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RECOVERY OUTCOMES IN PATIENTS UNDERGOING NON-ABDOMINAL SURGERIES: A PROSPECTIVE OBSERVATIONAL STUDY COMPARING ITIVA-GUIDED PROPOFOL INFUSION (SCHNIDER MODEL) WITH MANUAL INFUSION

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Abstract

Background:

Total intravenous anesthesia (TIVA) with propofol is widely used for general anesthesia. The iTIVA application, utilizing the Schnider pharmacokinetic model, allows individualized dosing based on patient-specific parameters. This study compared recovery outcomes of propofol delivered via iTIVA versus conventional manual infusion in patients undergoing elective non-abdominal surgeries.

Methods:

In this prospective observational study, 52 ASA I–II patients aged 18–65 years undergoing elective non-abdominal surgeries under general anesthesia were enrolled. Patients were allocated into two groups: **Group A** (n = 26) received propofol via iTIVA (Schnider model), and **Group B** (n = 26) received manual infusion. Primary outcome was time to eye opening after discontinuation of propofol. Secondary outcomes included time to obey verbal commands, time to extubation, total propofol consumption, and hemodynamic stability. Data were analyzed using appropriate statistical tests, with $p < 0.05$ considered significant.

Results:

Time to eye opening was significantly shorter in the iTIVA group compared to the manual infusion group (6.8 ± 1.2 vs. 9.4 ± 1.6 min, $p < 0.001$). Similar trends were observed for time to obey verbal commands (7.5 ± 1.4 vs. 10.2 ± 1.9 min, $p < 0.001$) and time to extubation (8.0 ± 1.5 vs. 11.0 ± 2.0 min, $p < 0.001$). Total propofol consumption was significantly lower in the iTIVA group (540 ± 75 mg) than in the manual infusion group (620 ± 90 mg, $p = 0.002$). Mean arterial pressure and heart rate were comparable between groups, but the number of hemodynamic variability episodes was lower with iTIVA (1.2 ± 0.6 vs. 2.1 ± 0.8, $p = 0.01$).

Conclusion:

Propofol administration via iTIVA using the Schnider pharmacokinetic model resulted in faster recovery, lower drug consumption, and fewer hemodynamic fluctuations compared to manual infusion in non-abdominal surgeries. Automated PK-guided delivery may improve anesthetic precision and postoperative recovery profiles.

Keywords:iTIVA, Schnider model, propofol, TIVA, recovery profile, manual infusion, general anesthesia

INTRODUCTION

Total intravenous anesthesia (TIVA) is a well-established modality for maintaining anesthesia, often favored for its reduced risk of postoperative nausea and vomiting and better hemodynamic control. Propofol is the agent of choice due to its favorable pharmacokinetic properties. While manual infusion of propofol remains standard in many settings, advancements in pharmacokinetic modeling and automation have introduced tools like the iTIVA application, which utilizes patient-specific parameters and the Schnider model to optimize infusion rates.
This study aims to evaluate whether the precision offered by iTIVA using the Schnider model translates to improved recovery outcomes in patients undergoing non-abdominal surgeries, as compared to conventional manual infusion.

METHODS

Study Design and Participants
This was a prospective observational study conducted at Saveetha Medical college Hospital over a period of January 2024 – January 2025. After ethics committee approval and informed consent, adult patients (ASA I–II) scheduled for elective non-abdominal procedures under general anesthesia were enrolled.

Inclusion Criteria

- Age 18–65 years
- ASA physical status I–II
- Undergoing elective non-abdominal surgery
- Use of propofol for maintenance of anesthesia

Exclusion Criteria

- Known allergy to propofol
- Significant hepatic or renal dysfunction
- BMI > 35 kg/m²
- Emergency surgeries

Group Allocation
Patients were assigned to:

- **Group A:** Propofol via iTIVA using the Schnider model
- **Group B:** Manual infusion based on anesthetist's discretion

Anesthesia Protocol
Standard monitoring was used in all cases. Induction was performed using fentanyl and propofol. Maintenance of anesthesia was achieved with propofol (iTIVA/manual), with adjunct opioids and muscle relaxants as needed.

Outcomes

- **Primary Outcome:** Time to eye opening after cessation of propofol
- **Secondary Outcomes:**
  - Time to obey verbal commands
  - Time to extubation
  - Hemodynamic variables (HR, BP)
  - Total propofol consumption

Statistical Analysis
Data were analyzed using [SPSS version 31]. Continuous variables were compared using Student's *t*-test or Mann-Whitney *U* test. Categorical variables were compared using Chi-square or Fisher's exact test. $p < 0.05$ was considered significant.

Results
A total of 52 patients undergoing elective non-abdominal procedures were included in the study. They were equally distributed into two groups:

- **Group A (iTIVA, n = 26):** Received propofol infusion guided by the iTIVA application using the Schnider pharmacokinetic model.
- **Group B (Manual Infusion, n = 26):** Received propofol via manually adjusted infusion rates based on clinical judgment.

Demographic and Baseline Characteristics
The two groups were comparable with respect to age, gender distribution, ASA physical status, body mass index (BMI), and duration of surgery. No statistically significant differences were noted in baseline parameters.

Primary Outcome

The **time to eye opening** after discontinuation of propofol was significantly shorter in the iTIVA group (6.8 ± 1.2 minutes) compared to the manual infusion group (9.4 ± 1.6 minutes), (p< 0.001). This suggests a more rapid emergence from anesthesia when using the iTIVA-guided approach.

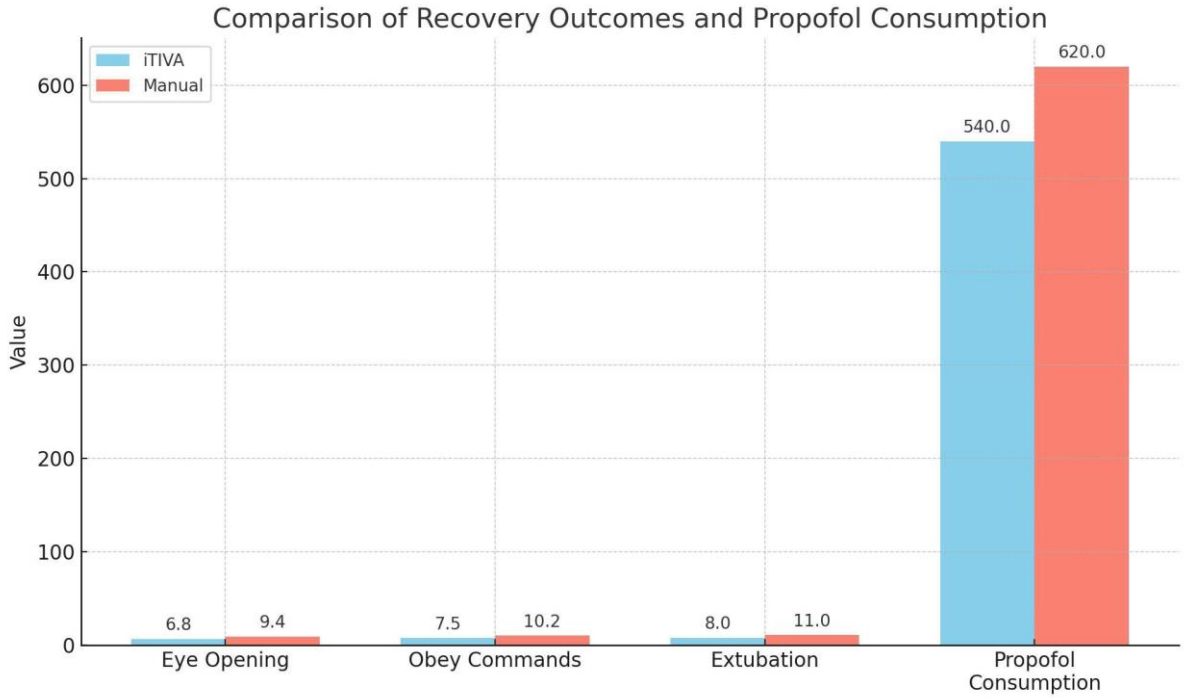
Secondary Outcomes

- **Time to obey verbal commands** was significantly lower in Group A (7.5 ± 1.4 min) versus Group B (10.2 ± 1.9 min), (p< 0.001).
- **Time to extubation** was also significantly shorter in the iTIVA group (8.0 ± 1.5 min) compared to the manual infusion group (11.0 ± 2.0 min), (p< 0.001).
- **Total propofol consumption** during the intraoperative period was significantly less in the iTIVA group (540 ± 75 mg) compared to the manual infusion group (620 ± 90 mg), (p = 0.002).
- **Hemodynamic parameters** (mean arterial pressure and heart rate) remained stable in both groups with no statistically significant differences. However, the number of hemodynamic variability episodes (defined as fluctuations requiring intervention) was significantly fewer in the iTIVA group (1.2 ± 0.6) than in the manual group (2.1 ± 0.8), (p = 0.01).

Table 1 – Comparison of recovery outcomes between I TIVA and manual infusion groups

Parameter	iTIVA Group (n = 26)	Manual Infusion Group (n = 26)	p-value
Time to eye opening (min)	6.8 ± 1.2	9.4 ± 1.6	< 0.001
Time to obey verbal commands (min)	7.5 ± 1.4	10.2 ± 1.9	< 0.001
Time to extubation (min)	8.0 ± 1.5	11.0 ± 2.0	< 0.001
Total propofol consumption (mg)	540 ± 75	620 ± 90	0.002
Mean intraoperative MAP (mmHg)	82 ± 6	85 ± 7	0.07
Mean intraoperative HR (beats/min)	72 ± 5	74 ± 6	0.15
Hemodynamic variability episodes (n)	1.2 ± 0.6	2.1 ± 0.8	0.01

Figure 1 – comparison of recovery outcomes and propofol consumption



DISCUSSION

The findings suggest that propofol delivery via the iTIVA app using the Schnider model allows for a more consistent and rapid emergence from anesthesia, likely due to optimized drug titration and reduced accumulation. These outcomes align with previous research highlighting the advantages of pharmacokinetic-guided infusion systems.

Although the hemodynamic stability did not differ significantly, the reduced total drug requirement in the iTIVA group is clinically relevant, potentially reducing the risk of delayed emergence and propofol-related side effects.

Limitations:

- Non-randomized design
- Single-center study
- Small sample size

Future randomized trials with larger populations are needed to confirm these findings and evaluate long-term outcomes such as PACU discharge time and cognitive recovery.

CONCLUSION

The use of iTIVA with the Schnider pharmacokinetic model for administering propofol in non-abdominal surgeries offers improved recovery outcomes compared to manual infusion. This automated method may enhance the precision and quality of TIVA practices.

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