



Ampicillin induced anaphylactic shock in a newborn case report

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Abstract

Context: Anaphylaxis, an allergic reaction that is fast in onset, is rare in the neonatal period due to immaturity of the immunological system. Ampicillin is a broad-spectrum penicillin derivative antibiotic widely used as empiric antimicrobial therapy against Gram-positive and Gram-negative bacteria for severe infections, meningitis, or septicemia in the neonatal period.

Objective: We report a case of a 7-day-old girl neonate with ampicillin-induced anaphylaxis.

Patient: The patient is a 7-day-old girl neonate who was presented to our emergency department with complaints of fever and continuous diarrhea for one day. The patient was clinically stable; once intravenous ampicillin was administered, the patient suddenly developed mottled skin, cold extremities, apnea, and cyanosis. We observe the sudden clinical deterioration as a drug allergy.

Conclusions: Although drug allergies are rare in newborns due to their life-threatening features, close monitoring is essential. Physicians should be aware of the potentially adverse effects of ampicillin in newborns. Physicians should be aware of the potential adverse effects of intravenous antibiotic therapy since rapid assessment and treatment are crucial to reducing morbidity and mortality.

Keywords: adverse effect, ampicillin, anaphylaxis, newborn

Introduction

Anaphylaxis is a dangerous, potentially life-threatening allergic reaction that rapidly occurs after contact with an allergen. According to international studies, the global estimated prevalence ranges between 0.05 and 2% [1]. Anaphylaxis is a dangerous allergic reaction that is rapid in onset and life-threatening. After contact with an allergen, mast cells and basophils release chemical mediators. Increased immunoglobulin E (IgE) is responsible for pathogenesis [1].

The most common triggers of allergic reaction in children are food and medicines. Anaphylaxis caused by drugs is mostly seen in hospitals. [2]. Anaphylaxis in infants carries a high risk of morbidity and mortality as respiratory or cardiac arrest and death can occur within minutes. Therefore, it requires prompt diagnosis and treatment. Ampicillin is a broad-spectrum penicillin derivative antibiotic widely used as empiric antimicrobial therapy against Gram-positive and Gram-negative bacteria for severe infections, meningitis, or septicemia in the neonatal period.

Penicillin allergy is the most reported antibiotic allergy reaction. Despite this, hypersensitivity reactions are rare in neonatal periods due to the immaturity of their immunological system [2]. Penicillin belongs to an influential group of antibiotics called beta (β)-lactam antibiotics. This class of antibiotics includes penicillin and penicillin derivatives such as ampicillin and amoxicillin, cephalosporins, monobactams, carbapenems, and β -lactamase inhibitors. Penicillin derivatives can also cause allergic reactions such as penicillins. Newborns are less likely to develop anaphylaxis because of weak immunoglobulin E (IgE)-mediated immunity and nonimmune mechanisms [1].

We present this case due to ampicillin, a commonly used antibiotic in newborn intensive care units (NICU) and pediatric emergency department (PED), and because of the rare occurrence of anaphylaxis in the newborn period. We want to emphasize the importance of observing patients who are followed up in newborn intensive care units, have a premature immunologic system concerning life-threatening drug allergies to take precautions and determine the treatment approach more effectively. This report describes a case of fatal anaphylaxis due to intravenous ampicillin in a 7-day old neonate with suspected sepsis.

Case report

A 7-day-old girl neonate was presented to our emergency department, King Saud Medical City (KSMC), Riyadh, KSA) with complaints of fever and continuous diarrhea for one day. She was born at term through a caesarian section of a preeclampsia mother. She was normal until her presentation. There was no history of apnea, cyanosis, or seizure. On arrival to emergency room triage, she was febrile (38.9 °C), mildly dehydrated, with jaundice. Her weight was 2.8 kg; heart rate, 172/min; respiratory rate, 48/min; and glucose level 119 mg/dl. She was allocated to the observation unit to diagnose a febrile infant for a full septic workup. Initially, she received an intravenous blouse of normal saline for dehydration. Blood samples were obtained for Complete blood count, chemistry, and blood culture; lumbar puncture was successfully done, CSF fluid appeared clear, slightly yellow. Venous blood gases have done, which showed PH 7.26. PCO₂ 37 mmHg PO₂ 38 mmHg HCO₃ 16.6 mEq/L lactate 1.9 mmol/L. once Intravenous ampicillin was administered patient suddenly developed mottled skin, cold extremities, apnea, and cyanosis. We observe the sudden clinical deterioration as a drug allergy. Therefore, Intravenous infusion immediately stopped, and the patient was transferred to the resuscitation unit. Cardiopulmonary resuscitation started. Epinephrine 1:10000 intravenously administered with a dose of 0.01 mg/kg, 3 minutes after an intravenous epinephrine injection, after conducting a prompt two cycles of CPR, spontaneous respirations appeared regularly, and skin findings faded. In blood gas parameters, metabolic acidosis was detected (pH: 7.11, pCO₂: 34 mmHg, pO₂: 41 mmHg, HCO₃: 10.8 mEq/L, BE: -17.7, lactate: 6.6 mmol/L). The following doses of ampicillin were withheld, steroids and ranitidine were added. Control complete blood count revealed: hemoglobin: 14.9 g/ dL, leukocyte: 17050/μL (neutrophil: 5650/μL, lymphocyte: 7900/μL, eosinophil: 530/μL, monocyte: 2890/μL, basophil: 80/μL), liver and kidney function test results were within normal limits. After stabilization, the patient was admitted to a high dependency area (Special care unit) for monitoring and follow-up. The patient received cefotaxime as an alternative antibiotic. CSF analysis was normal. CSF culture, blood culture, urine culture all showed no growth. The patient remained stable and had no biphasic reaction. After three days of hospitalization, she was discharged with a follow-up with an allergist.

Discussion

Anaphylaxis is an acute life-threatening type I hypersensitivity reaction developing over minutes to hours with multisystem involvement due to the systemic effects of histamine release. The immune system gets sensitized to an allergen after initial exposure. On subsequent exposure, massive mast cell degranulation and release of inflammatory mediators occur, leading to severe anaphylactic reaction resulting in circulatory collapse, laryngotracheal edema, and spasm^[3]. Hypersensitivity reactions can occur in children under six months of age whose immunological systems are still immature^[4]. Our case is one of the rare cases of newborn anaphylaxis. Because of their immature immune system, diagnosing anaphylaxis in neonates is challenging. In addition to that, anaphylaxis signs like dysphonia and flushing can be seen in healthy crying babies^[4]. Signs and symptoms diagnose anaphylaxis shock after the allergen encounter incident. Clinical findings such as flashing, edema, dyspnea, bronchospasm, or hypotension are seen during the first minutes or hours. Mediators released from basophils and mast cells cause clinical signs with vasodilatation, increased capillary permeability, and platelet aggregation. Diagnosis of anaphylaxis depends on clinical symptoms and signs rather than laboratory findings. IgE-independent mechanisms may also activate mast cells and basophils and cause “anaphylactoid” reactions with similar clinical features. Anaphylaxis with IgE-mediated immunity or non-immunization mechanisms is less common due to the immaturity of the immunological system during the neonatal period. For this cause, the diagnosis of anaphylaxis in the newborn is controversial, and it is necessary to evaluate the differential diagnosis in detail^[2]. In the present case, who had clinical findings of tachycardia, and circulatory disturbances, are indicative of neonatal sepsis, and septic shock must be considered and excluded. However, the onset of symptoms following the intravenous ampicillin injection, accompanied by a response to adrenaline, was consistent with a drug-induced anaphylactic reaction. To our information, our case is one of the first cases reported with Ampicillin-induced fatal anaphylaxis in a neonate. The case reported by Katipoğlu et al. exhibited anaphylaxis in neonates due to Ampicillin like our patient, and it is the only case report^[2].

If anaphylaxis is highly suspected, epinephrine should be administered immediately following immediate resuscitation measures such as airway management, supplemental oxygen, and intravenous fluids. Once the infant is stabilized, close monitoring is required for the possible biphasic reaction. Periodic follow-up for the infant and the caregiver with an allergist and medical educator is necessary to assess potential triggers, provide epinephrine auto-injector with dose adjustment, and increase their knowledge and self-care. We have reported a rare case of Ampicillin-induced anaphylaxis in a neonate with suspected sepsis. Only a few cases in the neonatal periods are reported, including hypersensitivity reactions to Ampicillin, cefotaxime, ceftazidime, Amikacin, and meropenem. Physicians should be aware of the potential adverse effects of intravenous antibiotic therapy since rapid assessment and treatment are crucial to reducing morbidity and mortality.

Abbreviations

IgE: Immunoglobulin E

KSMC: King Saud Medical City

KSA: Kingdom of Saudi Arabia

PED: Pediatric Emergency Department

CSF: Cerebral Spinal Fluid

CPR: Cardiopulmonary Resuscitation

Funding

None

Conflict of Interest

None declared

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