

PG of Lung Cancer (ESAP): Update of Lung Cancer

# Thoracic CT pattern in lung cancer: correlation of CT and pathologic diagnosis

Kazuma Kishi, M.D.

Department of Respiratory Medicine,  
Toranomon Hospital, Tokyo

# High-resolution CT findings of various lung cancers by histology

- Adenocarcinoma
  - Preinvasive lesions
  - Minimally invasive adenocarcinoma
  - Invasive adenocarcinoma
  - Variants of invasive adenocarcinoma
- Squamous cell carcinoma
  - Central type
  - Peripheral type
- Small cell carcinoma

# IASLC/ATS/ERS classification of Lung Adenocarcinoma in Resected Specimens

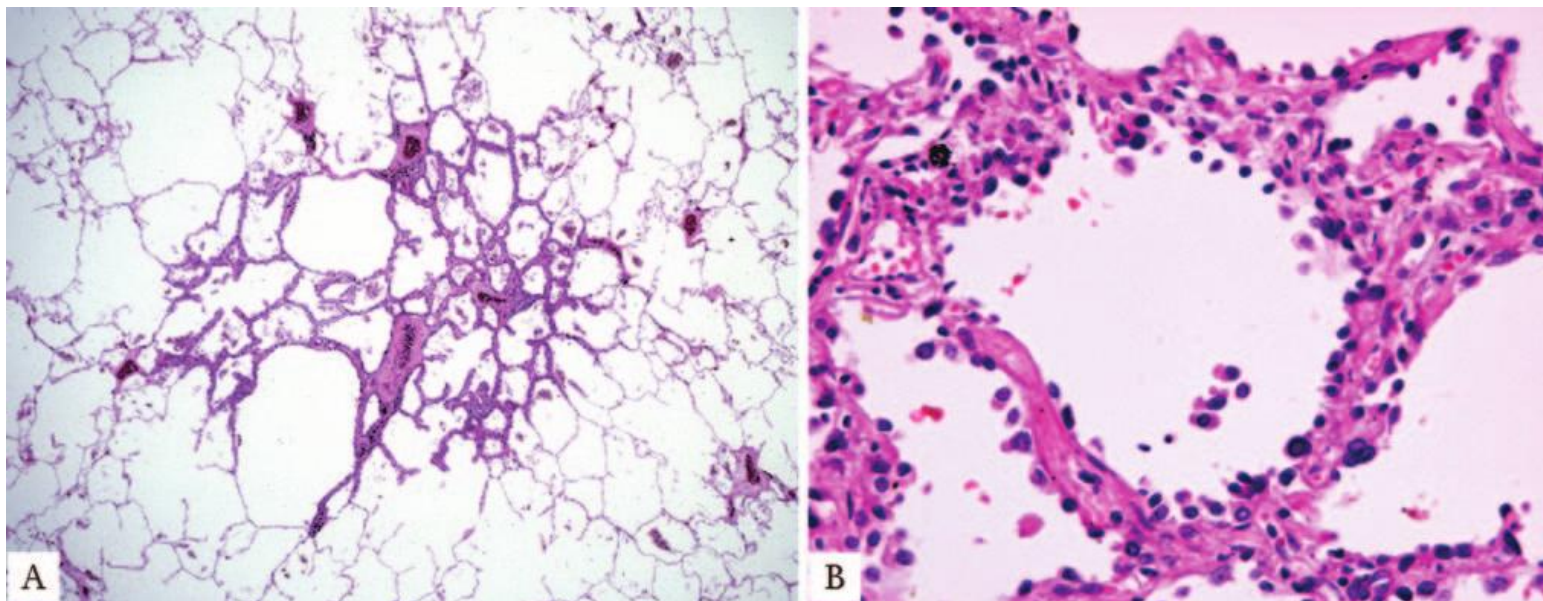
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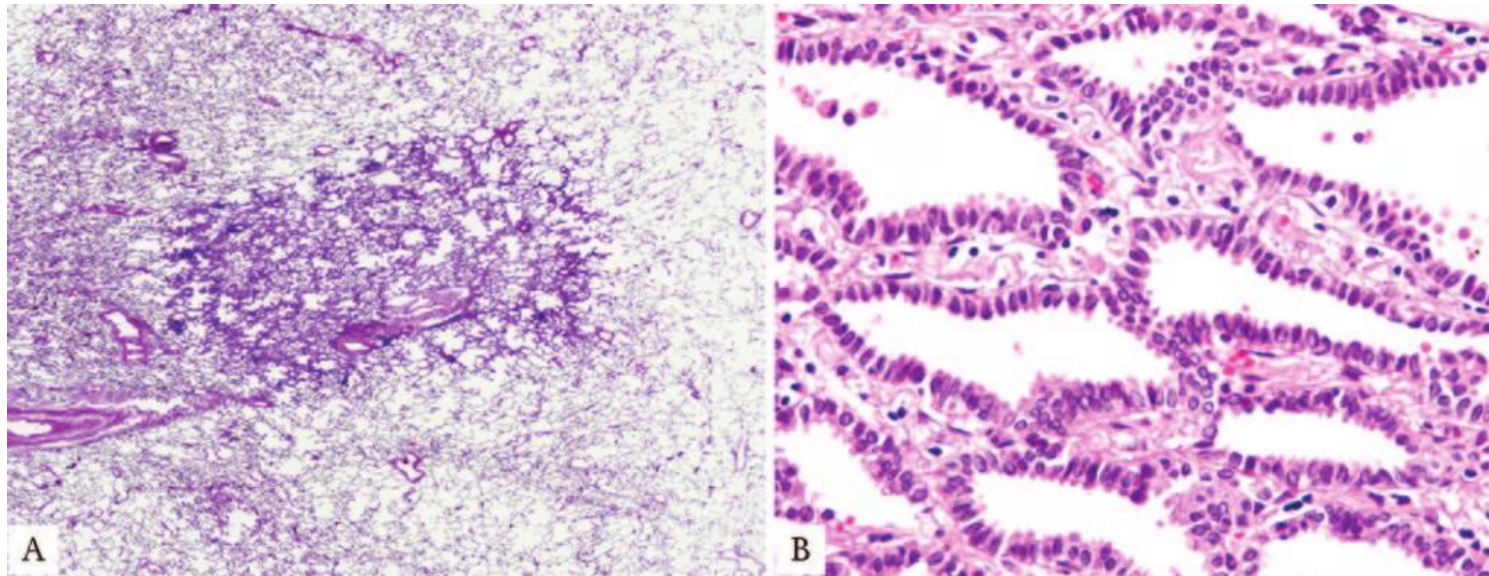
# Atypical Adenomatous Hyperplasia (AAH)

A localized, small (usually 5 mm or less) proliferation of mildly to moderately atypical type II pneumocytes and/or Clara cells lining alveolar walls



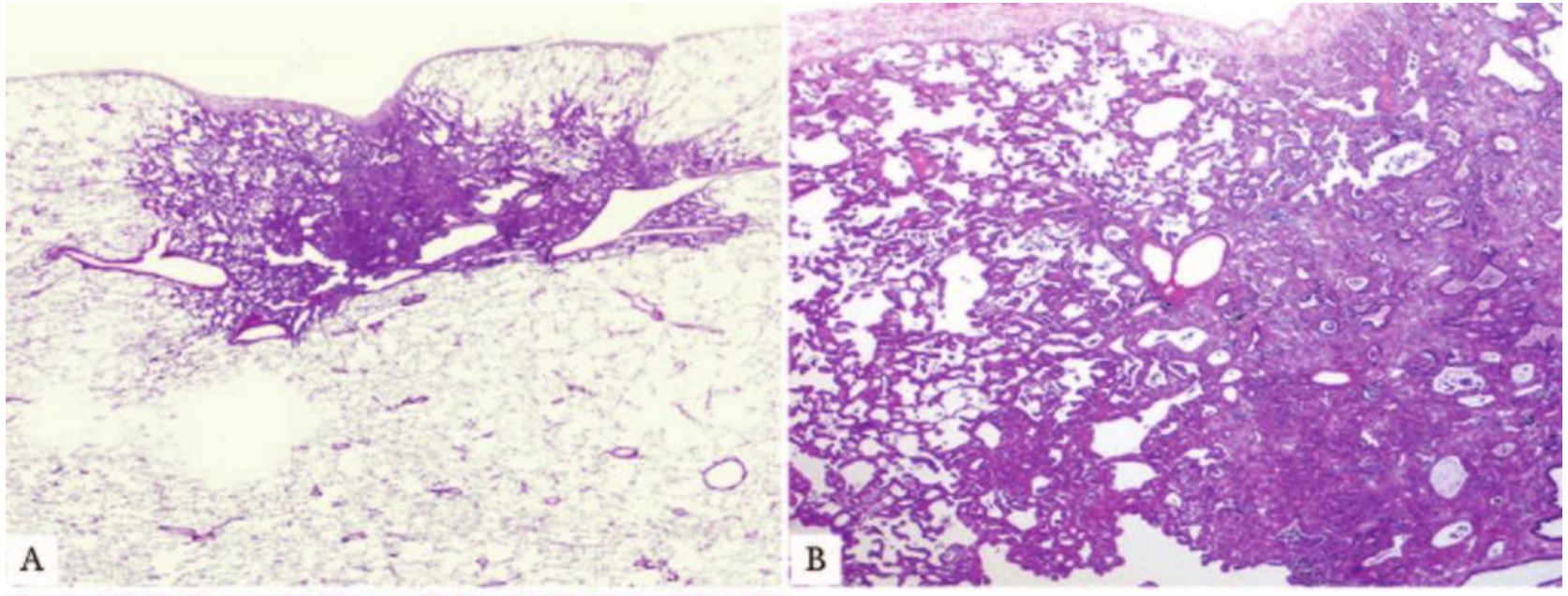
# Adenocarcinoma in situ (AIS)

A localized small ( $\leq 3\text{cm}$ ) adenocarcinoma with growth restricted to neoplastic cells along preexisting alveolar structures (**lepidic growth**), lacking stromal, vascular, or pleural invasion. Septal widening with sclerosis is common.

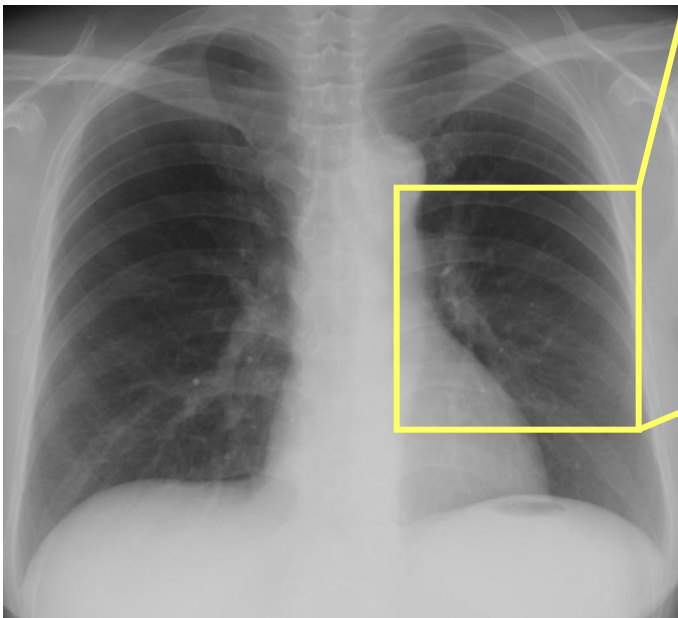
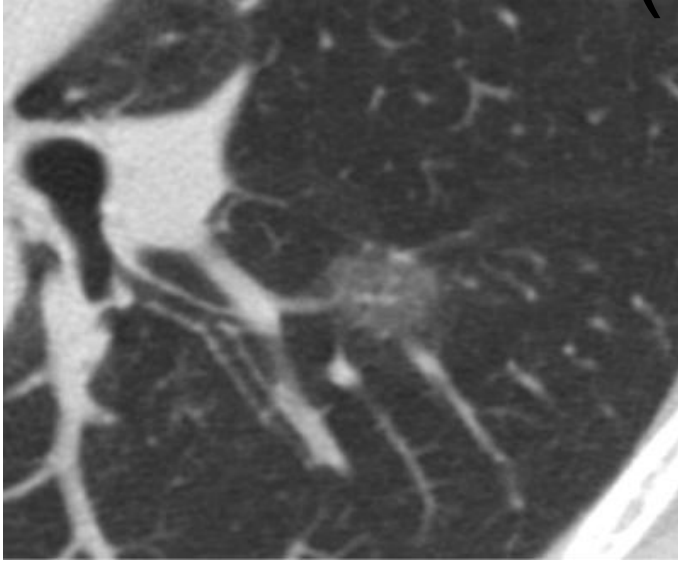


# Minimally Invasive Adenocarcinoma (MIA)

A small, solitary adenocarcinoma ( $\leq 3\text{cm}$ ), with a predominantly lepidic pattern and  $\leq 5\text{mm}$  invasion in the greatest dimension in any one focus.



# Focal Ground Glass Nodules (GGNs)





# Ground Glass Nodule (GGN): on HRCT scans

- Defined as a hazy increased opacity within a lung that does not obscure the underlying vessels.
- It shows preserved bronchial and vascular margins

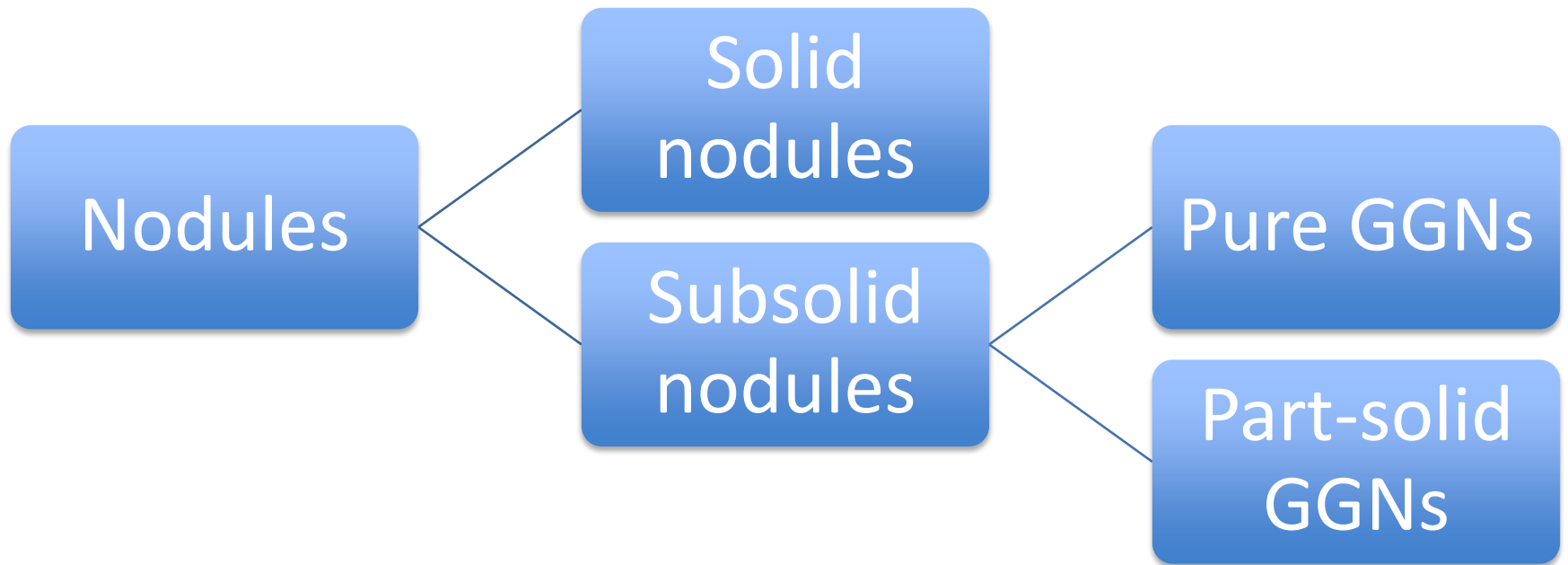
**Fleischner Society Glossary: Radiology 2008; 246:697-722**

# Ground Glass Nodules: on HRCT scans

- Caused by partial filling of the airspaces
- Interstitial thickening
- Partial collapse of the alveoli
- Increased capillary blood flow
- Or any combination of the above
- **Common factor is partial displacement of air**

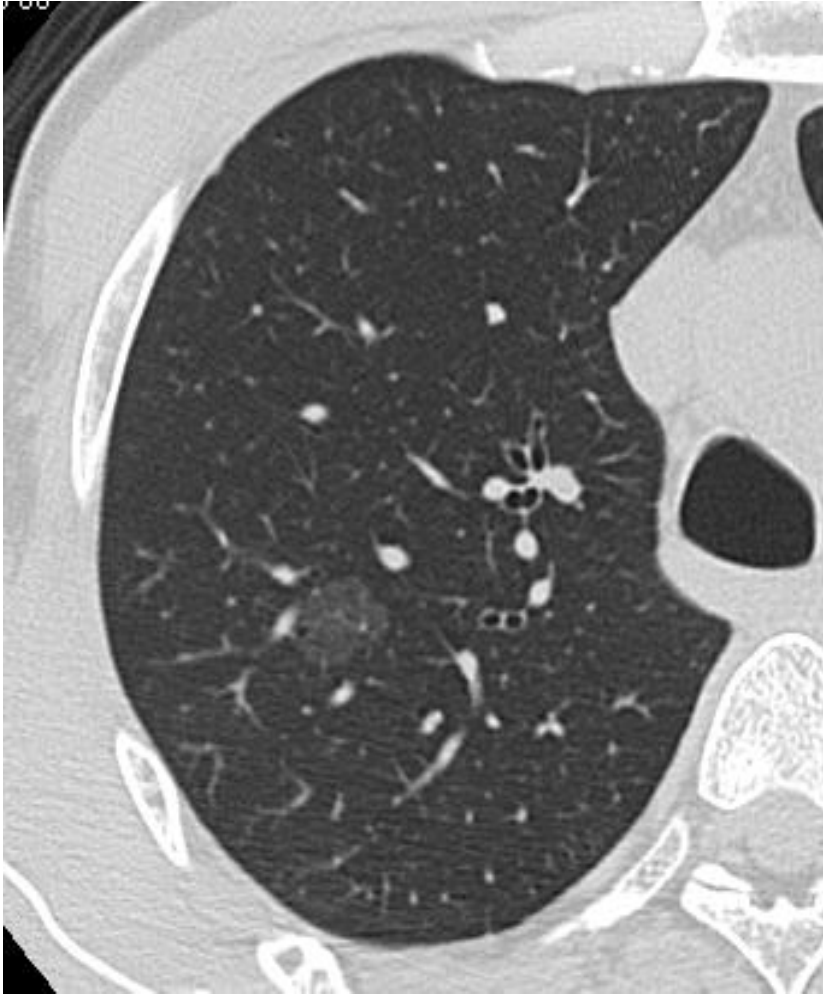
**Fleischner Society Glossary: Radiology 2008; 246:697-722**

# Pulmonary nodules



GGNs=ground glass nodules

# Subsolid Nodules ( $\leq 3$ cm)



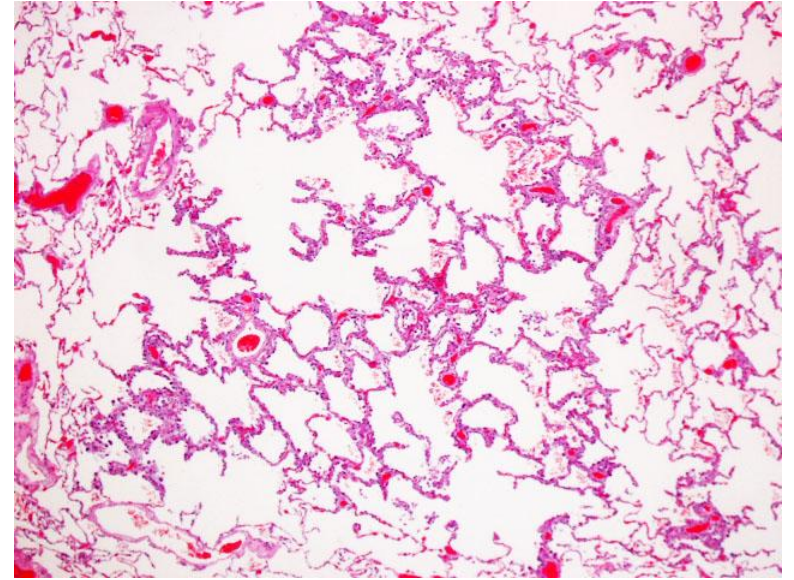
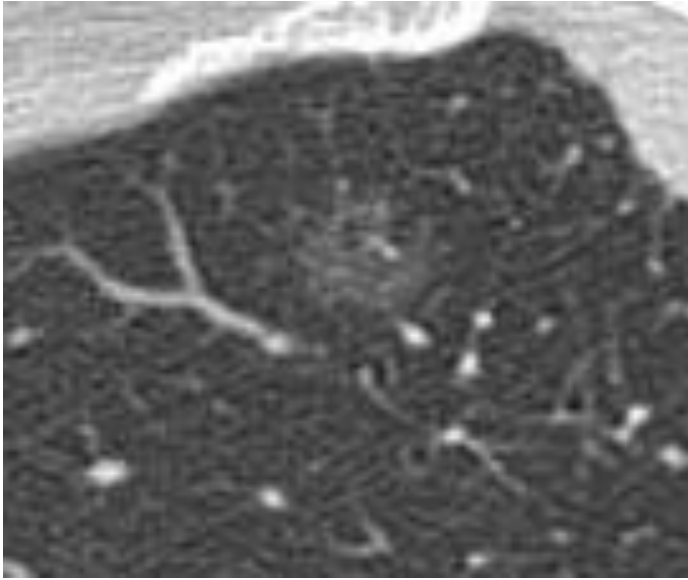
Pure GGN



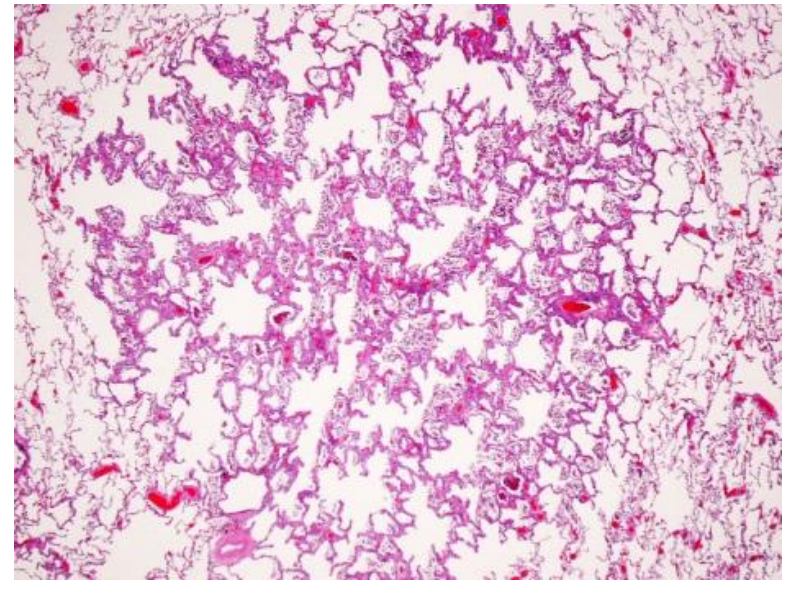
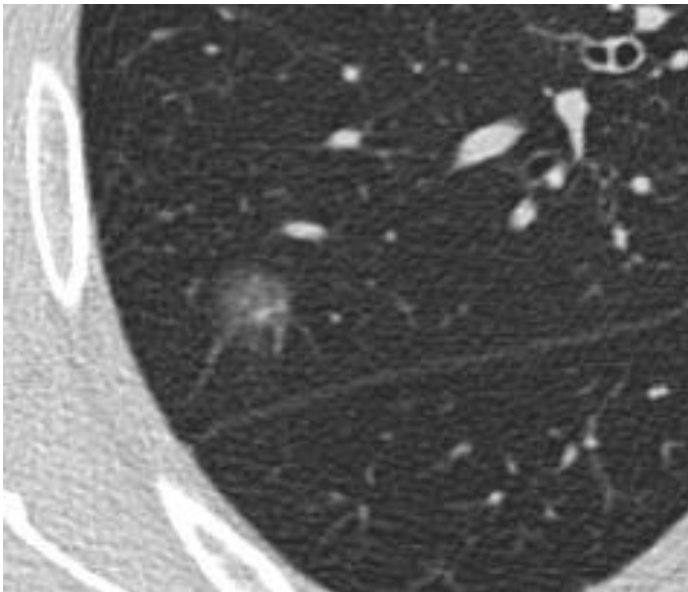
Part-solid GGN

# Preinvasive Lesions

AAH



AIS

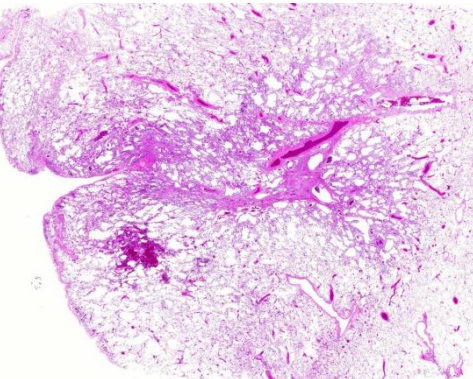
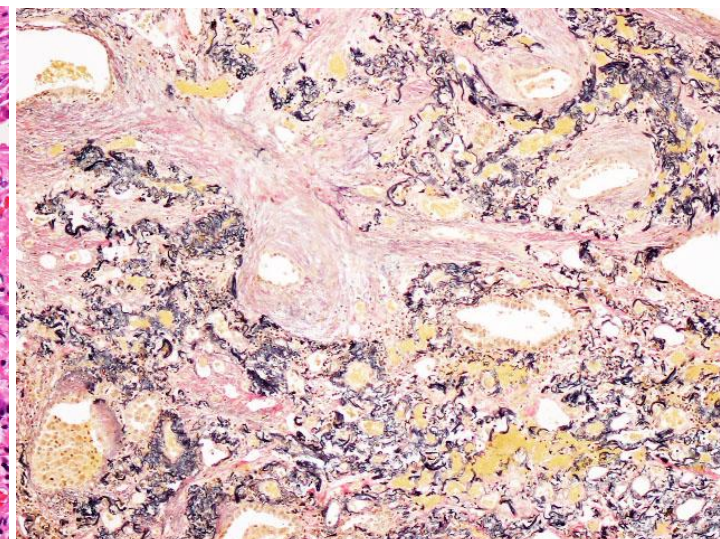
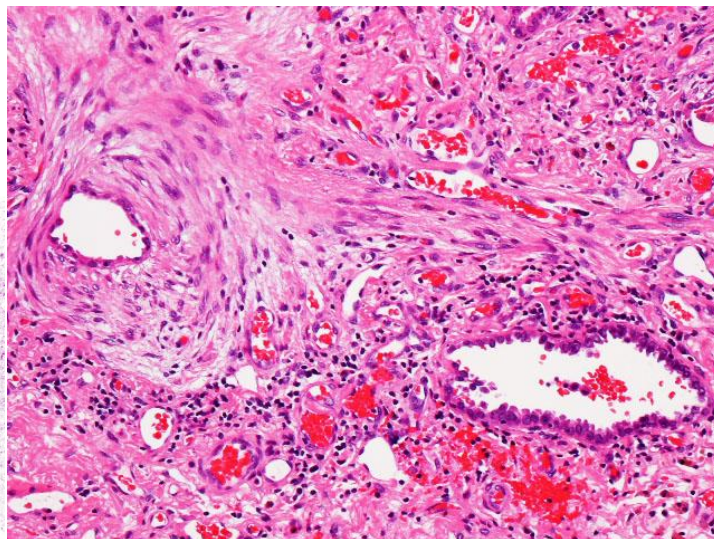
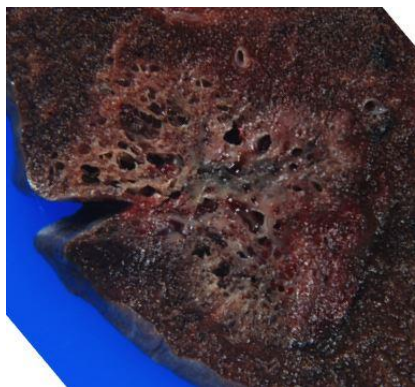
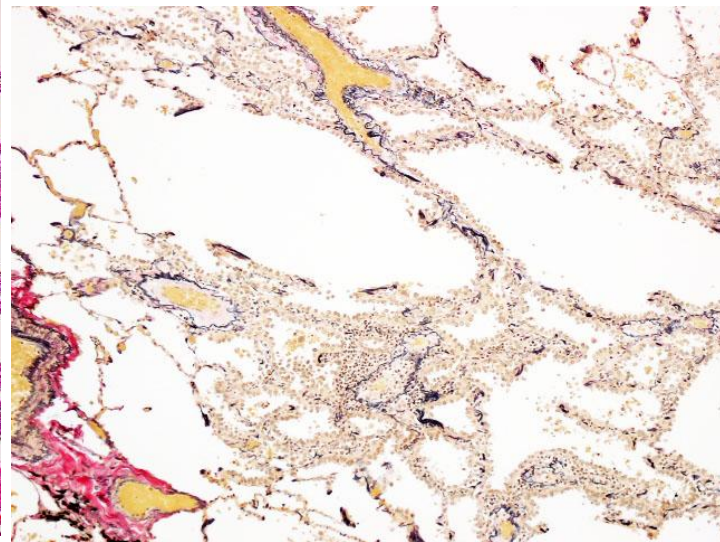
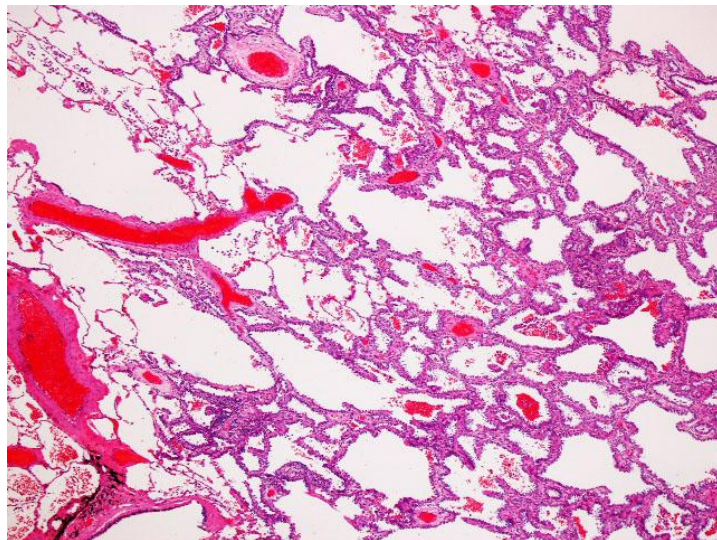
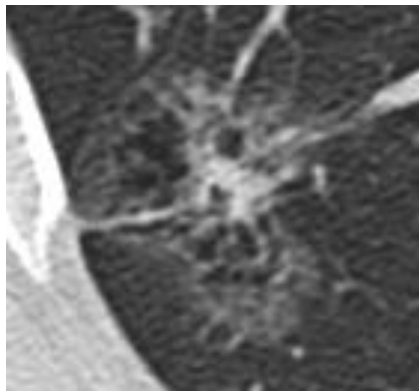


# Minimally Invasive Adenocarcinoma (MIA)

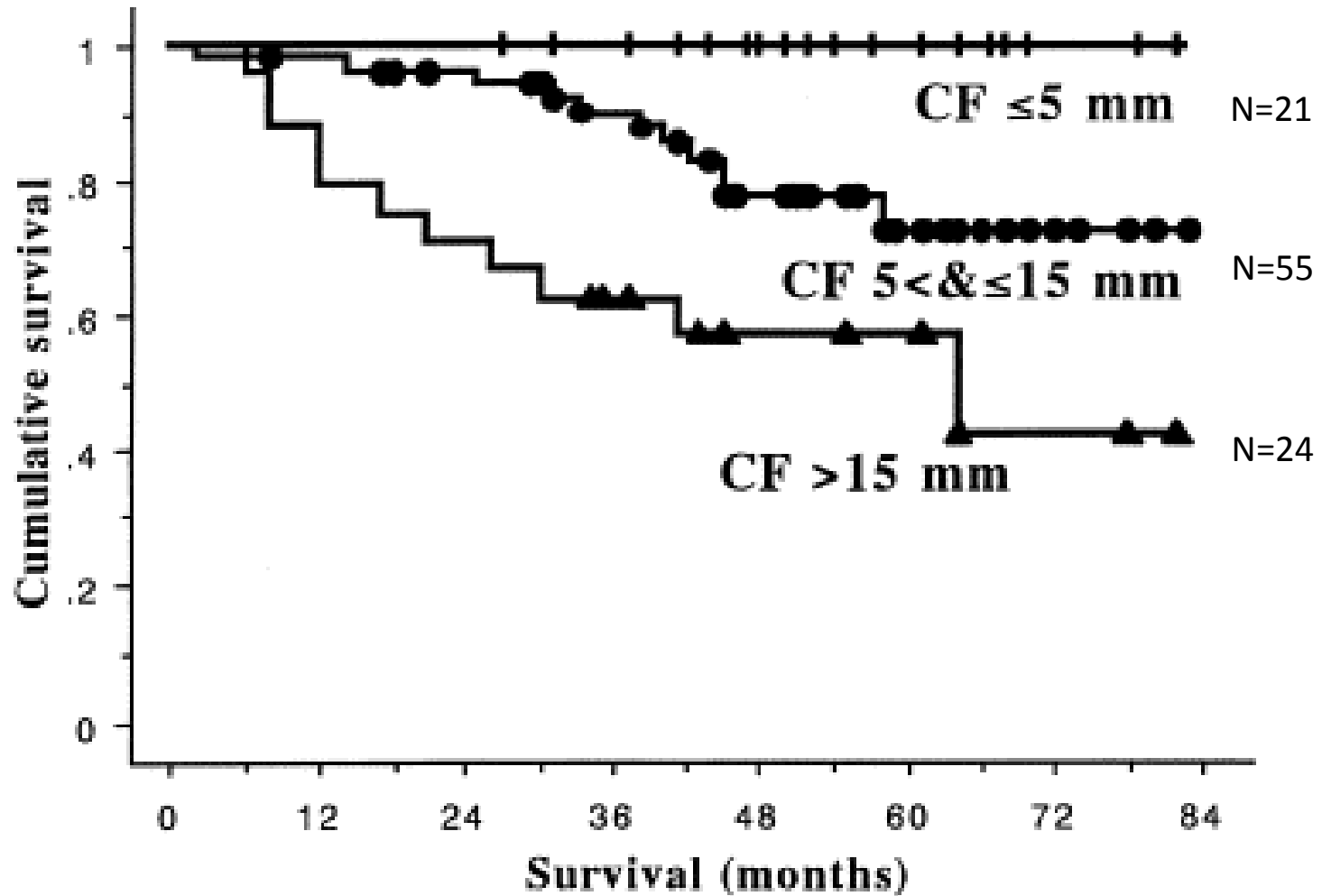
( $\leq 3$  cm lepidic predominant tumor with  $\leq 5$ mm invasion)



# Minimally Invasive Adenocarcinoma



# Survival for patients with ADC $\leq 3$ cm



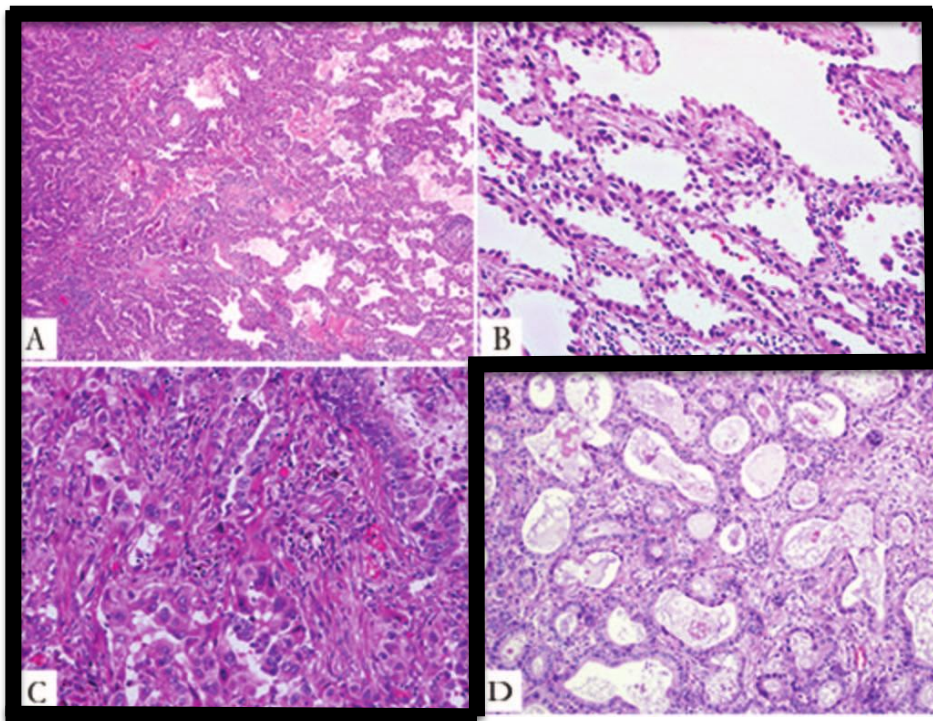


# IASLC/ATS/ERS classification of Lung Adenocarcinoma in Resected Specimens

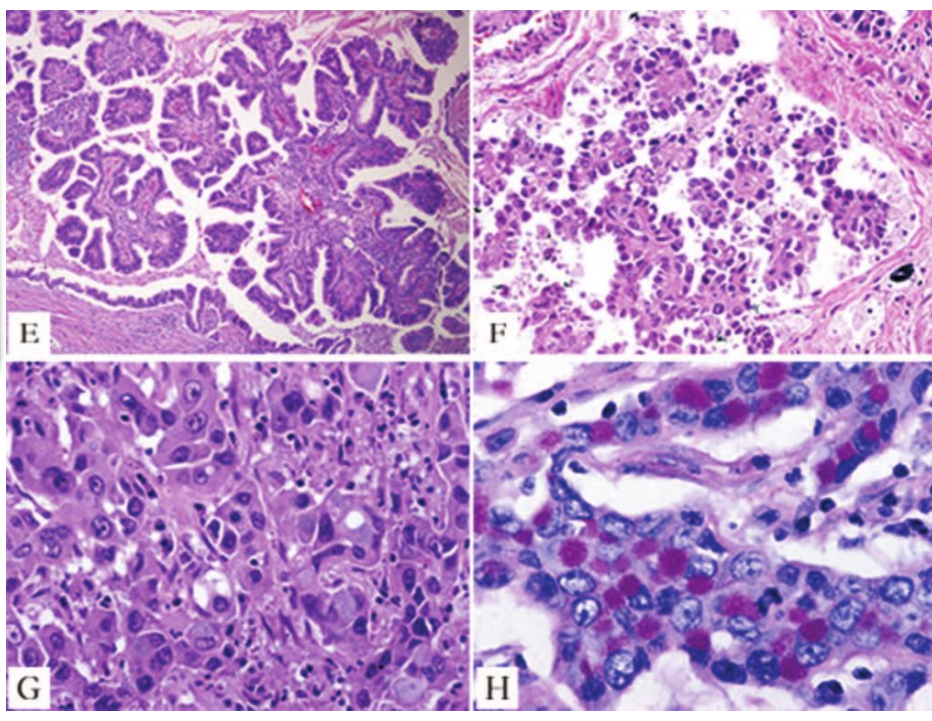
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# Invasive adenocarcinoma

Lepidic predominant ADC



Papillary ADC

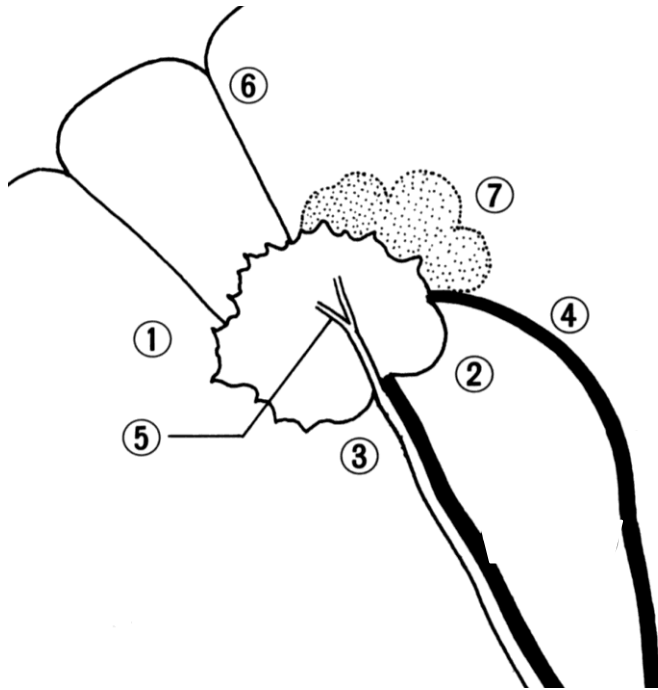


Micropapillary ADC

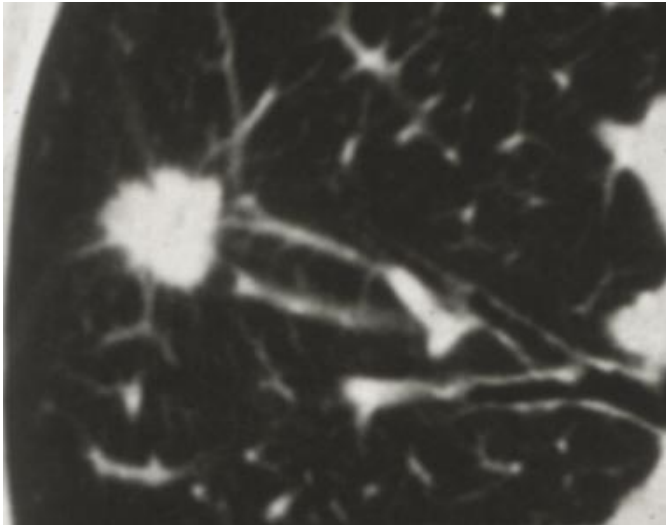
Acinar ADC

Solid ADC with mucin

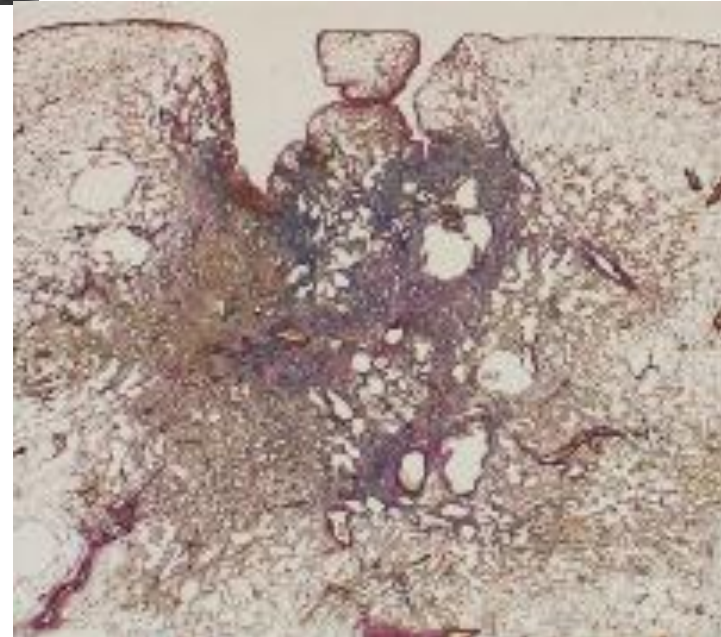
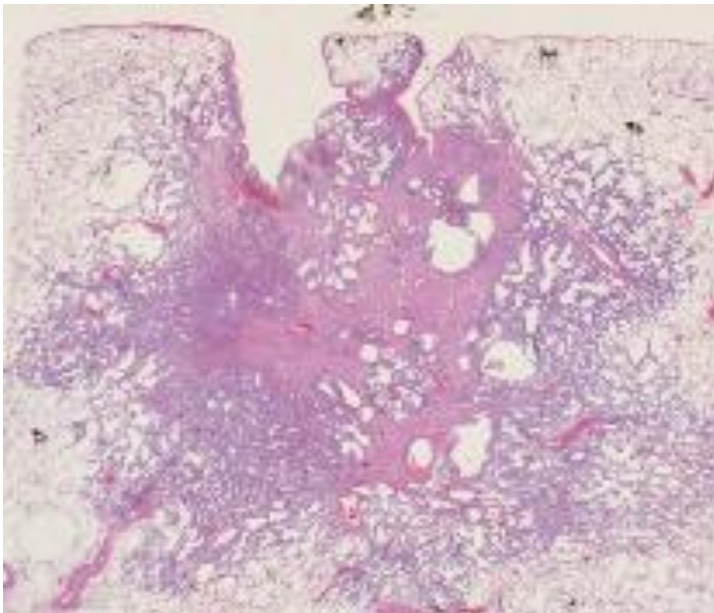
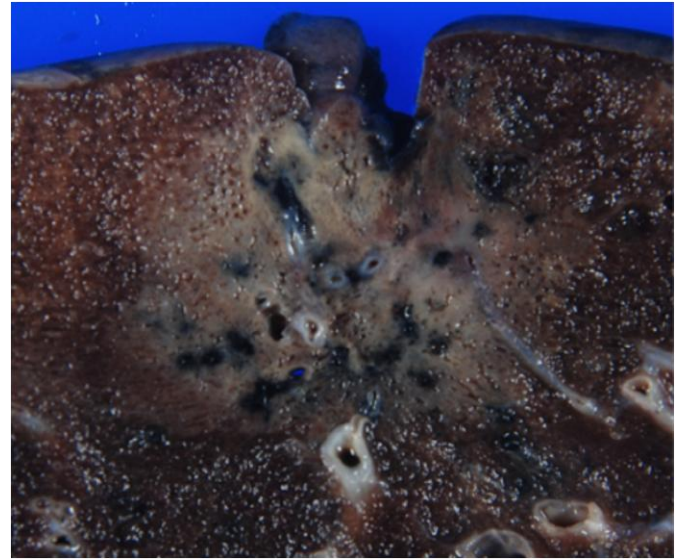
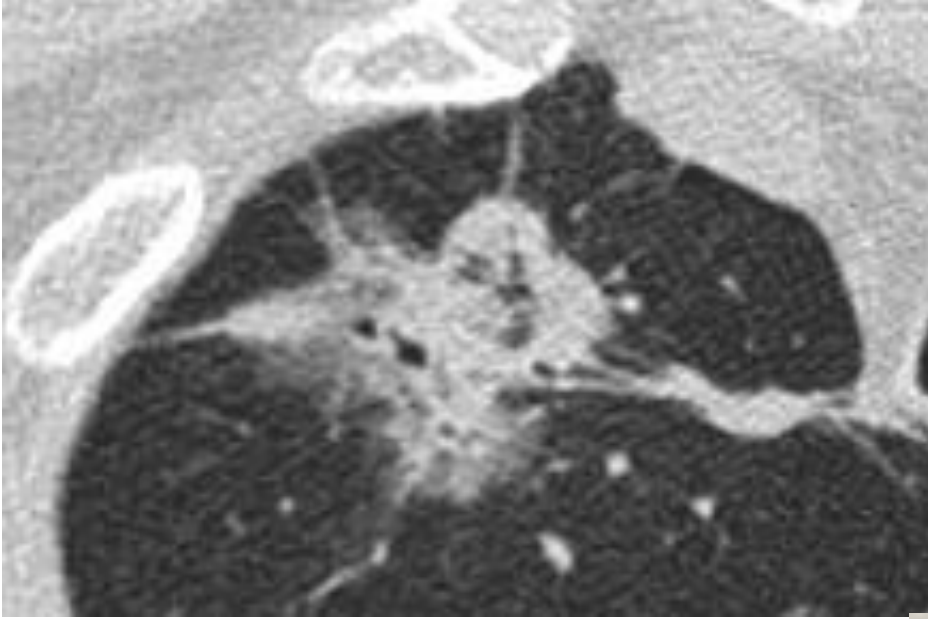
# Invasive adenocarcinoma



- ① Spiculation
- ② Convergence of bronchovascular bundles
- ③ Positive bronchus sign
- ④ Pulmonary vein involvement
- ⑤ Air bronchograms
- ⑥ Pleural indentations
- ⑦ Peripheral well-defined and lobulated ground-glass opacity

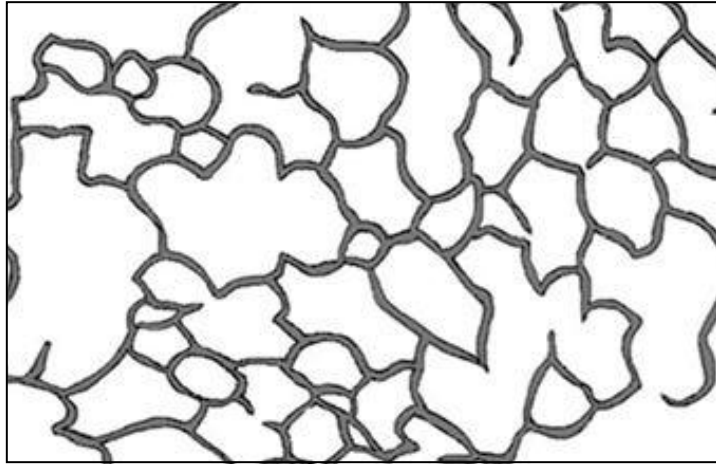


# Lepidic predominant invasive adenocarcinoma



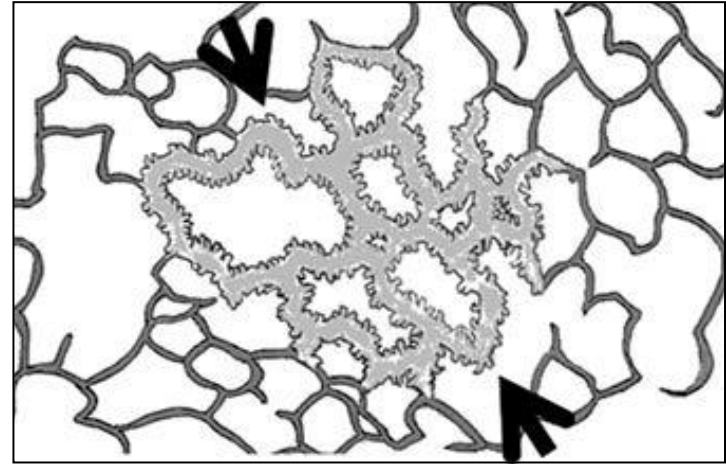
# Histologic differences among normal lung, AIS, MIA, and invasive ADC

Normal lung



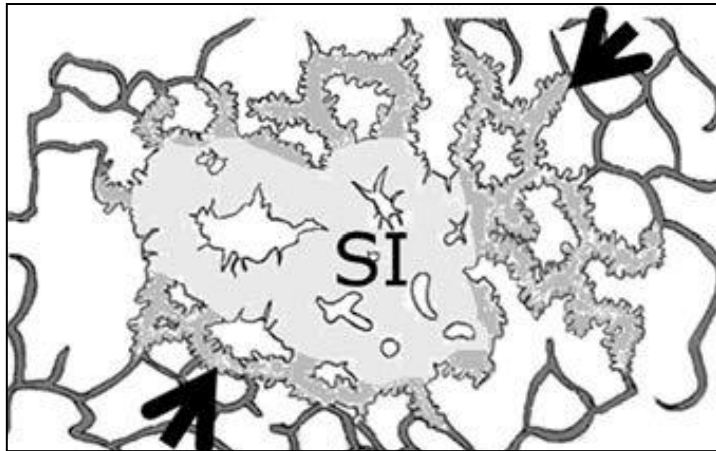
**A**

AIS



**B**

MIA



**C**

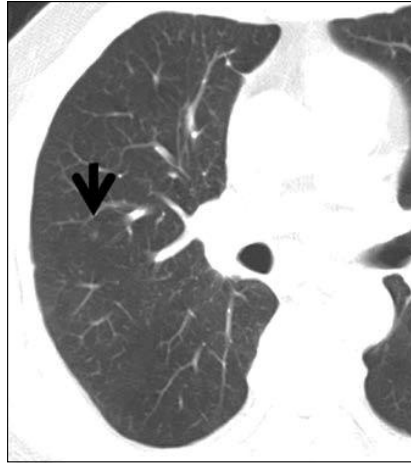
Invasive ADC



**D**

# Slow evolution of pure GGN over 9 years

June 2004  
4.3 mm  
pure GGN



A

April 2008  
8.3 mm  
pure GGN



B

August 2011  
12.5 mm  
pure GGN



C

August 2013  
18.0 mm  
Part-solid GGN



D

# New classification and HRCT findings

AAH

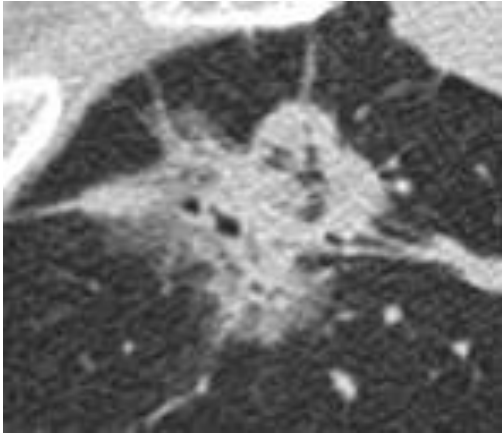
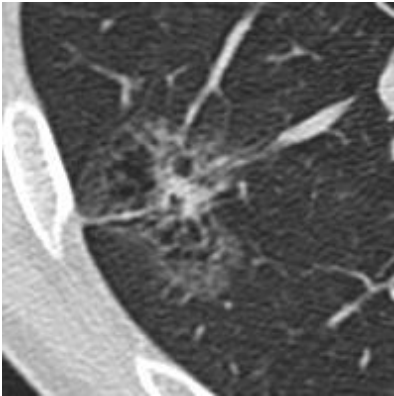
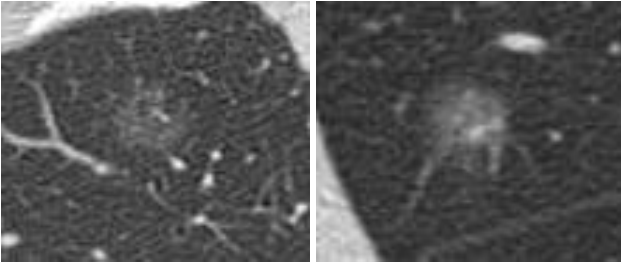
AIS



MIA



invasive adenocarcinoma

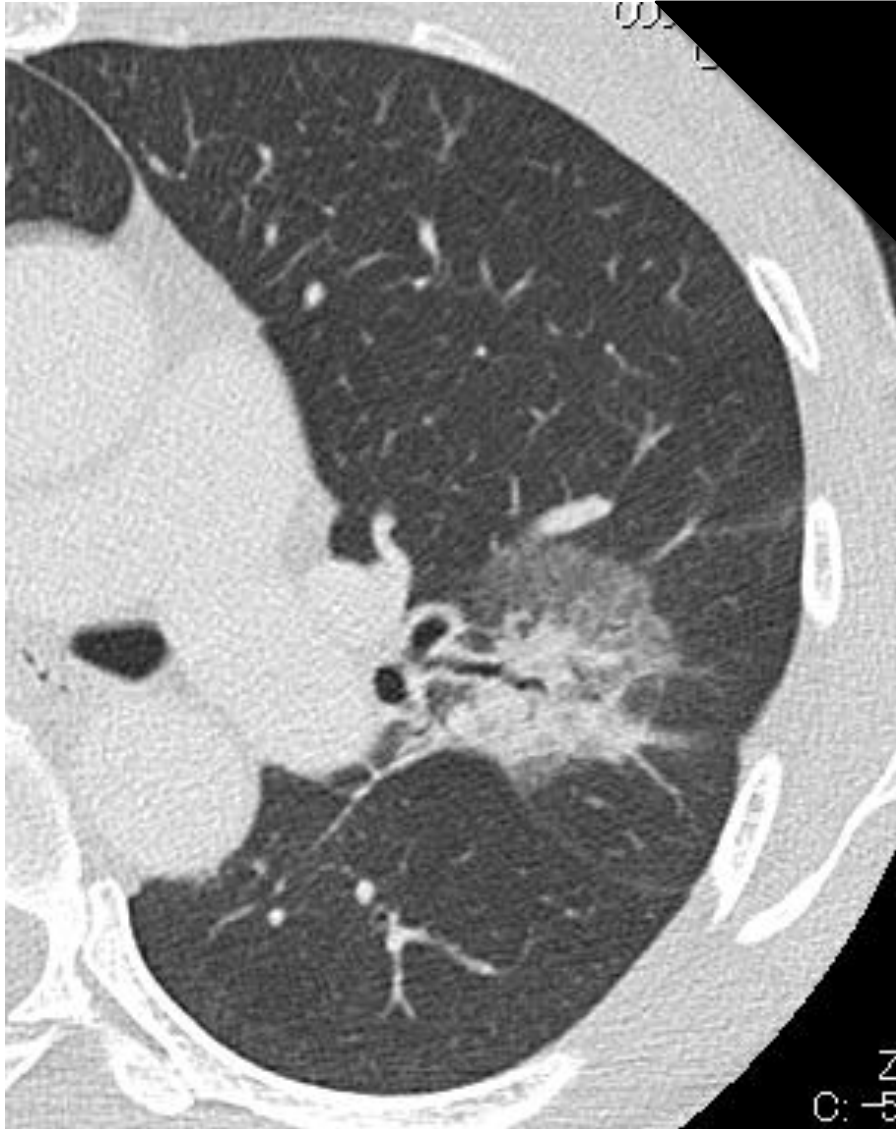


Pure GGN

Pure GGN  
Part-solid GGN

part-solid GGN  
Solid GGN

# Which is lung cancer?

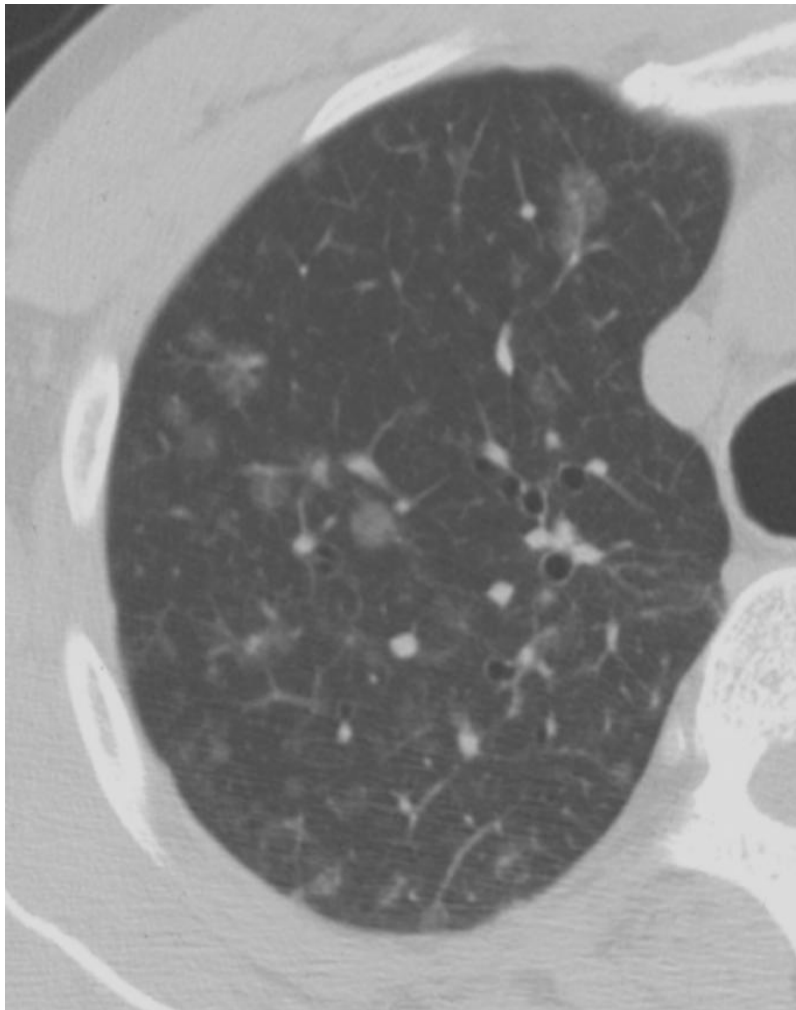




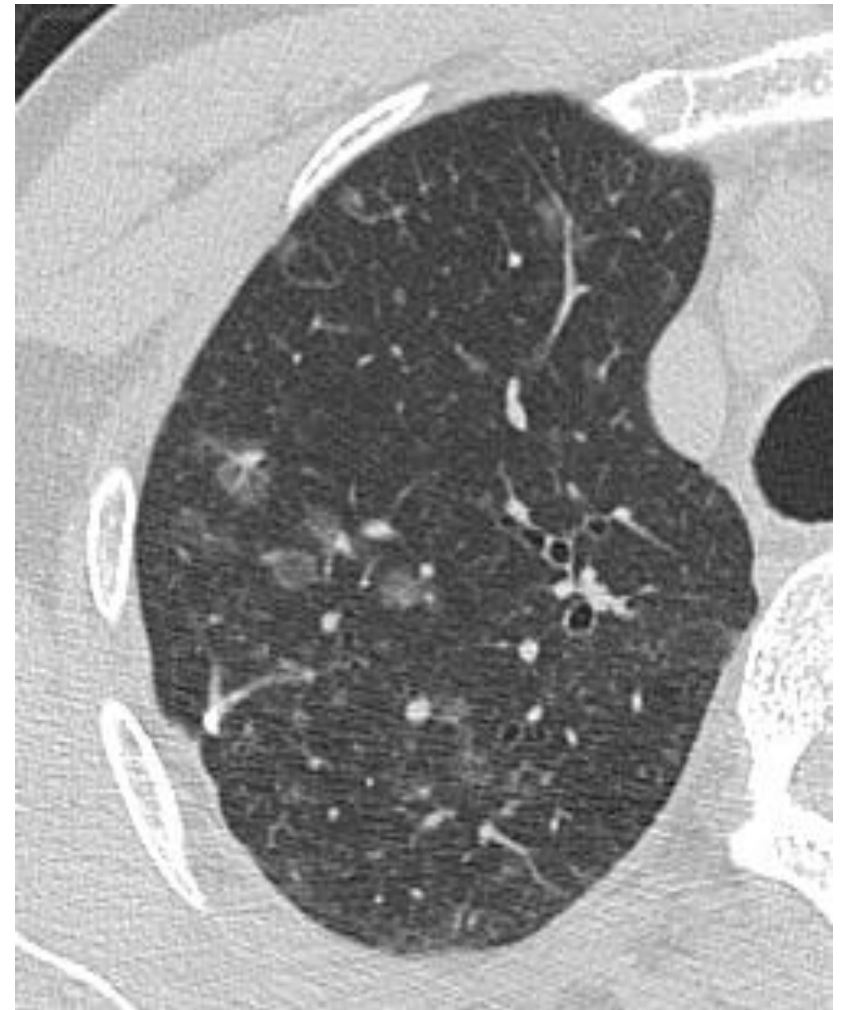
# Malignant vs Benign GGNs on HRCT

	Malignant GGNs	Benign GGNs
HRCT findings	Rounded, lobulated Well-defined margins	Polygonal, Ill-defined margins
Follow-up HRCT	No regression	Regression
FDG-PET	Low sensitivity	

# Multiple pure GGNs: Multiple AAH/AIS



March 26, 1999



March 28, 2008

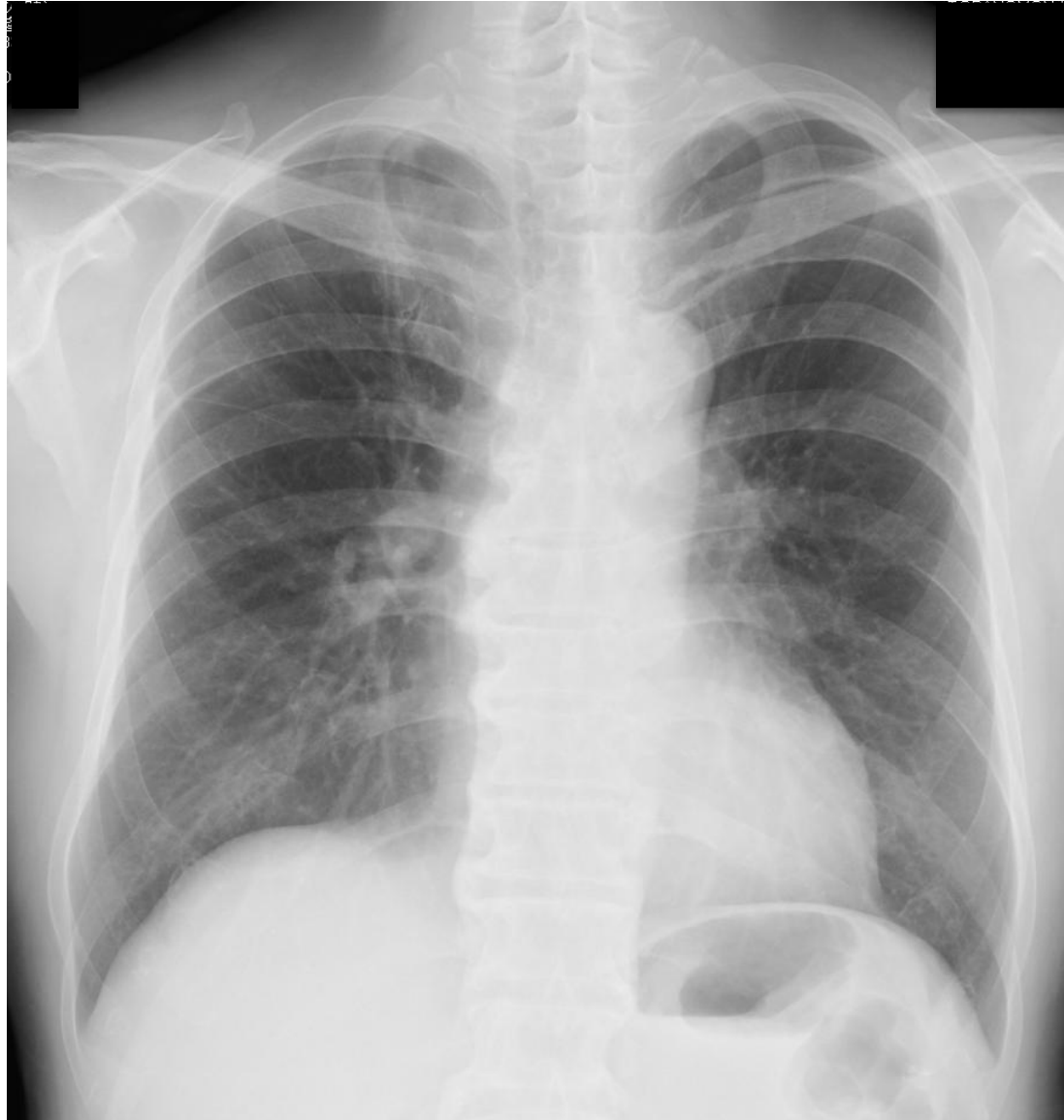
# Variants of invasive adenocarcinoma



# Invasive mucinous adenocarcinoma



# Old inflammatory lesion?



# Serial Chest Radiographs



97/1/27



01/5/1

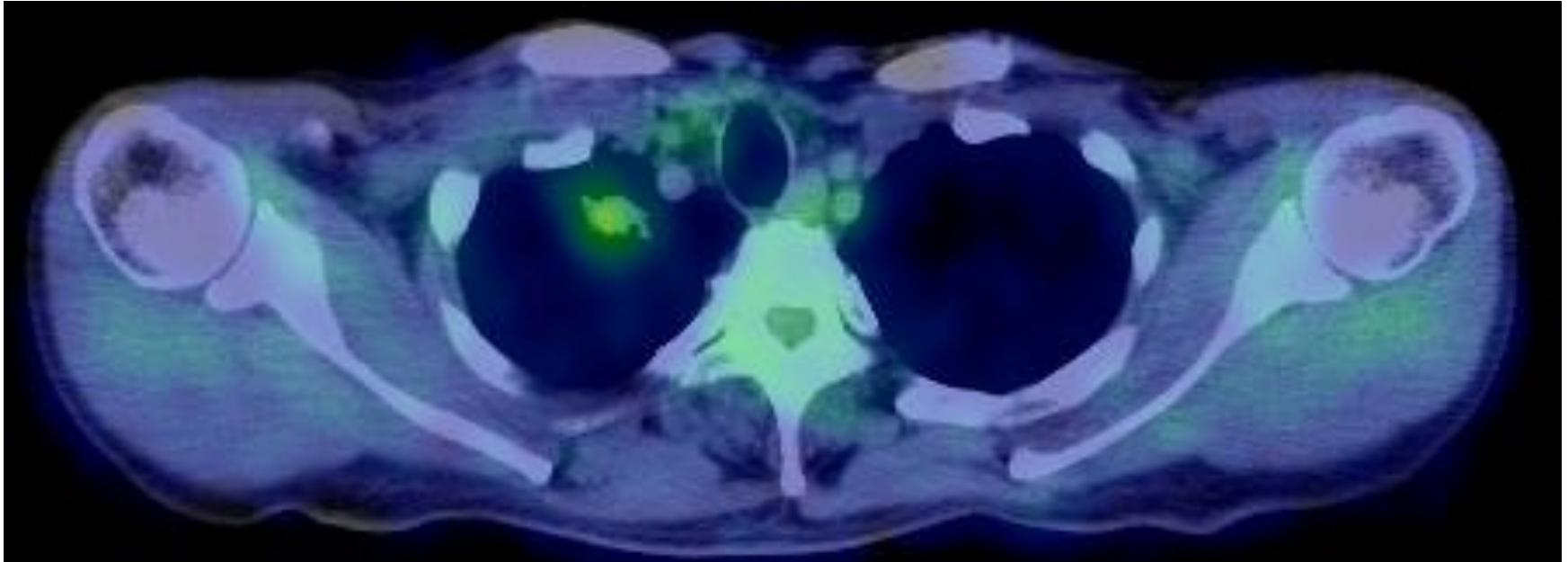


05/4/28



08/5/16

# FDG-PET



SUV max 2.2→1.8

Mildly increased FDG uptake in the right apical mass.  
Follow-up study is recommended.

# HRCT

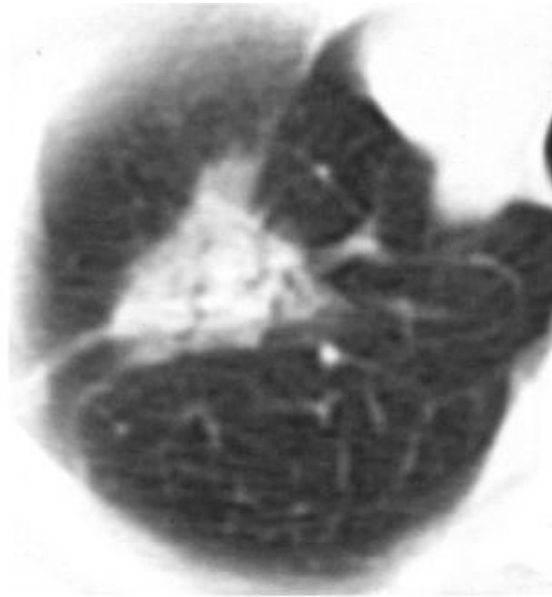


- Irregular shape with peripheral ground-glass opacity
- Many ectatic air bronchograms resembling **bubbles**
- Enhanced pleural tags

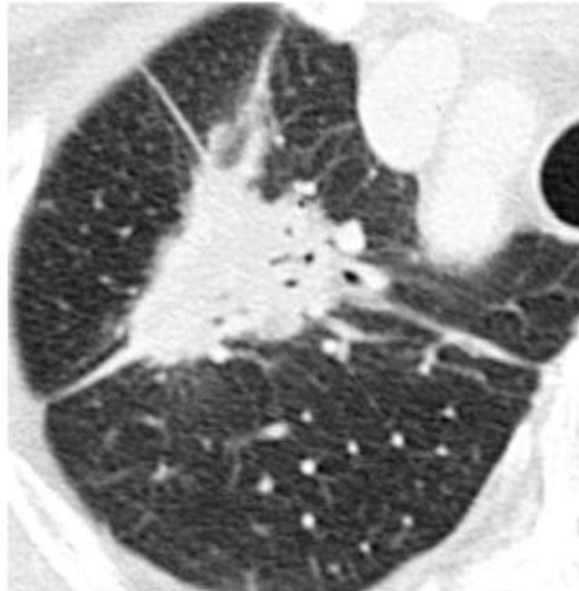
Adenocarcinoma, mixed subtype of papillary and bronchioloalveolar pattern  
pT1N2M0, stage 3A



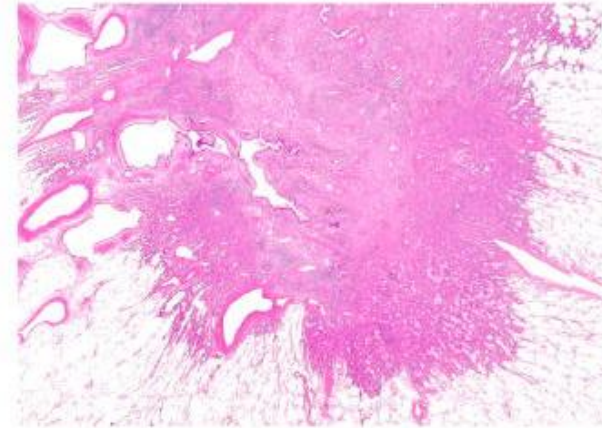
# Bubble like appearance on HRCT



A Initial (25 × 20mm)



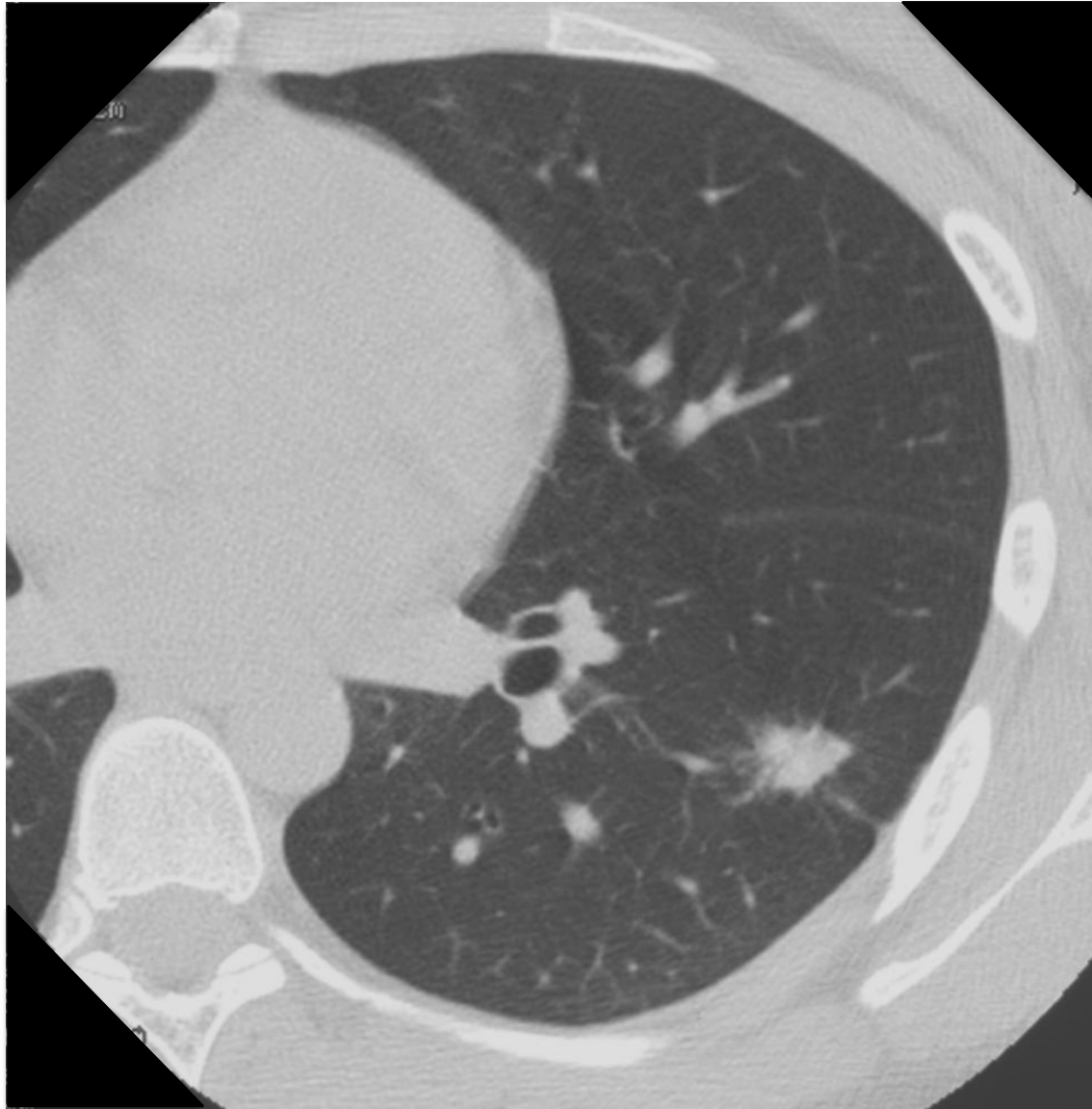
B 28 mo after



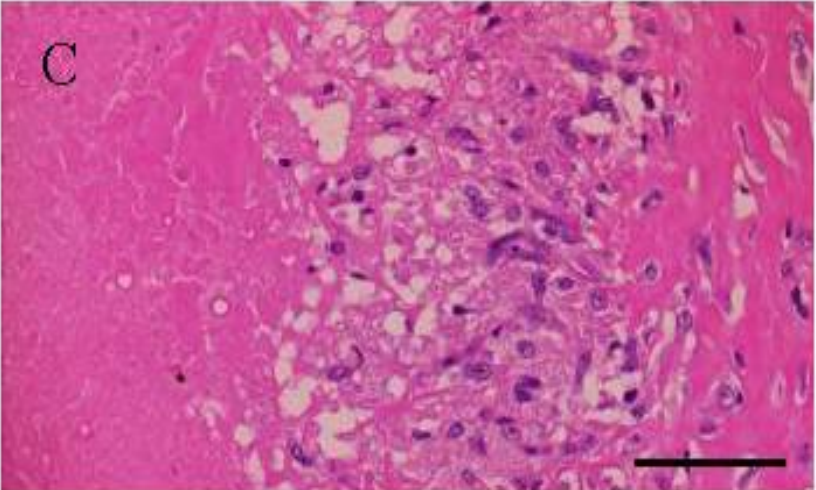
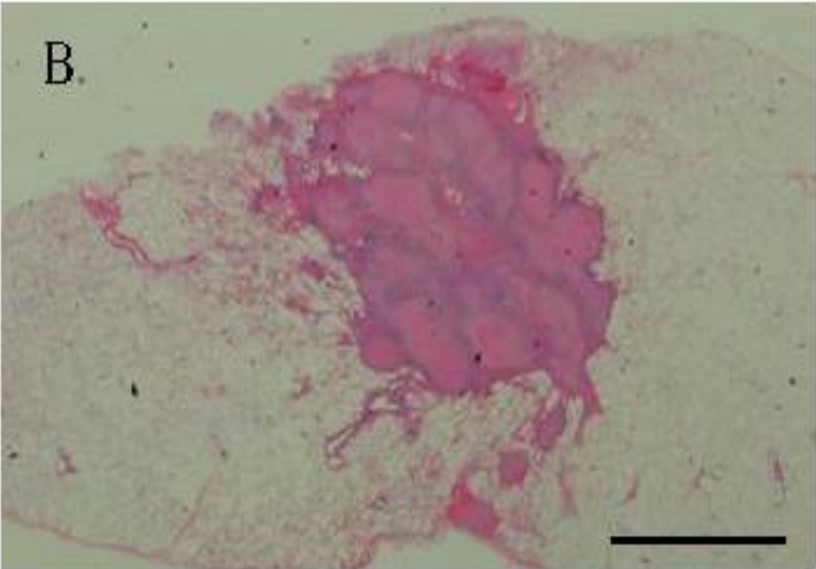
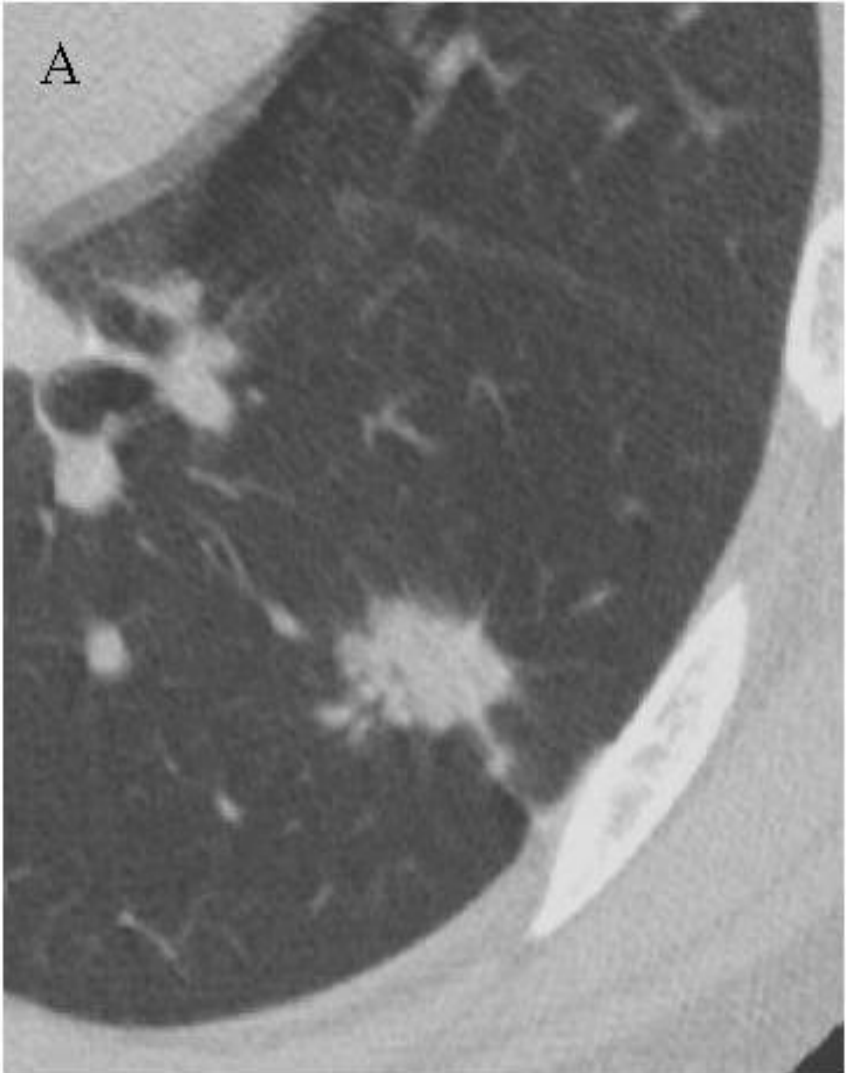
C

Mean tumor volume doubling time was **1,363**  $\pm$  1141 days (range 382-2980 days)

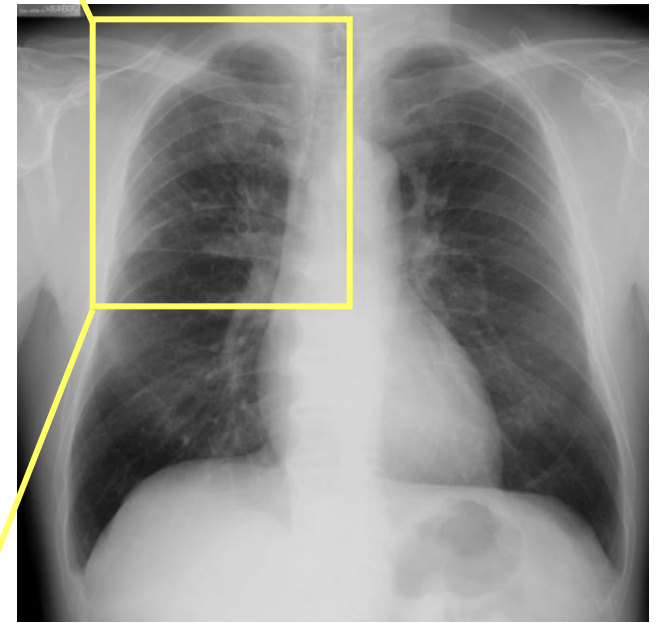
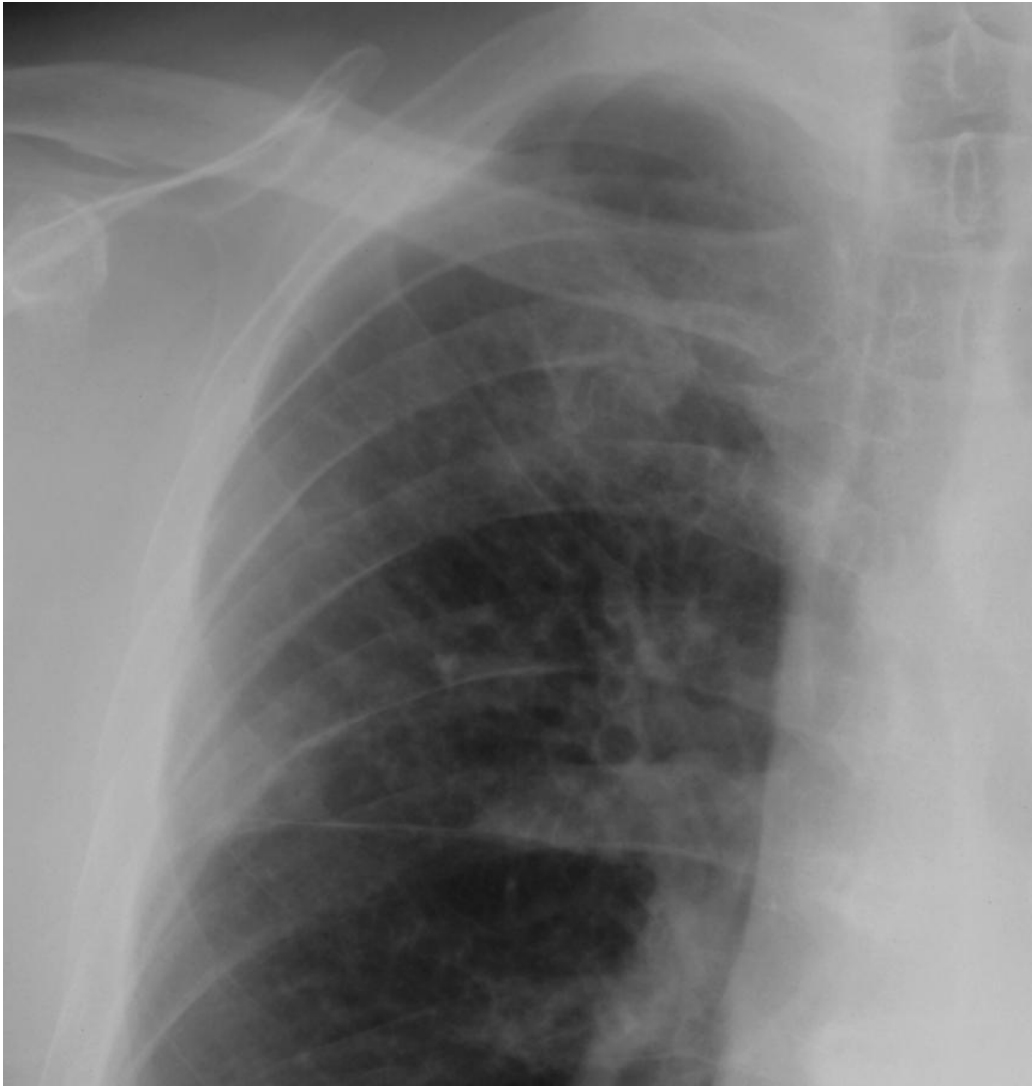
# Differential diagnosis for adenocarcinoma



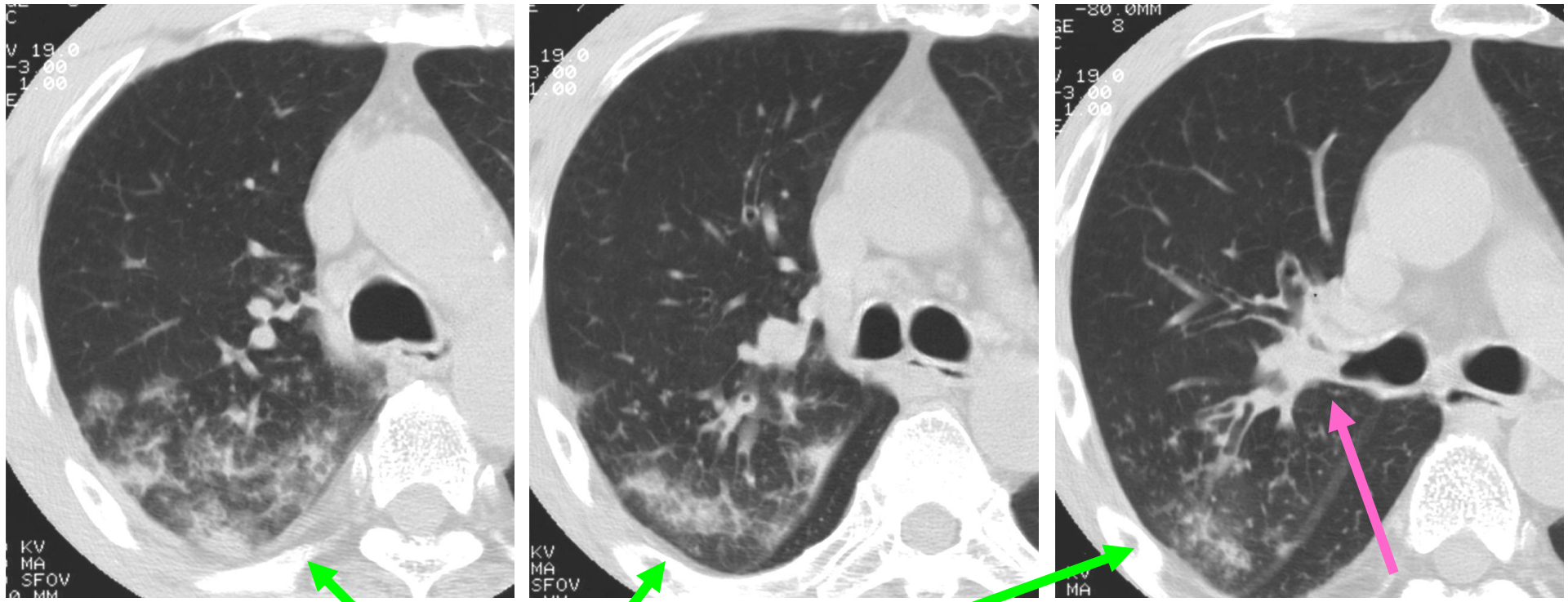
# Pulmonary cryptococcosis mimicking lung cancer



# Squamous cell carcinoma (central type)



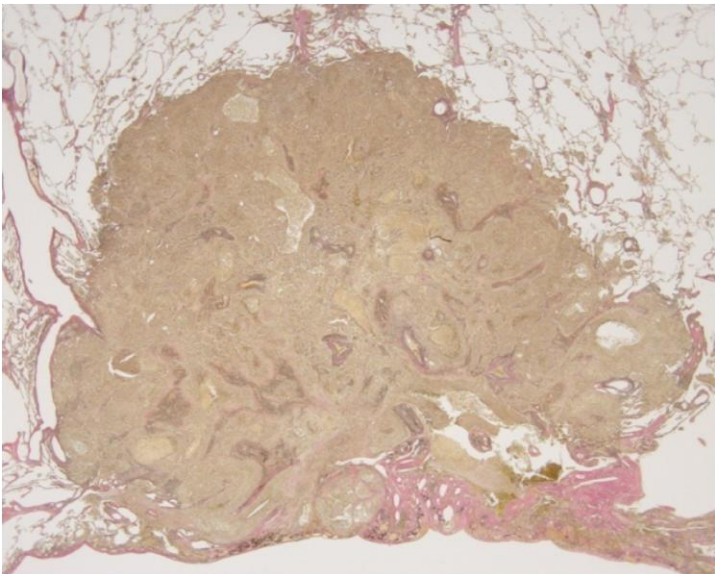
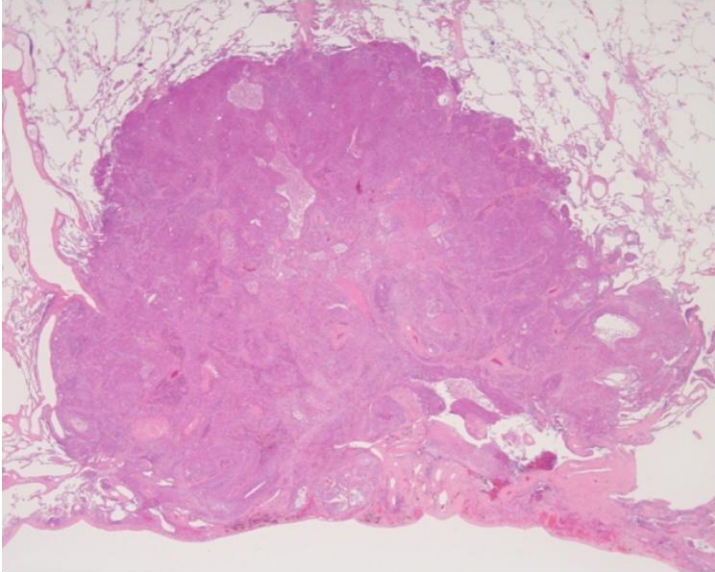
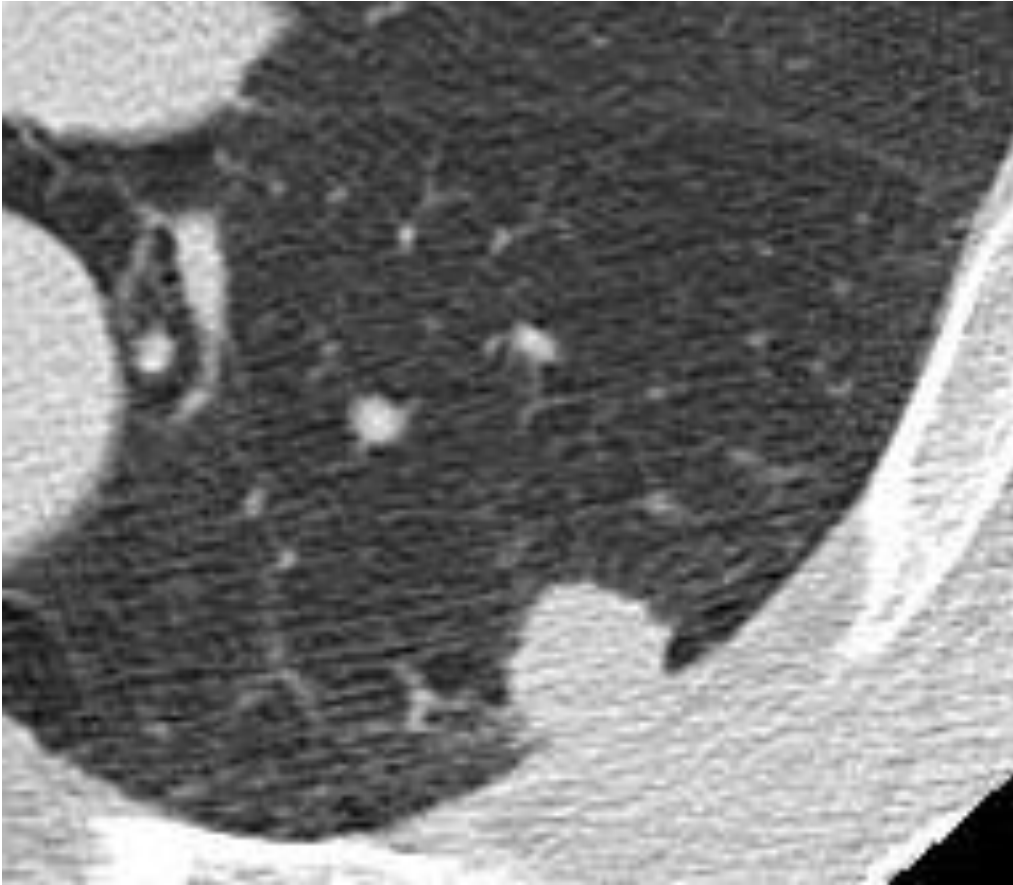
# Obstructive pneumonia due to Squamous cell carcinoma



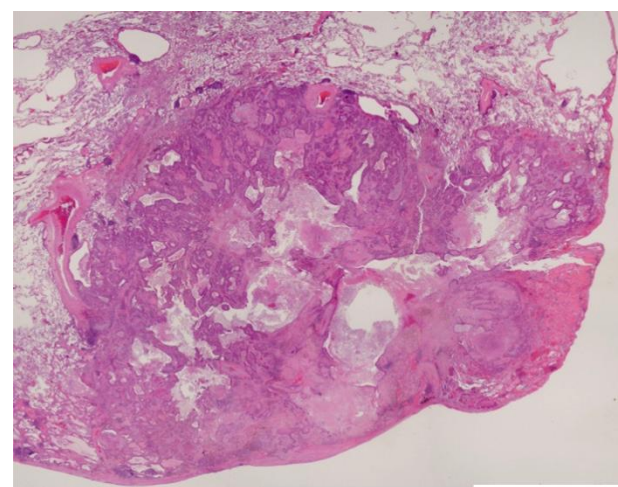
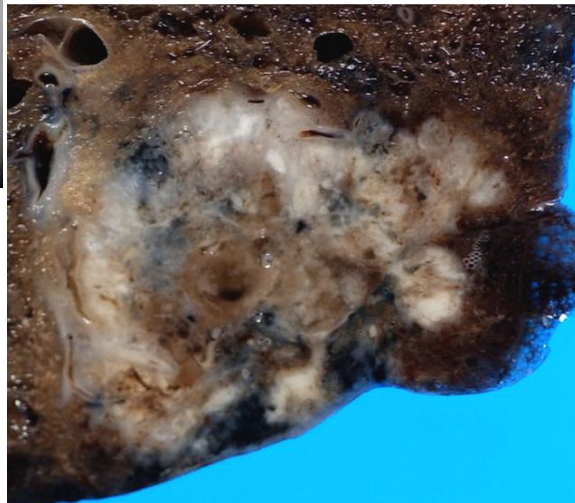
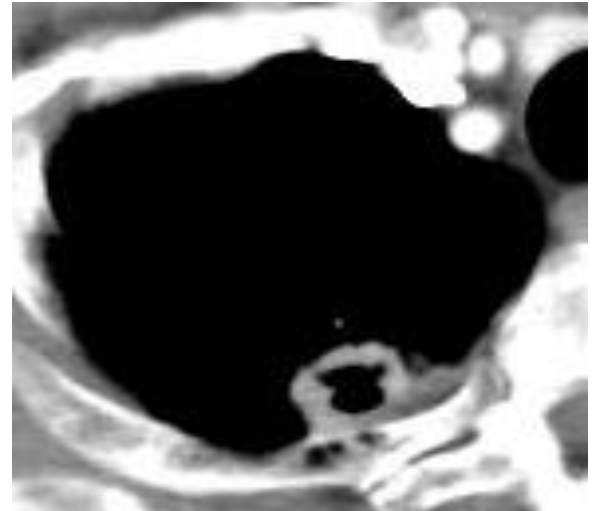
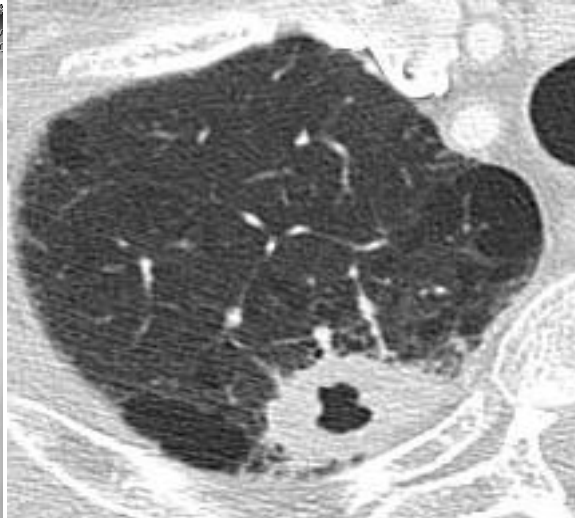
**Obstructive Pneumonia**

**Squamous cell carcinoma**

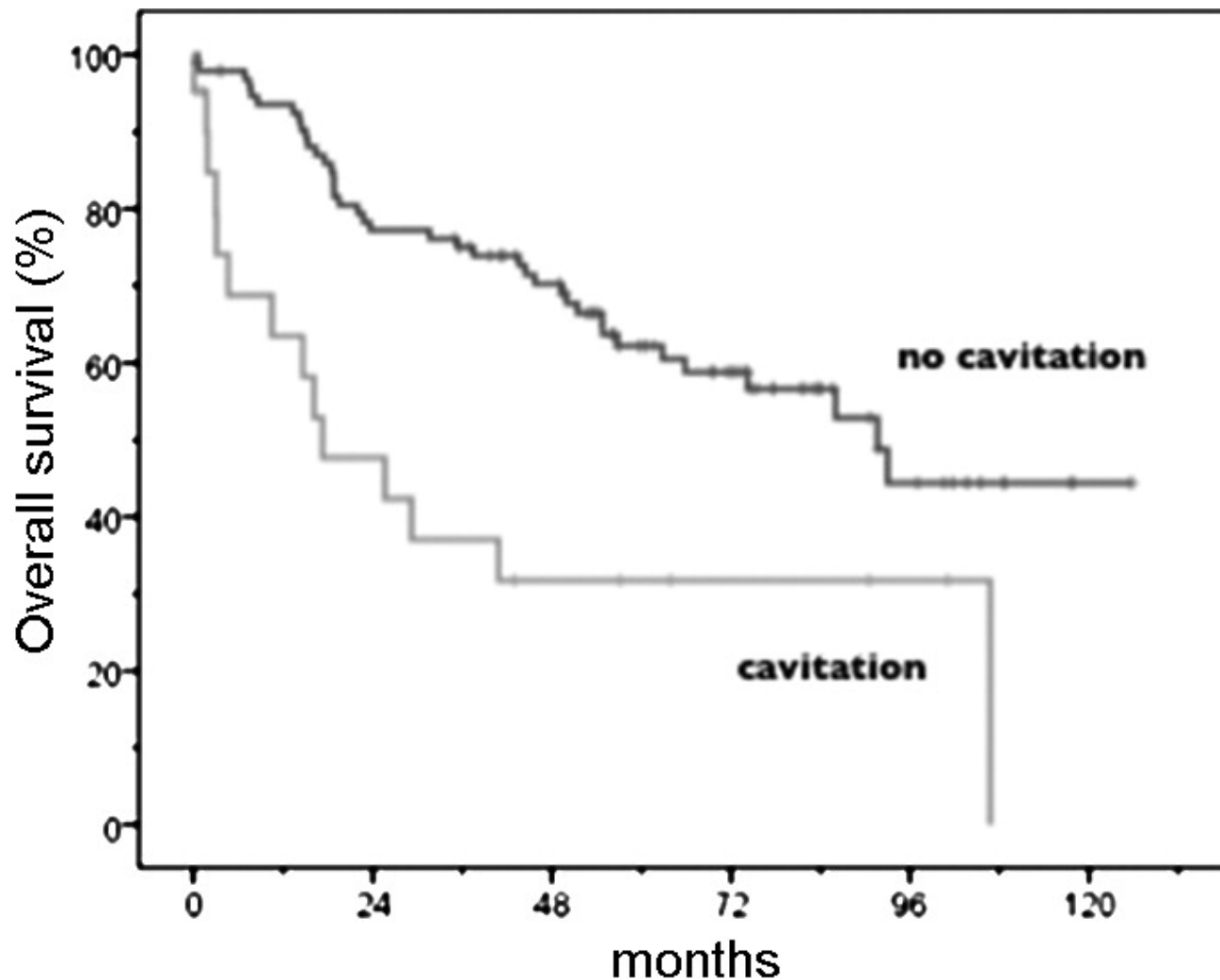
# Squamous cell carcinoma (peripheral type)



# Squamous cell carcinoma with cavity

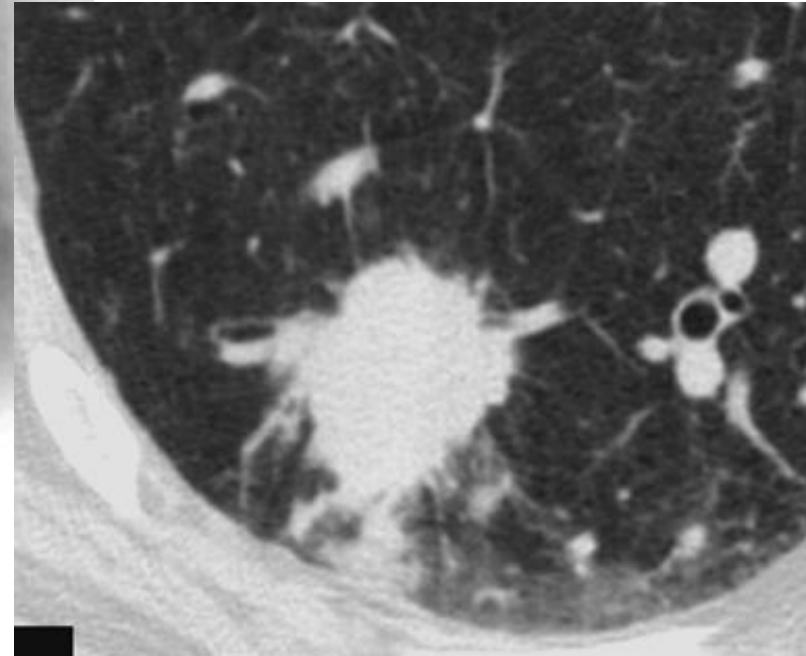
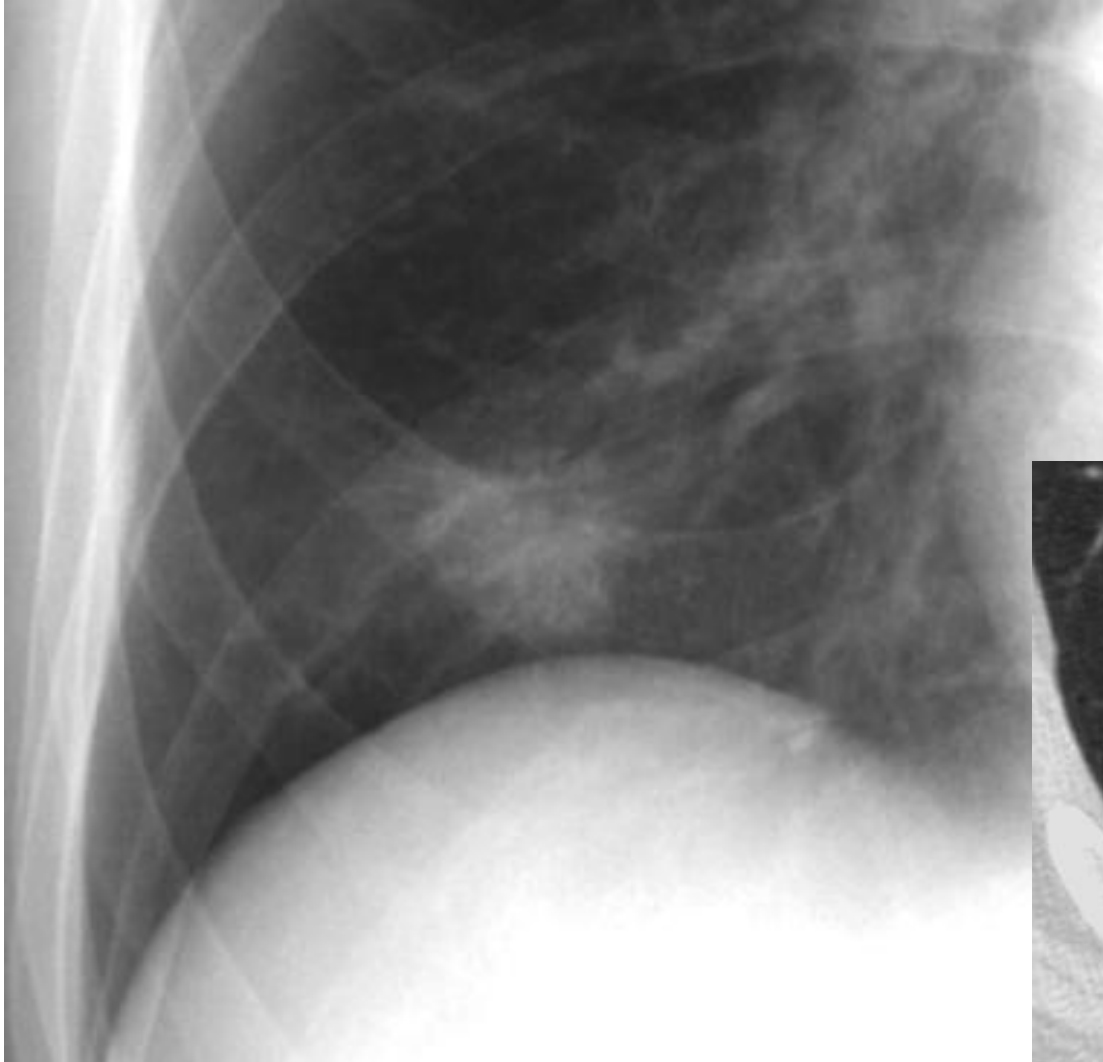


# Association of cavitation and survival





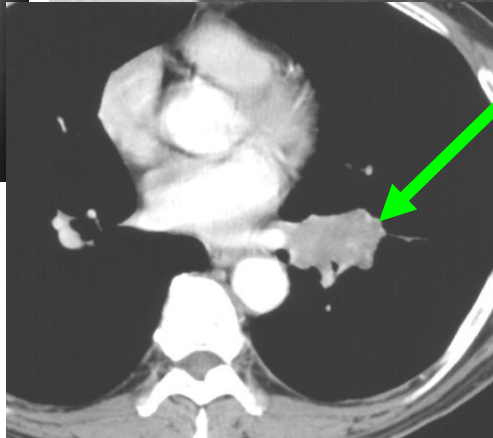
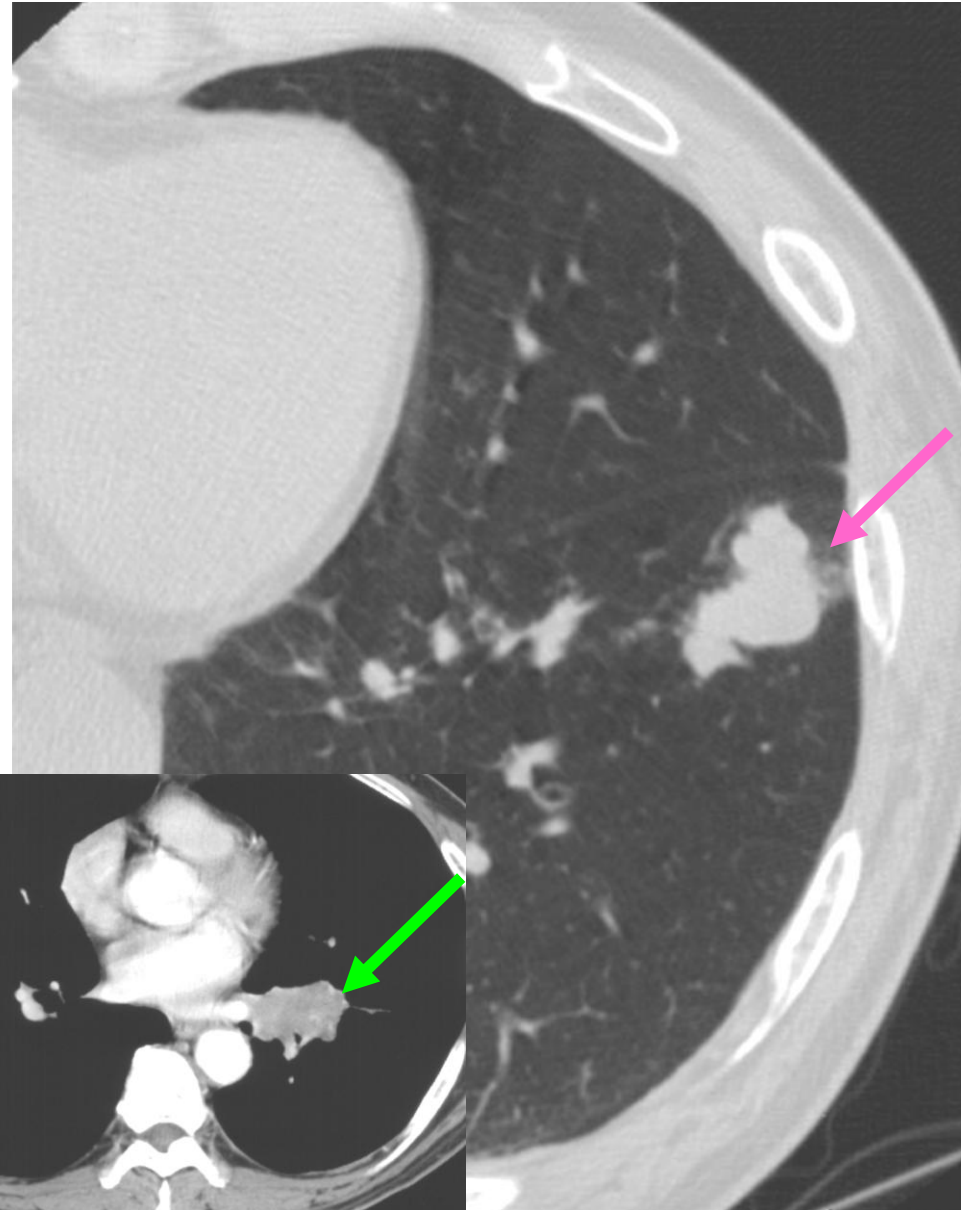
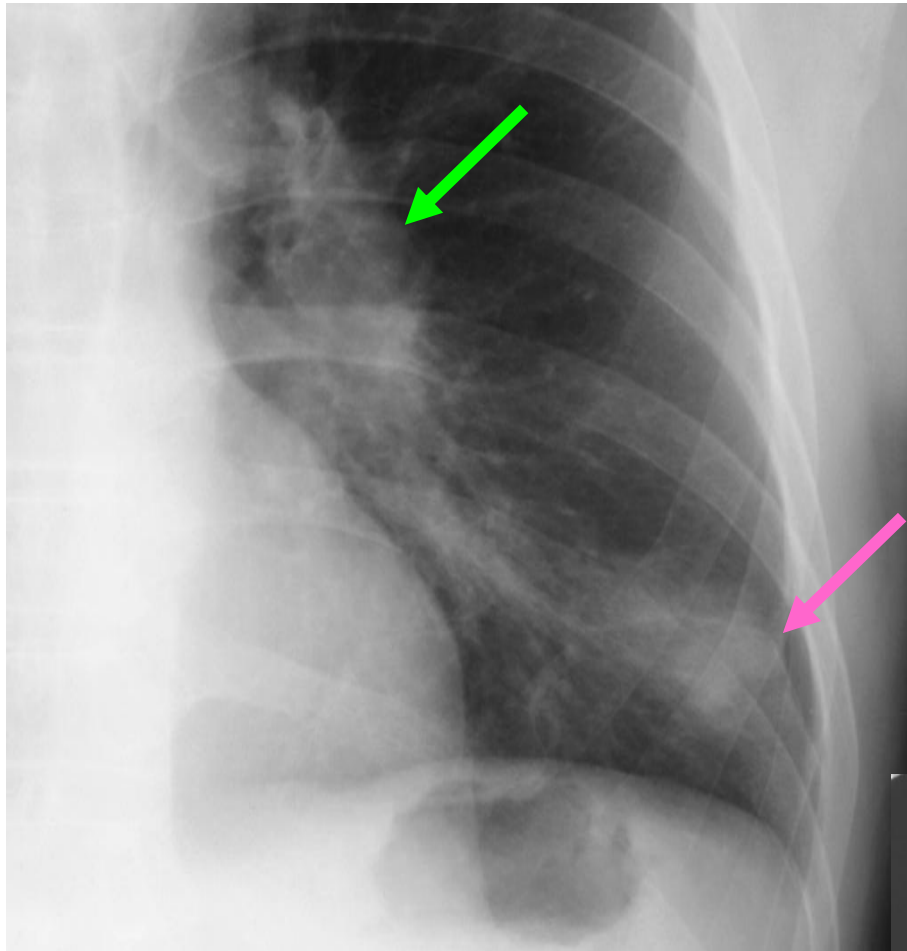
# Squamous cell carcinoma resembling adenocarcinoma



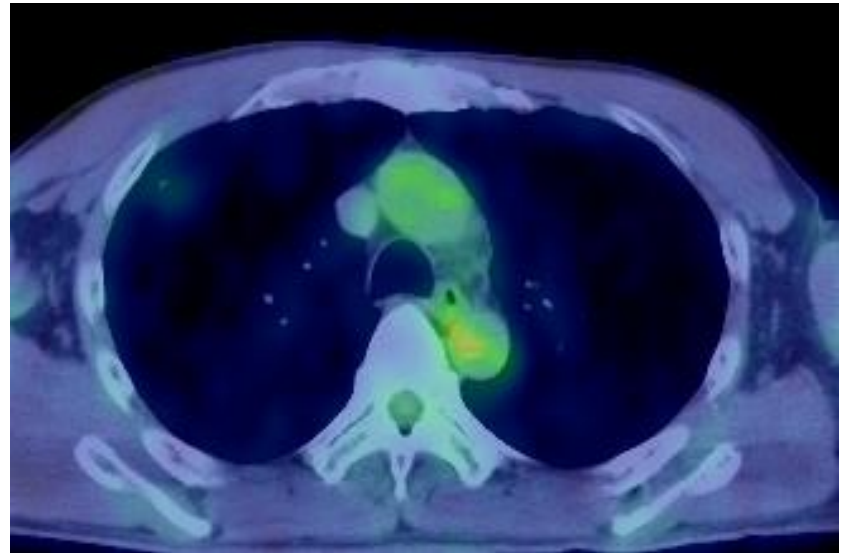
# Small cell carcinoma



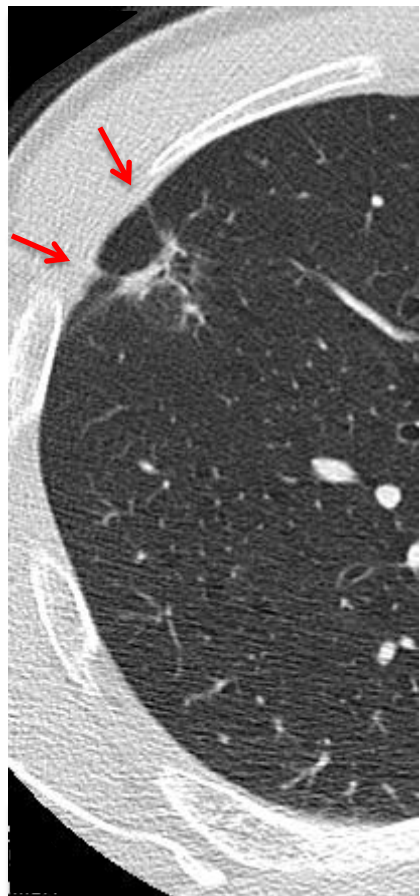
# Small cell carcinoma



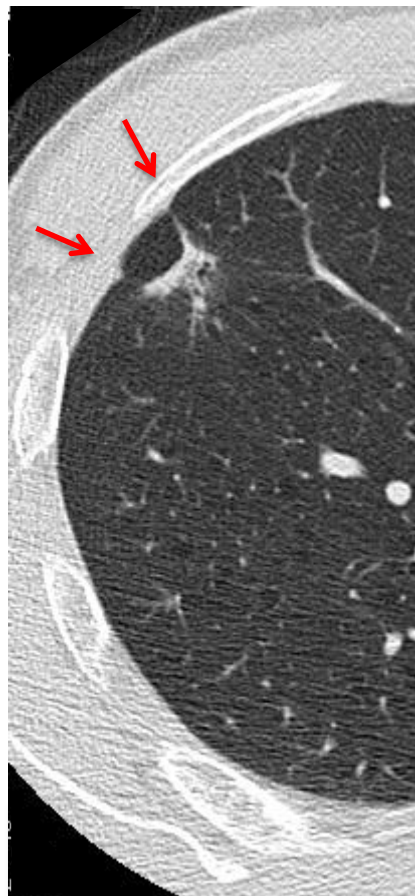
# Part-solid GGN (PET negative)



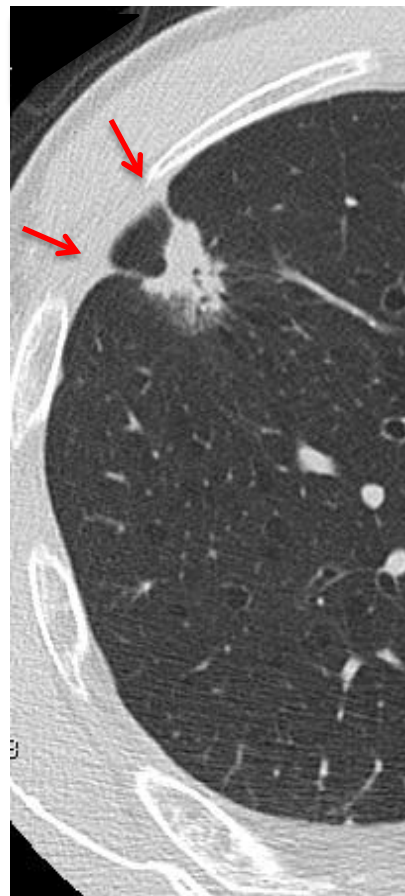
# Serial HRCT



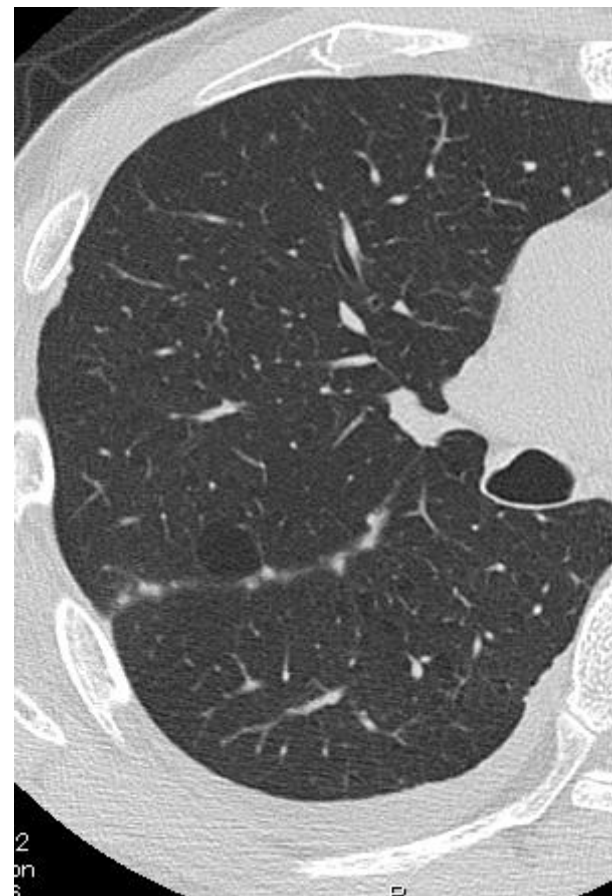
2009/2/12



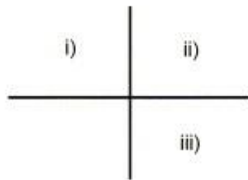
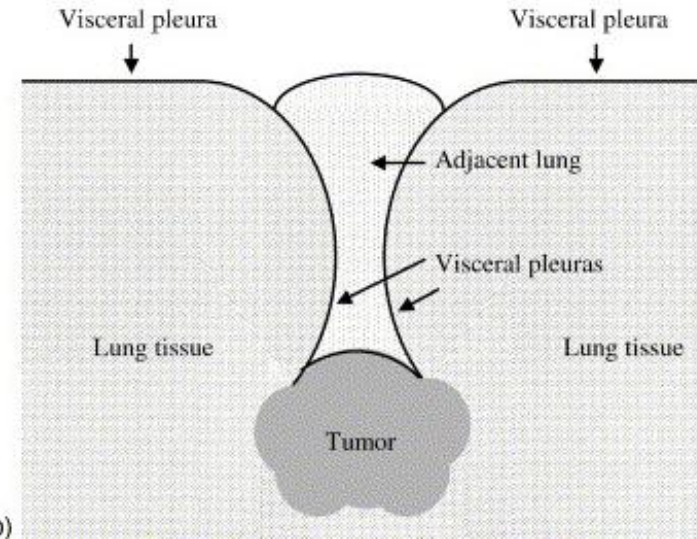
2009/9/4



2011/2/3

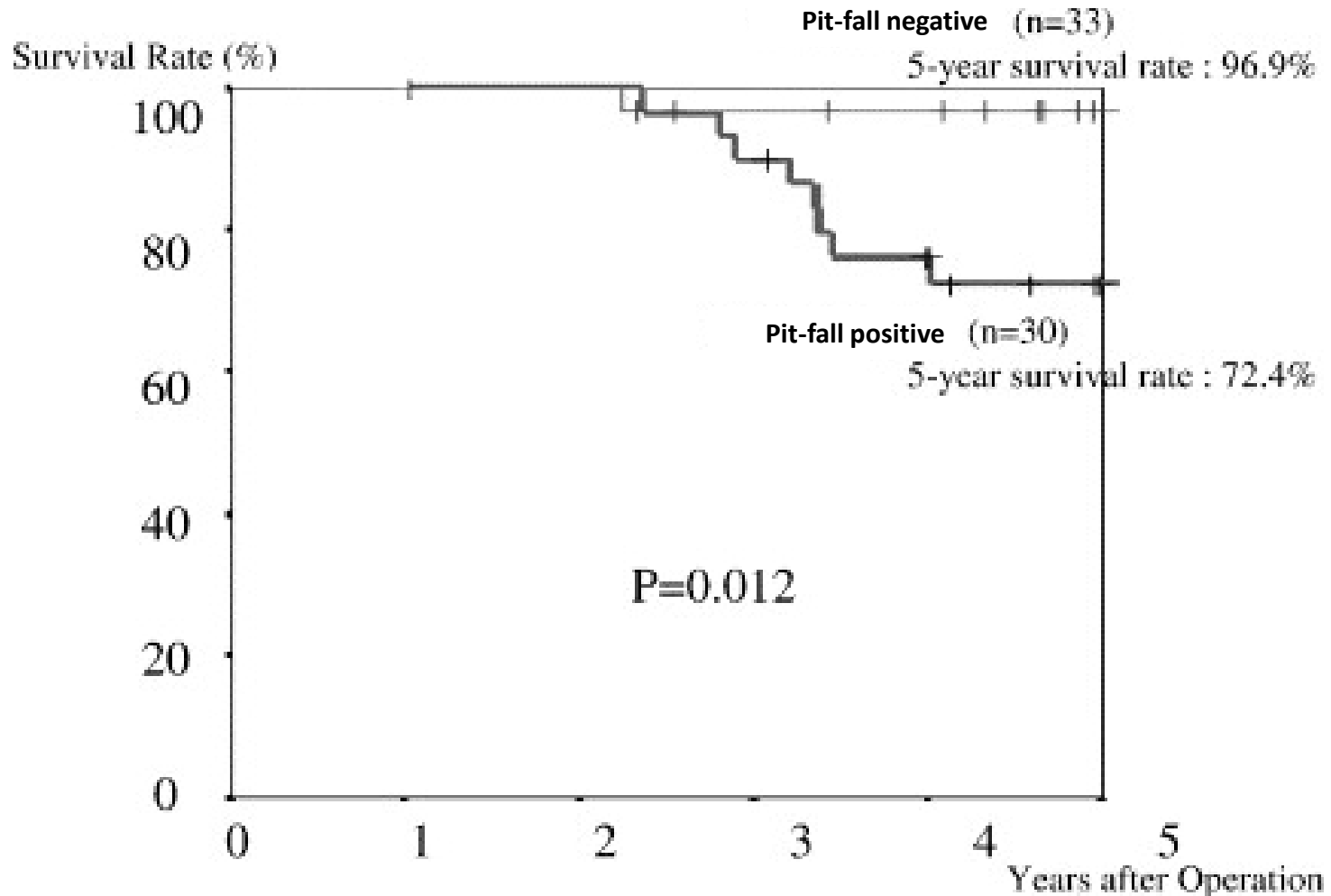


# Pit-fall sign



(a)

# Survival of stage I NSCLC by pit-fall sign



# Summary

- Persistent, well-defined and rounded GGNs strongly indicate lepidic growth adenocarcinoma
- HRCT findings of lung cancer reflect its histologic characteristics