June 2015 Imaging Case of the Month

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Clinical History: A 58-year-old man presented for a pre-operative evaluation for surgery planned for resection of localized prostate malignancy. A frontal chest radiograph (Figure 1) was performed.

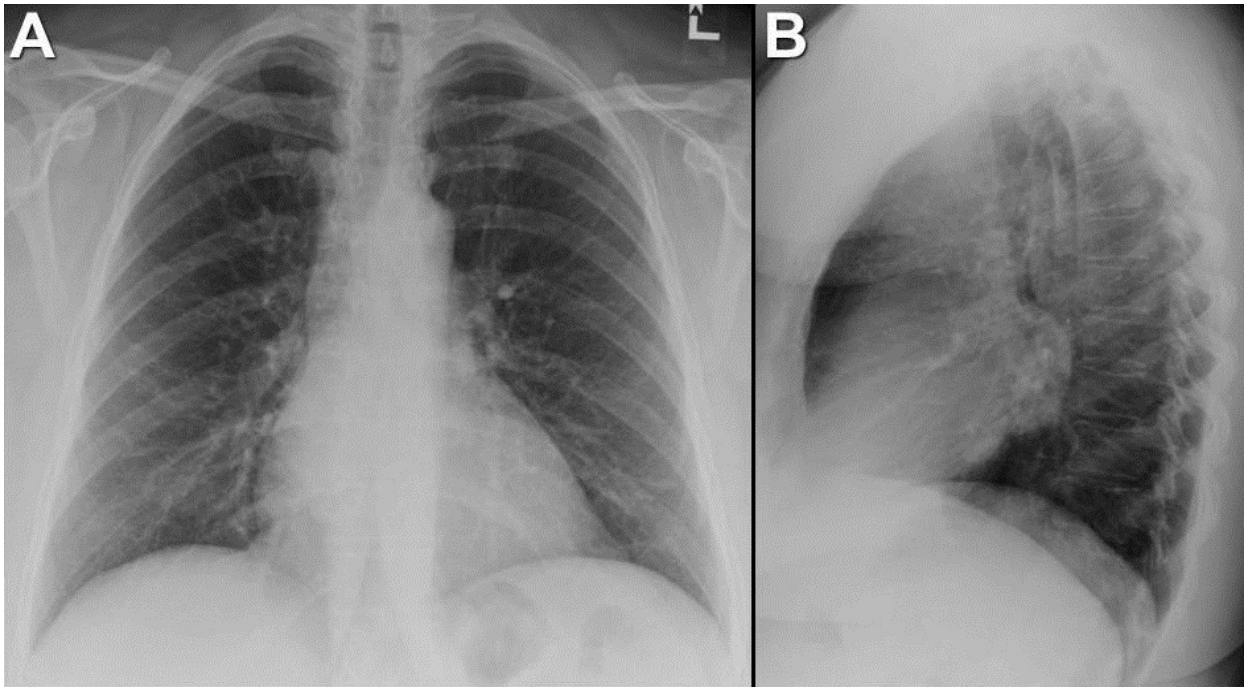

Figure 1. Figure 1: Frontal (A) and lateral (B) chest radiography.

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

1. The frontal chest radiograph shows an abnormal mediastinal contour
2. The frontal chest radiograph shows basal predominant fibrotic abnormalities
3. The frontal chest radiograph shows large lung volumes with a cystic appearance
4. The frontal chest radiograph shows multifocal small pulmonary nodules
5. The frontal chest radiograph shows no abnormal findings

Correct!

1. The frontal chest radiograph shows an abnormal mediastinal contour

The frontal chest radiograph shows normal lung volumes and clear lungs; no pleural abnormality is present. There is no evidence of cystic lung disease or basal fibrotic abnormalities. An abnormal mediastinal contour is present, best seen on the lateral projection, projected just posterior to the heart (Figure 2).

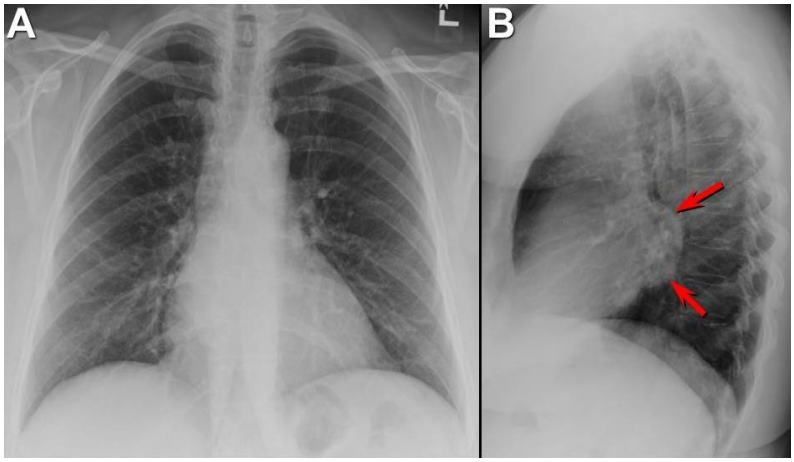

Figure 2. Frontal (A) and lateral (B) chest radiography shows normal lung volumes and clear lungs. An abnormal contour is present in the mediastinum, best seen on the lateral projection (arrows).

The patient subsequently underwent contrast-enhanced thoracic CT (Figure 3).

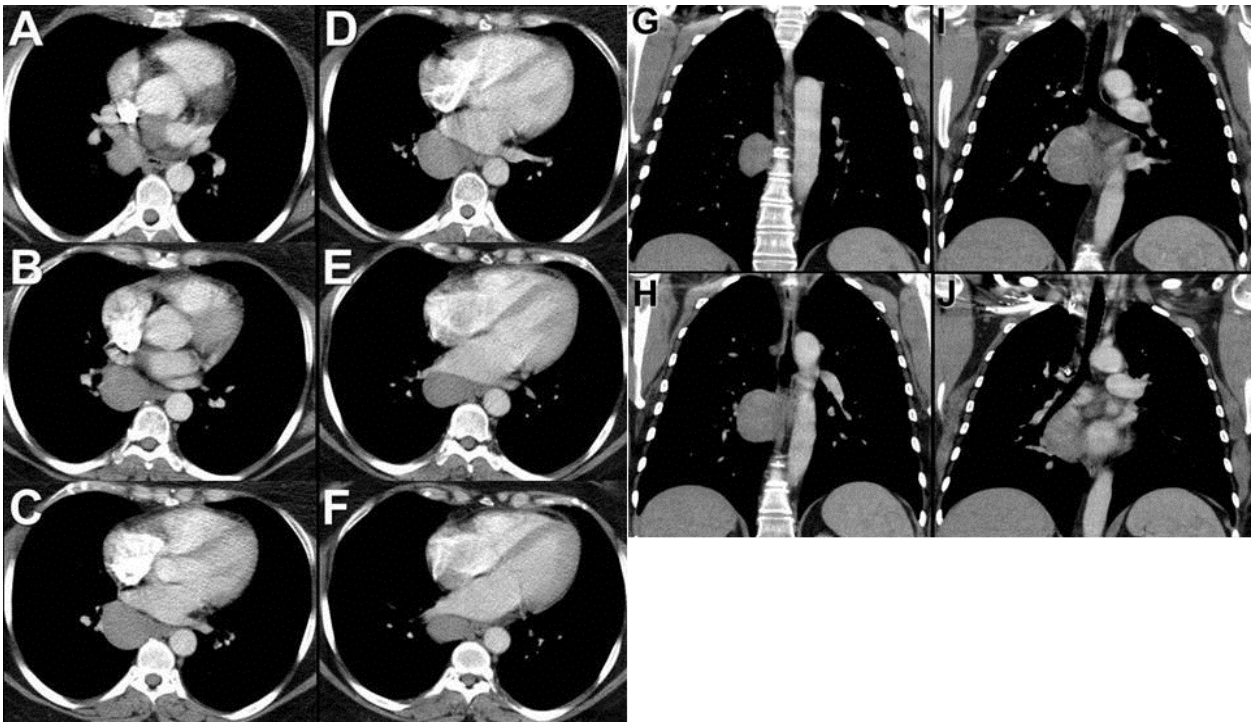

Figure 3. Axial (A-F) and coronal (G-J) enhanced thoracic CT.

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

1. The thoracic CT shows a destructive chest wall mass
2. The thoracic CT shows a subcarinal mediastinal mass
3. The thoracic CT shows an enhancing pleural lesion
4. The thoracic CT shows intrathoracic herniation of right-sided posterior subdiaphragmatic structures
5. The thoracic CT shows multifocal mediastinal and peribronchial lymph node enlargement

Correct!
2. The thoracic CT shows a subcarinal mediastinal mass

The thoracic CT shows normal pleural surfaces and the chest wall appears normal; no evidence of bone destruction or chest wall mass is present. The diaphragmatic contours, visible on the coronal images, appear normal; no evidence of intrathoracic herniation of abdominal contents is seen. A mediastinal mass, representing the lesion seen at chest radiography, is present, located in the subcarinal region (Figure 4).

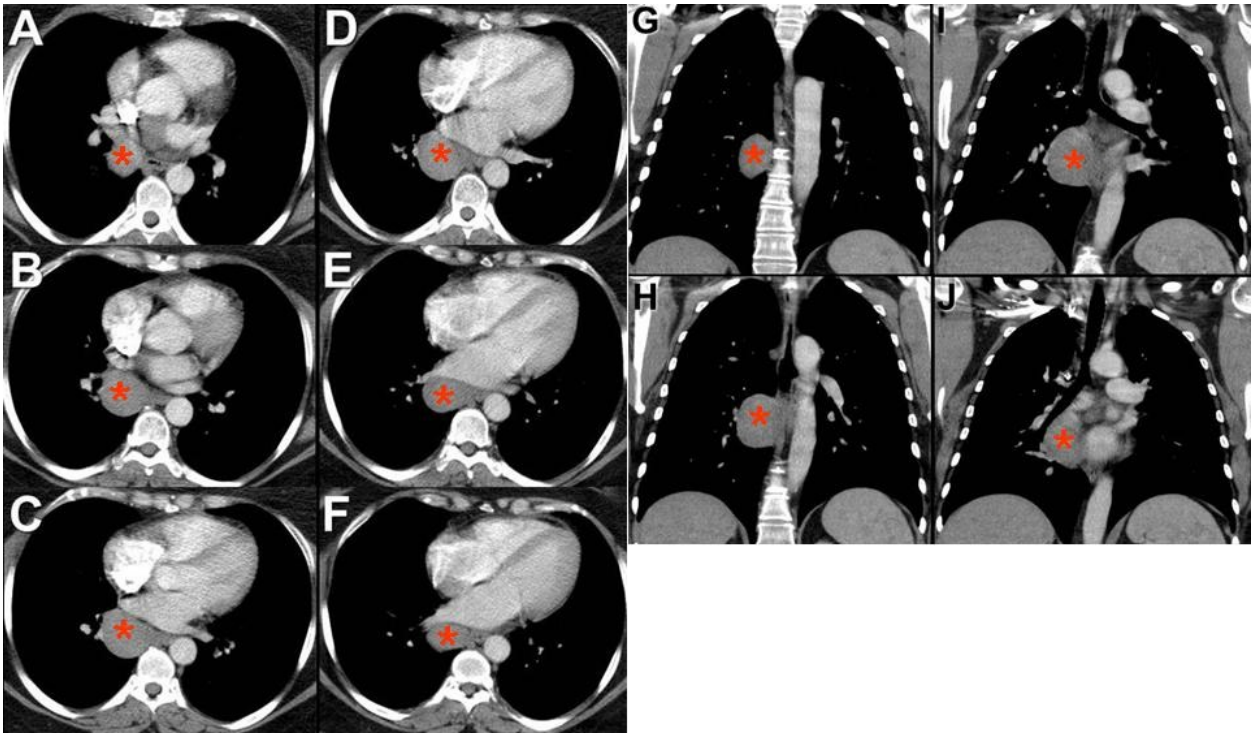

Figure 4. Axial (A-F) and coronal (G-J) enhanced thoracic CT shows a homogeneous mass (*) in the subcarinal region.

There is no evidence of either peribronchial or mediastinal lymph node enlargement outside the subcarinal region.

Regarding the thoracic CT examination, which of the following is ***correct***?

1. The thoracic CT shows that the subcarinal mediastinal lesion is cystic
2. The thoracic CT shows that the subcarinal mediastinal lesion is enhancing
3. The thoracic CT shows that the subcarinal mediastinal lesion is homogeneous
4. The thoracic CT shows that the subcarinal mediastinal lesion is necrotic
5. The thoracic CT shows that the subcarinal mediastinal lesion possess locally aggressive behavior

Correct!

3. The thoracic CT shows that the subcarinal mediastinal lesion is homogenous

The thoracic CT shows that the lesion in the subcarinal space is fairly homogeneous. There is no central low attenuation, which could represent cystic or necrotic change, evident. The lesion may be enhancing, but enhancement at CT cannot always be known with certainty, particularly when low-level, in the absence of unenhanced imaging for comparison. This is because some processes, such as hemorrhage and proteinaceous fluid within a cystic lesion, can appear somewhat hyperattenuating. Therefore, although this mass appears mildly hyperattenuating (similar to intercostal muscle), this appearance could reflect hemorrhage or proteinaceous fluid within a cyst rather than enhancement. Similarly, clear low attenuation to suggest internal cystic change is not evident, but a cystic lesion containing hyperattenuating contents remains a possibility. The subcarinal lesion is smoothly marginated and circumscribed and does not appear locally aggressive.

To further characterize the lesion discovered at CT scanning, the patient was underwent thoracic MR (Figure 5).

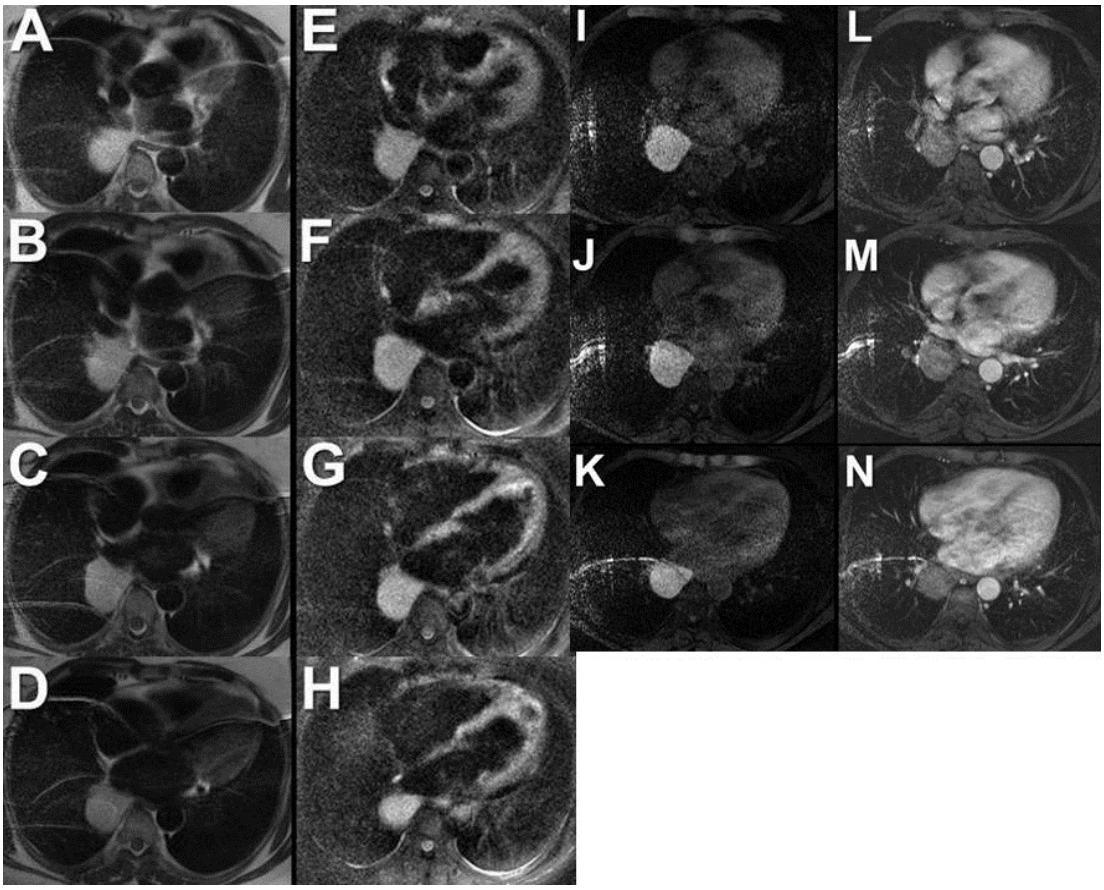

Figure 3: Axial double inversion recovery T1-weighted (A-D), triple inversion recovery (E-H; a fluid-sensitive sequence), axial unenhanced (I-K) and enhanced (L-N) liver acquisition with volume acceleration (LAVA) imaging.

Which of the following regarding this MR examination is ***correct***?

1. The thoracic MR reveals additional sites of abnormality, suggesting a systemic process
2. The thoracic MR shows that the lesion contains fat
3. The thoracic MR shows that the lesion does ***not*** enhance significantly
4. The thoracic MR shows that the lesion is solid
5. The thoracic MR shows the same mass at CT, but adds little additional information to that already available with CT

Correct!

3. The thoracic MR shows that the lesion does *not* enhance significantly

The thoracic MR shows the same subcarinal mass seen at CT, but adds additional information regarding the subcarinal lesion's tissue components. The subcarinal lesion does show increased signal intensity on the T1-weighted images, which is common with fat (note the hyperintense signal of subcutaneous fat on these images); however, the lesion continues to show hyperintense signal on MR sequencing employing fat saturation, indicating that the internal hyperintensity of the lesion is *not* due to fat. *Fat saturation* refers to MR techniques designed to eliminate signal from fat. When a lesion shows high signal on T1-weighted imaging, suggesting the possibility of intralesional fat, if that signal disappears when using fat-saturation techniques, then one can be relatively certain that the hyperintensity of the lesion on T1-weighted imaging is not due to the presence of intralesional fat; rather, the increased signal could be due to other causes of hyperattenuation on T1-weighted imaging, particularly hemorrhage or proteinaceous fluid. The increased signal on the triple inversion recovery images (which is a sequence designed to show increased signal within fluid- note the hyperintensity of the cerebrospinal fluid posteriorly) suggests the possibility of a cyst, but some solid lesions can display this behavior as well, so the lesion cannot be characterized as a cyst on this sequence alone. However, the images obtained before and after intravenous contrast administration, which show no evidence of enhancement, combined with the fluid signal on the triple inversion recovery sequences, are consistent with a cystic mediastinal lesion in the subcarinal space. The thoracic MR study shows no other sites of abnormality.

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

1. ^{18}FDG-PET
2. ^{68}Ga-citrate scintigraphy
3. Mediastinoscopy
4. Observation only
5. Percutaneous transthoracic fine needle aspiration biopsy

Correct!
4. Observation only

The imaging features are consistent with a particular diagnosis, and invasion testing is not necessary. Therefore, percutaneous transthoracic fine needle aspiration biopsy and mediastinoscopy are not the correct answers. The risk of spillage of the cystic content during percutaneous transthoracic fine needle aspiration biopsy is unacceptably high whereas the likelihood of obtaining a histopathological diagnosis is low for this cystic, isolated, indolent-appearing, and incidentally detected lesion. The lesion is too caudal in the subcarinal space to be reached via mediastinoscopy. While ^{18}FDG-PET could potentially be a useful procedure for the evaluation of mediastinal lesions, as it has the ability to assess for metabolic activity within the lesion as well as the ability to detect potential sites of disease elsewhere within and outside the thorax, the lesion has already been well-characterized by cross sectional imaging. The lack of tracer utilization within the lesion would simply reinforce the impression of a benign abnormality, whereas increased tracer utilization would most likely prompt incorrect consideration of an aggressive process for this lesion. ^{68}Ga-citrate scintigraphy would not provide addition useful information in this patient.

Based on the data thus far, which of the following represents the ***most likely diagnosis*** for this patient?

1. Bronchogenic cyst
2. Isolated subcarinal renal cell carcinoma metastasis
3. Müllerian duct (Hattori) cyst
4. Pericardial cyst
5. Thoracic duct cyst

Correct!
1. Bronchogenic cyst

As noted previously, the cross sectional imaging findings indicate an indolent-appearing, incidentally discovered cyst in the subcarinal space. Renal cell malignancies can occasionally appear necrotic, even cystic, and can manifest as isolated mediastinal lesions. However, this patient has no active or previous renal malignancy, and even prominently cystic or necrotic renal cell carcinoma metastases usually show some solid, enhancing areas; the latter are lacking in this patient. The lesion's location is unusual for pericardial cysts (typically anteriorly located in the right >left cardiophrenic angle), Müllerian duct (aka Hattori) cysts (typically posterior- superior mediastinum in women), and thoracic duct cysts (posterior mediastinum, connected to the thoracic duct). However, the lesion's location in the subcarinal space is the most common location for a bronchogenic cyst, which also is the most common cause of a cystic middle mediastinal lesion.

Diagnosis: Bronchogenic cyst

References

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