

# Cardiac Tamponade in a Patient Supported by Veno-arterial Extracorporeal Membrane Oxygenation

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## ABSTRACT

Cardiac tamponade occurring in a patient supported on central veno-arterial extracorporeal membrane oxygenation is depicted in a transesophageal echocardiography image and associated rendering. Prompt recognition of tamponade, which can be assisted with echocardiography, and emergent evacuation is critical to restoring cardiovascular stability.

**Keywords:** ECHO, echocardiography, ECMO, tamponade, transesophageal

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## IMAGE DESCRIPTION

Complete loss of pulsatility of the systemic arterial waveform rapidly developed in a patient supported on central veno-arterial (VA) extracorporeal membrane oxygenation (ECMO). Progressive inability to maintain ECMO flow was noted along with increasingly negative inlet pressure and a rising central venous pressure (CVP). Transesophageal echocardiography [Figure 1a] identified a large pericardial effusion with early diastolic collapse of the right ventricle. The left ventricle (LV) was underfilled, despite a severe reduction in flow through the LV vent. Findings were consistent with cardiac tamponade [Figure 1b], and the patient underwent emergent surgical evacuation of hemopericardium.

Cardiac tamponade in the native circulation occurs when increased intrapericardial pressure prevents diastolic filling of the heart, causing reduced cardiac output that can lead

to shock. Similarly, reduced venous return from tamponade in patients on VA ECMO causes ECMO flow to drop. Inlet pressures become increasingly negative from reduced venous return even though CVP rises as a reflection of elevated juxta cardiac pressure. Tamponade is not unique to VA ECMO as this complication has been described during veno-venous (VV) ECMO secondary to catheter malposition and right ventricular rupture. In VV ECMO, tamponade presents with a rising CVP, increasingly negative inlet pressures and reduced ECMO flow.<sup>[1]</sup> However, the reduced VV ECMO flow does not impact systemic blood flow, which is reduced by the effect of tamponade on native cardiac output.

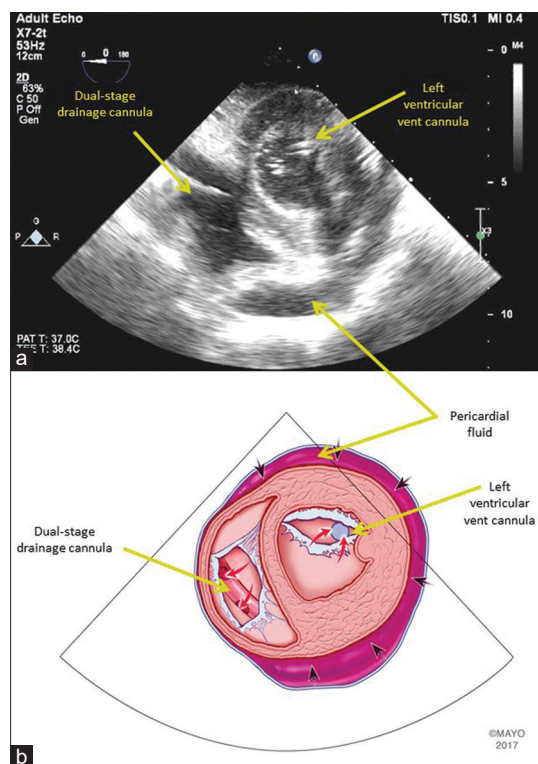
Hemostatic complications remain a leading cause of morbidity and mortality in patients supported with ECMO.<sup>[2]</sup> Approximately 60% of ECMO episodes are complicated by at least one bleeding event.<sup>[3]</sup> Data from the Extracorporeal Life Support Organization registry

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**Figure 1:** (a) Transgastric short-axis TEE image showing the base of the left ventricle with the mitral valve open. The venous cannula visualized passing through the right atria. A circumferential pericardial effusion is shown along with diastolic collapse of the right ventricle. (b) Rendering demonstrating key anatomic findings including the venous cannula, the left ventricular vent in cross-section, and the pericardial effusion. Extrinsic compression of the left and right ventricle from fluid accumulating within the pericardial sac is denoted by black arrows

reported a 2.3% incidence of tamponade carrying a 52% mortality.<sup>[2]</sup> Tamponade in patients supported with ECMO may present with rising negative inlet pressure despite a rising CVP. Prompt recognition of tamponade and

emergent evacuation is critical to restoring cardiovascular stability.

### Declaration of patient consent

Written informed consent for research authorization of the patient's medical record for the purposes of publication was obtained and is a component of the medical record.

### Abbreviations

VA, veno-arterial

VV, veno-venous

ECMO, extracorporeal membrane oxygenation

TEE, transesophageal echocardiography

CVP, central venous pressure

LV, left ventricle

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### Conflicts of interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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