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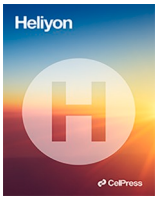

Case report

# Anaphylactic shock induced by intravenous ketorolac: A case report

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ABSTRACT

Ketorolac trometamol injection is the first injectable nonsteroidal anti-inflammatory drug (NSAID) approved for the short-term management of moderate to severe pain. As a non-opioid alternative, it represents a critical development for acute pain relief, particularly in post-operative and injury-related scenarios. Like other NSAIDs, ketorolac trometamol is associated with common adverse reactions such as dizziness, headache, drowsiness, nausea, and vomiting, which are generally mild to moderate. However, rare but severe reactions like anaphylactic shock have been reported. This case report highlights a specific instance of anaphylactic shock induced by intravenous ketorolac trometamol, emphasizing the rapid onset of symptoms and the importance of vigilant monitoring during administration to prevent severe outcomes. Additionally, recommendations for post-recovery monitoring and allergological evaluation are provided to enhance clinical management in similar cases.

## 1. Introduction

Ketorolac trometamol is a widely used non-steroidal anti-inflammatory drug (NSAID). Its clinical dosage forms include injections, tablets, capsules, and eye drops [1]. The injectable formulation, in particular, provides a rapid and effective analgesic option for managing acute, severe pain, serving as an alternative to opioids in specific clinical settings [2]. In intravenous form, this drug reaches its serum peak level within 1–3 minutes [3].Some literature suggests that oral or intramuscular administration of ketorolac may provoke asthma attacks or other intolerance symptoms [4,5]. Although ketorolac has a favorable safety profile, anaphylaxis and anaphylaxis may occur following administration [6,7]. These reactions, whether acute or delayed, are rare, and they can be fatal and unpredictable.This case report describes an unusual occurrence of anaphylactic shock induced by intravenous ketorolac trometamol, with the aim of raising awareness among healthcare providers regarding this potential adverse reaction. The report was conducted with the patient's informed consent.

## 2. Case presentation

The patient was a 52-year-old woman with a history of cervical discectomy and an allergy to sulfa drugs. On July 9, 2024, she presented with pain in the right neck, shoulder, waist, hip, and knees, which had persisted for over two weeks following a fall. This

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ongoing discomfort prompted her visit to the outpatient clinic for treatment. By July 22, 2024, the severity of the patient's pain had not abated, leading her to request hospitalization. On the morning of July 25, 2024, at 09:50, while awaiting acupuncture treatment for her right waist and hip, the patient received an intravenous injection of 10 ml of 0.9 % sodium chloride and 30 mg of ketorolac trometamol for preventive analgesia. Notably, the patient's weight was not documented during her hospital visit, which represents a limitation in assessing the appropriateness of ketorolac trometamol dosing in this case. Nevertheless, the administered dose of 30 mg fell within the standard recommended range for intravenous use, as outlined in current clinical guidelines. Five minutes post-injection, she developed numbness and itching in her hands and feet, consistent with rapid-onset hypersensitivity reactions reported in other cases [8]. Examination revealed no skin rash, and she was promptly administered 5 mg of dexamethasone sodium phosphate intravenously. By 10:04, systemic symptoms emerged, including flushing of the limbs, sweating, confusion, and general weakness, with vital signs showing significant hypotension (73/35 mmHg) and oxygen saturation dropping to 89 %, supporting a diagnosis of anaphylactic shock. Immediate interventions included positioning the patient in a shock recumbent position, providing medium-flow oxygen, conducting multi-functional monitoring, and administering an intramuscular injection of 0.5 mg of epinephrine hydrochloride. Rapid establishment of two intravenous infusion channels was initiated, along with the concurrent use of sodium bicarbonate Ringer's injection and aggressive fluid resuscitation. At 10:23, the patient reported shaking, chest tightness, and a sensation of throat constriction. The physician ordered an intramuscular injection of 25 mg of promethazine hydrochloride, followed by an intravenous injection of 10 ml of 10 % glucose and 10 ml of 10 % calcium gluconate. By 10:45, the patient's symptoms of shivering, chest tightness, and throat constriction had improved. Follow-up measurements indicated blood pressure at 145/70 mmHg, heart rate at 73 beats per minute, respiration at 16 breaths per minute, and blood oxygen saturation at 99 %. By 11:00, the patient's vital signs stabilized, and there were no reports of discomfort, including shivering, chest tightness, or throat constriction. Continuous monitoring until 20:55 confirmed the resolution of acute symptoms, and the patient remained stable throughout the observation period.

## 3. Discussion

In this case, the patient clearly indicated an allergy to sulfa drugs and reported no prior use of other medications before the administration of ketorolac trometamol, thereby excluding other potential factors that could cause similar symptoms. Although the relationship between sulfonamide allergy and NSAID hypersensitivity is not fully understood, shared pathways involving immune-mediated or pharmacological mechanisms may predispose patients to cross-reactivity. Consequently, patients with known drug allergies, particularly to sulfa drugs, may have an elevated risk of severe reactions.Previously reported cases demonstrate that adverse reactions typically began with mild symptoms such as skin itching and rapidly escalated to life-threatening conditions. This underscores the necessity of cautious administration in high-risk patients. Similar to other NSAIDs, the common adverse reactions associated with the short-term use of ketorolac trometamol primarily encompass neurological symptoms, such as dizziness, headache, drowsiness, and abnormal thinking, alongside gastrointestinal reactions, including nausea, vomiting, abdominal pain, and indigestion. These symptoms are generally mild to moderate in severity, while allergic reactions remain relatively rare [9]. Current research indicates that ketorolac induces allergic reactions primarily through its inhibition of cyclooxygenase-1 (COX-1) activity. This inhibition disrupts normal metabolic processes, amplifying the 5-lipoxygenase pathway and releasing excessive inflammatory mediators, such as cysteinyl leukotrienes. This cascade leads to allergic symptoms, including bronchoconstriction, increased vascular permeability, and angioedema [10]. Additionally, ketorolac's hapten-like properties may trigger immunogenic responses, culminating in histamine release and severe allergic reactions [11].In this case, the patient developed symptoms within 5 minutes of intravenous administration, which is consistent with previously documented rapid responses to ketorolac. For example, in a 1995 report, a 30-year-old female patient exhibited symptoms such as facial flushing and difficulty breathing within minutes of receiving a 60 mg intramuscular injection of ketorolac, ultimately leading to a fatal outcome despite rescue efforts [12]. Similarly, in a 2010 case, a patient experienced an allergic reaction approximately 30 minutes after intravenous administration of ketorolac, presenting with red papules, facial edema, and respiratory distress [7]. In contrast, oral administration of ketorolac tends to induce slower reactions, such as the cases reported in 2023, where symptoms like periorbital swelling and dyspnea developed hours after ingestion [13]. The rapid onset observed in our case aligns with the most severe reactions reported in the literature, underscoring the critical need for immediate recognition and intervention. This highlights the potential immediacy and severity of allergic reactions associated with intravenous ketorolac, necessitating vigilant monitoring during administration. Despite its significance, this case has certain limitations. Trypsin levels and other biochemical markers were not assessed, representing a limitation in confirming the diagnosis of anaphylaxis. However, in acute settings, the clinical priority is to stabilize the patient's vital signs rather than perform extensive diagnostic testing. Additionally, long-term follow-up was not conducted, as the acute condition resolved without complications. Nonetheless, similar cases warrant long-term monitoring and allergological evaluations to identify specific triggers, prevent recurrence, and guide future management strategies.

Our primary aim in reporting these cases is to enhance healthcare workers' awareness of the potentially serious and life-threatening side effects associated with ketorolac and to recommend vigilant monitoring during administration, particularly in patients with a history of drug allergies. Future research should focus on identifying specific risk factors for hypersensitivity reactions to ketorolac and developing standardized clinical protocols for early recognition and management of such events. Additionally, the implementation of routine allergy testing in high-risk patients could further reduce the likelihood of severe outcomes.

## 4. Conclusions

Although anaphylactic shock induced by ketorolac trometamol is rare, it poses a significant and immediate threat to patient safety,

requiring prompt recognition and intervention. This case highlights the importance of vigilant monitoring during administration, particularly for high-risk patients with a history of allergies. Healthcare providers should be aware of the rapid onset of symptoms, which can escalate within minutes, and be prepared to administer life-saving treatments such as epinephrine without delay. In addition, the absence of biochemical markers like tryptase in this case underscores the value of thorough diagnostic workups in confirming allergic reactions. This report emphasizes the need for post-recovery follow-up and allergological evaluations to identify specific triggers and prevent recurrence. Preventing anaphylactic shock and managing drug hypersensitivity reactions should remain a critical priority in clinical practice, supported by ongoing education and awareness among healthcare professionals.

## CRediT authorship contribution statement

**Huijuan Lu:** Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Kaili Lai:** Writing – review & editing, Writing – original draft, Formal analysis, Data curation, Conceptualization. **Shuzhu Lin:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Data curation, Conceptualization. **Guining Dang:** Writing – review & editing, Visualization, Supervision, Resources, Project administration, Methodology, Conceptualization.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. The research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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