



Original article

A comparative study between propofol and thiopentone for hemodynamic parameters during induction of general anesthesia in surgical patients

Rakesh Kushwaha¹, Savita Choudhary²

¹Department of Anesthesiology & Critical Care, Pacific Institute of Medical Sciences, Umarda, Udaipur- 313003, Rajasthan, India.

²Department of Anesthesiology & Critical Care, Geetanjali Medical College & Hospital, Udaipur-313002, Rajasthan, India.

Article history

Received 24 October 2016
Revised 18 November 2016
Accepted 19 November 2016
Early online 04 January 2017
Print 31 January 2017

Corresponding author

Savita Choudhary

Associate Professor,
Department of Anesthesiology &
Critical Care,
Geetanjali Medical College & Hospital,
Hiranmagri Extension, Manwakhera
NH-8 Bypass, Near Eklingpura
Chouraha, Udaipur-313002,
Rajasthan, India.
Phone: +91-7568347994
Email: drsavitaneetra10@gmail.com

Abstract

Hemodynamic stability is very much important during induction of general anesthesia. So, this study was planned to compare hemodynamic parameters during induction by thiopentone and propofol. This prospective study was conducted after approval from institutional ethics committee in non-hypertensive patients of ASA grade I and II aged between 18-60 yrs of either sex, admitted for different surgical procedure. The patients were randomized into group P (propofol) and group T (thiopentone). Heart rate, both systolic (SBP) and diastolic blood pressure (DBP) were recorded during induction and at 1 minutes, 2 minutes, 3 minutes and 4 minutes interval after intubation. Thirty patients in each group were included during study period. After induction, there was fall in both mean SBP and DBP after an increase during intubation which was more in group T ($p < 0.05$). The statistically significant difference was observed only at 1min between two groups for SBP (P value < 0.05). The mean heart rate was almost similar at pre induction time in both the groups ($p > 0.05$). There was rise in heart rate during intubation in both the groups, thereafter heart rate started decreasing. The fall was similar in both the group at any given point of observation (P value > 0.05). Both propofol and thiopentone alter the blood pressure and heart rate during induction in surgical patients which are more pronounced in thiopentone but these changes return close to baseline value earlier in case of propofol. So, propofol could be the preferred inducing agent in hemodynamically unstable patients.

Key words: Hemodynamic parameters, Induction, Intubation, Propofol, Thiopentone

DOI: 10.5455/jmas.247007

© 2017 Deccan College of Medical Sciences. All rights reserved.

Hemodynamic stability is very much important during induction of general anaesthesia in surgical patients. Thus, anaesthetic agent with minimum effect on heart rate (HR) and blood pressure (BP) would be the agent of choice for general anaesthesia. Use of inhalational anaesthetics

can cause progressive cardiopulmonary depression. Thus, use of non-inhalational anaesthetic agents can decrease the requirement of inhalational anaesthetics which lead to less cardiovascular depression¹. Intravenous anaesthetics have a faster onset with minimal side effects than inhalation anaesthetics.

ics and are used commonly in induction of general anaesthesia for most of the surgical procedures. The concept of intravenous anaesthesia was first established in 1920². Thiopentone, the most widely used intravenous inducing agent was first administered in 1934 by Waters and Lundy. Even today thiopentone remains the gold standard against which all newer intravenous induction agents are compared. Hypertensive and hypovolemic patients are more sensitive to thiopentone, characterised by exaggerated hypotensive effects which is due to decrease in myocardial contractility as well as peripheral vasodilation^{3,4}. Propofol came into use for practice in 1984. It produces rapid, smooth induction of anaesthesia and fast recovery with decrease incidence of postoperative nausea and vomiting. Thus propofol appears to be a suitable alternative induction agent. The cardiovascular depressant properties of propofol are similar or greater than those of thiopentone⁵. Propofol is likely to cause profound hypotension in hypovolemic or previously hypertensive patients and those with cardiac disease. Reduced myocardial contractility and decreased systemic vascular resistance could be the reason for decrease in blood pressure^{6,7}.

On literature search very few studies were found in India which compared hemodynamic parameters of thiopentone and propofol. This present study was done to compare hemodynamic parameters during induction of general anaesthesia by thiopentone and propofol in surgical patients.

Materials and methods

The present prospective study was conducted in a tertiary care teaching hospital of southern Rajasthan for a period of one year. After approval from institutional ethics committee; non-hypertensive patients of physical state ASA grade I and grade II aged between 18-60 yrs of either sex, admitted for different surgical procedure were included in the study.

The patients were randomly selected into two groups using computer generated random numbers. Informed consent was taken from all the patients. A thorough pre-anaesthetic check-up with detailed

history, clinical examination and routine investigations were done in all cases before surgery. Patients were pre medicated with Inj. Glycopyrrolate 4µg/kg, Inj. Ondansetron 0.1mg/kg, Inj. Fentanyl 2µg/kg and Inj. Midazolam 0.02mg/kg intravenously 10 minutes before induction. Injection scoline 1.5 mg/kg was also given to all patients during induction and intubation. Group P received propofol 2.2 mg/kg, and Group T received thiopentone 5 mg/kg intravenously for the induction of anaesthesia. All patients had continuous pulse oximeter, ECG and blood pressure monitoring. Hemodynamic parameters like pulse rate, blood pressure both systolic and diastolic were recorded during induction and at 1 minutes, 2 minutes, 3 minutes and 4 minutes interval after intubation.

All data is expressed in Mean±SD. Data was analyzed using Microsoft excel and SPSS software version 17. Suitable statistical tests like Chi square test and t test were used to analyze the data. A p value of less than 0.05 was considered statistically significant.

Result

In present study both group P and group T were comparable with respect to age, sex and weight of all patients (Table 1).

Table 2 and figure 1 show mean SBP at different time periods in both the groups. The base line values were almost similar in both the groups. ($p>0.05$) After induction, there was fall in mean SBP which was after an increase during intubation when compared to baseline. Rise was more in group T ($p<0.05$). The statistically significant difference was observed only at 1min interval between two groups ($p<0.05$).

Table 1: Characteristics of both the groups

Parameter	Group P	Group T	P value
Age (years)	36.96±12.34	40.48±15.06	>0.05
Weight (kg)	57.09±9.11	60.52±10.18	>0.05
Male/Female ratio	8/22	10/20	-

Table 2: Comparison of mean systolic blood pressure at different time interval in both the groups

Timing	Group P	Group T	P value
Baseline	128.35±11.62	133.39±09.78	>0.05
1 min after intubation	141.91±18.66	160.30±19.38	<0.05*
2 min after intubation	133.00±17.97	145.83±19.91	>0.05
3 min after intubation	123.57±15.15	135.74±15.09	>0.05
4 min after intubation	118.30±11.85	127.61±13.57	>0.05

Table 3: Comparison of mean diastolic blood pressure at different time interval in both the groups

Timing	Group P	Group T	P value
Baseline	74.70±08.22	79.04±07.49	>0.05
1 min after intubation	83.04±16.69	97.00±16.41	>0.05
2 min after intubation	74.22±14.31	85.57±14.45	>0.05
3 min after intubation	68.13±13.98	76.65±12.59	>0.05
4 min after intubation	61.78±11.82	69.65±09.04	>0.05

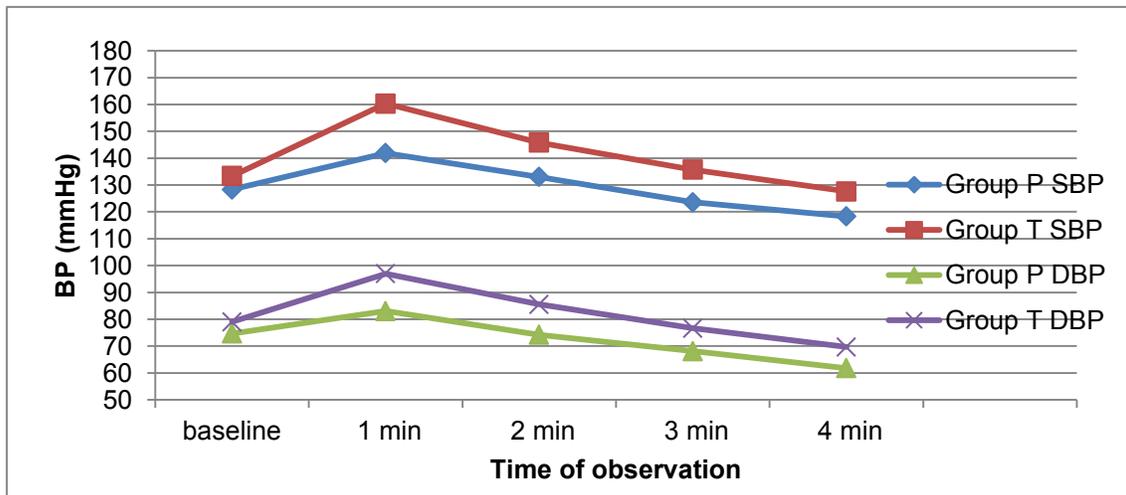


Fig 1. Change in Blood pressure in both the groups

Table 4: Comparison of mean heart rate at different time of observation in both the groups

Timing	Group P	Group T	P value
Baseline	99.00±20.59	100.83±21.18	>0.05
1 min after intubation	112.61±20.31	117.04±13.84	>0.05
2 min after intubation	115.78±18.21	116.22±15.53	>0.05
3 min after intubation	115.39±16.41	113.13±16.02	>0.05
4 min after intubation	111.96±17.21	109.78±14.43	>0.05

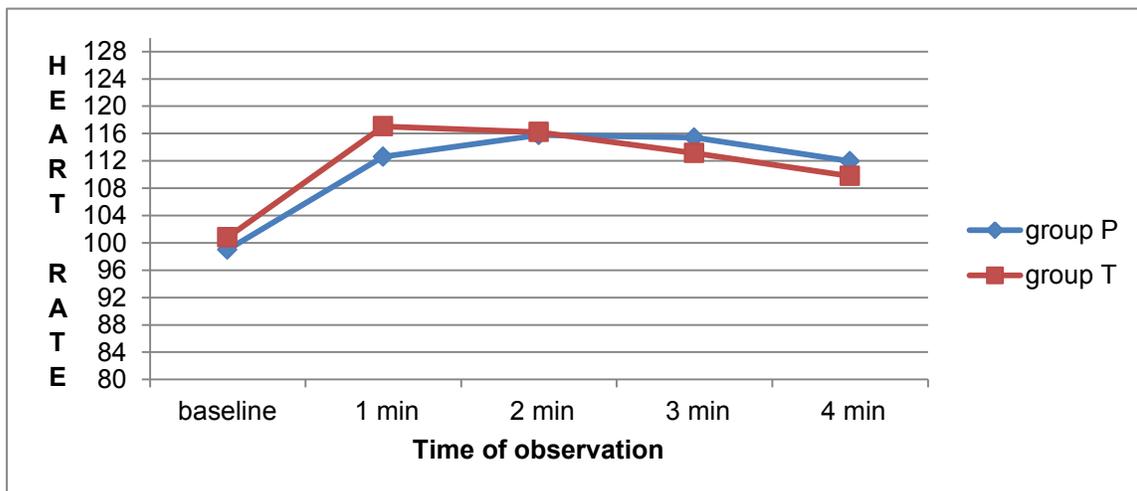


Fig 2. Change in heart rate in both the groups

There was fall in mean DBP after intubation in both groups, but fall was slightly more in T group. The mean DBP was almost similar at all time intervals in both the groups. There was no statistically significant difference at any point of observation ($p > 0.05$).

Table 4 and figure 2 show mean heart rate at different time periods in both the groups. The mean heart rate was almost similar at pre induction time in both the groups ($p > 0.05$). There was rise in heart rate during intubation in both the groups, thereafter heart rate started decreasing. The fall was similar in both the group. There were no significant difference at any given point of observation ($p > 0.05$).

Discussion

Propofol and thiopental have been used routinely as inducing agents for various surgical procedures. Hemodynamic instability can occur at the time of induction in patients. Thus, anesthesiologists have been trying to use a variety of induction modes to decrease these hemodynamic changes and various studies have shown comparable results of thiopentone and propofol on hemodynamic changes during induction^{8,9}. In present study we compared the hemodynamics parameter of thiopental and propofol used for induction of general anaesthesia.

There was no significant difference in blood pressure and heart rate between the two groups prior to intubation in present study. However, there was significant increase in both systolic blood pressure and diastolic blood pressure; and heart rate after 1 minute of intubation in both the groups. The reason for this could be due to the fact that we recorded blood pressure and heart rate after intubation which can cause sympathetic stimulation; often leading to release of catecholamines which manifested as an increase in systolic and diastolic blood pressures and heart rate^{10,11}. Other studies had also shown more hemodynamic changes after laryngoscopy and intubation than those after the use of laryngeal mask airway^{12,13}.

In present study fall of blood pressure by propofol was much greater than those seen after thiopentone after 2, 3 and 4 min of intubation. This fall could be due to decrease in myocardial contractibility, peripheral vascular resistance and sympathetic tone caused by propofol⁵. McCollum et al have also observed that propofol caused significantly more hypotension than thiopentone¹⁴. In present study after one minute of intubation rise in blood pressure was significantly more in thiopentone group. That is why propofol is more effective in preventing the increase in blood pressure after intubation than thiopentone¹⁵. In present study heart rate was found to be increased in both the groups after intubation and there was no significant

difference at any point of observation after intubation in both the groups. Various other studies have also reported variable change in heart rate like no change, a decrease and an increase^{8,16,17}. This variation could be due to depression of the baroreceptor response or reflex tachycardia probably due to a central vagolytic effect⁶.

Conclusion

Both propofol and thiopentone alter the hemodynamic parameters like BP and HR during induction. These changes are more pronounced in thiopentone but these changes return close to baseline value earlier in case of propofol then with thiopentone. So, propofol could be the preferred inducing agent as compared to thiopentone.

Conflict of interest: None

Acknowledgements: None

References

- Gutierrez-Blanco E, Victoria-Mora JM, Ibancovich-Camarillo JA, Sauri-Arceo CH, Bolio-Gonzalez ME, Acevedo-Arcique CM, Marin-Cano G, Steagall PV. Evaluation of the isoflurane-sparing effects of fentanyl, lidocaine, ketamine, dexmedetomidine, or the combination lidocaine-ketamine-dexmedetomidine during ovariohysterectomy in dogs. *Vet Anaesth Analg* 2013; 40(6):599-609.
- Lee JA, Atkinson RS, Rushwan GB. *Intravenous Anaesthetic agents* In: A synopsis of Anaesthesia. 10th ed. Burlington, MA: Butterworth-Heinemann Ltd, pp. 226-50, 1987.
- Dwyer EM Jr, Wiener L. Left ventricular function in man following thiopental. *Anaesth Analg*. 1969 May-Jun; 48(3):499-505.
- Aitkenhead AR. Thiopentone sodium as induction agent. In: Aitkenhead AR, Rowbohan DJ, Smith G eds. *Intravenous anesthetic agents*. Edinburgh: Churchill Livingstone, p.171-2, 2001.
- Furuya A, Matsukawa T, Ozaki M, Nishiyama T, Kume M, Kumazawa T. Intravenous ketamine attenuates arterial pressure changes during the induction of anaesthesia with propofol. *Eur J Anaesthesiol*. 2001 Feb; 18(2):88-92.
- Bano F, Zafar S, Sabbar S, Aftab S, Haider S, Sultan ST. Intravenous ketamine alternates injection pain and arterial pressure changes during the induction of anaesthesia with propofol. A comparison with lidocaine. *J Coll Physician Surg Pak* 2007; 17:390-3.
- Djaiani G, Ribes-Pasto MP. Propofol auto-co-induction as an alternative to midazolam co-induction for ambulatory surgery. *Anaesthesia*. 1999 Jan; 54(1):63-7.
- Valtonen M, Kanto J, Rosenberg P. Comparison of propofol and thiopentone for induction of anaesthesia for elective caesarean section. *Anaesthesia*. 1989 Sep; 44(9):758-62.
- Huma PO. A Comparison of diprivan and thiopentone when used as induction agent for short surgical procedures. *East Afr Med J*. 1990 Sep; 67(9):622-31.
- Turner RJ, Gatt SP, Kam PC, Ramzan I, Daley M. Administration of a crystalloid fluid preload does not prevent the decrease in arterial blood pressure after induction of anaesthesia with propofol and fentanyl. *Br J Anaesth*. 1998 Jun; 80(6):737-41.
- Prys-Roberts C, Greene LT, Meloche R, Foex P. Studies of anaesthesia in relation to hypertension II. Hemodynamic consequences of induction and endotracheal intubation. *Br J Anaesth*. 1971 Jun; 43(6):531-47.

12. Yeo KS, Kua SW, Teoh GS, Onsiang MK. The use of thiopentone/propofol admixture for laryngeal mask airway insertion. *Anaesth Intensive Care*. 2001 Feb; 29(1):38-42.
13. Wilson IG, Fell D, Robinson SL, Smith G. Cardiovascular responses to insertion of laryngeal mask. *Anaesthesia*. 1992 Apr; 47(4):300-2.
14. McCollum JS, Dundee JW. Comparison of induction characteristics of four intravenous anaesthetic agents. *Anaesthesia*. 1986 Oct; 41(10):995-1000.
15. Igarashi M, Nishikawa K, Nakayama M. Circulatory changes at the time of anaesthetic induction and endotracheal intubation. Comparison of thiamylal induction group and propofol induction group. *Jap J Anaesthesiology* 1998; 47:1193-9.
16. Morton NS, Wee M, Christie G, Grey IG, Grant IS. Propofol for induction of anesthesia in children. A comparison with thiopentone and halothane inhalational induction. *Anaesthesia*. 1988 May; 43(5):350-5.
17. Mackenzie N, Grant IS. Comparison of new emulsion formulation of propofol with methohexitone and thiopentone for induction of anaesthesia in day cases. *Br J Anaesth*. 1985 Aug; 57(8):725-31.