Original Research Article

Propofol and Thiopentone as induction agents in Obstetric anesthesia - A comparative study

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Abstract

Background: In Cesarean, two anesthesia techniques are commonly used i.e. general and regional techniques. Regional anesthesia is most preferable under some circumstances. Commonly used induction agents include thiopental, Ketamine and propofol, depending on availability and the maternal clinical condition.
Aim: Propofol 2.5 mg/kg was compared with Thiopentone 5 mg/kg as on induction agent for elective Cesarean section.
Materials and methods: A total 103 healthy patients were included in an open randomized study, among whom 51 patients received Thiopentone and 52 received Propofol. These patients were unpremedicated, after induction dose the maintenance was similar for both groups.
Results: Both Propofol and Thiopentone group produced a rapid and smooth induction of anesthesia with a low incidence of side effects. Diastolic blood pressure was lower in Propofol group during the induction to delivery interval. Other hemodynamic changes were similar for both groups. Respiratory upsets occurred less frequently with Propofol (7.8%) than with Thiopentone (22.5%), but Propofol caused more pain (28.8%) on injection compared to Thiopentone. Recovery time was shorter after Propofol as evaluated by time to open eyes on commands. There was no significant neonatal depression as assessed by Apgar score.
Conclusion: Propofol appears to be a suitable alternative to Thiopentone as induction agent for Obstetric anesthesia.

Key words

Propofol, Thiopentone, Anesthesia, Apgar score.

Introduction

The concept of intravenous anesthesia was known to Sir Christopher wren since 1665, but it first became established in 1920's with the use of intravenous alcohol, Tribromoethanol and the barbiturate [1].

Propofol is a highly lipophilic compound and is extensively bound to plasma protein (97-99%) [2, 3]. The mean fetal/ maternal ratio for Thiopentone and Propofol has been reported to be in the range of 0.4-1.0 and 0.62-0.86 respectively, demonstrating that both drugs diffuse across the placenta efficiently [4, 5].

The use of Propofol infusion coupled with nitrous oxide has proved to be a satisfactory technique for caesarean section. Several studies have been performed to evaluate the value and safety of Propofol as an induction agent for general anesthesia in comparison with Thiopental in parturient undergoing elective caesarean section and found that induction characteristics of Propofol to be similar to Thiopental [6-9]. The main objective of this study was to compare propofol and Thiopentone as an alternative induction agent in obstetric anesthesia.

Material and methods

This study was conducted in Department of Anesthesiology in association with Department of Obstetrics and Gynecology at MNR Medical College and Hospital, Sangareddy from 2013 to 2015. A total 103 patients were randomly selected to receive either Thiopentone or Propofol.

Inclusion criteria

This study involved healthy women who presented to the Department of Anesthesiology for elective Cesarean section and were at least 36 weeks pregnant. An informed written consent was obtained from all of them.

Exclusion criteria

Patients with other complications of pregnancy and emergency Cesarean section were not included as they could interface with the study. Patients with previous history of allergy to anesthetics were also excluded.

The principal drugs used for this study were Propofol 1% and Sodium Thiopentone 2.5%. Monitor: H P Viridia automatic monitor model 24 CT was used for measurement of hemodynamic parameters mainly systolic blood pressure, diastolic blood pressure, mean blood pressure and heart rate. A stop watch was used for measurement of induction time, induction to delivery time and recovery period.

Results

Out of the 103 patients involved in this study, 51 (49.5%) received Thiopentone and 52 (50.5%) received propofol after being randomly allocated. In this study, the dose of induction agent was based on the body weight, 5 mg/kg Thiopentone and 2.5 mg/kg Propofol. However 20 patients (19.6%) of Thiopentone group required additional 10-20% of the induction dose. Both drugs were given intravenously over a period of 10 seconds.

The mean difference in induction time between two groups was statistically significant; $p<0.05$ (**Table - 1**). In the present study, 80.8% smooth induction and 19.2% disturbed induction was found in propofol group and 71.6% smooth induction and 28.4% disturbed induction was found in Thiopentone group. No induction failure was encountered in this study and all patients became unconscious by the end of 43 seconds. Pain at injection was noted to be the major adverse effect, in propofol group, out of 52, 15 (28.8%) patients experienced pain and only 2 (3.8%) in Thiopentone group. Difference was statistically significant; $p<0.05$.

Table – 1: Distribution of Mean Induction Time (Seconds).

Drug	Mean	SD	Range
Thiopentone	31.59	2.22	25 – 43
Propofol	25.55	4.00	20 - 40

The mean heart rate at baseline of propofol group was 87.6 ± 11.51 while for Thiopentone group was 86.13 ± 9.39 with a range of 60-120 beats/min for the whole group. The difference was not statistically significant; p – value > 0.05. The mean systolic blood pressure at baseline between Thiopentone group 122.58 ± 12.59 and propofol group 122.97± 12.66 showed no statistically significant difference; P >0.05 (**Table - 2**).

Table – 2: Comparison of Means (SD) of hemodynamic values at baseline between Thiopentone and Propofol group.

	Thiopentone (Mean ± SD)	Propofol (Mean ± SD)	P - value
SBP	122.58±12.59	122.97±12.66	0.81
DBP	70.93±9.18	69.64±11.02	0.63
MAP	88.69±9.62	87.93±10.73	0.59
HR	86.13±9.39	87.86±11.51	0.24

The mean change in heart rate between basal and after induction for those who received Thiopentone was 20.32 compared to 15.5 for induced with propofol. This change was not statistically significant between groups; P >0.05 (**Table - 3**).

Table – 3: Hemodynamic changes in Thiopentone group and propofol group after induction.

Thiopentone group (N = 51)	Mean baseline	Mean at induction	Mean change $P = (X_2 - X_1)$
SBP	122.58	123.67	1.09
DBP	70.93	71.62	0.69
MAP	88.69	89.76	1.07
HR	86.13	106.45	20.32
Propofol group (N = 52)			
SBP	122.97	120.20	-2.77
DBP	69.64	66.37	-3.27
MAP	87.93	84.71	-3.22
HR	87.86	103.136	15.5

The mean change in heart rate between basal and intubation for Thiopentone compared to propofol group was found to be 37.68 and 34.08 respectively, which was not statistically significant; P >0.05 (**Table - 4**).

The mean change in heart rate between base line and 10 minutes after induction (post-delivery) was not statistically significant between groups. For Thiopentone group, it was 20.59 compared to propofol group, 18.8 with P value > 0.05 (**Table - 5**). The difference in mean diastolic blood pressure at baseline compared for two groups of patients was found to be not statistically significant with P value > 0.05 (**Table - 4**). For Thiopentone group, the mean diastolic pressure is 70.93 ± 9.18 and for propofol group is 69.64 ± 11.02.

Table – 4: Hemodynamic changes in Thiopentone group and Propofol group after intubation.

Thiopentone group (N = 51)	**Mean baseline**	**Mean at intubation**	**Mean change P = (X_2 - X_1)**
SBP	122.58	148.06	25.48
DBP	70.93	92.79	21.86
MAP	88.69	112.49	23.8
HR	86.13	123.81	37.68
Propofol group (N = 52)			
SBP	122.97	143.98	21.01
DBP	69.64	82.02	12.38
MAP	87.93	102.94	15.01
HR	87.86	121.94	34.08

Table – 5: Hemodynamic changes in Thiopentone group and Propofol group after 10 minutes (Post delivery).

Thiopentone group (N = 51)	**Mean at base**	**Mean at 10 minutes**	**Mean change P = (X_2 - X_1)**
SBP	122.58	128.77	6.19
DBP	70.93	70.00	-0.93
MAP	88.69	90.23	1.54
HR	86.13	106.72	20.59
Propofol group (N = 52)			
SBP	122.97	130.06	7.09
DBP	69.64	66.00	-3.64
MAP	87.93	87.59	-0.34
HR	87.86	106.66	18.8

Discussion

This study involved 103 healthy obstetric patients randomly allocated to receive either Thiopentone 5mg/kg or propofol 2.5 mg/kg. The induction of anesthesia had a mean induction time of 31.59 ± 2.22 and 25.55 ± 4.00 for Thiopentone and propofol group is comparable to the results obtained by other authors who defined induction time as the time taken from injection of the drug to loss of eyelash reflex [10, 11, 12]. Rolly and co-workers had significantly shorter induction time of 21.5 seconds when injection time was 5 seconds [13]. Mean induction time was increased to 50.5 seconds when injection time was changed to 60 seconds. Thus showing the rate of injection time had influence on induction time. De Groom PMRM, et al. found longer induction time of 39.1 sec and 52.4 sec using stop counting and negative eyelash reflex method respectively, when induction dose was 2 mg/kg [14]. A smaller induction dose of 2 mg/kg induced anesthesia was done in only 80% of unpremedicated patients [15]. No statistically significant differences were found when propofol compared with Thiopentone, etomidate are methohexitone by using either loss of counting or interval between injection of induction agent and loss of eye lash reflex [12, 14, 16].

Apart from rapidity of action the induction with propofol was generally found to be smooth in the majority of patients 80.8%, with the incidence of disturbed induction being 19.2%. This was comparable to Thiopentone group with smooth induction of 71.6% while disturbed induction of

28.4%. These results are comparable with other studies [10, 16]. Higher incidence of respiratory upsets found in Thiopentone group contributes to high number of patients with disturbed induction.

After induction the mean change of heart rate between groups were not statistically significant. This change was found to be an increase of heart rate from baseline values by 15.5 beats/min to 20.32 beats/min. the heart rate changes in propofol anesthesia is usually variable and not uniform. No change in heart rate, a decrease and an increase have all been reported [10, 12, 16, 17, 18, 19].

The mean change in heart rate at 10 minutes after induction i.e. after delivery was not statistically significant between Thiopentone and propofol group. There is tendency to return to their baseline values. This explains no significance difference in heart rate change during induction and maintenance of anesthesia between the groups.

After induction the mean change of systolic blood pressure from baseline value was found an increase of blood pressure 4.12 mmHg to 4.68 mmHg. No significant difference between groups. These results i.e. slight increase in systolic blood pressure were comparable with other studies in obstetric patients. In non-obstetric patients, propofol caused more marked decrease in systolic arterial pressure after induction range between 18 mmHg to 39 mmHg [16].

In this study, the mean systolic blood pressure at baseline in both groups was less than 130 mmHg. The lower initial systolic blood pressure in this group of patients it is attributed to physiological changes during pregnancy i.e. reduction in peripheral resistance There was an increase of 21.01 to 25.48 mmHg of blood pressure from base line values. This is comparable with other studies [20].

This change in mean systolic blood pressure found in this study was high in comparison with that found in non-obstetric patient. Mwami reported increase of 7.11 mmHg in intubated patients who had undergone minor gynecological operation. This hypertensive response to tracheal intubation in common in light anesthetized obstetric patients and could be important if hypertension or intracranial vascular lesions are present.

In this study, the mean change in diastolic pressure after induction, intubation and 10 minutes after induction were significantly at lower levels in propofol group in comparison with Thiopentone group. A decrease in diastolic blood pressure of 3.27 mmHg after propofol induction was statistically significant compared to increase in diastolic blood pressure of 0.69 mmHg in Thiopentone group. After intubation an increase in mean change in diastolic blood pressure after propofol induction was 12.38 mmHg. At post-delivery, reduction of mean change of 3.64 mmHg after propofol was considerably higher than 0.93 after Thiopentone.

A fall in mean of diastolic blood pressure and mean arterial pressure after induction with propofol was found to be less in this study in comparison with non-obstetric patient. Huma Phares reported a mean fall of 7.5 mmHg of MAP 2 minutes after induction when Halothane 2% was used, premedication with an opioid gave the same result [21].

Conclusion

From this study, propofol has been shown to be a rapid acting intravenous agent, causing no significant cardiovascular depression in obstetric patients with neonatal outcome comparable to Thiopentone. At the induction dose used in this study, induction of anesthesia was found to be smooth with minimum side effects. These desirable properties of the drug offer an advantage to obstetric patients having in consideration that regurgitation of gastric contents associated with aspiration is a well-known risk at induction of anesthesia for caesarean section and to minimize drug effect on

the fetus is another problem. Thus propofol appears to be a suitable alternative induction agent for obstetric anesthesia. The main side effect was pain; care should be taken with regard to this. Excitatory phenomenon was comparable to Thiopentone, as this occurs after loss of consciousness they may not be perceived by the patient. Usually their duration of effect is less than 1 minute and they are a mild annoyance.

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