전공의 1년차가 알아야할 흉부 영상

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많이 사용하는 영상

- Chest X-ray
- Chest CT, Abdomen CT
- PET
- MRI
- Esophagography

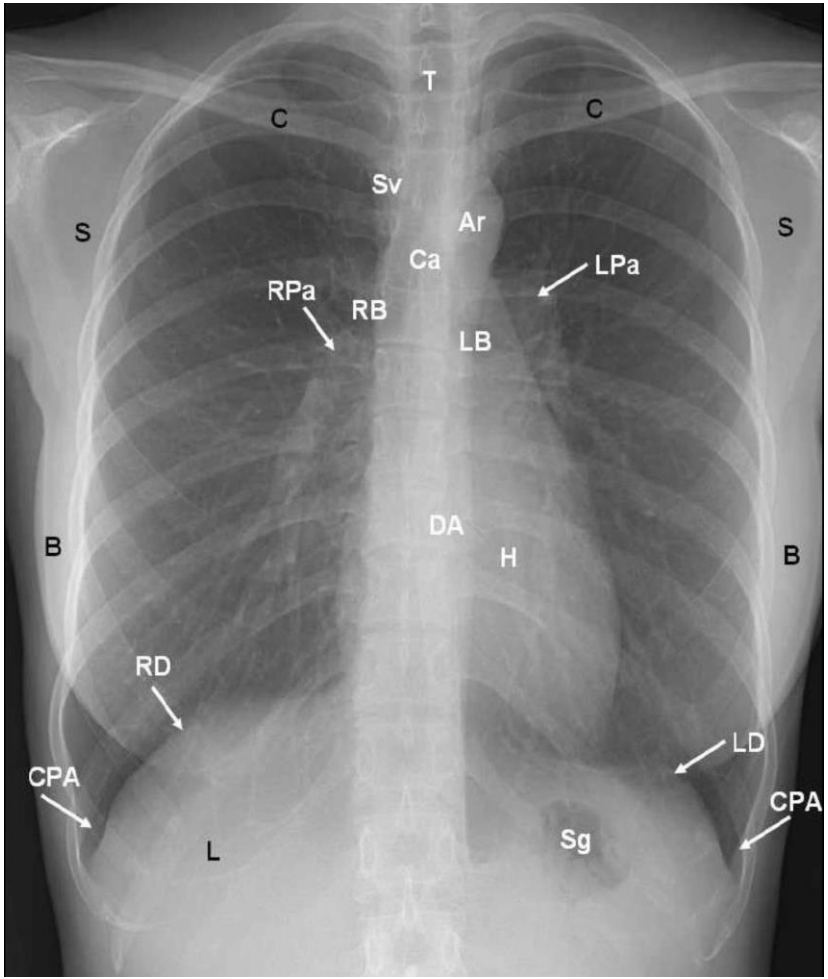
- Bed-side Ultrasound

Chest X-ray

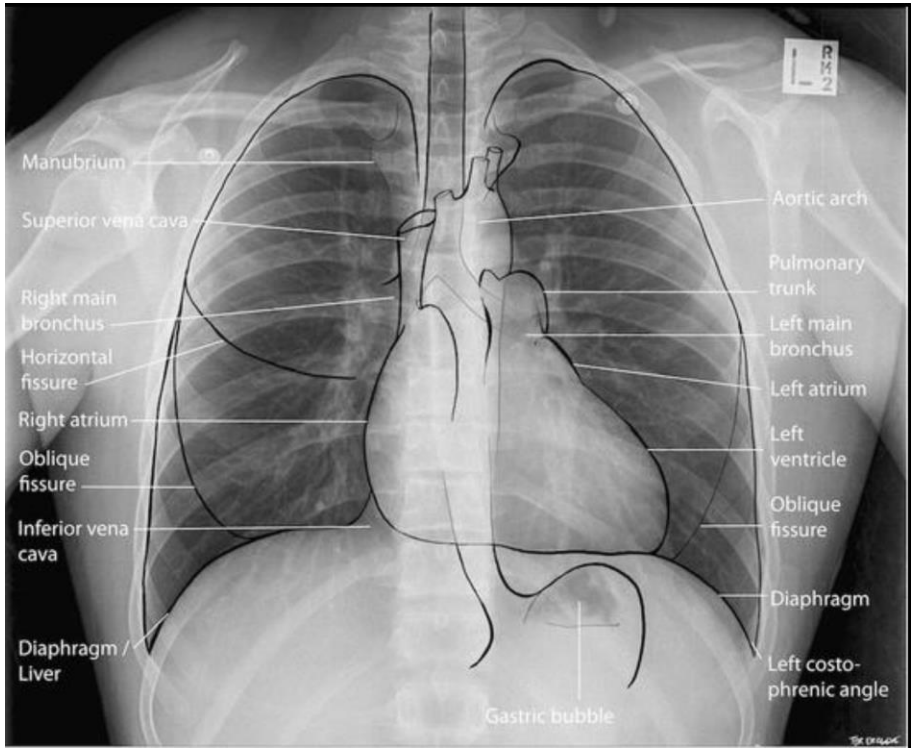
- Pneumothorax, pleural effusion
- Atelectasis
- Infiltration
- Mass
- Rib fracture
- Central line, C Tube , L tube, intubation tube……

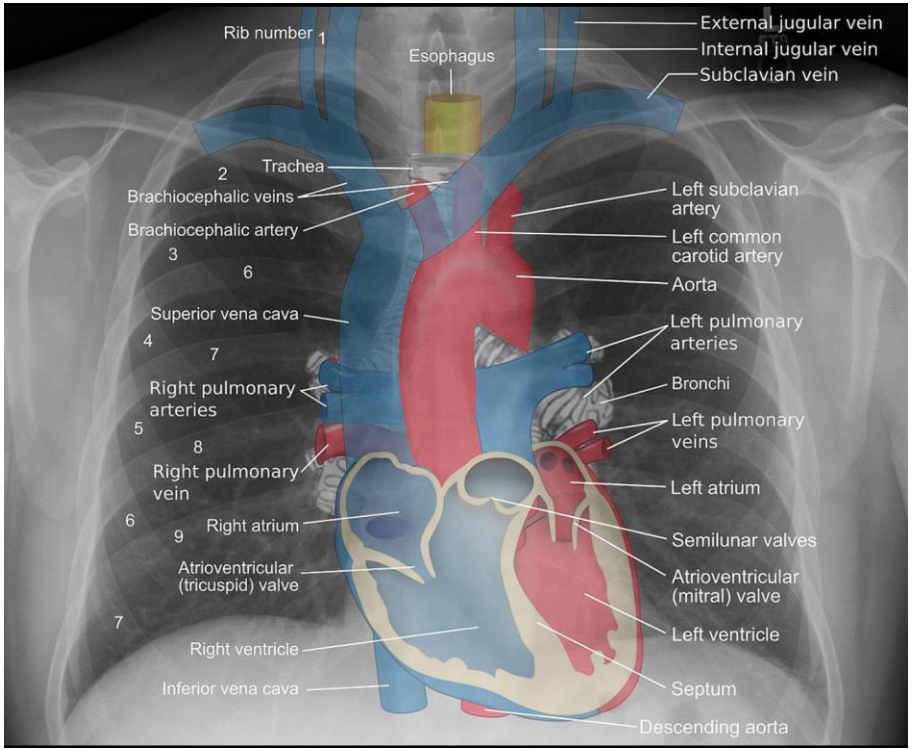
- 항상 이전 X-ray와 비교해야 한다!

Chest X-ray

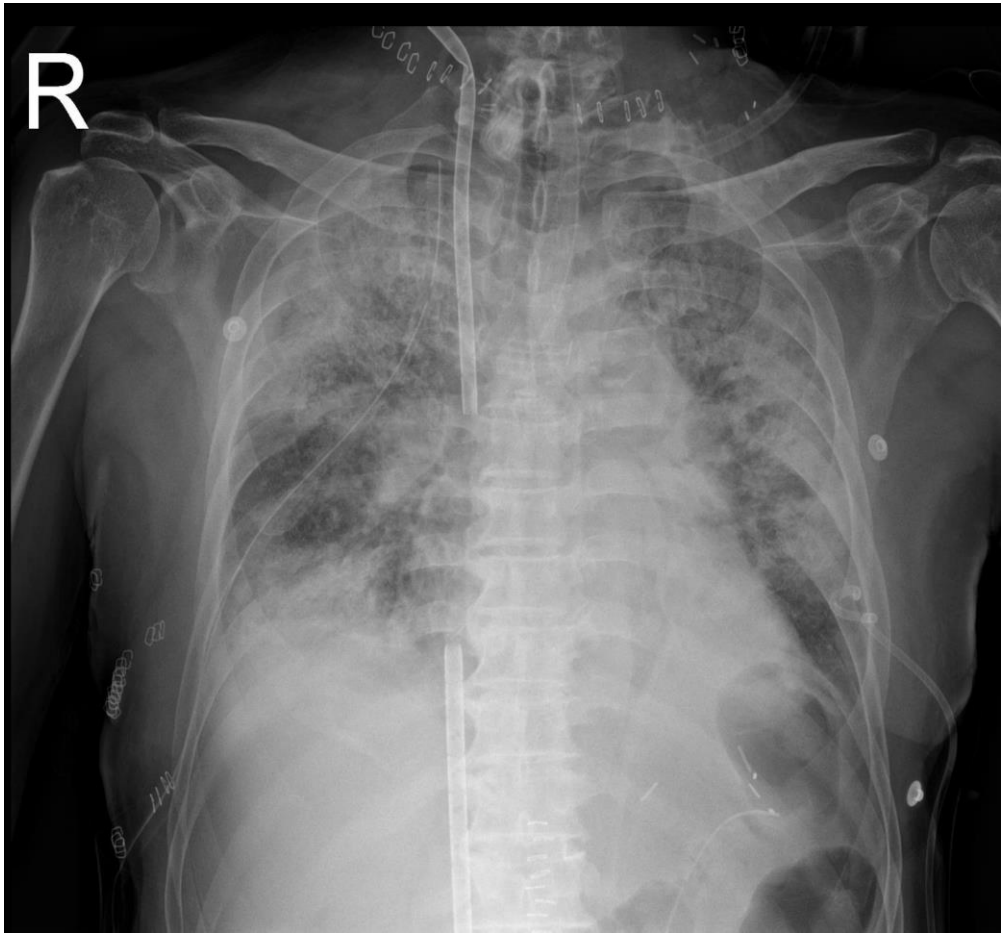


Chest X-ray


Manubrium
Superior vena cava
Right main bronchus
Horizontal fissure
Right atrium
Oblique fissure
Inferior vena cava
Diaphragm / Liver
Aortic arch
Pulmonary trunk
Left main bronchus
Left atrium
Left ventricle
Oblique fissure
Diaphragm
Left costo-phrenic angle
Gastric bubble


Rib number 1
Esophagus
External jugular vein
Internal jugular vein
Subclavian vein
2
Trachea
Brachiocephalic veins
Brachiocephalic artery
3
6
Superior vena cava
4
7
Right pulmonary arteries
5
8
Right pulmonary vein
6
9
Right atrium
Atrioventricular (tricuspid) valve
7
Right ventricle
Inferior vena cava
Left subclavian artery
Left common carotid artery
Aorta
Left pulmonary arteries
Bronchi
Left pulmonary veins
Left atrium
Semilunar valves
Atrioventricular (mitral) valve
Left ventricle
Septum
Descending aorta

Chest X-ray



Chest CT

- Most important imaging modality in thoracic disease (backbone of thoracic imaging)
- Contrast
- 종류
  - Contrast vs Noncontrast Chest CT
  - HRCT
  - Pulmonary CT
  - Aorta CT

Chest CT

- Most important imaging modality in thoracic disease (backbone of thoracic imaging)
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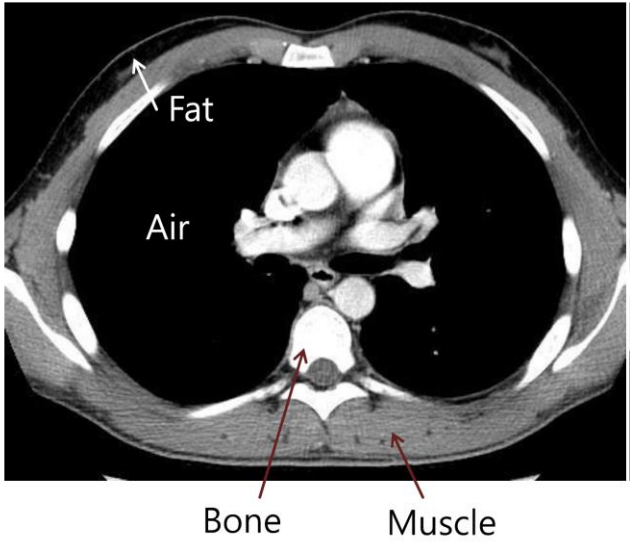
  - Pulmonary CT
  - Aorta CT

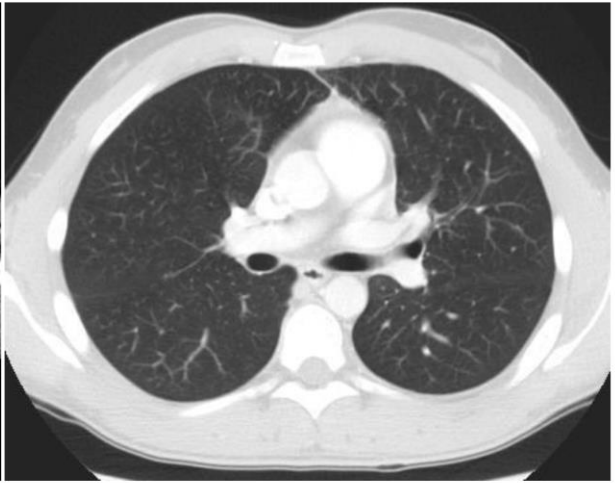
Chest CT

- Mediastinal setting으로 먼저 본 후, Lung setting 으로 바꿔서 본다.
- 양측 폐를 동시에 보지 말고, 한쪽 폐를 먼저 보고, 다른 쪽을 다시 본다.

Mediastinal window



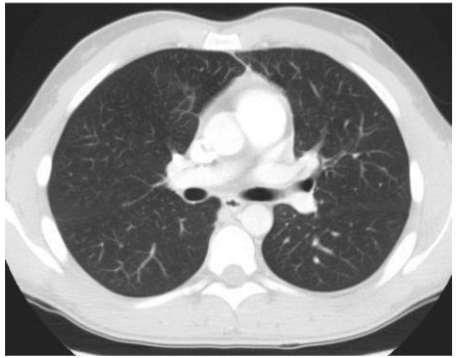
Lung window

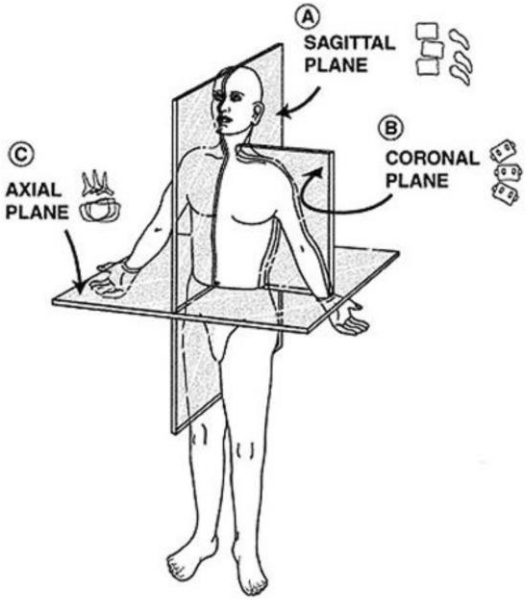


Chest CT

- Axial, coronal, sagittal view 를 모두 확인한다.
- CT image thickness 확인한다.

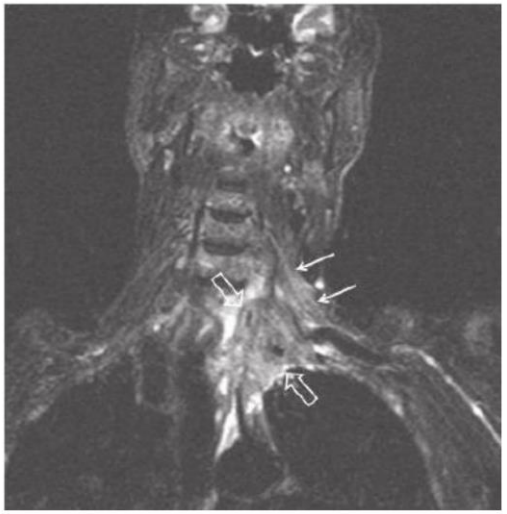
- **Axial; 위에서 아래로 촬영**
- **Coronal; 정면에서 촬영**
- **Sagittal; 측면에서 촬영**

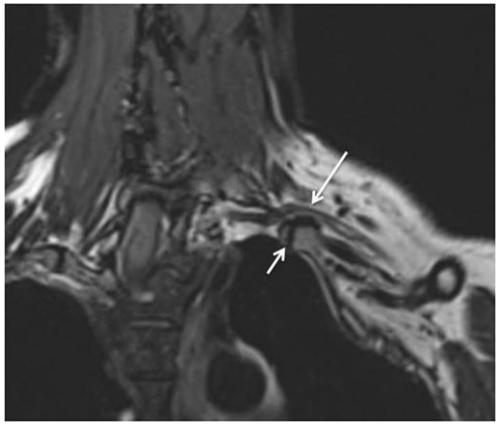




Chest MRI

- Useful situation
  - Brachial plexus invasion
  - Spinal cord invasion
  - Brain Metastasis
  - Pancoast tumor, thoracic outlet syndrome, mesothelioma, adrenal mass
- Not useful situation : Invasion of aorta or trachea



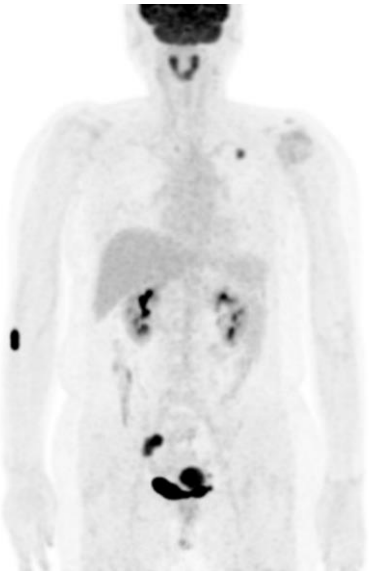


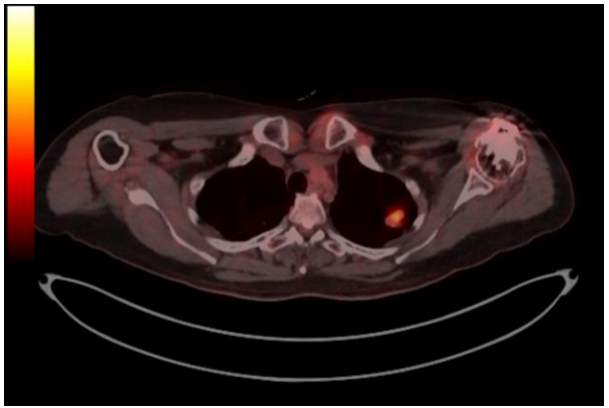
PET-CT

- Glucose uptake of cells
- Physiologic uptake, inflammation

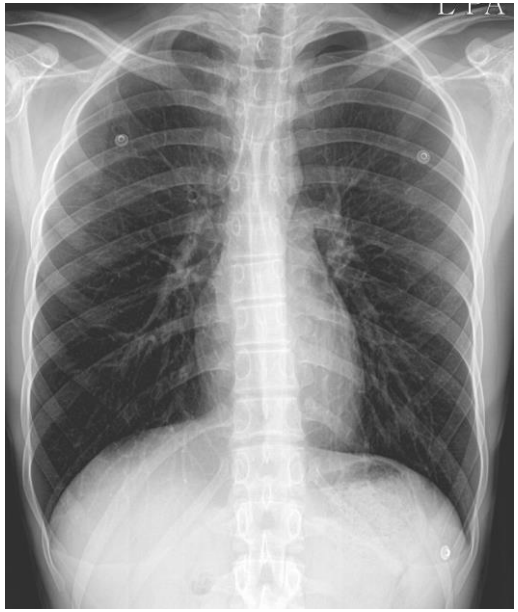
- Parameters
  - SUV (Standardized uptake value) max, mean
  - MTV (Metabolic tumor volume)
  - TLG (Total lesion glycosysis) =SUVmean X MTV

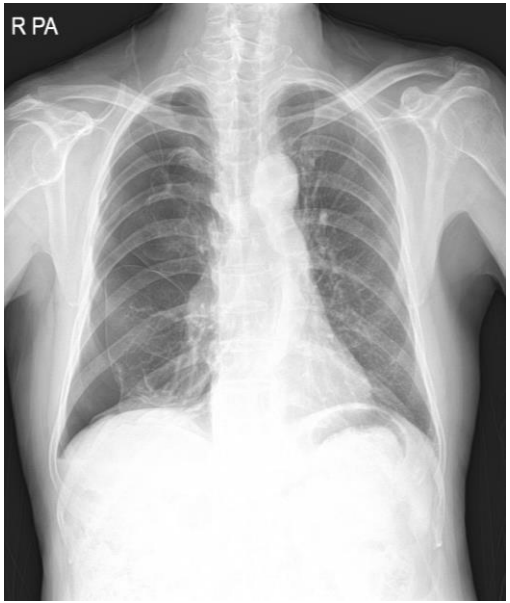
- 7mm~1cm 이상 되어야 확인 가능
- 감염성 질환과 감별이 안됨





Pneumothorax

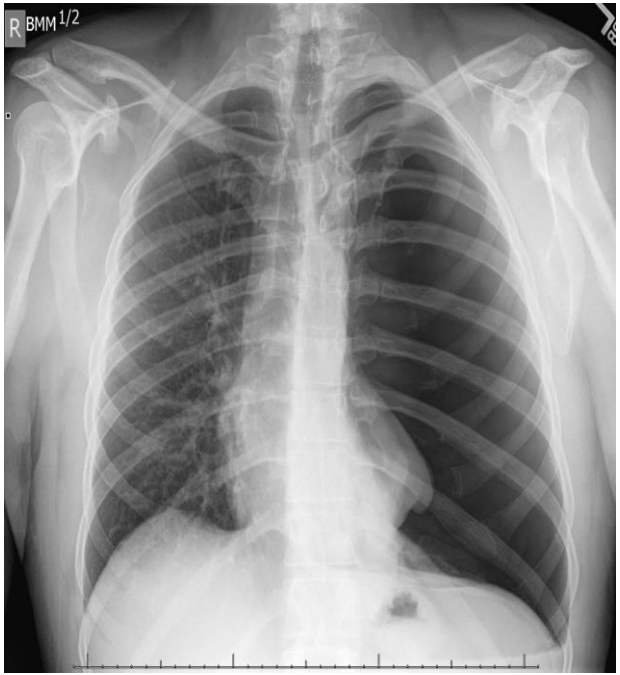




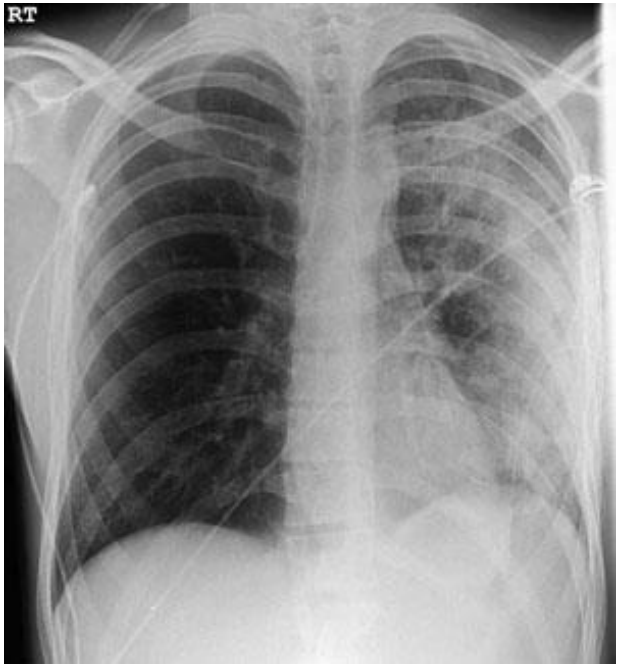
- ✓ When do you consider chest tube insertion?
- ✓ When do you consider operation?

Pneumothorax

Tension pneumothorax

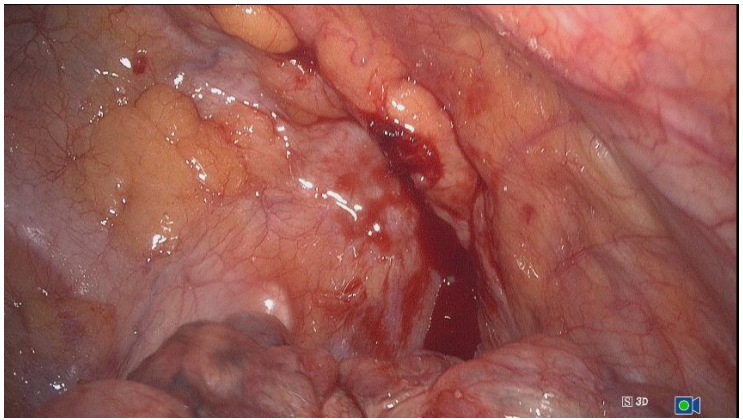


Re-expansion edema

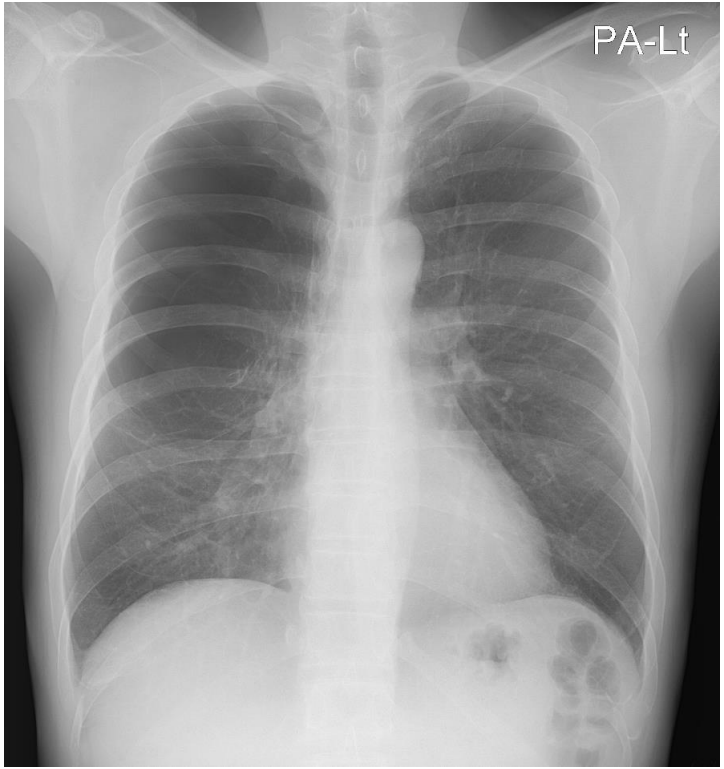


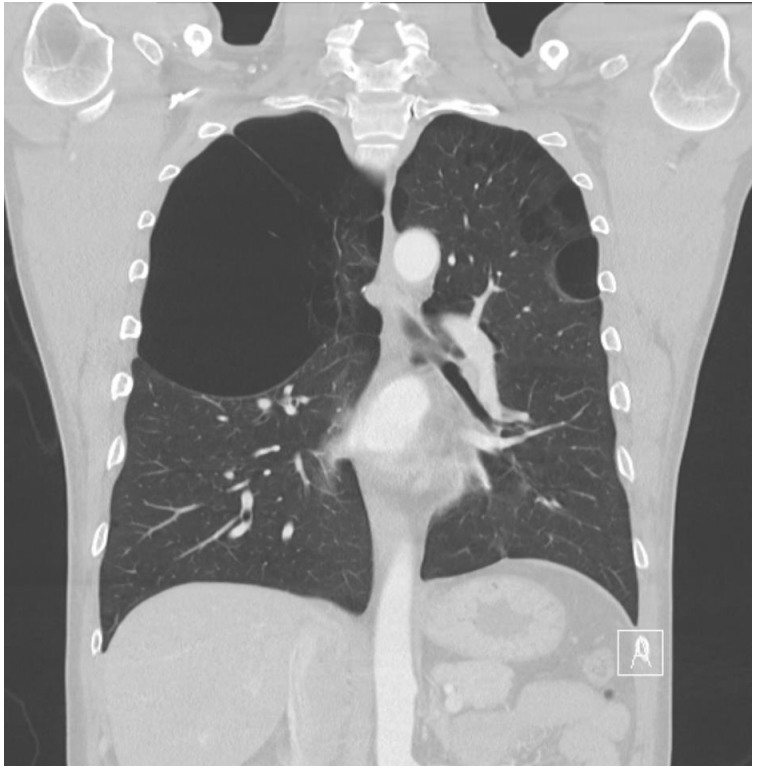
Pneumothorax

Hydropneumothorax



DDx: Emphysema

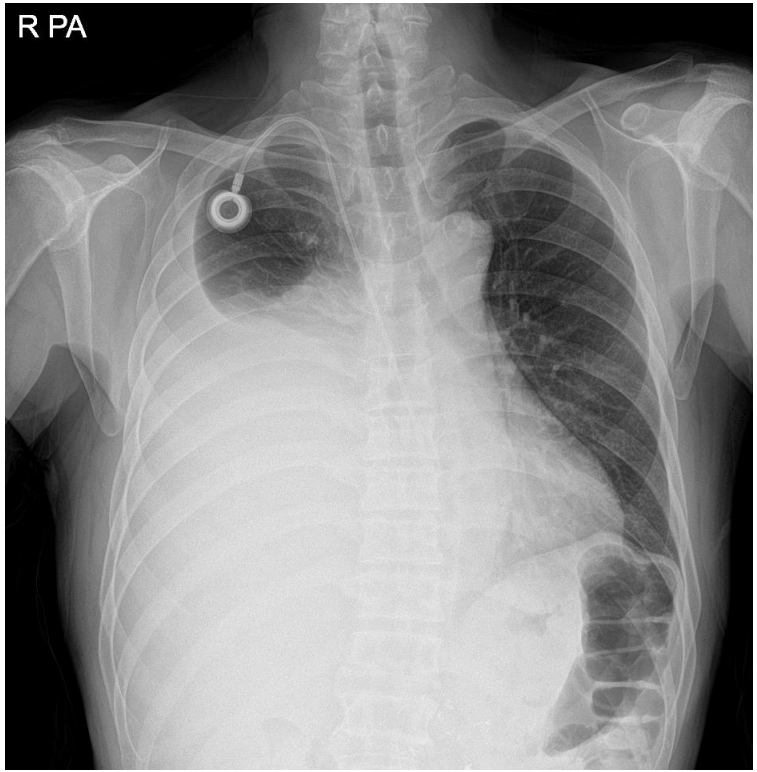




DDx: Skinfold

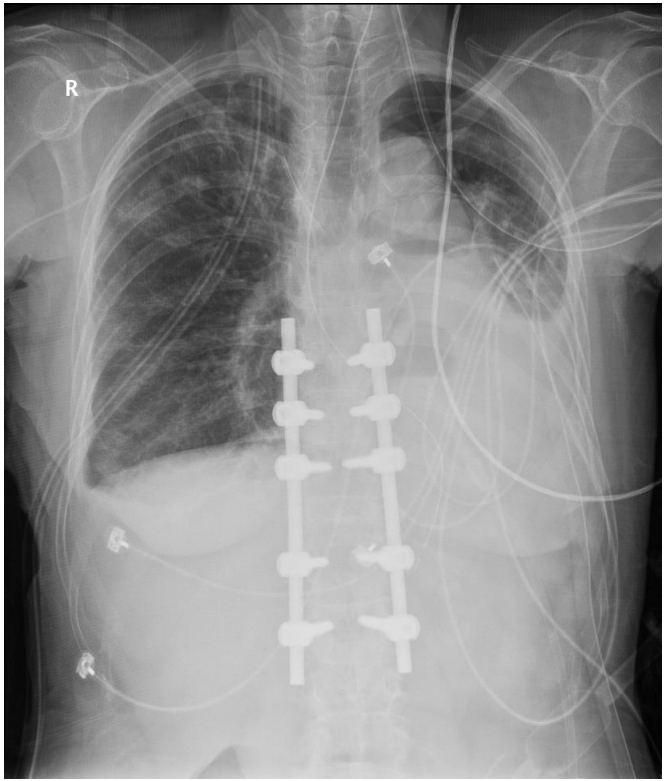
- line 바깥에 존재하는 혈관음영
- line이 흉벽까지 연장

Pleural effusion

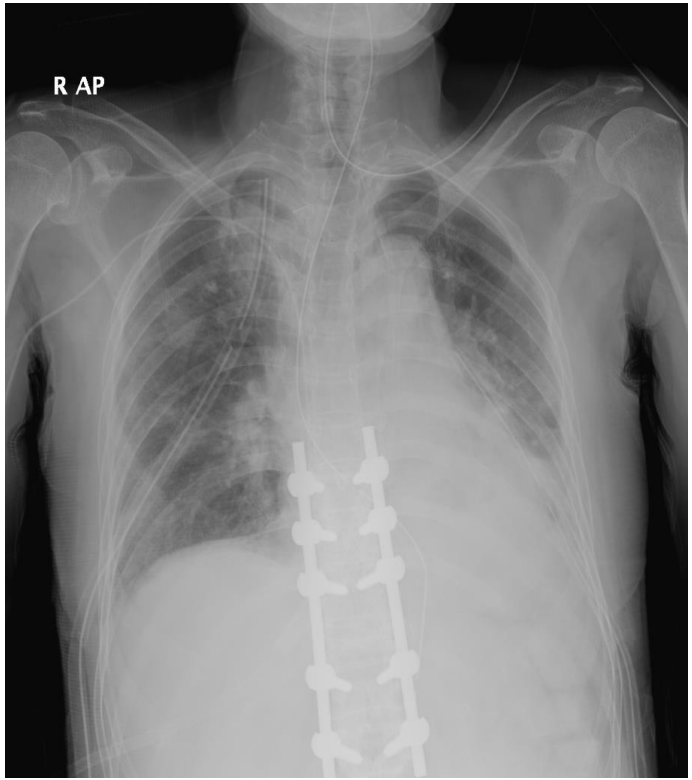


- **CPA blunting**
  - 50ml : Posterior CPA blunting
  - 200ml : Lateral CPA blunting
- Fluid shifting : Lateral decubitus view
  : Diagnostic thoracentesis > 1cm
  (1cm: 200ml, 1.5cm: 350ml)
- Meniscus sign
  : 4^{th} rib – 1000ml

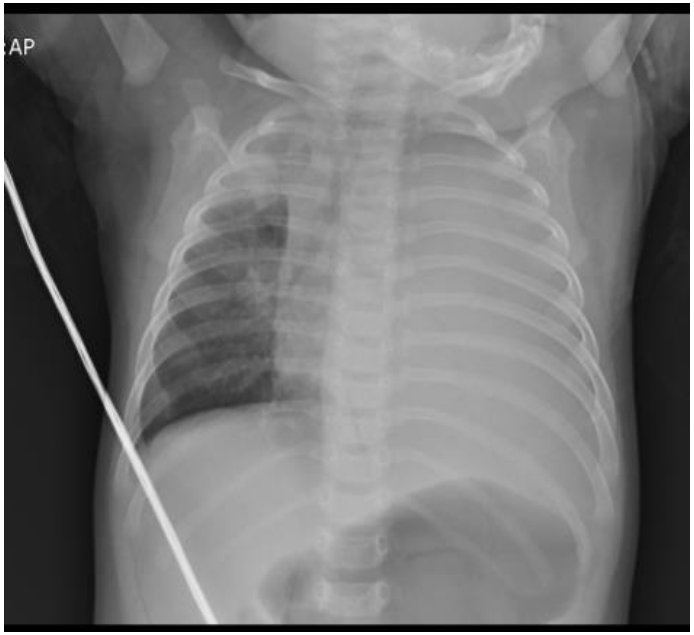
DDx: Atelectasis



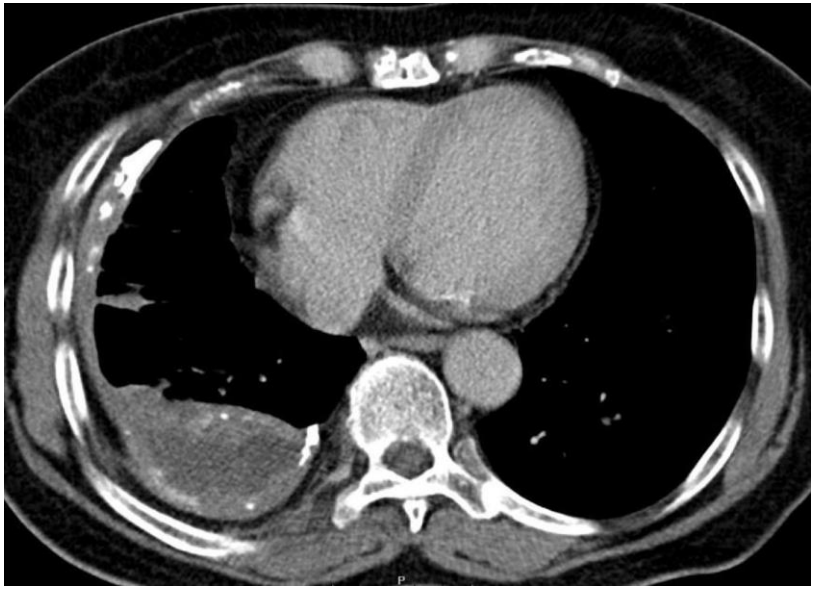
bronchoscopy



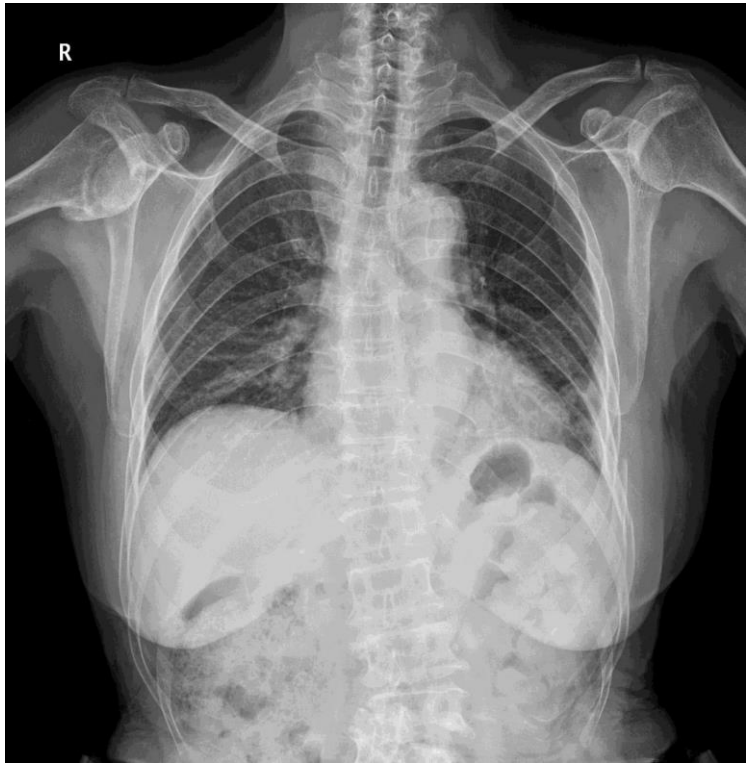
DDx: Atelectasis



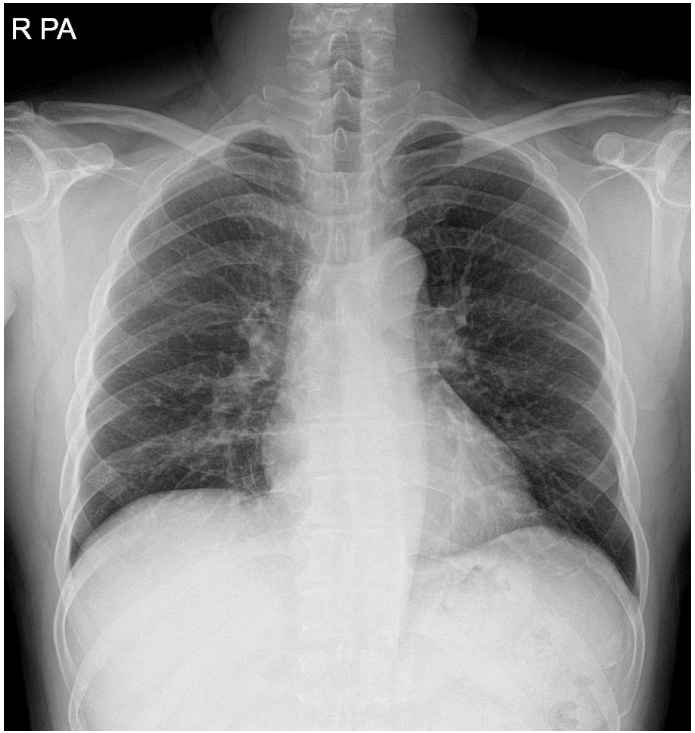
DDx: empyema sac

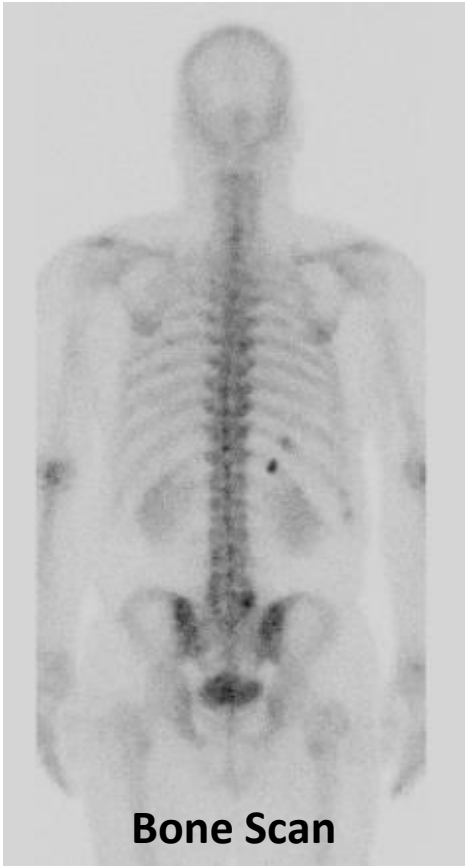


Rib fracture

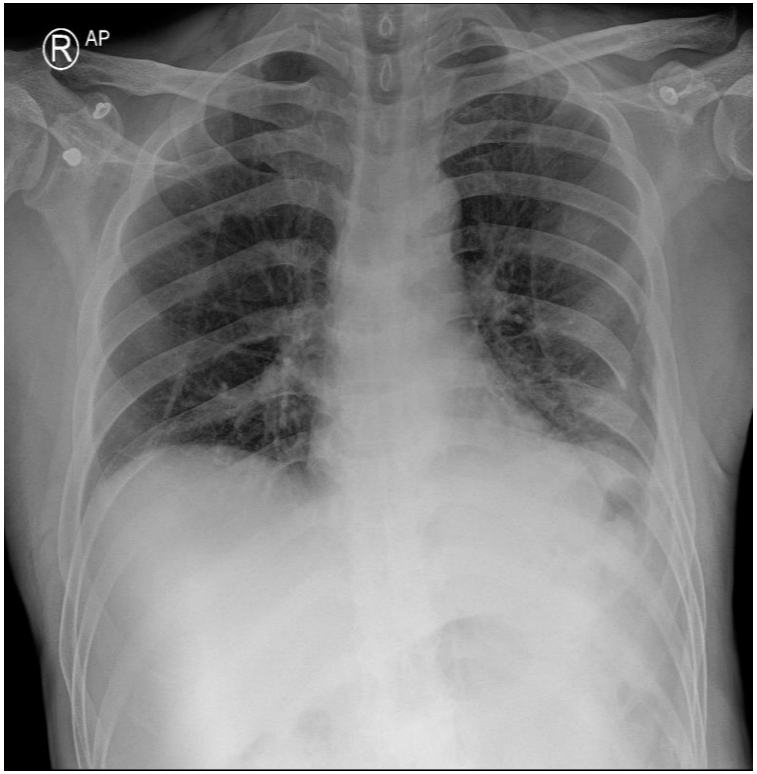


Rib fracture

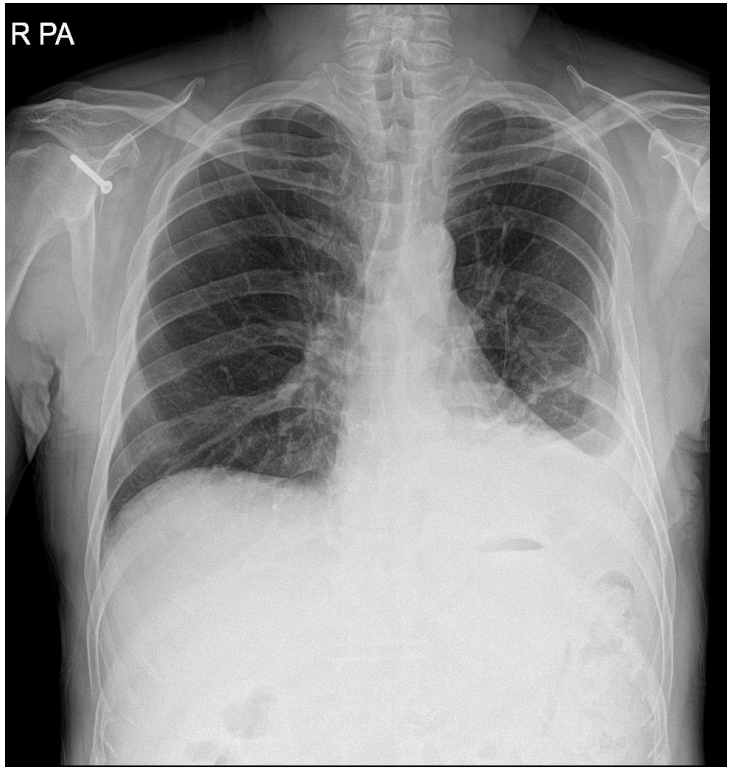




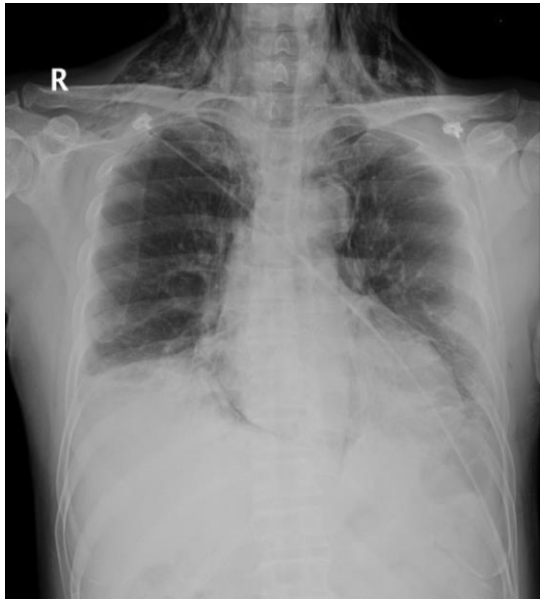
Rib fracture : delayed pneumothorax/hemothorax

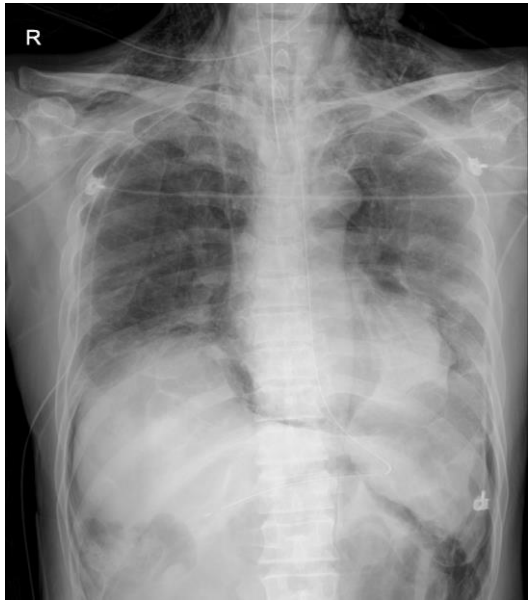


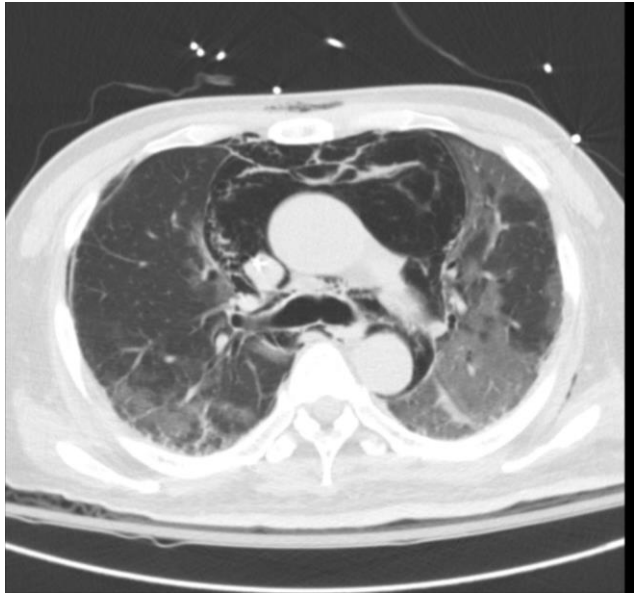
1wk f.u



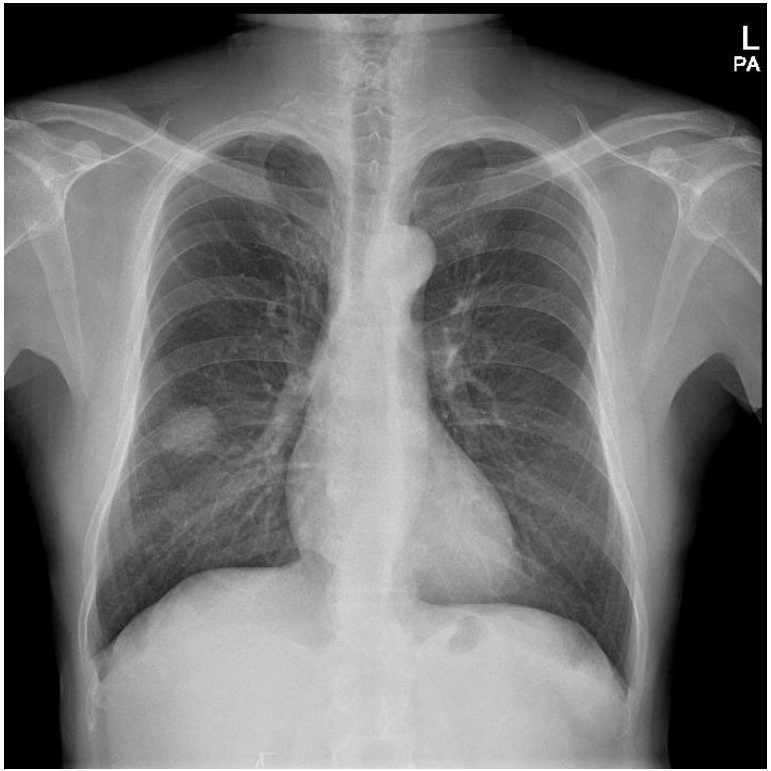
Pneumomediastinum







Solitary pulmonary nodule



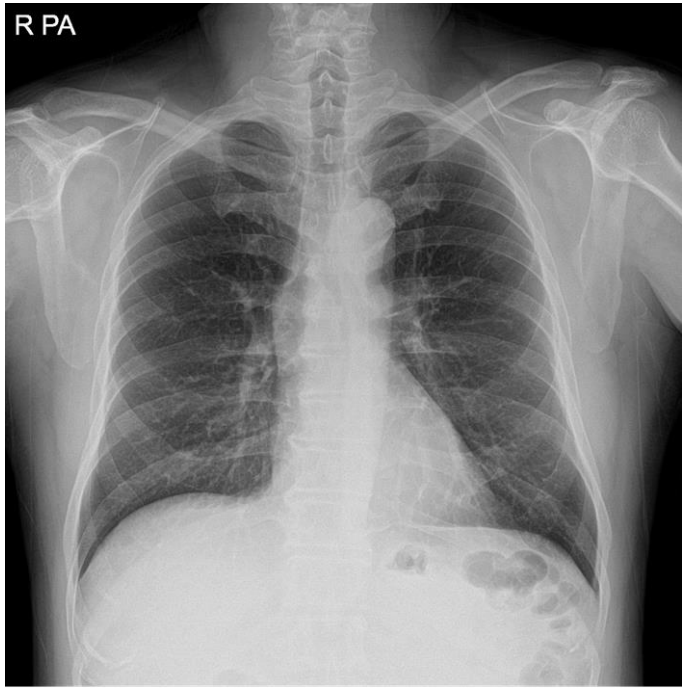
DIFFERENTIAL DIAGNOSIS FOR SOLITARY PULMONARY NODULES

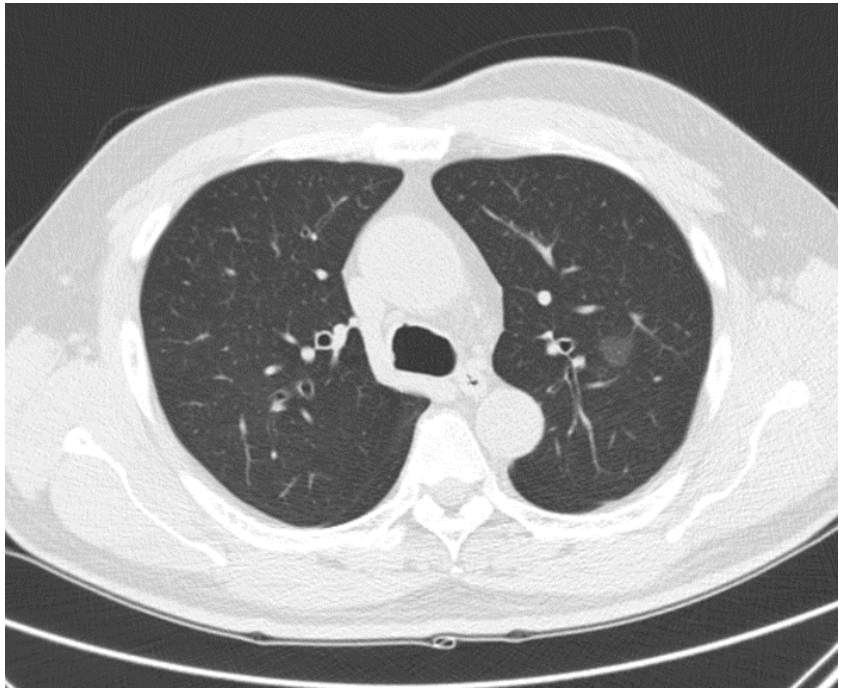
NODULE ETIOLOGY	DISTINGUISHING CHARACTERISTICS
Granuloma	Smooth margins Solid or lamellated calcifications
Carcinoid	Lobulated margins Dystrophic, eccentric calcifications
Hamartoma	Lobulated margins Calcifications appear in rings or arcs Fat
AVM	Lobulated margins Infrequent calcification (vascular) Feeding/draining vessels
Lung cancer	Spiculated, lobulated, or smooth margins Dystrophic calcifications Large lesions with necrosis Cavitation in squamous cell carcinoma and adenocarcinoma
AIS/MIA	≤5 mm of atypical adenomatous hyperplasia Ground-glass opacity Well-demarcated margins Part-solid nodule Cystic spaces Focal extensions to pleura Very slow growth
Solid pulmonary metastasis	Nonspecific, although may have appearance characteristic of primary tumor

AVM, arteriovenous malformation; AIS/MIA, adenocarcinoma in situ/minimally invasive carcinoma.

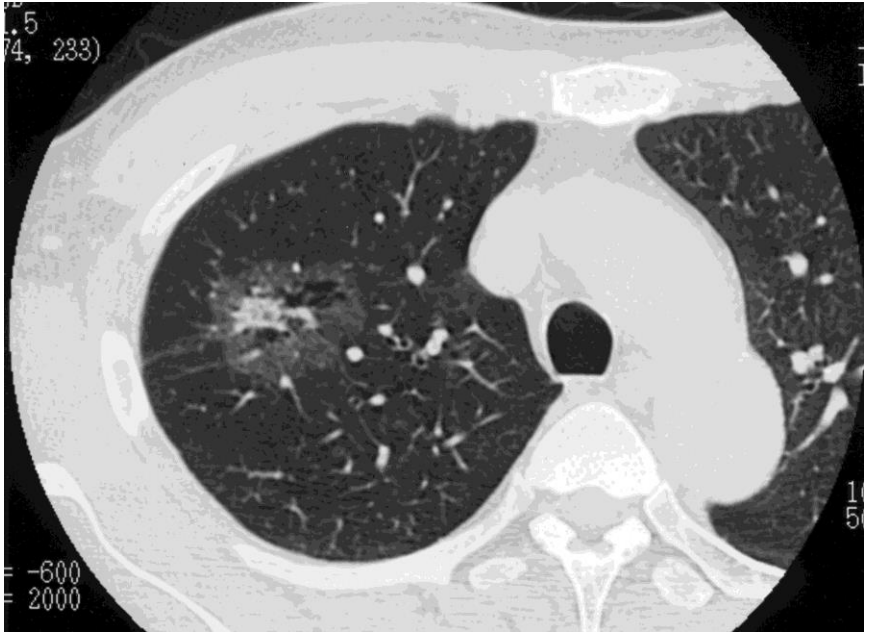
Solitary pulmonary nodule

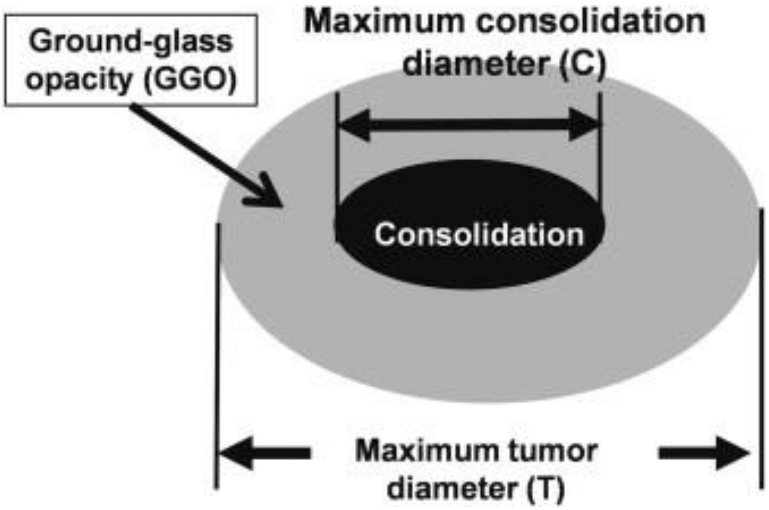
GGN





GGN





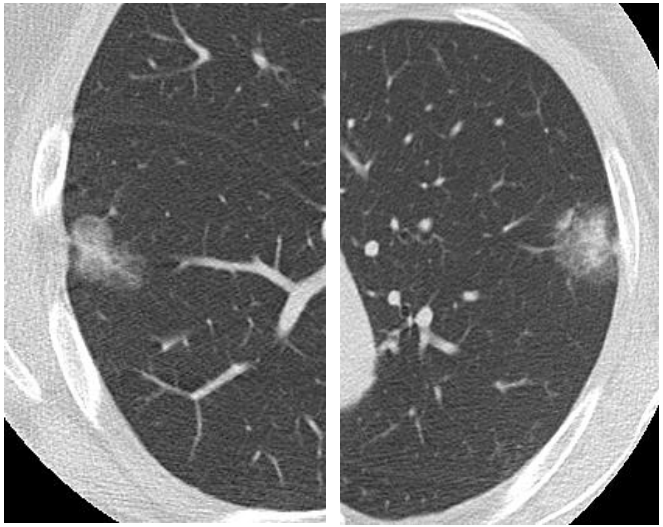
CTR = consolidation / tumor ratio

GGN

Pure GGO

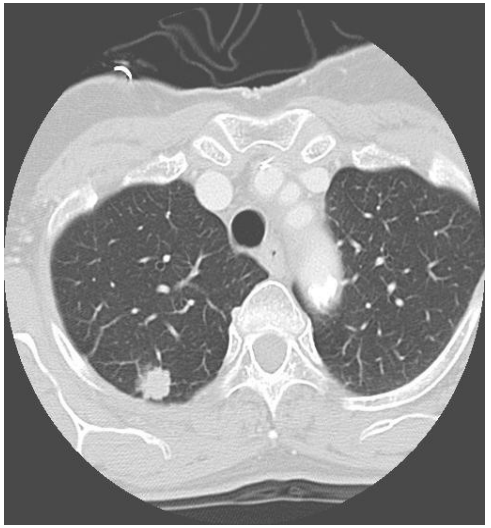
CTR=0

Part-solid GGO



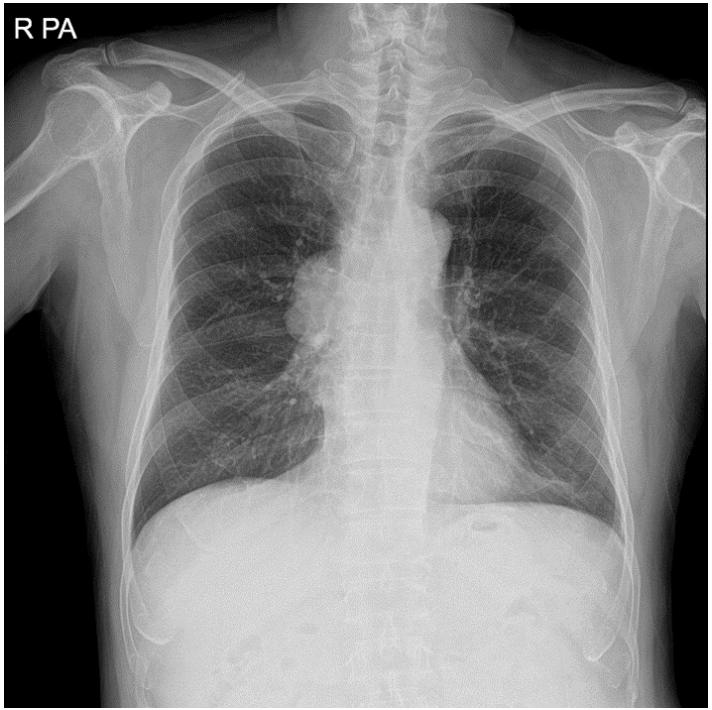
0<CTR<1

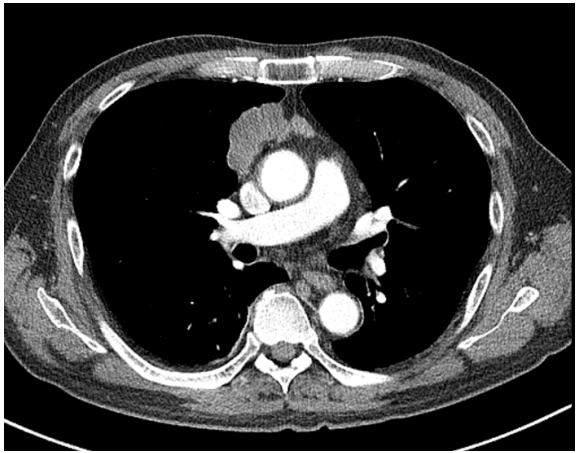
Solid lesions



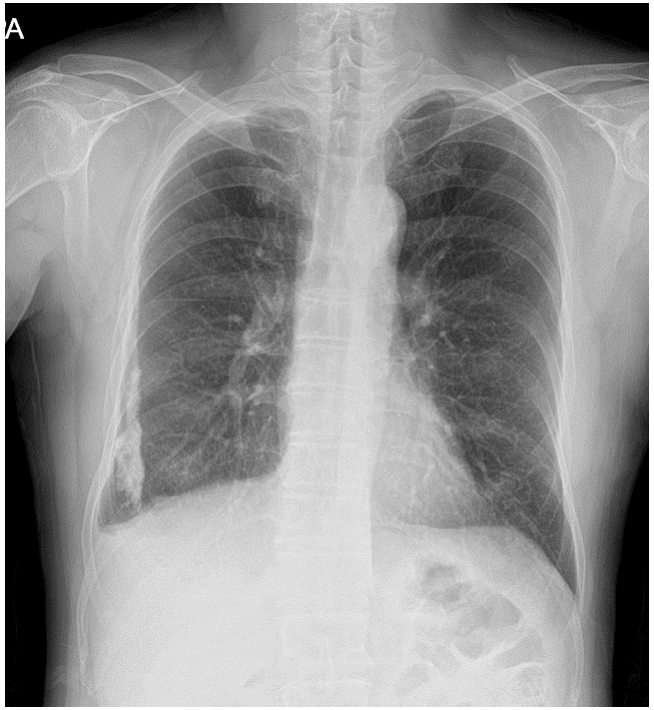
CTR=1

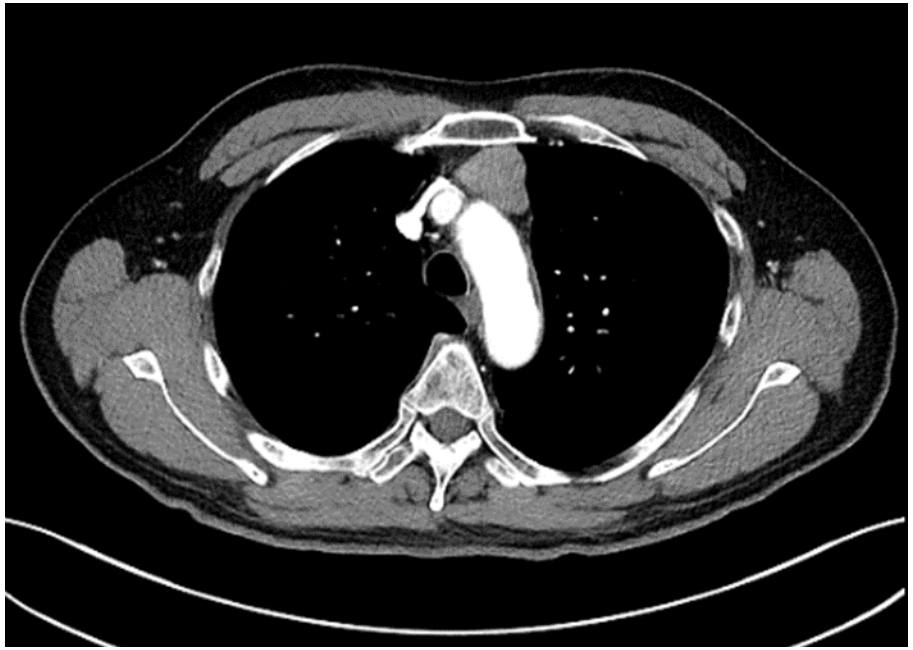
Mediastinal mass





Mediastinal mass



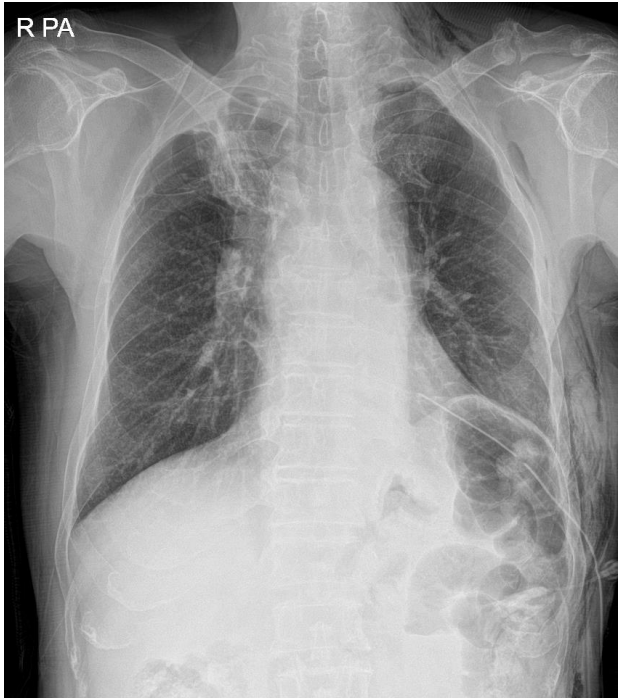


Mediastinal mass

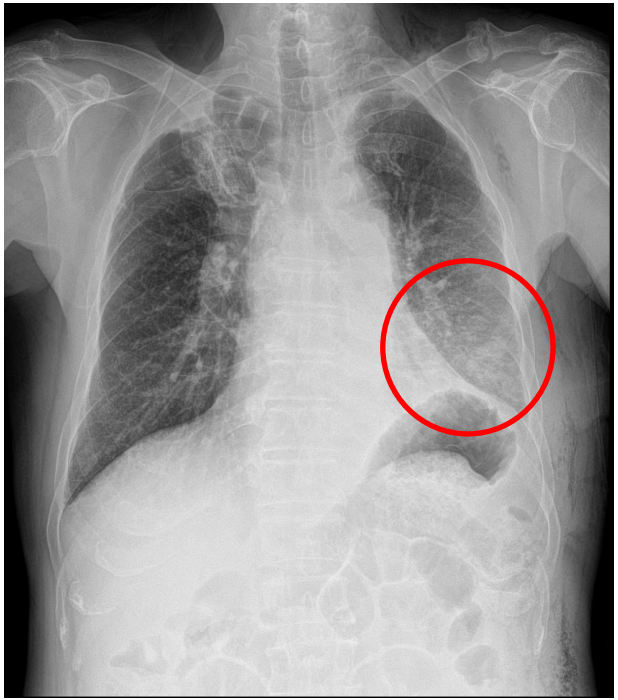
DIFFERENTIAL DIAGNOSIS OF MEDIASTINAL MASSES

MASS	DIFFERENTIAL DIAGNOSIS	LOCATION	FEATURES
Anterior mediastinal mass	Thyroid mass	Contiguous with thyroid gland	Deviation of trachea
	Thymoma or thymic cyst	Thymic bed	Smoothly marginated
	Lymphoma and small cell lung cancer	All lymph node stations in superior mediastinum, thymic bed, prevascular space, aorticopulmonic window	May be lobulated Mass may involve multiple lymph node groups Hilar lymph node enlargement may be asymmetric
		Extramediastinal location hilar lymph nodes	Hodgkin disease spreads from thymic bed to middle mediastinum to hilar lymph nodes
	Germ cell tumor	Variable, including prevascular space and thymic bed	Fat, hair, and teeth are diagnostic May be homogeneous with smooth margins
Middle mediastinal mass	Duplication cyst (includes bronchogenic cyst)	Most often located at bifurcation of trachea and central airways May be paraesophageal or intraparenchymal	Smoothly marginated High-attenuation fluid
	Lymphadenopathy	All lymph node stations, including subcarinal space	May appear as separate enlarged nodes or as a multiple lymph node mass May be homogeneous or heterogeneous Low attenuation indicates tuberculosis Single site with enhancement indicates Castleman disease
	Pericardial cyst	Adjacent to heart, especially in cardiophrenic sulcus	Smoothly marginated Water attenuation Can also represent pericardial diverticulum if history of mediastinoscopy
	Thyroid mass (intrathoracic goiter)	Thyroid, extending into thorax 15% of these masses extend behind the trachea	Appearance of thyroid tissue is heterogeneous, can include calcifications and focal fluid
	Tracheal tumor	Within or surrounding trachea	Narrowing of trachea Adenoid cystic carcinoma has more tumor outside the trachea than within it, so-called toothpaste lesion
	Vascular variants and abnormalities	Posterior to trachea Anterior or posterior to esophagus	Diverticulum of Kommerall with aberrant subclavian artery Vascular rings and slings
Posterior mediastinal mass	Esophageal abnormalities and masses	Large esophageal mass can occupy middle and posterior mediastinal compartments	Esophageal cancer Foregut duplication cyst
	Neurogenic tumor	Connected to neural foramen	Smoothly marginated or lobulated May have low attenuation May contain fat
	Extramedullary hematopoiesis	Paraspinal masses	Masses are often paired Smoothly marginated

Pneumonia

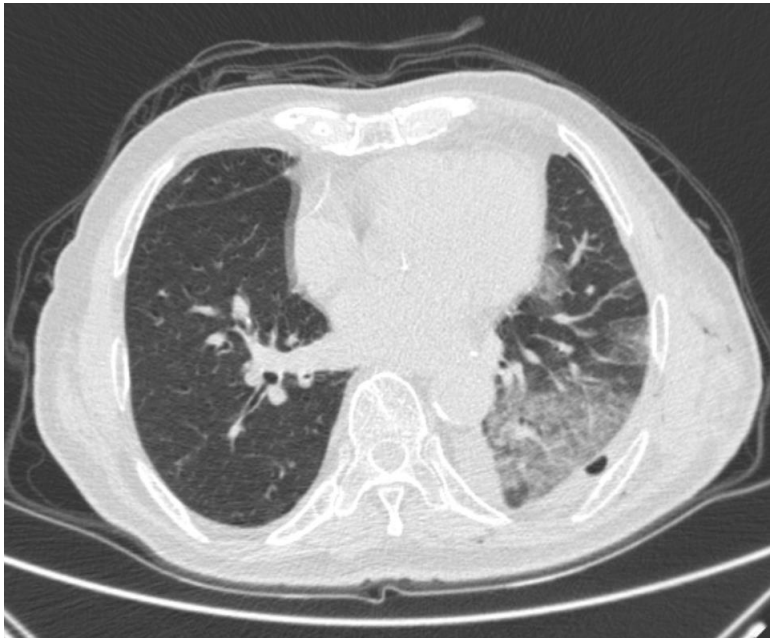


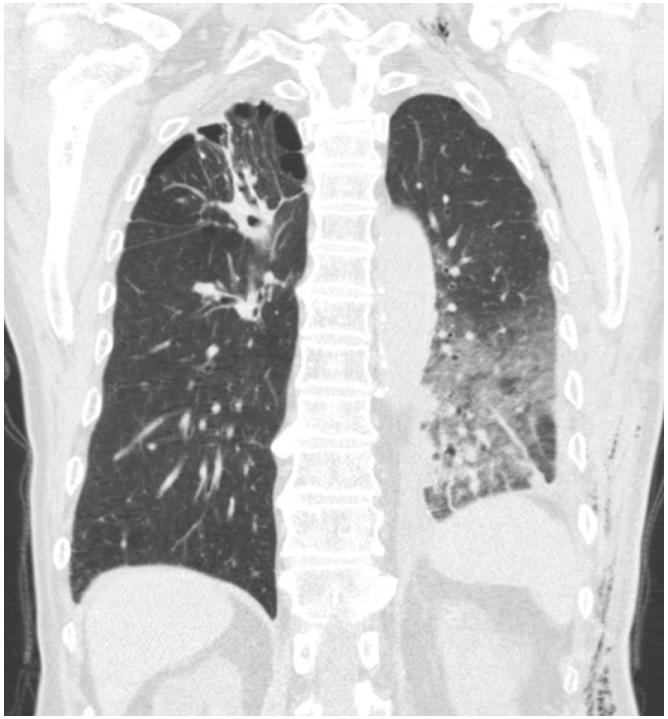
s/p VATS LLLobectomy (POD#1)



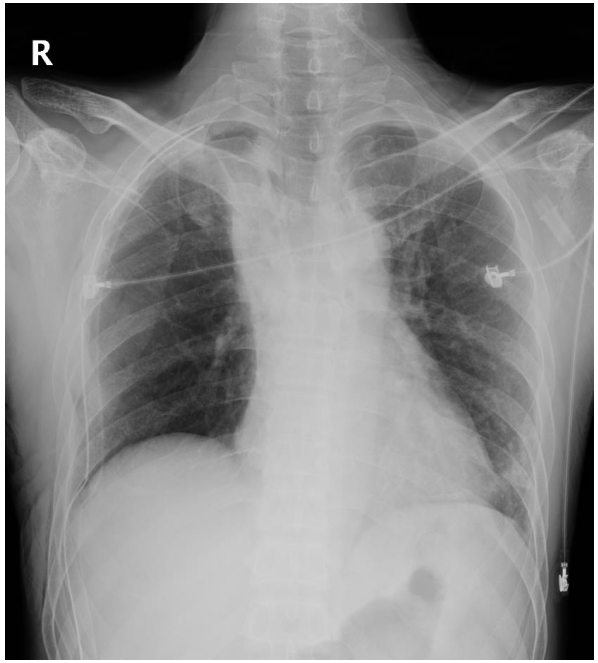
s/p VATS LLLobectomy (POD#3)

Pneumonia

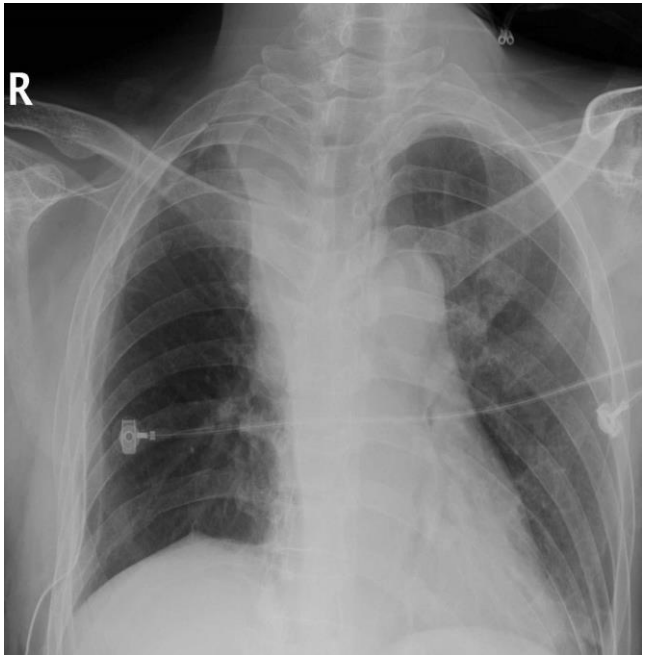




Torsion

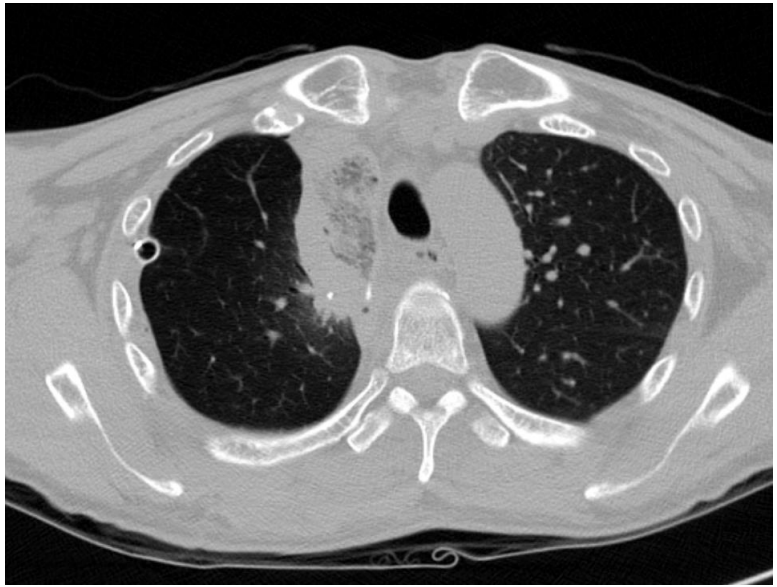


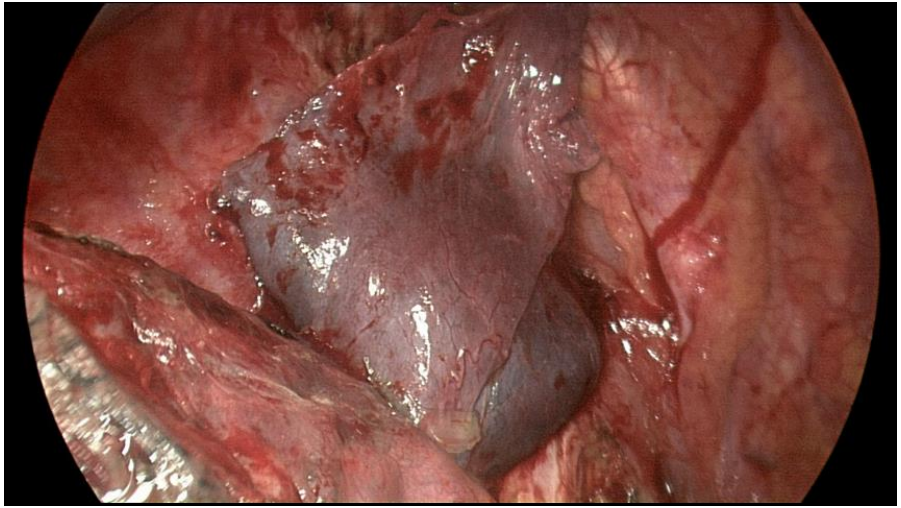
s/p VATS RULobectomy POD#1



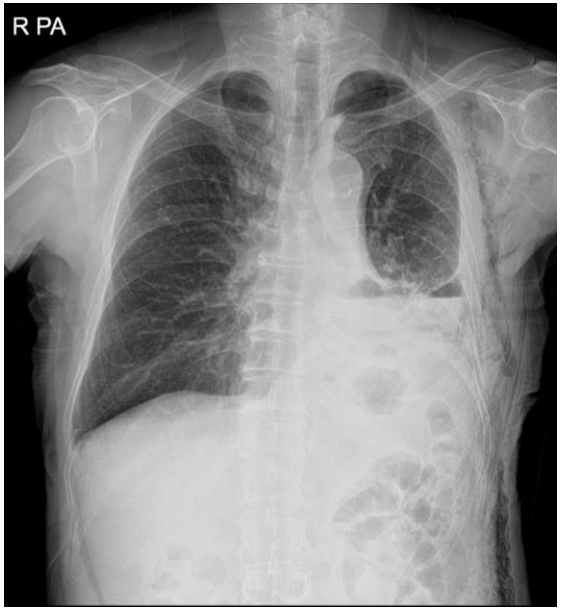
s/p VATS RULobectomy POD#2

Torsion

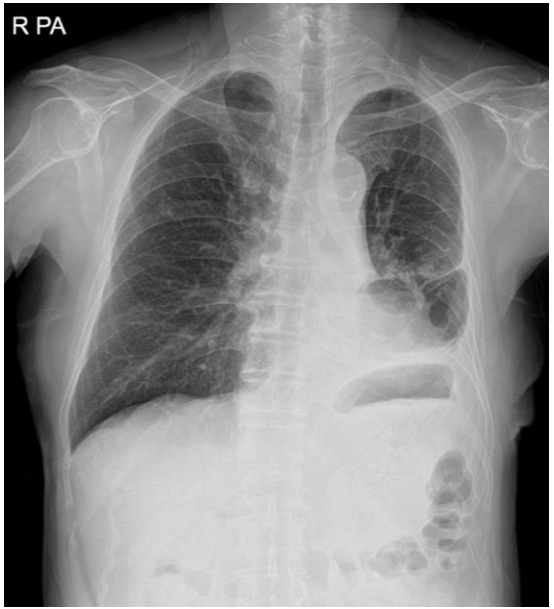




BPF

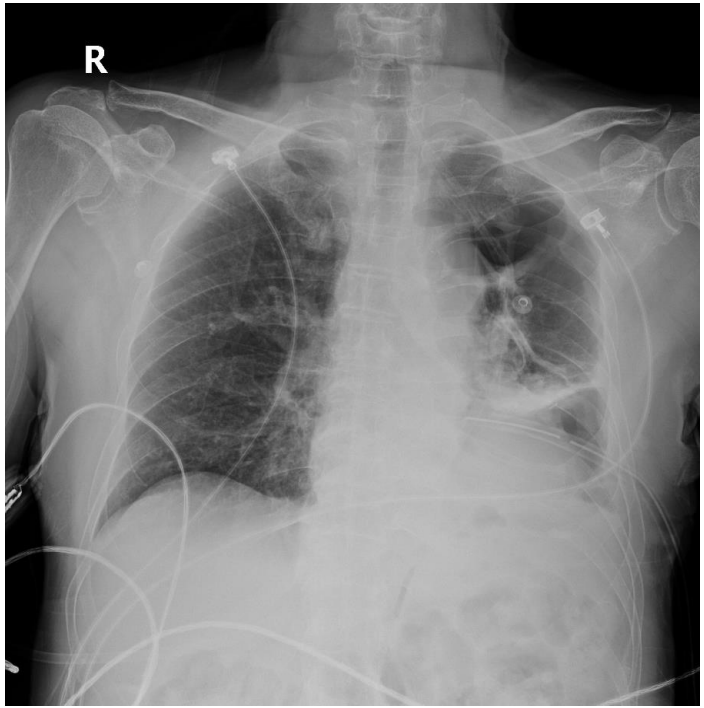


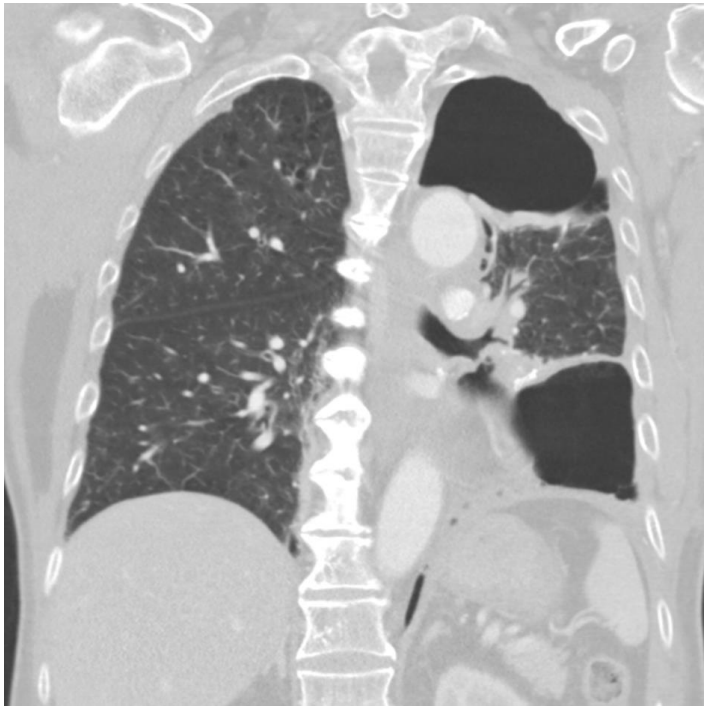
s/p VATS LLLobectomy,
LUL lingular segmentectomy



Postop 1st VISIT (POD#20)

BPF





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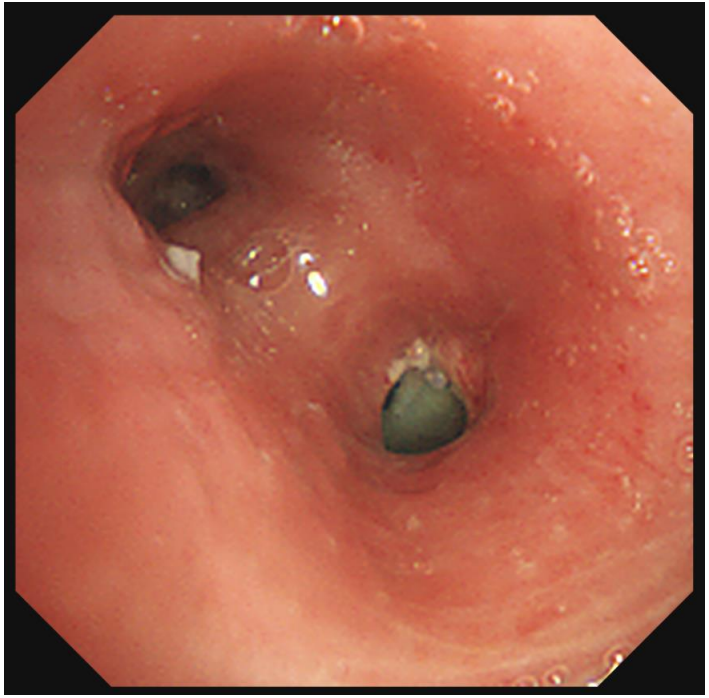
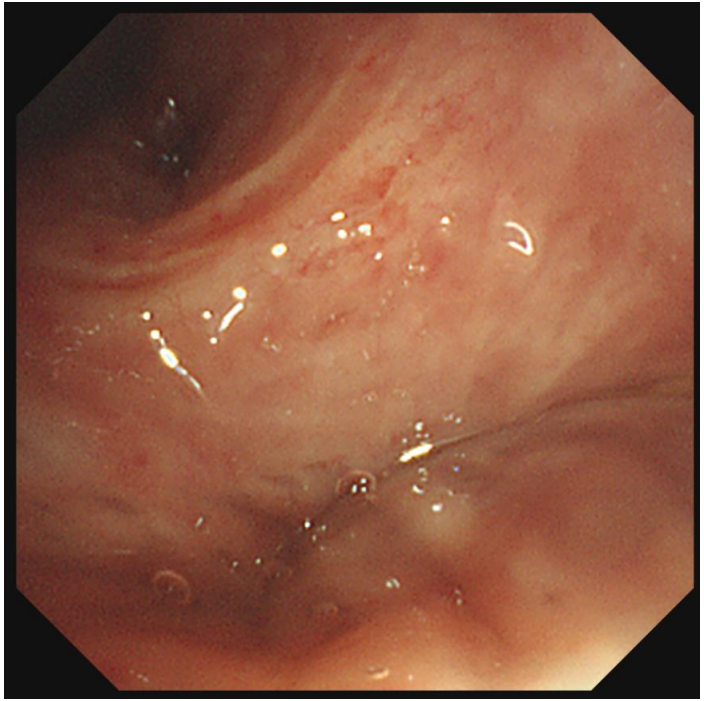
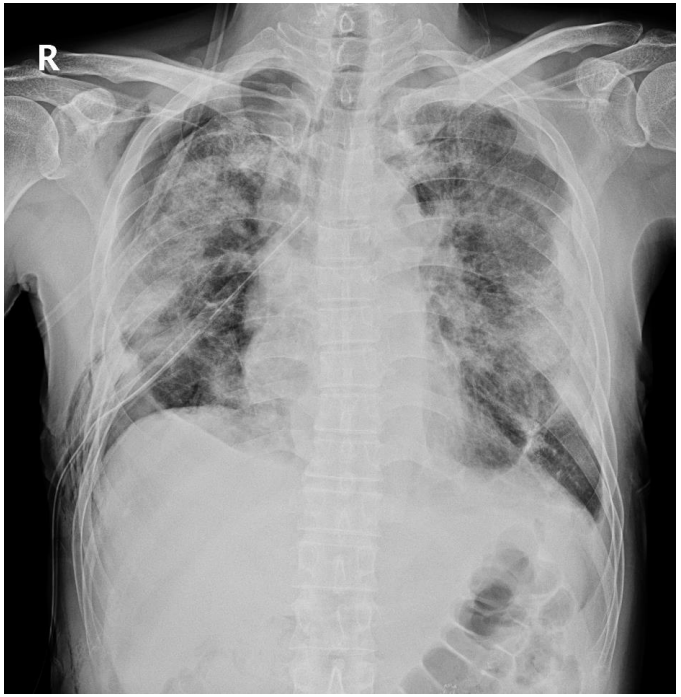


After repair



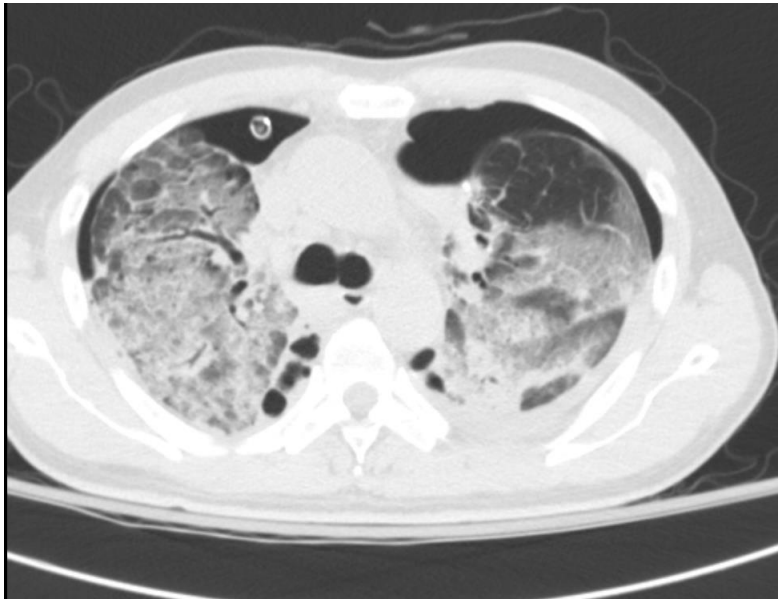
ARDS

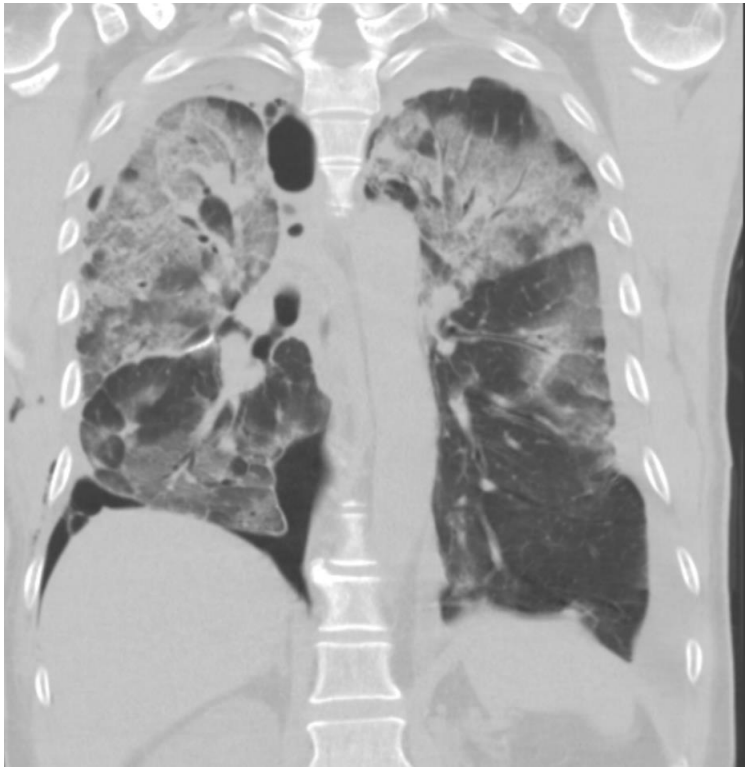
s/p VATS LUL Wedge resection,
VATS RLLobectomy (POD#2)



s/p VATS LUL Wedge resection,
VATS RLLobectomy (POD#5)

ARDS





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Development and Validation of a Deep Learning–Based Automated Detection Algorithm for Major Thoracic Diseases on Chest Radiographs

Eui Jin Hwang, MD; Sunggyun Park, MS; Kwang-Nam Jin, MD; Jung Im Kim, MD; So Young Choi, MD; Jong Hyuk Lee, MD; Jin Mo Goo, MD, PhD; Jaehong Aum, PhD; Jae-Joon Yim, MD; Julien G. Cohen, MD; Gilbert R. Ferretti, MD; Chang Min Park, MD, PhD; for the DLAD Development and Evaluation Group

Abstract

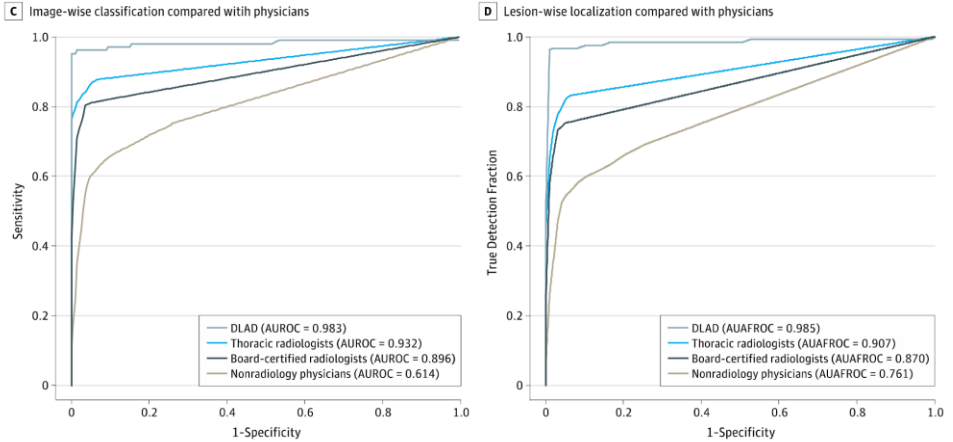
IMPORTANCE Interpretation of chest radiographs is a challenging task prone to errors, requiring expert readers. An automated system that can accurately classify chest radiographs may help streamline the clinical workflow.

OBJECTIVES To develop a deep learning–based algorithm that can classify normal and abnormal results from chest radiographs with major thoracic diseases including pulmonary malignant neoplasm, active tuberculosis, pneumonia, and pneumothorax and to validate the algorithm's performance using independent data sets.

Key Points

Question Can a deep learning–based algorithm accurately discriminate abnormal chest radiograph results showing major thoracic diseases from normal chest radiograph results?

Findings In this diagnostic study of 54 221 chest radiographs with normal findings and 35 613 with abnormal findings, the deep learning–based



Tips

- 사진보다 중요한 것은 증상이다. **사진은 증상보다 뒤늦게 나타난다.**
- 수술 받은 환자의 경우, 수술을 이해해야만 정확히 판독이 가능하다.
- 수술 후 anatomy 는 외과의사만이 제대로 이해가 가능하다.
- 영상은 병에 대한 사전 지식이 있어야 해석이 가능하고, 지식을 바탕으로 확률을 계산하는 것이다.
- 사진은 항상 이전 사진과 비교해야 한다.
- 병변은 여러분이 생각하는 곳과 다른 곳에 위치할 수 있다.

Thank you for your attention