

AMSER Case of the Month

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33 year-old female presenting with hemoptysis and
associated back pain

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Patient Presentation

- **HPI:** 33 y/o F G3P1112 presenting with multiple (x5) episodes of hemoptysis and associated back pain.
- **PMHx:** Asthma, Anemia, Arrhythmia, Hashimoto thyroiditis, PE, AKI
- **PSH:** CS c/b preeclampsia with severe features, BTL, AVNRT
- **Allergies:** Ibuprofen
- **Vitals:** BP 126/73, Pulse 94, Temp 100 °F, SpO2 99%
- **Physical Exam:**
 - Chest: does not appear to be taking full deep breaths
 - Back: tenderness to palpation along the right paraspinal muscles on deep palpation

Pertinent Labs

- Cardiac Work-up:

- High Sensitive Troponin T (Gen 5) <6ng/L (Ref 0-19 ng/L)
- NT-PROBNP 47 pg/mL (L) (Ref 92-177 pg/mL)

What Imaging Should We Order?

ACR Appropriateness Criteria

Variant: 2 Nonmassive (non–life-threatening) hemoptysis. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
Radiography chest	Usually Appropriate	☼
CT chest with IV contrast	Usually Appropriate	☼☼☼
CTA chest with IV contrast	Usually Appropriate	☼☼☼
Arteriography bronchial with embolization	May Be Appropriate	☼☼☼☼
CT chest without IV contrast	May Be Appropriate	☼☼☼
CT chest without and with IV contrast	Usually Not Appropriate	☼☼☼

This imaging modality was ordered by the physician

Findings (unlabeled)-- CTA chest with IV contrast

R



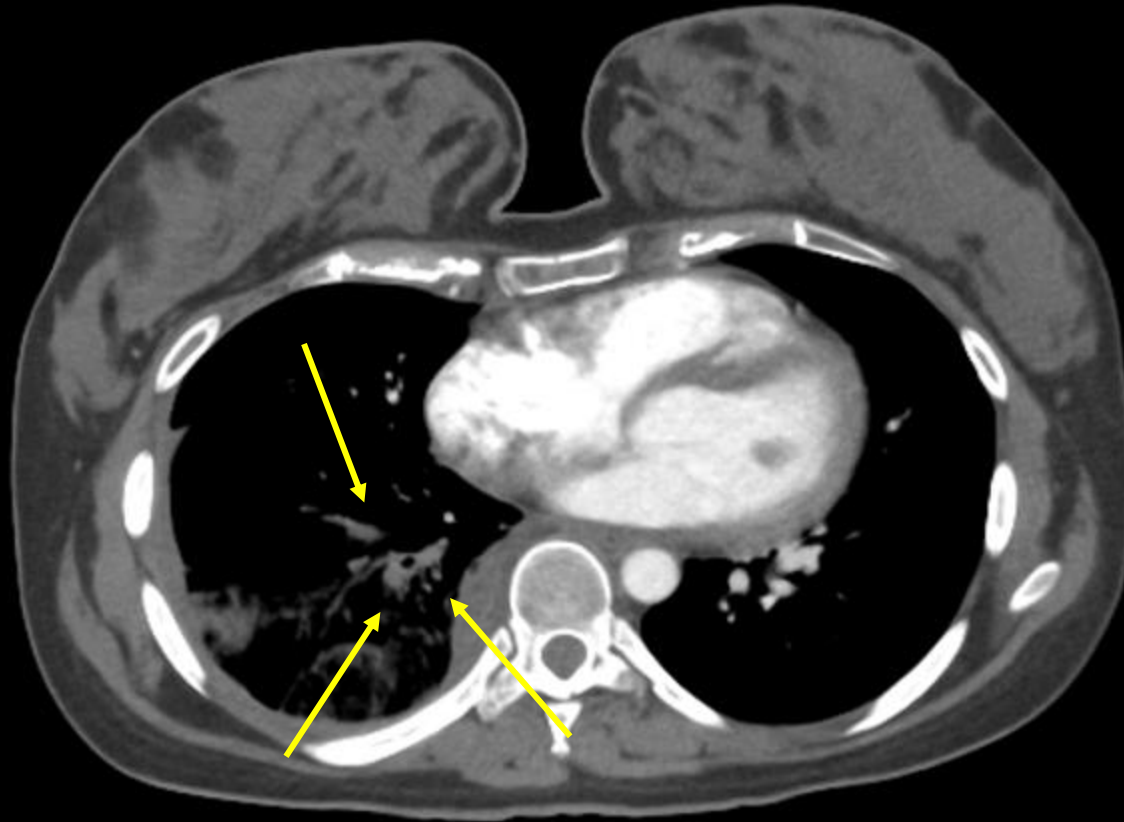
Findings (unlabeled)-- CTA chest with IV contrast

R



Findings (labeled)-- CTA chest with IV contrast

R



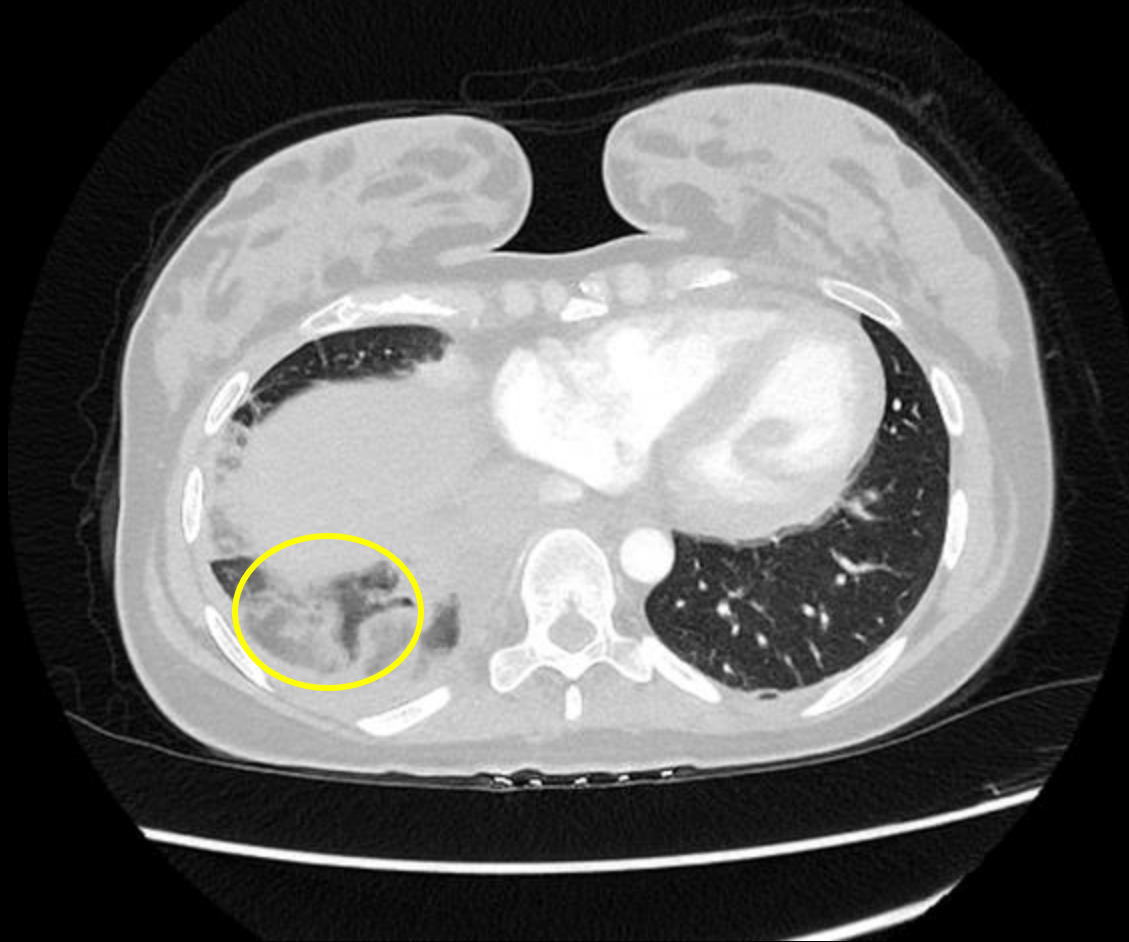
Filling defects within multiple right lower lobe pulmonary arteries, consistent with pulmonary emboli

Findings (labeled)-- CTA chest with IV contrast

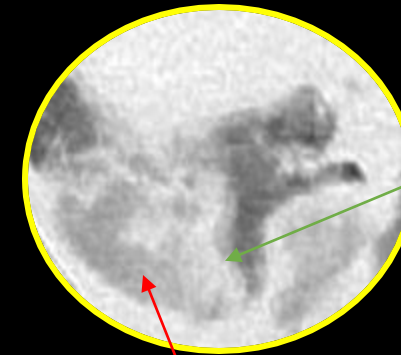
Atoll (Reverse Halo) Sign

Pleural-based ground-glass opacity surrounded by a peripheral ring of consolidation

R



Enlarged view demonstrating the Atoll Sign.



peripheral ring of consolidation

central ground glass opacity

Final Dx:

Right lower lobe pulmonary emboli with
pulmonary infarcts

Case Discussion

Background:

- Pulmonary embolism (PE) is an acute and potentially fatal condition in which embolic material blocks one or more pulmonary arteries, causing impaired blood flow¹
- PE can present with symptoms resembling pneumonia, complicating it's diagnosis²
- About two-thirds of PE cases occur during pregnancy and one-third post partum¹ as seen in this patient

Case Discussion

Diagnostic Approach:

- Initial CXR demonstrated new right basilar opacities concerning for pneumonia, supported by the patient's initial symptoms of congestion and sputum production, for which empiric antibiotic therapy was initiated.
- However, the patient's subsequent presentation with multiple episodes of hemoptysis (atypical for uncomplicated pneumonia) prompted reconsideration of the diagnosis
 - The patient did not have significant leukocytosis and had negative viral testing making an acute infectious process less likely
- In the setting of the postpartum hypercoagulable state, these findings raised suspicion for pulmonary infarction due to pulmonary embolism and prompted further evaluation with CT pulmonary angiography (CTPA), which remains the gold standard for imaging PE³
 - Imaging confirmed right lower lobe pulmonary emboli

Case Discussion

Radiographic Findings:

- The reversed halo sign (RHS), or Atoll sign, is characterised as a central ground-glass opacity surrounded by a complete or incomplete ring of consolidation on chest CT⁴
- Though initially it was described in organizing pneumonia, the RHS has a broad differential diagnosis that includes infectious, inflammatory, and vascular etiologies.⁴
- PE can lead to wedge-shaped infarcts that manifest as the RHS, typically in the posterior or basal segments of the lung⁵ as seen in this patient's presentation

Treatment⁶:

- Options for PE management include: systemic anticoagulation in patients who have no signs of right heart dysfunction to systemic thrombolysis, catheter-directed therapy, and surgical embolectomy in patients with submassive and massive PE.
 - After checking this patient's ECG, Troponin and NT-PROBNP as well as post-Hematology Oncology consult, the patient was started on anticoagulation therapy

References:

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2. Kumar S, Alwa KS, Vemuri MB, Gupta AGG, Vallapudasu N, Geddada S. Unveiling the Impostor: Pulmonary Embolism Presenting as Pneumonia: A Case Report and Literature Review. *J Pulmonol Respir Res*. 2025; 9(1): 001-005. Available from: <https://dx.doi.org/10.29328/journal.jprr.1001065>
3. Righini M, Robert-Ebadi H, Le Gal G, Diagnosis of acute pulmonary embolism, *Journal of Thrombosis and Haemostasis*, 15, 1251-1261
4. Ufuk, F., Ocak, I., Chelala, L. et al. The reverse halo sign in emergency chest CT: A diagnostic guide across diverse pulmonary conditions. *Emerg Radiol* 32, 435–445 (2025). <https://doi.org/10.1007/s10140-025-02337-2>
5. Schueremans, T., Versavel, M. and Dubbeldam, A. (2023) 'The Reversed Halo Sign in Pulmonary Infarction due to Acute Pulmonary Embolism', *Journal of the Belgian Society of Radiology*, 107(1), p. 71.
6. Martinez Licha CR, McCurdy CM, Maldonado SM, Lee LS. Current Management of Acute Pulmonary Embolism. *Ann Thorac Cardiovasc Surg*. 2020 Apr 20;26(2):65-71. doi: 10.5761/atcs.ra.19-00158. Epub 2019 Oct 5. PMID: 31588070; PMCID: PMC7184035.