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CASE REPORT

Delayed apnea after ketamine use in an obese child: a case report

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ABSTRACT

Background: Ketamine is one of the safest medications used in emergency medicine procedural sedation due to its minimal effects on respiratory and cardiovascular systems. This case raises concerns about potential ketamine-delayed respiratory complications in obese patients.

Case Presentation: We report the case of an 11-year-old child who underwent emergency department sedation for cut wound repair using ketamine administered intravenously. The patient developed apnea 2 hours after an uneventful sedation while he was in the observation period. The apnea was managed by supplemental oxygen and physical stimulation, and the patient was put on continuous positive airway pressure. He was admitted to the critical care unit for observation and was discharged the next day without complications.

Conclusion: Our case highlights the possibility of delayed respiratory complications due to ketamine use in obese children.

Keywords: Case report, ketamine, apnea, sedation, respiratory depression.

Introduction

Ketamine is considered a safe and preferred medication in the emergency department (ED) procedural analgesia, as it does not affect respiratory parameters, such as tidal volume and minute ventilation [1]. The medication works by causing cortical dissociation, which allows physicians to perform painful procedures while preserving some level of consciousness [2]. Many studies have shown that ketamine has minimal to no respiratory adverse effects [3]. The overall complication rate associated with ketamine is very low, and it was estimated to be 2.4% according to some studies [4], while the respiratory complication rate was estimated at 0.8% [2]. However, in a large retrospective study (N = 1,022), ketamine was found to cause respiratory/airway complications in 1.4% of the patients [2]. Apnea was observed in only 2 out of the 1,022 patients. Therefore, respiratory depression/apnea due to ketamine is considered a very rare event. Delayed respiratory complications/apnea beyond the period of drug administration has not been reported previously [2]. However, we report a case of apnea that developed 2 hours following ketamine use for procedural analgesia in an 11-year-old male patient.

Case Presentation

An 11-year-old male not known to have any medical illness was brought to the ED by his family after he sustained an injury to his left lower extremity when he slipped and fell on a broken glass jar. There were no other sites of injury or a history of a loss of consciousness. He received first aid at home to control the bleeding.

Upon examination, he had normal vital signs. He was alert and oriented, but he appeared to be in severe pain. The patient was obese [weight, 75.2 kg; height, 157 cm; and body mass index (BMI), 30]. There were multiple wounds on the left lower limb; the largest of which was on the left calf and measured 7 cm, with exposed muscles and active bleeding. There was no vascular or tendon injury noticed. Distal pulses were intact. Neurological examination results were normal.

Radiography of the lower extremity was performed and showed no foreign body or fracture.

Due to the presence of multiple wounds, the clinicians decided to perform procedural sedation to repair the wounds. The patient's father consented to the procedure. The patient was moved to a monitored bed, and a

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conscious sedation protocol was followed to monitor the patient during the procedure.

The patient received fentanyl 40 mcg intravenously (IV) for pain control before the procedure. Then, he received 50 mg ketamine IV, followed by an additional 20 mg ketamine IV after 15 minutes during the procedure. In addition, the patient was injected locally with 15 ml of 1% lidocaine. During the whole procedure, there was no oxygen desaturation, and the procedure was tolerated without complications. The patient regained consciousness and was kept on the monitor for postprocedure observation.

The procedure was finished at approximately 2 am. After 120 minutes of observation, the patient became cyanosed and developed apnea (respiratory rate was zero), and his oxygen saturation level dropped to 20% while sleeping. Painful stimulation was applied, and 15 L of O_2 through a nonrebreathing mask was given to the patient, who immediately woke up, and his oxygen saturation level rose quickly to 100%. The physician closely observed the patient for any drop in the oxygen saturation level. After 10 minutes, he fell asleep again and developed apnea. He had multiple episodes of apnea each time he fell asleep, but when he was stimulated, he woke up and breathed spontaneously, with an oxygen saturation level of 100%. The patient was placed on continuous positive airway pressure (CPAP) to prevent another episode of apnea while sleeping. A venous blood gas (VBG) analysis was performed, and the results were normal.

While the team was observing the patient, his mother emphasized that since the patient had gained weight in the last 2 years, he had started to snore and stop breathing while sleeping. The patient was admitted to the pediatric intensive care unit for observation. CPAP was stopped the next morning, and the patient did not experience any additional hypoxia/apnea episodes. He was discharged home and scheduled for an outpatient sleep study. A sleep study was performed; the apnea hypopnea index (AHI) was 2.6 (normal reference AHI less than 5). The patient was referred to an endocrine specialist for obesity investigation/management and received advice on diet and lifestyle modifications.

Discussion

Ketamine is accepted for ED sedation due to its safety profile. Ketamine administration requires a well-trained professional to address potential complications such as apnea [3]. The standard loading dose of ketamine is 1.5-2 mg/kg IV and should be administered over 30-60 seconds [2]. Typically, ketamine takes 50-110 minutes to be cleared [2], and reported complications usually occur during the first 5-10 minutes of ketamine administration.

The risk of respiratory complications during anesthesia is higher among obese patients [5]. There are several factors in obese patients that might contribute to respiratory complications, such as a reduction in respiratory compliance. This reduction in compliance is due to reduced total lung capacity, vital capacity, and functional residual capacity [6]. In addition, the obesity effect on drug clearance is not fully understood or predicted [7]. Until now, there has been no reliable metric to measure drug clearance in obese individuals [7].

Our report discusses the development of delayed apnea following ketamine administration in an obese child 2 hours after the conscious sedation procedure. The patient's BMI was 30, and he had a history of snoring/apnea during sleep, which had not been clinically investigated or treated. His high BMI put him at risk of having sleep apnea/obesity hypoventilation syndrome. His VBG analysis results did not show hypercapnia, and his AHI in a sleep study performed 2 weeks later was normal (2.6). However, we still believe the patient has a type of hypoventilation due to obesity that was exacerbated by ketamine sedation and led to delayed apneic episodes.

In a 9-year prospective study, 1,022 children received intramuscular (IM) ketamine for sedation, and only 1.4% of them developed transient airway complications, such as airway obstruction/laryngospasm [8]. Only 2 out of the 1,022 patients developed apnea within 4-5 minutes of ketamine injection. The lowest saturation reached 88% and was reversed after bag-valve-mask ventilation. In another retrospective chart review of the cases of 156 patients, transient apnea occurred in only 1 patient who received 2 mg/kg ketamine as a loading dose for rapid push. Another retrospective review of the cases of 636 patients over 5 years of age who received IV or IM ketamine sedation during pediatric gastroenterology procedures showed apnea and respiratory depression in 0.5% of the patients and partial airway obstruction in 1.3% of the patients. Other cases of respiratory depression have been reported in the literature [9,10], but these cases were in patients who received IM ketamine.

Such rare events usually happen during or immediately after the procedure. However, surprisingly, our patient developed respiratory complications during the observation period. This emphasizes the significance of adherence to the protocol in observing patients after sedation and the importance of being vigilant about respiratory complications, especially in obese children.

Conclusion

This case report aims to raise awareness about delayed respiratory complications/apnea with the administration of a regular dose of ketamine in obese children during procedural sedation. Thus, the postsedation observation period should not be overlooked.

List of Abbreviations

ED	emergency department
BMI	body mass index
IV	intravenous
VBG	venous blood gas
CPAP	continuous positive airway pressure
AHI	Apnea hypopnea index
IM	intramuscular

Conflict of interest

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

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Ethical approval
Ethical approval is not required at our institution to publish an anonymous case report.

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