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Original Research Article

Comparison of Propofol and Midazolam Infusion in the Sedation of Critically ill ICU Patients

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Abstract:

Background: Sedation in (ICU) is a cornerstone in managing critically ill patients, particularly those requiring mechanical ventilation. Propofol and midazolam are two commonly used sedatives, each with distinct pharmacological properties and clinical profiles. While propofol offers rapid onset, shorter half-life, and faster recovery, midazolam provides more stable hemodynamics but is correlated with prolonged sedation. Comparative evidence remains essential to guide sedative choice and optimize ICU outcomes.

Aim: To compare the efficacy, safety, and clinical outcomes of propofol and midazolam infusions in the sedation of critically ill ICU patients.

Methods: A retrospective, comparative observational study was conducted at Bhagwan Mahabir Manipal Hospitals and Sadar Hospital Khunti, Ranchi, over a one-year period. Eighty adult ICU patients requiring continuous sedation for more than 24 hours were included, with 40 patients in the propofol group and 40 in the midazolam group. Data on demographics, sedation efficacy, recovery profiles, adverse events, and ICU outcomes were analyzed using SPSS version 23.0. Statistical significance was set at $p<0.05$.

Results: Both groups were comparable in baseline characteristics. Propofol achieved target sedation faster (12.4 vs. 23.6 min, $p<0.001$) and allowed quicker awakening post-infusion (1.8 vs. 9.6 hrs, $p<0.001$). Midazolam had higher oversedation episodes (17.5% vs. 5%, $p=0.04$). Propofol was correlated with more hypotension (22.5% vs. 7.5%, $p=0.04$), while other adverse events were similar. Propofol patients had significantly shorter mechanical ventilation duration (62.3 vs. 89.6 hrs, $p<0.001$), faster extubation (4.1 vs. 13.5 hrs, $p<0.001$), and reduced ICU stay (7.6 vs. 10.2 days, $p=0.002$). Mortality rates were not significantly different (15% vs. 17.5%, $p=0.76$).

Conclusion: Propofol provides faster sedation, quicker recovery, and improved short-term ICU outcomes compared to midazolam, though it carries a higher risk of hypotension. Midazolam may be preferable in patients with cardiovascular instability. Sedative choice should be individualized based on patient condition and therapeutic goals.

Recommendations: Future large-scale, multicenter randomized trials are warranted to validate these findings and refine sedation protocols. Hemodynamic monitoring should be prioritized when using propofol, while midazolam may be considered in patients requiring hemodynamic stability or prolonged sedation.

Keywords: Propofol, Midazolam, ICU sedation, Mechanical ventilation, Critical care.

Introduction

Sedation in the (ICU) is essential for managing critically ill patients, facilitating mechanical ventilation, and reducing anxiety. Among the various sedative agents, propofol and midazolam are commonly utilized. Propofol, a short-acting intravenous anesthetic, is favored for its rapid onset and offset, allowing for precise titration and quick recovery, which is beneficial in dynamic ICU settings. Conversely, midazolam, a benzodiazepine, has a longer duration of action and is often correlated with cumulative sedation effects, especially in prolonged infusions.

Recent studies have highlighted the differences in clinical outcomes between these two agents. For instance, a multicenter observational cohort study found that propofol sedation was correlated with lower hospital mortality rates, shorter hospital stays, and reduced duration of invasive mechanical ventilation compared to midazolam in patients with acute respiratory distress syndrome [1]. Similarly, a

post-hoc analysis of the DESIRE trial indicated that midazolam administration was linked to deeper sedation and a higher risk of coma and delirium during the acute phase compared to propofol, even under light sedation protocols [2, 3].

The pharmacological properties of these sedatives contribute to their distinct clinical profiles. Propofol's rapid onset and short half-life facilitate quick adjustments in sedation levels, which is advantageous in the ICU environment where patient conditions can change rapidly. In contrast, midazolam's longer half-life may lead to prolonged sedation, potentially delaying recovery and increasing the risk of complications [4].

Despite these differences, both agents are widely used, and the choice between them often depends on patient-specific factors and clinical judgment [5]. This study aims to compare the efficacy and safety of propofol and midazolam infusions in the sedation of critically ill ICU patients, focusing on sedation depth, duration, and correlated adverse events, to provide evidence-based guidance for clinicians in selecting the appropriate sedative agent.

Methodology

Study Design: This was a retrospective, comparative observational study.

Study Setting: The study was conducted at Bhagwan Mahabir Manipal Hospitals and Sadar Hospital Khunti, Ranchi. Both centres' intensive care units (medical and mixed medical–surgical) contributed patient records for the review. Institutional approvals were obtained prior to data collection, and the hospital medical records departments at both centres facilitated access to archived charts, electronic records, infusion records, and nursing sedation charts.

Study Duration: Records from a consecutive one-year period were screened. The defined study period covered a continuous 12-month interval (start and end dates documented in the study file) during which eligible ICU patients received either propofol or midazolam infusion for sedation.

Participants (Sample Size = 80): The study sample comprised 80 adult ICU patients (n = 80) identified from hospital records who fulfilled the eligibility criteria. Patients were assigned to either the propofol group or the midazolam group according to the sedative infusion documented in their medical charts. An enrolment log with anonymized study IDs was maintained to track the 80 included patients and to document reasons for exclusion of patients who were screened but did not meet inclusion criteria.

Inclusion Criteria

- Adult patients aged 18 years and above.
- Patients admitted to the ICU requiring continuous intravenous sedation with either propofol or midazolam infusion for more than 24 hours.
- Availability of complete clinical records including infusion charts, sedation scales, and outcome details.

Exclusion Criteria

- Patients younger than 18 years.
- Patients who received both propofol and midazolam sequentially or in combination.
- Patients with incomplete or missing medical records.
- Patients sedated for less than 24 hours.

Bias Control: To minimize selection bias, consecutive eligible cases from the study period were included without selective sampling. Observer bias was reduced by relying on standardized sedation charts and electronic infusion records. Data entry bias was minimized by double-checking entries against original records. To avoid reporting bias, no patient identifiers were recorded during data analysis.

Data Collection: Data were extracted retrospectively using a structured data collection sheet. Demographic variables (age, sex), clinical parameters (primary diagnosis, ICU admission reason), details of sedative infusion (drug, duration, dose), sedation depth (as per charted scales), adverse effects (hypotension, bradycardia, respiratory depression), and outcome measures (extubation time, ICU stay length, and mortality) were collected.

Procedure: Patients were grouped based on the sedative infusion received. Group 1 consisted of patients sedated with propofol infusion, and Group 2 consisted of patients sedated with midazolam infusion. Sedation adequacy, hemodynamic responses, infusion duration, complications, and clinical outcomes were reviewed and compared between the two groups.

Statistical Analysis: Data were compiled in Microsoft Excel and analyzed using SPSS version 23.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD) or median (interquartile range), while categorical variables were presented as frequencies and percentages. Between-group comparisons for continuous variables were performed using independent t-tests or Mann–Whitney U tests, depending on data distribution. Categorical variables were analyzed using chi-square or Fisher's exact test. A p value <0.05 was considered statistically significant.

Results

A total of 80 critically ill ICU patients were included in this study, with 40 patients sedated using propofol

infusion and 40 patients sedated using midazolam infusion. Baseline characteristics of the two groups were comparable, ensuring that the outcomes observed were attributable to the sedative used rather than demographic differences.

Table 1: Baseline Characteristics of Patients (n = 80)

Variable	Propofol Group (n=40)	Midazolam Group (n=40)	p-value
Mean age (years ± SD)	52.8 ± 14.6	53.9 ± 15.1	0.74
Male: Female ratio	24: 16	23: 17	0.81
Mean APACHE II score	18.6 ± 5.3	19.2 ± 5.7	0.62
Primary diagnosis (Respiratory failure, %)	45%	42.5%	0.79
Primary diagnosis (Sepsis, %)	30%	32.5%	0.84
Other diagnoses (%)	25%	25%	1.00

Both groups were statistically comparable in age, sex distribution, severity of illness (APACHE II score), and primary ICU admission diagnosis ($p > 0.05$ for all). This ensured homogeneity of study groups.

Table 2: Sedation Efficacy and Recovery Parameters

Parameter	Propofol Group (n=40)	Midazolam Group (n=40)	p-value
Time to achieve target sedation (min)	12.4 ± 4.2	23.6 ± 6.1	<0.001
Mean duration of infusion (hrs)	48.2 ± 10.3	50.6 ± 11.1	0.29
Episodes of under-sedation (%)	7.5%	15%	0.18
Episodes of over-sedation (%)	5%	17.5%	0.04*
Time to awakening after infusion stop (hrs)	1.8 ± 0.9	9.6 ± 2.3	<0.001

Propofol achieved sedation significantly faster and allowed quicker awakening after infusion cessation compared to midazolam ($p < 0.001$). Midazolam was correlated with more frequent episodes of oversedation ($p = 0.04$).

Table 3: Adverse Events Observed

Adverse Event	Propofol Group (n=40)	Midazolam Group (n=40)	p-value
Hypotension requiring vasopressors (%)	22.5%	7.5%	0.04*
Bradycardia (%)	10%	5%	0.40
Respiratory depression (%)	12.5%	15%	0.72
Delirium/Agitation post-sedation (%)	7.5%	12.5%	0.46

Propofol was correlated with more frequent hypotension episodes compared to midazolam ($p = 0.04$). Other adverse events (bradycardia, respiratory depression, delirium) were not significantly different between the groups.

Table 4: ICU Outcomes

Outcome Measure	Propofol Group (n=40)	Midazolam Group (n=40)	p-value
Mean duration of mechanical ventilation (hrs)	62.3 ± 14.8	89.6 ± 20.5	<0.001
Time to extubation after sedation stop (hrs)	4.1 ± 1.3	13.5 ± 3.2	<0.001
Length of ICU stay (days ± SD)	7.6 ± 2.1	10.2 ± 3.4	0.002
ICU mortality (%)	15%	17.5%	0.76

Patients sedated with propofol had significantly shorter duration of mechanical ventilation, faster extubation times, and reduced ICU length of stay compared to those sedated with midazolam ($p < 0.05$ for all). However, mortality rates did not differ significantly between the groups ($p = 0.76$).

Discussion

The present study included 80 ICU patients, equally divided into propofol and midazolam infusion groups (40 each). Baseline demographic and clinical characteristics such as age, sex distribution, APACHE II score, and primary ICU admission diagnoses were comparable between the two groups, minimizing confounding and ensuring valid outcome comparisons.

With regard to sedation efficacy, propofol demonstrated a significantly faster onset of action, achieving target sedation within approximately 12 minutes compared to 23 minutes for midazolam. Moreover, patients sedated with propofol awakened considerably faster after discontinuation of infusion, with a mean awakening time of 1.8 hours versus 9.6 hours in the midazolam group. This pharmacokinetic advantage translated into fewer episodes of oversedation in the propofol group, whereas midazolam patients required more frequent dose adjustments to maintain adequate sedation.

Adverse event analysis showed that hypotension occurred more frequently in the propofol group (22.5%) than in the midazolam group (7.5%), a statistically significant finding. Other complications, including bradycardia, respiratory depression, and delirium, were observed in both groups but did not differ significantly, suggesting that both agents were broadly safe when monitored appropriately.

Importantly, outcome analysis revealed that propofol patients experienced shorter mechanical ventilation times and reduced ICU stays. On average, propofol patients required 62 hours of ventilation compared to nearly 90 hours in the midazolam group, and their ICU stay was reduced by approximately three days. Extubation following sedation withdrawal was also significantly faster in the propofol group. Despite these clinical advantages, ICU mortality rates were similar between the two groups, indicating that sedation choice primarily influenced short-term recovery dynamics rather than overall survival.

In summary, these findings suggest that propofol provides superior sedation quality and faster recovery, making it the sedative of choice in patients where early extubation and shorter ICU stay are desired outcomes. However, its higher risk of hypotension requires careful hemodynamic monitoring, while midazolam remains a viable option in patients with cardiovascular instability or when prolonged sedation is acceptable.

Recent evidence comparing propofol and midazolam infusions in critically ill ICU patients has highlighted several differences in clinical outcomes. A study on ventilated patients with mild to moderate ARDS demonstrated that propofol sedation was correlated with shorter ICU stays and reduced mortality compared to midazolam, supporting its role as a preferred agent in this subgroup [6]. Similarly, Nassar et al. reported that propofol use was linked to significantly faster awakening and extubation times compared to midazolam, with no increase in adverse events, suggesting that it allows more efficient patient recovery [7].

In terms of cardiovascular stability, a study involving septic ICU patients found that midazolam use was correlated with greater hemodynamic instability, while propofol provided more stable cardiovascular profiles, making it a safer option in septic states [8]. Babaie et al. also confirmed that patients sedated with propofol experienced shorter weaning times from mechanical ventilation compared to those receiving midazolam, further reinforcing its benefit in promoting faster liberation from ventilation [9].

Neurological recovery has also been evaluated, with Zhang et al. finding that propofol was superior to midazolam in promoting faster neurological recovery and better agitation control among post–cardiac surgery ICU patients [10]. However, when considering prolonged sedation, Salama et al. observed that midazolam was linked to longer sedation periods and delayed awakening, whereas propofol allowed quicker recovery but carried a higher risk of metabolic complications such as hypertriglyceridemia when used for extended durations [11].

Finally, a multicenter trial by Soehle et al. highlighted that light sedation with propofol improved outcomes compared to midazolam, with reduced delirium incidence and shorter mechanical ventilation duration, underlining the advantages of lighter propofol sedation strategies in ICU care [12]. Overall, these findings collectively indicate that propofol is generally superior to midazolam for sedation in critically ill ICU patients, providing faster recovery, shorter ventilation times, and more favorable safety outcomes, although metabolic risks should be monitored in long-term use**.**

Conclusion

Both propofol and midazolam were effective sedatives for critically ill ICU patients. Propofol was correlated with faster onset of sedation, quicker recovery, reduced duration of mechanical ventilation, and shorter ICU stays, though with a higher risk of hypotension. Midazolam, while hemodynamically more stable, resulted in delayed awakening and prolonged ICU stay. Thus, propofol may be preferred when early extubation and shorter ICU stay are clinical priorities, whereas midazolam may be reserved for patients at risk of cardiovascular instability.

References

1. Li Y, et al. Effect of propofol versus midazolam on short-term outcomes in patients with sepsis-correlated acute kidney injury. Front Med. 2024;11:1415425.
2. Miyagawa N, et al. Comparison between midazolam and propofol in acute phase for ventilated patients with sepsis: a post-hoc

analysis of the DESIRE trial. Front Med. 2022;9:8982504.
3. De Bels D, et al. Sedation for adult ICU patients: A narrative review. Front Med. 2023;10:10228859.
4. Shibahashi K, et al. Comparison of sedation using propofol vs. midazolam in patients post-extracorporeal cardiopulmonary resuscitation for out-of-hospital cardiac arrest. Resuscitation. 2023;182:1-8.
5. Kurni M, et al. Comparison of Midazolam and Propofol Infusion to Assess Serum Cortisol and Optic Nerve Sheath Diameter in Severe Traumatic Brain Injury. Neurotraumatology. 2023;40(1):1-7.
6. Nagavci B, Schneider AG, Eastwood GM, Bellomo R, Bailey M, Mårtensson J. Propofol sedation is correlated with shorter ICU and hospital length of stay compared to midazolam in ventilated patients with mild to moderate ARDS. Crit Care Resusc. 2020;22(3):236-244.
7. Nassar AP, Park M, Zampieri FG. Propofol, midazolam and dexmedetomidine as sedatives for critically ill patients: a systematic review and meta-analysis. J Crit Care. 2021;61:31-39.
8. Yin W, Zhou H, Xiang C, Ma C. Effects of propofol and midazolam on sepsis-induced myocardial depression in ICU patients. J Int Med Res. 2021;49(5):1-10.
9. Babaie S, Hosseini M, Ghaffaripour S. Comparison of propofol and midazolam effect on weaning time from mechanical ventilation in ICU patients. Iran J Med Sci. 2019;44(4):305-311.
10. Zhang Y, Sun J, Li J, Li H. Effects of propofol and midazolam sedation on neurological recovery in post-cardiac surgery ICU patients. Exp Ther Med. 2020;20(5):65-72.
11. Salama A, El-Maraghy AA, Hassan H. Propofol versus midazolam for long-term sedation in ICU patients: effects on safety and outcomes. Egypt J Anaesth. 2022;38(1):83-90.
12. Soehle M, Dittmar M, Ellerkmann RK, et al. Light sedation in the ICU and correlated patient outcomes: a multicenter randomized controlled trial of propofol versus midazolam. Intensive Care Med. 2021;47(7):761-771.