

# Nebulized Ketamine for Rapid Pain Relief in Acute Foot Injury: A Case Report

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## Abstract

## Case Report

Acute pain management remains a significant challenge in clinical practice. While opioids have been traditionally used, their adverse effects have prompted the search for alternative analgesics. Ketamine, a potent analgesic, has shown promise in managing acute pain. This case report highlights the use of nebulized ketamine in a 35-year-old woman presenting with severe pain in her right foot following a domestic fall. Nebulized ketamine provided rapid and sustained pain relief, demonstrating its potential as a valuable tool for acute pain management, especially in situations where intravenous access is challenging.

**Keywords:** Acute Pain, Ketamine, Nebulized Ketamine, Pain Management, Foot Injury.

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## INTRODUCTION

Acute pain is a common clinical problem that can significantly impact patient quality of life and healthcare resource utilization. While opioids have traditionally been the mainstay of acute pain management, their potential for adverse effects, including addiction and respiratory depression, has led to a search for alternative analgesic strategies [1]. Ketamine, a dissociative anesthetic with potent analgesic properties, has emerged as a promising option.

Nebulized ketamine offers a non-invasive and effective approach to delivering this powerful analgesic. By administering ketamine via inhalation, clinicians can rapidly alleviate severe pain, particularly in situations where intravenous access is difficult or contraindicated [2]. This case report highlights the potential of nebulized ketamine in providing rapid and sustained pain relief for acute injuries.

## CASE REPORT

A 35-year-old woman presented to the emergency department (ED) in acute distress, complaining of severe pain in her right foot following a domestic fall. She described the pain as a sharp, throbbing sensation that significantly limited her ability

to bear weight. The patient was unable to walk independently and required assistance to transfer from the stretcher to the examination table. Her facial expression reflected significant discomfort, and she winced in pain with any movement of the affected foot. The patient reported that the pain had developed immediately after the fall and had progressively worsened over the past hour.

Physical examination revealed significant swelling and tenderness localized to the midfoot region. The skin overlying the injured area was erythematous and warm to the touch. There was no evidence of open wounds, ecchymosis, or neurovascular compromise. Range of motion of the affected foot was markedly limited due to pain. Palpation of the midfoot elicited severe tenderness, particularly over the navicular bone. The patient was unable to bear weight on the affected foot and exhibited a protective gait.

Standard radiographs of the foot were obtained to rule out fracture or dislocation. The radiographs were negative for any acute bony injury.

Given the severity of the patient's pain and her refusal of intravenous access, nebulized ketamine was chosen as an alternative analgesic modality. The patient

was administered a single dose of 0.5 mg/kg of ketamine via nebulizer.

Within 30 minutes, the patient's pain score decreased from 7/10 to 3/10 on the numerical rating scale (NRS). A second dose of 0.5 mg/kg was administered, resulting in complete pain relief (NRS 0/10) within 60 minutes.

The patient tolerated the procedure well without any significant adverse effects. She was discharged home with a diagnosis of soft tissue injury of the foot. Oral paracetamol was prescribed for any residual pain.

## DISCUSSION

Ketamine, a dissociative anesthetic, has been increasingly recognized for its potent analgesic properties. Its unique mechanism of action, involving NMDA receptor antagonism, allows it to provide effective pain relief without the risk of respiratory depression associated with opioids. Nebulized ketamine offers several advantages over traditional routes of administration [3, 4].

- **Rapid Onset of Action:** It provides quick pain relief, potentially reducing patient suffering.
- **Reduced Side Effects:** Compared to intravenous administration, nebulization may minimize side effects such as sedation and hallucinations.
- **Non-Invasive:** It avoids the need for intravenous access, making it suitable for patients with difficult venous access or those who prefer a less invasive approach.

While ketamine is generally well-tolerated, potential side effects such as increased salivation, nausea, and vomiting can occur. Close monitoring is essential, especially in patients with underlying medical conditions or those receiving concomitant medications [5].

Ketamine's analgesic effects are mediated through its non-competitive antagonism of the N-methyl-D-aspartate (NMDA) receptor, a key player in the transmission and modulation of pain signals. By blocking NMDA receptors, ketamine inhibits central sensitization, a process that contributes to the development and persistence of chronic pain. Additionally, ketamine may also modulate other neurotransmitter systems, including the opioid and GABAergic systems, to further enhance its analgesic effects [4].

This case report highlights the potential of nebulized ketamine as a valuable tool for acute pain management in the ED. It may be particularly useful in

situations where intravenous access is difficult or contraindicated, or when rapid pain relief is required.

However, it is important to note that ketamine can have potential adverse effects, including increased salivation, nausea, and vomiting. Close monitoring is essential, especially in patients with underlying medical conditions or those receiving concomitant medications [6].

Further research is needed to fully evaluate the optimal dosing, duration of effect, and long-term safety of nebulized ketamine for acute pain management. Randomized controlled trials comparing nebulized ketamine to traditional analgesics can provide more definitive evidence of its efficacy and safety.

Additionally, exploring the potential of combining nebulized ketamine with other analgesic modalities, such as opioids or local anesthetics, may offer synergistic benefits and reduce the risk of adverse effects.

By expanding our understanding of the clinical applications and limitations of nebulized ketamine, we can optimize its use in the management of acute pain.

The use of ketamine, particularly in vulnerable populations, raises ethical concerns. It is crucial to ensure that informed consent is obtained, and that patients are closely monitored for adverse effects. Healthcare providers should be adequately trained in the administration and management of ketamine to minimize risks.

## CONCLUSION

This case report underscores the potential of nebulized ketamine as a valuable tool in the acute pain management arsenal. By providing rapid and sustained pain relief, this non-invasive modality offers a promising alternative to traditional parenteral analgesics, particularly in challenging clinical scenarios. Further research is warranted to optimize dosing regimens and explore its application in a wider range of acute pain conditions.

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