



## COMPARATIVE STUDY BETWEEN INTRAVENOUS THIOPENTAL SODIUM AND PROPOFOL FOR HEMODYNAMIC RESPONSE DURING INDUCTION OF GENERAL ANAESTHESIA

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### ABSTRACT

**Aim:** To study the effectiveness of Thiopentone sodium versus Propofol during induction of general anaesthesia on haemodynamic response. **Background and Introduction:** The induction phase of general anaesthesia is a critical period during which hemodynamic stability is essential to ensure patient safety. This study aimed to compare the hemodynamic responses of two commonly used intravenous anaesthetic agents, thiopental sodium and propofol, during the induction of general anaesthesia. **Materials and Methods:** A randomized controlled trial was conducted on 80 adult patients scheduled for elective surgeries under general anaesthesia. Patients were randomly assigned to receive either thiopental sodium or propofol for induction. Hemodynamic parameters, including heart rate, blood pressure, and oxygen saturation, were recorded at baseline and at various time points following induction. Intraoperative complication and recovery profiles were also assessed. **Results:** The results of this study demonstrated that both thiopental sodium and propofol effectively induced anaesthesia. However, propofol exhibited a more favourable hemodynamic profile with significantly less change in heart rate and blood pressure compared to thiopental sodium. Propofol induction was associated with a smoother and more stable hemodynamic response, reducing the risk of perioperative complications.

**KEYWORDS :** Thiopentone sodium , Propofol , hemodynamic responses, General anaesthesia , induction, comparative study

### INTRODUCTION

Patients undergoing laryngoscopy and endotracheal intubation generally develop Haemodynamic changes like increase in Blood pressure (BP) and Heart rate (HR). In susceptible patients, such changes may lead to myocardial ischemia or a rise in the Intracranial pressure (ICP).<sup>[1,2]</sup>

Use of inhalational anaesthetics causes progressive cardiopulmonary depression. Hence, using non inhalational anaesthetics can decrease the need of inhalational anaesthetics leading to less cardiovascular depression. Intravenous anaesthetics have a faster onset with lesser side effects than inhalational anaesthetics and hence commonly used in induction of General anaesthesia for most procedures.

With induction dose of Thiopental sodium, dose dependent hypotension is seen as side effect. This is due to decrease in myocardial contractility as well as peripheral vasodilation. Heart rate falls but there is generally reflex tachycardia which may be due to a central vagolytic effect. Hypertensive and hypovolemic patients are more prone to these effects of Thiopental, marked by exaggerated hypotensive effects due to reduction in myocardial contractility as well as peripheral vasodilatation.<sup>[5,6]</sup>

Propofol is a short acting, rapidly metabolized intravenous anaesthetic agent used in recent years as an effective alternative to the time-tested thiopentone for intravenous induction of anaesthesia. Induction with Propofol is smoother, almost equally rapid, has rapid awakening and orientation times, better intubating conditions and upper airway integrity compared to thiopentone sodium.<sup>[7,8,9]</sup> An antinociceptive and analgesic effect of Propofol is also well known<sup>[10]</sup>, which might attenuate the pressor response to tracheal intubation. Advantage of Propofol is that it is more effective in preventing the increase in arterial pressure after intubation than Thiopental sodium.<sup>[11,12,13,14]</sup>

### Aims and Objectives

**Aim:** To study the effectiveness of Thiopentone sodium versus Propofol during induction of general anaesthesia on

haemodynamic response.

### MATERIAL AND METHODS

This study was a randomized, single blinded, prospective study conducted in civil hospital, Ahmedabad. Institutional Ethics Committee approval was obtained from 2021 to 2022.

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### Patient Selection

#### Inclusion Criteria

1. Patient giving positive consent.
2. ASA grade I, II, undergoing elective surgery under general anaesthesia.
3. Age 18-60 years
4. Either gender
5. Surgical procedures – general surgery, urosurgery, orthopaedics surgery, neurosurgery, ENT Surgery (under general anaesthesia)

#### Exclusion Criteria

1. Patient giving negative consent.
2. Age <18year and >60 years
3. Patients having recent URTI, any drug allergy
4. Anticipated difficult airway, restricted mouth opening, H/o regurgitation
5. Patients having Neuromuscular disorder and neurological symptoms, pathology of oropharynx, neck & upper GIT
6. Patients having hypertension.
7. Pregnancy.
8. Patients on medications affecting heart rate and blood pressure.

Patients undergoing surgeries under general anaesthesia were screened for eligibility to participate in the study considering the inclusion and exclusion criteria as mentioned above, first eligible and consenting 80 patients were included and divided into two groups of 40 each by a computer generated randomization technique.

Group P received Inj. Propofol 2.5-3 mg/kg iv as induction

agent

Group T received Inj. Thiopental sodium 3-5 mg/kg iv as induction agent

All preoperative assessment of the patient including history, general examination, systemic examination with all required investigations were done a day before the procedure. Patient were kept nil per oral for 8 hours before surgery.

Informed written consent were obtained from patients aged 18-65 years, who were scheduled for elective surgeries under general anaesthesia in their own language in the preoperative room in Civil Hospital, Ahmedabad attached to B. J. Medical College, Ahmedabad, Gujarat.

An intravenous line with proper size was secured and hydration was started with appropriate intravenous fluids. All patients are premedicated with inj Glycopyrrolate 4 microgram/kg IV, inj Fentanyl 2 microgram/kg IV and inj Ondansetron 0.15 mg/kg IV 20 minutes prior to induction. Patients were taken on OT table and all the minimum mandatory monitors that are non invasive blood pressure (NIBP), heart rate (HR), pulse oximetry, end tidal CO<sub>2</sub> were applied. Pre operative baseline heart rate (HR), blood pressure BP (Systolic blood pressure -SBP, Diastolic blood pressure-DBP, Mean arterial pressure (MAP), and oxygen saturation (SPO<sub>2</sub>) were measured after premedication. After monitoring the hemodynamics for 10 minutes, the anaesthetic procedure was started. General anaesthesia technique was selected for all.

Patients were preoxygenated with 100% oxygen for 3-5 minutes. All patients were divided into two groups: In group P, Patients were induced with Inj Propofol 2.5-3mg/kg IV till loss of consciousness occurred. In group T, patients were induced with inj Thiopental sodium 3-5mg/kg iv till loss of eyelash reflex. After checking for mask ventilation, inj Succinyl Choline 2mg/kg iv was given to facilitate induction. Following this, endotracheal intubation was done with proper endotracheal tube size. Following laryngoscopy and endotracheal intubation, HR, BP (Systolic blood pressure, Diastolic blood pressure, Mean arterial pressure) and SPO<sub>2</sub> were recorded. All parameters mentioned above were monitored at 0, 1, 3, 5, 10 and 15 min after induction. Patient were maintained under controlled ventilation with O<sub>2</sub>, Sevoflurane and inj Atracurium besylate 0.5 mg/kg IV as maintenance anaesthesia. After surgery, reversal was achieved with Inj. Neostigmine 0.05 mg/kg IV and Inj. glycopyrrolate 8 mcg/kg IV and tracheal extubation was done when the patients were fully awake. Inj Paracetamol 15mg/kg was given for analgesia.

**OBSERVATION AND RESULTS**

Haemodynamic stability is very crucial 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.<sup>[9]</sup>

This study was carried out in 80, ASA risk I and II patients, undergoing elective surgery under general anaesthesia. The study population was randomly allocated to two groups: group P was given Inj. Propofol 2.5-3mg/kg IV till loss of consciousness occurred and group T was given Inj. Thiopental sodium 3-5mg/kg iv till loss of eyelash reflex, with 40 patients in each group.

At the end of study, the observations made were tabulated and analyzed using appropriate statistical tools. Statistical software package SPSS version 26 was used. Data was analysed using independent sample t test and chi square test for quantitative and qualitative data respectively. The results were expressed in terms of mean and standard deviation. P

value of less than 0.05 was considered to be statistically significant.

**Table 1: Distribution According To Mean Age In Both The Groups**

Demographic Characteristics	Group P		Group T		P Value
	Mean	SD	Mean	SD	
Age in Years	38.13	14.16	34.88	11.17	0.258
Weight in Kgs	57.23	8.89	56.50	8.36	0.708

**Table 2: Distribution According To Sex In Both The Groups**

Demographic Characteristics	Group P		Group T		P Value
	No.	%	No.	%	
Male	14	35.0%	17	42.5%	0.823
Female	26	65.0%	23	57.5%	

Above table shows demographic characteristics of study subjects of my study.

No statistically significant difference was found in both the groups regarding age, weight and sex. (p>0.05)

**Table 3: Distribution According To ASA Grade In Both The Groups**

Demographic Characteristics	Group P		Group T		P Value
	No.	%	No.	%	
ASA 1	24	60.0%	23	57.5%	0.820
ASA 2	16	40.0%	17	42.5%	

Patient with ASA physical status I and II were included in this study. ASA physical status of patients was comparable in both Groups. The difference is statistically not significant (p>0.05).

**Table 4: Intergroup Comparison Of Heart Rate**

HR	Group P		Group T		P Value
	Mean	SD	Mean	SD	
Baseline	82.75	4.25	83.85	4.07	0.241
After Induction At 1 min	74.55	4.62	84.78	3.79	<0.001*
At 3 min	69.48	3.10	77.90	4.30	<0.001*
At 5 min	70.15	2.64	78.68	5.57	<0.001*
At 10 min	72.80	2.69	77.70	5.65	<0.001*
At 15 min	74.25	5.19	78.73	4.22	<0.001*

\*significant p <0.05

In my study, Heart Rate at baseline in both the groups were comparable and statistically not significant (p >0.05). The mean HR at baseline in group P was 82.75±4.25 bpm and 83.85±4.07 bpm in group T. Then after induction, the heart rate were significantly different between the two groups, compared with unpaired t test (p <0.001). At 1, 3, 5, 10 and 15 min after induction, the mean heart rate in group P were 74.55±4.62 bpm, 69.48±3.10 bpm, 70.15±2.64 bpm, 72.80±2.69 bpm and 74.25±5.19 bpm respectively whereas in group T it was 84.78±3.79 bpm, 77.90±4.30 bpm, 78.68±5.57 bpm, 77.70±5.65 bpm and 78.73±4.22 bpm respectively. The difference was statistically significant at all times after induction with p <0.001. After induction in group T heart rate was slightly increased and later decreased up to 15 min.

**Table 5: Intergroup Comparison Of Systolic Blood Pressure**

SBP	Group P		Group T		P Value
	Mean	SD	Mean	SD	
Baseline	122.93	4.96	125.03	5.05	0.064
After Induction At 1 min	118.00	6.50	120.83	6.34	0.053
At 3 min	113.85	3.89	119.23	6.63	<0.001*
At 5 min	114.43	4.13	118.90	6.43	<0.001*
At 10 min	113.70	3.72	118.85	6.87	<0.001*
At 15 min	112.93	4.22	118.90	6.87	<0.001*

\* significant p <0.05

In my study, Systolic blood pressure (SBP) at baseline in both the groups were comparable and statistically not significant ( $p > 0.05$ ). The mean SBP at baseline in group P was  $122.93 \pm 4.96$  mmHg and in group T was  $125.03 \pm 5.05$  mmHg with. Then after induction, SBP were significantly different between the two groups, compared with unpaired t test ( $p < 0.05$ ). At 1 min after induction, mean SBP in group P was  $118.00 \pm 6.50$  mmHg and in group T was  $120.83 \pm 6.34$  mmHg. The difference was statistically not significant with p value of 0.053. At 3 min, 5 min, 10 min and 15 min after induction, the mean SBP in group P was  $113.85 \pm 3.89$  mmHg,  $114.43 \pm 4.13$  mmHg,  $113.70 \pm 3.72$  mmHg and  $112.93 \pm 4.22$  mmHg and it was  $119.23 \pm 6.63$  mmHg,  $118.90 \pm 6.43$  mmHg,  $118.85 \pm 6.87$  mmHg and  $118.90 \pm 6.87$  mmHg in group T respectively. The difference was statistically significant at 3, 5, 10 and 15 minutes with  $p < 0.001$ .

**Table 6: Intergroup Comparison Of Diastolic Blood Pressure**

DBP	Group P		Group T		P Value
	Mean	SD	Mean	SD	
Baseline	81.80	4.68	83.03	5.23	0.273
After Induction At 1 min	76.60	4.58	76.43	5.62	0.879
At 3 min	73.28	4.20	75.93	5.27	0.015*
At 5 min	73.78	3.61	74.18	3.96	0.638
At 10 min	73.98	3.58	77.40	4.41	<0.001*
At 15 min	73.93	3.40	78.68	4.46	<0.001*

\*significant  $p < 0.05$

In my study, Diastolic blood pressure (DBP) at baseline, 1 min and 5 min after induction in both the groups were comparable and statistically not significant ( $p > 0.05$ ). The mean DBP in group P was  $81.80 \pm 4.68$  mmHg,  $76.60 \pm 4.58$  mmHg and  $73.78 \pm 3.61$  mmHg at baseline, 1 min and 5 min after induction and in group T it was  $83.03 \pm 5.23$  mmHg,  $76.43 \pm 5.62$  mmHg and  $74.18 \pm 3.96$  mmHg at baseline, 1 min and 5 min after induction respectively. Then after induction at 3, 10 and 15 min, the difference was statistically significant between two groups, compared with unpaired t test. The mean DBP at 3 min in group P was  $73.28 \pm 4.20$  mmHg and in group T was  $75.93 \pm 5.27$  mmHg. The result was statistically significant with  $p = 0.015$ . At 10 and 15 min after induction, the mean DBP in group P was  $73.98 \pm 3.58$  mmHg and  $73.93 \pm 3.40$  mmHg and in group T it was  $77.40 \pm 4.41$  mmHg and  $78.68 \pm 4.46$  mmHg respectively. Result The was statistically significant with  $p < 0.001$ .

**Table 7: Intergroup Comparison Of Mean Arterial Pressure**

MAP	Group P		Group T		P Value
	Mean	SD	Mean	SD	
Baseline	95.51	3.36	97.11	4.19	0.011
After Induction At 1 min	90.40	4.23	91.23	4.84	0.419
At 3 min	86.80	3.46	90.36	4.68	<0.001*
At 5 min	87.33	3.21	89.08	3.79	0.028*
At 10 min	87.22	2.95	91.22	3.46	<0.001*
At 15 min	86.93	2.98	92.08	4.17	<0.001*

\*significant  $p < 0.05$

In my study, Mean arterial pressure (MAP) at baseline and 1 min after induction in both the groups were comparable and statistically not significant ( $p > 0.05$ ). The mean MAP at baseline and 1 min after induction was  $95.51 \pm 3.36$  mmHg and  $90.40 \pm 4.23$  mmHg in group P and it was  $97.11 \pm 4.19$  mmHg and  $91.23 \pm 4.84$  mmHg in group T respectively. Then after induction, at 3, 5, 10 and 15 mins, the results were statistically significant between the two groups, compared with unpaired t test. The mean MAP at 3, 10 and 15 min after induction in group P was  $86.80 \pm 3.46$  mmHg,  $87.22 \pm 2.95$  mmHg and  $86.93 \pm 2.98$  mmHg whereas it was  $90.36 \pm 4.68$  mmHg,  $91.22 \pm 3.46$  mmHg and  $92.08 \pm 4.17$  mmHg in group T respectively. The result was statistically significant with  $p < 0.001$ . The mean MAP at 5 min after induction was

$87.33 \pm 3.21$  mmHg in group P and it was  $89.08 \pm 3.79$  mmHg in group T and the result was statistically significant with p value of 0.028.

In my study, Mean SpO2 was comparable in both the groups at all time interval. The results were statistically non significant with pvalue  $> 0.05$  at all time intervals.

**DISCUSSION**

This is a prospective study which compares Propofol with Thiopental sodium on haemodynamic response during induction of general anaesthesia.

Both the groups were matched by demographic and clinical variables.

Laryngoscopy and endotracheal intubation are considered as the most critical events in conducting general anaesthesia.<sup>[28]</sup> They provoke a transient but marked sympathoadrenal response resulting in tachycardia and hypertension<sup>[29,30]</sup>. Thus, anaesthesiologists have been trying to use a variety of induction modalities to minimize haemodynamic changes. Therefore, the search for an ideal agent is continuing. So, we have compared Propofol and Thiopental sodium in our study.

**Haemodynamic Parameters**

**Heart Rate**

In my study, there was no significant difference in heart rate between the two groups prior to induction. However, there was increase in heart rate in group T after 1 min of induction while decrease in group P with the mean HR in group P being  $74.55 \pm 4.62$  bpm and in group T being  $84.78 \pm 3.79$  bpm and the difference was statistically significant with  $p < 0.001$ . After induction, at 3, 5, 10 and 15 minutes the heart rate in both the groups decreased and the decrease was more in Propofol group than in Thiopental sodium group.

He difference was statistically significant at all times after induction with  $p < 0.001$ . After induction, in group T heart rate was slightly increased and later decreased up to 15 min.

**Blood Pressure**

In my study, there was no significant difference in the systolic, diastolic and mean arterial pressure between the two groups prior to induction. The systolic blood pressure decreased in both the groups after induction but was statistically significant at 3, 5 and 15 minutes after induction. The diastolic blood pressure also decreased after induction but was statistically significant at 3, 10 and 15 minutes in my study. The mean arterial pressure also decreased after induction and was statistically significant at 3, 5, 10 and 15 minutes after induction. The decrease in SBP, DBP and MAP after induction was seen more in Propofol group than in Thiopental sodium group.

Mean SpO2 in my study at all time intervals was comparable with the other studies stated above and the difference was found to be statistically non significant with  $p > 0.05$ .

None of the 80 patients in our study faced stress induced symptoms like coughing or straining etc., during laryngoscopy and endotracheal intubation. We did not observe any severe drop in blood pressure and heart rate after induction and any deleterious surge in these variables after laryngoscopy and endotracheal intubation in any of the two groups in our study.

**SUMMARY**

This study was done to compare the hemodynamic response of intravenous Thiopental sodium versus Propofol during induction of general anaesthesia in 80 patients divided into 2 groups. Group P was given Inj. Propofol 2.5-3 mg/kg IV as induction agent while Group T was given Inj. Thiopental

sodium 3-5 mg/kg IV as induction agent. Standard anaesthetic technique was followed in all patients. Hemodynamics were monitored at 0, 1, 3, 5, 10 and 15 minutes after induction.

- 1) There was no statistically significant difference among two groups regarding age, gender, weight and ASA status.
- 2) Mean heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure were comparable at baseline.
- 3) There was decrease in heart rate at 1 minute after induction in group P where as it increased in group T and the difference was statistically significant ( $p < 0.001$ ). Thereafter, heart rate decreased in both the groups and results were statistically significant ( $p < 0.001$ ).
- 4) There was decrease in systolic, diastolic and mean arterial blood pressures after induction and were statistically significant at 3, 5, 10 and 15 minutes after induction for SBP and MAP and at 3,10 and 15 minutes after induction for DBP ( $p < 0.001$ ).
- 5) Mean SpO<sub>2</sub> was comparable all the time intervals.

### CONCLUSION

Concluding our study, both Propofol and Thiopental sodium cause hemodynamic changes during induction of general anaesthesia. These changes are more pronounced with Thiopental sodium but they return near to baseline values earlier in Propofol. So, Propofol could be the induction agent of choice as compared to Thiopental sodium because of its rapid recovery and better outcomes in patients undergoing general anaesthesia.

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