

INVESTIGATIONS OF LUNG DISEASE

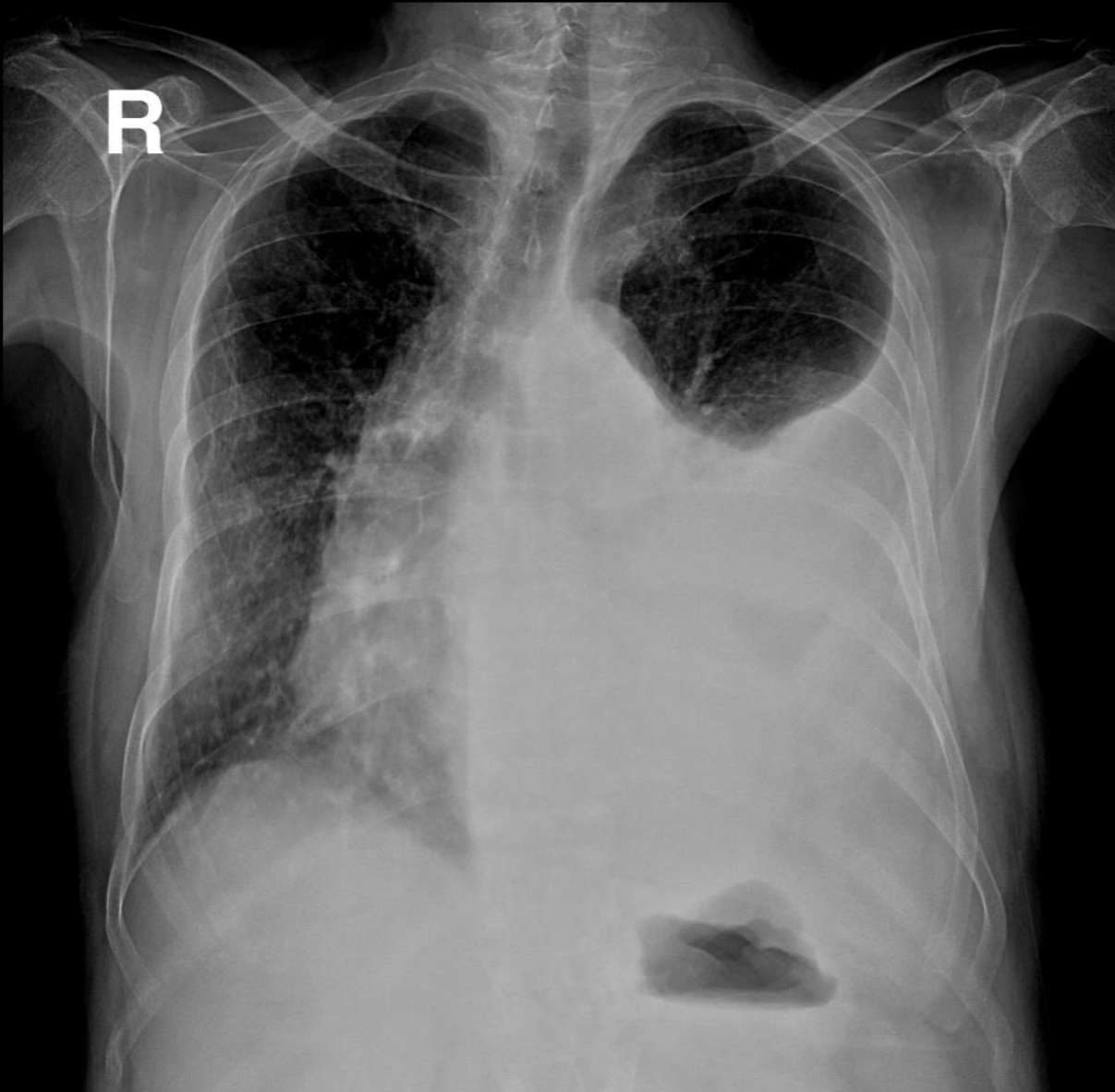
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Objectives

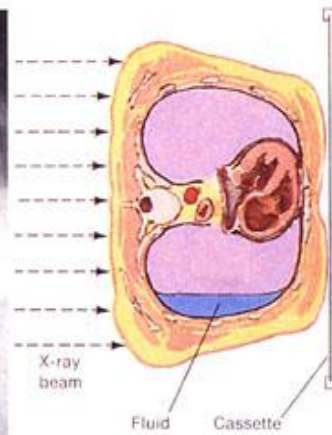
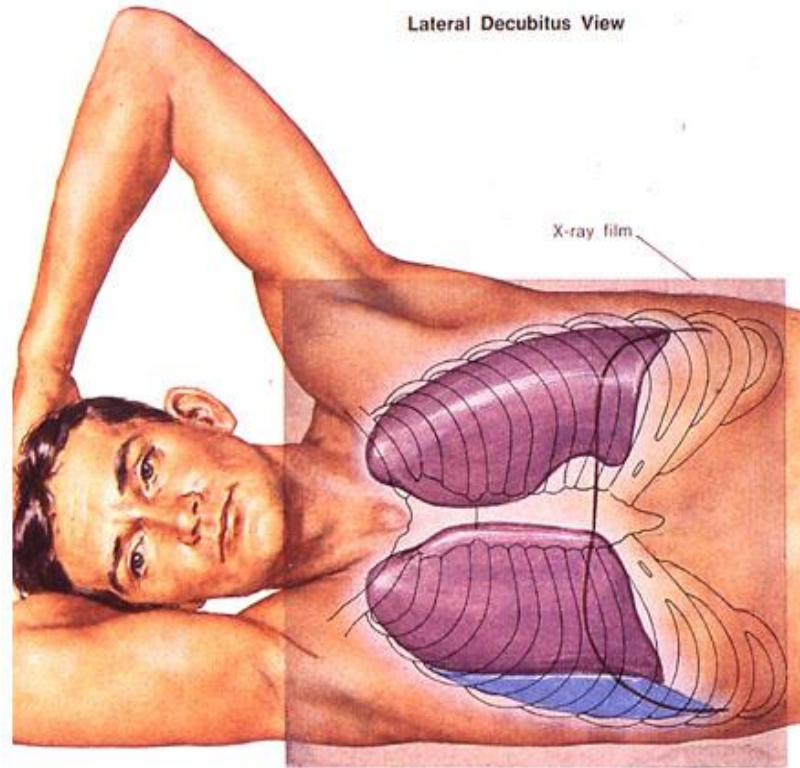
- Describe the types of pulmonary diagnostic tests and procedures.
- Explain each type of pulmonary diagnostic test and procedures.
- Explain the role of each pulmonary diagnostic tests & procedures in diagnosing lung diseases.
- Explain when and how to apply each diagnostic tests & procedures.

Pulmonary Diagnostic Procedures

- Thoracentesis
- Chest tube
- Pleural biopsy
- Bronchoscopy
- Pulmonary function tests
- Computed tomography



Lateral Decubitus View



Sectional view

lateral decubitus x-ray film: fluid in r. pleural space

Thoracentesis

- Appearance
- Gram stain, and cultures
- pH
- Chemistry (glucose, amylase, LDH, protein)
- Cytology

Separation of Transudates from Exudates

- Pleural fluid protein divided by the serum protein greater than 0.5
- Pleural fluid LDH divided by the serum LDH greater than 0.6
- Pleural fluid LDH greater than two-thirds of the upper limit of normal for the serum LDH

- Gross appearance is pus

or

- Gram stain positive

or

- pH below 7.20

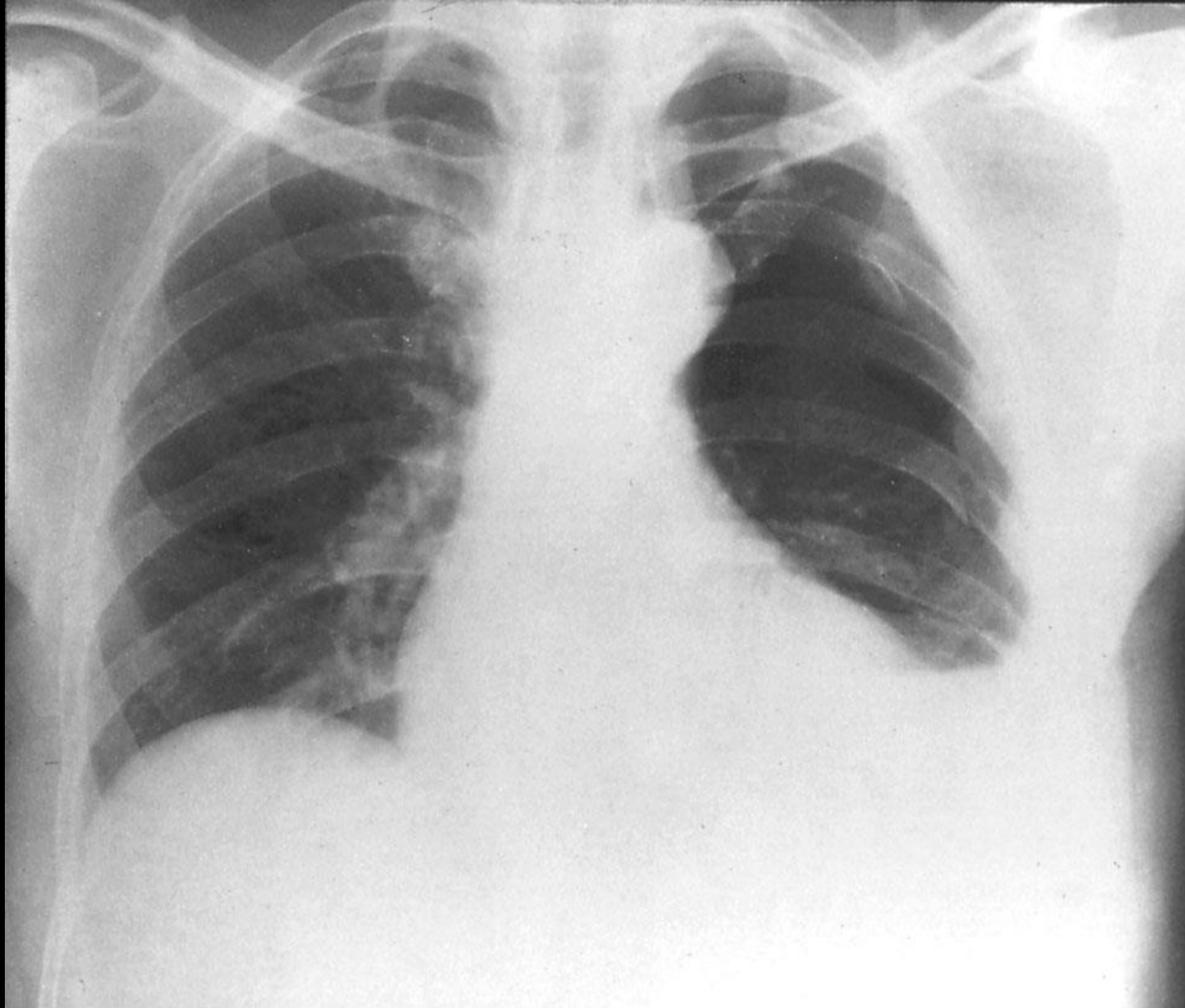
Chest tube

Indication for chest tube insertion

- Empyema
- Complicated parapneumonic effusion
- Symptomatic pleural effusion
- Hemothorax
- Pneumothorax

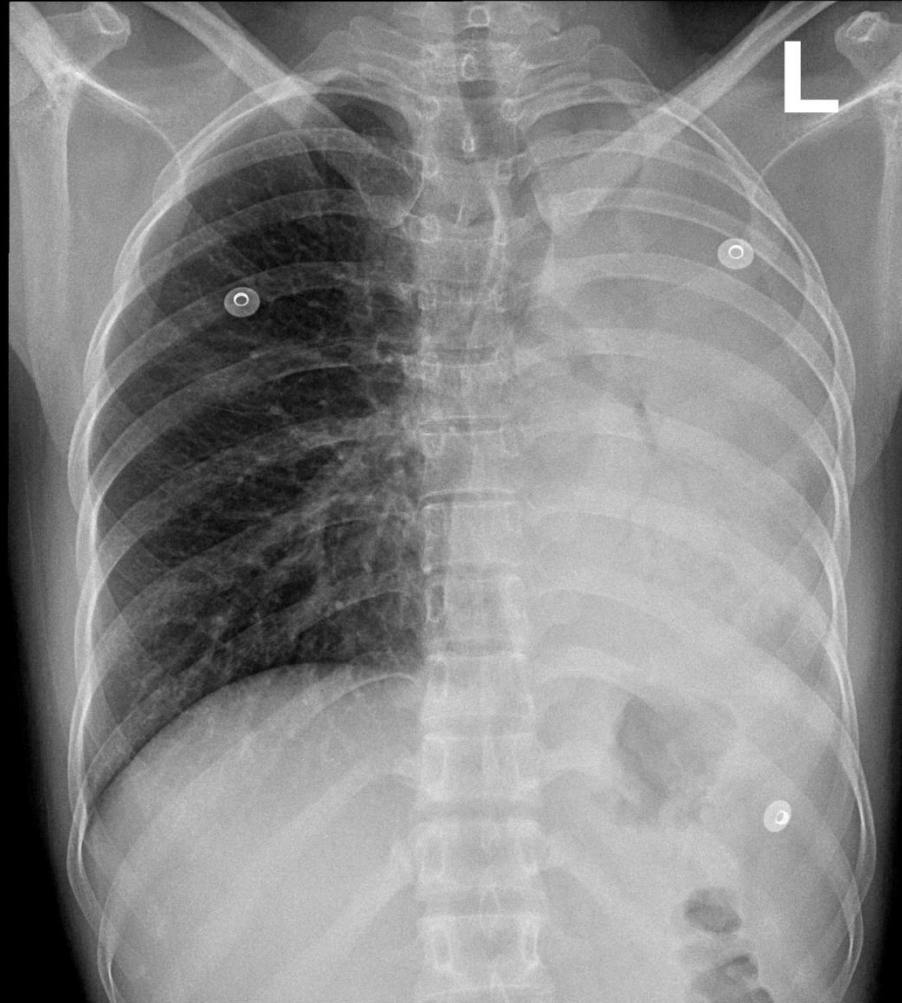
Complication of Thoracentesis

- Pneumothorax
- Bleeding
- Infection
- Hypotension
- Hypoxemia
- Air embolism
- Splenic laceration

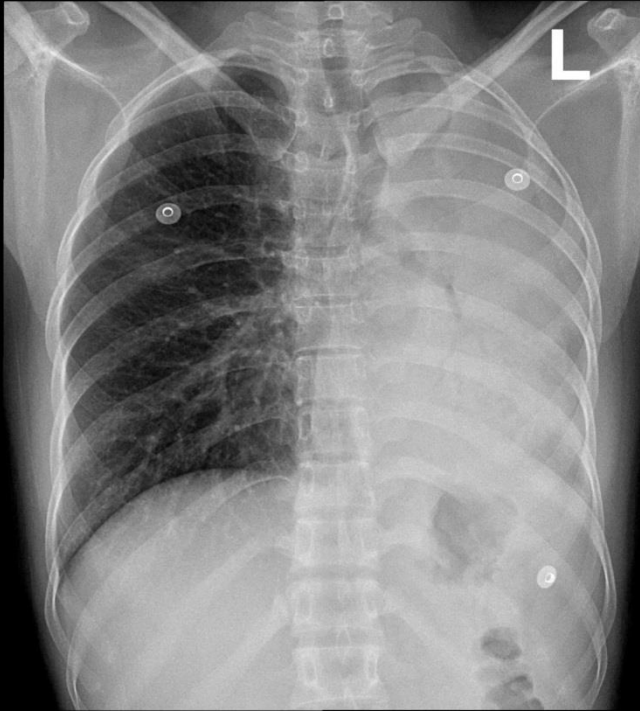


Pleural biopsy

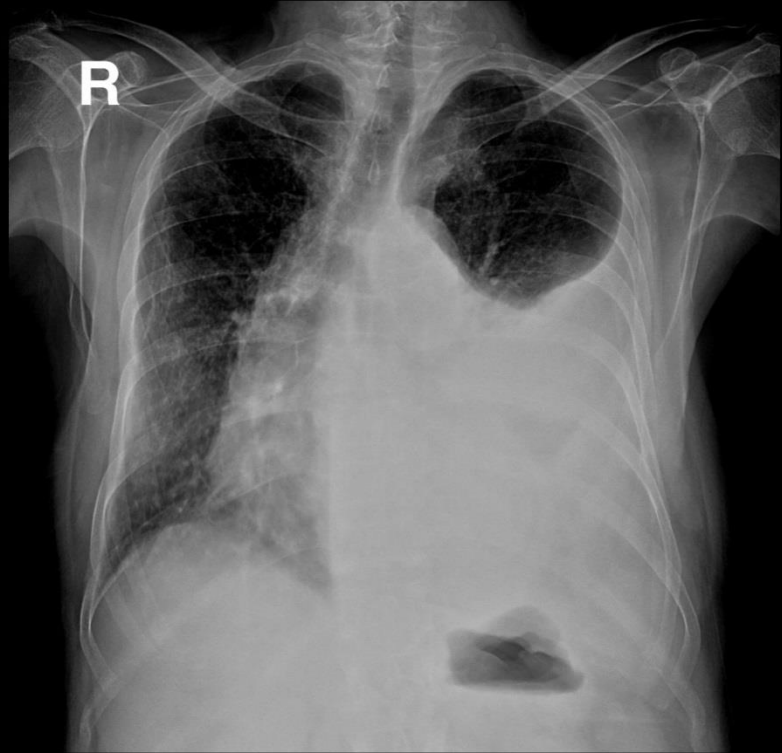
- Granulomatous disease
- Malignancy



A



B



Bronchoscopy

Suspected lung cancer

Abnormal CXR

Hemoptysis

Unexplained cough

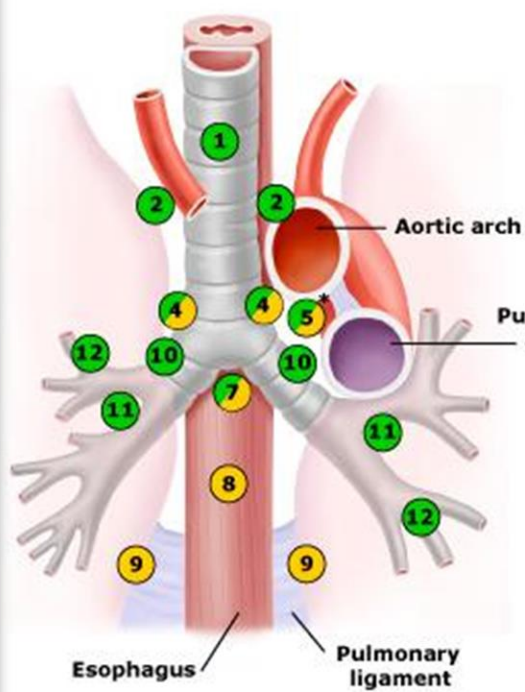
Localized wheeze

Positive sputum cytology

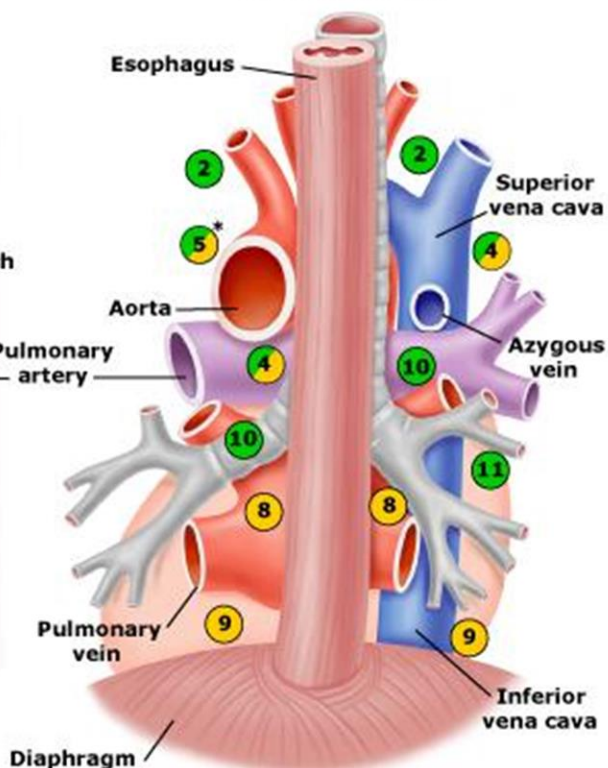
Bronchoscopy

- Mediastinal lymph nodes
- Hemoptysis
- Refractory cough
- Unexplained pleural effusion
- Lung abscess
- Staging of lung cancer
- Obtain culture material
- Airway trauma
- Tracheoesophageal fistula
- Diffuse lung disease

Anterior view



Posterior view



- Endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA)
- Endoscopic ultrasound-guided fine-needle aspiration (EUS-FNA)
- EBUS-TBNA or EUS-FNA
- * Controversial

Lymph node stations: 1 = Supraclavicular, 2 = Upper paratracheal, 3 = Prevascular and retrotracheal (not shown), 4 = Lower paratracheal, 5 = Subaortic, 6 = Para-aortic (not shown), 7 = Subcarinal, 8 = Paraesophageal, 9 = Pulmonary ligament, 10 = Hilar, 11 = Interlobar, 12 = Lobar

Bronchoscopy

Therapeutic

- Remove foreign bodies
- Remove abnormal endobronchial tissue
- Difficult endotracheal tube intubation
- Endobronchial stent placement

Pulmonary function tests

- Spirometry
- Lung volumes
- Diffusion capacity
- Respiratory muscle strength

Spirometry

- FVC (L) predicted >90%
- FEV1 (L) predicted >90%
- FEV1/FVC > 70

- Diagnose obstructive lung disease
- Suggest restrictive lung disease

Lung volumes

- TLC (L) >90% predicted
- RV (L) > 90% predicted
- Diagnose restrictive lung disease
- Diagnose air trapping

Diffusing capacity (DL)

- Measure the ability of gases to diffuse from the alveoli into the pulmonary capillary blood
- CO not normally present in lungs or blood
- More soluble in blood than lung tissues
- D_{lco}

↓ DLco

Reflect loss or damage to the gas exchanging surface of the lung

Emphysema

Distinguish emphysema from chronic bronchitis or chronic asthma

Interstitial lung disease

Pulmonary vascular disease

Respiratory muscle strength

- $P_{I\max}$, $P_{E\max}$
- Measured by pressure transducer at the mouth when subject make a maximal inspiratory effort from full expiration or maximal expiratory effort from full inspiration
- P_I reflect inspiratory muscles (diaphragm)
- P_E expiratory muscles including abdominal
- Motor neuron disease, Guillian Barre syndrom

DIAGNOSIS

	Baseline		
Date and Time	03/02/2010	08:41	
SPIROMETRY	Pred	Pre	%Pred/P
FVC (L)	5.04	3.13	62.1
FEV 1 (L)	4.25	2.53	59.5
FEV 1 FVC		80.91	
MMEF 75/25 (L/s)	4.93	2.46	49.9
PEF (L/s)	9.73	7.88	81
FIF (50 (L/s)		4.09	
FEF 50 (L/s)	5.45	4.23	77.6
BODY PLETHYSMOGRAPH			
VC (L)	5.27	3.13	59.4
TLC (L)	6.9	4.51	65.4
ITGV (L)	3.25	3.58	110.2
ERV (L)	1.59	2.2	138.4
RV (L)	1.66	1.38	83.1
RV % TLC	24.49	30.58	124.9
PI MAX (kPa)	10.96	7.11	64.9
PE MAX (kPa)	14.51	11.55	79.6
DIFFUSING CAPACITY			
TLCO SB (mmol/min/kPa)	11.63	5.27	45.3
Hb (g/100ml)		16.2	
TLCOc SB (mmol/min/kPa)	11.63	5.06	43.5
KCO (mmol/min/kPa)	1.68	1.54	91.7
TLC-He (L)	6.75	3.42	50.7

- 50 yr old male with SOB and cough >3yrs
- Exam: clubbing and bilat insp crackles
- CXR: reticulation bilateral
- ABG: hypoxic respiratory failure
- PFT: restrictive defect with significant impairment in DLco

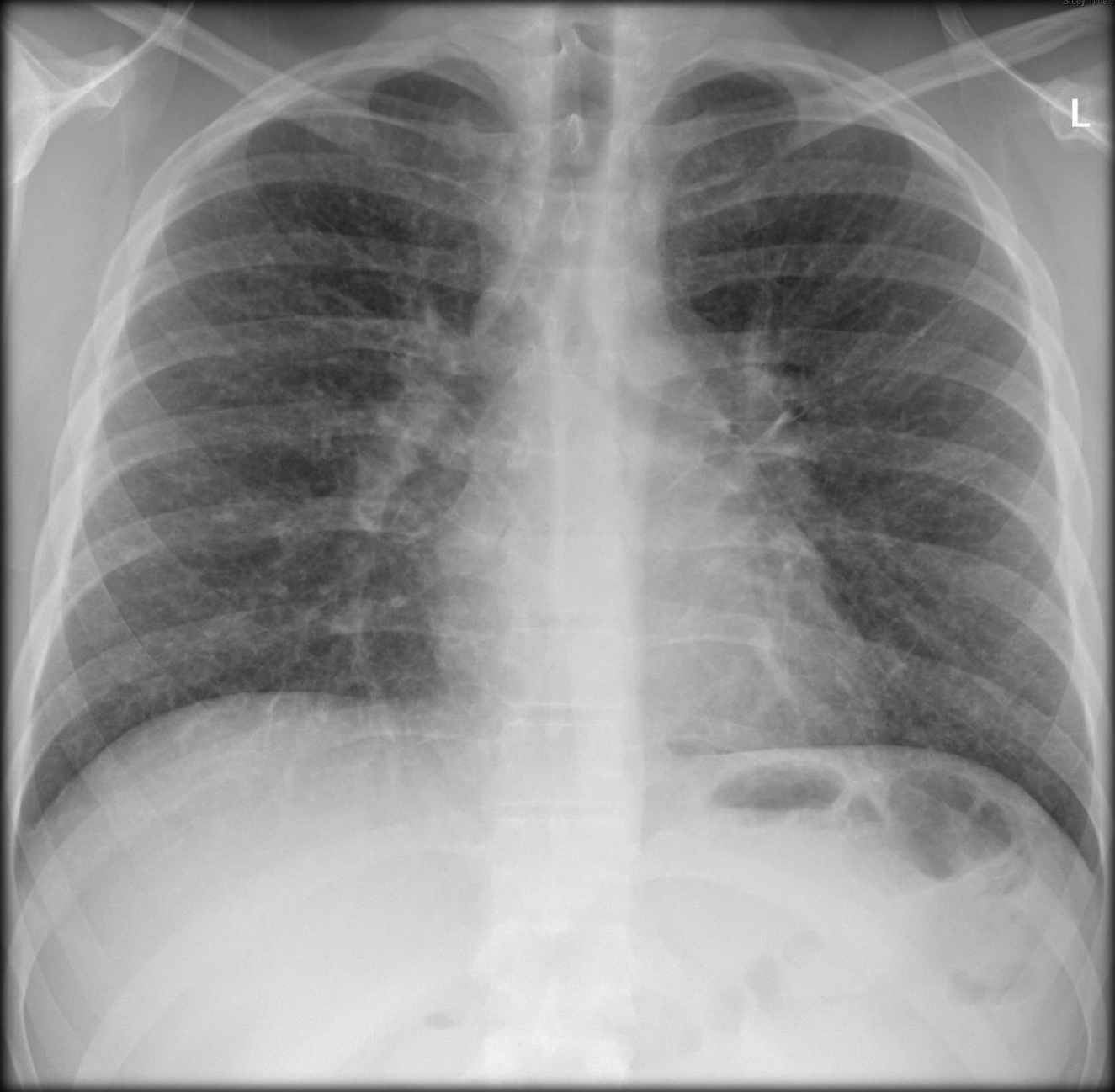
HRCT

- Designed for detailed evaluation of interstitial structures of the lung
- Use narrow slice thickness (1-2 mm) compared with 5-10 mm for routine scans

HRCT

Principle indications

- Suspected interstitial lung disease
- Characterization of interstitial lung disease
- Characterization of solitary pulmonary nodules
- Diagnosis of bronchiectasis

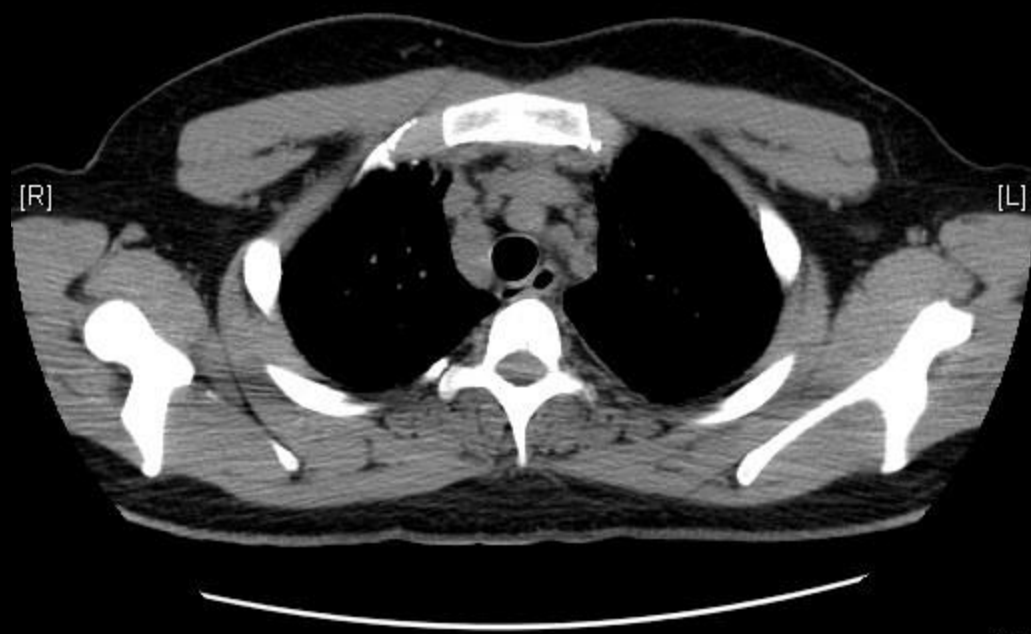


Se:2
Im:11

[A]



Study Time:4:00:04 PM
MRN:

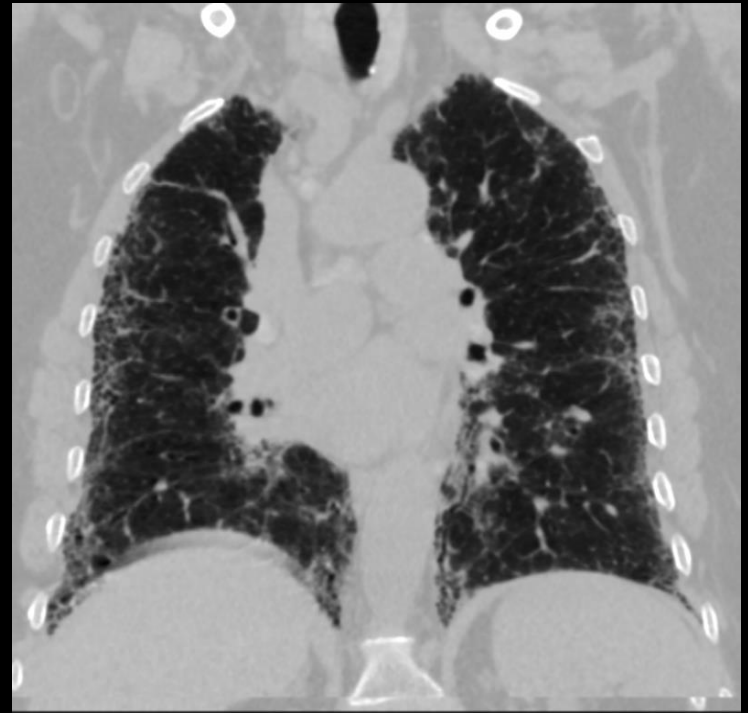
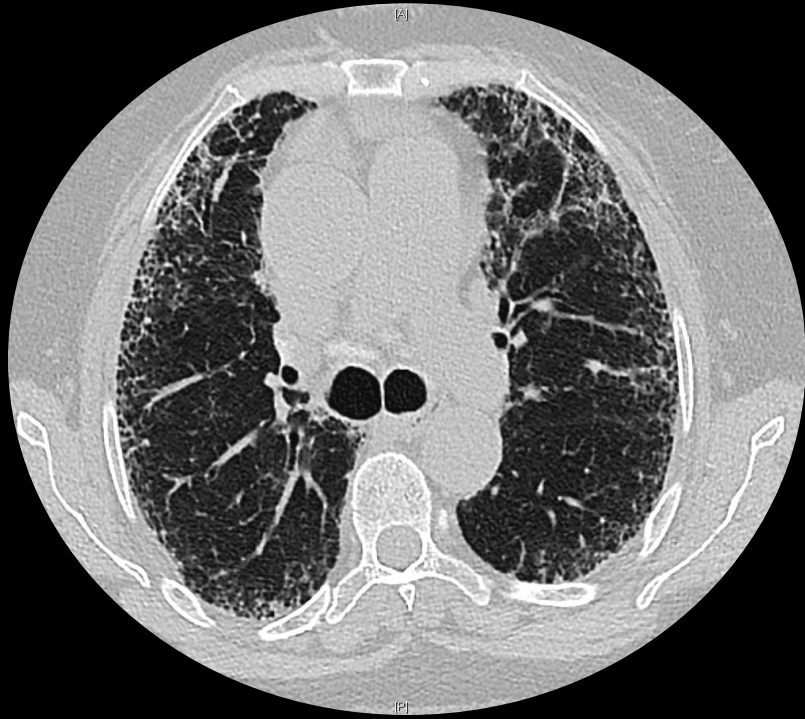


[R]

[L]

[P]

C56
W342



Se:4
Im:5

[A]



Study Time: 2:45:11 PM
MRN:



[R]

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[P]

C-498
W1465

[R]



[A]

[L]

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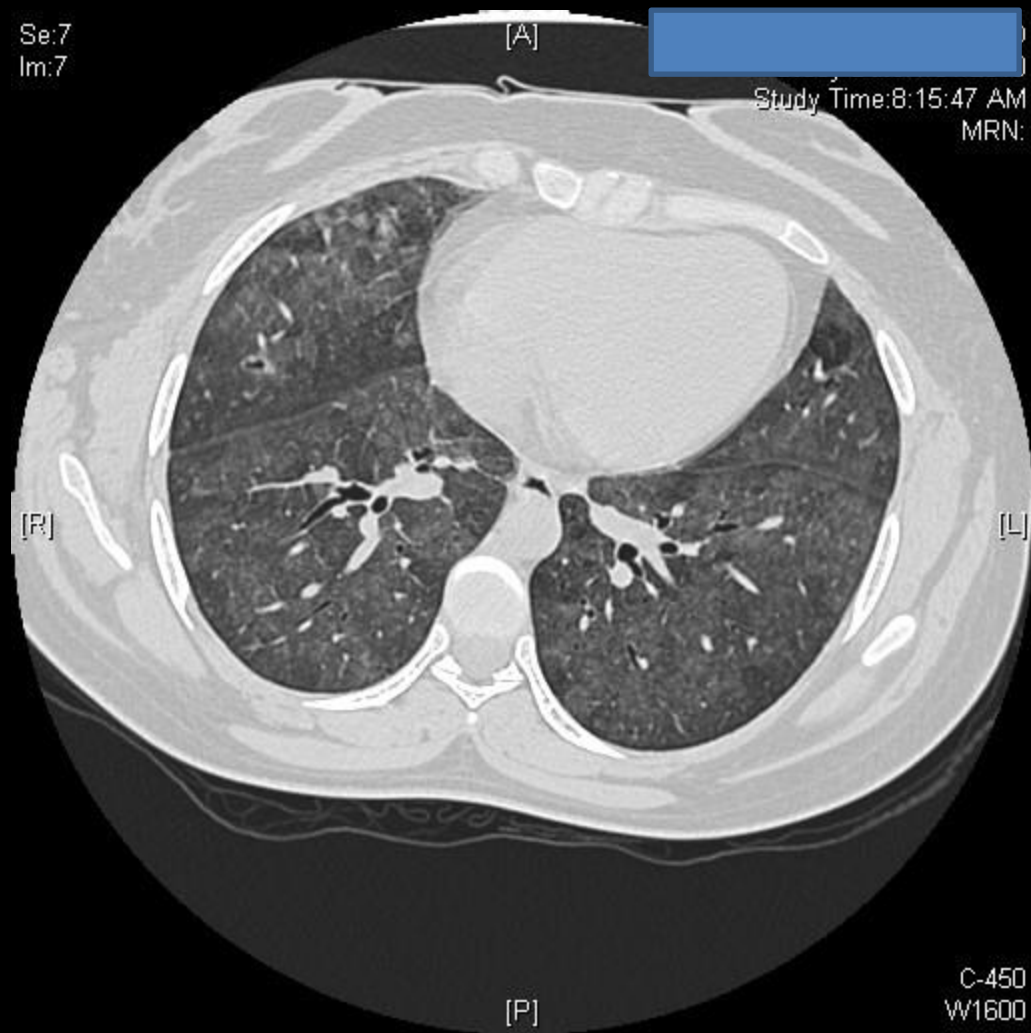
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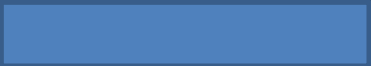


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C-450
W1600

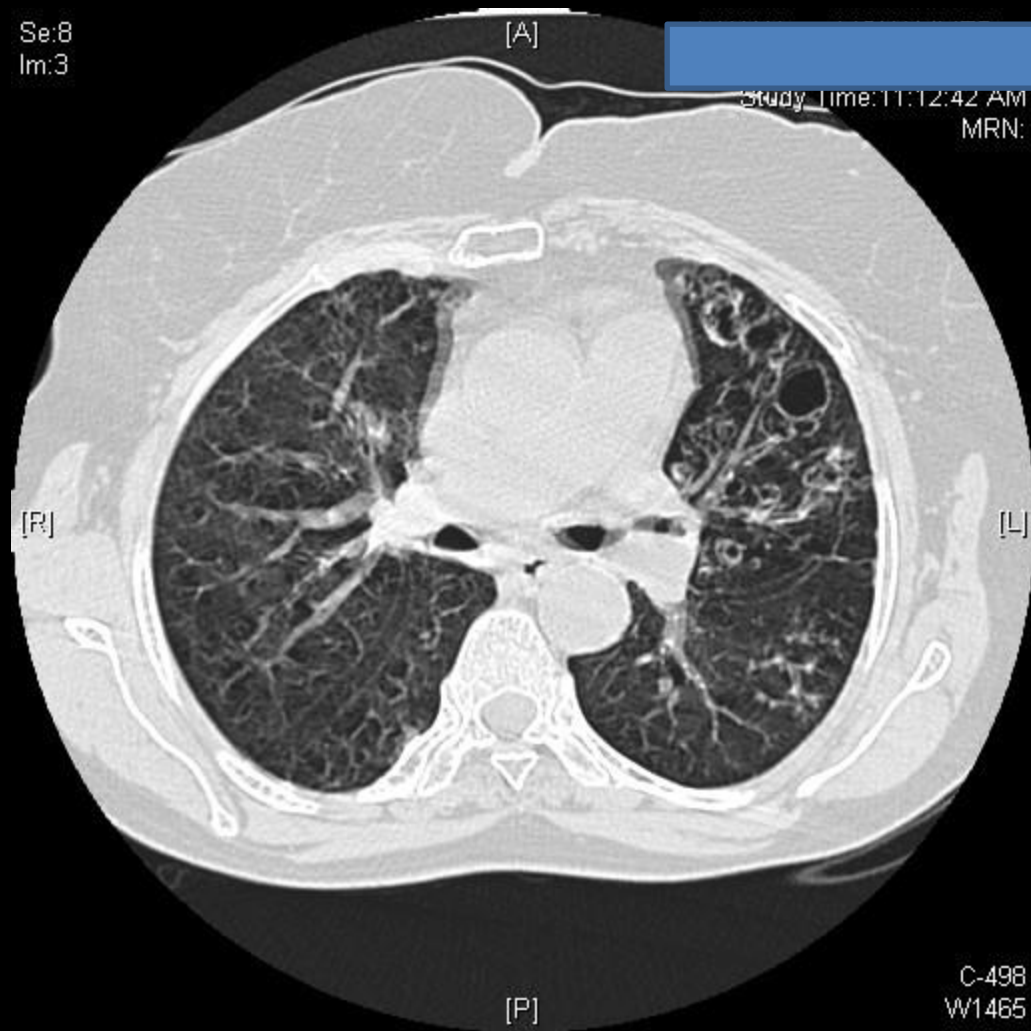
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Im:3

[A]



Study Time: 11:12:42 AM
MRN:

[R]



[L]

[P]

C-498
W1465

- 45 yrs old female with RT sided chest pain for 1 day

- ABG pH 7.32, PaCO₂ 28, PaO₂ 50, O₂sat 88%
- EKG sinus tachycardia
- CXR normal
- Spiral CT

CT Angiography

- Image data are acquired continuously as the tube and detector rotate within the gantry and the patient moves continuously through the gantry

Advantages

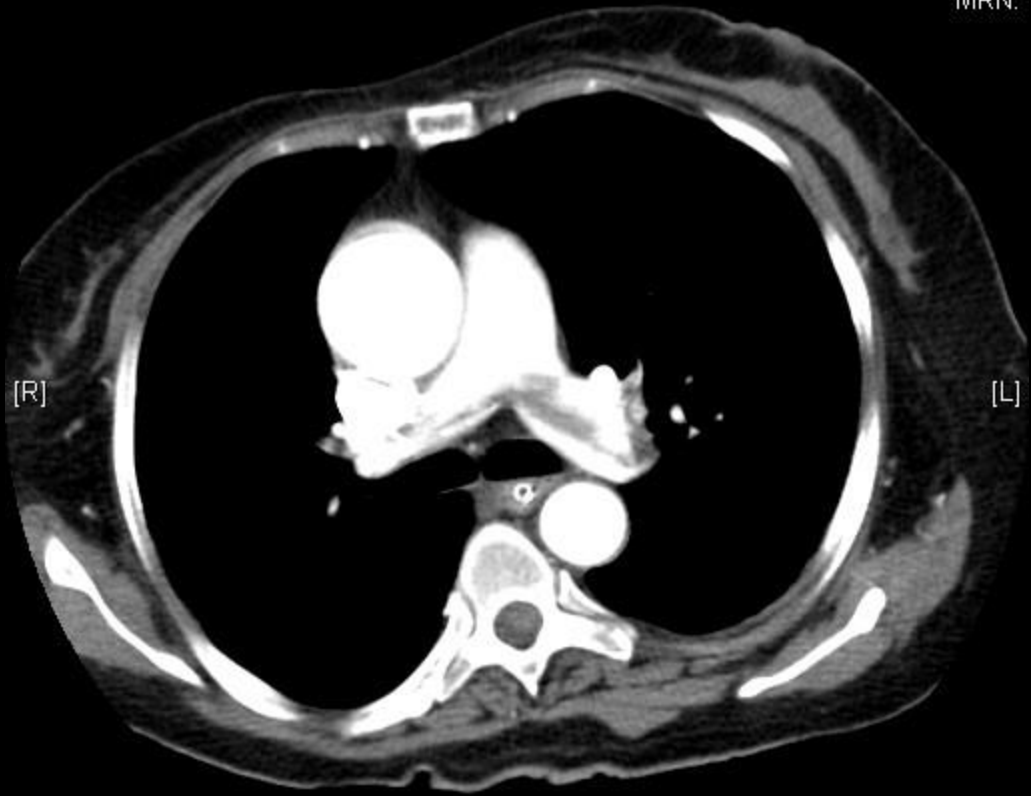
- Critically ill patients
- Children
- Less volume of intravenous contrast
- Permits greater processing of the raw data

Se:2
Im:17

[A]



MRN:



[R]

[L]

[P]

C56
W342

