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TO STUDY THE EFFICACY OF PROPHYLACTIC INTRAVENOUS PHENYLEPHRINE IN PROPOFOL-INDUCED HYPOTENSION DURING INDUCTION OF GENERAL ANAESTHESIA

Anaesthesiology

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ABSTRACT

INTRODUCTION : Hypotension is the most common complication during induction of general anesthesia. Hypotension is the decrease in systolic blood pressure below the normal accepted value, that is less than 90mm of Hg or decrease in mean arterial pressure of less than 65 mmHg. It is asymptomatic while induction of anesthesia and recognition requires proper predictors on multipara monitors like systolic blood pressure and mean arterial blood pressure. To prevent hypotension many methods like co-loading with intravenous crystalloids, vasopressors have been tried. In our study we are using prophylactic intravenous phenylephrine to prevent fall in blood pressure and to measure the SBP and MAP after induction of anaesthesia and intubation in the study and control group. (At 5 minutes, 10 minutes, and 15 minutes)" **METHODOLOGY**-The study was conducted at "Dr. D. Y. Patil medical college, hospital, and research institute" from March 2021 to August 2022 after institutional ethical approval. Total of 120 patients were selected and were divided into two groups, the study group (n =60) the control group (n =60). Routine systematic preoperative assessment and investigation were performed according to the study protocol. **RESULTS**- SBP was observed to be significantly declined in the "control group" compared to the "study group" when observed at 10min and 15min time intervals. MAP was found to be effectively reduced in the "control group compared to the "study group" when observed at 10 min and 15min time intervals. **CONCLUSION**-From the study it was concluded that the "prophylactic intravenous phenylephrine is effective in preventing fall in blood pressure associated with propofol-induced hypotension at the time of induction during general anaesthesia"

KEYWORDS

Hypotension, anaesthesia, phenylephrine, blood pressure, prophylactic

INTRODUCTION-

Every year around 300 million surgical procedures are carried out globally .[1] The incidence of postoperative severe complications and mortality during the first week are high.[2,3] Postoperative mortality results from the surgery associated with intraoperative complications.[3-5] Thus, to avoid complications, it is important to determine and terminate modifiable risk factors like "intraoperative hypotension (IOH)".[6] IOH is associated with a "cardiac and renal injury" which may be followed by death.[7]"Intraoperative hypotension in the operating room is a serious issue that should not be ignored for any age group". Most of the IOH occurs between anaesthetics induction and surgical incision. [8] "Arterial hypotension" in subjects undergoing surgery under general anaesthesia (GA) is generally designated by the term IOH. "Arterial hypotension is defined based on the period of occurrence as post-induction hypotension (until 20 min from induction of general anaesthesia), and early intraoperative hypotension (during the first 30 min of surgery)" [9] It is the most common unfavourable condition developed during general anaesthesia induced by propofol. The incidence of IOH resulting from propofol-induced general anaesthesia ranges from 25% to 67.5%. [10] Propofol" is categorized as the "drug of choice" for induction of general anaesthesia due to its quick onset of action and offset with complete "sedation property". However, anaesthesia induction with "propofol" is associated with "hypotension and decreased heart rate "[11]. resulting from the inhibition of "sympathetic nerves" and the "dilatation of blood vessels". "Exaggeration of Propofol-induced hypotension can be seen in hypovolaemic patients, geriatric patients, and patients with coronary artery disease". [12]other cardiac disease and emergency surgeries. Various therapeutic interventions are available to treat this propofol-induced hypotension in general anaesthesia such as "slow injection of the drug, bolus fluids, preloading with 3.5 % polymers of degraded gelatin solution, and vasoactive agents (dopamine, dobutamine, ephedrine, phenylephrine, and ketamine) which are given along with propofol". Among the vasoactive agents, phenylephrine is most effectively used to reduce hypotension in general anaesthesia.[13]

"Phenylephrine is a synthetic sympathomimetic non-catecholamine, directly stimulating α1 adrenergic receptors". Negligible effect of "Phenylephrine" can be seen on "β adrenergic receptors". The increasing release of "norepinephrine" causes some indirect action. An intravenous dose of "phenylephrine bolus ranges from 50 to 200µg" to reduce hypotension associated with peripheral vasodilatation. [13,14] It is recognized that "laryngoscopy and intubation" procedures cause haemodynamic stress response and there is elevated "SBP and tachycardia" up to 27% to 30% and it is observed maximum for 3 minutes and decreases after 5 minutes.[15] Hence, the present study was undertaken to study the effectiveness of intravenous phenylephrine in the prevention of propofol-induced hypotension at the time of induction" along with measuring the SBP and MAP after induction of anaesthesia and intubation in the study and control group. (At 5 minutes, 10 minutes, and 15 minutes)"

MATERIALS & METHODS

The present randomized double-blind case-control study was conducted at "Dr. D. Y. Patil Hospital, and research institute" from March 2021 to August 2022 after institutional ethical approval. The sample taken for the study was 120.Patients aged between 18 to 60 years of any gender undertaking "elective surgeries" under general anaesthesia with endotracheal intubation and "American Society of Anaesthesiologists (ASA) grade 1 and 2" were included in the study whereas, patients with ischemic heart disease, cardiac conduction block, uncontrolled hypertension, history of allergies to any drug, pheochromocytoma, expected difficult intubation and BP more than 180/110 mm Hg after intubation were excluded from the study. Informed consent for the study was obtained from the included subjects before the initiation of the study. A total of 120 patients were selected and were divided into two groups by a computerized generated random number method and by envelope method they are enrolled into two groups. The "study group (n =60) received intravenous phenylephrine 100 mcg" and The control group (n =60) received normal saline". Routine systematic preoperative assessment and investigation were performed according to the study protocol. The drug was prepared by a person other than the investigator accordingly both for study and control groups other. Before administration of the pre-medications, baseline parameters with a standard multipara monitor were recorded and pre-anaesthetic medications like injection "midazolam 0.05 mg/kg", "injection ranitidine 4 to 6 mg/kg", "injection ondansetron 0.1 mg/kg", "injection glycopyrrolate 0.004mg/kg" and "injection pentazocine 30 mg" were given intravenously. Induction of general anaesthesia was done with "2 mg/kg of propofol", and "2mg of succinylcholine" was used as a

muscle relaxant. After intubation, maintenance was done with oxygen, air sevoflurane (2%), and long-acting non-depolarising muscle relaxant vecuronium 0.08 to 0.1 mg/kg. After the 5 minutes of intubation procedure, various parameters such as HR, SBP, DBP, and MAP were recorded and further patients of the "study group received 100 mcg of phenylephrine in a 10 cc syringe" and patient of the "control group received 10cc of normal saline". The patients with BP more than 180/110 did not receive anything. Baseline parameters were recorded before induction.5 minutes after intubation, parameters were recorded. Those with BP of more than 180/110, either systolic or diastolic changes were excluded. Parameters were recorded 10 and 15 minutes after intubation. After the interval of 5 to 10 minutes, any adverse effects such as bradycardia (HR less than 60); (hypertension 20% more than baseline) was observed. Besides the study drug, if hypotension occurs, the plan was to treat it conventionally with mephentermine 3 mg bolus as required. But we did not observe hypotension during our study period. The rest of the procedure was carried out routinely and at the end of the process, the patient was reversed. All intraoperative medications and the duration of anaesthesia were recorded and hemodynamic charting was completed as a routine procedure and postoperative hemodynamic monitoring was continued. Data were collected and added into a "Microsoft excel sheet". Using the "SPSS IBM 20" version categorical variables were evaluated in terms of frequency and percentages, and the distribution was illustrated using pie charts. Continuous variables were analyzed using measures of central tendency (mean) and dispersion (Standard deviation), bar chart was used to represent data in diagrammatic form. "Independent sample T test and Mann Whitney u test were used to find the significant difference between the groups. P<0.05 was considered statistically significant".

RESULT

Comparison of SBP

SBP was found to be significantly decreased in the "control group" compared to the "study group" when observed at 10min (111.28±14.17 vs 129.40±20.90, P=0.00000021) and 15min time intervals (109.08±10.17 vs 132.95±19.12, P=0.0000) (table 1. and figure 1.)

Table 1. Comparison Of Sbp Between The Groups.

Time Intervals (min)	Systolic Blood Pressure (mmhg)		P Value
	Control (mean±SD)	Study (mean±SD)	
Baseline	111.17±7.36	110.68±15.67	0.8293
5	113.67±19.26	119.32±20.60	0.1233
10	111.28±14.17	129.40±20.90	0.00000021
15	109.08±10.17	132.95±19.12	0.0000

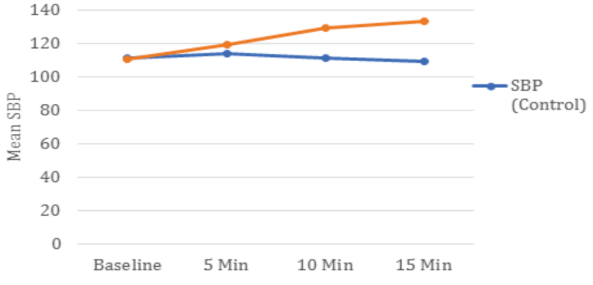

Figure 1. Comparison Of Sbp Between The Groups

Comparison of MAP

MAP was found to be significantly declined in the "control group" compared to the "study group" when observed at 10min (83.47±12.93vs 95.13±16.19, P=0.0000029) and 15min (80.58±10.02 vs 98.62±15.42, P=0.0000) intervals (table 2. and figure 2.)

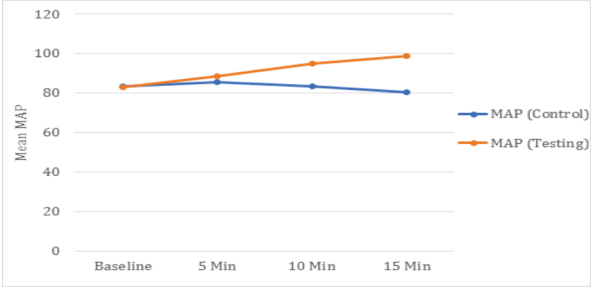

Figure 2. Comparison Of Map Between The Groups

Table 2. Comparison Of Map Between The Groups.

Time Intervals (min)	Mean Arterial Pressure (mmhg)		P Value
	Control (mean±SD)	Study (mean±SD)	
Baseline	83.33±4.78	83.13±11.46	0.9010
5	85.47±15.29	88.57±15.62	0.2741
10	83.47±12.93	95.13±16.19	0.000029
15	80.58±10.02	98.62±15.42	0.0000

DISCUSSION

The current study aimed "to study the effectiveness of intravenous phenylephrine in the prevention of propofol-induced hypotension intraoperatively at the time of induction". Significant findings of the study were intraoperative pulse rate which was significantly less in the "study group" than in "control group" subjects at 10 min and 15 min time intervals (P<0.01). Though not requiring treatment. "Systolic blood pressure, and mean arterial pressure" were significantly decreased in "control group" subjects compared to the "study group" at 10 min and 15 min time intervals (P<0.0000). These findings suggest that intravenous phenylephrine is effective in the prevention of propofol-induced intraoperative hypotension. "Propofol alters the baroreflex mechanism", ensuing in a comparatively lesser increase in "heart rate" for a given reduction in "AP". Similarly, the "PR" in the "control group" subjects was significantly elevated compared to study group subjects at 10 min and 15 min time intervals (P<0.01). However, there is not much difference observed in the pulse rate in the study group requiring atropine treatment. This was similar to the findings of El-Tahan MR.[16] Propofol-associated hypotension results from the propofol-mediated reduced sympathetic action leading to decreased "systemic vascular resistance" and decreased "CO" by a combination of "venous and arterial vasodilation", "impaired baroreflex mechanism", and depression of "myocardial contractility".[18-20] In this study we witnessed that "SBP, and MAP" were significantly decreased after induction of anaesthesia in the "control group" which is also confirmed in earlier studies.[16,17] In the "study group" using "phenylephrine 100mcg", "SBP and MAP" were compared with the "control group" till 5 min post-induction. SBP was observed to be significantly declined in the "control group" compared to the "study group" when observed at 10min (111.28±14.17 vs 129.40±20.90, P=0.00000021) and 15min time intervals (109.08±10.17 vs 132.95±19.12, P=0.0000). MAP was found to be effectively reduced in the "control group compared to the "study group" when observed at 10min (83.47±12.93vs 95.13±16.19, P=0.0000029) and 15min (80.58±10.02 vs 98.62±15.42, P=0.0000) intervals. These findings are similar to the study of Imran M. et al. and Kwok FY. et al.[16, 17] These findings suggest that phenylephrine 100mcg is effective in the prevention of "propofol-induced hypotension", specifically during the initial 10 minutes after induction. **The strength** of the present study was the adequate sample size, uniform application of the protocol, and the investigator was blinded. The key **limitation** of the current study was a dose of phenylephrine was administered only in a standard dose of 100mcg while propofol was given according to body weight. Sevoflurane was used to maintain the anaesthesia in the subjects which could have a confusing effect on the "haemodynamic response to propofol and phenylephrine", which might have predisposed the results. Moreover, we did not assess the adverse effects of phenylephrine. The other important limitation of the study was, only one dose of phenylephrine was assessed, we assume that a higher dose can be more effective than the dose used in the present study. Assessment of the combination of "phenylephrine" with normal saline and propofol was not included in our study scope. Furthermore, time intervals between the recordings of haemodynamic parameters were large which may create fluctuations in data. We did a study in ASA 1, ASA 2, and less than 60 years, though hypotension due to propofol is mainly in geriatric and ASA 3 and ASA 4. Further research is warranted to fix the optimum dosage of phenylephrine in the prevention of "hypotension" induced by propofol, and cost-effectiveness.

CONCLUSION

From our study, we can conclude that the "prophylactic intravenous phenylephrine is effective in preventing fall in blood pressure associated with propofol-induced hypotension at the time of induction during general anaesthesia".

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