# November 2019 Imaging Case of the Month: A 56-Year-Old Woman with a Rash

***Michael B. Gotway, MD***

Department of Radiology
Mayo Clinic Arizona
Scottsdale, AZ USA

**Clinical History:** A 56-year-old post-menopausal woman with a remote history of asthma and asymptomatic uterine fibroids presented with a macular-papular rash over the upper chest, upper medial left forearm, and medial legs, without scaling that has intermittently recurred over the previous few years. The rash is unaccompanied by fever, chills, rigors, abdominal pain, cough, conjunctivitis, urethritis, or any other mucocutaneous lesions. The patient did not note any seasonal relationships or association with food, and the rash regresses promptly with $H_1$ or $H_2$-blocker therapy.

The patient's past medical history was otherwise unremarkable. Her surgical history was positive only for a laparoscopic left inguinal hernia repair 7 years earlier. The patient indicated she was neither a smoker nor a drinker. Her medications included an as-needed albuterol inhaler, a steroid inhaler, a nasal steroid spray, a multivitamin, and a topical steroid.

The patient's physical examination showed normal vital signs, although her pulse rate was 95 beats / minute. The physical examination was otherwise entirely within normal limits aside from her presenting complaint of rash; in particular, her lungs were clear to auscultation.

About 2 weeks later, the patient began to complain of myalgias and some wheezing in addition to her rash, with some mild fatigue as well. She denied other complaints, such as coryza, cough, nasal drainage, ear pain, and neck pain or stiffness. At repeat physical examination, her lungs remained clear to auscultation; no wheezing was noted. A dermatology consult suggested that the rash was most consistent with atopic dermatitis, for which a topical steroid was prescribed.

Basic laboratory data showed a white blood cell count in the normal range, mild anemia (hemoglobin / hematocrit = 11.5 mg/dL / 34.7%), a normal platelet count, normal serum chemistries and renal function parameters, and normal liver function tests aside from a mildly elevated alkaline phosphatase level of 145  U/L147 (normal, 35 – 104 U/L). A C-reactive protein level was elevated at 38.5 mg/L (normal, ≤8 mg/L). The patient was referred for chest radiography (Figure 1).

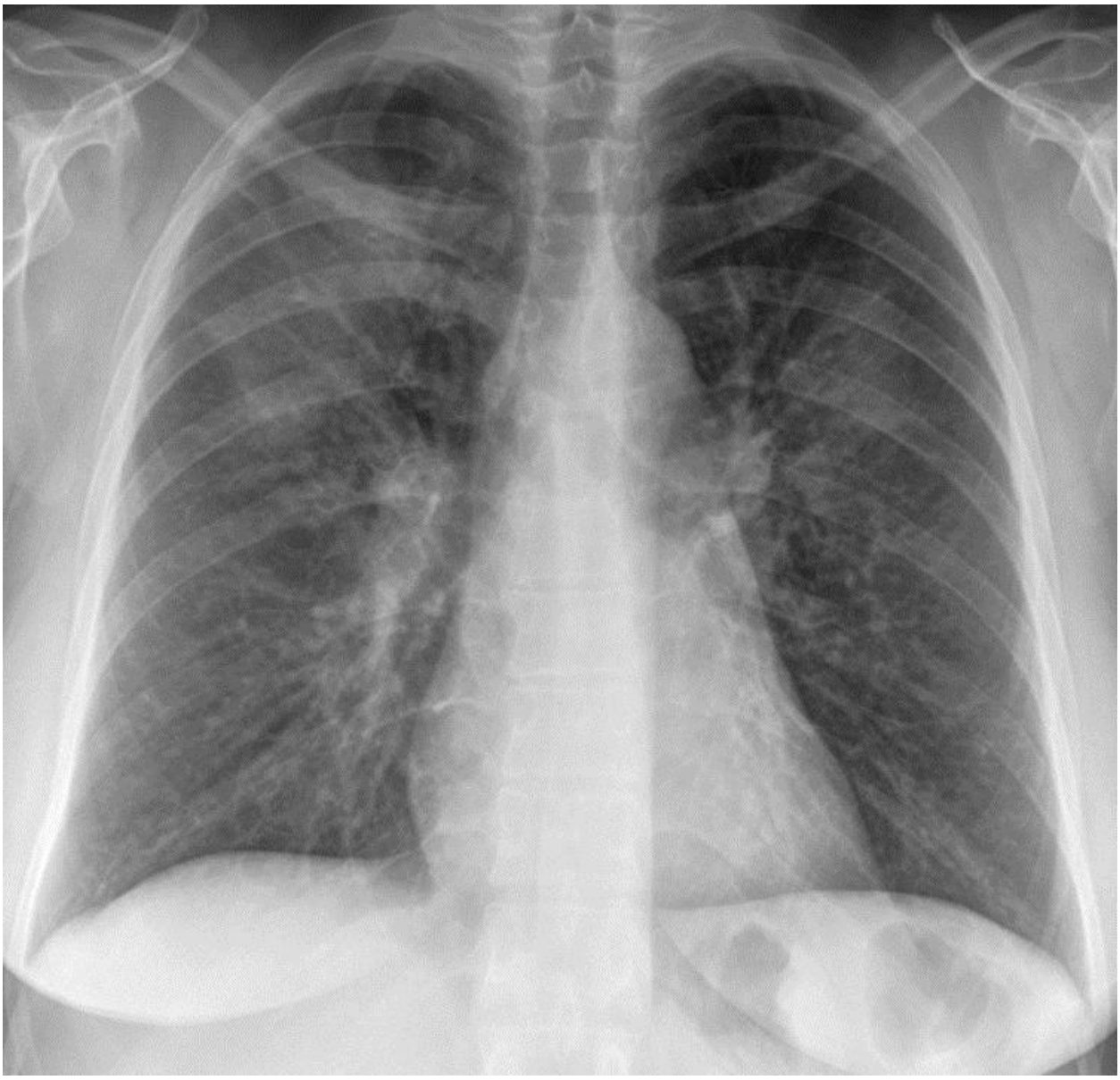

Figure 1. Frontal chest radiograph.

Which of the following statements regarding the chest radiograph is ***most accurate***?

1. The chest radiograph shows mediastinal and peribronchial lymph node enlargement
2. The chest radiograph shows bilateral consolidation
3. The chest radiograph shows cavitary lung disease
4. The chest radiograph shows findings suggesting increased pressure pulmonary edema
5. The chest radiograph shows numerous small nodules

**Correct!**
**2. The chest radiograph shows bilateral consolidation**

Frontal and lateral chest radiography shows bilateral pulmonary consolidation without features suggesting increased pressure pulmonary edema, such as cardiomegaly, a widened mediastinum, interlobular septal thickening, or pleural effusion. No clear evidence of mediastinal or peribronchial lymph node enlargement is present. No pulmonary nodules are seen and there is no evidence of cavitary lung disease.).

Which of the following courses of action is the ***most appropriate next step*** for the management of this patient?

1. $^{18}$FDG-PET scanning
2. Bronchoscopy with transbronchial biopsy
3. Cardiac MRI
4. Check for infections, such as coccidioidomycosis
5. Percutaneous transthoracic fine needle aspiration biopsy

**Correct!**
**4. Check for infections, such as coccidioidomycosis**

The chest radiograph is clearly abnormal and may subsequently lead to further investigations, including invasive tissue sampling procedures, but these approaches are premature at this point. $^{18}$FDG-PET scanning is also premature at this point, and the results of $^{18}$FDG-PET are unlikely to alter the approach to the chest radiographic findings. Typically, results from $^{18}$FDG-PET scanning are interpreted in the context of the imaging findings at chest CT and the latter has yet to be performed. Cardiac MRI is not relevant for this patient, at least at this point, as neither her history nor her chest radiograph suggests cardiac dysfunction.

Investigations for fungal infections, including *Aspergillus* and *Coccioides*, were unrevealing; *Coccioides* IgM and IgG enzyme immunoassays, *Coccioides* complement fixation, and immunodiffusion were negative. The patient was referred to pulmonary medicine, and her pulmonary physician did elicit a history of a new-onset dry cough, but no chest pain, shortness of breath, night sweats, or arthralgias. By the time of her pulmonary medicine appointment, her rash had resolved and the muscle aches were improving. The patient underwent chest CT (Figure 2).

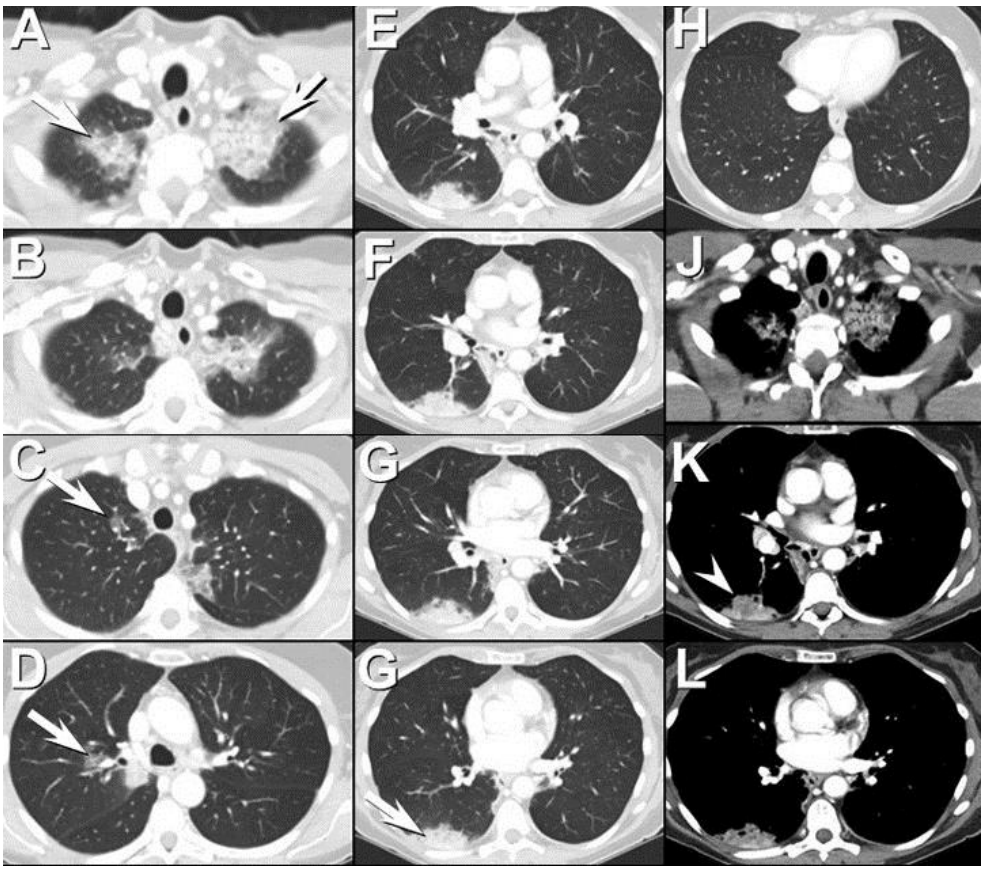


Figure 2. Axial enhanced chest CT displayed in lung (A-H) and soft tissue (J-L) windows.

Which of the following statements regarding the chest CT is ***most accurate***?

1. The chest CT shows bilateral ground-glass opacity associated with smooth interlobular septal thickening
2. The chest CT shows multifocal peripheral ground-glass opacities and consolidation
3. The chest CT shows numerous small nodules
4. The chest CT shows numerous small pulmonary cavities
5. The chest CT traction bronchiectasis, reticulation, and honeycombing consistent with fibrotic lung disease

**Correct!**
**2. The chest CT shows multifocal peripheral ground-glass opacities and consolidation**

The chest CT shows multifocal areas of ground-glass opacity and consolidation in the biapical, medial right upper lobe, and right lower lobe subpleural and ground-glass opacity and consolidation (arrows). A small focus of low attenuation (arrowhead) is present in the subpleural right lower lobe consolidation. Mild right peribronchial and mediastinal lymph node enlargement is present. No features of fibrosis- such as traction bronchiectasis, intralobular lines, architectural distortion, and honeycombing- are evident. No evidence of cavitary lung nodules is seen. While some ground-glass opacity is present, it is unassociated with interlobular septal thickening.

A repeat complete blood count was performed which again showed a white blood cell count within the normal range, but mild eosinophilia-0.75 x $10^9$ / L (normal, 0.03 – 0.48 x $10^9$ / L) was again noted.

Which of the following represents the ***most likely diagnosis*** this patient?

1. Acute coccioidomycosis infection
2. Aspiration pneumonia
3. Bacterial pneumonia
4. Bronchogenic malignancy
5. Usual interstitial pneumonia / idiopathic pulmonary fibrosis

**Correct!**
**1. Acute coccioidomycosis infection**

The patient's presentation and imaging are relatively non-specific, but are consistent with acute coccidioidomycosis. The mild eosinophilia is consistent with that diagnosis. Bacterial pneumonia can cause consolidation, but the patient has no symptoms of such an infection, and the rather extensive lung opacities, if due to bacterial pneumonias, would be expected to result in at least some symptoms, such as productive cough and fever. The chest CT shows no features of fibrotic lung disease, such as traction bronchiectasis, intralobular lines, architectural distortion, and honeycombing, excluding the diagnosis of usual interstitial pneumonia / idiopathic pulmonary fibrosis. Aspiration pneumonia is a consideration, but the patient does not have predisposing factors for this condition, and the lung opacities do not show a bronchiolitis pattern or airway thickening, nor are they preferentially dependently distributed. Bronchogenic malignancy is unlikely, typically appearing as a solitary poorly defined nodule or mass, but occasionally unusual imaging patterns can be seen, particularly multicentric adenocarcinomas, often when a mucinous histology is present. This consideration remains within the differential diagnostic possibilities when fairly extensive lung opacities are encountered within a minimally asymptomatic patient, but is still less likely that an acute fungal infection in a patient with rash and eosinophilia living in an endemic region.

The patient was referred to infectious disease, who felt her presentation was consistent with acute coccioidomycosis infection complicated by a hyperimmune response. The reason for her negative serological testing was unclear but was attributed to control of fungal growth. Anti-fungal therapy was not prescribed as it was felt the patient's immune response was adequate and protective. She was advised to follow up with infectious disease in 3 months with *Coccioides* serologies to be repeated. Her primary care physician planned to follow up on the patient's elevated alkaline phosphatase level with an outpatient bone scan.

The patient returned to her infectious disease physician just under 3 months later. She reported feeling well, with her rash, muscle aches and fatigue entirely resolved. Repeat *Coccioides* serology was negative. Her chest CT was repeated (Figure 3).

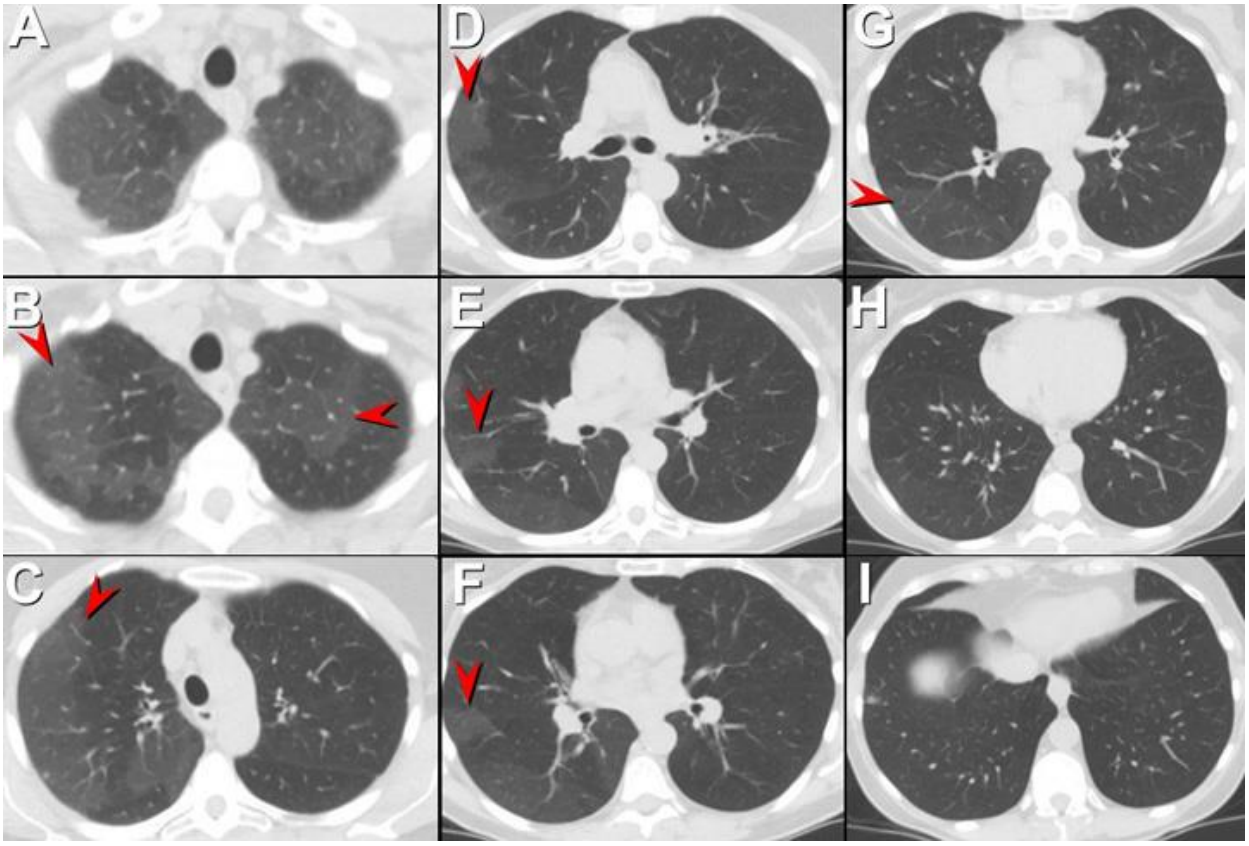


Figure 3. Repeat axial enhanced chest CT displayed in lung windows.

Regarding the follow up chest CT (Figure 3), which of the following statements is ***most accurate***?

1. The chest CT is unchanged; the previously noted pulmonary abnormalities and lymph node enlargement remain stable
2. The chest CT shows new pleural abnormalities
3. The chest CT shows progression of the previous pulmonary opacities and lymph node enlargement
4. The chest CT shows regression in much of the peripheral consolidation and lymphadenopathy, but some new areas of ground-glass opacity have developed
5. The chest CT shows resolution of the previous abnormalities and is now normal

**Correct!**

**4. The chest CT shows regression in much of the peripheral consolidation and lymphadenopathy, but some new areas of ground-glass opacity have developed**

The repeat chest CT shows that the previous areas of multifocal consolidation and ground-glass opacity in the peripheral aspects of the upper, mid, and lower lungs have regressed significantly, as has the mediastinal lymph node enlargement, but ground-glass opacity now occupies some previously consolidated areas and has also appeared is some areas of previously involved lung. No pleural abnormalities are present. The changes between the presentation (Figure 2) and follow up (Figure 3) CTs are illustrated in Figure 4.

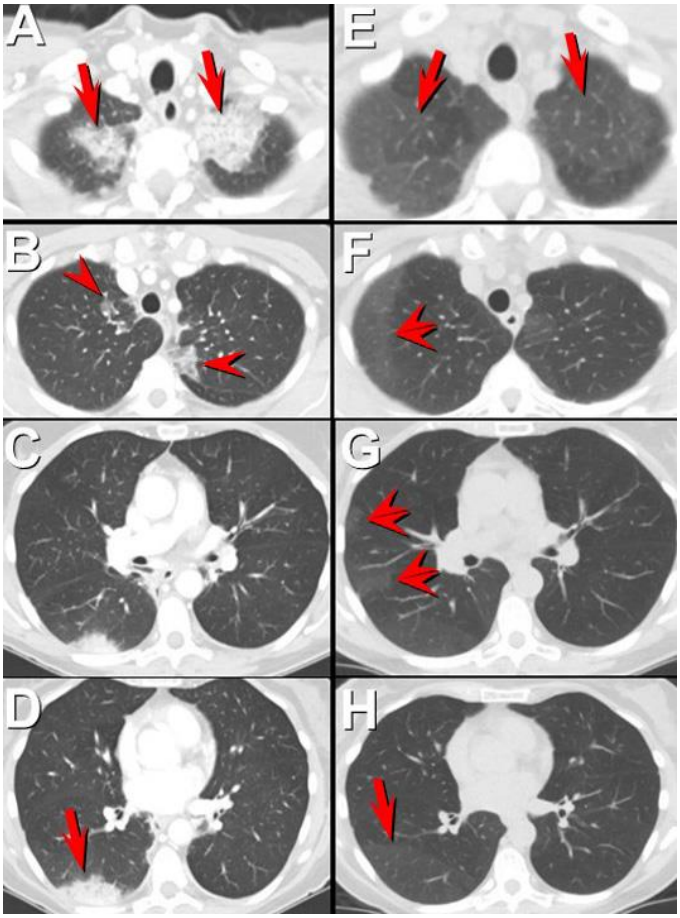


Figure 4. Comparison of presentation chest CT and follow up CT 86 days later. The presentation chest CT (A-D) shows multifocal areas of ground-glass opacity and consolidation (arrows A and D), with these parenchymal abnormalities resolving to pure ground-glass opacity on the follow up chest CT (Arrows, E and F). Note, however, that medial right and left upper lobe opacity at the presentation chest CT (arrowheads, B) resolves completely (F), but that new peripheral ground-glass opacity has developed on the follow up study (double arrowhead, F) in a previously unaffected region of lung. Similarly, new peripheral ground-glass opacity has developed in the right middle and lower lobe (double arrowheads, G) and the follow up CT.

The patient reported feeling well.

Which of the following courses of action is the ***most appropriate next step*** for the management of this patient?

1. $^{18}$F-fluciclovine scanning
2. $^{68}$Ga-dotatate scanning
3. Conservative therapy with imaging follow-up
4. CT pulmonary angiography
5. Enhanced thoracic MRI

**Correct!**
**3. Conservative therapy with imaging follow-up**

Enhanced thoracic MRI is unlikely to provide any useful information regarding the pulmonary abnormalities detected at thoracic CT. $^{68}$Ga-dotatate scanning is used for the detection and assessment of treatment response for neuroendocrine malignancies, but the nature of the pulmonary abnormalities is not suggestive of malignancy. $^{18}$F-fluciclovine is used for the detection of prostate carcinoma and therefore is not relevant to this patient. The pulmonary abnormalities, as well as the patient's presentation, are not suggestive of thromboembolic disease and therefore CT pulmonary angiography would probably not contribute significant information to what is already known from the previous two chest CTs. Given that the volume of pulmonary disease overall has decreased on the repeat chest CT, and the patient feels well, a conservative approach appears reasonable.

The patient presented to her pulmonary physician about 26 days later, about 146 days after her initial presentation, again complaining of fatigue, body aches, and occasional chills of 10 days duration. Her repeat complete blood count now showed a mildly elevated white blood cell count of 11.9 x $10^9$ / L (normal, 3.4 – 9.6 x $10^9$ / L with mild eosinophilia of 0.87 x $10^9$ / L (normal, 0.03 – 0.48 x $10^9$ / L) and her C-reactive protein level remained elevated as well at 75 mg/L (normal, ≤8 mg/L). She denied cough, mucous production, or chest pain. Repeat chest radiography (Figure 5) was performed.

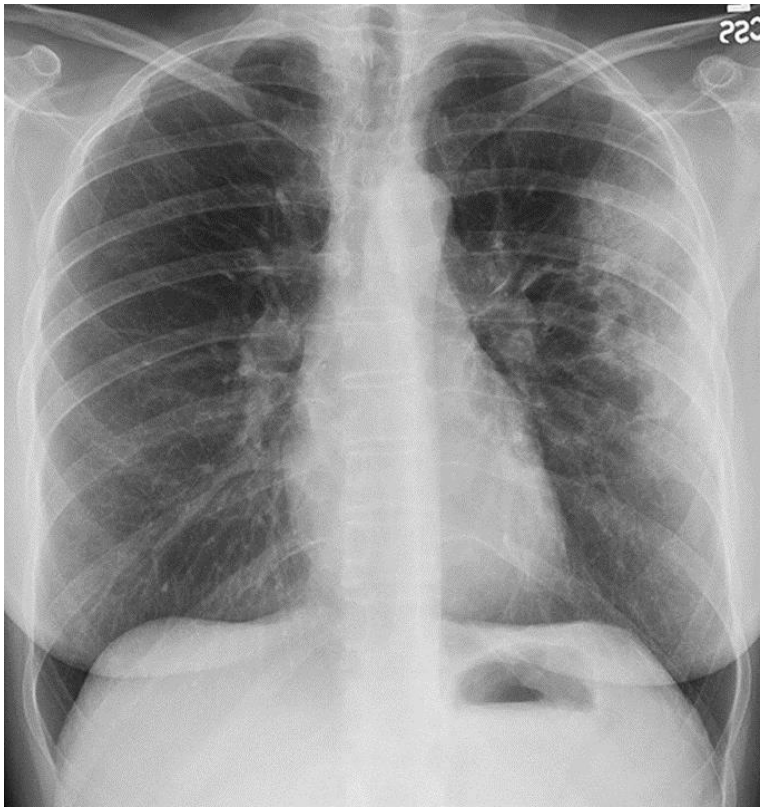

Figure 5. Repeat frontal chest radiography.

Regarding the chest radiograph, which of the following statements is ***most accurate***?

1. The chest radiograph shows multifocal bilateral consolidation
2. The chest radiograph shows new cardiomegaly
3. The chest radiograph shows pleural effusion
4. The chest radiograph shows pneumothorax
5. The chest radiograph shows unilateral consolidation

**Correct!**
**5. The chest radiograph shows unilateral consolidation**

The repeat chest radiograph shows peripheral left upper lobe consolidation; no consolidation is present in the left base or the entire right side and therefore the consolidation is not multifocal. No pleural abnormalities are present and the heart size is, and remains, normal.

Lyme disease and West Nile virus testing showed no abnormal findings. The patient underwent repeat chest CT (Figure 6).

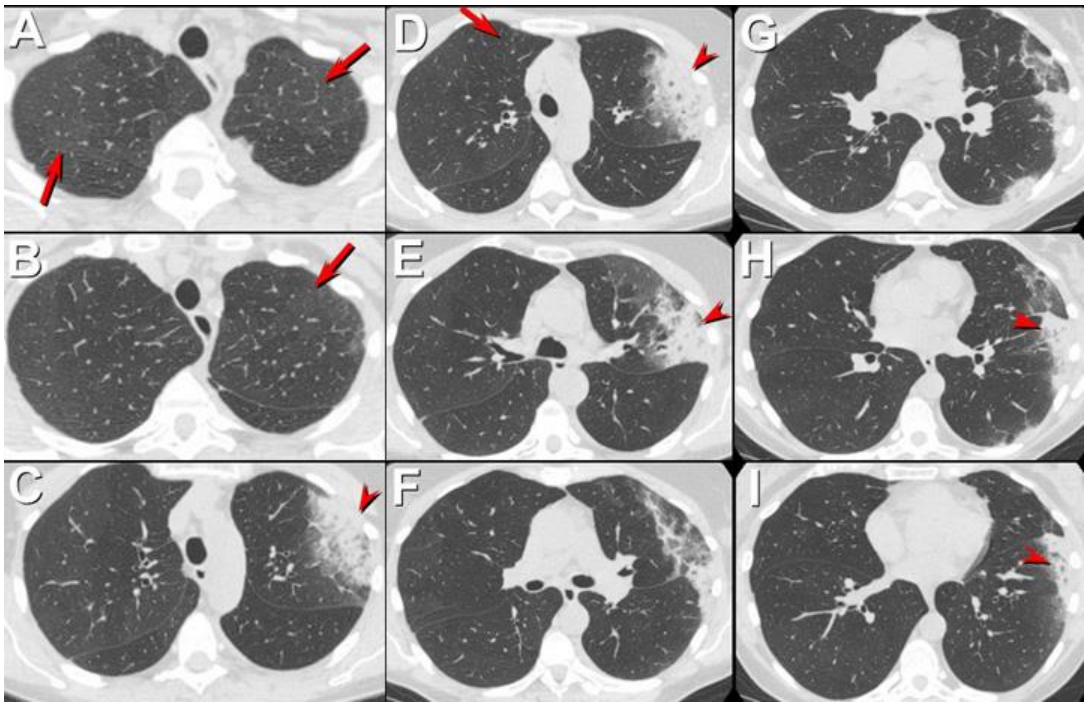


Figure 6. Axial enhanced chest CT displayed in lung windows performed 146 days after presentation.

Regarding the assessment of the thoracic CT findings, which of the following is ***most accurate***?

1. The chest CT shows new subpleural left upper lobe consolation accompanied by numerous, small, randomly disseminated pulmonary nodules
2. The chest CT shows new subpleural left upper lobe consolation with new pleural effusion
3. The chest CT shows new subpleural left upper lobe consolation with *complete* resolution of previously noted pulmonary parenchymal abnormalities
4. The chest CT shows new subpleural left upper lobe consolation with *significant regression* of previously noted pulmonary parenchymal abnormalities
5. The chest CT shows that the new left upper lobe subpleural consolidation has areas of cavitation

**Correct!**

**3. The chest CT shows new subpleural left upper lobe consolation with complete resolution of previously noted pulmonary parenchymal abnormalities**

The repeat chest CT shows subpleural left upper lobe consolation with *significant regression* of previously noted pulmonary parenchymal abnormalities; some ground-glass opacity can faintly be seen in the right upper lobe and left apex, again peripheral-even frankly subpleural- in distribution. No pulmonary nodules are present and no new pleural or mediastinal abnormalities are seen. No areas of cavitation are noted. Of note the left upper lobe consolidation shows some perilobular opacity on its margins, both superiorly and inferiorly. The evolution of the pulmonary findings from the 3 chest CTs is shown in Figure 7.

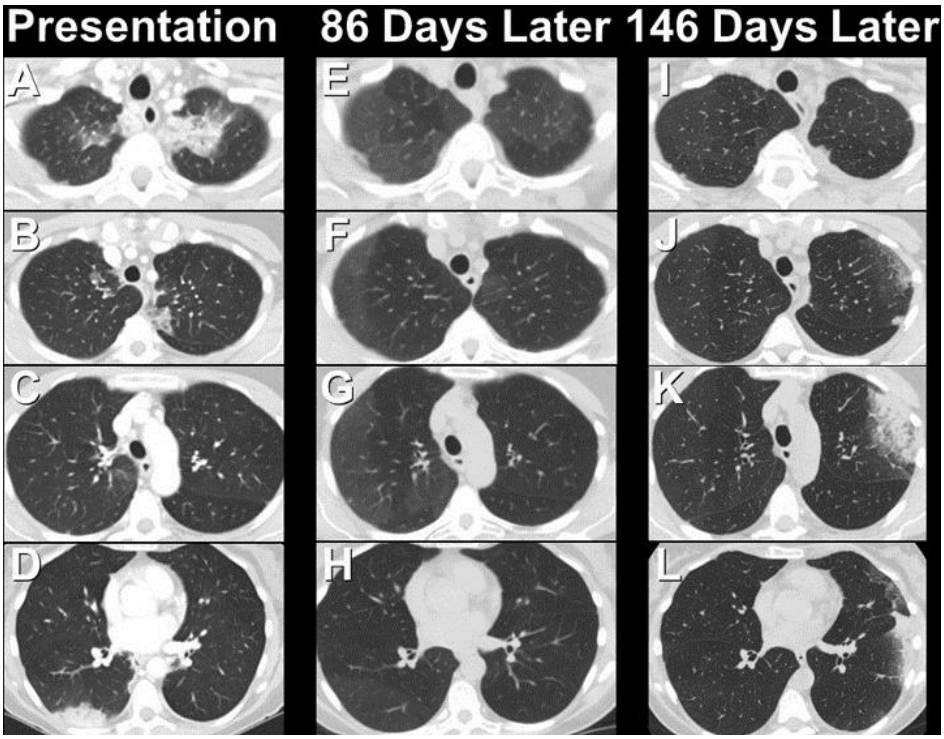


Figure 7. Comparison of the presentation chest CT (A-D), follow up chest CTs performed 86 (E-F) and 146 (I-L) following presentation shown at selected levels shows the transient and migratory areas of non-segmental peripheral and frankly subpleural areas of ground-glass opacity and consolidation.

At this point, which of the following *does not* represent ***least likely*** diagnosis for this patient?

1. Chronic eosinophilic pneumonia
2. Mucinous adenocarcinoma of the lung
3. Organizing pneumonia
4. Pulmonary vasculitis
5. Silent reflux with recurrent aspiration

**Correct!**
**2. Mucinous adenocarcinoma of the lung**

All of the entitles listed can cause chronic, non-resolving opacities at chest imaging; however, mucinous adenocarcinoma, which can appear as areas of consolidation rather than the typical focal nodule or mass, or multiple nodules or masses, associated with bronchogenic malignancy, generally will not cause transient and migratory opacities that entirely resolve in some areas of lung. The other listed entities are well-known to cause multifocal, bilateral, frequently peripheral and often frankly subpleural, areas of ground-glass opacity and consolidation that transiently involve one area of lung and then migrate to involve a different region of lung.

The patient's anti-nuclear antibody level was within the normal range. Gastrointestinal medicine was consulted and expressed concern for silent reflux with micro-aspiration, but endoscopy and esophageal pH monitoring and a barium esophagram showed no evidence of reflux.

Which of the following courses of action is the ***most appropriate next step*** for the management of this patient?

1. $^{18}$FDG-PET scanning
2. Bronchoscopy with bronchoalveolar lavage
3. Pleuroscopy
4. Repeat chest CT with pulmonary angiography protocol
5. Video-assisted thoracoscopic lung biopsy

**Correct!**
**2. Bronchoscopy with bronchoalveolar lavage**

A repeat CT of the chest will add little to what is already known from the evolution of the pulmonary opacities on the previous three chest CTs, particularly given that neither the patient's presentation and evolution, nor her imaging findings, are suggestive of pulmonary vascular disease or thromboembolic disease. $^{18}$FDG-PET scanning would add little management-altering information because whether or not the pulmonary opacities show elevated tracer utilization is irrelevant- a tissue sampling procedure is required for diagnosis at this point. Given that the patient has no extrathoracic complaints and her clinical course has been entirely related to abnormalities in the lung parenchyma, it is unlikely that $^{18}$FDG-PET scanning will show unsuspected foci of extrapulmonary tracer uptake that could provide a target for intervention. Pleuroscopy is not indicated given that the patient's abnormalities are entirely pulmonary parenchymal- none of her 3 chest CTs have shown a pleural abnormality. Video-assisted thoracoscopic lung biopsy would be capable of providing sufficient tissue for a diagnosis, but is overly invasive given that bronchoscopy with bronchoalveolar lavage may be capable of providing the correct diagnosis in a less invasive manner. The patient underwent bronchoscopy (Figure 8) with bronchoalveolar lavage and cryobiopsy, which showed areas of organizing pneumonia with abundant eosinophils.

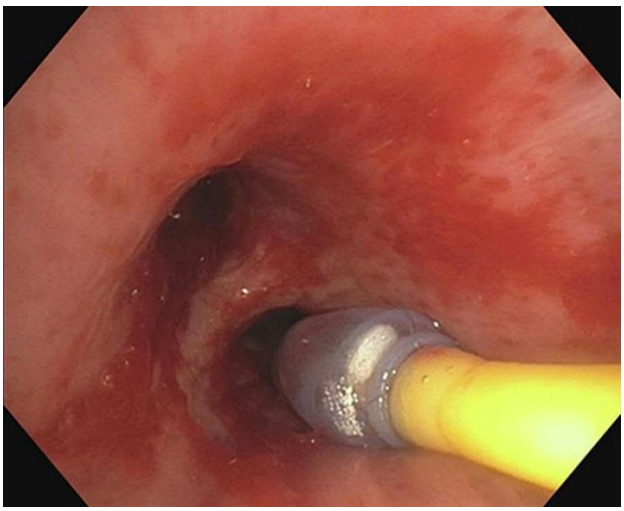

Figure 8. Bronchoscopy with bronchoalveolar lavage and cryobiopsy. No central airway abnormalities were noted.

No hyaline membranes were seen and no organisms were found.

Which of the following represents the ***correct diagnosis*** for this patient?

1. Acute eosinophilic pneumonia
2. Chronic eosinophilic pneumonia
3. Coccidioidomycosis
4. Pulmonary vasculitis
5. None of the above

**Correct!**
**2. Chronic eosinophilic pneumonia**

The mild peripheral eosinophilia, pulmonary parenchymal eosinophils, and chronic, recurrent, migratory pulmonary opacities are all most consistent with chronic eosinophilic pneumonia. Coccidioidomycosis is a prominent consideration for any patient from an endemic region with a respiratory illness, and can be associated with pulmonary eosinophilia, but repeatedly negative serological testing is unusual in the context of recent infection, and the organism was not identified at tissue sampling. Vasculitis is not a consideration as rheumatologic testing was negative, no pulmonary hemorrhage was detected at bronchoscopy or histopathological sampling, and no evidence of perivascular inflammation was present at pulmonary tissue sampling. While acute eosinophilic pneumonia also produces pulmonary eosinophilia, this disorder is less commonly associated with peripheral eosinophilia and typically patients with acute eosinophilic pneumonia have a more abrupt onset of a severe pulmonary illness rather than the chronic, relapsing course and mild illness displayed by this patient.

**Diagnosis:** Chronic eosinophilic pneumonia

***References***


1. Turner J, Wang JG, Neighbour H. Chronic eosinophilic pneumonia: a diagnostic challenge. J Allergy Clin Immunol Pract. 2017;5(6):1737-18. [CrossRef] [PubMed]
2. Cottin V. Eosinophilic lung diseases. Clin Chest Med. 2016;37(3):535-56. [CrossRef] [PubMed]
3. Malo J, Luraschi-Monjagatta C, Wolk DM, Thompson R, Hage CA, Knox KS. Update on the diagnosis of pulmonary coccidioidomycosis. Ann Am Thorac Soc. 2014;11(2):243-53. [CrossRef] [PubMed]
4. Khasawneh KR, Mahmood T, Halloush RA, Khasawneh FA. A pneumonia that will not go away. Can Respir J. 2014;21(2):80-2. [CrossRef] [PubMed]
5. Al-Tawfiq JA, Doujaiji B. Bilateral upper-lobe peripheral consolidation in a 56-year-old woman. Chest. 2008;133(6):1512-6.[CrossRef] [PubMed]