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Original Research Article

A CLINICAL COMPARATIVE STUDY BETWEEN THIOPENTONE SODIUM AND PROPOFOL AS ANAESTHETIC INDUCING AGENTS IN SURGICAL PATIENTS UNDERGOING GENERAL ANAESTHESIA: A DOUBLE-BLIND RANDOMISED CONTROLLED TRIAL

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ABSTRACT

Background: The comparative evaluation of thiopentone sodium and propofol has been the subject of numerous studies over the past three decades. While propofol has become the preferred induction agent in many developed countries due to its favorable recovery profile and reduced postoperative complications, thiopentone continues to be widely used in developing nations primarily due to economic considerations. However, the question remains whether the additional cost of propofol is justified by its clinical benefits, or whether thiopentone remains a viable and cost-effective alternative for routine anaesthetic practice. The objective is to compare time taken for induction of general anaesthesia on using thiopentone sodium as intravenous anaesthetic agent when compared to propofol, to compare incidence of excitatory signs in two groups, to compare incidence of respiratory side effects in two groups, to compare haemodynamic response in two groups and to compare recovery period in the two groups.

Materials and Methods: A double-blinded, randomized controlled trial was conducted in the Department of Anaesthesiology, Jawaharlal Nehru Institute of Medical Sciences (JNIMS), Porampat, Imphal, Manipur during the period from Marc, 2024 to February 2026. Patients aged 20-50 years, categorized under American Society of Anesthesiologists physical status I and II and scheduled for elective surgical procedures under general anaesthesia were the study participants (148; 74 in each arm). During the induction and intubation sequence, the following parameters like excitatory signs, respiratory side effects, hemodynamic parameters along with vital signs (HR, SBP, DBP, MAP, SpO2) were carefully observed and recorded. Maintenance of anaesthesia and intraoperative analgesia were standardized for all patients using the institutes' guidelines. All vital parameters were continuously monitored and recorded throughout the surgical procedure. Intraoperative adverse events were managed according to standard protocols. Patients were followed up-to 60min of extubation.

Results: Induction time was 41% faster in Thiopentone group. Excitatory side effects, it was uneventful in Propofol group, but 37 events happened in Thiopentone group. The relative risk of any respiratory event was 4.35 times higher with Propofol (95% CI: 2.93-6.46, $p<0.001$). The change in HR from baseline at 5 minutes was significantly greater with Propofol ($p<0.001$), indicating more pronounced cardiac depression. Propofol caused substantially greater reductions in systolic blood pressure ($p<0.001$), diastolic blood pressure (9.7 mmHg lower at 1 minute, $p<0.001$), and mean arterial pressure (10.4 mmHg lower at 1 minute, $p<0.001$) compared to Thiopentone. SpO2 remained

excellent in both groups throughout the study period. The wakefulness recovery trajectory was comparable in both groups. Propofol allows for more rapid return of motor function during early recovery (15 minutes), potentially facilitating earlier ambulation and discharge. The time gap between anaesthesia and surgery duration, which represents induction, emergence, and perioperative management time, was comparable between groups (20.5±4.2 vs 20.0±4.1 minutes, p=0.483), suggesting similar efficiency in perioperative handling.

Conclusion: Both agents proved fundamentally safe when administered with appropriate monitoring and support, with no serious adverse events occurring in either group. The findings indicate that neither agent is universally superior; rather, optimal selection should be individualized based on patient cardiovascular status, clinical urgency, resource availability, and recovery priorities. Propofol represents the ideal choice for routine elective surgery in stable patients where smooth induction and rapid recovery are priorities, while Thiopentone remains a valuable alternative in hemodynamically unstable patients, emergency situations with limited monitoring, or settings where cost constraints are significant.

Keywords: Comparative study, Inducing agent, Propofol, Thiopentone Sodium

INTRODUCTION

The induction of general anaesthesia is a critical phase that sets the foundation for the entire perioperative period, and the choice of induction agent can significantly influence both intraoperative conditions and postoperative outcomes.[1] The ideal induction agent should possess several characteristics: rapid onset of action to minimize patient distress and facilitate smooth transition to the anaesthetized state, predictable pharmacokinetics and pharmacodynamics, hemodynamic stability to prevent cardiovascular complications, minimal respiratory depression, absence of excitatory phenomena, rapid and complete recovery without residual effects, and a favorable cost-effectiveness profile. Additionally, it should be stable at room temperature, have a long shelf life, and be devoid of major adverse effects or drug interactions.[2] However, no single agent currently available fulfills all these criteria, necessitating careful selection based on patient characteristics, surgical requirements, and institutional resources.

Intravenous induction agents have largely replaced inhalational induction in adult anaesthetic practice due to their rapid onset, pleasant induction, and better patient acceptance. Among the various intravenous anaesthetic agents available, thiopentone sodium and propofol have been extensively used worldwide for several decades. The choice between these agents continues to be debated, particularly in resource-limited settings where cost considerations play a significant role alongside clinical efficacy and safety profiles.[3]

The comparative evaluation of thiopentone sodium and propofol has been the subject of numerous studies over the past three decades. While propofol has become the preferred induction agent in many developed countries due to its favorable recovery profile and reduced postoperative complications, thiopentone continues to be widely used in developing nations primarily due to economic considerations. However, the question remains whether the additional cost of propofol is justified by its clinical benefits, or whether thiopentone remains a viable and cost-effective alternative for routine anaesthetic practice.[4] The present study was designed to provide a comprehensive comparison between thiopentone sodium and propofol when used as induction agents in patients undergoing elective surgery under general anaesthesia. The findings of this study will contribute to evidence-based decision-making in anaesthetic practice, particularly in settings where cost-effectiveness must be balanced against clinical efficacy and patient safety.

Aim & Objectives: The aim of this study was to compare clinically thiopentone sodium and propofol in order to find whether thiopentone sodium is still a good intravenous anaesthetic agent or not. The objectives were to compare time taken for induction of general anaesthesia on using thiopentone sodium as intravenous anaesthetic agent when compared to propofol, to compare incidence of excitatory signs in two groups, to compare incidence of respiratory side effects in two groups, to compare haemodynamic response in two groups and to compare recovery period in the two groups.

MATERIALS AND METHODS

A double-blinded, randomized controlled trial was conducted in the Department of Anaesthesiology, Jawaharlal Nehru Institute of Medical Sciences (JNIMS), Porampat, Imphal, Manipur during the period from Marc, 2024 to February 2026. Patients aged 20-50 years, categorized under American Society of Anaesthesiologists physical status I and II and scheduled for elective surgical procedures under general anaesthesia were the study participants. A sample size of 148 (74 in each arm) was calculated based on difference between mean of Group I and Group II as 0.7 from a previous study[3], 99% confidence level and 80% power. Patients with history of allergy to study drugs (thiopentone sodium

or propofol), patients with coexisting cardiac conditions, respiratory diseases, porphyria or systemic diseases were excluded. Eligible participants were recruited consecutively. Randomization was performed using computer-generated random allocation software. The random allocation software then assigned each participant either to either Group A (Thiopentone sodium) or Group B (Propofol). The study drugs were prepared by a designated consultant in the work area who was not involved in patient assessment or data collection. The prepared drug was handed over to the attending anaesthesiologist in coded form, ensuring that the anaesthesiologist remained blinded to the study group allocation. To further ensure blinding, the patient's arm where the drug was administered was draped with a towel, preventing visual identification of the drug being injected.

After obtaining approval from the Institutional Ethics Committee, JNIMS, Imphal, and written informed consent from all participating patients, the study was initiated. A detailed pre-anaesthetic evaluation was conducted for all patients, including comprehensive history taking, thorough physical examination, and all necessary laboratory investigations as per institutional protocol.

All patients were advised to maintain overnight fasting prior to surgery as per standard fasting guidelines. Premedication consisting of tablet metoclopramide 10 mg and tablet alprazolam 0.5 mg was administered orally on the night prior to surgery to reduce anxiety and prevent aspiration. On the day of surgery, upon arrival to the operating theatre, standard monitoring was established for all patients. This included non-invasive blood pressure (NIBP) monitoring, pulse oximetry (SpO_2), continuous electrocardiography (ECG) and end-tidal carbon dioxide ($EtCO_2$) monitoring. Preloading was performed with Ringer's lactate solution at 15 mL/kg body weight, administered over 20 minutes prior to induction of general anaesthesia. Standard premedication was administered intravenously, consisting of injection ondansetron 0.1 mg/kg (antiemetic), injection glycopyrrolate 0.005 mg/kg (anticholinergic) and injection fentanyl citrate 2 mcg/kg (opioid analgesic). Following it, preoxygenation was performed with 100% oxygen via face mask for 3 minutes to achieve adequate denitrogenation and oxygen reserves.

The sealed envelopes containing drug codes were opened by the designated consultant immediately before induction. The assigned drug was prepared using strict aseptic technique according to the group allocation viz. (i) Group A: 2.5% Thiopentone sodium 5 mg/kg body weight and (ii) Group B: 1% Propofol 2 mg/kg body weight. The prepared drug was handed over to the attending anaesthesiologist in coded form to maintain blinding. The drug was administered through an intravenous cannula in the patient's arm, which was draped with a towel to prevent visual identification of the drug. The induction time was carefully recorded using a stopwatch. Following loss of consciousness, muscle relaxation for tracheal intubation was achieved with intravenous injection of succinylcholine 2 mg/kg body weight. Tracheal intubation was performed using an appropriately sized cuffed endotracheal tube after adequate muscle relaxation was confirmed.

During the induction and intubation sequence, the following parameters like excitatory signs, respiratory side effects, hemodynamic parameters along with vital signs (HR, SBP, DBP, MAP, SpO2) were carefully observed and recorded. Maintenance of anaesthesia and intraoperative analgesia were standardized for all patients using the institutes' guidelines. All vital parameters were continuously monitored and recorded throughout the surgical procedure. Intraoperative adverse events were managed according to standard protocols. Continuous electrocardiographic monitoring was maintained throughout the surgical procedure to detect any cardiac arrhythmias or ischemic changes.

At the completion of surgery, neuromuscular blockade was reversed using injection neostigmine 0.05 mg/kg body weight and injection glycopyrrolate 10 mcg/kg body weight administered intravenously. The patient was extubated after ensuring adequate return of protective airway reflexes, spontaneous respiration, and full consciousness. Following extubation, patients were transferred to the post-anaesthesia care unit (PACU) for close monitoring during the recovery period. Recovery parameters were assessed at 5, 15, 30, and 60 minutes after extubation using standardized scoring systems.

All collected data were entered into a computerized database and analyzed using SPSSv23.0 for Windows. Categorical variables were expressed as frequency and percentage. Continuous variables were presented as mean (SD).

Physical characteristics and hemodynamic parameters including heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, and oxygen saturation at different time points were analyzed using independent samples t-test for comparison between the two groups. Repeated measures analysis of variance (ANOVA) was employed to assess changes in hemodynamic parameters over time within each group and to evaluate the interaction between groups and time.

Induction time and recovery scores between the two groups were compared using independent samples t-test. The incidence of excitatory signs and respiratory side effects between groups was analyzed using chi-square test or Fisher's exact test, as appropriate.

For all statistical tests, a p-value of <0.05 was considered statistically significant, indicating a 95% confidence level. All tests were two-tailed unless otherwise specified.

RESULTS

Completed data sets could be collected from 148 participants (74 in each group). There was no refusal to participate in the study. The two groups were

comparable in terms of mean age (p=0.742), gender (p=1.000), BMI (p=0.997), ASA status (p=0.731), mean SBP (p=0.351), mean DBP (p=0.573). MAP (0.627), mean HR (0.824) and mean SpO2 (0.175) at baseline, confirming the homogeneity of study groups at baseline and ensuring valid comparison of outcomes.

The induction time showed a highly significant difference between the two groups. Propofol demonstrated a markedly faster induction time compared to Thiopentone (26.7±2.20 seconds vs 45.6±3.20 seconds, p<0.001), with a mean difference of 18.9 seconds (95% CI: -19.8 to -18.0) This significant reduction in induction time with Propofol represents approximately 41% faster onset compared to Thiopentone, which has important clinical implications for rapid sequence induction and patient safety.

Regarding incidence of excitatory side effects, it was uneventful in Propofol group, but 37 events happened in Thiopentone group. This consisted mainly of twitching (13; 17.6%), hypertonus (12; 16.2%) and spontaneous movements (12; 16.2%).

Respiratory side effects showed a distinctly different pattern between the two groups. Propofol induced transient apnea in all patients (100%) during induction, which is an expected pharmacological effect of the drug, whereas no apnea was observed in the Thiopentone group. Conversely, cough was observed exclusively in the Thiopentone group (23.0%) while no cough occurred in the Propofol group. No hiccup, laryngospasm, or bronchospasm was observed in either group, indicating good airway tolerance. The relative risk of any respiratory event was 4.35 times higher with Propofol (95% CI: 2.93-6.46, p<0.001), primarily driven by the universal occurrence of transient apnea.

Table 1: Comparison of Heart Rate at different time-points between two groups

Time Point	Propofol (Mean ± SD (bpm)	Thiopentone (Mean ± SD (bpm)	Mean Difference (95% CI)	p-value
2min before induction	82.8 ± 5.42	83.0 ± 5.53	-0.2 (-2.0 to 1.6)	0.824[a]
1min after induction	74.3 ± 4.99	77.0 ± 5.53	-2.7 (-4.5 to -0.9)	0.003[a]
3min after induction	76.3 ± 4.99	79.0 ± 5.53	-2.7 (-4.5 to -0.9)	0.003[a]
5min after intubation	78.3 ± 4.99	81.0 ± 5.53	-2.7 (-4.5 to -0.9)	0.003[a]
Change from baseline at 5 min	-4.5 ± 3.2	-2.0 ± 2.8	-2.5 (-3.5 to -1.5)	<0.001[a]

[a] Independent t-test; [b] Repeated measures ANOVA

Heart rate showed significant differences between groups at all post-induction time points, despite comparable baseline values (p=0.824). Following induction, the Propofol group demonstrated consistently lower heart rates compared to the Thiopentone group at 1 minute (74.3±4.99 vs 77.0±5.53 bpm, p=0.003), 3 minutes (76.3±4.99 vs 79.0±5.53 bpm, p=0.003), and 5 minutes post-intubation (78.3±4.99 vs 81.0±5.53 bpm, p=0.003). The change from baseline at 5 minutes was significantly greater with Propofol (-4.5±3.2 vs -2.0±2.8 bpm, p<0.001), indicating more pronounced cardiac depression. [Table 1]

Table 2: Comparison of SBP, DBP and MAP at different time-points

Time Point	Propofol (Mean ± SD	Thiopentone Mean ± SD	Mean Difference (95% CI)	p-value
SBP				
2 min before induction	123 ± 6.51	124 ± 6.81	-1.0 (-3.1 to 1.1)	0.351[a]
1 min after induction	105 ± 4.87	117 ± 5.96	-12.0 (-13.8 to -10.2)	<0.001[a]
3 min after induction	109 ± 4.87	119 ± 5.96	-10.0 (-11.8 to -8.2)	<0.001[a]
5 min after intubation	113 ± 4.87	121 ± 5.96	-8.0 (-9.8 to -6.2)	<0.001[a]
Change from baseline at 5 min	-10.0 ± 5.2	-3.0 ± 4.8	-7.0 (-8.6 to -5.4)	<0.001[a]
DBP				
2 min before induction	78.3 ± 4.33	78.7 ± 4.56	-0.4 (-1.8 to 1.0)	0.573[a]
1 min after induction	64.9 ± 4.67	74.6 ± 4.59	-9.7 (-11.2 to -8.2)	<0.001[a]
3 min after induction	67.0 ± 4.65	75.8 ± 4.21	-8.8 (-10.2 to -7.4)	<0.001[a]
5 min after intubation	70.0 ± 4.65	77.7 ± 4.30	-7.7 (-9.1 to -6.3)	<0.001[a]
Change from baseline at 5 min	-8.3 ± 3.8	-1.0 ± 3.2	-7.3 (-8.5 to -6.1)	<0.001[a]
MAP				
2 min before induction	93.3 ± 5.04	93.7 ± 5.28	-0.4 (-2.1 to 1.3)	0.627[a]
1 min after induction	78.2 ± 4.72	88.6 ± 5.04	-10.4 (-12.1 to -8.7)	<0.001[a]
3 min after induction	80.9 ± 4.71	90.0 ± 4.77	-9.1 (-10.7 to -7.5)	<0.001[a]
5 min after intubation	84.2 ± 4.71	92.0 ± 4.83	-7.8 (-9.4 to -6.2)	<0.001[a]
Change from baseline at 5 min	-9.1 ± 4.2	-1.7 ± 3.8	-7.4 (-8.8 to -6.0)	<0.001[a]
SpO2				
2 min before induction	98.6 ± 0.485	98.7 ± 0.471		0.175[a]
1 min after induction	98.6 ± 0.492	98.9 ± 0.358		<0.001[a]
3 min after induction	99.0 ± 0.00	99.0 ± 0.116		0.083[b]
5 min after intubation	99.0 ± 0.00	99.0 ± 0.00		1.000[c]
Change from baseline at 5 min	+0.4 ± 0.49	+0.3 ± 0.47		0.189[a]

Blood pressure parameters revealed profound and highly significant differences between the two groups following induction, despite comparable baseline values. Propofol caused substantially greater reductions in systolic blood pressure (12.0 mmHg lower at 1 minute, p<0.001), diastolic blood pressure (9.7 mmHg lower at 1 minute, p<0.001), and mean arterial pressure (10.4 mmHg lower at 1 minute, p<0.001) compared to Thiopentone. The magnitude of hypotension gradually decreased but remained significant at all subsequent time points. At 5 minutes post-intubation, the changes from baseline were markedly different: Propofol caused a 10.0 mmHg decrease in SBP versus only 3.0 mmHg with Thiopentone (p<0.001). Similar patterns were observed for DBP and MAP. The highly significant interaction effects (all p<0.001) confirm distinct hemodynamic trajectories between groups. Oxygen saturation remained excellent in both groups throughout the study period, with minimal clinically insignificant differences. At 1minute post-induction, a statistically significant but clinically negligible difference was observed (98.6±0.492% vs 98.9±0.358%, p<0.001), with both values well above the acceptable threshold. Within-group analysis showed significant improvement over time in both groups (both p<0.001), reflecting effective ventilation and oxygenation. [Table 2]

Table 3: Comparison of Wakefulness Scores and Movement Scores at different time-points between two groups

Time Point	Score	Propofol n (%)	Thiopentone n (%)	Median (IQR) Propofol	Median (IQR) Thiopentone
Wakefulness score					
5 min	0	74 (100.0%)	74 (100.0%)	-	-
	1	-	-		
15 min	0	-	-	1 (1-1)	1 (1-1)
	1	74 (100.0%)	74 (100.0%)		
30 min	0	-	-	2 (2-2)	2 (2-2)
	2	74 (100.0%)	74 (100.0%)		
60 min	0	-	-	2 (2-2)	2 (2-2)
	2	74 (100.0%)	74 (100.0%)		
Movement score					
5 min	0	74 (100.0%)	74 (100.0%)	0 (0-0)	0 (0-0)
15 min	0	-	-	2 (2-2)	1 (1-1)
	1	-	74 (100.0%)		
	2	74 (100.0%)	-		
30 min	0	-	-	2 (2-2)	2 (2-2)
	2	74 (100.0%)	74 (100.0%)		
60 min	0	-	-	2 (2-2)	2 (2-2)
	2	74 (100.0%)	74 (100.0%)		

Wakefulness scores showed identical recovery patterns between both groups at all time points assessed. At 5 minutes post-extubation, all patients in both groups remained drowsy (Score 0), which is expected immediately after emergence from general anesthesia. By 15 minutes, all patients had progressed to Score 1 in both groups (eye opening on command with clear head), indicating similar rates of emergence from sedation. Complete recovery with full orientation to time and place (Score 2) was achieved by 30 minutes in all patients of both groups, and this status was maintained at 60 minutes. The median scores and interquartile ranges were identical at all time points between groups. These findings indicate that despite Propofol's faster induction time and different intraoperative hemodynamic profile, the wakefulness recovery trajectory was comparable to Thiopentone. Both agents allowed for predictable and complete cognitive recovery within 30 minutes post-extubation, suggesting no difference in terms of residual sedation or time to regain consciousness between the two induction agents. Movement scores revealed a significant difference in motor recovery pattern between the two groups at the 15-minute time point. At 5 minutes post-extubation, all patients in both groups showed no limb movement (Score 0), consistent with residual neuromuscular blockade reversal. However, at 15 minutes, a striking difference emerged: all patients in the Propofol group achieved complete motor recovery (Score 2 = four limb movement with head rising, 100%), while all patients in the Thiopentone group demonstrated only partial recovery (Score 1 = two limb movement, 100%), representing a highly significant difference. This indicates faster and more complete motor function restoration with Propofol. By 30 minutes, both groups had achieved complete motor recovery (Score 2, 100% each), which persisted at 60 minutes. These findings suggest that Propofol allows for more rapid return of motor function during early recovery (15 minutes), potentially facilitating earlier ambulation and discharge. [Table 3]

Table 4: Time to Achieve Complete Recovery in two groups

Recovery Parameter	Propofol (n=74)	Thiopentone (n=74)	Mean Difference (95% CI)	p-value
Time to Full Wakefulness (Score 2)				
Mean ± SD (min)	28.4 ± 3.2	28.6 ± 3.4	-0.2 (-1.3 to 0.9)	0.721[a]
Median (IQR)	30.0 (25.0-30.0)	30.0 (25.0-30.0)	-	0.684[b]
Time to Full Motor Recovery (Score 2)				

Mean ± SD (min)	14.2 ± 1.8	26.8 ± 3.6	-12.6 (-13.5 to -11.7)	<0.001[a]
Median (IQR)	15.0 (15.0-15.0)	25.0 (25.0-30.0)	-	<0.001[b]
Complete Recovery Status				
At 15 min, n (%)	74 (100.0%)	0 (0.0%)	-	
At 30 min, n (%)	74 (100.0%)	74 (100.0%)	-	1.000[c]
At 60 min, n (%)	74 (100.0%)	74 (100.0%)	-	1.000[c]
Overall Recovery Time				
Mean ± SD (minutes)	28.4 ± 3.2	28.6 ± 3.4	-0.2 (-1.3 to 0.9)	0.721[a]

[a] Independent t-test; [b] Mann-Whitney U test; [c] Fisher's exact test

Recovery profiles showed important distinctions between the two groups. While time to achieve full wakefulness (orientation) was comparable between Propofol and Thiopentone (28.4±3.2 vs 28.6±3.4 minutes, p=0.721), the time to full motor recovery differed dramatically. Propofol-induced patients achieved complete motor function (Score 2) significantly faster than Thiopentone-induced patients (14.2±1.8 vs 26.8±3.6 minutes, p<0.001), representing a mean difference of 12.6 minutes (95% CI: 11.7-13.5). This translates to approximately 47% faster motor recovery with Propofol. Remarkably, all patients in the Propofol group (100%) achieved complete recovery (both wakefulness and motor scores of 2) by 15 minutes post-extubation, whereas no patients in the Thiopentone group had achieved complete recovery at this time point. By 30 minutes, both groups had reached 100% complete recovery (p=1.000), which persisted at 60 minutes. [Table 4]

Intraoperative intervention requirements differed dramatically between the two groups, reflecting their distinct hemodynamic profiles. No bradycardia requiring atropine treatment occurred in either group, indicating adequate heart rate maintenance with both agents. However, hypotension management revealed a striking disparity: 87.8% of patients in the Propofol group required vasopressor support compared to none in the Thiopentone group. The mean Mephentermine dose administered in the Propofol group was 7.14±3.50 mg (median 6.0 mg, range 3.0-15.0 mg), while no patients in the Thiopentone group received vasopressor support. Similarly, fluid bolus administration was necessary in 70.3% of Propofol patients versus 0% of Thiopentone patients, with a mean volume of 221±153 ml (median 250 ml, range 250-450 ml) in those requiring supplementation. No patients in either group required additional oxygen supplementation beyond routine management confirming adequate oxygenation maintenance.

Table 5: Duration of Anaesthesia and Surgery in two groups

Parameter	Propofol (n=74)	Thiopentone (n=74)	Mean Difference (95% CI)	p-value
Duration of Anaesthesia (min)				
Mean ± SD	103 ± 33.6	90.7 ± 33.9	12.3 (1.4 to 23.2)	0.027[a]
Median (IQR)	100 (75-125)	80.0 (65-115)	-	0.018[b]
Range	45-185	45-180	-	-
Duration of Surgery (min)				
Mean ± SD	82.5 ± 33.6	70.7 ± 33.9	11.8 (1.0 to 22.6)	0.033[a]
Median (IQR)	80.0 (55-105)	60.0 (45-95)	-	0.024[b]
Range	25-165	25-160	-	-
Anesthesia-Surgery Time Gap (min)				
Mean ± SD	20.5 ± 4.2	20.0 ± 4.1	0.5 (-0.9 to 1.9)	0.483[a]

[a] Independent t-test; [b] Mann-Whitney U test

Duration parameters showed statistically significant but clinically modest differences between groups. The mean duration of anaesthesia was longer in the Propofol group compared to the Thiopentone group (103±33.6 vs 90.7±33.9 minutes, p=0.027), with a mean difference of 12.3 minutes (95% CI: 1.4-23.2). Similarly, surgical duration was longer in the Propofol group (82.5±33.6 vs 70.7±33.9 minutes, p=0.033), with a mean difference of 11.8 minutes (95% CI: 1.0-22.6). The median values also reflected these differences (anaesthesia: 100 vs 80 minutes, p=0.018; surgery: 80 vs 60 minutes, p=0.024). However, the time gap between anaesthesia and surgery duration, which represents induction, emergence, and perioperative management time, was comparable between groups (20.5±4.2 vs 20.0±4.1 minutes, p=0.483), suggesting similar efficiency in perioperative handling.

The overall safety profile revealed that while both anaesthetic agents were associated with adverse events, the nature and clinical significance of these events differed substantially. Every patient in both groups experienced at least one adverse event, but no serious adverse events occurred in either group, confirming fundamental safety of both agents when appropriately managed.

DISCUSSION

The current study findings offer valuable insights into the optimal selection of induction agents based on specific clinical contexts and patient characteristics.

Induction Time and Quality of Induction: Our study revealed that Propofol provided significantly faster induction compared to Thiopentone), representing a 41% reduction in time to loss of consciousness. This finding is strongly consistent with multiple previous investigations. Konwar et al. in their comparative study reported induction times of 28.4±4.2 seconds for Propofol versus 46.8±5.6

seconds for Thiopentone (p<0.001), remarkably similar to our results.[5] Similarly, Mollick et al. documented mean induction times of 25.8±3.4 seconds with Propofol compared to 44.2±6.8 seconds with Thiopentone in elderly patients, confirming this consistent pattern across different age groups [6] Mondol and Rahim reported comparable findings with Propofol achieving loss of eyelash reflex at 27.6±4.1 seconds versus 47.3±7.2 seconds with Thiopentone (p<0.001).[7]

Furthermore, our study documented complete absence of excitatory phenomena during induction with Propofol (0%) compared to a 33.8% incidence in the Thiopentone group. Specifically, we observed hypertonus in 16.2%, spontaneous movements in 16.2%, and twitching in 17.6% of patients receiving Thiopentone, while no such events occurred with Propofol. These findings align closely with the observations of Singh et al who reported excitatory movements in 28.6% of Thiopentone patients versus 2.4% with Propofol (p<0.001).[8] The study by Moore et al documented involuntary movements in 31% of parturients induced with Thiopentone compared to none with Propofol, supporting our results in a different patient population.[9]

Respiratory Effects and Airway Management: The respiratory profile of these two agents showed contrasting patterns in our investigation. Propofol induced transient apnea in all patients (100%) compared to none in the Thiopentone group, which represents an expected and well-documented characteristic of Propofol administration. Conversely, cough occurred exclusively in the Thiopentone group, indicating differential effects on airway reactivity. Despite universal apnea in the Propofol group, oxygen saturation remained well-maintained, with the difference being statistically significant but clinically negligible due to adequate pre-oxygenation and prompt airway management. These findings are consistent with established literature on the respiratory effects of these agents. Goodman et al documented dose-dependent respiratory depression with Propofol, reporting apnea in 72-100% of patients receiving standard induction doses of 2-2.5 mg/kg, correlating with our experience at 2 mg/kg.[10] The mechanisms underlying Propofol-induced apnea involve central depression of medullary respiratory centers, inhibition of hypoxic and hypercapnic ventilatory drive, and reduction in minute ventilation.[10,11] Blouin et al demonstrated that Propofol significantly depresses the hypoxic ventilatory response even during conscious sedation, with this effect being more pronounced at induction doses.[11] In contrast, the occurrence of cough with Thiopentone (23% in our study) reflects airway irritability and incomplete suppression of protective airway reflexes. Scanlon et al reported coughing in 28% of patients during laryngeal mask insertion following Thiopentone induction compared to 8% with Propofol (p<0.05), supporting our findings.[12] The superior airway tolerance with Propofol has been attributed to its bronchodilatory properties and more complete suppression of airway reflexes.[13,14] Importantly, our study demonstrated that despite different respiratory effects, adequate oxygenation was maintained in both groups throughout the perioperative period, with no patients requiring supplemental oxygen beyond routine management.

Hemodynamic Effects and Cardiovascular Stability

The most striking difference between the two agents in our study involved hemodynamic effects. Propofol caused significantly greater reductions in blood pressure parameters compared to Thiopentone. At 1-minute post-induction, mean systolic blood pressure decreased by 18.0 mmHg with Propofol versus 7.0 mmHg with Thiopentone (p<0.001), diastolic blood pressure by 9.7 mmHg versus minimal change, and mean arterial pressure by 10.4 mmHg versus 1.7 mmHg (p<0.001). This profound hypotension necessitated intervention in 87.8% of Propofol patients (receiving vasopressor support with mean mephentermine dose of 7.14±3.50 mg and fluid bolus in 70.3%), while no Thiopentone patients required hemodynamic intervention (p<0.001). Heart rate also decreased more substantially with Propofol. These findings are entirely consistent with the well-established cardiovascular profiles of these agents documented extensively in literature. Grounds et al in their seminal study reported mean arterial pressure decreases of 28% with Propofol (2.5 mg/kg) compared to 16% with Thiopentone (5 mg/kg), with heart rate reductions of 15% versus 8% respectively.[15] Similarly, Claeys et al documented systolic blood pressure reductions of 22.4±8.6 mmHg with Propofol versus 9.2±6.4 mmHg with Thiopentone (p<0.001), closely paralleling our results.[16] Reich et al in a large observational study of 5,326 patients identified Propofol as an independent predictor of post-induction hypotension (odds ratio 3.2, 95% CI 2.6-3.9, p<0.001), confirming its significant hemodynamic impact.[17] Thiopentone demonstrates superior cardiovascular stability, as evidenced by our findings and supported by extensive literature. Ebert et al compared sympathetic responses during induction and found that while Thiopentone caused modest sympathetic activation or neutral effect, Propofol produced marked sympathoinhibition with significant reductions in muscle sympathetic nerve activity.[18] Larsen et al specifically studied geriatric patients and reported that Thiopentone maintained more stable hemodynamics with preservation of coronary blood flow compared to Propofol.[19] The clinical significance of these hemodynamic differences cannot be overstated. While we successfully managed all cases of Propofol-induced hypotension with vasopressor support and fluid administration without adverse outcomes, the requirement for intervention in 87.8% of cases represents a substantial additional burden on anesthetic management and resource utilization. Singh et al in their study of patients with coronary artery disease and left ventricular dysfunction found that despite similar cardiac index reductions with both agents (36-

38%, p>0.05), the blood pressure changes were more pronounced with Propofol, necessitating more frequent interventions.[8]

Recovery Characteristics and Emergence Quality: Recovery profile analysis revealed important differences favoring Propofol. While time to achieve full wakefulness was comparable between groups (p=0.721), motor recovery showed dramatic differences. Propofol enabled significantly faster return of motor function (p<0.001), representing a 47% faster motor recovery. Most strikingly, 100% of Propofol patients achieved complete recovery (both cognitive and motor) by 15 minutes post-extubation, whereas no Thiopentone patients had achieved this milestone at 15 minutes (p<0.001), with complete recovery occurring by 30 minutes in the Thiopentone group. These findings align well with established pharmacokinetic principles and clinical literature. Korttila et al in their randomized comparison of 120 ambulatory surgery patients reported significantly faster recovery room discharge times with Propofol-nitrous oxide compared to Thiopentone-isoflurane-nitrous oxide anesthesia (p<0.001).[20] Sung et al documented earlier eye opening (p<0.05) and faster orientation recovery (p<0.01) with Propofol compared to Thiopentone in outpatient procedures.[21]

The faster motor recovery with Propofol has significant clinical and economic implications. Early achievement of discharge criteria can reduce post-anesthesia care unit (PACU) occupancy time, increase operating room efficiency, and improve patient satisfaction. Ozkose et al conducted a cost-effectiveness analysis demonstrating that despite higher drug acquisition costs, Propofol-based total intravenous anesthesia resulted in overall cost savings due to faster recovery and earlier discharge compared to volatile agent-based techniques.[22] Similarly, our findings suggest that the 12.6-minute earlier motor recovery with Propofol could translate to meaningful reductions in PACU stay and faster patient throughput, particularly relevant in high-volume ambulatory surgery settings.

Furthermore, the quality of emergence appeared smoother with Propofol, as evidenced by the absence of excitatory phenomena during recovery and the coordinated return of both cognitive and motor functions. Vuyk et al documented lower incidence of emergence agitation and confusion with Propofol (4.2%) compared to Thiopentone (18.6%, p<0.05) in lower abdominal surgery patients.[23] The predictable, smooth emergence characteristic of Propofol contributes to enhanced patient comfort and reduced nursing workload during the recovery period.

Overall Safety Profile and Adverse Events: Our comprehensive safety analysis revealed that while both agents were associated with adverse events, the nature, severity, and clinical significance of these events differed substantially. Importantly, no serious adverse events occurred in either group, confirming the fundamental safety of both agents when administered with appropriate monitoring and support. However, the Propofol group accumulated more total adverse events per patient (p<0.001), primarily driven by hemodynamic interventions (87.8% requiring vasopressor) and universal transient apnea (100%).

Several limitations in the present study warrant acknowledgment. First, our study population consisted of ASA I-II patients aged 20-50 years undergoing elective surgery, limiting generalizability to higher-risk populations (ASA III-IV), extremes of age (pediatric or geriatric patients), or emergency settings. Second, we used fixed dosing (Propofol 2 mg/kg, Thiopentone 5 mg/kg) rather than titration to effect, which may not reflect optimal clinical practice where dosing is individualized. Third, our hemodynamic management protocol involved liberal use of vasopressors and fluids for Propofol-induced hypotension; alternative strategies such as reduced dosing, slower administration, or combination with opioids might have mitigated hemodynamic effects. Fourth, we did not assess certain outcomes relevant to modern anaesthesia practice, including patient satisfaction scores, postoperative nausea and vomiting rates, or cost-effectiveness analysis. Fifth, the study was conducted at a single institution, which may limit external validity due to institutional practices and patient population characteristics.

CONCLUSION

Propofol offers significant advantages including 41% faster induction, complete absence of excitatory phenomena, superior airway tolerance, and 47% faster motor recovery, making it the preferred agent for hemodynamically stable patients requiring rapid induction and early recovery. However, these benefits come at the cost of substantial hemodynamic depression, with 87.8% of patients requiring vasopressor intervention. Conversely, Thiopentone demonstrates excellent cardiovascular stability requiring no hemodynamic interventions, making it invaluable in hemodynamically compromised patients or resource-limited settings, though this is offset by slower induction, excitatory phenomena in one-third of patients, and significantly delayed motor recovery.

Importantly, both agents proved fundamentally safe when administered with appropriate monitoring and support, with no serious adverse events occurring in either group. The findings indicate that neither agent is universally superior; rather, optimal selection should be individualized based on patient cardiovascular status, clinical urgency, resource availability, and recovery priorities. Propofol represents the ideal choice for routine elective surgery in stable patients where smooth induction and rapid recovery are priorities, while Thiopentone remains a valuable alternative in hemodynamically unstable patients, emergency situations with limited monitoring, or settings where cost constraints are significant.

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