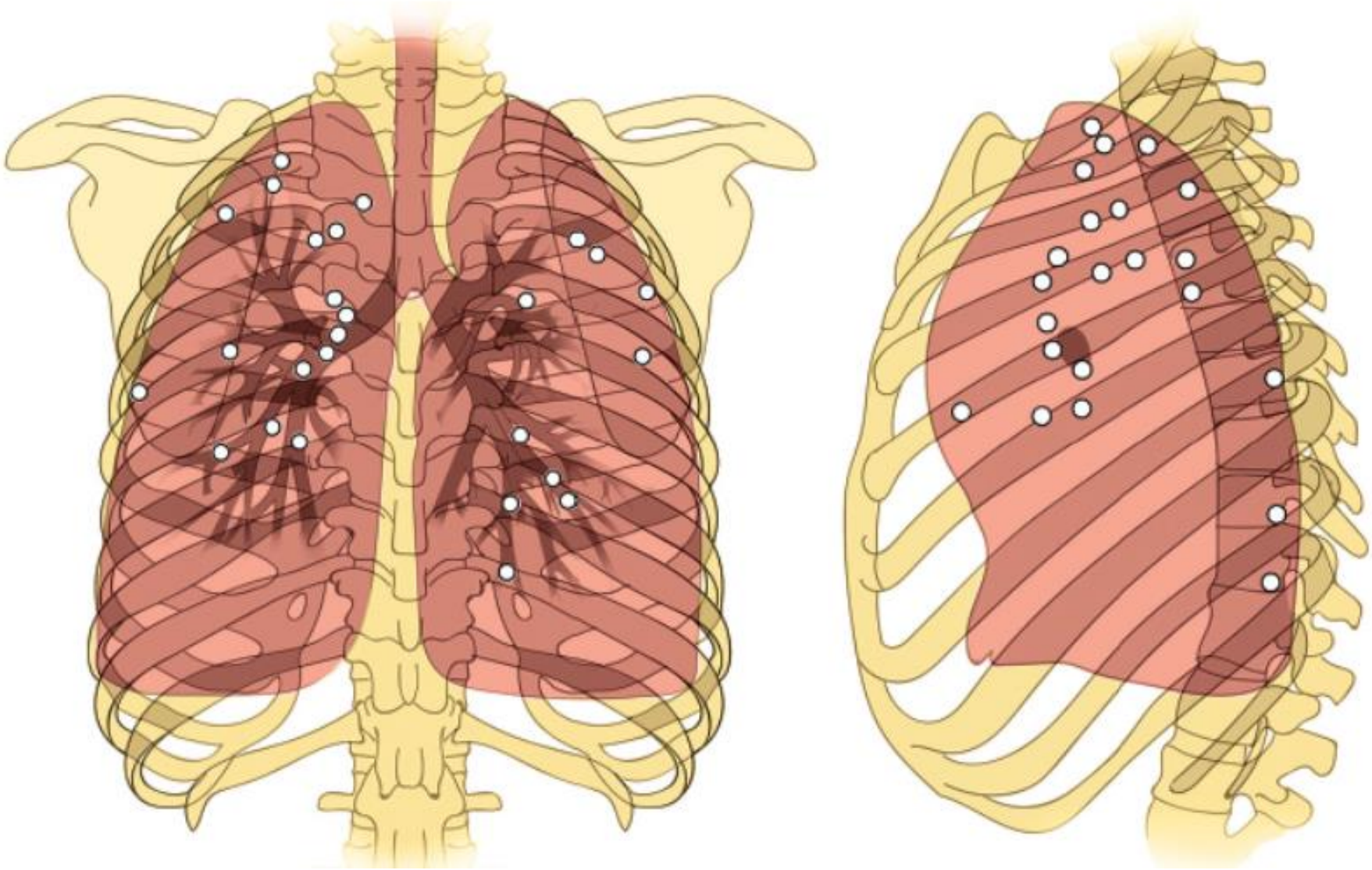
肺結節與腫瘤判讀

高雄榮總胸腔內科 林旻希醫師

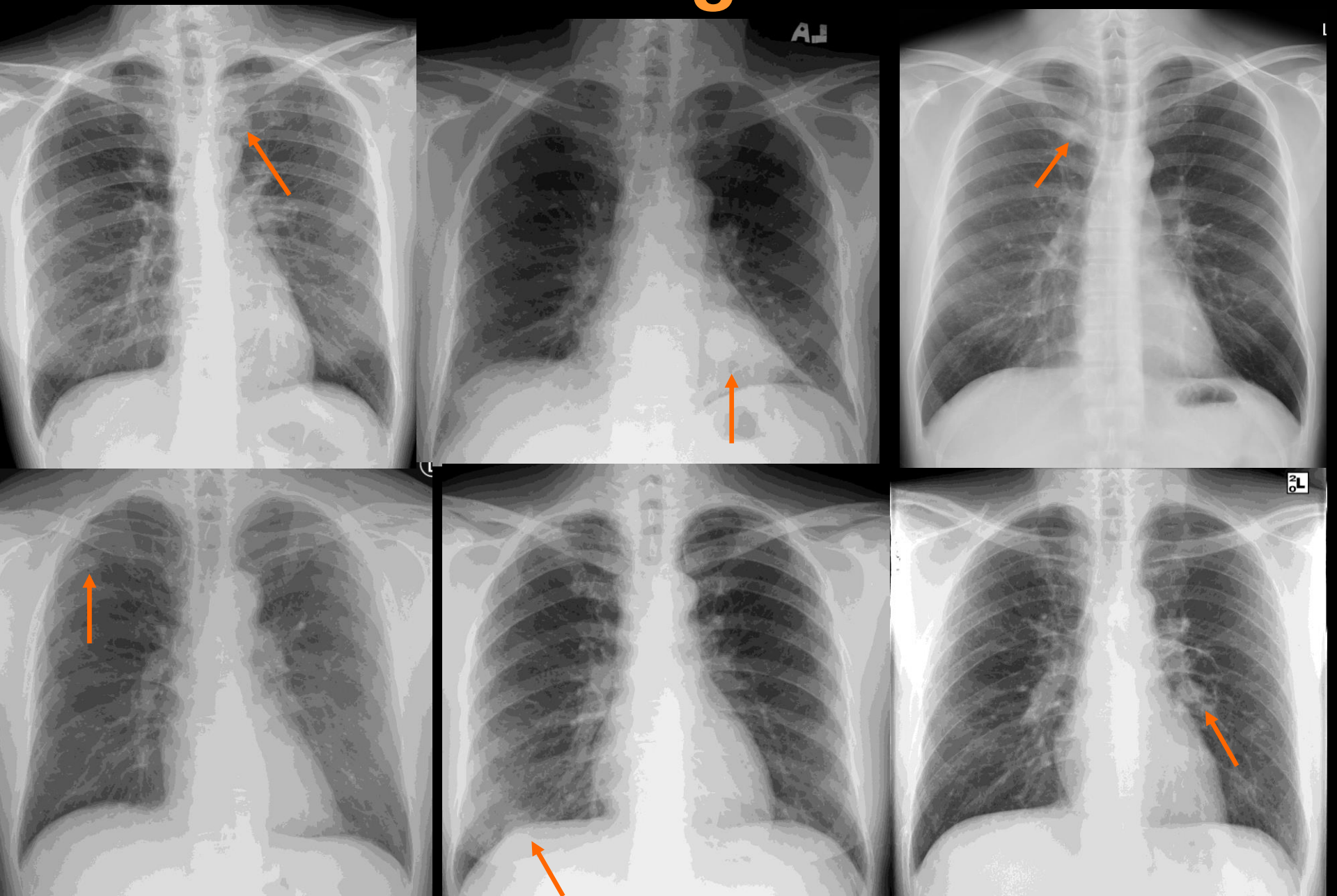
- Mimic pulmonary nodules
- Solitary pulmonary nodule
- Multiple pulmonary nodules/opacities
- Lung cancer staging

Most frequent location of missed lung cancers

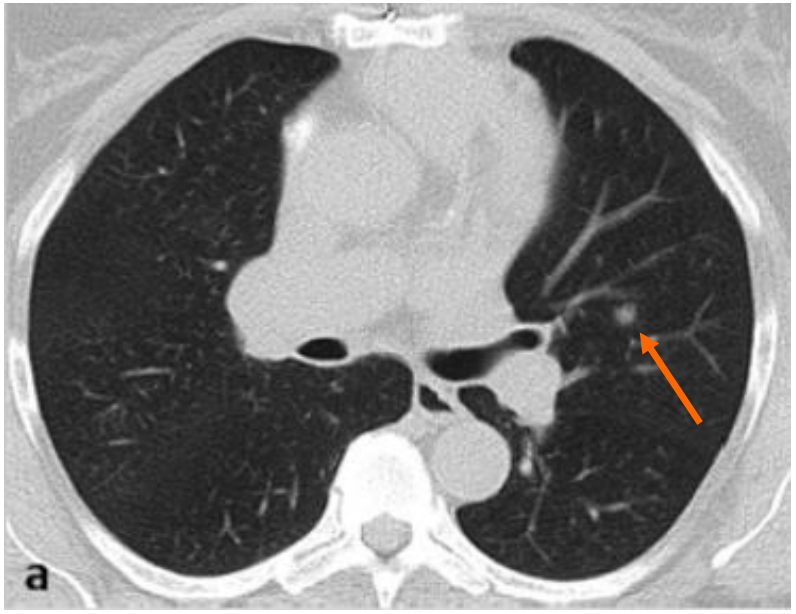


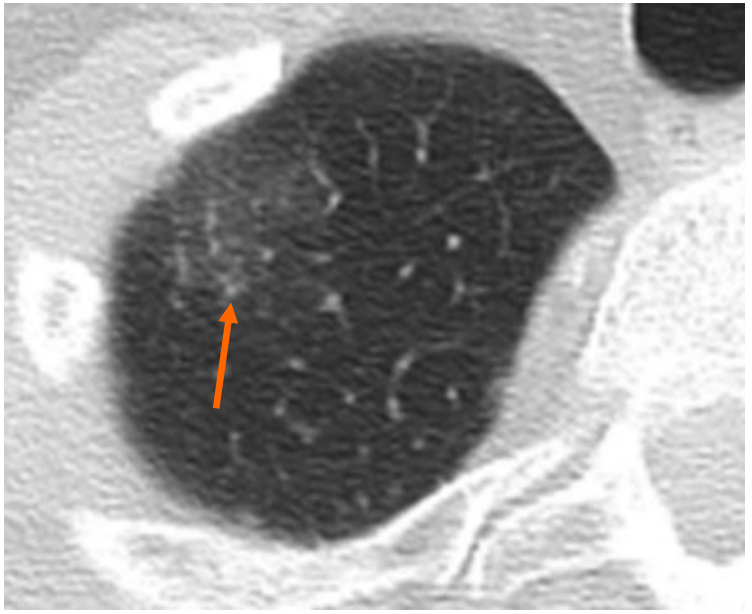
Austin et al, Radiology. 1992;182(1):115–122.)

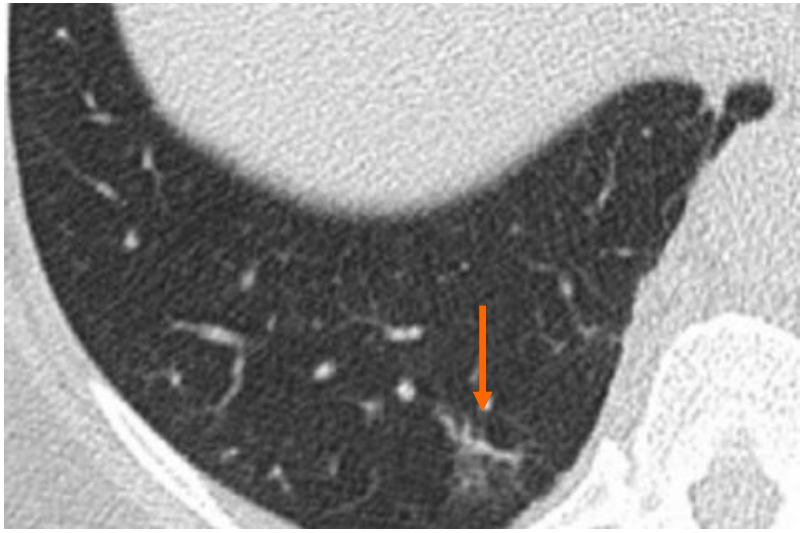
Missed lung cancers

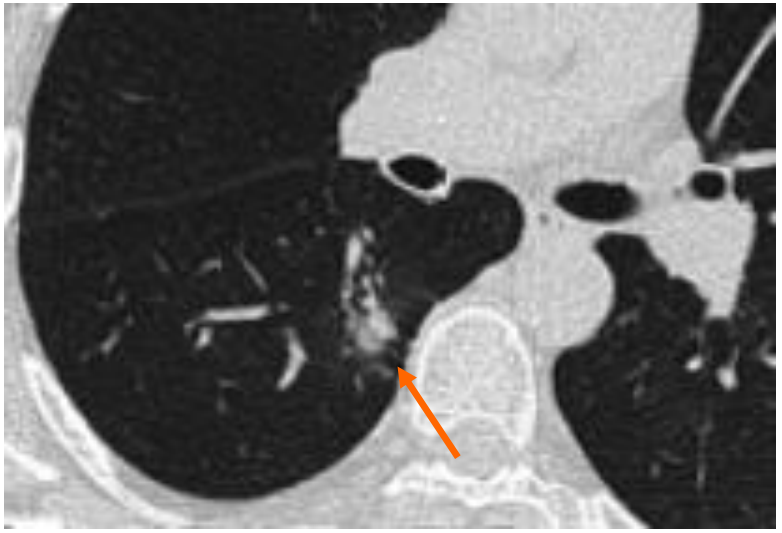


Missed lung cancers in CT



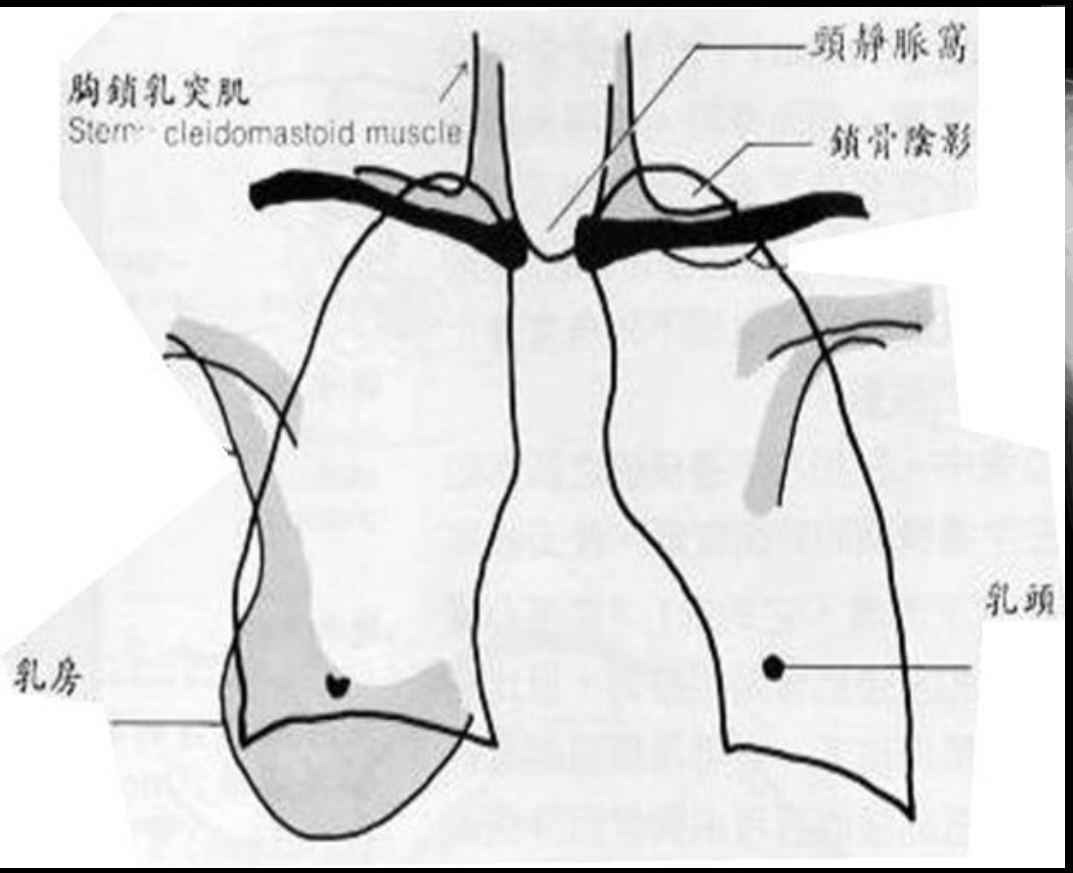


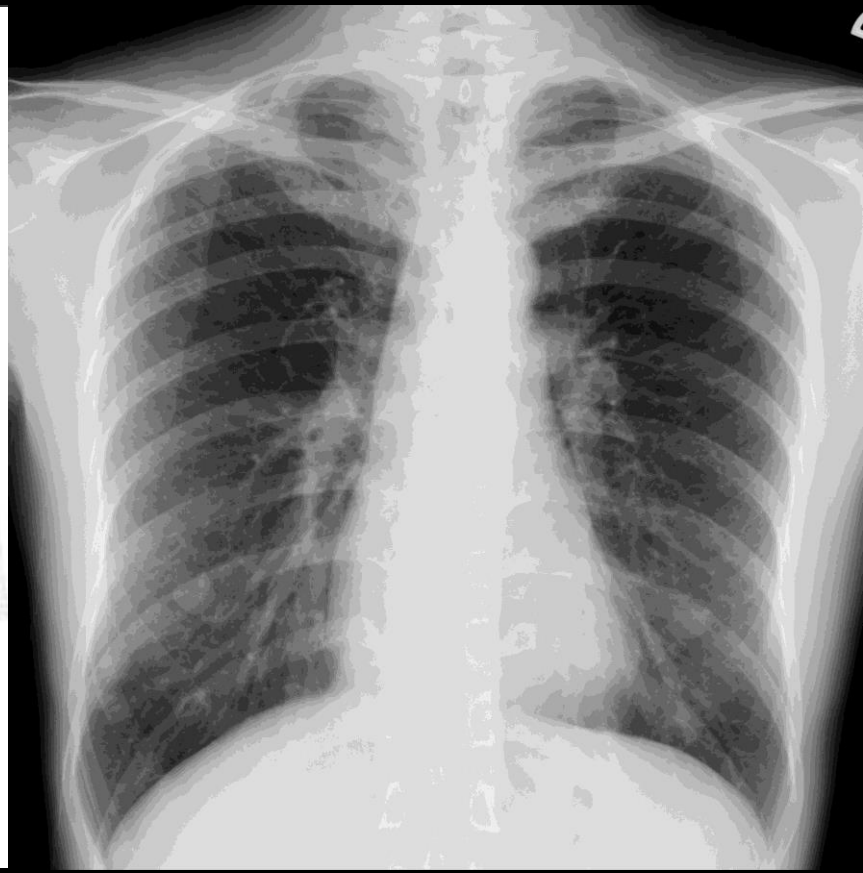




Mimic pulmonary nodules

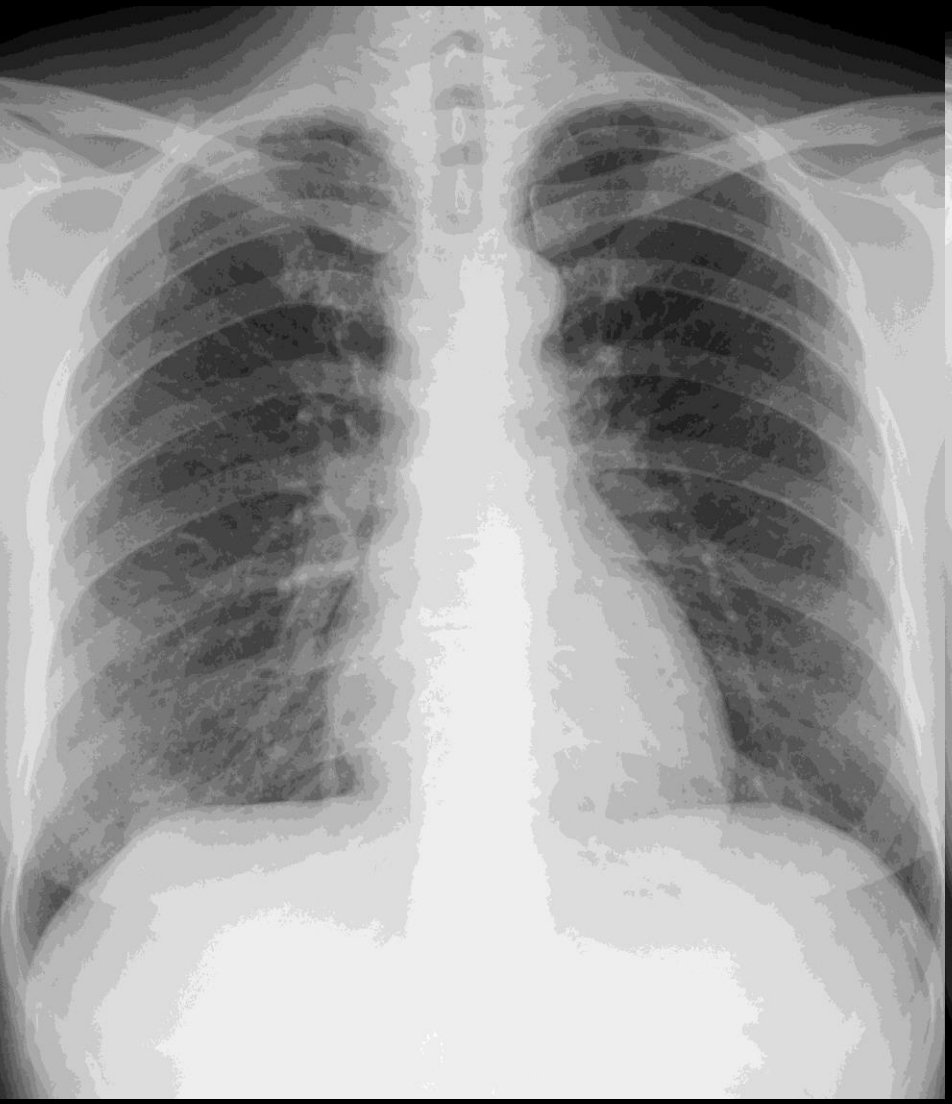
Nipple shadows

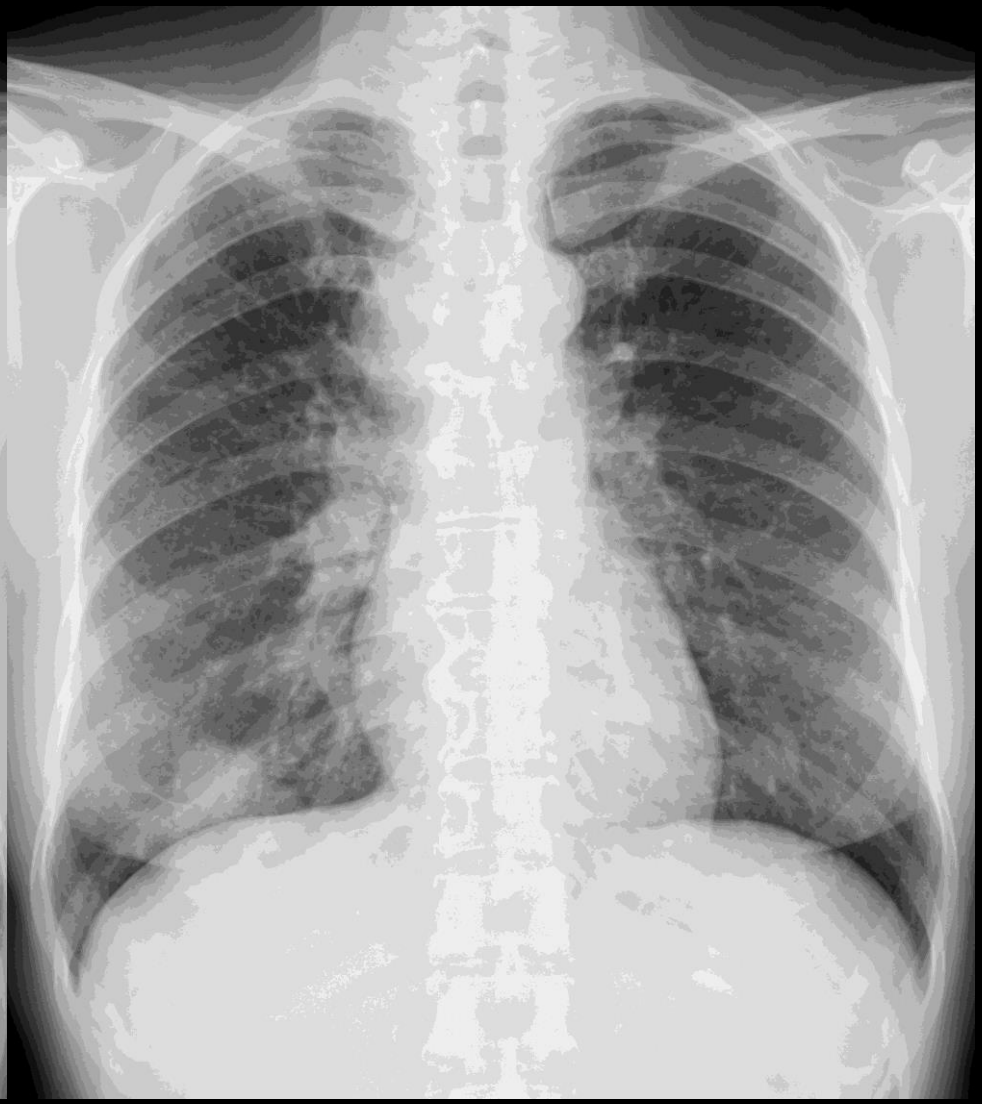




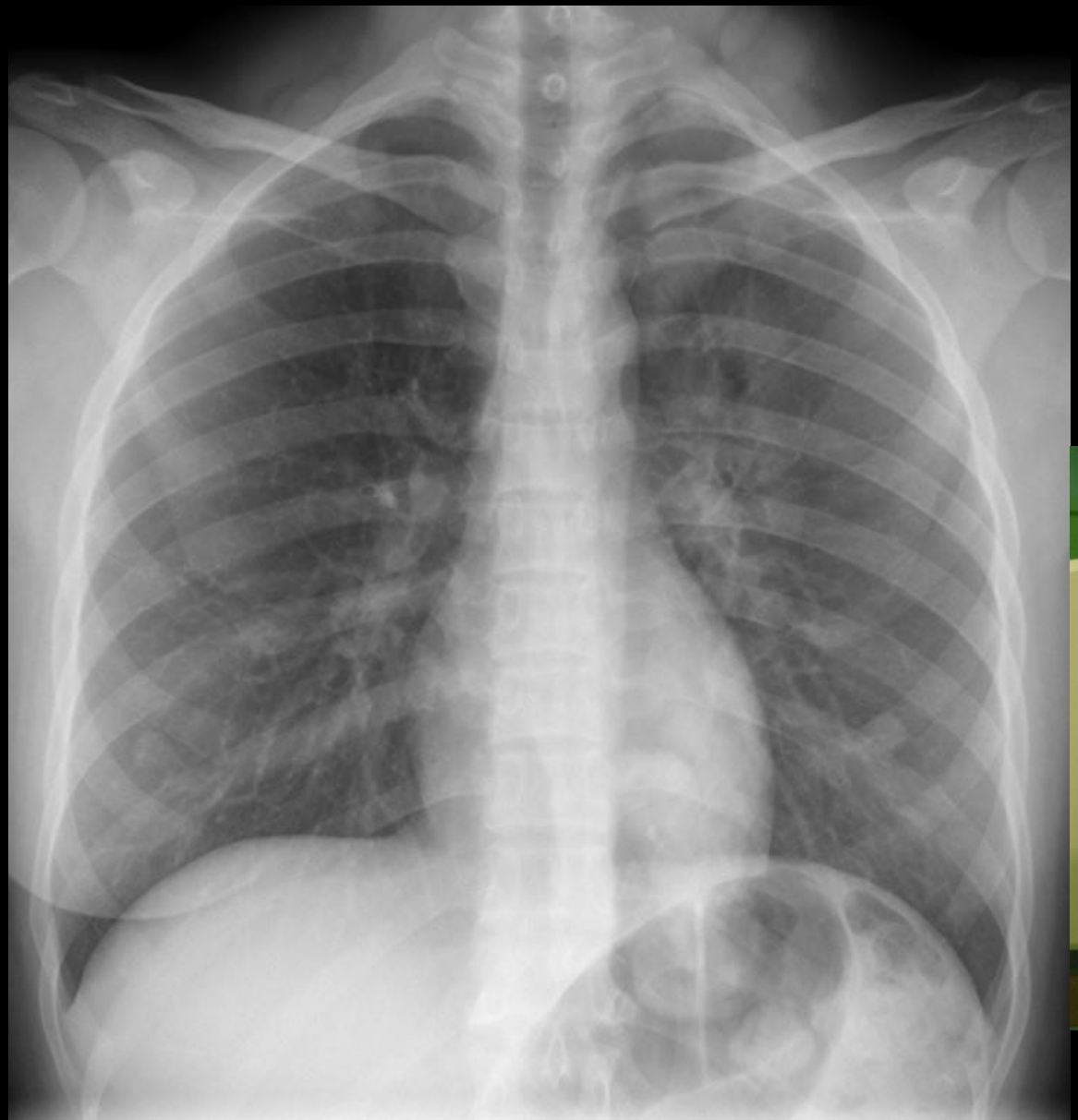
- Bilateral and symmetric, “fuzzy” or radiolucent “halo”
- In a characteristic position
  - Male : 9th and 10th ribs posteriorly or the 5th and 6th ribs anteriorly
  - Female: variable depending on the size of the breasts

Lung cancer

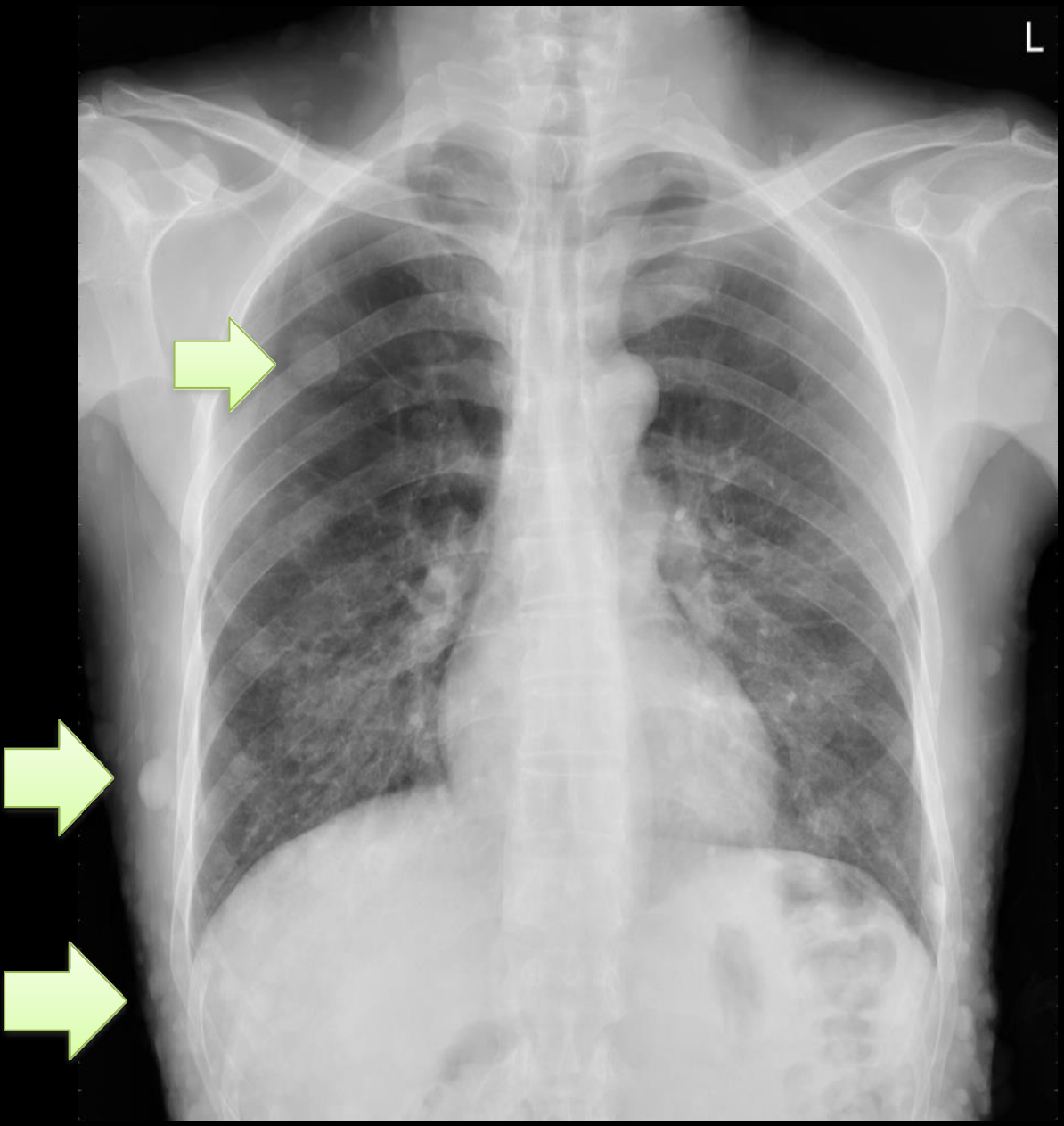




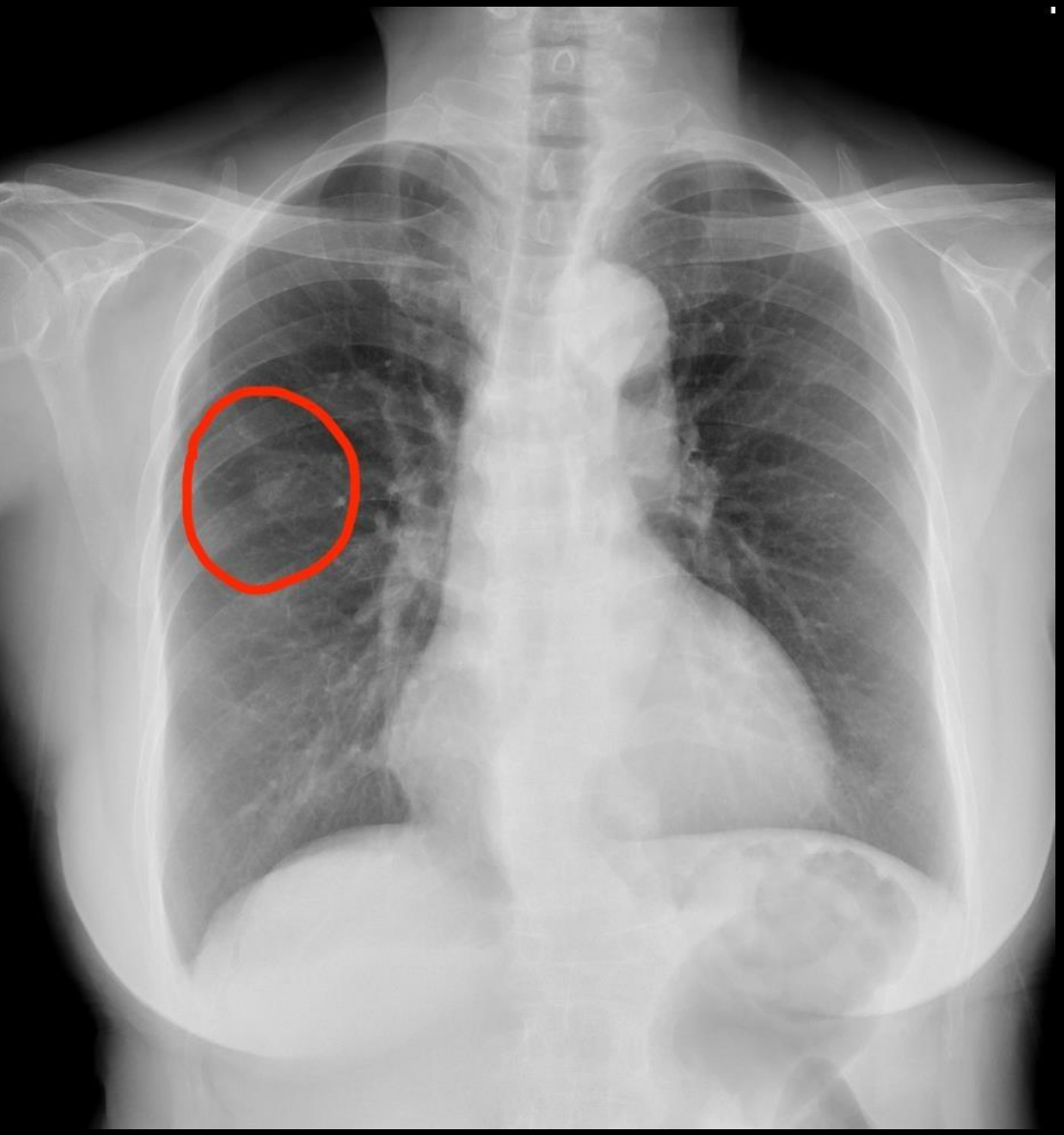
Hair braid 髮辮



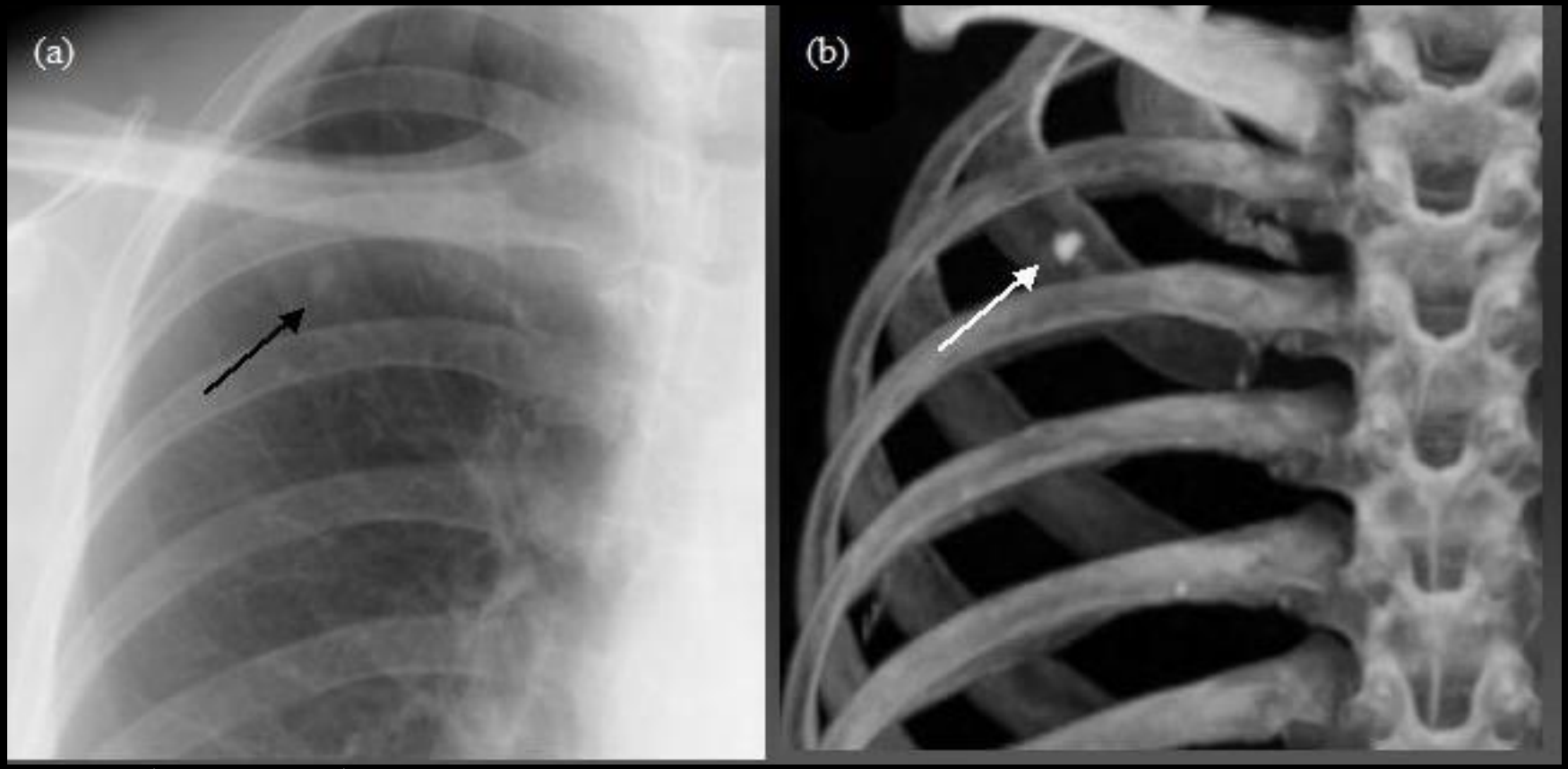
Neurofibromatosis 神經纖維瘤



Rib fracture with union



Bone island in the rib



（內生骨贅）

- **Enostoses**, also known as **bone islands.**
- Common benign sclerotic bone lesion, constitute a small focus of compact bone within cancellous bone
- Skeletal “don’t touch” lesions

肺結節鑑別診斷

- 腫瘤 Neoplasms
  - 惡性的 Malignant
    - 支氣管肺癌 Lung cancer
    - 淋巴瘤 Lymphoma
    - 類癌 Carcinoid
    - 肉瘤 Sarcoma
    - 肺轉移 lung metastasis
  - 良性的 Benign
    - 缺陷瘤 Harmatoma
    - 軟骨瘤 Chondroma
    - 脂肪瘤 Lipoma
    - 乳突瘤 Pappiloma
    - 肺良性轉移性平滑肌瘤 Pulmonary benign metastasizing leiomyoma
- 傳染病 Infections
  - 分枝桿菌 Mycobacteria
  - 真菌 Fungi
  - 圓形肺炎 Round pneumonia
  - 肺膿瘍 Lung abscess
  - 化膿性栓子 Septic emboli
  - 奴卡式菌 Nocardia
  - 包蟲囊腫 Hydatic cyst
- 免疫介導疾病 Immune-mediated dz
  - 惡性的 Malignant
    - 支氣管肺癌 Rheumatoid arthritis
    - 韋格納肉牙種 Granulomatosis with polyangiitis
    - 結節性結節病 Nodular sarcoidosis
    - 有機化肺炎 Organizing pneumonia
    - 淋巴肉芽腫 Lymphoid granulomatosis
- 先天性異常 Congenital abnormalities
  - 動靜脈畸形 Arteriovenous malformation
  - 支氣管囊腫 Bronchogenic cyst
  - 隔離肺 Pulmonary sequestration
  - 肺靜脈曲張 Pulmonary venous varix
  - 支氣管閉鎖 Bronchial atresia with bronchocele
- 其他 Miscellaneous
  - 圓形肺塌陷 Round atelectasis
  - 肺實質內淋巴結 Endoparenchymal lymph node
  - 進行性纖維化 Progressive massive fibrosis
  - 炎性假瘤 Inflammaotry fibroblastic tumor
  - 澱粉樣變性 Amyloidosis
  - 類脂性肺炎 Lipoid pneumonia

Images analyses for lung nodules and masses

- 大小 size/diameter
- 形狀 Shape/Margin
  Caviation/Cavity wall thickness
- 濃度 Density: solid/subsolid/ground glass
  calcification,Contrast enhancement
- 位置 Location: Intrathoracic/Extrathoracic
  Parenchymal/Mediastinal,Central/Peripheral
- 改變 Growth rate/Doubling time

Solitary pulmonary nodule

Size

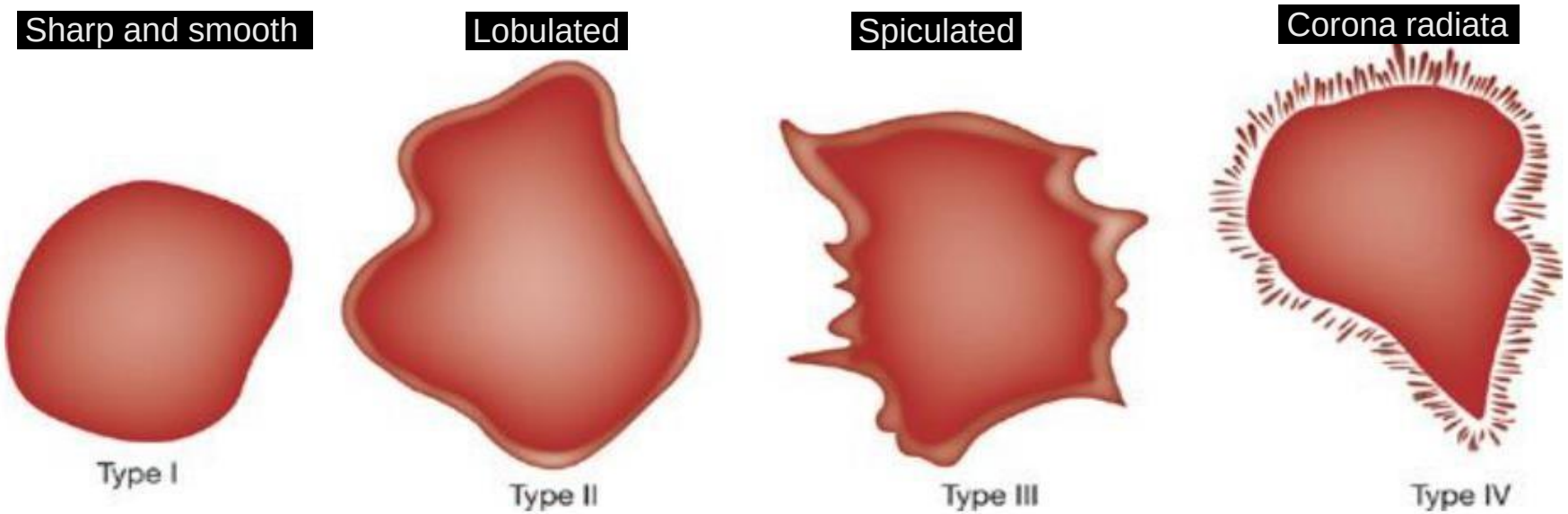
Miliary nodule

Micronodule

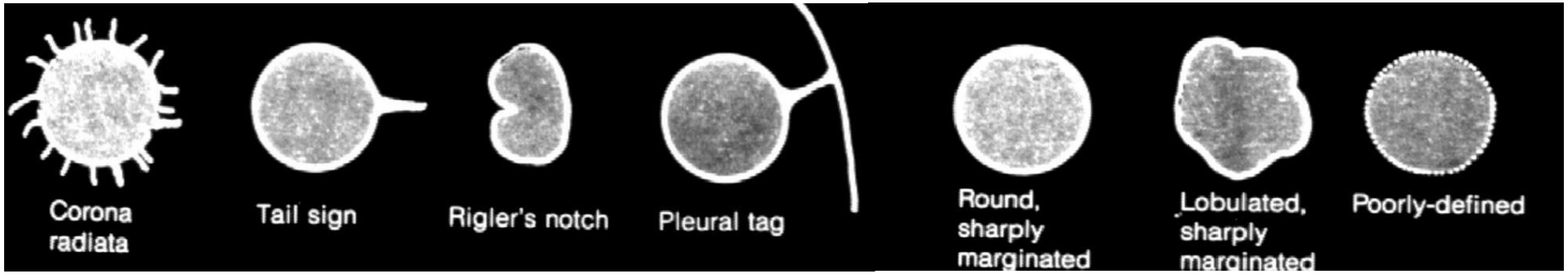
Nodule

Mass

Shape and margin

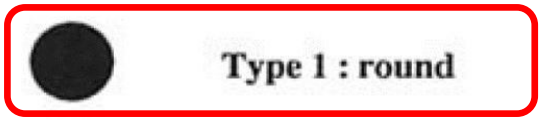


grossly irregular with many spiculations. *(Data from Siegelman SS, Khouri NF, Leo FP, Fishman EK, Braverman RM, Zerhouni EA. Solitary pulmonary nodules: CT assessment. Radiology. 1986;160(2):307–312.)*



Approach to the Patient with Pulmonary Nodules | Thoracic Key Sebastian Lange Radiology of Chest Diseases

Differentiation of pulmonary nodules by margin



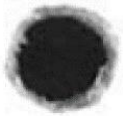
Type 1 : round

Type 2 : lobulated

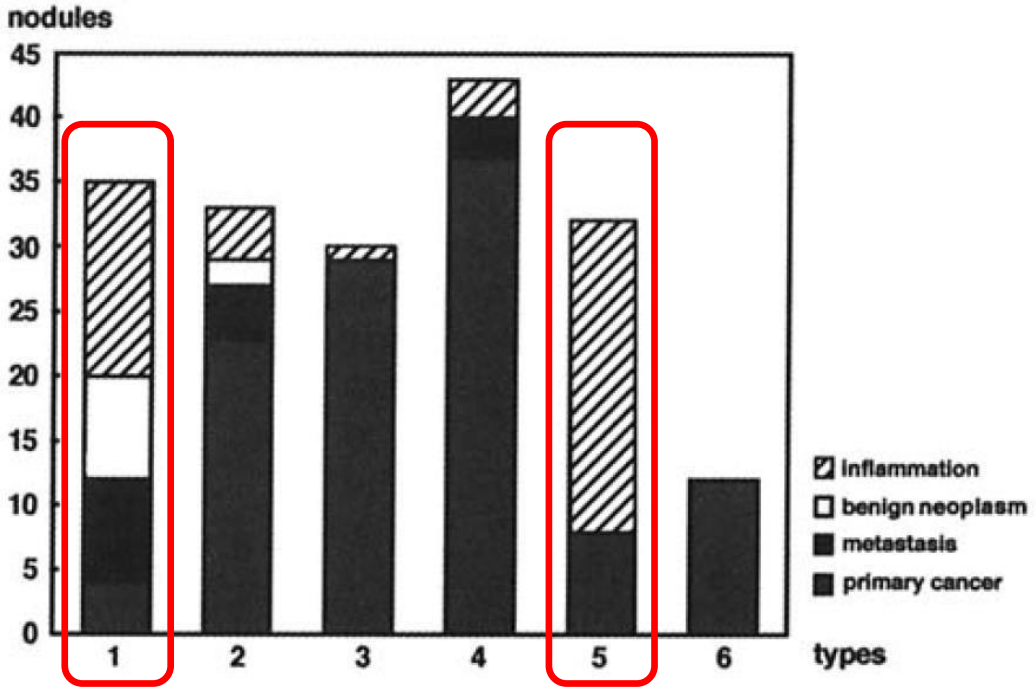
Type 3 : densely spiculated

Type 4 : ragged

Type 5 : tentacle or polygonal



Type 6 : halo

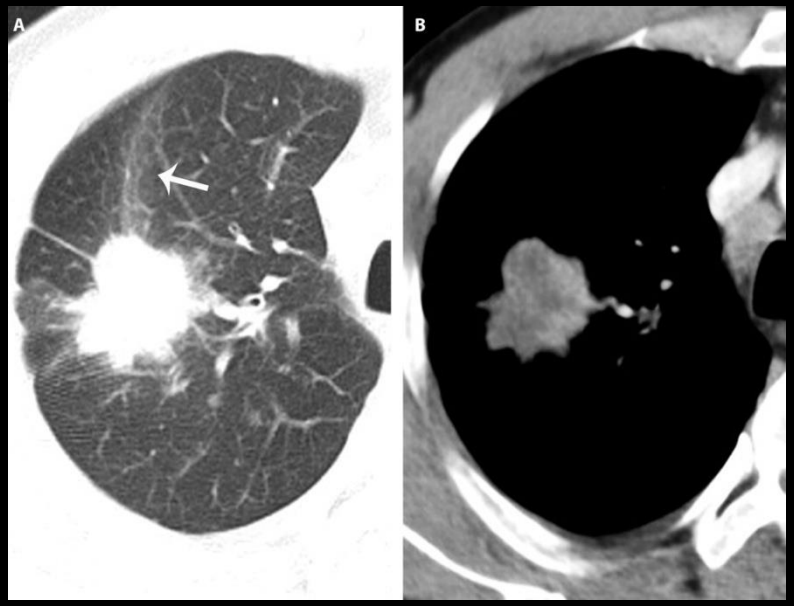


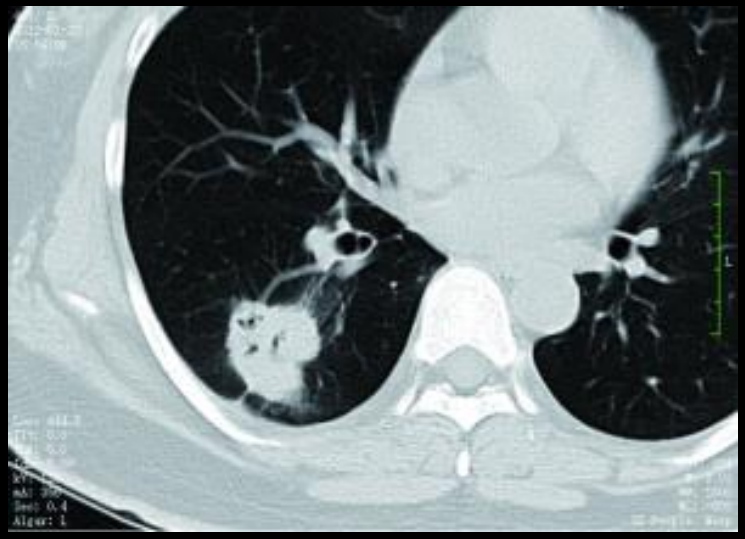
Acta Radiologica, 1999;40:496

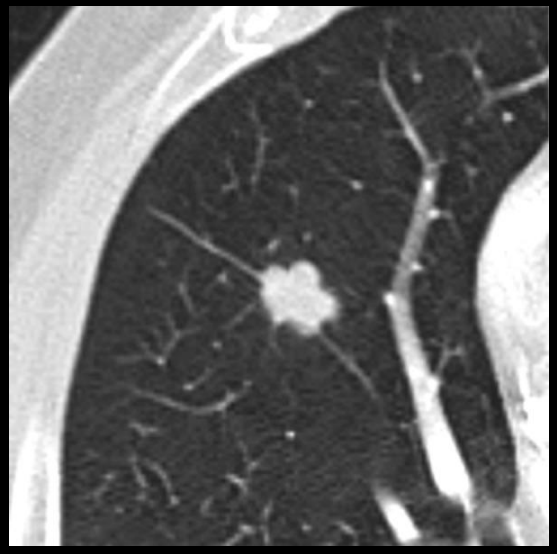
Radiologists view the shadows of gross pathology, the radiographic patterns are frequently nonspecific and those who expect to find one-to-one histologic correlation of the radiographic appearance with the microscopic diagnosis will be frustrated

–James C. Reed

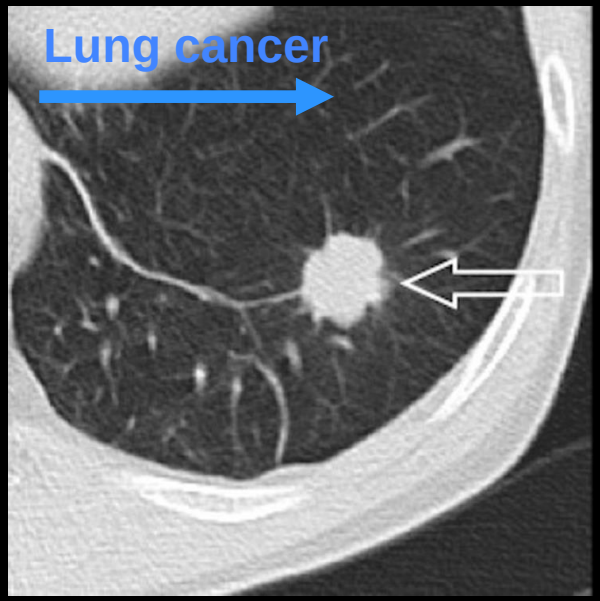
Lobulated

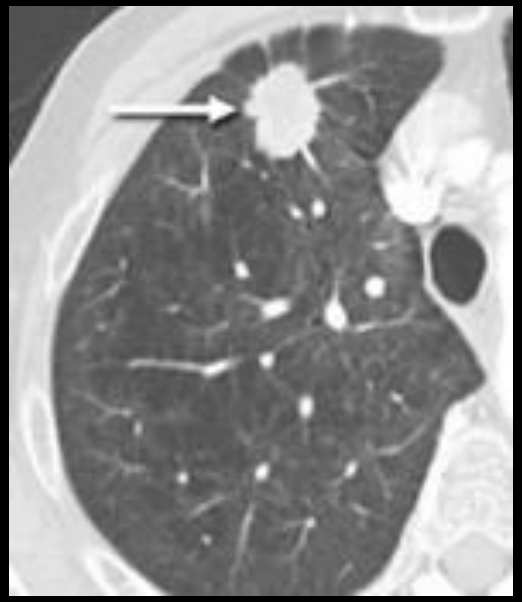


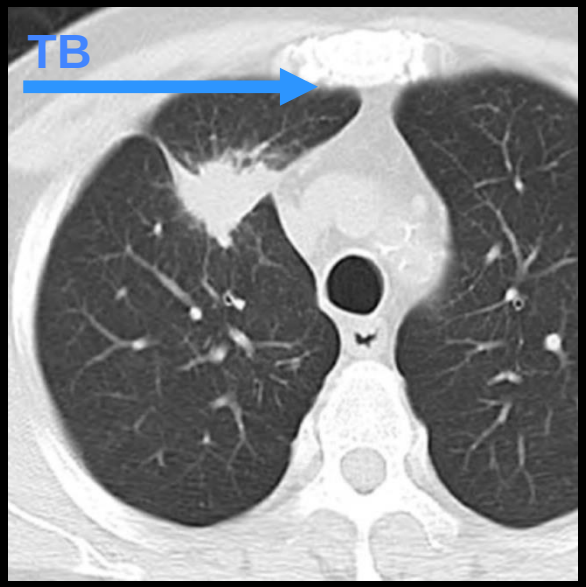




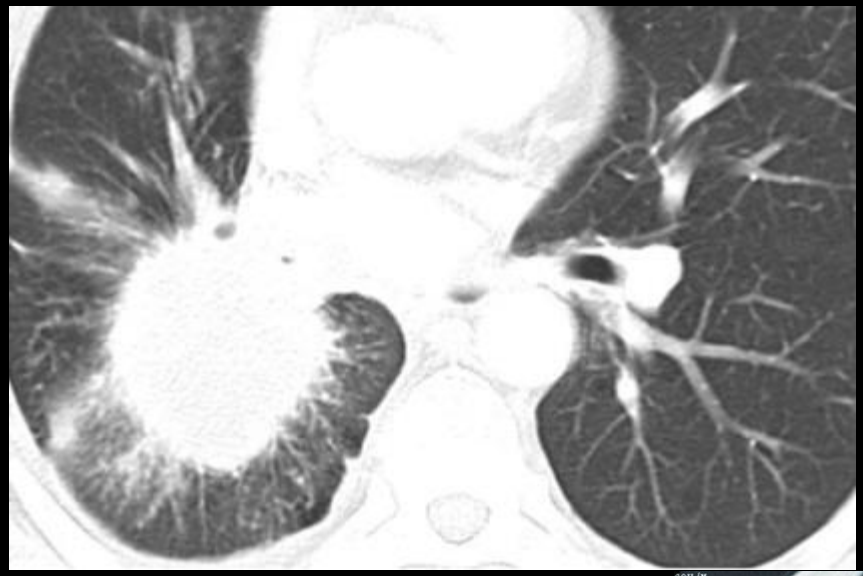
Spiculated

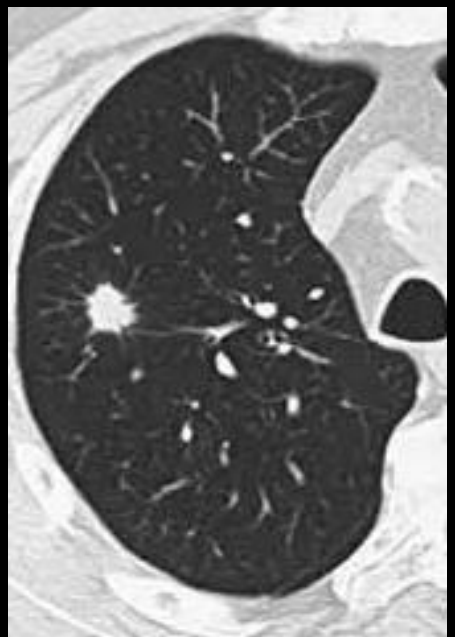


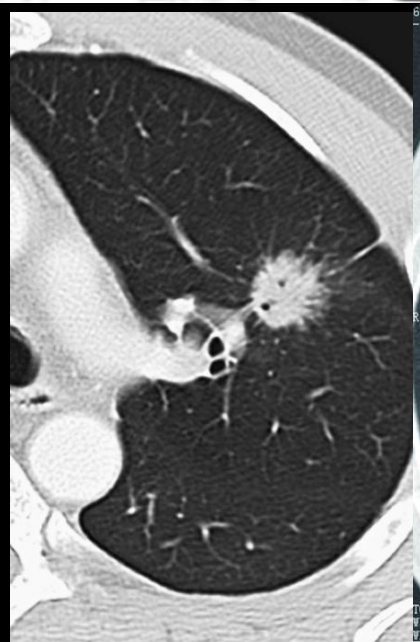




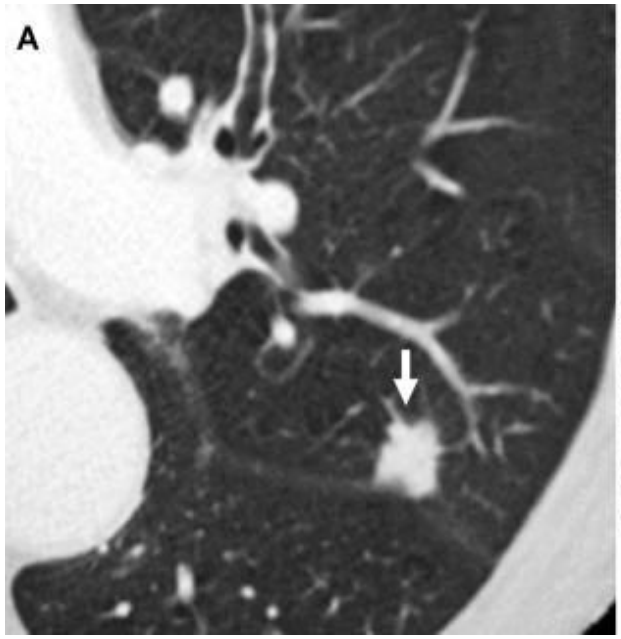
Corona radiata

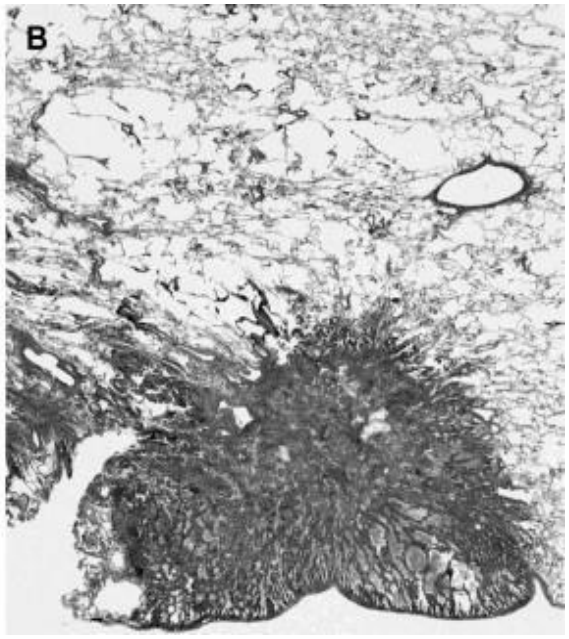




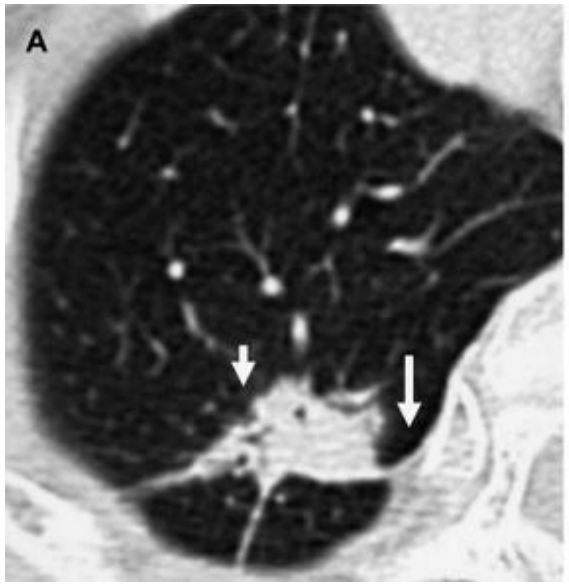


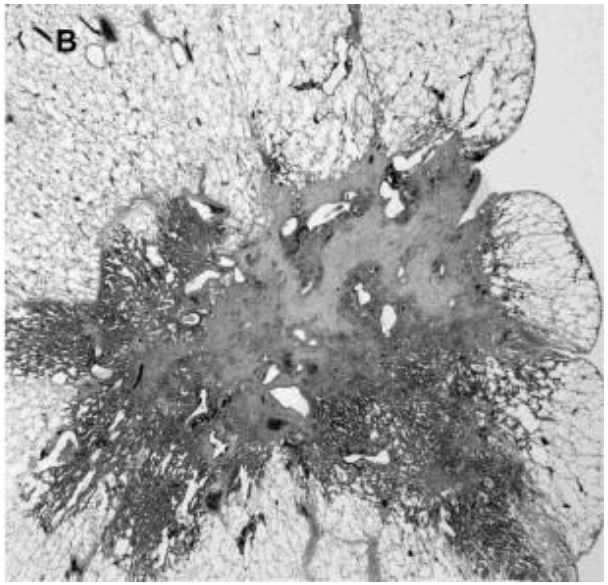
Malignant signs : Pleural traction or notching





Notching nodule

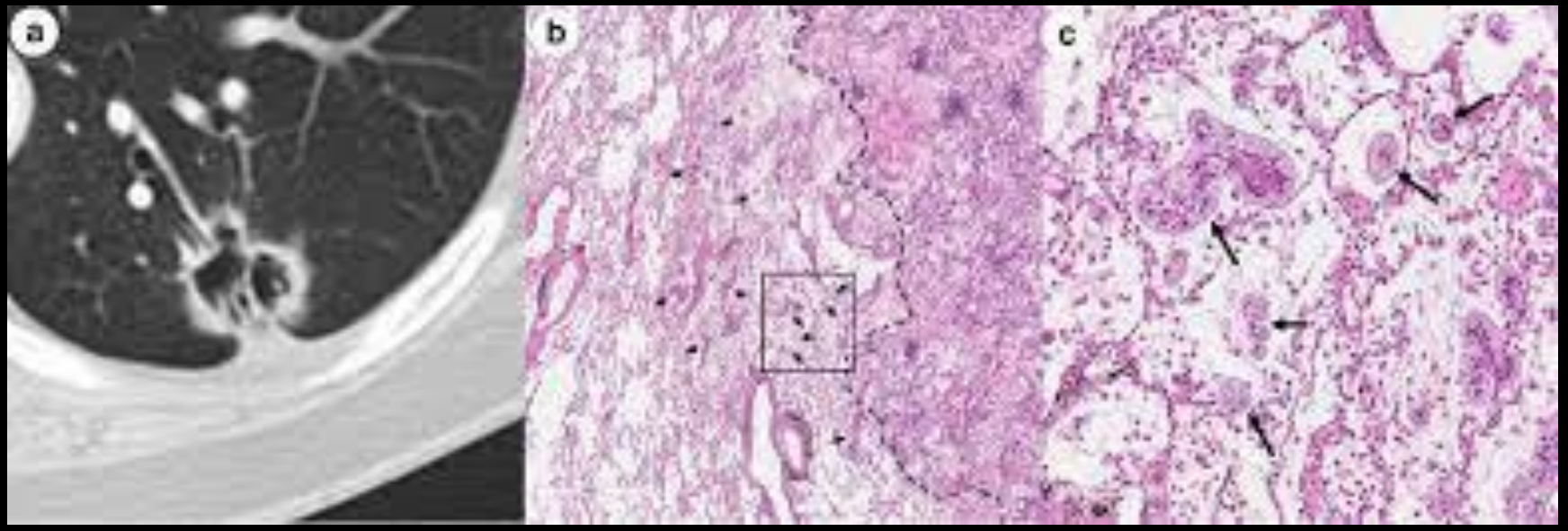


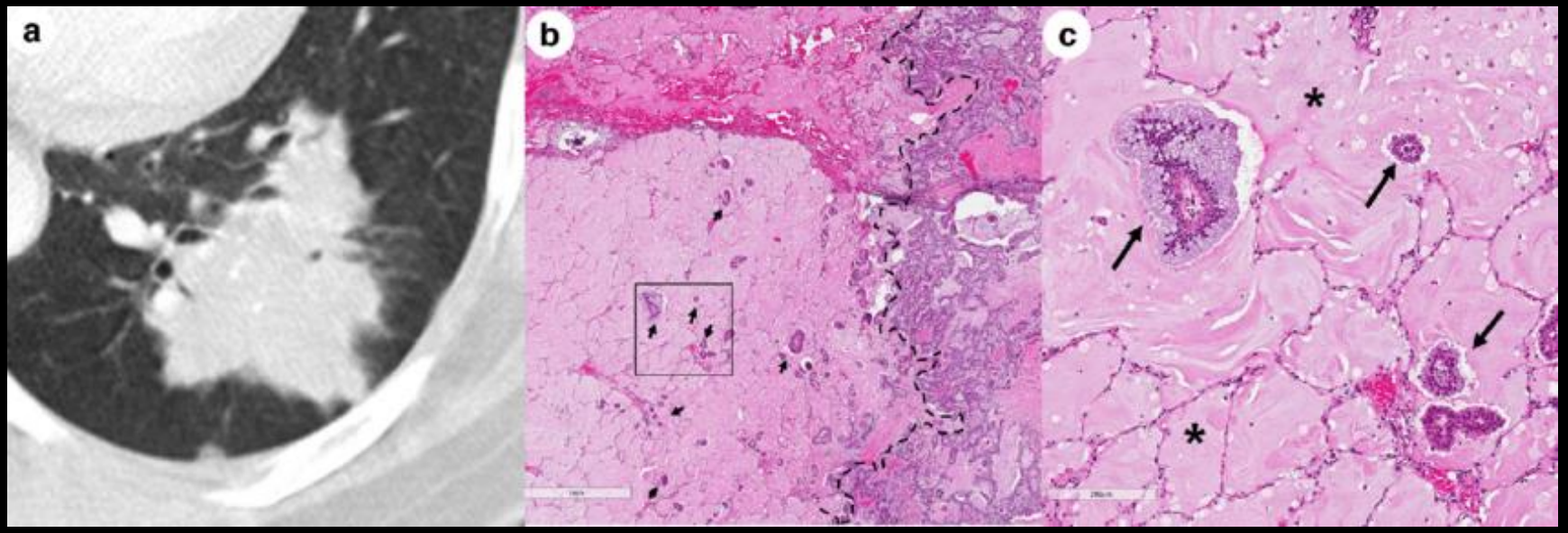


Pleural retraction nodule

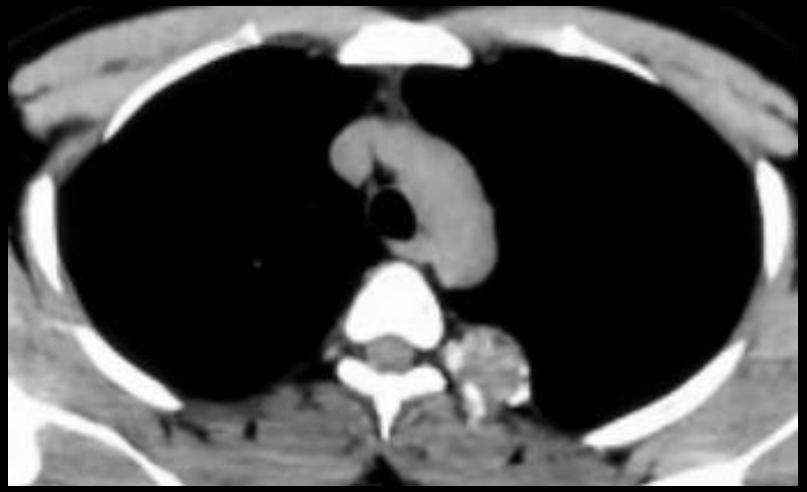
Eruopean J radiol 2012;81:189

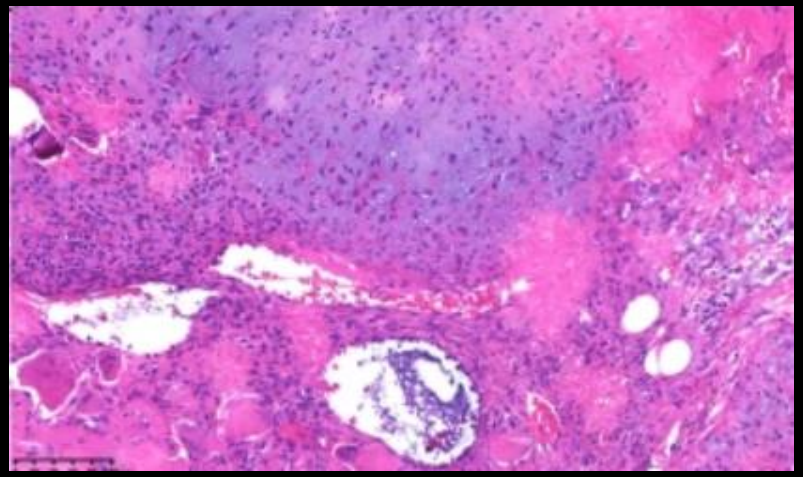
Pathologic findings of lung cancer spiculations





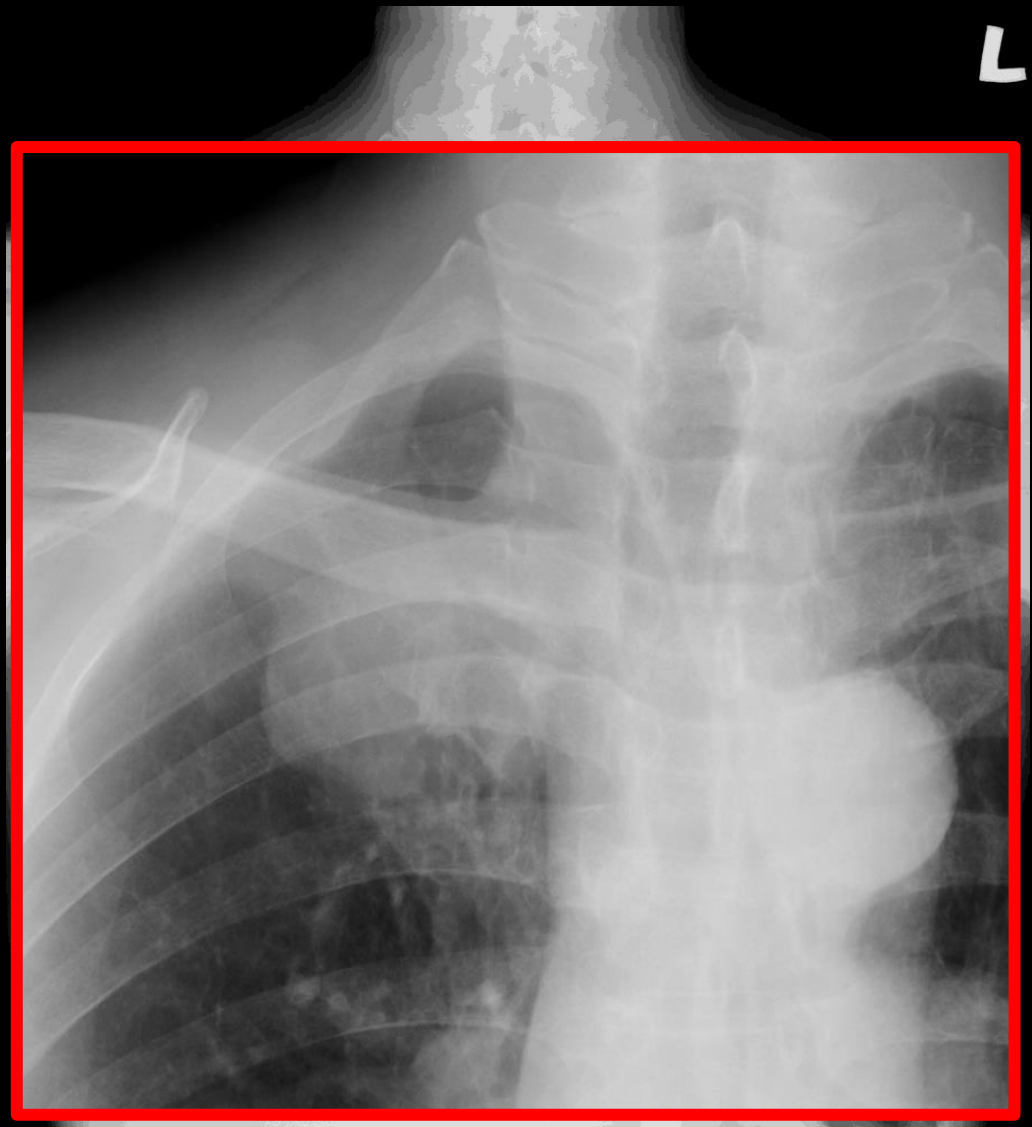
Harmatoma 缺陷瘤



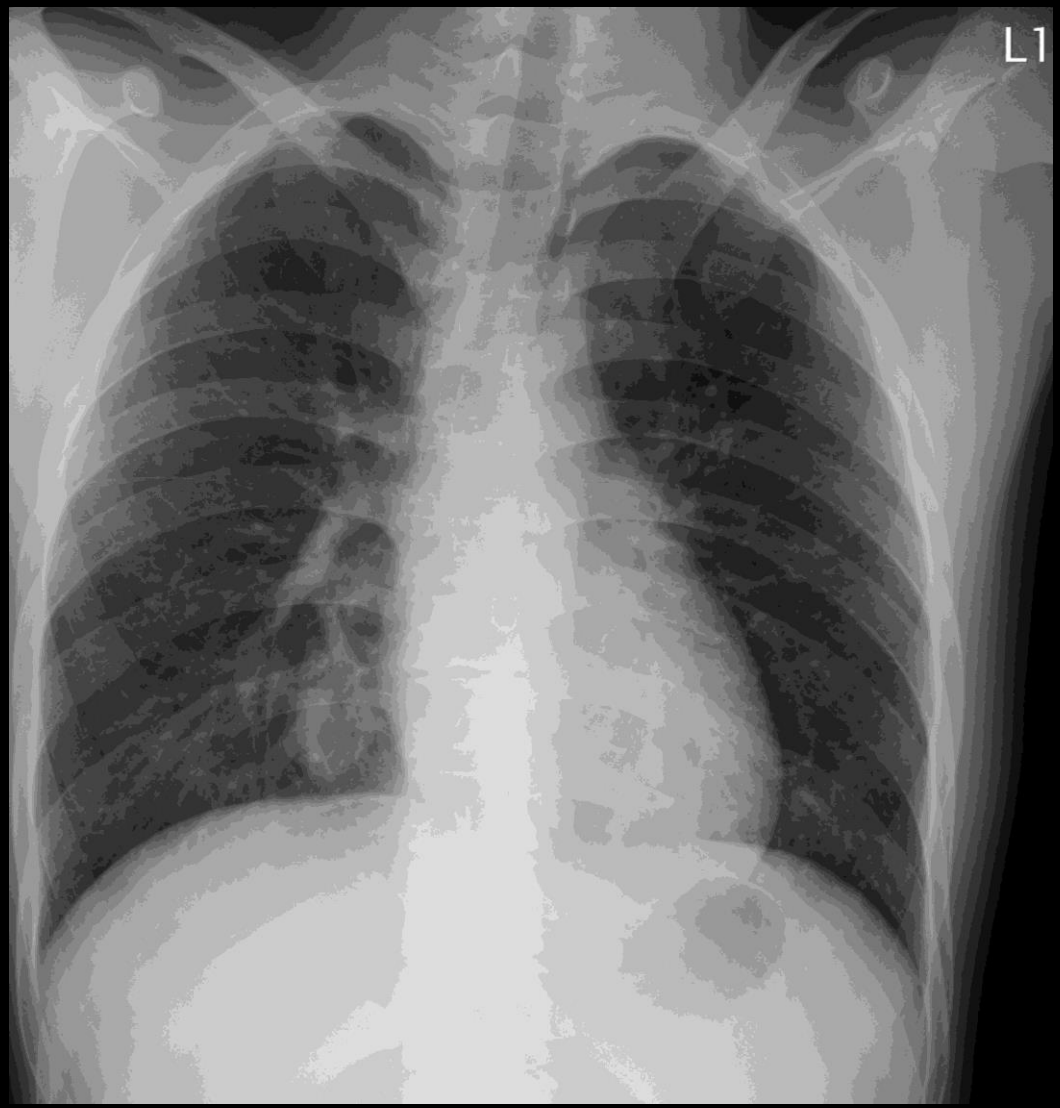


- Made up of bone, cartilage, connective tissue, fat and muscle

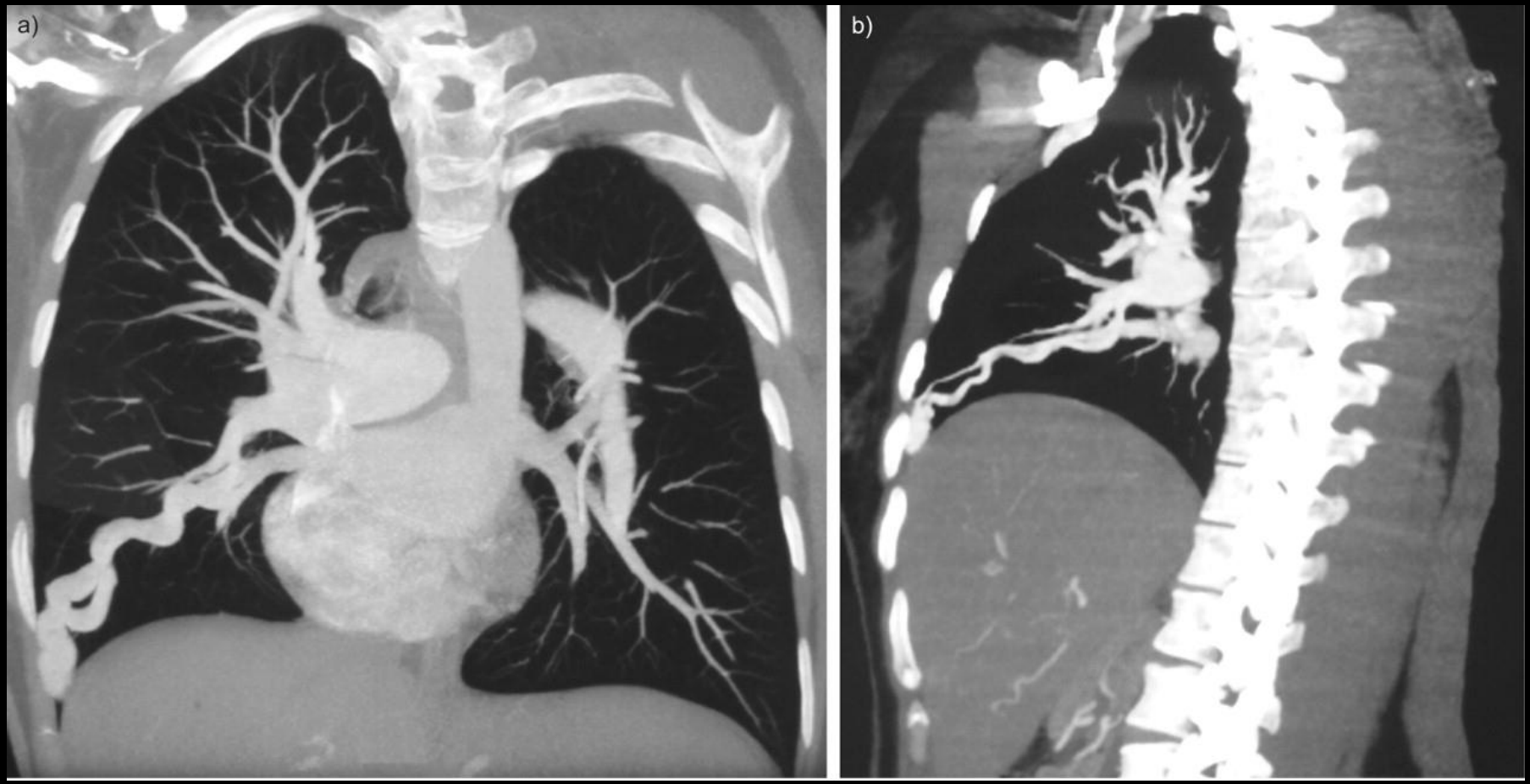
Tuberculoma



Arteriovenous malformation (AVM)

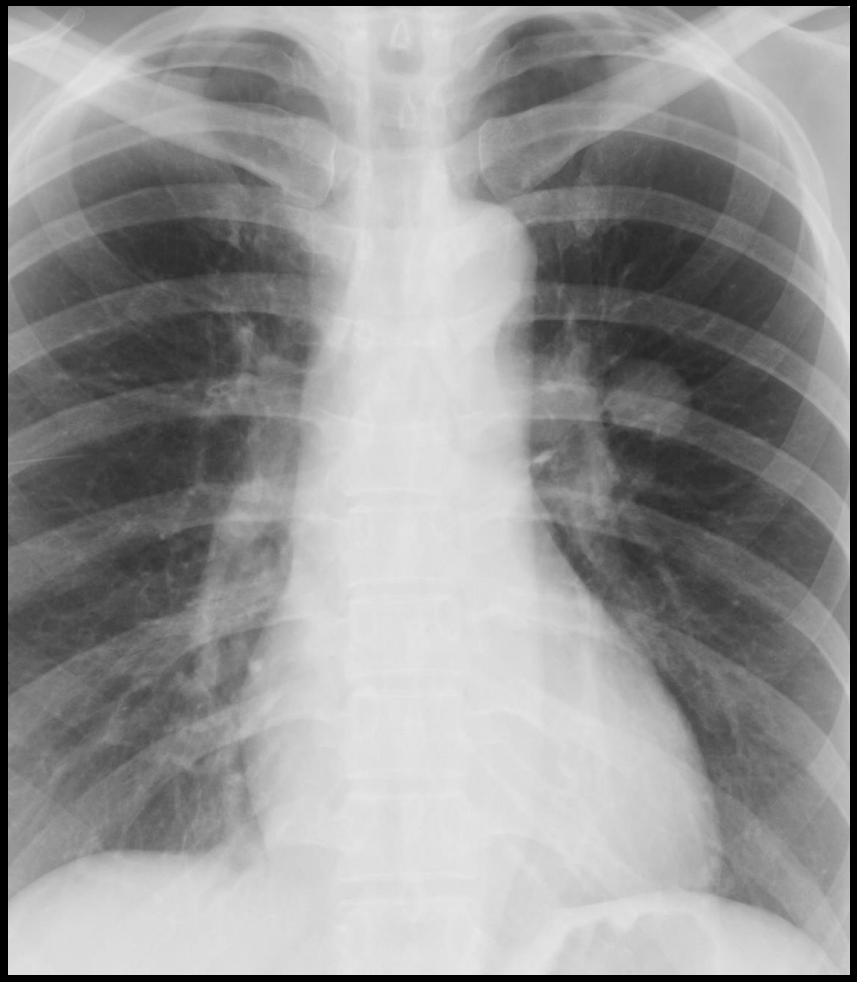


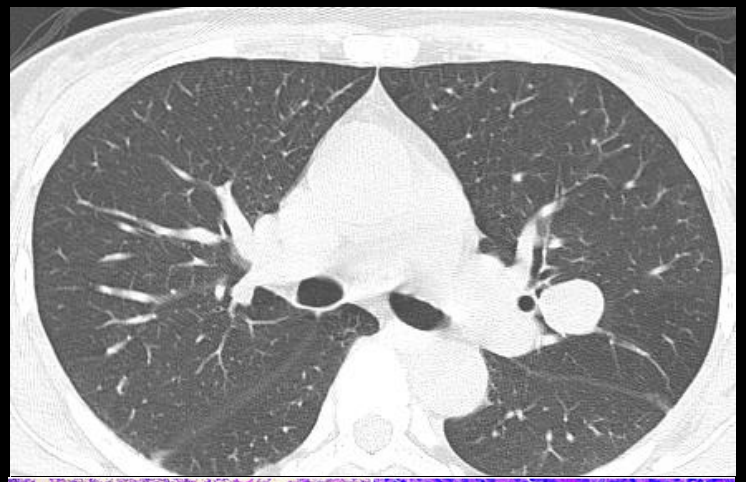
Arteriovenous malformation (AVM)

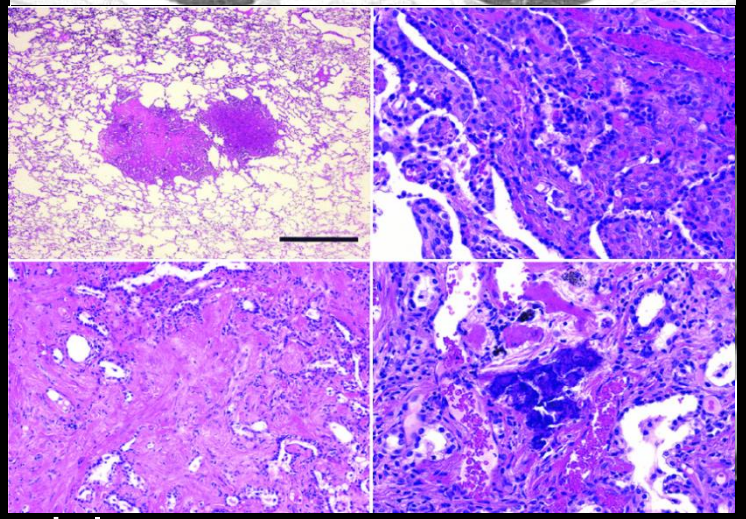


- Dilated vessels with right-to-left shunt between the pulmonary artery and vein

Sclerosing hemangioma

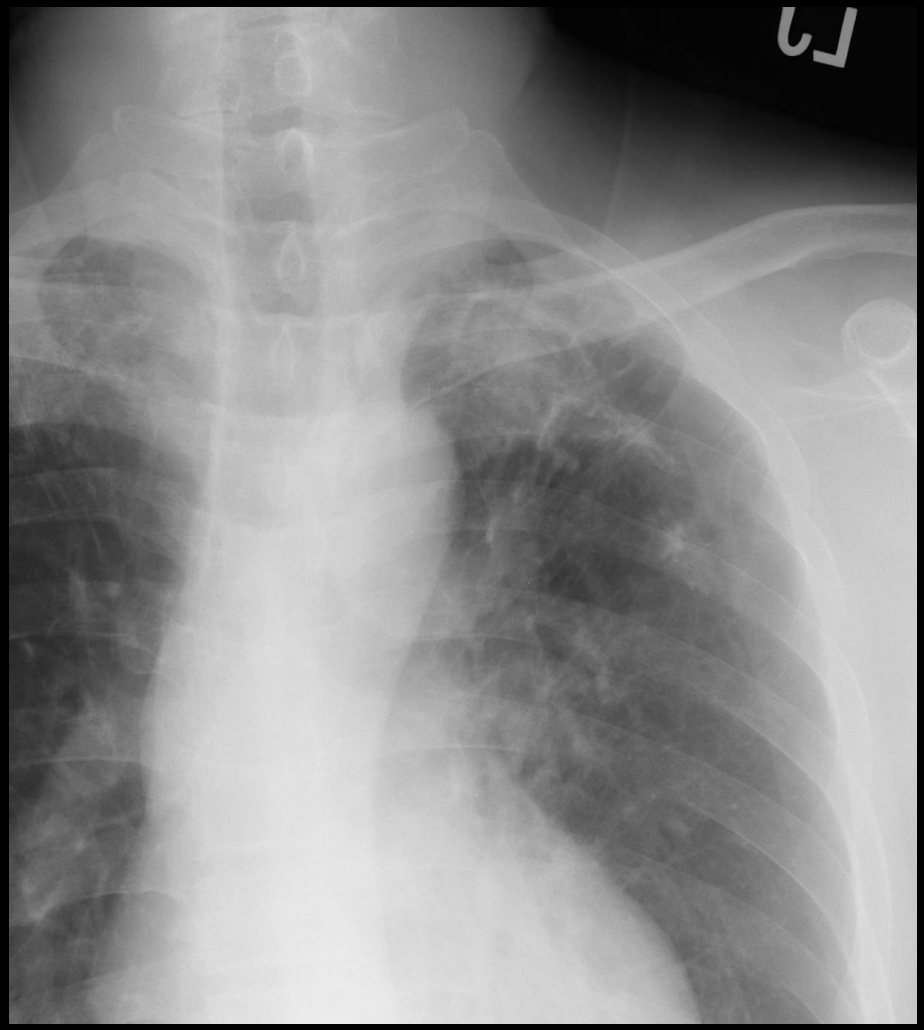


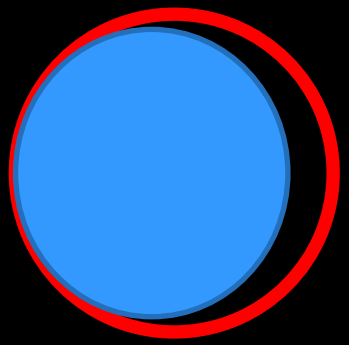


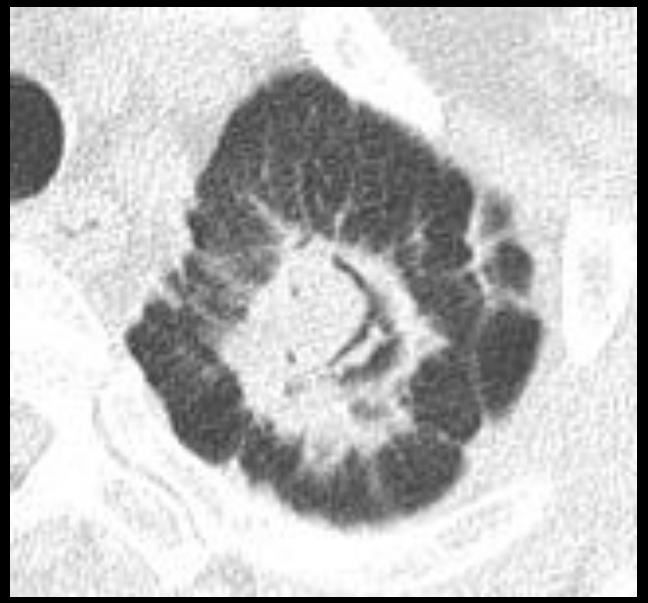


- Solitary, well-defined, homogeneous nodule
- Typically presents in middle age, female predilection
- Four main histological components (solid, papillary, sclerotic, and hemangiomatous). A thin fibrous pseudocapsule separates it from the adjacent compressed lung parenchyma

Mycetoma (Ball in hole)

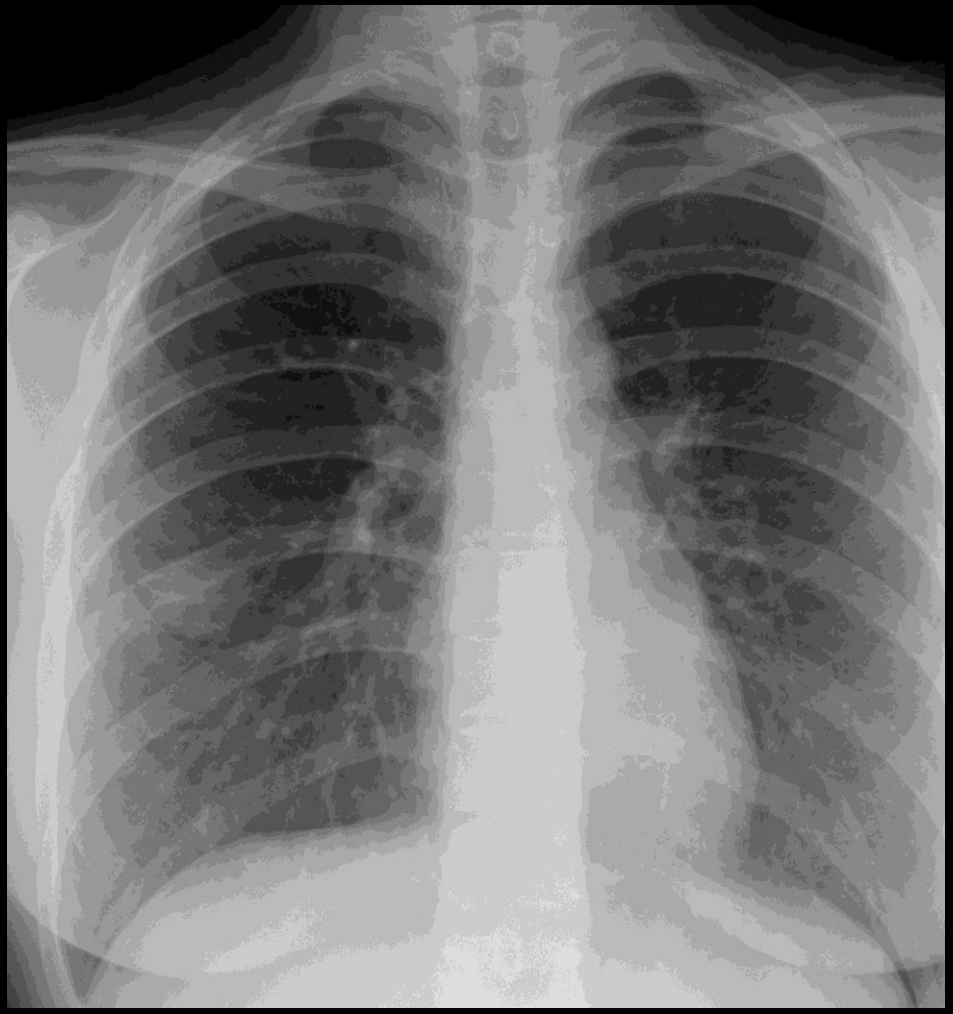






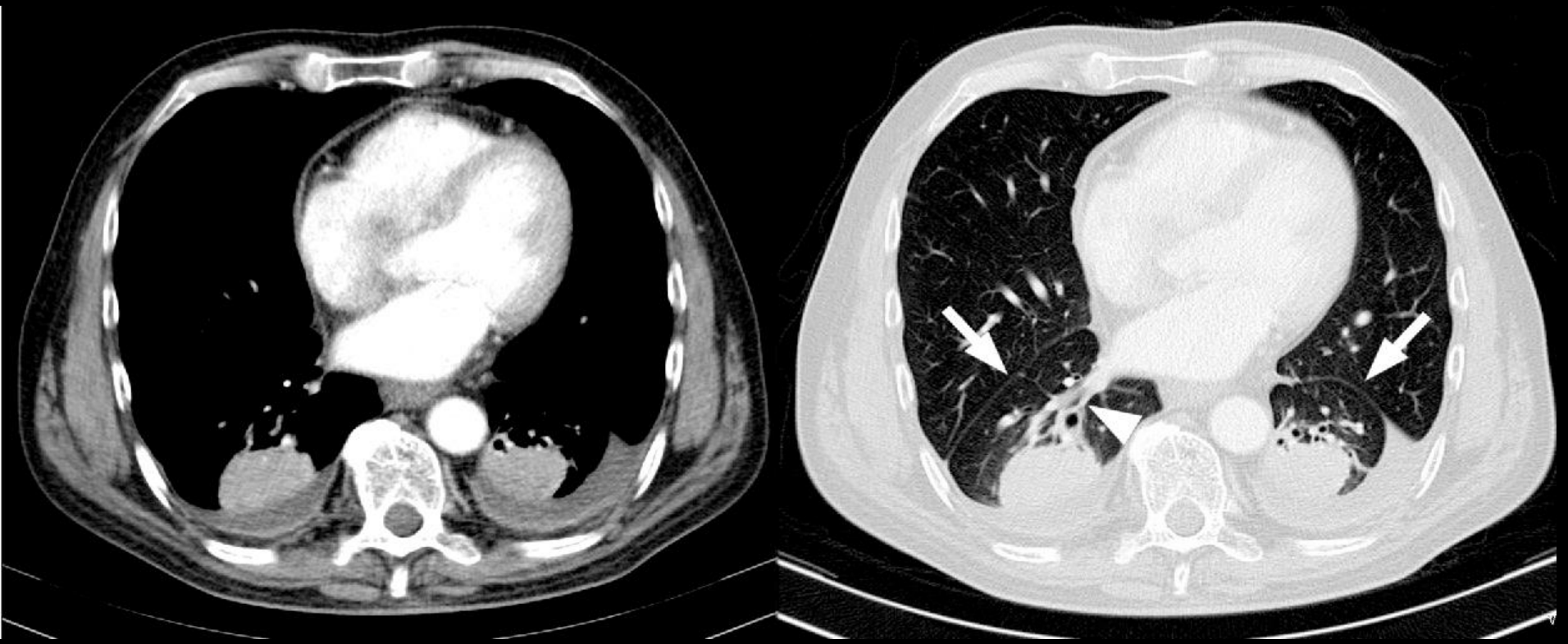
- Positive air crescent sign

Pulmonary cryptococcosis



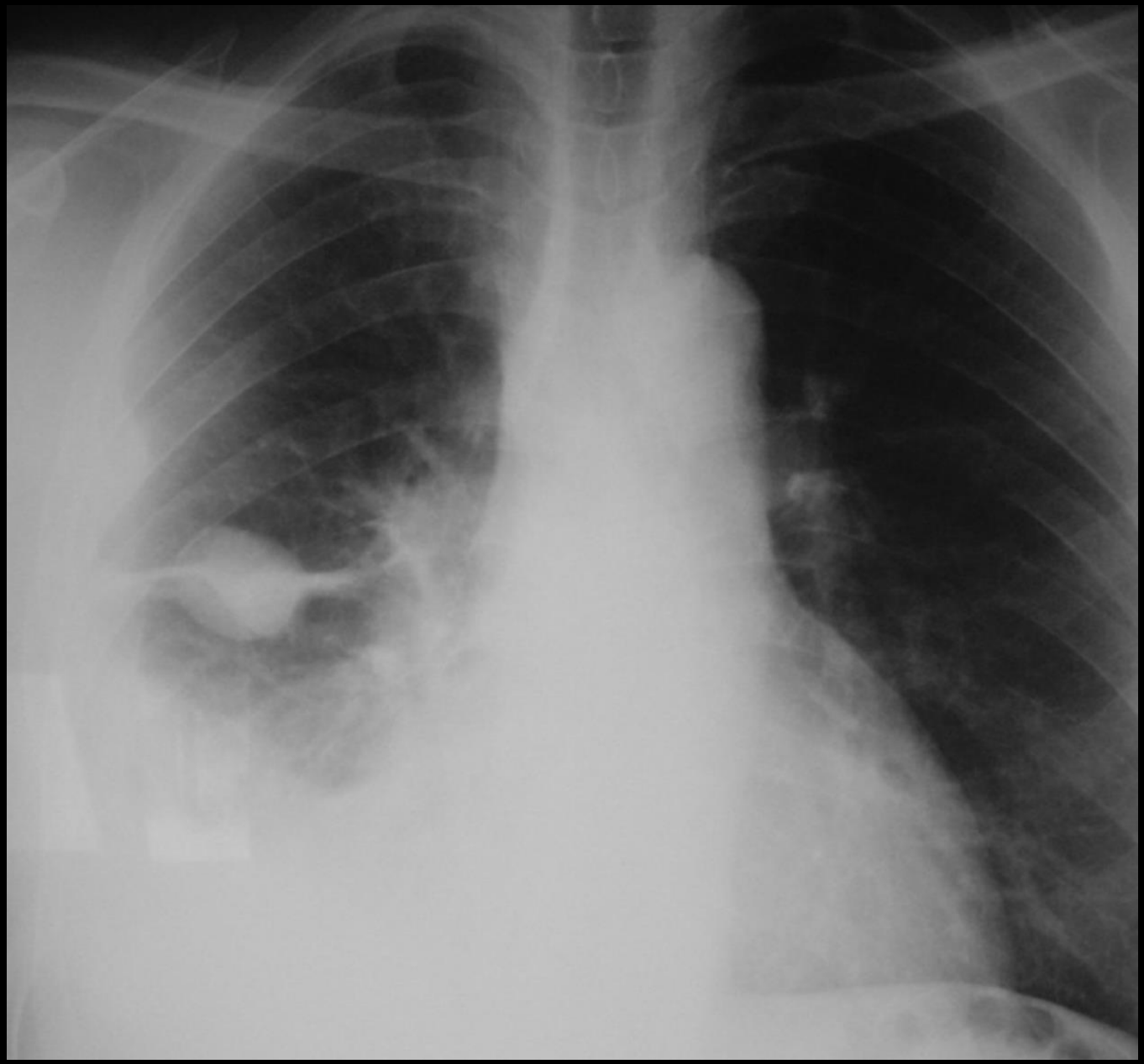
- Serum cryptococcal Ag (+)

Round atelectasis

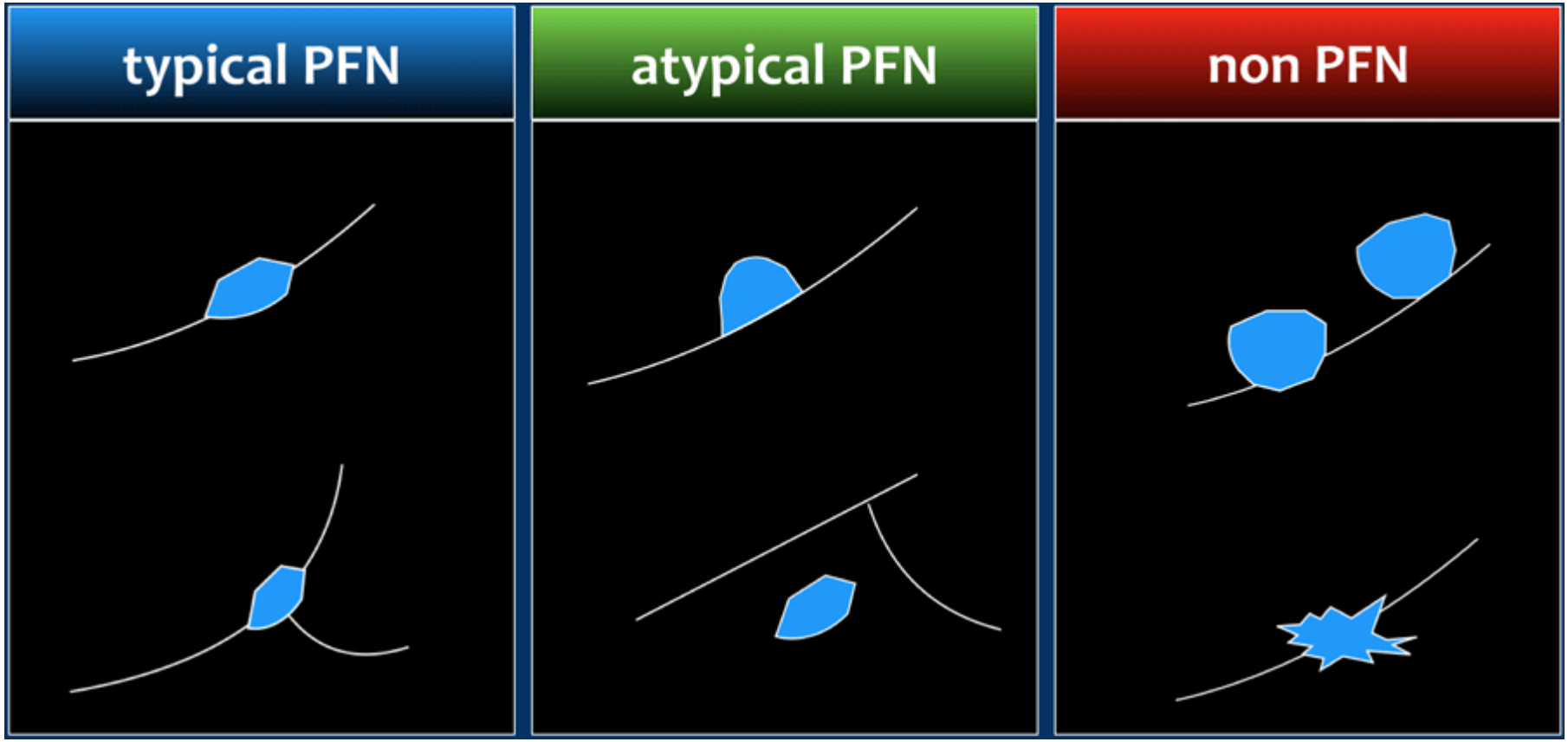


- An atypical form of atelectasis
- Usually occurs adjacent to scarred pleura
- Have history of asbestose exposure or pleural effusion

Phantom tumor — Interlobar effusion

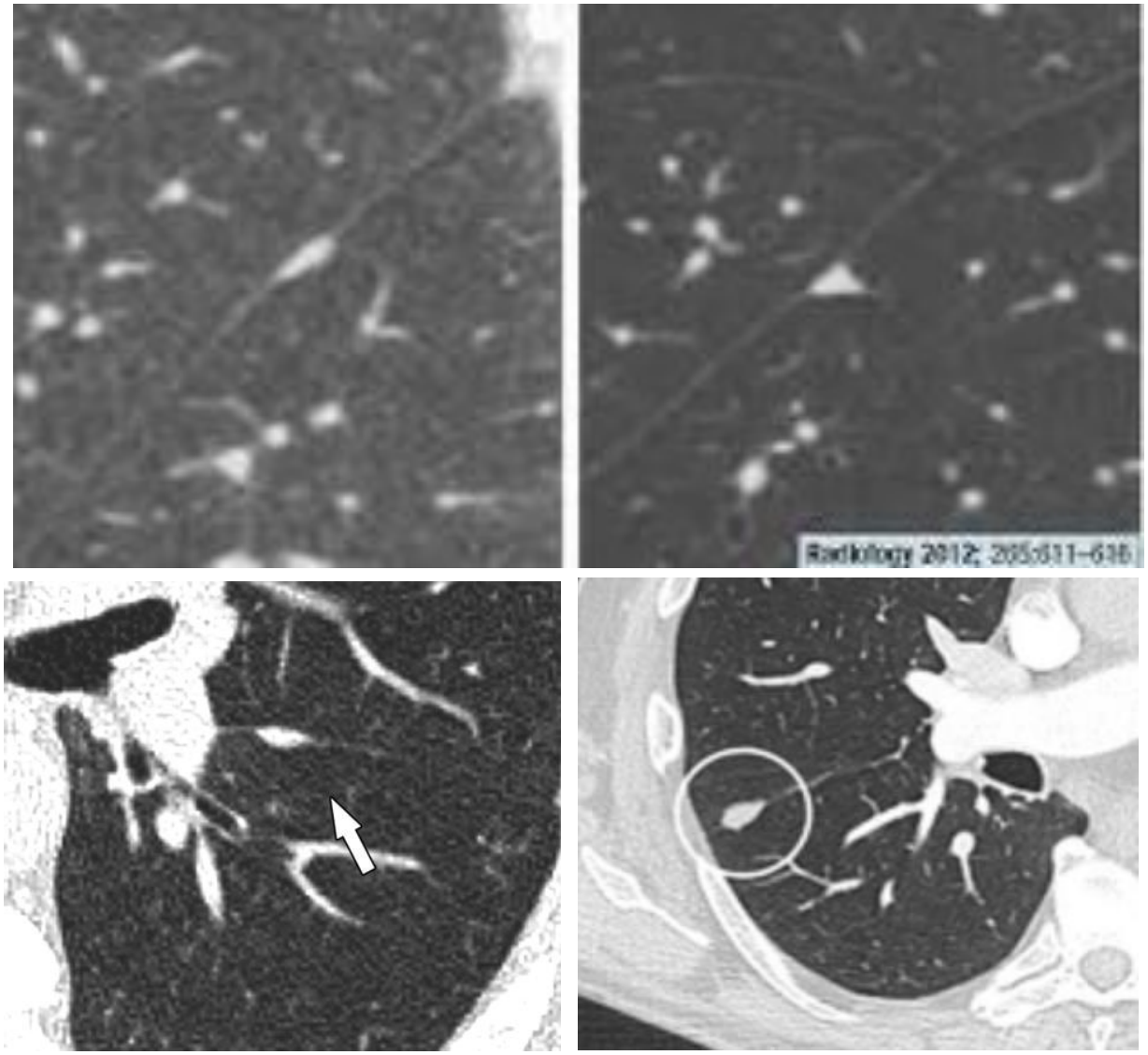


Perifissural nodules



- Morphologically these are solid, homogeneous nodules with a smooth margin, oval or rounded, lentiform or triangular in shape
- Most intrapulmonary lymph nodes
- Found growth in some PFNs, likely reactive changes

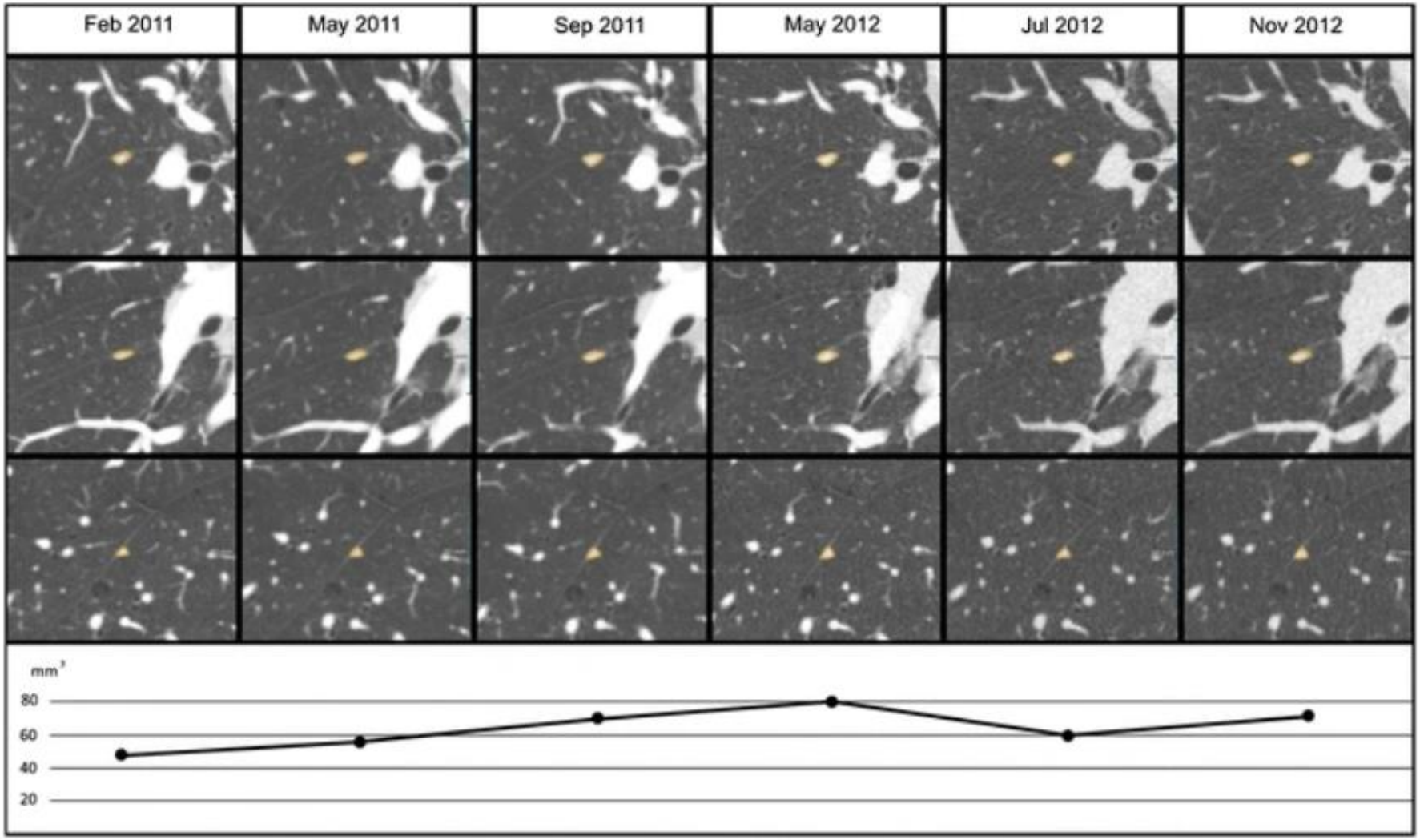
Perifissural nodules



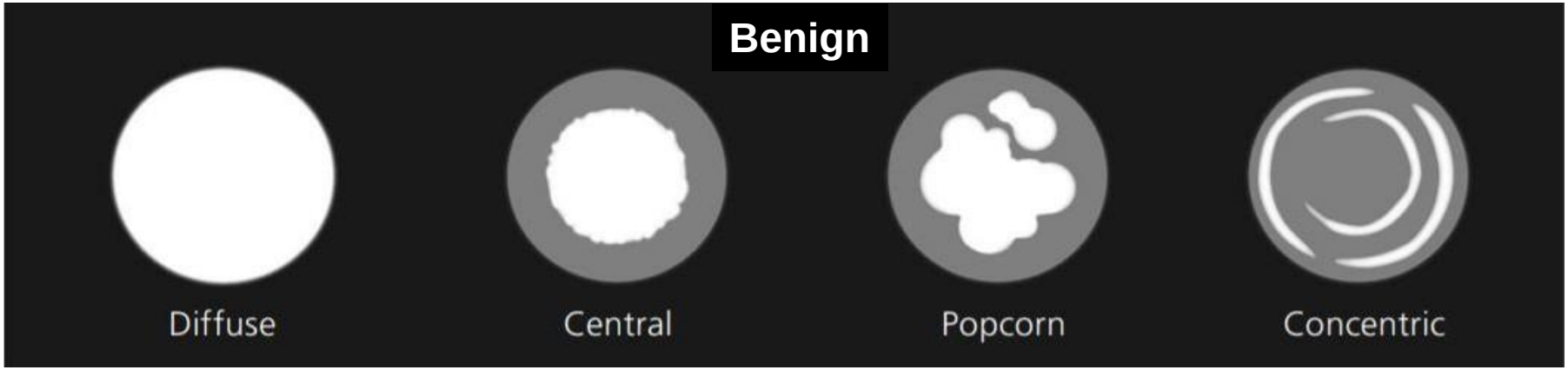
- N＝919, none of these PFNs proved to be malignant during the 5.5 yrs follow-up

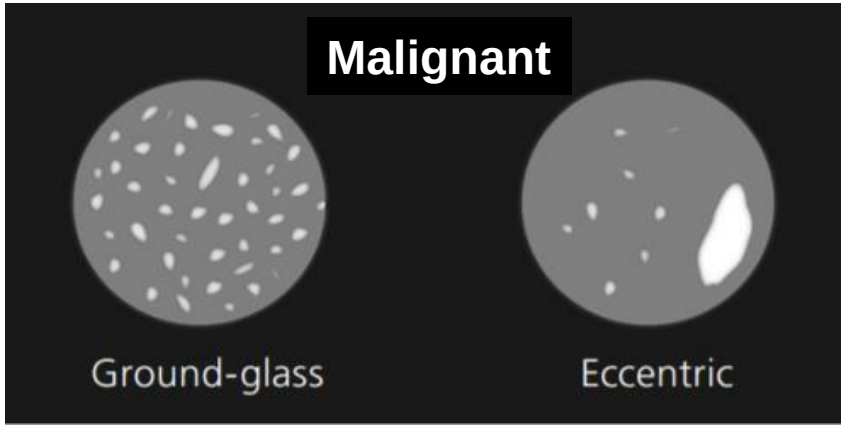
Bartjan de Hoop et al. Radiology. 2012; 265: 2

Perifissural nodules



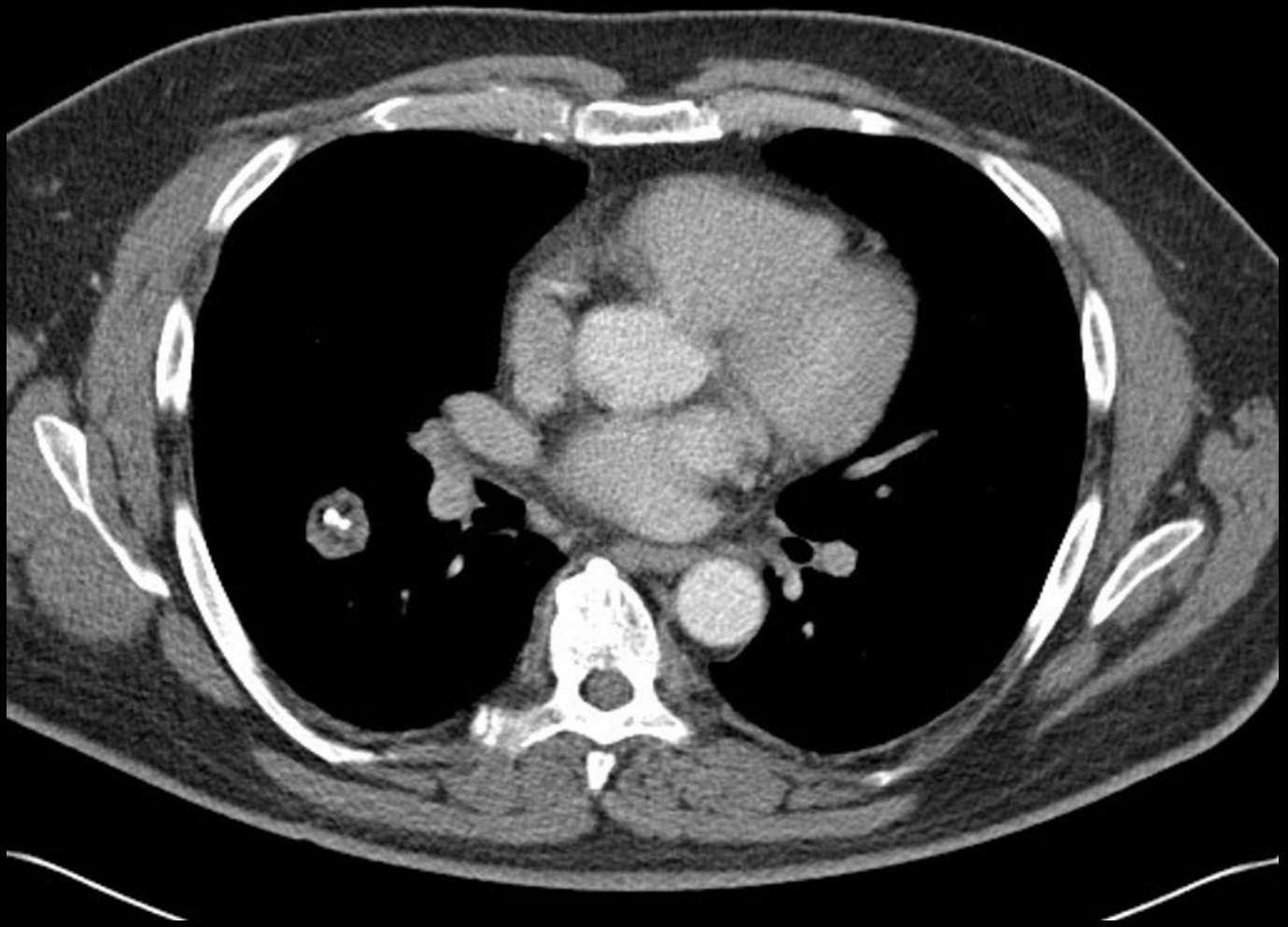
Patterns of calcification





Am Fam Physician. 2015 Dec 15;92(12):1084-1091A

Harmatoma 缺陷瘤



- Made up of cartilage, connective tissue, fat, muscle and bone

Osteosarcoma with lung metastasis

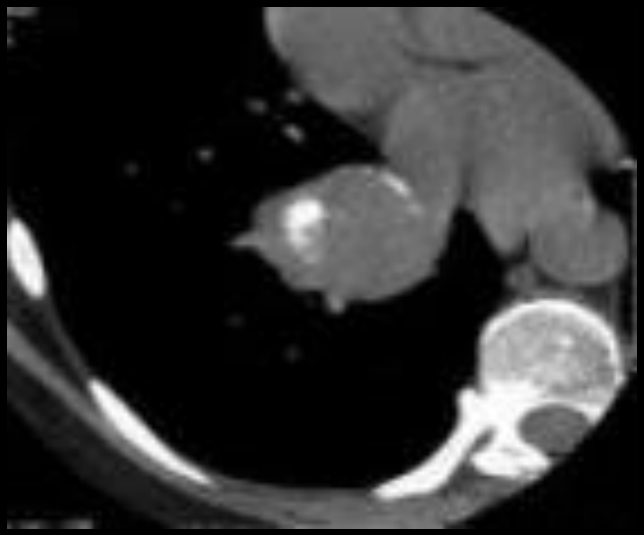
Chondrosarcoma with lung metastasis

- Can be synchronous or metachronous
- Larger nodules/masses termed cannon ball metastasis
- May have features of calcification,ossification,cavitation

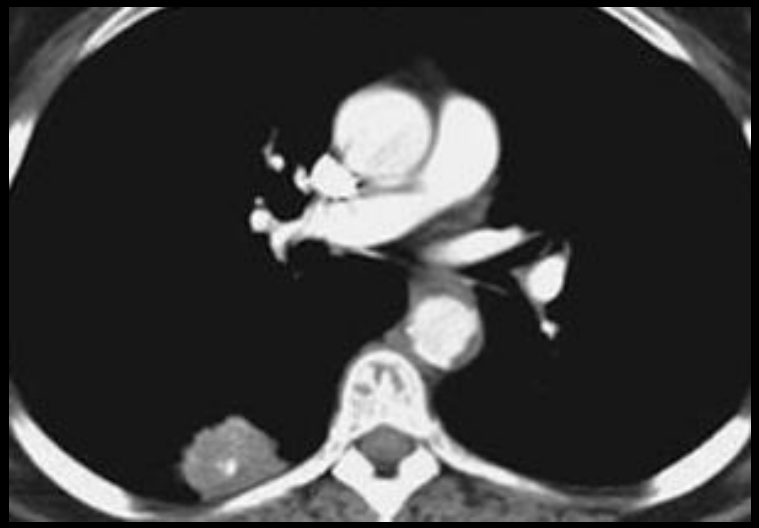
Diffuse calcification

Laminated calcification

Eccentric calcification
Atypical carcinoid



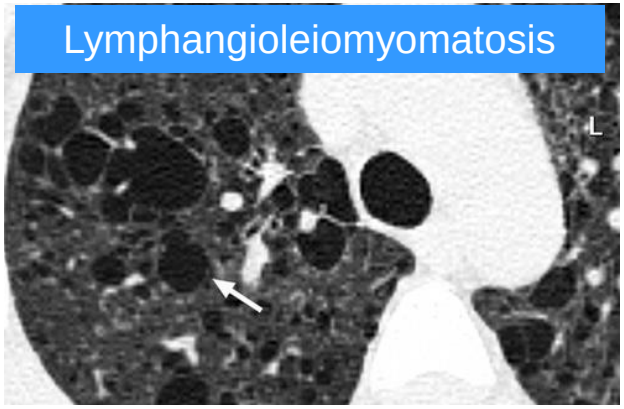
Small cell carcinoma



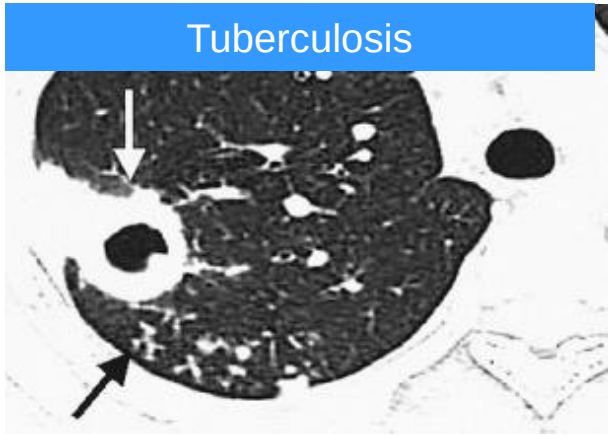
Patterns of cavitation

- 若呈eccentric(離心)，惡性機率大
- 若腫瘤開洞內緣不規則或呈鋸齒狀，惡性機率大
- 若空洞內緣平滑，壁薄均勻，良性機率大
- **壁厚 < 5mm，92% 良性**
- **壁厚 > 15mm，95% 惡性**

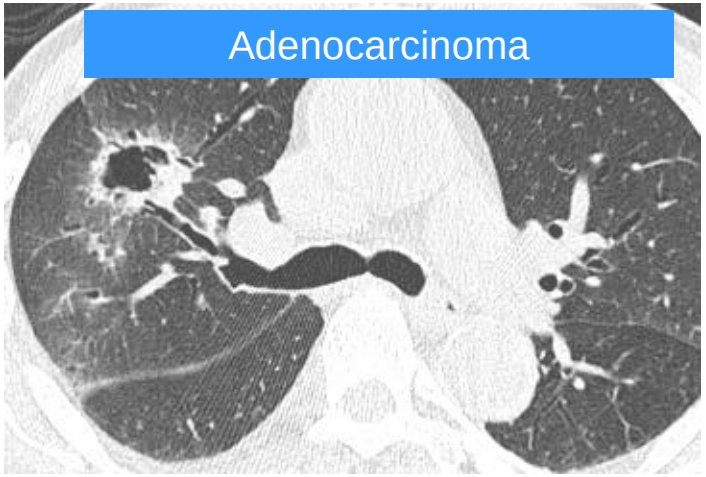
Lymphangioleiomyomatosis



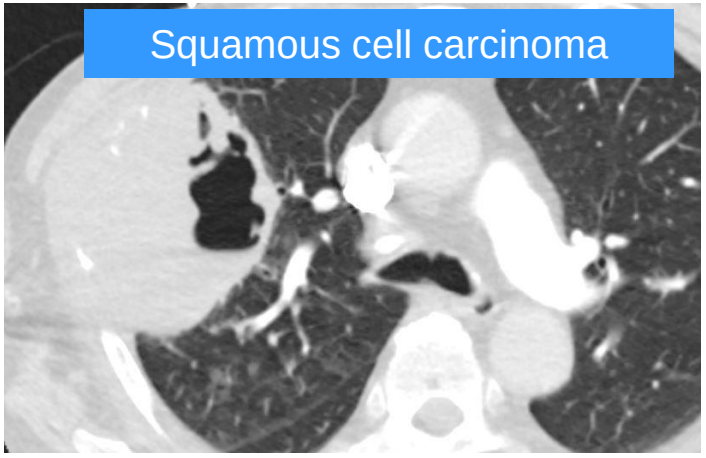
Tuberculosis



Adenocarcinoma

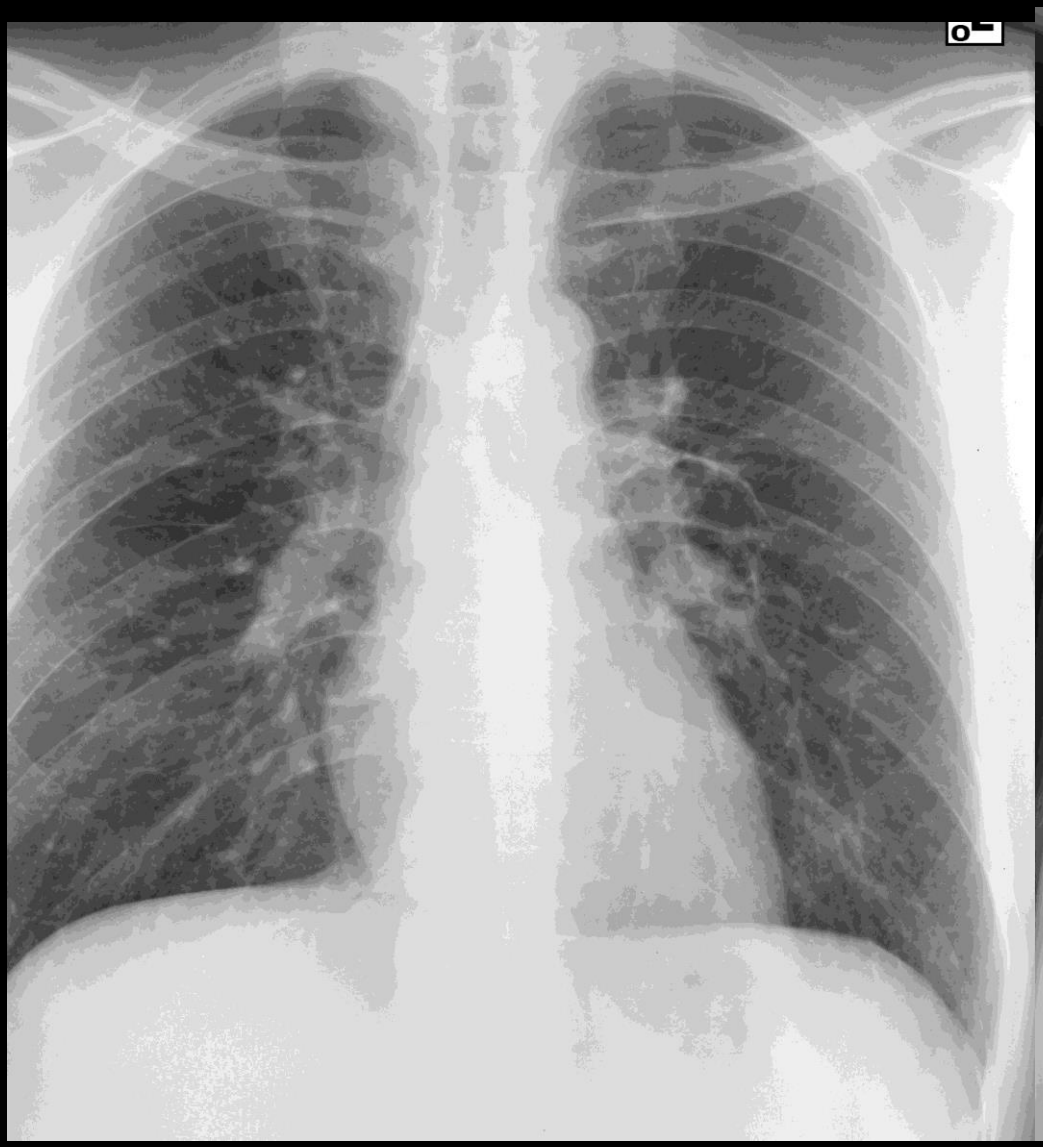


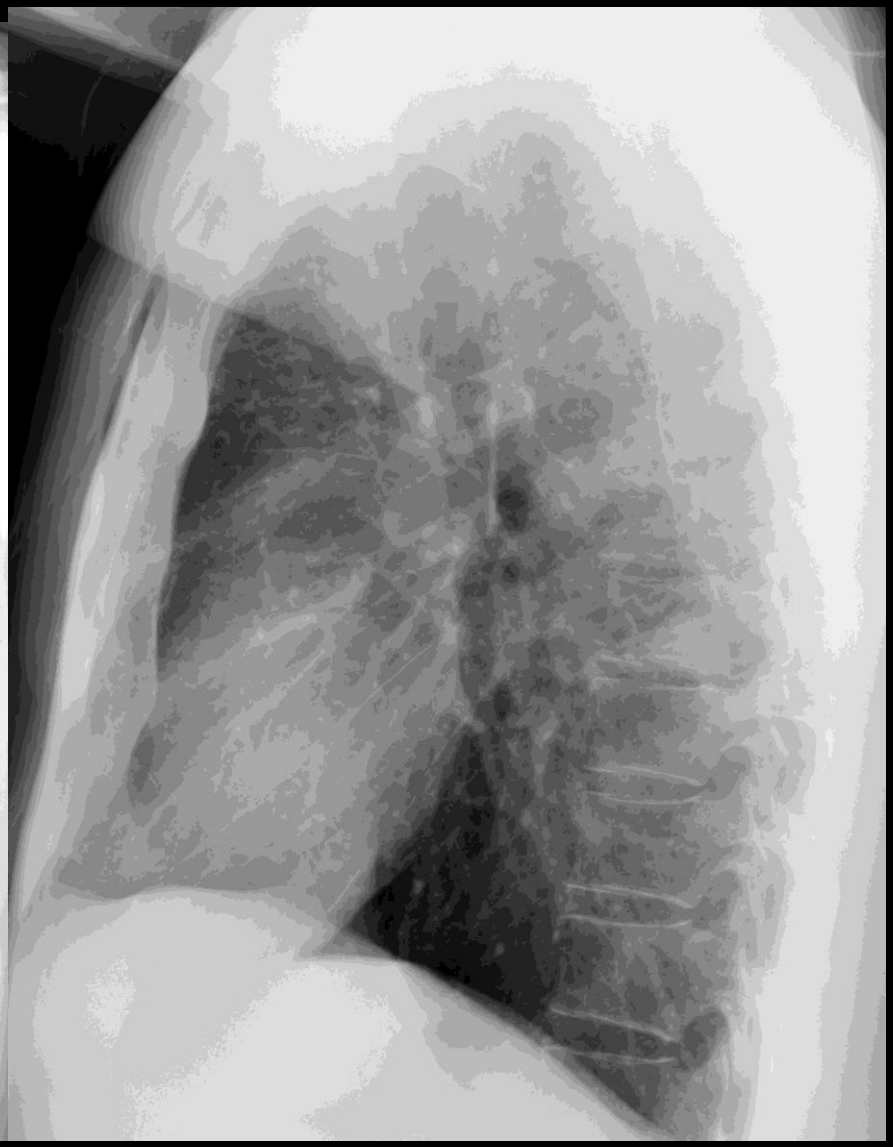
Squamous cell carcinoma



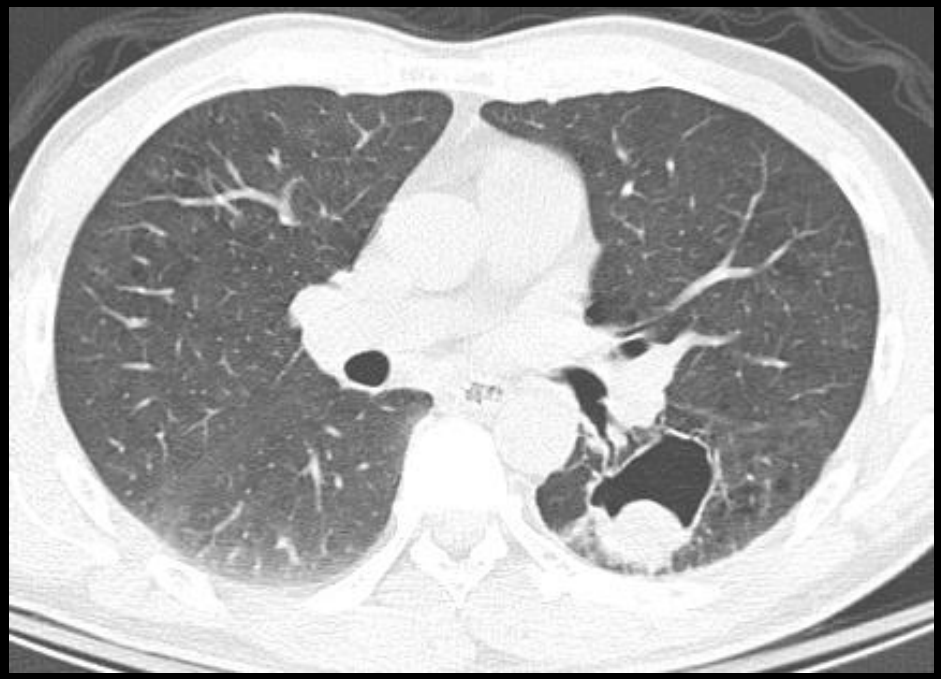
Am Fam Physician. 2015 Dec 15;92(12):1084-1091A

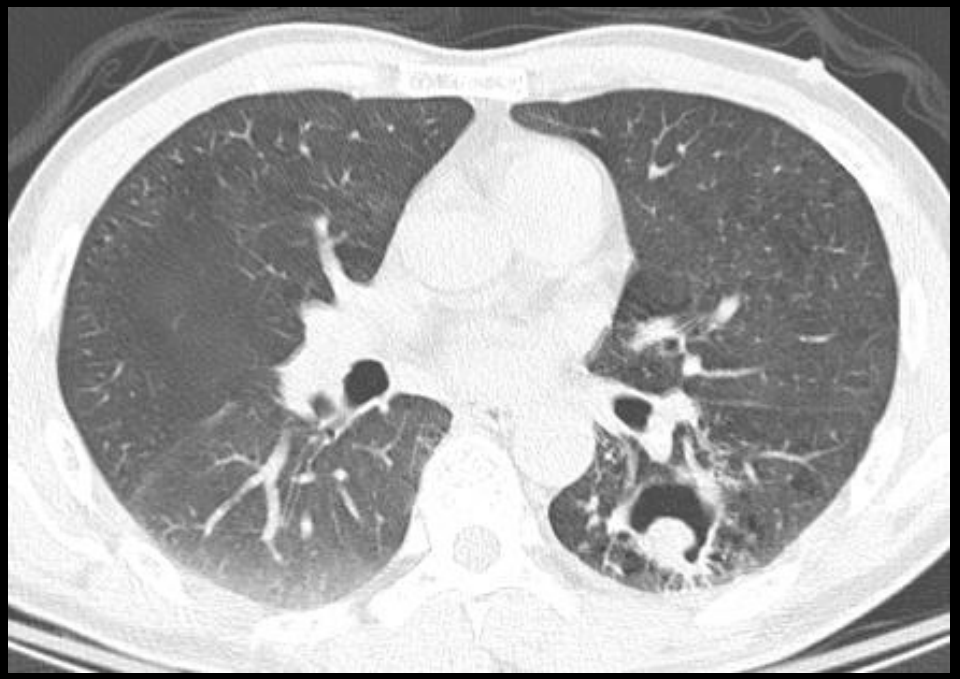
Healed TB cavity, mycetoma



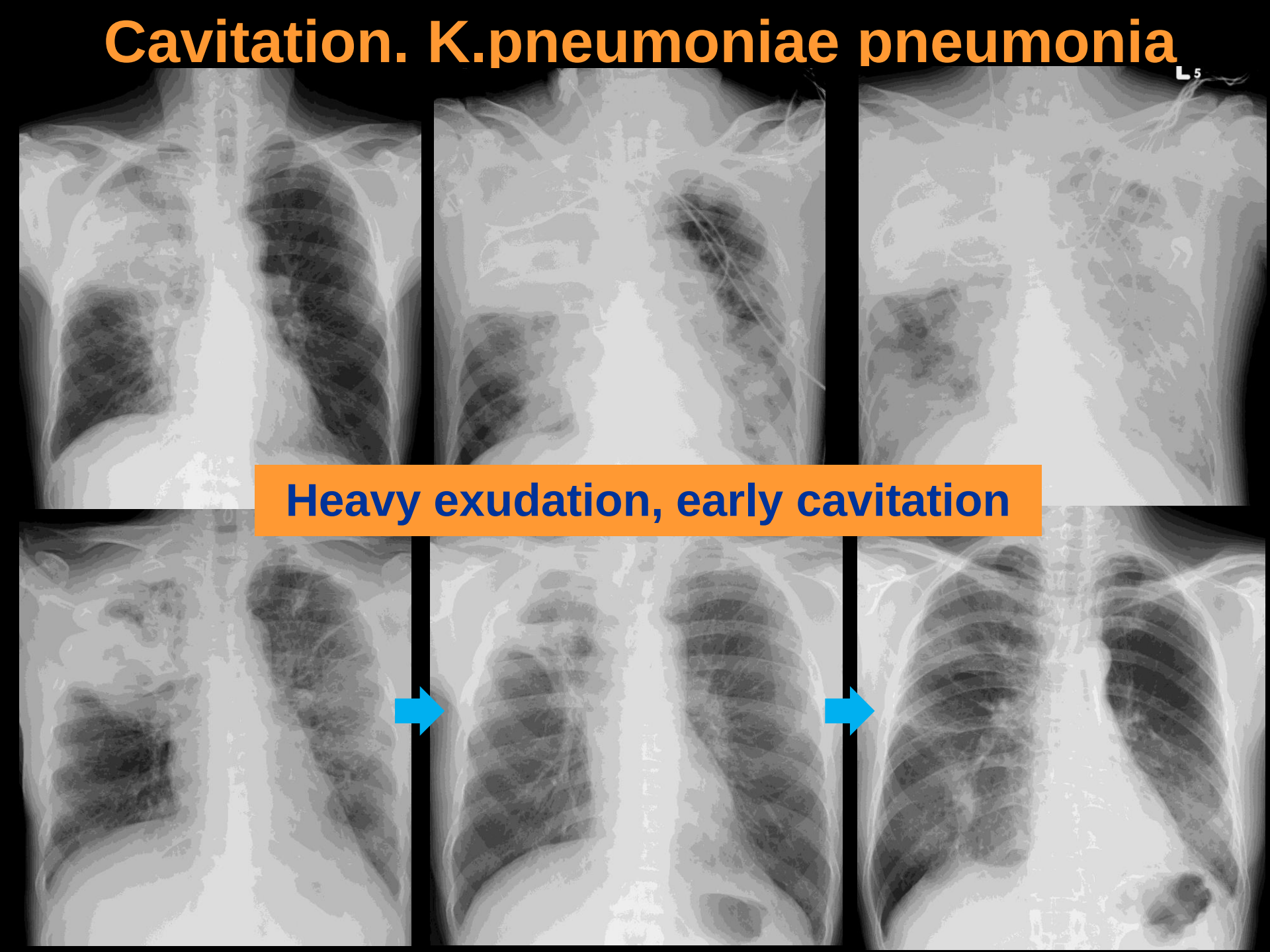


Healed TB cavity, mycetoma

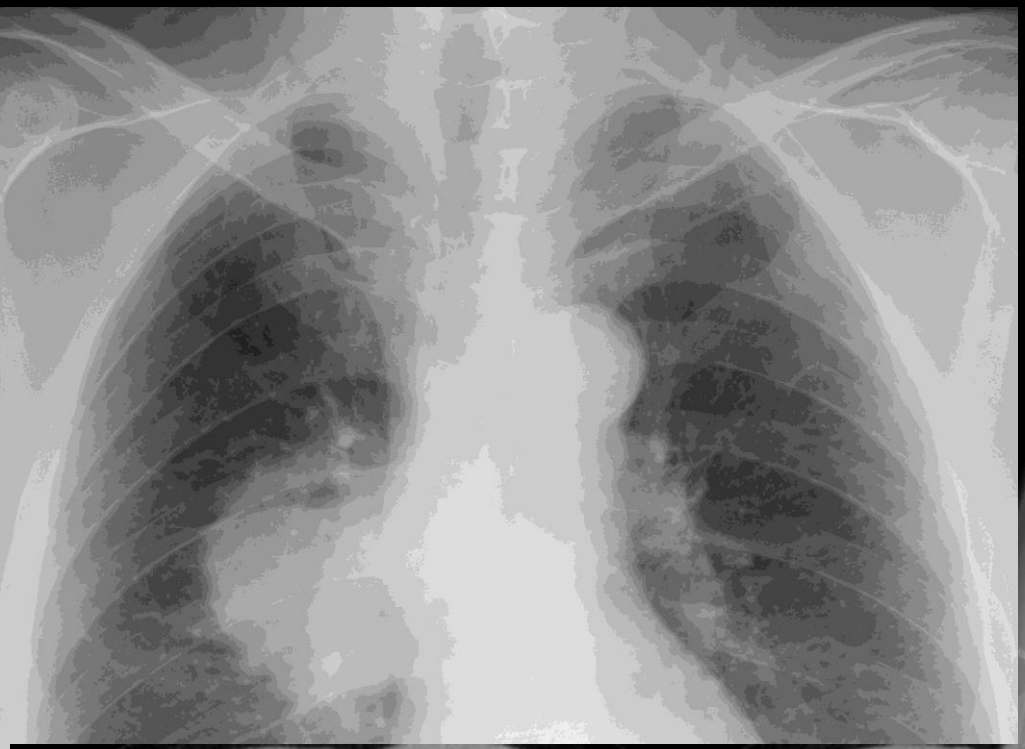


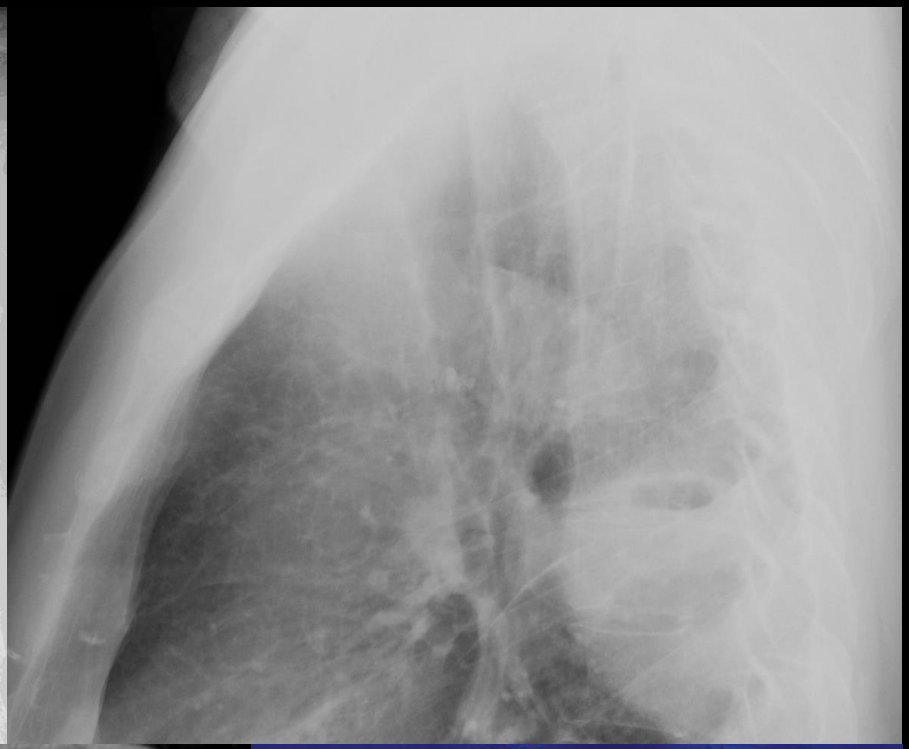


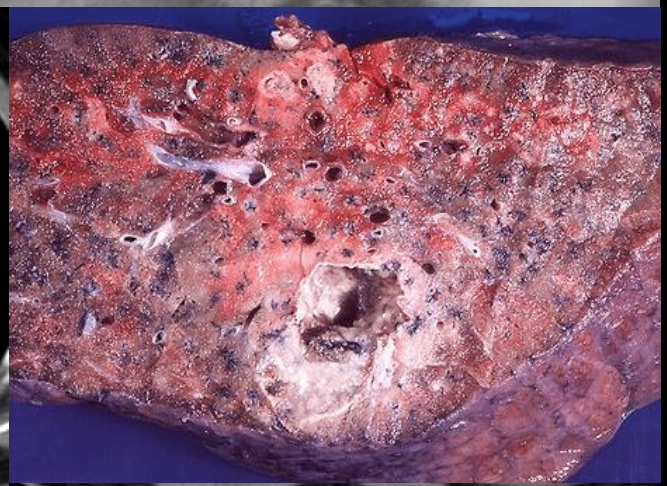
Cavitation. K.pneumoniae pneumonia



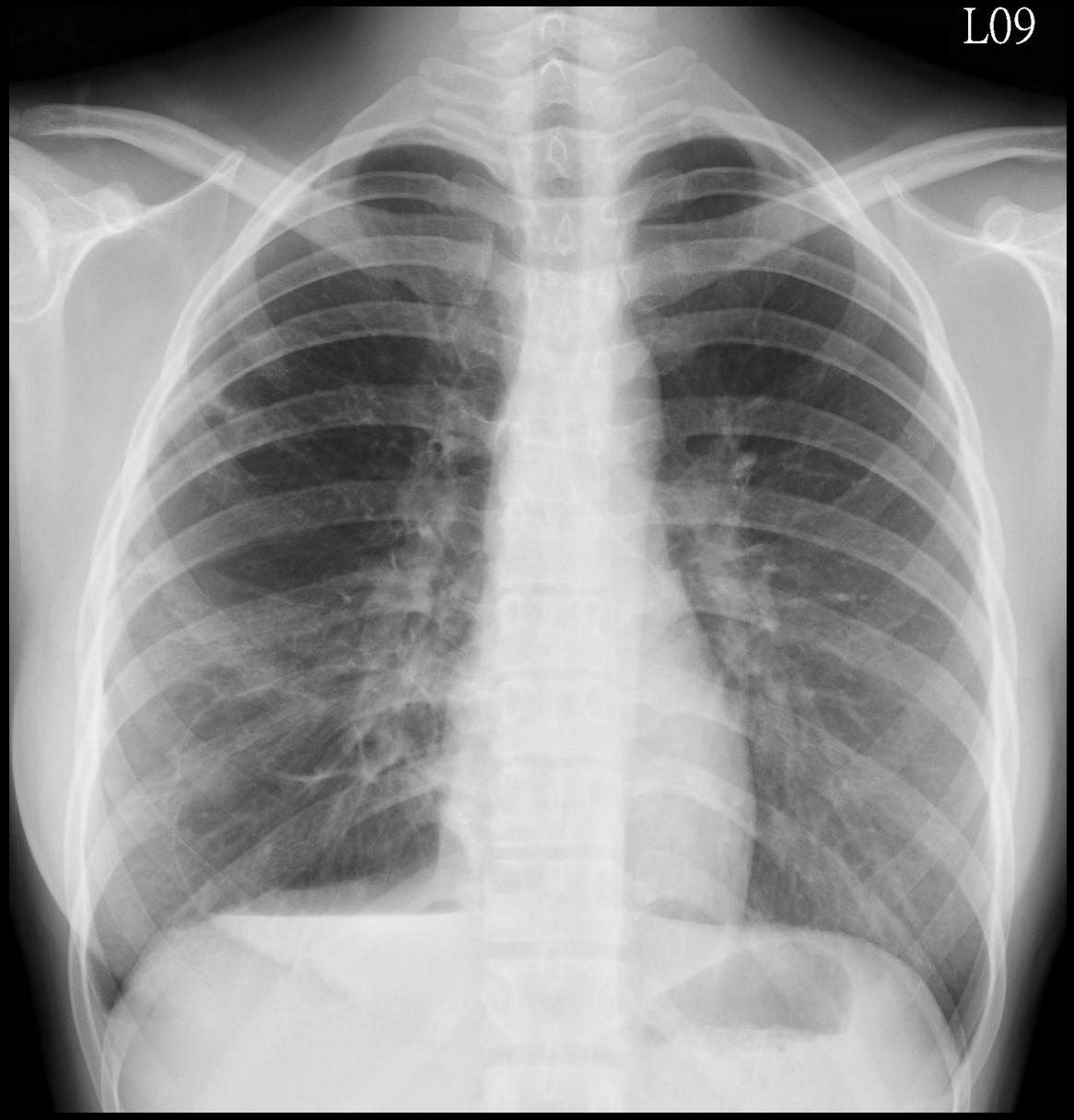
Lung abscess

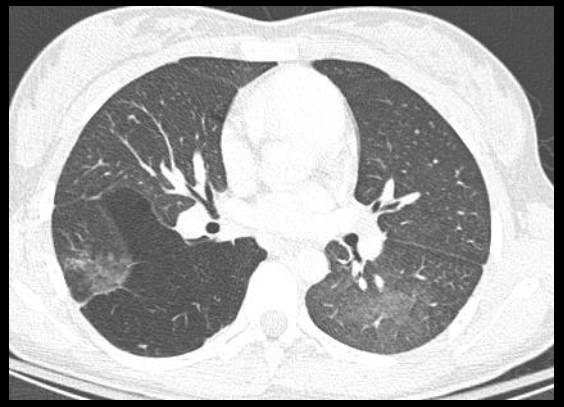






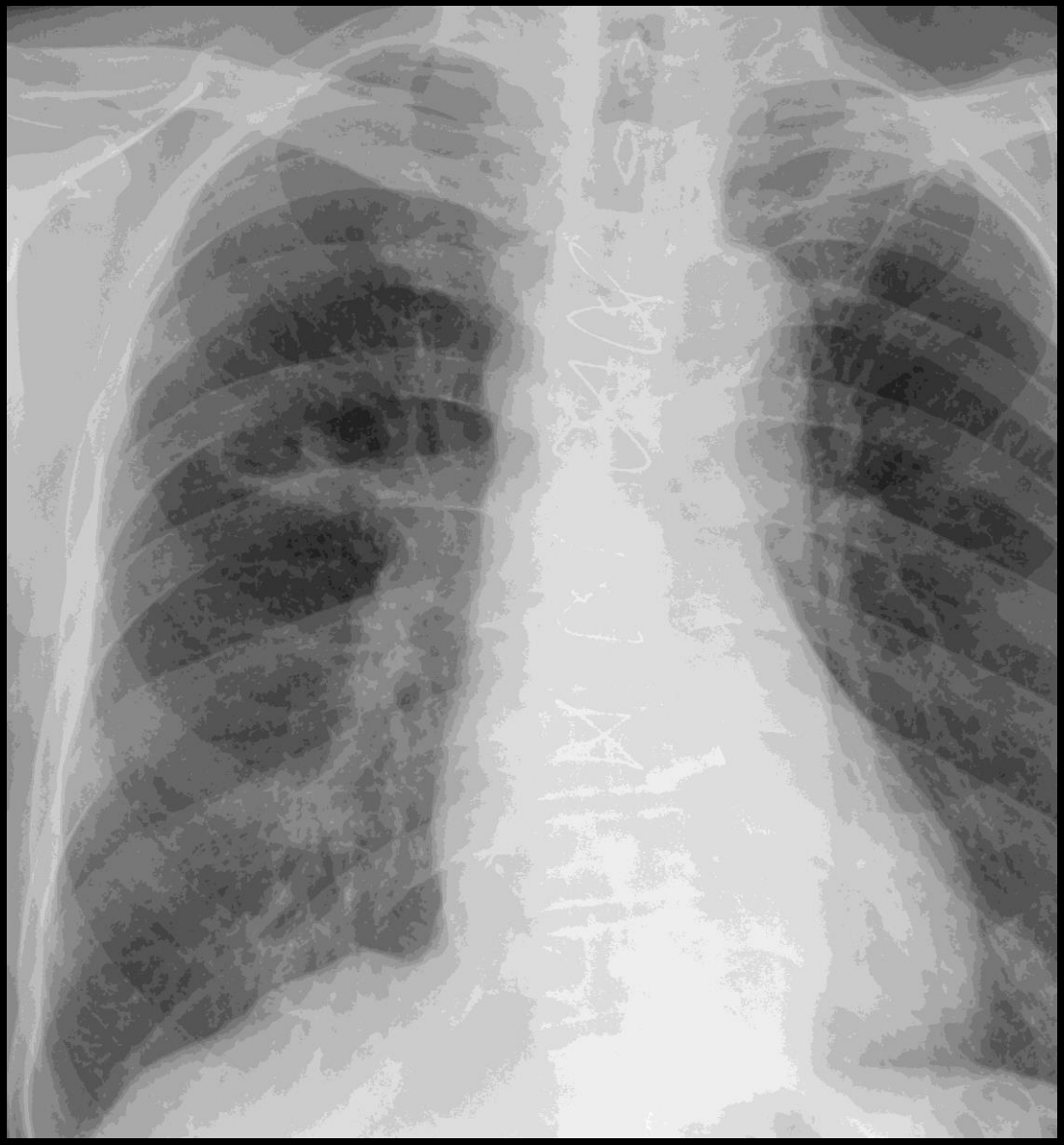
Congenital Cystic Adenomatoid Malformation (CCAM), type 1

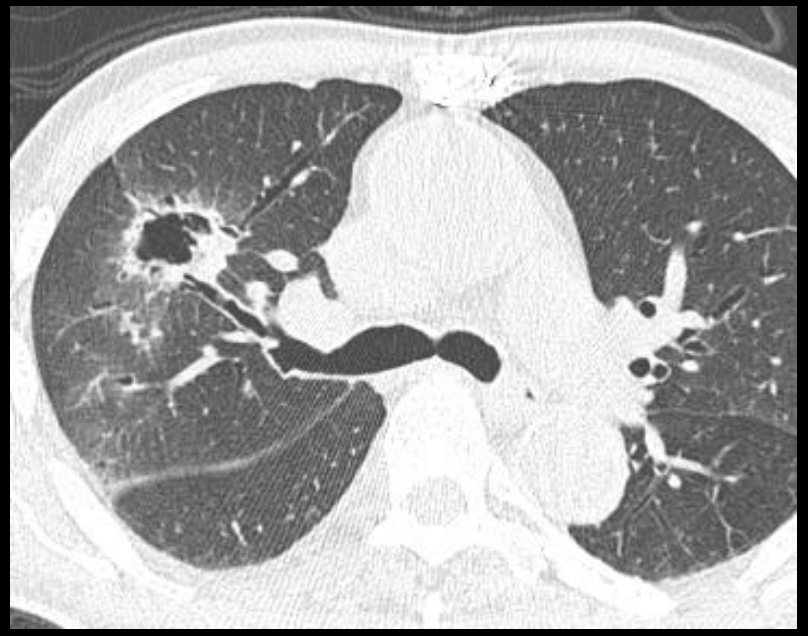


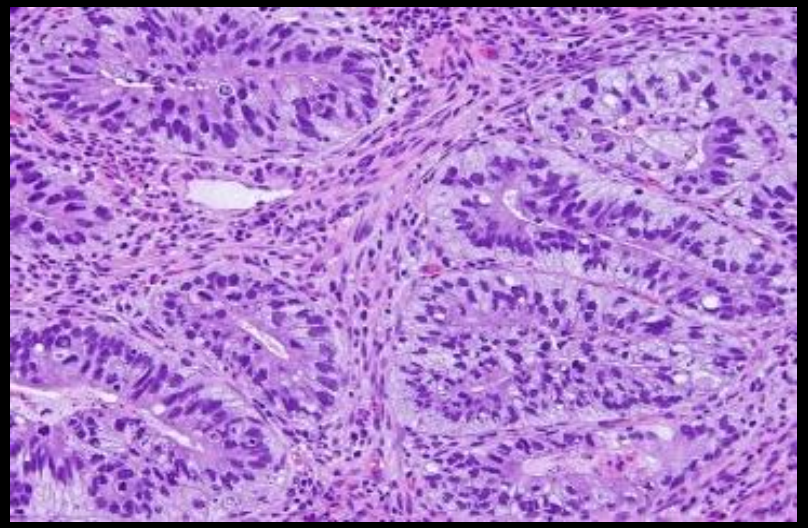


Cavitating squamous cell carcinoma, with mycetoma

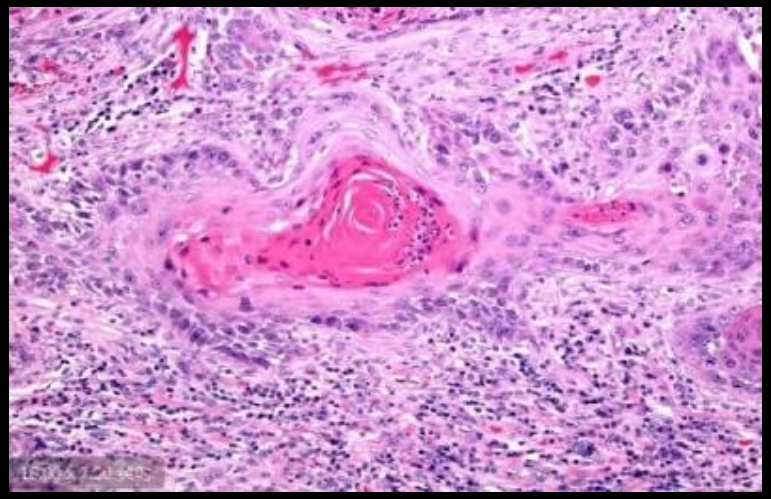
Adenocarcinoma of lung, cavitating



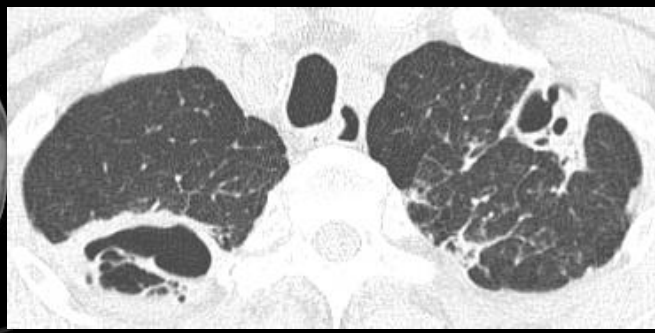




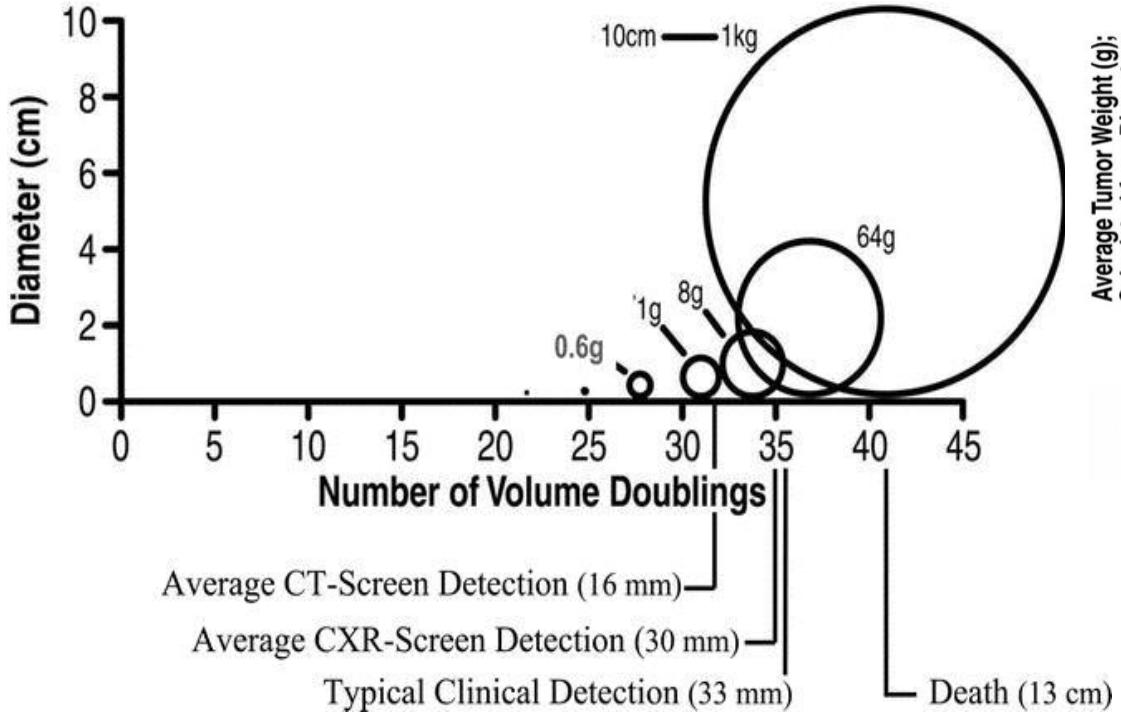
Squamous cell carcinoma of lung, cavitating

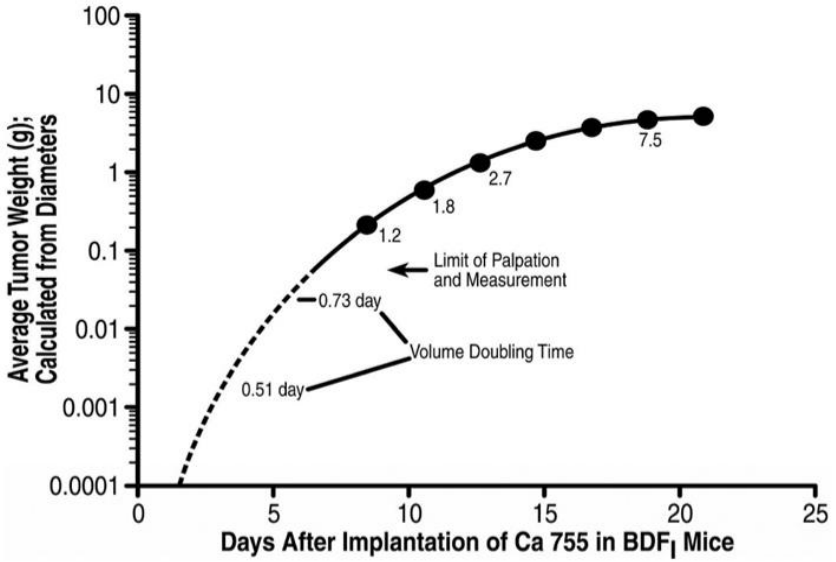


Mucormycosis

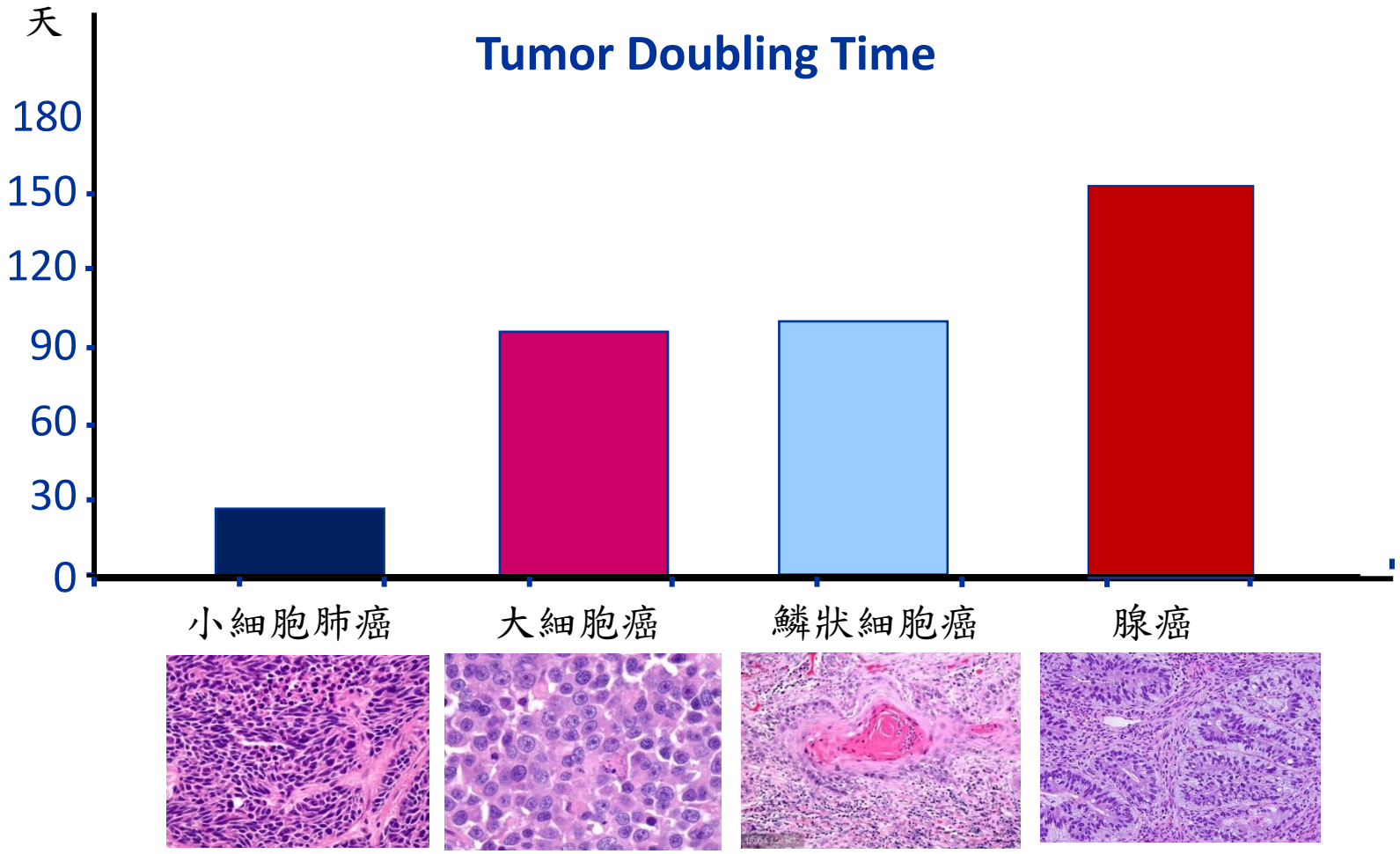


Tumor doubling time

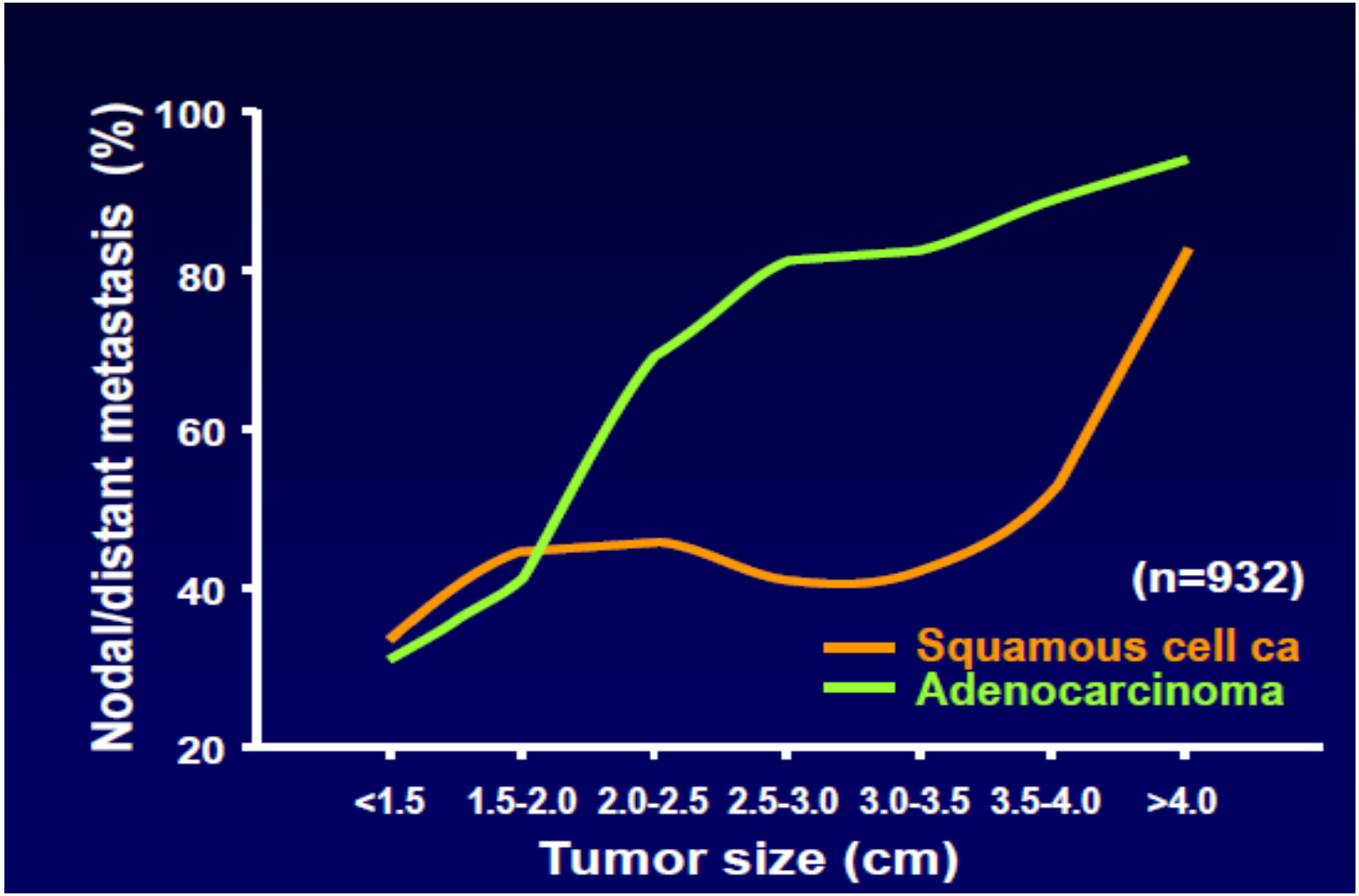




Tumor doubling time



Tumor size matters in nodal/distant metastasis between Sqcc and Adenocarcinoma



Lung cancer, 2010;67(3):296-300

Multiple nodules/masses

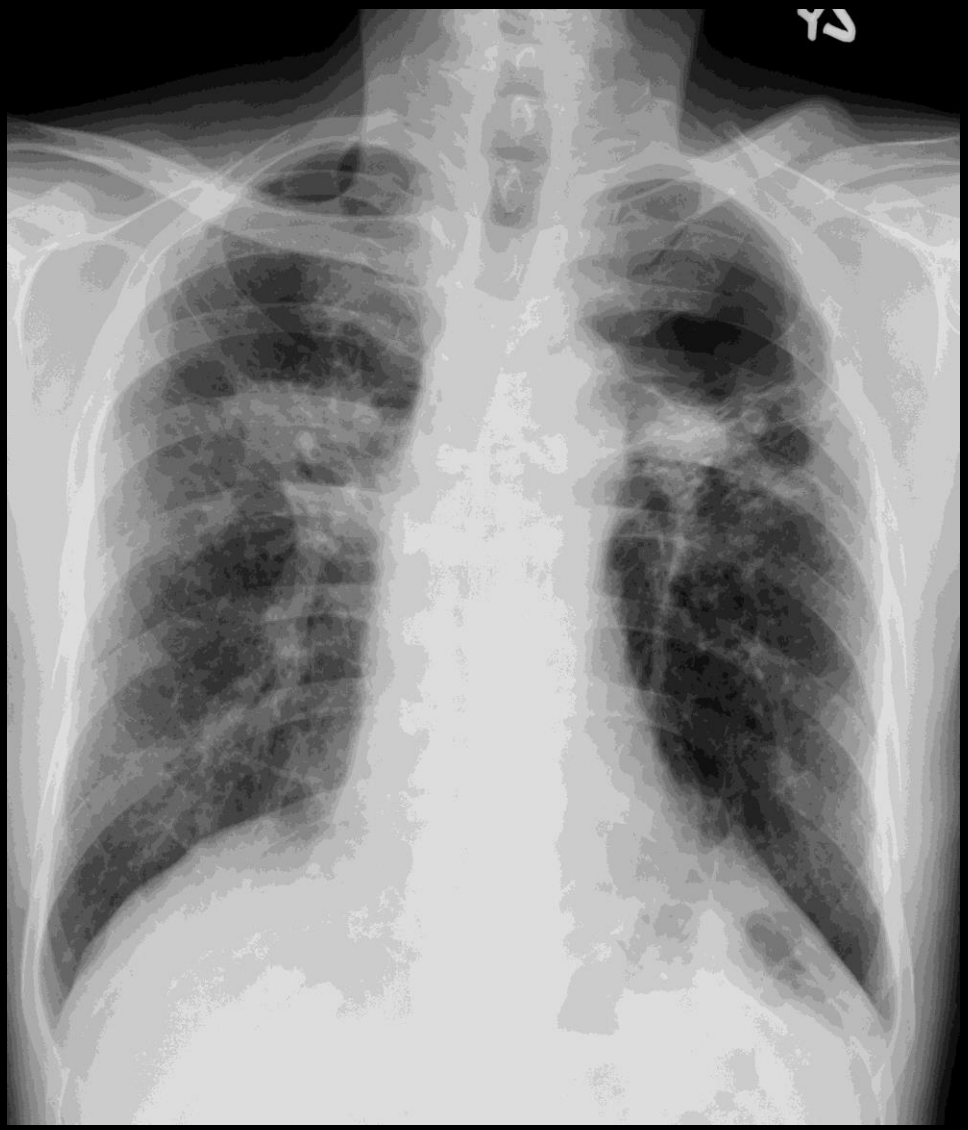
- 大小　size/diameter
- 形狀　Shape/Margin
  Caviation/Cavity wall thickness
- 濃度　Density: solid/subsolid/ground glass
  calcification,Contrast enhancement
- 位置　Location: Intrathoracic/Extrathoracic
  Parenchymal/Mediastinal,Central/Peripheral
- 改變　Growth rate/Doubling time

Multiple pulmonary nodules/opacities

Colon cancer with lung metastasis

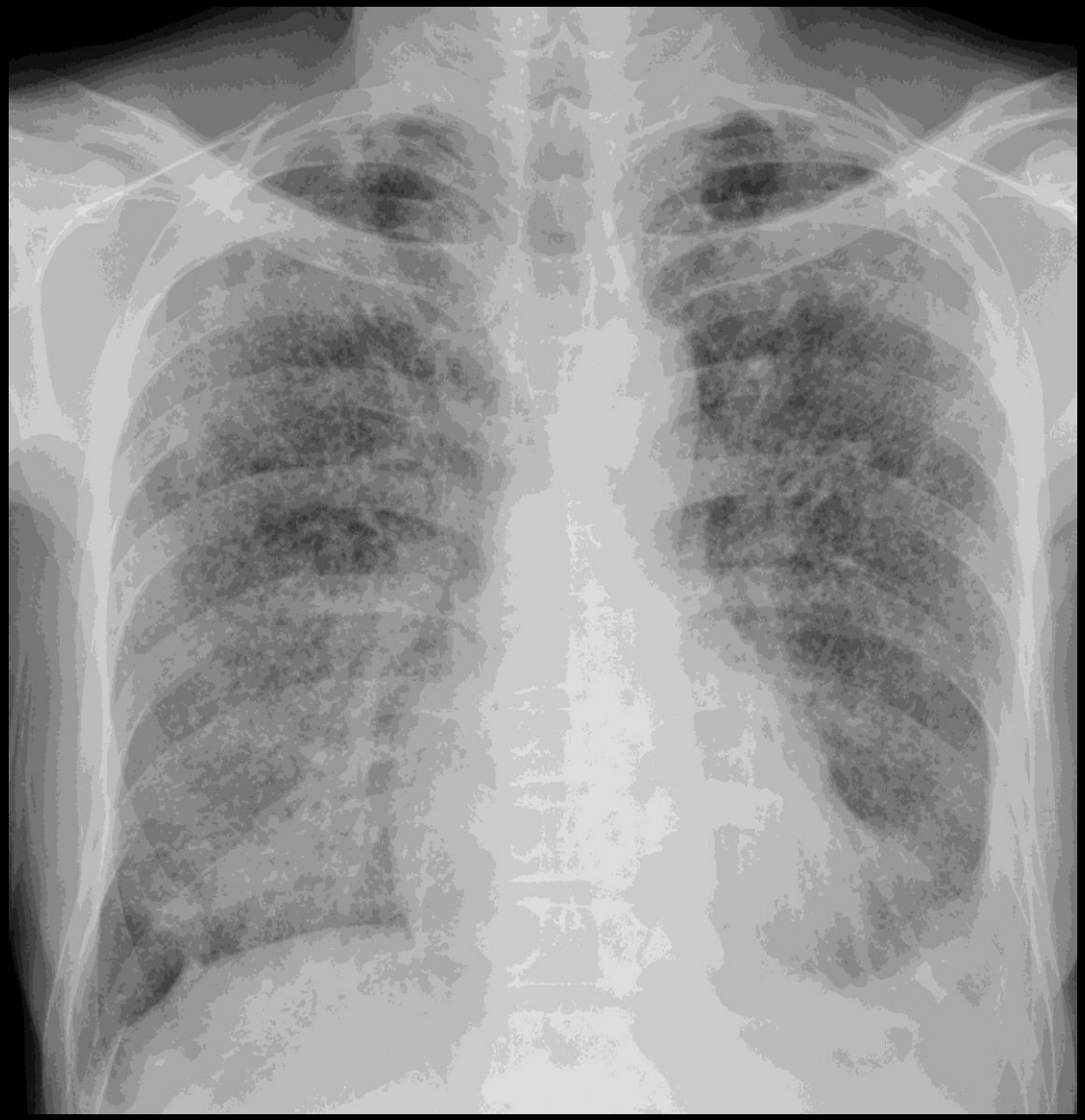
- Canon ball

Pneumoconiosis with PMF



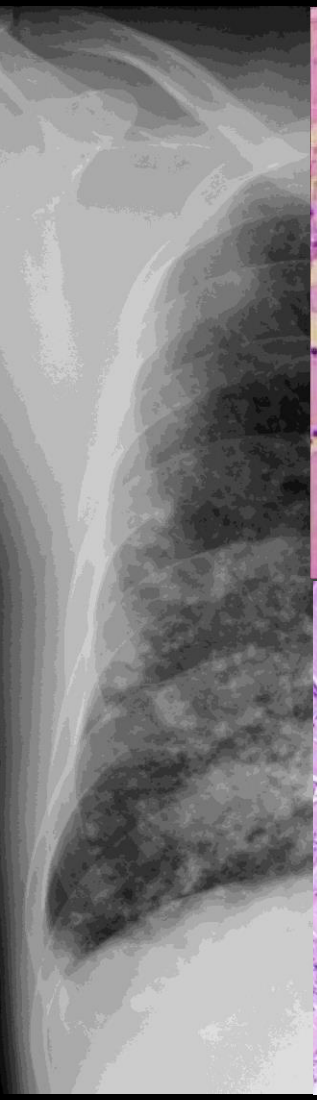
- Symmetric bilateral opacities, irregular margins in the upper lobe
- Often with enlarged calcified lymph nodes

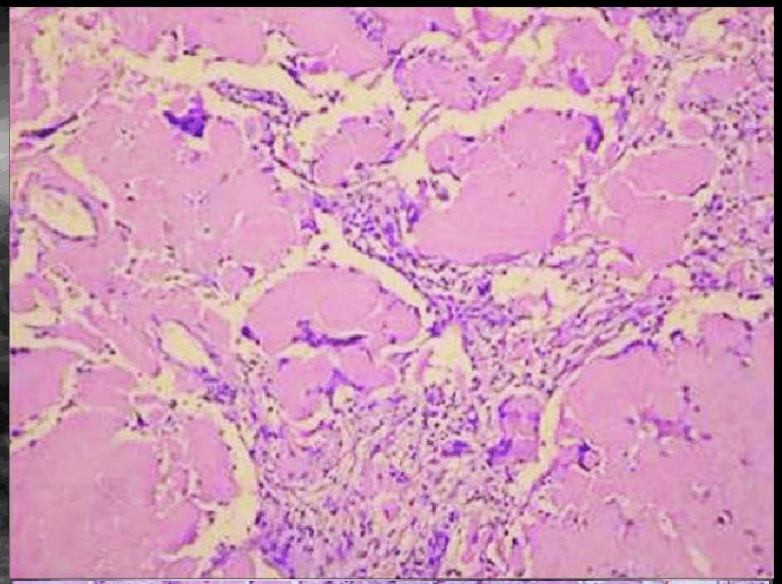
Miliary tuberculosis

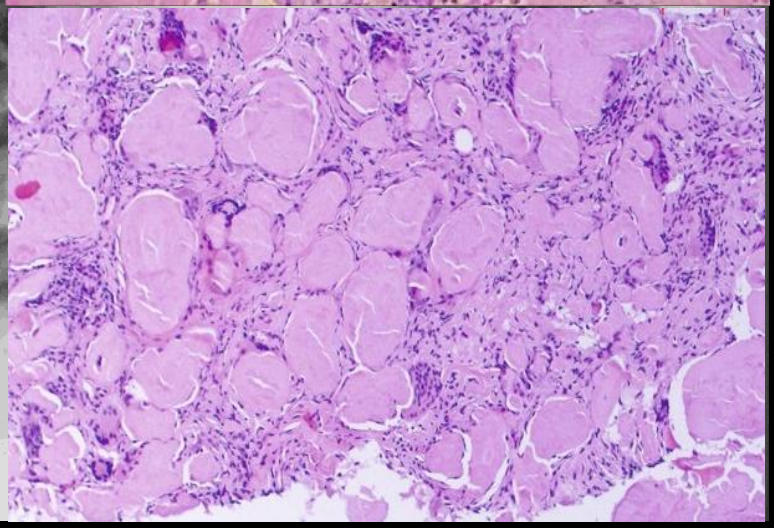


- 細到不能再細，密到不能再密

Pulmonary amyloidosis

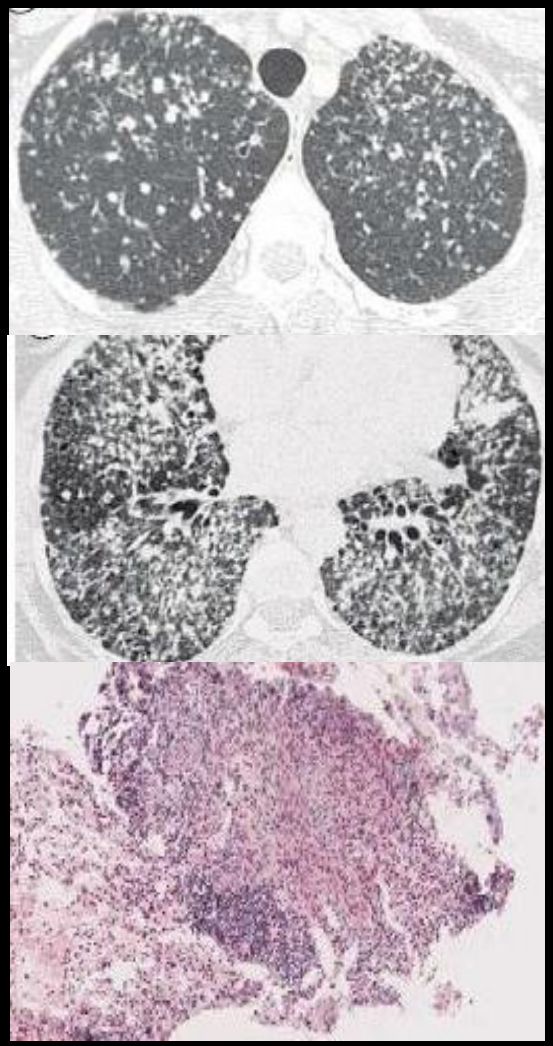






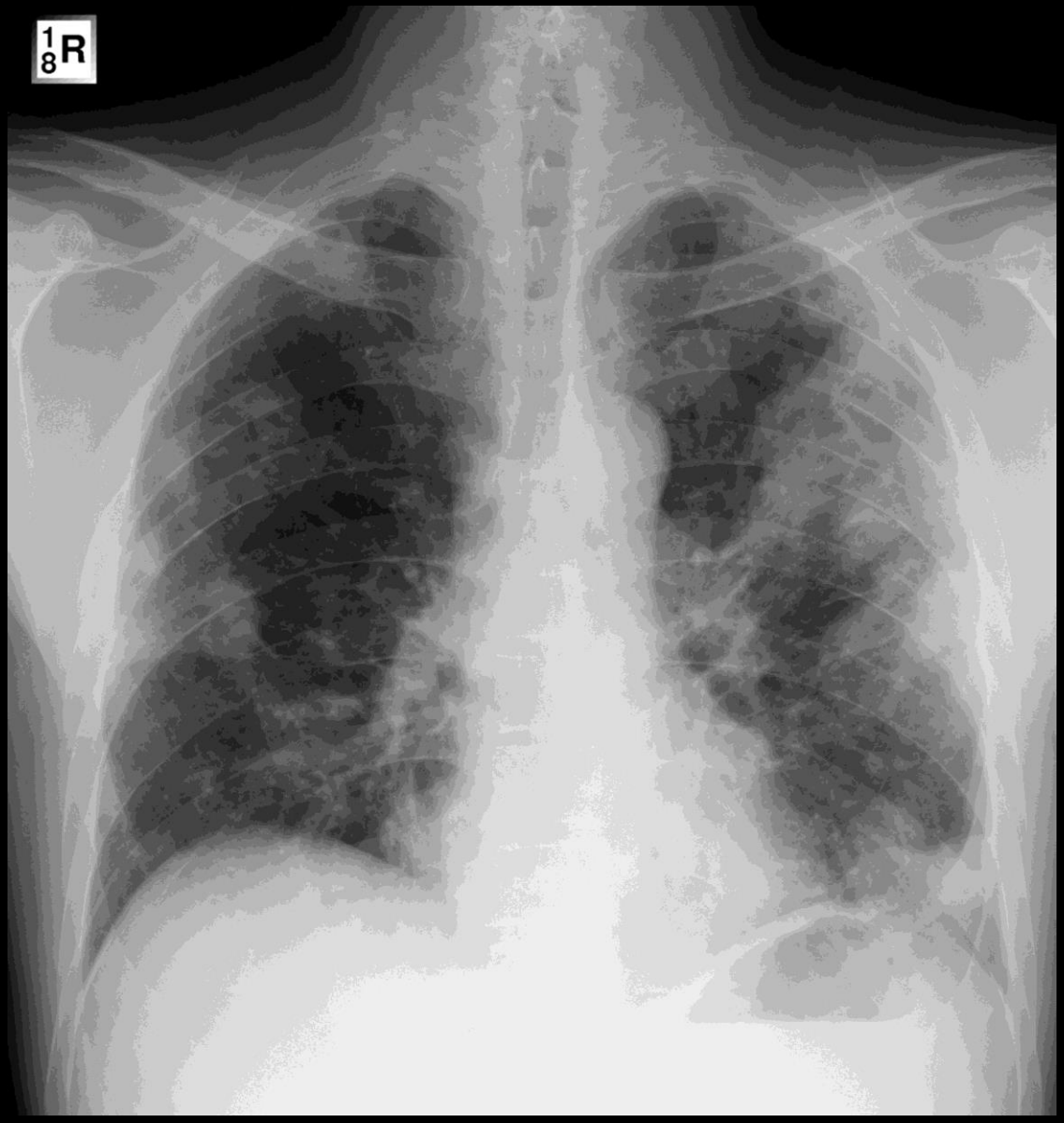
- Deposition of congophilic amyloid fibrils in the extracellular matrix of tissues and organs

Benign pulmonary metastasizing leiomyoma

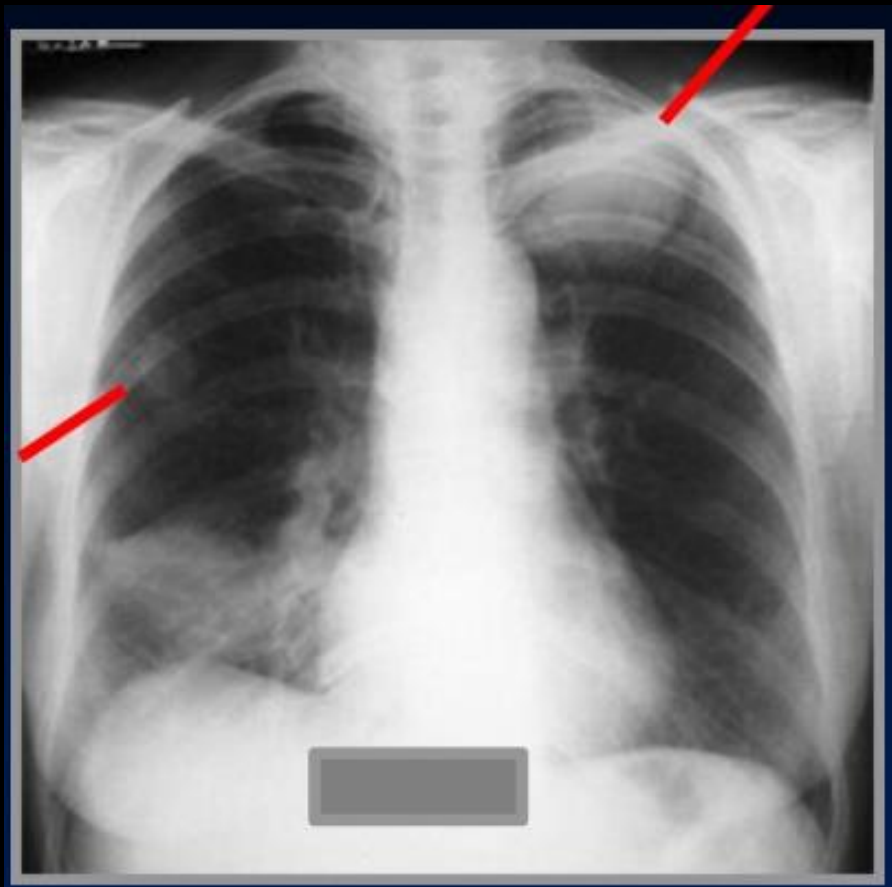


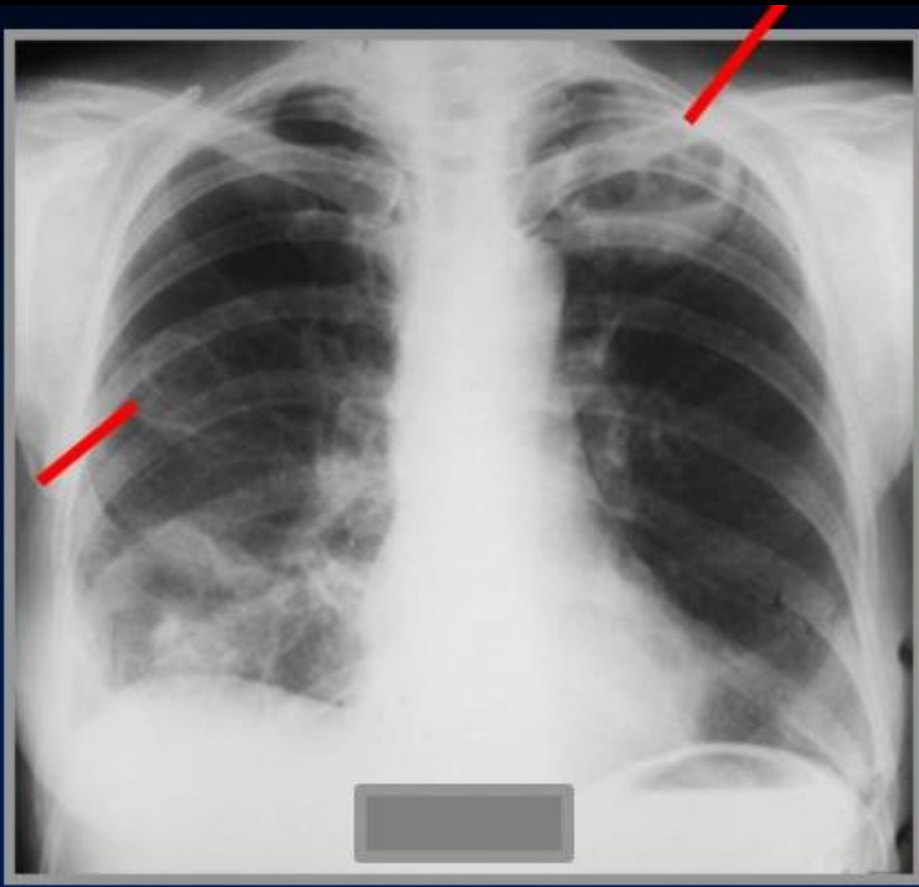
- A rare disorder, affects women with a Hx of uterine leiomyoma, which is found to metastasis within extrauterine sites
- Proliferation of multiple nodules composed of smooth muscle, histologically identical to the leiomyomas in the uterus

Liver abscess, K.p with pulmonary septic emboli



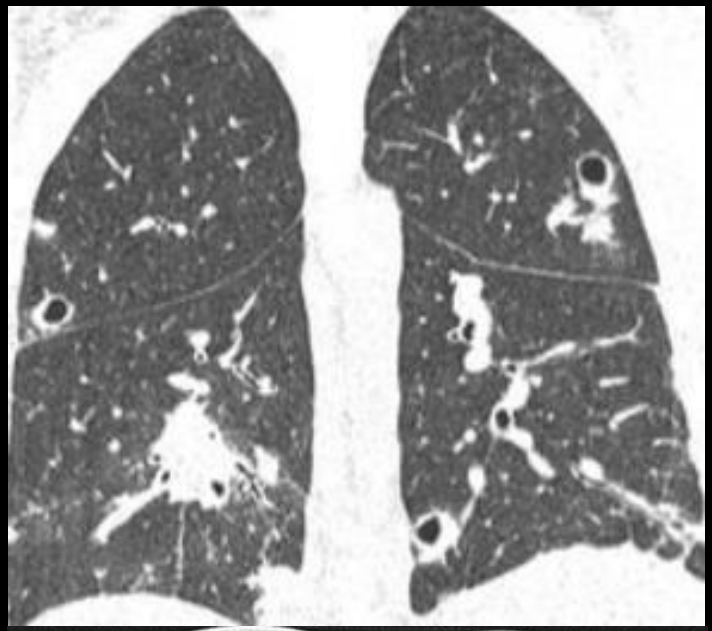
Granulomatosis with Polyangiitis (Wegener's Granulomatosis)

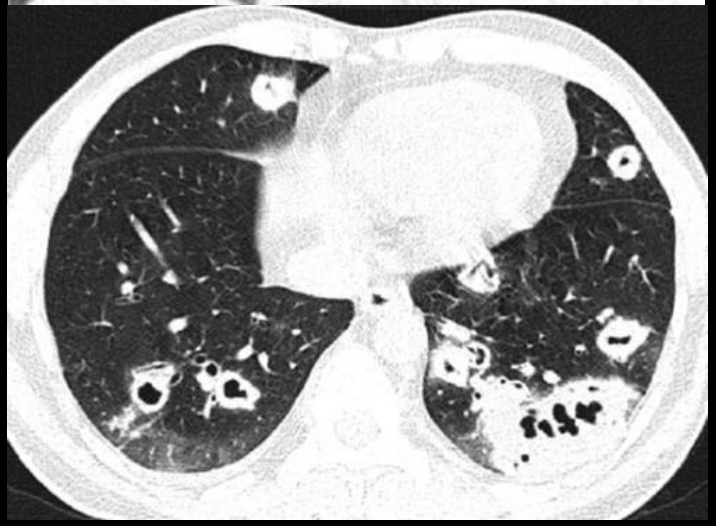


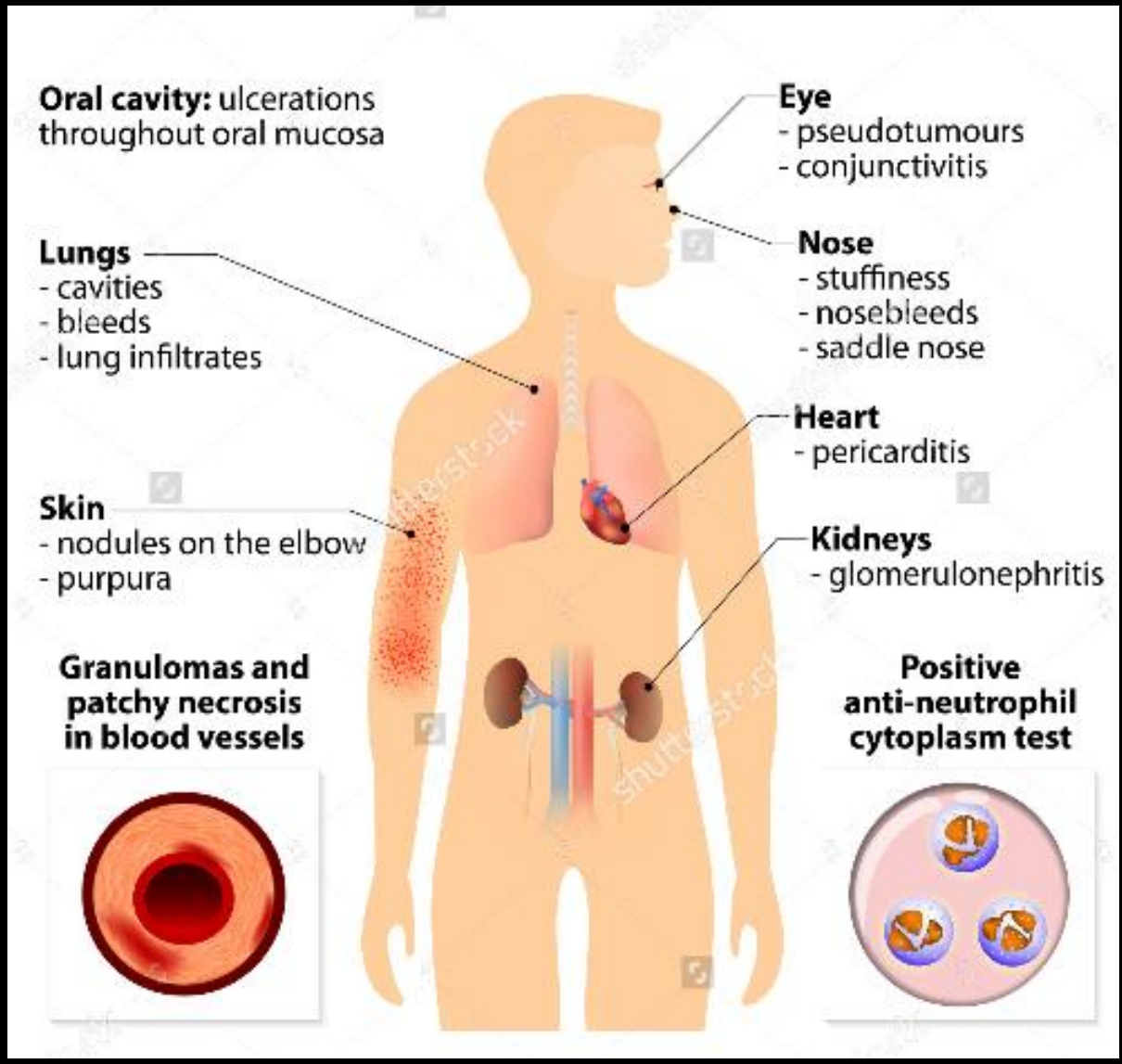


- Now the name "Wegener's granulomatosis" be changed to "Granulomatosis with polyangiitis"
- ANCA-associated vasculitides

Granulomatosis with Polyangiitis (GPA) (Wegener's Granulomatosis)



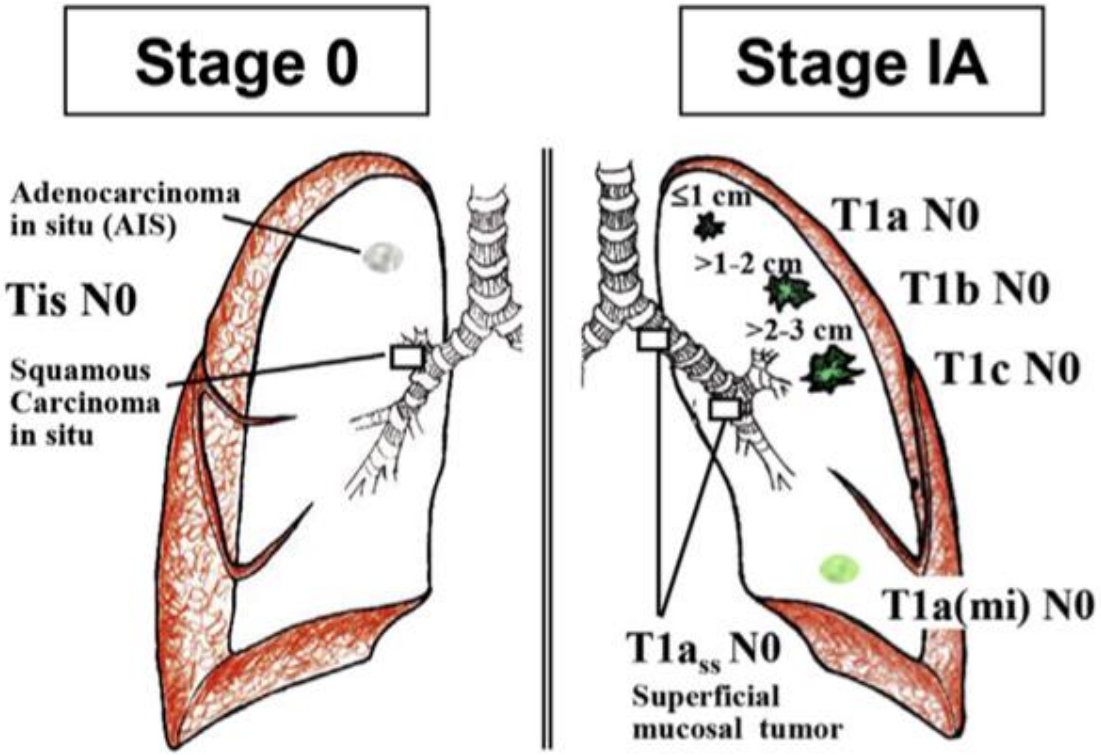




Lung cancer staging

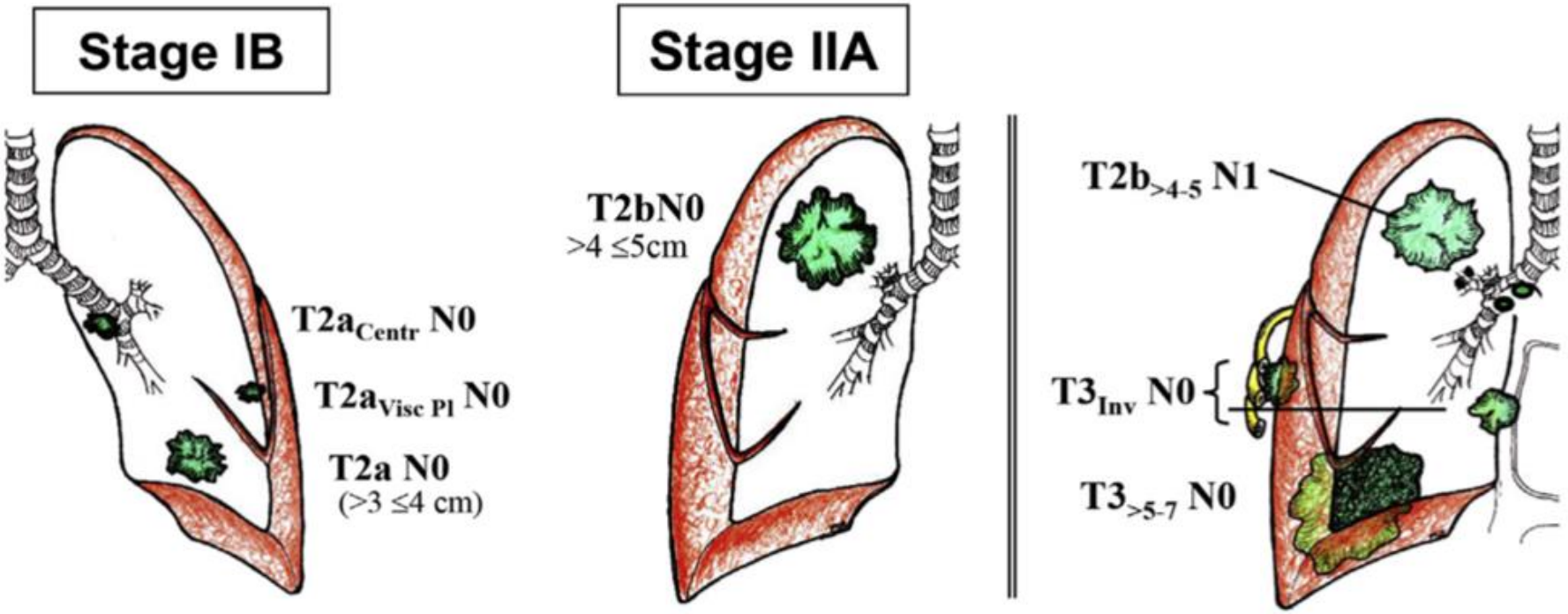
T1

- T1a ≦ 1 cm in longest axis
- T1b 1- ≦ 2 cm in longest axis
- T1c 2- ≦ 3 cm in longest axis

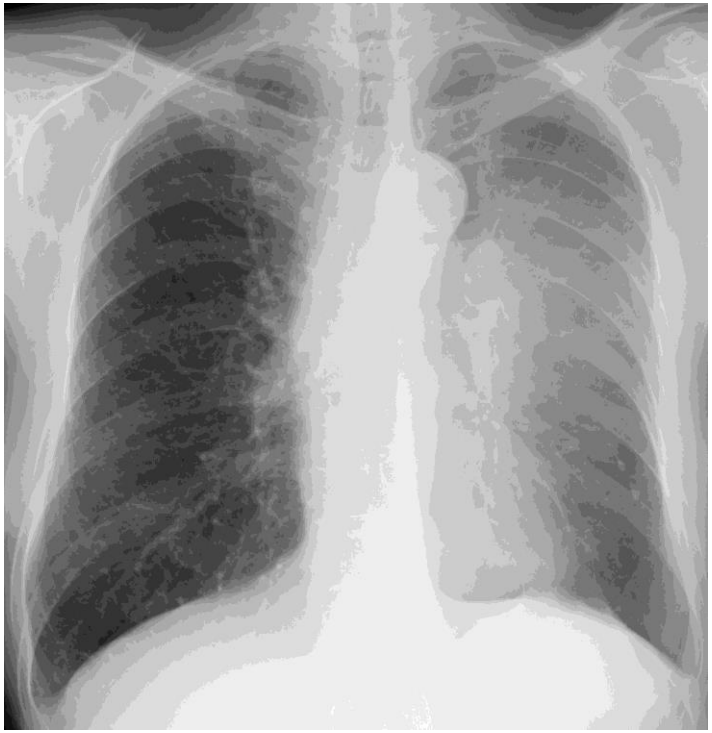


T2

- >3 cm to ≤5 cm in longest axis; involves main bronchus, visceral pleura, or atelectasis or obstructive pneumonitis extending to the hilum
  - T2a >3 cm to ≤4 cm in longest axis
  - T2b >4 cm to ≤5 cm in longest axis

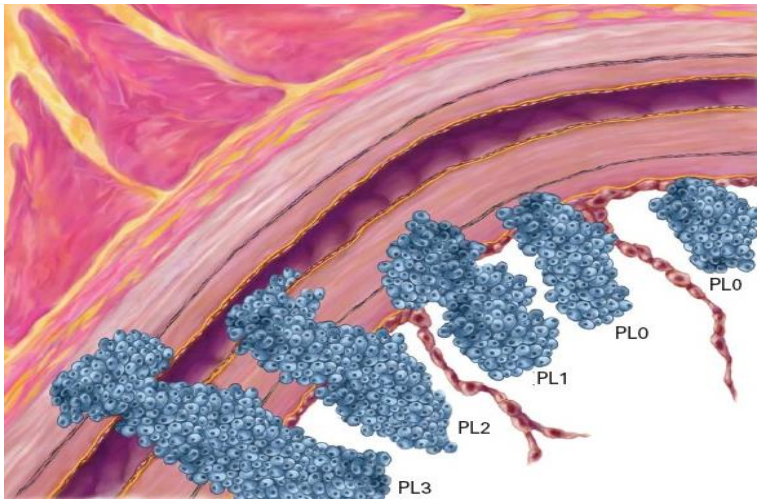


T2



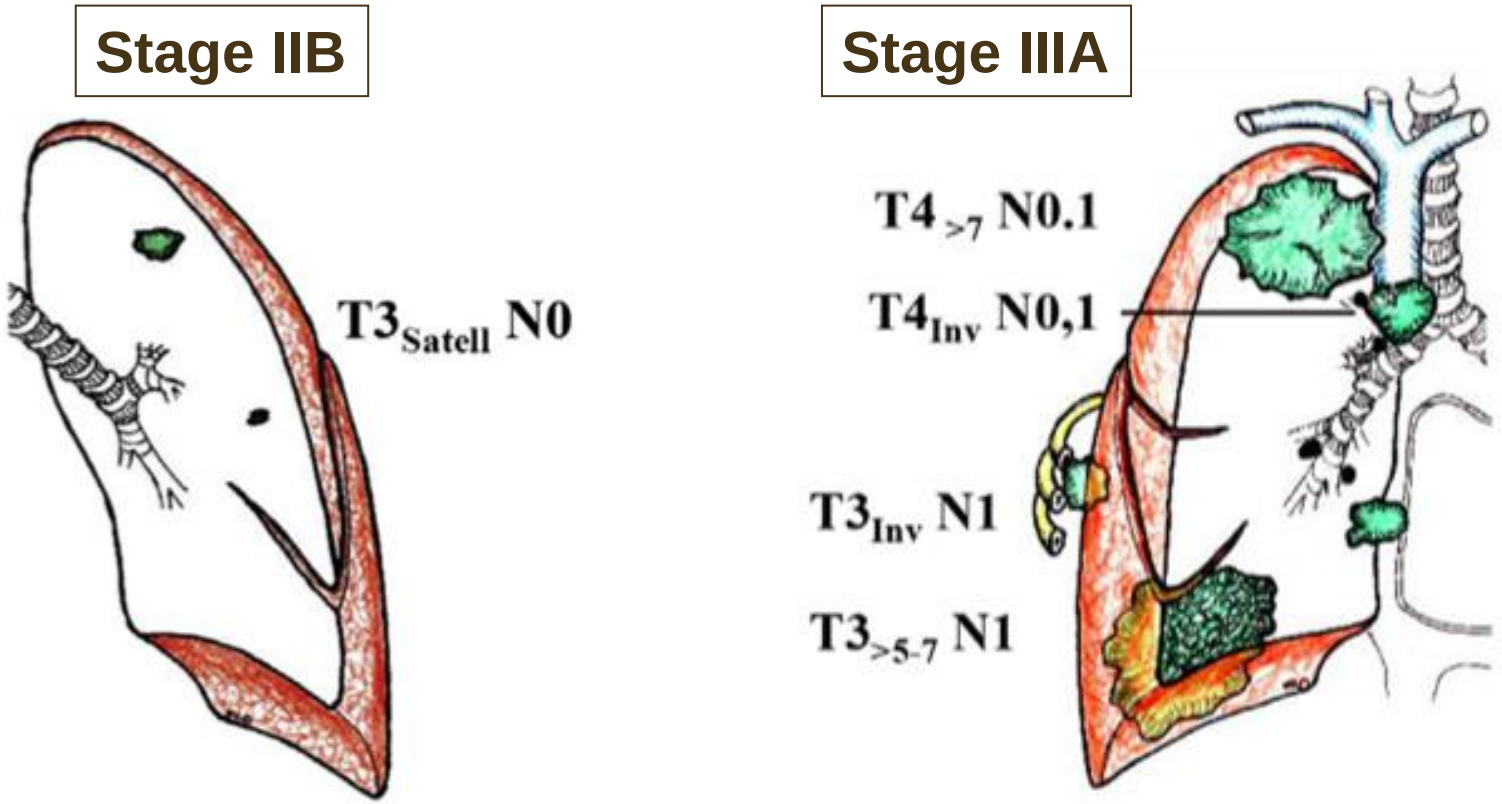
Lobar bronchus invasion, causing LUL collapse

Visceral pleural invasion

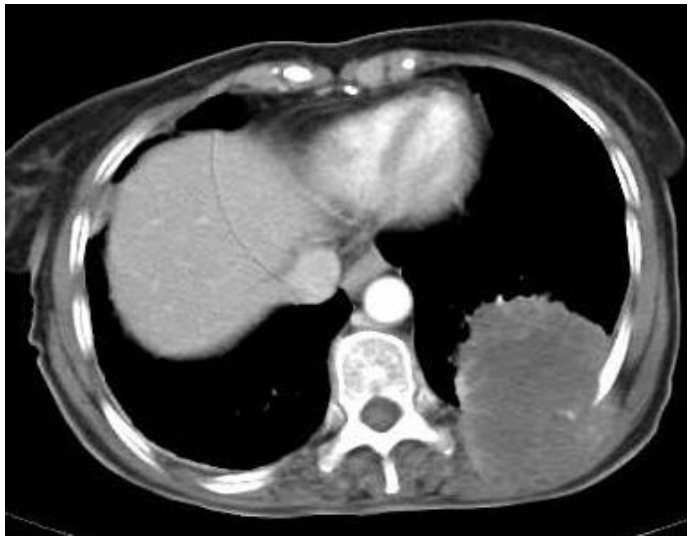


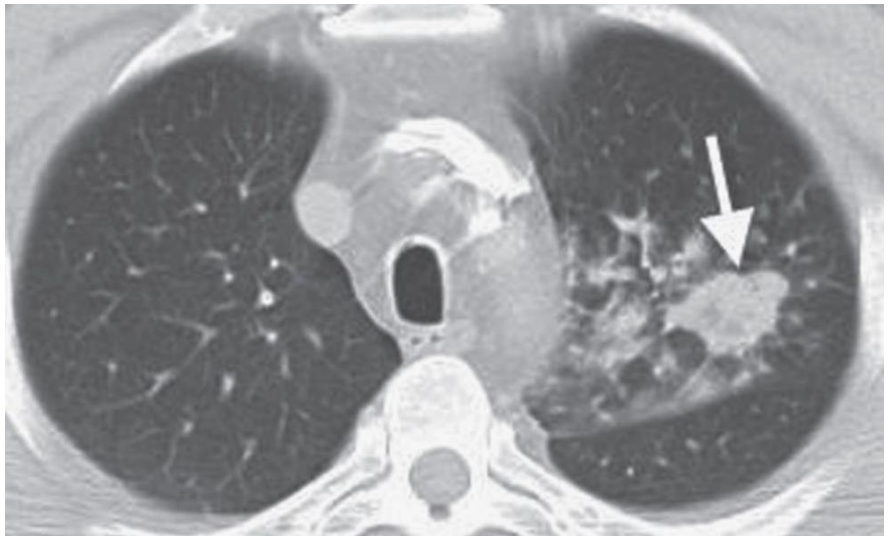
T3

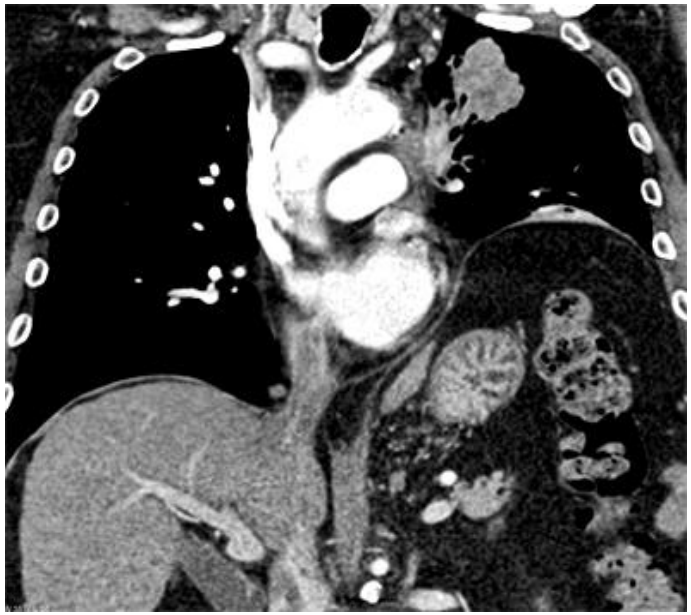
- >5 cm to ≤7 cm in longest axis; invades chest wall, phrenic nerve, or parietal pericardium; or nodule in same lobe as the primary tumor



T3

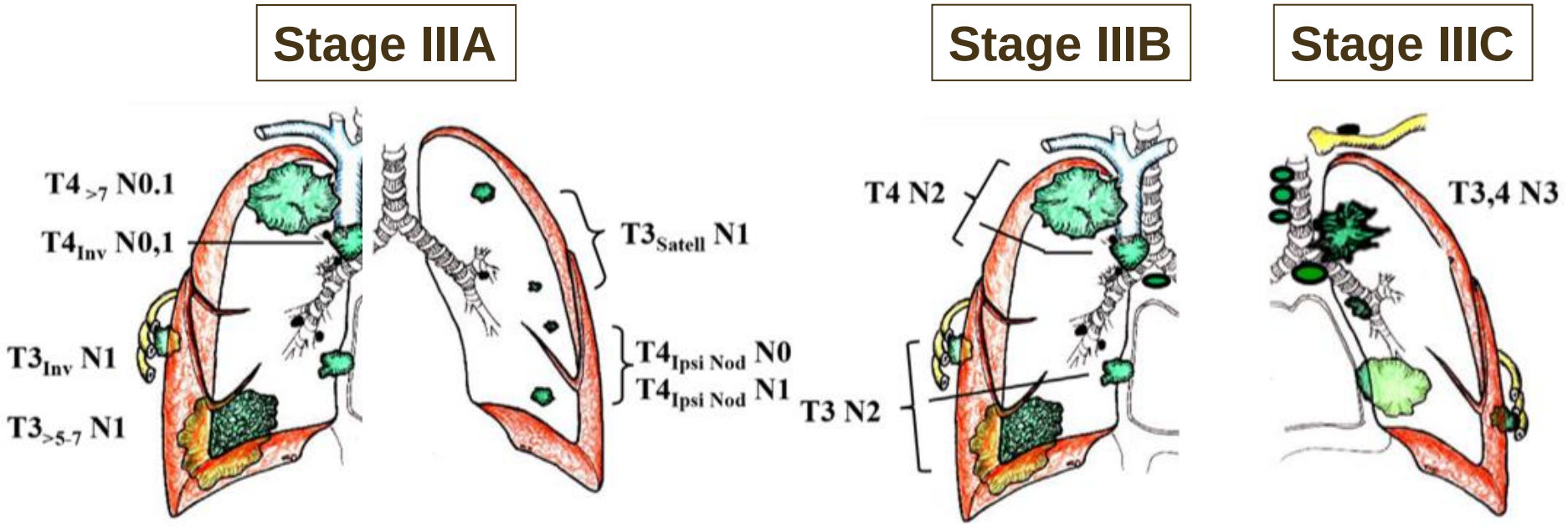




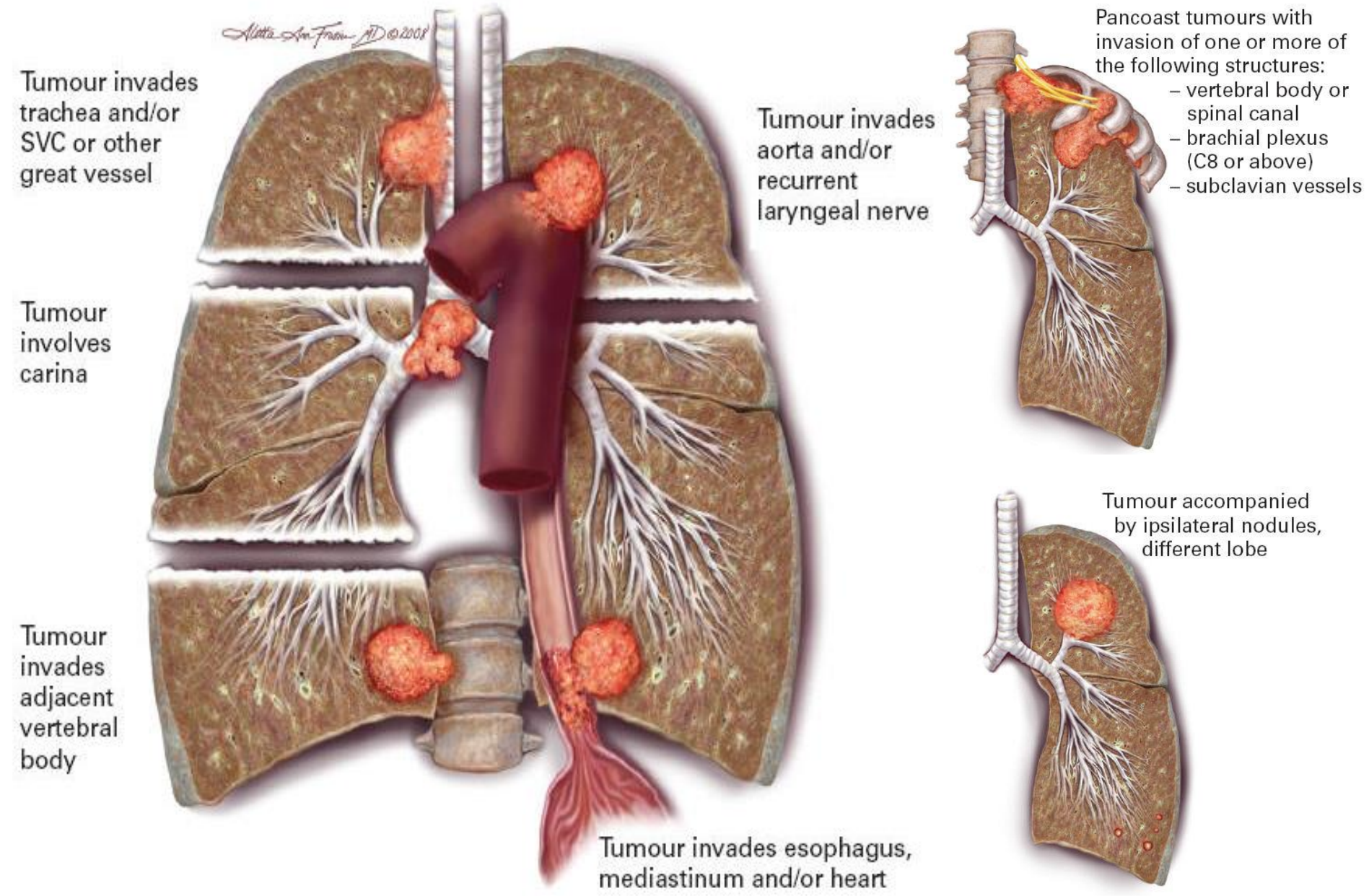


T4

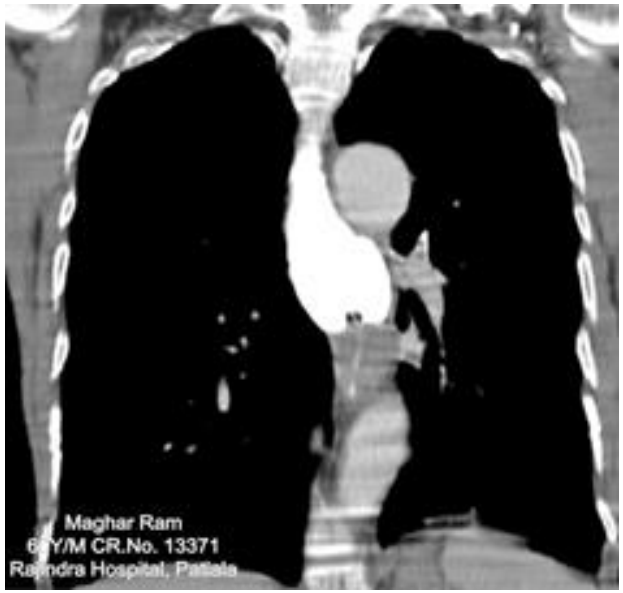
- >7 cm in longest axis; invades diaphragm, mediastinum, carina, trachea, heart, great vessels, recurrent laryngeal nerve, esophagus, or vertebral body; nodule in different ipsilateral

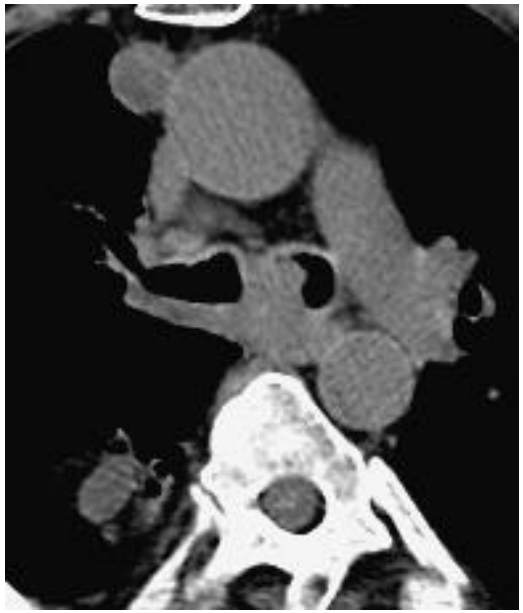


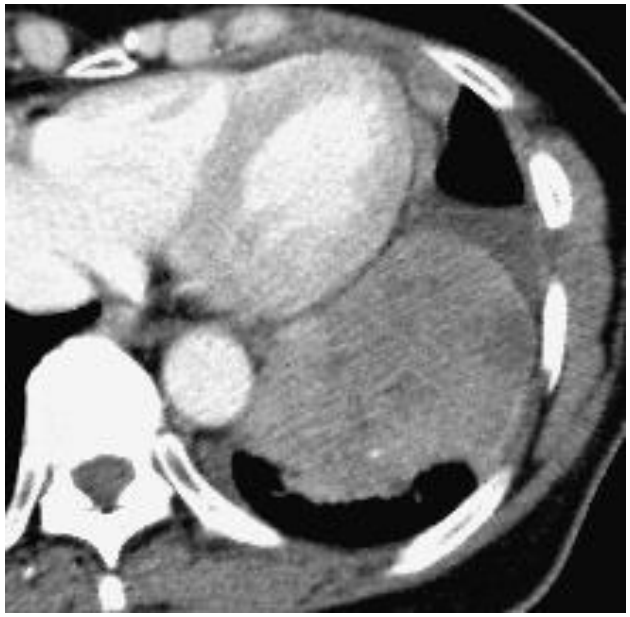
T4


Tumour invades trachea and/or SVC or other great vessel
Tumour involves carina
Tumour invades adjacent vertebral body
Tumour invades aorta and/or recurrent laryngeal nerve
Pancoast tumours with invasion of one or more of the following structures:
– vertebral body or spinal canal
– brachial plexus (C8 or above)
– subclavian vessels
Tumour accompanied by ipsilateral nodules, different lobe
Tumour invades esophagus, mediastinum and/or heart

T4







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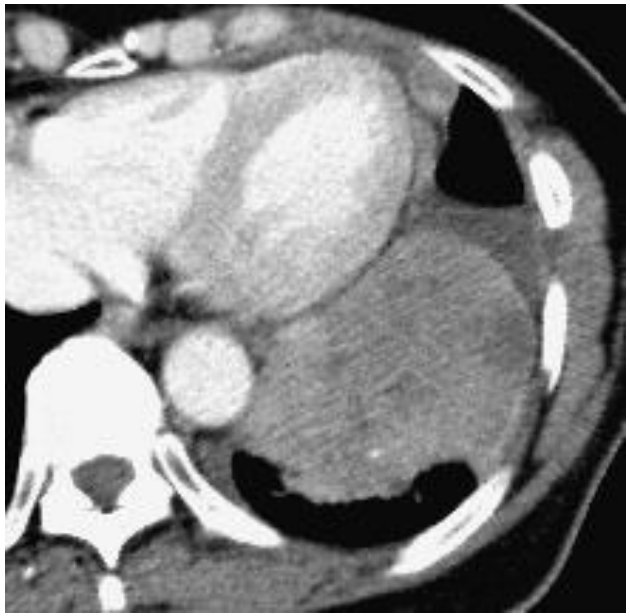
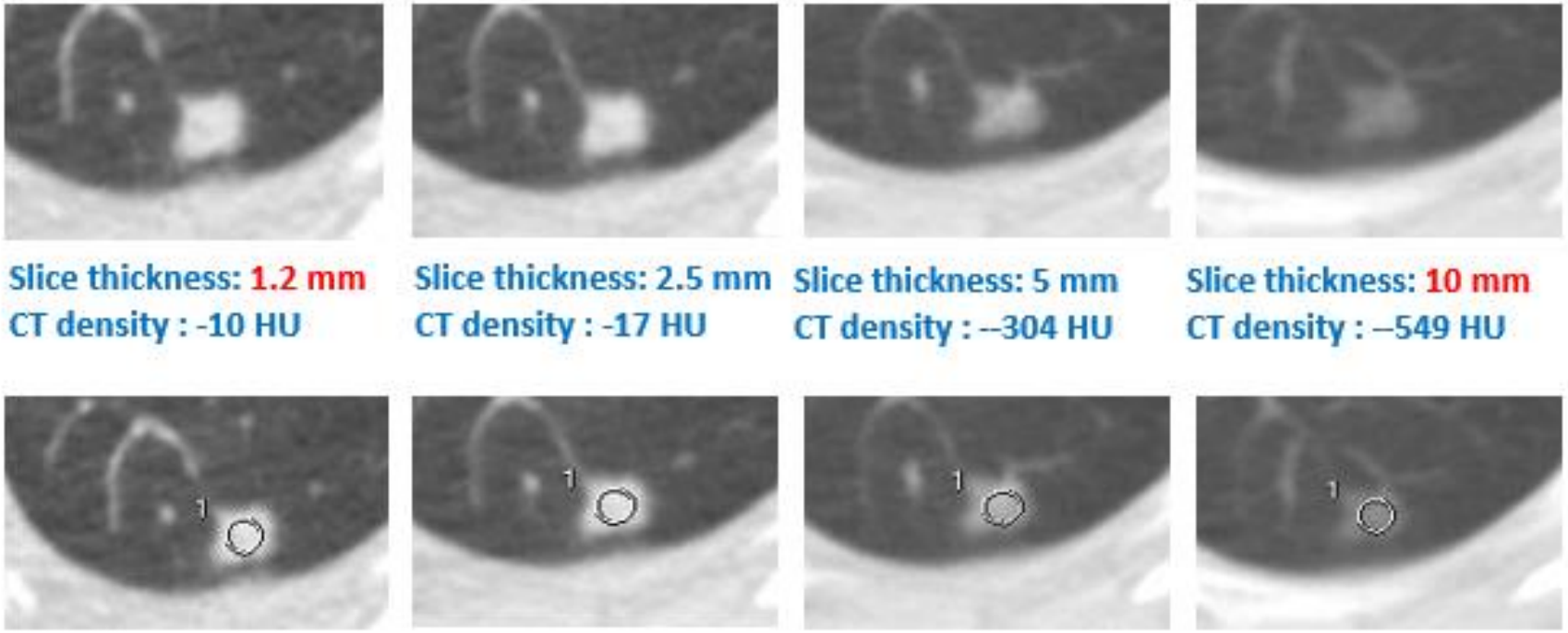
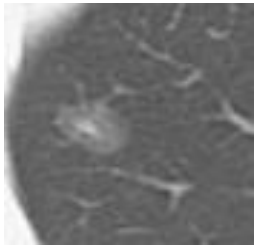


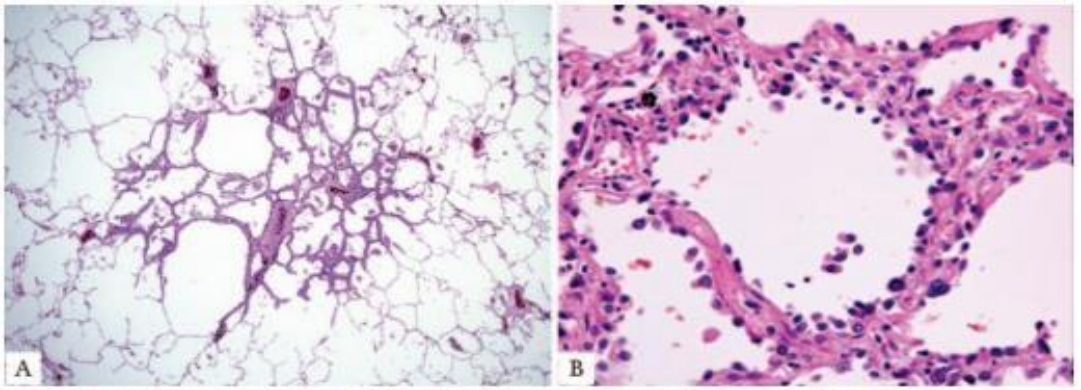
CT density of solid nodule with different slice thickness



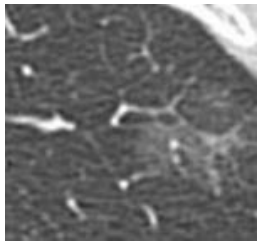
低倍　　高倍

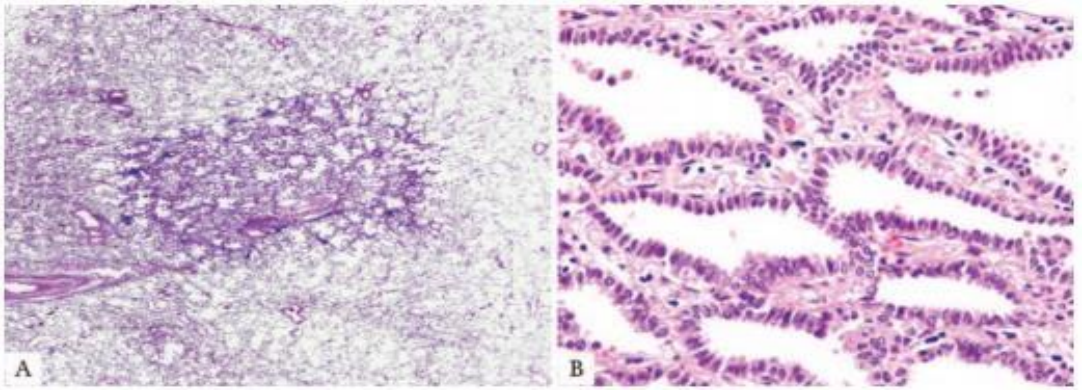
非典型腺瘤增生 (AAH)
Atypical adenomatous hyperplasia



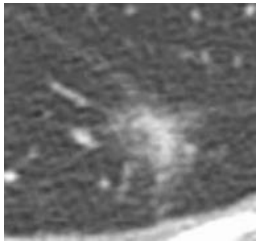


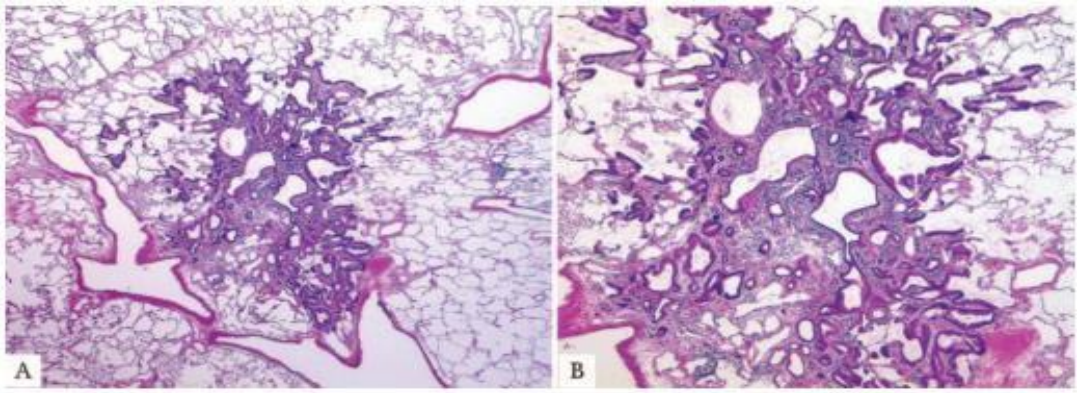
原位癌 (AIS)
Adenocacinoma in situ



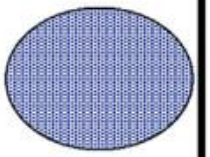
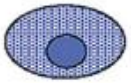
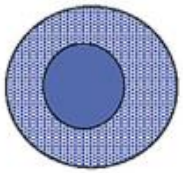
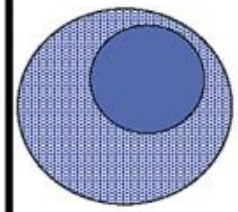
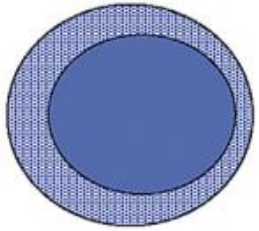


微浸潤腺癌 (MIA)
Minimally Invasive adenocarcinoma



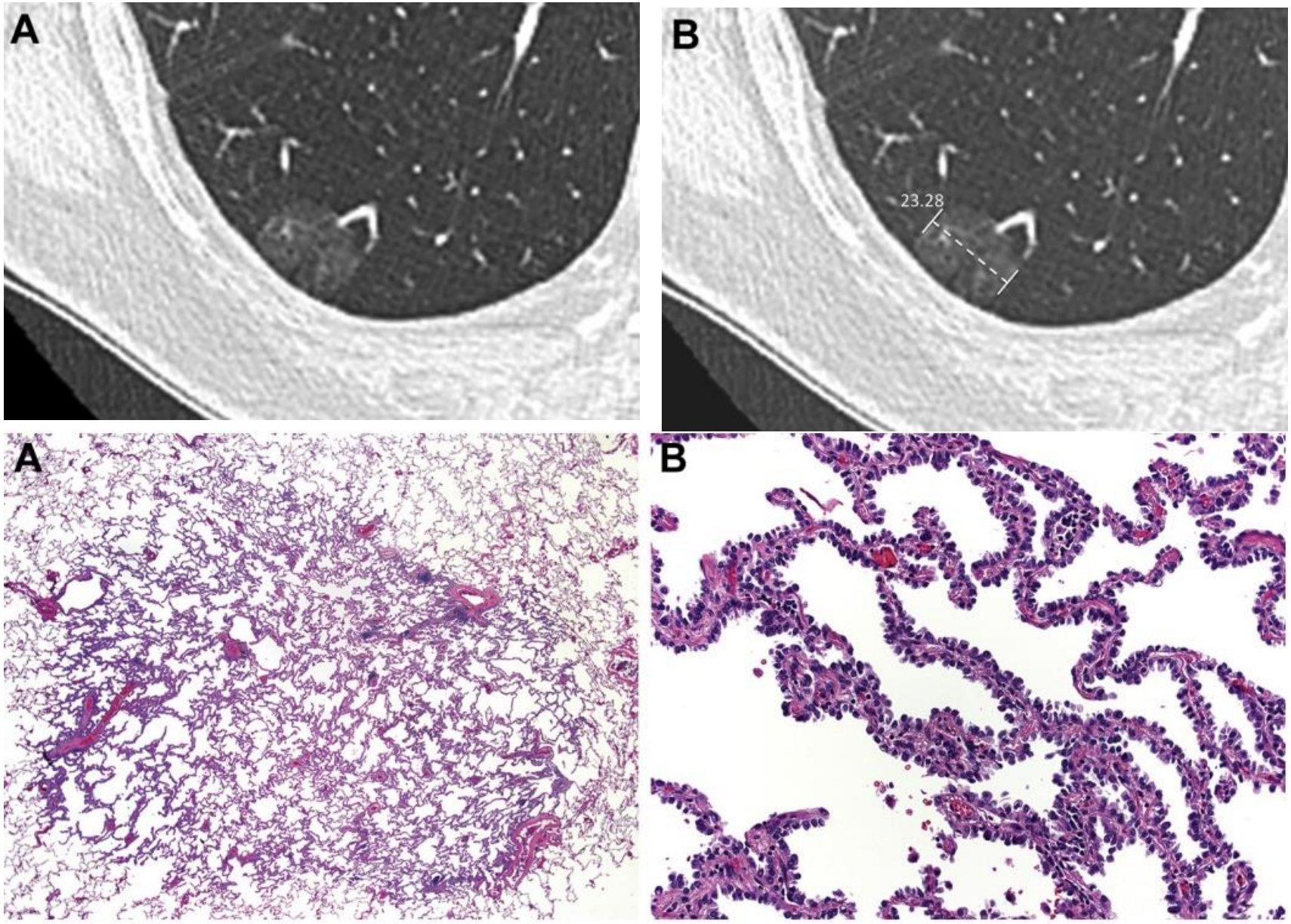


Assessment of tumor size in Part-solid tumors

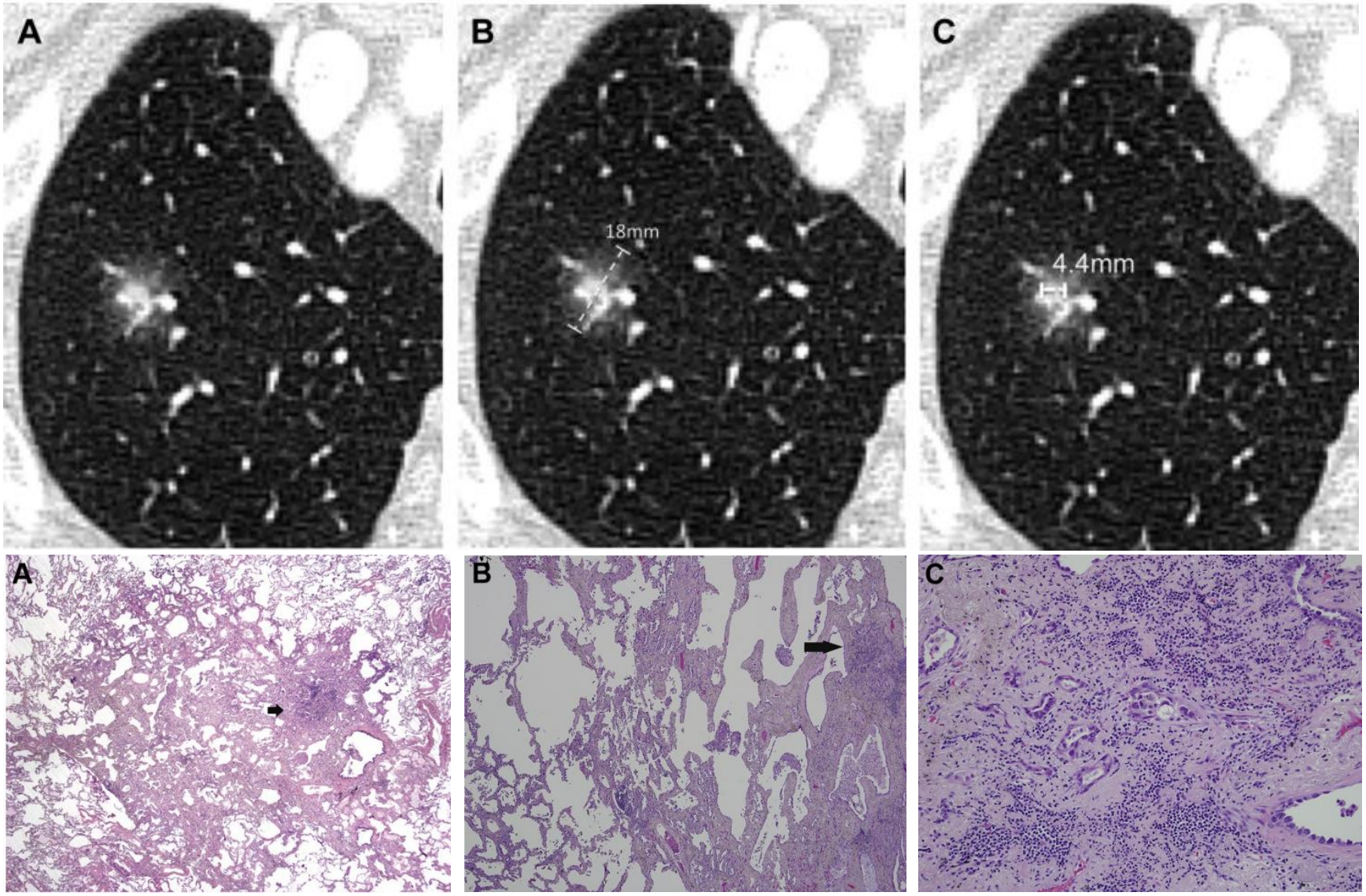
cT*	CT image on HRCT						
	Solid part	0 cm	0 cm	≤0.5 cm†	0.6-1.0 cm†	1.1-2.0 cm†	2.1-3.0 cm†
	Total tumor size including GG	≤0.5 cm	0.6-3.0 cm‡‡	≤3.0 cm‡‡	0..6-3.0 cm††	1.1-3.0 cm††	2.1-3.0 cm††
	Pathologic Differential Diagnosis	AAH‡, AIS, MIA	AIS, MIA, LPA	MIA, LPA, AIS	LPA, Invasive AD, MIA	LPA, Invasive AD	Invasive AD
	Clinical Stage*		cTis‡‡	cT1mi‡‡	cT1a	cT1b	cT1c
pT	Invasive part	0 cm	0 cm	≤0.5 cm‡‡	0.6-1.0 cm†	1.1-2.0 cm†	2.1-3.0 cm†
	Total tumor size including lepidic growth part	Usually ≤0.5 cm‡	≤3.0 cm‡‡	≤3.0 cm‡‡	0.6-3.0 cm††	1.1-3.0 cm††	2.1-3.0 cm††
	Pathology	AAH	AIS	MIA	Lepidic predominant AD or Invasive AD with lepidic compnent	Invasive AD with a lepidic component or lepidic predominant AD	Invasive AD with lepidic component
	Pathologic Stage		pTis‡‡	pT1mi‡‡	pT1a	pT1b	pT1c

J.Thor Onco, Aug,2016,11(8):1204-1223

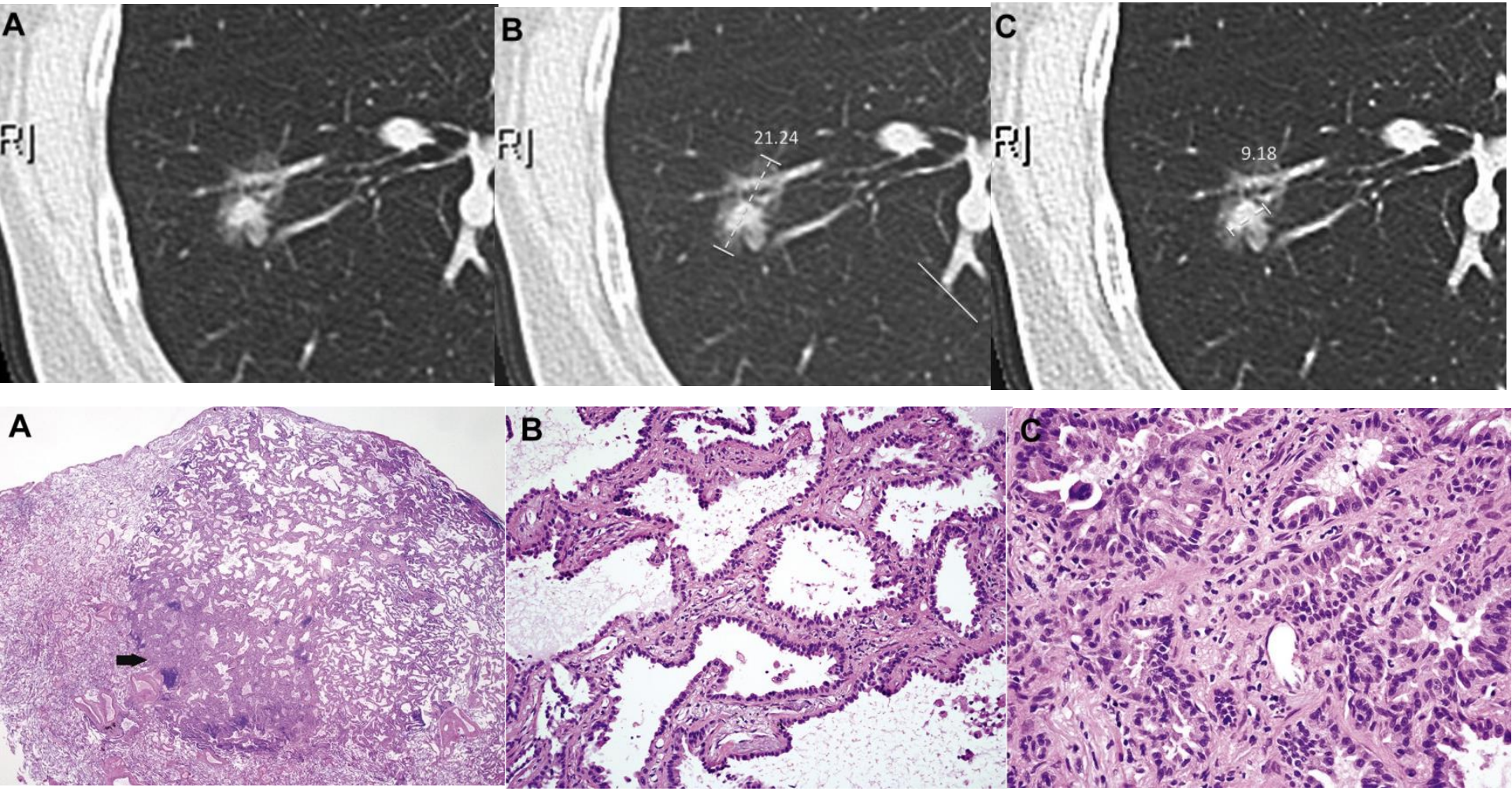
Adenocarcinoma in situ



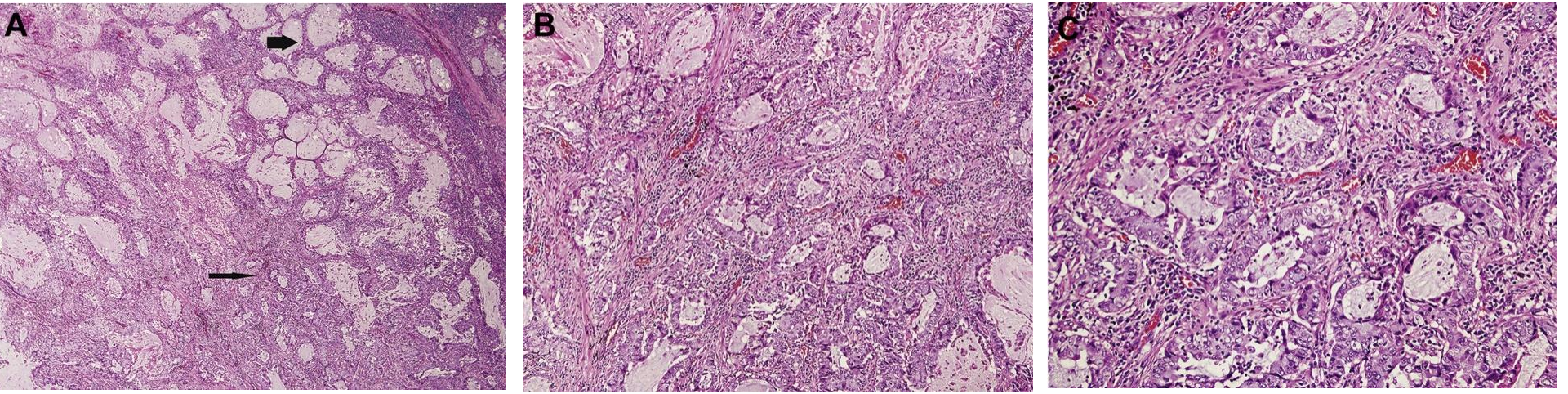
Minimally invasive adenocarcinoma



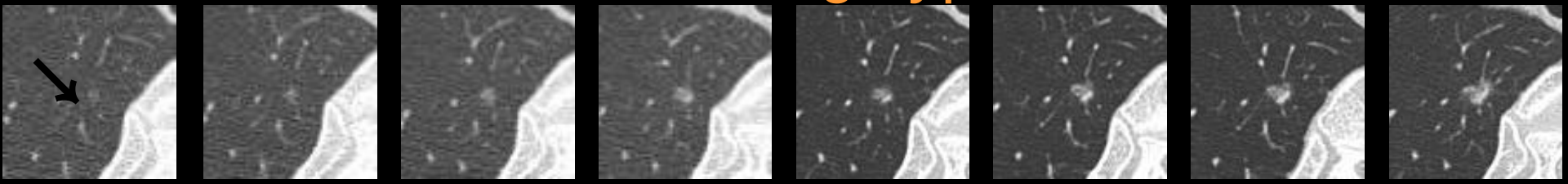
Lepidic predominant adenocarcinoma



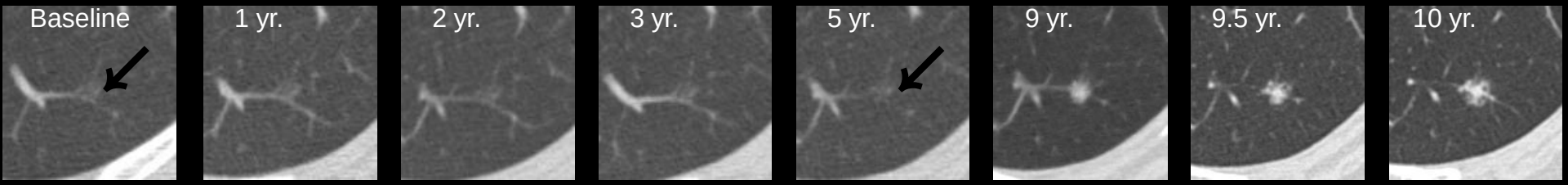
Invasive adenocarcinoma



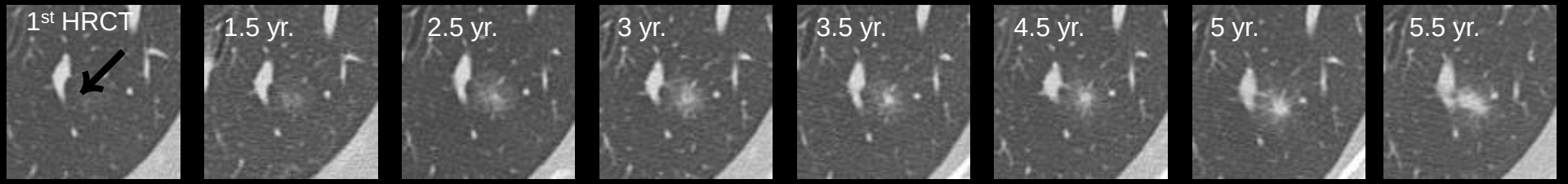
Increasing Type



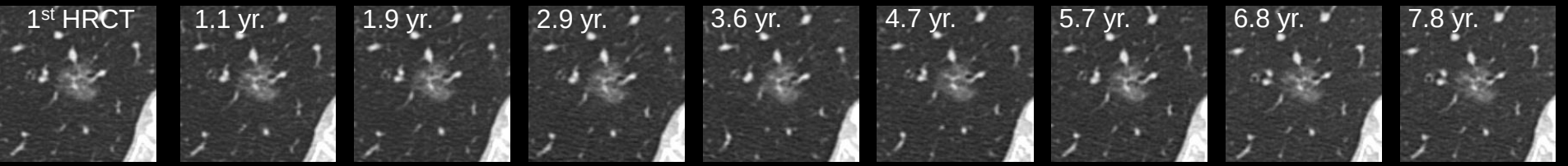
Sudden Onset Type



Fluctuation type

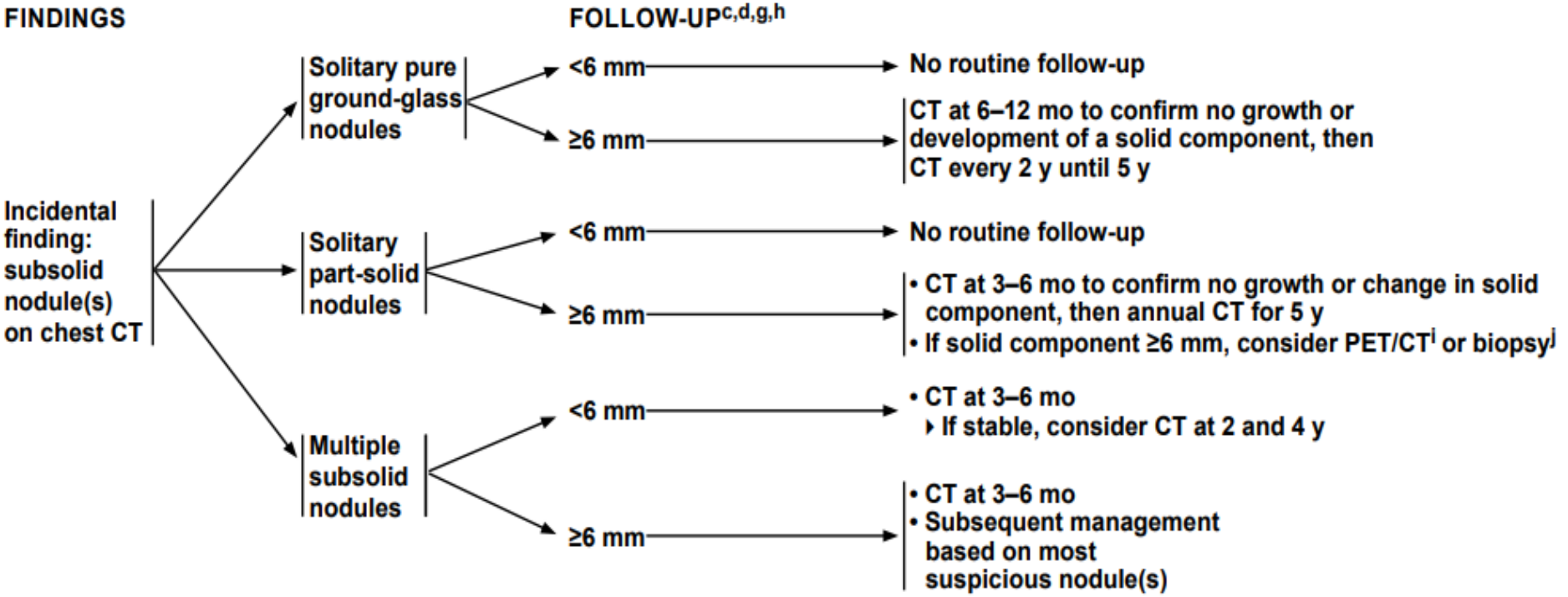


Stable type



National Comprehensive Cancer Network®

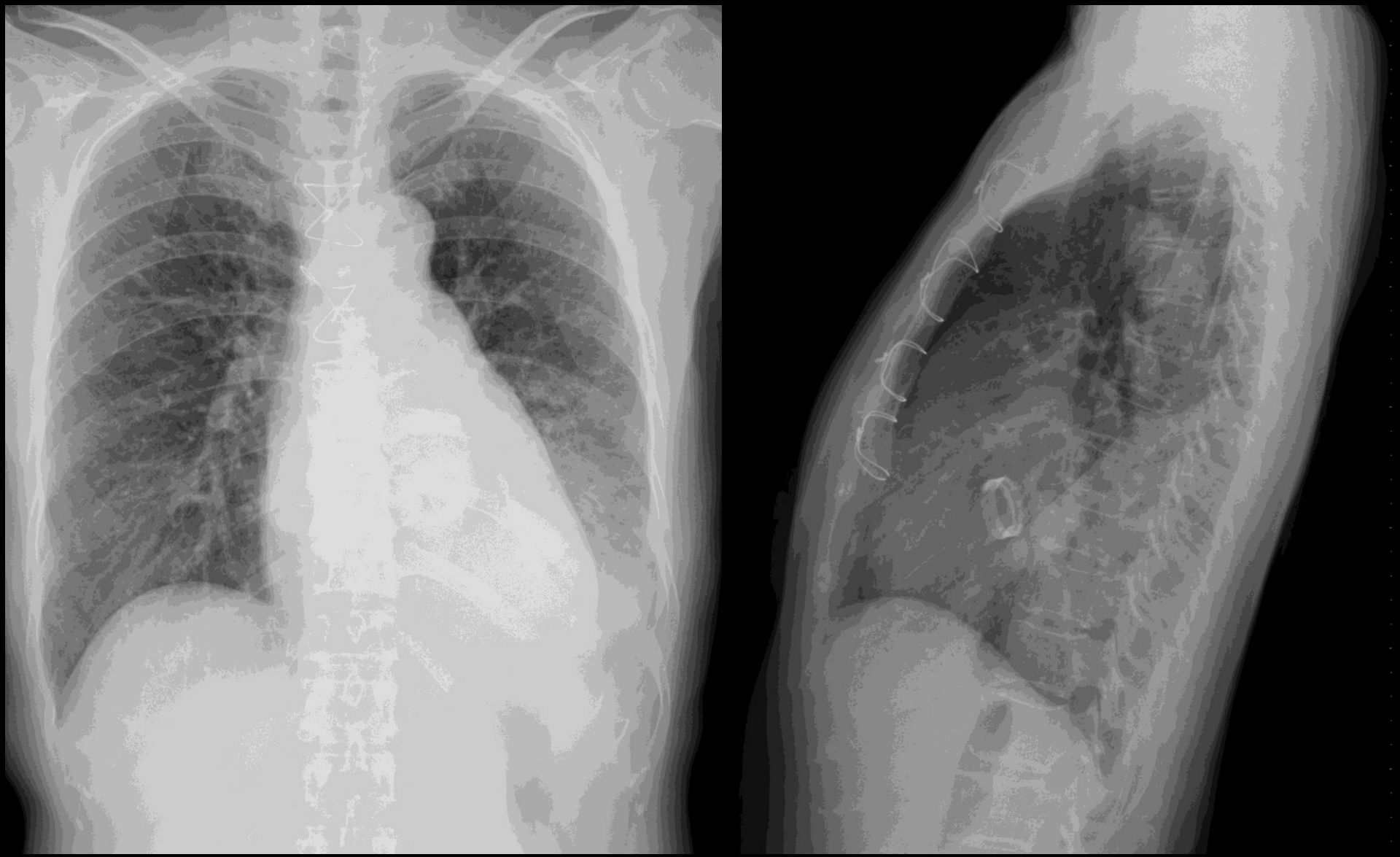
NCCN Guidelines Version 3.2022
Non-Small Cell Lung Cancer



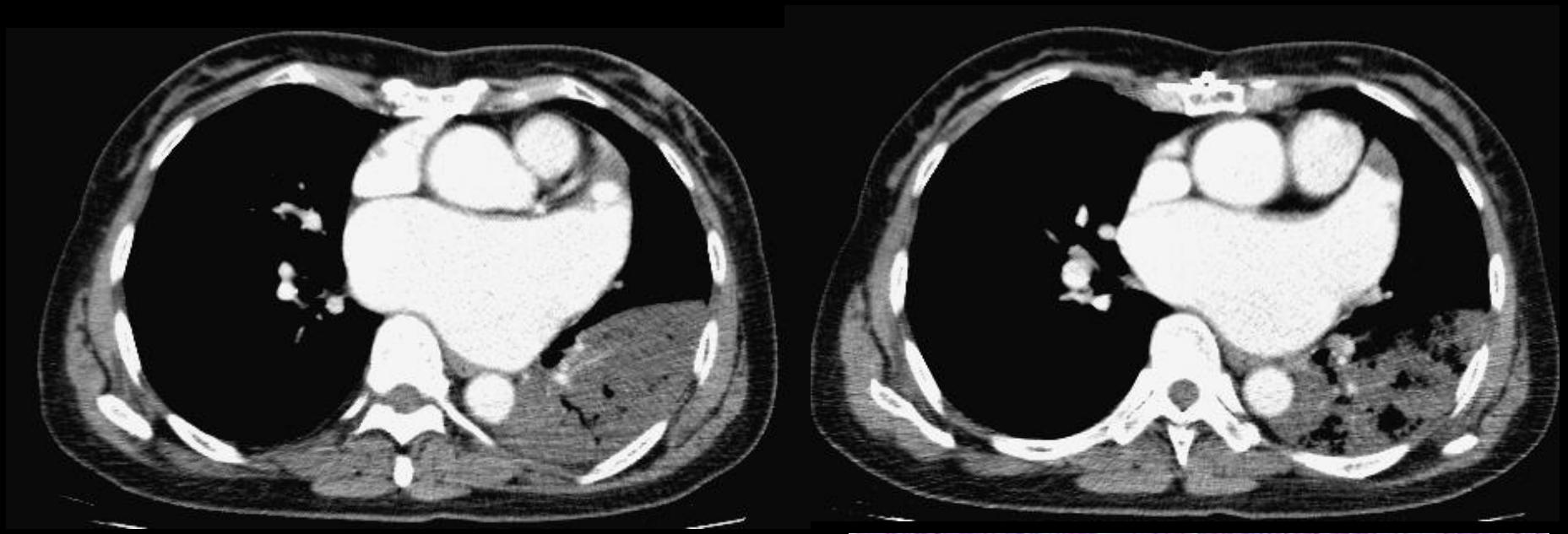
Summary of CT measurement recommendations

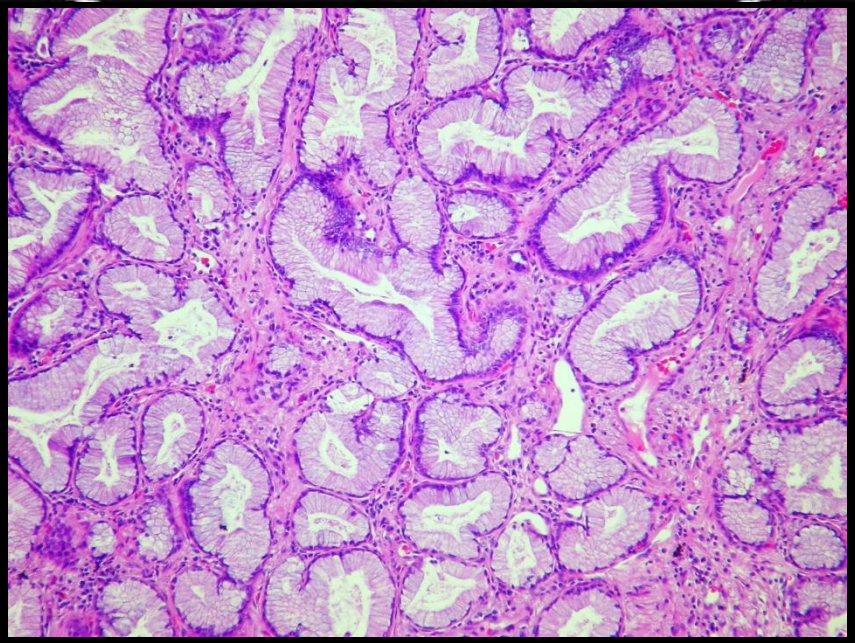
- Use contiguous 1-mm sections
- Use a lung window setting with a sharp filter
- Record nodule dimensions to the nearest millimeter
- For solid and pure ground glass nodules, record both long and short dimensions on the image that shows the greatest average dimension. For staging purposes, only the long axis dimension is used.
- For part-solid nodules, measure the long and short axis dimensions as stated, but also measure the long axis of the largest solid component.
- For staging purposes, only the long axis dimension of the solid component is used.

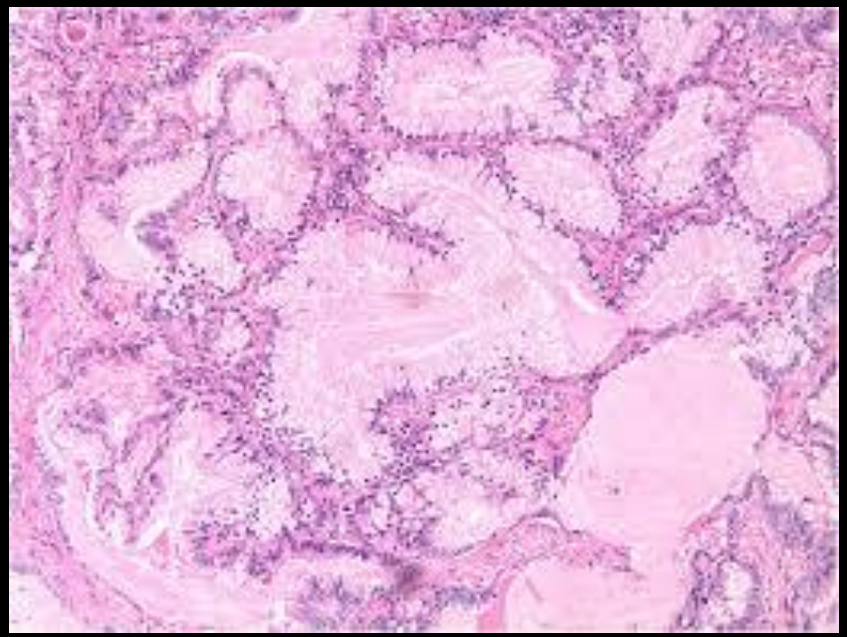
Invasive mucinous adenocarcinoma



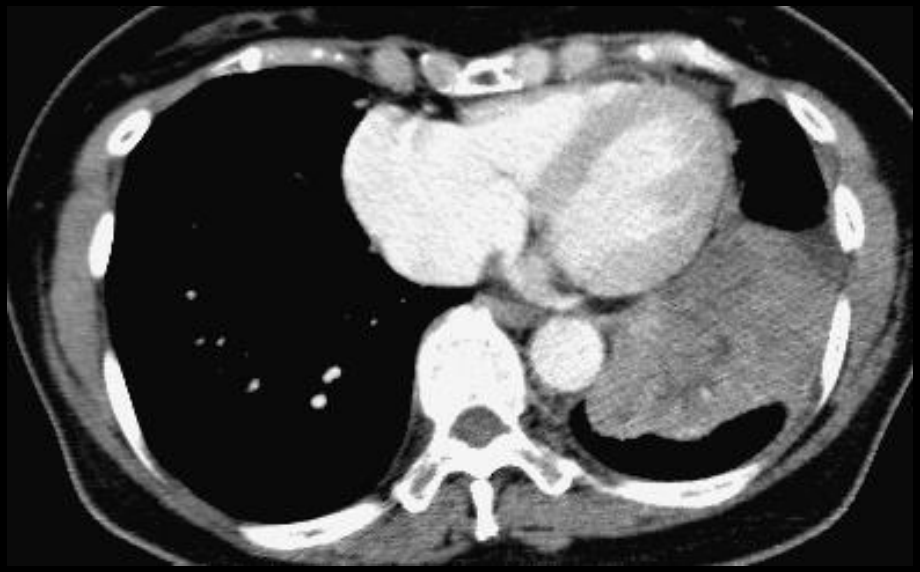
Invasive mucinous adenocarcinoma

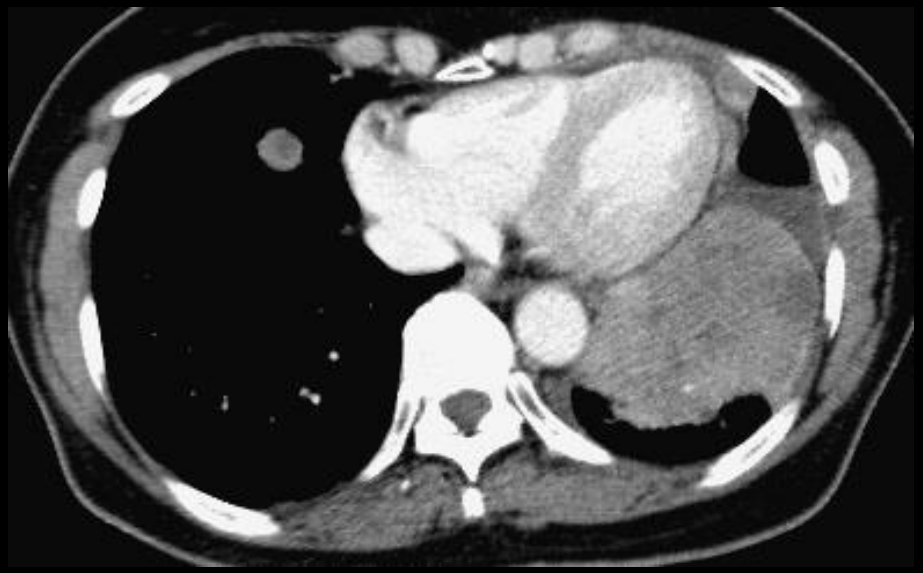






Invasive mucinous adenocarcinoma

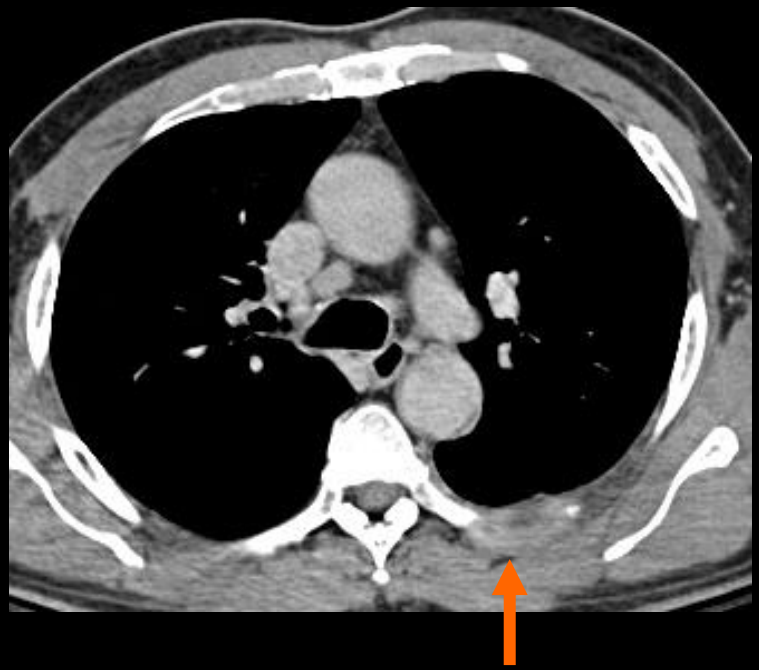




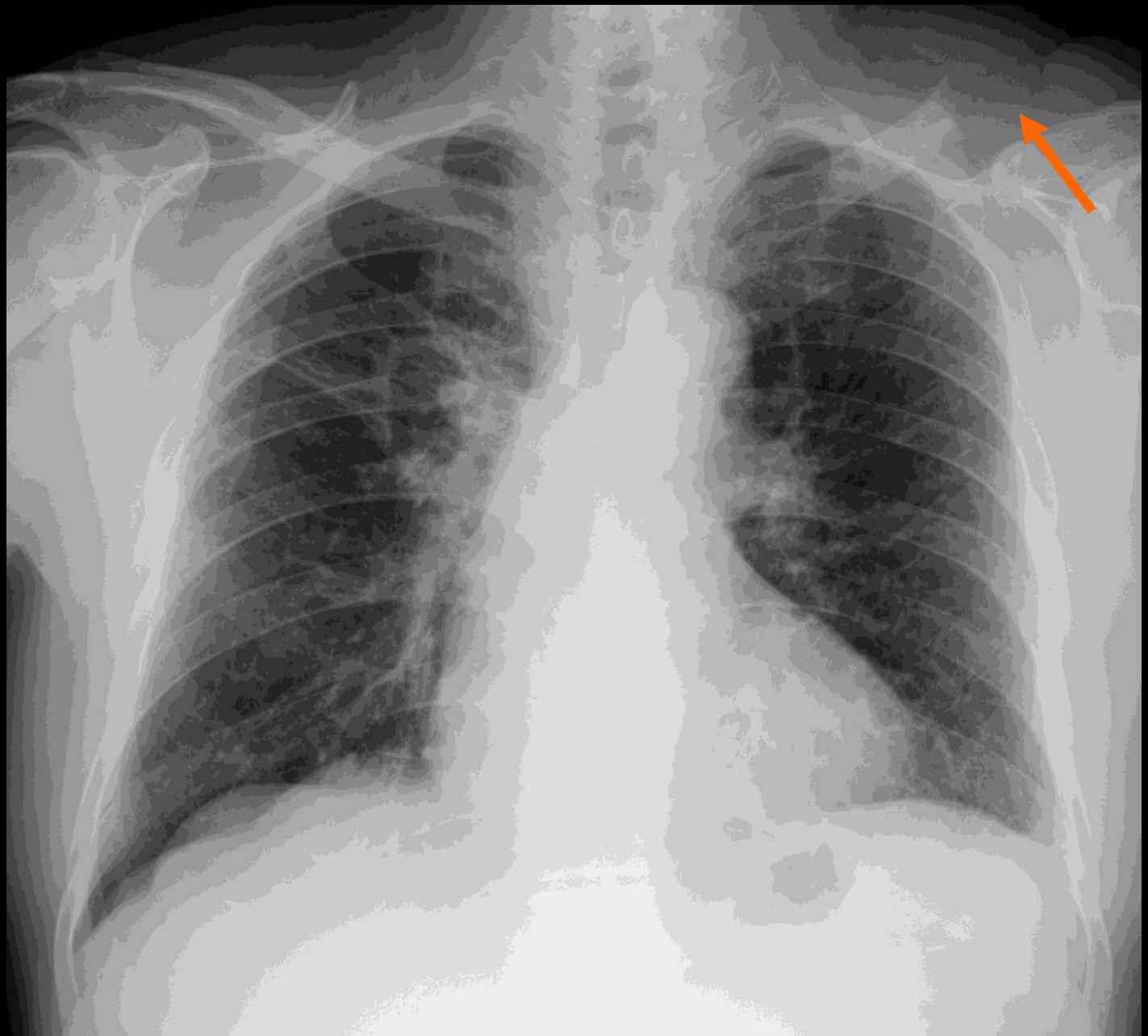
- “pneumonic” type cancer, intrapulmonary metastasis
- bronchorrhea
- *KRAS* mutations the most common type of oncogenic driver mutations. *KRAS* G12D mutations are the most common subtype , followed by G12V, G12C, and G12A mutations.
- *BRAF, ERBB2, NRG1* have also been observed

Additional findings

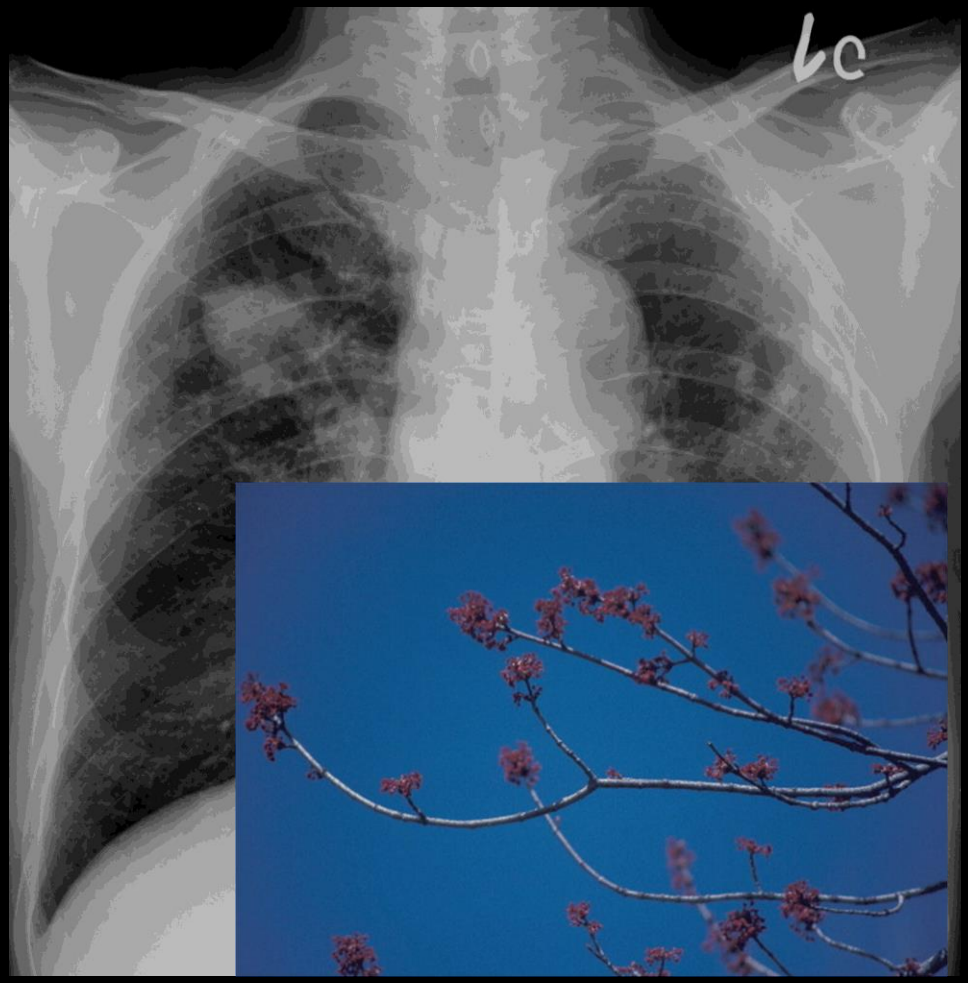
Lung cancer with Lt 6th rib metastasis

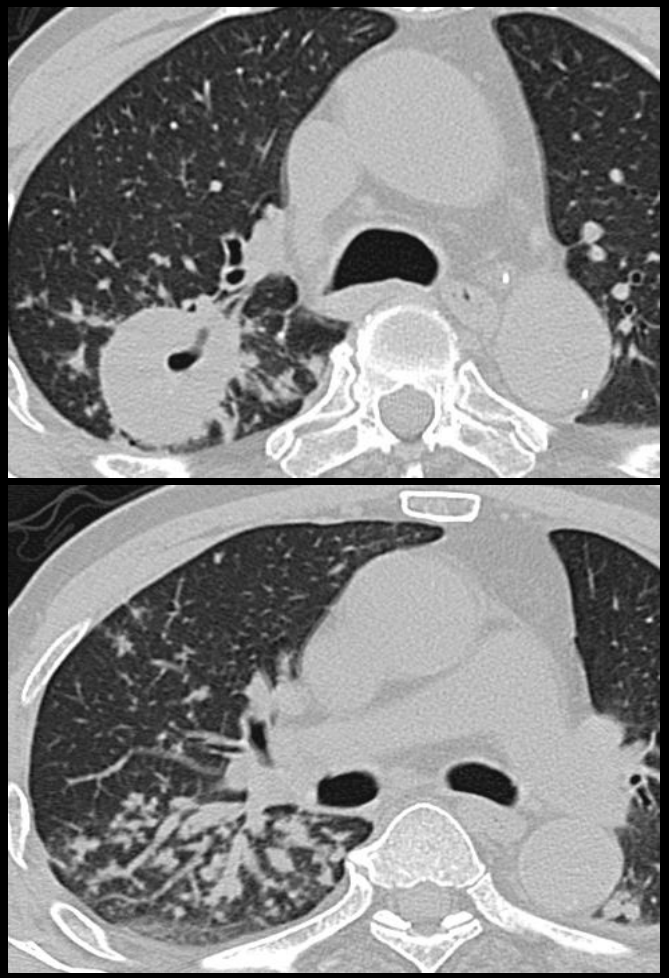


Lung cancer with Lt clavicle metastasis



Pulmonary tuberculosis

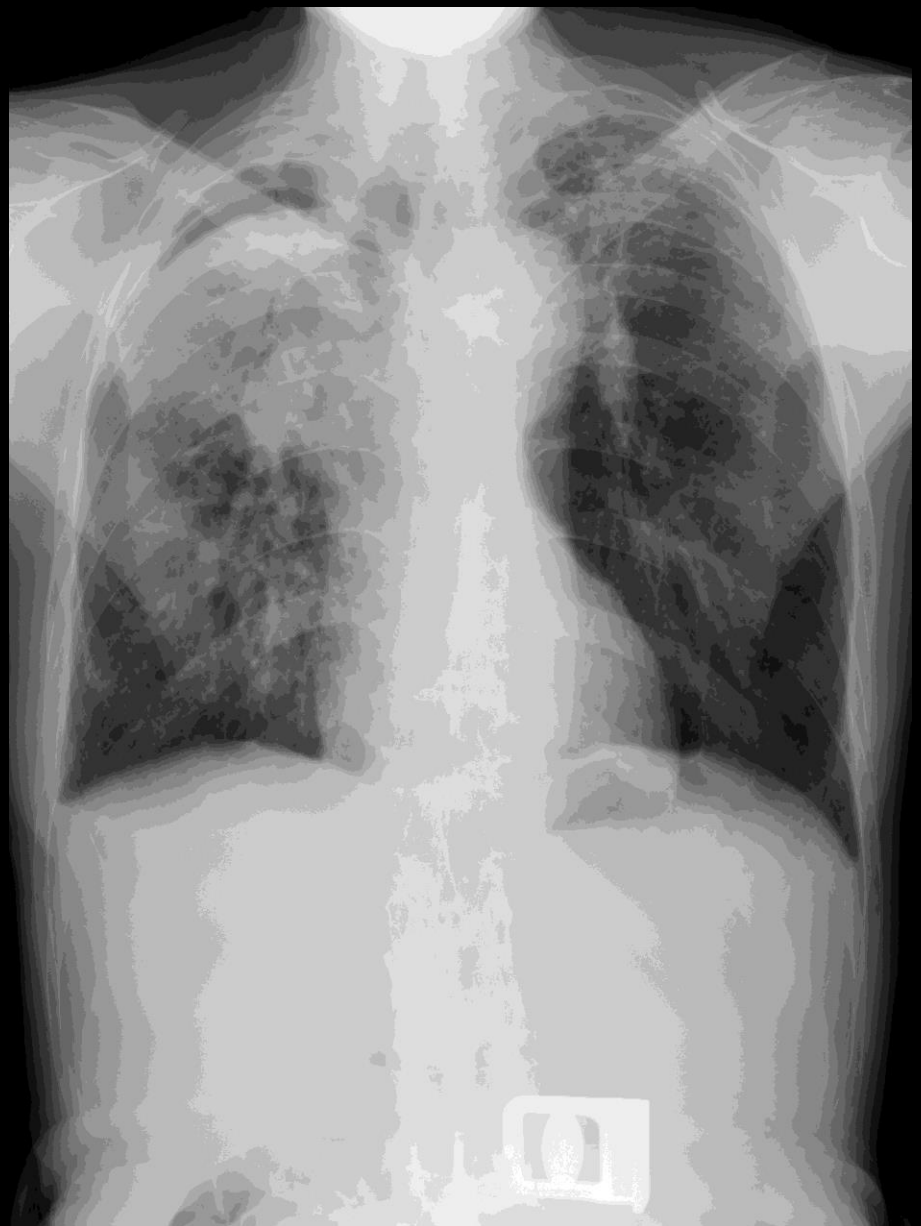


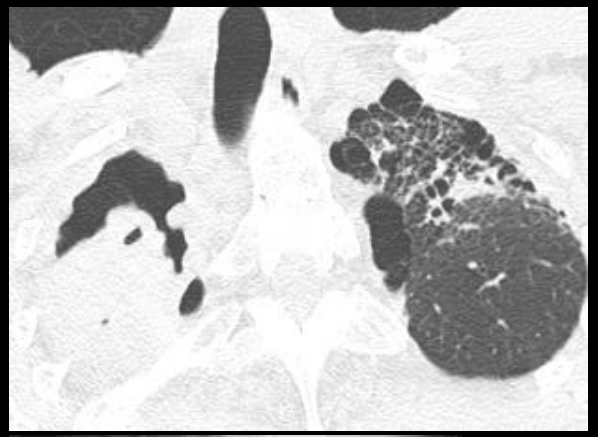


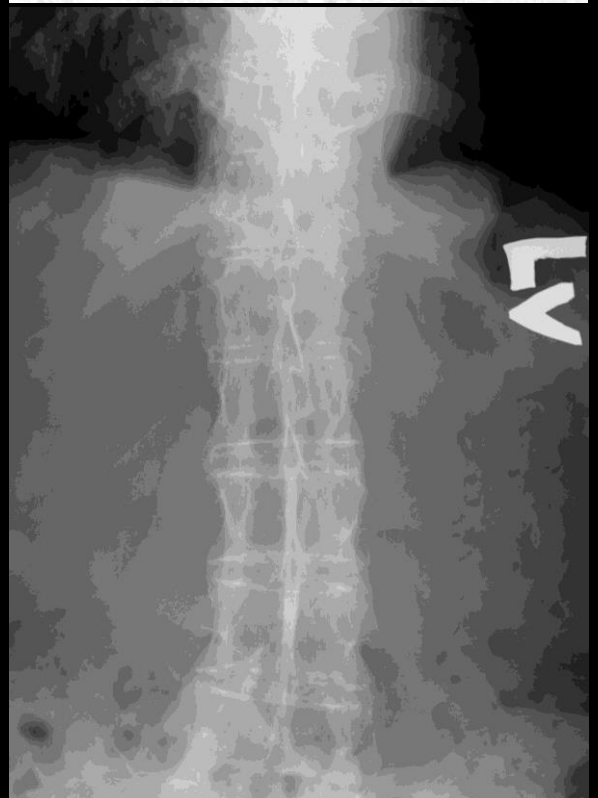
- Drainage bronchus
- Tree-in-bud lesion and rosette lesion

Ankylosing spondylitis

with pulmonary apical fibrocystic disease and mycetoma







謝謝聆聽