



Case report

Anaphylaxis to benzalkonium chloride-coated central venous catheter

Chih-Kai Shih (Resident)^{a,b}, Shu-Hung Huang (Staff Plastic Surgeon)^{b,c},
Cheng-Jing Tsai (Staff Anesthesiologist)^a,
Koung-Shing Chu (Assistant Professor)^{a,b,d},
Sheng-Hua Wu (Staff Anesthesiologist)^{a,b,*}

^aDepartment of Anesthesiology, Kaohsiung Medical University Hospital, Kaohsiung City 807, Taiwan

^bFaculty of Medicine, College of Medicine, Graduate Institute of Medicine, Kaohsiung Medical University, Taiwan, Kaohsiung City 807, Taiwan

^cDepartment of Plastic Surgery, Kaohsiung Medical University Hospital, Kaohsiung City 807, Taiwan

^dDepartment of Anesthesiology, Faculty of Medicine, College of Medicine, Kaohsiung Medical University, Kaohsiung City 807, Taiwan

Received 1 February 2009; revised 11 September 2009; accepted 26 September 2009

Keywords:

Anaphylactic shock;
Benzalkonium chloride;
Central venous catheter

Abstract Benzalkonium chloride (BAC) is commonly used as a bactericidal preservative and it may cause allergic reactions in some patients. An unusual case of anaphylactic shock in a 55-year-old woman following insertion of a central venous catheter (CVC) that was coated with BAC is presented. Assuming anaphylactic shock from the CVC, the catheter was removed immediately. Standard resuscitation was started with 100% oxygen, epinephrine, and saline infusion. The patient recovered without any sequelae. One month later, an intradermal skin test was positive for BAC.

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1. Introduction

Central venous catheters (CVC) are widely used for monitoring fluid status and fluid administration, especially in major surgery. However, clinicians may struggle with the decision to use CVCs with antiseptic agents. Central venous catheters coated with antiseptic agents are preferred in cases that are prone to infection, but they may be allergenic for some patients [1–3]. Antiseptics used to coat CVCs, such as

chlorhexidine and silver sulfadiazine, are effective in reducing the frequency of catheter-related bloodstream infections [4]. A number of CVCs impregnated with benzalkonium chloride also have been introduced for antiseptic purposes.

Benzalkonium chloride is a skin allergen that causes allergic contact dermatitis [5,6]. The case of a 55 year-old woman, who presented with anaphylactic shock following insertion of a benzalkonium chloride-coated CVC, is reported.

2. Case report

A previously healthy, 55-year-old, 60 kg, 153 cm woman had general anesthesia for elective radical nephrectomy. The

* Corresponding author. Department of Anesthesiology, Kaohsiung Medical University Hospital, No.100, Tzyou 1st Rd., Kaohsiung City 807, Taiwan. Tel: +886 7 312 1101x7033; fax: +886 7 321 7874.

E-mail address: elsawu2@gmail.com (S.-H. Wu).

patient did not receive any premedication before the surgery. After preoxygenation, anesthesia was induced smoothly with intravenous (IV) fentanyl 0.1 mg, propofol 100 mg, and rocuronium 30 mg. Approximately 90 seconds later, tracheal intubation was performed following another 30 mg administration of propofol. No skin rash or vital sign changes occurred after induction.

Due to the need for monitoring volume status, inotropes, and rapid fluid resuscitation, a 7-French double-lumen central catheter was inserted via the right internal jugular vein. In an attempt to limit infections associated with the CVC, an antiseptic CVC coated with benzalkonium chloride was chosen. Shortly after insertion of the CVC, the patient developed severe hypotension, tachycardia, generalized erythema, and swelling of the eyelids. Her systolic blood pressure decreased to below 50 mmHg, and her heart rate was 130 to 140 beats per minute (bpm). The differential diagnosis included pulmonary embolism, tension pneumothorax, acute coronary syndrome, and, lastly, anaphylaxis. The patient was maintained in the Trendelenburg position during CVC insertion. Real-time ultrasound was used to guide the CVC placement [7]. Electrocardiography showed tachycardia without ST segment changes. Anaphylaxis was suspected.

The CVC was removed immediately, and resuscitation was successful with 100% oxygen, epinephrine, hydrocortisone, and saline infusion. Her symptoms gradually improved after resuscitation but her elective surgery was postponed.

The patient was sedated and her lungs were ventilated for two hours. Edema of the larynx and airway was not observed, and the patient's trachea was extubated without any complications. Two days later, the patient underwent successful surgery and received the same induction agents. Another CVC without antiseptic coating was then inserted. No adverse events were reported. One month later, intradermal skin test with serial dilutions of benzalkonium chloride was performed. A positive reaction (wheal: 4×5 mm in diameter, flare: 20×20 mm) was observed 20 minutes later with 1:1,000 solution. At the same time, the patient reported mild dyspnea and palpitations.

3. Discussion

Anaphylaxis during anesthesia is rare. Its features include urticaria, laryngeal edema, hypotension, and cardiac arrhythmias. The entire reaction is abrupt. The reported incidence during anesthesia has been variously reported from 1:5,000 to 1:25,000 cases [8]. Anaphylactic shock is associated with a mortality rate of up to 6% [9].

Treatment of anaphylactic shock includes interruption of contact with possible antigens, 100% oxygen, intubation, epinephrine, and volume expansion. As suggested by a previous study [10], diagnosis may be made with intraoperative tests (serum histamine and mast cell tryptase) and

postoperative tests skin tests and radioallergosorbent (RAST) tests for specific Immunoglobulin-E (IgE) antibodies.

Neuromuscular blocking agents are the most common cause of anaphylaxis during anesthesia [11,12]. Anaphylaxis and bronchospasm associated with rocuronium use have been reported [11], but muscle relaxation did not seem to cause the anaphylactic shock noted in this case. The immediate development of symptoms and bronchoconstriction in response to CVC with benzalkonium chloride coating was significant in this case. This patient's history and the result of the skin test were highly suggestive of benzalkonium chloride-induced anaphylaxis.

Benzalkonium chloride is a quaternary ammonium cationic detergent widely used as a preservative, disinfectant, and antiseptic [13]. In previous reports, it has been described as one of the safest synthetic biocides known and it has a long history of efficacious use. It is a well-recognized irritant [6,14], and some case reports have identified benzalkonium chloride as the cause of contact dermatitis [15] and occupational asthma [13].

The mechanism of the allergic reaction to benzalkonium chloride and other chemicals remains controversial [13]. It may be related to either IgE-mediated or non-IgE-mediated mechanisms. Benzalkonium chloride may cause nonspecific histamine release from mast cells through their surface active properties [16].

In conclusion, clinicians should pay attention when antiseptic-coated catheters are used. Although anaphylaxis caused by benzalkonium chloride is rare, it remains a potential cause of perioperative anaphylaxis.

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