

## Case Report

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# A Case Report of Anaphylactic Shock Induced by Cisatracurium

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## Abstract

We report a case of severe anaphylactic shock caused by cisatracurium, a 30-year-old female who prepared to undergo cervical conization and had a history of penicillin allergy. Severe cardiovascular collapse suddenly occurred after giving the general anesthetic induction drugs (midazolam, fentanyl, propofol, and cisatracurium). Then, the patient received anti-anaphylactic shock therapy. The rescue was successful, but her surgery was cancelled. An allergen skin test was performed after 6 weeks, the results showed that cisatracurium was positive and confirmed that the allergic shock was caused by cisatracurium. In order to avoid the use of cisatracurium, the subsequent surgery was not performed with general anesthesia, instead of epidural anesthesia. The anesthesia was performed smoothly and the patient returned to the ward safely.

**Keywords:** Anaphylactic shock; Cisatracurium; Case report

## 1. Introduction

A variety of drugs will be used when patients undergoing general anesthesia within a short time, and various side effects may occur at the same time. However, allergic reactions are a life-threatening reaction. A recent study demonstrated that 90% of perioperative allergies occur during the anaesthesia induction period, 50% to 70% are caused by neuromuscular blockers, and succinylcholine and rocuronium are the most common, micuronium and

cisatracurium are rare, the incidence of cisatracurium allergy is 1/1388 [1]. Although cisatracurium has a few histamine release, there several serious allergic reactions have been reported since clinical use [2-6]. Allergies are a rare side effect, but they can lead to death if not diagnosed timely and treated quickly. In addition, identifying allergens is the most important step to prevent relapse. Herein, we report a case of anaphylactic shock caused by cisatracurium under general anesthesia. This reminds anesthesiologists to be alert to allergic reactions during general anesthesia induction.

## **2. Case Report**

The patient was 30 years old female, 60 kg weight, ASA grade I, diagnosed of cervical intraepithelial neoplasia, and prepared to undergo cervical conization under general anesthesia. She was in good health and had a history of penicillin allergy, no history of food allergy, all pre-operative examinations were normal. Routine preoperative fasting for 10 hours, monitoring in the operating room, blood pressure 120/70 mmHg, heart rate 70 beats/min, pulse oxygen saturation of 98%.

The patient arrived at the operating room with no premedication, anesthesia was induced by midazolam 1mg, fentanyl 0.2 mg, propofol 120 mg, and cisatracurium 5 mg. Then, the patient's oral secretions suddenly increased. We used the sputum suction tube to attract them, pulse oximetry decreasing to 85%, inserted larynx mask, poor ventilation, airway pressure increased to 28 cm H<sub>2</sub>O. Blood pressure was 70/35 mmHg, heart rate rose to 105 beats/min, gave ephedrine 10mg intravenously, blood pressure did not rise. Then, we gave the phenylephrine hydrochloride 100 µg intravenously, then, 10 mg was added to 100 ml saline intravenous drip. But, the blood pressure still did not rise and fell to 52/30 mmHg, heart rate was 120 beats/min, pulse oxygen saturation cannot be measured. We found conjunctival edema in the patient's eyes at this time, Therefore, we suspected that anaphylactic shock has occurred. So we took rescue measures immediately, gave 10 mg dexamethasone, injected 50 µg epinephrine intravenously, then 1 mg epinephrine was added to 250 ml saline static point rapidly. After 3 minute, blood pressure rose to 80/42 mmHg, the heart rate was 110 beats/min. After 10 minutes, the blood pressure rose to 105/60 mmHg, heart rate was 90 beats/min, and airway pressure dropped to 20 cm H<sub>2</sub>O, the condition of the patient improved. We adjust the speed of epinephrine drop, according to blood pressure. After 20 minutes, the patient moved and opened the eyes and face became swelled. At this time, blood pressure was 110/68 mmHg, heart rate was 88 beats/min. After adrenaline decelerates, blood pressure drops, adrenaline need continues to static point. The patient's spontaneous breathing recovery, and pulled the laryngeal mask out. Her blood pressure was 115/67 mmHg, heart rate was 85 beats/min, pulse oxygen saturation was 98%. Then, she was transferred to ICU, the patient's consciousness was clear, breathing was smooth, we saved the patient successfully.

After 6 weeks, the patient underwent the allergy testing. Skin test: midazolam, propofol, fentanyl, cisatracurium, rocuronium, lidocaine. Among them, cisatracurium was positive (+) and the rest was negative (-). In order to avoid the use of cisatracurium, the operation was performed under epidural anesthesia with 1.8% lidocaine 20 ml. The anesthetic effect was well, no allergic reaction occurred during the operation. The operation went well and the patient returned to the ward safely. Follow-up the patients after surgery, there was nothing uncomfortable.

### **3. Discussion**

Anaphylaxis is a severe, life-threatening, systemic hypersensitivity reaction. It is caused by the degranulation of mast cells or basophiles that results in the release of preformed mediators, including histamine and tryptase. These mediators can affect one or more organ systems such as the skin and the cardiovascular, respiratory, and gastrointestinal systems. The mechanisms that cause mast cell degranulation can be divided into immunemediated (IgE-mediated, anaphylactic) reactions and nonimmune-mediated (chemically-mediated, anaphylactic) reactions [7]. Isolated skin symptoms appear to be more common in non-IgE-mediated allergic reactions, while bronchial spasm and cardiovascular symptoms are more common in IgE-mediated allergic reactions [8]. In our case reported, the patient developed anaphylactic shock after induction of general anesthesia, no rash, but conjunctival edema and cardiovascular collapse. Drug skin tests showed that cisatracurium was positive, this could be diagnosed as immune-mediated IgE-mediated hypersensitivity according to clinical manifestations and skin tests. The retrospective diagnosis could depend on the results of serological and skin tests. Unfortunately, serological tests have not been performed in this case, but allergen specific IgE antibody tests (eg, radioallergy tests) are necessary, However, these tests are not yet available for cisatracurium in currently [9, 10].

Clinical use of muscle relaxant skin test as a predictor has few value, because a large number of false positive results can be produced in healthy people who have never used muscle relaxant. Therefore, muscle relaxant skin test is not recommended as a routine test before operation. However, the patients with a history of allergies to muscle relaxants, applied of non-diluted muscle relaxants for intradermal and acupuncture test has a high predictive value. However, this patient experienced a severe allergic reaction with the use of muscle relaxants firstly. This may be due to the fact that the patient had been exposed to some of the chemicals, such as detergents, disinfectants, and cosmetics which have the similar molecular characteristics to muscle relaxants. Quaternary ammonium groups are the common components, IgE antibodies produced by such antigens cross-react with muscle relaxants [11]. Due to the cross-sensitivity between muscle relaxants, and the severity of allergic reactions, we recommended the patient to avoid the use of muscle relaxants in subsequent anaesthesia, advocated regional or local anaesthesia. In this case, epidural anesthesia was used in the subsequent surgery and the anesthesia operation was successful.

In conclusion, during anesthesia induction, when the patient has a sharp drop in blood pressure, a sharp rise in heart rate, and an increase in respiratory resistance within an extremely short period, and no other reason can explain, it should be taken into account that there was a serious allergic event. The rescue measures should also get into the fast lane of anti-allergic shock as early as possible. It included that discontinuation of anesthetics or sensitizers, inhalation of pure oxygen, control of the airway, intravenous fluid rehydration rapidly, applied of glucocorticoids, the use of epinephrine early, and dare to use epinephrine. epinephrine is an alpha receptor agonist, it can restore the tension of blood vessels, relieve edema, excite  $\beta_2$  receptor to relieve bronchospasm and increase cardiac contractility at the same time, inhibit the release of leukotriene and histamine, and the inflammatory mediators, etc. Epinephrine are the first choice to rescue anaphylactic shock. Allergic lead to deaths are usually due to delayed or did not use of epinephrine, it rarely associated with overdose.

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