Original Article

Indian Journal of Anaesthesia and Analgesia
Volume 4 Number 2, April - June 2017 (Part–2)
DOI: http: / / dx.doi.org / 10.21088 / ijaa.2349.8471.4217.29

Effect of Auto-Co-Induction of Propofol on Total Induction Dose and Haemodynamics

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Abstract

Introduction: Rapid induction with propofol causes fall in arterial pressure and tachycardia. Our study aims at comparing the hemodynamic changes between rapid dose and priming dose, measure propofol requirement and evaluate complications between the two groups. *Materials and Methods:* Hundred consecutive patients posted for elective surgery under general anaesthesia with endotracheal intubation were randomly divided into two groups of 50 patients each (Group I and II). Group I (priming dose) received 20% of the total calculated dose of inj. Propofol (2 mg / kg) and 30 seconds later the remaining calculated dose of propofol was injected at a rate of 30 mg / 10 seconds till the loss of eyelash reflex and group II(rapid induction dose) were injected propofol at a speed of 30 mg / 10sec until the loss of eyelash reflex. Heart rate, arterial pressure, total induction dose and complications were recorded. *Results:* The mean induction dose of propofol was 109.60 in group II and 90.84 in group I. The mean heart rate were higher and mean arterial blood pressure were lower in control group at one and three minute after induction compared to study group. It was also observed that 50% in control group and 68% in study group had developed various complications. *Discussion:* In our study priming dose reduced the total induction dose requirement of propofol by 18%. There were lesser hemodynamic fluctuations with priming dose. Apnea and fasiculations were more in priming group. *Conclusion:* Priming principle requires lesser dose of propofol and prevents hemodynamic fluctuations caused due to propofol.

Keywords: Auto-co-Induction; Priming Dose; Rapid Dose; Blood Pressure; Heart Rate.

Introduction

Propofol is a commonly used intravenous anaesthetic agents. It can be used for both induction and maintenance of anaesthesia. Traditionally used thiopentone is considered as the gold Standard [1] among all intravenous induction agents as it is reliable and inexpensive. However it has no analgesic properties, is unable to inhibit airway reflexes and has delayed recovery. Propofol can suppress laryngeal reflexes and has antiemetic properties. Its rapid induction and quick recovery has made it a popular intravenous anaesthetic agent especially in day care surgeries.

The induction dose of propofol is 2-2.5mg / kg, which can cause vasodilation and cardiovascular depressant action resulting in profound hypotension [2] which could be dangerous in hemodynamically compromised patients. Use of smaller dose of propofol could prevent hypotension. Several methods have been tried to reduce the induction dose of propofol like concurrent use of nitrous oxide [34], opioids [5,6], thiopentone [7], midazolam [8], clonidine [9], augmentation with local anaesthetics [10], magnesium sulfate [11] and use of auto-co-induction technique / priming principle [12]. Auto-co-induction or priming principle is done by giving a precalculated dose of induction agent before giving full dose of same [13].

The auto-co-induction technique is commonly practised with non-depolarising muscle relaxants to shortens the onset of neuromuscular blockade, reduces the total required dose of the drug

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Received on 28.02.2017
Accepted on 04.03.2017

and provides better intubating conditions [14,15]. Our study is designed to analyze the role of auto-co-induction technique of propofol in prevention of hypotension by reduces the total induction dose.

The aim of study is to (1) compare the total induction dose and haemodynamic changes of propofol with auto-co-induction technique and rapid induction technique. (2) record the complication between the two groups.

Materials and Methods

After obtaining ethical committee approval, hundred consecutive patients posted for elective surgery under general anaesthesia with endotracheal intubation were included in the study. Written informed consent was obtained from all patients. Inclusion Criteria was ASA(American society of anaesthesia) Grade I and II patients in the age group between 18-60 years of age of both sexes. Exclusion Criteria were age less than 18 and above 60 years, ASA III and IV, allergy to propofol and its constituents(egg and egg proteins), pregnant and lactating women, difficult intubation, and very obese patients (BMI>35). Complete pre-anaesthetic assessment was done in all patients. Study group were randomly divided into two group of 50 patients each (Group I and II) by sealed envelope method. Patients were premedicated with tab. diazepam 5 mg and tab. ranitidine 150 mg. Preoperative vitals recorded. All patients were given inj glycopyrrolate 0.2 mg, inj midazolam 1 mg, inj fentanyl 2 mcg/kg over 30 secs and inj lignocaine 1.5mg/kg. Patients in group I(priming dose) received 20% of the total calculated dose of inj. Propofol (2 mg/kg) and 30 seconds later the remaining calculated dose of propofol was injected at a rate of 30 mg/10 seconds till the loss of eyelash reflex. Patients in group II (rapid induction dose) were injected propofol at a speed of 30 mg/10sec until the loss of eyelash reflex.

Intubation was accomplished with inj.scoline 1.5mg/kg intravenously followed by atracurium for subsequent muscle relaxant. Anaesthesia was maintained with isoflurane. No surgical stimulus was allowed for the first 5 minutes. The total dose of propofol given was recorded in all patients. Hemodynamic parameters like heart rate and blood pressure were recorded before induction, 1 minute, 3 minutes and 5 minutes after induction in both the groups. Complications of induction like apnea, vomiting, involuntary movements, laryngospasm and coughing were recorded.

The data was entered and analyzed using SPSS for windows (Version 17) statistical software. All the continuous variables were described using descriptive statistics and dichotomous variables using proportions. Student's t test and Pearson's Chi square test was the statistical test of significance. P value < 0.05 was considered as statistically significant.

Results

The demographic data between Group I and II were comparable and statistically not significant between both groups as shown in Table 1.

The mean induction dose of propofol was 109.60 in group II compared to 90.84 in group I which was statistically significant (p=0.012) as shown in table 2.

Table 1: Demographic data

	Group I	Group II	P-value
Mean Age	38.4	35.9	0.42
Mean B.M.I	25.1	25.7	0.65
Sex(M/F)	23/27	21/29	0.56
ASA I/ ASAII	36/14	30/20	0.37

Table 2: Induction dose

	Group I	Group II
Mean induction dose	90.84	109.6

P value = 0.012 (significant)

It was observed that the mean heart rate was statistically significant and high in control group at one minute (p=0.016) and three minutes(p=0.099) after induction as shown in table 3. However, the

heart rate at 5 minutes after induction was comparable between the 2 groups.

Table 3 shows the arterial blood pressure (systolic, diastolic and mean) were higher in study group, at one minute and at three minutes after induction and significant statistically compared to control group. The P-value of mean arterial pressures were 0.003 at 1min and 0.014 at 3min respectively. At 5 minutes the fall in arterial pressure in control group were lower but not statistically significant compared to study group.

The pulse oximetry readings were noted at all times during the study but were statistically not significant

It was also observed that 26% in control group and 68% in study group had developed various complications. Apnea was noted in 12%, fasciculations in 44%, cough in 8%, involuntary movements in 4% in group I. Group II had involuntary movements in 4%, cough in 4%, fasciculations in 16% and apnea in 2%. Vomiting and laryngospasm were not noted in both groups.

Table 3: Haemodynamic parameters

	Mean heart rate		Mean systolic blood pressure		Mean diastolic blood pressure			
	Group A	Group B	Group A	Group B	Group A	Group B	Group A	Group B
Baseline	82.16	82.04	130.68	134.72	78.52	78.88	95.91	97.49
1 min	82.04	97.48	120.48	107.20	76.20	70.20	90.96	82.53
3 min	92.68	99.0	122.12	110.2	76.48	68.0	91.69	82.07
5 min	92.72	97.68	114.56	109.36	74.84	71.56	88.08	84.16

Table 4: Complications

Complications	Group I	Group II
Apnea	6	1
Fasciculations	22	8
Cough	4	2
Involuntarymovements	2	2
Vomiting	0	0
Laryngospasm	0	0

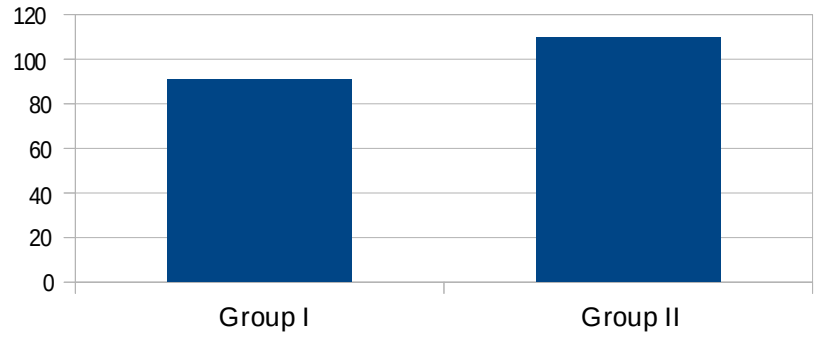

Chart 1: Mean induction dose

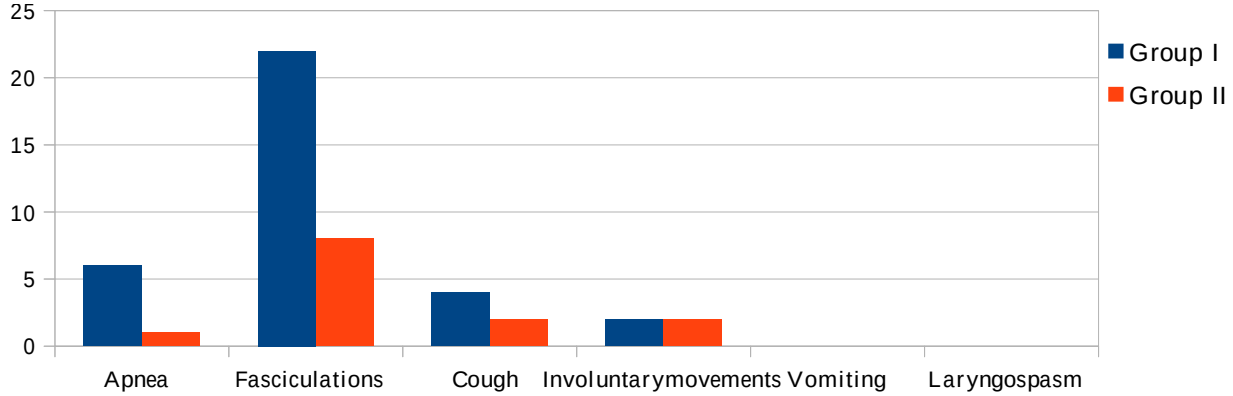

Chart 2: Complications

Discussion

Propofol is the new intravenous anaesthetic. It can be used for both induction and maintenance of anaesthesia. It has a quick onset of action and rapid recovery. Propofol is known for dose dependant hypotension which can be dangerous in hemodynamically unstable patients. To reduce the dose of propofol , it was combined with various drugs like opioids, barbiturates and nitrous oxide, but not with success. Auto-co-induction technique is commonly used in non-depolarising muscle relaxant to reduce the total dosage of drug and provide good results. Similar principle was tried with propofol by Anil kumar et al [12].

In our study priming dose reduced the total induction dose requirement of propofol by 18%. Similar reduction in propofol dose by priming was noted in study done by Anil Kumar [12], Roopam Kataria [16] et al, Anderson et al [17] and Djaini [13] et al. This result is probably achieved due to anxiolytic action of propofol at subhypnotic dose. Anxiolysis reduces the sympathetic drive and hence the induction dose. Subhypnotic dose of propofol causes amnesty and sedation [17].

Propofol has biphasic effect on cardiovascular system. During first phase(immediately after injection), there is a dose dependant fall in systemic vascular resistance and mean arterial pressure. The fall in the systemic vascular resistance causes a reflex rise in the sympathetic activity, which is done by the carotid sinus and aortic arch baroreceptors, resulting in rise of heart rate. In the second phase (two minutes after the injection), in spite of the low systemic vascular resistance both heart rate and stroke volume falls. This could probably be due to resetting of the baroreceptor reflex to a lower pressure value by the drug propofol [18]. This probable is the reason for higher heart rate at one and three minutes after induction in control group and similar heart rate between the two groups in our study at 5 minutes. The same was noted in study done by Anil Kumar [12] and Roopam Kataria [16].

In our study at the end of one minute fall in systolic, diastolic and mean arterial pressure in group I were 7.81%, 3% and 4.3% and in group II were 20.47%, 11.01% and 15.33% respectively from baseline. At the end of three minutes, fall in systolic, diastolic and mean arterial pressure in group I were 6.56%, 2.6% and 5.82% and in group II were 18.22%, 13.80% and 15.82% respectively from baseline.This shows that there was a statistically significant fall in arterial pressure (systolic, diastolic and mean) with rapid induction dose at 1 and 3 minute. However the arterial pressures were similar between two groups at five minutes. Fall in blood pressure is dose dependant as proven by Major et al [19]. Anil kumar et al [12] and Djaini et al [13] in their study showed a similar reduction in arterial pressures in rapid dose compared to priming dose.

Propofol causes vasodilatation due to decrease in vascular smooth muscle tone and peripheral resistance. It acts through the sympathetic supply to the heart and produce negative inotropic effect. Both these action reduce the mean arterial blood pressure by 22-33%. The various factors responsible for vasodilatory effect of propofol are decrease in sympathetic activity, a direct action on intracellular smooth muscle calcium mobilization, reduction of prostacyclin synthesis in endothelial cells, a lesser angiotensin II elicited calcium entry, stimulation of potassium ATP channels, and stimulation of nitric oxide [20]. The direct myocardial depressant effects of propofol has not been proven.

The incidence of complications was high in study group compared to control group. The incidence of apnea of more than 30 seconds in study group was 12% and 2% in control group in our study. But the previous studies showed higher incidence of apnea in control group [12,16]. Incidence of fasciculations with scoline were significantly higher with priming dose (44%) in our study. Rapid induction dose leads to deeper plane of anaesthesia, which is not achieved with priming dose. Hence fasciculations are higher with priming dose. Incidence of involuntary movements and coughing were similar in the two groups.

Conclusion

Auto-co-induction with 20% propofol reduces the total induction dose of anaesthesia. It also reduces the hemodynamic fluctuations like fall in blood pressure and rise in heart rate during induction compared to rapid induction dose. However the complications are slightly higher in priming principle.

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