October 2013 Imaging Case of the Month

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Clinical History

A 67-year-old man with a history of hypertension and chronic lymphocytic leukemia (CLL), the latter diagnosed 10 years earlier, in remission until recently, presented with complaints of weight loss, not eating much, lethargy, and shortness of breath. His CLL had recurred and he was treated with rituximab, and bendamustine (a nitrogen mustard alkylating agent) and intravenous immunoglobulin. Frontal chest radiography (Figure 1) was performed.

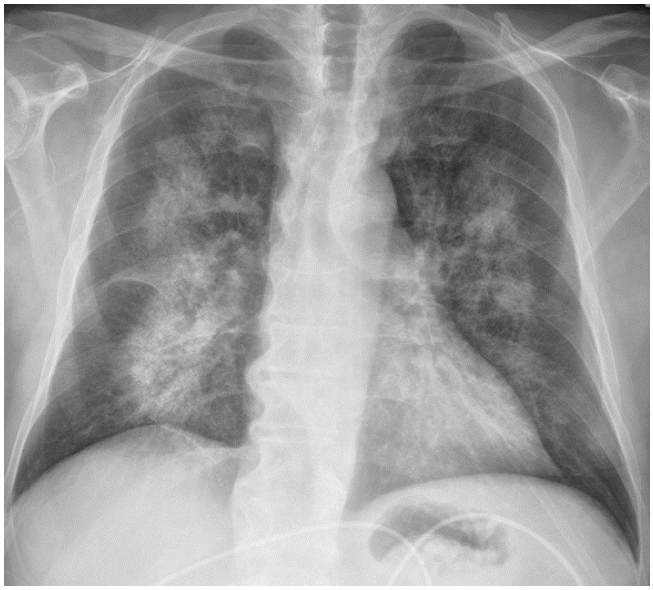

Figure 1. Initial chest radiograph.

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

1. The chest radiograph shows basal predominant linear opacities suggesting fibrosis
2. The chest radiograph shows large lung volumes with cystic change
3. The chest radiograph shows multifocal ground-glass opacity and cavitary consolidation
4. The chest radiograph shows multifocal ground-glass opacity and consolidation associated with linear and reticular abnormalities
5. The chest radiograph shows multiple nodules

Correct!

1. The chest radiograph shows multifocal ground-glass opacity and cavitary consolidation

The chest radiograph shows multifocal, bilateral areas of ground-glass opacity and consolidation associated with a background of reticulation and linear opacities. The opacities are distributed in the perihilar region, and are unassociated with pleural effusions. The lung volumes are normal, which argues against the presence of fibrotic lung disease. No cystic change or cavitation is present. Discrete pulmonary nodules are not seen.

Which of the following is an ***appropriate consideration*** among the differential diagnostic possibilities for the appearance of the patient's chest radiograph?

1. Acute atypical infection
2. Chemotherapy-induced pulmonary injury
3. Diffuse alveolar hemorrhage
4. Increased pressure edema
5. All of the above

Correct!
5. All of the above

The opacities on the chest radiograph engender a large number of differential diagnostic considerations. In the absence of prior imaging studies, such bilateral opacities are frequently assumed to represent acute pulmonary disease. The differential considerations for acute, multifocal areas of pulmonary ground-glass opacity and consolidation are numerous, and include increased pressure edema (hydrostatic edema), diffuse pulmonary infection (including opportunistic infections in the setting of an immunocompromised patient), diffuse pulmonary hemorrhage, non-infectious causes of pulmonary injury (such as a hypersensitivity reaction resulting from an environmental exposure or medication), and other non-infectious inflammatory insults of lung, such as developing acute respiratory distress syndrome/diffuse alveolar damage, or acute eosinophilic pneumonia. Any of the above choices could present with the findings on the chest radiograph.

The patient was treated with broad spectrum antibiotics and diuresis. Four months later, a repeat chest radiograph was performed (Figure 2).

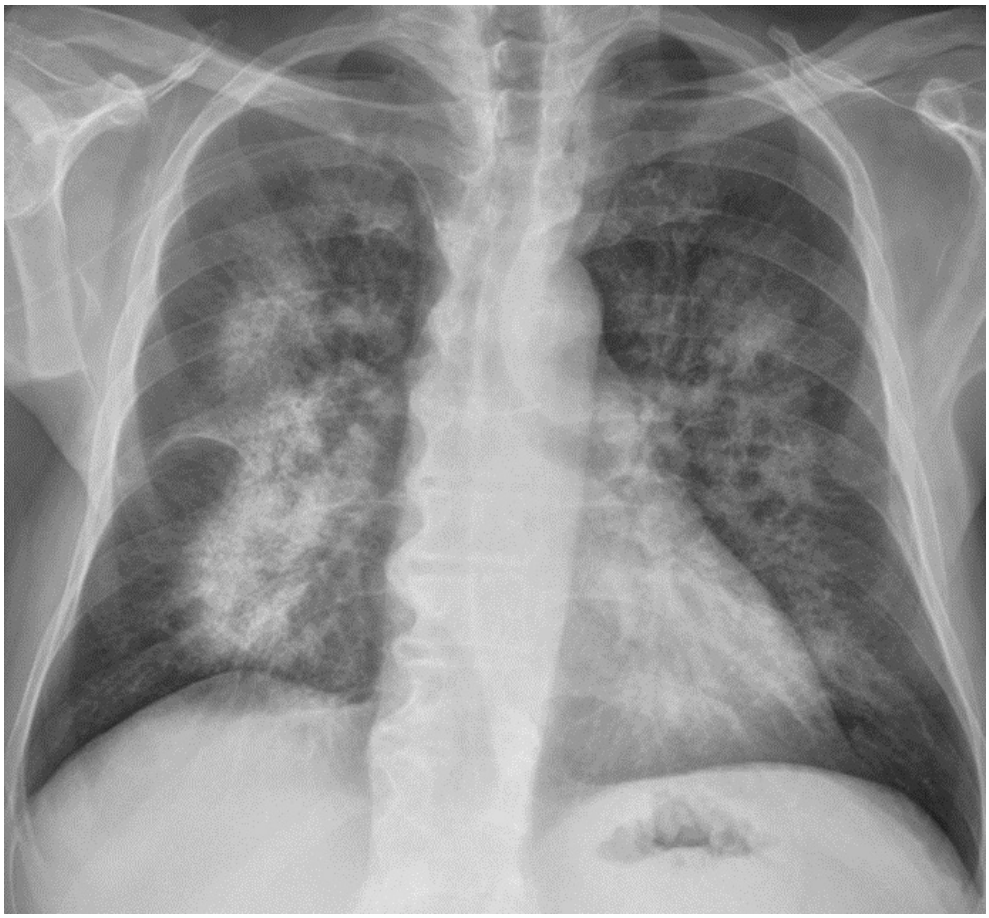

Figure 2. Repeat chest radiograph 4 months after the initial chest radiograph.

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

1. The chest radiograph appears essentially unchanged from the previous radiograph
2. The chest radiograph shows cavitation developing within the areas of multifocal ground-glass opacity and consolidation
3. The chest radiograph shows new multiple nodules, suggesting superimposed infection
4. The chest radiograph shows progressive multifocal bilateral ground-glass opacity and consolidation
5. The chest radiograph shows significant improvement in multifocal bilateral ground-glass opacity and consolidation

Correct!

1. The chest radiograph appears essentially unchanged from the previous radiograph

The chest radiograph appears essentially unchanged from 4 months prior (Figure 1); the ground-glass opacity and consolidation, with underlying liner opacity and reticulation, as well as the distribution of abnormalities, is largely stable. No cystic change or cavitation is present. Discrete pulmonary nodules are not seen.

In light of the time course now established for the imaging findings, which of the following is an ***appropriate consideration*** among the differential diagnostic possibilities for the appearance of the patient's imaging studies?

1. Acute eosinophilic pneumonia
2. Acute respiratory distress syndrome / diffuse alveolar damage
3. Increased pressure edema
4. *Pneumocystis jiroveci* infection
5. Pulmonary alveolar proteinosis

Correct
5. Pulmonary alveolar proteinosis

With the knowledge that the opacities on the chest radiograph are largely unchanged over a 4 month period, the differential diagnostic considerations for these opacities has shifted from a consideration of causes of acute, multifocal or diffuse pulmonary opacities to chronic multifocal or disuse pulmonary opacities. Among the considerations listed above, only pulmonary alveolar proteinosis would be expected to present as multifocal areas of ground-glass opacity and/or consolidation, with a background of linear and reticular opacities, remaining relatively unchanged over a 4 month period. A significant change or evolution in the appearance of the chest radiograph over a 4-month period would be expected for the other entities listed. Other diagnostic considerations for chronic, multifocal pulmonary opacities include several of the idiopathic interstitial pneumonias, chronic eosinophilic pneumonia, diffuse tumor infiltration, lipoid pneumonia, recurrent pulmonary hemorrhage, and recurrent aspiration.

The patient underwent thoracic CT (Figure 3) for further characterization of the abnormalities seen at chest radiography.

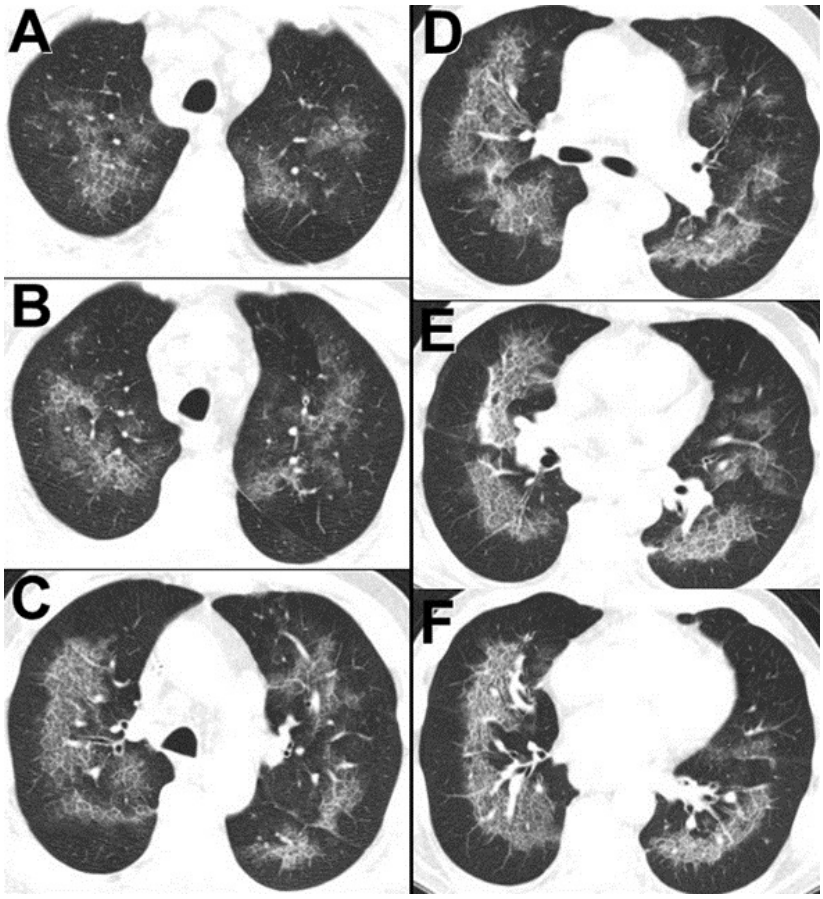

Figure 3. Thoracic CT scan.

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

1. The thoracic CT shows dense peribronchial consolidation with prominent air bronchograms
2. The thoracic CT shows multifocal, bilateral, gravitationally dependent ground-glass opacity associated with linear and reticular opacities
3. The thoracic CT shows multifocal, bilateral, peripherally predominant ground-glass opacity and consolidation associated with linear and reticular opacities
4. The thoracic CT shows multifocal, ground-glass opacity associated with linear and reticular opacities creating a “crazy paving” appearance
5. The thoracic CT shows variably sized pulmonary nodular opacities with surrounding ground-glass opacity halos

Correct!

4. The thoracic CT shows multifocal, ground-glass opacity associated with linear and reticular opacities creating a “crazy paving” appearance

The thoracic CT shows multifocal, bilateral, ground-glass opacities associated with smooth interlobular septal thickening and fine intralobular opacities. The appearance resembles “crazy paving”- smooth interlobular septal thickening associated with ground-glass opacity and intralobular lines, with a sharp demarcation between normal and abnormal lung. The areas of pulmonary infiltration are not gravitationally dependent, nor do they predominate along the bronchovascular bundles, and the opacities do not predominate in the peripheral aspects of the lung. There is minimal consolidation; the opacities are primarily ground-glass attenuation and are not “dense”; air bronchograms are not conspicuous. The pulmonary opacities are not nodular in appearance.

What is the ***appropriate next step*** for the evaluation / management of this patient?

1. ^{18}FDG-PET scanning
2. Bronchoscopy with bronchoalveolar lavage and transbronchial biopsy
3. Open surgical lung biopsy
4. Percutaneous transthoracic needle biopsy
5. Serial imaging to assess for change

Correct!

2. Bronchoscopy with bronchoalveolar lavage and transbronchial biopsy

Bronchoscopy with bronchoalveolar lavage and transbronchial biopsy is the most appropriate next step for the evaluation of this patient. Thoracoscopic lung biopsy- although not one of the choices listed above- is a reasonable consideration also, although pursuing the less invasive procedure (bronchoscopy) first is probably advisable. Serial imaging would not provide additional useful information; this approach has, essentially, already been pursued, and the opacities have not regressed. Percutaneous transthoracic needle biopsy is not an appropriate choice for diffuse lung disorders and is generally reserved for focal lung opacities, pleural masses, and chest wall lesions. Open surgical lung biopsy would undoubtedly provide tissue sufficient for diagnosis, but is needlessly invasive and morbid in this circumstance. ^{18}FDG-PET scanning would not provide management-altering information in this case- tracer accumulation within the pulmonary opacities would not provide information that would prompt a tissue diagnosis- that point has been reached already. Similarly, the lack of tracer accumulation in the pulmonary opacities would not allow an observational strategy.

The patient underwent bronchoscopy with transbronchial biopsy. Review of the material obtained by this procedure showed patchy interstitial lymphoid infiltrates within the alveolar septae and in a perivascular pattern, consistent with B-cell chronic lymphocytic leukemia/small lymphocytic lymphoma in a background of many parenchymal small T lymphocytes. No features to suggest pulmonary hemorrhage or pulmonary alveolar proteinosis were present.

Diagnosis: Pulmonary B-cell chronic lymphocytic leukemia

References

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