

Learning Objectives

- Venous air embolism is a rare but serious event that can occur during central venous catheter insertion, use, or removal.
- High flow oxygen therapy and repositioning are key treatment modalities.
- Standardized measures to prevent this complication, such as Trendelenburg positioning, are of utmost importance.

Case Description

A 76-year-old female with unknown medical history was brought to the emergency room due to failure to thrive. She was last seen well by her family several months ago.

Physical examination:

- Vital signs- Temp 36.4 C, HR 85 bpm, BP 115/60 mmHg, SpO2 97% on room air
- Notable exam findings- cachectic appearance with severe muscle wasting, dry mucous membranes, hepatomegaly with liver palpable in the right lower abdominal quadrant

Initial work-up and management:

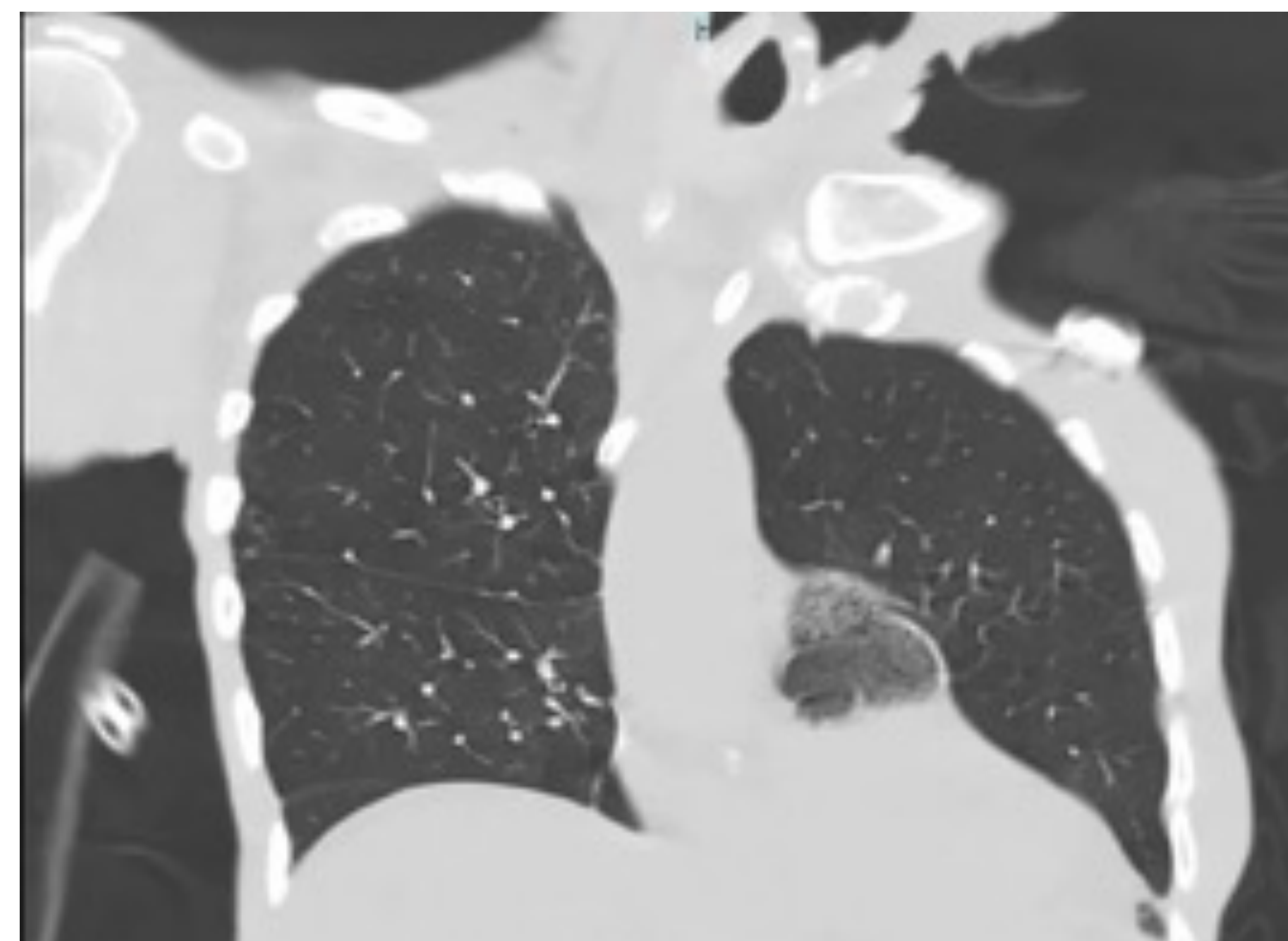
- **Laboratory analysis:** acute kidney injury with hyperkalemia and high anion-gap metabolic acidosis
- **CT Abdomen:** innumerable liver masses concerning for metastases
- Despite fluid resuscitation, she was anuric
- Admitted to the intensive care unit for emergent hemodialysis
- Hypotensive with BP 90/50 mmHg requiring norepinephrine
- Temporary hemodialysis catheter inserted into the left internal jugular vein under ultrasound-guidance. Chest radiograph confirmed appropriate catheter position.
- Continuous veno-venous hemodialysis was initiated
- The following day, a non-contrast CT chest was performed to evaluate metastatic disease (Figures 1 and 2)

Figures

Figure 1. Axial section of Chest CT (non-contrast) showing an air-fluid level within the right ventricle (RV)



Figure 2. Coronal section of Chest CT (non-contrast) demonstrating air within the RV outflow tract



Case Continued

- The patient was immediately repositioned to left lateral decubitus (Durant maneuver) and Trendelenburg position.
- High-flow nasal cannula with 100% oxygen was applied.
- Transthoracic echocardiogram the following day showed normal size and contractility of the right ventricle with no evidence of air.
- The patient was eventually transitioned to comfort care measures and expired 8 days after admission.

Discussion

- We present a patient with a large venous air embolus in the RV and RV outflow tract which was incidentally detected.
- On a root cause analysis, we identified several potential risk factors which predisposed our patient to venous air embolism, including hypovolemia (low central venous pressure), spontaneous breathing (negative intrathoracic pressure on inspiration) during catheter insertion, and insertion of a large bore catheter such as the hemodialysis catheter.
- Air entry could have occurred during catheter insertion, handling during dialysis, and discontinuation of continuous hemodialysis.
- The Durant maneuver helps to prevent air migration into the pulmonary vasculature, meanwhile high-flow 100% oxygen reduces the air bubble size by promoting nitrogen diffusion out of the bubble.
- It is important to follow standardized measures to prevent this complication during catheter insertion, handling and removal.

References

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2. McGee DC, Gould MK. Preventing complications of central venous catheterization. *N Engl J Med.* 2003 Mar 20;348(12):1123-33.
3. McCarthy CJ, Behraves S, Naidu SG, Oklu R. Air Embolism: Practical Tips for Prevention and Treatment. *J Clin Med.* 2016 Oct 31;5(11):93.