

Unexpected Hemodynamic Collapse in an Awake Pulmonary Artery Embolectomy

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Introduction

Pulmonary embolism is the third-leading cause of cardiovascular death in the United States.⁶ Approximately 20-25% of all PEs result in sudden death.⁶ In this case study, we discuss how the presentation of a subacute massive PE can mislead and undermine the high mortality risk of these patients.

Clinical Presentation

Patient is a 57M with HTN, DM, and obesity who presents to OSH with worsening dyspnea. Notable recent event include outpatient RLE sclerotherapy procedure 2.5 weeks prior with subsequent swelling of the RLE. Denies any prior VTE, cardiac, or vascular history.

Chest CT angiogram showed extensive bilateral PE with large burden to all sub-segmental lobes and right-heart strain. TTE showed mild RV dilation and dysfunction.

Patient was transferred to Medstar Washington Hospital Center with plan for pulmonary artery embolectomy.

Vitals in ED: BP 128/77, SpO2 92% on 2L NC, tachypneic, tachycardic. Elevated troponins.

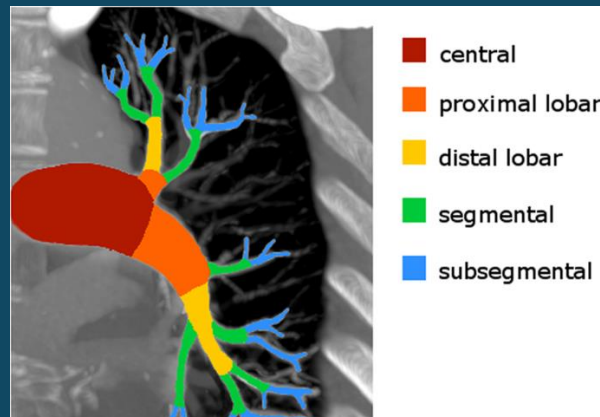


Figure 1. Classification of thrombus location.³

Hospital Course

Patient was deemed intermediate-high risk due to being hemodynamically stable with RV strain. A heparin drip was initiated in the ED.

22:55 Patient in OR, left radial A-line placed. No anesthetic was given except local infiltration.

23:08 Right femoral vein was accessed.

23:17 Catheter crossed the right heart into left main pulmonary artery. Extraction was uneventful.

23:53 Surgeon aspirates a large clot from right main PA. Simultaneously, the arterial line's MAP drops to 40s.

Surgeon states a massive clot was removed and patient's symptoms should improve immediately. Patient confirms no discomfort, chest pain, or shortness of breath. However, patient is still significantly hypotensive.

23:55 Attending was paged. Fluids and vasopressors were given in an attempt to restore blood pressure.

23:58 Patient becomes diaphoretic and agitated. SpO2 drops. Heart rate gradually slows to 30s.

23:59 Code Blue was called and ACLS was initiated. ECG showed PEA arrest.

Angiogram revealed significant clot burden with main, segmental, and sub-segmental branches being nearly occlusive on both sides of the lungs.

00:52 Patient expired despite aggressive direct tPA injections into the artery and significant clot aspiration. ETCO2 was never obtained during chest compressions and after intubation with confirmed placement of ETT.

"Lollopping"

Following the event, a discussion was had to explain the cause of near-complete occlusion of the pulmonary circulation following major clot aspiration. It is likely that during the aspiration of the right main pulmonary artery clot, the tail-end broke off and embolized.

A phenomenon known as "lollopping" of a clot during catheter-directed thrombectomy is a potentially underrecognized cause of intraprocedural embolization.² Attempting to aspirate a significant clot through a narrow catheter can cause the catheter to get clogged. Forcefully aspirating this lollopped clot can result in breakage and upstream embolization.

There are 2 documented case studies regarding this event, with one resulting in left lung embolization.² The paper describes surgical options to prevent embolization such as obtaining a 2nd access from the contralateral side and employing an IVC filter distal to the clogged clot (shown in Figure 2).²

Reference

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Discussion

According to the European Society of Cardiology, current risk-stratification techniques look at hemodynamic stability, RV dysfunction, and cardiac markers.⁵ The difference between high and intermediate-risk patient is the presence of shock. However, this hemodynamic stability can provide a false sense of security as 30-day mortality for this population is reported to range from 2-15%.⁴

When analyzing the factors used for risk-stratification, the patient presented with relatively benign parameters. A mildly dilated RV has minimal prognostic significance.⁴ Elevated troponins have low specificity for mortality in normotensive patients with an acute PE.⁴ However, a factor that may have contributed to the intraoperative event was the size of the PE. What is to be expected if a saddle PE with extensive clot burden involving all sub-segmental lobes were to break and embolize further downstream?

Another parameter, thrombus load, could be an additional factor to be assessed preoperatively, but there is controversy regarding the usefulness of PA obstruction index in predicting mortality.⁵ Some studies state a 11.2-fold increased risk of dying for those with an obstruction index greater than 40%, while other studies showed no association.¹ As a result, vascular obstruction score is not used in risk stratification of a PE.¹

This was a situation where the patient's mortality risk was potentially underestimated using standard risk-stratification guidelines. Knowing the size of the PE and potential difficulty with extraction, this patient could have been a suitable candidate for ECMO pre-cannulation. However, this is typically reserved for high-risk patients at this institution.

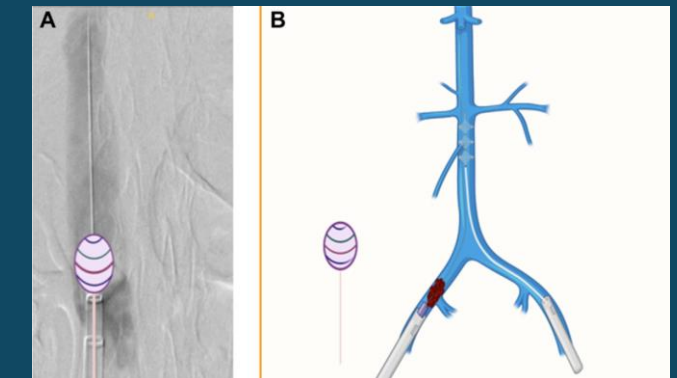


Figure 2. Lollopped clot on distal tip of FlowTrieve device.²