141. This 41-year-old woman developed acute left-sided chest pain. She has had gradually increasing shortness of breath and a dry cough over the last 8 months, and has a 25-pack-year history of cigarette smoking. Her posteroanterior chest radiograph (Figure 1) is presented. Which one of the following is the MOST likely diagnosis?

A. Tuberculosis
B. Metastatic disease
C. Lymphangioleiomyomatosis
D. Langerhan's cell histiocytosis
E. Sarcoidosis
Section IV – Thoracic Radiology (Chest)

Question #141

Findings: Chest X-ray shows a left-sided pneumothorax and diffuse irregular nodular opacities.

Rationales:

A) Incorrect. Mycobacterium tuberculosis may present innumerous discrete miliary nodules, known as military tuberculosis. The chest radiograph shows innumerous 2 to 3 mm nodules, symmetrically distributed throughout both lungs. This form of tuberculosis is not associated with pneumothorax.

B) Incorrect. Metastatic disease may present with multiple pulmonary nodules, usually larger in size. However, the occurrence of pneumothorax is very unusual, although it may uncommonly occur with some metastases, such as sarcomas. The absence of a history of known malignancy also argues against this diagnosis in this patient.

C) Incorrect. Lymphangioleiomyomatosis (LAM) is an obstructive pulmonary disease characterized by diffuse pulmonary cysts. Patients with LAM are female and of child-bearing age. Early chest radiographic findings include subtle, fine, reticular opacities. Later findings are discrete cysts. Spontaneous pneumothorax is the presenting event in more than half of patients. The older age of the test patient and the irregular nodular opacities make LAM not the most likely diagnosis.

D) Correct. Langerhan's cell histiocytosis is a smoking-related lung disease in adults. Chest radiographs typically demonstrate a symmetric, reticulonodular pattern, less commonly a solely nodular pattern, with upper and mid-lung predominance. The nodules are usually irregular. The disease may progress to cystic lung disease. Spontaneous pneumothorax is common, occurring in up to 25% of affected patients. The clinical and radiographic findings in this patient are characteristic of Langerhans cell histiocytosis.

E) Incorrect. Most patients clinically present with sarcoidosis between 20 and 40 years of age. Lymph node enlargement is the most common intrathoracic manifestation of sarcoidosis, occurring in about 80% of patients. The classic pattern is bilateral hilar and right paratracheal lymph node enlargement. Parenchymal disease is seen in about half of patients. Reticulonodular opacities are the most common pattern, and exhibit an upper lung predominance, along the bronchovascular bundles. While sarcoidosis may be associated with spontaneous pneumothorax, this is rare, and the absence of nodal enlargement makes sarcoidosis not the best choice.

Citations:


This 68-year-old female presented with abdominal pain. An abnormality was noted in the lower chest on an abdominal radiograph. Her posteroanterior chest radiograph (Figure 2A) and a CT image (Figure 2B) are presented. Which one of the following is the MOST likely diagnosis?

A. Lymphoma
B. Tuberculosis
C. Aneurysm
D. Neurenteric cyst
E. Bronchogenic cyst
Section IV – Thoracic Radiology (Chest)

Question #142

Findings: Chest radiograph shows a subcarinal mass. CT scanning demonstrates a rounded, thin-walled, water attenuation mass in the middle mediastinum.

Rationales:

A) Incorrect. Lymphoma is classified as either Hodgkin’s disease or non-Hodgkin’s lymphoma. The main imaging features of both diseases is mediastinal and bilateral hilar lymph node enlargement. Usually, the anterior mediastinal and paratracheal nodes are the most frequently involved, with subcarinal nodes also commonly enlarged. The enlarged nodes are typically of soft tissue attenuation on CT. Low-density areas can be seen, resulting from cystic degeneration, although a wall of soft-tissue attenuation is usually present. While the chest radiographic appearance in the test patient is consistent with lymphoma, the CT finding of a water, not soft tissue, attenuation mass argues against the diagnosis.

B) Incorrect. Lymph node enlargement is the predominant feature of primary tuberculosis. This form of the disease is more common in children than in adults. Affected patients are usually symptomatic and present with cough, shortness of breath, weight loss and fever. The common chest radiographic appearance is hilar lymph node enlargement; a subcarinal location occurs less commonly. While the chest radiographic appearance in the test case is consistent with tuberculosis, the patient’s age and absence of symptoms are atypical for tuberculosis. On CT, enlarged nodes in tuberculosis may be of water attenuation centrally, but with a rim of enhancing soft-tissue. On CT in the test case, the subcarinal mass is uniformly of water-attenuation, not consistent with the diagnosis of tuberculosis.

C) Incorrect. The aorta commonly becomes atherosclerotic and ectatic with increasing age, and it can become aneurysmally dilated. Aneurysms usually arise from the aortic arch or the descending aorta. Aneurysms can be distinguished from other mediastinal masses by recognizing their continuity with the aorta, the presence of calcification in the wall of the aneurysm, and enhancement on CT scanning performed with intravenous contrast. None of these features are seen in the test case.

D) Incorrect. Neurenteric cysts are posterior mediastinal cystic lesions connected to the meninges through a midline defect in one or more vertebral bodes. Associated vertebral anomalies suggest the diagnosis. In the test case, the absence of both a paravertebral location of the mass and adjacent spine abnormalities excludes neurenteric cyst as a diagnosis.

E) Correct. Bronchogenic cysts are bronchopulmonary foregut duplication anomalies that are usually discovered incidentally. Most arise in the mediastinum. They are seen on chest radiographs as a well-defined solitary mass, usually in close proximity to the airway. The most common site is subcarinal. CT scanning usually shows a thin-walled, fluid-filled mass. The CT attenuation value is typically the same as that of water, although when the cyst contains proteinaceous material or blood or is infected, the attenuation value can be higher. The chest radiographic and CT findings in this case are typical of a bronchogenic cyst.

Citations:
143. This 25-year-old female presented with hemoptysis. Her posteroanterior chest radiograph (Figure 3A) and a T2-weighted MR image (Figure 3B) are presented. Which one of the following is the MOST likely diagnosis?

A. Tuberculous empyema
B. Carcinoid tumor
C. Bronchogenic carcinoma
D. Hamartoma
E. Adenoid cystic carcinoma
Section IV – Thoracic Radiology (Chest)

Question #143

Findings: The chest radiograph shows mediastinal shift to the left and an opacified hemithorax. The findings are suspicious of atelectasis and an obstructing mass. MR imaging demonstrates a soft-tissue mass in the left main bronchus.

Rationales:

A) Incorrect. Empyema is defined as pus in the pleural cavity. The radiographic appearance is that of a homogeneous opacity paralleling the pleural surface. With large pleural collections, there can be mediastinal shift. Pleural fluid, including empyema, is a space-occupying process, and is not be associated with volume loss seen in the test case. The diagnosis of empyema alone would also not explain the endobronchial mass.

B) Correct. Carcinoid tumors represent approximately 70% of the so-called “bronchial adenomas,” a term which is now out of favor. Carcinoid tumors are very vascular, and therefore commonly associated with hemoptysis. Approximately 80% of pulmonary carcinoid tumors are endobronchial in location, and 20% present as a solitary pulmonary nodule. Endobronchial tumors are often associated with atelectasis or post-obstructive pneumonia. On MR imaging or CT scanning, the tumor can be seen within a central bronchus. The clinical and imaging findings in the test patient are consistent with the diagnosis of carcinoid tumor. The young age of the patient also favors carcinoid over bronchogenic carcinoma.

C) Incorrect. Bronchogenic carcinoma refers to a tumor originating from bronchial epithelium. This tumor is most often found in patients over 50 years of age and is associated with a history of cigarette smoking. Centrally located tumors can cause coughing, wheezing, hemoptysis and pneumonia. Adenocarcinomas account for about 50% of bronchogenic carcinomas. The typical imaging appearance of adenocarcinoma is a peripheral lung nodule or mass with irregular or spiculated margins. Squamous cell carcinoma is the second most common type of bronchogenic cancer. These tumors are most often central in location, arising within the main, lobar or segmental bronchi. Although squamous cell carcinoma can produce radiographic and MR findings similar to those in the test case, the young age of the patient makes this diagnosis less likely than a carcinoid tumor.

D) Incorrect. Pulmonary hamartomas are benign lesions consisting of an admixture of the normal components of the lung. Most contain cartilage and they may also contain fat or fluid. Over 90% are peripheral in location; the remainder are endobronchial in location. Most manifest as a solitary pulmonary nodule. Although a hamartoma could explain the imaging findings in the test patient, the absence of fat or calcium makes this diagnosis less likely than a carcinoid tumor.

E) Incorrect. As noted above, carcinoid tumors account for most bronchial adenomas. The remaining bronchial adenomas are adenoid cystic carcinoma and mucoepidermoid carcinoma. Adenoid cystic tumors usually involve the lower two thirds of the trachea, while mucoepidermoid cancer is more frequent in the main bronchi. Both appear as an endobronchial mass. While bronchial adenomas can cause the imaging findings in the test case, they are much less common than carcinoid tumors.

Citations:


144. This 65-year-old male developed a change in his baseline cough and new streaks of blood in his sputum. His posteroanterior chest radiograph (Figure 4A) and lateral chest radiograph (Figure 4B) are presented. Which one of the following is the MOST likely diagnosis?

A. Neurofibroma
B. Lung cancer
C. Mucous plug
D. Pneumonia
E. Foreign body
Section IV – Thoracic Radiology (Chest)

Question #144

Findings: Chest radiograph demonstrates a collapsed right upper lobe and a right suprahilar mass. The minor fissure is elevated and is concave peripherally. However, it has a convex border medially caused by a tumor mass in the right hilum. The shape of the fissure resembles a “S” shape. This appearance is referred to as the “S” sign of Golden. Note the elevation of the right hemidiaphragm, another sign of volume loss.

Rationale:

A) Incorrect. On chest radiography, neurofibromas appear as well-defined paraspinal masses with smooth or lobulated borders. Some can be large and can occupy part or most of a hemithorax. While a large neurofibroma might extend to the apex of the lung, it would not be associated with an elevated hemidiaphragm and tracheal deviation, both signs of volume loss.

B) Correct. As noted in the prior case, bronchogenic carcinomas typically occur in older patients and are associated with a history of cigarette smoking. Centrally located tumors can cause coughing, wheezing, hemoptysis and pneumonia. Tumors that are central in location (i.e., within bronchi) can also cause postobstructive pneumonia and atelectasis. The radiographic finding in the test patient, e.g., the S-sign of Golden (elevated minor fissure and a medial soft tissue mass) are diagnostic of bronchogenic carcinoma.

C) Incorrect. While a mucous plug can produce right upper lobe atelectasis, it does not explain the finding of a right hilar mass. Thus, mucous plug is an unlikely diagnosis.

D) Incorrect. Infectious pneumonia typically produces parenchymal opacity without lymphadenopathy on chest radiography. There may be associated air-bronchograms (i.e., a bronchus or bronchiole passing through airless lung). In general, pneumonia is not associated with a suprahilar mass or volume loss. These findings in the test patient make pneumonia not the best diagnosis.

E) Incorrect. A foreign body that completely obstructs the bronchus in which it is lodged can cause atelectasis. However, there should not be a right hilar mass.

Citations:
145. This 58-year-old male had increasing shortness of breath over 6 months. His posteroanterior chest radiograph (Figure 5A) and a single image from a high-resolution CT examination (Figure 5B) are presented. Which one of the following is the MOST likely diagnosis?

A. Pneumocystis carinii pneumonia  
B. Sarcoidosis  
C. Usual interstitial pneumonitis  
D. Alveolar proteinosis  
E. Pulmonary edema
Findings: Chest radiographs show bilateral symmetric alveolar opacities. CT demonstrates bilateral ground glass opacity with superimposed thickened septal lines, creating the so-called “crazy-paving” appearance.

Rationale:
A) Incorrect. Pneumocystis carinii pneumonia (PCP) is a common complication of HIV infection. The radiographic findings of PCP are diffuse opacity of the lung parenchyma, which may be reticular in early stages before progressing to confluent airspace disease. The absence of a history of HIV or immunocompromise also makes the diagnosis unlikely.

B) Incorrect. Sarcoidosis is usually seen in patients who present between 20 and 40 years of age. Lymph node enlargement is the most common intrathoracic manifestation of sarcoidosis. Parenchymal disease is less common and seen in about half of patients. Reticulonodular opacities are the most common pattern, and exhibit an upper lung predilection, along the bronchovascular bundles. On HRCT, the most common findings are miliary nodules, that cluster around the bronchovascular bundles. Over time the may coalesce, forming conglomerate masses, architectural distortion and peripheral bulla. The age of the test patient, the absence of lymph node enlargement, and the uniform ground glass opacity with a crazy paving appearance argue against the diagnosis of sarcoidosis.

C) Incorrect. Usual interstitial pneumonia (UIP) is a type of chronic interstitial pneumonia. Radiographic findings include ground-glass opacities and reticular interstitial opacities, including thickened septal lines and honeycombing. The abnormality has a predilection for the subpleural aspects of the lung bases. Symmetric bilateral ground glass opacity with superimposed septal lines forming a crazy paving pattern is not a feature of UIP.

D) Correct. Alveolar proteinosis refers to the deposition of lipoproteinaceous material in the alveolar spaces. Chest radiography shows bilateral diffuse alveolar opacities, often with a superimposed fine reticular pattern. CT scanning demonstrates diffuse ground glass opacity with superimposed septal lines creating the “crazy-paving” appearance. The imaging findings in the test patient are highly specific for alveolar proteinosis.

E) Incorrect. Radiographic findings of pulmonary edema include interstitial and alveolar edema, pulmonary vascular redistribution and pleural effusions. The edema is usually gravity dependent and therefore more severe at the lung bases. CT findings include ground-glass opacity and septal lines. In the test case, the ground glass opacity and septal lines are not gravity dependent, and therefore not consistent with pulmonary edema.

Citations: