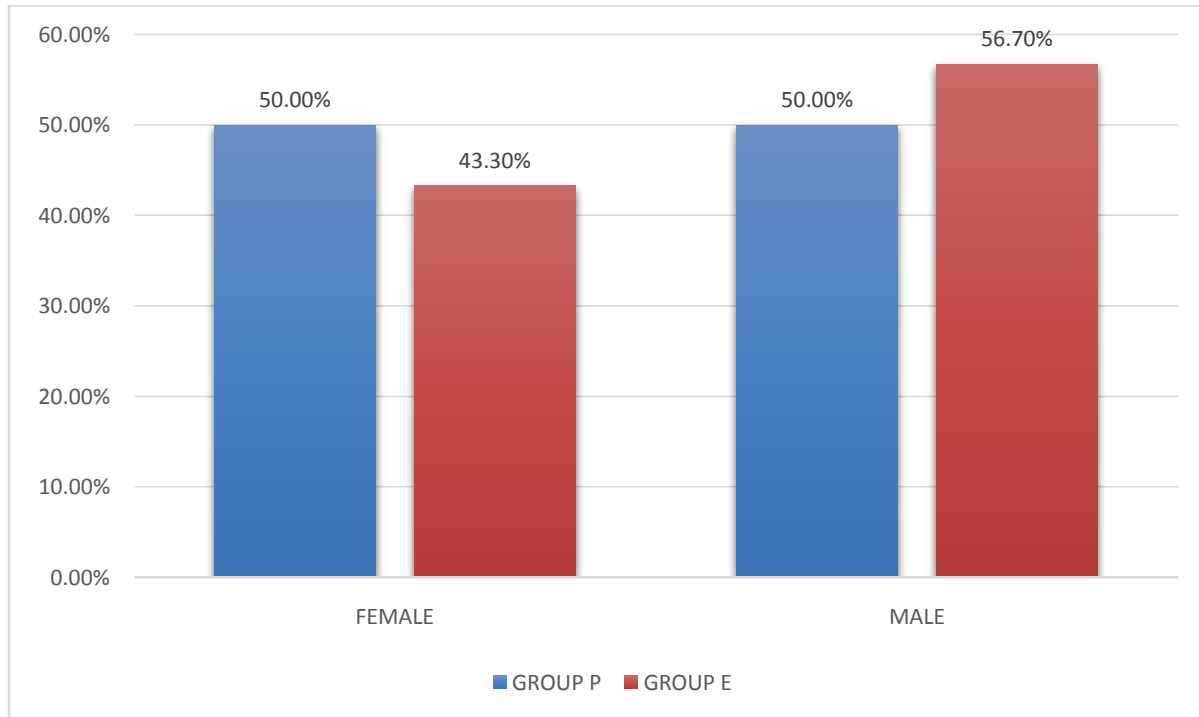
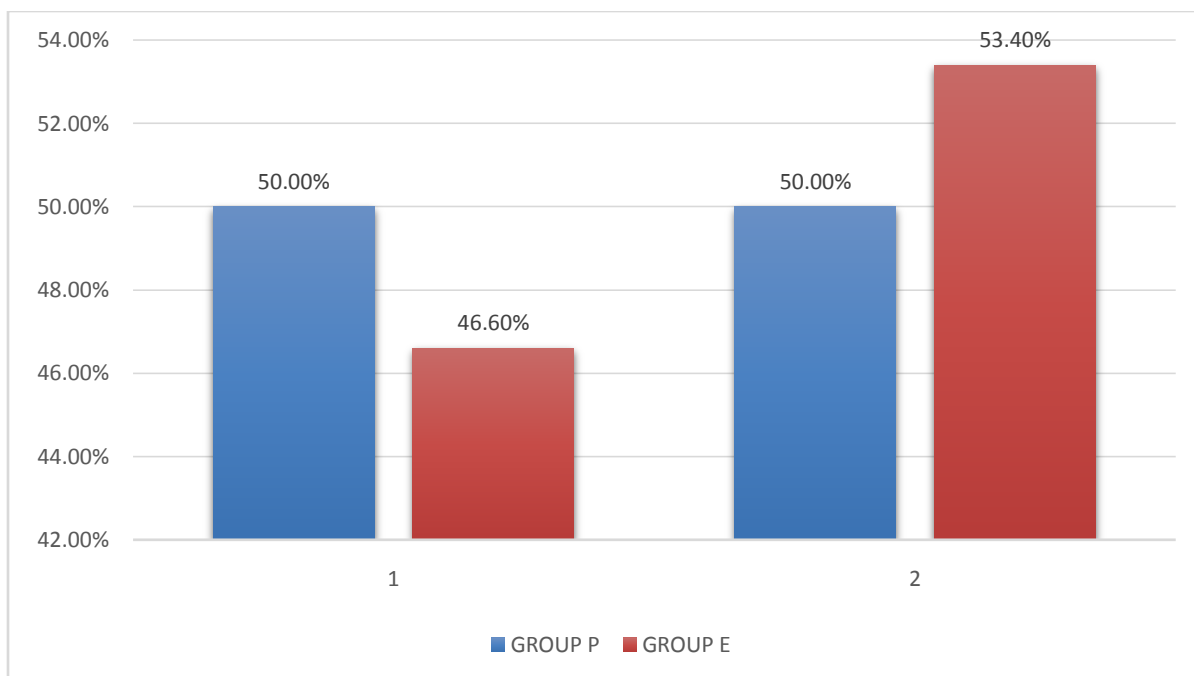
**Graph 2:-** Bar graph showing gender distribution between two groups.

Table no.2 and graph 2 shows gender wise distribution of cases in two study groups. There was no statistically considerable difference in two study groups

Table No. 3:- Asa Grading.

			GROUP		Total
			GROUP P	GROUP E	
ASA	I	Count	15	14	29
		%	50.0%	46.6%	48.3%
	II	Count	15	16	31
		%	50.0%	53.4%	51.7%
Total		Count	30	30	60
		%	100.0%	100.0%	100.0%

CHI SQUARE = 0.001, P VALUE = 1.000

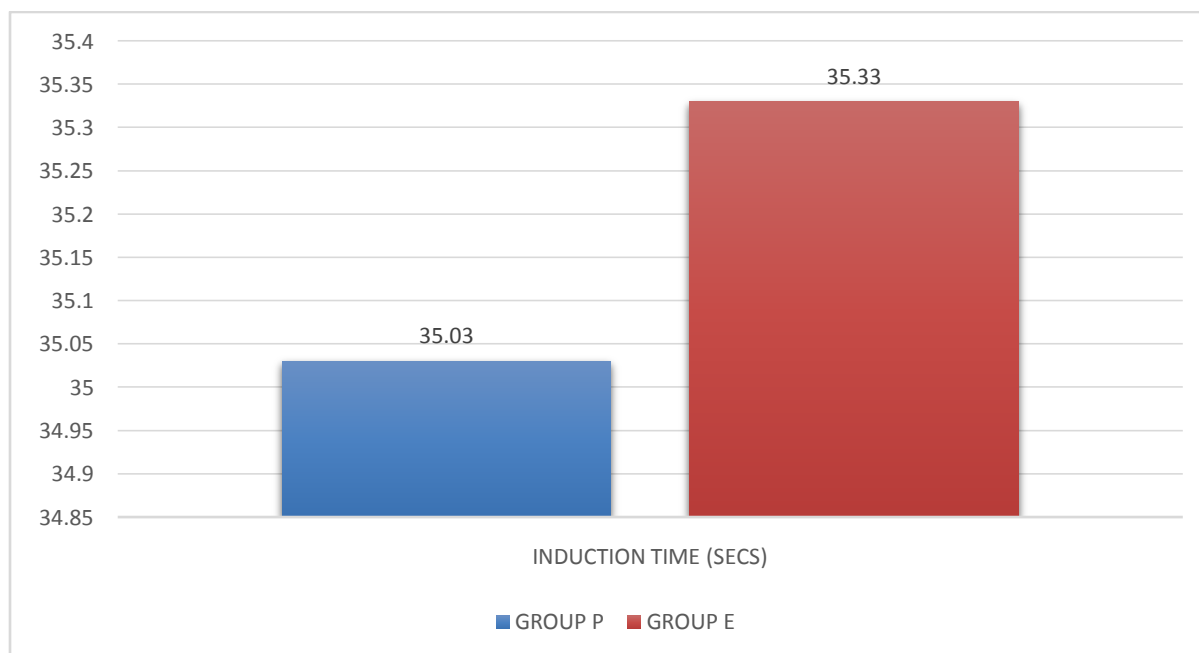


Graph 3:- Bar graph showing ASA grade distribution of patients between the two study groups.

Table no.3 and graph 3 show ASA grade wise distribution of cases in study groups. There was no statistically considerable difference in two study groups. Patients belonging to ASA grade I & II were only considered in the study.

Table No.4:- Time Of Induction.

VARIABLE	GROUP P MEAN + SD	GROUP E MEAN + SD	P VALUE
INDUCTION TIME (SECS)	35.03+2.498	35.33+2.218	0.625

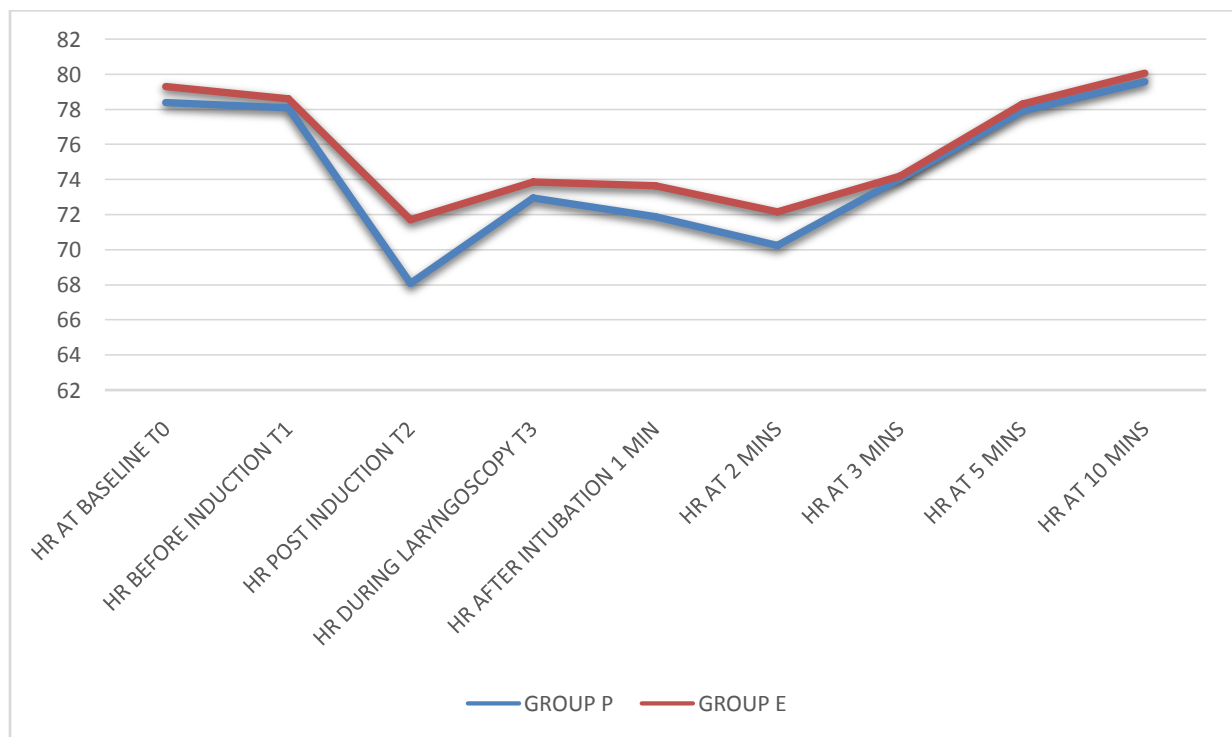


Graph 4:- Bar graph showing induction time between two group.

Table 4 and bar diagram 4 show induction time in Group P and Group E. Induction time between the two study groups was statistically insignificant. ($p>0.05$)

Table No. 5:- Heart Rate.

VARIABLE	GROUP P MEAN + SD	GROUP E MEAN + SD	P VALUE
HR AT BASELINE T0	78.4 + 2.74	79.33 + 1.918	0.133
HR BEFORE INDUCTION T1	78.1 + 2.59	78.63 + 1.847	0.362
HR POST INDUCTION T2	68.10 + 6.48	71.73 + 2.016	*0.005
HR DURING LARYNGOSCOPY T3	72.97 + 1.99	73.87 + 3.181	0.194
HR AFTER INTUBATION 1 MIN	71.90 + 1.32	73.67 + 3.315	*0.009
HR AT 2 MINS	70.27 + 1.23	72.17 + 1.683	*0.001
HR AT 3 MINS	74.07 + 3.07	74.20 + 3.022	0.866
HR AT 5 MINS	77.93 + 1.23	78.33 + 1.493	0.262
HR AT 10 MINS	79.60 + 1.30	80.07 + 1.337	0.176



Graph 5:-

Table 5 and graph 5 show comparison of heart rate between two groups. In group P, HR decreased at post induction (T2) (68.10 ± 6.48), at post intubation 1 min (71.90 ± 1.32) and at 2 min (70.27 ± 1.23) as compared to group E. It was statistically significant.

Table No. 6 SBP

VARIABLE	GROUP P MEAN + SD	GROUP E MEAN + SD	P VALUE
SBP AT BASELINE T0	129.53 + 3.048	128.53 + 1.961	0.136
SBP BEFORE INDUCTION T1	128.00 + 1.742	128.33 + 1.900	0.482

SBP POST INDUCTION T2	107.80 + 2.483	121.43 + 1.960	*0.001
SBP DURING LARYNGOSCOPY T3	130.70 + 1.119	131.40 + 1.673	0.062
SBP AFTER INTUBATION 1 MIN	118.67 + 1.988	130.93 + 1.143	*0.001
SBP AT 2 MINS	111.80 + 3.078	128.07 + 3.542	*0.001
SBP AT 3 MINS	113.87 + 3.598	126.60 + 1.499	*0.001
SBP AT 5 MINS	120.90 + 1.125	128.53 + 1.479	*0.001
SBP AT 10 MINS	130.33 + 0.922	130.80 + 1.126	0.084

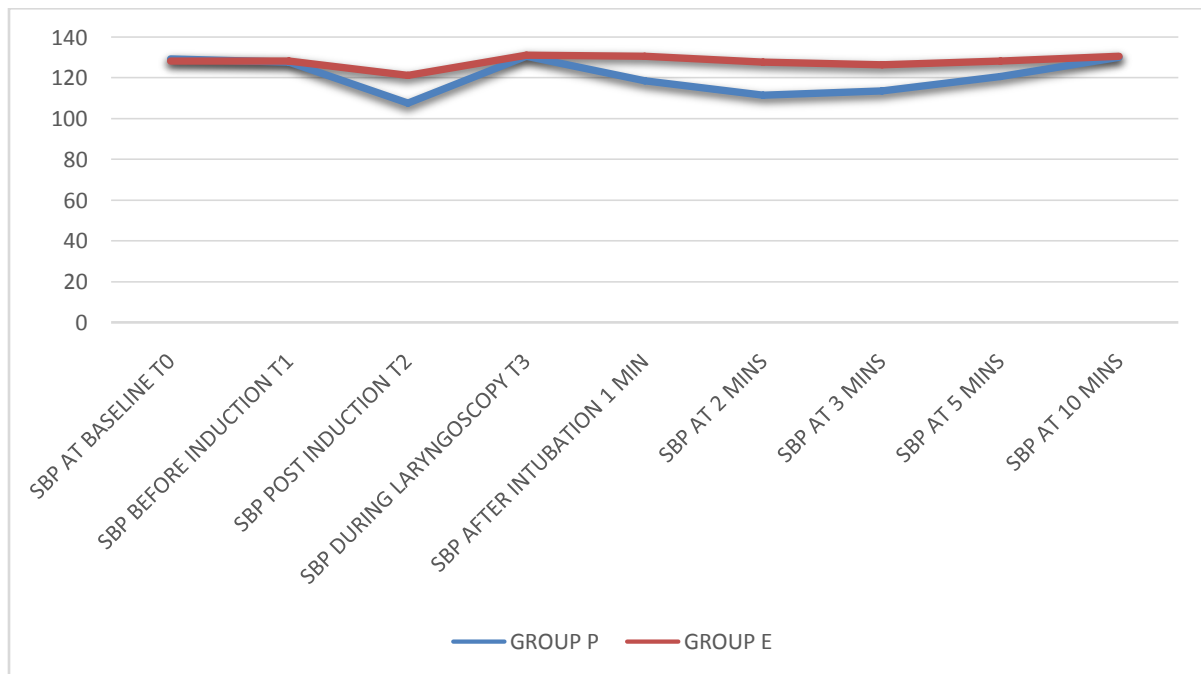
**Graph 6**

Table no 6 & Graph 6 show comparison in systolic blood pressure between two groups. In Group P, SBP decreased at post induction (T2) (107.80±2.483), after intubation at 1 min (118.67±1.988), at 2 mins (111.80±3.078), at 3 mins (113.87±3.598) & at 5min (120.90±1.125), as compared to group E. It was statistically significant.

Table No. 7:- DBP.

VARIABLE	GROUP P MEAN + SD	GROUP E MEAN + SD	P VALUE
DBP AT BASELINE T0	70.53 + 3.319	71.60 + 2.749	0.180
DBP BEFORE INDUCTION T1	70.47 + 2.813	70.60 + 2.978	0.859
DBP POST INDUCTION T2	65.00 + 2.393	70.93 + 3.051	*0.001
DBP DURING LARYNGOSCOPY T3	79.07 + 2.227	79.80 + 2.941	0.281
DBP AFTER INTUBATION 1 MIN	70.20 + 2.592	78.20 + 2.483	*0.001
DBP AT 2 MINS	65.20 + 2.821	73.80 + 2.295	*0.001
DBP AT 3 MINS	64.40 + 2.660	74.37 + 2.076	*0.001
DBP AT 5 MINS	66.47 + 2.837	71.77 + 3.126	*0.001
DBP AT 10 MINS	72.00 + 2.913	72.30 + 3.042	0.698

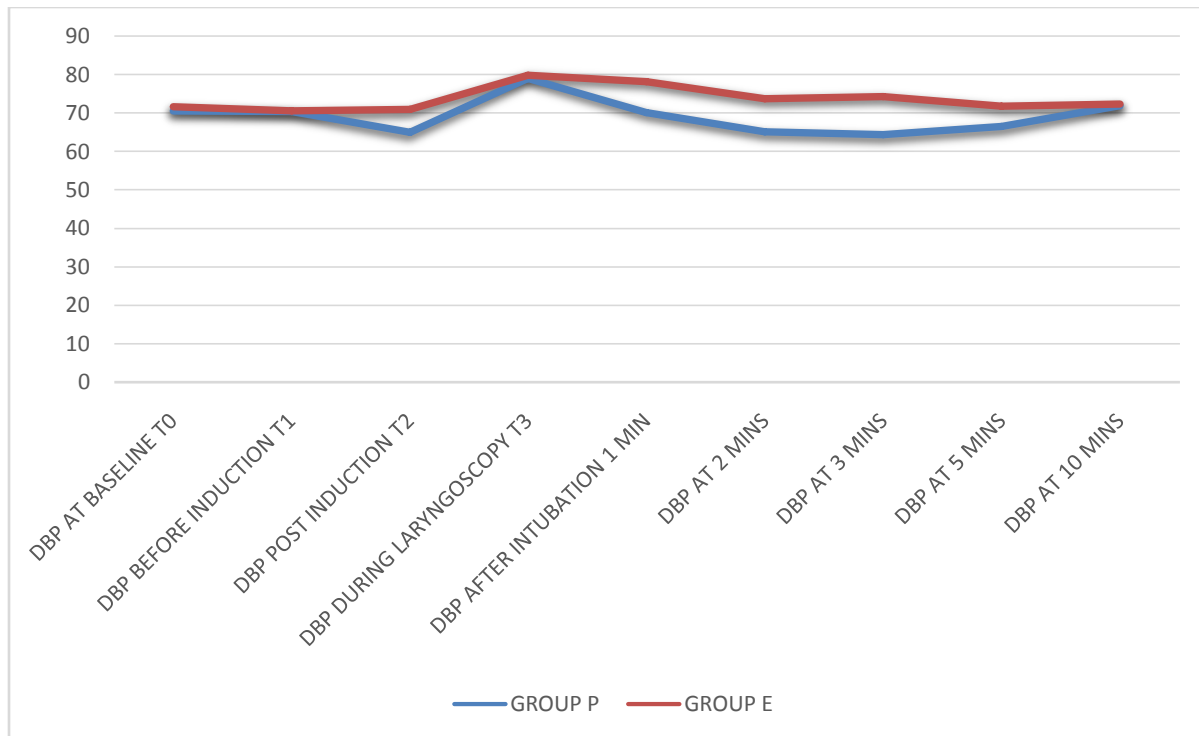
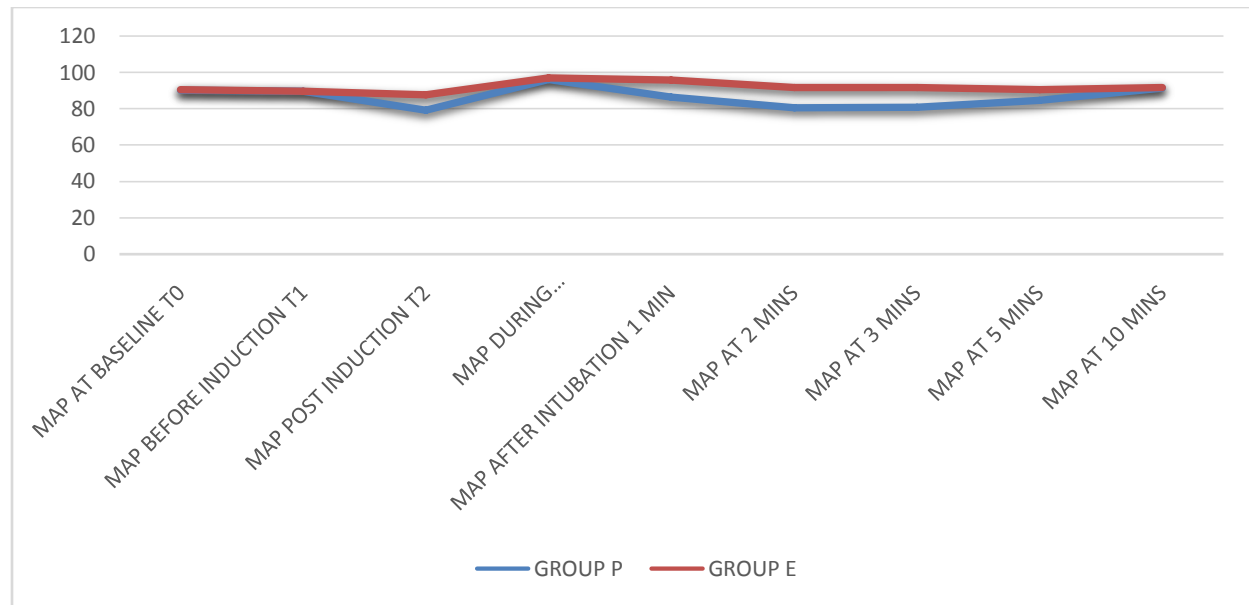
**Graph 7**

Table no 7 & Graph 7 show comparison of Diastolic Blood Pressure between two groups. In Group P, DBP decreased at post induction (T2) (65.10 ± 2.393), after intubation at 1 min (70.20 ± 2.592), 2 mins (65.20 ± 2.821), 3 mins (64.40 ± 2.660), and 5 mins (66.47 ± 2.837) as compared to group E. It was statistically significant.

TABLE NO. 8 MAP

VARIABLE	GROUP P MEAN + SD	GROUP E MEAN + SD	P VALUE
MAP AT BASELINE T0	90.20 + 2.33	90.57 + 1.87	0.492
MAP BEFORE INDUCTION T1	89.64 + 1.91	89.84 + 2.01	0.695
MAP POST INDUCTION T2	79.26 + 1.77	87.76 + 2.04	*0.001
MAP DURING LARYNGOSCOPY T3	96.27 + 1.57	97.00 + 1.88	0.113
MAP AFTER INTUBATION 1 MIN	86.35 + 1.85	95.77 + 1.69	*0.001
MAP AT 2 MINS	80.73 + 2.08	91.88 + 2.00	*0.001
MAP AT 3 MINS	80.88 + 2.00	91.77 + 1.38	*0.001
MAP AT 5 MINS	84.61 + 1.94	90.68 + 2.16	*0.001
MAP AT 10 MINS	91.44 + 1.99	91.80 + 2.05	0.499



Graph 8:-

Table 8 & Graph 8 show comparison of Mean Arterial Pressure between two groups. In Group P, MAP decreased at post induction (T2) (79.26 ± 1.77), after intubation at 1 min (86.35 ± 1.85), 2 mins (80.73 ± 2.08), 3 mins (80.88 ± 2.08), and 5 mins (84.61 ± 1.94) as compared to group E. It was statistically significant.

Table No. 9:- SPO2.

VARIABLE	GROUP P MEAN + SD	GROUP E MEAN + SD	P VALUE
SPO2 AT BASELINE T0	99.63 + 0.490	99.63 + 0.490	1.000
SPO2 BEFORE INDUCTION T1	99.63 + 0.490	99.60 + 0.498	0.795
SPO2 POST INDUCTION T2	99.60 + 0.498	99.63 + 0.490	0.795
SPO2 DURING LARYNGOSCOPY T3	99.63 + 0.490	99.60 + 0.498	0.795
SPO2 AFTER INTUBATION 1 MIN	99.60 + 0.498	99.63 + 0.490	0.795
SPO2 AT 2 MINS	99.60 + 0.498	99.63 + 0.490	0.795
SPO2 AT 3 MINS	99.60 + 0.498	99.63 + 0.490	0.795
SPO2 AT 5 MINS	99.60 + 0.498	99.60 + 0.498	1.000
SPO2 AT 10 MINS	99.63 + 0.490	99.63 + 0.490	1.000

Episodes of apnea were not observed in both the groups. There was no significant difference in oxygen saturation data between two groups. Samples are matched with $P > 0.05$.

Table No. 10:- Side Effects.

	GROUP P (N=30)	GROUP E (N=30)	P VALUE
PAIN ON INJECTION	26 (86.7%)	7 (23.3%)	0.001*
MYOCLONUS	2 (6.7%)	23 (76.7%)	0.001*
PONV	2 (6.7%)	3 (10.0%)	1.000

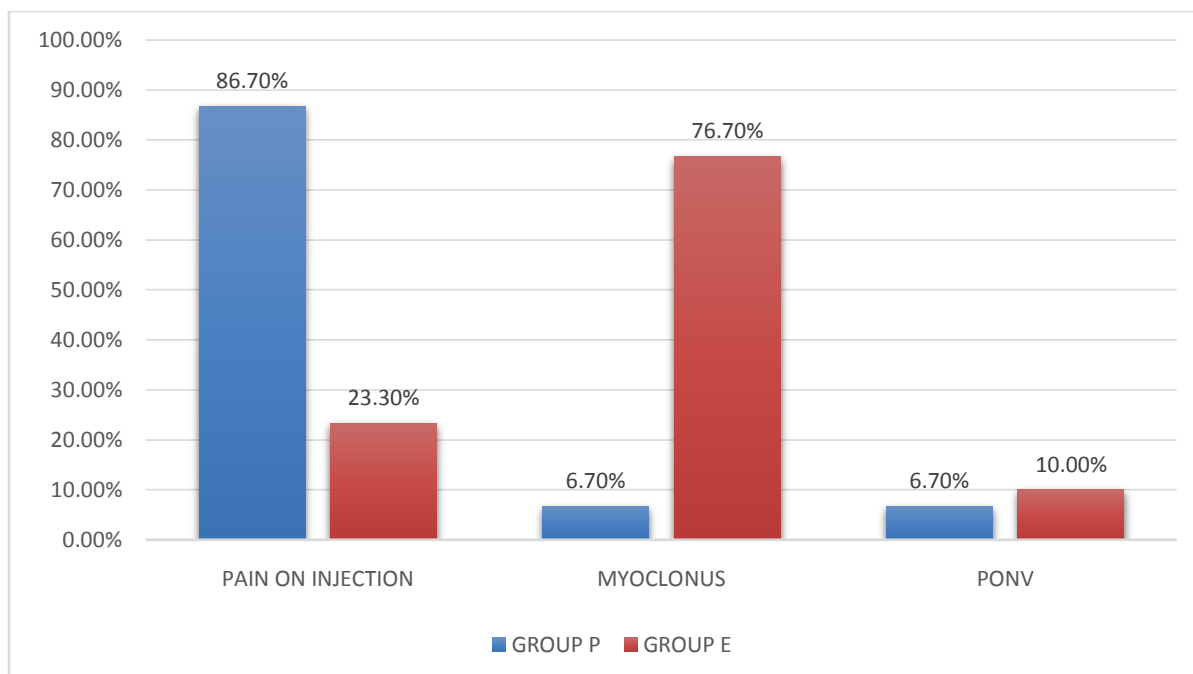
**Graph 10:-**

Table no 10 and Graph 10 show side effects of study drugs. In Group P - 26 patients out of 30 had pain on injection (86.7%) whereas in group E - 7 patients out of 30 had pain (23.3%). There was significant difference in incidence of pain on injection between the two groups. Sample showed P value < 0.05.

In Group P - 2 patients out of 30 had myoclonus activity (6.7%), whereas in Group E - 23 patients out of 30 had myoclonus activity (76.7%). There was statistically significant difference in incidence of myoclonus activity between the two groups. Sample showed P value < 0.05.

In group P - 2 patients out of 30 had PONV (6.7%) whereas in Group E - 3 patients out of 30 had PONV (10%). There was no statistically significant difference in incidence of PONV between the two groups. Sample showed P value > 0.05.

Discussion:-

The maintenance of hemodynamic stability during induction of anesthesia is dependent on basal tone of the autonomic nervous system and baroreceptor reflex regulation of autonomic outflow influencing cardiac function and peripheral vascular resistance.

Propofol is an intravenous induction agent which combines the desirable characteristics of smooth induction and rapid recovery from anesthesia.⁵² Propofol also reduces preload, afterload and contractility which directly effects on vascular smooth muscle and has venous dilating properties. It causes reduction in tonic levels of sympathetic activity.

The salient properties of etomidate like hemodynamic stability, minimal respiratory depression, and favourable pharmacokinetics enable rapid recovery after a single dose. Etomidate causes reduction in myocardial function and basal sympathetic tone. It maintains hemodynamic stability by preserving or augmenting baroreflex mechanisms.⁴¹

Demographic profile

In the present study, there was no significant difference in demographic data between the two groups in relation to Age, weight, gender, and ASA grades. Samples are matched with p > 0.05. [Table 1,2 and 3].

Hemodynamic Parameters

Baseline Parameters:

In this study, the baseline values (before drug administration) of HR, SBP, DBP & MAP were comparable in all two groups ($p = 0.133$, $p = 0.136$, $p = 0.180$, $p = 0.492$ respectively) i.e., p value was not significant ($p > 0.05$).

For premedication, InjOndansetron 0.1mg/kg iv, Inj Midazolam 0.02mg/kg iv and Inj fentanyl 2mcg/kg iv was used in all the cases.

Selected patients were induced with either Injpropofol 2.5 mg/kg iv or inj.Etomidate 0.3 mg iv according to the allocated groups.

Induction Time: According to our study the mean induction time in group P was 35.03 ± 2.498 sec whereas in Group E was 35.33 ± 2.218 sec, which was statistically insignificant.

Dr. Supriya Agarwal et al⁴⁹ in 2020 conducted a comparative study between etomidate and propofol as an induction agent during induction, laryngoscopy and intubation showed that mean duration of time to loss of consciousness between two groups was statistically insignificant

Results of our study was similar to above mentioned study

Haemodynamic parameters

Heart Rate:

Table 5 and graph 5 shows comparison of HR between the two groups at baseline (T0), before induction (T1), post induction (T2), during laryngoscopy (T3), after intubation at 1, 2, 3, 5 & 10 min.

Our observations showed statistically significant difference in HR values at post induction (T2), after intubation at 1 min and 2 min

There was decrease in heart rate in group P as compared to group E at Post induction (T2) group P (68.10 ± 6.48) vs group E (71.73 ± 2.016), at 1 min after intubation group P (71.90 ± 1.32) vs group E (73.67 ± 3.315), at 2 min After intubation group P (70.27 ± 1.23) vs group E (72.17 ± 1.683) and it was statistically significant with $P < 0.05$.

The fall in heart rate at post induction (T2), at 1 min, 2 min after intubation in Group P as compared to Group E was statistically significant with P value (< 0.05).

Djordjević B, Stojiljković M P. et al⁴³ in 1999 Jan-Feb, conducted a study to compare the cardio vascular effects of induction doses of propofol, etomidate and thiopentone on total 165 female patients randomly divided into three groups each one received a different anesthetic agent propofol 2.5 mg/kg ($n=58$), etomidate 0.3mg/kg ($n=54$) or thiopentone 5mg/kg ($n=53$) showed that slowing down of radial pulse was more marked in propofol, than in etomidate or thiopentone group at 2 min, 5 min, 10 min after induction of anesthesia.

The results of four studies were similar to the one obtained by the above-mentioned study.

Systolic Blood pressure

In our study, SBP was compared between two groups at baseline (T0), before induction (T1), post induction (T2), during laryngoscopy (T3), after intubation at 1, 2, 3, 5 & 10 min

Our observations showed statistically significant difference in SBP values at post induction (T2), after intubation at 1 min and 2 min, 3 min and 5 min.

In our study, it was found that in group P at post induction (T2) mean SBP was 107.80 ± 2.483 whereas in Group E it was 121.43 ± 1.960 , at 1 min after intubation in the Group P mean SBP was 118.67 ± 1.988 whereas in Group E it was 130.93 ± 1.143 , At 2 min after intubation in the Group P mean SBP was 111.80 ± 3.078 whereas in Group E it was 128.07 ± 3.542 , at 3 min after intubation in the group P mean SBP was 113.87 ± 3.598 whereas in Group E it was 126.6 ± 1.499 and at 5 min after intubation in the Group P mean SBP was 120.9 ± 1.125 whereas in Group E it was 128.58 ± 1.479

The fall in SBP at post induction(T2), at 1 min, 2 min, 3 min and 5 min after intubation in Group P as compared to Group E was statistically significant with P value (<0.05).

The following study shows similar results like our study

Thomas J Elbert⁴¹ et al 1992 compared injpropofol 2.5mg/kg and etomidate 0.3mg/kg to study the sympathetic response, and found that cardiac and baroslopoes were well maintained with etomidate but decreased with propofol. Haemodynamic stability was seen more with etomidate due to preservation of sympathetic outflow and autonomic reflexes.

Djordjević B, Stojiljković MP⁴³ et al in 1999 Jan-Feb. Conducted a study to compare the cardio vascular effects of induction doses of propofol, etomidate and thiopentone on total 165 female scheduled for abortion patients randomly divided into three groups each one received a different anestheshetic agent propofol 2.5 mg/kg (n=58), etomidate 0.3mg/kg (n=54) or thiopentone 5mg/kg (n=53) showed significant greater decrease in blood pressure was in propofol group than etomidate or propofol after induction at 2,5 and 10 min after induction.

P. Savanth Kumar, P Lokesh et al⁵⁰ in 2021 conducted a study on etomidate versus propofol for induction of general anesthesia, in this study group P comprised of 40 patients induced with inj. Propofol 2mg/kg and group E comprised of 40 patients induced with etomidate 0.3mg/kg. Study showed SBP decreased in propofol group from base line value at 1min, 2min and 3 min of induction, at 1 min and 2 min of post intubation compared to group E and it was statistically significant.

Diastolic Blood Pressure

In our study, the DBP was compared between two study groups at baseline (T0), before induction (T1), post induction (T2), during laryngoscopy (T3), after intubation at 1, 2, 3, 5 & 10min.

Our observations showed statistically significant difference in DBP in group P compared to group E at post induction (T2), after intubation at 1min and 2 min, 3min and 5 min.

In group P at post induction (T2) mean DBP was 65.00 ± 2.393 whereas in group E it was 70.93 ± 3.051 , after intubation at 1 min in group P mean DBP was 70.20 ± 2.592 whereas in group E it was 78.20 ± 2.483 , at 2min after intubation in group P mean DBP was 65.20 ± 2.821 whereas in group E it was 73.80 ± 2.295 , at 3min after intubation in group P mean DBP was 64.40 ± 2.660 where as in group E it was 74.37 ± 2.076 and at 5 min after intubation in group P mean DBP was 66.47 ± 2.837 whereas in group E it was 71.77 ± 3.126 [Table 6]

The fall in DBP at post induction(T2), at 1 min, 2 min, 3 min and 5 min after intubation in Group P as compared to Group E was statistically significant with P value (<0.05).

Following study shows similar results like our study

Shah, Jigna, et al⁴⁷. in 2018 conducted a "Comparative study of propofol vs etomidate as an induction agent to evaluate hemodynamic changes during induction of anesthesia in controlled hypertensive patients". Sixty patients undergoing surgery under general anesthesia. 30 patients Group P were given inj fentanyl 2 mcg/kg, followed by injpropofol 1-2 mg/kg; and patients of Group-E were given inj fentanyl 2 mcg/kg, followed by injetomidate 0.2-0.4 mg/kg. The fall mean in DBP in group P from baseline compared to group E was statistically significant at 1min, 3 min, 5 min and 10 min after induction.

Mean Arterial Pressure

In our study, the MAP was compared between two study groups at baseline (T0), before induction (T1), post induction (T2), during laryngoscopy (T3), after intubation at 1, 2, 3, 5 & 10min.

Our observations showed statistically significant difference in MAP values at post induction (T2), after intubation at 1min and 2 min, 3min and 5 min.

In group P at post induction (T2) MAP was 79.26 ± 1.77 whereas in group E it was 87.76 ± 2.04 , after intubation at 1 min in group P MAP was 86.35 ± 1.85 whereas in Group E it was 95.77 ± 1.69 , at 2min after intubation in group P

MAP was 80.73 ± 2.08) whereas in Group E it was 91.88 ± 2.00 , after intubation at 3 min in group P MAP was 80.88 ± 2.00 whereas in group E it was 91.77 ± 1.38 and at 5 min after intubation in group P MAP was 84.61 ± 1.94 whereas in group E 90.68 ± 2.16 .

The fall in Mean Arterial Pressure, post induction (T2), at 1 min, 2 min, 3 min and 5 min after intubation in Group P as compared to Group E was statistically significant with P value (<0.05).

Following studies show similar results like our study

Shah, Jigna, et al⁴⁷. in 2018 conducted a "Comparative study of propofol vs etomidate as an induction agent to evaluate hemodynamic changes during induction of anesthesia in controlled hypertensive patients". Sixty patients undergoing surgery under general anesthesia were randomly divided into two equal groups. Patients of Group P were given inj fentanyl 2 mcg/kg, followed by inj propofol 1-2 mg/kg; and patients of Group-E were given inj fentanyl 2 mcg/kg, followed by inj etomidate 0.2 to 0.4 mg/kg. The fall in mean MAP in group P compared to group E was statistically significant at 1 min, 3 min, 5 min and 10 min after induction.

P. Savanth Kumar, P Lokesh et al⁵⁰ in 2021 conducted a study on etomidate versus propofol for induction of general anesthesia, in this study group P comprised of 40 patients induced with inj. propofol 2 mg/kg and group E comprised of 40 patients induced with etomidate 0.3 mg/kg showed following induction, SBP, DBP and MAP decreased in propofol group from base line value at 1 min, 2 min and 3 min, etomidate group show stable SBP, DBP and MAP at 1 min, 2 min and 3 min of induction, at 1 min and 2 min of post intubation it was statistically significant.

Etomidate is considered to be an ideal induction agent specially for cardiac patients and small short-term surgeries.³⁸

The myocardial oxygen supply demand ratio is well maintained with Etomidate. It provides a better safety during induction in patients at risk of cardiac disease with less cardiovascular depression than propofol.³⁹

Oxygen Saturation

As per our study, there was no significant difference in oxygen saturation data between the two groups. Samples are matched with $p > 0.05$. [Table 8]. The episodes of apnea were not significant following induction and not associated with any fall in oxygen saturation.

JC Song⁴⁵ et al 2015 in his randomised clinical trial of Etomidate Anesthesia during ERCP Caused More Stable Haemodynamic Responses Compared with Propofol, in his study it showed that no patient from etomidate or propofol group experienced desaturation or apnea, oxygen saturation noted at point T0 = baseline values, 5 min after entering the endoscopy room; T1 = 5 min after the patients received midazolam; T2 = when BIS was 50 (after induction of etomidate or propofol); T3 = at scope intubation and T4-10 = by 5-min intervals during the ERCP.

Results of our study are similar to above mentioned study

Adverse effects

On comparing the adverse effects Use of propofol was associated with increased pain on injection than etomidate ($p < 0.05$). Out of 30 patients, 26 patients in group P had pain on injection (86.7%) whereas in group E - 7 patients out of 30 had pain on injection (23.3%) [Table 9].

Our findings are consistent with finding of **Agarwal S et al**⁴⁶ in 2016 who did a comparative study between etomidate and propofol 100 patients undergoing general anesthesia, similar findings observed in comparative study of the effects of Etomidate and propofol in patient undergoing laparoscopic cholecystectomy conducted by **Zarina Wahab et al**⁵³ in 2020

Use of etomidate was associated with high incidence of myoclonus than propofol (p value < 0.05). Out of 30 patients 2 patients in group P had myoclonus activity (6.7%). In group E 23 patients out of 30 had myoclonus activity (76.7%) [Table 10]

Fragen, Robert J. MD et al⁵⁴ in 1976 in his comparative study between Etomidate and thiopental for induction of general anesthesia high incidence of myoclonia was seen with etomidate. Myoclonus does not originate from an

epileptic focus. It arises due to subcortical disinhibition, leading to irritable leg syndrome during normal sleep. Myoclonus is characterised by uncomfortable legs, irritability, disability to sleep and numbness, with normal neurological examination.

Fatma Saricaoglu et al⁴⁴ 2011 in his study comparison of etomidate-lipuro, propofol and admixture at induction. 90 patients assigned into three groups; higher incidence of myoclonus seen in etomidate-lipuro group

Findings of our study are similar findings of above-mentioned studies

In our study, incidence of nausea and vomiting higher in group E 3 out of 30 patients (10%) as in group P 2 out of 30 patients (6.7%), although the difference was not statistically insignificant our findings are similar to the finding of **Kumar A et al⁴⁸** 2018 study on propofol and etomidate as an anesthetic agent for elective non cardiac surgery.

Summary And Conclusion:-

Result:-

The demographic profile was comparable.

There was no statistically considerable difference between the two study groups with respect to baseline parameters of HR, SBP, DBP, MAP and SpO₂.

There was decrease in mean heart rate seen in group P compared to group E at post induction (T2), after intubation 1 min, 2min, the values were statistically significant with P value <0.05, and decrease in mean SBP, mean DBP AND MAP in group P compared to group E at post induction (T2), after intubation 1, 2, 3, 5 min values were statistically significant with p value <0.05

Pain on injection was more in group P 26 out of 30 (86.7%) than group E, which was statistically significant with p value <0.05

Incidence of myoclonus was more in group E 23 patients out of 30 (76.7%) compared to group P which was statistically significant with p value <0.05.

In group P 2 out of 30 patients (6.7%) had vomiting and in group E 3 out of 30 patients (10%) had vomiting, difference was statistically insignificant with p value >0.05

Conclusion:-

1. Both, Propofol and etomidate are safe induction agents
2. Etomidate maintains better haemodynamic stability than propofol as induction agent
3. Pain on injection was more with propofol. However, myoclonus was more with etomidate
4. Both drugs were associated with no significant side effects/complication.

Bibliography:-

1. Magill, Endotracheal Anesthesia: Proceedings of the Royal Society of Medicine. 1928;22(2): p985-989.
2. Ried IC, Brace DE - Irritation of the respiratory tract and its reflex effect upon heart; SurgGynaec and Obst; 1940;70: pg 157-162.
3. Stoelting RK, Circulatory changes during laryngoscopy and tracheal intubation: influence of duration of laryngoscopy with or without lidocaine. Anesthesiology:1977; 47 pg 381-841.
4. R. Carlos, S. Innerarity. Effect of Premedication on Etomidate Anesthesia. British Journal of Anesthesia. 1979; 51:1159-1161
5. Fox EJ, Sklar GS, Hill CH, Complications related to pressor response to endotracheal intubation. Anesthesiology:1977; 47:pg 524-525
6. Gupta P, Panda B, Verma R, Ranjan P, Mathur S, Sinha G. Attenuation of Haemodynamic Responses to Laryngoscopy and Intubation following Nitro-glycerine and Esmolol infusion. The Internet Journal of Anesthesiology. 2009;22(2):1-5.
7. Sharma S, Mitra S, Grover VK, Kalra R. Esmolol blunts the haemodynamic responses to tracheal intubation in treated hypertensive patients. Can J Anesth. 1996; 43:778-782.

8. Braunwald E. Control of myocardial oxygen consumption: physiological and clinical considerations. Am J Cardiol. 1971;27(4):416-432.
9. Tan PH, Yang LC, Shih HC, Lin CR, Lan KC, Chen CS. Combined use of esmolol and nicardipine to blunt the haemodynamic changes following laryngoscopy and tracheal intubation. Anesthesia. 2002;57(12):1207-1212.
10. Singh H, Vichitvejpaisal P, Gaines GY, White PF. Comparative effect of lidocaine, esmolol and NTG in modifying the hemodynamic response to laryngoscopy and intubation. ClinAnesthesh. 1995; 7:1155-1158.