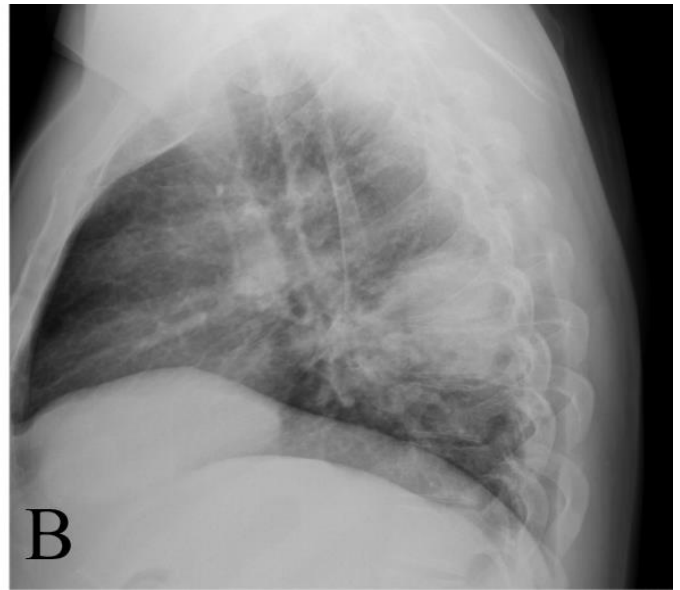


CLINICAL PRESENTATION AND RADIOLOGY QUIZ QUESTION

A 47 year old man presents with a productive cough resulting in green phlegm. He has a fever and feels fatigued. The patient started smoking when a teenager and admits to one pack per day currently. His blood pressure is 78/60, his pulse 78, his respiratory rate 20, and his temperature 101.2 F. His O₂ saturation is 94% on room air. A chest radiograph was obtained:



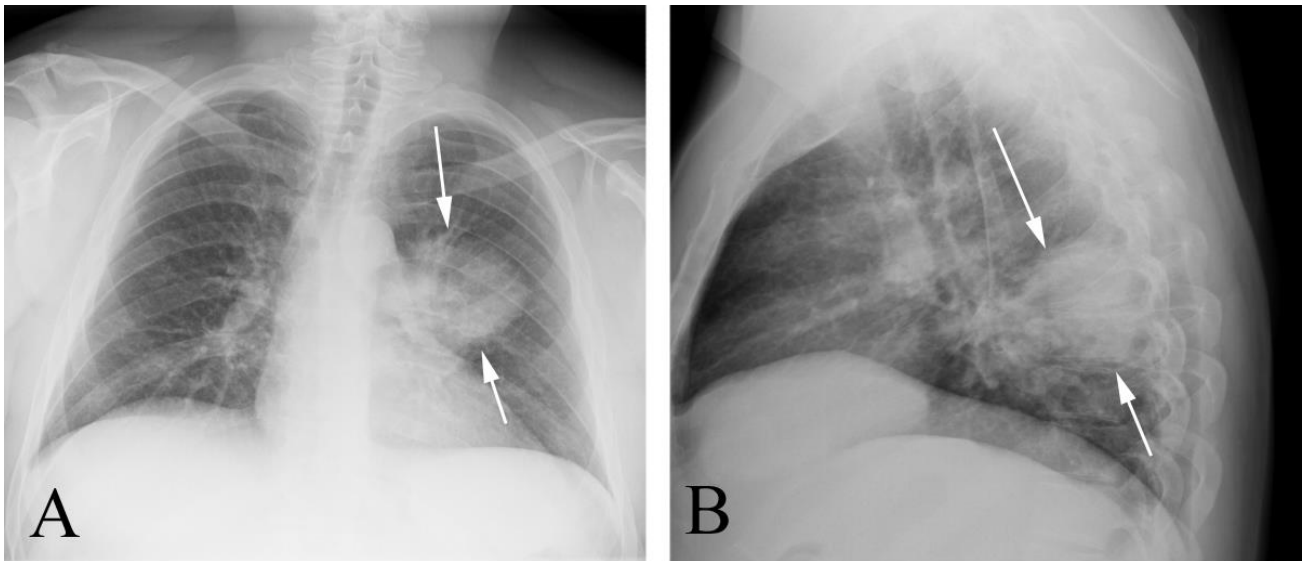
Which of the following imaging studies is the best next step in the evaluation of this patient?

- (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

[For the patient history, see Page 1.] 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



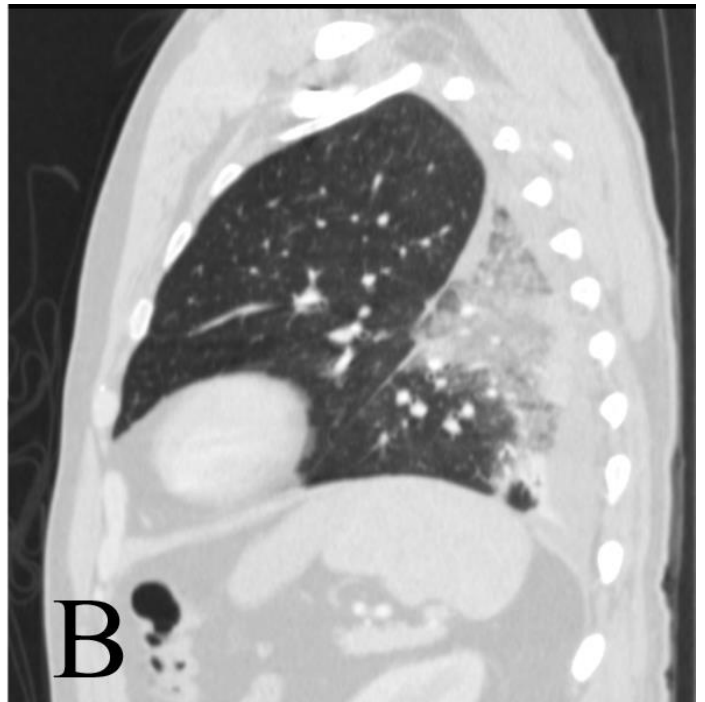
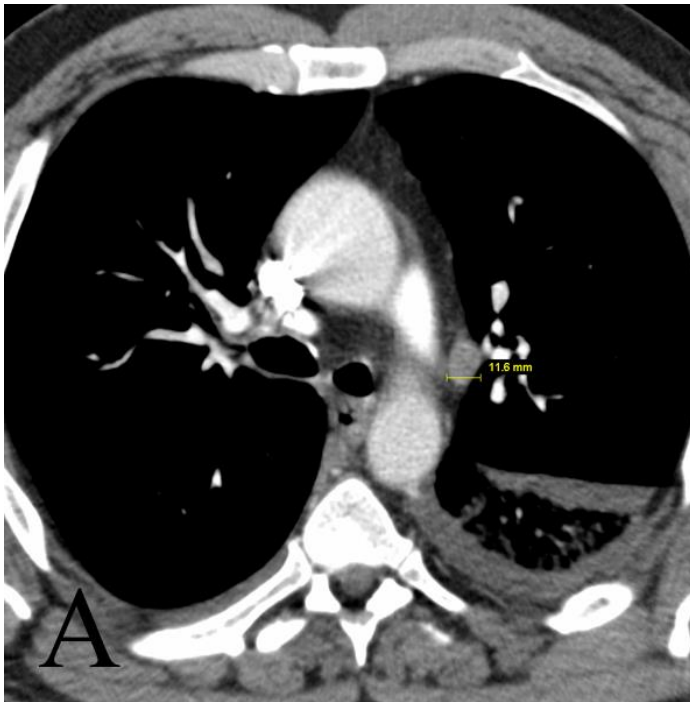
47 year old man with cough and fever. A&B. PA and lateral chest radiograph shows abnormal, spherical increased density in the left lower lobe (arrows) which has the appearance of a mass.

Answer: (c), computed tomography of the chest, is the correct response. While the patient's clinical features are typical of pneumonia, the chest radiograph shows an apparent spherical mass in the left chest. Given the history of smoking, a lung tumor with associated pneumonia needs to be considered, and the best imaging study to further evaluate the abnormal chest radiograph is a chest CT.

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

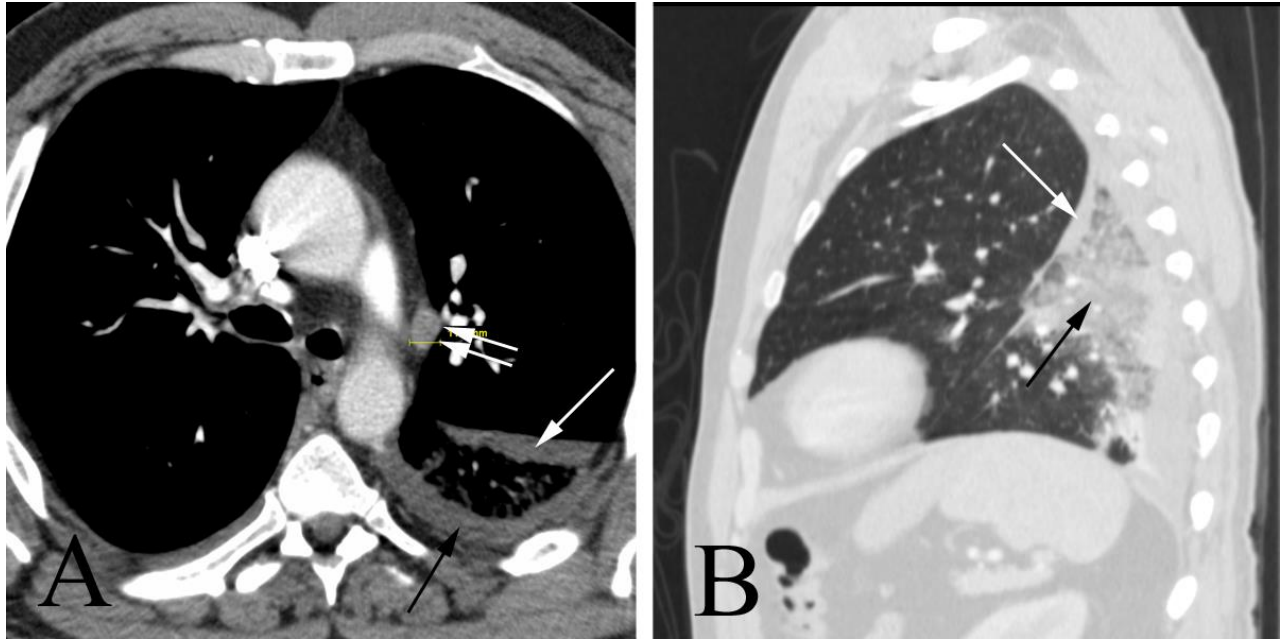
The patient underwent imaging:



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 soft tissue windows. B is a sagittal reconstruction chest CT performed with intravenous contrast material filmed at lung windows.
- 2) Are there any abnormalities? Yes. A demonstrates loculated pleural fluid (black arrow), lung consolidation (white arrow), and a prominent left hilar lymph node (double white arrow). B demonstrates a combination of a thickened oblique fissure (likely more loculated fluid) (white arrow) and central *ground glass opacity* (black arrow). With *ground glass opacity*, lung markings are visible through the abnormal lung density, whereas with *consolidation*, no lung markings are visible through the abnormal lung density.
- 3) What is the most likely diagnosis? Pneumonia.
- 4) What is the next step in management? Treatment with appropriate antibiotics and documentation of clearing of pneumonia.

PATIENT DISPOSITION, DIAGNOSIS, AND FOLLOW-UP
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In addition to suffering from pneumonia, the patient had acute renal failure secondary to sepsis at the time of presentation (accounting for his low blood pressure). He was admitted to the hospital and treated with hydration. His fever remitted and his other vital signs returned to normal as well.

SUMMARY

Presenting symptom: The patient initially presented with typical features of a clinically acquired pneumonia, namely cough, fever, myalgia, headache, and fatigue. *Whether, when, and how* to treat such patients without antibiotics (assuming a viral infection) and with antibiotics (assuming a bacterial infection) is a subject of ongoing controversy and beyond the scope of this quiz.

Imaging work-up: In ambulatory patients with acute cough, *whether* and *when* to obtain an imaging study is also a subject of ongoing controversy, but *how* to image them is much less controversial: the initial step should be with plain films of the chest (and not, for example, with 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 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 productive cough and fever favored pneumonia in this case, but the radiographic appearance on plain film evaluation was of a spherical mass, which was particularly worrisome given the patient's smoking history. CT showed a combination of pleural thickening/loculated pleural fluid and ground-glass opacity accounting for the apparent "mass" seen on the plain films, and these findings considered characteristic enough of pneumonia to make a presumptive diagnosis and to treat the patient accordingly.

Take-home message: When imaging is performed in ambulatory patients with cough, 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.

FURTHER READING

Goroll AH and Mulley AG. "Evaluation of subacute and chronic cough" Chapter 41 in *Primary Care Medicine: Office Evaluation and Management of the Adult Patient*, 6th edition, Lippincott William & Wilkins.

Porter RS (Editor). Cough in adults. Chapter in *The Merck Manual of Patient Symptoms*, Merck & Company, Whitehouse Station, NJ 2008.

Renfrew, DL. Cough, dyspnea, and lung nodules. Chapter 10 of *Symptom Based Radiology*, Symptom Based Radiology Publishing, Sturgeon Bay, WI, 2010, available for no charge at www.symptombasedradiology.com.

Seller RH. Cough. Chapter 9 in *Differential Diagnosis of Common Complaints*. Saunders, 2000, Philadelphia.