World Journal of Medical Sciences 10 (1): 74-77, 2014
ISSN 1817-3055

DOI: 10.5829/idosi.wjms.2014.10.1.828

Effects of Propofol on Haemodynamics and Blood Profile of Human

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Abstract: The effects of Propofol on haemodynamic conditions and intracellular enzymes of pre and post anaesthesia patients were assessed. The blood samples of patients were collected before and after the treatment of anaesthesia, from the District Hospital Gujarat, Pakistan. The Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Platelets, Red Blood Cells, Haemoglobin, Alanine Aminotransferase (ALT) and Creatinine were recorded significantly different ($p < 0.05$), whereas there was non-significant ($p < 0.05$) effect on Heart beat rate. It is concluded that Propofol has a significant impact on hemodynamic parameters and blood profile in surgical patients, however further studies are needed to compare Propofol impact with other anaesthetic drugs like Ketamine and Pentothal to prevent possible side effects in human.

Key words: Enzymes · Blood · Surgery · Physiology · Diseases

INTRODUCTION

Propofol, 2, 6 diisopropylphenol, is also known as Diprivan, an intravenous anaesthetic agent. Due to its fast induction and recovery time, it is widely used in daily clinical practice in surgical patients for the induction and maintenance of general anaesthesia [1, 2]. However, when Propofol is used as ananaesthetic agent, various components of blood fluctuate more or less as compared to other intravenous anaesthetic agents [3, 4].

Many studies documented the adverse effects of Propofol on haemodynamics and blood profile of patients. For instance, Claeys *et al.* [5] reported significant decrease in systolic and diastolic arterial pressure, even when a single dose of Propofol given to the patient. Moreover it has a major impact on platelet aggregation along with increase in level of Alanine Aminotransferase (ALT), Aspartate Aminotransferase (AST), as well as Blood Pressure and Heart beat rate affected by the use of Propofol in surgery patients [6, 7].

Keeping in view the above discussion, there is dearth of literature on the effects of Propofol in surgery patients. However some studies are available, which partially discussed the Propofol after effects on haemodynamics and enzymatic activity [6-10]. Therefore the present study aimed to determine the pre-anaesthetic and post-anaesthetic effects of Propofol on haemodynamic changes as well as to evaluate the effect on blood profile in humans together with its quantification of intracellular enzymes.

MATERIALS AND METHODS

A total of thirty patients (16-70 years old) constituted both male (n= 15) and female (n= 15) were sampled to evaluate haemodynamic and blood profile, which had undergone a variety of general surgical procedures, receiving bolus dose of Propofol (2.5mg/kg) as an anaesthetic agent, at District Head Quarter Hospital Gujrat, Pakistan. In the operating room, pre-anaesthetic and post-anaesthetic Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Heart Rate (HR) were measured by using Sphygnomanometer. Furthermore pulse oximetery SpO_2 was attached with one of the finger for early detection of fall in patient haemoglobin (Hb) saturation with oxygen. A supplemental dose of fentanyl 2 $\mu g.kg^{-1}$ was given as needed throughout the procedure.

An arm vein was cannulated for administration of anaesthetic drug and for collection of blood samples. Venous Blood samples (5ml) were taken before and after Propofol administration and preserved in vacuum-operated tubes, containing EDTA (Ethylene Diamine Tetra Acetic Acid) as an anticoagulant and vacuum-operated gel tubes (Vacutainer; BD Franklin Lakes NJ

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USA). Blood sample tests were performed on ABACUS automated hematology analyzer. The blood was also mixed gently to carry out hematological analysis. The biochemical tests were performed on Metro Lab 1600DR, clinical chemistry analyzer by kinetic and fixed end point method using commercially available kits (Humans GmbH-65205 Wiesbaden-Germany) at 37°C.

Statistical Analysis: Data was represented in Mean ± SE. Paired sample t-test was used for comparison between pre anaesthetic and post anaesthetic measurements by using SPSS (version= 16.0) with $p \leq 0.05$ accepted as a level of significance.

RESULTS AND DISCUSSION

Propofol supplemented with non-depolarizing muscle relaxants, has been used successfully for induction of anaesthesia in surgery patients [4]. In the present study, effects of Propofol on patients, which undergone four different types of surgery viz., Laparoscopy Cholecystectomy (53.3%), Inguinal hernia (10.0%), Hysterectomy (26.7%) and Appendectomy (10.0%) was assessed (Table 1).

The table 2 reveals the haemodynamics and blood profile of surgery patients, which were analyzed throughout the study period. Both the systolic (126.33±7.64 mmHg) and diastolic blood pressure (78.33±7.46 mmHg) of the patients were recorded higher before the administration of Propofol (before surgery) than after surgery (SBP= 100±17.811 mmHg; DBP= 60±7.43 mmHg). Furthermore in SBP and DBP highly significant difference ($p<0.05$) was found between pre and post induction of medicine. These results are similar to the findings of Basu *et al*. [11]. Moreover Michelsen *et al*. [12] described drastic attenuation of blood pressure after the administration of Propofol. However heart beat rate was found slightly higher (81.97±8.656 bpm) after surgery compared to before surgery (80.23±7.06 bpm) and there was non-significant difference ($p < 0.05$) between pre and post induction of medicine. Billard *et al.* [13] reported that temporary but non significant increase in Heart Rate occurs in sveral patients during propofol injection, that might be due the pain on injection site. However Claeys *et al.* [5] documented non-significant change in heart beat rate. Propofol can induce pronounced depression of the sympathetic nervous system and a potent â-adrenergic is required to restore normal heart rate or to maintain the heart beat rate up to the desired level in certain patients receiving Propofol [14]. Infusion of Propofol is mainly a result of a decrease in after load without compensatory increases in heart rate or cardiac output [5]. In addition Coates *et al*. [15] reported no change after the induction of Propofol anesthesia.

Post anaesthetic Platelets count/L (272.40±77.258 L^{-1}) was dramatically decreased compared to pre anaesthetic condition (373.63±96.31 L^{-1}). Serum Alanine Aminotransferase (ALT) and Creatinine level increased in

Table 1: Categories of surgeries received by patients.

Categories of surgery	Male	Female	Total (%)
Laparoscopy Cholecystectomy	06	10	16 (53.3)
Inguinal hernia	03	-	03 (10.0)
Hysterectomy	-	08	08 (26.7)
Appendectomy	01	02	03 (10.0)
Total	10	20	30 (100.0)

Table 2: Comparison of Mean±SE of pre and post anesthesia blood sample values along with the level of significance (n= 30).

				95% Confidence interval of Mean±SE the Difference		
			Post-induction	----------		
Parameters	Unit	Pre-induction	Mean±SE	Lower	Upper	*p-value*
SBP	mmHg	126.33±7.64	100.00±17.811	26.333	19.911	0.001***
DBP	mmHg	78.33±7.46	60.00±7.43	15.219	21.447	0.000***
HR	bpm	80.23±7.06	81.97±8.65	-5.692	2.226	0.378^{ns}
Platelets	L^{-1}	373.63±96.31	272.40±77.25	68.472	133.995	0.000***
ALT	u/l	44.00±25.54	71.90±43.21	42.472	13.328	0.001***
Creatinine	mg/dl	0.8567±0.16	1.1733±0.25	0.406	0.22675	0.000***
Hb	g/dl	13.83±2.14	11.90±2.22	1.262	2.605	0.000***
RBC	L^{-1}	5.31±0.64	4.02±0.98	0.917	1.656	0.000***

Note: SBP= systolic Blood Pressure, DSP= Diastolic Blood Pressure, HR= Heart Beat Rate, ALT= Alanine Aminotransferase, Hb= Haemoglobin and RBC= Red Blood Cells

the patients after Propofol administration, whereas Red Blood Cells and Haemoglobin level were decreased. All the blood profile parameters such as ALT, Creatinine, Hb and RBC of patients were recorded highly significantly difference ($p < 0.05$) between pre and post induction of Propofol. Propofol inhibited platelet aggregation in surgical patients mainly as a result of the inhibition of Thromboxane synthesis and the increase in nitric oxide production. These effects are thought to be related to the hypotensive effect of this anesthetic drug. The administration of a single bolus dose of Propofol (2.5 mg/kg) significantly inhibited the maximum intensity of platelet aggregation induced by collagen or arachidonic acid in whole blood [16]. Serum ALT also was increased after reperfusion to a greater extent with Propofol compared with sevoflurane [14- 19]. The decrease in hemoglobin and RBC count might be due to severe bleeding.RBC consumption is correlated with initial hemoglobin and hematocrit levels and the duration of surgery [20, 21].

CONCLUSIONS

Propofol is widely used as anesthetic agent during surgery of patients in hospitals. However the present study showed that, hemodynamic and blood profile of surgical patients is largely influenced by the use of Propofol. Moreover further studies are recommended to compare Propofol impact with other anaesthetic drugs like Ketamine and Pentothal to prevent possible side effects in human.

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