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Peer-reviewed Case Report

Thrompella: Acute Impella Thrombosis during Ecpella Support

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Abstract

We present a case of acute Impella thrombosis during Ecpella support in a 48-year-old man listed for a heart transplantation. After two weeks of Ecpella support, echocardiography revealed a 2.6 x 1.1 cm mobile thrombus attached to the Impella inlet (Video). The Impella and attached thrombus were pulled across the aortic valve into the descending aorta and removed without systemic thromboembolism. Due to the ongoing need for left ventricular venting, a new Impella CP was placed.

Keywords: Impella, extracorporeal membrane oxygenation, thrombosis, Ecpella

Introduction

Retrograde aortic blood flow during peripheral veno-arterial extracorporeal membrane oxygenation (V-A ECMO) can result in aortic valve closure, left ventricular (LV) distension, stagnation of blood, and thrombus formation. Approximately 4% of patients who receive V-A ECMO support can develop intraventricular thrombus despite therapeutic anticoagulation; left ventricular venting (LVV) may reduce this risk.[1] Although internal Impella (Abiomed) thrombosis or failure can occur ~25% of the time in the absence of anticoagulation, acute extra-device thrombus ingestion is rare, and optimal management remains unknown.[2] We present a case of acute Impella thrombosis during Ecpella support.

Case Report

A 48-year-old man with end-stage cardiomyopathy was urgently listed for a heart transplant. While awaiting a donor, he decompensated, necessitating peripheral V-A ECMO support. Subsequently, pulmonary edema and hemoptysis developed leading to intubation and LVV with an Impella CP (Figure 1).

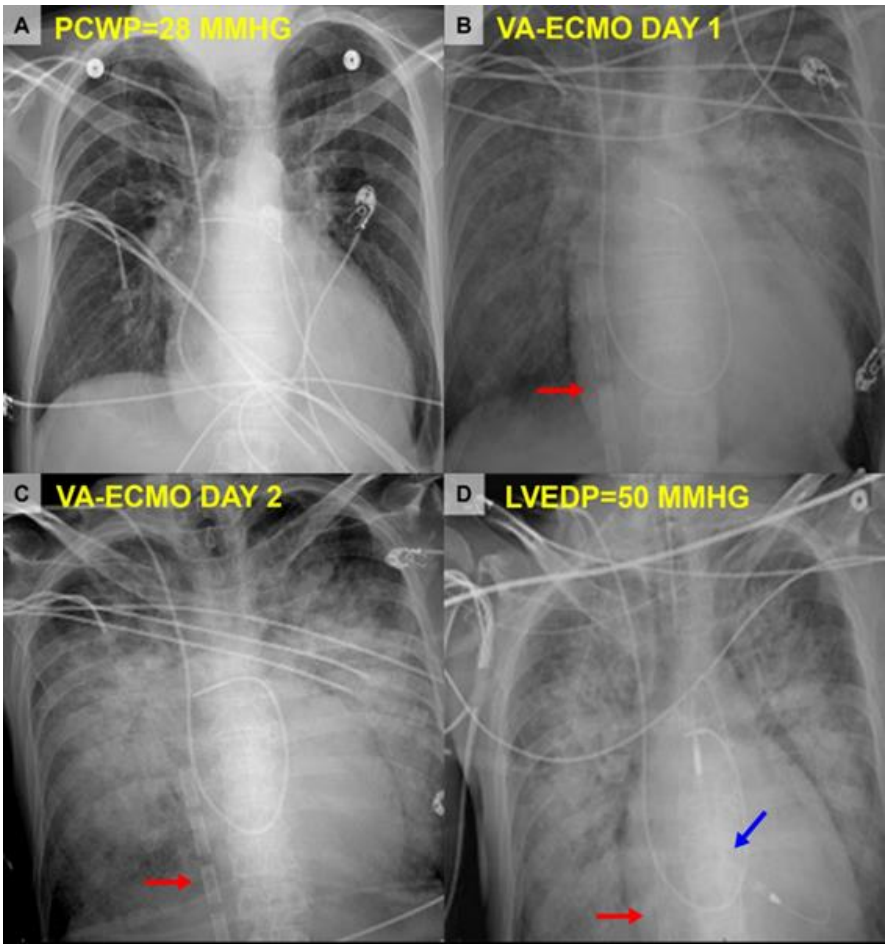

Figure 1. *Changes in left heart filling pressure and chest radiographs over time. (A) Image is taken before V-A ECMO. (B-D) Images after V-A ECMO support. Red arrows indicate ECMO venous drainage cannula. Blue arrow points to Impella CP. LVEDP, left ventricular end-diastolic pressure; PCWP, pulmonary capillary wedge pressure; V-A ECMO, veno-arterial extracorporeal membrane oxygenation.*

Ongoing bleeding complications required prolonged reduction of anticoagulation. After two weeks, multiple suction events suddenly occurred without a change in purge pressure or flow rate (Figure 2). Echocardiography revealed a 2.6 x 1.1 cm mobile thrombus attached to the Impella inlet, which was not present ten days earlier (Figure 3; Video). The Impella was wired with a 0.035" Amplatz Super Stiff guidewire (Boston Scientific). After the flow was increased to P8 (to minimize thrombus embolization), the Impella and attached thrombus were pulled across the aortic valve into the descending aorta.

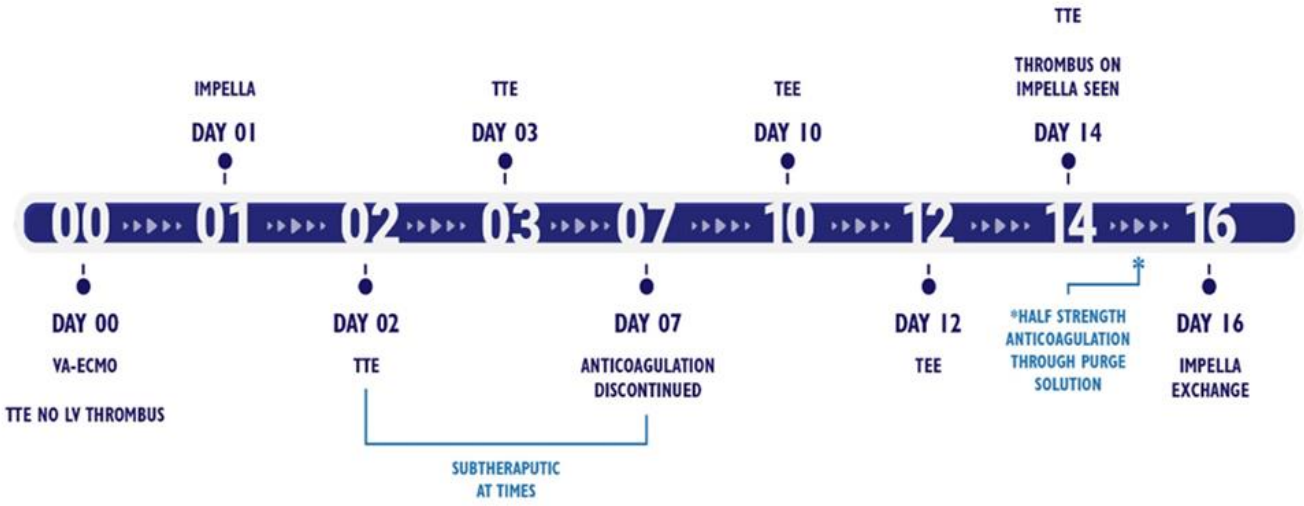

Figure 2. *Timeline of events. LV, left ventricular; TTE, transthoracic echocardiogram; V-A ECMO, veno-arterial extracorporeal membrane oxygenation.*

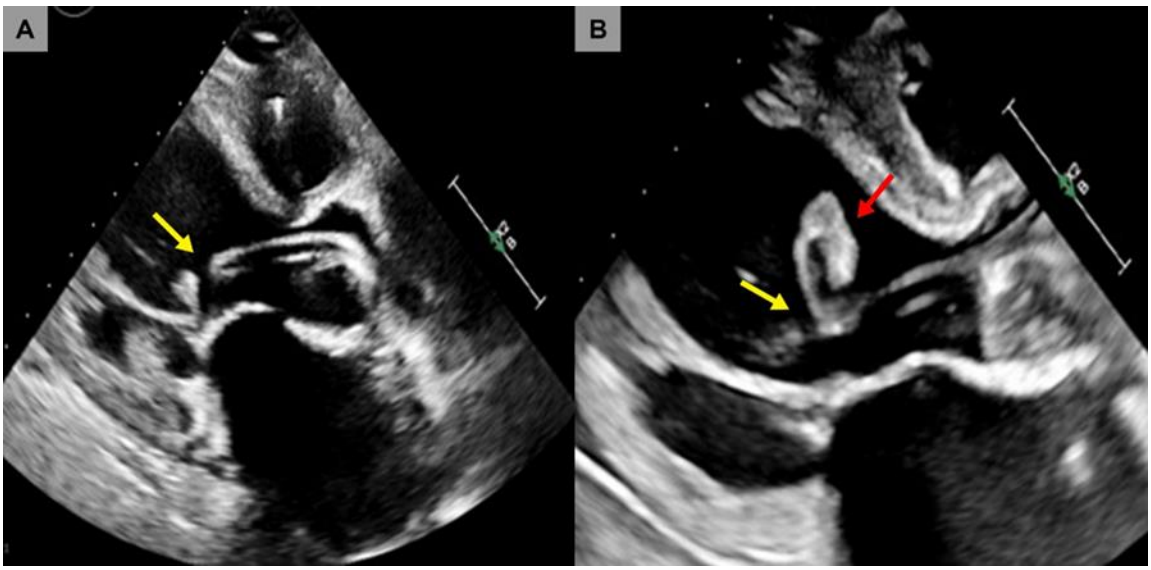

Figure 3. *Echocardiogram ten days apart. (A) Initial echocardiogram. (B) Echocardiogram ten days later. Yellow arrows point to the Impella inlet. Red arrow points to acutely ingested thrombus.*

The flow was decreased to P0, and both the Impella and the entire thrombus were removed without systemic thromboembolism (Figure 4). Due to the ongoing need for LVV, a new Impella CP was placed, and flows were set to 2-2.1 L/min.

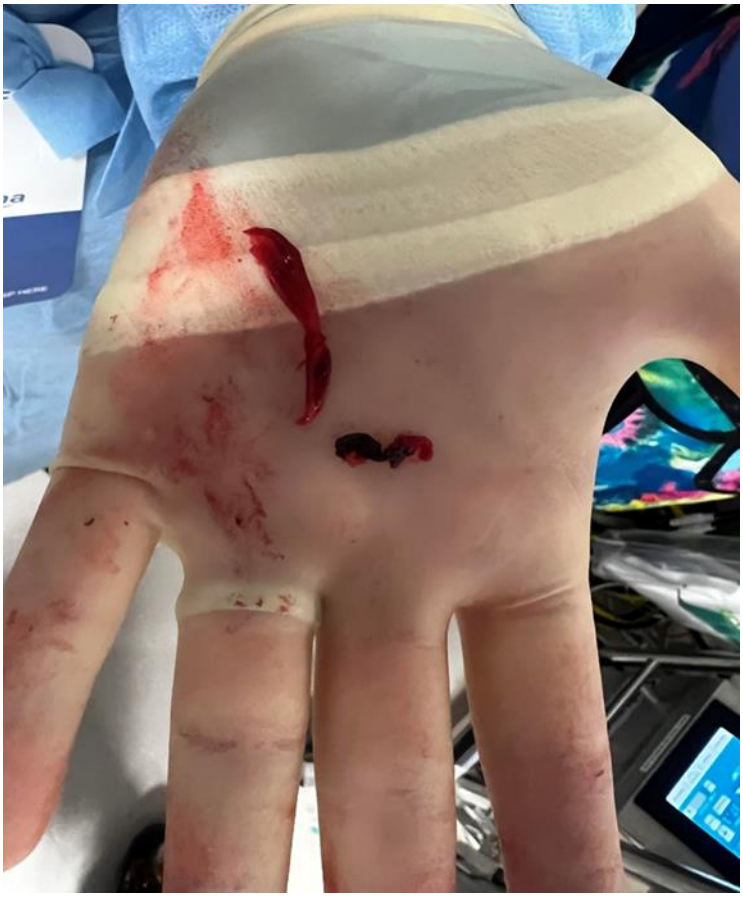

Figure 4*. Successful removal of the ingested thrombus.*

Discussion

Acute thrombus ingestion during Ecpella support is rare, and optimal management of this potentially catastrophic scenario is unknown. Surgical device removal (sternotomy and aortotomy) or percutaneous exchange (Impella-to-Impella, or Impella-to-intra-aortic balloon pump) have been done with or without the concomitant use of a cerebral embolic protection device.[2,3] As an example, a Sentinel cerebral embolic protection system (Boston Scientific) was prophylactically used to prevent LV thrombus embolization during an Impella removal although, upon examination, no thrombus was seen within the cerebral protection device.[4] Furthermore, in the recently published PROTECTED TAVR trial, the use of a cerebral embolic protection system did not result in a statistically significant difference in the incidence of stroke compared to the control group.[5,6] However, using the protection system resulted in fewer disabling strokes, which was one of 15

secondary endpoints in the trial.[5,6] This suggests that the device was better at blocking larger emboli than smaller ones.

In regard to monitoring, the Extracorporeal Life Support Organization (ELSO) guidelines do not address the frequency of echocardiography during Ecpella support.[7] Specifically, the guidance for adult cardiac patients on V-A ECMO support does not comment on the frequency of ultrasound or echocardiography during Ecpella or otherwise.[7] In contrast, the joint European Association of Percutaneous Cardiovascular Interventions/Association for Acute Cardiovascular Care expert consensus on percutaneous ventricular assist devices recommends that echocardiography be performed daily and when hemodynamic changes occur in patients requiring short-term mechanical circulatory support.[8]

Finally, tissue plasminogen activator is infused through the purge solution and has been used for internal Impella thrombosis. Nevertheless, the efficacy of thrombolytic therapy for acute thrombus ingestion has not been studied.[9]

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