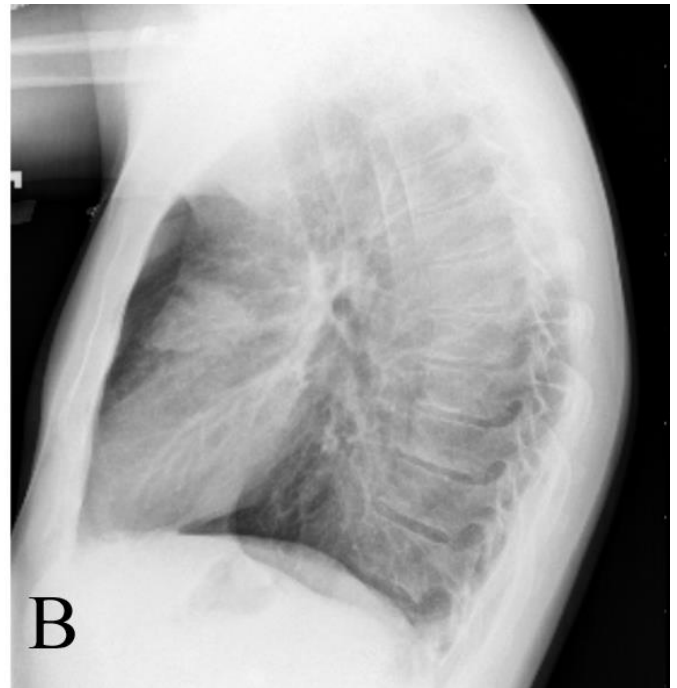
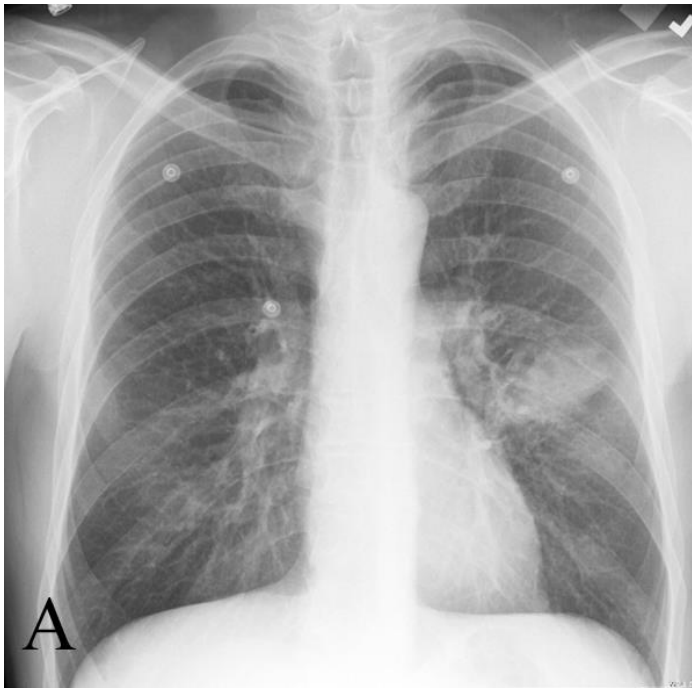


CLINICAL PRESENTATION AND RADIOLOGY QUIZ QUESTION

A 42 year old man presents to the emergency room with chest pain, which is worse when he is on his left side. He has been having chills. The patient has a 25 pack/year smoking history. His blood pressure is 140/86, his pulse 78, his respiratory rate 18, and his temperature 98.9 F. His O₂ saturation is 98% on room air. His white blood cell count is 11,600. A chest radiograph was obtained:



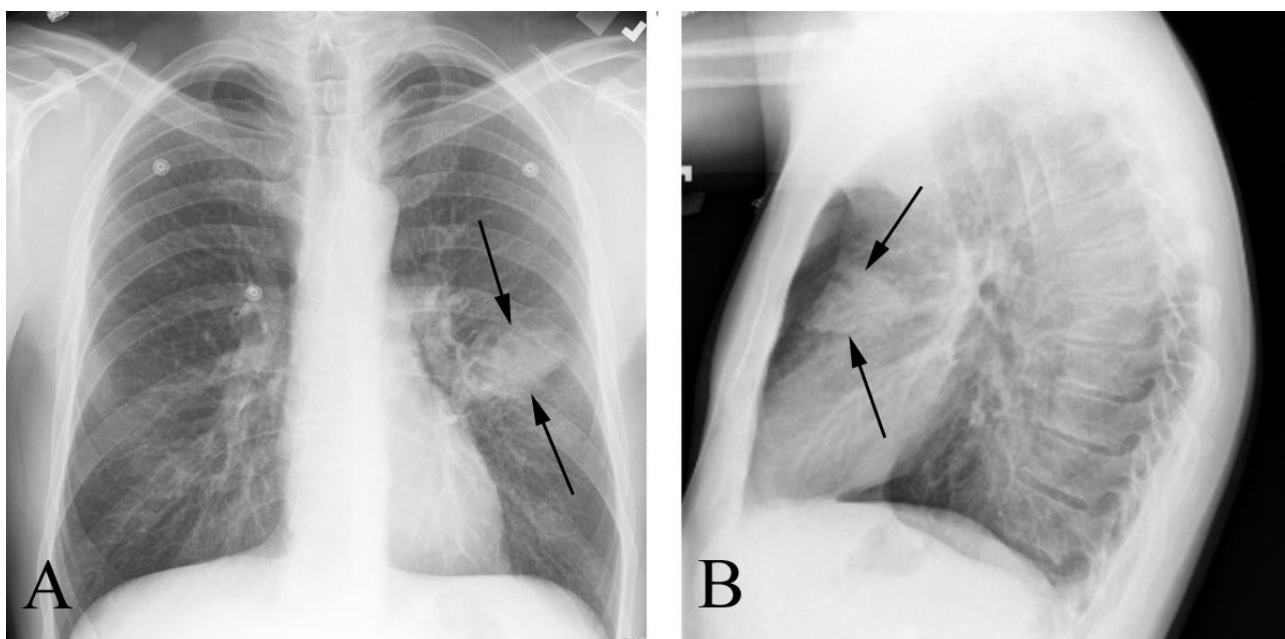
Which of the following imaging studies is the best next step in the evaluation of this patient?

- (a) left side down decubitus plain film examination
- (b) ultrasound of the chest
- (c) computed tomography of the chest
- (d) magnetic resonance imaging of the chest

RADIOLOGY QUIZ QUESTION, ANSWER, AND EXPLANATION

Which of the following imaging studies is the best next step in the evaluation of this patient?

- (a) left side down decubitus plain film examination
- (b) ultrasound of the chest
- (c) computed tomography of the chest
- (d) magnetic resonance imaging of the chest



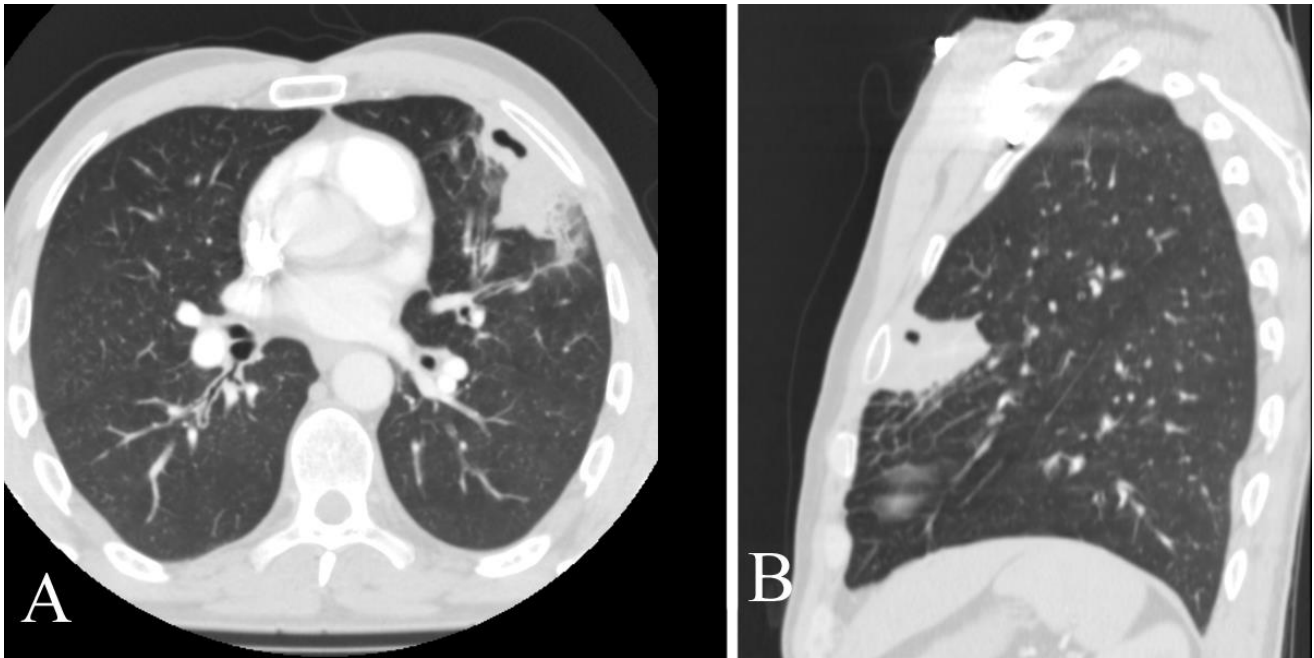
43 year old man with chest pain and fever. A&B. PA (A) and lateral (B) chest radiograph shows abnormal, focal increased density in the left upper lobe (arrows).

Answer: (c), computed tomography of the chest, is the correct response. The chest radiograph shows a triangular-shaped density in the left chest. While the patient's fever and elevated white count favor pneumonia, pulmonary embolism with associated pulmonary infarction should also be considered. In addition, given the history of smoking, a lung tumor with associated pneumonia needs to be considered.

A left-side down decubitus plain film might be helpful in cases where a left pleural effusion or a right pneumothorax was suspected on a supine radiograph, but not in this case, and (b) is incorrect. Ultrasound of the chest is helpful to evaluate the location and extent of a pleural effusion but the ultrasound beam would be blocked by the surrounding lung in this case, and (b) is incorrect. Magnetic resonance of the chest is rarely performed and is not the standard next step in evaluation of an abnormal chest radiograph, and (d) is incorrect.

IMAGING STUDY AND QUESTIONS

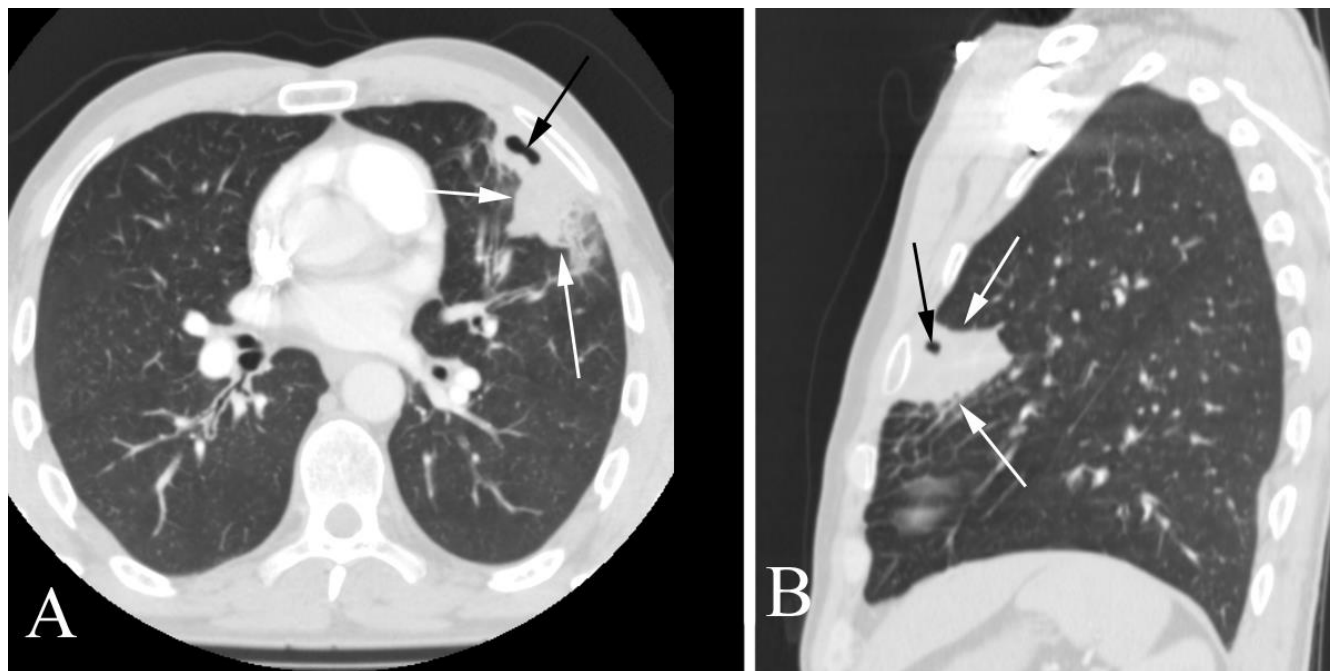
The patient underwent further imaging:



Imaging questions:

- 1) What type of study is shown?
- 2) Are there any abnormalities?
- 3) What is the most likely diagnosis?
- 4) What is the next step in management?

IMAGING STUDY QUESTIONS AND ANSWERS

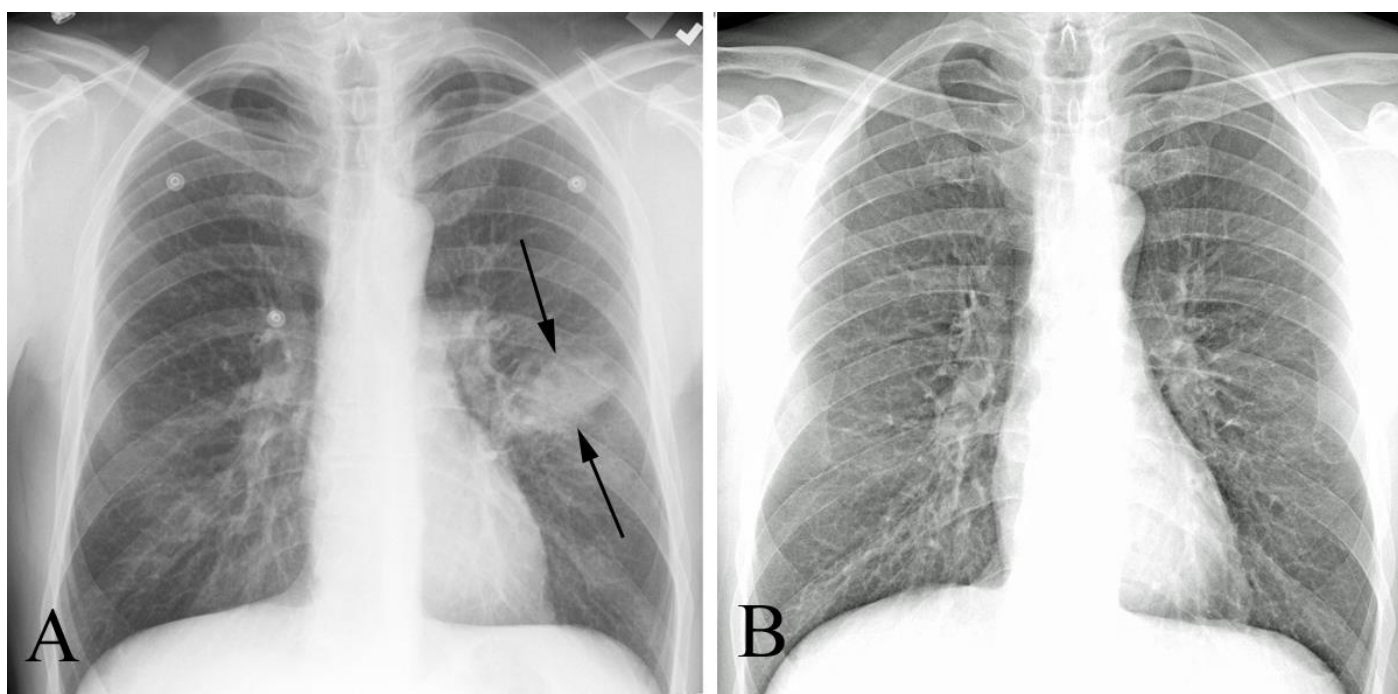


Imaging questions:

- 1) What type of study is shown? Chest CT. A is an axial chest CT performed with intravenous contrast filmed at lung windows. B is a sagittal reconstruction chest CT performed with intravenous contrast material filmed at lung windows.
- 2) Are there any abnormalities? Yes. A and B both demonstrate an area of consolidation (white arrows), with a focal gas pocket (black arrow).
- 3) What is the most likely diagnosis? Pneumonia with apparent early cavitation (the gas pocket). There were no pulmonary emboli seen within the pulmonary arteries to suggest that the density represented a pulmonary infarction. The density did not displace vessels (as seen when viewing the abnormality at soft tissue windows, not shown here), arguing against a mass, but an endobronchial lesion causing pneumonia is still possible.
- 4) What is the next step in management? Treatment with appropriate antibiotics. Close follow-up will likely be needed to document clearing of the pneumonia, as further cavitation may require either percutaneous aspiration/drainage or resection of the diseased lung segment. Bronchoscopy should also be considered to evaluate whether there is an underlying obstructing endobronchial lesion (especially a malignancy) in the involved lung segment.

PATIENT DISPOSITION, DIAGNOSIS, AND FOLLOW-UP

Sputum cultures were negative for bacteria, fungus, and tuberculosis. The patient was treated with antibiotics. He felt considerably better with resolution of his chest pain and cough. A repeat chest radiograph documented clearing of the consolidation seen on the initial study, compatible with cleared pneumonia. The patient's initial chest pain was presumably from inflammation of lung tissue and the adjacent pleura along the anterior chest wall.



42 year old man with chest pain and fever. A. PA chest radiograph shows abnormal, focal increased density in the left upper lobe (arrows) compatible with consolidation from pneumonia. B. PA chest radiograph obtained after treatment with antibiotics (and clearing of the patient's symptoms) documents resolution of the focal consolidation, compatible with cleared pneumonia.

SUMMARY

Presenting symptom: The patient initially presented with chest pain. He also had cough and fever, compatible with pneumonia, but the presence of chest pain was worrisome for possible pulmonary embolism, and the history of cigarette smoking raised concern for pulmonary tumor.

Imaging work-up: In ambulatory patients with acute chest pain, the initial imaging procedure is a plain film of the chest (and not, for example, magnetic resonance imaging, computed tomography, or ultrasound). In those cases when the plain film demonstrates an abnormality that needs further characterization, the next step in imaging is usually a CT scan, as was done in this case.

Establishing the diagnosis: While it is helpful to have a positive sputum culture to secure the diagnosis, sputum cultures are often negative, even in patients with established pneumonia. The clinical features of cough and fever favored pneumonia in this case, but the presence of chest pain and the radiographic appearance was somewhat worrisome given the patient's smoking history. CT showed a combination of consolidation and apparent minimal cavitation within the consolidated lung compatible with pneumonia, and the patient was treated accordingly with relatively prompt resolution of symptoms. Documented clearing of pulmonary opacity (on the follow-up chest radiograph) and resolved symptoms after treatment with antibiotics allow a presumptive diagnosis of pneumonia even without positive cultures.

Take-home message: When imaging is performed in ambulatory patients with chest pain, the initial study should be an upright, two-view chest radiograph. If an abnormality is detected that requires further imaging characterization, CT is almost always the best next step. If there is a strong suspicion of pulmonary embolism, the regardless of the chest radiograph results, chest CT should probably be performed.

Note the similarity of this case to RQW058, Acute Cough II. Chest pain and cough often accompany each other.

FURTHER READING

Meisel JL. Diagnostic approach to chest pain in adults. UpToDate, accessed 10/2/09.

Renfrew, DL. Imaging of chest pain. Chapter 11 of *Symptom Based Radiology*, Symptom Based Radiology Publishing, Sturgeon Bay, WI, 2010, available for no charge at www.symptombasedradiology.com.

Thompson BT, Hales CA. Overview of acute pulmonary embolism. UpToDate, accessed 10/2/09.