Ketamine versus morphine for musculoskeletal trauma pain: a meta-analysis of randomized controlled trials

Mansoureh Fatahi[1]*, Saba Aghajani[2], Alireza Ebrahimi[3]
1. Department of Emergency Medicine, Head of Department, Surgical Art Hospital, Lusail, Qatar
2. School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran
3. School of Medicine, Faculty of Medicine, Kurdistan University of Medical Sciences, Sanandaj, Iran
Correspondence to: Mansoureh Fatahi
*Department of Emergency Medicine, Head of Department, Surgical Art Hospital, Lusail, Qatar.
Email: Fattahi.110203@yahoo.com
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Background: Pain is a primary reason for emergency department (ED) visits after injuries, making effective pain control essential. While opioids are commonly used, ketamine has recently been explored for pain management in various settings. This meta-analysis aimed to compare the efficacy and safety of morphine sulfate and ketamine in trauma patients experiencing musculoskeletal pain.

Methods and materials: This meta-analysis was registered in PROSPERO (CRD420251001307). An extensive search was conducted to identify randomized controlled trials (RCTs) comparing ketamine and morphine for pain in trauma patients. Inclusion criteria focused on English-language RCTs comparing intravenous (IV) or intranasal (IN) ketamine to IV morphine sulfate in trauma patients with bone fractures or soft tissue injuries. Quality assessment was performed using the Cochrane Risk of Bias (RoB-2) tool. Data analysis involved calculating the standardized mean difference (SMD) and 95% confidence interval (CI) using a random-effects model.

Results: Twelve RCTs involving 1892 patients were included. A quality assessment revealed five studies with a high risk of bias, three with a low risk, and four with some concerns. Comparison of pain scores at 30, 60, 90, and 120 minutes showed no statistically significant differences between groups, with high heterogeneity observed at all time points (30 minutes: SMD –0.38, 95% CI –1.08 to 0.31, $p = 0.32$, $I^2 = 94.5\%$; 60 minutes: SMD –0.42, 95% CI –1.3 to 0.46, $p = 0.41$, $I^2 = 93.2\%$; 90 minutes: SMD –0.03, 95% CI –0.50 to 0.44, $p = 0.91$, $I^2 = 74.8\%$; 120 minutes: SMD –0.44, 95% CI –2.46 to 1.58, $p = 0.70$, $I^2 = 95.9\%$). Regarding side effects, neurologic side effects were significantly higher in the ketamine group (RR: 2.38; 95% CI 1.23 to 4.63; $p = 0.016$, $I^2 = 72.5\%$). Overall, side effects showed no meaningful difference (RR: 0.88; 95% CI 0.43 to 1.80; $p = 0.71$, $I^2 = 88.2\%$).

Conclusion: Sub-dissociative ketamine and morphine provide comparable analgesia for acute musculoskeletal pain. While ketamine may offer a more rapid onset of action, its overall analgesic superiority over morphine was not demonstrated. Both agents were well-tolerated, although ketamine was associated with a higher risk of neurological adverse events.

Keywords: ketamine, morphine sulfate, trauma, pain.

Conflict of interests

The authors declare that there is no conflict of interest regarding the publication of this article.

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Ethical approval

Ethical approval was granted by the Ethics Committee/Institutional Review. Board/Research Committee (choose whichever is applicable) via reference/letter number ---- dated: -----. Ethical approval is not required at our institution to publish an anonymous case report.