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A COMPARATIVE STUDY OF HEMODYNAMIC EFFECTS OF INDUCTION DOSES OF PROPOFOL-THIOPENTONE AND PROPOFOL-KETAMINE COMBINATIONS

Anaesthesiology

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ABSTRACT

Objective: We conducted this study to compare the hemodynamic effects of propofol-ketamine combination as induction agents to propofol-thiopentone combination. **Methods:** An interventional comparative study was carried out at Santhiram medical college, Nandyal. 50 ASA 1 and 2 patients in the age group of 18-50 years, undergoing elective surgery under general anaesthesia were enrolled for this study and were randomly allotted into two groups (A and B) of 25 each. Group A was induced with propofol-thiopentone and Group B was given propofol-ketamine combination. The hemodynamic parameters- heart rate, systolic, diastolic and mean arterial pressures were monitored starting from baseline up to 10 minutes. **Results:** There was a significant decrease in systolic blood pressure ($p<0.05$) in group A at 4 and 7 min compared to group B. There was significant increase in pulse rate in group A at 1,4,7 and 10 minutes after intubation ($p<0.05$).Diastolic and mean arterial pressures were comparable in both the groups. **Conclusion:** Administration of ketamine with propofol was comparatively better in maintaining the hemodynamic stability after induction as compared to Thiopentone- propofol combination.

KEYWORDS

Propofol-thiopentone; propofol-ketamine combination; Hemodynamics; Blood pressure; General anesthesia; Induction.

INTRODUCTION

Propofol, thiopentone and ketamine are the commonly used intravenous (IV) agents in anaesthesia practice. Hemodynamic disturbances are common with these agents; while thiopentone and propofol are associated with hypotension, ketamine causes hypertension and tachycardia. Several studies have been conducted in order to find out the anaesthetic agent with least hemodynamic changes.

Propofol has a rapid onset and recovery with fewer unwanted side effects and is ideal for short and ambulatory surgical procedures[1].When used as a sole induction agent, it causes significant reduction in arterial blood pressure and cardiac output[2].

Thiopentone has been in use for a long time as an induction agent, it causes rapid and smooth induction. But unlike propofol it does not suppress the airway reflexes.

Admixture of thiopentone and propofol is compatible and stable. It has a synergistic interaction.

Ketamine is a potent analgesic which release catecholamines, with subsequent tachycardia and hypertension and a preferred agent in patients with hypotension and shock[3].Administration of ketamine before induction with propofol has been shown to produce more hemodynamic stability as compared to propofol alone[1]

AIM AND OBJECTIVES

To compare the hemodynamic effects of propofol-thiopentone combination to propofol -ketamine as induction agent.

Various hemodynamic effects compared are systolic blood pressure, diastolic blood pressure etc.

MATERIALS & METHODS:

Source of data: All patients in the age group 18-50 years posted for elective surgeries under general anesthesia in Santhiram medical college & general hospital, Nandyal.

Study design: A prospective randomized trial.

Study period: April 2022 to September 2022.

Method of collection of data: The data will be collected in the proforma consisting of age, sex, and weight meeting the objectives of the study.

Study population: All patients with ASA physical status I and II aged 18-50 years posted for elective surgeries under general anesthesia.

Sample size: 50 patients

Sampling Criteria:

Inclusion Criteria

1) Patients aged between 18 to 50 years
2) Patients who give consent for the study
3) Patients with ASA physical status I and II
4) Patients who are scheduled for elective surgery under general anesthesia

Exclusion Criteria

1) Pregnant, lactating woman
2) Suspected difficult airway
3) Hypertensive patients
4) Patients with neurological disease

Statistical Analysis

The statistical software namely SAS 9.2, SPSS 16.0 were used for analysis of data and Microsoft word and Excel have been used to generate graphs and tables.

Percentage distribution of age group, gender was compared in between groups using non parametric (Pearson Chi-Square) test. Mean difference of Age, SBP, DBP, MAP, HR were compared in between groups using unpaired t test. The significance level of 0.05 was set for the entire statistical test at 95% confidence interval.

METHODOLOGY

50 patients were divided into two equal groups- group A(propofol-thiopentone) and group B(propofol-ketamine).

Randomization was done among the enrolled patients for allocation to either group A or B using computer generated randomization table. Data was collected and study parameters entered before and during intervention.

Patients were fasted overnight and premedicated with omeprazole 20 mg capsule and diazepam 5 mg tablet night before surgery and morning of surgery. In the operating room baseline blood pressure and heart rate were recorded. Patients were premedicated with intravenous glycopyrrolate 0.2 mg, ondansetron 4 mg and fentanyl 1microgram/kg body weight followed by preoxygenation for 3 minutes with 100 % oxygen. Induction with propofol and thiopentone in equal volumes [thiopentone1.25% and propofol 0.5mg%] was done in group A. In group B, ketamine 0.5mg/kg was given 1 min prior to induction with propofol.

Loss of response to verbal commands and absence of eye lash reflex were taken as end point for induction. Immediately after induction, atracurium 0.5mg/kg was administered. Patients were ventilated with face mask with oxygen 40%, nitrous oxide 60% and isoflurane 1% for 3 minutes, followed by endotracheal intubation. Anaesthesia was maintained with 0.5%-1 % isoflurane and 60% nitrous oxide in oxygen. The systolic, diastolic, mean arterial pressure and HR were recorded as baseline, preinduction, prior to tracheal intubation, 1min after intubation and every 3 minutes thereafter for 10 min.

The data was collected and analyzed using appropriate statistical methods.

RESULTS AND OBSERVATIONS

Table 1: Comparison Of Systolic Blood Pressure (SBP) In Two Groups Of Patients Studied.

GROUP	SYSTOLIC BLOOD PRESSURE						
	BASE LINE	PRE INDUCTION	PRE INTUBATION	1 MIN	4 MIN	7 MIN	10 MIN
A	125.73± 12.487	122.01± 9.78	104.21± 12.58	121.7± 16.11	120.23 ± 16.84	115.64 ± 11.86	114.34 ± 10.12
B	124.89± 10.20	124.60± 10.55	108.36± 10.79	119.53 ± 16.73	123.69 ± 11.01	118.92 ± 11.86	116.03 ± 11.17
P Value	0.607	0.073	0.013	0.351	0.026	0.031	0.264

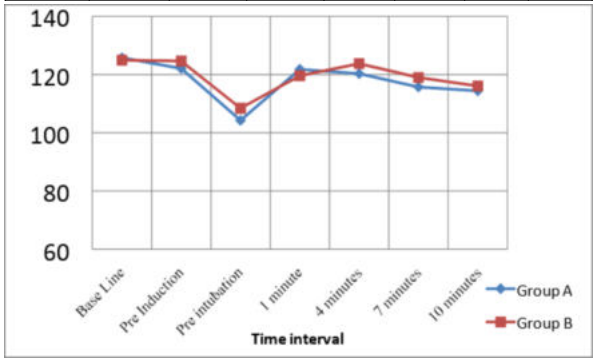

Figure 1 - Comparison Of Systolic Blood Pressure Of Two Groups

There is statistically significant (**p <0.01**) difference of mean systolic blood pressure at pre intubation, 4 min and 7 min between two groups.

Table 2: Comparison Of Diastolic Blood Pressure

GROUP	DIASTOLIC BLOOD PRESSURE						
	BASE LINE	PRE INDUCTION	PRE INTUBATION	1 MIN	4 MIN	7 MIN	10 MIN
Group A	78.72± 5.38	77.80± 5.79	67.14± 10.96	81.5± 12.86	78.25± 9.94	76.50± 7.28	75.07± 8.71
Group B	80.13± 7.96	79.36± 7.96	70.13± 9.15	80.35± 12.28	79.14± 9.53	77.02± 8.28	76.57± 8.68
P value	0.144	0.144	0.19	0.519	0.519	0.638	0.229

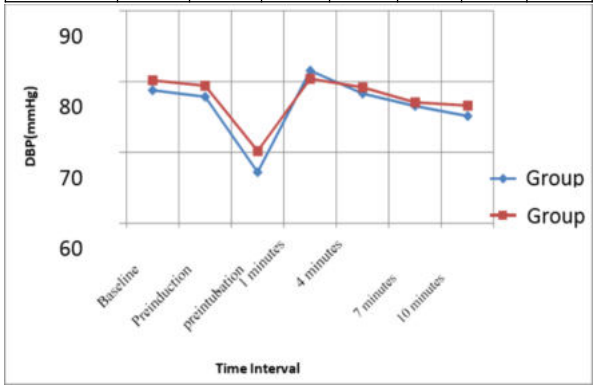

Figure 2-Comparison Of Diastolic Blood Pressure Of Two Groups

There was no statistically significant difference between the two groups.

Table 3- Comparison Of Mean Arterial Blood Pressure Of Two Groups

Group	MAP						
	Baseline	Pre Induction	Pre Intubation	1 Min	4 Min	7 Min	10 min
Group A	93.47± 6.94	91.53± 8.20	79.97± 11.12	93.91± 13.32	92.11± 9.28	89.29± 9.44	86.76± 7.07
Group B	94.21± 9.11	93.34± 8.50	83.34± 8.91	93.37± 12.6	93.36± 9.72	90.67± 7.5	88.76± 7.397
P value	0.519	0.127	0.19	0.769	0.260	0.254	0.062

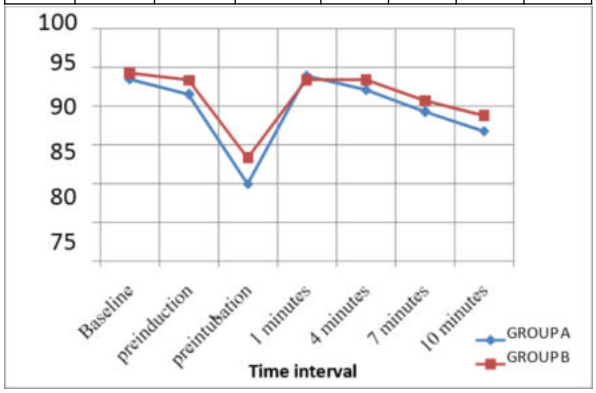

Figure 3- Comparison Of MAP At Different Intervals Between The Two Groups

There was no statistical significant difference between two groups.

Table 4: Comparison Of Mean Heart Rate Between Two Study Groups

Group	Heart Rate						
	Baseline	Pre Induction	Pre Intubation	1 min	4 min	7 min	10 Min
Group A	81.31± 9.83	85.43± 11.25	92.36± 9.99	102.1± 11.55	96.19± 9.114	93.45± 11.85	90.66± 11.34
Group B	81.4± 9.05	83.13± 8.92	90.08± 10.8	93.27± 12.76	91.42± 9.22	87.77± 9.04	86.32± 8.25
P value	0.946	0.111	0.123	0.000**	0.000**	0.000**	0.002**

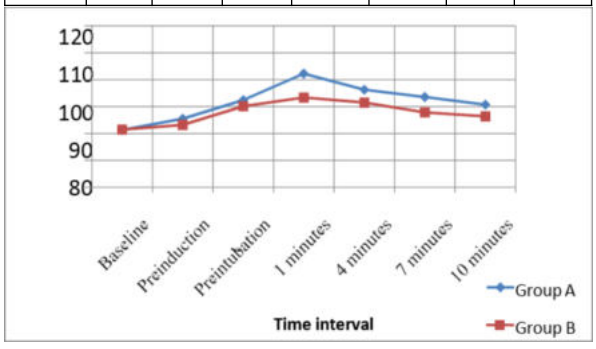

Figure 4- Comparison Of Mean Heart Rate Between Two Study Groups

There was statistically highly significant difference between the two groups in heart rate at 1, 4 and 7 minutes ($p<0.001$) and 10 min ($p=0.002$)

DISCUSSION:

During induction of general anesthesia maintenance of hemodynamic stability is an important consideration.

Propofol is widely used as an induction agent during general anesthesia. It causes a larger decrease in arterial pressure after induction, by decreasing peripheral vascular resistance and myocardial contractility. Vagotonic effects of propofol reduce the heart rate that may cause severe bradycardia, complex atrioventricular

block, and cardiac arrest.

Thiopentone sodium decreases myocardial contractility and causes peripheral vasodilation[5]. Cardiac output is maintained due to increase in heart rate and increase in myocardial contractility from compensatory baroreceptor reflex.

Ketamine, a phencyclidine derivative as an anesthetic agent produces sympathetic stimulation leading to increase in myocardial contractility and vascular resistance, which in turn leads to increased arterial pressure and heart rate. Increase in plasma concentrations of epinephrine and norepinephrine occur as early as 2 minutes after intravenous administration of ketamine and return to control levels 15 minutes later[6].

The superior recovery profile of propofol and its relative infrequency of post operative side effects are offset by its tendency to cause apnea on induction, cardiovascular instability, pain on injection, and its cost. Thiopentone and ketamine are time tested agents but with disadvantages like prolonged recovery, emergence delirium, post operative nausea and vomiting etc. So, the combination of propofol with either thiopentone or ketamine might be a better alternative.

Rajkumar et al,[4] studied 120 ASA 1 and 2 patients undergoing general and gynecological surgeries under general anesthesia. Their study reveals that the total induction dose of propofol was reduced by 42.69% in patients who were co-induced with ketamine (0.3mg/kg) as compared to the control group (normal saline). The fall in mean arterial pressure from baseline was least in ketamine group at 8.37%. Ketamine reduced the induction dose requirement of propofol to the greatest degree and provides the best cardiovascular stability. In our study also propofol-ketamine was hemodynamically more stable than propofol- thiopentone combination.

CONCLUSION

Administration of ketamine with propofol was comparatively better in maintaining the hemodynamic stability after induction as compared to Thiopentone-propofol combination.

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