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Targeted temperature management after cardiac arrest with anaphylaxis

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ABSTRACT

Fatal anaphylaxis is uncommon but not rare. Extrapolated mortality rates are 0.52% of total anaphylaxis patients Bock et al. (Jan. 2001) [1]. Nevertheless, compared with the incidence of the other cardiac arrest events, the incidence of cardiac arrest due to anaphylaxis is relatively small. As a result, the effect using targeted temperature management after anaphylaxis is not clearly understood. We report the case of a 63-year-old man who developed cardiac arrest after ingestion of two pieces of peach. He was resuscitated and his circulation returned spontaneously after approximately 11 min of cardiopulmonary resuscitation, but he was unresponsive and had fixed dilated pupils. We initiated therapeutic hypothermia on the basis of protocol for 24 h. The patient was gradually and successfully cooled and rewarmed. The patient opened his eyes spontaneously on day 5, obeyed commands on day 6, and was discharged on day 18. At the time of discharge, he had no neurologic deficiencies or other complications.

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Anaphylaxis was first reported by Richet and Portier in 1902 [2]. Anaphylaxis is a life threatening hypersensitivity reaction. The systemic release of inflammatory mediators from basophils and mast cells results in anaphylaxis [3]. The life-time prevalence of anaphylaxis is estimated at 0.05–2%, and this prevalence seems to be increasing [4]. The estimated mortality rate of anaphylaxis is estimated at 0.52%. Death due to anaphylaxis results from respiratory arrest, circulatory collapse, or a mixture of the two [5]. In the United States, the annual number of deaths related to anaphylaxis ranges from 186 to 225 [6], and approximately 424 000 of out-of-hospital cardiac arrest (OHCA) events occur annually in the United States [7]. Considering these facts, the annual number of deaths related to anaphylaxis is relatively small. As a result, little research has been done regarding the management for cardiac arrest due to anaphylaxis. It is suggested that targeted temperature management (TTM) in patients who remain comatose upon resuscitation is fundamental for neurologic recovery [8]. But, TTM after cardiac arrest with anaphylaxis is unknown. Here, we report the use of TTM in a patient who developed cardiac arrest after ingestion of two pieces of peach.

A 63-year-old man was referred to the Emergency Department for shortness of breath and loss of consciousness after ingesting two pieces of peach. He had a 9-year history of liver cirrhosis due to hepatitis B (HBV), which was being treated with oral medication. He had an allergy

to peaches. When the patient arrived at the emergency department, he suddenly collapsed and went into a cardiac arrest. Pulseless electrical activity (PEA) was identified as the initial electrocardiography (ECG) rhythm (Fig. 1). The patient experienced return of spontaneous circulation (ROSC) after 11 min of cardio-pulmonary resuscitation, without any shockable rhythm. But he was unresponsive with a Glasgow coma score of 3 and had fixed dilated pupils. After ROSC, his initial vital signs included a temperature of 36.2 °C, a heart rate of 111 beats per minute, a blood pressure of 150/62 mm Hg, and a respiratory rate of 21 breaths per minute. Arterial Blood Gas Analysis showed metabolic acidosis with pH of 6.95. Portable chest X-ray revealed no acute change.

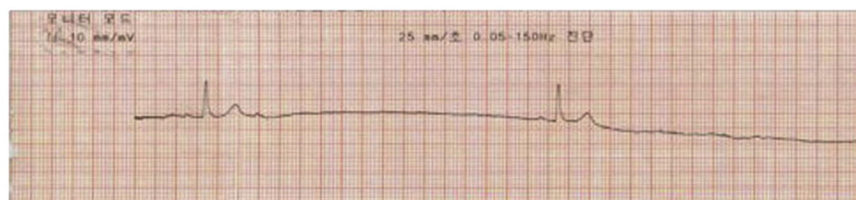
TTM was initiated in the emergency department without delay with surface cooling equipment. The equipment's target temperature was 34 °C. After starting TTM, arterial blood pressure dropped to 81/52 mm Hg with a heart rate of 64 per minute. However, vital signs were normalized immediately by increasing the infusion of norepinephrine. After stabilization, he was transferred to the Intensive Care Unit. TTM was continued for 24 h. During 24 h, midazolam, fentanyl, and rocuronium were administered to the patient intravenously. After 24 h, the patient was rewarmed gradually at a rate of 0.5 °C per hour (Fig. 2). There was no temperature fluctuation, arrhythmias, shivering, or seizure during TTM and rewarming. TTM and rewarming were completed on day 3. The patient opened his eyes spontaneously on day 5, obeyed commands on day 6, and was discharged on day 18. At the time of discharge, the patient had no neurologic deficiencies or other complications.

Our case report described the benefit of TTM for neurologic recovery in a patient who developed cardiac arrest with anaphylaxis. Anaphylaxis can be defined as an allergic reaction with an acute onset and a

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(A) Initial Rhythm



(B) Rhythm after ROSC

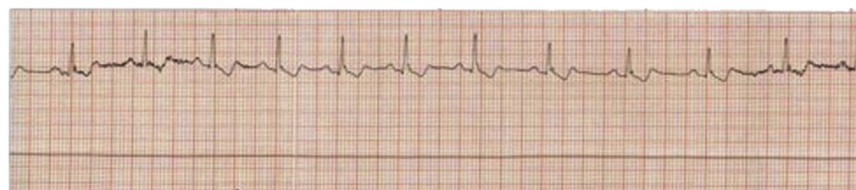


Fig. 1. EKG (lead II) rhythm strip.

potentially fatal outcome. Anaphylaxis is characterized by symptoms including more than two organ systems and the onset within a few minutes to hours [9]. When the diagnosis of anaphylaxis is made, appropriate treatment should be initiated immediately. Preferentially, intramuscular administration of epinephrine is recommended as a first line therapy. If repeated intramuscular epinephrine administration does not lead to stabilization, intravenous epinephrine administration should be considered. With epinephrine administration, supportive care such as allergen removal, fluid replacement, and oxygen therapy should be implemented [10].

However, until now, there are no recommendations for patients who undergo cardiac arrest care following anaphylaxis. According to the American Heart Association Guidelines in 2015, regardless of initial ECG rhythm, TTM is recommended for comatose adult patients with ROSC after cardiac arrest [11]. Also, a nationwide observational study showed that the effect of therapeutic hypothermia is best in OHCA patients with PEA as the initial ECG rhythm [12]. Therefore, TTM may increase functional recovery and survival in patients who experience ROSC after cardiac arrest with anaphylaxis.

Despite the limitation that this is only one case report, our case report is the first demonstration of a successful outcome following the

use of TTM after cardiac arrest and anaphylaxis. Based on our successful outcome, we recommend that TTM is considered in future cases involving cardiac arrest and anaphylaxis.

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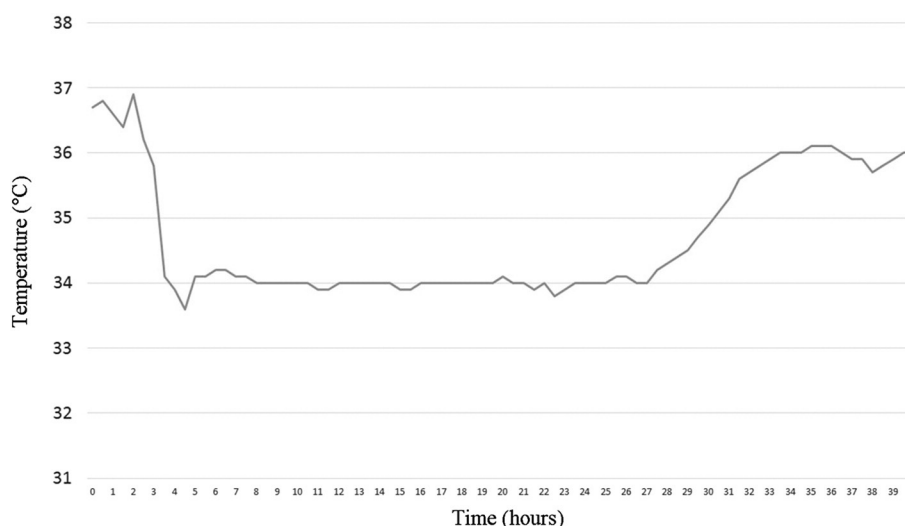


Fig. 2. Patient's core temperature (°C) over time.

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