Effect of Propofol, Midazolam on ICU Patients with Sepsis

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Abstract

However, propofol and midazolam are widely used for intravenous sedation in very ill patients. Midazolam and propofol are used under light sedation in order to evaluate the effects of different sedation strategies on the clinical outcomes for sepsis patients. In a retrospective cross-sectional study between June 2021 and June 2023, an ICU in Baghdad Medical City examined sepsis patients who required mechanical ventilation and compared the sedation of those who got midazolam and propofol to those who did not. The outcomes of the sequential organ failure assessment (SOFA), day one acute physiology and chronic health evaluation II (APACHE II), and emergency surgery were all recorded for the patients. The midazolam and propofol groups each had 73 and 78 patients, with a mean age of 50 years (SD, 15.4 years) for the midazolam group and 56 years (SD, 16 years) for the propofol group, respectively. Of these participants, 52 (71.2%) and 56 (71.8%) were men. Midazolam and propofol groups' median APACHE II scores were 21 (17-25) and 20(16-25), respectively. The median SOFA scores for midazolam and propofol were 6(4-8) and 6(4-9) respectively. In comparison to propofol groups, midazolam groups had longer median weaning periods, recovery times, and lengths of stays. Both the midazolam and propofol groups had higher rates of infection in the belly, lungs, and other body regions; the length of artificial breathing in both the midazolam and propofol groups exceeded 5 days. To support this finding, additional prospective studies are required.

Keywords: Intensive care unit; Midazolam; Propofol; SOFA; Sepsis

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Introduction

Worldwide, sepsis is thought to affect 48.9 million people annually, of whom 11 million (22.5%) pass away [1]. Sepsis is a severe problem globally despite regional diversity and a declining fatality rate [2]. About 40-80% of sepsis patients in the intensive care unit (ICU) require invasive mechanical ventilation (MV), highlighting the significance of respiratory treatment [3,4]. When treating sepsis patients who needed ventilator support, maintaining modest sedation was linked to better clinical results [5]. According to the clinical recommendations for sedation techniques in intensive care, mild sedation management should start early on with the use of a suitable sedation regimen [6]. According to a recent study, managing light sedation during the acute phase of the first 48 hours of intensive care was linked to improved survival, decreased delirium, and successful ventilator weaning [7]. Therefore, throughout the first 48-72 hours of intensive care, we concentrated on sedation control. A handy medication with no impact on hemodynamic, midazolam has been shown to build up in the body, extending the duration of MV and raising the likelihood of delirium in patients in intensive care units [8,9]. The best of our knowledge, there have been a limited number of studies comparing the effects of midazolam and propofol on clinical outcomes in sepsis patients that concentrate on light sedation during the study. In order to assess the effects of various sedation techniques employing midazolam and propofol under light sedation on clinical outcomes for patients with sepsis

Methods

Between June 2021 and June 2023, an ICU in Baghdad Medical City conducted a retrospective cross-sectional study among sepsis patients who needed mechanical ventilation, comparing sedation between the patients who received midazolam and propofol and those who did not. For sedation, only midazolam and propofol were utilized. This research did not include patients who were discharged from the intensive care unit (ICU) by day 2 and who did not receive either midazolam or propofol, or who received both medications during the first two days of enrolment. Dexmedetomidine, fentanyl, and sedatives given in a bolus were not included in the grouping.

The Iraqi Ministry of Health provided ethical approval before we began collecting our data.

Data on the patients' age, sex, emergency surgery, day one acute physiology and chronic health evaluation II (APACHE II), and sequential organ failure assessment (SOFA) results were gathered. We also gathered information on mortality, ventilator-free days (VFD), infection site (abdomen, lung, or other), and length of stay in the ICU. Each variable of the data was entered into an excel spread sheet and examined using SPSS version 20.Continuous variables were expressed as median (interquartile range [IQR]) or mean (SD), whereas categorical variables were expressed as a number (%).

Results

Of the 151 patients, 73 and 78 patients were in the midazolam and propofol groups, respectively (**Table 1**). **Table 1** displays the characteristics of the two groups. With a mean age of 50 years (SD, 15.4 years) for the midazolam group and 56 years (SD, 16 years) for the propofol group, respectively, 52 (71.2%) and 56 (71.8%) of these participants were men. In the midazolam and propofol groups, the number of patients with BMI was 22.9 (SD, 3.5 kg/m^2) and 24.2 (SD, 4 kg/m^2), respectively. The median APACHE II score for the midazolam and propofol groups was 21 (17-25) and 20 (16-25), respectively. Midazolam and propofol each had a median SOFA score of 6(4-8) and 6(4-9) respectively. Additionally, the median RASS score for midazolam and propofol was -3, respectively. According to **Figure 1**, the emergency room, medical ward, postoperative room, and surgical ward were the places where patients were most frequently admitted. The primary outcome measure reveals that the median weaning time for midazolam was 49 (26.5-73.0) hours and for propofol was 32 (23-51) hours. The median recovery time for the midazolam and propofol groups, respectively, was 7(2-28) hours and 2(1-4.5) hours. Midazolam and propofol groups' median lengths of stay in the ICU were 18 days and 14 days, respectively. The median hospital stay was 24 days for the midazolam group and 19 days for the propofol group, respectively. In the midazolam and propofol groups, the ICU fatality rates were 5 and 7, respectively (**Table 2**). According to the **Figure 2**, the most common sites of infection were the lung (54.8%), others (23.3%), and abdomen (21.9%) in the midazolam groups and the abdomen (47.4%), lung (29.5%), and others (23.1%), all in the propofol groups.

According to the length of mechanical ventilation, the midazolam and propofol groups exhibit 53.4% and 52.6% in the ≥ 5 days, and 46.6% and 47.4% in the < 5 days (**Figure 3**).

Figure 2 Site of infection among patients with sepsis.

Table 2. Raw data of main outcome.

Propofol (n=78)	Midazolam (n=73)	Outcome measure
32(23-51)	49(26.5-73.0)	Weaning time, median (IQR), h
2(1-4.5)	7(2-28)	Recovery time, median (IQR), h
3.5(1.5-5.5)	7(2-30.2)	Extubation time, median (IQR), h
14.2(9.8-18.9)	18.3(11.7-28.7)	ICU duration, median (IQR), day
19.4(14.9-34.5)	23.8(17.3-40.3)	Length of hospital stay, median (IQR), day
7(9.0)	5(6.8)	ICU mortality, No. (%)

Table 1. Baseline characteristic of patients with sepsis (n=151).

Propofol (n=78)	Midazolam(n=73)	Characteristic
51.0 ± 16.0	50.8 ± 15.4	Mean/SD (year)
56(71.8)	52(71.2)	Male
22(28.2)	21(28.8)	Female
24.2 ± 4.0	22.9 ± 3.5	Mean/SD (kg/m^2)
20(16-25)	21(17-25)	Median (IQR)
6(4-9)	6(4-8)	Median (IQR)
-3(-4 to 3)	-3(-4 to 2)	Median (IQR)

BMI: Body Mass Index; APACHE II: Acute Physiology and Chronic Health Evaluation II; IQR: Interquartile Range; SOFA: Sequential Organ Failure Assessment; RASS: Richmond Agitation and Sedation Scale
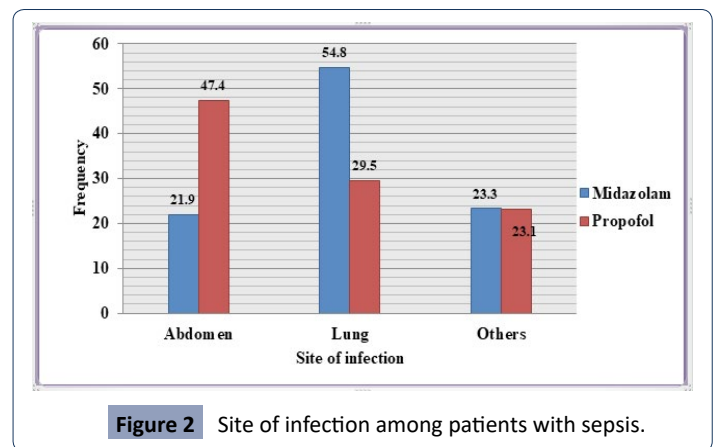
This study sought to assess the effectiveness of midazolam and propofol among sepsis patients in the intensive care unit. In the sedative treatment of ICU patients with sepsis, propofol,

midazolam, and dexmedetomidine are efficient and secure [10]. In this investigation, it was discovered that the midazolam and propofol groups, respectively, contained 73 and 78 individuals. In contrast to another study conducted in China by Yu et al. (2015), the patients in this study were split into two groups: those receiving midazolam (n = 21) and those receiving propofol (n = 22) [11]. In a 2019 study in China, 146 individuals received midazolam, whereas 152 received propofol [12]. The midazolam group's mean age in the current study was 50 years (SD, 15.4 years), while the propofol group's mean age was 56 years (SD, 16 years). While a 2019 study in China found that the median ages for the midazolam and propofol groups were 54 years (SD, 11.6 years) and 55 years (SD, 11 years), respectively [12]. A prospective randomized trial with 20 patients in each midazolam and propofol group was carried out in Egypt. The results showed that the mean ages of the midazolam group were 55.7 ± 9.6 and the propofol group was 53.9 ± 7.7.52 (71.2%) and 56 (71.8%) of the participants in the current study were men [13].

The authors noted that in 2019 men in China were 101 (69.2) for the midazolam group and 110 (72.4) for the propofol group [12]. There were 22.9 (SD, 3.5 kg/m^2) and 24.2 (SD, 4 kg/m^2) patients with BMI in the midazolam and propofol groups, respectively. In 2019, Ding found that the BMI for the midazolam group was 21.3 ± 5.1 and for the propofol group it was 21.9 ± 5.4 [10].

Midazolam and propofol groups' median APACHE II scores were 21 (17-25) and 20 (16-25), respectively. According to the authors, the mean and SD of the APACHE II test in China were 16 ± 6 for midazolam groups and 15 ± 6 for propofol groups [12]. Clinical traits and background medical therapy did not differ statistically significantly. Ding discovered that the mean of the APACHE II test in 2019 was 19.02 ± 4.63 for midazolam groups and 18.7 ± 4.2 for propofol groups [10]. Additionally, the median SOFA scores for midazolam and propofol in this trial were 6 (4-8) and 6 (4-9) respectively. The mean and SD of the SOFA scores 9 ± 3 for the midazolam and propofol groups in China were described by the authors [12].

According to Moeen et al. in 2022, the median SOFA score for midazolam groups was 10 [6-13] while for propofol groups it was 9 (6-13) [14]. The mean SOFA score was 6.25 (4.03) for midazolam groups and 5.10 (3.35) for propofol groups, according to Sun et al in 2022 [15]. Additionally, midazolam and propofol had median RASS scores of -3 and -3, respectively. In a double-blind, randomized, controlled research Hughes et al. conducted in 2021 at 13 medical sites in the United States with 208 patients receiving propofol, the authors noted the median RASS score while taking the medicine was- 1.95 (ranging from-3.03 to 0.98) [16]. Medical ward, postoperative room, and surgical ward were the areas where patients were frequently hospitalized with regard to the emergency department. According to Zhang et al. in 2019, patients with an EDLOS of 6 hours or less had a crude mortality rate of 21.4%, which was considerably lower than patients with an EDLOS of 12 to 24 hours (31.9%) and patients with an EDLOS of more than 24 hours (31.8%). EDLOS remained independently linked with increased risk of hospital mortality after controlling for PaO$_2$/FiO$_2$, serum creatinine, age, Sequential Organ Failure Assessment, body mass index, lactate, comorbidities, and infection site [17]. The major outcome measure indicates that

the median weaning time for propofol was 32 (23-51) hours and for midazolam was 49 (26.5-73.0) hours. In Germany, Muellejans et al. conducted a prospective, open-label, randomised, single-center study in 2006 with 33 patients receiving midazolam and 39 patients receiving propofol. The authors found that the mean and Sd of weaning time were 5.7 ± 6.6 for the midazolam groups and 2.2 ± 4.3 for the propofol groups [18]. As was said, the midazolam and propofol groups' respective median recovery times were 7(2-28) and 2(1-4.5) hours. The recovery period was 58 hours for midazolam groups and 1.5 hours for propofol groups, according to Zhou et al. (2014). The median lengths of stay in the ICU were 18 days for the midazolam group and 14 days for the propofol group, respectively [19]. According to a 2019 study by Ding, the average length of stay in China was 7.93 ± 3.5 for midazolam groups and 7.8 ± 3.3 for propofol groups [10]. For the midazolam group and the propofol group, the median length of stay in the hospital was 24 days and 19 days, respectively. The median length of stay was 72 hours for midazolam groups and 69.8 hours for propofol groups, according to a multicenter, randomized, open label trial conducted in Canada by Hall et al in 2001 [20]. Patients using midazolam had a median hospital length of stay of 9.5 days, according to research by Tekwani et al. from 2010 (interquartile range [IQR]: 4.6 to 16 days) [21]. The ICU fatality rates were 5 and 7 for the midazolam and propofol groups, respectively. Additionally, Tekwani et al. (2010) explained that hospital mortality was 21 of 59 (36%; 95% confidence interval [CI] 24% to 49%) for patients taking midazolam [21]. According to Zhou et al. (2014), ICU mortality was 7(16.3) for groups receiving midazolam and 6(14.3) for those receiving propofol [19].

Infections most frequently occurred in the abdomen (47.4%), lung (29.5%), and others (23.1%) in the propofol groups and the lung (54.8%), others (23.3%), and abdomen (21.9%) in the midazolam groups. In Japan, a nested cohort analysis was carried out by Miyagawa et al. in 2022 among 51 patients for midazolam and 66 patients for propofol groups. The authors found that the abdomen for the propofol groups and the lung for the midazolam groups were the sites of infection, respectively [22]. The midazolam and propofol groups show 53.4% and 52.6% in the first 5 days, and 46.6% and 47.4% in the next 5 days, respectively, depending on the duration of mechanical breathing. According to Miyagawa et al. 2022, sedation with midazolam based on a mild sedation strategy may be related with inappropriate sedation during the acute phase, with greater coma and delirium as compared to propofol, in patients with sepsis who required mechanical ventilation [22]. A retrospective analysis with 2,174 cases (51.91%) in the propofol group and 2,014 cases (48.09%) in the midazolam group was carried out in China in 2022 by sun et al. The rate of patients getting mechanical ventilation was demonstrably greater in the propofol group than in the midazolam group (99.60% vs. 76.90%, P0.001), according to the authors [15].

Conclusion

We come to the conclusion that there were significantly more male patients than female cases in both the midazolam and propofol groups, with the emergency room serving as the main entry point. Midazolam groups had longer median weaning

times, recovery times, and lengths of stays than propofol groups. The belly, lung, and other body parts were the most often infected ones among both the midazolam and propofol groups; the duration of mechanical breathing in both the midazolam and propofol groups surpassed 5 days. Additional prospective studies are needed to confirm this finding.

Conflict of interest: None

References

1   Rudd Kristina E (200-211) Global regional and national sepsis incidence and mortality, 1990-2017: analysis for the Global Burden of Disease Study. The Lancet 395.10219.

2   Singer Mervyn (2016) the third international consensus definitions for sepsis and septic shock (Sepsis-3) 315: 801-810.

3   Quenot Jean-Pierre (2013) the epidemiology of septic shock in French intensive care units: the prospective multicenter cohort EPISS study. Critical care 17: 1-10.

4   Prism Investigators (2017) early, goal-directed therapy for septic shock a patient-level meta-analysis. New Eng J Med 376: 2223-2234.

5   Treggiari Miriam M (2009) Randomized trial of light versus deep sedation on mental health after critical illness. Critical care medicine 37: 2527-2534.

6   Devlin John W (2018) Clinical practice guidelines for the prevention and management of pain, agitation/sedation, delirium, immobility, and sleep disruption in adult patients in the ICU." Critical care med 46: e825-e873.

7   Shehabi Yahya (2018) Sedation intensity in the first 48 hours of mechanical ventilation and 180-day mortality: a multinational prospective longitudinal cohort study. Critical care med 46: 850-859.

8   Fraser, Gilles L (2013) Benzodiazepine versus non-benzodiazepine-based sedation for mechanically ventilated, critically ill adults: a systematic review and meta-analysis of randomized trials. Critical care med 41: S30-S38.

9   Riker Richard (2009) Dexmedetomidine vs midazolam for sedation of critically ill patients: a randomized trial. 301: 489-499.

10 Ding Jia, Yuwen Chen, Yuan Gao (2019) Effect of propofol, midazolam and dexmedetomidine on ICU patients with sepsis and on arterial blood gas. Exp Therp Med 18: 4340-4346.

11 Yu Tao (2015) Propofol increases preload dependency in septic shock patients. J Surg Res 193: 849-855.

12 Li Wei-Xia (2019) Effects of propofol, dexmedetomidine, and midazolam on postoperative cognitive dysfunction in elderly patients: a randomized controlled preliminary trial. Chin Med J 132: 437-445.

13 Lewis, Kimberley (2022) Dexmedetomidine vs other sedatives in critically ill mechanically ventilated adults: a systematic review and meta-analysis of randomized trials. Int Care Med 48: 811-840.

14 Moeen, Seham M (2022) Dexmedetomidine versus propofol or midazolam in patients with abdominal sepsis regarding inflammatory response and capillary leak. Egyp J Anaes 38: 23-32.

15 Sun Wen (2022) the effects of midazolam or propofol plus fentanyl on ICU mortality: a retrospective study based on the MIMIC-IV database. Annals translational med 10: 4.

16 Hugher Christopher G (2021) Dexmedetomidine or propofol for sedation in mechanically ventilated adults with sepsis. New England J Med 384: 1424-1436.

17 Zhang Zhongheng (2019) Prolonged length of stay in the emergency department and increased risk of hospital mortality in patients with sepsis requiring ICU admission. Em Med J 36: 82-87.

18 Muellejans, Bernd (2006) Sedation in the intensive care unit with remifentanil/propofol versus midazolam/fentanyl: a randomised open-label, pharmacoeconomic trial. Critical Care 10: 1-9.

19 Zhou Yongfang (2014) Midazolam and propofol used alone or sequentially for long-term sedation in critically ill, mechanically ventilated patients: a prospective, randomized study. Critical Care 18: 1-9.

20 Hall Richard I (2001) Propofol vs midazolam for ICU sedation: a Canadian multicenter randomized trial. Chest 119: 1151-1159.

21 Tekwani Karis L (2010) A comparison of the effects of etomidate and midazolam on hospital length of stay in patients with suspected sepsis: a prospective, randomized study. Annals of emergency medicine 56: 481-489.

22 Miyagawa Noriko (2022) Comparison between midazolam and propofol in acute phase for ventilated patients with sepsis: a post-hoc analysis of the DESIRE trial. Acute Med Surg 9: e746.