

CASE REPORT

INTERMEDIATE

CLINICAL CASE: PULMONARY EMBOLISM RESPONSE TEAM (PERT) CONSORTIUM 2021

Pulmonary Embolism Complicated With Cardiopulmonary Arrest Treated With Combination of Thrombolytics and Aspiration Thrombectomy



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ABSTRACT

Systemic thrombolytic therapy is frequently used in the treatment of massive pulmonary embolism. We describe a case of pulseless electrical activity arrest, refractory obstructive shock in the setting of massive pulmonary embolism despite tissue plasminogen activator that was successfully treated with catheter-directed aspiration thrombectomy. (**Level of Difficulty: Intermediate.**) (J Am Coll Cardiol Case Rep 2022;4:576–580) © 2022 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

HISTORY OF PRESENTATION

A 66-year-old man presented to the emergency room via emergency medical services with worsening shortness of breath and chest pain. He described his pain as substernal pressure that has been ongoing for the previous week; however, his symptoms acutely worsened in severity within the past 24 hours,

prompting him to seek medical evaluation. He denied fever, chills, cough, and edema and his review of systems was otherwise noncontributory. His temperature was 36.9°C, heart rate 117 beats/min, blood pressure 142/95 mm Hg, respiratory rate of 36 breaths/min, and oxygen saturation (SpO₂) 60%. He was immediately placed on bilevel positive airway pressure with minimal improvement of SpO₂ to 70%. His examination was notable for significant respiratory distress with clear bilateral breath sounds, tachycardia without murmur, and jugular venous distension. His extremities were warm without any evidence of edema.

LEARNING OBJECTIVES

- To recognize that in the setting of massive PE complicated by cardiopulmonary arrest, a combination of thrombolytic therapy and CDTE may be a feasible option in critical situations.
- To acknowledge CDTE allows for rapid and effective reduction in clot burden to improve ventilation/perfusion mismatch and hemodynamics.

PAST MEDICAL HISTORY

The patient's past medical history is notable for benign prostatic hyperplasia, erectile dysfunction on testosterone supplementation, essential hypertension, and provoked deep vein thrombosis and

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pulmonary embolism (PE). The deep vein thrombosis and PE occurred in the setting of prolonged immobility during a long car ride 10 years ago. He was treated with 6 months enoxaparin and is no longer on anticoagulation.

DIFFERENTIAL DIAGNOSIS

Acute myocardial infarction, PE, and pneumothorax were included in the differential.

INVESTIGATIONS

His electrocardiogram revealed sinus tachycardia, left anterior fascicular block, and nonspecific T-wave abnormalities (Figure 1). Laboratory results were significant for a D-dimer of 3.583 ng/mL, troponin I 0.07 ng/mL, and an arterial blood gas of pH 7.36, PaCO₂ 40 mm Hg, PaO₂ 50 mm Hg, and bicarbonate of 22 mmol/L. A chest x-ray was normal. Computed tomography pulmonary angiography revealed extensive embolic disease with thrombus in the right pulmonary artery extending into the upper middle and lower lobes. There was also thrombus in the ascending and descending branches of the left pulmonary artery along with evidence of right heart strain (Figure 2). On echocardiography, the right ventricle was not well visualized but appeared to be dilated.

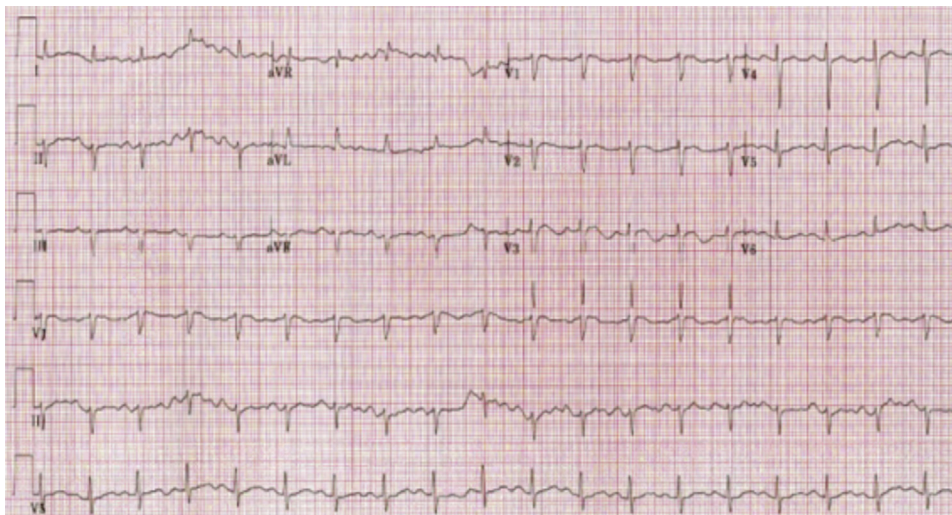
MANAGEMENT

After computed tomography pulmonary angiography, 7,000 U (80 U/kg) heparin bolus was immediately administered followed by 18 U/kg/h infusion with a target partial thromboplastin time of 60 to 80 seconds. Plans were made to perform aspiration thrombectomy in the cardiac catheterization laboratory (CCL). However, the patient's SpO₂ rapidly deteriorated, requiring endotracheal intubation followed by pulseless electrical activity (PEA) arrest prompting emergent 100 mg intravenous tissue plasminogen activator (tPA) administration during cardiopulmonary resuscitation. After tPA, he had a return of spontaneous circulation, but still required vasopressors and had an SpO₂ of 70%. He was emergently transferred to the CCL for catheter directed thrombectomy (CDTE). A 24-F FlowTrieve (Inari) via left femoral access using ultrasound guidance was used to perform bilateral CDTE. The duration of the aspiration thrombectomy was 60 minutes and resulted in improvement in SpO₂ to 86% with decreased vasopressor requirements (Figure 3). He was subsequently transferred to a tertiary center for veno-arterial extracorporeal membrane oxygenation (VA-ECMO) consideration in the event of any further deterioration.

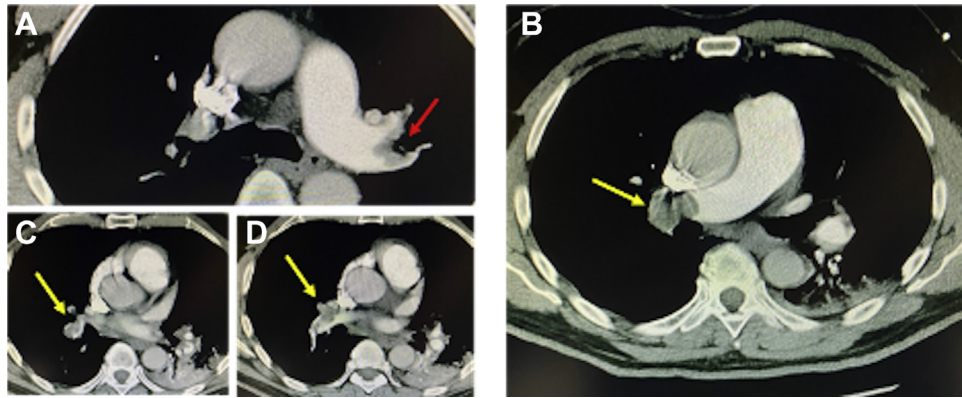
ABBREVIATIONS AND ACRONYMS

- CCL** = cardiac catheterization laboratory
- CDTE** = catheter directed thrombectomy
- PE** = pulmonary embolism
- PEA** = pulseless electrical activity
- SpO₂** = oxygen saturation
- tPA** = tissue plasminogen activator
- VA-ECMO** = veno-arterial extracorporeal membrane oxygenation

FIGURE 1 Admission Electrocardiogram



Electrocardiogram on admission demonstrating sinus tachycardia with left anterior fascicular block and nonspecific ST and T-wave abnormalities.

FIGURE 2 Admission Computed Tomography Angiography

(A) Computed tomography angiography demonstrating saddle pulmonary embolism noted in the left main pulmonary artery (red arrow). (B to D) Pulmonary embolism in the right main pulmonary artery (yellow arrows) with extensive clot burden extending segmentally.

DISCUSSION

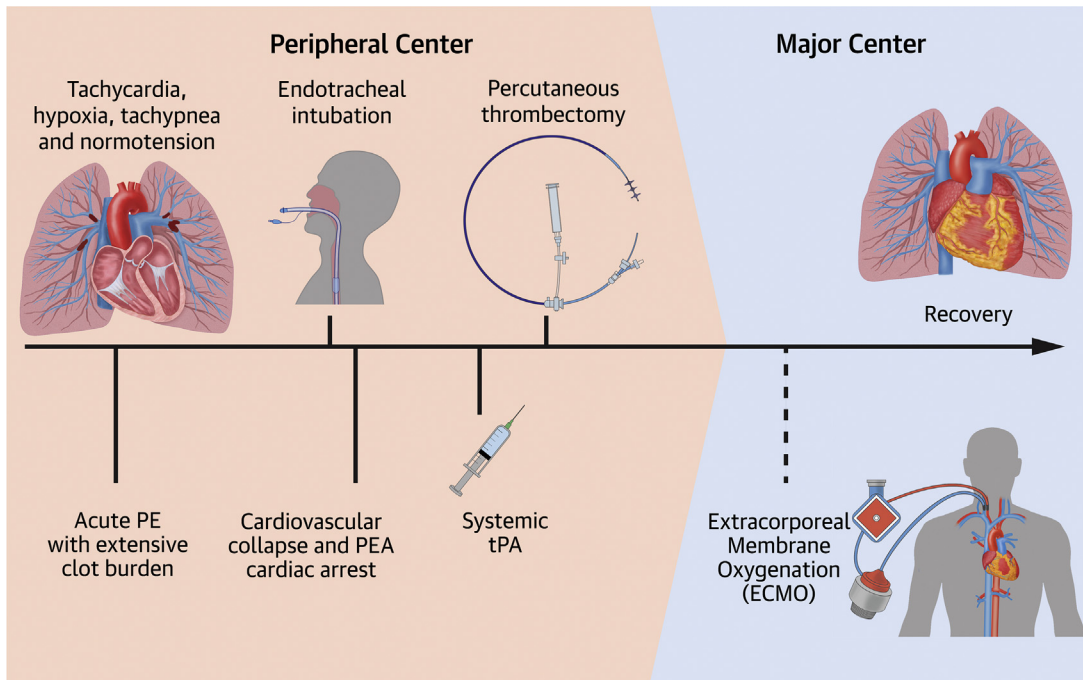
This patient had a massive PE that unfortunately deteriorated and suffered from PEA arrest and was appropriately treated with tPA.¹ Unfortunately, the patient remained profoundly hypoxic and hypotensive. Despite receiving systemic tPA, he was emergently taken to the CCL for a successful CDTE. No bleeding complications were encountered. The use of ultrasound-guided access and careful monitoring of activated clotting time are recommended to minimize chance of bleeding.

The literature on the feasibility of the combination of thrombolytics and CDTE is sparse.² There are limited case reports in management of patients after PEA arrest despite thrombolytic administration, including VA-ECMO.³ One group successfully placed a patient on VA-ECMO after achieving return of spontaneous circulation after PEA arrest secondary to massive PE despite thrombolytics.⁴ This patient was able to be weaned off VA-ECMO in 4 days and made a full recovery. Here, we present a similar case, but was successfully treated with CDTE to allow for rapid and effective reduction of thrombotic burden resulting in

FIGURE 3 Pulmonary Angiography Before and After Aspiration Thrombectomy

(A) Right pulmonary angiogram (RPA) in left anterior oblique view revealing extensive clot burden in the RPA (red arrows). (B) Left pulmonary angiogram (LPA) in the right anterior oblique highlighting clots in the LPA (yellow arrows). (C) RPA revealing near resolution of the pulmonary embolism after catheter directed thrombectomy using the 24-F FlowTriever. (D) LPA in the right anterior highlighting a similar excellent angiographic result.

CENTRAL ILLUSTRATION Management of Massive PE Requiring Combination of Thrombolytics and Percutaneous Thrombectomy



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PE = pulmonary embolism; PEA = pulseless electrical activity; tPA = tissue plasminogen activator.

improvement in perfusion/ventilation and hemodynamic status. VA-ECMO was considered, but would have necessitated transfer to a tertiary center with ECMO capabilities because the hospital he presented to was not equipped for ECMO. However, he was critically unstable for hospital transfer and was taken directly to the CCL for CDTE instead (**Central Illustration**).

FOLLOW-UP

The patient was transferred to an ECMO-capable center in the event of any further deterioration. He never required mechanical support and was eventually weaned off the ventilator and pressor support within days. He was discharged home in stable condition on lifelong oral anticoagulation therapy. He had a negative outpatient hypercoagulability laboratory workup. After consultation with hematology, the PE was determined to be potentially provoked by his

supplemental testosterone therapy. He has remained stable 1 year following hospitalization with excellent improvement in functional capacity.

CONCLUSIONS

In the setting of massive PE complicated with cardiopulmonary arrest, combination of thrombolytic therapy and CDTE is a feasible and effective option for patient management.

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The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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KEY WORDS catheter directed thrombectomy, pulmonary embolism, thrombolytics