

## IMAGES IN INTERVENTION

# First-in-Man Fully Percutaneous Complete Bypass of Heart and Lung

L. Christian Napp, MD,<sup>a</sup> Jens Vogel-Clausen, MD,<sup>b</sup> Andreas Schäfer, MD,<sup>a</sup> Axel Haverich, MD,<sup>c</sup> Johann Bauersachs, MD,<sup>a</sup> Christian Kühn, MD,<sup>c</sup> Jörn Tongers, MD<sup>a</sup>

A 24-year-old man was admitted to a regional hospital after an attempted suicide by taking 9 g of the antidepressant venlafaxine. After initial seizures, overnight progressive cardiogenic shock developed (1,2) and resulted in cardiac arrest from electromechanical dissociation (EMD) 12 h after ingestion.

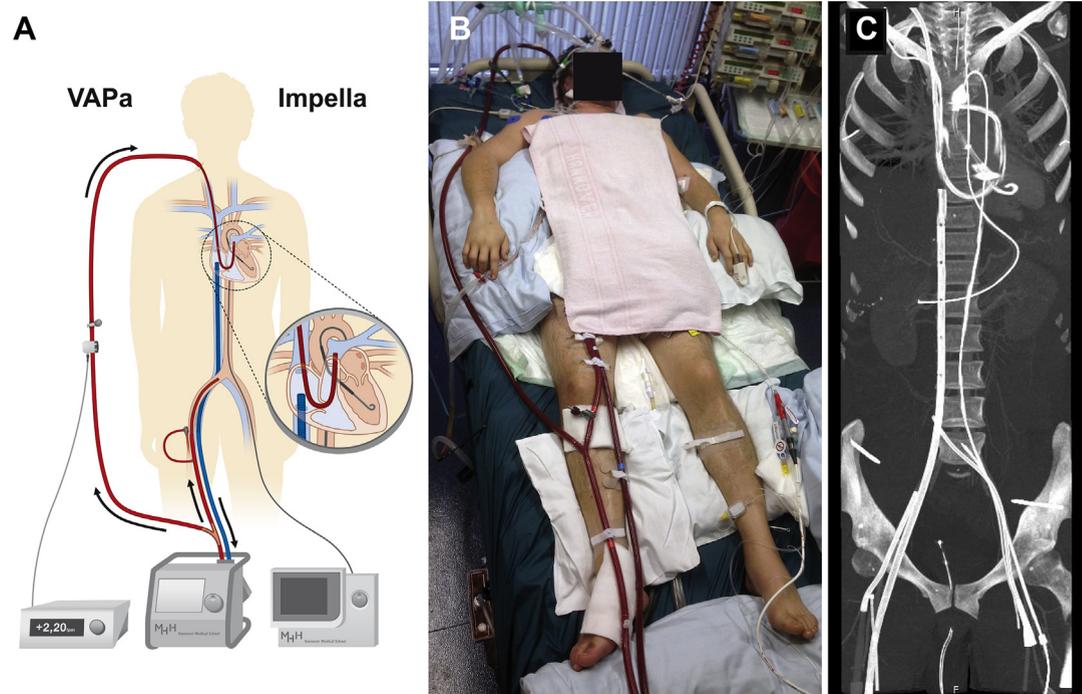
Femoral venoarterial extracorporeal membrane oxygenation (VA-ECMO) was inserted under continued cardiopulmonary resuscitation. On arrival at our center the patient had persistent cardiac arrest (EMD) on VA-ECMO support (flow, 5.5 l/min). Coronary artery disease was absent on angiography. The left ventricle (LV) was severely dilated (left ventricular end-diastolic pressure, 36 mm Hg) (Online Video 1) with most segments being akinetic. Massive pulmonary congestion caused by functional cardiac arrest and a toxic effect of venlafaxine (3) was present, necessitating repetitive endotracheal suctioning. For re-establishing transpulmonary blood flow (Online Video 2) and unloading the LV, an Impella CP microaxial pump (Abiomed, Danvers, Massachusetts) was inserted (Figure 1). However, Impella flow was very unstable because of persistent right ventricular arrest (Online Video 2), and pulmonary gas exchange was almost impossible.

Therefore we expanded the system to a novel form of mechanical support.

A flexible 15-F ECMO cannula was introduced via the right internal jugular vein into the pulmonary artery (Figure 1) over a stiff Amplatz guidewire and connected to the ECMO outflow (veno-arterial-pulmonary-arterial cannulation [VAPA]) (4). Now the ECMO drained 5.5 l/min from the right atrium and returned 2 to 3 l/min to the pulmonary artery and 2.5 to 3.5 l/min toward the aorta, as adjusted by a clamp. The failing right ventricle was bypassed and preoxygenated blood supplied to the pulmonary artery was consecutively drained from the failing LV by the Impella. As a result, upper and lower body gas exchange was completely taken over by the ECMO, and systemic and pulmonary circulatory function was taken over by the triple cannulated ECMO and the Impella.

The LV consecutively regained pulsatility, catecholamine use decreased, and respiratory function recovered (Figure 2). After 6 days ECMO and Impella could be explanted. The patient was weaned from mechanical ventilation, fully mobilized, and ultimately transferred to rehabilitation with normalized cardiac function (Online Video 3), chest radiograph,

From the <sup>a</sup>Cardiac Arrest Center, Department of Cardiology and Angiology, Hannover Medical School, Hannover, Germany; <sup>b</sup>Institute for Diagnostic and Interventional Radiology, Hannover Medical School, Hannover, Germany; and the <sup>c</sup>Department of Cardiothoracic, Transplantation and Vascular Surgery, Hannover Medical School, Hannover, Germany. This study was supported by the German Research Foundation (Clinical Research Unit 311). The authors received no funding for the present work and there was no sponsor or funder involved. The work is fully investigator-initiated. Dr. Napp received travel support to congresses from Abiomed; and lecture honoraria from Maquet. Dr. Vogel-Clausen is an advisor to Boehringer Ingelheim, Novartis, Parexel, and Bayer; and has received research support from Siemens Healthineers. Dr. Schäfer has received lecture honoraria and research funding from Abiomed. Dr. Haverich has received lecture honoraria from Xenios/Medos. Dr. Bauersachs received lecture honoraria and research funding from Abiomed. Dr. Kühn has received lecture honoraria from Maquet. Dr. Tongers has received travel support and lecture honoraria from Abiomed. Drs. Kühn and Tongers contributed equally to this article.

**FIGURE 1** Total Percutaneous Mechanical Support of Cardiopulmonary Failure

On arrival the patient had functional cardiac arrest ([Online Videos 1 and 2](#)) on veno-arterial (VA) extracorporeal membrane oxygenation (ECMO) support and severe lung failure. An Impella microaxial pump was inserted into the left ventricle and VA-ECMO was escalated to veno-arterial-pulmonary-arterial (VAPa) ECMO by introducing a third cannula into pulmonary artery position. This approach overall resulted in a circulatory bypass of both ventricles and fully extracorporeal gas exchange. **(A)** Schematic. **(B)** Picture of the patient. **(C)** Computed tomography.

Download English Version:

<https://daneshyari.com/en/article/8664206>

Download Persian Version:

<https://daneshyari.com/article/8664206>

[Daneshyari.com](https://daneshyari.com)