June 2018 Imaging Case of the Month

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Clinical History: A 63-year-old non-smoking woman presented with complaints of nausea, vomiting and abdominal pain, which prompted CT of the abdomen and pelvis (images not shown). The CT of the abdomen and pelvis disclosed several small basilar nodules, for which dedicated thoracic CT (Figure 1) was performed.

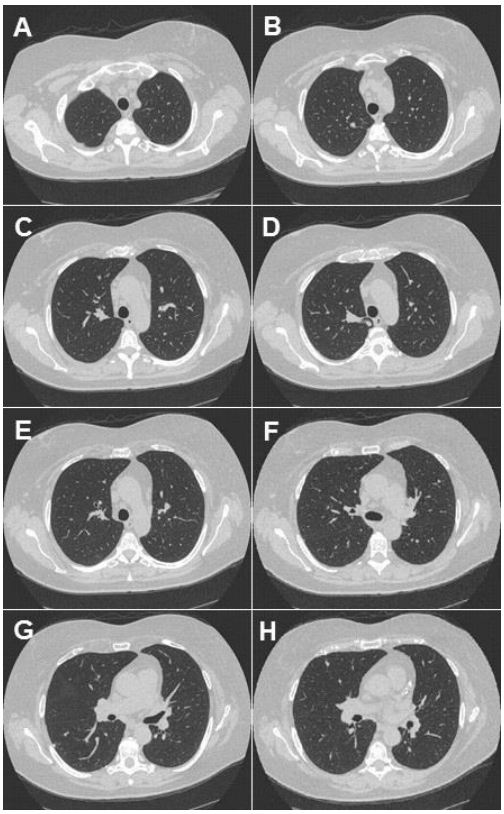

Figure 1. Representative images from unenhanced axial thoracic CT displayed in lung windows.

Which of the following represents ***the most accurate assessment*** of the thoracic CT findings?

1. Thoracic CT shows bibasilar fibrotic-appearing opacities
2. Thoracic CT shows cavitary pulmonary lesions
3. Thoracic CT shows multifocal bronchiectasis
4. Thoracic CT shows multifocal ground-glass opacity
5. Thoracic CT shows small pulmonary nodules

Correct
5. Thoracic CT shows small pulmonary nodules

Thoracic CT shows multiple small pulmonary nodules, many of which are closely related to the pleura, or are frankly subpleural, and represent perifissural nodal tissue, reflecting intrapulmonary lymph nodes (Figures 2-5). A more focal opacity is present within the right suprahilar region, in the posterior portion of the apical segment of the right upper lobe; this focus has a different morphology than the other numerous, bilateral subcentimeter pulmonary nodules. There is no evidence of bronchiectasis or basilar fibrotic changes, and no ground-glass opacity is seen. None of the small nodules show evidence of cavitation.

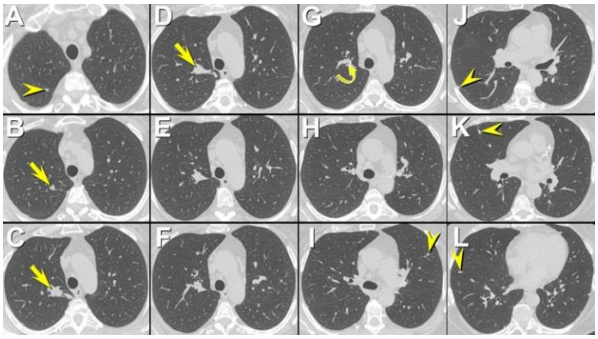

Figure 2 Unenhanced axial thoracic CT displayed in lung windows shows multiple, bilateral, peripheral and frankly subpleural, subcentimeter circumscribed nodules (arrowheads) bilaterally. Many of these small nodular opacities are very closely related to the costal and fissural pleural surfaces and are consistent with perifissural nodules, which typically reflect benign intrapulmonary lymph nodes. No evidence of cavitation within the nodules is seen, and no ground-glass opacity, bronchiectasis, or fibrotic changes are present. A focal opacity (arrows) with a somewhat tubular configuration (arrow in B) is present. This lesion is closely related to right upper lobe apical subsegmental airways. A small endobronchial lesion (curved arrow) may be present within a right upper lobe apical subsegmental airway.

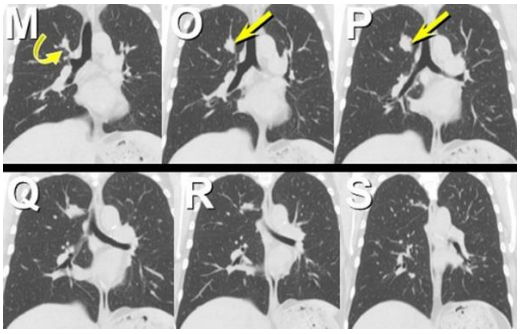

Figure 3. Unenhanced thoracic CT reformatted in the coronal plane focused on the opacity within in the right upper lobe apical segment shows the somewhat nodular character (arrow) of the lesion. A possible relationship between the lesion and right upper lobe apical subsegmental airways (curved arrow) is evident in this projection.

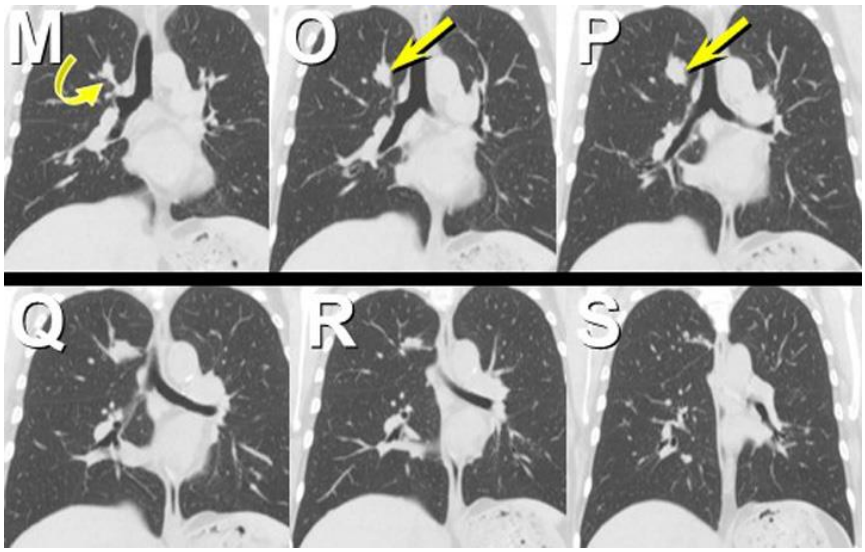

Figure 4. Unenhanced thoracic CT reformatted in the sagittal plane focused on the opacity within in the right upper lobe apical segment shows the somewhat nodular character (arrow) of the lesion. The tubular nature of the lesion (arrowheads) is demonstrated along the cranial aspect of the right upper lobe nodular focus. A close relationship between the lesion and right upper lobe apical subsegmental airways (curved arrow) is evident in this projection.

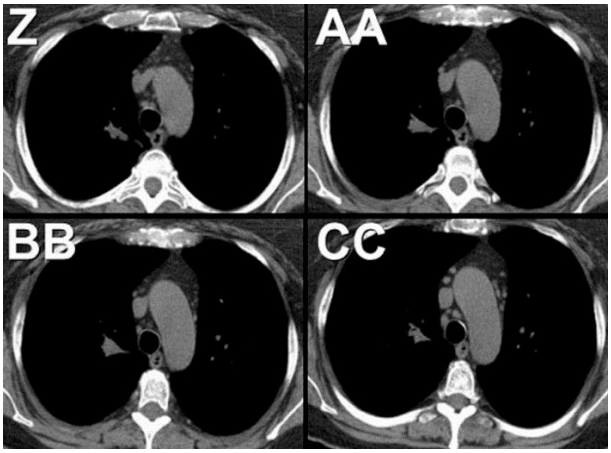

Figure 5. Unenhanced axial thoracic CT displayed in soft tissue windows shows no evidence of calcification within the right apical lesion.

At this point, which of the following represents the ***most appropriate step*** in this patient's management?

1. Bronchoscopy with transbronchial biopsy
2. Comparison to prior imaging if available
3. Cryobiopsy
4. Open surgical lung biopsy
5. Video-assisted thoracoscopic biopsy

Correct!
2. Comparison to prior imaging if available

As a general rule with practically any imaging finding (note that there are always exceptions), comparison to prior studies is the first step when evaluating abnormal imaging findings. If an abnormality can be shown to be completely stable for a number of years, often such demonstration can change management from the need for immediate tissue sampling to a conservative strategy of observation, with associated reduction in cost, morbidity, and, rarely, even mortality. Among the choices list, bronchoscopy with transbronchial biopsy is also a reasonable choice, and would be the preferred management strategy should no prior imaging be available. The remaining choices listed are rather invasive for a first-line investigation.

Prior imaging performed 8 years earlier (Figure 6) was located for comparison.

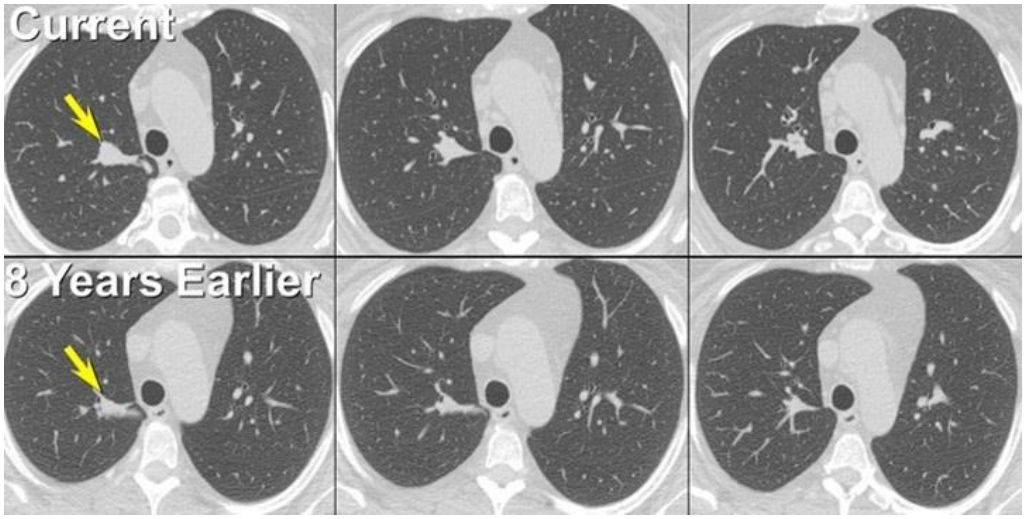

Figure 6: Representative images comparing the presentation thoracic CT (Figure 1, labeled “Current”) and the previous thoracic CT performed nearly 8 years earlier (labeled “8 Years Earlier”).

Which of the following represents ***the most accurate assessment*** of the comparison between the *lung imaging findings* on the presentation thoracic CT (Figure 1) and the comparison thoracic CT performed 8 years earlier (Figure 6)?

1. The comparison between the two studies in unrevealing and therefore non-contributory
2. Thoracic CT shows that the focal right upper lobe opacity has a completely different morphology on the prior compared to the current study
3. Thoracic CT shows that the focal right upper lobe opacity *has decreased in size* over time
4. Thoracic CT shows that the focal right upper lobe opacity *has grown* over time
5. Thoracic CT shows that the focal right upper lobe opacity *has not changed* over time

Correct!

4. Thoracic CT shows that the focal right upper lobe opacity has grown over time

The direct comparison between the two thoracic CT studies (Figure 6) shows that the focal right upper lobe opacity has a similar morphology between the two thoracic CT examinations, but that the lesion has grown over time.

The CT scan in soft tissue windows was also evaluated (Figure 7).

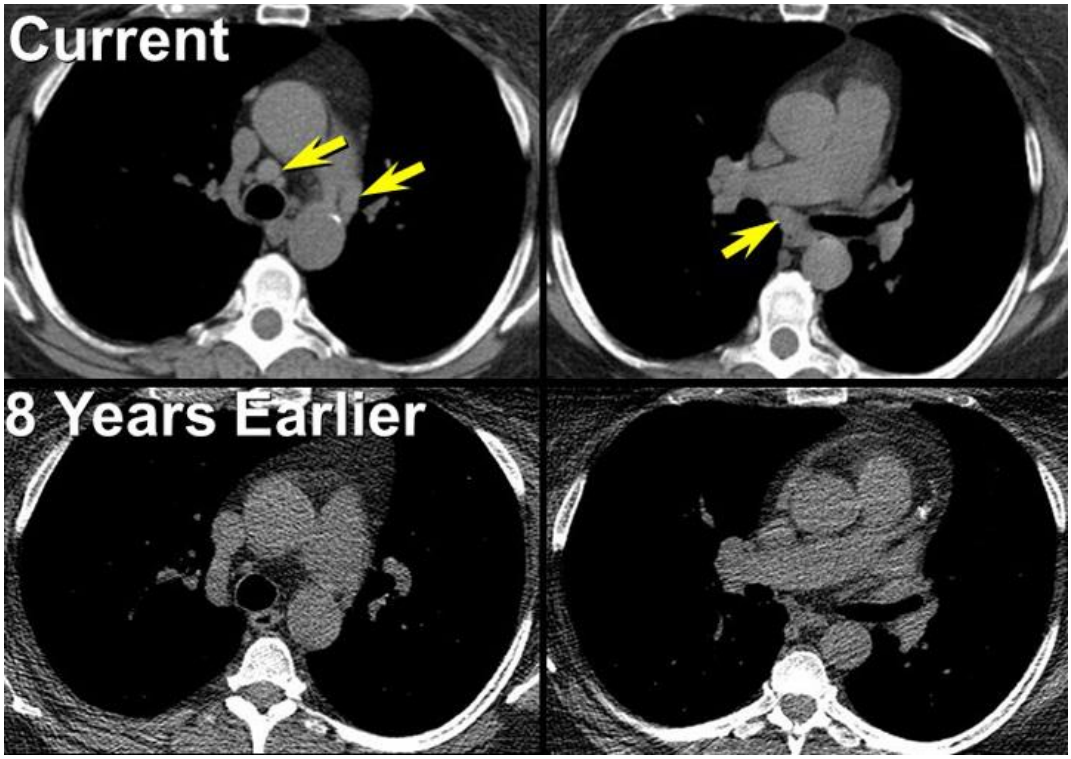

Figure 7. Unenhanced thoracic CT performed at presentation (Figure 1, labeled "Current") and 8 years earlier provided for comparison.

Which of the following represents ***the most accurate assessment*** of the comparison between the *mediastinal findings* on the presentation thoracic CT (Figure 1) and the comparison thoracic CT performed 8 years earlier (Figure 6)?

1. Thoracic CT shows borderline to-mild-mediastinal lymph node enlargement *on the prior comparison study has resolved* on the presentation study
2. Thoracic CT shows interval development of an anterior mediastinal mass on the presentation thoracic CT
3. Thoracic CT shows *interval development* of borderline to-mild mediastinal lymph node enlargement
4. Thoracic CT shows mediational lymph nodes evident on the previous comparison study have calcified on the presentation thoracic CT
5. Thoracic CT shows *no interval change* between the two examinations

Correct!

3. Thoracic CT shows interval development of borderline to-mild mediastinal lymph node enlargement

Thoracic CT shows interval development of borderline-to-mildly enlarged mediastinal lymph nodes on the presentation thoracic CT relative to the comparison thoracic CT performed 8 years earlier. There is no evidence of anterior mediastinal mass on either the current or prior thoracic CT examination, and no calcification is seen within the mediastinal lymph nodes on either study.

At this point, which of the following represents the ***most appropriate step*** in this patient's management?

1. ^{18}FDG – PET
2. Bronchoscopy with transbronchial biopsy and possibly lymph node biopsy
3. Cervical mediastinoscopy
4. Open surgical lung biopsy
5. Video-assisted thoracoscopic biopsy

Correct!

2. Bronchoscopy with transbronchial biopsy and possibly lymph node biopsy

Given the slow growth in the focal right upper lobe opacity, neither positive nor negative ^{18}FDG-PET scan findings would be clearly contributory towards the patient's management. Similarly, given that new borderline-to-mild mediastinal lymph node enlargement has occurred on the presentation thoracic CT (Figure 1) compared with the previous thoracic CT performed 8 years earlier (Figure 6), whether or not these lymph nodes are ^{18}FDG-avid probably will not impact the next management steps. If the nodes are ^{18}FDG-avid, they may serve as a target for bronchoscopic biopsy; however, bronchoscopy is likely indicated regardless, given the enlargement of the right apical opacity, and it also matters little if this focal right apical opacity shows ^{18}FDG tracer avidity or not. In fact, one may suspect that the focal right upper lobe lesion may show little tracer activity given its minimal enlargement over an 8-year period. There is always the possibility that ^{18}FDG-PET scanning will disclose an unsuspected, more readily accessible, target for intervention and obviate the need for bronchoscopy, but there is little to indicate such a possibility at this point. Cervical mediastinoscopy would be able to access the right paratracheal lymph nodes but is needlessly invasive when bronchoscopy could access these nodes as well as the focal right upper lobe opacity in the same procedure. Similarly, both open surgical lung biopsy and video-assisted thoracoscopic biopsy of the lung lesion could provide tissue for a diagnosis, but both are needlessly invasive when bronchoscopy with transbronchial biopsy of the lung lesion and sonographically-guided lymph node biopsy of the mediastinal lymph nodes could be performed.

However, ^{18}FDG-PET scanning was performed (Figure 8).

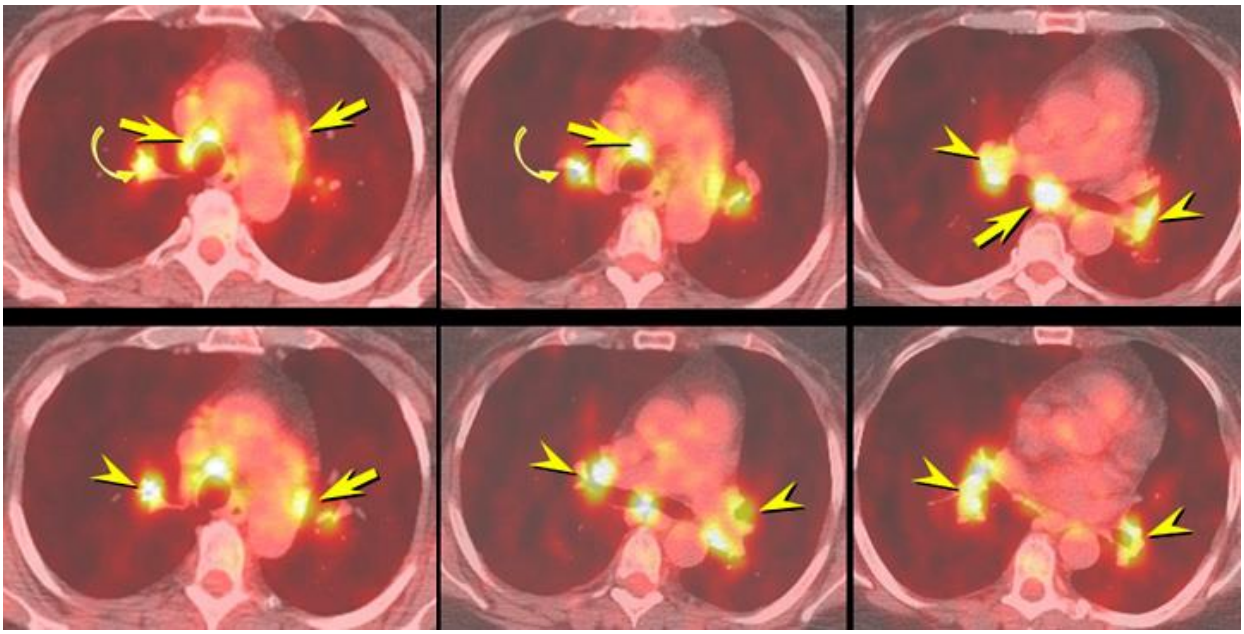

Figure 8. Representative axial 18FDG-PET scan images.

Which of the following represents ***the most accurate assessment*** of the ^{18}FDG-PET scan findings?

1. ^{18}FDG – PET is technically limited, probably due to hyperglycemia, and is non-contributory
2. ^{18}FDG – PET shows hypermetabolic activity *within both* the focal right upper lobe opacity and the mediastinal lymph nodes
3. ^{18}FDG – PET shows hypermetabolic activity within the focal right upper lobe opacity *but not* mediastinal lymph nodes
4. ^{18}FDG – PET shows hypermetabolic activity within the mediastinal lymph nodes *but not* the focal right upper lobe opacity
5. ^{18}FDG – PET shows *no* abnormal tracer activity within the thorax

Correct!

2. ^{18}FDG – PET shows hypermetabolic activity within both the focal right upper lobe opacity and the mediastinal lymph nodes

^{18}FDG-PET scanning shows hypermetabolic activity *within both* the focal right upper lobe opacity and the mediastinal lymph nodes. The study is of good quality and is not technically limited.

At this point, which of the following represents the ***most appropriate step*** in this patient's management?

1. Bronchoscopy with biopsy and possibly lymph node biopsy
2. Cervical mediastinoscopy
3. Contrast-enhanced thoracic MRI
4. Repeat thoracic CT performed with high-resolution technique
5. Video-assisted thoracoscopic biopsy

Correct!
1. Bronchoscopy with biopsy and possibly lymph node biopsy

Bronchoscopy with transbronchial biopsy of the lung lesion and endosonographically-guided lymph node biopsy of the mediastinal lymph nodes provides the least invasive method to obtain a diagnosis for this patient. The right upper lobe lesion, which has an endobronchial component, as well as the metabolically active lymph nodes, can be targeted in a single procedural sitting. Repeating the thoracic CT would not provide useful information in addition to what is already known, even with the addition of high-resolution technique. Similarly, thoracic MRI would not add additional diagnostically useful information to what is already known through the combination of thoracic CT and ^{18}FDG-PET scanning. As noted previously, both cervical mediastinoscopy and video-assisted thoracoscopic biopsy would provide sufficient material to establish a diagnosis, but both are needlessly invasive and would merit consideration only if bronchoscopy were contraindicated or failed to provide a diagnosis.

The patient underwent bronchoscopy with biopsy of the right upper lobe focal lesion (Figure 9).

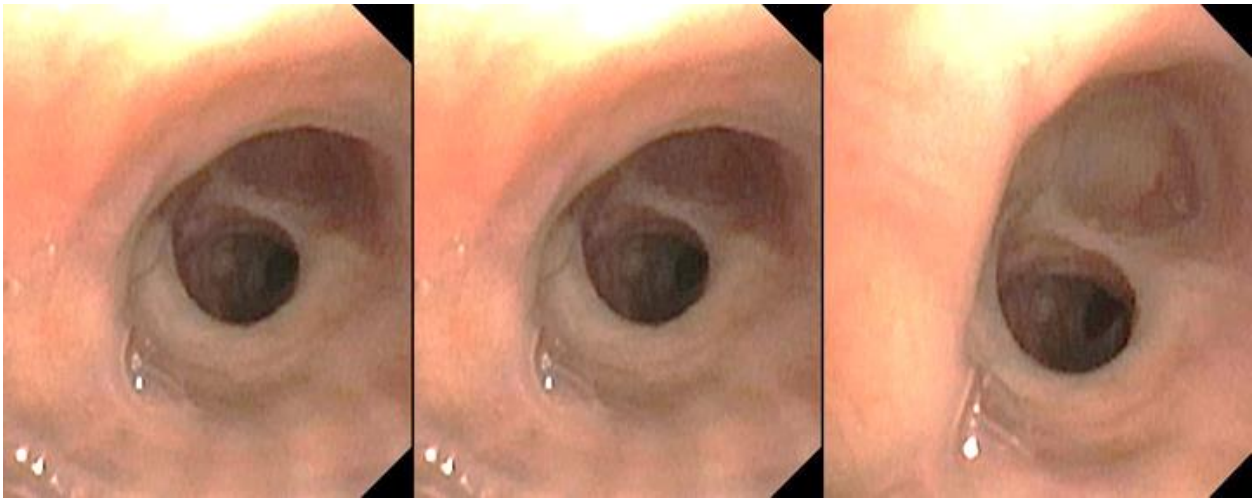

Figure 9. Bronchoscopy shows an endobronchial lesion within a proximal posterior subsegmental airway within the apical segment of the right upper lobe. The lesion was biopsied.

An endobronchial lesion was identified within a posterior subsegmental airway in the apical segment of the right upper lobe and was biopsied. Endobronchial ultrasound-guided fine needle aspiration biopsy of station 4R (right paratracheal), station 7 (subcarinal) lymph nodes, and right peribronchial lymph nodes (station 11) was also performed. Following the procedure, the patient developed chest pain with ST segment elevation on ECG, associated with hypotension. Dobutamine stress echocardiography suggested myocardial ischemia when apical and anterior wall motion abnormalities were noted during the stress test; however, subsequent cardiac catheterization showed no flow-limiting atherosclerosis.

The specimens obtained at bronchoscopy showed a possible granuloma within the biopsy performed for the right peribronchial lymph node. Only blood, without any specific pathological abnormalities, was seen in the sampled mediastinal lymph nodes. Dedicated biopsy of the right upper lobe lesion showed bronchial cells and spindle cells suspicious for a low-grade spindle cell neoplasm.

At this point, which of the following represents the ***most appropriate step*** in this patient's management??

1. Extended cervical mediastinoscopy
2. Follow the right upper lobe lesion and lymph nodes with serial imaging
3. Repeat bronchoscopy with transbronchial biopsy and lymph node sampling
4. Resect the right upper lobe
5. Upper endoscopy

Correct!
4. Resect the right upper lobe

The right upper lobe should be resected. At surgery, the entire lesion in the right upper lobe can be sampled and both peribronchial and right mediastinal and subcarinal lymph nodes can be sampled as well, which should provide a definitive diagnosis and stage any neoplasm subsequently proven. Upper endoscopy could sample the subcarinal lymph nodes, as could repeat bronchoscopy with endobronchial ultrasound-guided fine needle aspiration, but neither of these procedures alone can sample the right upper lobe lesion, peribronchial lymph nodes, and mediastinal lymph nodes completely and assure that they all reflect the same process or actually reflect different coincident pathologies. Extended cervical mediastinoscopy can be used to sample left-sided lymph nodes [station 5, aorto-pulmonary lymph nodes in particular], but would not be a useful procedure in this patient. Serial imaging evaluation would not play a role in the management of this patient's current imaging findings at this point.

The patient underwent cervical mediastinoscopy followed by video-assisted thoracoscopy with right upper lobe surgical resection (Figure 10) without complication.

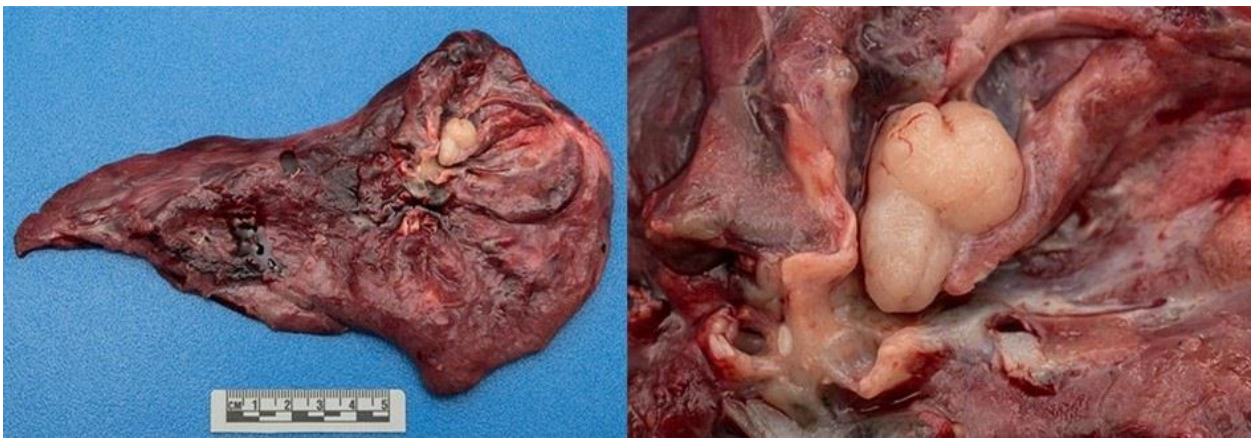

Figure 10. Resected right upper lobe specimen shows a focal, 1.6 cm lesion originating from a subsegmental airway within the apical segment of the right upper lobe.

Lymph nodes in the right peribronchial region (stations 10 and 11), right paratracheal region (station 4), subcarinal region (station 7), and pulmonary ligament (station 9) were resected and showed no evidence of malignancy but did show non-necrotizing granulomatous inflammation without any organisms on dedicated stating. The findings within the lymph nodes were most consistent with sarcoidosis. The right upper lobe lesion showed positive staining of the epithelial component for AE1/AE3, positive staining of the myoepithelial and spindle cell component for SMA and S-100 protein, patchy staining of both components for TTF-1, and no staining for ALK, desmin, or CD34, supporting the diagnosis of pneumocytic adenomyoepithelioma.

Diagnosis: Bronchial pneumocytic adenomyoepithelioma on a background of sarcoidosis

References

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