Chest and Abdominal Radiograph 101

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July 16, 2010

Objectives

- Chest radiograph
  - Approach to interpreting chest films
  - Lines/tubes
  - Pneumothorax/pneumomediastinum/pneumopericardium
  - Pleural effusion
  - Pulmonary edema
- Abdominal radiograph
  - Tubes
  - Bowel gas pattern
    - Ileus
    - Bowel obstruction
  - Pneumoperitoneum

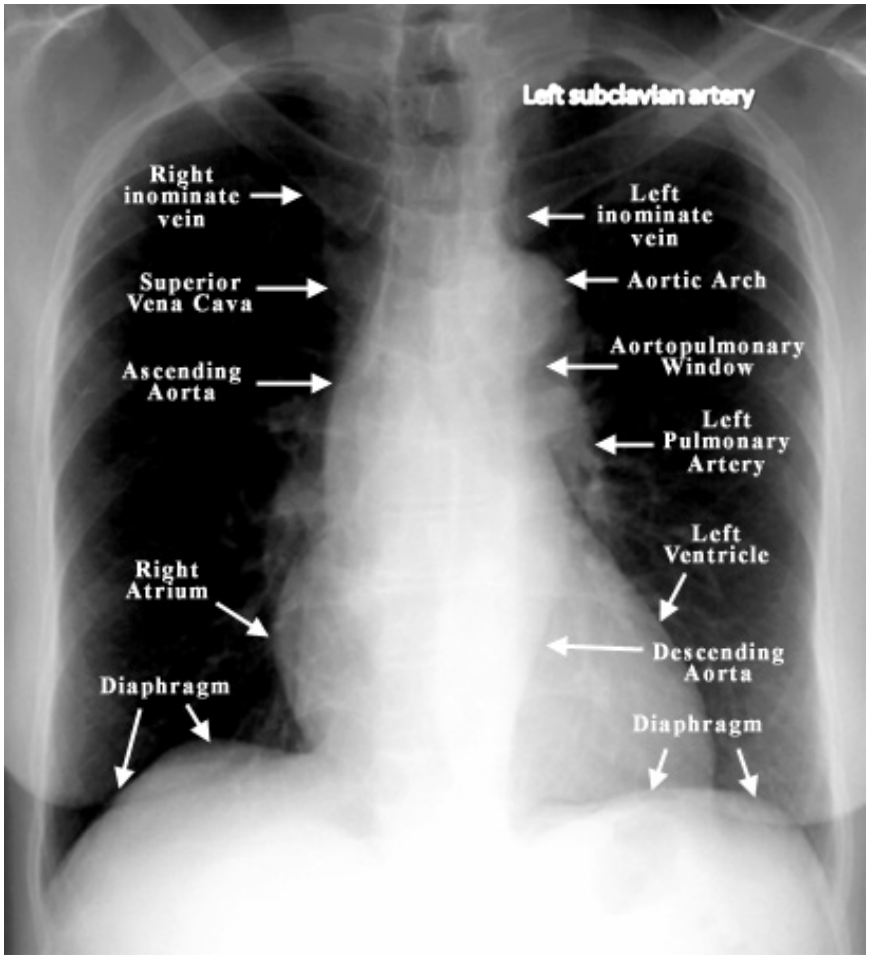
First things first

- Turn off stray lights, optimize room lighting
- Patient Data
  - Correct patient
  - Patient history
  - Look at old films
- Routine Technique: AP/PA, exposure, rotation, supine or erect

Approach to Reading a Chest Film

- Identify tubes and lines
- Airway: trachea midline or deviated, caliber change, bronchial cut off
- Cardiac silhouette: Normal/enlarged
- Mediastinum
- Lungs: volumes, abnormal opacity or lucency
- Pulmonary vessels
- Hila: masses, lymphadenopathy
- Pleura: effusion, thickening, calcification
- Bones/soft tissues (four corners)

Anatomy of a PA Chest Film



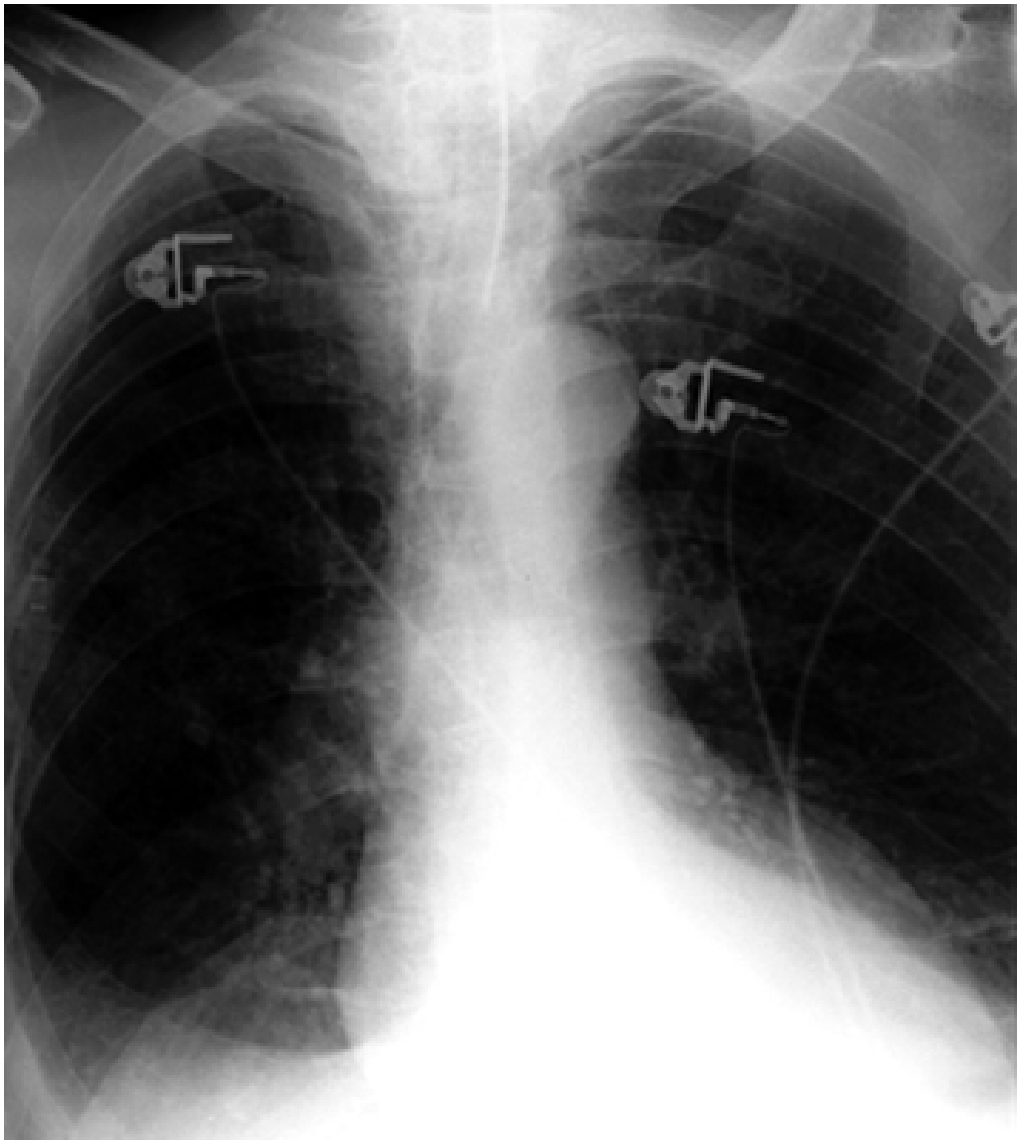
TUBES

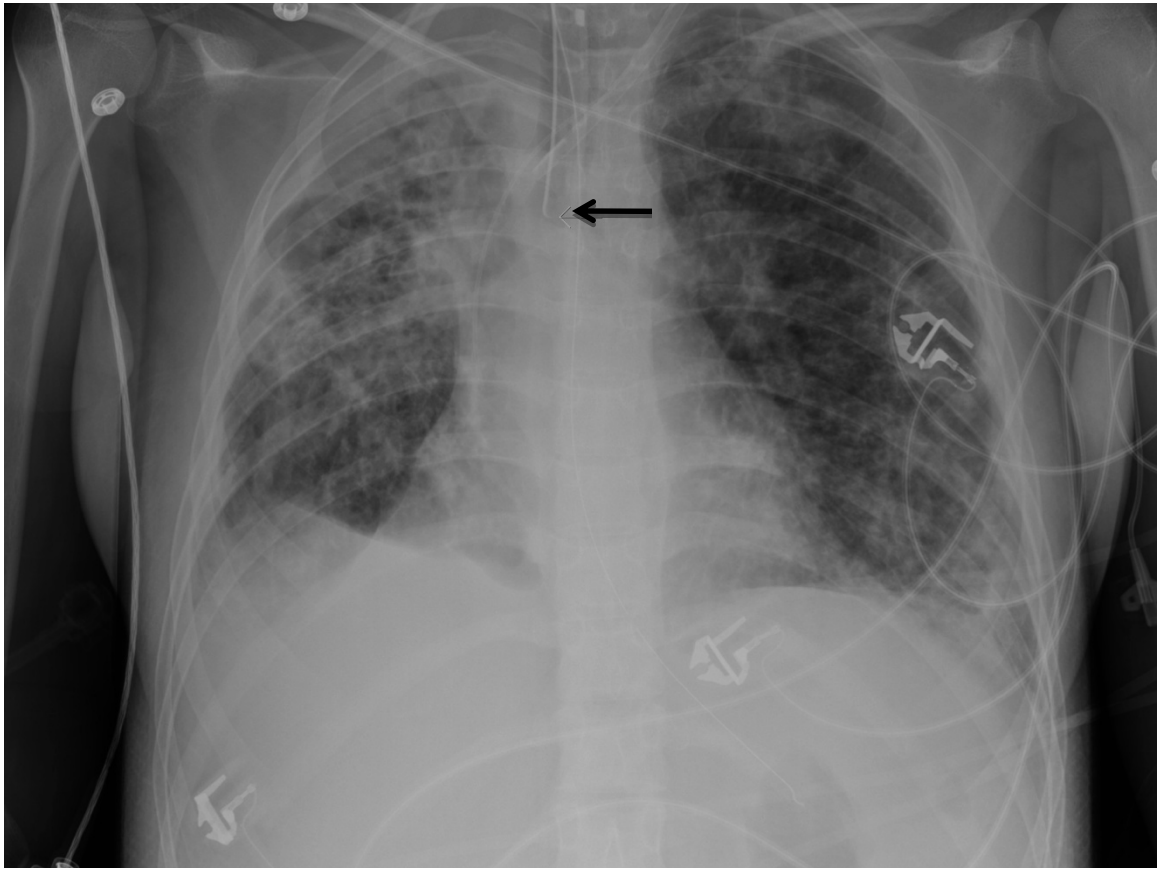
Endotracheal Tubes

Ideal location for ETT

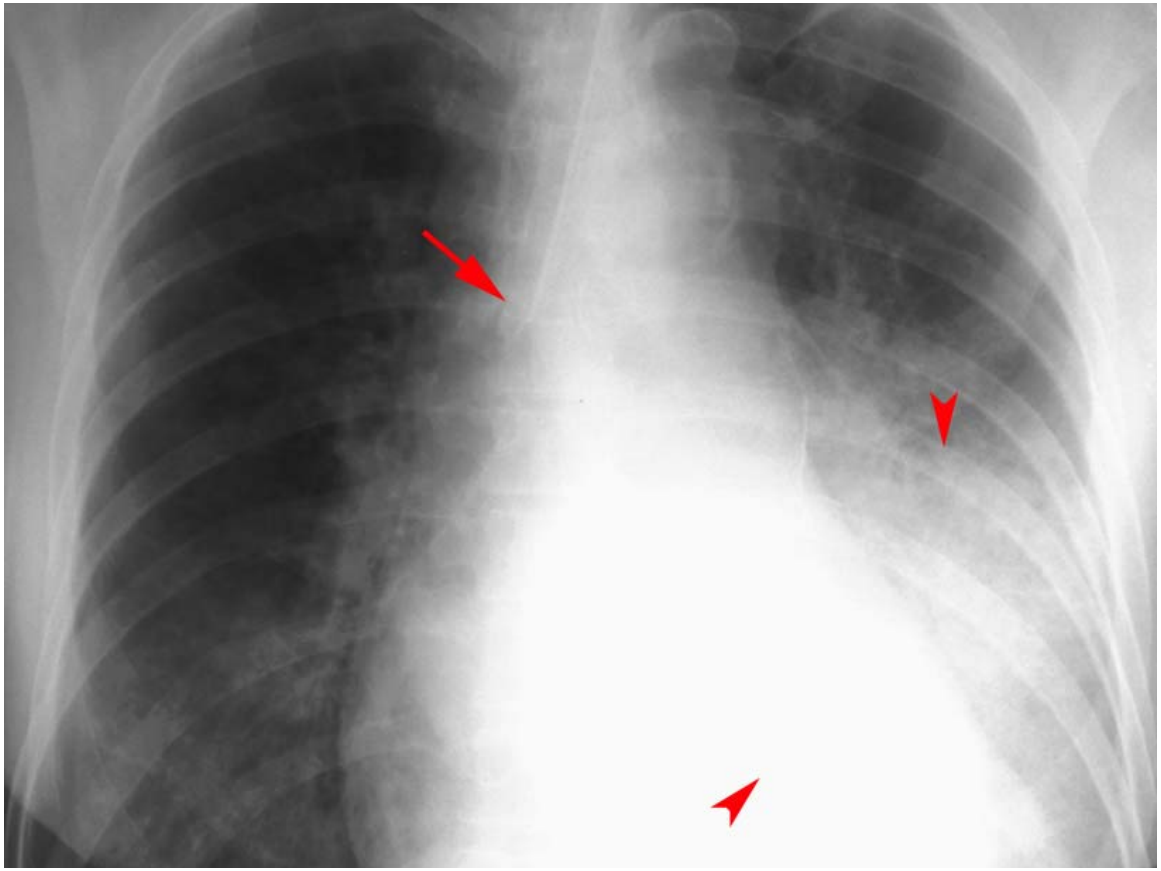
Is 5 +/- 2 cm from carina

-Normal ETT excursion with flexion and extension of neck 2 cm.



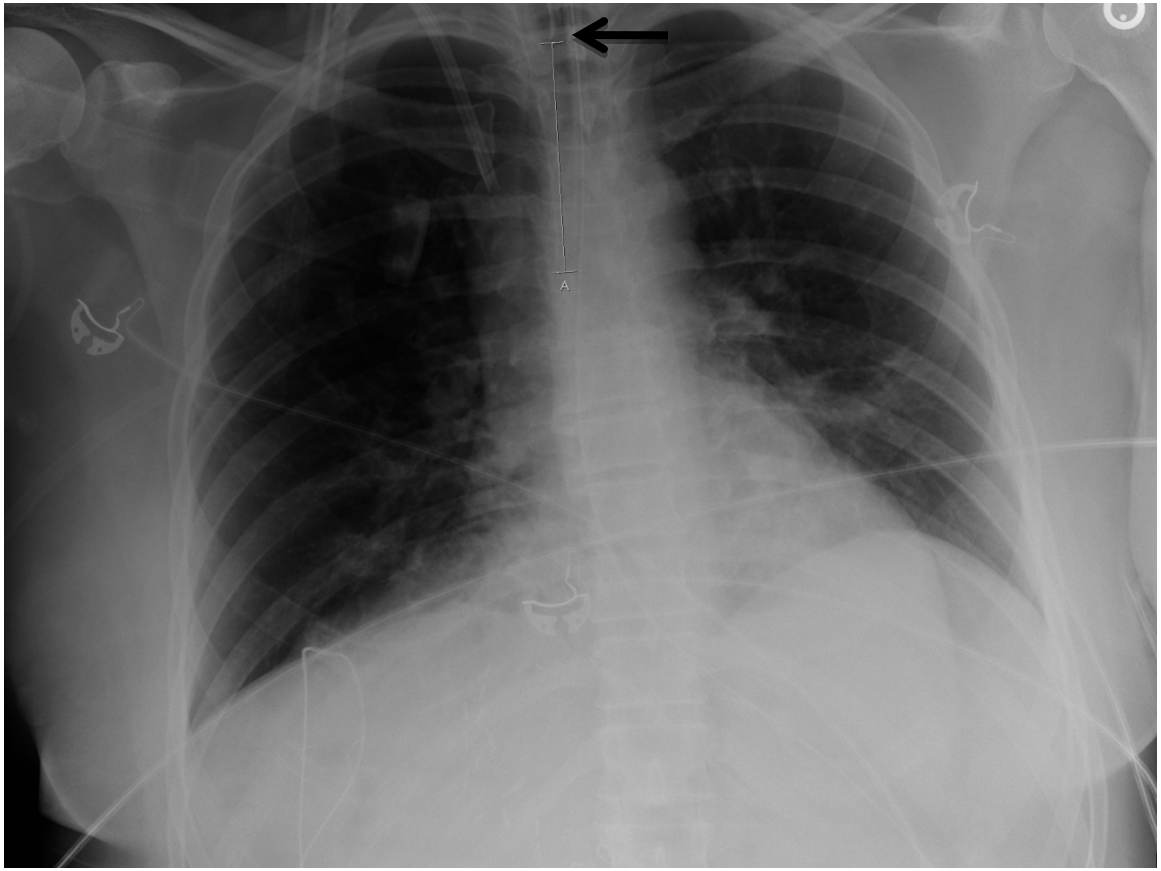


ETT at carina



Right mainstem Intubation

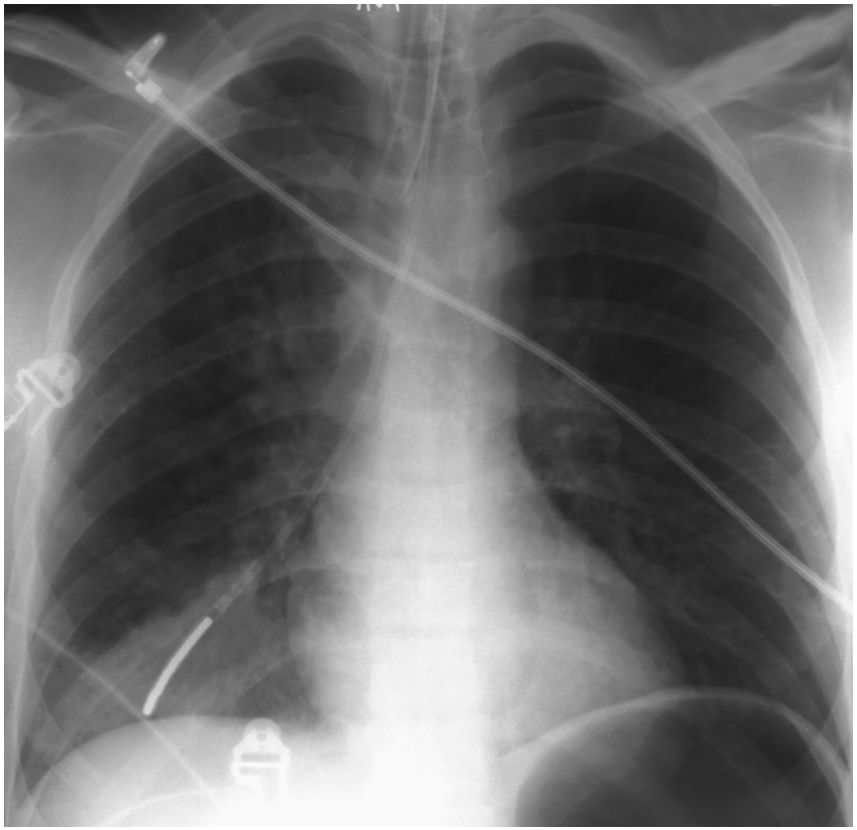
-Right mainstem intubation with left basilar atelectasis.



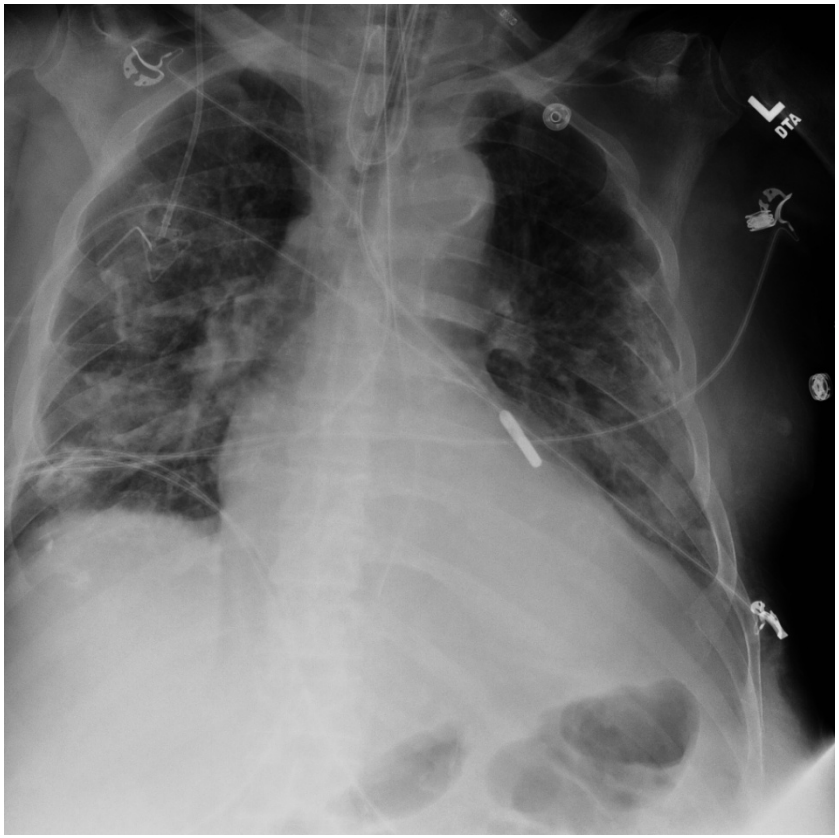
ETT too high

Other tubes to consider

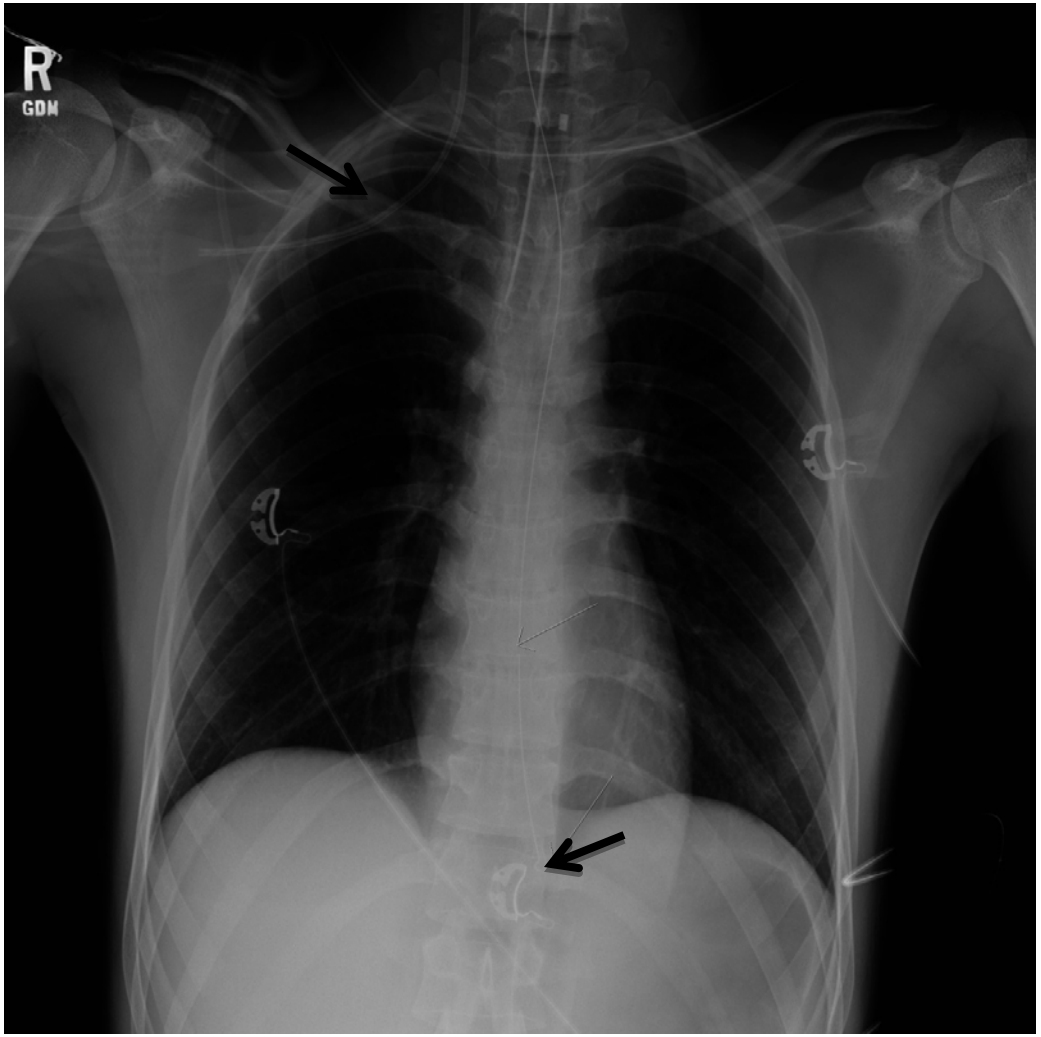
DHT down right mainstem



DHT down left mainstem



NGT with tip at GE junction



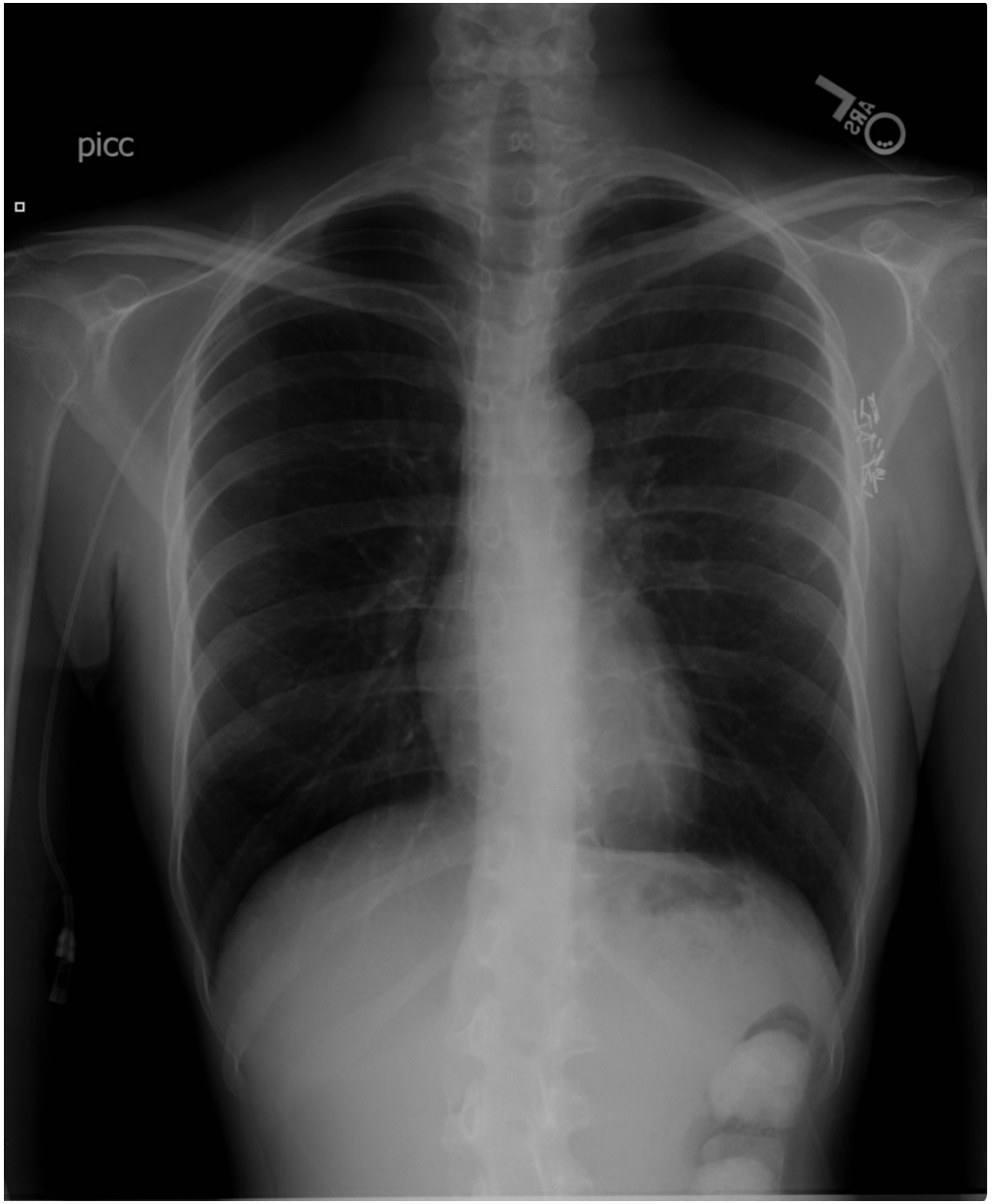
CENTRAL LINES

Central Venous Line

Ideal location for tip of central venous line is within superior vena cava.

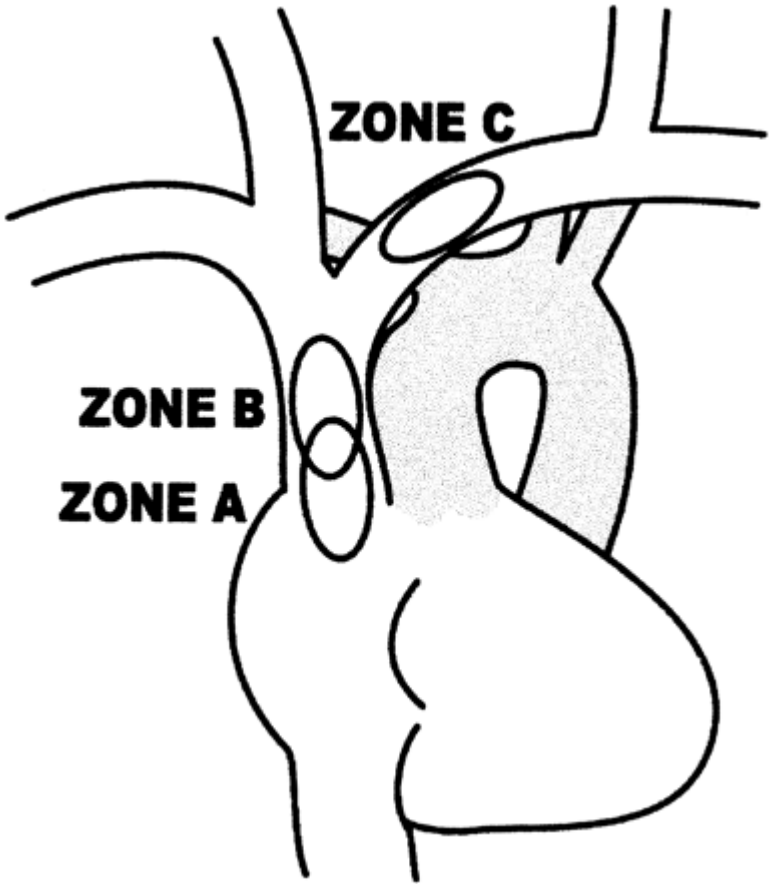
- Risk of thrombosis decreased in central veins.

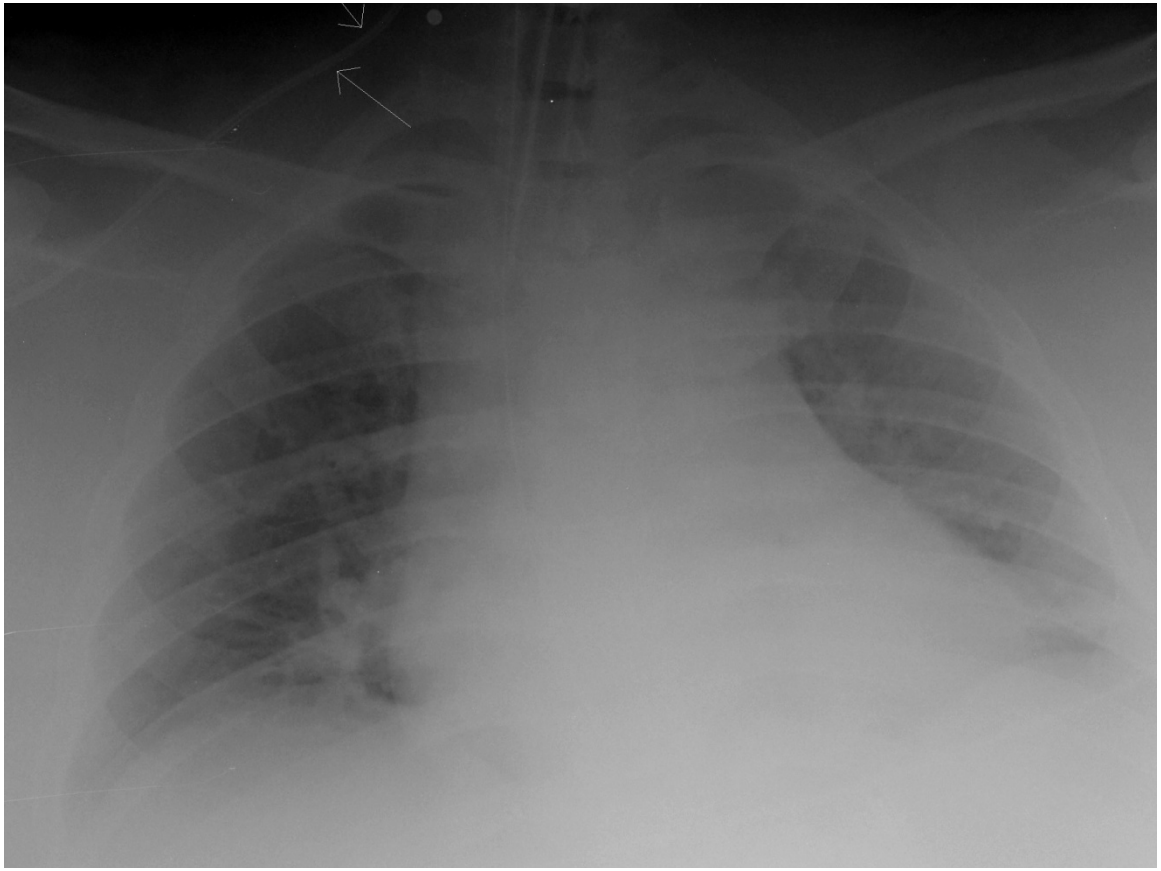
- Catheter position within atrium increases risk of perforation



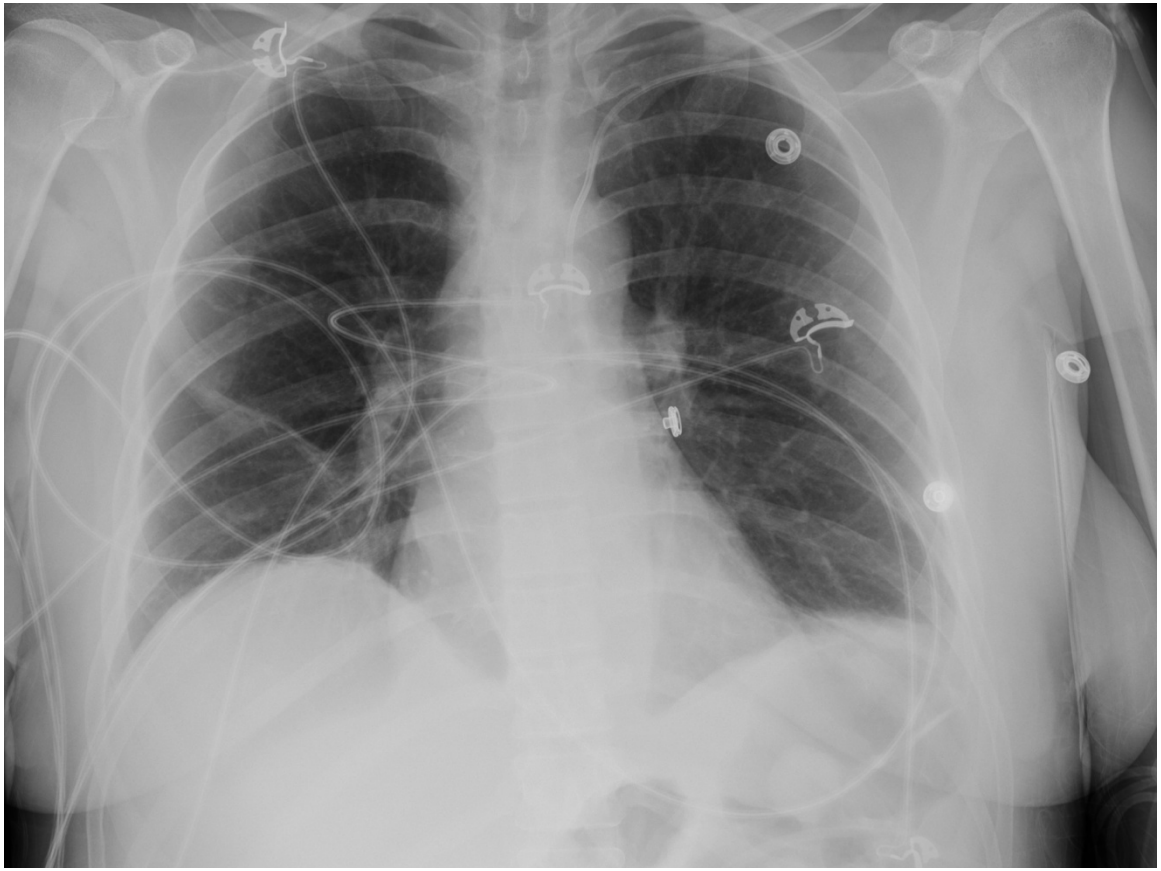
Acceptable central line positions

- **Zone A** – distal SVC/superior atriocaval junction.
- **Zone B** – proximal SVC
- **Zone C** – left brachiocephalic vein.





Right subclavian central venous catheter directed cephalad into IJ

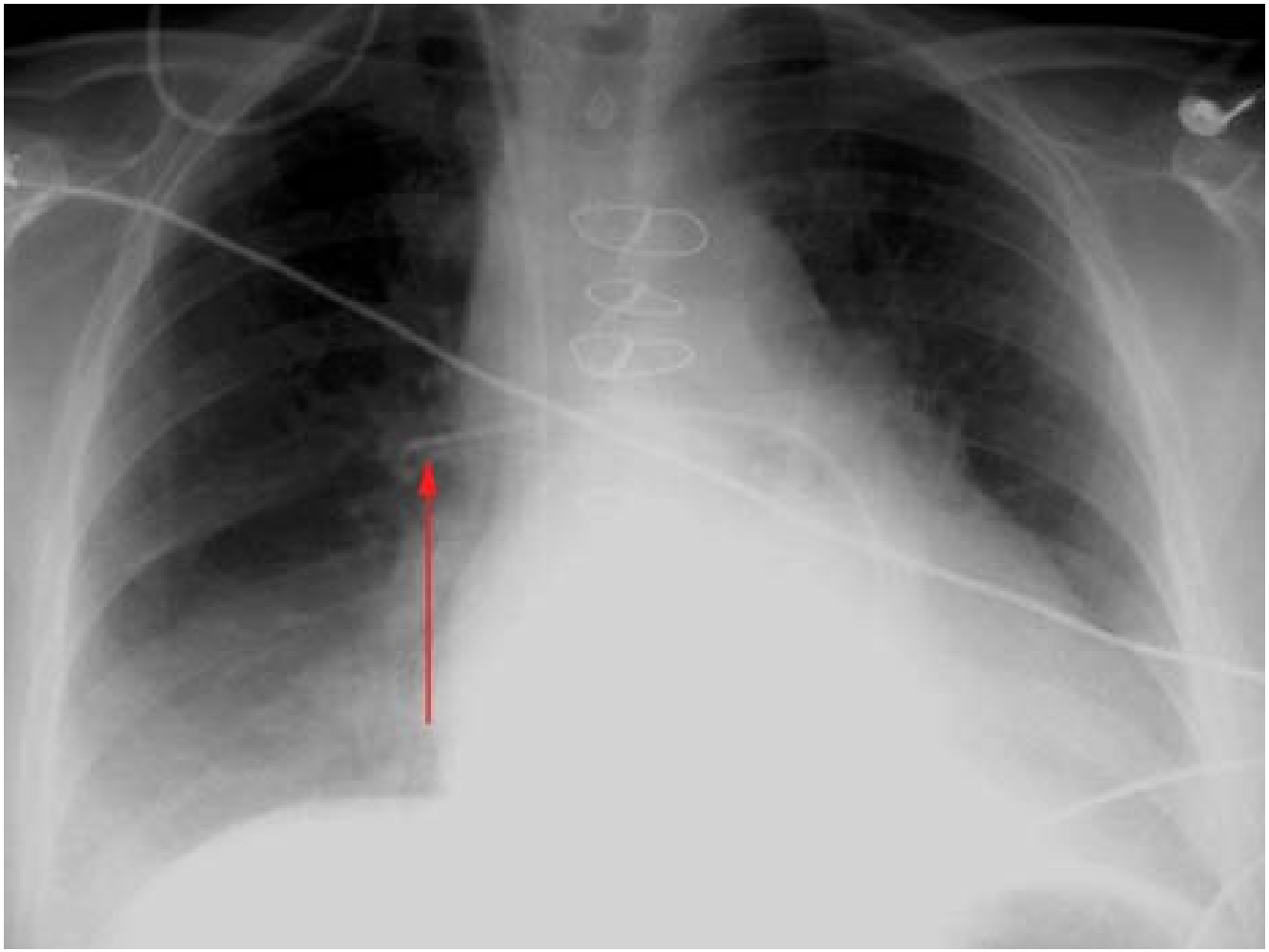


Where is this tip?

Hemiazygous

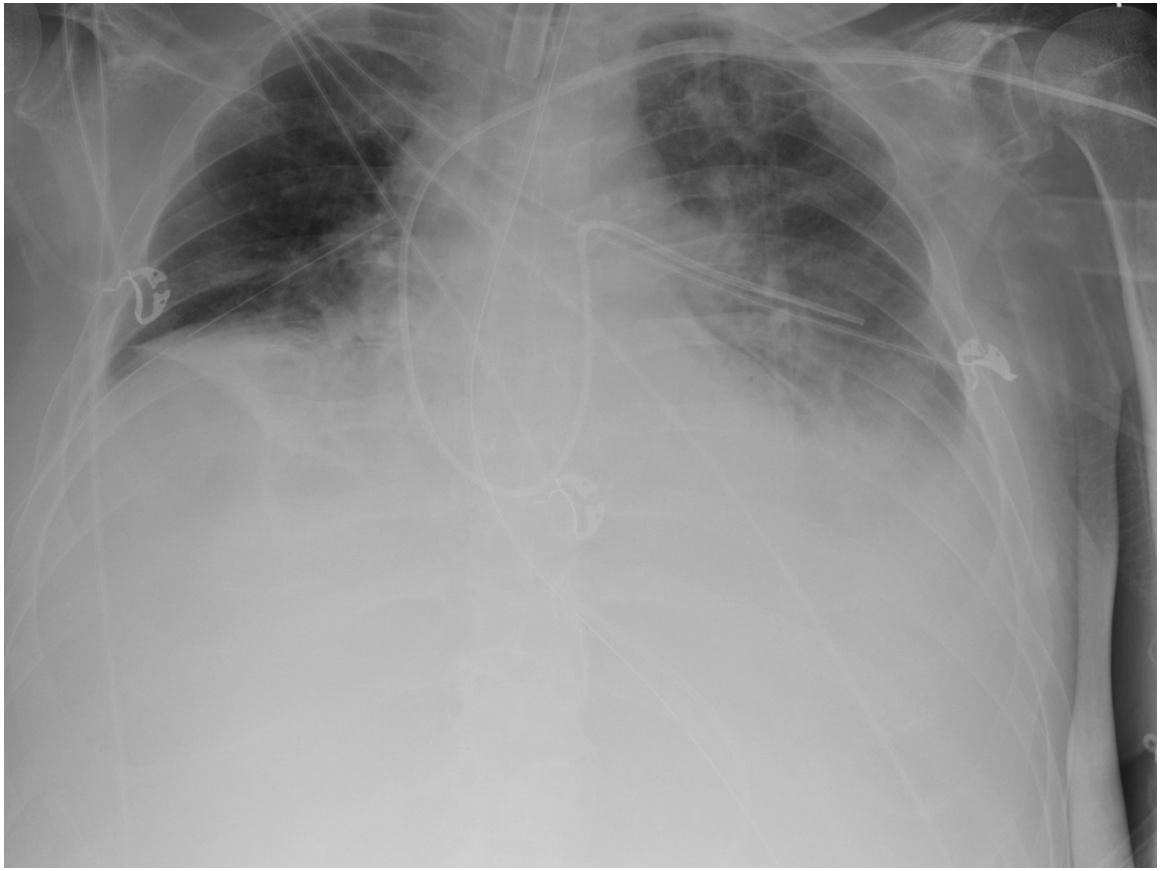
Or this one?

Right vertebral artery



Pulmonary Arterial Catheter

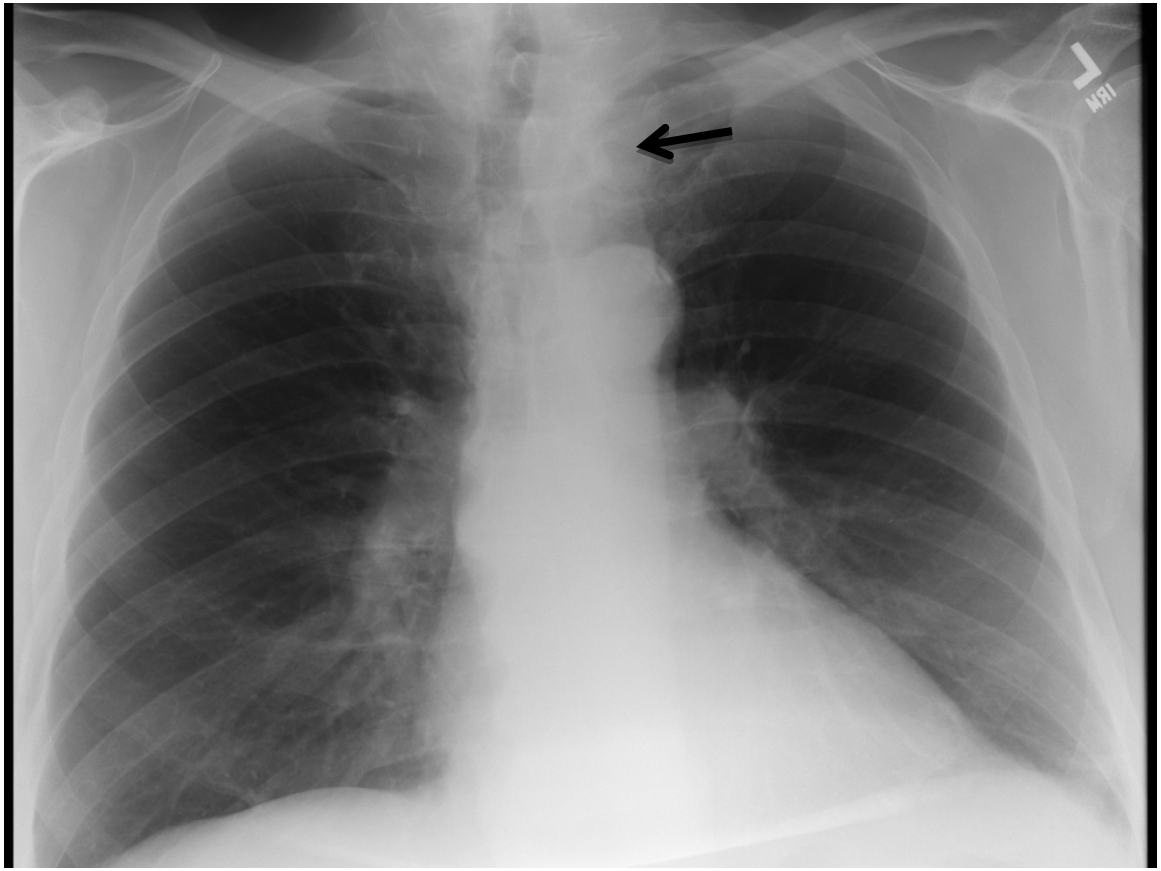
Ideal location for tip of PA catheter within mediastinal shadow. Placement too distal can cause pulmonary infarct or vessel rupture.



PAC in distal branch of left PA

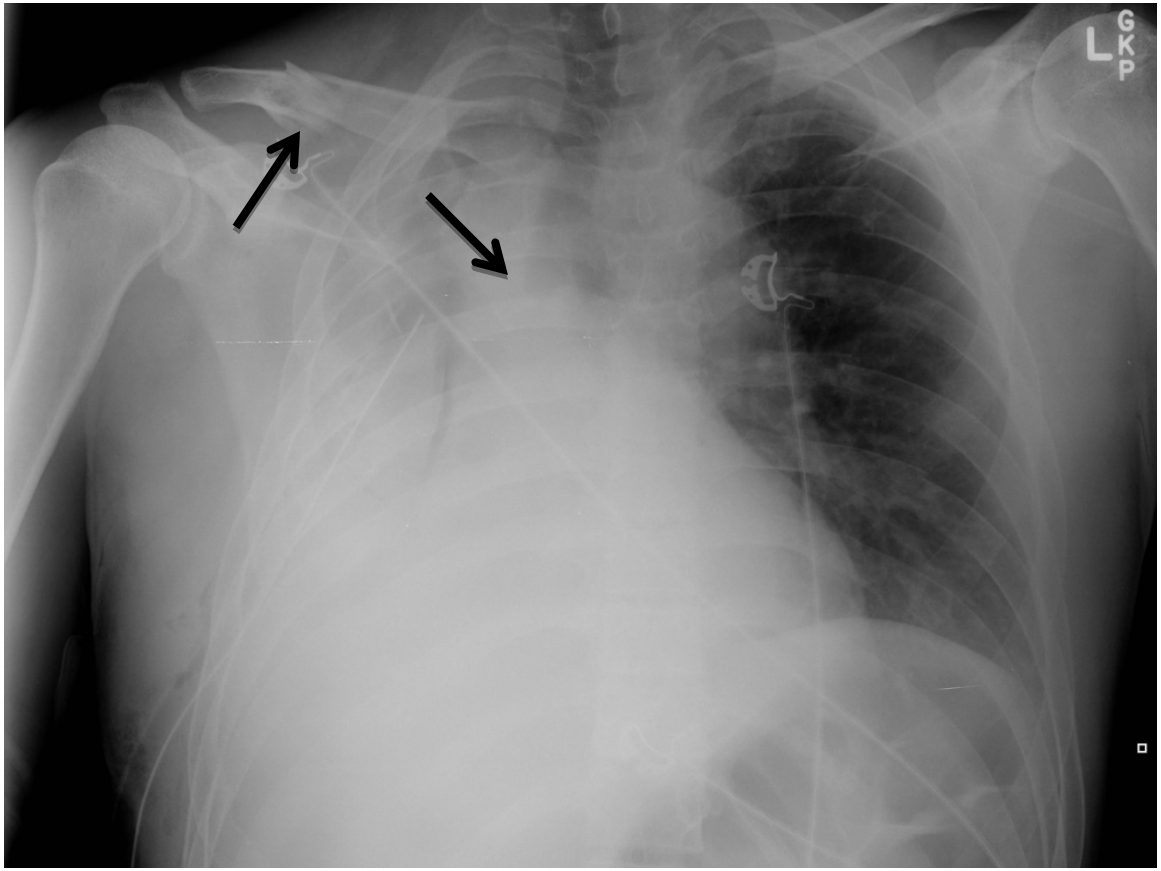
PAC in interlobar artery

AIRWAY



What's wrong with this airway?

Note rightward tracheal deviation at thoracic inlet due to thyroid mass

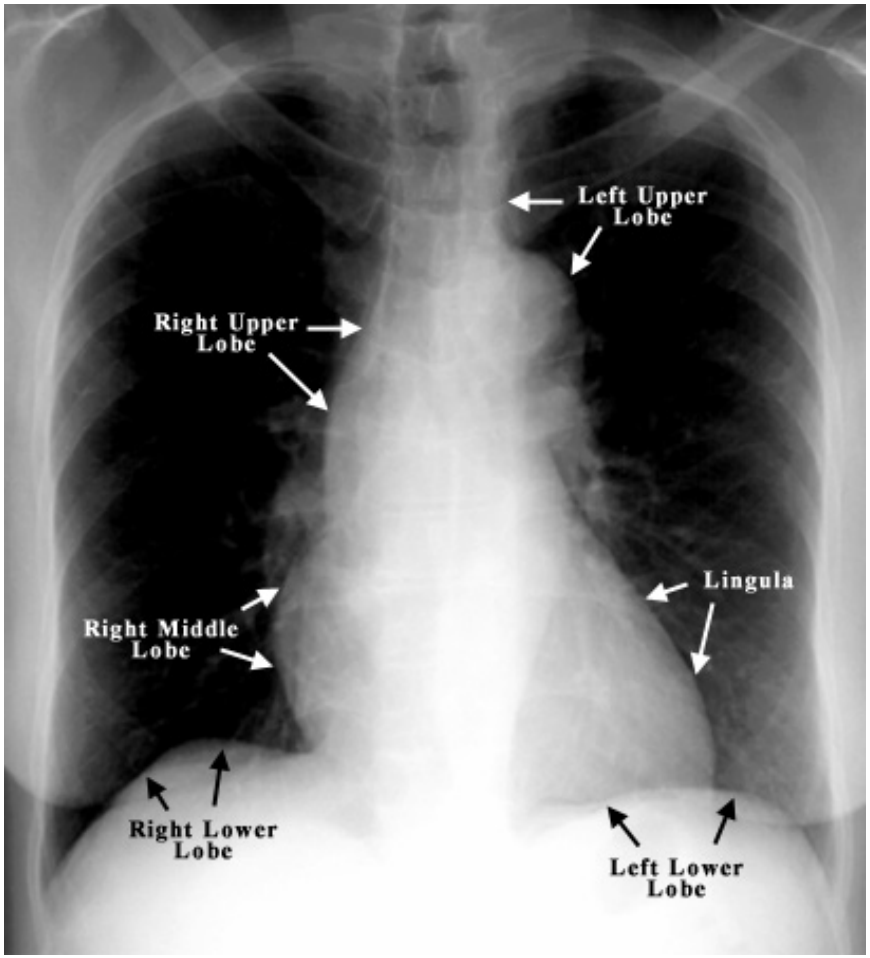


Bronchial cutoff due to mucous plug

Note near complete whiteout of right hemithorax and rightward mediastinal shift.

Lungs

Silhouette Sign



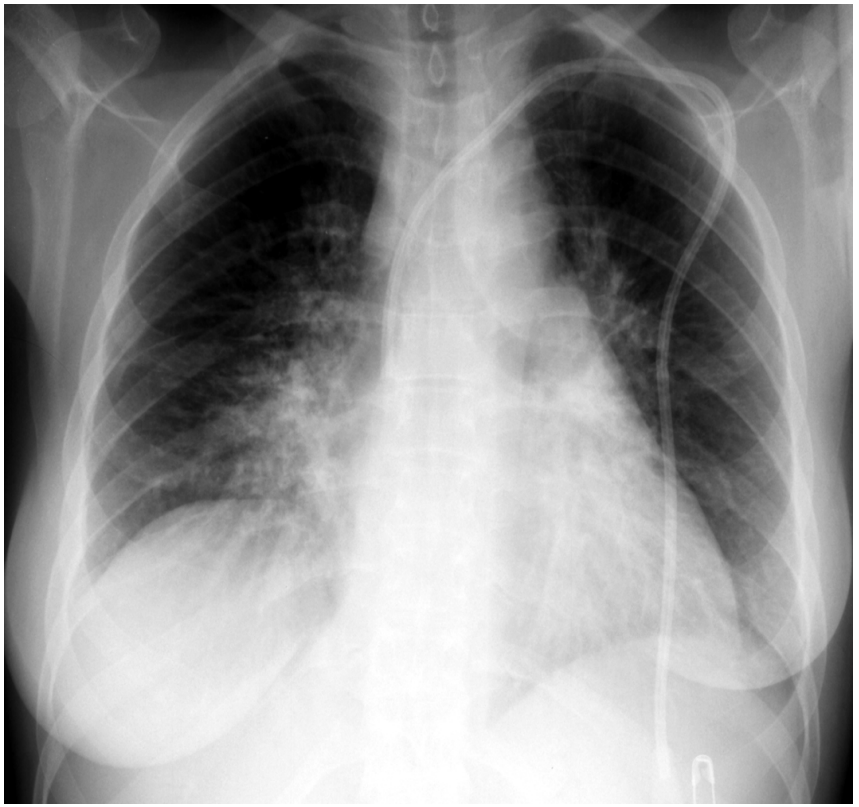
Atelectasis vs Pneumonia

Atelectasis	Pneumonia
Volume loss	Normal or increased volume
Associated with ipsilateral mediastinal shift	No shift
Linear, wedge shaped	Consolidation, air space process
Apex at hilum	Not centered at hilum
Vascular crowding	
Air bronchograms	Air bronchograms

RML pneumonia versus atelectasis

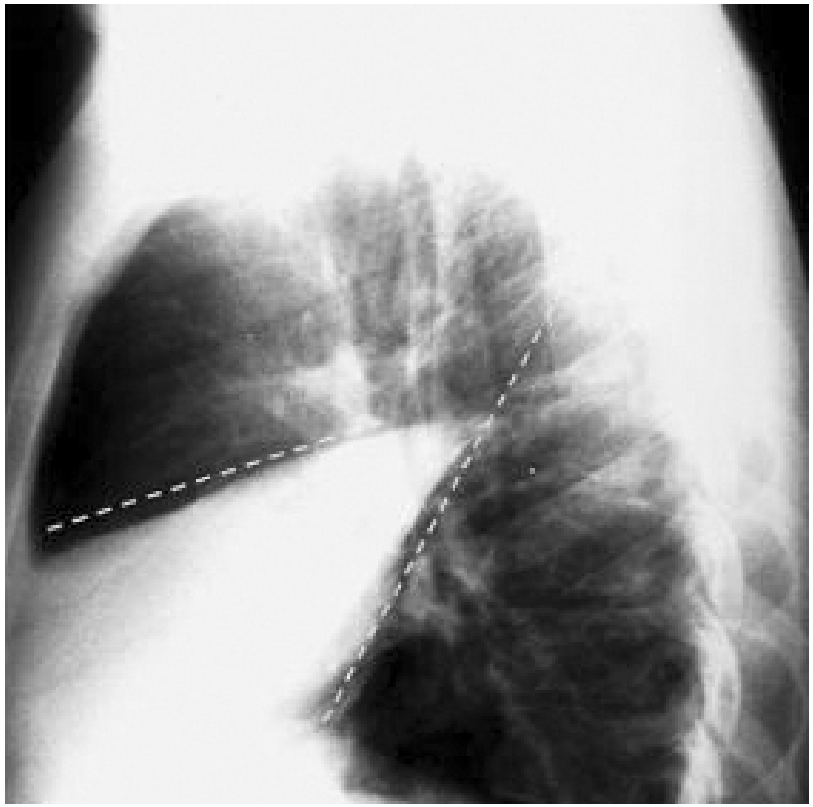
Pneumonia

Atelectasis

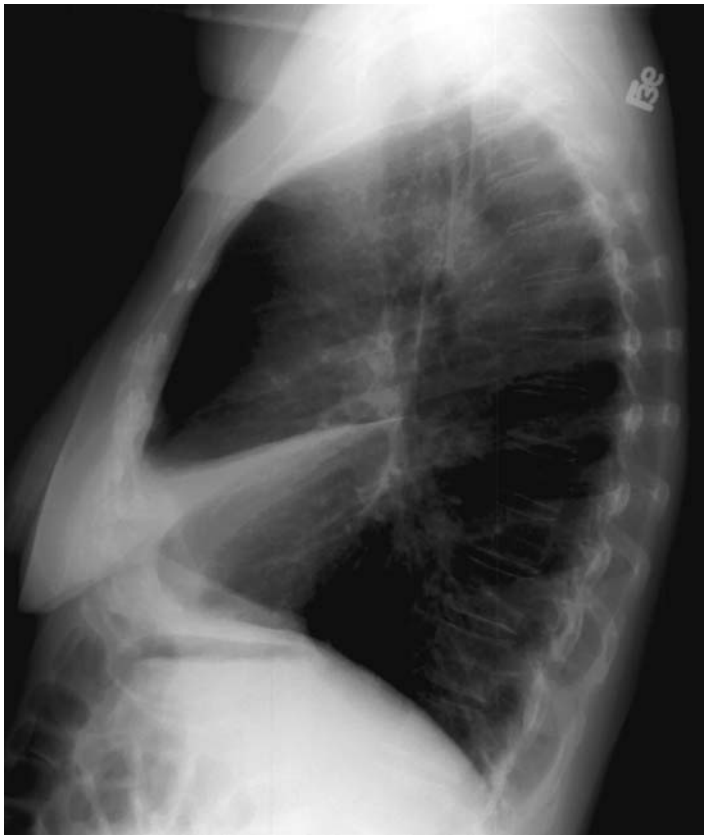


RML pneumonia vs atelectasis

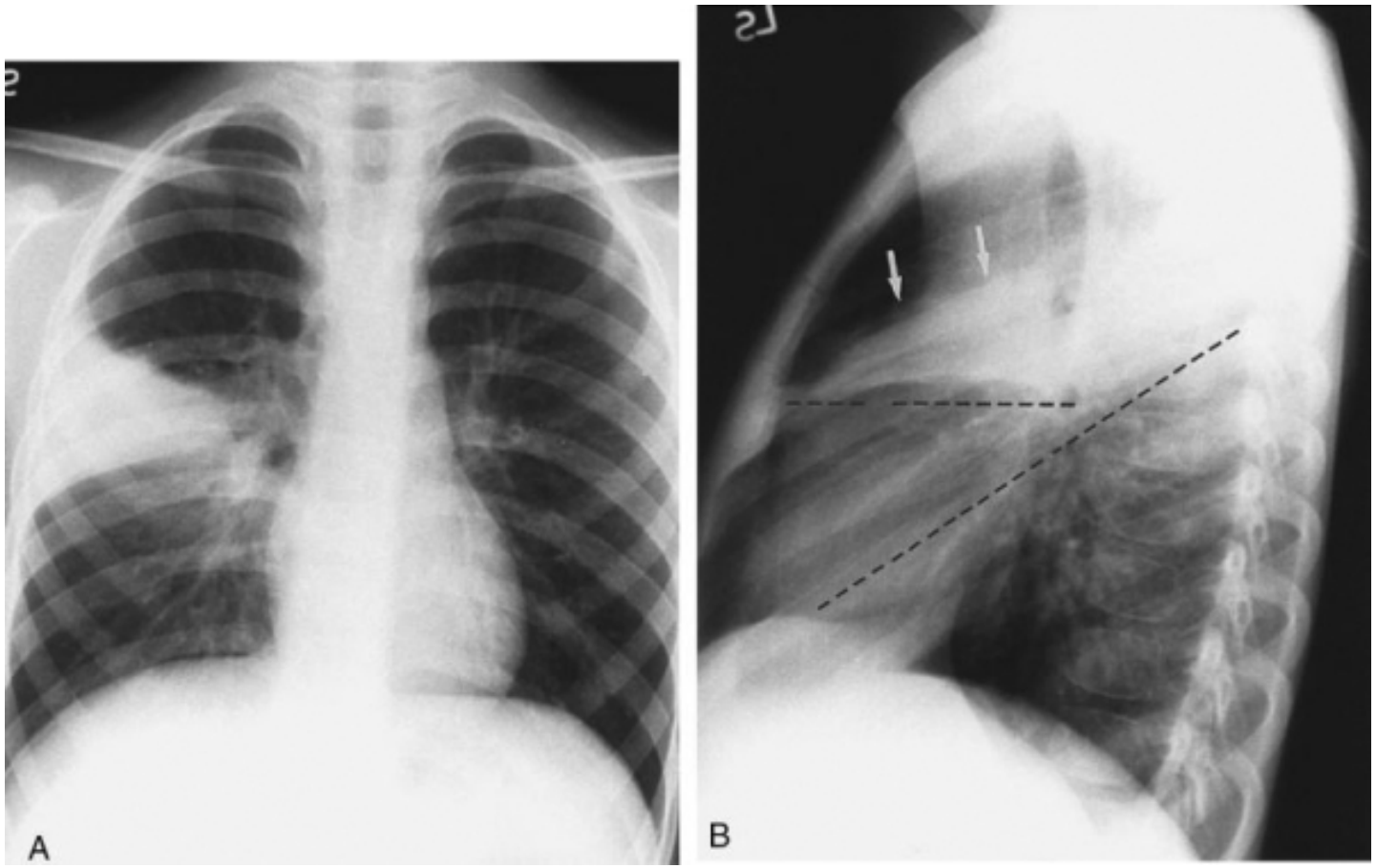
Pneumonia



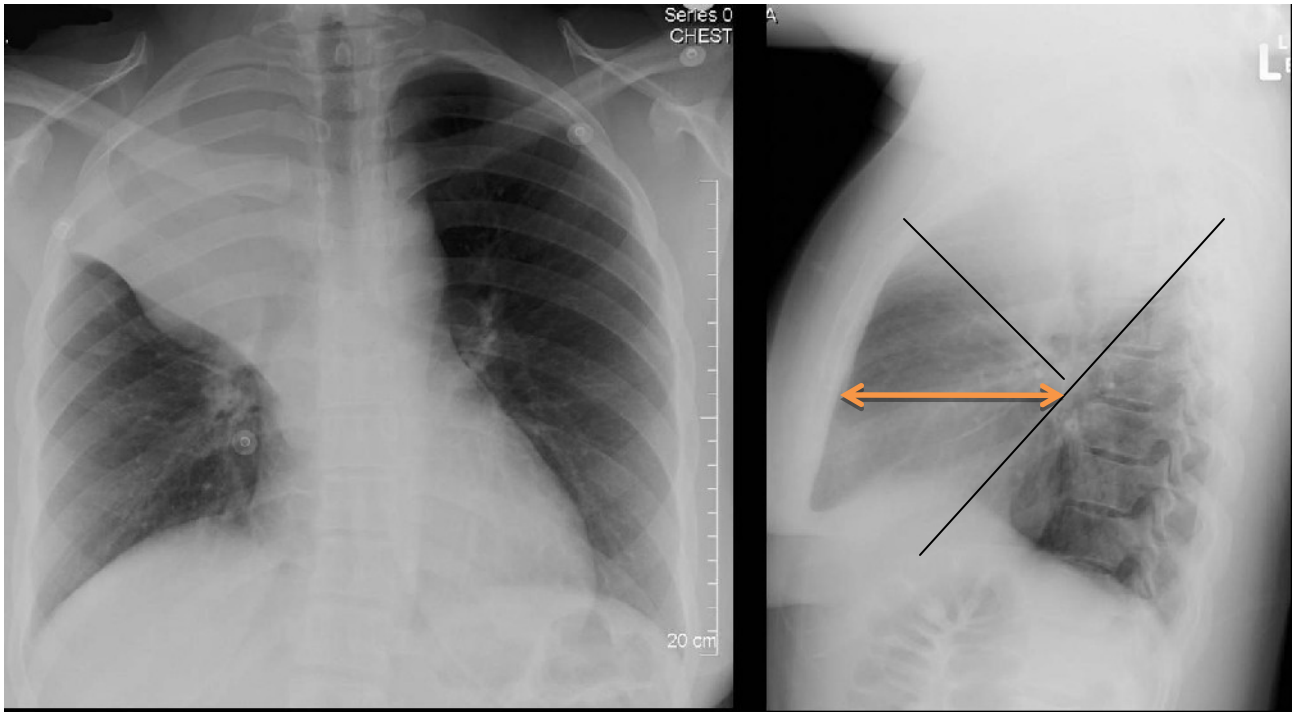
Atelectasis



Right upper lobe pneumonia



Right upper lobe collapse

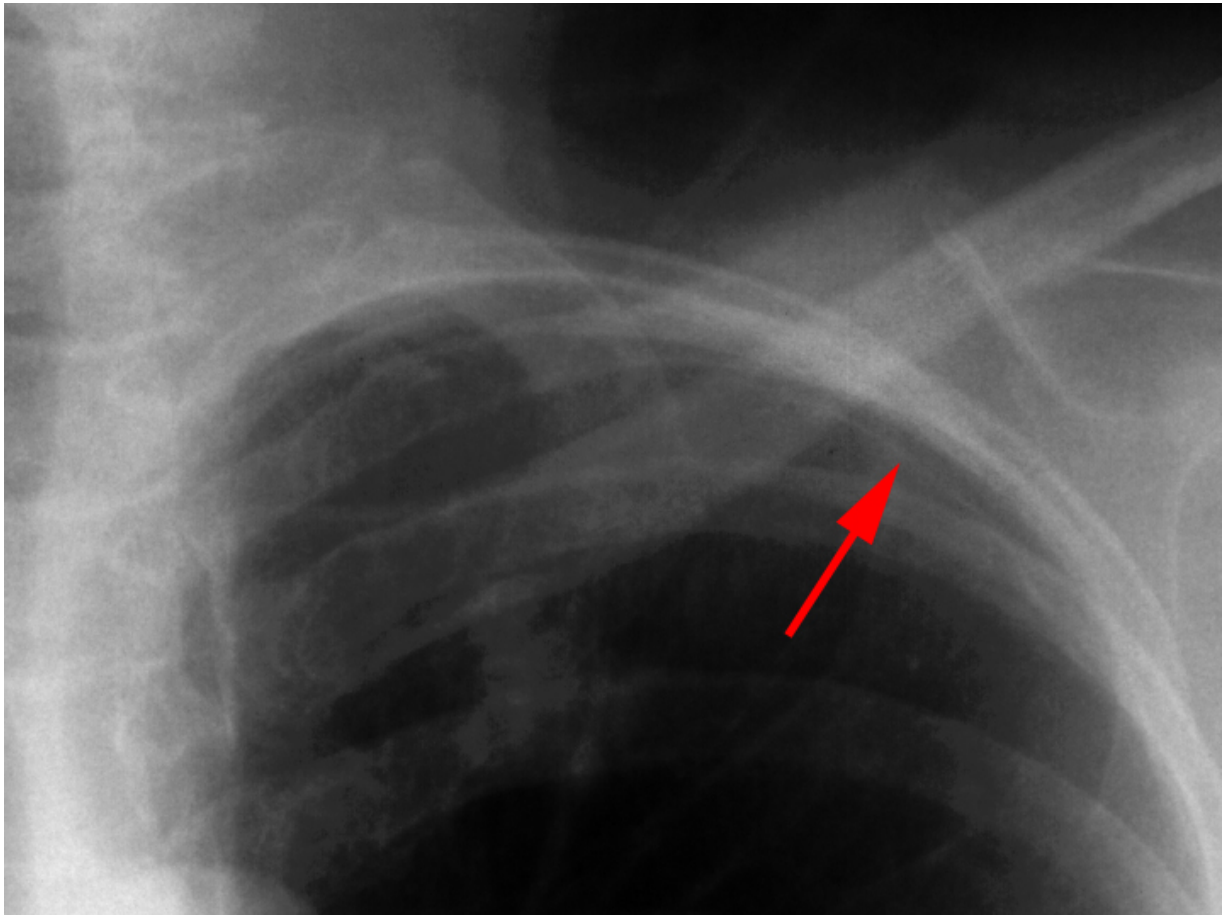


PNEUMOTHORAX

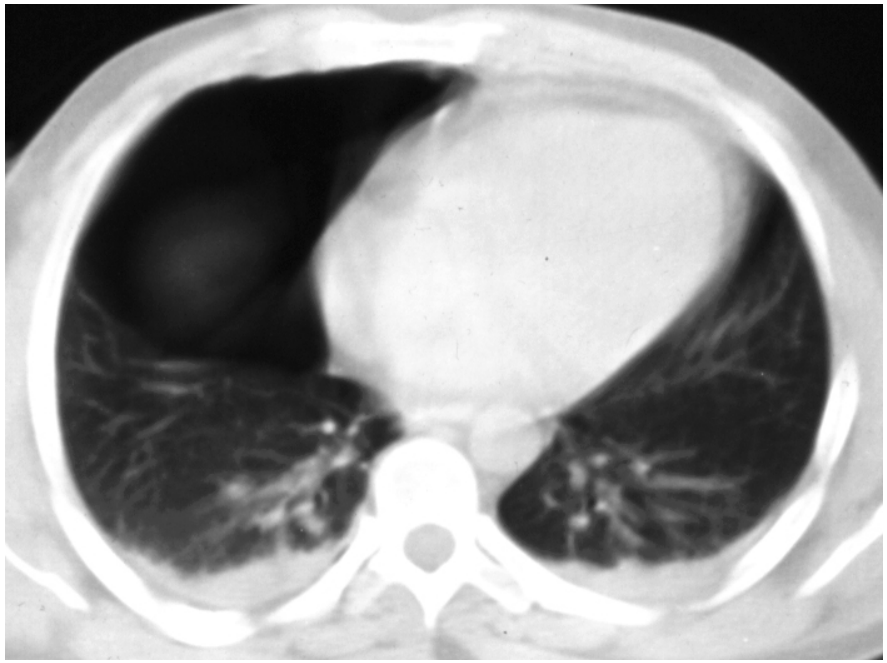
Signs of pneumothorax

- Pneumothorax
  - Nondependent location
    - Different appearance in erect or supine patient
- Signs of pneumothorax
  - Hyperlucent lung (anterior pneumothorax)
  - Thin white line
  - Deep sulcus sign
  - Mediastinal shift associated with hyperlucency
    - Tension
  - Sharp diaphragm (subtle)

Thin White Line

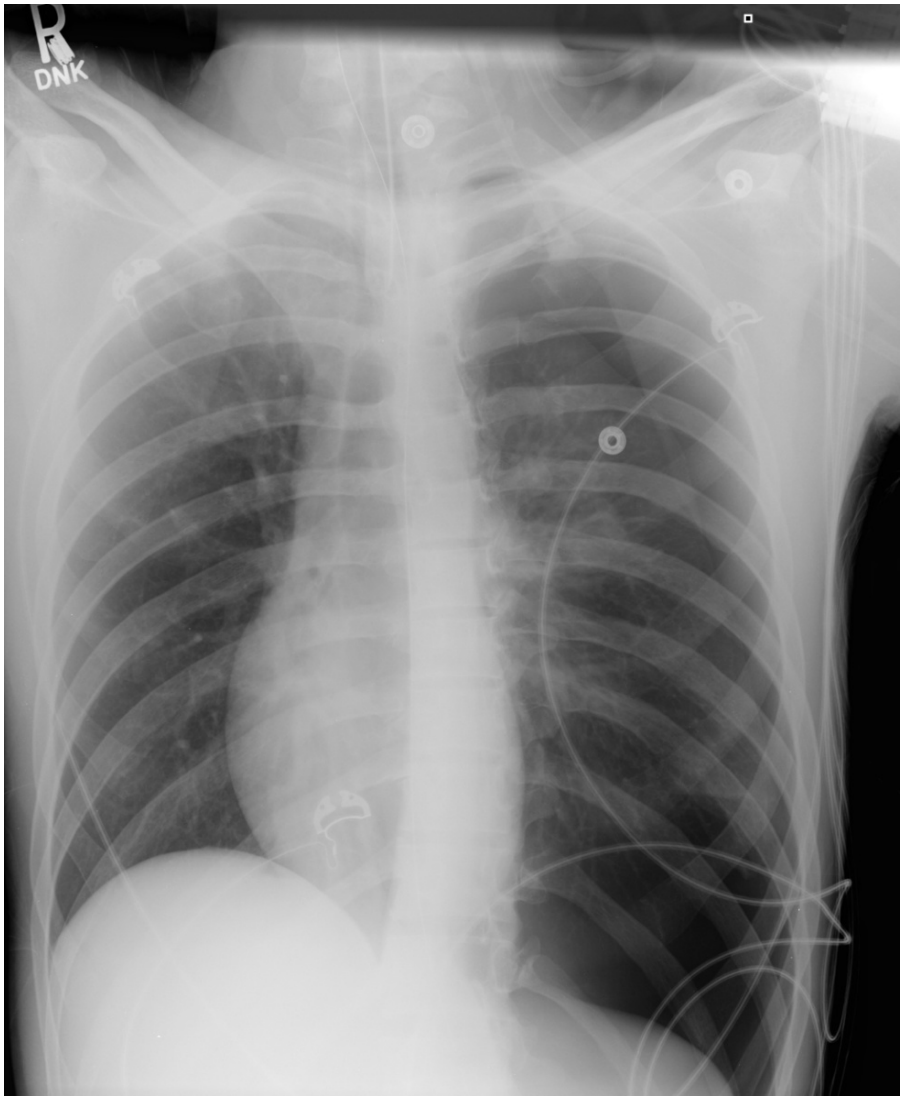


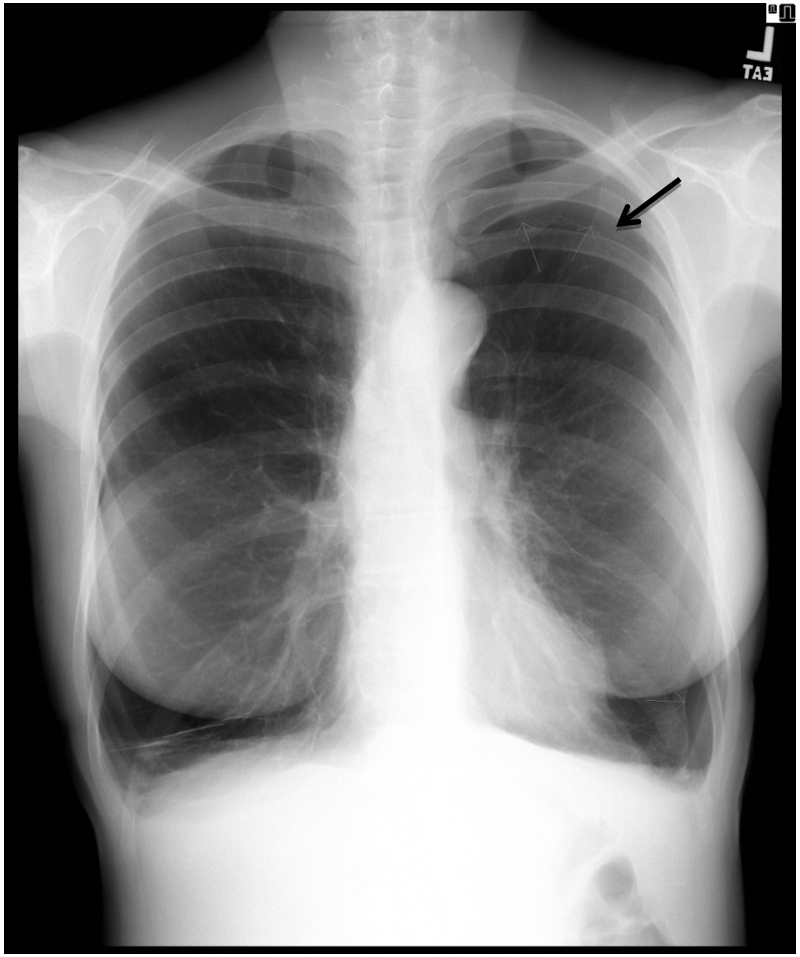
Anterior pneumothorax

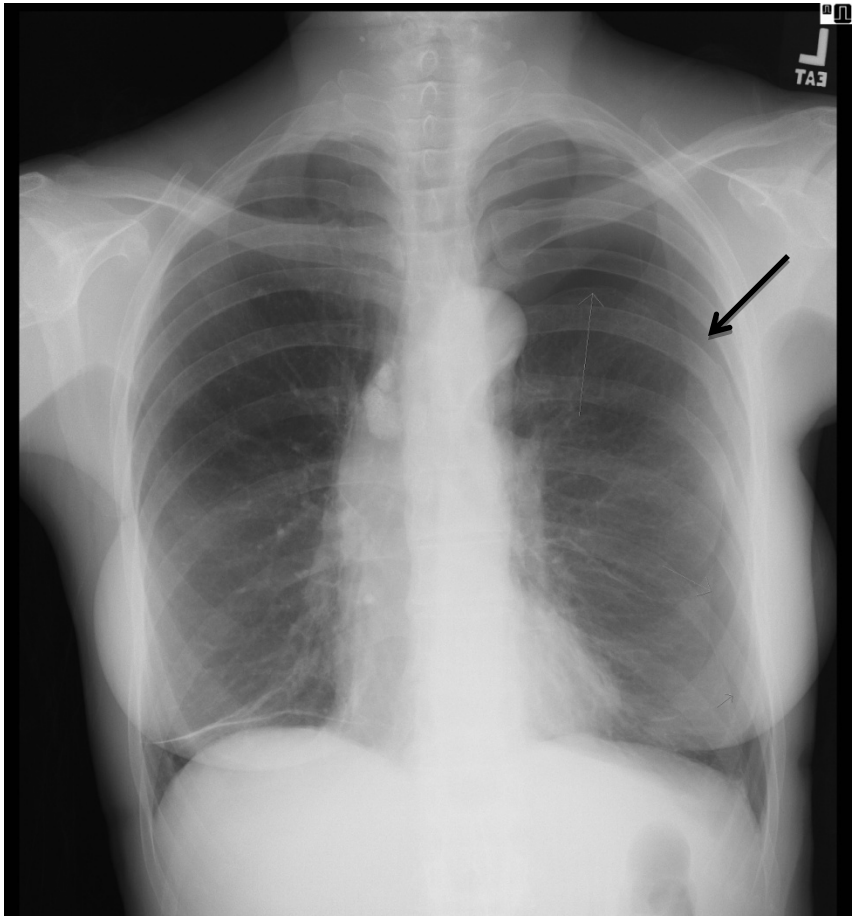


Tension pneumothorax

- Hyperlucency left lung base
- Deep sulcus sign
- Mediastinal shift





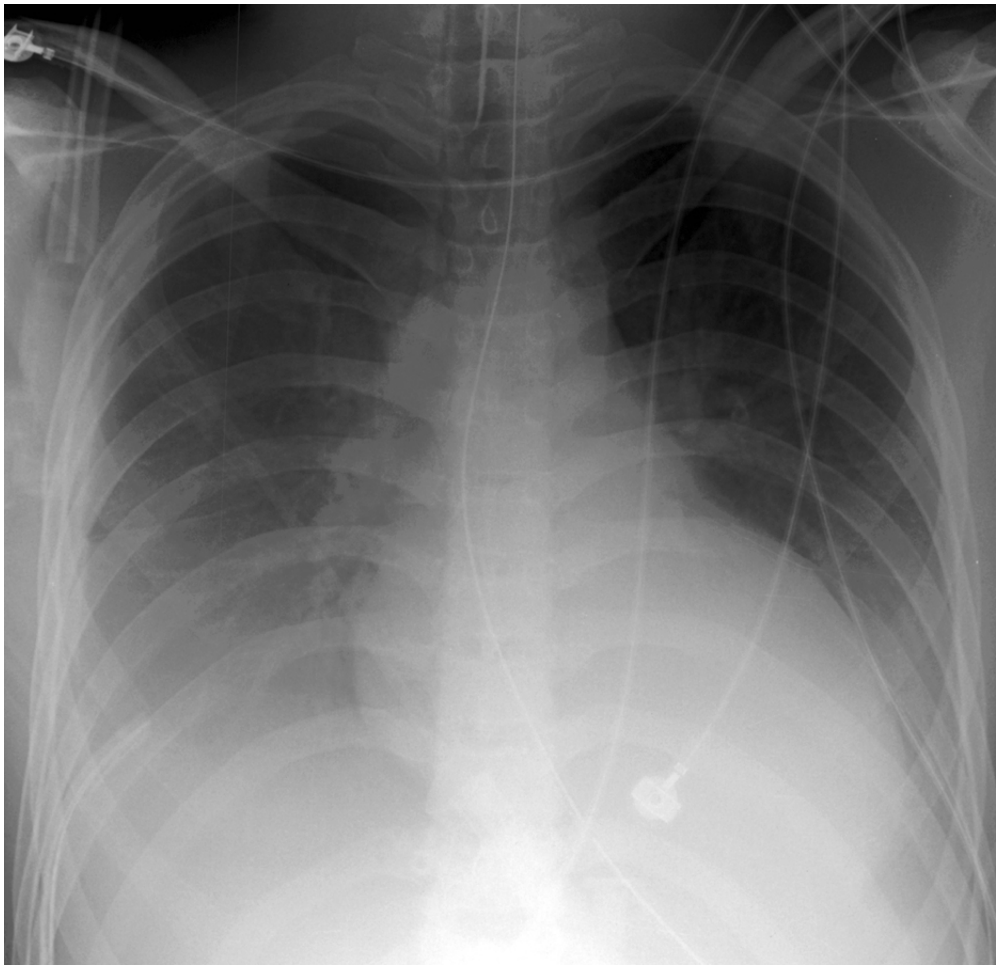


EFFUSION

Pleural effusion

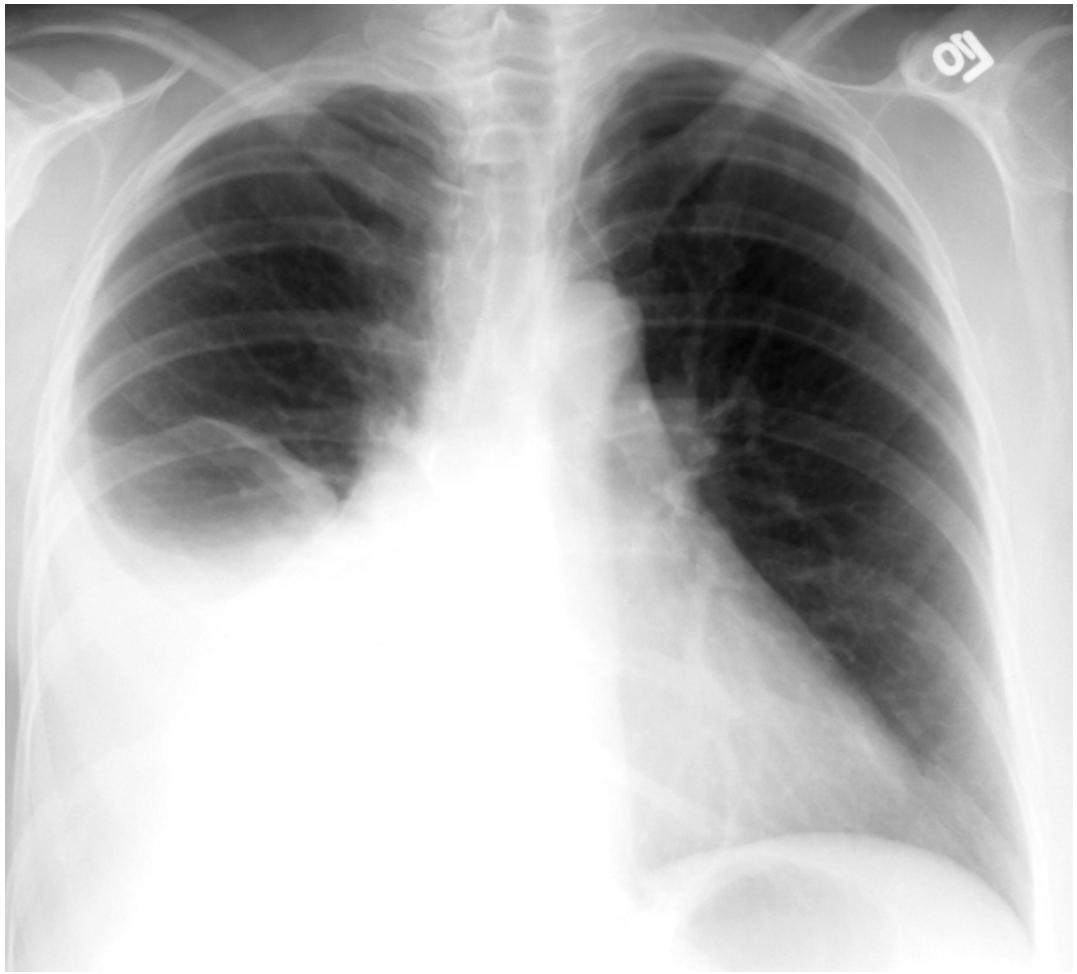
- Unless loculated, pleural fluid will layer dependently
  - Different appearance in erect vs supine patient
- Can distinguish free vs loculated effusion with lateral decubitus film (affected side down)

Pleural effusion



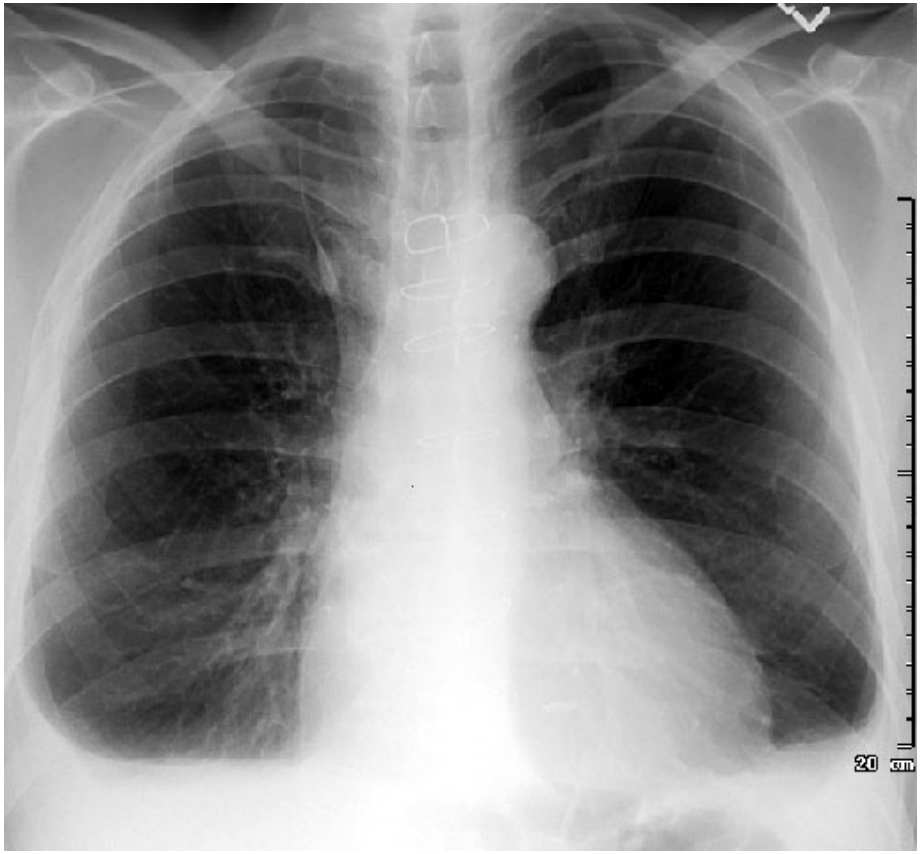
- Gradient density
  - Typical appearance in supine patient

Pleural Effusion



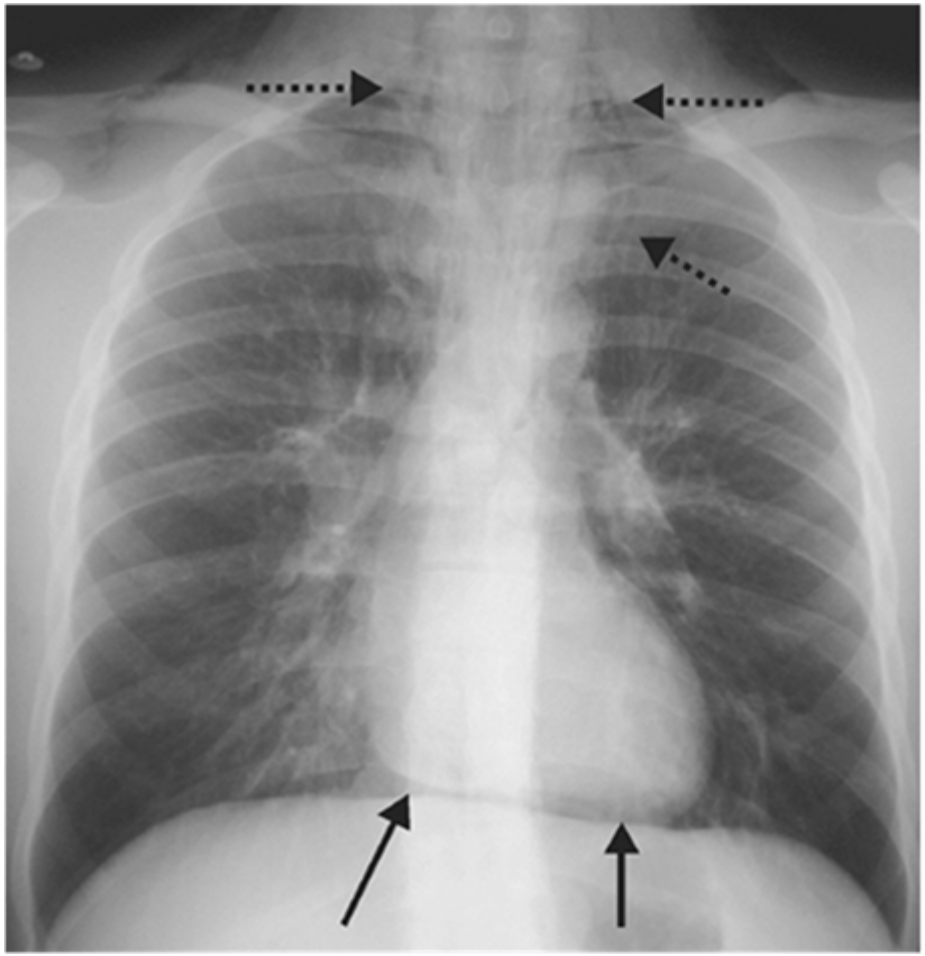
- Meniscus
  - Erect patient

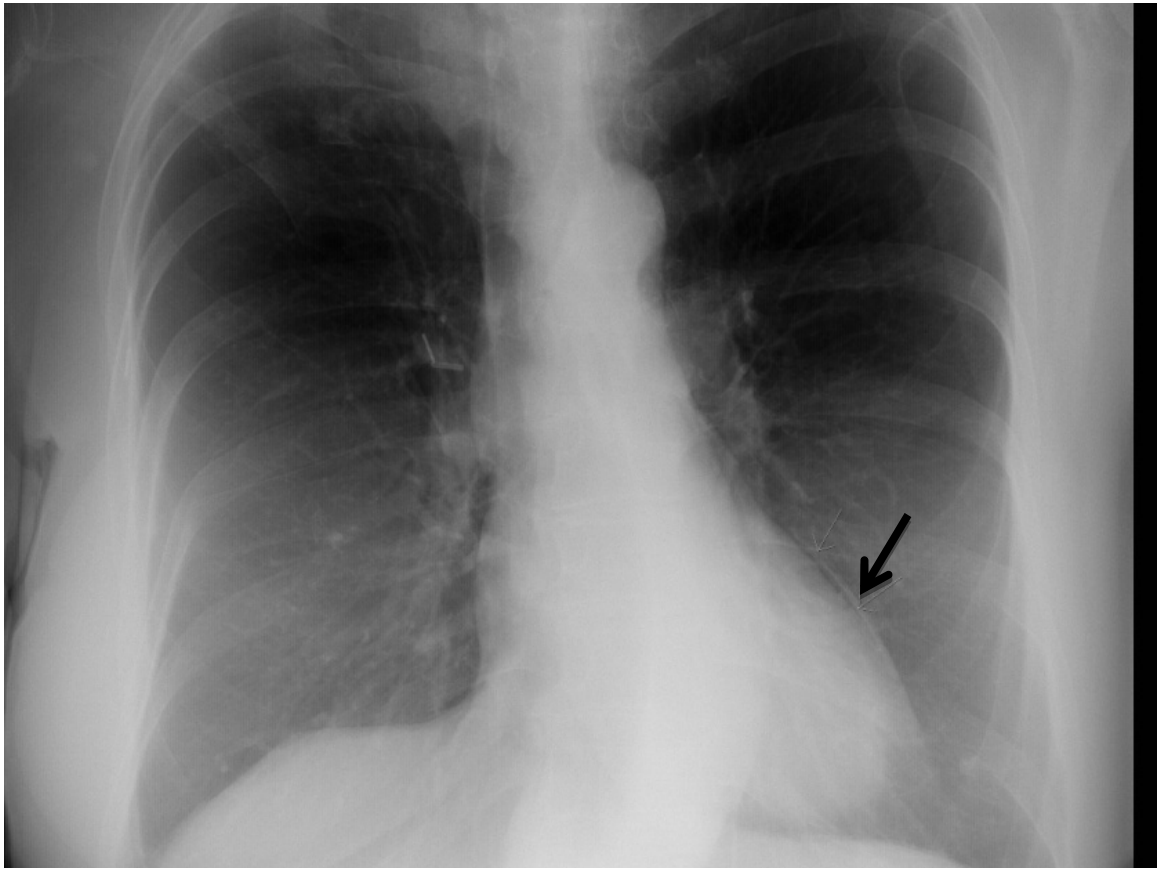
Pleural Effusion



Hydropneumothorax

Pneumomediastinum





Pneumopericardium

Will extend to pericardial reflection but not above

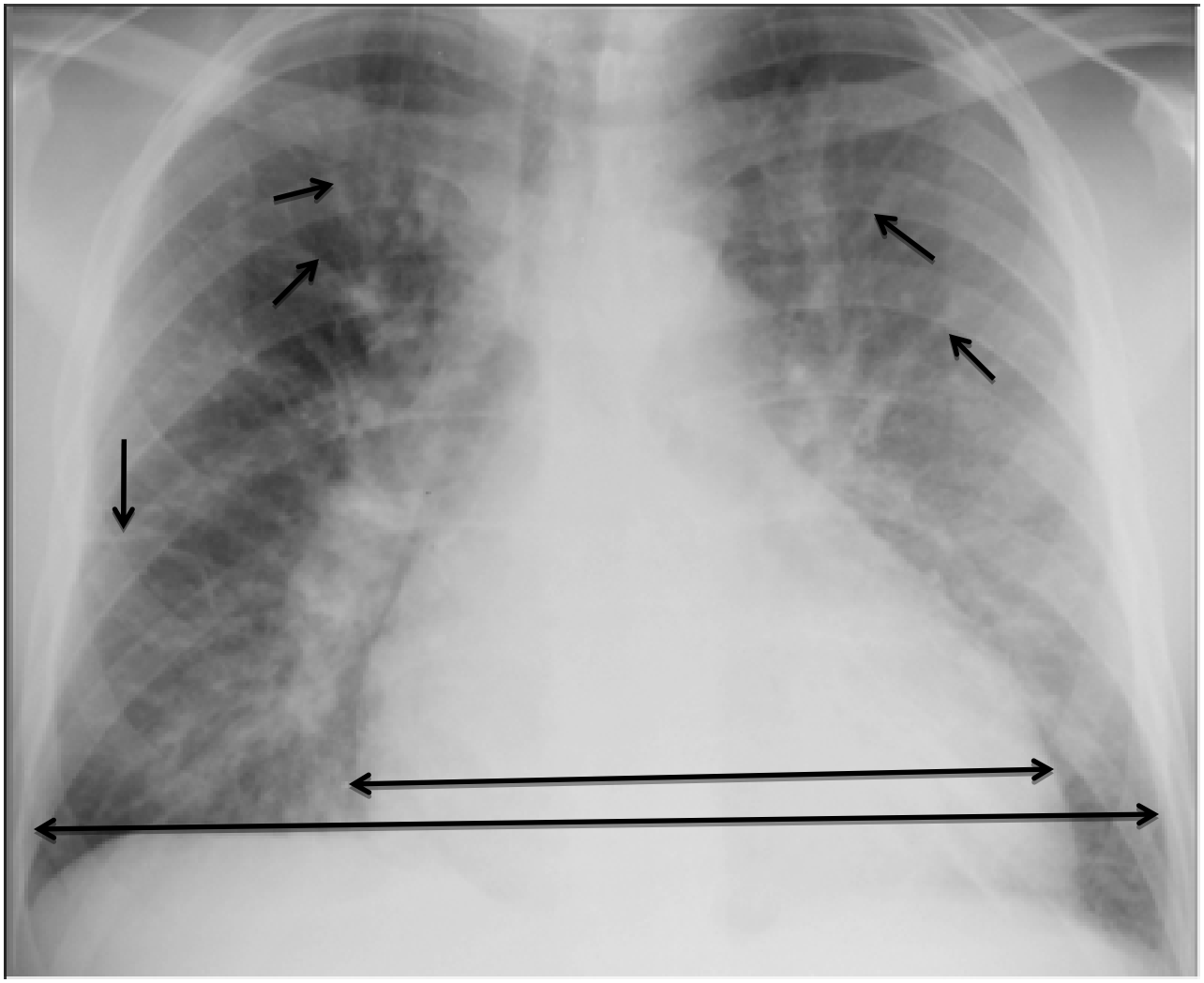
Pulmonary Edema

- Pulmonary edema has various etiologies
  - Altered capillary permeability
    - Near drowning
    - ARDS
    - Injury edema (smoke inhalation)
  - Increased pulmonary capillary pressure
    - Cardiac
      - Left heart failure (MI, etc
    - Noncardiac
      - Pulmonary veno-occlusive disease
    - Fluid overload
  - Decreased oncotic pressure (hypoalbuminemia)
  - Lymphatic Insufficiency
  - Mixed/unknown
    - Neurogenic
    - Eclampsia

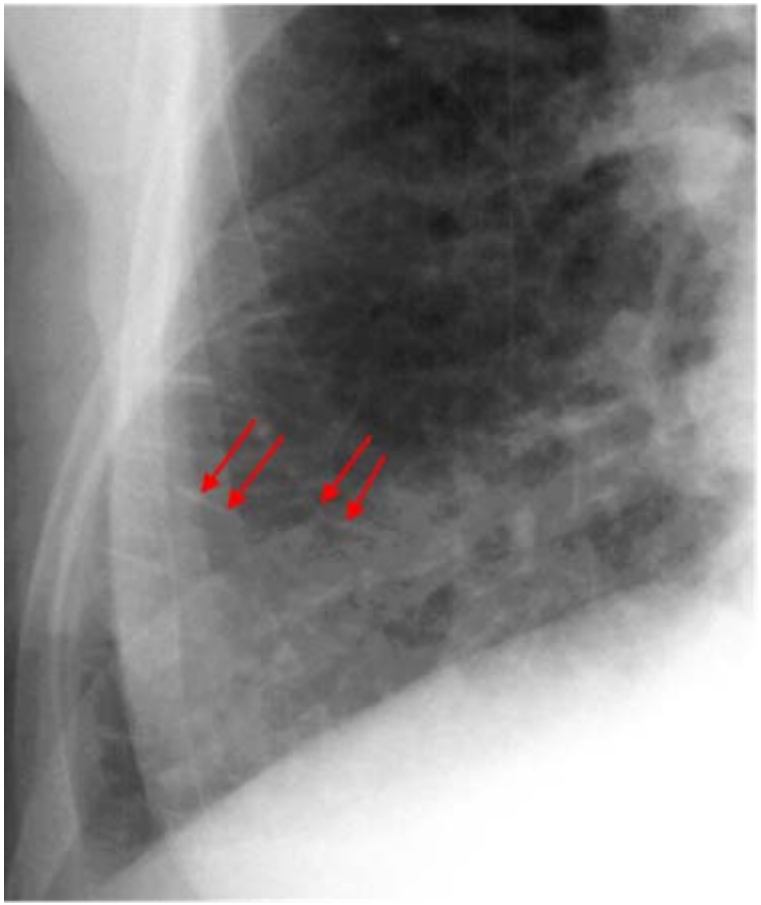
Pulmonary Edema

Cardiogenic	Non-cardiogenic
Heart failure	Smoke inhalation
MI with left heart failure	Neurogenic
Arrhythmia (afib)	Hypovolemic shock
Fluid overload (renal failure)	Re-expansion pulmonary edema
Mitral disease	DIC
Cardiomyopathy	Near drowning
	ARDS

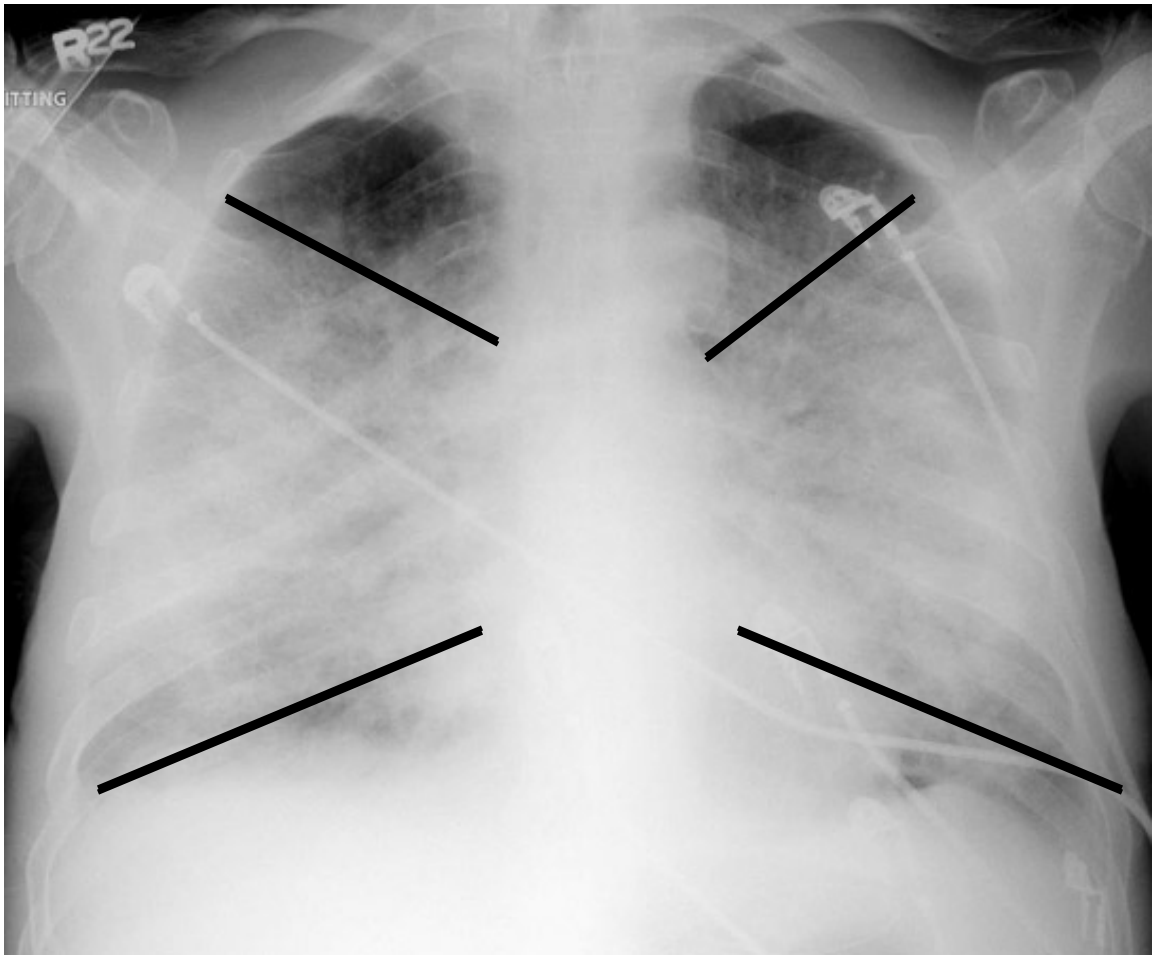
Pulmonary Edema



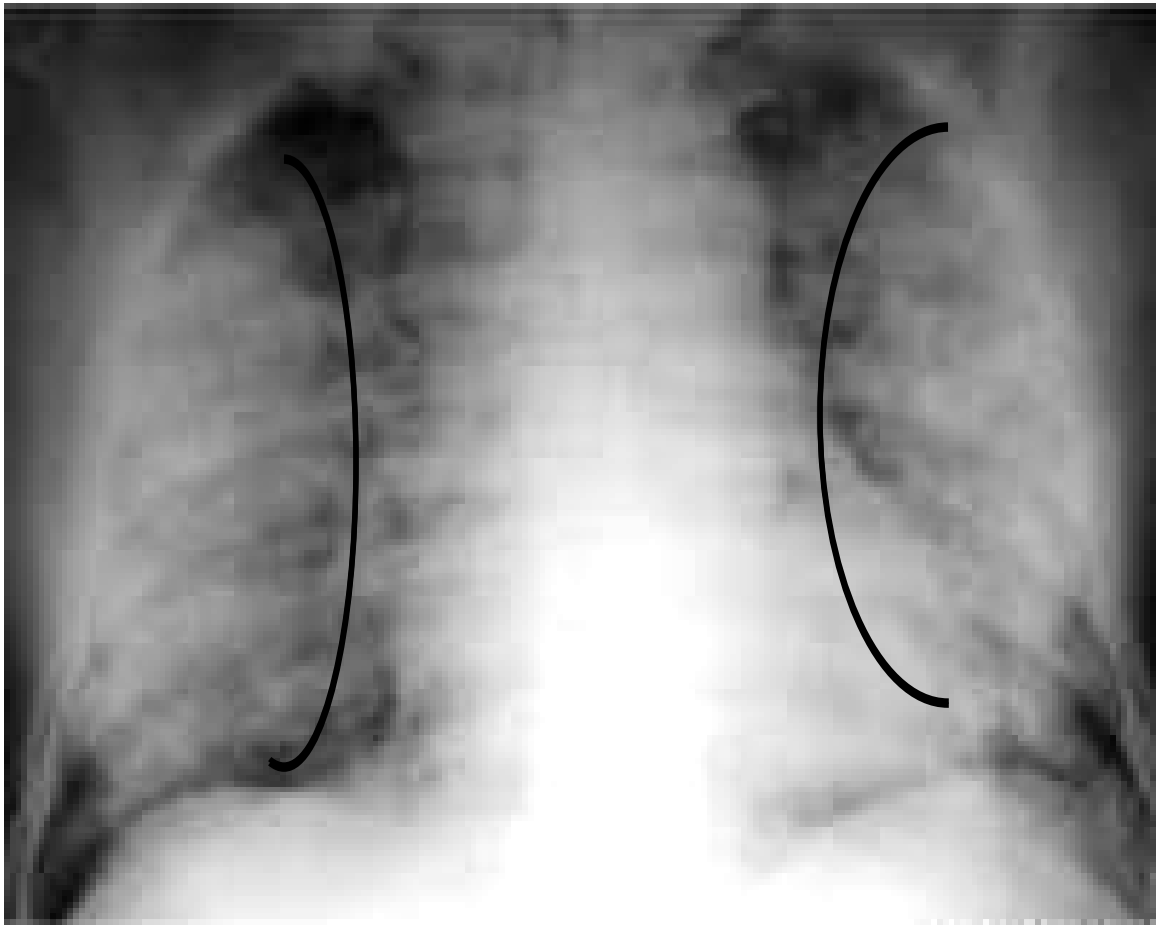
Septal Lines (aka Kerley B lines)



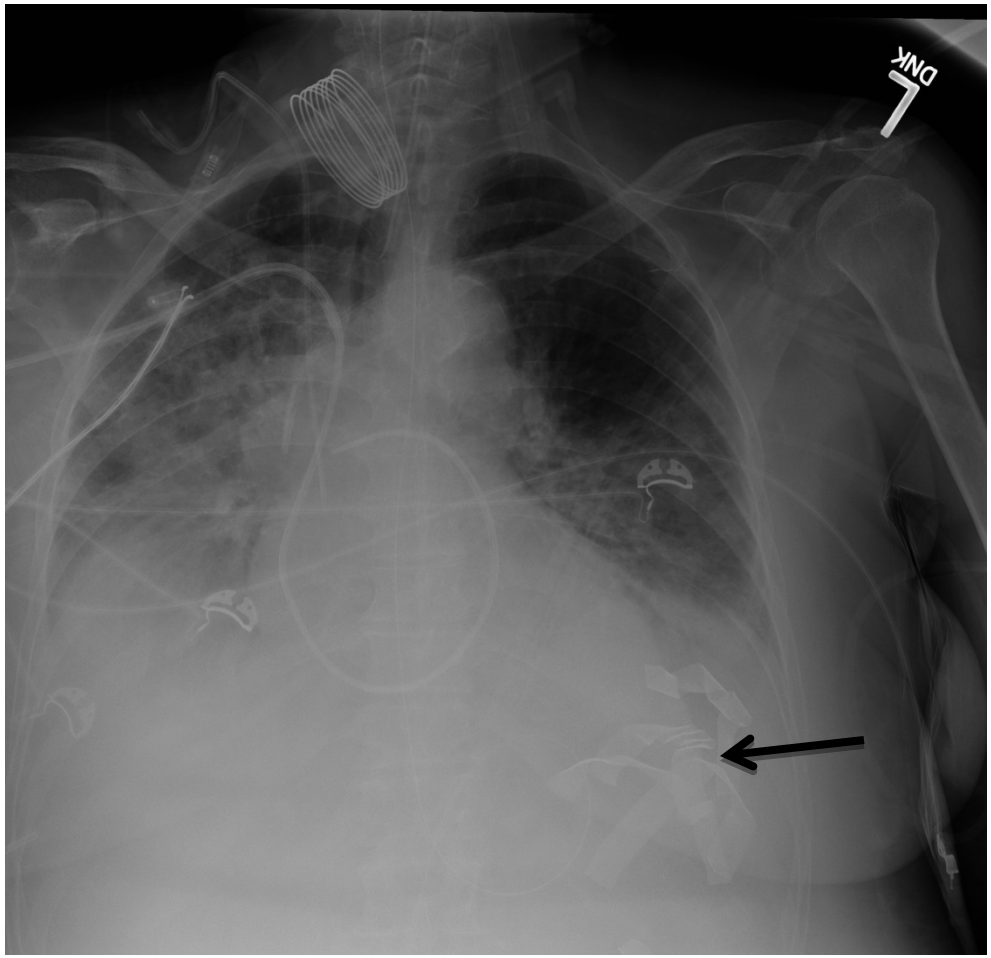
Alveolar Edema



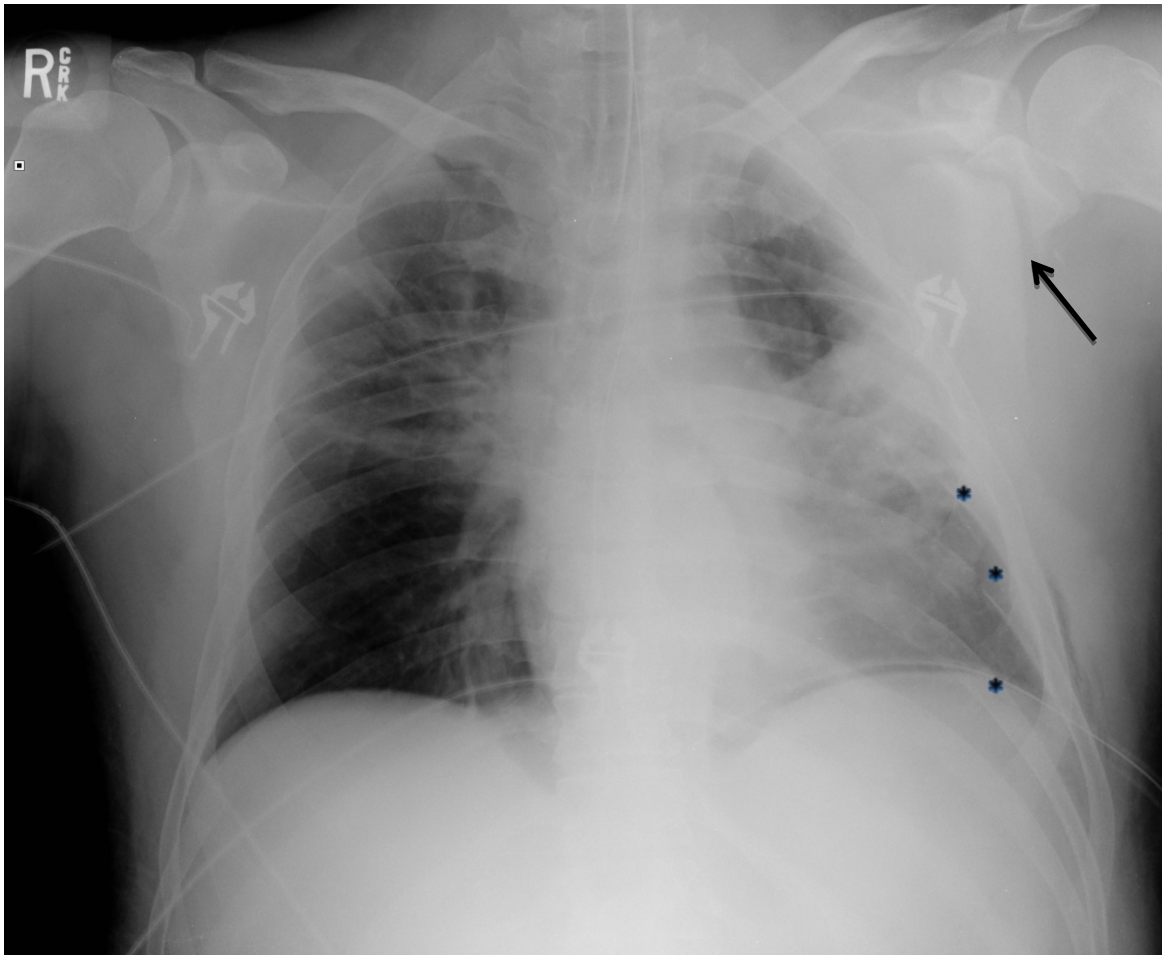
Injury Edema



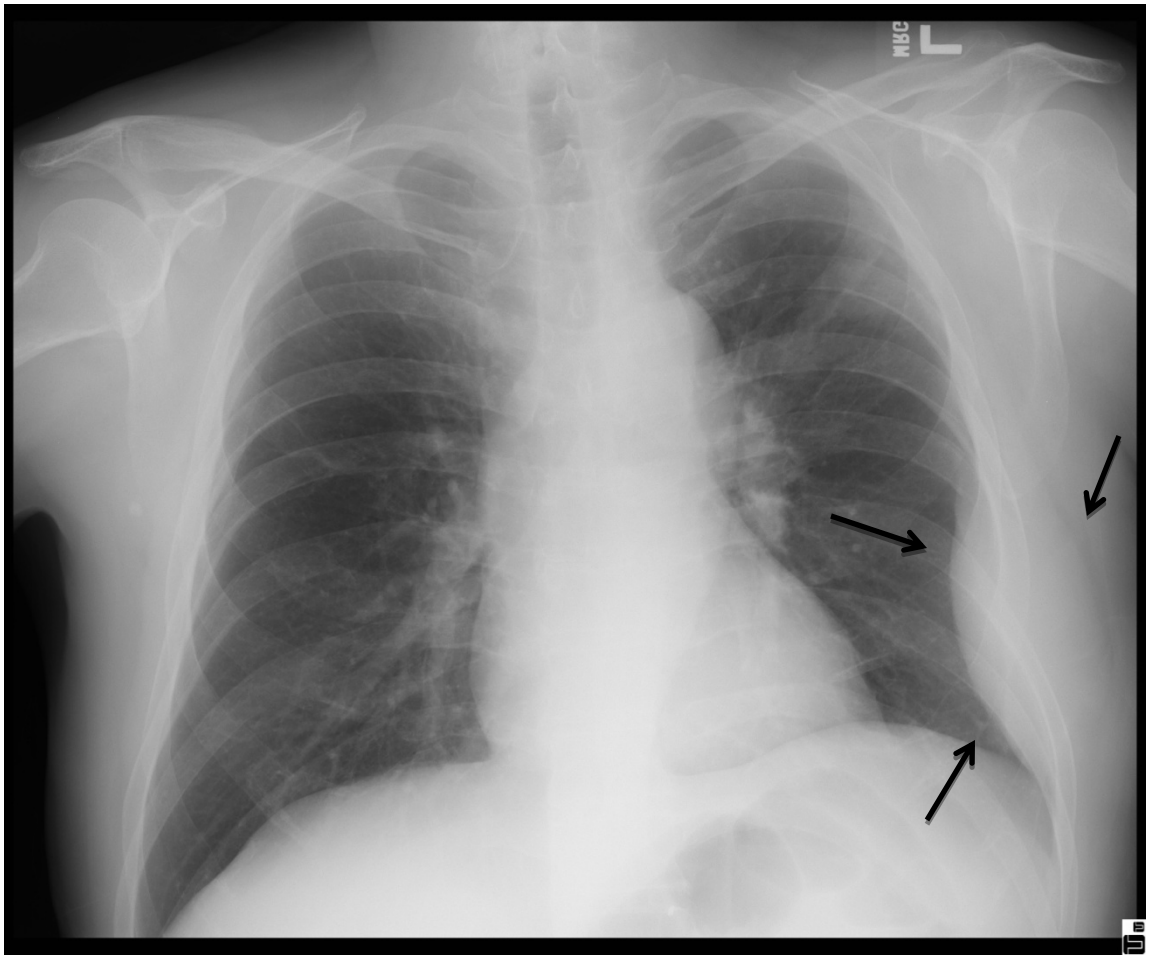
Don’t stop at the diaphragm



Bones



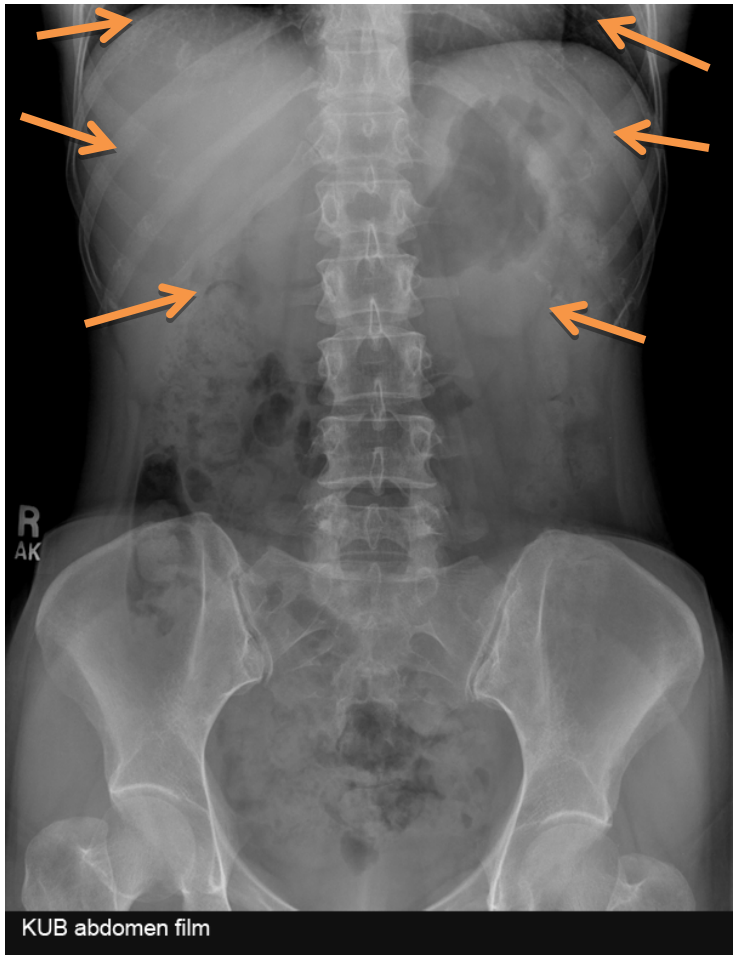
Soft tissues



ABDOMEN

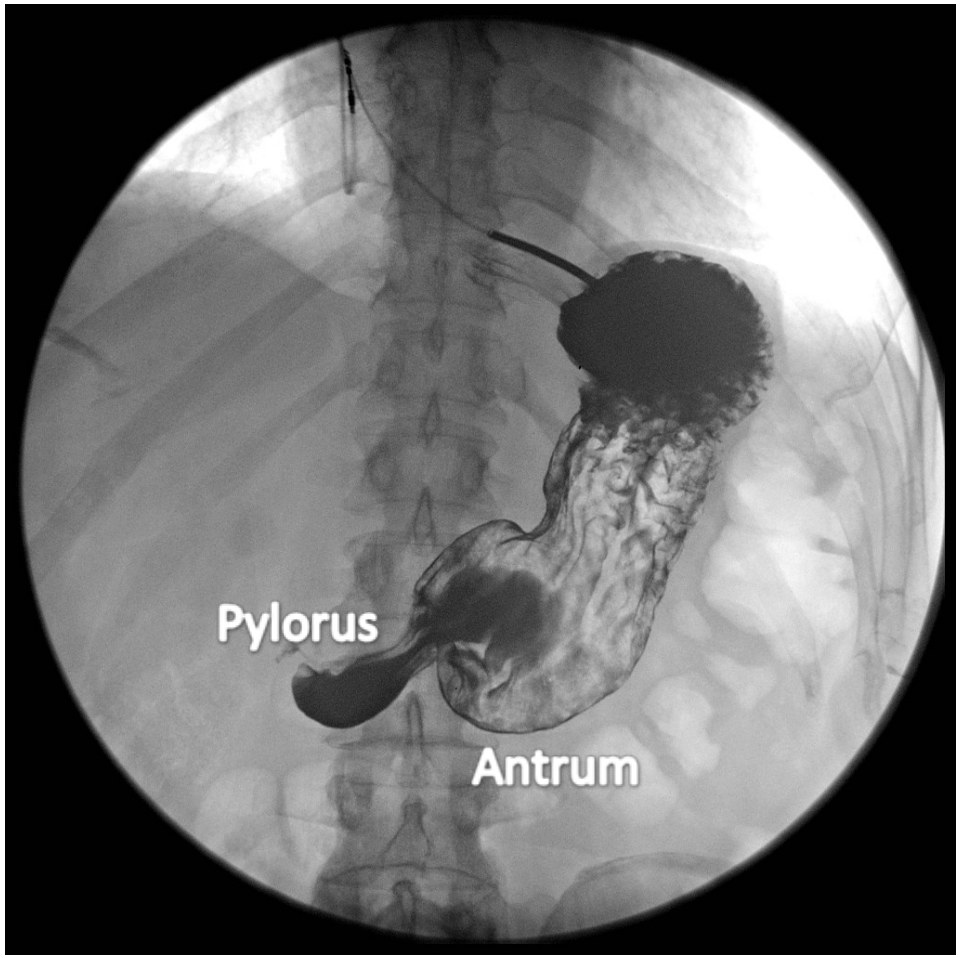
Abdominal Radiograph

- Tubes
- Lung base
- Organ shadows
- Calcifications
  - Nephroureteral calculi
  - Calcified gallstones
  - Vascular
    - Egg shell calcifications in AAA
  - Adrenal calcifications
    - Old trauma or worse (neoplasm)
- Bowel gas pattern
- Pneumoperitoneum
- Bones

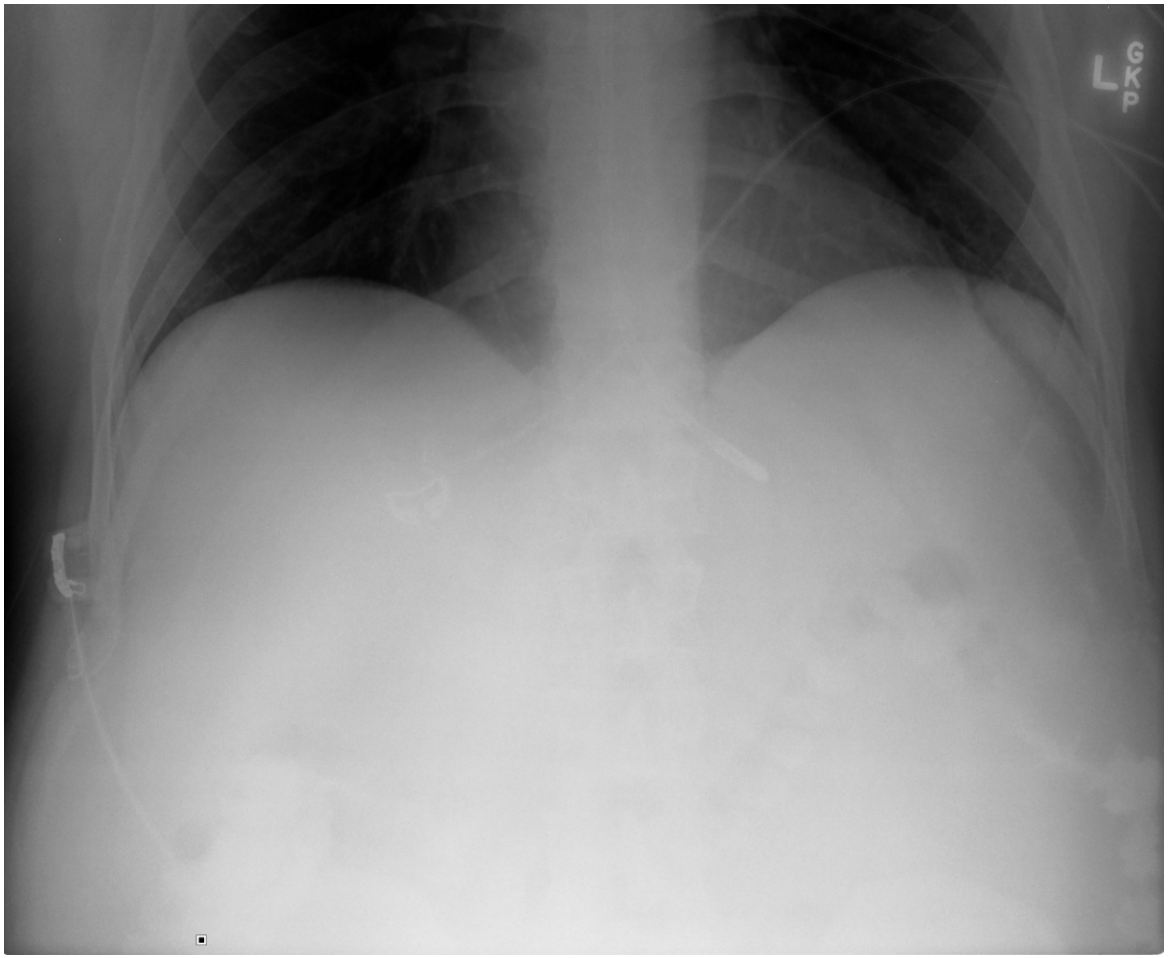


KUB abdomen film

Tubes



Tubes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G
K
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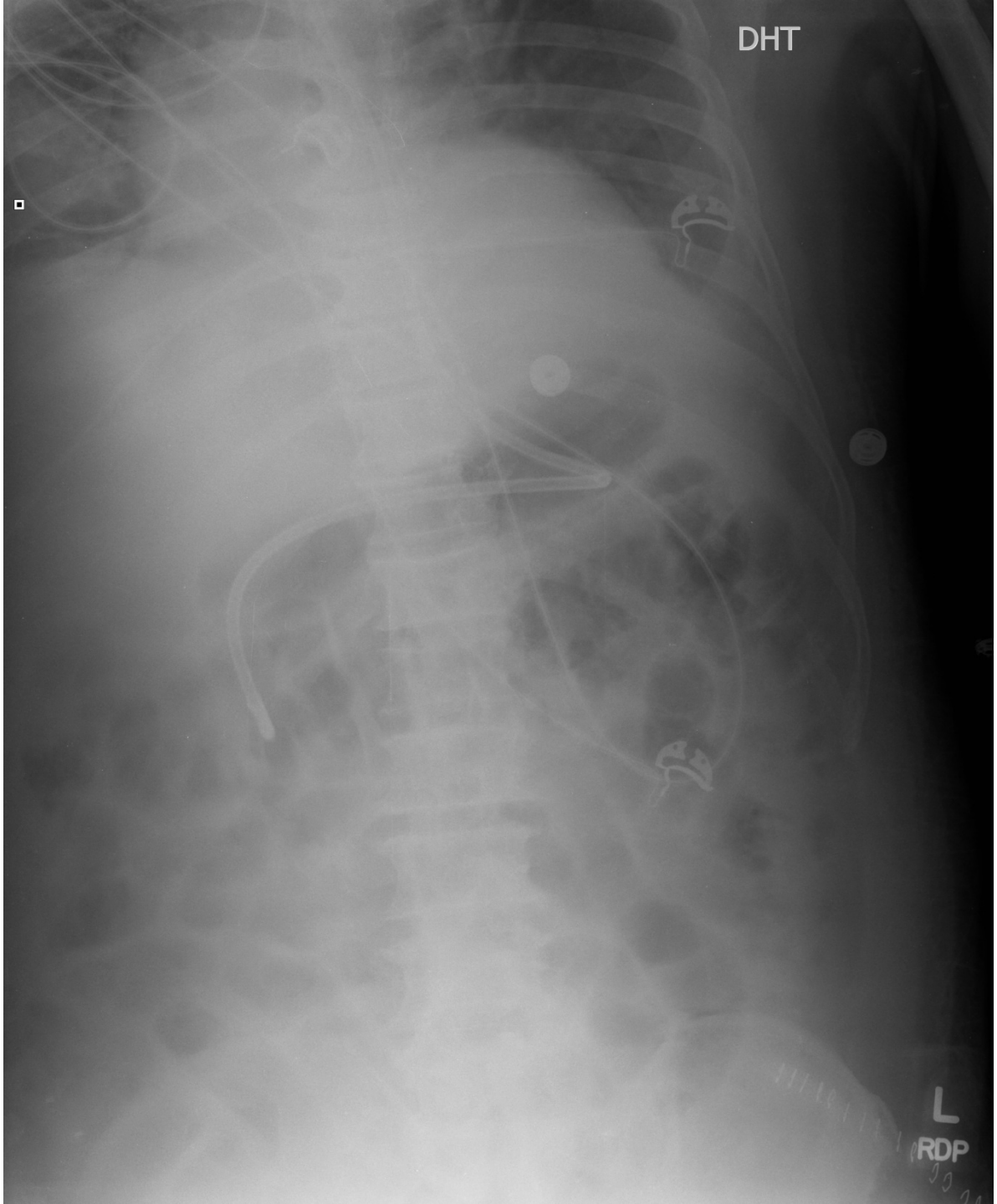
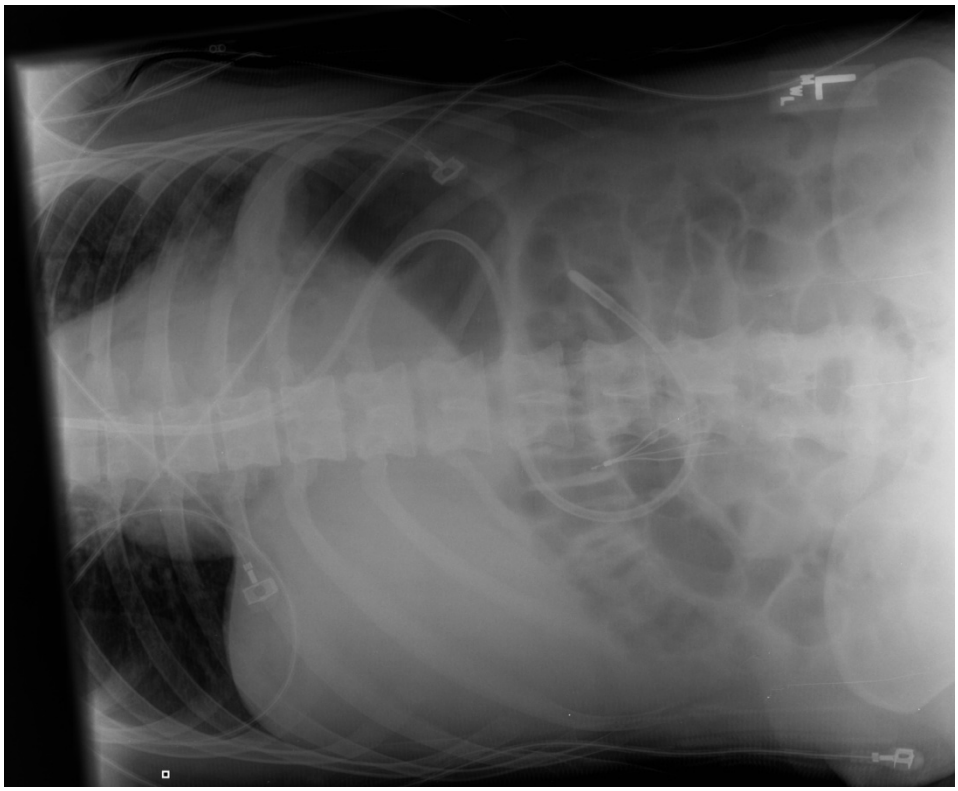
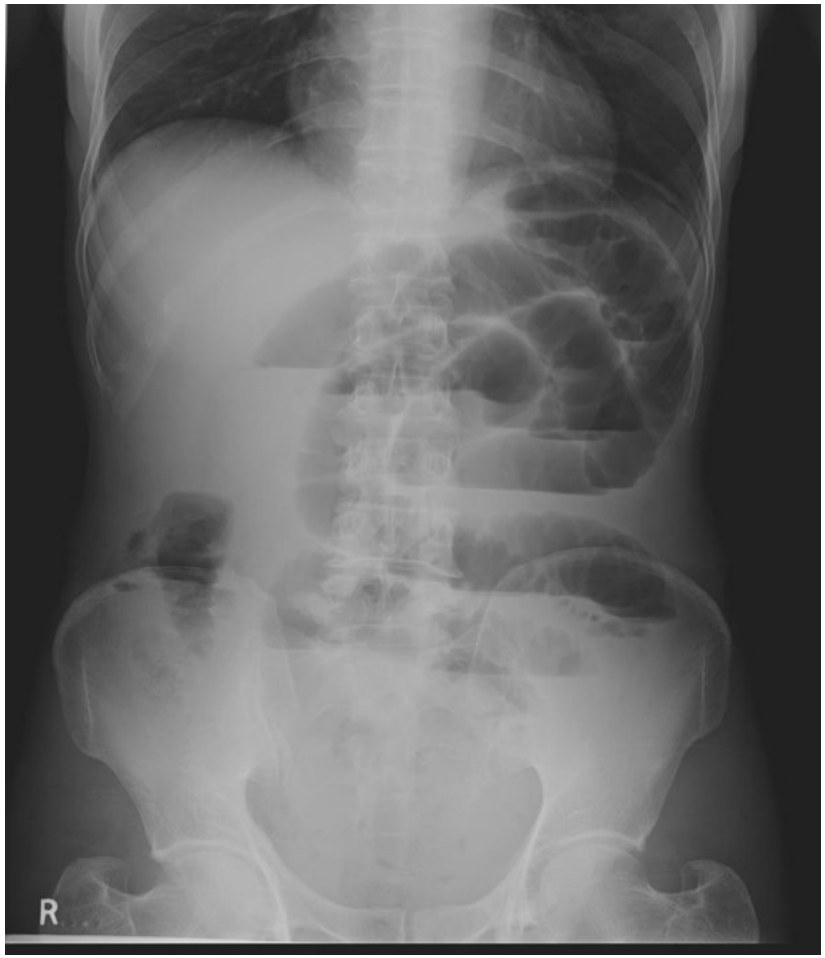

DHT
L
RDP

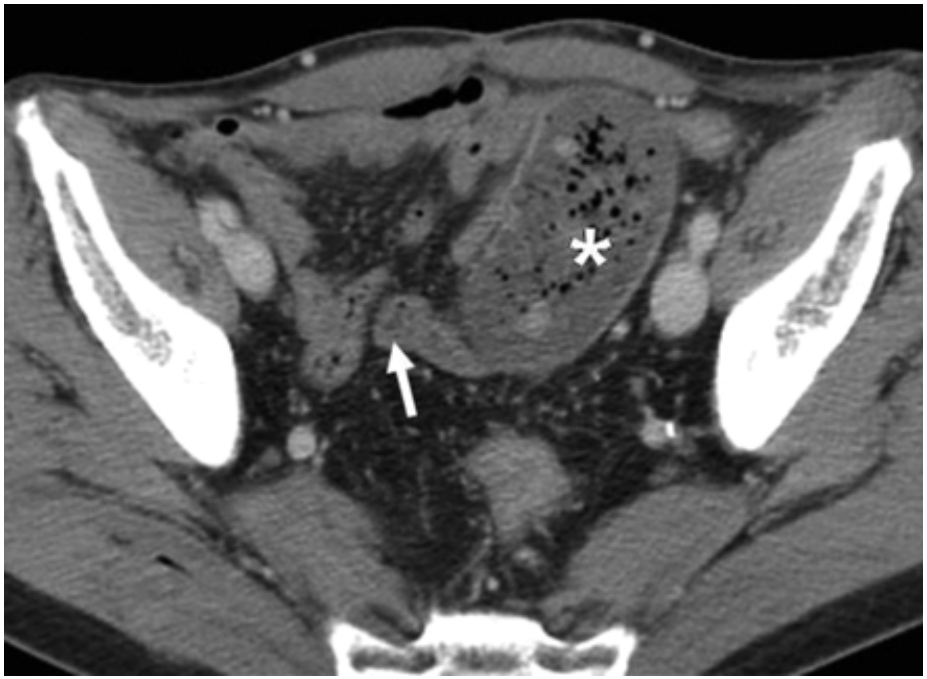


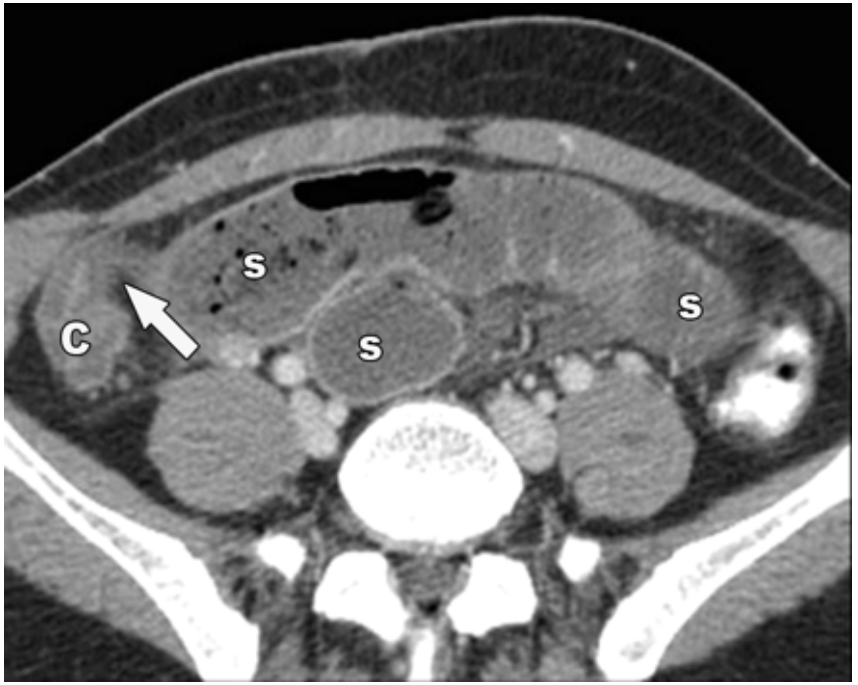
Small bowel obstruction



- Dilated small bowel loops > 2.5cm
- Differential air fluid levels
- Relative decompression of large intestine or absence of colonic gas

Small bowel obstruction

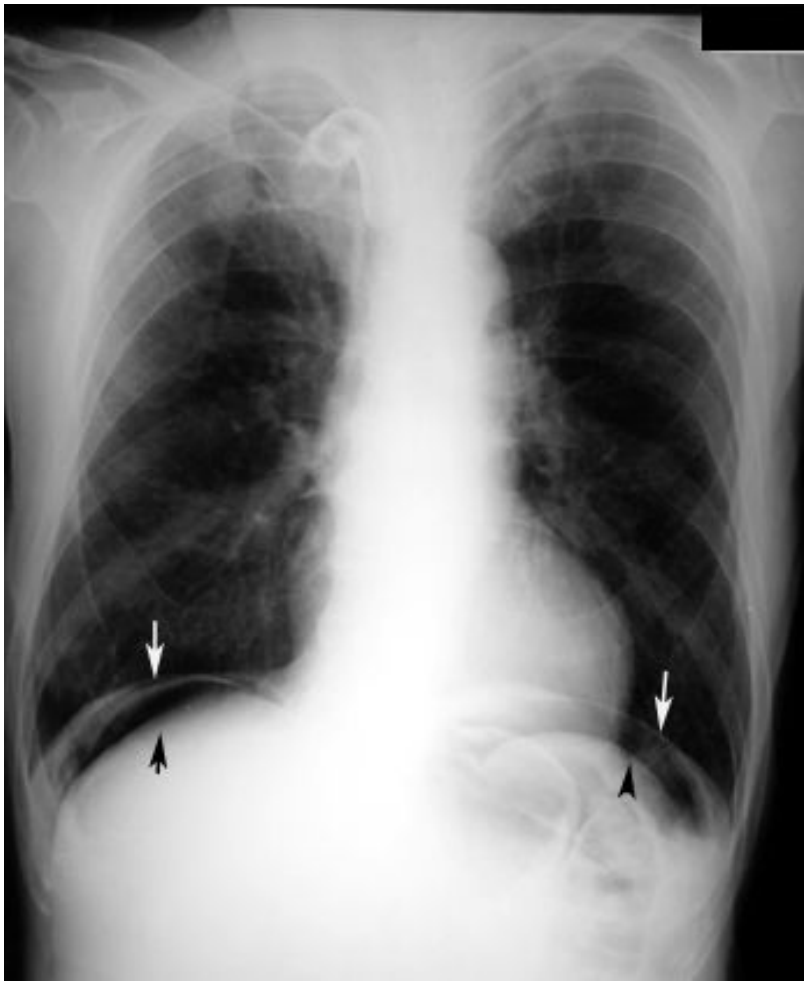




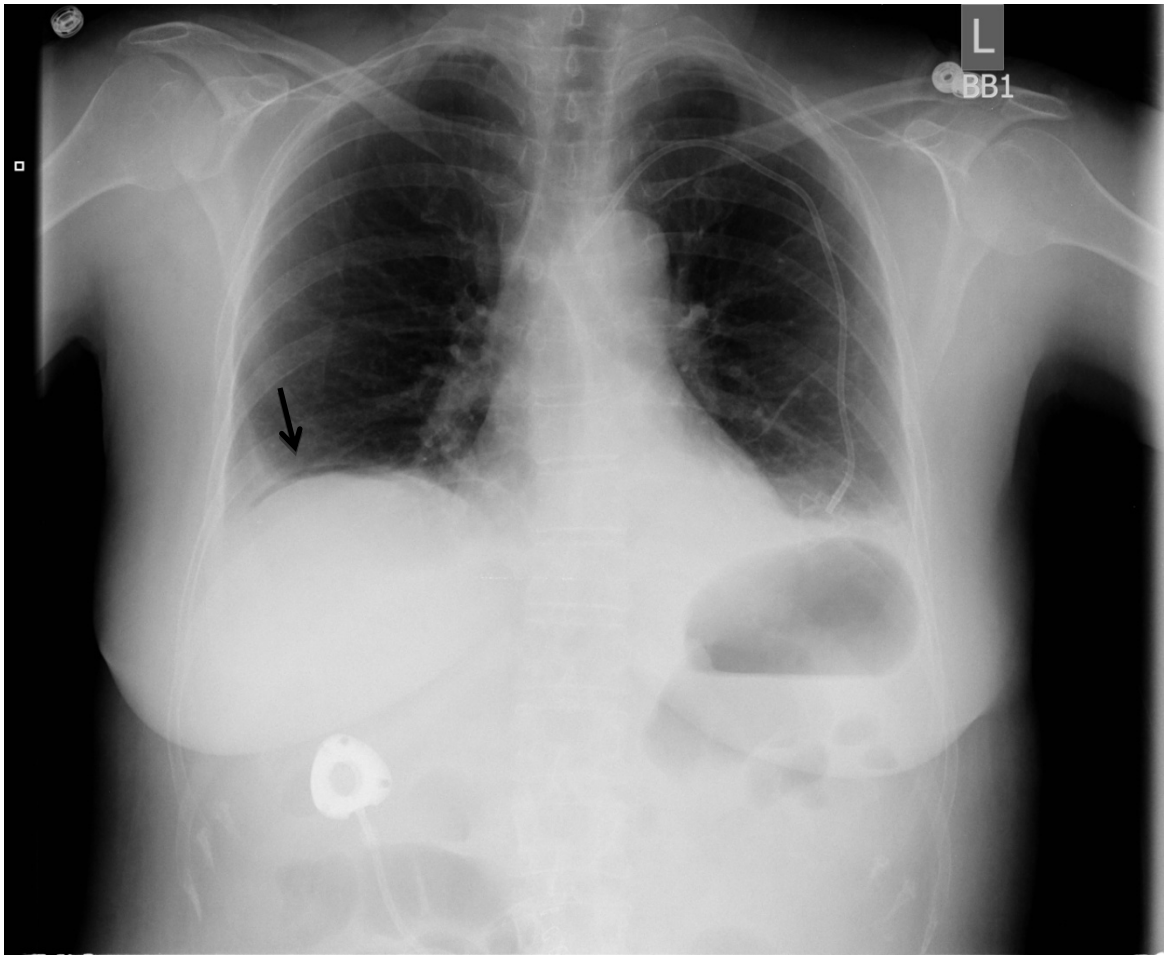
Ileus

- Small +/- large intestine dilated with air reaching rectum.

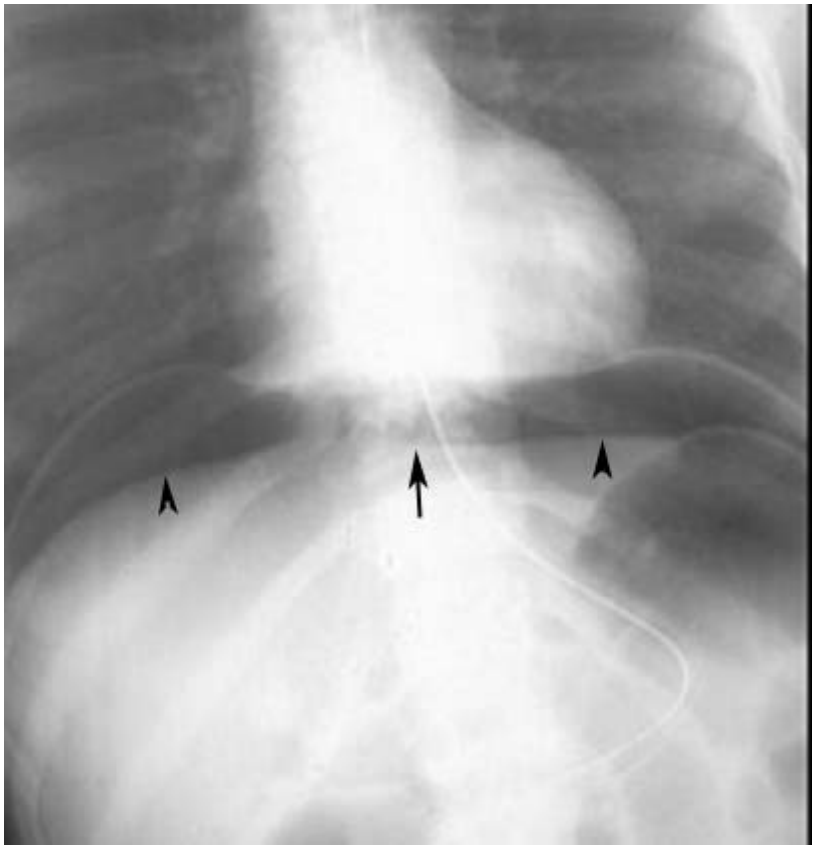
Pneumoperitoneum



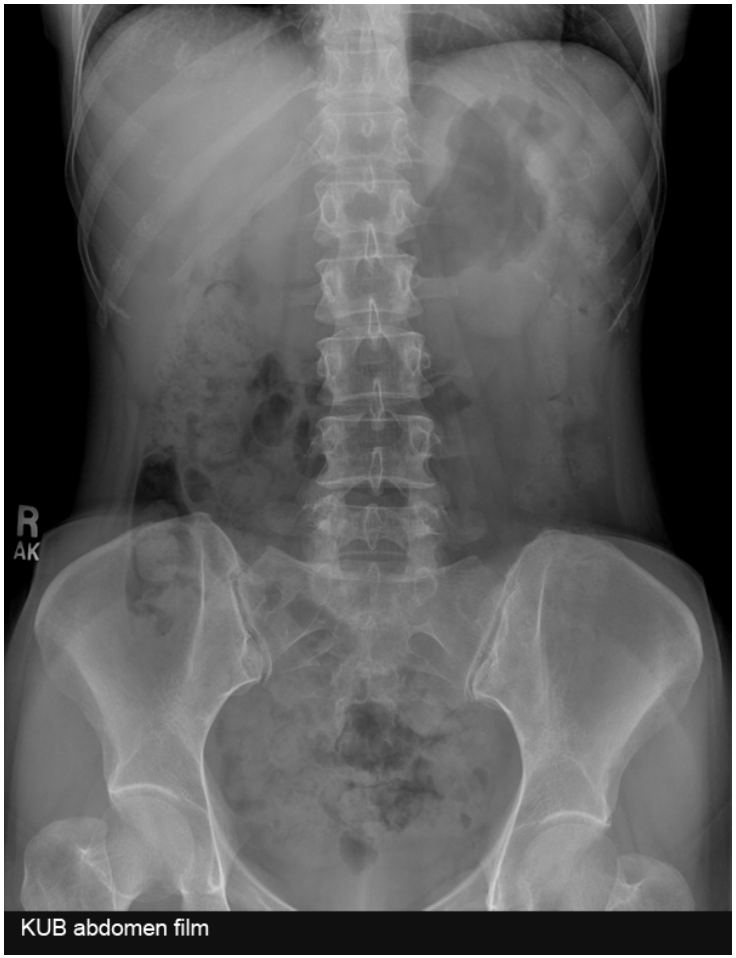
Pneumoperitoneum



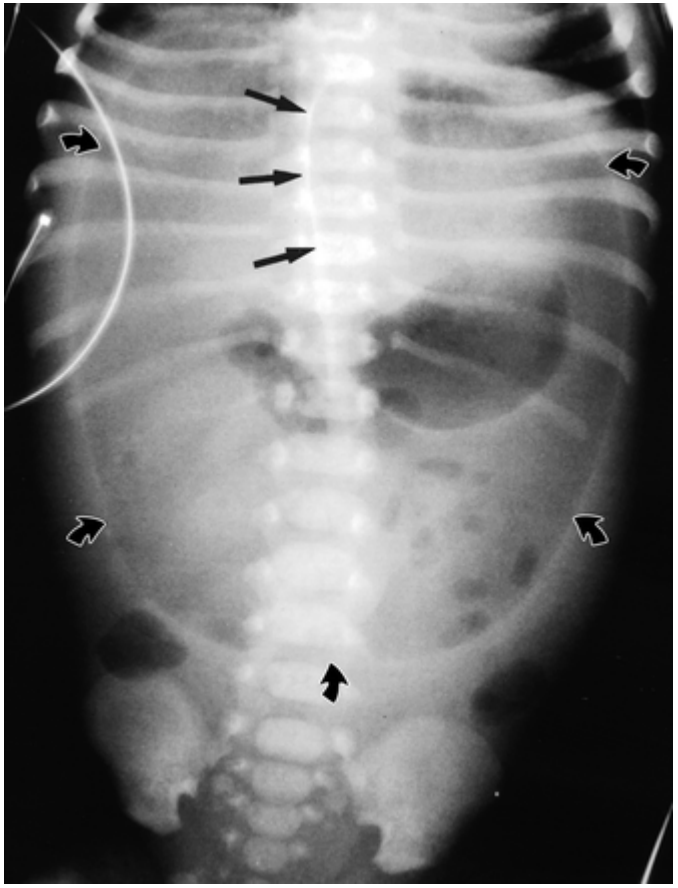
Pneumoperitoneum



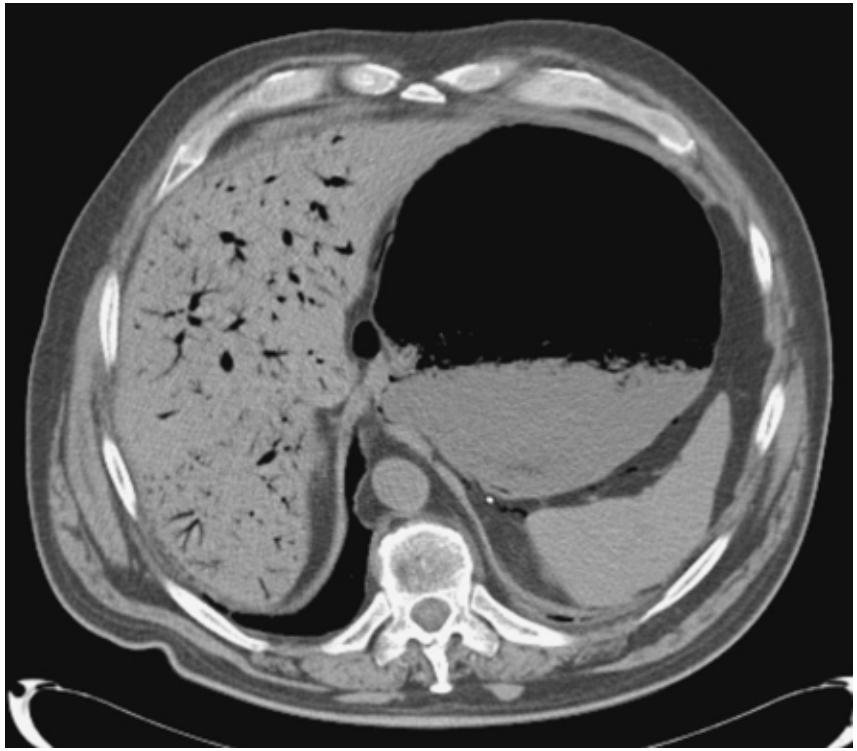
Rigler’s sign



Football sign



Portal Venous Gas



Thank you!!!