



RESEARCH ARTICLE

Comparative Evaluation of Propofol and Thiopentone Sodium for Induction of General Anaesthesia in Patients Undergoing Elective Surgery

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Abstract

Background: Thiopentone sodium was, for several decades, the standard intravenous induction agent for general anaesthesia, but propofol has been increasingly adopted owing to its favourable recovery profile, though direct comparative data on induction and recovery characteristics remain clinically relevant.

Objectives: To compare quality of induction, haemodynamic response, recovery characteristics, and side effects between propofol and thiopentone sodium for induction of general anaesthesia in patients undergoing elective surgery.

Methods: This was a prospective, randomised, comparative study of 100 ASA physical status I or II patients undergoing elective surgery under general anaesthesia, allocated to receive induction with propofol 2-2.5 mg/kg (Group P, n=50) or thiopentone sodium 5-6 mg/kg (Group T, n=50). Quality of induction, haemodynamic parameters, recovery time, and side effects were recorded and compared.

Results: Induction was rated excellent in 74.0% of the propofol group compared with 54.0% of the thiopentone group. Propofol produced a greater fall in systolic blood pressure immediately after induction, while thiopentone produced a transient rise. Recovery was significantly faster with propofol across all measured parameters (all $p < 0.001$).

Conclusion: Propofol provides smoother induction and significantly faster recovery than thiopentone sodium, at the cost of a greater incidence of injection pain and transient hypotension, supporting its preferential use where rapid recovery is clinically prioritised, such as in day-case surgery.

Keywords: Propofol, thiopentone, induction of anaesthesia, recovery, general anaesthesia

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1 | INTRODUCTION

Thiopentone sodium, a rapidly acting barbiturate, served as the standard intravenous induction agent for general anaesthesia for several decades following its introduction into clinical practice, valued for its rapid onset and predictable effect. (1) The subsequent introduction of propofol, an alkylphenol derivative formulated as a lipid emulsion, offered an alternative induction agent with a reportedly smoother induction profile and, most notably, a substantially faster and clearer recovery compared with thiopentone. (2, 3)

Early comparative studies, including the work of Mackenzie and Grant comparing propofol with methohexitone and thiopentone in day-case surgery, and the haemodynamic comparison by Grounds and colleagues, established the broad comparative profile of these two agents: propofol produces smoother induction with less excitatory activity but greater cardiovascular and respiratory depression immediately following injection, while thiopentone is associated with more prolonged and less predictable recovery (4) Subsequent studies in both outpatient and paediatric populations have generally confirmed this pattern, while also documenting a higher incidence of pain on injection with propofol compared with thiopentone. (5–7)

Given the practical importance of rapid, predictable recovery in contemporary surgical practice, particularly with the growing emphasis on day-case and ambulatory surgery, continued comparative evaluation of these two induction agents across different patient populations and practice settings remains clinically relevant. (5)

2 | MATERIALS AND METHODS

2.1 | Study Design and Setting

This was a hospital-based, prospective, randomised, comparative clinical study conducted in the Department of Anaesthesiology of a tertiary care teaching hospital over a defined study period.

2.2 | Study Population

One hundred ASA physical status I or II patients aged 18-60 years undergoing elective surgery under general anaesthesia were enrolled after obtaining informed consent.

2.3 | Inclusion and Exclusion Criteria

Patients aged 18-60 years, ASA physical status I or II, scheduled for elective surgery of duration 30-120 minutes under general anaesthesia, were included. Patients with known cardiac disease, hypersensitivity to study drugs, difficult airway, or those on sedative or opioid medication were excluded.

2.4 | Anaesthetic Technique

All patients were premedicated as per standard departmental protocol and preoxygenated prior to induction. Group P received propofol 2-2.5 mg/kg intravenously over 15-20 seconds, and Group T received thiopentone sodium 5-6 mg/kg intravenously over the same duration. Quality of induction was graded by a blinded observer as excellent, good, or poor based on ease of induction, presence of excitatory movements, and injection pain. Standard maintenance anaesthesia and neuromuscular blockade were used identically in both groups.

2.5 | Monitoring and Outcome Assessment

Heart rate, non-invasive blood pressure, and oxygen saturation were monitored continuously and recorded at baseline and at 1, 3, 5, and 10 minutes after induction. Apnoea was defined as cessation of spontaneous respiration for more than 20 seconds. Recovery parameters, including time to eye opening, response to verbal command, orientation, and

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discharge readiness from the recovery room, were recorded by a blinded observer.

2.6 | Statistical Analysis

Data were analysed using descriptive statistics; continuous variables were expressed as mean $\pm$ SD and compared using the independent samples t-test, and categorical variables were expressed as frequencies and percentages and compared using the chi-square test. A p-value <0.05 was considered statistically significant.

3 | RESULTS

The two groups were comparable at baseline for age, weight, and ASA physical status (Table 1).

Induction was rated excellent in 37 (74.0%) patients in the propofol group compared with 27 (54.0%) patients in the thiopentone group (Table 2, Figure 1).

Propofol produced a marked fall in systolic blood pressure within the first few minutes after induction, whereas thiopentone produced a transient rise followed by gradual normalisation (Table 3, Figure 2).

Recovery was significantly faster with propofol across all measured parameters (Table 4, Figure 3).

Pain on injection and apnoea were more common with propofol, while excitatory movements and post-operative nausea/vomiting were more common with thiopentone (Table 5, Figure 4).

4 | DISCUSSION

The higher proportion of excellent-quality induction observed with propofol in this study is consistent with the original comparative work of Mackenzie and Grant, who similarly found propofol to produce smoother induction than thiopentone in day-case patients, with fewer excitatory phenomena. (1) This finding has been confirmed across multiple subsequent studies in both adult and paediatric populations, including that of Mirakhur comparing induction characteristics of propofol and thiopentone in children. (8)

The haemodynamic pattern observed in this study, with a more pronounced fall in blood pressure following propofol compared with a transient rise followed by gradual normalisation with thiopentone, closely mirrors the findings of Grounds and colleagues in their direct haemodynamic comparison of the two agents, and reflects the greater vasodilatory and negative inotropic effect of propofol relative to thiopentone at equipotent induction doses. (2) This difference has practical clinical relevance in patients with limited cardiovascular reserve, where the more pronounced hypotensive response to propofol may warrant more cautious dosing or haemodynamic support.

The substantially faster recovery observed with propofol across all measured parameters in this study is consistent with the well-established pharmacokinetic advantage of propofol, related to its rapid hepatic clearance and redistribution, as reviewed by Langley and Heel, and confirmed in the outpatient comparative study of Edelist. (4, 5) This recovery advantage underlies the widespread adoption of propofol as the preferred induction agent for day-case and ambulatory surgery, where rapid, clear-headed recovery is a key determinant of patient discharge readiness and satisfaction. (6)

The higher incidence of pain on injection observed with propofol in this study is a well-recognised limitation of the drug, related to its formulation in a lipid emulsion, and has prompted various strategies to mitigate this effect, including pre-treatment with lidocaine, as discussed in several of the early comparative studies of propofol. Conversely, the higher incidence of excitatory movements and postoperative nausea and vomiting observed with thiopentone in this study is consistent with its recognised barbiturate-related side effect profile, as reviewed by Sear in the context of intravenous anaesthetic toxicity. (8)

5 | STRENGTHS AND LIMITATIONS

This study's strengths include its randomised, comparative design and standardised, blinded assessment of induction quality and recovery parameters. Limitations

TABLE 1: Demographic and Baseline Characteristics

Parameter	Group P: Propofol (n=50)	Group T: Thiopentone (n=50)
Age (years), mean ± SD	38.6 ± 12.3	39.4 ± 11.8
Weight (kg), mean ± SD	63.8 ± 9.1	64.5 ± 8.7
ASA physical status I, n (%)	41 (82.0%)	40 (80.0%)
ASA physical status II, n (%)	9 (18.0%)	10 (20.0%)

TABLE 2: Quality of Induction

Quality of Induction	Propofol, n (%)	Thiopentone, n (%)
Excellent	37 (74.0%)	27 (54.0%)
Good	10 (20.0%)	17 (34.0%)
Poor	3 (6.0%)	6 (12.0%)

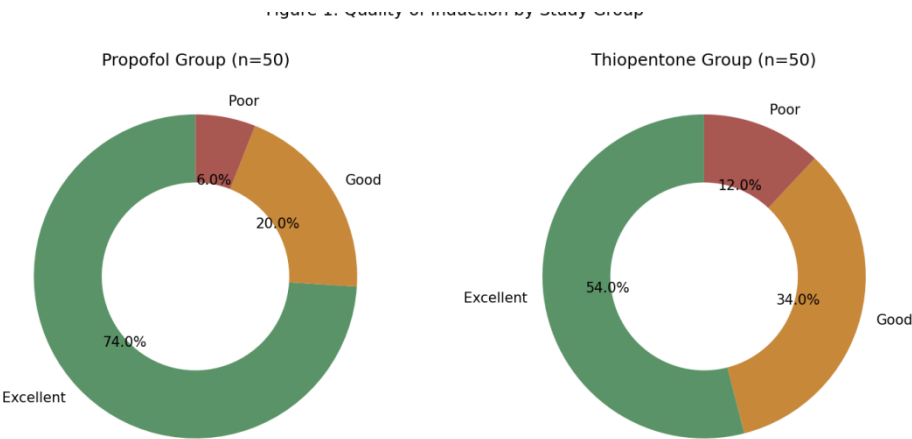


FIGURE 1:

TABLE 3: Systolic Blood Pressure Trend After Induction

Time	SBP Propofol (mmHg)	SBP Thiopentone (mmHg)
Baseline	124 ± 10	126 ± 11
1 minute	102 ± 12	132 ± 14
3 minutes	98 ± 11	124 ± 12
5 minutes	104 ± 10	118 ± 10
10 minutes	112 ± 9	116 ± 9

TABLE 4: Recovery Characteristics

Recovery Parameter	Propofol (min)	Thiopentone (min)	P-value
Time to eye opening	4.2 ± 1.1	8.6 ± 1.8	<0.001
Time to response to command	5.1 ± 1.3	10.3 ± 2.1	<0.001
Time to orientation	7.8 ± 1.6	15.2 ± 2.8	<0.001
Time to discharge from recovery room	28.4 ± 4.7	46.7 ± 6.9	<0.001

Figure 2: Systolic Blood Pressure Trend After Induction

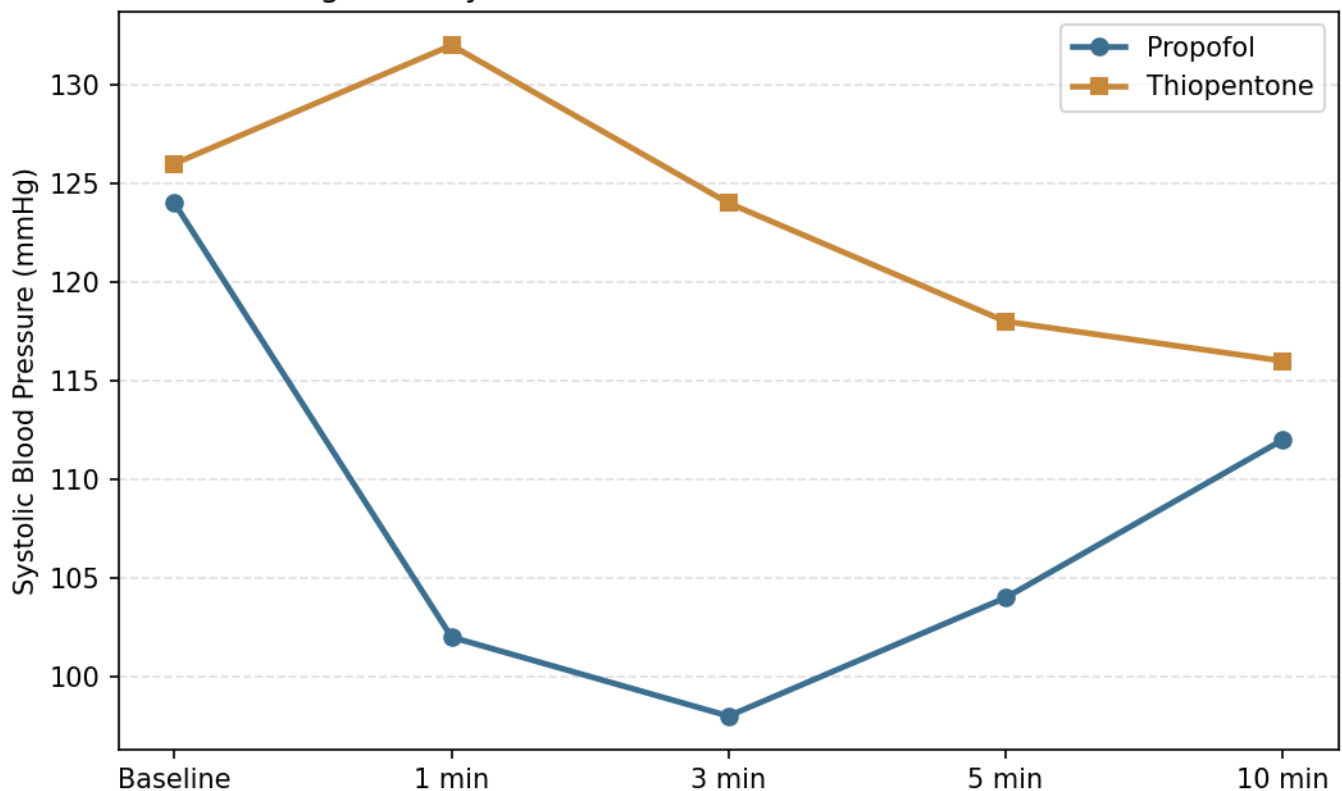


FIGURE 2:

TABLE 5: Side Effects by Study Group

Side Effect	Propofol, n (%)	Thiopentone, n (%)
Pain on injection	18 (36.0%)	6 (12.0%)
Apnoea >20 seconds	9 (18.0%)	3 (6.0%)
Excitatory movements	4 (8.0%)	11 (22.0%)
Postoperative nausea/vomiting	5 (10.0%)	12 (24.0%)

tations include the absence of a formal a priori sample size calculation in this template, which should be included in any real study; the use of fixed weight-based dosing rather than titration to clinical effect; and the relatively short follow-up period, which did not extend to assessment of very late postoperative outcomes. (4)

pain and more pronounced transient hypotension immediately following induction. These findings support the preferential use of propofol where rapid recovery is a clinical priority, such as in day-case and ambulatory surgery, while thiopentone remains a viable alternative in settings where its lower cost and different side effect profile may be advantageous.

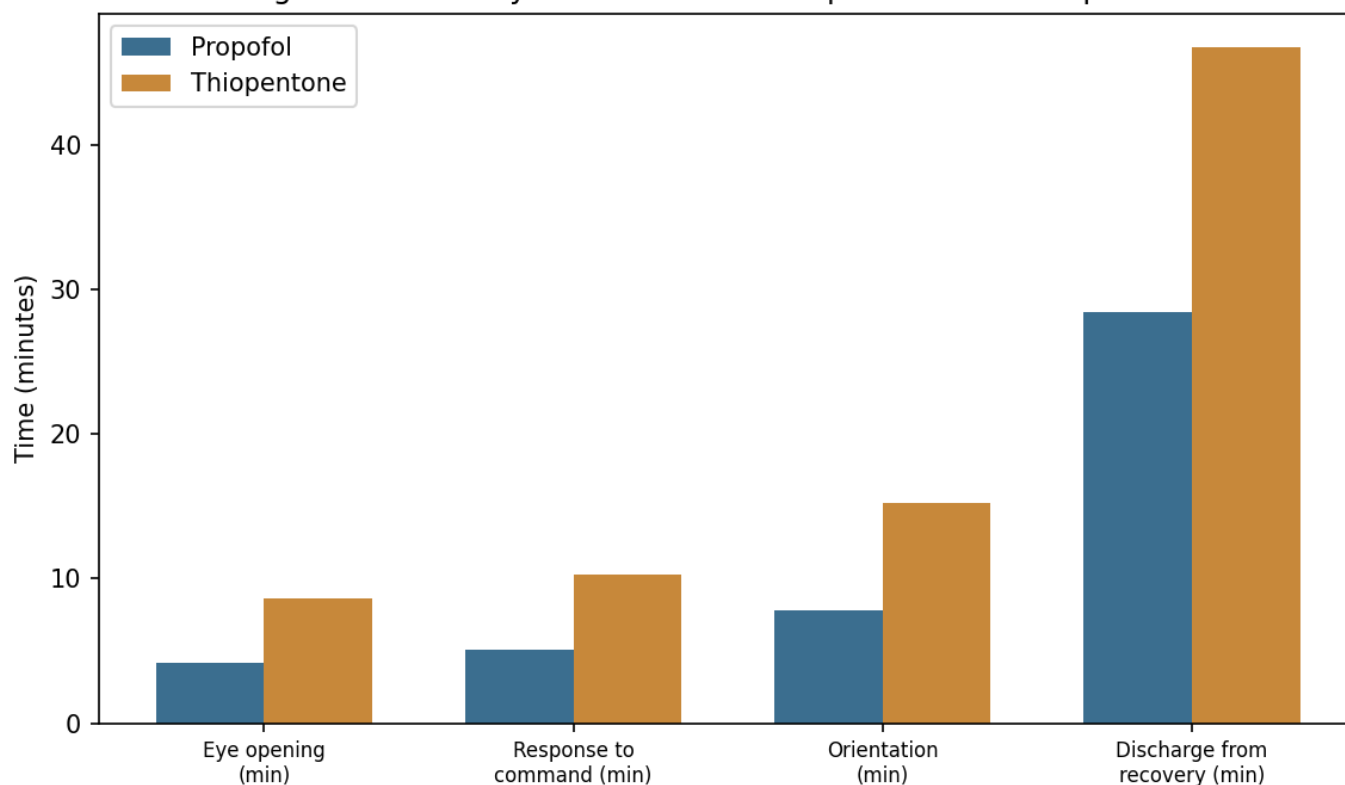
6 | CONCLUSION

Propofol provides smoother induction and significantly faster, clearer recovery than thiopentone sodium, at the cost of a greater incidence of injection

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Figure 3: Recovery Characteristics: Propofol versus Thiopentone


FIGURE 3:

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Figure 4: Side Effects by Study Group

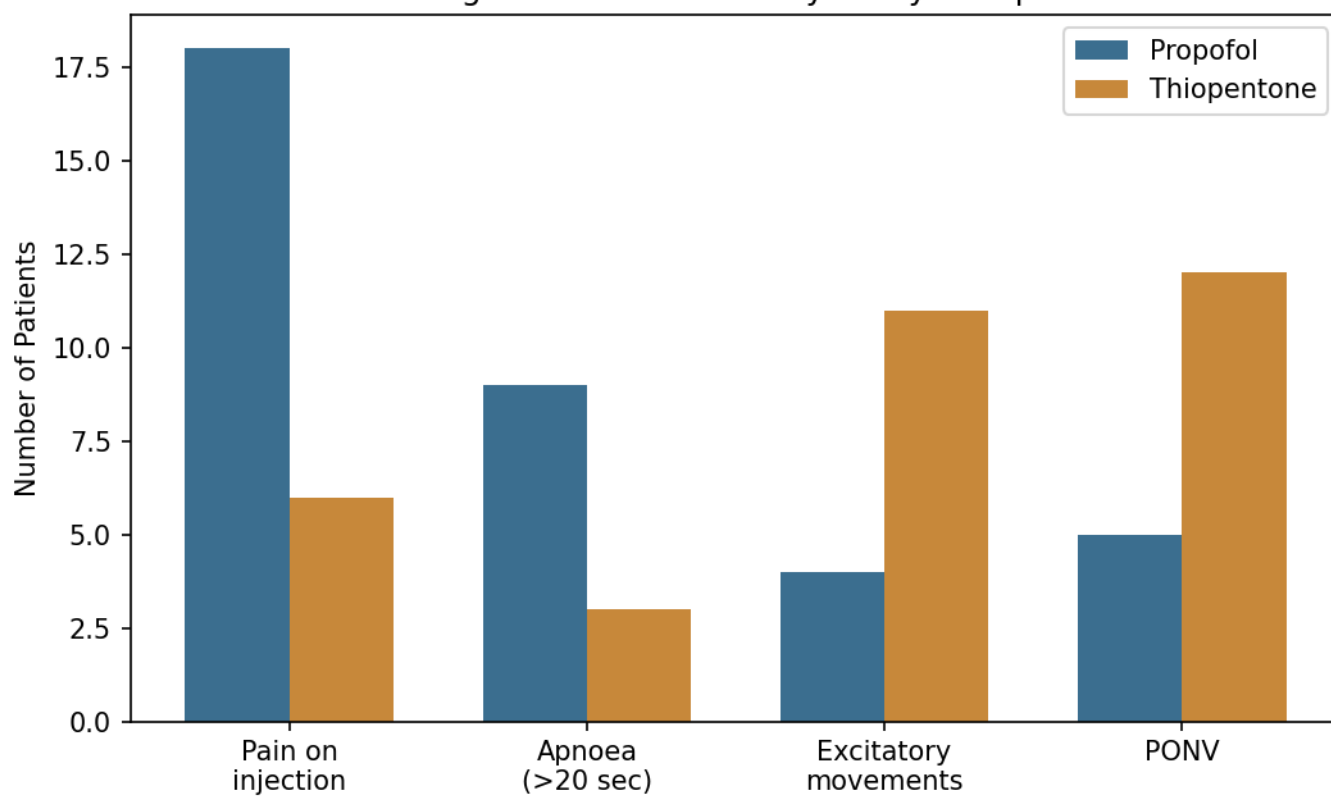


FIGURE 4:

Figure 5: Study Design Comparing Propofol and Thiopentone for Induction of General Anaesthesia

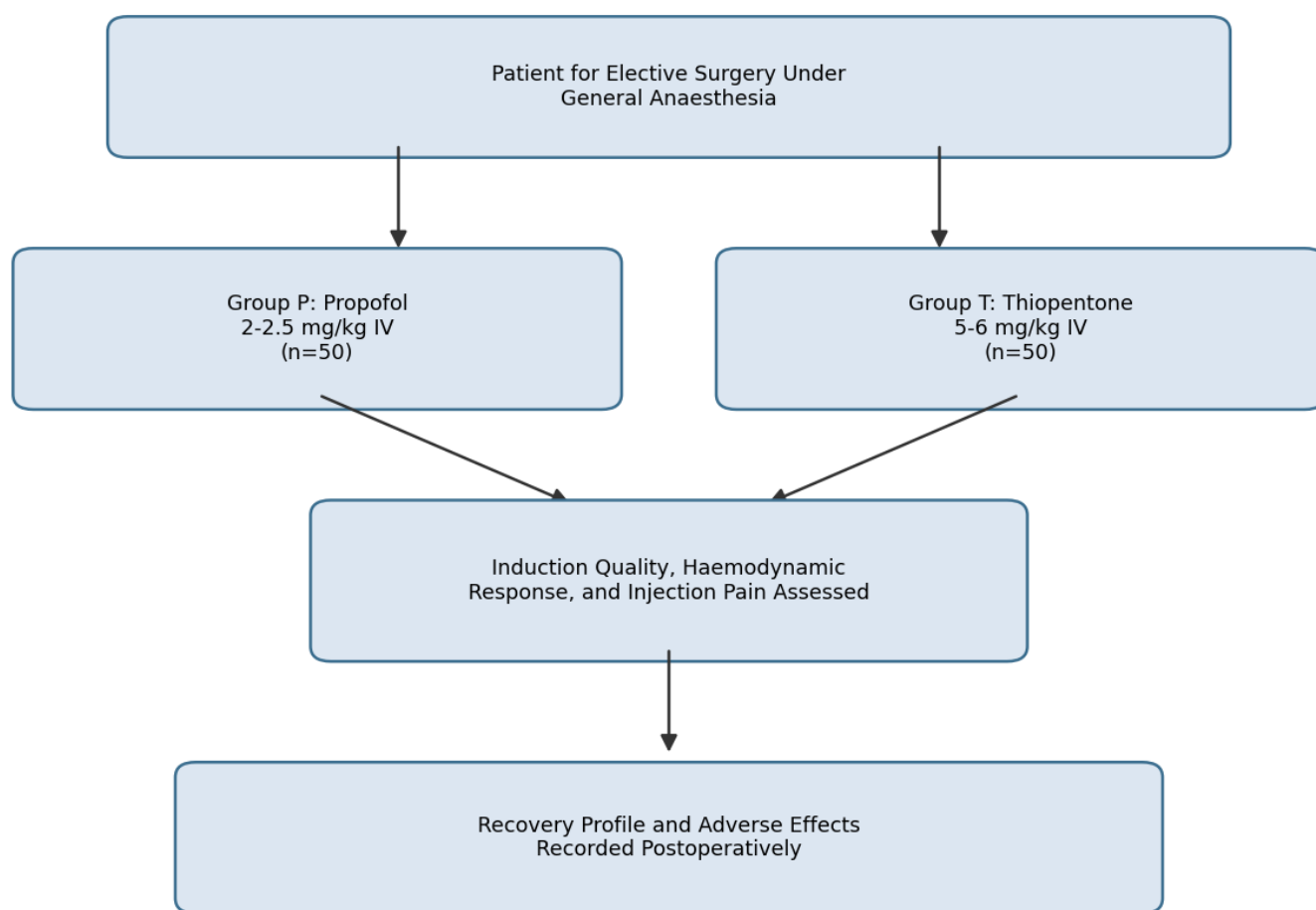


FIGURE 5: Study design comparing propofol and thiopentone for induction of general anaesthesia.