

## “ECMELLA” use in a critically ill patient with cardiogenic shock

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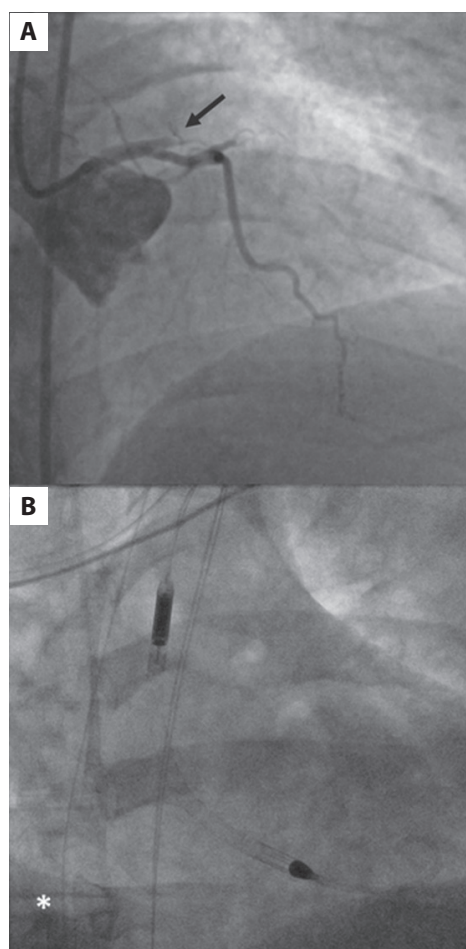
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A 43-year-old male was admitted to the catheterization laboratory with ST-segment elevation myocardial infarction (STEMI) complicated by cardiogenic shock (CS). Before admission, the patient experienced 20 hours of chest pain and a sudden cardiac arrest (CA) resuscitated by emergency medical services. On admission, the patient was conscious and reported that he had been on a ketogenic diet (KD) in the previous months. An emergent coronary angiogram revealed an occluded left anterior descending artery (LAD) following percutaneous coronary angioplasty with implantation of the Xience Pro S stent (Abbott Vascular, Irvine, CA, US; **Figure 1A**). At the time of the procedure, multiple episodes of cardiac arrest caused by asystole reoccurred. Despite quick and effective resuscitation, the arterial blood gas test showed profound metabolic acidosis with a pH of 6.9. Due to his worsening hemodynamic state, the patient was intubated and veno-arterial extracorporeal membrane oxygenation (V-A ECMO) Xenios (Fresenius Medical Care, Heilbronn, Germany) was applied with cannulas inserted into the femoral vessels (**Figure 1B**). However, after a few hours, symptoms of volumetric and pressure overload of the left ventricle occurred. Consequently, the Impella CP (Abiomed, Danvers, MA, US) system was implanted in the left ventricle via the femoral approach (**Figure 1B**). Despite clinical improvement on “ECMELLA” support, gradual deterioration of hemodynamic status and multi-organ failure were observed, resulting in death on the 3<sup>rd</sup> day of hospitalization.



**Figure 1. A.** Initial coronary angiography showing occlusion in the proximal segment of the LAD. At the time of PCI, implantation of V-A ECMO was performed (arrow). **B.** Radiogram showing Impella CP implanted in the aorta and left chamber. The venal catheter of the ECMO system is visible in the left bottom corner of the image (asterisk)

Abbreviations: LAD, left anterior descending artery; PCI, percutaneous coronary intervention; V-A ECMO, veno-arterial extracorporeal membrane oxygenation

There is a growing body of evidence suggesting that early unloading of the left ventricle via the Impella CP system, combined with ECMO, provides better results than ECMO alone in critically ill patients with CS [1–3]. Importantly, hemodynamic benefits of “ECMELLA” may be easily offset by complications, mostly including bleeding and hemolysis. That being said, obtaining meticulous vascular access and careful monitoring must be conducted. Despite none of these complications occurring in the presented patient, the combined support did not provide enough improvement to save his life.

The role of ketone body metabolism in heart ischemia remains unclear. In animal models, variations in ketone body concentrations did not affect meaningfully healthy heart metabolism [4]. In contrast, under circumstances of ischemia, a high concentration of ketone bodies was associated with worse outcomes [5]. Further research is necessary to elucidate if ketosis worsens heart ischemia or is it rather a hallmark of severe metabolic alterations. Therefore, the presence of KD in the presented patient’s medical history leaves the question of its role in the course of MI unanswered. However, an untypical association between KD and the occurrence of post-reperfusion non-shockable arrhythmias and a strong tendency to acidosis cannot be excluded.

“ECMELLA” constitutes a promising therapeutic intervention for the most severe cases of cardiogenic shock. Its use should be considered only in highly experienced centers to minimize the risk of complications which could outweigh its potential benefits. Nonetheless, even quick and uncomplicated implementation of “ECMELLA” does not guarantee success.

## Article information

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