# Incidental Pulmonary Nodule

Radiology-Pathology Correlation Lisa Friedman August 2018

### History

- O 71 yo male
- O PMHx:
  - O HTN, HLD
  - O Parkinson's disease
  - Urothelial carcinoma s/p partial cystectomy, on immunotherapy
  - Cutaneous squamous cell carcinoma (superficially invasive, fully excised 26 yrs ago)
- Presented to an outside physician c/o abdominal pain, diarrhea, constipation
  - Obtained CT C/A/P
  - Incidentally found 1.7 cm LUL pulmonary nodule

### History

#### • Smoking history:

- 2-3 cigars/wk x 45 yrs, quit 5 yrs ago
- Occasional marijuana
- Remote past history of crack
- No pulmonary/constitutional sx

### CT



• Solitary left upper lobe pulmonary nodule

### CT



• Solitary left upper lobe pulmonary nodule

CT



- Solid •
- •
- •
- Homogeneous Not spiculated Well-demarcated •

### Fleischner Society Guidelines

#### Fleischner Society 2017 Guidelines for Management of Incidentally Detected Pulmonary Nodules in Adults

#### A: Solid Nodules\*

Nodule Type	Size			
	<6 mm (<100 mm <sup>3</sup> )	6–8 mm (100–250 mm <sup>3</sup> )	>8 mm (>250 mm³)	Comments
Single				
Low risk <sup>†</sup>	No routine follow-up	CT at 6–12 months, then consider CT at 18–24 months	Consider CT at 3 months, PET/CT, or tissue sampling	Nodules <6 mm do not require routine follow-up in low-risk patients (recommendation 1A).
High risk†	Optional CT at 12 months	CT at 6–12 months, then CT at 18–24 months	Consider CT at 3 months, PET/CT, or tissue sampling	Certain patients at high risk with suspicious nodule morphology, upper lobe location, or both may warrant 12-month follow-up (recommendation 1A).

MacMahon et al 2017

### FDG-PET/CT



## FDG-PET/CT



### **CT-guided biopsy**

#### Intra-procedural imaging



- Conscious sedation (midazolam and fentanyl)
- BioSentry used postbiopsy



### **CT-guided biopsy**

Intra-procedural imaging

![](_page_10_Figure_2.jpeg)

### FNA: Diff-quik stain

![](_page_11_Picture_1.jpeg)

![](_page_11_Picture_2.jpeg)

- Highly cellular
- O Loosely cohesive
- O Bland, uniform cells
- High/mid N:C
- Fine chromatin, lack of prominent nucleoli

### FNA: Pap stain

![](_page_12_Picture_1.jpeg)

- O Highly cellular
- Loosely cohesive
- Bland, uniform cells
- Fine chromatin, lack of prominent nucleoli

### **CT-guided biopsy**

Intra-procedural imaging

![](_page_13_Figure_2.jpeg)

## Challenges with FNA diagnosis of pulmonary NETs

- 51% of cytologic dx of typical carcinoids agreed with the final histologic dx (Stoll et al 2010)
- Air-drying
- O Crush artifact
- O Hypercellularity
- Sampling error

### Core biopsy: H&E stain

![](_page_15_Picture_1.jpeg)

- Histology: eosinophilic cytoplasm
- Architecture: nested

![](_page_15_Picture_4.jpeg)

### Histologic classification: pulmonary NETs

#### • Low-grade (2):

- Typical carcinoid: well-diff, epithelioid or spindled cells, round or oval nucleoli, salt-and-pepper chromatin, no nucleoli, no mites.
- Atypical carcinoid: features similar to typical carcinoid but with 2-10 mites/2 mm<sup>2</sup> and/or necrosis

#### • High-grade (2):

- Small cell lung cancer: hyperchromatic, nuclear molding with lack of clear demarcation between cells, no nucleoli, many mites, necrosis
- Large cell neuroendocrine carcinoma: neuroendocrine tumor with abundant cytoplasm and/or single large nucleolus

### Staining profile: carcinoids

- + synaptophysin, chromogranin A, CD56, INSM1
- +cytokeratin (80%)
- +TTF-1 (50%)
- +ER (50%)
- Ki-67 can help evaluate proliferative activity

### Core biopsy: special stains

#### Chromogranin

![](_page_18_Picture_2.jpeg)

#### Synaptophysin

![](_page_18_Picture_4.jpeg)

![](_page_18_Picture_5.jpeg)

![](_page_18_Picture_6.jpeg)

#### GATA3

![](_page_18_Picture_8.jpeg)

![](_page_18_Picture_9.jpeg)

![](_page_18_Picture_10.jpeg)

### **Bottom-line diagnosis**

### OLow-grade epithelial neoplasm

### **Epidemiology: carcinoids**

- 2-5% of all lung cancers
- 20-40% arise in nonsmokers
- Genetic factors: 5% patients with MEN I
  - Typical carcinoids: 47% have 11q del
  - Atypical carcinoids: 55% have 11q del
- Average dx at 30-40 yo in typical carcinoids (vs 60-70 yo in SCLC)

### Imaging features: carcinoids

- Size: typical carcinoid  $\leq$  2 cm, atypical carcinoid  $\geq$  4 cm
- Edges: typical carcinoid = smooth, atypical carcinoid = not smooth
- May see IV contrast enhancement vascular lesions
- 30% have calcifications
- Variable avidity on PET/CT
- Somatostatin receptor scintigraphy: identifies 80-90% NETs but with low sensitivity for poorly-diff tumors

### Gross description: carcinoids

![](_page_22_Picture_1.jpeg)

- Tan/yellow
- 75% intraluminal (bronchus),
  25% intraparenchymal (lung)
- May be ulcerated, vascular

Fisseler-Eckhoff and Demes, 2012

### Clinical considerations: pulmonary carcinoids

• Treatment: surgery

Wedge resection vs lobectomy

• Metastatic potential:

• Typical carcinoids: 10-15% to LN, 3-5% to remote sites

• Atypical carcinoids: 50% to LN, 25% to remote sites

• Prognosis – 5-yr survival:

• Typical carcinoid: 92-100%

• Atypical carcinoid: 62-88%

### Follow-up

- OR on 8/6: flexible bronchoscopy and LUL VATS wedge resection → 1.5 cm nodule
- Patient is recovering well
- Histologic diagnosis: metastatic urothelial carcinoma
  - Found weak, focal, nuclear GATA3 positivity and cellular features consistent with the primary tumor

### Follow-up: urothelial carcinoma

#### • Epidemiology:

- Average age of dx: 70 yo
- M > F (3:1)
- Histology: papillary vs nonpapillary (micropapillary, sarcomatoid)
  - Loosely cohesive
  - May be plasmacytoid
  - Fine chromatin, prominent nucleoli
- Special staining:
  - CK7+ (90-100%), CK20 (50%), THR, high molecular weight thrombomodulin
- #1 prognostic factor: invasion
- Metastatic sites: LN, liver, lung, bone, adrenal

### Resources

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