

AMSER Rad Path Case of the Month:

Asymptomatic 56-year-old male with MDS pre-transplant

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Patient History

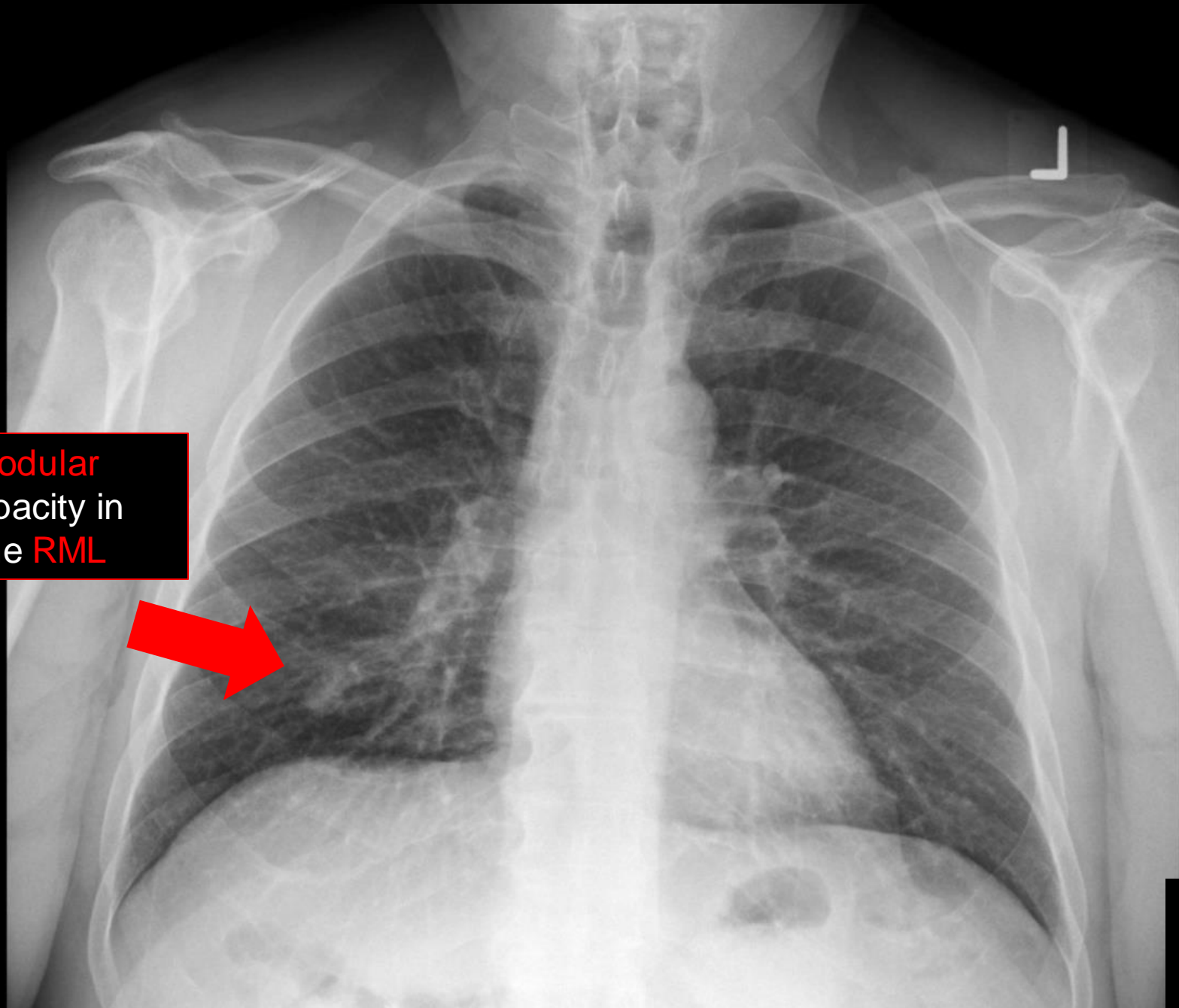
MM is a **previously healthy** 56-year-old male with recently diagnosed chronic myelomonocytic leukemia and myelodysplastic syndrome. He is transferring care to Dana-Farber Cancer Institute for autologous stem cell transplant.

A **CXR** was requested prior to therapy.

SH: occasional EtOH use, **27 pack-year smoking history**



Nodular
opacity in
the RML



**American College of Radiology
ACR Appropriateness Criteria® 1**

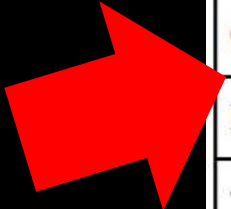
Clinical Condition: **Radiographically Detected Solitary Pulmonary Nodule**

Variant 2: **Solid nodule ≥ 1 cm, moderate to high clinical suspicion for cancer.**

Radiologic Procedure	Rating	Comments	RRL*
CT chest without IV contrast	8	To detect occult calcifications, fat, bronchus sign, etc.	☼☼☼
FDG-PET/CT whole body	8	If nodule is indeterminate on HRCT.	☼☼☼☼
Transthoracic needle biopsy	8	If nodule shows contrast enhancement or PET scan is positive.	Varies
CT chest with IV contrast	6	Probably not indicated if PET is performed.	☼☼☼
CT chest without and with IV contrast	6	Can look at washout.	☼☼☼
Watchful waiting with CT follow-up	2		Varies
MRI chest without IV contrast	2	Limited data.	0
MRI chest without and with IV contrast	2	Limited data.	0

Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate

*Relative
Radiation Level



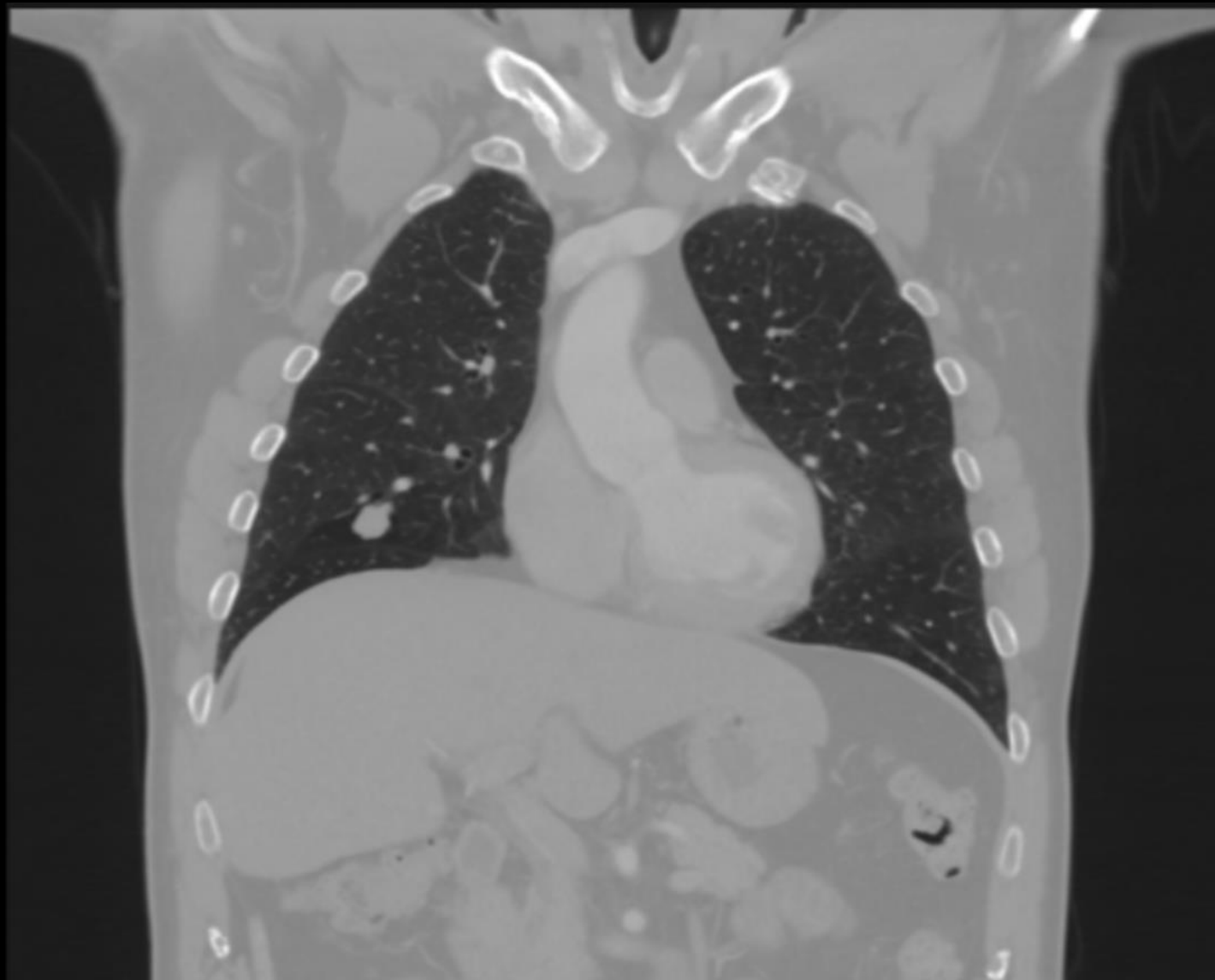
Initial Differential Diagnosis

- Solitary Pulmonary Nodule:
 - A round opacity that is at least moderately well marginated and no larger than 3 cm in its maximum diameter²
- The differential includes:
 - Granuloma
 - Bronchogenic carcinoma
 - Metastasis
 - Organizing pneumonia
 - Abscess
 - Hematoma
 - Carcinoid tumor
 - Arteriovenous malformation

Diagnostic Workup

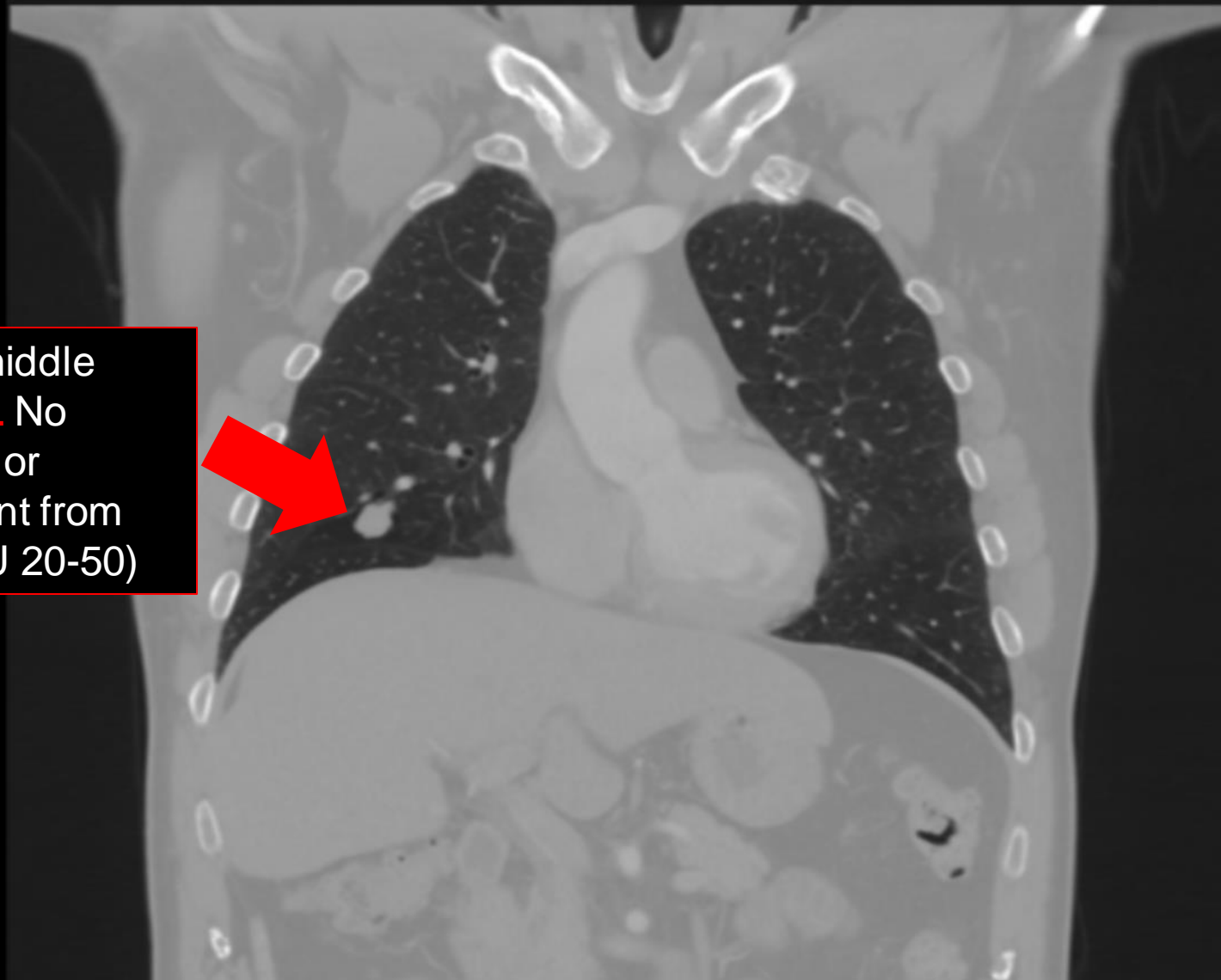
- As seen in the ACR appropriateness criteria, chest CT should be performed to characterize the nodule.
- PET-CT should also be considered, since it can detect malignancy in focal pulmonary lesions of greater than 1 cm with a sensitivity of about 97% and a specificity of 78%. ³
However,
 - Low metabolism neoplasms (low-grade adenocarcinoma and typical carcinoid) can be false negatives ⁴

Chest CT with contrast

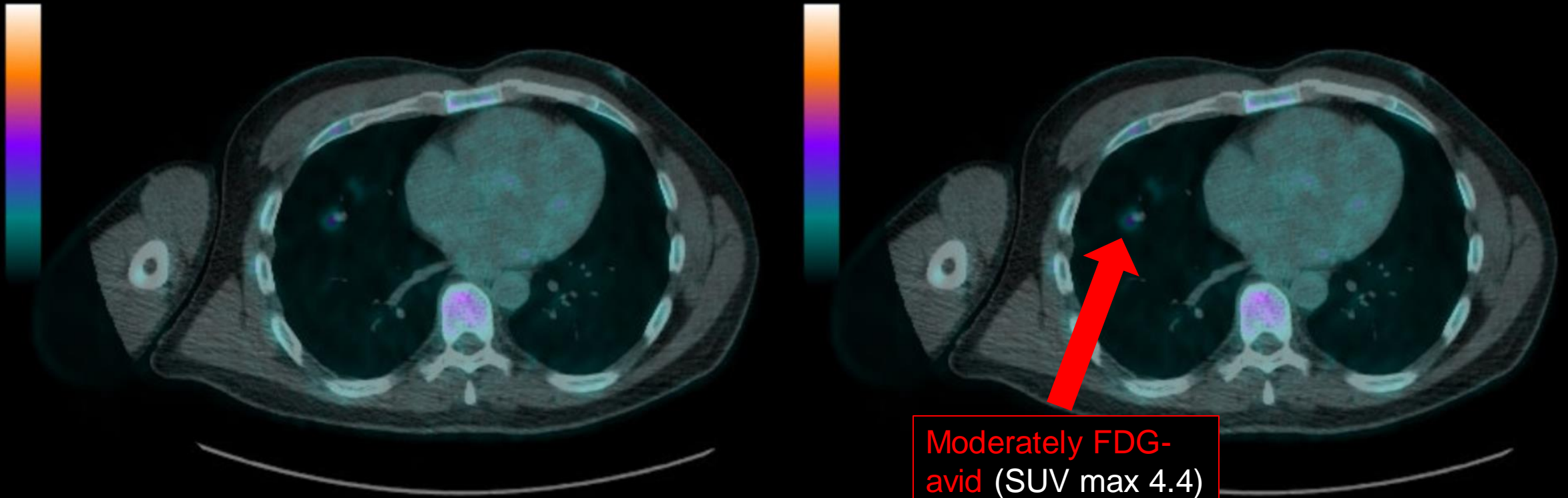


Chest CT with contrast

2 cm right middle lobe **nodule**. No calcification or enhancement from contrast (HU 20-50)



PET-CT



Moderately FDG-
avid (SUV max 4.4)
2.0 cm solitary
pulmonary nodule.
No other areas of
FDG uptake.

Differential

With moderate metabolic activity, our differential is narrowed to include:

- **Bronchogenic carcinoma**
- **Metastasis**
- **Lymphoma**
- **Pulmonary carcinoid (bronchial or peripheral)**

Surgical Management

He underwent bronchoscopy and then a right VATS middle lobectomy and mediastinal lymph node dissection.

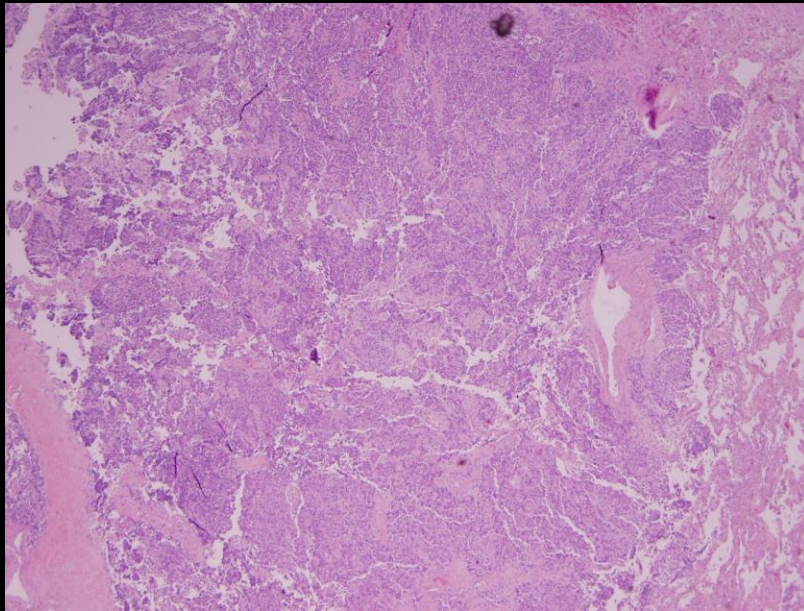
Intraoperatively, the specimen's margins were negative and no tumor was present in one level 11 sump node.

Eleven nodes from levels 7 and 11R were sent to permanent pathology; all negative for tumor.

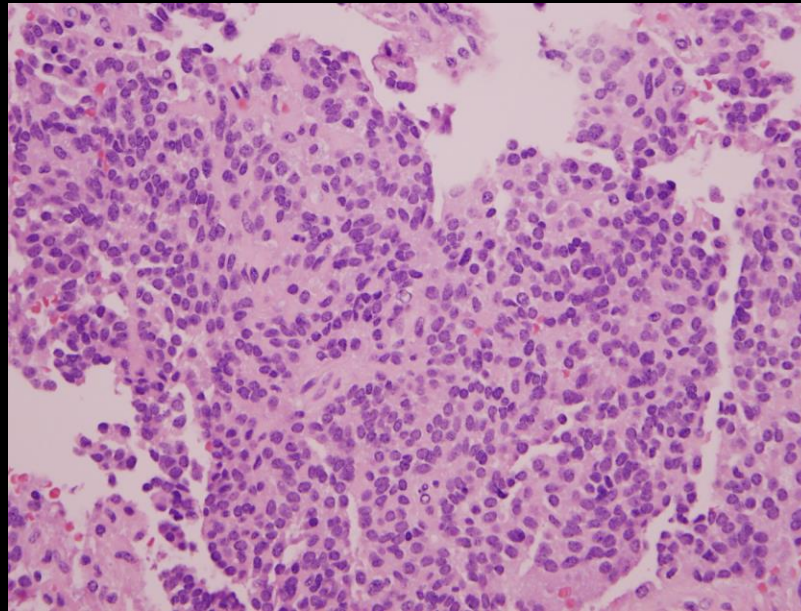
Histopathology

Using an H&E stain, we can see that at both low (a) and high (b&c) powered fields, the nodule is:

- Fairly well circumscribed, monomorphic cell population
- Demonstrates 'salt and pepper' chromatin →
- Notable for rare mitoses



a)

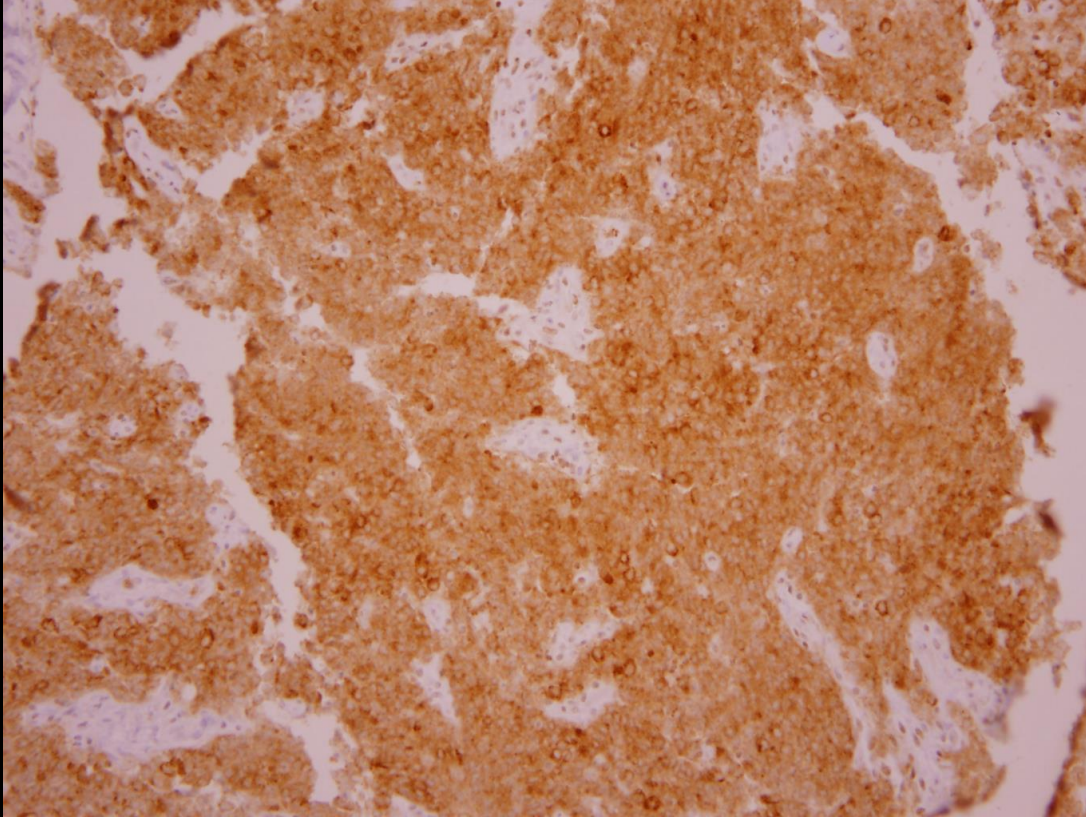


b)



c)

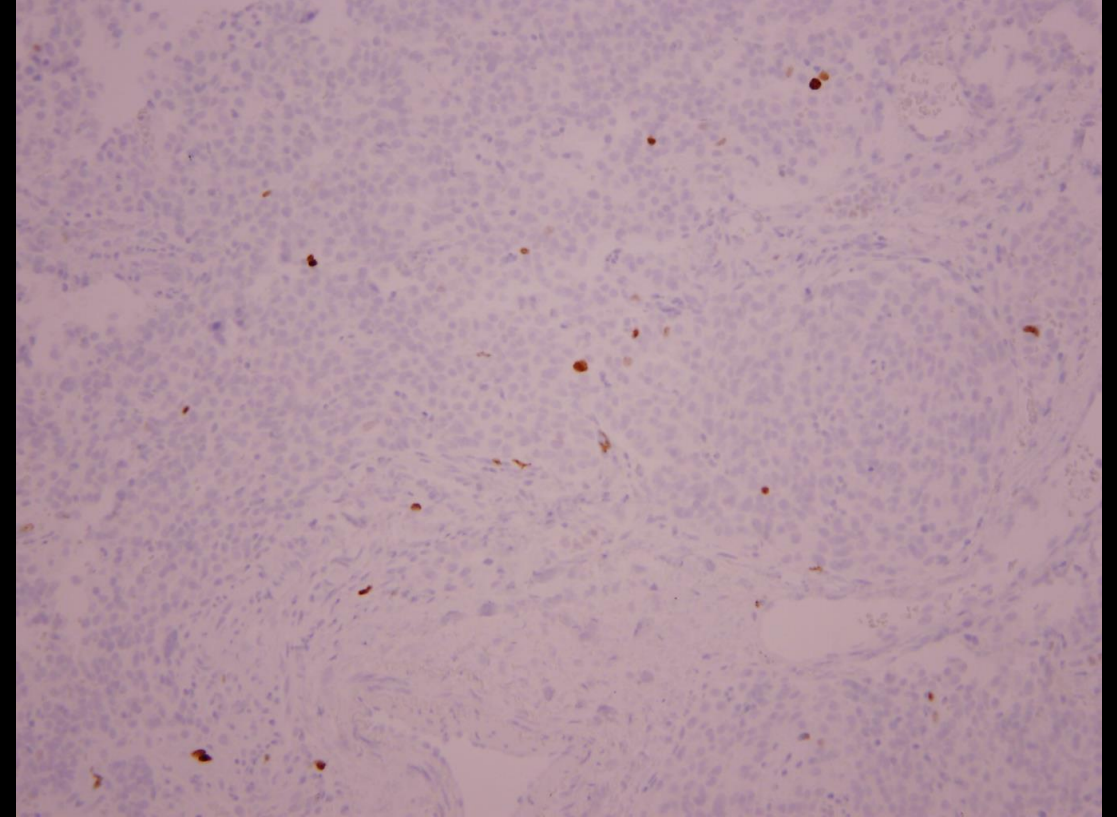
Immunohistochemistry



Synaptophysin:

- A marker for neuroendocrine tumors (NET)
- Strongly positive

Chromogranin (for granule containing endocrine cells, including NETs) was positive.



On MIB (or KI-67):

- A marker for active mitosis
- Useful classifying NETs along the spectrum
- Low staining in our case

Final Dx:

Typical pulmonary carcinoid

Discussion

- Carcinoid tumors of the lung are an uncommon (around 1%) neoplasm that are usually discovered either incidentally or from symptoms relating to the enlarging mass (coughing, hemoptysis, chest pain). ⁵
- The lungs are the second most common location for these neuroendocrine tumors, following the GI tract. However, they can present in many tissues, including thymus and ovaries.
- Average age at diagnosis is 40-50, affects males and females equally. There is a small predilection towards smokers.
- Up to a quarter do not show metabolic activity on FDG, but other radiolabeled tracers (eg, 68GA-Dotatate) can be helpful. ⁶
- Pulmonary carcinoids are differentiated (typical vs. atypical) based on mitotic activity, with typical carcinoid having lower mitotic activity. ⁵
- There is low likelihood of metastasis, and surgical excision is usually curative. ⁷

References:

- <https://acsearch.acr.org/docs/69455/Narrative/>
- Truong, Mylene T., et al. "Update in the evaluation of the solitary pulmonary nodule." *Radiographics* 34.6 (2014): 1658-1679. <https://www.ncbi.nlm.nih.gov/pubmed/25310422>
- Gould, Michael K., et al. "Accuracy of positron emission tomography for diagnosis of pulmonary nodules and mass lesions: a meta-analysis." *Jama* 285.7 (2001): 914-924. <https://www.ncbi.nlm.nih.gov/pubmed/11180735>
- Cheran, Sendhil Kumar, Nathan D. Nielsen, and Edward F. Patz Jr. "False-negative findings for primary lung tumors on FDG positron emission tomography: staging and prognostic implications." *American Journal of Roentgenology* 182.5 (2004): 1129-1132. <https://www.ncbi.nlm.nih.gov/pubmed/15100107>
- [https://www.uptodate.com/contents/lung-neuroendocrine-carcinoid-tumors-epidemiology-risk-factors-classification-histology-diagnosis-and-staging?search=Lung%20neuroendocrine%20\(carcinoid\)%20tumors:%20Epidemiology,%20risk%20factors,%20classification,%20histology,%20diagnosis,%20and%20staging&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1](https://www.uptodate.com/contents/lung-neuroendocrine-carcinoid-tumors-epidemiology-risk-factors-classification-histology-diagnosis-and-staging?search=Lung%20neuroendocrine%20(carcinoid)%20tumors:%20Epidemiology,%20risk%20factors,%20classification,%20histology,%20diagnosis,%20and%20staging&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1)
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- https://www.uptodate.com/contents/lung-neuroendocrine-carcinoid-tumors-treatment-and-prognosis?search=lung%20neuroendocrine%20tumor&source=search_result&selectedTitle=2~150&usage_type=default&display_rank=2