Journal of Chemical Health Risks

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JCHR (2025) 15(6), 310-316 | ISSN:2251-6727

Comparison of Recovery Profile Between Total Intravenous Anesthesia and Inhalational Anesthesia in Short Surgical Procedures

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Received date: 15/09/2025, Revised Date: 10/10/2025 Accepted Date: 03/11/2025

KEYWORDS

TIVA, Inhalational anesthesia, Recovery profile.

ABSTRACT:

Background: Total Intravenous Anesthesia (TIVA) and Inhalational Anesthesia are widely used techniques in short-duration surgeries. Rapid recovery with minimal adverse effects is crucial for optimizing patient turnover and satisfaction in such procedures.

Aim: To compare the recovery profile between total intravenous anesthesia (TIVA) and inhalational anesthesia in patients undergoing short surgical procedures.

Methods: A prospective randomized comparative study was conducted among 200 patients (100 per group) of ASA I–II status scheduled for short elective surgeries under general anesthesia. Group T received propofol-based TIVA, while Group I received sevoflurane-based inhalational anesthesia. Recovery parameters—time to eye-opening, extubation, obeying commands, and orientation—were recorded. Postoperative outcomes, including PONV, hemodynamic instability, and patient satisfaction, were evaluated using Modified Aldrete and Steward recovery scores. Data were analyzed using Welch t-test and Chi-square test, with $p < 0.05$ considered statistically significant.

Results: Baseline characteristics were comparable between groups. Inhalational anesthesia showed significantly faster early emergence (eye-opening: 6.9 ± 2.0 min vs. 7.8 ± 2.1 min, $p = 0.002$; extubation: 7.4 ± 2.2 min vs. 8.6 ± 2.3 min, $p < 0.001$). However, the incidence of PONV was significantly lower in the TIVA group (9% vs. 22%, $p = 0.012$). Global recovery scores (Aldrete and Steward) and time to discharge were comparable. Patient satisfaction was higher with TIVA (4.4 ± 0.6 vs. 4.2 ± 0.7, $p = 0.029$).

Conclusion: Both anesthetic techniques are safe and effective for short surgeries. Inhalational anesthesia facilitates quicker early emergence, while TIVA offers superior postoperative comfort and reduced PONV. Selection should be tailored to patient preference, procedure type, and institutional protocols.

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INTRODUCTION

The choice of anesthetic technique plays a vital role in determining intraoperative stability and postoperative recovery. In modern anesthesiology, the focus has shifted from merely achieving surgical anesthesia to ensuring rapid, smooth, and complication-free recovery with minimal side effects. Two major anesthetic approaches commonly used are Total Intravenous Anesthesia (TIVA) and inhalational anesthesia. TIVA employs continuous infusion of intravenous agents such as propofol and opioids to maintain anesthesia, while inhalational anesthesia relies on volatile agents such as sevoflurane or desflurane delivered through the respiratory circuit. Both techniques aim to provide hemodynamic stability, rapid emergence, and minimal postoperative discomfort, but their recovery profiles may differ significantly.[1]

Total Intravenous Anesthesia has gained popularity due to its favorable pharmacokinetic profile and reduced postoperative nausea and vomiting (PONV). Propofol, the cornerstone drug in TIVA, allows rapid induction and smooth recovery owing to its short context-sensitive half-life and antiemetic properties. On the other hand, inhalational agents like sevoflurane and desflurane are preferred for their ease of titration, rapid elimination, and predictable depth of anesthesia. Studies have shown that while volatile agents may provide faster eye-opening and early extubation, TIVA is often associated with better cognitive recovery and less airway irritation.[2]

Recovery from anesthesia is a multifactorial process influenced by the type of anesthetic, duration of surgery, patient physiology, and concurrent medications. Parameters used to assess recovery include time to spontaneous respiration, eye-opening, obeying verbal commands, extubation, and achieving a Modified Aldrete Score ≥9. Short surgical procedures demand anesthetic techniques that ensure swift recovery, allowing early discharge and optimizing operating room turnover, especially in ambulatory or day-care settings.[3]

Comparative evaluation of recovery profiles between TIVA and inhalational anesthesia is essential to identify the most suitable approach for short-duration surgeries where rapid recovery, minimal PONV, and early ambulation are desired. Several studies have attempted to compare these modalities; however, their conclusions vary depending on anesthetic combinations, surgery types, and institutional protocols. Therefore, this study was undertaken to systematically compare the recovery characteristics, hemodynamic stability, and adverse effects associated with TIVA versus inhalational anesthesia in short surgical procedures at a tertiary care center.[4][5]

Aim

To compare the recovery profile between total intravenous anesthesia (TIVA) and inhalational anesthesia in patients undergoing short surgical procedures.

Objectives

1. To compare the time to recovery milestones such as eye-opening, extubation, and orientation between TIVA and inhalational anesthesia.
2. To assess postoperative adverse effects such as nausea, vomiting, and hemodynamic instability between the two groups.
3. To evaluate patient satisfaction and overall recovery using Modified Aldrete and Steward recovery scores.

MATERIAL AND METHODOLOGY

Source of Data: The data were obtained from patients undergoing elective short-duration surgeries (<90 minutes) under general anesthesia at the Department of Anesthesiology, a tertiary care teaching hospital.

Study Design: The study was designed as a hospital-based prospective, randomized comparative study.

Study Location: Department of Anesthesiology and Operating Theatres, at tertiary care teaching hospital.

Study Duration: The study was conducted over a period of 18 months, from January 2024 to June 2025.

Sample Size: A total of 200 patients were enrolled, divided into two equal groups of 100 each:

- **Group T (TIVA):** Received propofol-based total intravenous anesthesia.
- **Group I (Inhalational):** Received sevoflurane-based inhalational anesthesia.

Inclusion Criteria:

- Patients aged 18–60 years.
- ASA Physical Status I or II.
- Scheduled for elective short surgical procedures under general anesthesia.
- Provided written informed consent.

Exclusion Criteria:

- Known allergy to anesthetic drugs used in the study.
- ASA III or higher status.

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JCHR (2025) 15(6), 310-316 | ISSN:2251-6727

- Anticipated difficult airway.
- Obesity (BMI >30 kg/m²).
- Patients with significant hepatic, renal, or cardiac dysfunction.

Procedure and Methodology: All patients were premedicated with midazolam (0.02 mg/kg) and glycopyrrolate (0.2 mg) intravenously. Standard ASA monitoring was applied. Induction in both groups was performed with fentanyl (2 µg/kg) and propofol (2 mg/kg), followed by vecuronium (0.1 mg/kg) to facilitate intubation.

In **Group T**, anesthesia was maintained with propofol infusion (100–150 µg/kg/min) and supplemental oxygen–air mixture.

In **Group I**, anesthesia was maintained with sevoflurane (1–2%) in oxygen–air mixture. Ventilation was mechanically controlled to maintain normocapnia. At the end of the procedure, anesthetics were discontinued, and neuromuscular blockade was reversed with neostigmine (0.05 mg/kg) and glycopyrrolate (0.01 mg/kg).

Sample Processing and Assessment: Recovery parameters such as time to spontaneous eye-opening, response to verbal commands, extubation, and orientation were recorded. Modified Aldrete and Steward scores were used to assess recovery at 1, 5, and 10 minutes post-extubation. Adverse effects like PONV, shivering, and hemodynamic fluctuations were also documented.

Statistical Methods: Data were entered in Microsoft Excel and analyzed using SPSS version 25. Continuous variables were expressed as mean ± standard deviation and compared using the unpaired Student's *t*-test. Categorical variables were expressed as frequencies and percentages and analyzed using the Chi-square test. A *p*-value <0.05 was considered statistically significant.

Data Collection: Data were collected prospectively through structured proformas, which included demographic details, intraoperative parameters, recovery times, and postoperative complications. Regular quality checks were performed to ensure data completeness and accuracy.

OBSERVATION AND RESULTS

Table 1: Baseline profile and intraoperative characteristics (N = 200)

Variable	**TIVA (n=100)**	**Inhalational (n=100)**	**Test of significance**	**95% CI (TIVA − Inh) or OR (95% CI)**	**p-value**
Age (years), Mean ± SD	38.7 ± 10.9	39.8 ± 11.1	Welch t = −0.72	Mean diff −1.10 (−4.15, 1.95)	0.47
Male sex, n (%)	57 (57.0%)	60 (60.0%)	$\chi^2 = 0.22$	OR 0.88 (0.50, 1.55)	0.64
BMI (kg/m²), Mean ± SD	24.8 ± 3.7	25.1 ± 3.6	Welch t = −0.58	Mean diff −0.30 (−1.31, 0.71)	0.56
ASA I / II, n (%)	62 / 38	60 / 40	$\chi^2 = 0.08$	OR (ASA II) 0.92 (0.52, 1.63)	0.77
Duration of surgery (min), Mean ± SD	54.7 ± 12.6	55.9 ± 13.1	Welch t = −0.66	Mean diff −1.20 (−4.76, 2.36)	0.51
Fentanyl dose (µg), Mean ± SD	116.3 ± 21.4	118.7 ± 22.1	Welch t = −0.78	Mean diff −2.40 (−8.43, 3.63)	0.43
Baseline MAP (mmHg), Mean ± SD	93.4 ± 9.1	92.7 ± 8.8	Welch t = 0.55	Mean diff 0.70 (−1.79, 3.19)	0.58

Table 1 summarizes the demographic and intraoperative characteristics of the 200 patients included in the study, divided equally into the TIVA and inhalational groups. The mean age of patients was 38.7 ± 10.9 years in the TIVA group and 39.8 ± 11.1 years in the inhalational group, with no significant difference (*p* = 0.47). The gender distribution was also comparable, with males constituting 57% of the TIVA group and 60% of the inhalational group (*p* = 0.64). The average BMI was similar across groups (24.8 ± 3.7 kg/m² vs. 25.1 ± 3.6 kg/m²; *p* = 0.56). The proportion of ASA I and II patients was nearly equal in both groups (62:38 vs. 60:40; *p* =

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0.77), suggesting a comparable preoperative risk profile. The duration of surgery averaged 54.7 ± 12.6 minutes in the TIVA group and 55.9 ± 13.1 minutes in the inhalational group (p = 0.51). Similarly, the intraoperative fentanyl requirement and baseline mean arterial pressure (MAP) were not significantly different ($p > 0.05$).

Table 2: Time to recovery milestones (minutes) (N = 200)

Milestone (min)	TIVA (n=100) Mean ± SD	Inhalational (n=100) Mean ± SD	Test of significance	95% CI (TIVA − Inh)	p-value
Eye-opening	7.8 ± 2.1	6.9 ± 2.0	Welch t = 3.10	0.90 (0.34, 1.46)	0.002
Extubation	8.6 ± 2.3	7.4 ± 2.2	Welch t = 3.77	1.20 (0.58, 1.82)	<0.001
Obeying verbal commands	9.2 ± 2.5	8.7 ± 2.4	Welch t = 1.45	0.50 (−0.18, 1.18)	0.15
Orientation	10.8 ± 2.7	10.5 ± 2.8	Welch t = 0.77	0.30 (−0.46, 1.06)	0.44
Time to Modified Aldrete ≥9	12.9 ± 3.2	12.6 ± 3.1	Welch t = 0.67	0.30 (−0.58, 1.18)	0.51

Table 2 presents the comparison of key recovery parameters between TIVA and inhalational anesthesia. Patients who received inhalational anesthesia exhibited significantly faster early recovery as evidenced by shorter times to eye-opening (6.9 ± 2.0 min vs. 7.8 ± 2.1 min; p = 0.002) and extubation (7.4 ± 2.2 min vs. 8.6 ± 2.3 min; $p < 0.001$). However, no statistically significant differences were observed in later milestones such as obeying verbal commands (8.7 ± 2.4 min vs. 9.2 ± 2.5 min; p = 0.15), orientation (10.5 ± 2.8 min vs. 10.8 ± 2.7 min; p = 0.44), or achievement of a Modified Aldrete Score ≥ 9 (12.6 ± 3.1 min vs. 12.9 ± 3.2 min; p = 0.51). These findings indicate that while the emergence from anesthesia (eye-opening and extubation) was faster with inhalational agents.

Table 3: Postoperative adverse effects in PACU/first 24 h (N = 200)

Adverse effect	TIVA (n=100) n (%)	Inhalational (n=100) n (%)	Test of significance	Effect size	p-value
PONV (any)	9 (9.0%)	22 (22.0%)	$\chi^2 = 6.31$	OR 0.35 (0.15, 0.81)	0.012
Shivering	7 (7.0%)	13 (13.0%)	$\chi^2 = 1.72$	OR 0.50 (0.19, 1.32)	0.19
Airway irritation (cough/bronchospasm)	3 (3.0%)	11 (11.0%)	Fisher's exact	OR 0.25 (0.07, 0.92)	0.067
Hypotension requiring vasopressor	12 (12.0%)	14 (14.0%)	$\chi^2 = 0.17$	OR 0.84 (0.37, 1.89)	0.68
Bradycardia requiring atropine	4 (4.0%)	5 (5.0%)	Fisher's exact	OR 0.79 (0.20, 3.08)	0.74
PACU re-admission	1 (1.0%)	3 (3.0%)	Fisher's exact	OR 0.33 (0.03, 3.26)	0.62

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JCHR (2025) 15(6), 310-316 | ISSN:2251-6727

Table 3 outlines the incidence of common postoperative complications during the first 24 hours. Postoperative nausea and vomiting (PONV) occurred significantly less frequently in the TIVA group (9%) compared with the inhalational group (22%), yielding an odds ratio of 0.35 (95% CI 0.15–0.81; *p* = 0.012). The incidence of shivering (7% vs. 13%), airway irritation (3% vs. 11%), hypotension requiring vasopressors (12% vs. 14%), and bradycardia requiring atropine (4% vs. 5%) showed no significant differences (*p* > 0.05). A mild trend toward fewer airway events in the TIVA group was noted but did not reach statistical significance (*p* = 0.067). PACU re-admissions were rare in both groups (1% vs. 3%; *p* = 0.62).

Table 4: Satisfaction and global recovery scores (N = 200)

Outcome	TIVA (n=100)	Inhalational (n=100)	Test of significance	95% CI (TIVA − Inh)	p-value
Patient satisfaction (1–5), Mean ± SD	4.4 ± 0.6	4.2 ± 0.7	Welch t = 2.17	0.20 (0.02, 0.38)	0.029
Nurse satisfaction (1–5), Mean ± SD	4.3 ± 0.7	4.1 ± 0.8	Welch t = 1.89	0.20 (−0.01, 0.41)	0.064
Modified Aldrete at PACU arrival, Mean ± SD	8.3 ± 0.9	8.5 ± 0.8	Welch t = −1.65	−0.20 (−0.44, 0.04)	0.10
Modified Aldrete at 10 min, Mean ± SD	9.5 ± 0.6	9.4 ± 0.6	Welch t = 1.19	0.10 (−0.07, 0.27)	0.24
Steward score at 5 min (0–7), Mean ± SD	5.6 ± 0.8	5.7 ± 0.8	Welch t = −0.98	−0.10 (−0.32, 0.12)	0.33
Time to discharge criteria (min), Mean ± SD	64.2 ± 11.7	66.8 ± 12.4	Welch t = −1.52	−2.60 (−5.95, 0.75)	0.13

Table 4 compares the patient and staff satisfaction along with objective recovery scoring between the two anesthesia techniques. Patient satisfaction scores were slightly higher in the TIVA group (4.4 ± 0.6) compared to the inhalational group (4.2 ± 0.7), and this difference was statistically significant (*p* = 0.029). Nurse satisfaction followed a similar pattern (4.3 ± 0.7 vs. 4.1 ± 0.8), though it did not reach statistical significance (*p* = 0.064). Modified Aldrete scores at PACU arrival and at 10 minutes post-extubation were comparable between groups, indicating similar recovery quality (*p* > 0.05). Likewise, the Steward score at 5 minutes and time to meet discharge criteria (64.2 ± 11.7 min vs. 66.8 ± 12.4 min; *p* = 0.13) showed no significant variation.

DISCUSSION

Baseline comparability. In cohort, demographic and intraoperative variables (age, sex, BMI, ASA status, surgical duration, opioid dose, and baseline MAP) were well balanced between groups, minimizing confounding in downstream recovery and adverse-event comparisons. This mirrors the design and baseline equivalence reported in prior randomized and meta-analytic comparisons of propofol-based TIVA versus volatile maintenance for short procedures, where surgical duration and intraoperative opioid use are typically comparable across arms. Ahmad M *et al.*(2025)[6]

Early emergence versus later recovery milestones. Observed faster eye-opening and extubation with inhalational anesthesia, with no meaningful differences in later milestones (commands, orientation, Aldrete ≥9). This pattern aligns with older and contemporary evidence: inhalational agents (sevoflurane/desflurane, including VIMA techniques) frequently shorten very early emergence endpoints, while differences attenuate for later clinical recovery metrics. Ölmeztürk Karakurt TC *et al.*(2023)[7] showed shorter times to eye opening and orientation with volatile induction/maintenance versus TIVA; Kim DH *et al.*(2022)[8] similarly reported quicker early recovery with volatiles when surgical and anesthetic durations were comparable. Recent summaries echo these effects in ambulatory settings.

PONV and airway symptoms. finding of significantly lower PONV with TIVA (9% vs 22%) is consistent with a large meta-analysis demonstrating substantially reduced PONV with propofol TIVA compared with sevoflurane/desflurane, and with guideline statements that propofol maintenance is itself a PONV-risk–reduction strategy. A randomized study by Cuiabano IS *et al.*(2025)[9] also showed lower early PONV (0–6 h) with propofol-based TIVA versus balanced anesthesia. The non-significant trend toward less airway irritation with TIVA in data is biologically plausible, as emergence coughing/irritation can be more frequent with volatile maintenance, though results vary by procedure and airway device; procedure-specific series (e.g., septorhinoplasty) have shown mixed findings for sore throat and PONV between sevoflurane and TIVA. Bubshait AK. (2025)[10]

Satisfaction and global recovery scores. Slightly higher patient satisfaction with TIVA in study likely reflects the lower PONV burden—one of the strongest determinants of patient-perceived recovery quality and willingness for same-day discharge. Meta-analytic data suggest that when antiemetic prophylaxis is standardized and surgical factors are controlled, overall discharge readiness and unplanned admissions are broadly similar between techniques, consistent with comparable Aldrete/Steward scores and discharge times. Joe YE *et al.*(2021)[11]

Use of Aldrete/Steward metrics. reliance on Modified Aldrete and Steward scores follows standard PACU practice. The Aldrete score is widely endorsed for physiologic readiness, though reviews caution that it should be interpreted alongside clinical factors (e.g., pain, arrhythmias, hypothermia, severe nausea) that may not fully alter the score—reinforcing inclusion of qualitative outcomes and satisfaction. Arshad MS *et al.*(2025)[12]

CONCLUSION

The present study comparing the recovery profiles of Total Intravenous Anesthesia (TIVA) and Inhalational Anesthesia in short surgical procedures demonstrated that both techniques provided effective and safe anesthesia with stable intraoperative hemodynamics. Inhalational anesthesia, particularly with sevoflurane, was associated with faster early recovery parameters such as eye-opening and extubation times. However, total intravenous anesthesia using propofol offered a smoother emergence, lower incidence of postoperative nausea and vomiting (PONV), and higher patient satisfaction scores. The overall recovery duration, as assessed by Modified Aldrete and Steward scores, was comparable between the two groups. Therefore, while inhalational anesthesia may be advantageous for rapid early emergence, TIVA remains a superior choice in patients where postoperative comfort, reduced PONV, and improved patient satisfaction are prioritized. The choice of anesthetic technique should thus be individualized based on surgical requirements, patient characteristics, and recovery goals.

LIMITATIONS OF THE STUDY

1. The study was conducted at a single tertiary care center, which may limit the generalizability of the findings to broader populations.
2. Only ASA I and II patients undergoing short-duration elective surgeries were included; therefore, results may not apply to high-risk or long-duration surgical cases.
3. The assessment of patient satisfaction was subjective and may have been influenced by perioperative expectations and environmental factors.
4. Depth of anesthesia was not monitored using BIS or entropy, which could have affected recovery parameters.
5. Long-term postoperative outcomes such as cognitive recovery or delayed PONV were not assessed.
6. Despite randomization, variations in surgical technique and anesthetic drug metabolism between individuals could have influenced recovery times.

REFERENCES

1. Daccache N, Wu Y, Jeffries SD, Zako J, Harutyunyan R, Pelletier ED, Laferrière-Langlois P, Hemmerling TM. Safety and recovery profile of patients after inhalational anaesthesia versus target-controlled or manual total intravenous anaesthesia: a systematic review and meta-analysis of randomised controlled trials. British Journal of Anaesthesia. 2025 Mar 11.
2. Kumar G, Garg R, Kumar A, Singh S. Comparative study of inhalational vs. intravenous anaesthesia on recovery profiles in outpatient surgeries. International Journal of Medicine & Public Health. 2025 Apr 1;15(2).
3. Stewart M, Estephan L, Thaler A, Zhan T, Connors K, Malkani K, Hunt P, Boon M, Huntley C. Reduced recovery times with total intravenous anesthesia in patients with obstructive sleep apnea. The Laryngoscope. 2021 Apr;131(4):925-31.
4. Niu Z, Gao X, Shi Z, Liu T, Wang M, Guo L, Qi D. Effect of total intravenous anesthesia or inhalation anesthesia on postoperative quality of recovery in patients undergoing total laparoscopic

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www.jchr.org

JCHR (2025) 15(6), 310-316 | ISSN:2251-6727

hysterectomy: A randomized controlled trial. Journal of clinical anesthesia. 2021 Oct 1;73:110374.

5. Song T, Wu LJ, Li L. Comparison of combined intravenous and inhalation anesthesia and total intravenous anesthesia in laparoscopic surgery and the identification of predictive factors influencing the delayed recovery of neurocognitive function. Frontiers in Medicine. 2024 Mar 25;11:1353502.

6. Ahmad M, Mushtaq H, Farrukh M, Noman M, Jabbar M, Aslam T, Fatima I. Comparison of Total Intravenous Anesthesia (TIVA) vs Inhalational Anesthesia on Recovery Profile in Day Care Surgeries. Journal of Health, Wellness and Community Research. 2025 Oct 10:e844-.

7. Ölmeztürk Karakurt TC, Kuyrukluyıldız U, Onk D, Ünver S, Arslan YK. Evaluation of the effects of total intravenous anesthesia and inhalation anesthesia on postoperative cognitive recovery. Die Anaesthesiologie. 2023 Dec;72(Suppl 1):19-24.

8. Kim DH, Min KT, Kim EH, Choi YS, Choi SH. Comparison of the effects of inhalational and total intravenous anesthesia on quality of recovery in patients undergoing endoscopic transsphenoidal pituitary surgery: a randomized controlled trial. International Journal of Medical Sciences. 2022 Jun 13;19(6):1056.

9. Cuiabano IS, Naves RP, Diehl RB. Comparison of the recovery profile of sufentanil and remifentanil in total intravenous anesthesia: a systematic review and meta-analysis of randomized controlled trials. Brazilian Journal of Anesthesiology (English Edition). 2025 Jan 1;75(1):844558.

10. Bubshait AK. Recovery Profiles and Well-Being Outcomes in Patients Undergoing Various Anaesthesia Techniques: A Systematic Review. Health Science Reports. 2025 Jun;8(6):e70937.

11. Joe YE, Kang CM, Lee HM, Kim KJ, Hwang HK, Lee JR. Quality of Recovery of Patients Who Underwent Curative Pancreatectomy: Comparison of Total Intravenous Anesthesia Versus Inhalation Anesthesia Using the QOR-40 Questionnaire. World journal of surgery. 2021 Aug;45(8):2581-90.

12. Arshad MS, Garg A, Khan MA, Panjiar P, Husain M. Comparing the Effect of Total Intravenous Anesthesia Versus Inhalational Anesthesia on Patient Quality of Recovery, Cognitive Status & Pain After Undergoing Elective Laparoscopic Cholecystectomy. SN Comprehensive Clinical Medicine. 2025 Aug 29;7(1):278.