European Journal of Molecular & Clinical Medicine

ISSN 2515-8260 Volume 09, Issue 05, 2022

ORIGINAL RESEARCH

A STUDY ON THE EFFECT OF CRYSTALLOID PRELOADING ON INDUCTION DOSE REQUIREMENT OF PROPOFOL

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ABSTRACT

Background: Propofol is one of the most commonly used anaesthetic drugs. Extensive researches have been done on the factors affecting the induction dose requirement of propofol forbetter hemodynamic stability. In the literature there is no mention on the dose requirement of propofol in the hydrated patients. This prospective randomized double blind study was done to assess the effect of preloading on induction dose requirement of propofol in patients undergoing general anaesthesia requiring endotracheal intubation.

Materials and Methods: Two hundred forty adult patients requiring endotracheal intubation under general anaesthesia were randomly divided into two groups, the study group and the control group. Study group received 20 ml/kg of normal saline over 2 hours, 4 hours prior to the induction of general anaesthesia and control group did not receive any fluid preloading. General anaesthesia was induced with titrated doses of propofol with the aid of BIS monitoring. The dose requirement of propofol, hemodynamic stability (HR, SBP, DBP and MAP was measured at intubation (0 min), 1 min, 2 min, and 3 min post intubation) and awareness during anaesthesia was assessed in both the groups.

Results: The dose requirement of propofol in the study group was 00.62±0.12 mg/kg and 1.24±1.30mg/kg in control group. There was no clinically significant change in the hemodynamic parameters between both the groups. None of patients in either group had awareness under general anaesthesia which was assessed post operatively using Brice questionnaire.

Conclusion: Crystalloid preloading reduces induction dose requirement of propofol during general anaesthesia with better hemodynamic stability.

Keywords: Preloading, Crystalloids, Propofol, BIS monitoring.

INTRODUCTION

The modern anaesthesia practice is dynamic and constantly evolving, for better patient care. Invention of various drugs, monitors, instruments and understanding bodily functions at a cellular level has taken anesthesia care from highercomplications and mortality to a much safer zone. Intravenous fluid therapy has been one of the cornerstones of anesthetic practice for over a century. With the advent of newer fasting guidelines it has assumed greater significance in clinical practice. Since late 1960s many measures are taken to overcome hypotension in live donor nephrectomy.[1] In live donor nephrectomy, hydration was done to maintain good renal blood flow especially during induction and insufflations of peritoneum with carbon dioxide or change in position of patient from supine to lateral. Various studies have been conducted in this regard. In live donor nephrectomy, donors are hydrated with crystalloid solutions overnight preceding harvesting or during operation. Purposementioned by various study groups are different but the goal is to maintain good diuresis and to optimize graft function.[2-5] Incidentally we have noticed that during induction, dose requirement of propofol was comparatively less in the hydrated donors. Hypotension due to propofol induction is not addressed. Propofol (2-2.5 mg/kg) could lower blood pressure as much as 25-40%in all the patients regardless of any underlying conditions.[6] So we conducted this study to assess the effect of crystalloid preloading on induction dose requirement of propofol, who are coming for surgery requiring endotracheal intubation. Hypothetically preloading could reduce the dose requirement of propofol for induction during general anaesthesia. Depth of anaesthesia during induction was monitored by Bispectral Index (BIS) which is an EEG derived index. BIS is a useful monitor to titrate the anaesthetic dose with better hemodynamic stability and fast tracking.[7,8] In routine practice donors are anaesthetized by conventional method (calculating dose/kg). Propofol at a dose of 2.5 mg/kg achieves induction in 95% of healthy unpremeditated patients,[9] but no mention is made on dose requirement in hydrated patients. So we did a study, to assess the effect of preoperative hydration on induction dose requirement of propofol correlated with BIS index. This study was undertaken with a hope of providing a new line of thought in anaesthetic practice that might help in improving the quality and efficiency of anesthesia care.

MATERIALS & METHODS

Source of data: The randomized prospective double blind single center study was undertaken at Govt Medical College/ hospital, Nalgonda between Jan 2021 to June 2022. After obtaining hospital ethics committee approval and informed consent from the patients, the study was conducted on total 240 patients of either sex Samplesize was determined following a pilot study.

Inclusion Criteria

1. Patients scheduled for elective surgeries
2. American Society of Anaesthesiologists (ASA) class I patients
3. Age between 18-45 years
4. Any surgery under general anaesthesia requiring endotracheal intubation

5. Body mass index (BMI) – 18.5-29.9

Exclusion Criteria

1. Emergency surgery
2. Patients with multiple injuries, pregnancy
3. Airway Mallampati grade III and IV

Randomization was done using computer generated number and divided into twogroups (n=120 patients each), the study group and control group.

Study group – Patients were preloaded with normal saline 20 ml/kg over 2 hours, 4hours prior to surgery.

Control group – No preloading.

Drug administration and parameters recording were doneblinded to the randomization process. Patients included in the study were also blinded to the study methodology. Decoding was done for statistical analysis after completion of the study.

RESULTS

Table 1: Demographics of the study participants

Parameters		**Study group (n=120)**	**Control group (n=120)**	**Total (n=240)**
Gender (P value 0.7743)	Male	49(40.83%)	51 (42.51%)	100 (41.66%)
	Female	71 (59.16%)	69 (57.5%)	140 (58.33%)
ASA	ASA-I	46 (38.33%)	68 (56.66%)	114 (47.51%)
	ASA-II	74 (61.66%)	52 (43.33%)	126 (52.52%)
Age	Male	38.2±1.89	41.1±2.47	-
	Female	29.2±1.89	31.1±2.47	
Mean weight (kgs) P value 0.2321	Male	60.56±1.9	59.67±2.7	-
	Female	53.56±2.6	56.67±1.5	
Duration of surgery P value 0.2174		25.21	27.01	-

The demographics of the study participants across gender, weight, ASA score, and duration of surgery performed across both groups are delineated in [Table 1]. In our study participants, the mean age was found to be 38.2±1.89 years in males and 29.2±1.89 years in females of Group A whereas the mean age of males was 41.1±2.47 years and 31.1±2.47 years in females of Group B. In group A and B females were predominant than males with 71 (59.16%), 69 (57.5%) cases respectively.

Table 2: Propofol requirement for induction in study and controlgroups

Propofol Dose(mg/Kg)	**Study**		**Control**	
	No	**%**	**No**	**%**
<1.0	109	90.83%	26	21.66
>1.0	11	9.16%	94	78.33
Total	120	100%	120	100%
Mean ± SD	0.62±0.12		1.24±1.30	
P value < 0.001				

In the study group the m eanvalue of propofol requirement for induction was 0.62±0.12mg/kg,where as in the control group it was 1.24±1.30 mg/kg which was significant with a P < 0.001(table II) with stable hemodynamic parameters (table II).

Table 3: Comparison of hemodynamics parameters in both groups

Parameter	**Timing**	**Study group (n=120)**	**Control group (n=120)**	**P value****	**t value**
Systolic Blood Pressure (SBP)	At Baseline	130.17±5.94	131.58±5.53	0.446	8.883
	At 10 Minutes	120.26±3.07	126.92±2.04	<0.001	8.821
	p-value*	<0.001	0.672	-	10.21
Diastolic Blood pressure (DBP)	At Baseline	89.68±5.76	90.01±2.31	0.688	11.26
	At 10 Minutes	76.34±6.35	93.38±6.08	<0.001	12.32
	p-value*	<0.001	0.107	-	12.72
Mean arterial pressure (MAP)	At Baseline	103.17±4.29	103.80±4.57	0.96	11.85
	At 10 Minutes	92.97±4.58	102.22±4.62	<0.001	10.93
	p-value*	<0.001	0.097	-	12.54
Heart rate (HR)	At Baseline	79.95±6.10	79.62±2.24	0.827	6.871
	At 10 Minutes	80.53±6.88	89.83±5.86	<0.001	10.27
	p-value*	0.498	<0.001		7.98
Comparison of recovery time for (sec)	Spontaneous eye opening	193.6 ±2.433	219.6 ±0.6405	< 0.0001	8.525
	Extubation	201.3 ±2.444	225.5 ±0.6955	< 0.0001	10.32
	Orientation	308.4 ±3.020	401.8 ±.1.650	< 0.001	9.525
Comparison of ETCO2	At Baseline	32.64 ± 0.3409	32.12 ± 3.340	0.4512	0.8326
	At 10 Minutes	29.84 ± 0.3772	31.50 ± 0.25	0.0165	2.276
	p-value*	<0.001	0.001		2.294
Comparison of Vas Scores	(V0)	3.234 ± 0.1023	2.550 ± 0.10	< 0.0001	5.922

[Table 2] elucidates the comparison of hemodynamic parameters of SBP, DBP, MAP, HR, changes among the study groups. A paired t-test was used to compare the mean values at baseline and after 10 minutes within each group. An independent sample t-test was applied to compare means between the two groups. There is a significant rise in heart rate in the group B and a fall in the group A. The peak effect of rise in heart rate in Group A was 80.53±2.88 (79.95±6.10 at base line) and group B was 89.83±6.86 (89.83±5.86 at base line) seen in the 10^{th} minute. The peak fall in the systolic BP was in the 10^{th} minute in groups, group A 120.26±3.07, (130.17±5.94 of baseline) and Group B 126.92±2.04 (131.58±5.53of baseline). The peak rise in diastolic BP observed in group B was 93.38±6.08 (90.01±2.31 base line) and significant fall noted in group A was 76.34±6.35 (89.68±3.76 base line). MAP in both the groups was compared at baseline and at various intervals. There is a statistically significant lower value of MAP in Group A 92.97±4.58 (103.17±4.29 at base line) as compared to Group B 102.22±4.62 (103.80±4.57 at base line) at 10^{th} minute of induction. There was a significant difference (P value < 0.0001) between the two groups in the time for recovery for Spontaneous eye opening, orientation and extubation There was a significantly lower (P value 0.0165) ETCO2 recorded at 10^{th} minute in Group A was 29.84 ± 0.3772 (32.64 ± 0.3409 at base line) as compared to Group B 31.50 ± 0.25 (32.12 ± 3.340 at base line). The comparison of vas scores also denoted in [Table 3].

DISCUSSION

Propofol is supposed to be a very good drug for intravenous sedation. It has short duration of action. On intravenous administration it produces various haemodynamic effects generally dose dependant. It causes peripheral vasodilation and to some extent myocardial depression. Propofol anaesthesia is administered which a short is acting synthetic narcotic to provide analgesia. These toxic effects are hypotension, asystole or respiratory depression. Hypotension produced in any case is threatening particularly in compromised patients. So it is better to prevent the hypotension and other adverse cardiovascular effects. A study conducted by Perel et al,[10] and Singh et al,[11] showed hypotension induced by subarachnoid block is prevented by preloading the vascular compartment with the crystalloid fluids. On this basis present study was designed. In this study 240 patients were randomly chosen and divided in two groups (study and control) of 120 each. Control group did not receive any fluid preload and study group patients received fluid preload with normal saline 20 ml/kg over 2 hours, 4hours prior to surgery. Heart rate, SPO2, blood pressure was recorded just before preloading and at the time of induction of anaesthesia then every 2 minutes up to 20 minutes. The recorded data were compared to find the efficacy of fluid preloading. The observed changes were statistically significant (P<0.001) when compared with their base line value. On group to group comparison at each point of time the mean value of heart rate, blood pressure was comparable and there were no statistically significant changes. The findings of this study are comparable with other studies. Aun et al,[12] studied the effect of propofol. They observed a significant decrease in systolic, diastolic and mean arterial pressure. Vohra et al,[13] and Woodey,[14] had observed no significant changes in heart rate with propofol administration. J.P. Williams et al,[15] observed no change with propofol alone

but there was significant fall in heart rate when used with preloading. In the present study systolic, diastolic and mean arterial pressure was deceased significantly in two groups following administration of propofol with preloading. The maximum changes were at initial time of induction of anaesthesia. On group to group comparison the maximum fall in parameters was in control group but less fall in study group. The effect of hypotension can be minimized with preloading the patient with crystalloids.

CONCLUSION

Based on the present comparative study concludes that the crystalloid preloading in ASA I patients with objective monitoring reduces the induction dose requirement of propofol during general anaesthesia with better hemodynamic stability with BIS monitoring none of the patients in either group included in the study had awareness under anaesthesia.

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