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Attenuation of Hypotension Using Phenylephrine During Induction of Anesthesia With Propofol: A Randomized Control Trial

KEYWORDS

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ABSTRACT *Hypotension associated with induction of anesthesia with propofol is its most significant side effect. A number of technique have been tried to counteract the hypotensive effects of propofol. Phenylephrine is a synthetic non catecholamine that stimulates principally 1 adrenergic receptors by a direct effect.A randomized control study was conducted to evaluate the attenuating effect of phyneyephrine in propofol induced hypotension. The authors conclude that phenylephrine is an effective agent in the management of hypotension induced by propofol.*

Introduction

Propofol when used for induction of anesthesia in shorter procedures results in significantly quicker recovery and earlier return of psychomotor function as compared to other intravenous induction agents irrespective of the agent used for maintenance of anesthesia[1]. Induction with propofol has also some untoward effects. However decrease in the systemic blood pressure associated with induction of anesthesia with propofol is its most significant side effect[2].

Direct myocardial depression and decreased systemic vascular resistance have been implicated as important factor in producing cardiovascular depression. These effects are dose dependent. In addition to arterial vasodilatation, propofol produces venodilatation which further contributes to its hypotensive effect[3]. This hypotensive effect of propofol is not desirable mostly and particularly in sick patients and elderly patients. A number of technique have been tried to counteract the hypotensive effects of propofol, for example, slow administration of drug, preloading and administration of vasoactive drugs to raise BP[1].

Phenylephrine is a synthetic non catecholamine that stimulates principally α1 adrenergic receptors by a direct effect[1]. Phenylephrine 50-200µg intravenously is often administered in adults to treat fall in blood pressure that accompanies sympathetic nervous system blockade produced by a regional anesthetic technique and peripheral vasodilatation that accompanies administration of injected or inhaled anesthetic[4].

The objective of this study was to evaluate efficacy of phenylephrine by mixing it in two different doses to counteract the anticipated hypotensive effect of propofol during induction of anesthesia. Hypotension is defined as 20% decrease in baseline systolic blood pressure recorded before induction of an aesthesia.

Materials and Methods

Prospective Randomized Controlled Clinical Trial in 90 patients of ASA grade I and II admitted in General Surgery Department, undergoing elective surgery in the age group of 15-65years satisfying inclusion and exclusion criteria.

INCLUSION CRITERIA:

1. ASA I or II of both sexes
2. Age group 15 – 65years
3. Body Weight < 70kg
4. General Surgery patients
5. Elective Surgery
6. Duration of Surgery < 2hours
7. Patients requiring General Anesthesia with endotracheal tube for surgery
8. Mallampati Class I and II

EXCLUSION CRITERIA:

1. ASA III or IV
2. Age < 15 and > 65yrs
3. Body weight > 70kg
4. Emergency surgery
5. Superspeciality surgeries
6. Duration of surgery > 2hours
7. Hypersensitivity to Propofol
8. Patients with known cardiovascular disease
9. Failure to intubate in first attempt
10. Fasting > 10hours
11. Diabetes Mellitus
12. Bronchial Asthma
13. Prostate hyperplasia
14. Patients not willing to give consent

Patients age, sex, weight, height, physical examination noted after a thorough preanesthetic check up. Thorough preanesthetic checkup and investigations were taken for all patients. All patients were premedicated with Tab. Ranitidine 150mg, T.Metoclopramide 10mg and Tab.Diazepam 5mg the night before surgery and 6am on the morning of surgery in addition to Inj. Buprenorphine 3µg/kg and Promethazine 0.25mg/kg i.m. 45minutes prior to surgery.

Patients randomized and allotted into three groups.(30 each)

Group A α Receiving Propofol + 2ml saline (control group)
Group B α Receiving Propofol + 2ml Phenylephrine (25µg/ml)
Group C α Receiving Propofol + 2ml Phenylephrine (50µg/ml)

Baseline recording of heart rate, SPO_2, systolic BP, Diastolic BP and mean arterial BP done 5minutes after attaching monitors. General anaesthesia induced with propofol (mixed with study drug) 2.5mg/kg given over 20seconds. Intubation done in first attempt after giving Inj. Succinylcholine 1.5mg/kg I.V. GA maintained with 0_2, N_20 and Vecuronium.Systolic, diastolic, mean arterial pressure, heart

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rate and SPO_2 monitored at time O, 1st, 2nd, 3rd, 4th, 5th and 6th minute of induction. Any side effect also noted. In this study, hypotension is taken as > 20% fall in systolic blood pressure from baseline.

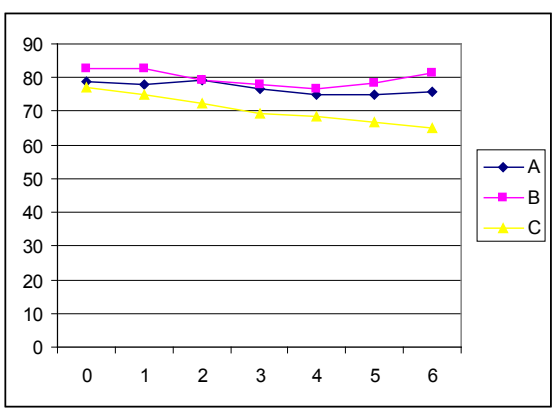
Data collected was statistically analyzed using SPSS version 22.0 Software programme.

Observation and Results

While doing study two cases from group A and one from group B are excluded due to hypotension (Systolic BP < 75mm of Hg) which needed intervention. Finally, for group A n= 28; group B n= 29; group C n= 30.

The age and sex of patients included in the study are comparable between three groups. The height and weight of patients included in the study are comparable between 3 groups. Baseline $SP0_2$ was 99% in all cases. There is no significant difference in mean values of baseline parameters.

Graph 1Comparison of Heart Rate between groups at different times



There is significant difference in Heart rate between groups. Six patients in group C had bradycardia.

Table 1 Comparison of Systolic BP between groups at different times

Minute	Average SBP			VR	CD (5%)			P value
	A	B	C		AB	BC	AC	
0	122.43	121.24	115	14.77	2.92	2.87	2.90	0.000
1	108.64	106.48	115	5.02	5.58	5.48	5.53	0.000
2	98.29	100.55	117	25.95	5.65	5.55	5.60	0.000
3	95.29	98.28	113.6	30.52	5	4.92	4.96	0.000
4	95.14	96.82	115.4	32.27	5.57	5.48	5.53	0.000
5	100.43	95.38	114.6	27.29	5.39	5.29	5.34	0.000
6	100.64	95.17	116	33.25	5.29	5.20	5.24	0.000

There is significant difference in SBP between groups. The frequency of hypotension in Group A was 82.14% (23/28), Group B was 79.31% (23/29) and 0% in Group C. 50% in Group C had increasing SBP. Maximum increase was 16.67% from baseline value.

Table 2 Comparison of Diastolic BP between groups at different times

Minute	Average DBP			VR	CD (5%)			P value
	A	B	C		AB	BC	AC	
0	81.25	79.79	76.6	9.03	2.22	2.18	2.20	0.002
1	77.14	76.14	77.4	0.98	1.89	1.86	1.88	0.38
2	74.71	75.38	77.6	4.60	1.98	1.95	1.96	0.012
3	74.04	74.14	77.2	5.61	2.14	2.10	2.12	0.005
4	74.57	72.90	77.4	8.14	2.25	2.21	2.23	0.0005
5	74	72.07	77.8	12.76	2.30	2.27	2.29	0.000
6	74.21	71.24	77.8	16.22	2.30	2.26	2.28	0.000

There is significant difference in DBP except at 1st minute. Almost stable DBP in Group C.

Table 3 Comparison of Mean arterial BP between groups at different times

Minute	Average MABP			VR	CD (5%)			P value
	A	B	C		AB	BC	AC	
0	93.64	92.72	89.2	6.04	2.68	2.64	2.66	0.0036
1	88	85.93	89.6	3.37	2.82	2.77	2.80	0.04
2	82.32	82.48	90.4	22.27	2.76	2.71	2.74	0.000
3	80.93	80.86	89	25.41	2.61	2.57	2.59	0.000
4	81.89	80.14	89.7	26.12	2.81	2.76	2.79	0.000
5	82.29	79.10	90.1	26.43	3.11	3.05	3.08	0.000
6	82.64	79.83	90.5	24.99	3.12	3.07	3.10	0.000

There is significant difference in MABP between groups. Almost stable MABP in Group C. $SP0_2$ was 99% at all times in all groups.

Table No: 4 Comparison of sample based on Hypotension in different groups

Hypotension	Group A		Group B		Group C	
	No	%	No	%	No	%
Yes	23	82.14	23	79.31	0	0
Nil	5	17.86	6	20.69	30	100

82.14% in group A and 79.31% in group B had hypotension compared to 0% in group C that is highly significant.

20% of patients in group C (6/30) had bradycardia. Minimum value was 51/minute. No active intervention done due to stable BP. 50% in group C (15/30) had increase in systolic BP from baseline. Maximum value was 140mm of Hg. No other side effects noted.

Discussion

study show that mixing 100µg Phenylephrine along with Propofol is a good option for attenuation of hypotension during induction of general anesthesia. It has been found to be a simple and effective method of reducing hypotension along with induction. The incidence of hypotension was nil and blood pressure was maintained a stable more trend compare to saline group and phenylephrine 50µg group. It helps to maintain haemodynamics in patients in whom propofol is the only induction agent that is safe. It helps in situations where propofol is the sole induction agent that is available. However it is safer to avoid in patients with preexisting hypertension or cardiovascular disease.

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