Two Survival Cases Of Severe Aconite Poisoning By Percutaneous Cardiopulmonary Support System And Cardiopulmonary Bypass For Fatal Arrhythmia: A Case Report

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Citation

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Abstract

Objective: to propose adequate treatment of fatal aconite poisoning using percutaneous cardiopulmonary support system and cardiopulmonary bypass.
Design: case study.
Setting: cardiac care unit in a university hospital.
Patient: a 17-yr-old man ingested aconite roots to commit suicide and a 41-yr-old man eaten aconite tubers by accident.
Intervention: immediate application of percutaneous cardiopulmonary support system and cardiopulmonary bypass for fatal arrhythmia caused by aconite.
Measurements and main results: continuous ecg monitoring was performed. Concentrations of aconites in blood were measured by gas chromatography selected ion monitoring during institution of percutaneous cardiopulmonary support system and cardiopulmonary bypass. The changes of aconite concentration in blood showed that these concentrations are decreased under critical level 24 hours later from ingestion. At the same time fatal arrhythmias were also disappeared. The patients improved fatal arrhythmia and systemic circulation and discharged without neurological deficit.
Conclusion: immediate application of percutaneous cardiopulmonary support system and cardiopulmonary bypass enable to survive fatal aconite poisoning patients.

INTRODUCTION

Aconite tubers are most toxic wild plants distributed from asia to western europe [1,2,3,4]. It achieved some notoriety in the 19 th century as an agent for homicides and suicides. In modern times, aconite has been used as chinese herbal medicine, which are freely purchased from herb shop and consumed a doctation by herbal practitioner for pain control in northern hemisphere[5]. In japan, some cases of aconite poisoning appeared as result of committing suicide or accidental ingestion, mistaken for edible grass.

However aconite alkaloids have potential of serious and even fatal cardiotoxity, which management has still remained difficult to save in patients with therapeutic resistant fatal arrhythmia [6,7].

This report details two-survival cases of severe aconite-induced cardiotoxity using percutaneous cardiopulmonary support system (pcps and cardiopulmonary bypass) (cpb with changes of concentration of aconite alkaloids in blood and urine samples measured by gas chromatography selected ion monitoring [8].

CASE REPORTS

CASE 1

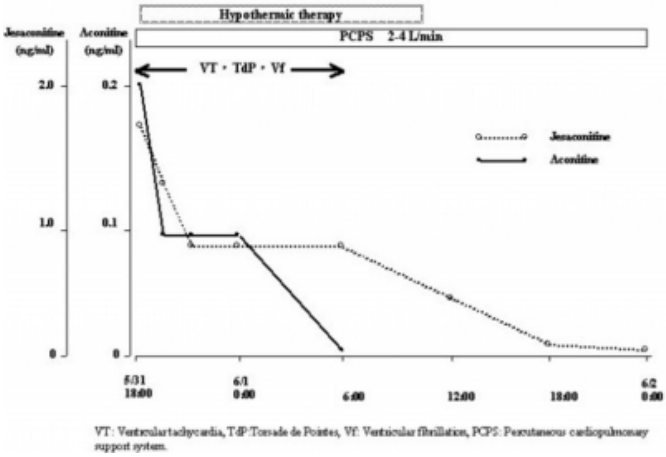
A 17-year old man had roots of “toricabuto”, one of wild plant known as monkshood, which contains aconite alkaloids to commit suicide. Two hours later he begun nausea, vomiting and chest discomfort, and then he was transferred to hospital. At that time, ventricular tachycardia and ventricular fibrillation appeared with a rapid faint pulse, weak respiration, and loss of consciousness. Four and a half hours later, he was transported to our hospital by ambulance

car. On admission, he was cardiac arrest and apnea so that he was immediately performed cardiopulmonary resuscitation (cpr, intubation and mechanical ventilation). After resuscitation, twelve-lead electrocardiogram showed multifocal tachycardia, torsade de pointes with rapid degeneration of ventricular fibrillation. Portable chest x-ray revealed no abnormality and laboratory examination revealed slight elevation of liver enzymes. Na, k and cl were 141.0, 4.6 and 106 meq/l respectively. Though intravenous infusion of several types of antiarrhythmics, such as lidocaine, mexiletine, magnesium, procaine and over thirty times of cardioversion had no effect of termination of such arrhythmia, forty minutes later from his admission he was performed percutaneous cardiopulmonary support system to maintain cerebral and visceral circulation.

Hypothermic therapy of 32 degree of rectal temperature was also performed to prevent brain damage and organ function, and then he was transferred to cardiac care unit for intensive care. He was maintained at least 60mmhg of systolic blood pressure and 50ml/hour of urination. Five hours later from the application, he improved decreased appearance of ventricular fibrillation. Fifteen hours later, sinus rhythm was appeared and he recovered from shock. About 48hours later, pcps was terminated with no difficulty. According to measurements of aconite alkaloids in blood and urine by gas chromatography selected ion monitoring [8],[9],[10], maximum aconitine concentration in blood was over 0.2ng/ml at nine hours later from his ingestion. It took eighteen hours that aconitine concentration in blood decreased below 0.12ng/ml (fig 1, which is fetal concentration of aconitine calculated from ld_{50} [11]). He discharged, nineteen days following admission without any neurological deficit.

Figure 1

Fig 1: Changes Of Concentration Of Aconites In Blood.



VT: Ventricular tachycardia, TdP:Torsade de Pointes, Vf: Ventricular fibrillation, PCPS: Percutaneous cardiopulmonary support system.

CASE 2

A 41-year old male ate “torikabuto” aconite tuber mistaken for edible grass. Soon after eating it, he developed symptoms of numbness, nausea, vomiting and dysarthria and admitted to emergency room. He developed ventricular tachycardia and torsade de pointes with rapid degeneration of ventricular fibrillation. Portable chest x-ray was normal and laboratory examination revealed no abnormality. On admission, he was not unconsciousness but difficult to walk alone. Two hours later, frequent ventricular premature contractile appeared. Thirty hours later, ventricular tachycardia and ventricular fibrillation appeared and he was unconsciousness. He became cardiac arrest and apnea so that he was immediately performed cardiopulmonary resuscitation (cpr, intubation and mechanical ventilation). After resuscitation, it was difficult to maintain systemic circulation, so that percutaneous cardiopulmonary support was applied immediately. Primary flow rate of pcps was set as 3l/min, but it found very difficult to maintain systemic circulation, because of thin in and out catheters. Over forty times of direct current cardioversion were performed for fatal arrhythmia. Twenty-three hours later, we decided to apply cardiopulmonary bypass using canulations to ascending aorta and right atrium. Cardiopulmonary bypass was performed for 186 hours because of prolonged pulmonary edema and left ventricular dysfunction. He also had complicated pulmonary fibrosis and acute renal failure during his admission. Therefore he discharged, ninety-five days following admission with no neurological deficit.

DISCUSSION

Aconite alkaloids are well known as one of herbal medicine,

and commonly used in asia [2,3]. However, they have potential of serious and even fatal cardiotoxity, which management has still remained difficult to save patients with fatal arrhythmia [12]. Some previous reports showed effectiveness of antiarrhythmics [1,6], such as mexiletine, lidocaine, magnesium sulfate which had no effect in these cases. However, in our cases, any cardiopulmonary resuscitation, antiarrhythmics and direct current cardioversion had not effective as a therapy in critical phase to maintain systemic circulation.

Fitzpatrick et al reported a first survival case of fatal aconite poisoning using cardiopulmonary bypass system and left ventricular assist device [13], but other reports detailed no available therapy for severe case that had fatal arrhythmia [14, 15]. Cpb and pcps are usually used to maintain systemic circulation during cardiac surgery or severe cardiac dysfunction. Our first case, primary application of pcps had much effectiveness for maintaining systemic circulation that enabled to keep renal function. According to the changing of aconites concentration in blood and urine measured by gc/sim [8], aconites disappeared from blood 24hours after ingestion and arrhythmia also disappeared simultaneously, but those in urine were detected for a few days. In second case, arrhythmia was also disappeared at 24 hours after ingestion. These results shows that it may take about 24 hours to decrease the concentration of aconites in blood less than 0.12 ng/ml, associated with improvement of arrhythmia. In addition, ohno et al. Reported the influence of tetrodotoxin, which attenuated toxic effects of aconitine in vivo, which might be an antagonist for aconites [16].

Therefore, in fatal case, immediate application of pcps and/or pcb must be considered to rescue severe aconites poisoning patient, which enable to maintain systemic circulation until the concentration of aconite alkaloids decrease below 0.12 ng/ml in blood within first 24hours.

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