



## Case Report

# Novel resuscitation devices facilitate complete neurologic recovery after prolonged cardiac arrest in postanesthesia care unit<sup>☆</sup>



Elif C. Cingi MD (Assistant Professor of Anesthesiology)\*, Luke A. McMahon DDS, Richard C. Prielipp MD, MBA, FCCM (Professor of Anesthesiology)

Department of Anesthesiology, University of Minnesota, 420 Delaware St SE, MMC 294, Minneapolis, MN 55455, USA

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**Abstract** Cardiac arrest in the perioperative period is associated with significant morbidity and mortality. Novel resuscitation devices may afford patients improved survival and limit neurologic injury. We report a case of cardiac arrest in the postanesthesia care unit that required an extensive period of cardiopulmonary resuscitation assisted by the ResQPOD impedance threshold device to optimize coronary perfusion and a LUCAS chest compression system to maintain optimal cardiopulmonary resuscitation while transporting the patient to the cardiac catheterization laboratory. Furthermore, after stabilization for an occluded left anterior descending artery with stent placement, an institutional hypothermia protocol was initiated using ThermoGuard XP Temperature Management system for 24 hours.

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## 1. Introduction

Prompt recognition of cardiovascular collapse in the postanesthesia care unit (PACU) with appropriate intervention by anesthesiologists is critical to maximize the patient's chance for complete recovery [1]. Indeed, as anesthesiologists acquire greater comprehensive responsibility for the patient's global well-being, they must stay current with advanced resuscitation technology. This perioperative responsibility includes guidelines to the American Heart Association basic and advanced life support algorithms, as well as application of novel devices

that optimize ventilation and circulation to maximize perfusion to the heart and brain [2]. Lastly, after resuscitation from warm circulatory arrest, increased attention has focused on improving brain recovery by instituting immediate global hypothermia. This report highlights the need for anesthesiologists to stay abreast of these technologies as the sequential application of 3 such resuscitation aids maximized the opportunity for rescue and full recovery of our patient after sudden cardiac arrest in the PACU.

## 2. Case description

A 51-year-old man was scheduled for a robotic-assisted left partial nephrectomy under general anesthesia. During assessment 6 weeks prior for complaints of chest pain at an outside hospital, an incidental left renal mass was noted. At that time,

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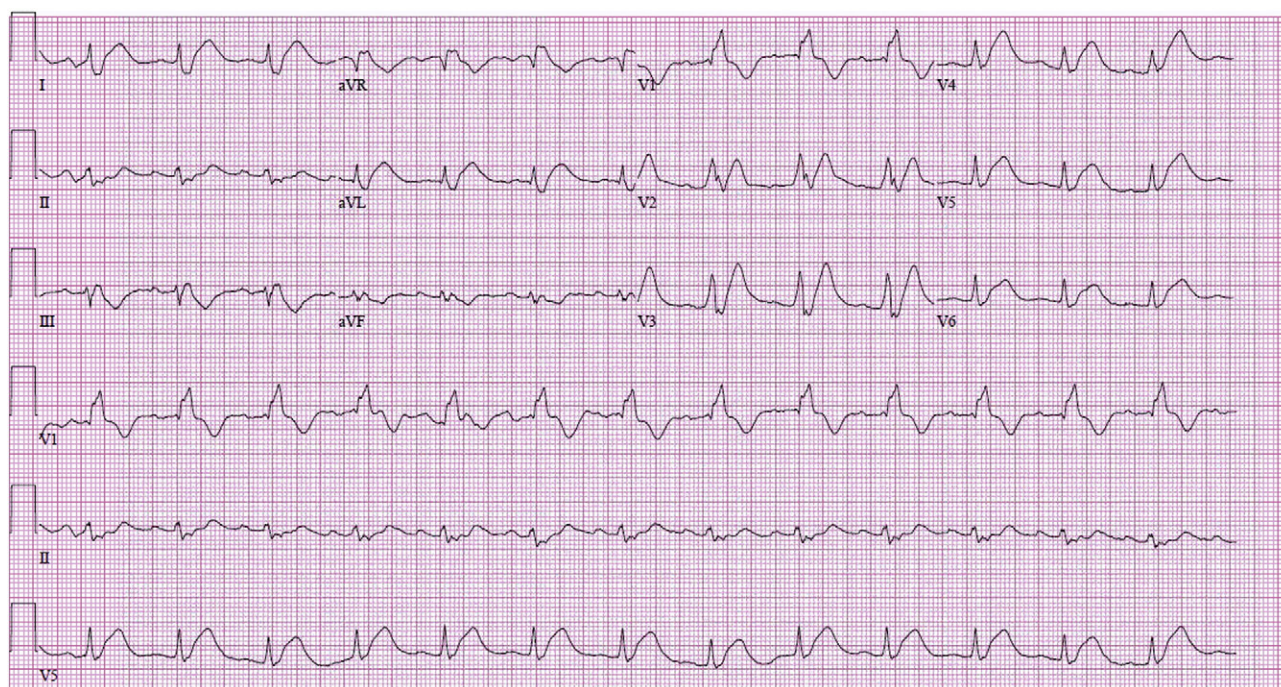
\* Corresponding author at: North Memorial Medical Center, Robbinsdale, 3300 Oakdale Ave N, Robbinsdale, MN 55422, USA.

E-mail addresses: cing0004@umn.edu, elifcanan@hotmail.com (E.C. Cingi), mcmah117@umn.edu (L.A. McMahon), prielipp@umn.edu (R.C. Prielipp).

a significant increase in troponin and ST-segment elevation on his electrocardiogram were noted and the patient underwent cardiac catheterization which demonstrated no evidence of obstructive coronary artery disease and normal left ventricular function. Thoracic echocardiogram demonstrated an ejection fraction of 65%, normal left ventricular function, and no wall motion abnormalities. Coronary computed tomographic angiogram showed no evidence of coronary artery disease with a low (0) coronary artery calcium score of zero (no calcified plaque detected). A cardiac magnetic resonance imaging was performed and demonstrated 2 small foci of myocarditis, presumably accounting for the chest pain. The patient was seen for preoperative evaluation and cleared by cardiology and the perioperative anesthesia assessment team for the elective renal resection. The patient denied any chest pain, shortness of breath, or dyspnea on exertion on the day of surgery.

After induction of general anesthesia with 2 mg intravenous midazolam, 100 mg propofol, fentanyl 100  $\mu$ g, and rocuronium 50 mg, the trachea was intubated and a left radial arterial catheter inserted. Anesthesia was maintained with isoflurane. The case lasted 5 hours and there were no periods of significant hypotension, hypertension, or tachycardia. One hour before the end of surgery, a sinus arrhythmia was noted and 1 g of magnesium sulfate was administered with prompt resolution. Simultaneously, an arterial blood gas revealed no abnormalities. However, during emergence and extubation, QRS widening was noted and the decision was made to obtain additional laboratory studies and consult cardiology postoperatively. The patient was responsive and breathing spontaneously, and all vital signs were stable upon transport to the PACU.

Immediately upon arrival to the PACU, a 12-lead electrocardiogram revealed ST changes noted in the limb leads (Fig. 1). Nine minutes after arrival to the PACU, the patient entered into polymorphic ventricular tachycardia (Fig. 2) while talking to the cardiology team. Advanced Cardiac Life Support (ACLS) protocol was initiated and the patient underwent continuous chest compressions and mask ventilation with an Impedance Threshold Device (ITD), the ResQPod Circulatory Enhancer (Advanced Circulatory Systems, Inc, Roseville, MN), used during assisted ventilation. After the second of 2 initial cardioversions, the patient had return of spontaneous circulation (ROSC). He was responsive and breathing spontaneously, and had 9 minutes of sinus rhythm; however, his cardiac rhythm suddenly deteriorated into ventricular fibrillation. The airway was then secured with tracheal intubation again using the ResQPod device now attached to the endotracheal tube. During this second resuscitation, the patient received epinephrine, lidocaine, phenylephrine, and magnesium sulfate along with 8 cardioversions and continuous chest compressions. The LUCAS (Physio-Control Inc/Jolife AB, Lund, Sweden) device was used to ensure adequate chest compressions during the transport to the cardiac catheterization laboratory, 36 minutes after the initial arrest. A 100% thrombotic occlusion of the left anterior descending coronary artery was noted (Fig. 3). Successful percutaneous coronary intervention (PCI) was performed (Fig. 4) with thrombectomy and stent placement 59 minutes after the initial cardiac arrest. The patient was supported by the LUCAS device for 28 minutes during the transport and initial PCI. Shortly after the PCI, the LUCAS device was removed, and an intra-aortic balloon pump was placed. The patient was transferred to the intensive



**Fig. 1** Initial ECG obtained in PACU with QRS widening and ST changes. ECG = electrocardiogram; PACU = postanesthesia care unit.

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