

## Case Report

# Successful recovery from prolonged cardiopulmonary resuscitation in cardiac arrest with refractory ventricular fibrillation

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Anesthesia-attributed cardiac arrest has been known to be associated with improved survival. When the duration of cardiopulmonary resuscitation (CPR) increases, the survival rate decreases. We experienced a case of a 68-year-old man with post-extubation cardiac arrest due to refractory ventricular fibrillation. Despite of 52 minutes of conventional CPR, sustained return of spontaneous circulation (ROSC) was not

achieved. After insertion of extracorporeal membrane oxygenation, ROSC was achieved. The patient was discharged on postoperative day 25 without any neurologic complications. (Rawal Med J 201;43:186-188).

**Keywords:** Cardiac arrest, extracorporeal membrane oxygenation, hypothermia, ventricular fibrillation.

## INTRODUCTION

Cardiac arrests during perioperative period represent the most serious complication of anesthesia and surgery. Ventricular fibrillation (VF) is a life-threatening rhythm. Survival rate declines from 15% to 4.3% when the duration of cardiopulmonary resuscitation (CPR) exceeds 15 min.<sup>1</sup> And when the interval from initiation of CPR to first defibrillation exceeds 4 min, the survival rate also declines from 33.3% to 5.4%.<sup>1</sup> In this case, we describe a patient who received prolonged CPR lasted for 84 min due to recurrent VF and survived.

## CASE PRESENTATION

A 68-year-old man (159 cm and 55 kg) with past history of valvular heart disease, chronic kidney disease and heart failure underwent acromioplasty and repair of rotator cuff tear. Two years ago, echocardiography revealed ejection fraction of 18% with global akinesia of left ventricle and severe left ventricular systolic dysfunction. He had been taking aspirin, bisoprolol, candesartan, hydrochlorothiazide and spironolactone. On this admission, preoperative transthoracic echocardiography showed ejection fraction of 45 percent and regional wall motion abnormality with moderate left ventricular systolic dysfunction. ECG showed sinus rhythm with heart rate of 57 beats per minute.

Before induction of general anesthesia, his blood pressure was 168/83 mmHg and heart rate was 61 beats per minute. General anesthesia was commenced with 0.15 mcg/kg/min of remifentanyl infusion, 80 mg of propofol, and 50 mg of rocuronium. Endotracheal intubation was performed with a reinforced endotracheal tube (7.5 mm in internal diameter) and anesthesia maintained with 0.075 mcg/kg/min of remifentanyl and 6 vol% of desflurane. Hypotension occurred after position changed from supine to beach chair position and 100 mcg of phenylephrine was intravenously administered. He was hemodynamically stable throughout the surgery, which took 70 minutes. Two mg/kg of sugammadex was given to reverse neuromuscular block and he was extubated.

Two minutes later, ECG revealed ventricular fibrillation and there was no pulse; thus, immediate defibrillation and standard CPR were performed. Five minute later, first return of spontaneous circulation (ROSC) was achieved. He was intubated again after 40mg of propofol. One minute after intubation, ECG revealed ventricular fibrillation again and ACLS was started. Ventricular fibrillation repeatedly developed during resuscitation. Despite of 50 minutes of ACLS, sustained ROSC was not achieved. And body temperature gradually decreased from 36.0 to 29.0<sup>c</sup>

A decision was made to place the patient to

extracorporeal life support. Venoarterial extracorporeal membrane oxygenation (ECMO) catheters were inserted into his femoral vessels and ECMO was started with an initial flow of 3.25 L/min. During extracorporeal CPR, his body temperature gradually increased to 33.0°C and ROSC was achieved. His blood pressure was 143/94 mmHg. The sustained ROSC happened after 84 minutes from first cardiac arrest and 32 minutes from start of ECMO.

Echocardiography was similar to the results of previous echocardiography. And the ergonovine test result was positive. He was successfully weaned off ECMO and ventilation support. He was discharged on 25<sup>th</sup> postoperative day without any serious complications.

## DISCUSSION

The incidence of perioperative cardiac arrest is has been reported to range between 0.5 and 9.6 per 10000 anesthesia and it may be decreasing over time.<sup>2</sup> The anesthesia-related cardiac arrest account for a small portion of total perioperative cardiac arrests. Several studies showed that perioperative anesthesia-related cardiac arrests were between 4.3 to 10.8% of all cardiac arrests respectively.<sup>3-5</sup>

In 1980s, the most common cause of anesthetic cardiac arrest was inadequate ventilation. Due to advanced respiratory monitoring, medication-related cardiac arrest became the most common cause of anesthetic cardiac arrest.<sup>6</sup> There are narcotic overdose, overdose of induction agent, reaction to premedication and recently sugammadex in the causes of medication-related cardiac arrest. But the cause of cardiac arrest in this case was not clear. We supposed that his underlying heart disease or sugammadex could be the cause of this cardiac arrest. Although the patient had past histories of valvular heart disease and heart failure, perioperative ECG and cardiac enzymes were normal and there weren't enough signs to diagnose anaphylaxis or anaphylactoid reaction.<sup>7</sup> It was his first exposure to sugammadex and no immunologic test was done.

The possibility of Kounis syndrome was considered.<sup>8</sup> This is defined as an acute coronary syndrome such as coronary spasm, acute myocardial infarction, and stent thrombosis

triggered by the release of inflammatory mediators following an allergic insult. It can occur without typical symptoms of anaphylaxis such as skin, respiratory and GI symptoms. Considering sudden ECG changes to VF after sugammadex injection and postoperative positive ergonovine test, Kounis syndrome can be the cause of this cardiac arrest.

Anesthesia-attributed and medication-related cardiac arrests are known to be associated with improved survival.<sup>3-5</sup> In a study by Sprung et al,<sup>5</sup> 79.2% of patients whose cardiac arrests were attributed to anesthesia survived, whereas only 29.1% of patients whose cardiac arrests were not related to anesthesia survived. Newland et al,<sup>4</sup> and An et al,<sup>3</sup> reported that the survival of medication-related cardiac arrest was relatively high. In this case, although the patient was defibrillated within 4min, he did not recover after one hour CPR. Nevertheless, we didn't give up and he eventually survived without neurologic sequelae.

Chen et al<sup>9</sup> reported that extracorporeal CPR had a short-term and long-term survival benefit over conventional CPR in patients with cardiac arrest of cardiac origin. Cerebral metabolic rate is known to decrease by 6% to 7% degree Celcius of temperature reduction.<sup>10</sup> Bruel et al<sup>11</sup> suggested that inducing mild hypothermia during ACLS may reduce the duration of cerebral ischemic injury compared with post-ROCS cooling. In our case, sustained ROSC couldn't be achieved despite 50 minutes of conventional CPR and it happened after insertion of ECMO. And although we didn't intend, his body temperature gradually decreased and it might have resulted in favorable neurologic outcome. In summary, if the cardiac arrest or VF seem unresponsive to conventional CPR, we can consider applying ECMO or therapeutic hypothermia. If we don't give up, there is possibility of recovery.

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