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IMAGING VIGNETTE

INTERMEDIATE

CLINICAL VIGNETTE

Coronary Artery and Right Ventricular Perforation Due to Mechanical CPR Trauma

David Elison, MD, Creighton Don, MD, PhD, Kenta Nakamura, MD

ABSTRACT

Mechanical cardiopulmonary resuscitation (CPR) devices provide consistent, high-quality CPR but have been associated with a risk of visceral organ injury. However, these devices are used when traditional CPR is logistically difficult, such as during primary percutaneous coronary intervention. The following patient case illustrates mechanical CPR device use resulting in ventricular and coronary artery injury. (**Level of Difficulty: Intermediate.**)
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A 46-year-old man suffered unwitnessed cardiac arrest. On medic arrival, patient's rhythm was ventricular fibrillation that was unresponsive to defibrillation. Cardiopulmonary resuscitation (CPR) was initiated, and subsequent rhythm checks revealed pulseless electrical activity. He was transported with ongoing CPR to a high-volume academic center. Chest compressions were transitioned to the LUCAS device (Physio-Control Inc./Jolife AB, Lund, Sweden) to facilitate cardiac catheterization (**Figure 1**). Breath sounds were not appreciated on the right side, and tube thoracostomy was performed with drainage of serous fluid. Return of spontaneous circulation was achieved but could not be maintained; thus, the decision was made to initiate extracorporeal membrane oxygenation. Upon cannulation, the patient was volume sensitive and noted to have a copious blood from the right chest tube.

Coronary angiography revealed perforation of an atrial branch from the right coronary artery (RCA) (**Figure 2A**) and acute occlusion of the distal left main coronary artery (not shown). Percutaneous coronary intervention was successfully performed with placement of a drug-eluting stent across the left main and left anterior descending coronary arteries with restoration of flow. The patient was successfully defibrillated. Next, the atrial branch was selectively engaged with a microcatheter (**Figure 2B**) and confirmed (**Figure 2C**). Multiple 2-mm neurovascular coils were deployed, and a mixture of abdominal fat and Gel-foam (Pharmacia and Upjohn Company, Kalamazoo, Michigan) was injected for embolization (**Figure 2D**).

From the Division of Medicine, Department of Cardiology, University of Washington Medical Center, Seattle, Washington. The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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ABBREVIATIONS AND ACRONYMS

CPR = cardiopulmonary resuscitation

RCA = right coronary artery

RV = right ventricle

The patient continued to hemorrhage from the right hemithorax. Sternotomy revealed laceration of the right ventricle (RV) directly below the LUCAS suction cup. The RV injury was surgically repaired (**Figure 3**). Unfortunately, the patient progressed to multisystem organ failure. Given the grave prognosis, care was withdrawn, and the patient expired.

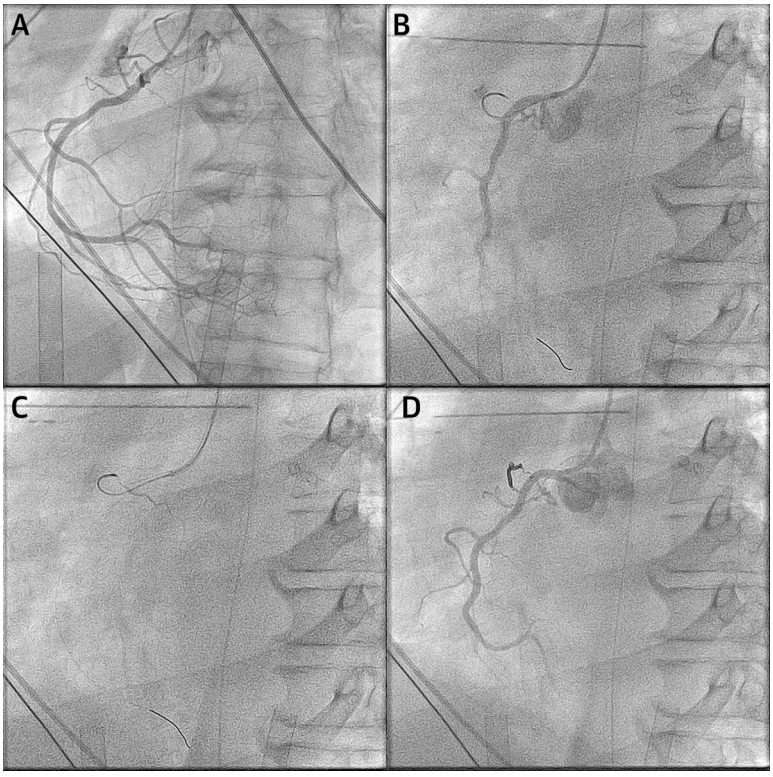
DISCUSSION

Mechanical CPR (mCPR) has been studied in out-of-hospital cardiac arrest with generally equivocal outcomes. Although laboratory analysis of mCPR demonstrates consistent elevations in cardiac output (1), randomized controlled data have shown no survival benefit or improved neurological outcomes at 4 h, hospital discharge, and 30-day follow-up (2). Although we believe this is the first publication reporting RCA and RV laceration during CPR, a large autopsy study by Smekal et al. (3) suggests lower cardiac complication rates from standard CPR compared with mCPR. In emergency settings, mCPR can provide support during angiography and revascularization, although this technique is not without risk. The present patient likely suffered both RCA and RV injury as a result of device trauma despite use by experienced operators at a high-volume center.

FIGURE 1 The LUCAS Device

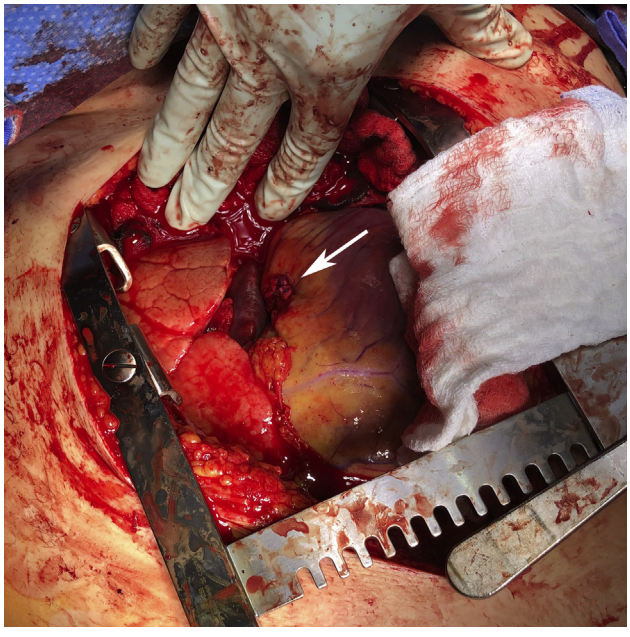
The LUCAS device (Physio-Control Inc./Jolife AB, Lund, Sweden).

FIGURE 2 RCA Angiography With Perforation



(A) Perforated proximal atrial branch of the right coronary artery. **(B)** Selective engagement of the perforation. **(C)** Microcatheter contrast injection of the perforated vessel. **(D)** Hemostasis obtained. RCA = right coronary artery.

FIGURE 3 Intraoperative Right Ventricular Repair



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ADDRESS FOR CORRESPONDENCE: Dr. David Elison, University of Washington Medical Center, 1959 NE Pacific Street, Box 356422, Seattle, Washington 98195. E-mail: davide5@uw.edu.

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KEY WORDS coronary artery laceration, CPR, CPR complications, mechanical cardiopulmonary resuscitation, percutaneous coronary intervention, PCI