January 2016 Imaging Case of the Month

Michael B. Gotway, MD

Department of Radiology
Mayo Clinic Arizona
Scottsdale, AZ

Clinical History: A 44 year-old man presented with refractory heart failure following the relatively asymptomatic detection of severe aortic regurgitation at auscultation 11 years earlier. When the valvular disease was discovered, the patient's left ventricular ejection fraction was 25%. He underwent open aortic valvular replacement and his systolic function stabilized on medication in the years that followed, but eventually his cardiac function deteriorated further and he was listed for cardiac transplant.

As part of the pre – transplant evaluation frontal and lateral chest radiography (Figure 1) was performed.

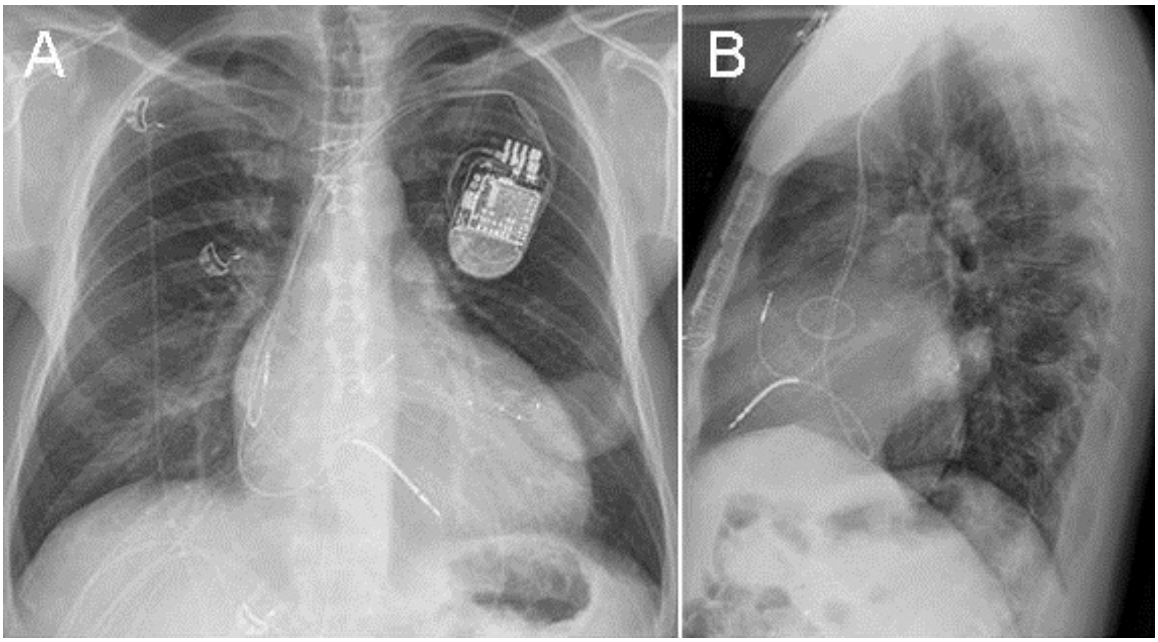

Figure 1. Frontal (A) and lateral (B) chest radiography.

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

1. The frontal chest radiograph shows a relatively circumscribed opacity at the left base
2. The frontal chest radiograph shows abnormal mediastinal contours
3. The frontal chest radiograph shows basal predominant fibrotic abnormalities
4. The frontal chest radiograph shows large lung volumes with a cystic appearance
5. The frontal chest radiograph shows no abnormal findings

Correct!

1. The frontal chest radiograph shows a relatively circumscribed opacity at the left base

The frontal and lateral chest radiograph shows a relatively circumscribed mass projected over the left cardiac base. The heart is enlarged, but the mediastinal contours are otherwise unremarkable. Lung volumes appear normal and no evidence of cystic lung disease is seen, nor is there evidence of a fibrotic abnormality.

Which of the ***following is correct*** regarding the description of the chest radiographic findings of the left-sided lesion?

1. The left lower thoracic lesion demonstrates an oblong configuration suggesting an origin from the left major fissure
2. The left lower thoracic lesion demonstrates the “hilum overlay” sign
3. The left lower thoracic lesion shows evidence of calcification
4. The left lower thoracic lesion shows evidence of cavitation
5. The left lower thoracic lesion shows the “incomplete border” sign

Correct!
1. The left lower thoracic lesion demonstrates an oblong configuration suggesting an origin from the left major fissure

The frontal and lateral chest radiograph shows a relatively circumscribed mass in the left lower lobe, without evidence of increased attenuation to suggest calcification, but without air lucency to suggest cavitation. The lesion has an oblong configuration, which can be seen with abnormalities arising from the fissural surfaces, in this case, the left major fissure. The “hilum overlay” sign is present when a mass overlies the hilum, but the hilum can still be seen “though” the mass. This implies that there is still aerated lung parenchyma around the vessels of the hilum, so the mass cannot reside in this area and must reside anterior or posterior to the hilum. The hilum overlay sign was originally conceived to distinguish an enlarged heart and pulmonary artery from a mediastinal mass. It was noted that the proximal portions of the pulmonary arteries in the hilar regions typically lie just lateral to the heart border or may overlap the lateral heart border, even when cardiomegaly is present (see Figure 1A). Occasionally an anterior mediastinal mass can simulate cardiomegaly, but such masses cannot lie medial to the pulmonary artery since this position is occupied by the heart and pericardium; therefore, anterior mediastinal masses will overlap the pulmonary artery as it exists the hilum, and the pulmonary artery will be seen “through” the mass (Figure 2A). The “incomplete border” sign is present when a lesion shows a circumscribed margin on one side, and an obscured, or “fading” margin on the other side- this configuration is typical of extraparenchymal lesions, such as those arising from the pleura or chest wall (Figure 2B).

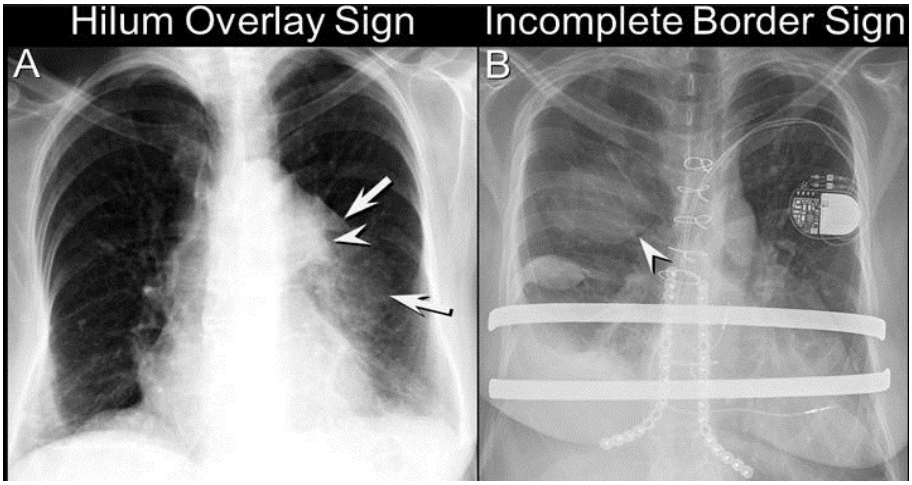

Figure 2. Panel A: “Hilum overlay” sign. Note that the vessels of the left hilum (arrowhead) can be “seen through” the mass (arrows) projected over the left hilum. The pulmonary artery lies medial to the anterior mediastinal mass, which represented thymic neuroendocrine malignancy. Panel B: "Incomplete border” sign. Note the circumscribed inferior margin (arrowhead) of the opacity overlying the right upper lobe, with the cranial margin of this opacity “fading” indistinctly. The cause of the finding was multiloculated pleural effusion.

The patient underwent unenhanced thoracic CT for further evaluation of the chest radiographic abnormality (Figure 3).

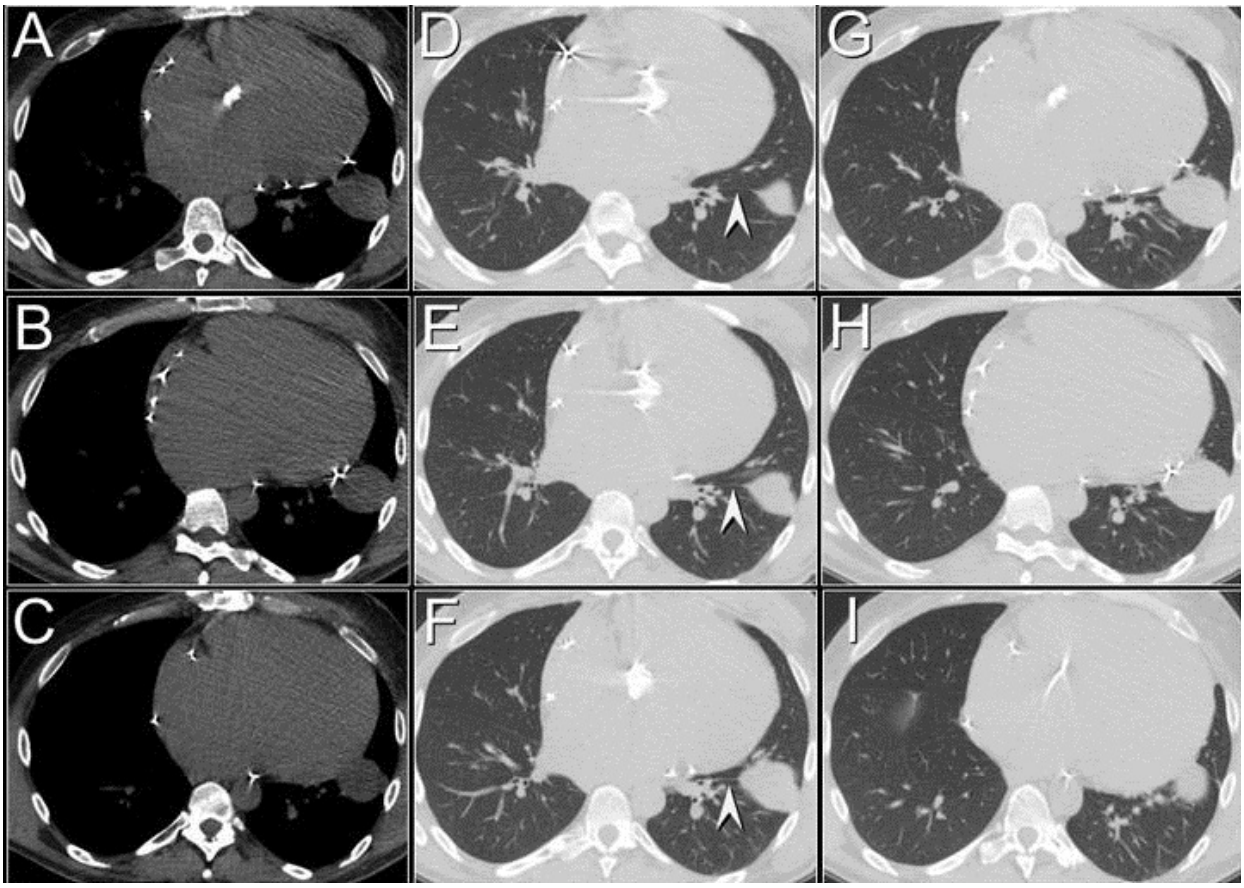

Figure 3: Axial thoracic CT displayed in soft tissue (A-C) and lung (D-I) windows.

Regarding this examination, which of the following is ***correct***?

1. The thoracic CT shows a destructive left-sided chest wall mass
2. The thoracic CT shows a large left pleural effusion
3. The thoracic CT shows a posterior mediastinal mass
4. The thoracic CT shows an oblong soft tissue mass in the left lower thorax
5. The thoracic CT shows intrathoracic herniation of left-sided posterior subdiaphragmatic structures

Correct!

4. The thoracic CT shows an oblong soft tissue mass in the left lower thorax

The unenhanced thoracic CT shows an oblong, non-calcified mass in the left lower thorax, demonstrating a close relationship with the left major fissure. There are no diaphragmatic abnormalities to suggest that the lesion arises from intrathoracic herniation of abdominal contents. The lesion is surrounded by lung, and therefore cannot arise from the chest wall or mediastinum, nor does the visible chest wall show destructive changes. No pleural effusion is present.

Which of the following represents an ***appropriate step*** for the evaluation of this patient?

1. ^{68}Ga-citrate scanning
2. ^{99m}Tc-MAA ventilation-perfusion scintigraphy
3. Inspiratory and expiratory chest radiography
4. Repeat enhanced thoracic CT
5. None of the above

Correct!
5. None of the above

The left base thoracic lesion was fairly well seen at the unenhanced thoracic CT study and repeat contrast enhanced thoracic CT would probably add little further information. Inspiratory and expiratory radiography is primarily used for detection of pneumothorax or to assess for air trapping, such as in the context of a suspected foreign body within the large airways, and would not play a role here. ^{68}Ga-citrate scintigraphy is occasionally used for assessment of diffuse lung opacities, perhaps to detect opportunistic infections in immunocompromised patients, or pneumonitis related to medication-induced pulmonary injury, but neither are appropriate considerations for this patient. ^{99m}Tc-MAA ventilation-perfusion scintigraphy is useful for the detection of suspected thromboembolic disease but pulmonary embolism is not highly suspected in this patient as the morphology of the left thoracic lesion is not suggestive of an infarct; therefore ^{99m}Tc-MAA ventilation-perfusion scintigraphy is not the most appropriate next step. None of the options listed would provide additional characterization of the left thoracic lesion.).

Based on the data thus far, which of the following represents the ***next most appropriate step*** for the evaluation of this patient?

1. Endoscopic ultrasound
2. Flexible fiberoptic bronchoscopy
3. Mediastinoscopy
4. Percutaneous transthoracic fine needle aspiration and core biopsy
5. Video-assisted thoracoscopic surgery

Correct!
4. Percutaneous transthoracic fine needle aspiration and core biopsy

Given the peripheral nature of this lesion and the lack of an associated airway, flexible fiberoptic bronchoscopy is not the best method for obtaining a tissue diagnosis for the lesion in this patient. Mediastinoscopy cannot access the inferior thorax caudal to the posterior aspect of the subcarinal space, and the lesion in this patient has no mediastinal extension. Similarly, the lesion does not have contact with, and is not in proximity to, the esophagus, and therefore endoscopic ultrasound would not be a good choice for obtaining a tissue diagnosis in this patient. Video-assisted thoracoscopic surgery would be a useful procedure for obtaining a tissue diagnosis for this patient, but a tissue diagnosis could also be achieved less invasively using percutaneous transthoracic fine needle aspiration and core biopsy; the latter is the best method among those listed for obtaining a diagnosis for this patient.

The patient underwent percutaneous transthoracic fine needle aspiration and core biopsy which showed a bland spindle cell lesion embedded within a myxocollagenous stroma, without nuclear atypia or mitotic activity. Immunoperoxidase staining showed positivity for BCL-2, although CD34 staining was negative. The histopathological features are consistent with solitary fibrous tumor of the pleura.

Diagnosis: Solitary fibrous tumor of the pleura

References

1. Ginat DT, Bokhari A, Bhatt S, Dogra V. Imaging features of solitary fibrous tumors. AJR Am J Roentgenol. 2011;196(3):487-95. [CrossRef] [PubMed]
2. Sung SH, Chang JW, Kim J, Lee KS, Han J, Park SI. Solitary fibrous tumors of the pleura: surgical outcome and clinical course. Ann Thorac Surg. 2005;79(1):303-7. [CrossRef] [PubMed]
3. Truong M, Munden RF, Kemp BL. Localized fibrous tumor of the pleura. AJR Am J Roentgenol. 2000;174(1):42. [CrossRef] [PubMed]
4. Chick JF, Chauhan NR, Madan R. Solitary fibrous tumors of the thorax: nomenclature, epidemiology, radiologic and pathologic findings, differential diagnoses, and management. AJR Am J Roentgenol. 2013;200(3):W238-W248. [CrossRef] [PubMed]
5. Bhardwaj H, Lindley S, Bhardwaj B, Carlile PV, Huard DR. Catch me if you can: a wandering solitary fibrous tumor of the pleura. Am J Respir Crit Care Med. 2014; 190(3):e7-9. [CrossRef] [PubMed]
6. Cardillo G, Lococo F, Carleo F, Martelli M. Solitary fibrous tumors of the pleura. Curr Opin Pulm Med. 2012;18(4):339-46. [CrossRef] [PubMed]
7. Algın O, Gökalp G, Topal U. Signs in chest imaging. Diagn Interv Radiol. 2011;17(1):18-29. [CrossRef] [PubMed]
8. Hsu CC, Henry TS, Chung JH, Little BP. The incomplete border sign. J Thorac Imaging. 2014;29(4):W48. [CrossRef] [PubMed]