COMPARISON OF VARIATION IN MEAN ARTERIAL BLOOD PRESSURE AFTER INDUCTION WITH SEVOFLURANE VERSUS PROPOFOL

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ABSTRACT

Objective: To compare mean arterial pressure (MAP) variation after anaesthetic induction with inhalational sevoflurane versus intravenous propofol.

Study Design: Randomized controlled study.

Place and Duration of Study: The study was carried out at Combined Military Hospital Bahawalpur - a tertiary care hospital, after seeking permission from hospital ethical committee. The data was collected for 06 months starting, from Jul 2017 to Dec 2017.

Material and Methods: In this study a total of 110 patients fulfilling the inclusion criteria were selected. Patients were randomly divided into two groups (55 in each group). Group A were anaesthetized with sevoflurane and group B with propofol. Mean arterial pressure measurement was carried out before induction, and then 02 minutes after induction. Difference of change in MAP from baseline was recorded both for sevoflurane and propofol. Digital monitor was used for MAP monitoring. The result of MAP was recorded in mmHg.

Results: In our study, MAP at baseline was calculated as 102.62 ± 5.22 mmHg in group-A and 101.69 ± 5.57 mmHg in group-B, *p*-value was 0.36 showing insignificant difference at baseline and after 02 minutes of induction was calculated as 87.65 ± 3.49 mmHg in group-A and 84.11 ± 3.62 mmHg in group-B, *p*-value was 0.0001, a significant difference. Mean change in arterial pressure after 02 minutes of induction was calculated as 14.96 ± 6.89 mmHg in group-A and 17.58 ± 5.33 mmHg in group-B, *p*-value was 0.0001, a significant difference.

Conclusion: It is concluded that induction with sevoflurane is significantly better than induction with propofol for prevention of hypotension.

Keywords: Induction of anaesthesia, Mean arterial pressure, Sevoflurane versus propofol, Variation.

INTRODUCTION

An anaesthetist needs to address the hemodynamic changes in every patient undergoing surgery and this presents a dynamic clinical challenge. Anaesthetic and surgical stresses are known to effect the cardiovascular system of body and maintaining the mean arterial pressure of patients during induction is a key to smooth and safe anaesthesia[1]. At the time of induction anaesthetic agents especially propofol cause fall in mean arterial pressure (MAP) due to drop in systemic vascular resistance as a result of inhibition of sympathetic vasoconstrictor activity. Inhalational anaesthetics especially sevoflurane during induction have least possible adverse effects on cardiovascular system causing less fall in MAP as compared to propofol[2]. Sevoflurane during mask ventilation while induction is not irritable to mucous membrane, is nonpungent and has smooth and rapid inhalational induction[3]. Induction with sevoflurane is a practical and safe method with its minimal hemodynamic effects. Some studies show that sevoflurane and propofol does not differ much in keeping the patient hemodynamically stable[4]. Some studies in literature have indicated that induction with sevoflurane is more cardio-protective keeping MAP stable. In a study published in Saudi J Anaesthesia in October 2012 it was noted that there is a fall in MAP after induction. The fall in MAP was 16 ± 9mmHg in propofol group and 12 ± 7mmHg in sevoflurane group (p<0.05).

The rationale of this study is to find out if induction of anaesthesia with sevoflurane is

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considered to be better than with propofol. It will enable us to prevent significant decrease in MAP after induction in patients undergoing surgery and better clinical outcome. No such study is published in our local literature.

PATIENTS AND METHODS

This randomized control study was carried out at the department of Anaesthesiology, Combined Military Hospital Bahawalpur from July 2017 till Dec 2017. It is a tertiary care hospital.

Sample size was calculated by using WHO sample size calculator. Keeping level of significance 5%, power 80%. Test value of population mean=162, anticipated population mean=122, pooled SD ± 8, sample size is 55 in each group. Total sample size was 110.

Non probability consecutive sampling technique was used.

Inclusion criteria for sample selection was patients of both genders having age between 15 to 60 years, patients having American Society of Anaesthesiology (ASA) status I and planned elective surgery.

While exclusion criteria was patients with cardiovascular, pulmonary, renal or liver disease, genetic predisposition to malignant hyperthermia, patients sensitive/allergic to sevoflurane and propofol, hemodynamically unstable patients and patients not willing to participate in the study.

In this randomized controlled study a total of 110 (n=110) patients were included and after seeking permission from hospital ethical committee, patients fulfilling inclusion criteria were enrolled after describing the study protocols and informed written consent was taken from patients or attendants of patient. Those who were willing and eligible for study were randomly divided into two groups (A and B), based on lottery method.

Patients assigned to group A were started induction with sevoflurane 2% and increased upto 8% within 1 min. Patients assigned to group B were induced with propofol 1.5 mg/kg to 2 mg/kg. Loss of eyelash reflex was taken as end point of induction and then after 2 mins BP was recorded. MAP measurement was recorded by applying BP cuff according to patients arm circumference on patient's arm over the brachial artery. First MAP reading was taken before induction and then reading was taken 2 minutes after induction. Difference of change in MAP from base line was recorded both for sevoflurane and propofol. Digital monitor was used for MAP monitoring. The result of MAP was recorded in mmHg.

Data was entered and analyzed with the help of statistical package for social sciences version-16. Frequency and percentages were calculated

Table-I: Mean arterial pressure at baseline (n=110).

	Group-A (n=55)		Group-B (n=55)	
MAP at baseline	Mean	SD	Mean	SD
	102.62	5.22	101.69	5.57

*p-value=0.37

Table-II: Mean arterial pressure after induction (n=110).

	Group-A-S (n=55)		Group-B-P (n=55)	
MAP after 02 minutes of induction	Mean	SD	Mean	SD
	87.65	3.49	84.11	3.62

p-value=0.001

Table -III: Mean change in arterial pressure after induction (n=110).

	Group-A-S (n=55)		Group-B-P (n=55)	
MAP change after 02 minutes of induction	Mean	SD	Mean	SD
	14.96	6.89	17.58	5.33

p-value=0.028

for gender. Mean and standard deviation was calculated for quantitative data (age, weight, MAP), independent sample was used to determine mean change in MAP from base line between two groups. A *p*-value<0.05 was considered significant. Effect modifiers like age and gender was controlled by stratification. Post stratification independent sample t-test was applied. Keeping *p*-value <0.05 as significant.

RESULTS

Total 110 cases fulfilling the inclusion criteria were enrolled to compare mean arterial pressure variation after induction with inhalational anaesthetic sevoflurane versus intravenous anaesthetic propofol.

Mean arterial pressure at baseline was calculated as 102.62 ± 5.22 mmHg in group-A and 101.69 ± 5.57 mmHg in group-B, *p*-value was 0.36 showing insignificant difference at baseline (table-I).

Mean arterial pressure after 02 minutes of induction was calculated as 87.65 ± 3.49 mmHg in group-A and 84.11 ± 3.62 mmHg in group-B, *p*-value was 0.0001, a significant difference (table-II).

Mean change in arterial pressure after 02 minutes of induction was calculated as 14.96 ± 6.89 mmHg in group-A and 17.58 ± 5.33 mmHg in group-B, *p*-value was 0.0001, a significant difference (table-III).

Effect modifiers like age and gender was controlled by stratification. Post stratification independent sample t test was applied. Keeping *p*-value<0.05 as significant.

Patients were distributed according to age, it shows that 49.09% (n=27) in group-A and 40% (n=22) in group-B were between 15-40 years of age while 50.91% (n=28) in group-A and 60% (n=33) in group-B were between 41-60 years of age, mean ± SD was calculated as 40.73 ± 9.69 years in group-A and 42.51 ± 9.13 years in group-B (table-IV).

Patients were distributed according to gender, it shows that 56.36% (n=31) in group-A and 58.18% (n=32) in group-B were male and 43.64% (n=24) in group-A and 41.82% (n=23) in group-B were females (table-V).

Table-IV: Stratification for mean change in arterial pressure after induction with respect to age (n=110).

Age: 15-40				
MAP change after 2 minutes of induction	**Group-A-S (n=55)**		**Group-B-P (n=55)**	
	Mean	SD	Mean	SD
	13.96	7.12	17.91	4.92
p-value=0.032				
Age: 41-60				
MAP change after 2 minutes of induction	**Group-A-S (n=55)**		**Group-B-P (n=55)**	
	Mean	SD	Mean	SD
	15.93	6.66	17.36	5.67
p-value=0.36				

Table–V: Stratification for mean change in arterial pressure after induction with respect to gender (n=110).

Male				
MAP change after 2 minutes of induction	**Group-A-S (n=55)**		**Group-B-P (n=55)**	
	Mean	SD	Mean	SD
	15.46	7.28	18.04	5.51
p-value=0.17				
Female				
MAP change after 2 minutes of induction	**Group-A-S (n=55)**		**Group-B-P (n=55)**	
	Mean	SD	Mean	SD
	14.58	6.68	17.25	5.26
p-value=0.082				

DISCUSSION

Induction of anaesthesia is an important and serious affair[5] during which vital and hemodynamic stability is significant goal to achieve. Most common anaesthetic agent during induction is propofol whereas a newly introduced inhalational anaesthetic is sevoflurane. This study evaluates difference in mean arterial pressure on induction with sevoflurane versus propofol.

The findings of our study are comparable with a study published in Saudi J Anaesthesia in Oct 2012 in which it was noted that there is a fall in MAP after induction. The fall in MAP was 16 ± 9mmHg in propofol group and 12 ± 7mmHg in sevoflurane group (p<0.05)[2].

Rawal and others[6] published their study in which the induction of anaesthesia with propofol was compared with that to sevoflurane and recorded baseline hemodynamic parameters in these two groups. There was a considerable fall in MAP and heart rate from values before and after the induction between the two groups. Fall in MAP was dramatically more in propofol group briefly during induction. The decrease in heart rate was profoundly more in sevoflurane group at 01, 03 and 05 minutes after induction (p<0.05). Therefore it was concluded that induction with Propofol verified a significant fall in MAP on the other hand induction with sevoflurane resulted in greater reduction in heart rate.

In 1968 a major discovery of sevoflurane was carried out at Baxter-Travenol laboratories, Illinois, USA by Regan and colleagues[7]. Though its use was limited clinically as sevoflurane was thought to be associated with significant nephrotoxic effects as it produces metabolic end products such as Compound A, carbon monoxide and fluoride ions. Later on after two decades many studies established its safety and its use was started clinically in anaesthesia settings[8]. Therefore, sevoflurane has been demonstrated as an amazing discovery among inhalational anaesthetic agents[8]. For an ideal anaesthetic induction, hemodynamic stability is required[9]. Although high risk patients e.g. elderly patients or patients with cardiovascular diseases[10] are more vulnerable to hemodynamic unstable changes during induction, but the associated hazards cannot be ignored in healthy individuals as well[11]. However, some studies do not show any hemodynamic difference between propofol and sevoflurane whereas other studies shows better hemodynamic stability with one anesthetic agent as compared to the other[12]. MAP values were particularly measured for analysis of blood pressure. MAP is the accurate driving pressure for analysis of peripheral blood flow[13] which does not show any change in the pressure waveform distally; moreover it is not affected by any distortions or changes that are produced by recording systems. Non-invasive oscillatory method gives accurate measurement of MAP rather than systolic or diastolic blood pressure[14].

However, the findings of our study demonstrate that induction of anaesthesia with sevoflurane is better than with propofol and it enables us to prevent significant decrease in MAP after induction in patients undergoing surgery and better clinical outcome of patients, moreover, in absence of such study published in our local literature, it will be helpful for local health care-providers.

CONCLUSION

It is concluded that induction with sevoflurane is significantly better than induction with propofol for prevention of hypotension.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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