

Chest X-Ray Interpretation

Oday Awad Hamad, MD
Teaching Assistant, AUG

Systematic Approach to Read X ray

IDENTIFICATION

- Correct patient (name and age)
- Correct date & time
- View: PA , AP, Lateral, lateral decubitus
- Rt and Lt

x Bone → highest density.

IDENTIFICATION

• Quality:

- **Inspiration:** 5-6 ribs anteriorly, 9-10 ribs posteriorly. *Normally*

in RA side → the diaph. crus above the 1st side by one intercostal space.

- **Penetration** (hard or soft film) *depend on quality of image*

تراکم تصویر
سماوات یکنواخت
خوب
density or
penetration
of imaging.

- **Rotation:** medial end of clavicle at equal distance from the spinous process.

rotational side mid line
انحراف از خط میانی
انحراف از خط میانی
medial aspect of clavicle.
پشت و پیش از هم

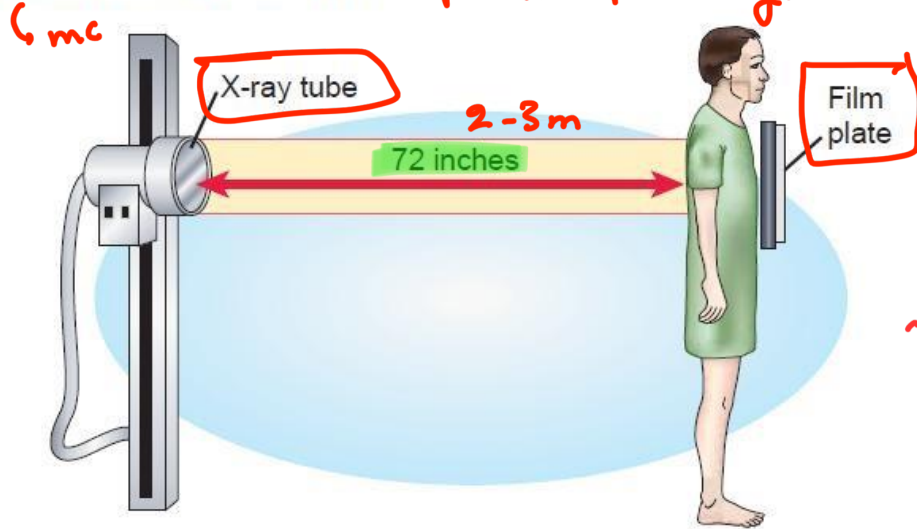
- **Angulation:** medial end of clavicle at the same level.

[he should take dec insp. and catch it]
during imaging..

← medial aspect of RA clavicle
یعنی از طرف میانی استخوان

Common Radiographic Views

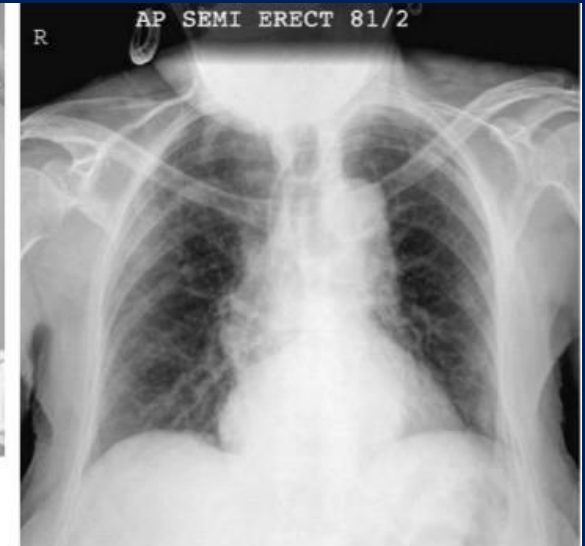
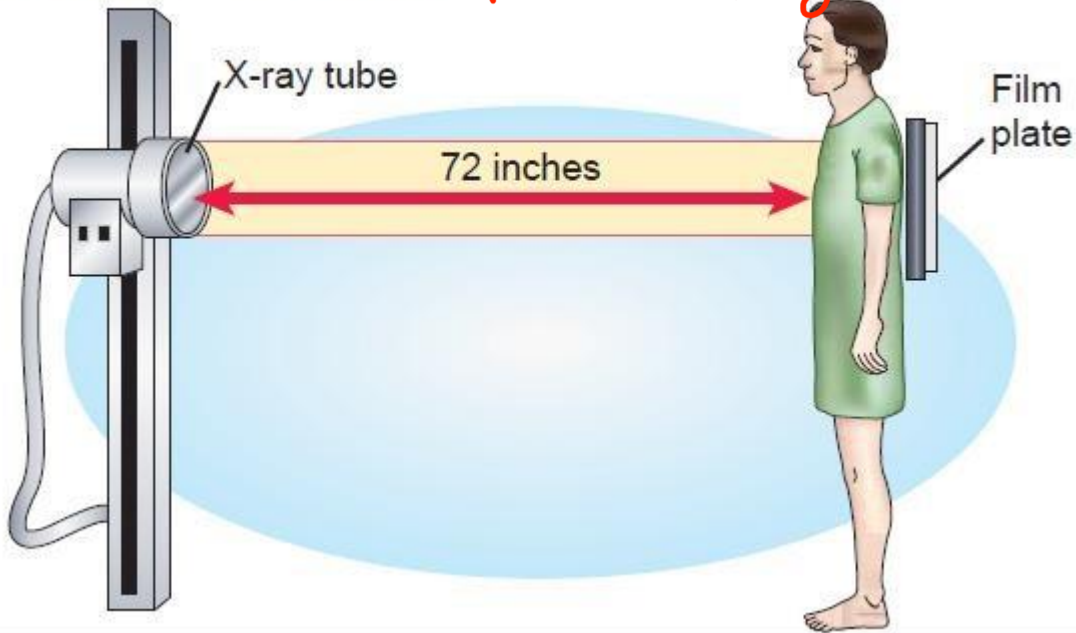
Posterior-Anterior (PA) xrim from post body.



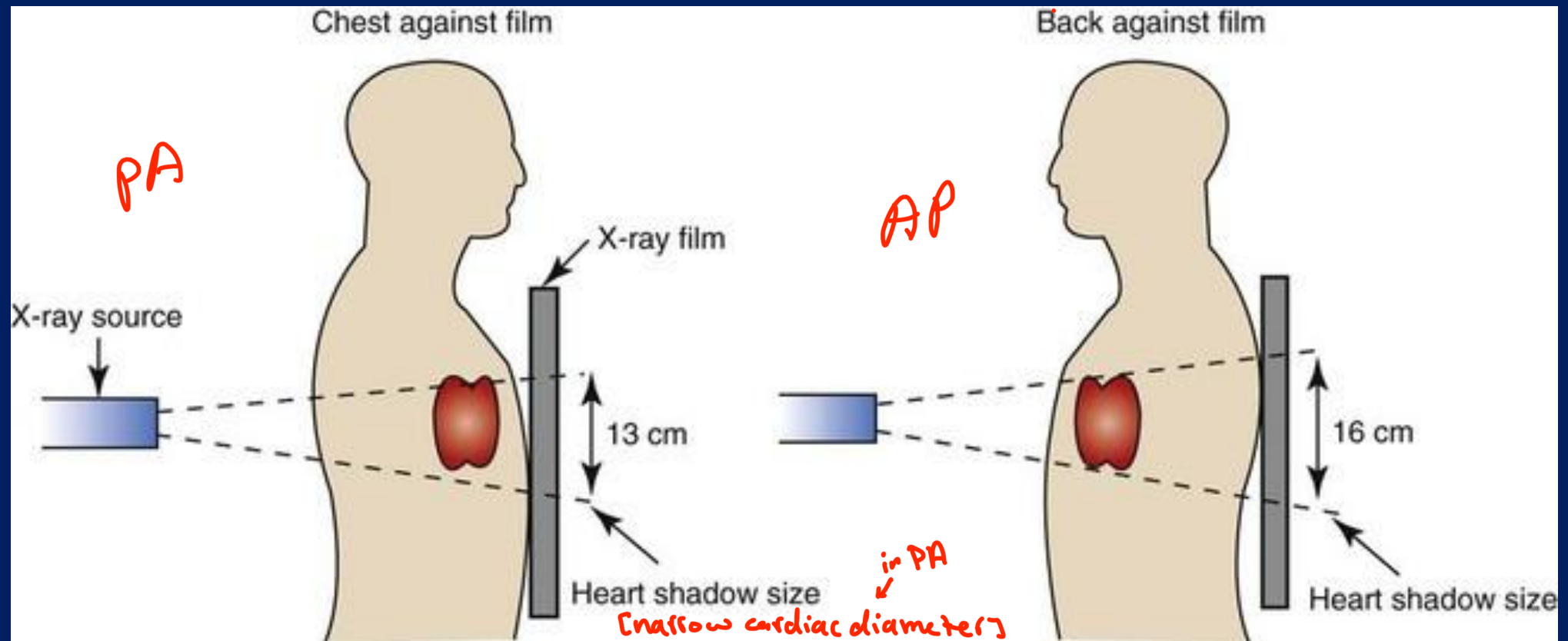
Views

← انحراف استاندارد در صدی
 ۵-۱۰ یا ضد نفسی کامل و خفیه
 در عینکه خانه له ما اخذ نفسی خفیه
 ریه یکون، phrenum له لغوه
 در عین ریه تغیر ال lung tissue
 نبشکه کامل و واضح...

Anterior-Posterior (AP) xrim from A. Body.



Normal semi-erect radiograph of thorax. The chin is just superimposed on the upper thorax





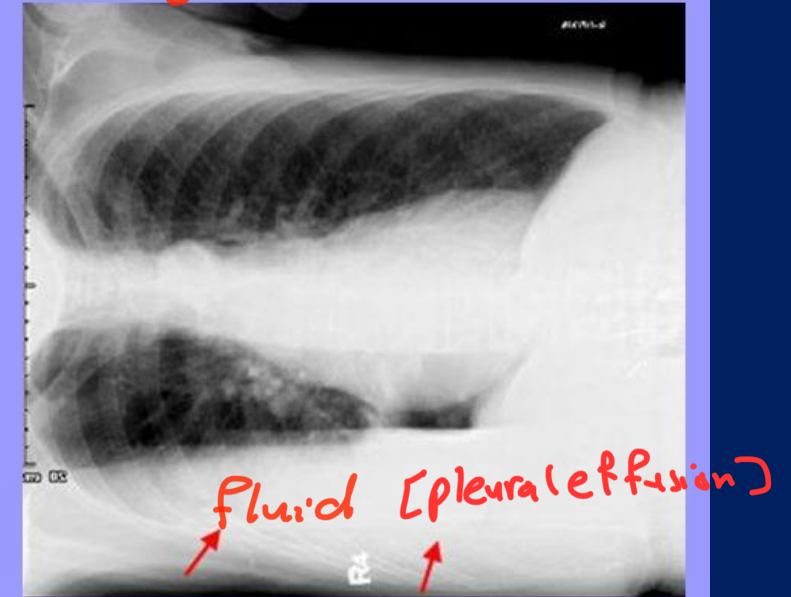
Techniques - Projection (continued)

- Lateral Decubitus for pleural effusion

هو نمائندگی از fluid بترک مع حرکت المريض
[not lucidated]



- بیمار را در حالت خوابیده بر روی بستر قرار دهید
و از PE و السان استفاده کنید ..



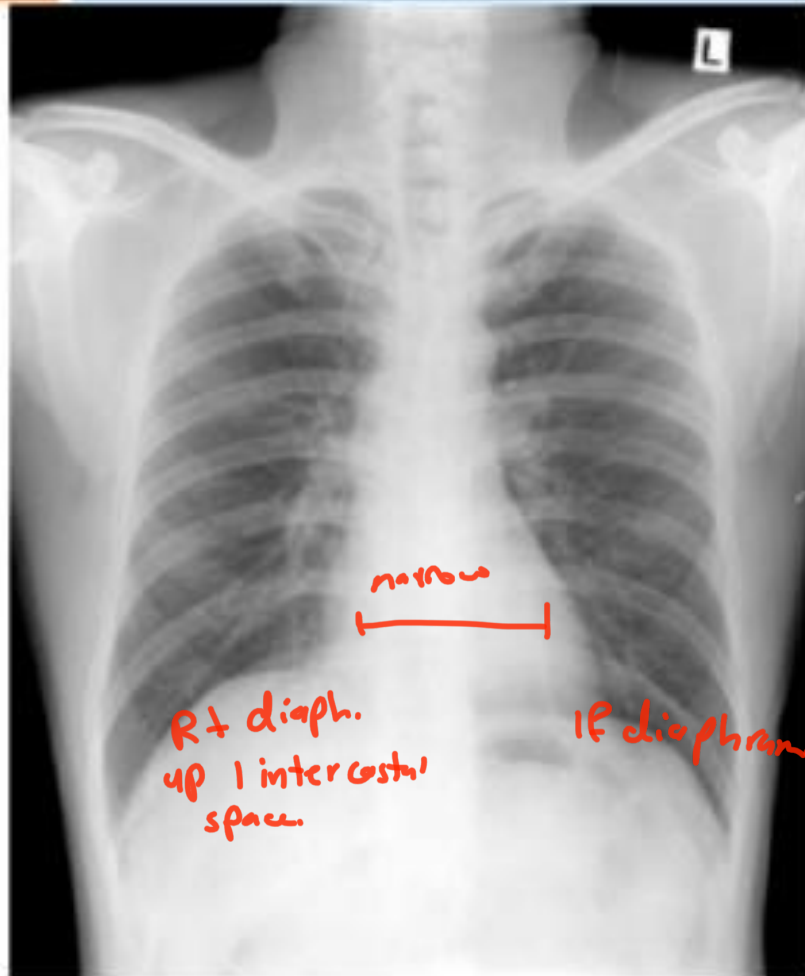
PA

9-10 ribs
narrow cardiac diameter

VS

AP

5-6 ribs
wide cardiac diameter

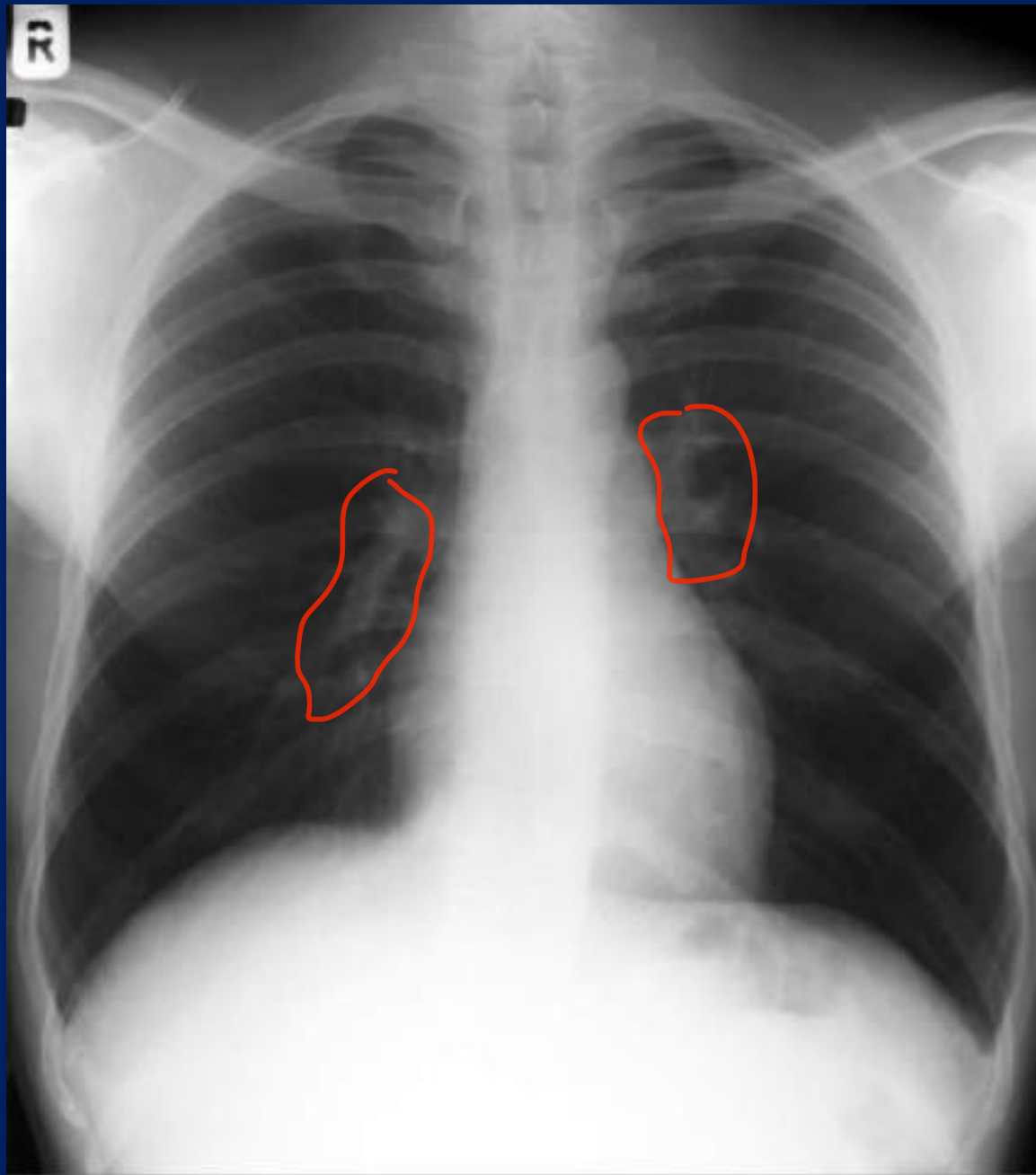


AP film



PA film





lung structures *في الرئة*

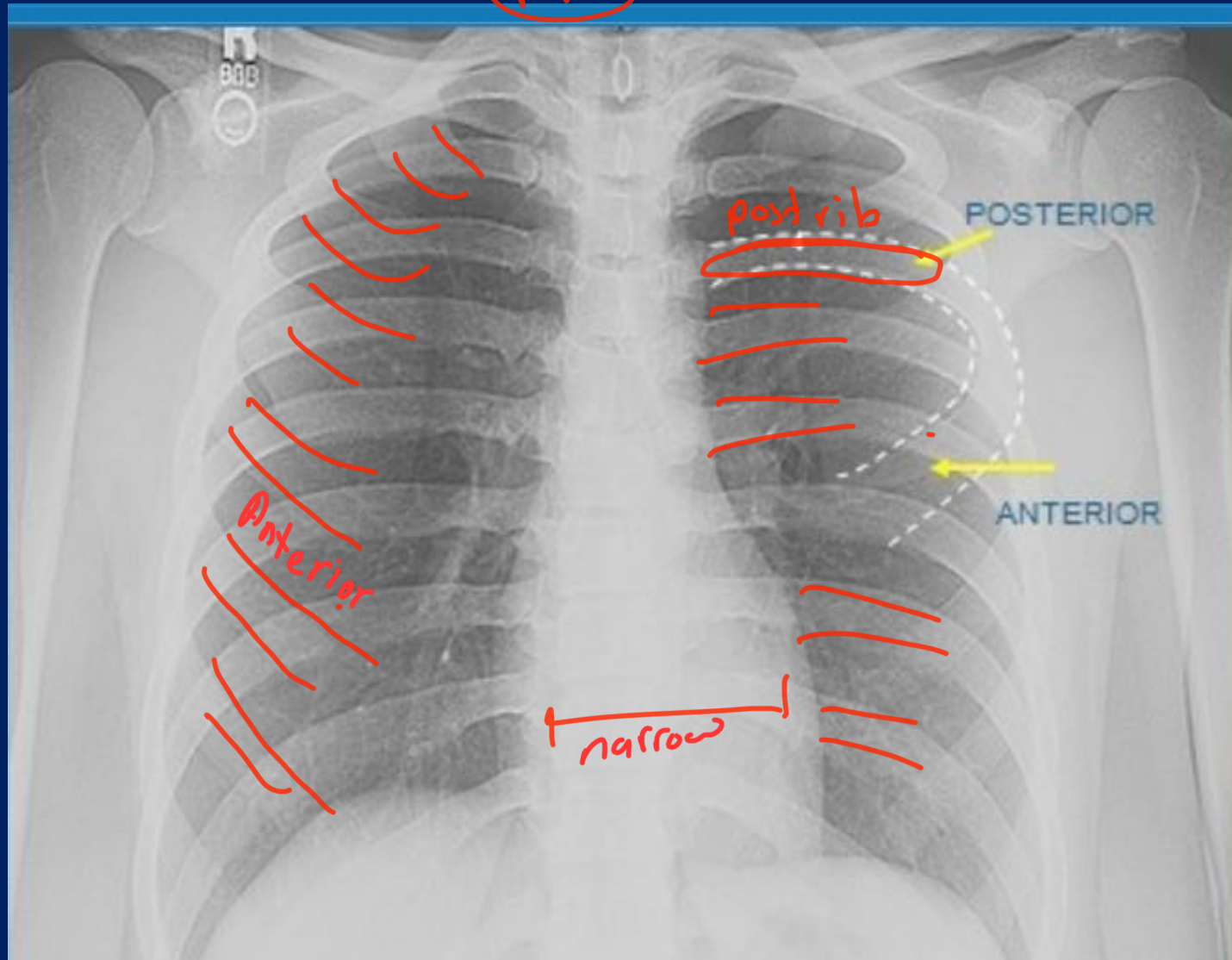
Hila on PA View

↳ normal to see it

but if there is increased [become prominent]
indicate fibrosis

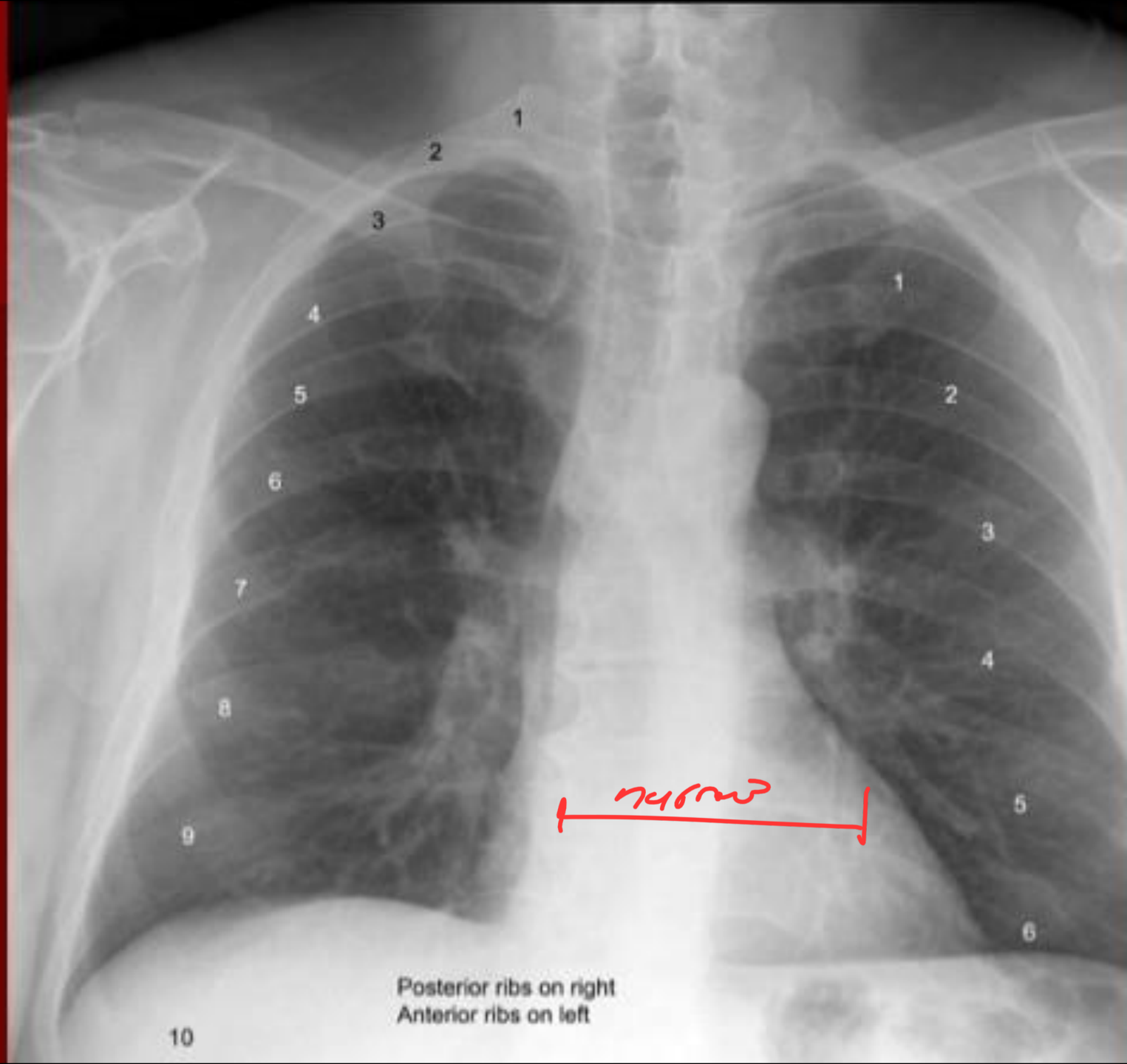
RT and LT

PA



Counting the ribs

↳ depend on the view.



PA

normal

Inspiration

- The level of ^{deep.} inspiration ^{and catch it} can be estimated by counting ribs. Visualization of nine posterior ribs, or fifth anterior ribs on an upright PA radiograph projecting above the diaphragm would indicate a satisfactory inspiration

Inspiration

deep breath and catch it...
9-10 rib in PA view

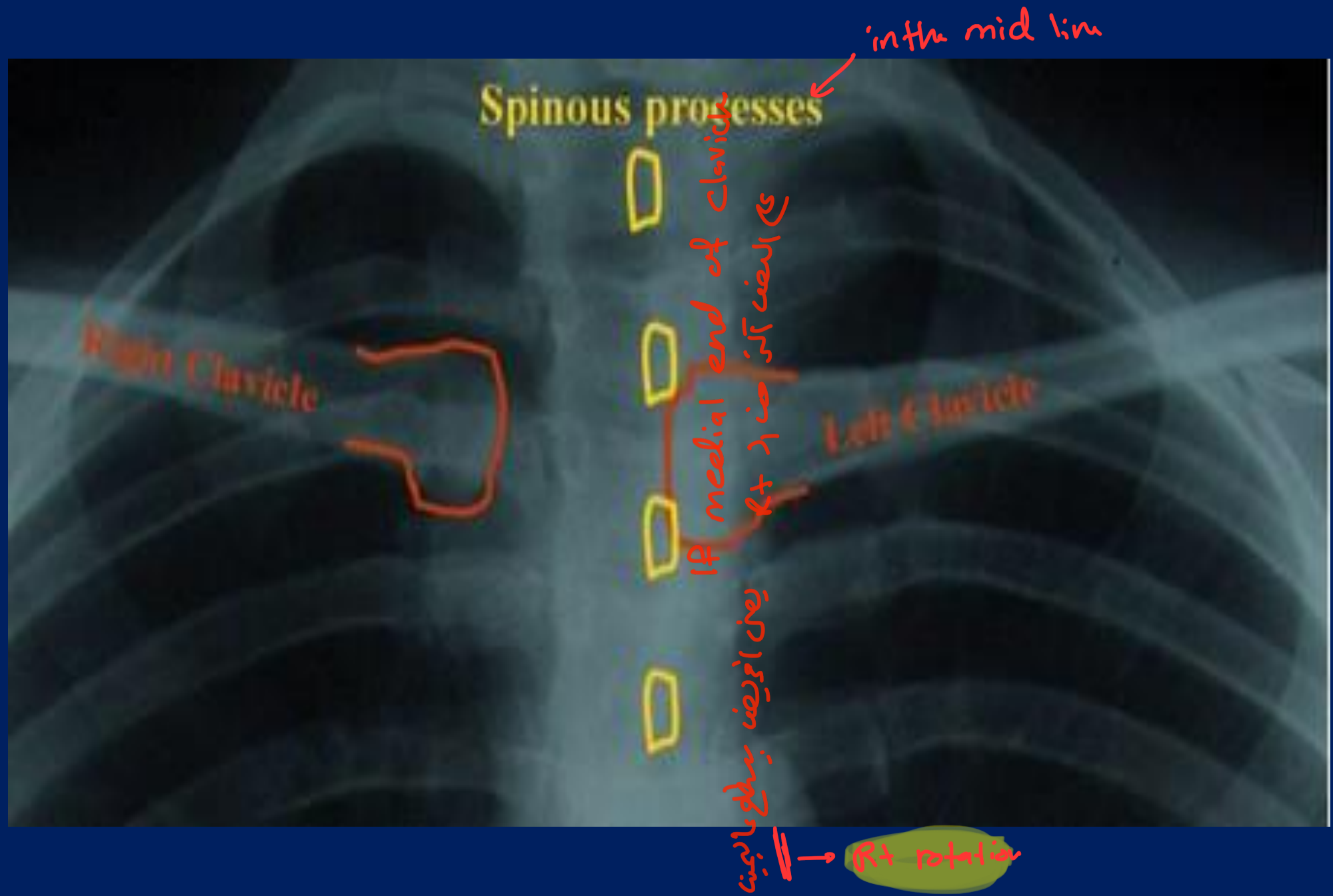


Expiration

with old age or child
+ if the pt has HFr lung fibrosis

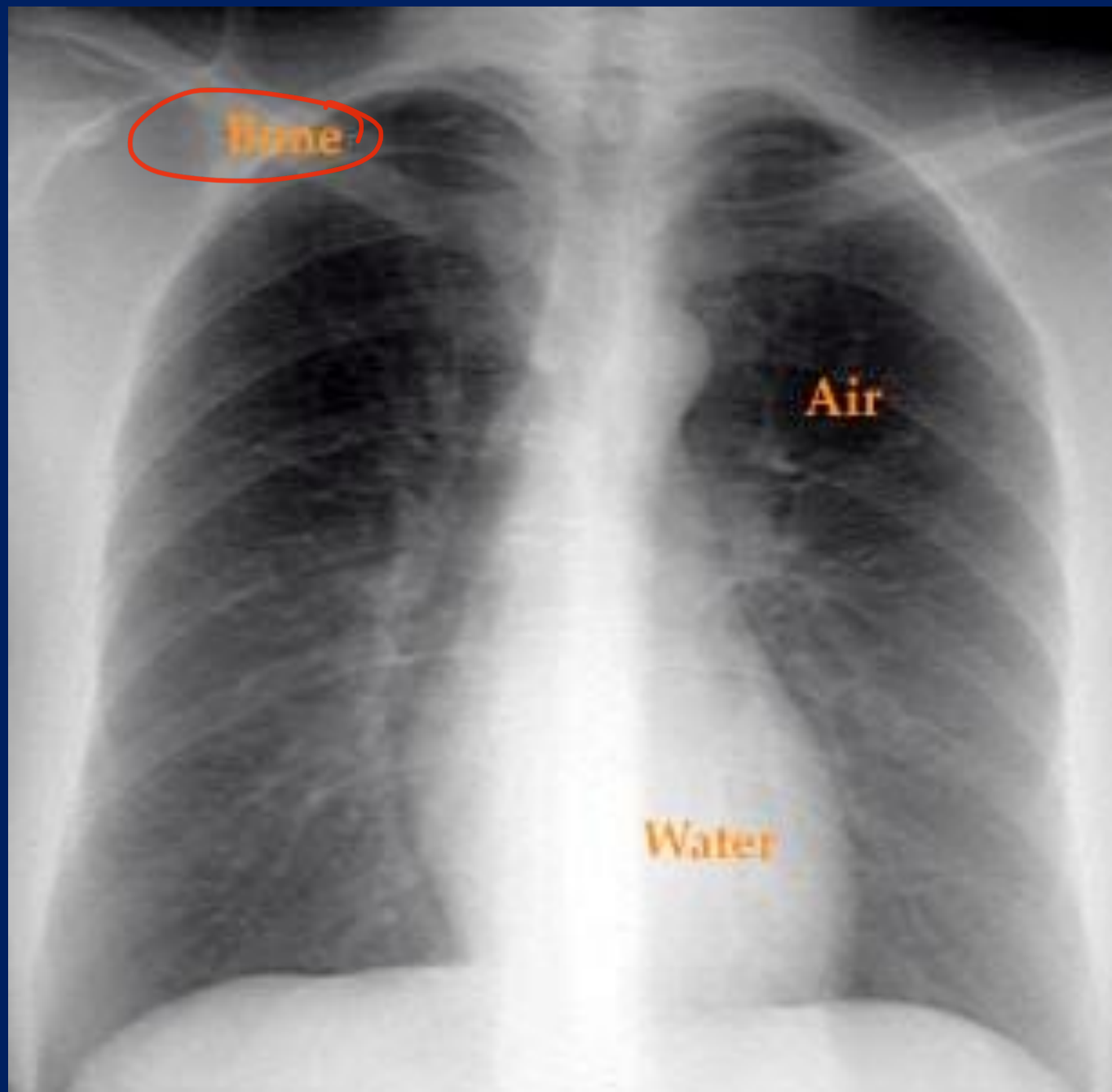


PA view but the pt not take breath



❖ Different tissues in our body absorb X-rays at different extents:

- ^{+teeth + skull} Bone- high absorption (white)
- Tissue- somewhere in the middle absorption (grey)
water
- Air- low absorption (black)
less opaque



Differential Absorption of X-rays

- Determine the gray scale of the radiograph
- Absorb few x-rays = film black
many x-rays = film white

Five Radiographic Opacities

Air Fat Soft tissue Bone ^{بقيصري} Metal



✓ least opaque

to

most ✓
opaque

✓ most lucent

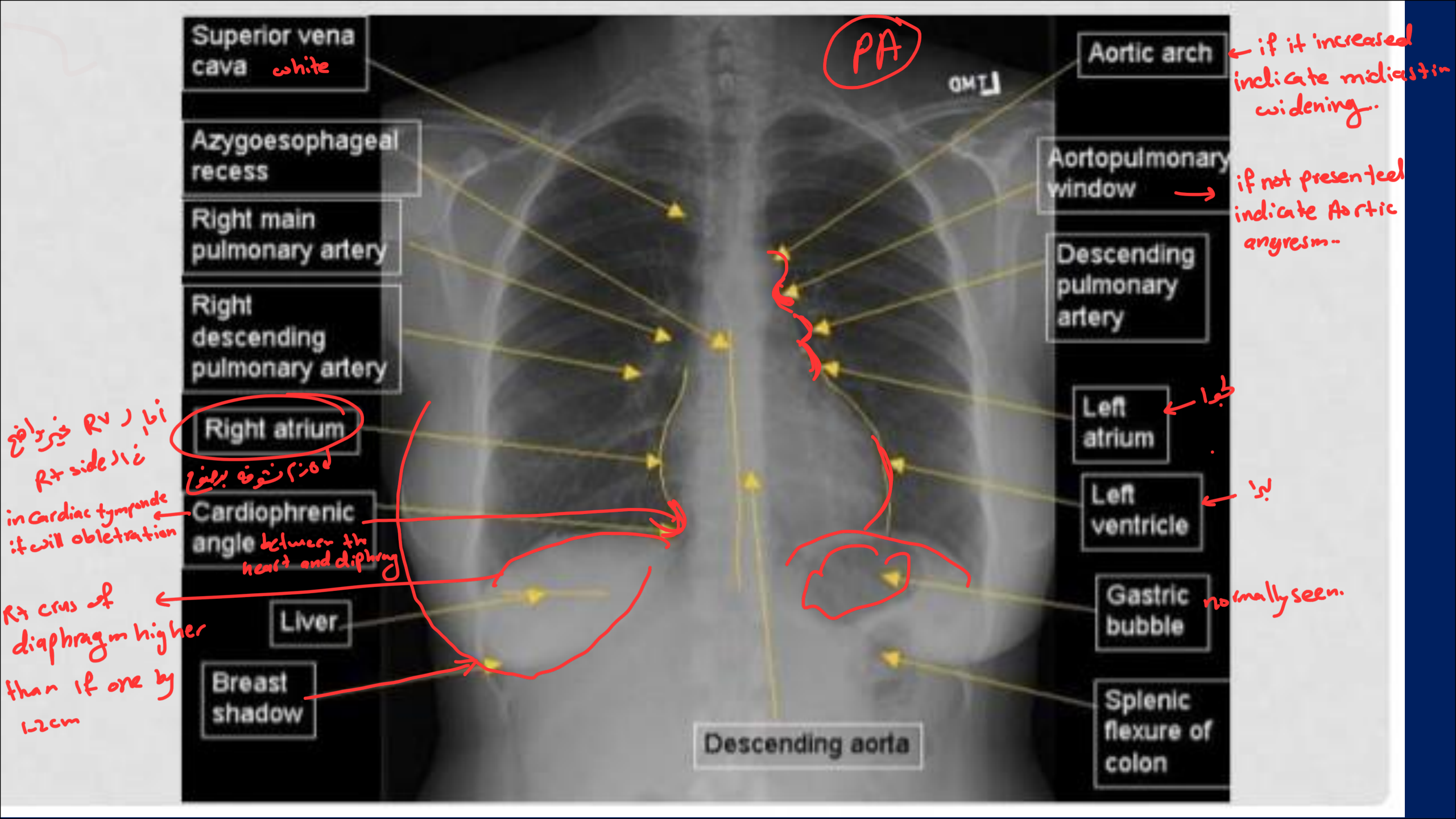
to

least lucent

Black

to

White ✓



Superior vena cava *white*

Azygoesophageal recess

Right main pulmonary artery

Right descending pulmonary artery

Right atrium

Cardiophrenic angle *between the heart and diaphragm*

Liver

Breast shadow

PA

Aortic arch

Aortopulmonary window

Descending pulmonary artery

Left atrium

Left ventricle

Gastric bubble

Splenic flexure of colon

Descending aorta

← if it increased indicate mediastin widening.

→ if not present indicate Aortic angyresm.

طبوا

بوی

normally seen.

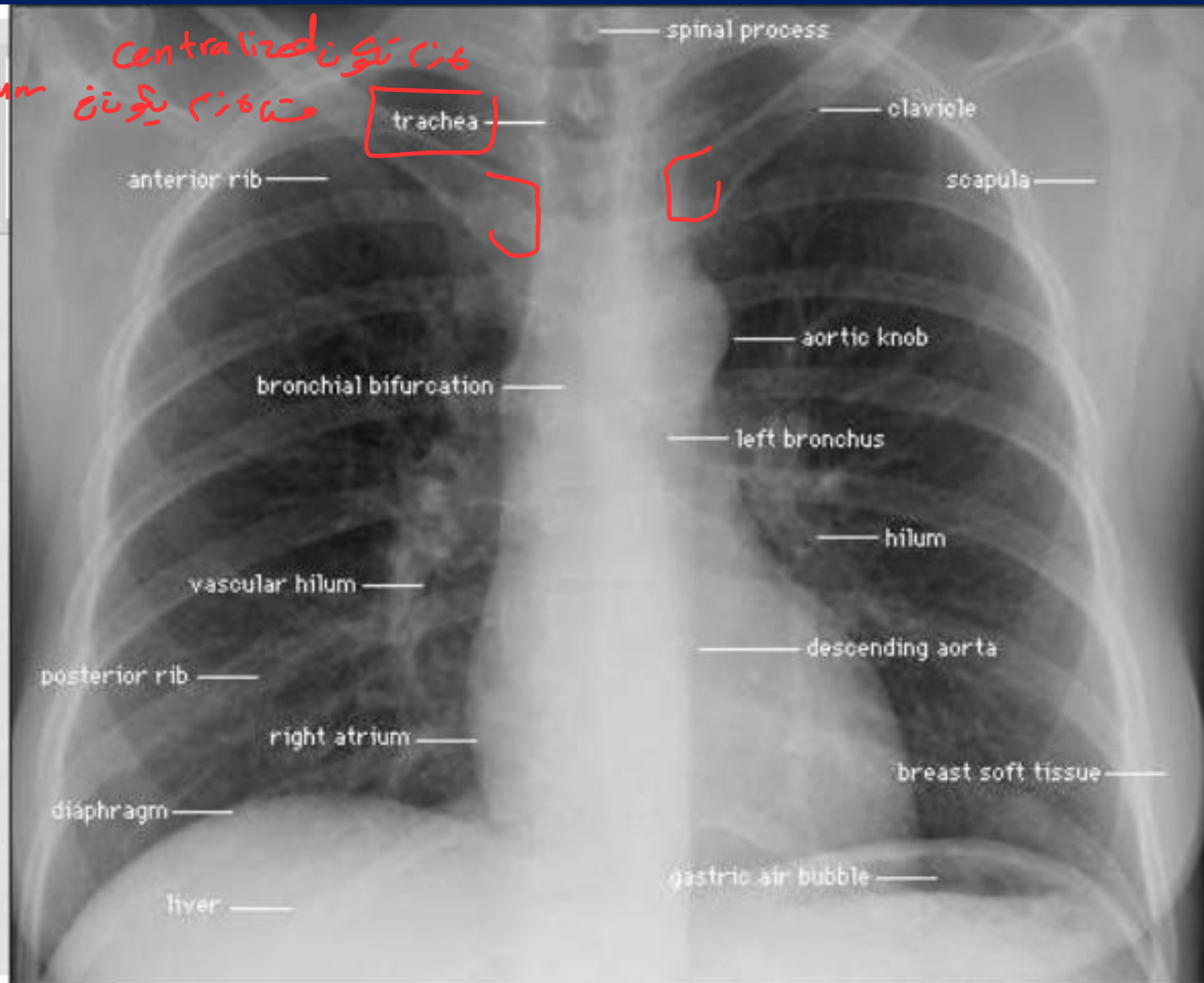
این را ر RV خیر داخل
Rt side

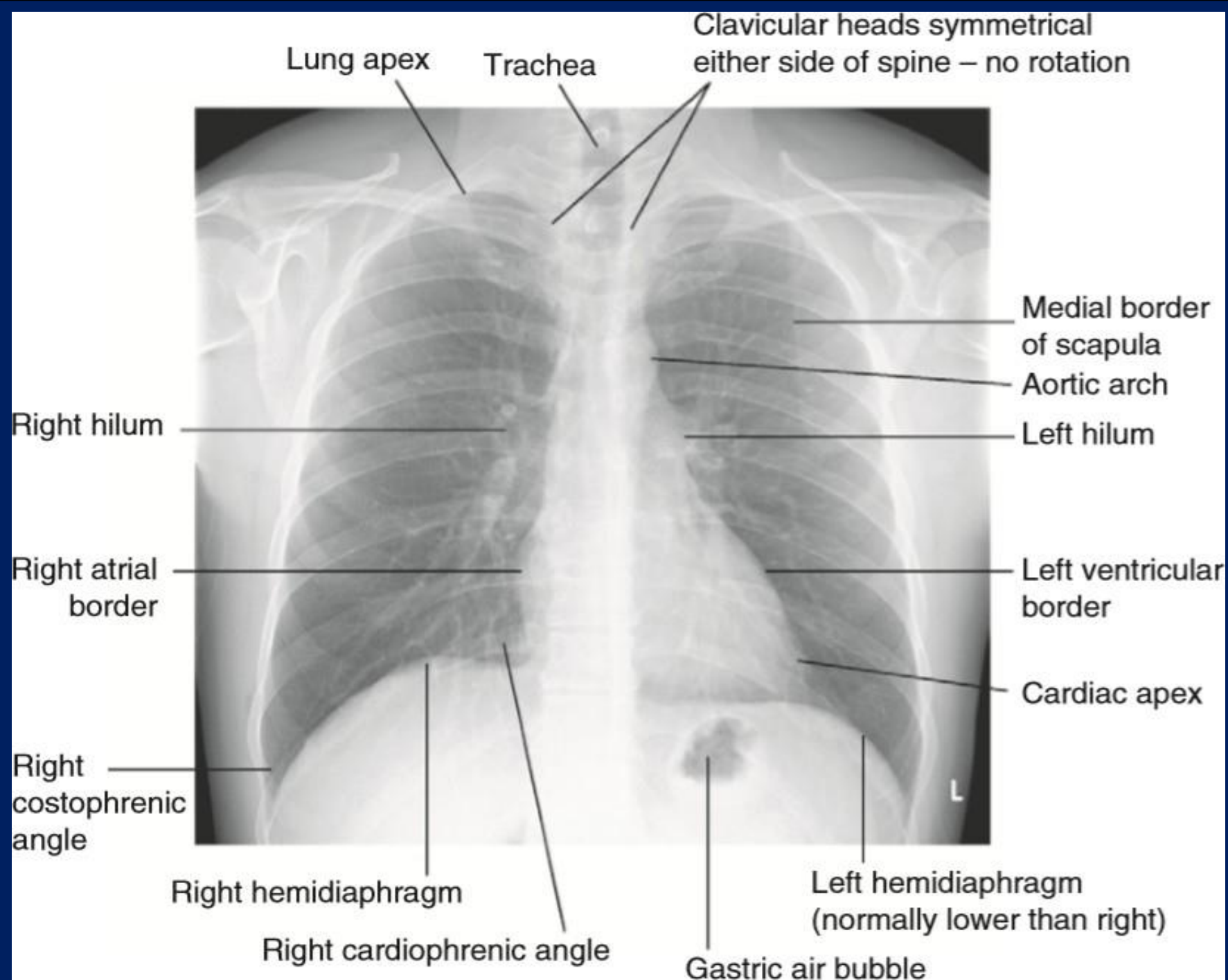
in Cardiac tympanide
it will obliteration

← Rt crus of diaphragm higher than lt one by 1-2cm

medial sternal
shift

centralized
مركزی

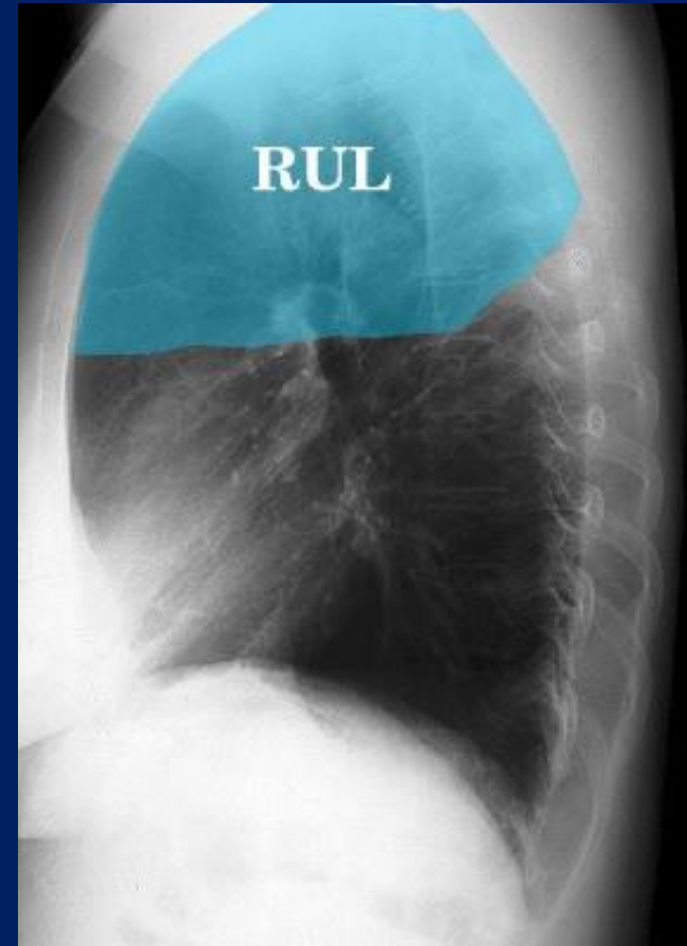
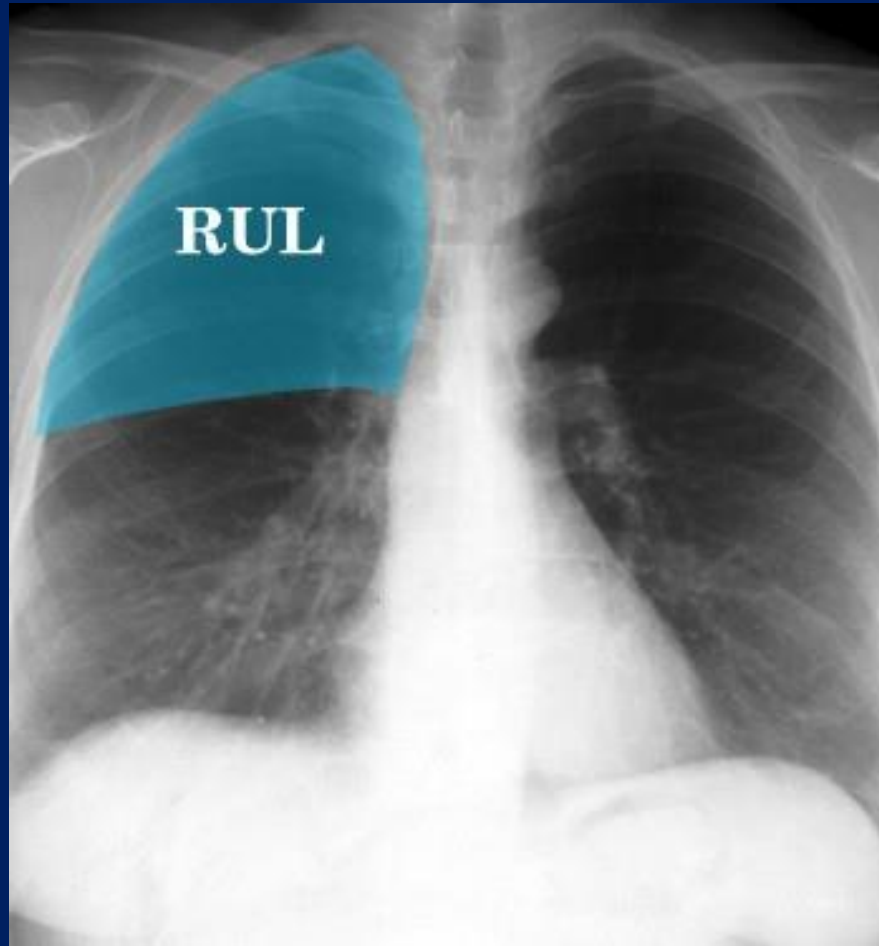




* There is overlap between the lung lobes...

{ 3 lobes in R lung
2 lobes in L lung

RUL (Right Upper Lung)

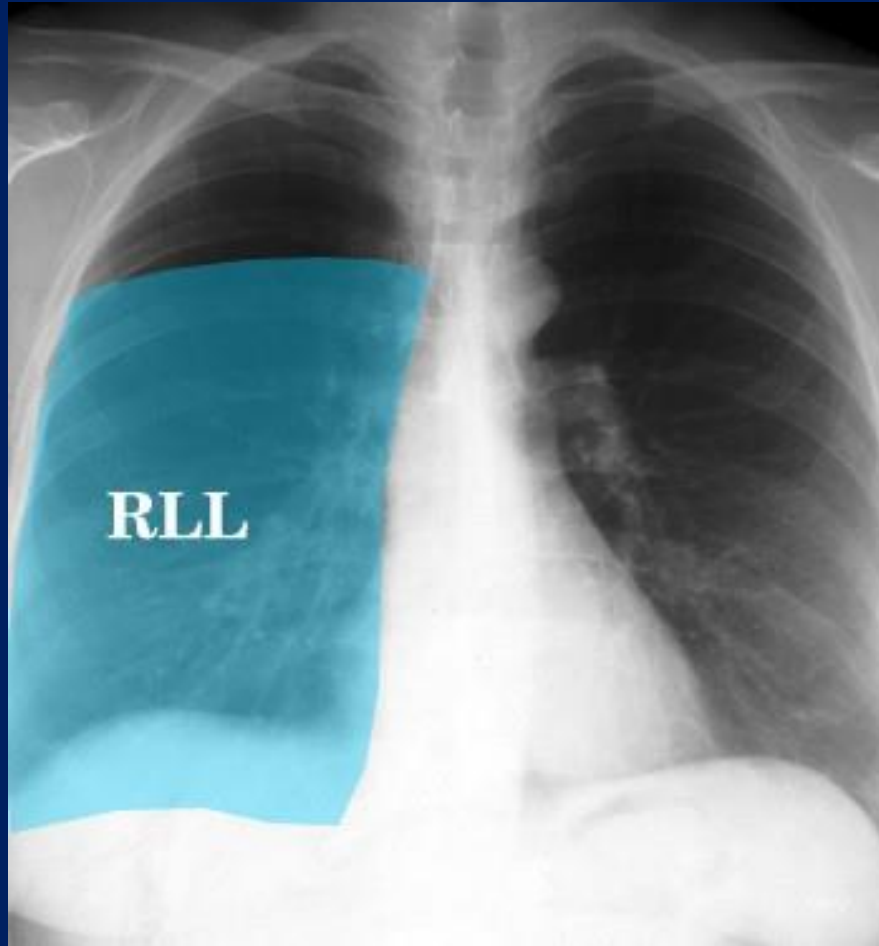


RML (Right Middle Lung)



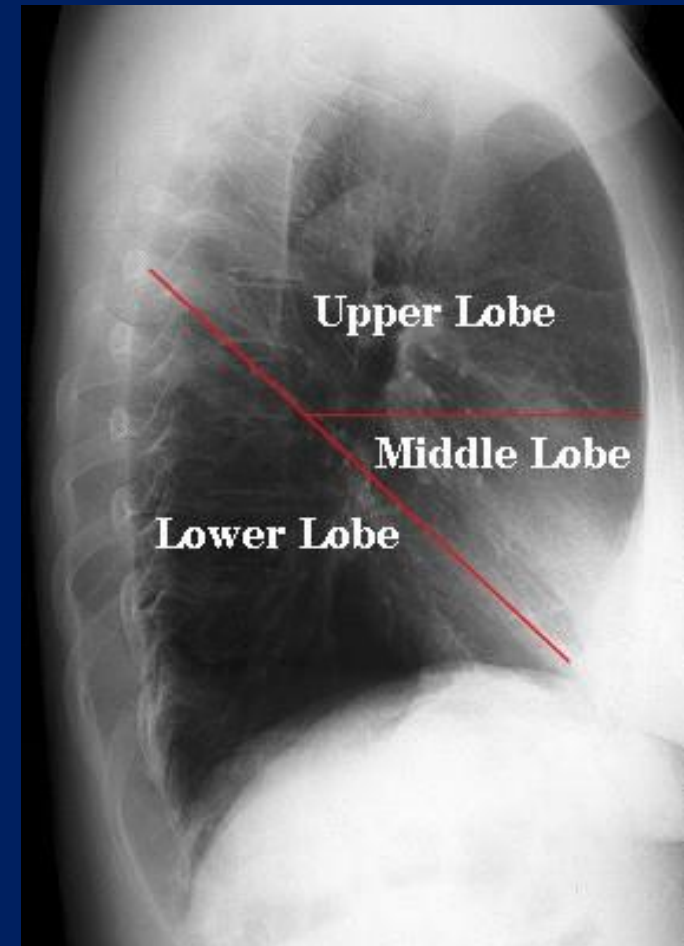
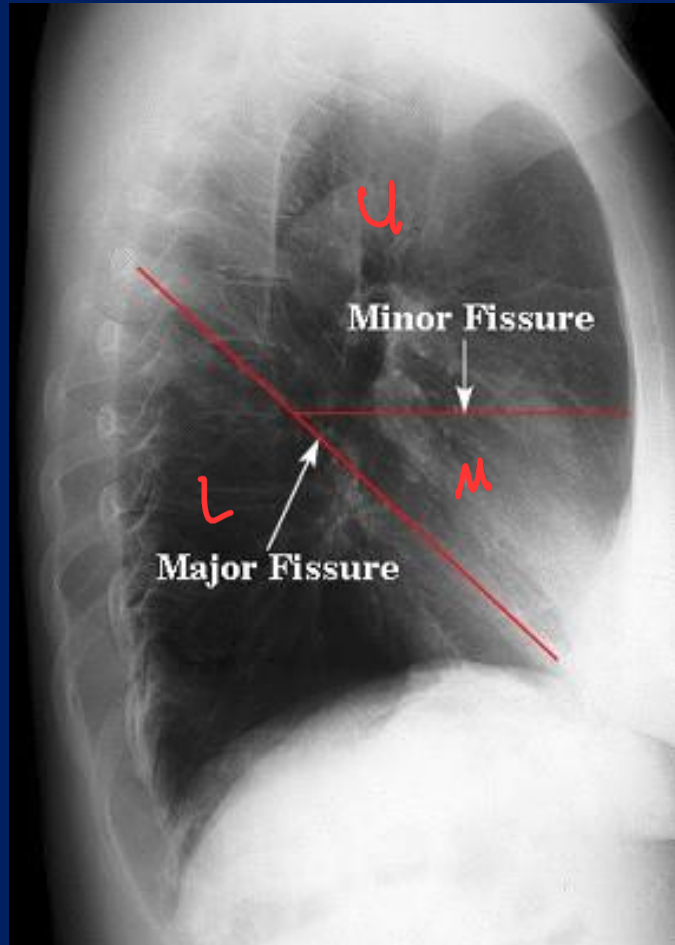
من post آلت

RLL (Right Lower Lung)

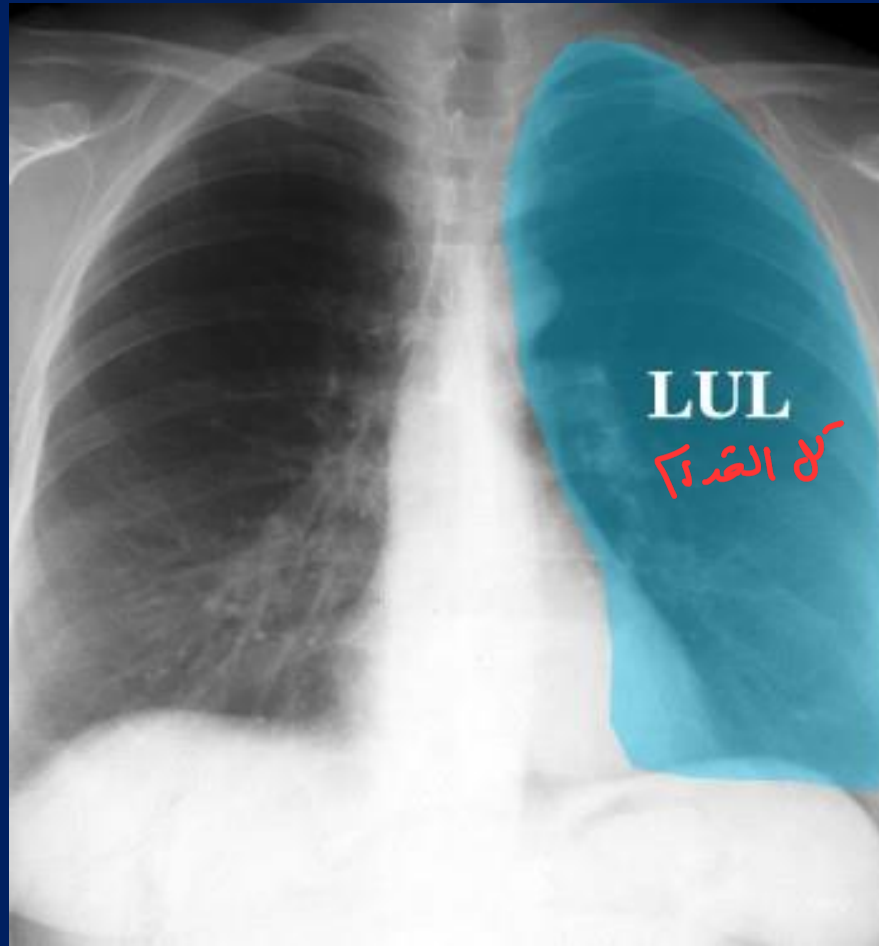


lat. view.

Right Sided Fissures

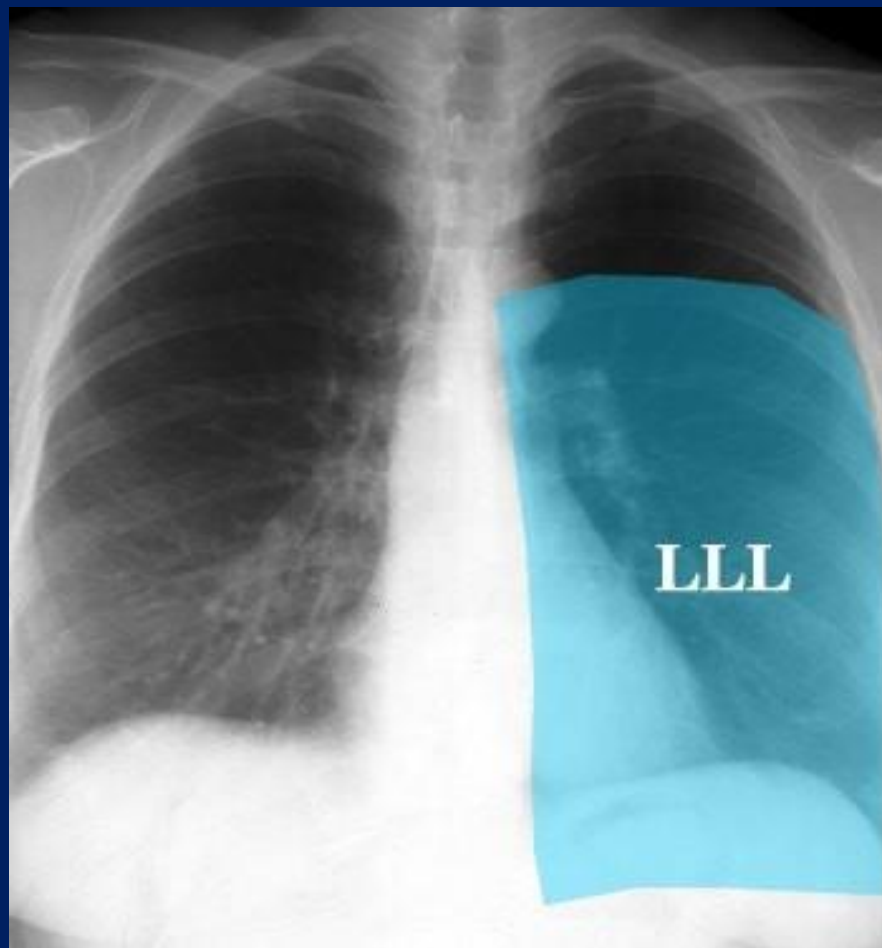


LUL (Left Upper Lung)

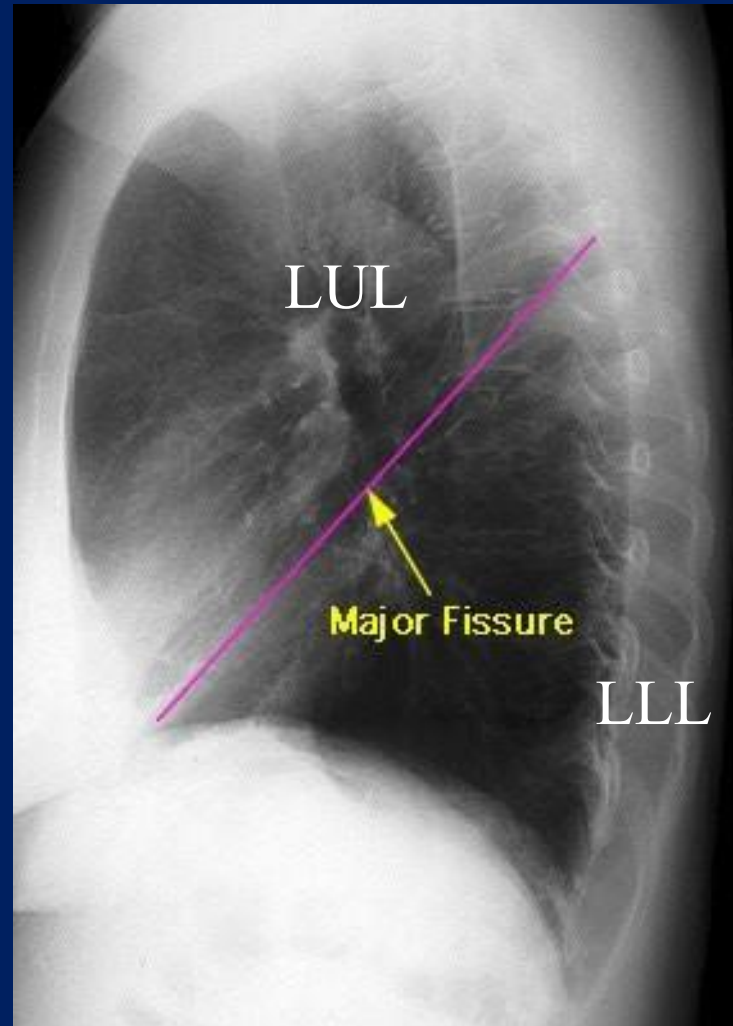


LLL (Left Lower Lung)

* From AP, PA there is overlap between LUL, LLL
* in lat. view there is NO overlap between them.



Left Side Fissure



Trachea

- Size and shape
- Position

. Normally trachea is
central

. Abnormally:

- Shifted to the right
or
- Shifted to the left

→ to know if it ipsilateral or contralateral shifting.
→ لښوځېدنه يا ډېر لږ لښوځېدنه

Soft tissues of the chest

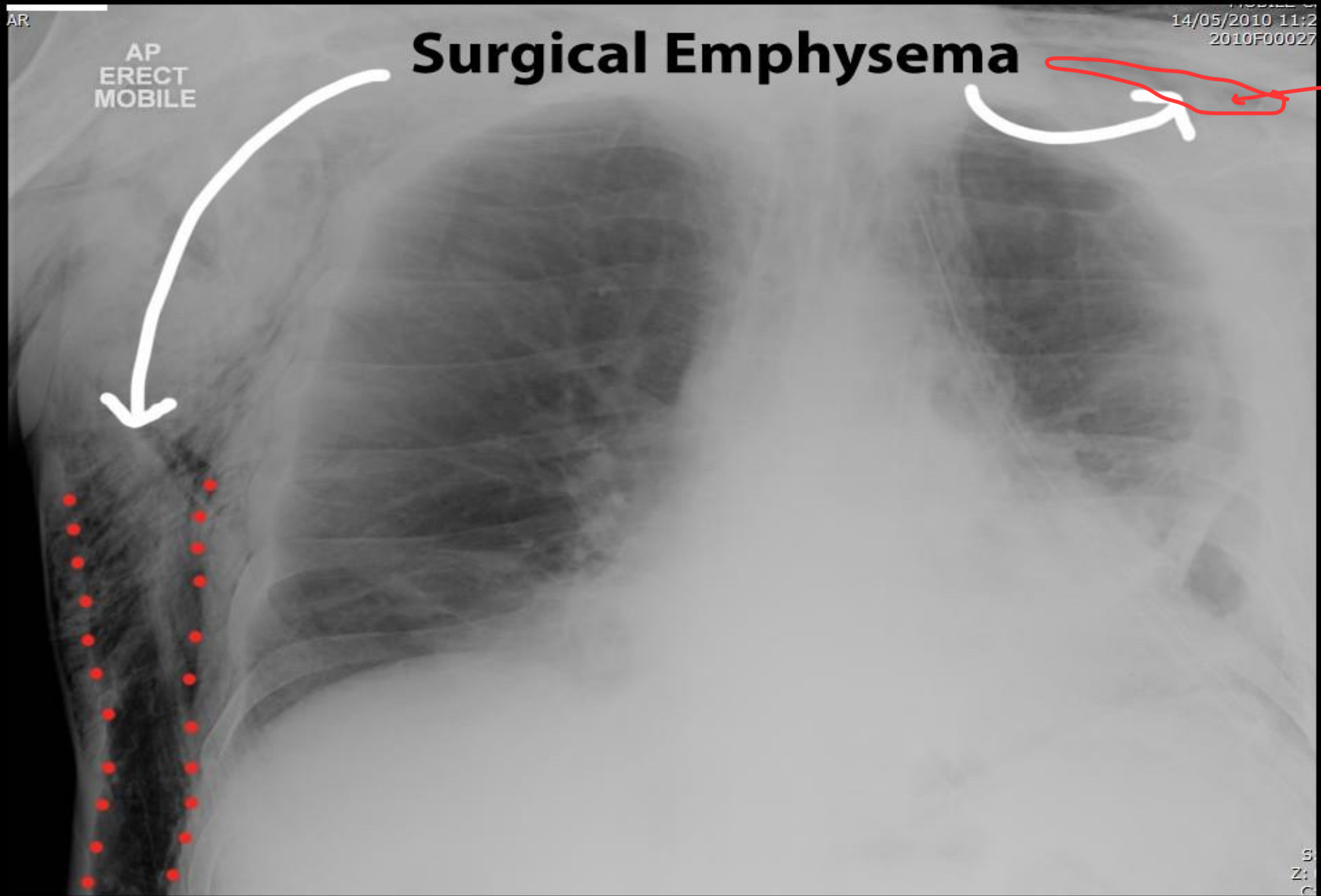
- Breast shadow:
 - . Sex: male or female
 - . Radical mastectomy or not
- Body built:
 - . Obese
 - . Under or over-built
- Surgical emphysema
- Axillary lymph nodes enlargement

AR

14/05/2010 11:2
2010F00027

AP
ERECT
MOBILE

Surgical Emphysema



air
under
the skin

Bony cage ↔ in surgical emergency or fracture

- Congenital anomalies of ribs
- Fractures
- Erosion of ribs
- Metastasis of bones or ribs
- Osteoporosis
- Intercostal spaces on both sides
- Counting the ribs

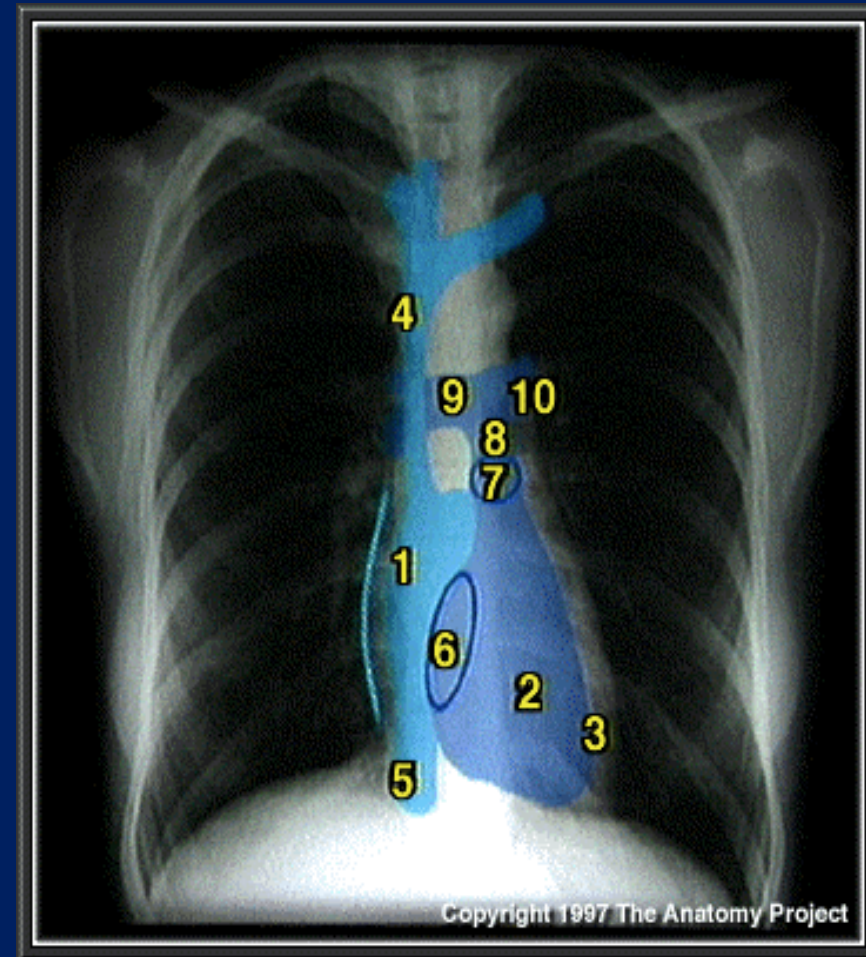
Diaphragm

- Position
 - Normally the right hemidiaphragm is at the level of 10th rib posteriorly (mid-inspiratory position).
- Shape
 - Dome-like
 - Right diaphragm is usually 1-2 cm higher

Check the Heart

- Size
- Shape
- Silhouette-margins should be sharp
- Diameter ($>1/2$ thoracic diameter is enlarged heart)

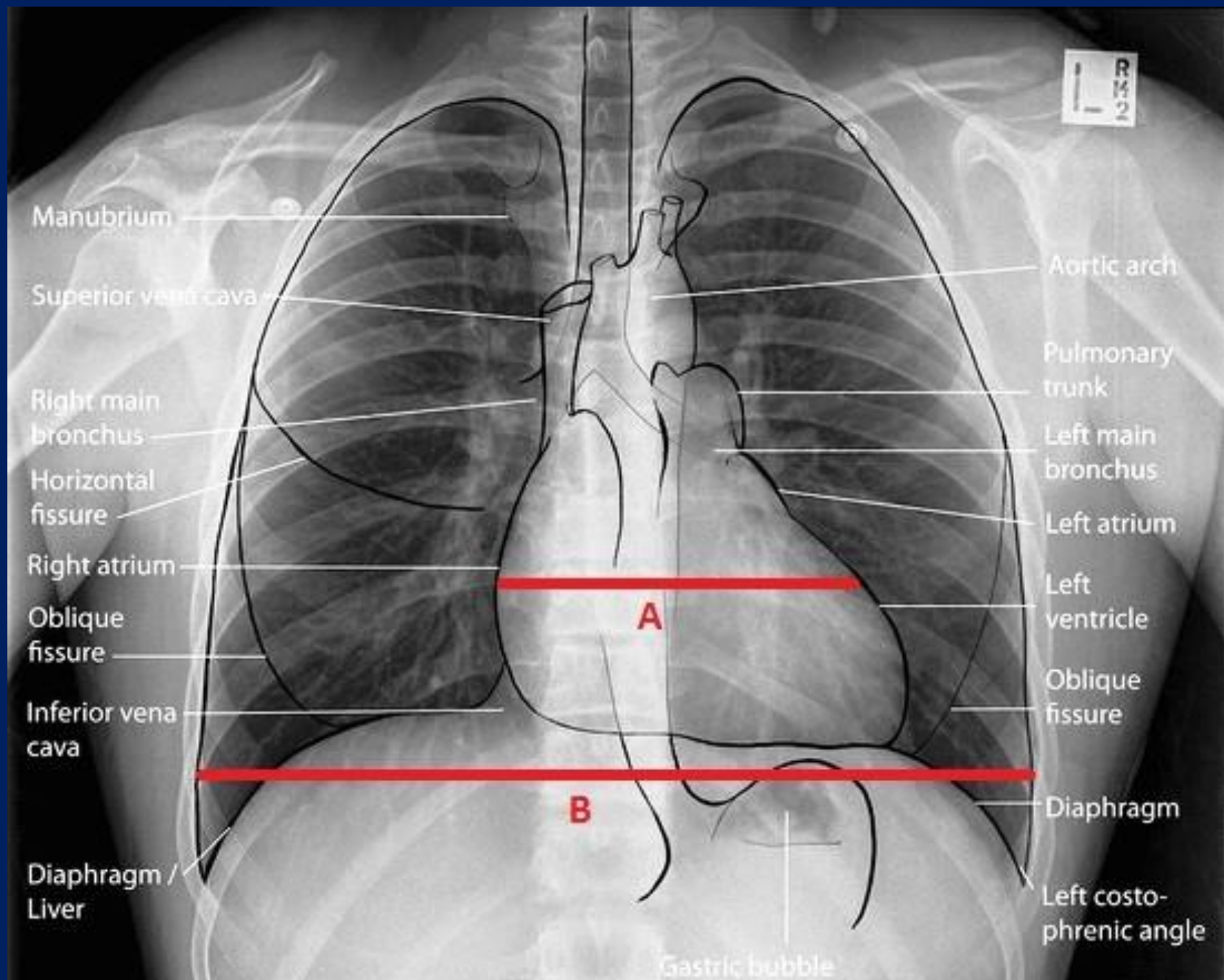
Remember: AP views make heart appear larger than it actually is.

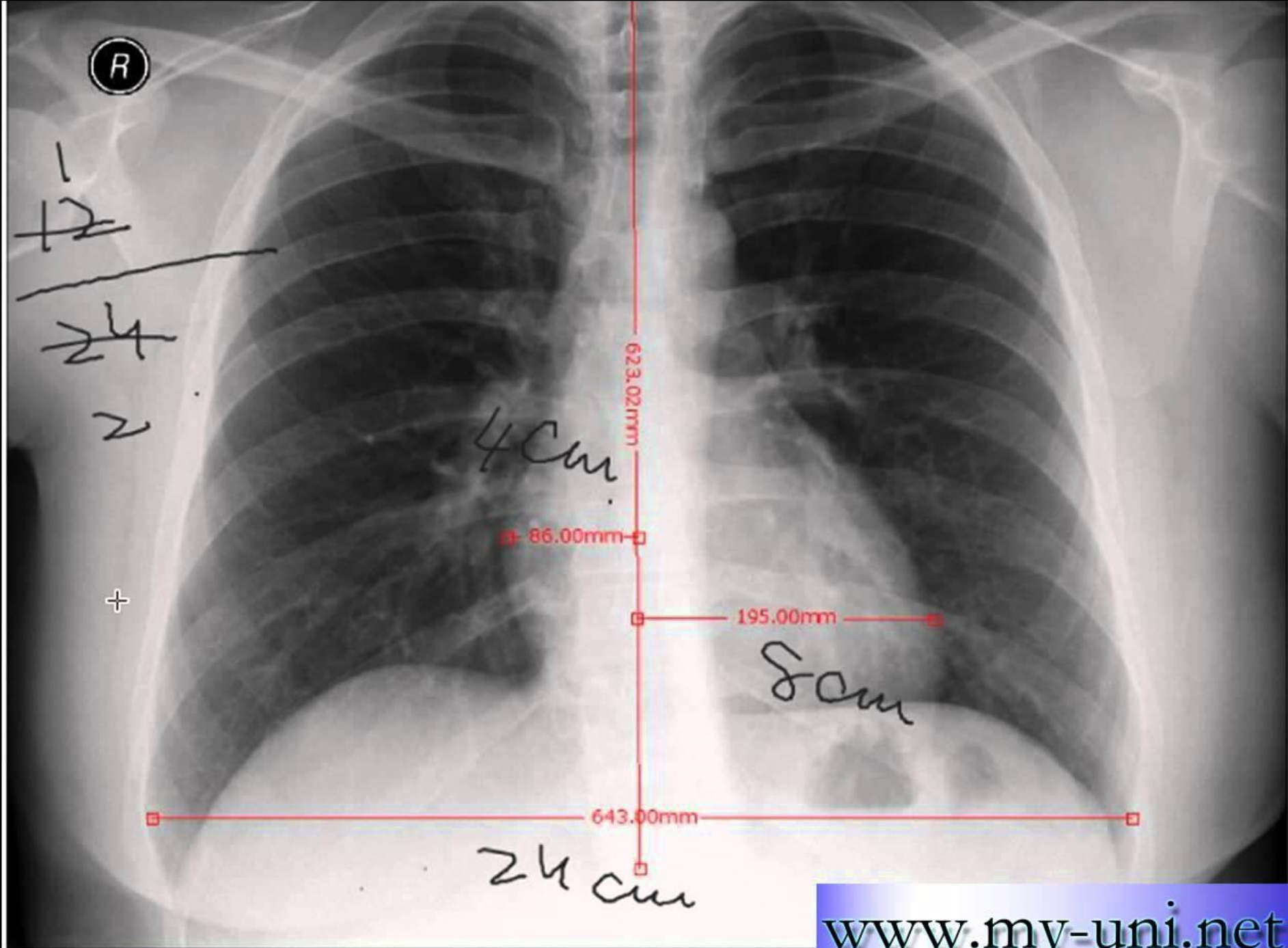


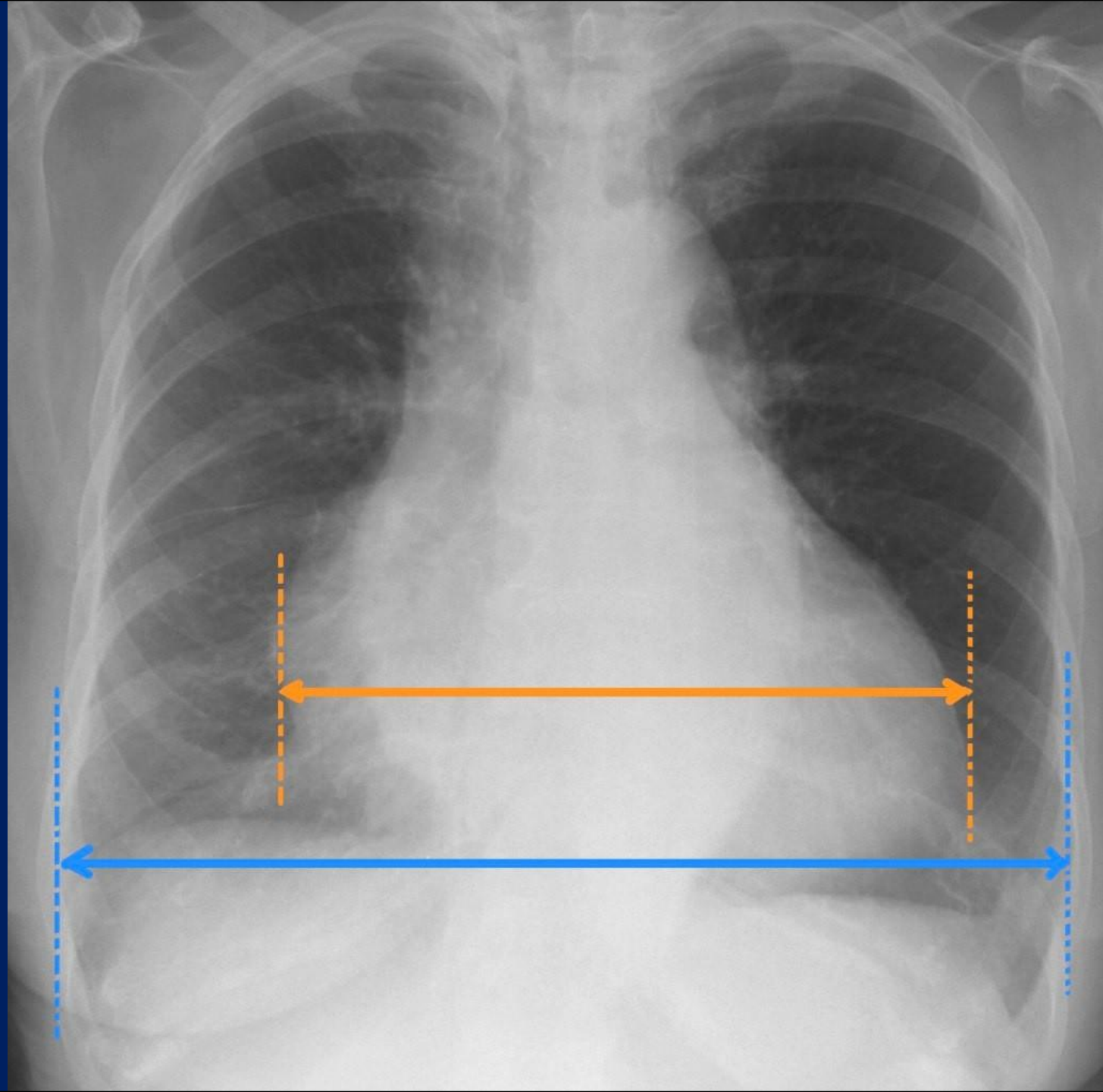
- 1. R Atrium
- 2. R Ventricle
- 3. Apex of L Ventricle

- 4. Superior Vena Cava
- 5. Inferior Vena Cava
- 6. Tricuspid Valve

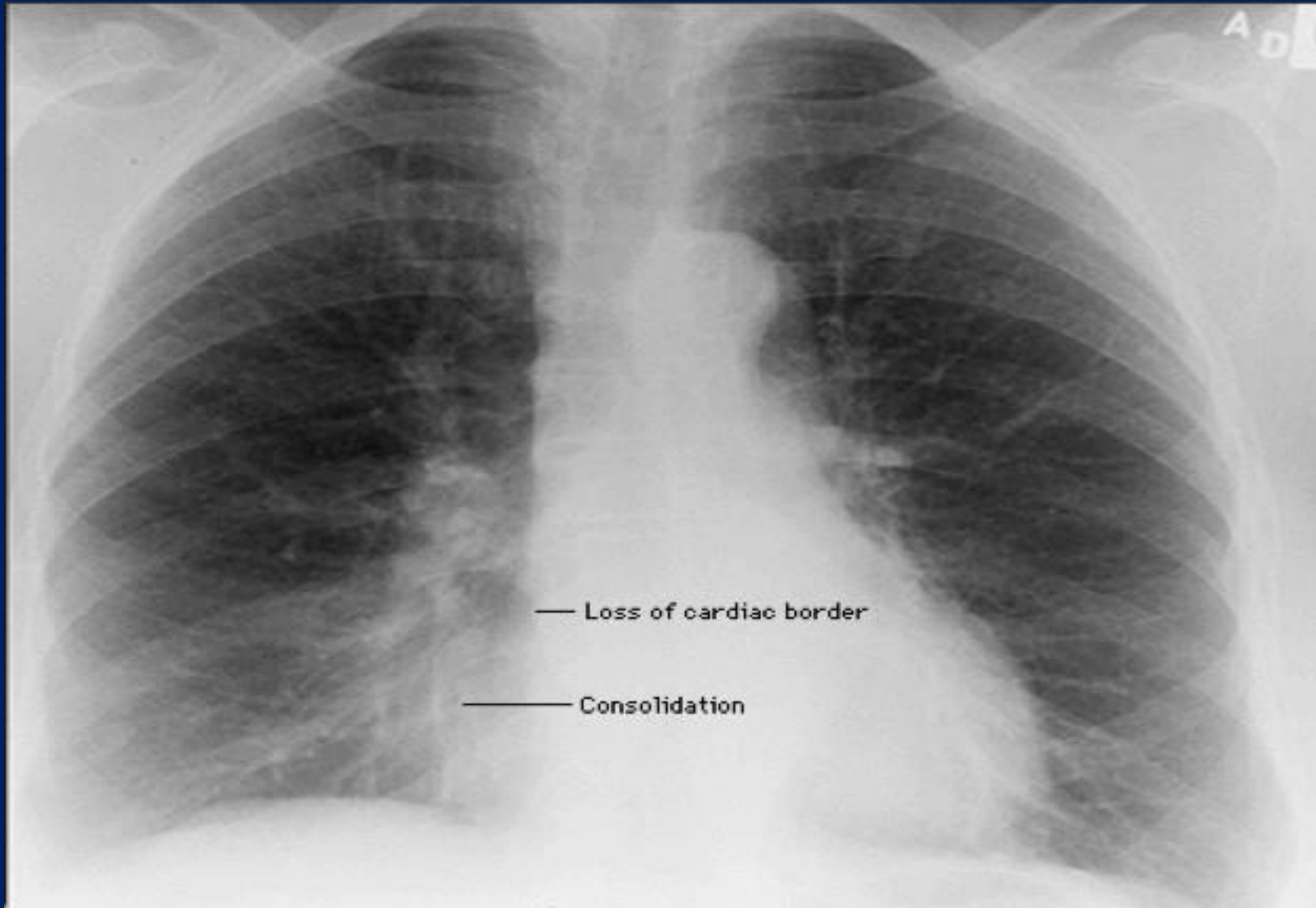
- 7. Pulmonary Valve
- 8. Pulmonary Trunk
- 9. R PA
- 10. L PA



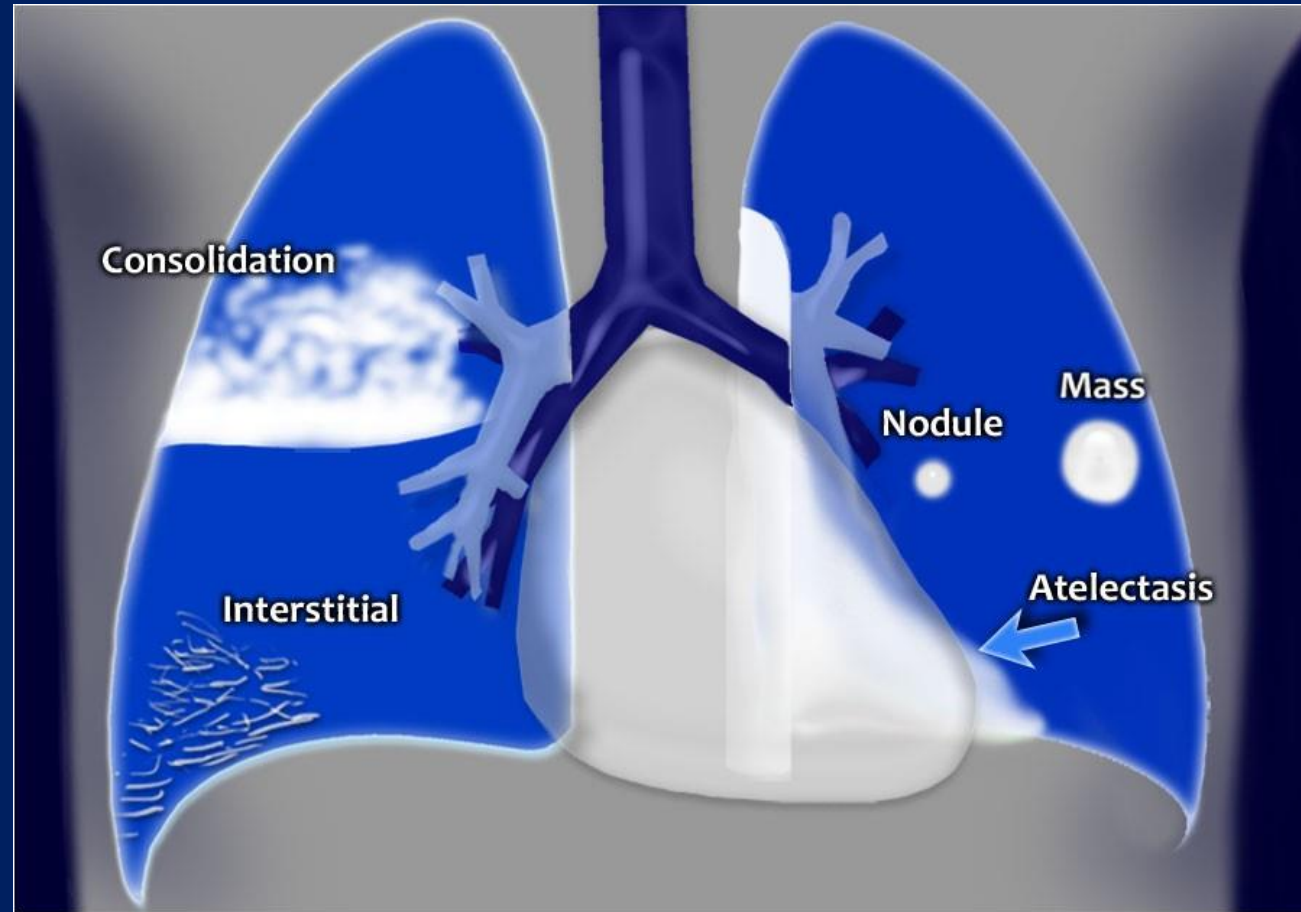




Cardiac Silhouette



Lung Diseases



Chest X-ray For Lobar Pneumonia

Consolidation
confined to
one or more
lobes (or
segments of
lobes) of
lungs.



bronchopneumonia

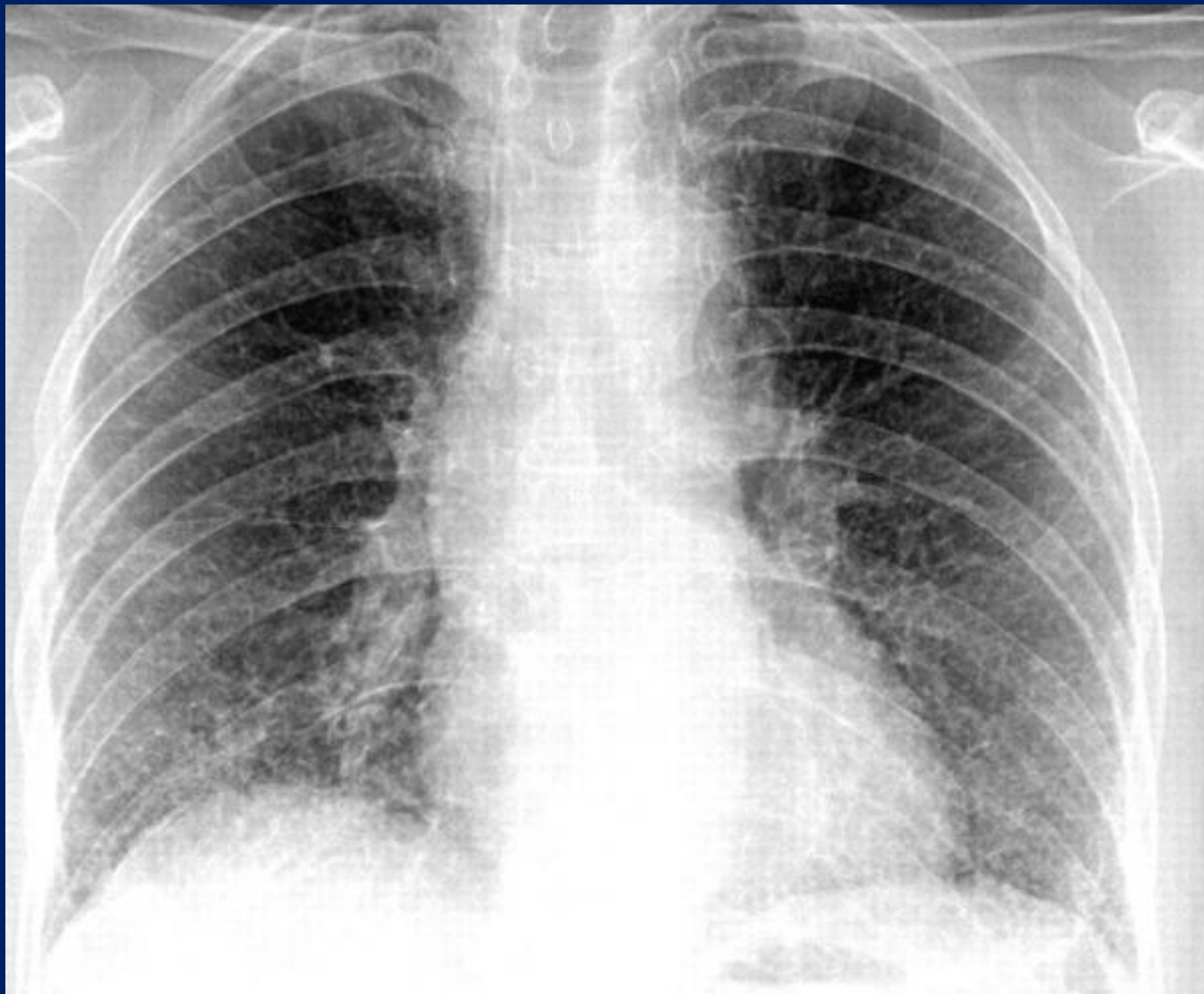
pneumonia with bronchial tree



Interstitial pneumonia

← due to Atypical Pneumonia

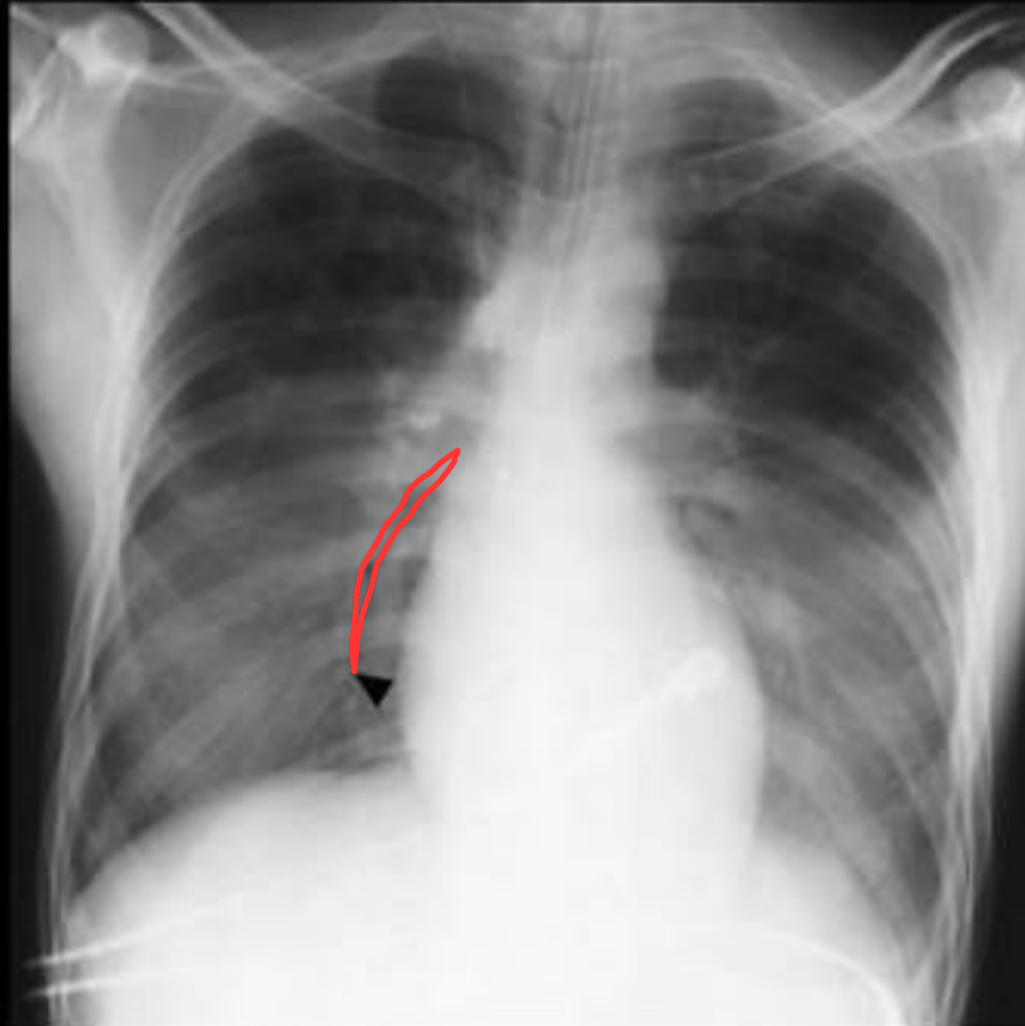
no obvious area in the lung
no consolidation [diffuse]



Air bronchogram in pneumonia

air bronchogram

sign of interstitial
pneumonitis





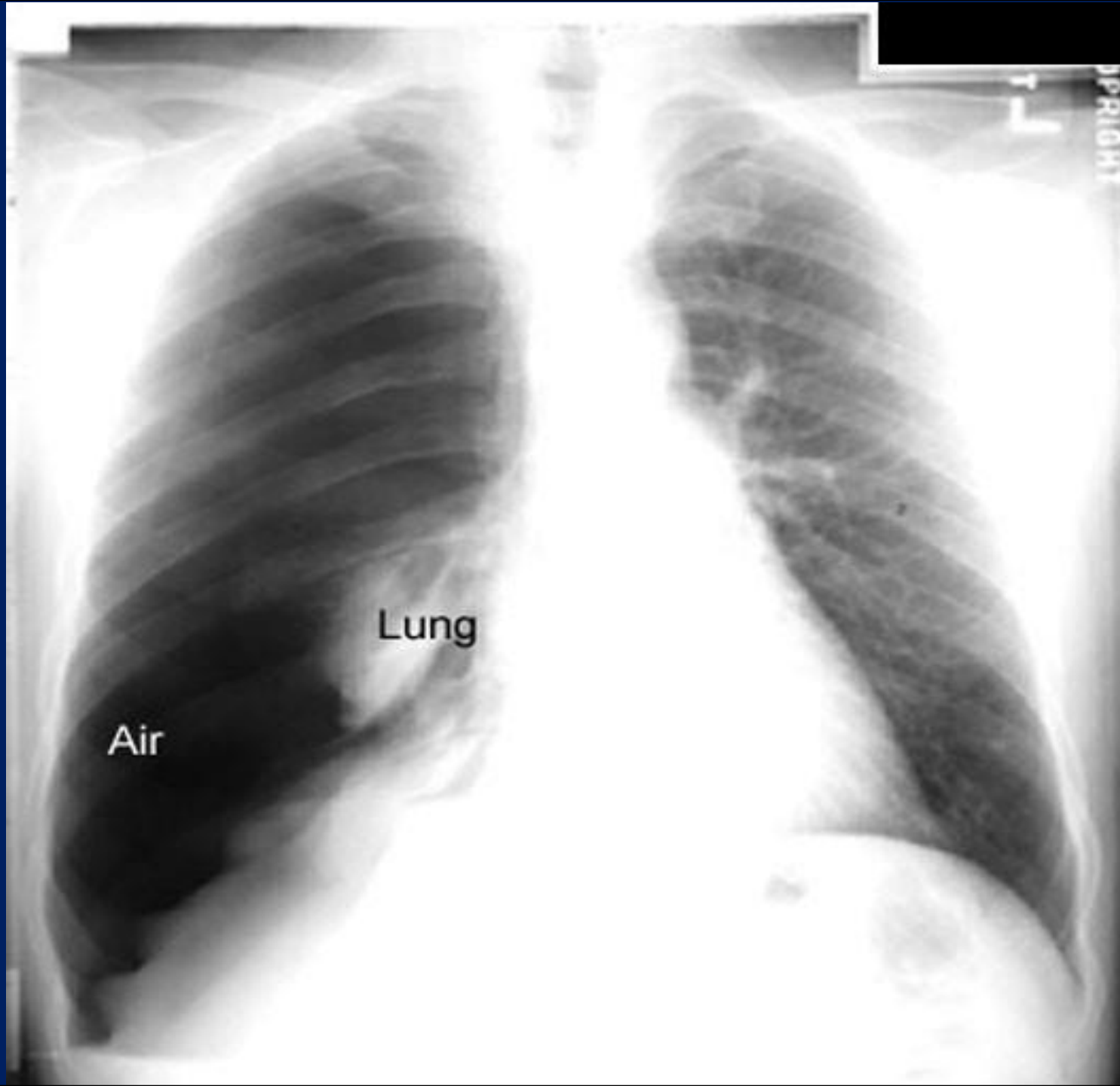
Silhouette sign

un obvious Rt border of the
heart → Rt consolidation.
[Rt pneumonia]

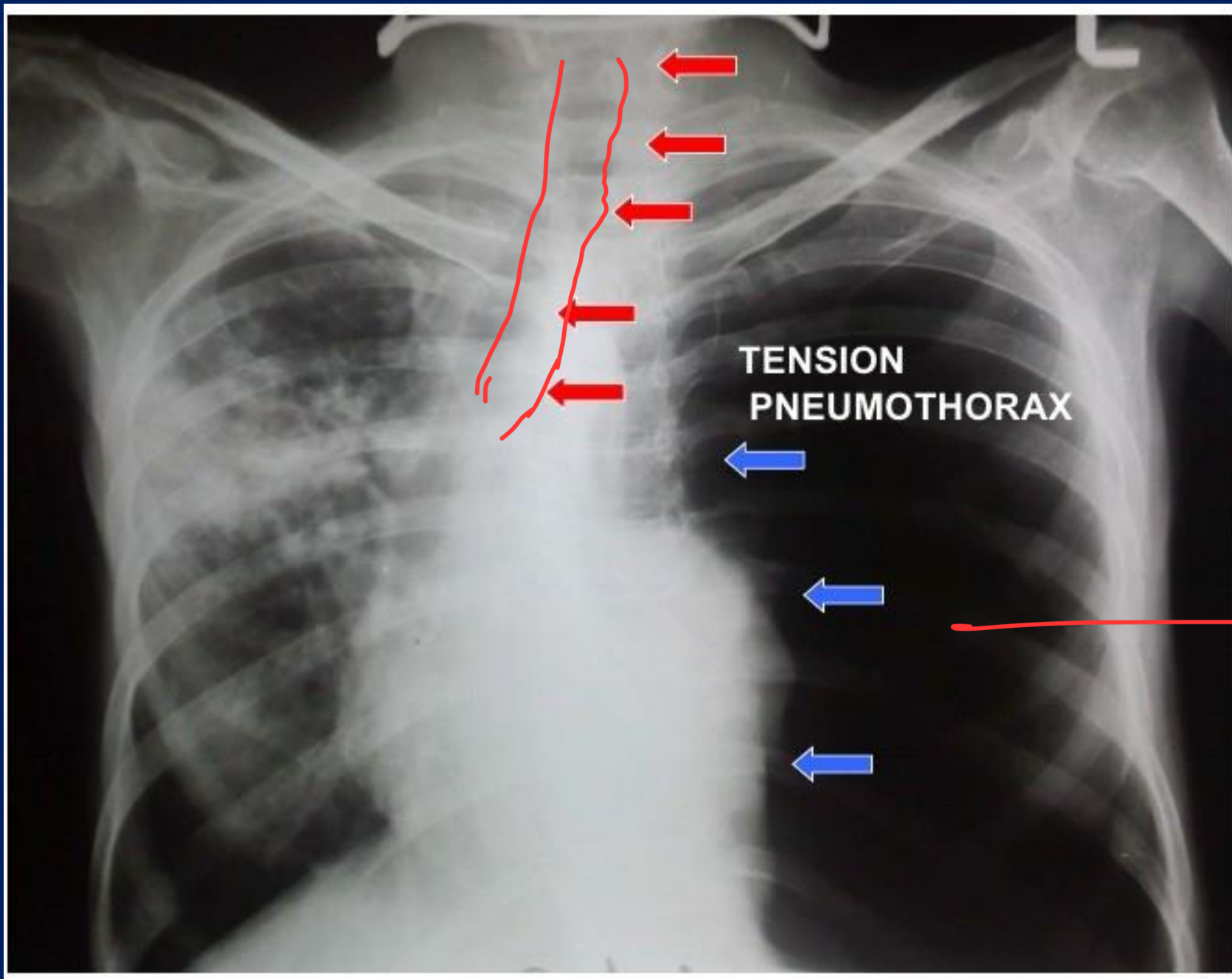


atelectasis

Rt lung → white lung.

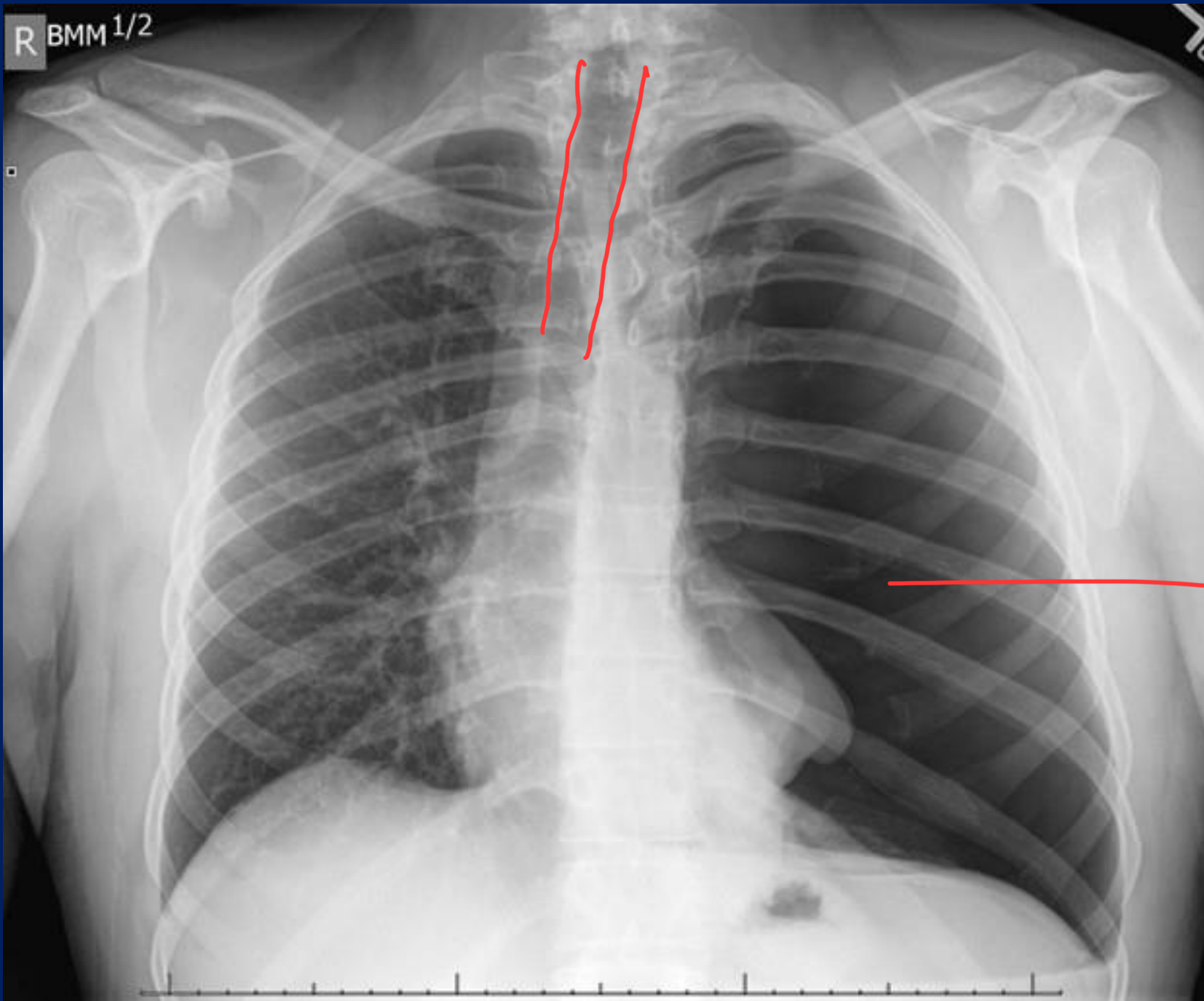


No Bronchial tree
[vascular - Bronchial]
obvious called:-
(Black jet)
↳ pneumothorax
tension non tension
└──────────┘
depend on tracheal
position.



Pneumothorax

Black jet + shifted
trachea $\Rightarrow$ tension pneumothorax



Black
jet
+ shifted
tracheah.
↓
tension
pneumothorax

PCREleva01
Ex: S-GW8CNPS6.1
PA
C:
Se: 1/1
Im: 2/1
SKULL

DAHL Memorial Clinic

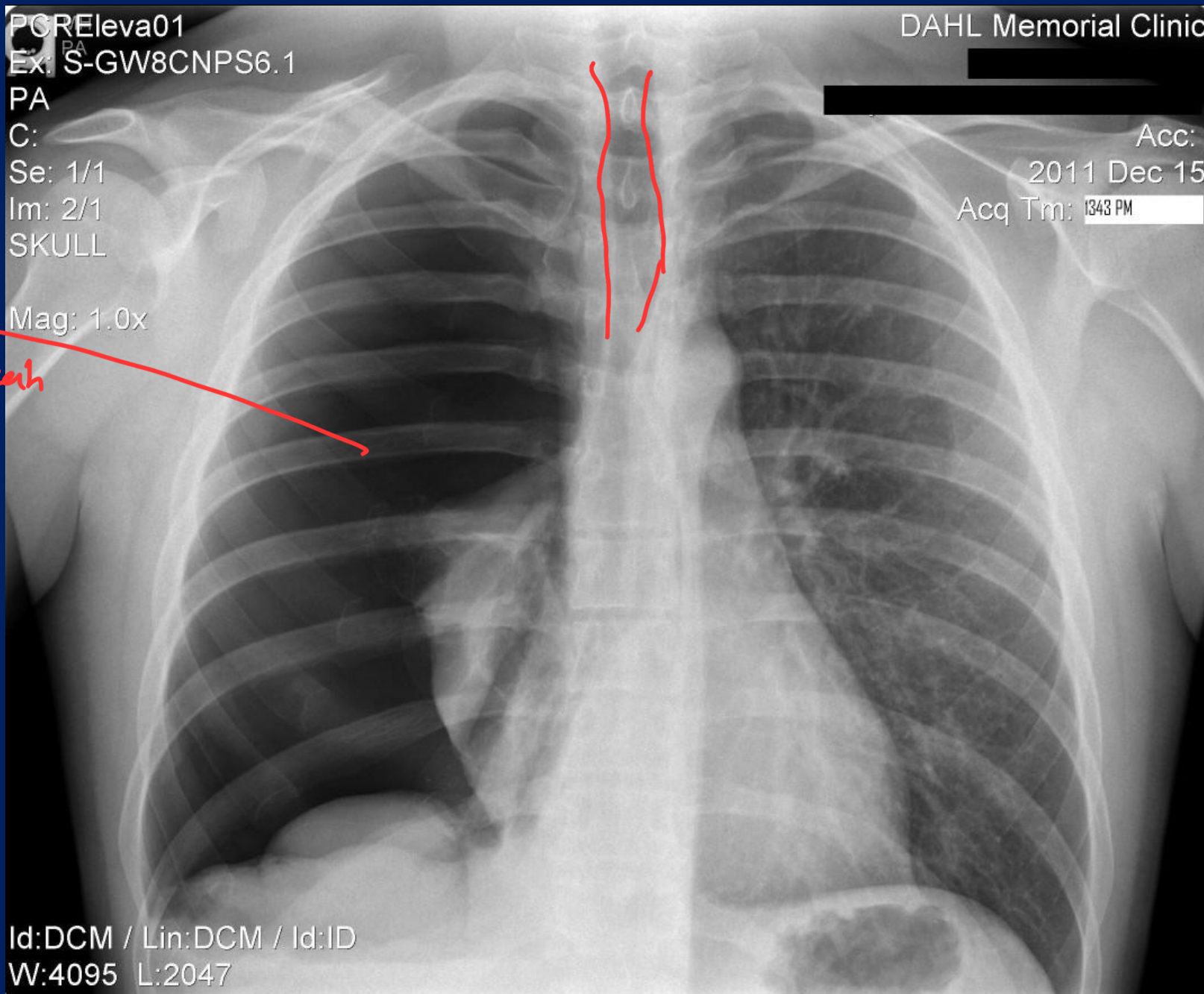
Acc:
2011 Dec 15
Acq Tm: 1:43 PM

Mag: 1.0x

Black jet
+ central trachea

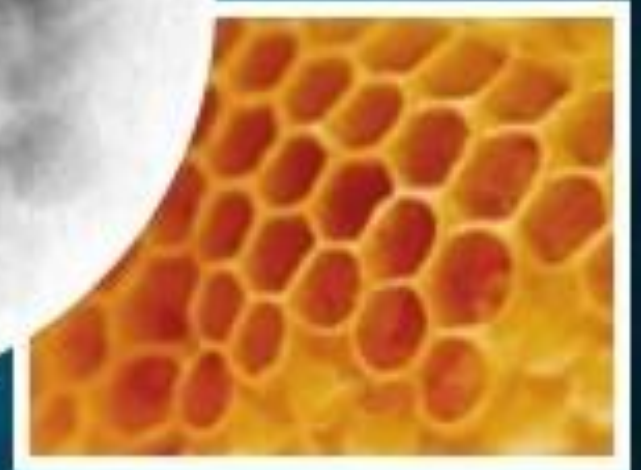
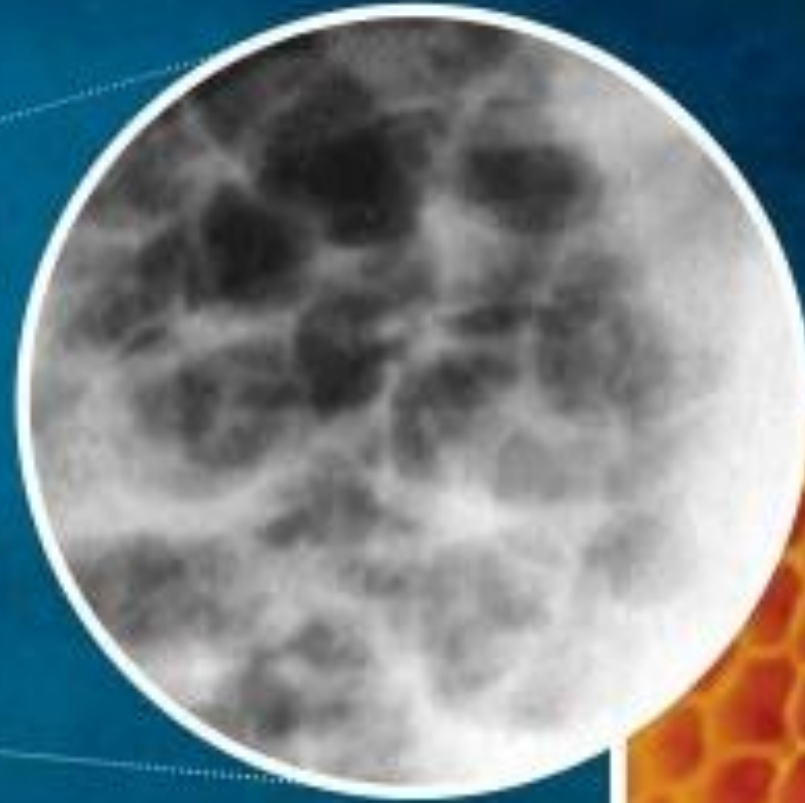
non tension
pneumothorax

Id:DCM / Lin:DCM / Id:ID
W:4095 L:2047





Chest Radiograph (2)



Conglomerating cysts of varying size
and wall thickness

appears in covid 19
← DDx كوفيد
mcc is infection

"Honeycomb" sign

Bronchiectasis → CT diagnosis



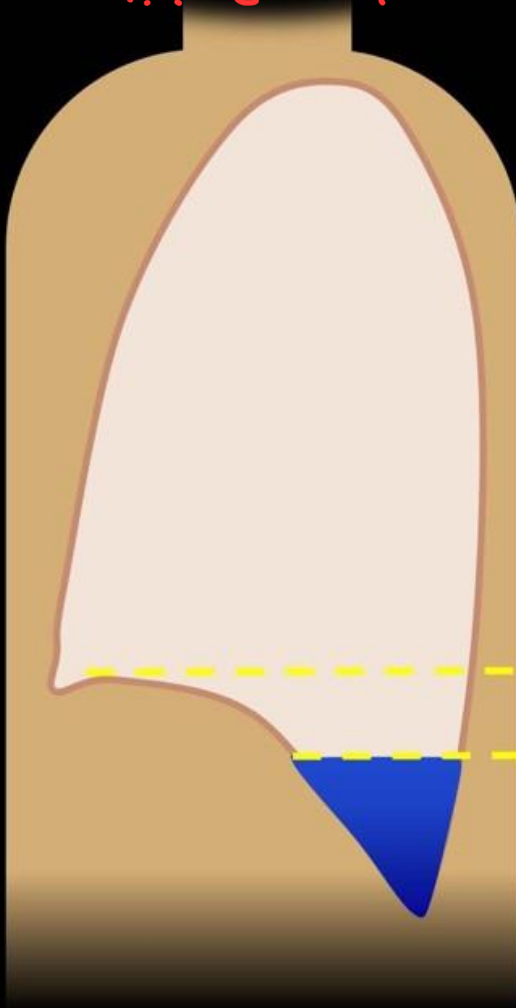
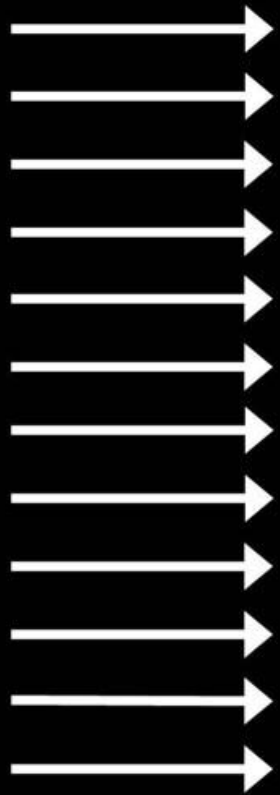
- * in xray we see:-
- ① segment sign appearance
 - ② Tan tracking appearance



Pleural Effusions [common] & we see in the xray:-

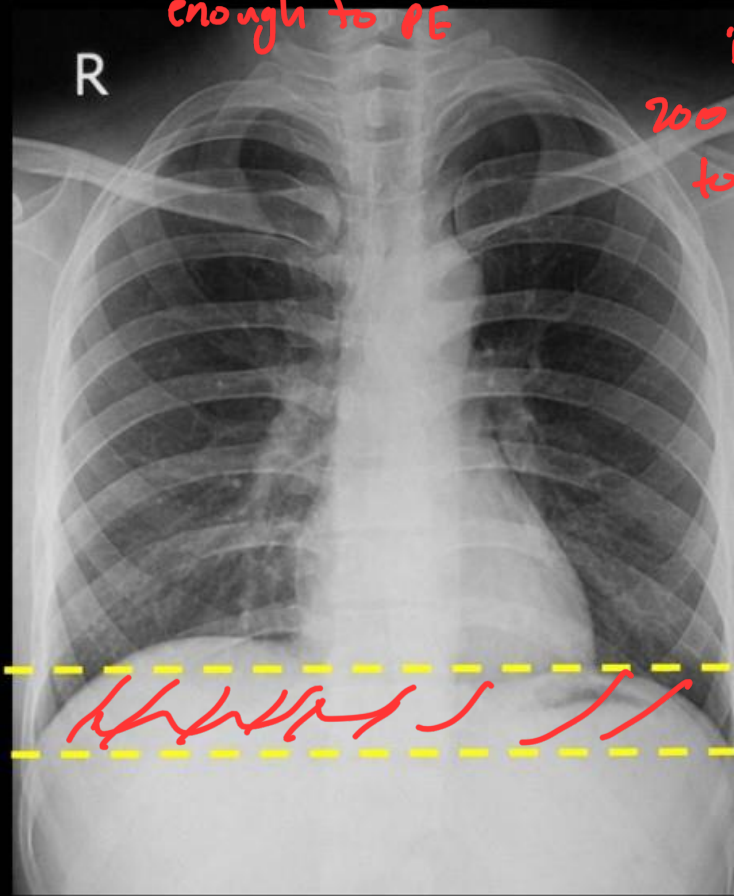
costophrenic angle ↓ gravity ↓
 fluid ↓ ↓
 -تحت ثقل الجاذبية ساقط السائل

X-rays



X ray
film

↓
 in US we see 50 cc
 enough to PE

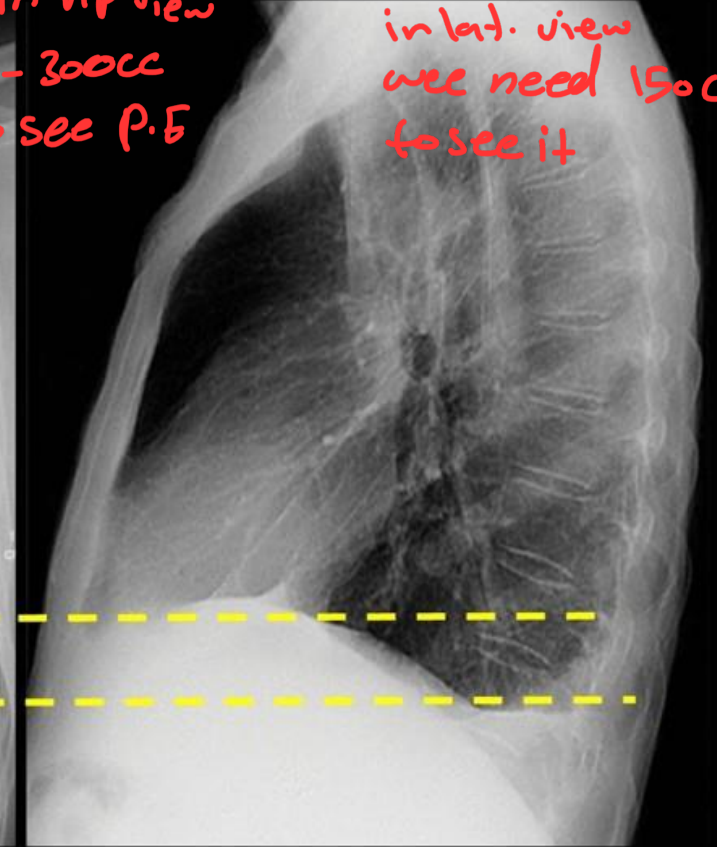


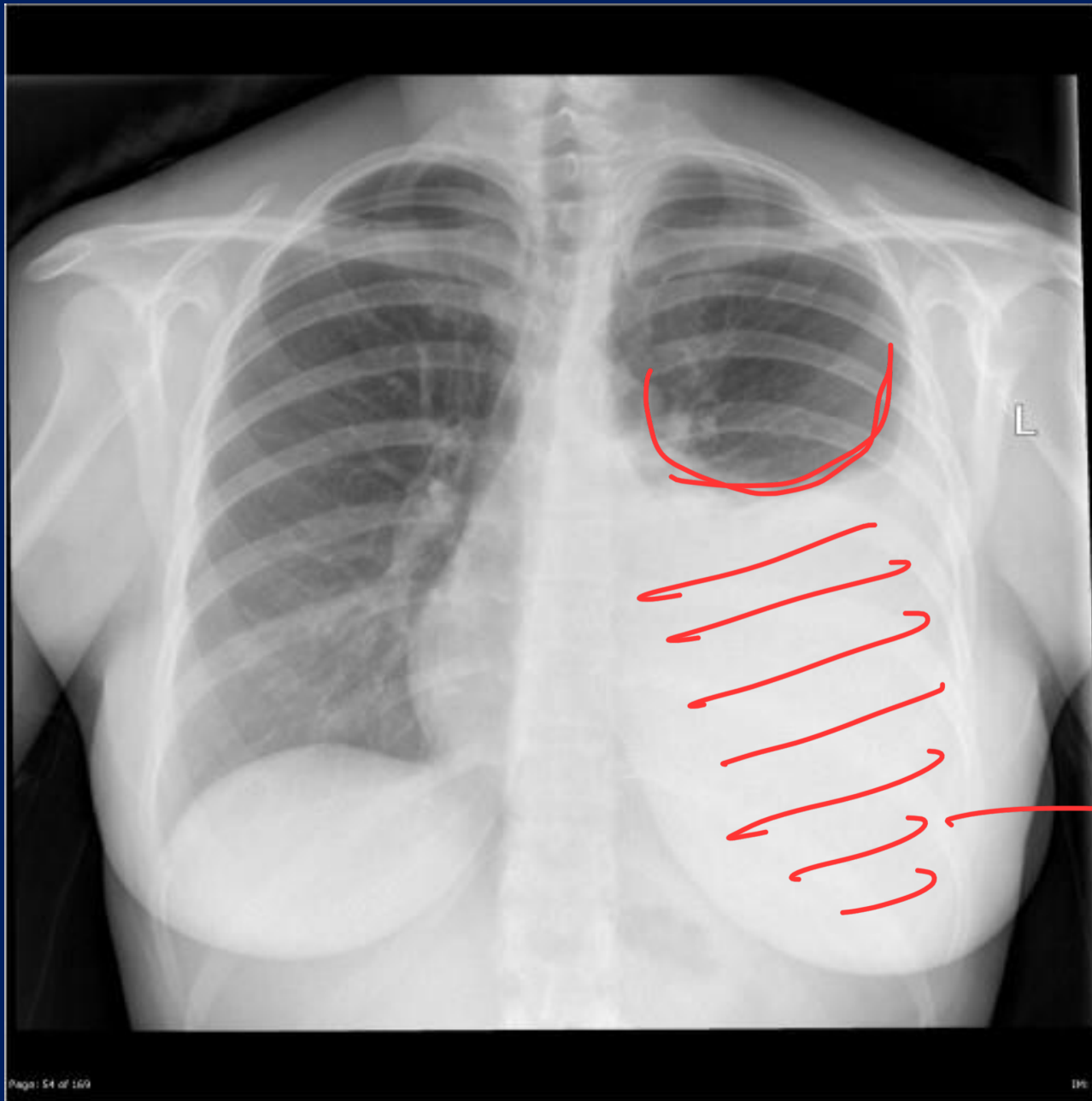
200-300cc
 to see P.E

in AP view

① Blunting of costophrenic angle
 depend on How much CC

in lat. view
 we need 150cc
 to see it



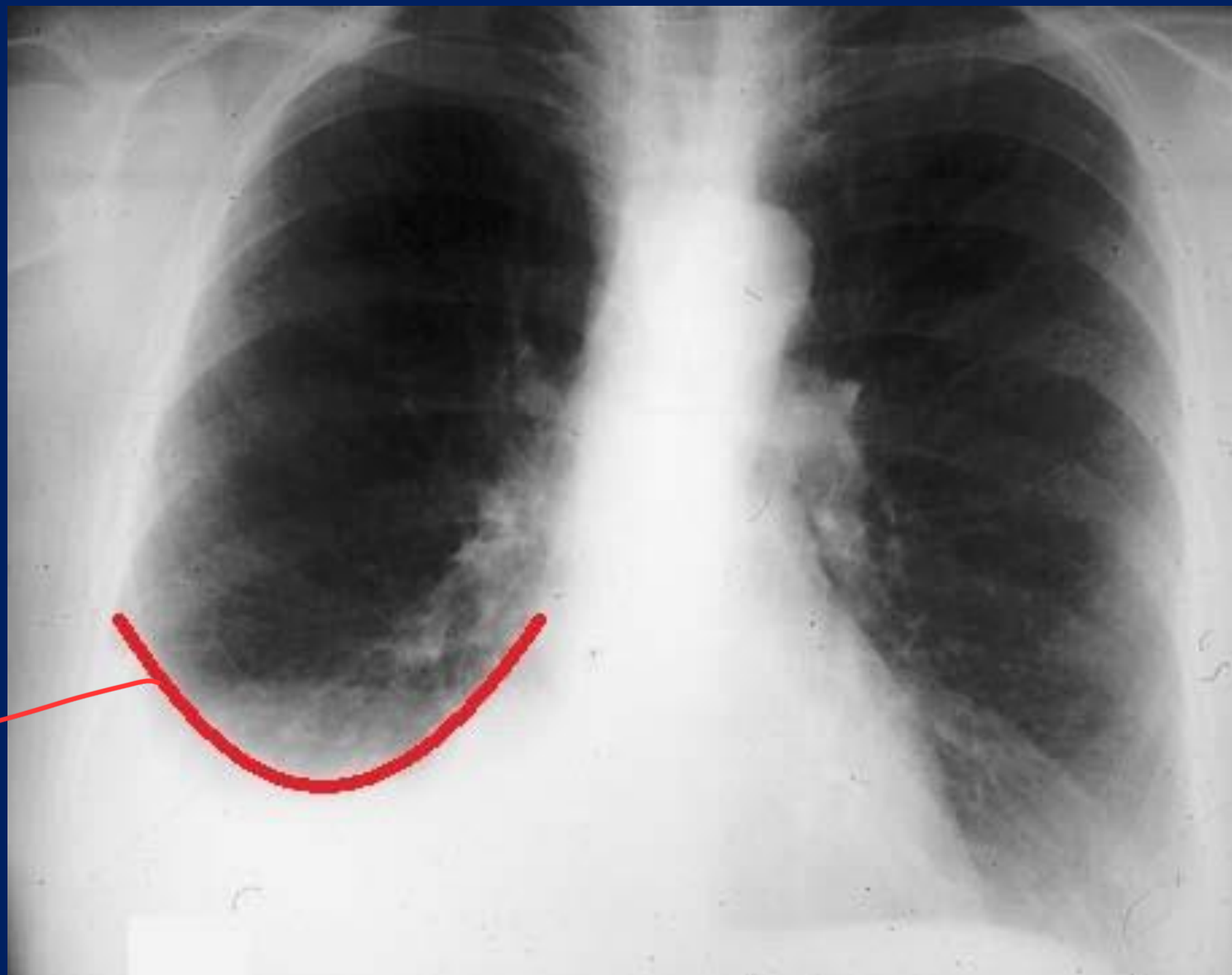


صحن الكحل
Meniscus
sign

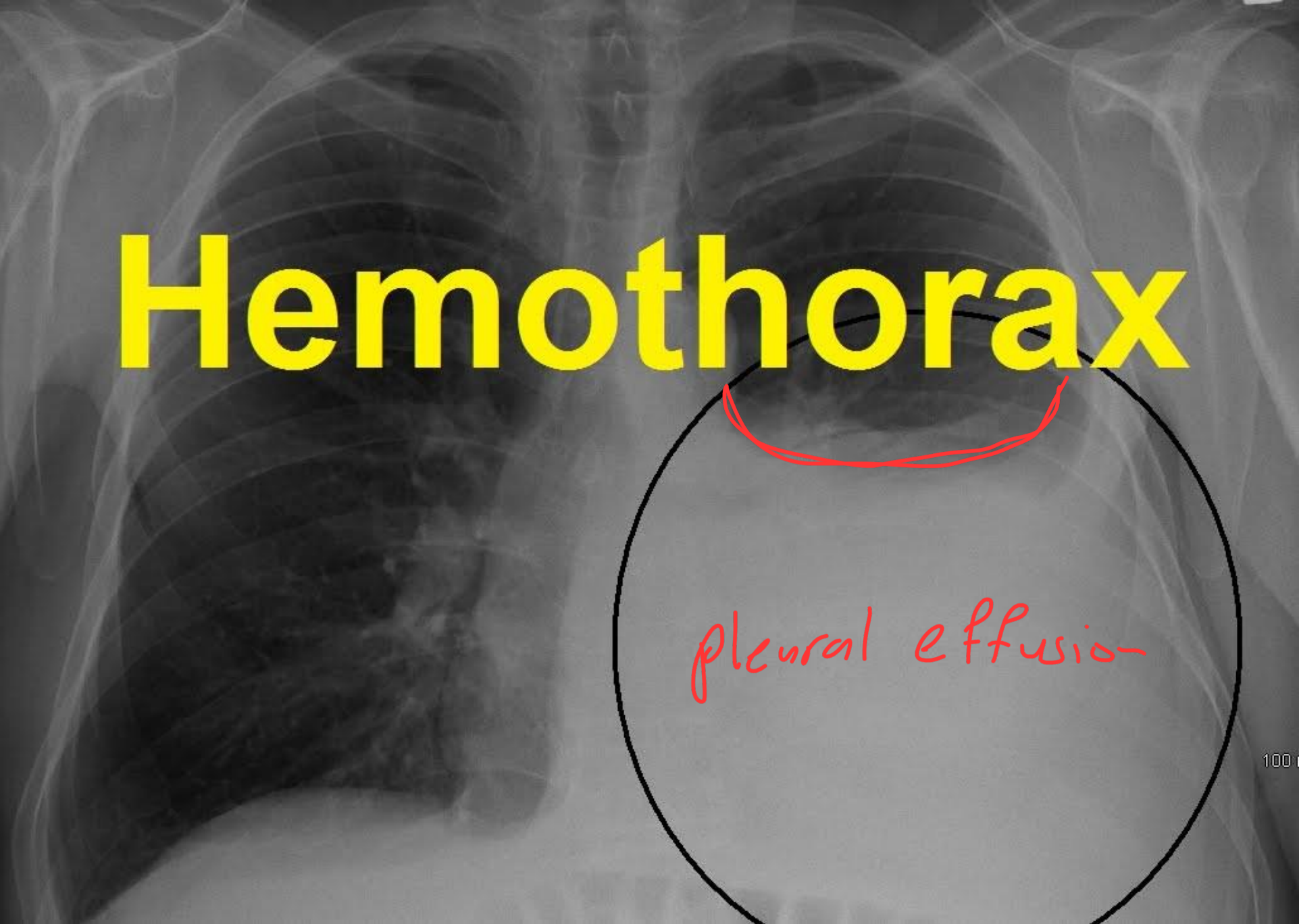
significant
for pleural
effusion.

water

meniscus
sign



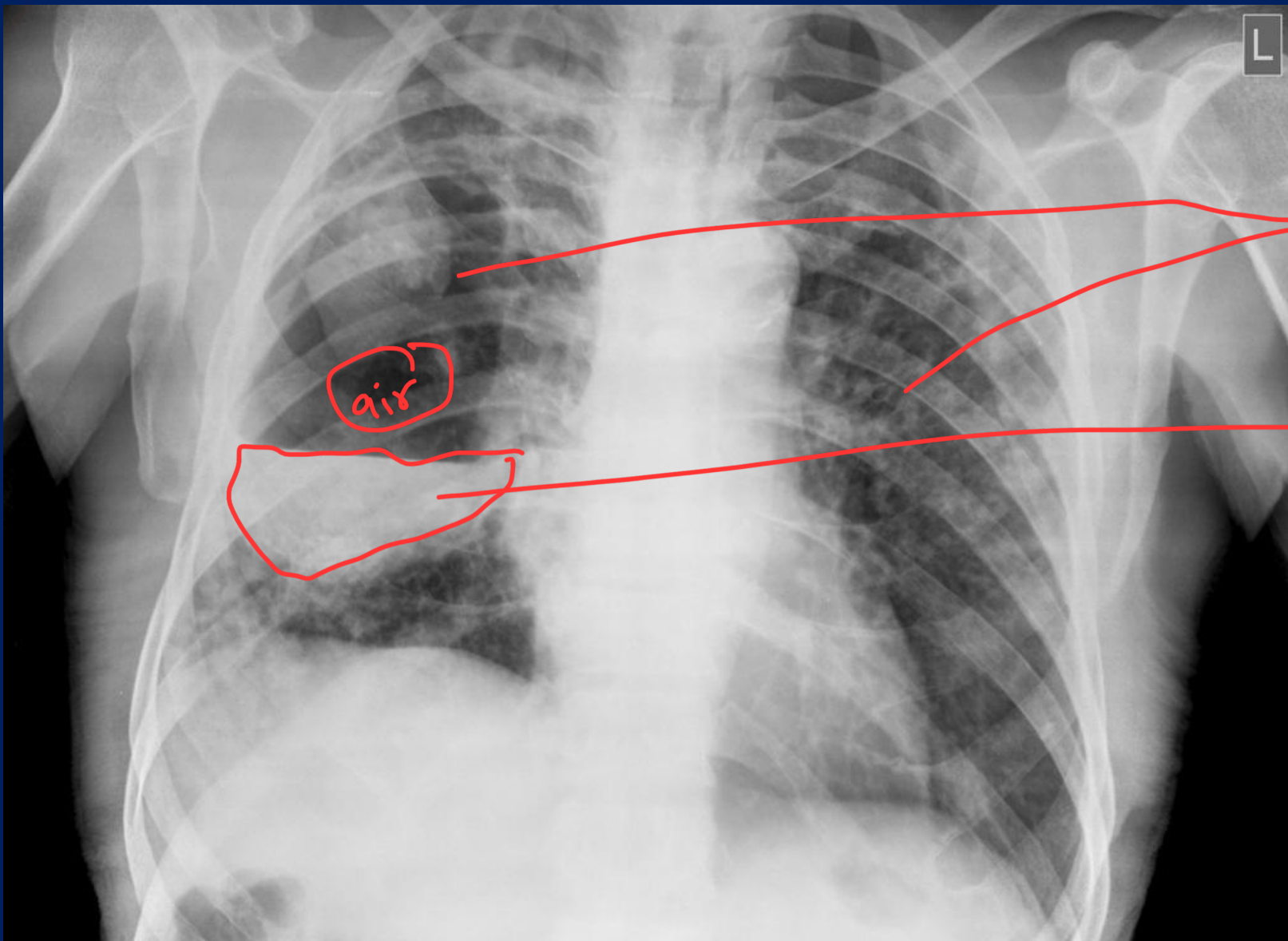
Hemothorax



A frontal chest X-ray showing a large, homogeneous opacity in the right hemithorax, consistent with a hemothorax. The opacity obscures the right lung and the right heart border. A black circle is drawn around the right hemithorax, and a red line is drawn along the upper margin of the opacity. The left lung appears clear.

pleural effusion



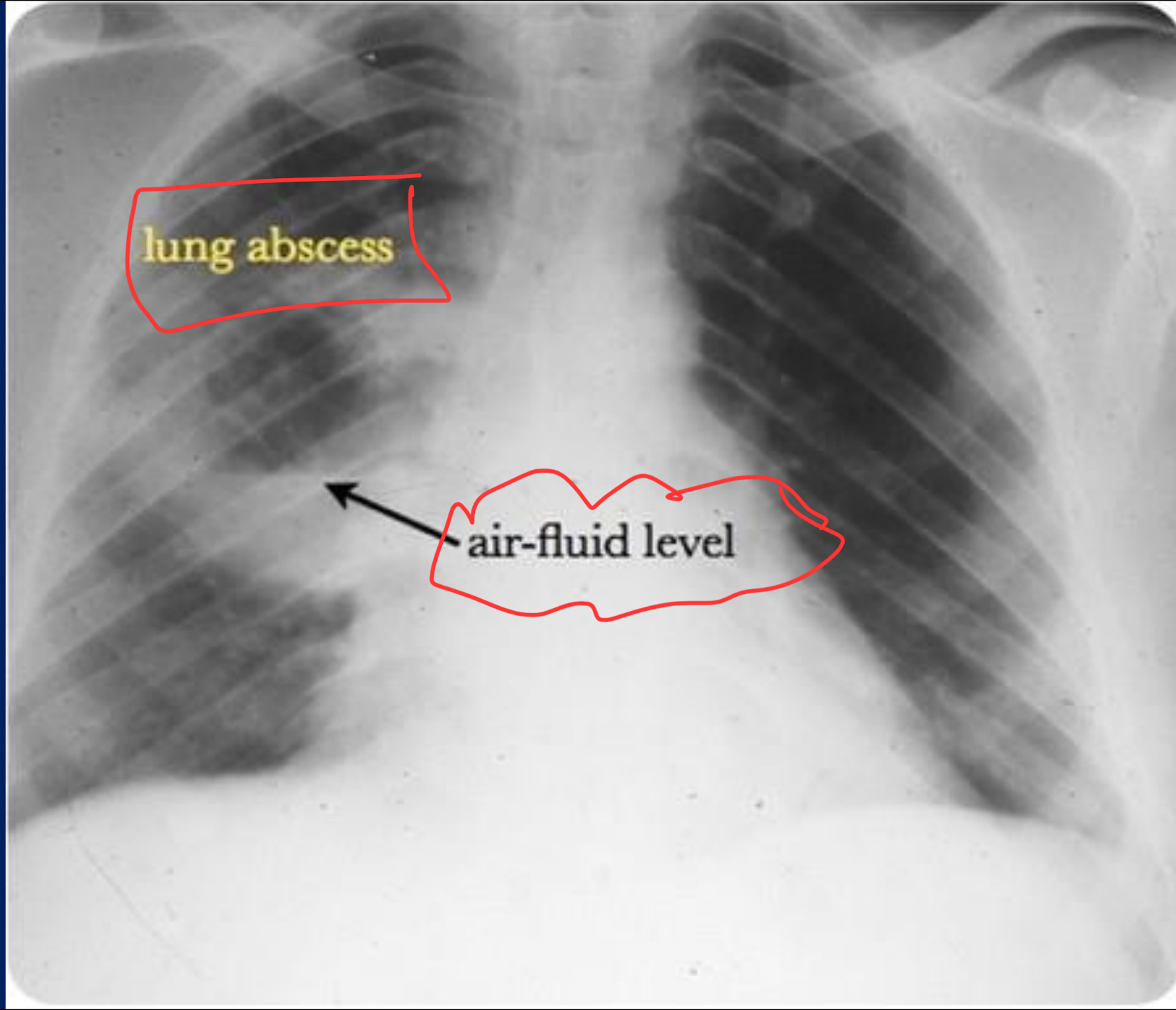


interstitial pneumonia
Bilateral consolidation

Lung abscess

Fluid Blunt + above it
there is air
↓
lung abscess
[air fluid level]...

mc Bacteria make lung abscess → Staph or Klebsella.



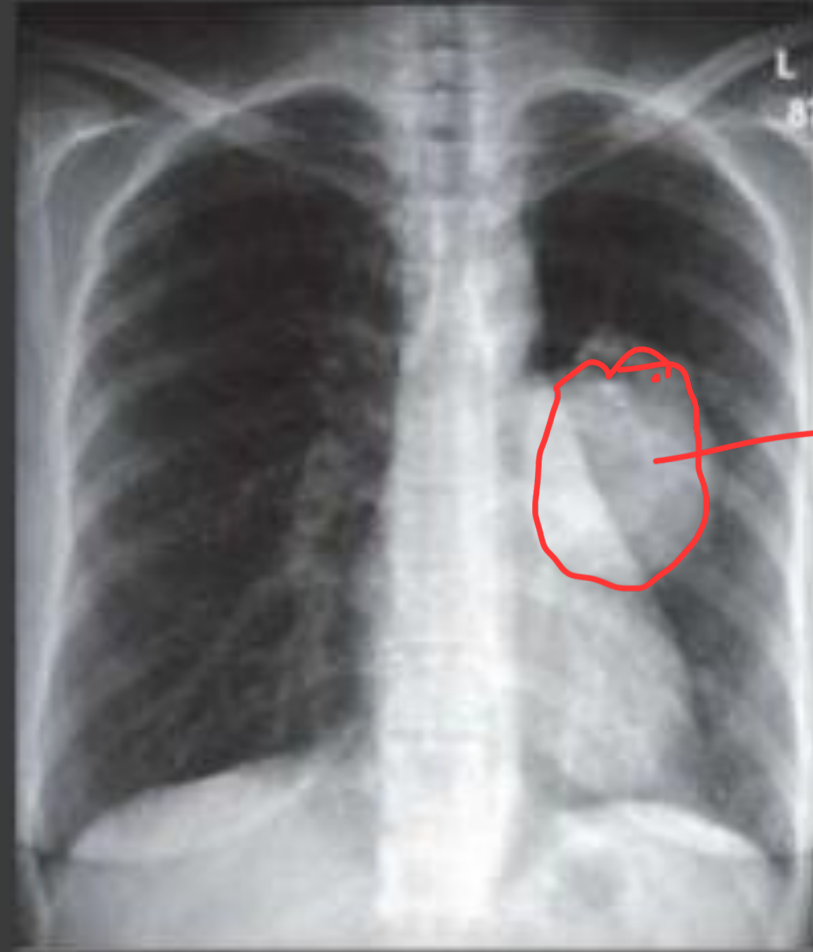
Lesions more than 3cms are termed as masses.

SPN $< 3\text{cm}$

MASS $> 3\text{cm}$

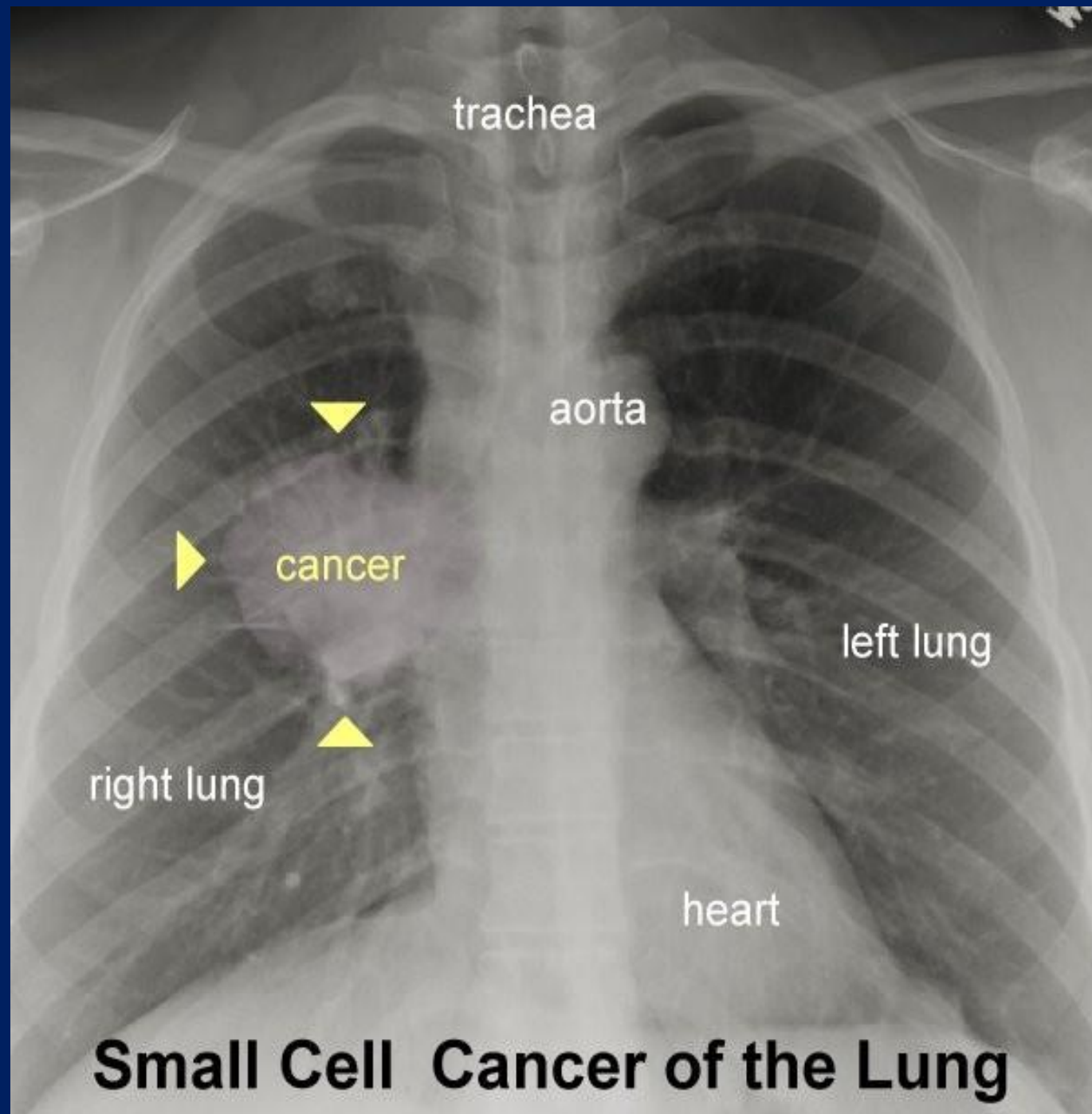


$< 3\text{cm}$
single
pulmonary
nodule.



$> 3\text{cm}$

↙ - first step we do if we see mass is compare with last xray ...
برای آن صورت بیهوشی CT - CT
Bronchial or trans thoracic biopsy

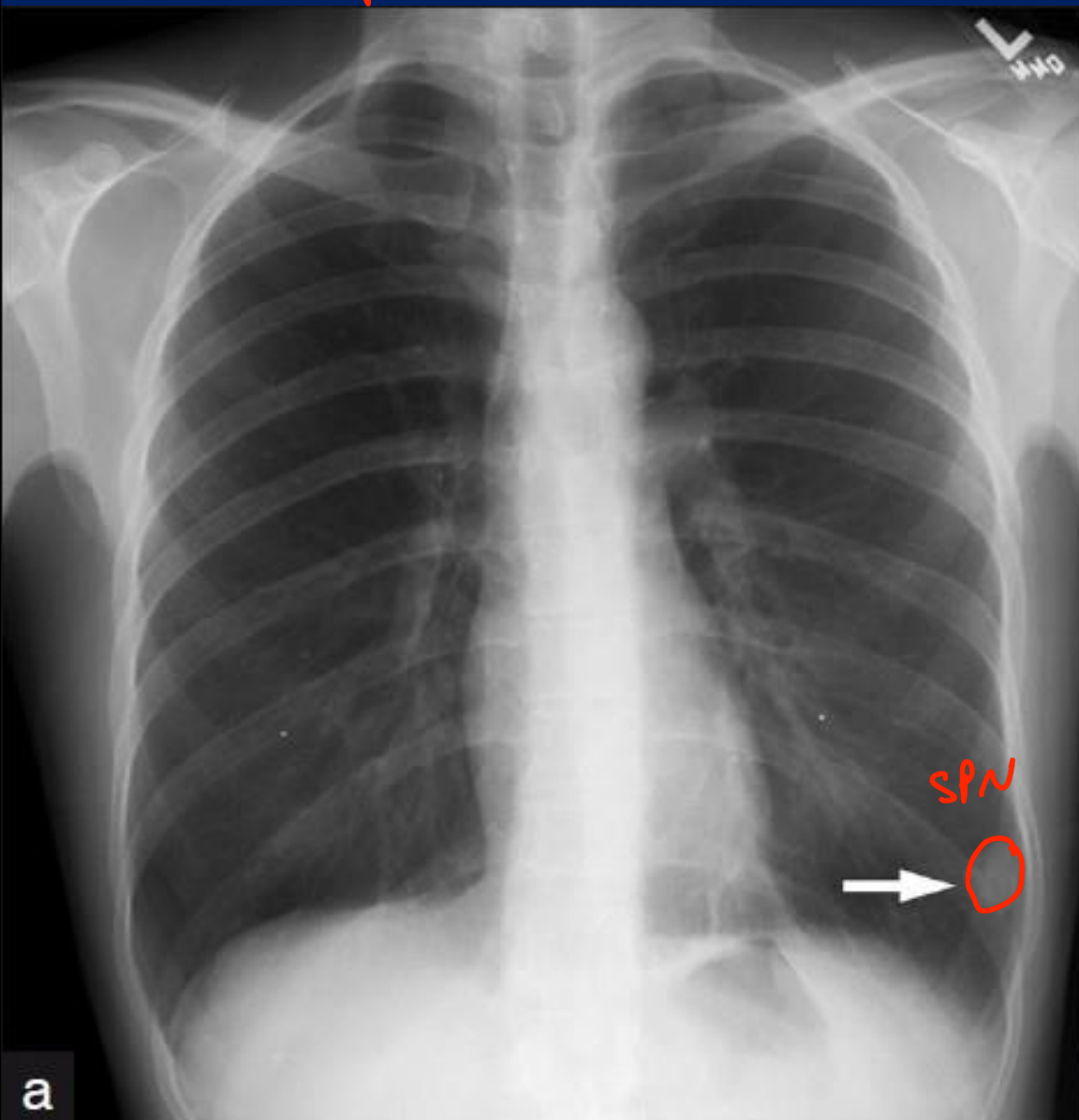


* markers of cancer in xray:-

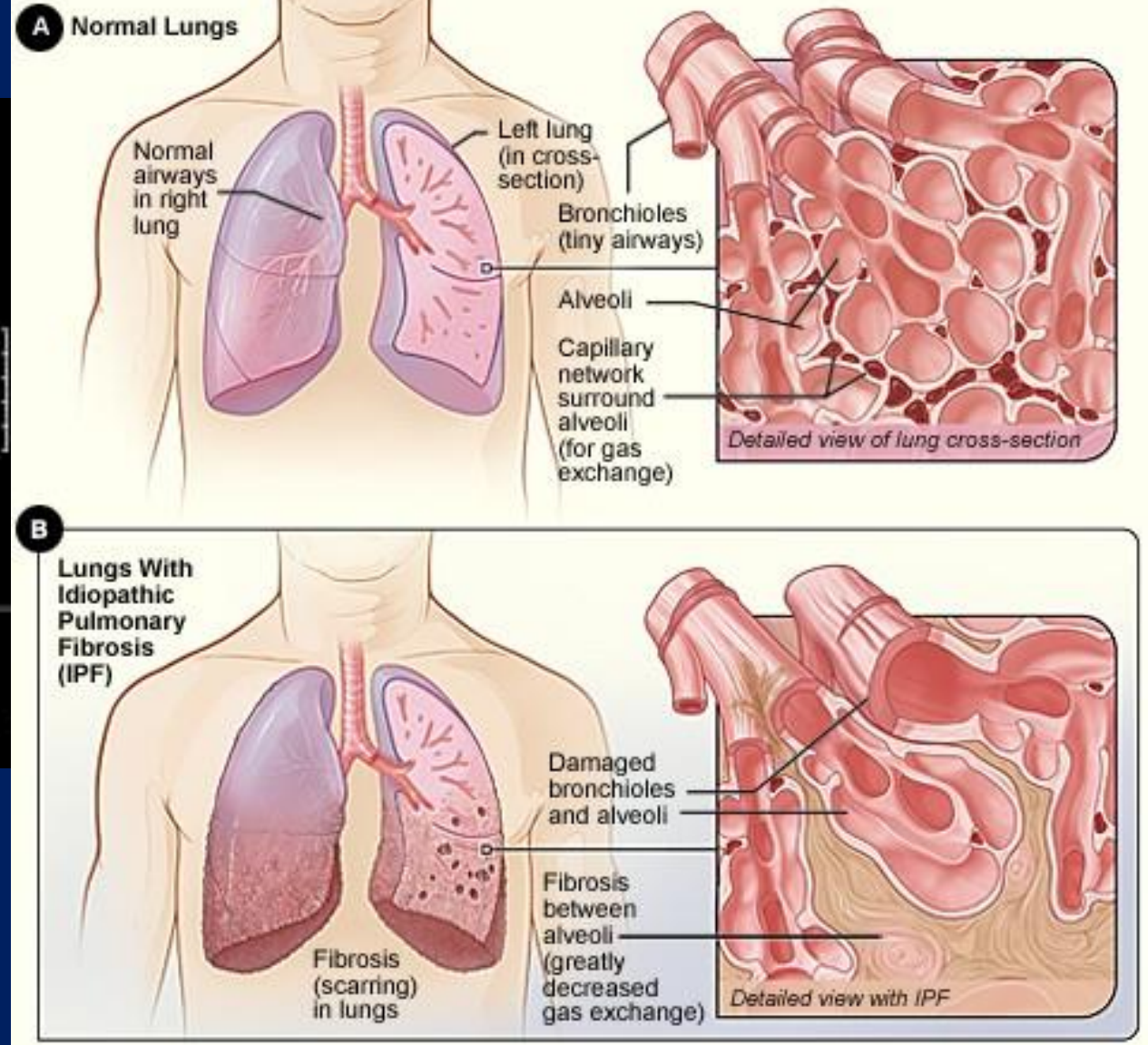
- ① irregular Border
- ② doubling time

Small Cell Cancer of the Lung

PA view

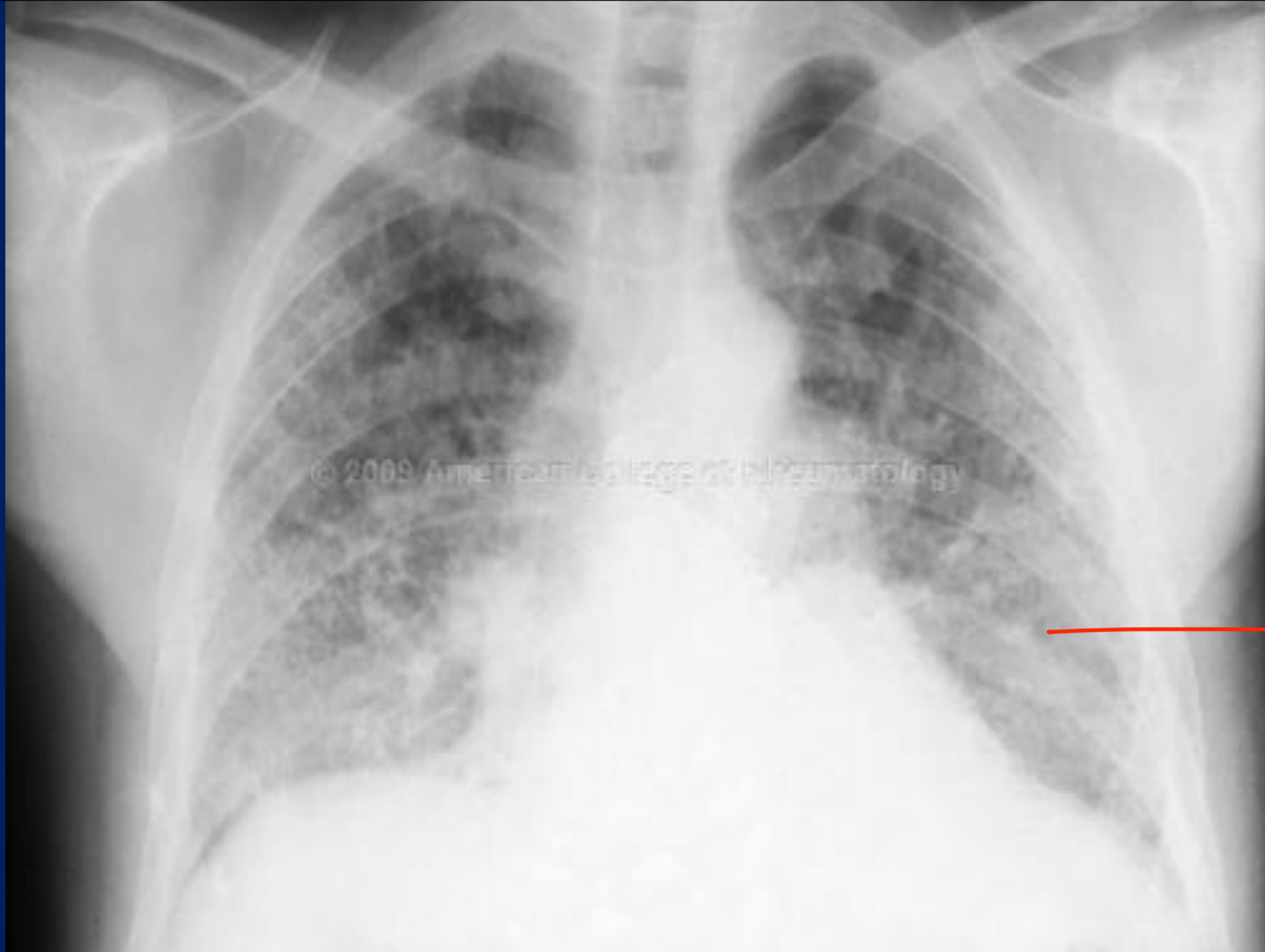


مصابى التنج Lung fibrosis



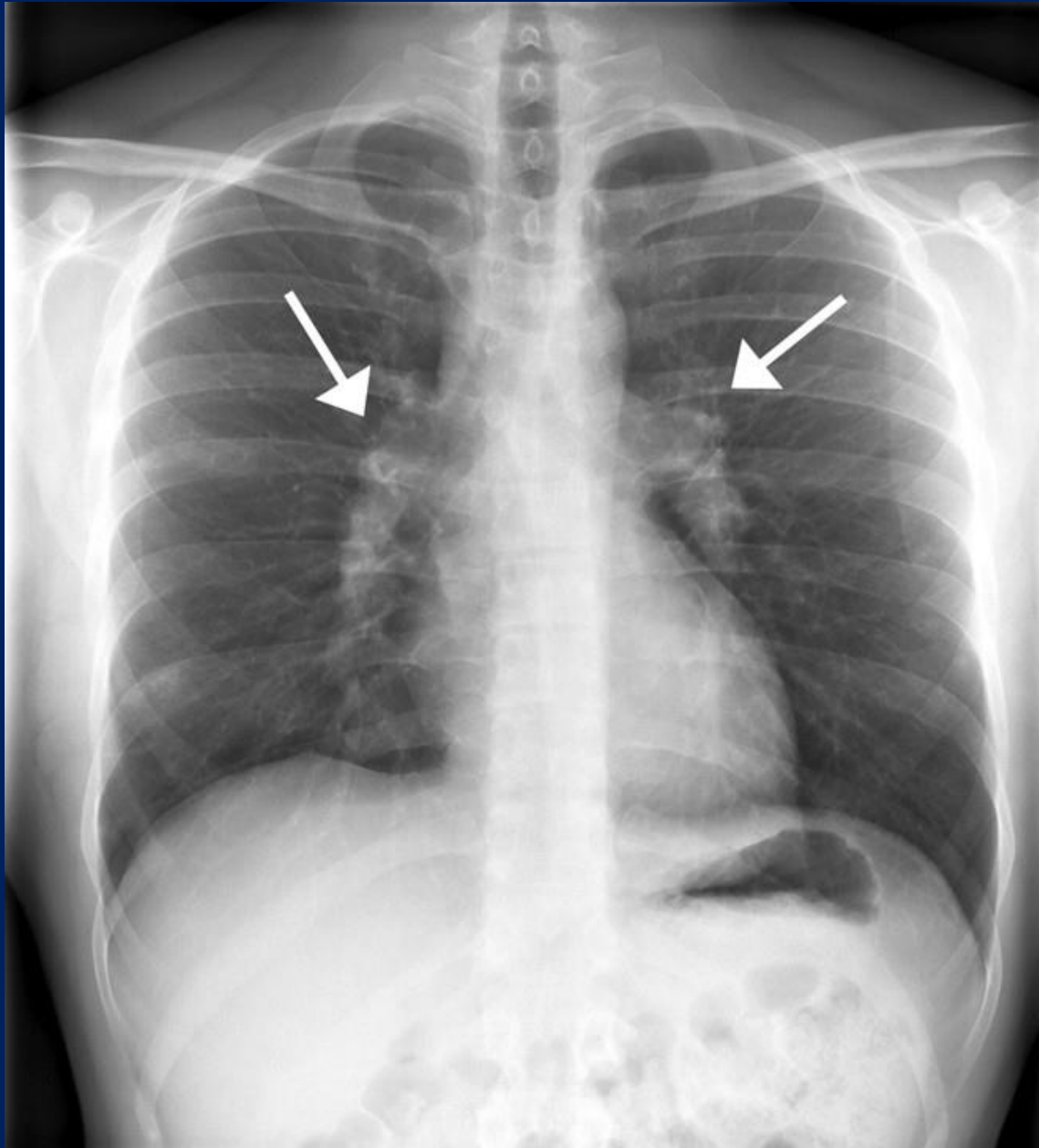


Bilateral consolidation
↓
lung fibrosis



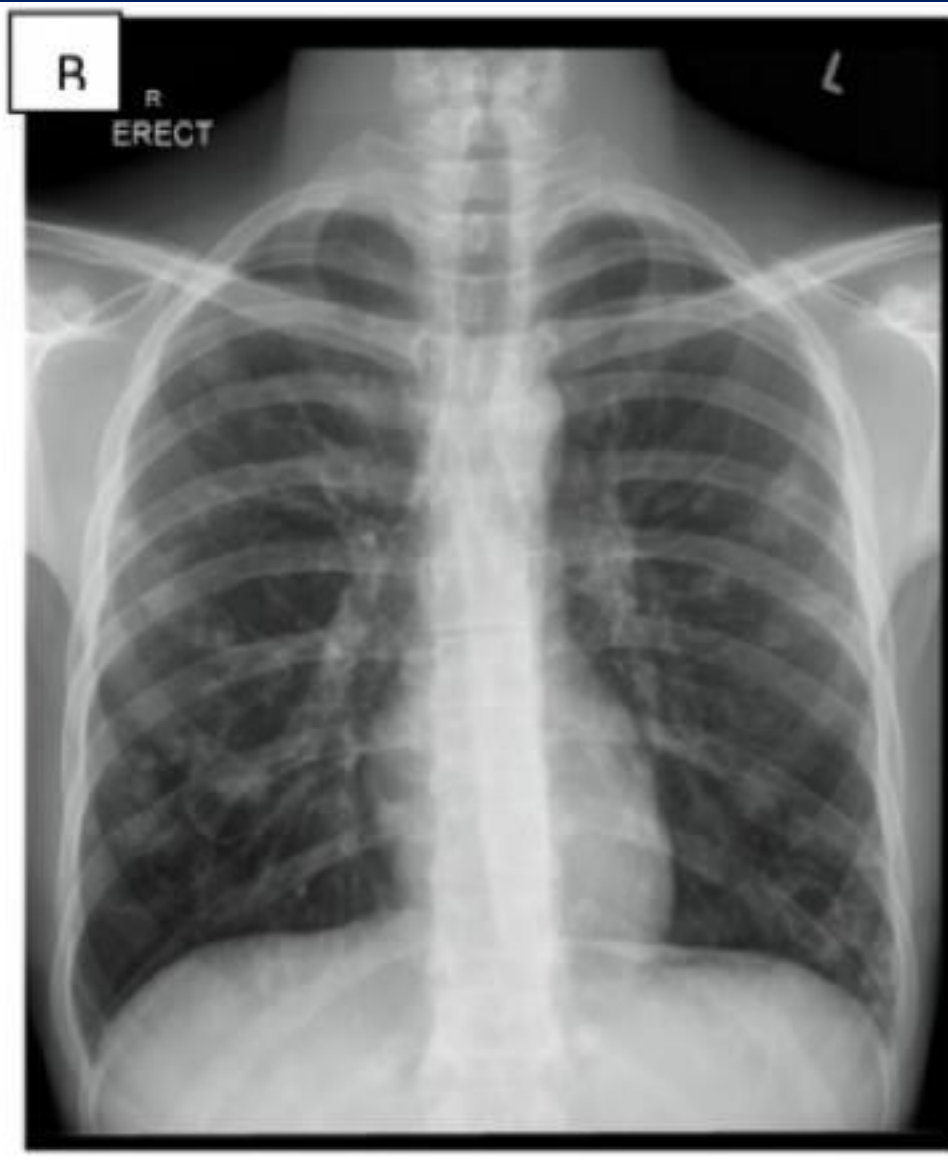
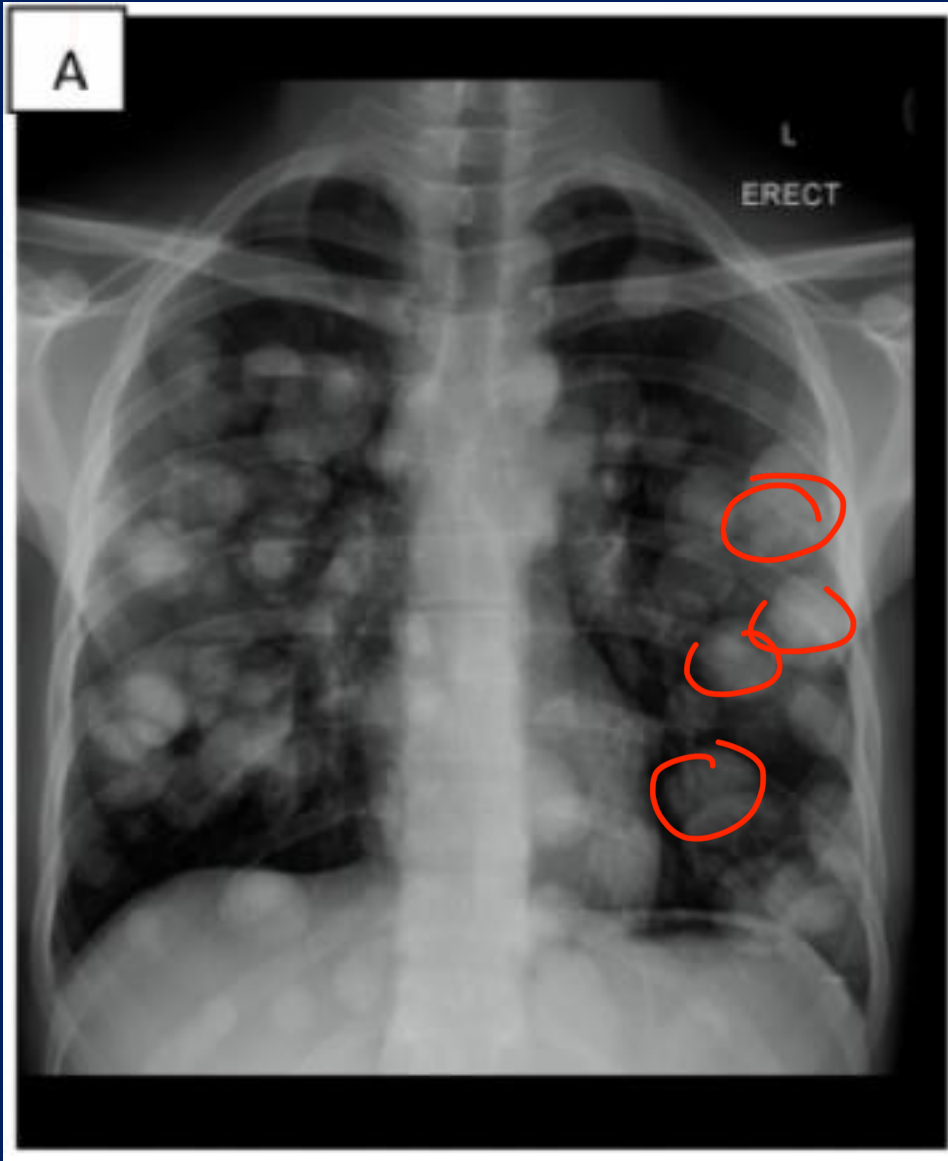
© 2009 American College of Physicians

→ lung
fibrosis



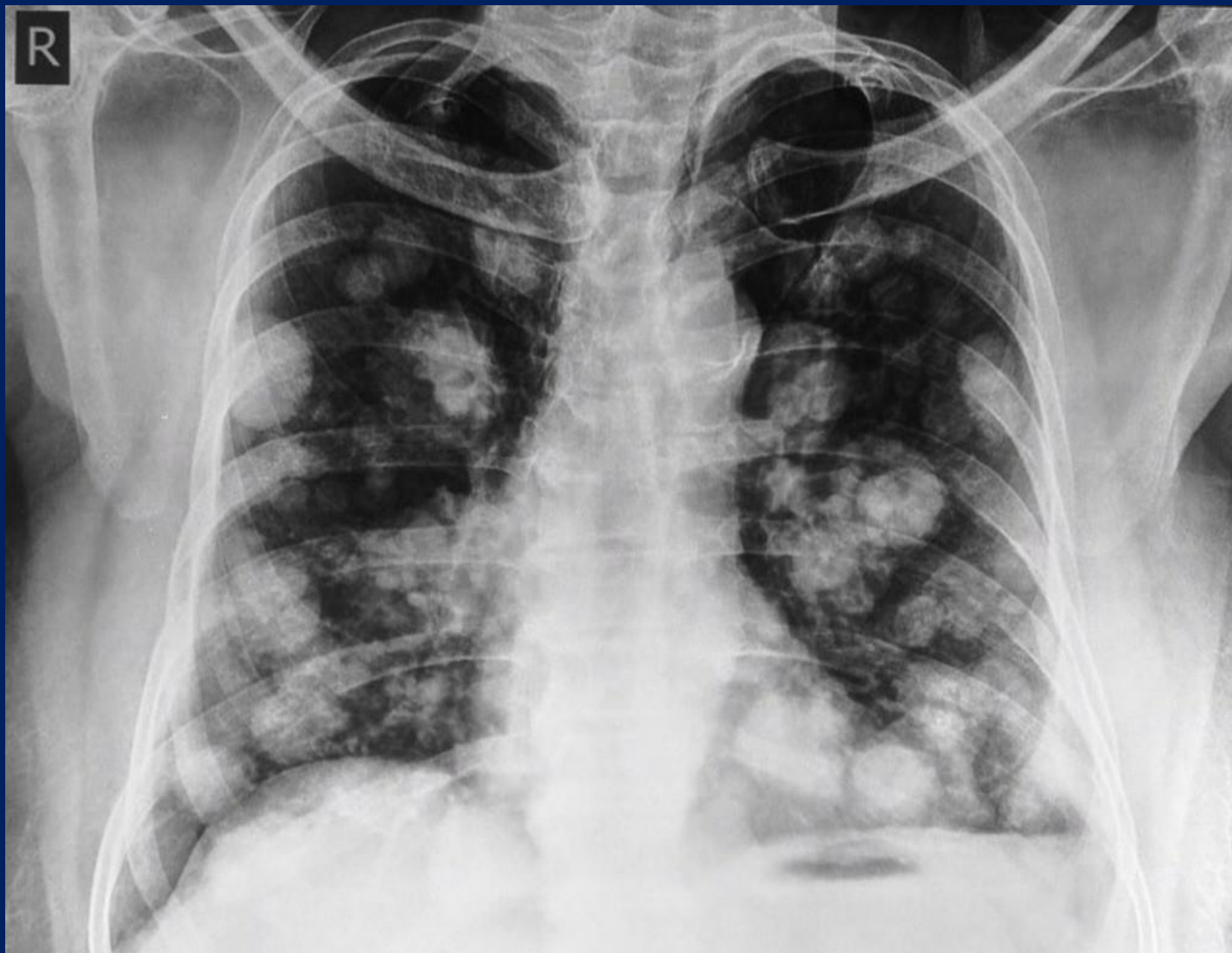
Hilar LN

- ① if there is any lung dz
 - ② if there is symptom
 - ③ The size of LN
- if we see LN in xray



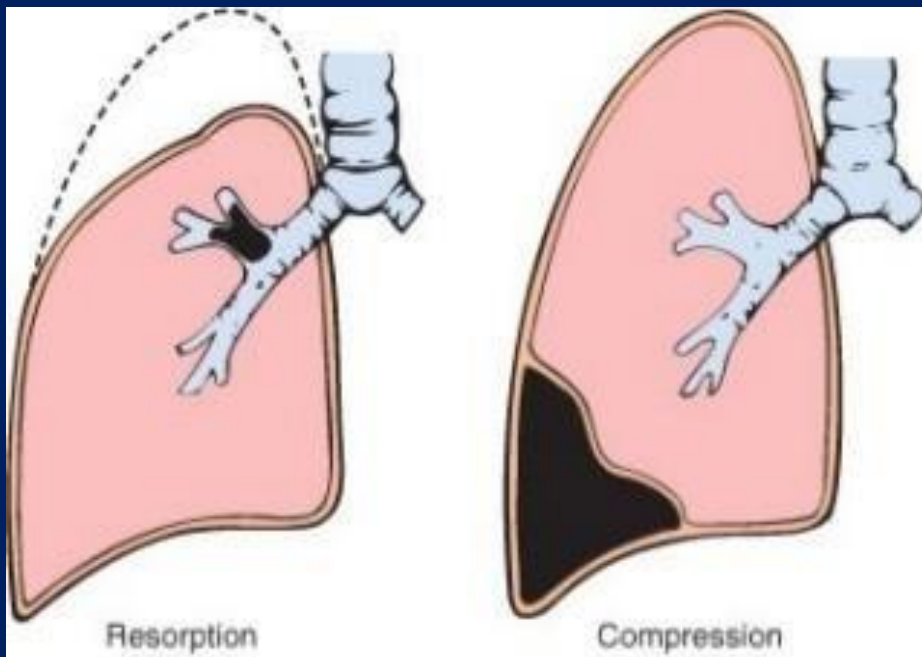
of 1/3 cancer
mets
Canon ball appearance

- The mets mc from
- ① Kidney
 - ② Colon
 - ③ uterus

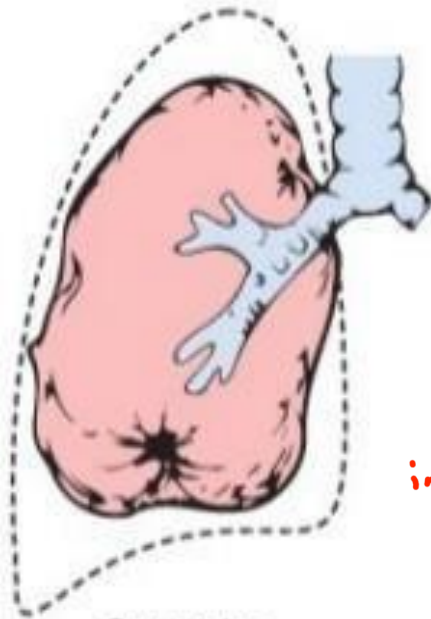


CXR static

Atelectasis



1. **Resorption atelectasis** = complete obstruction of an airway → resorption of the oxygen trapped in the dependent alveoli, without impairment of blood flow through the affected alveolar walls.



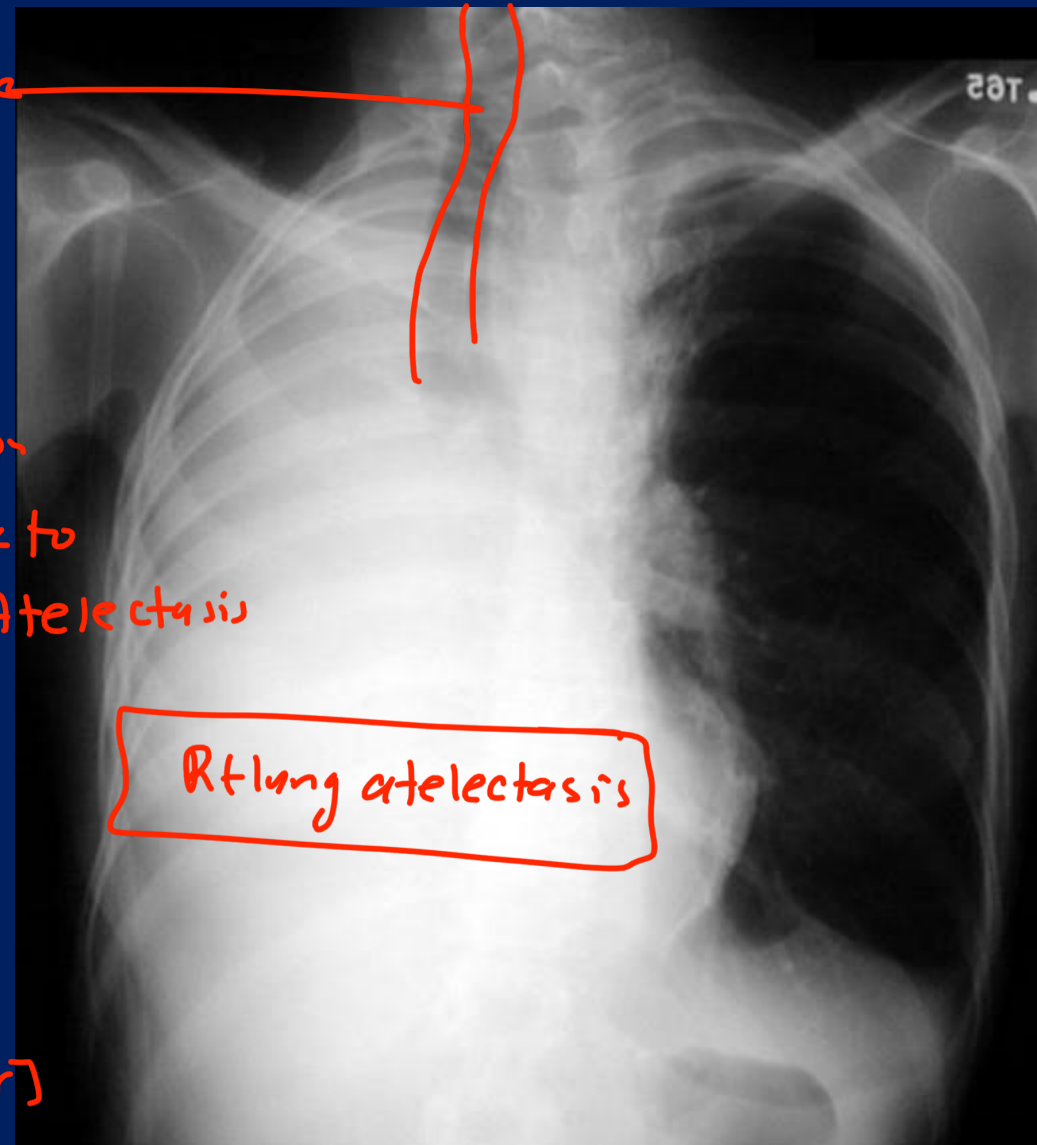
2. **Compression atelectasis** results whenever the pleural cavity is partially or completely filled by fluid exudate, tumor, blood, or air.
3. **Contraction atelectasis** occurs when local or generalized fibrotic changes in the lung or pleura prevent full expansion.

- Homogenous density right hemithorax
- Mediastinal shift to right
- ✓ Atelectasis may be the result of a
 - blocked airway (obstructive) or of
 - pressure from outside the lung (nonobstructive).

↳ due to compression from outside [cancer]

ipsilateral shifting
of trachea
[reduction of
lung volume]

due to contraction
of lung mass due to
(1) cancer (2) Atelectasis



Obstructive atelectasis may be caused by:

- **Mucus plug.** often occurring during and after surgery. Mucus plugs also are common in children, people with cystic fibrosis and during severe asthma attacks.
- **Foreign body.**
- **Narrowing of major airways from disease.** Chronic infections, including fungal infections, tuberculosis and other diseases, can scar and constrict major airways.
- **Tumor in a major airway.** An abnormal growth can narrow the airway.
- **Blood clot.** This occurs only if there's significant bleeding into the lungs that can't be coughed out.

Possible causes of nonobstructive atelectasis include:

- ✓ • **Injury.** Chest trauma due to the pain
 - **Pleural effusion.** ✓
 - **Pneumonia.** ✓
 - **Pneumothorax.** ✓
- ✓ • **Scarring of lung tissue.** Scarring could be caused by injury, lung disease or surgery. In these rare cases, the atelectasis is minor compared with the damage to the lung tissue from the scarring.
- ✓ • **Tumor.** A large tumor can press against and deflate the lung, as opposed to blocking the air passages.
outside of the lung

A 55-year-old man comes for evaluation of exercise intolerance over the past 6 months. He has no significant past medical history. He informs you that over the past week he can not walk across the room without getting "short of breath."
dyspnea with minimal exertion

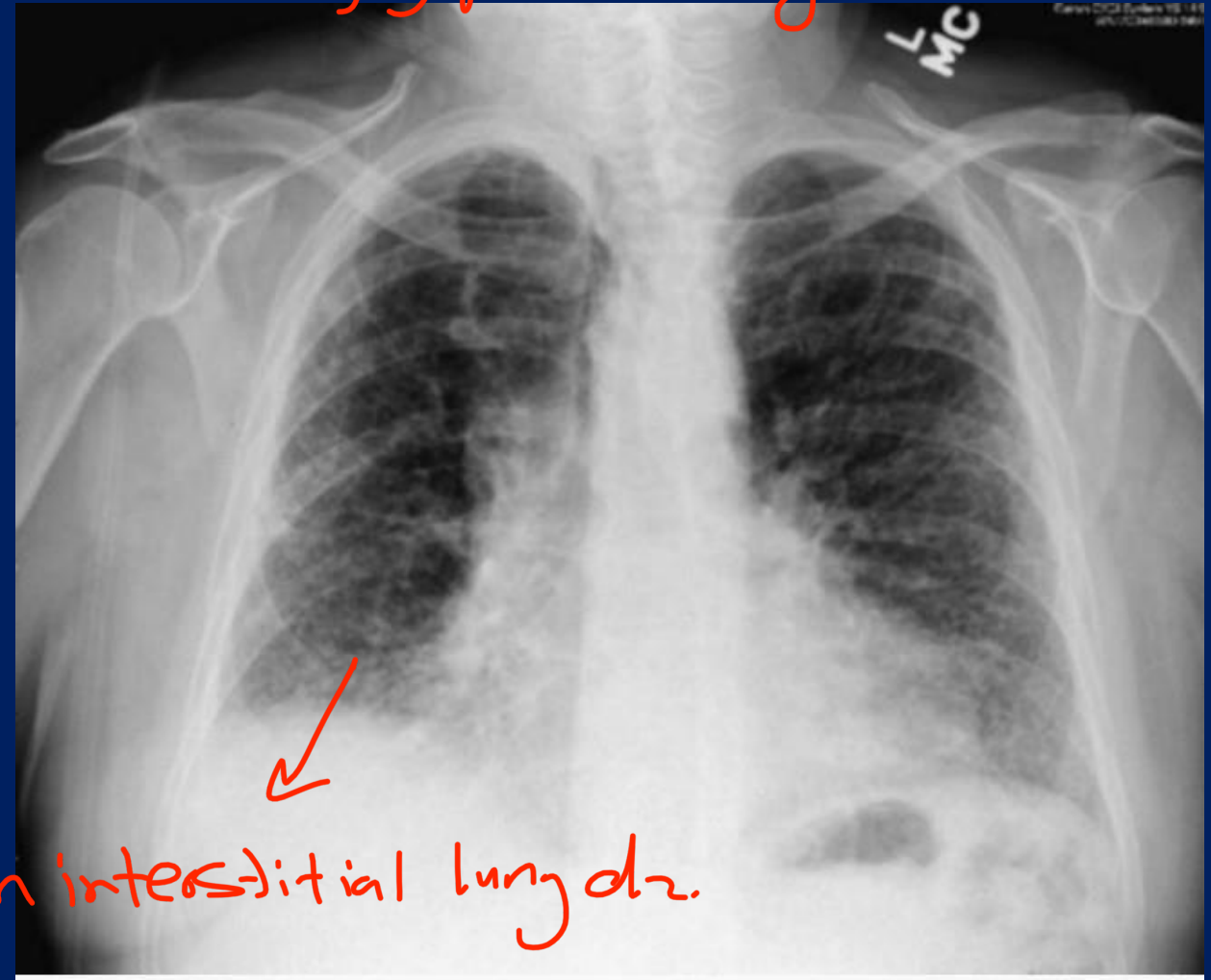
may due to anemia, lung dz, cardiac issue.

He takes no medications and has never smoked.

**any dyspnea need xray.*



clubbing + dyspnea $\Rightarrow$ mc in interstitial lung dz.



Mention the abnormality in the CXR ?

fine small nodules.

The chest x-ray is consistent with diffuse reticular or reticulonodular pattern ("ground-glass" appearance). overall volume loss and poorly demarcated pleural-parenchymal borders along the hemidiaphragms and heart

Causes include:

Idiopathic pulmonary fibrosis ✓

} mc

Sarcoidosis

Pneumoconiosis

occupational lung disease

Connective tissue disease

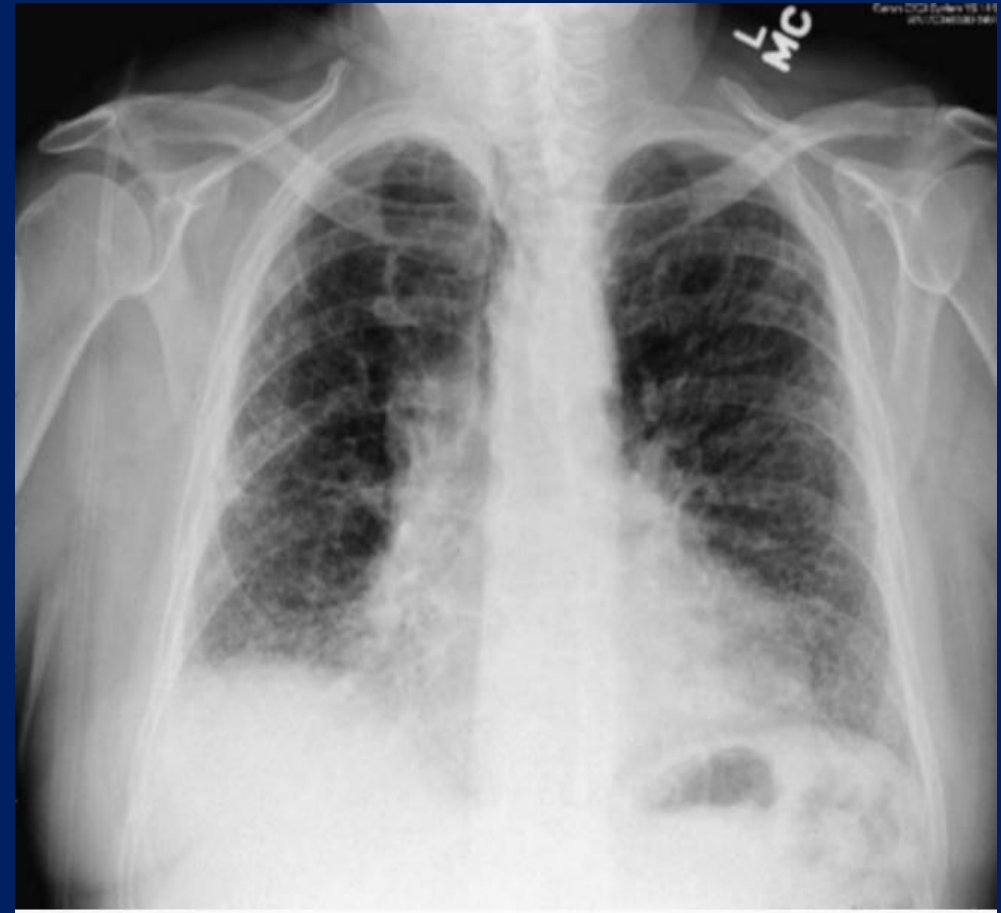
Hypersensitivity pneumonitis

Langerhan cell histiocytosis

Chronic eosinophilic pneumonia

Wegener granulomatosis

} interstitial lungd 2.



lower zone
fibrosis



Drugs that cause ILD ?

(BBCMAN)

Buosulfan belomycine cyclophosphamide methotrextrate amidrone
nitrofurtoine

Causes of lower zone fibrosis ?

- 1-IPF *idopathic pulmonary fibrosis*
- 2- CTD except anklosoyning spondylitis
- 3- Drug induce ✓
- 4-Asbestosis ✓

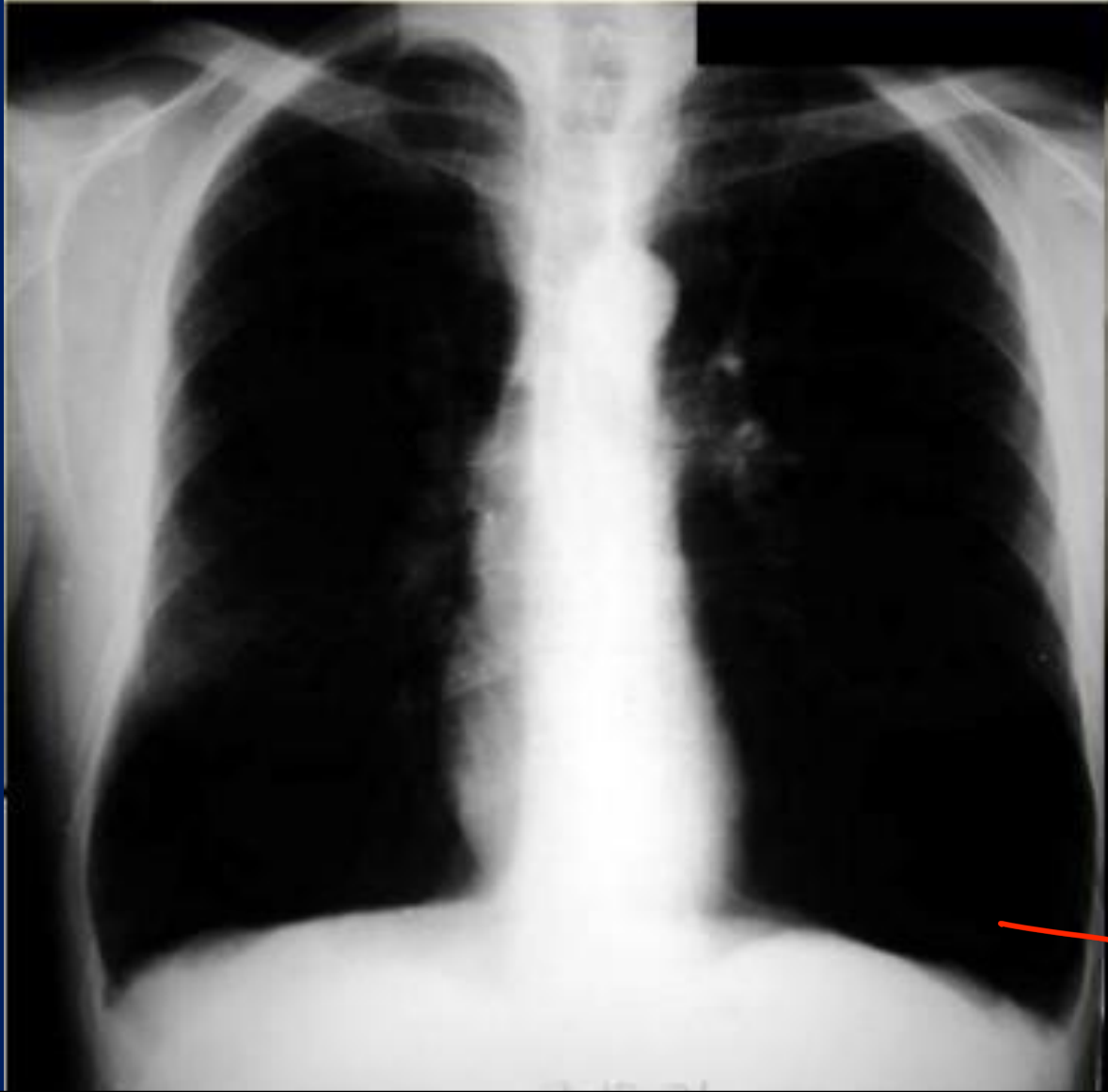
Note / all other causes will cause upper zone or diffuse type

- **Most sensitive imaging technique is ?**
- HRCT *high resolution CT scan for a teleclasis*
- Irregular liner opacities
reticulonodular pattern
and Honeycombs
- IPF associated with
**RTA, celiac disease, and
Ulcerative colitis**





COPD



- ^{12 rib} Hyperinflation of the lungs mc
- Hyperlucency of the lungs
- Flat diaphragm
- Tubular mediastinum

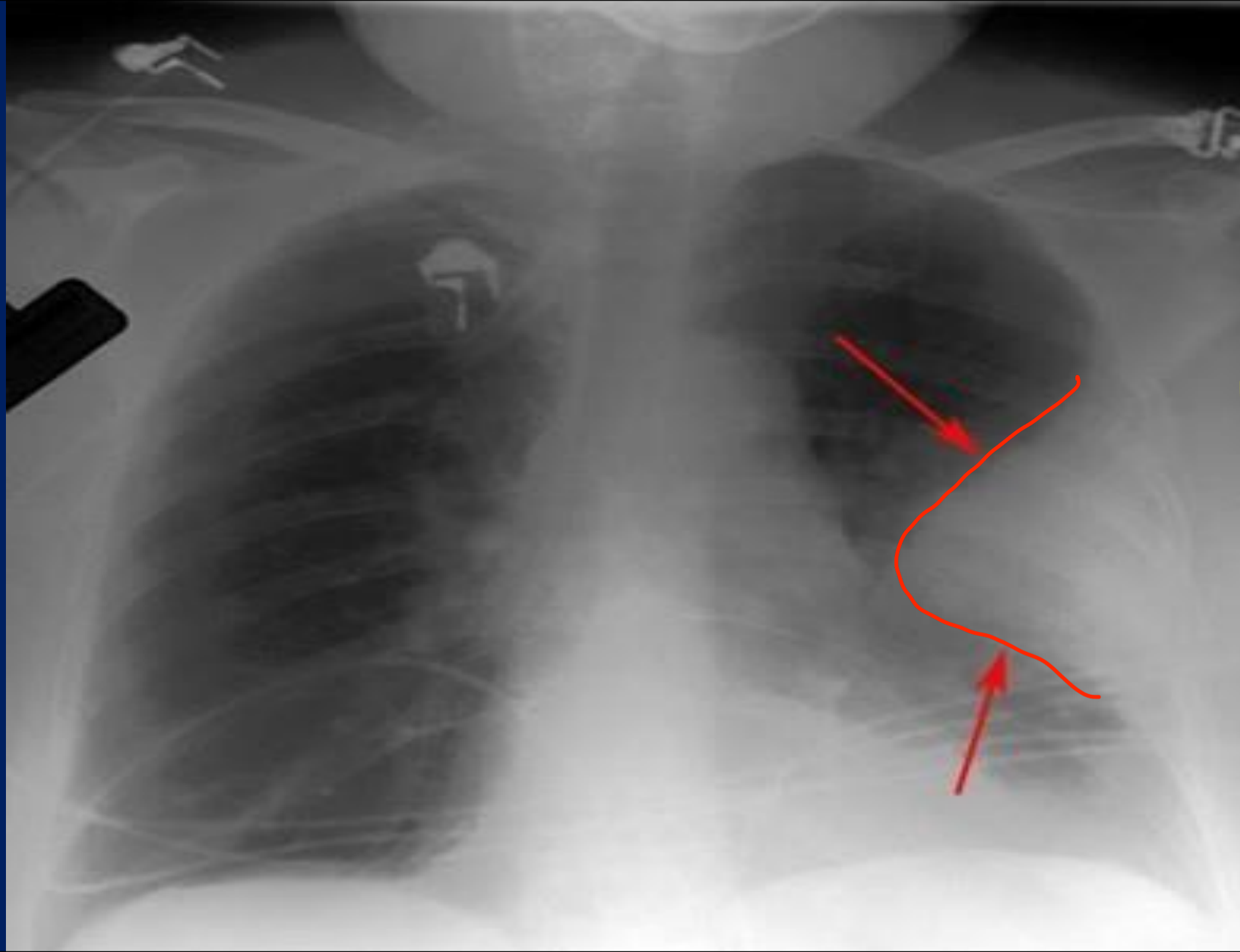
→ in advance COPD..

Emphysema



- Hyperinflation
- Hyperlucency
- Low set flat diaphragm
- Vertical heart
- Pre and infra cardiac lungs
- Barrel shape
- Emphysema
- Avascular zones
- Cephalization of upper lung fields is not evident
- Predominant basal involvement (not evident)





[rare]
hampton hump
appearance
↓
wedge shape
area in PE
↓
mc free in
xray.

45 y old male pt presented with sudden-onset dyspnea and hemoptysis, and Rt-sided pleuritic chest pain PO2 55 mmHg ^{low}

Describe the abnormality in CT?

Rt main pulmonary artery filling defect in CT angio

clot in RPA

modality for dx of PE

What are the risk factors for this disease?

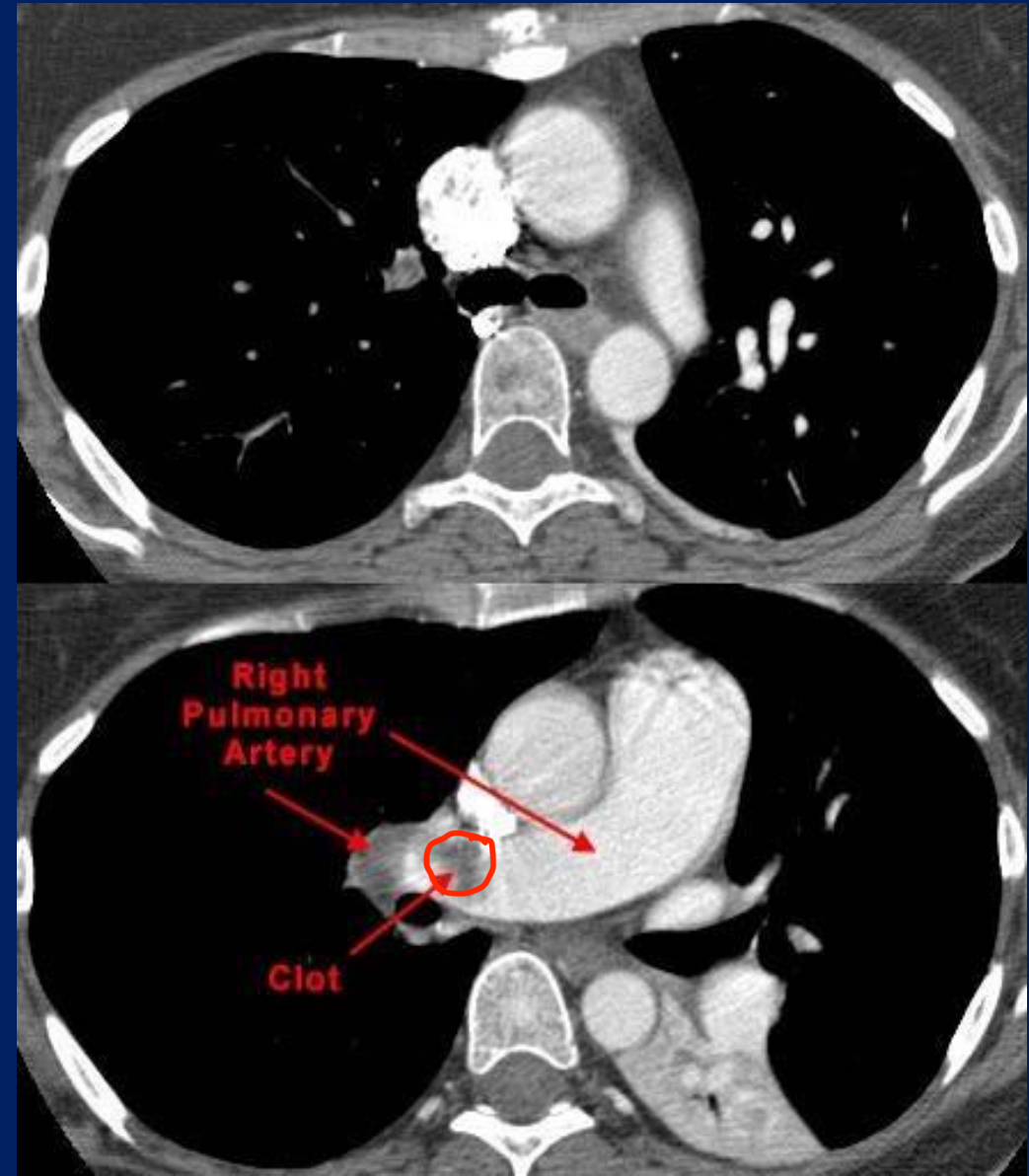


Table 8.27**Risk factors of venous thromboembolism****Patient factors**

Age

BMI >30 kg/m²

Varicose veins

Continuous travel more than

3 h in preceding 4 weeks

Immobility (bed rest > 4 days)

Pregnancy and puerperium

Previous deep vein

thrombosis or pulmonary
embolism

Thrombophilia

Antithrombin deficiency

Protein C or S deficiency

Factor V Leiden

Resistance to activated
protein C (caused by
factor V Leiden variant)

Prothrombin gene variant

Hyperhomocysteinaemia

Antiphospholipid antibody/
lupus anticoagulantOestrogen therapy including
HRT

Dysfibrinogenaemia

Plasminogen deficiency

**Disease or surgical
procedure**Trauma or surgery,
especially of pelvis, hip or
lower limb

Malignancy

Cardiac or respiratory
failureRecent myocardial
infarction or strokeAcute medical illness/severe
infection

Inflammatory bowel disease

Behçet's disease

Nephrotic syndrome

Myeloproliferative disorders

Paroxysmal nocturnal
haemoglobinuria

Paraproteinaemia

Sickle cell anaemia

Central venous catheter in
situ

What is the Dx ?

Pulmonary embolism

Describe this CXR for other pt with the same pathology CXR Lt middle zone wedge shape well demarcated opacity

the most common chest x-ray finding associated with PE is a “normal” chest x-ray.

① → loss of vascular marker [clot in RPA]

Westermark sign is the lack of vascular markings that occur distal to the pulmonary embolus.

② **Hampton hump** is a wedge-shaped infiltrate (just above the diaphragm) and is due to pulmonary infarction

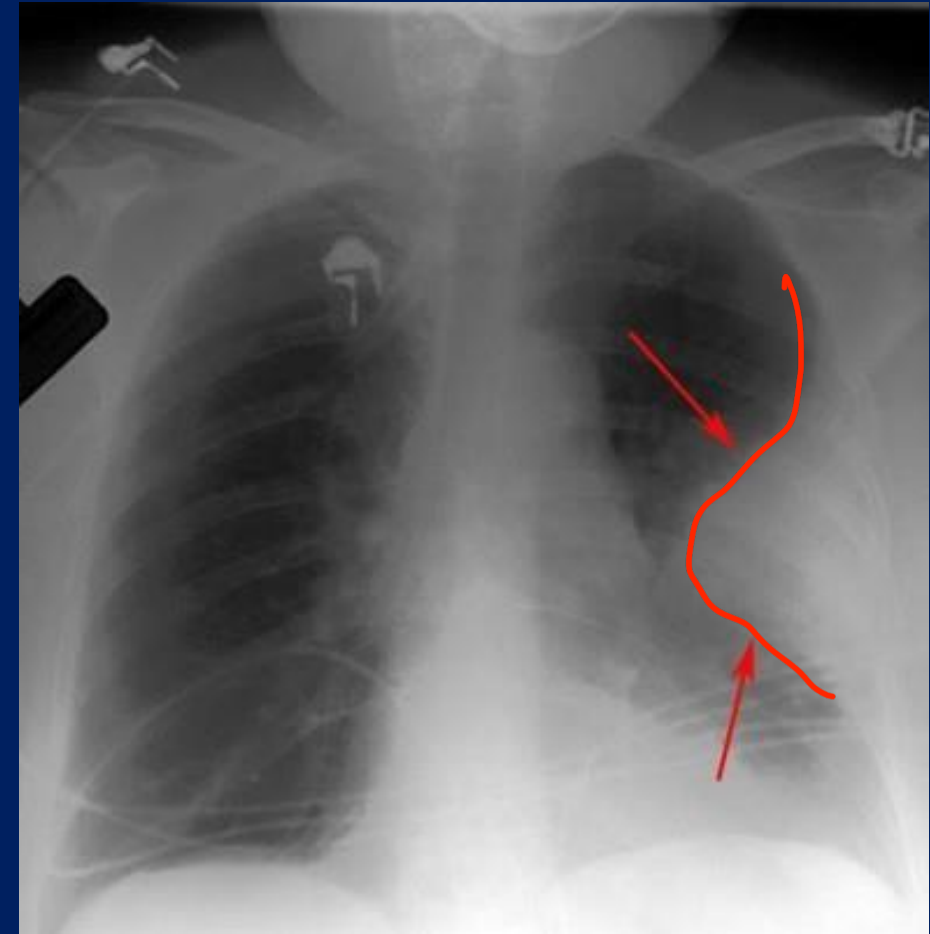
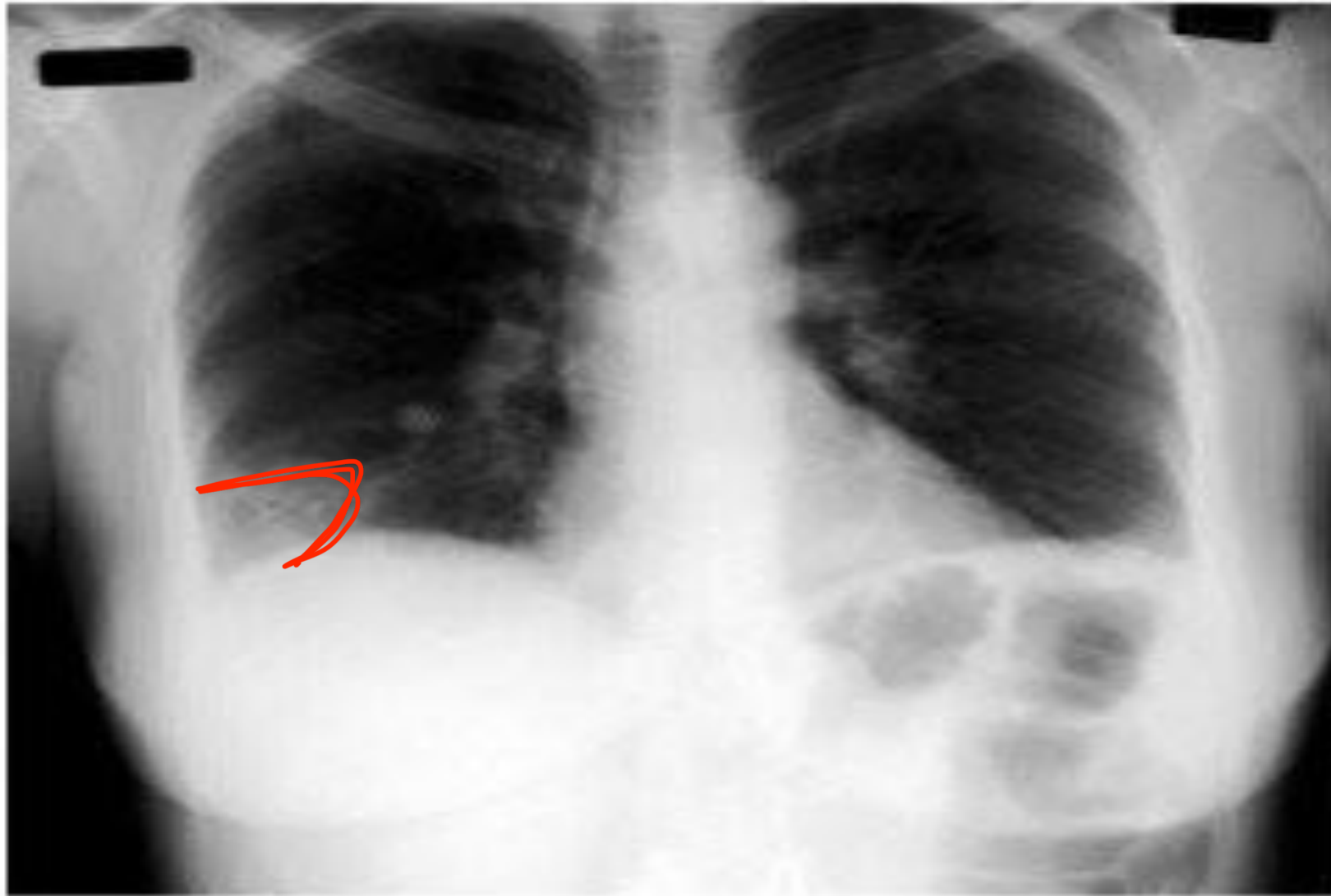


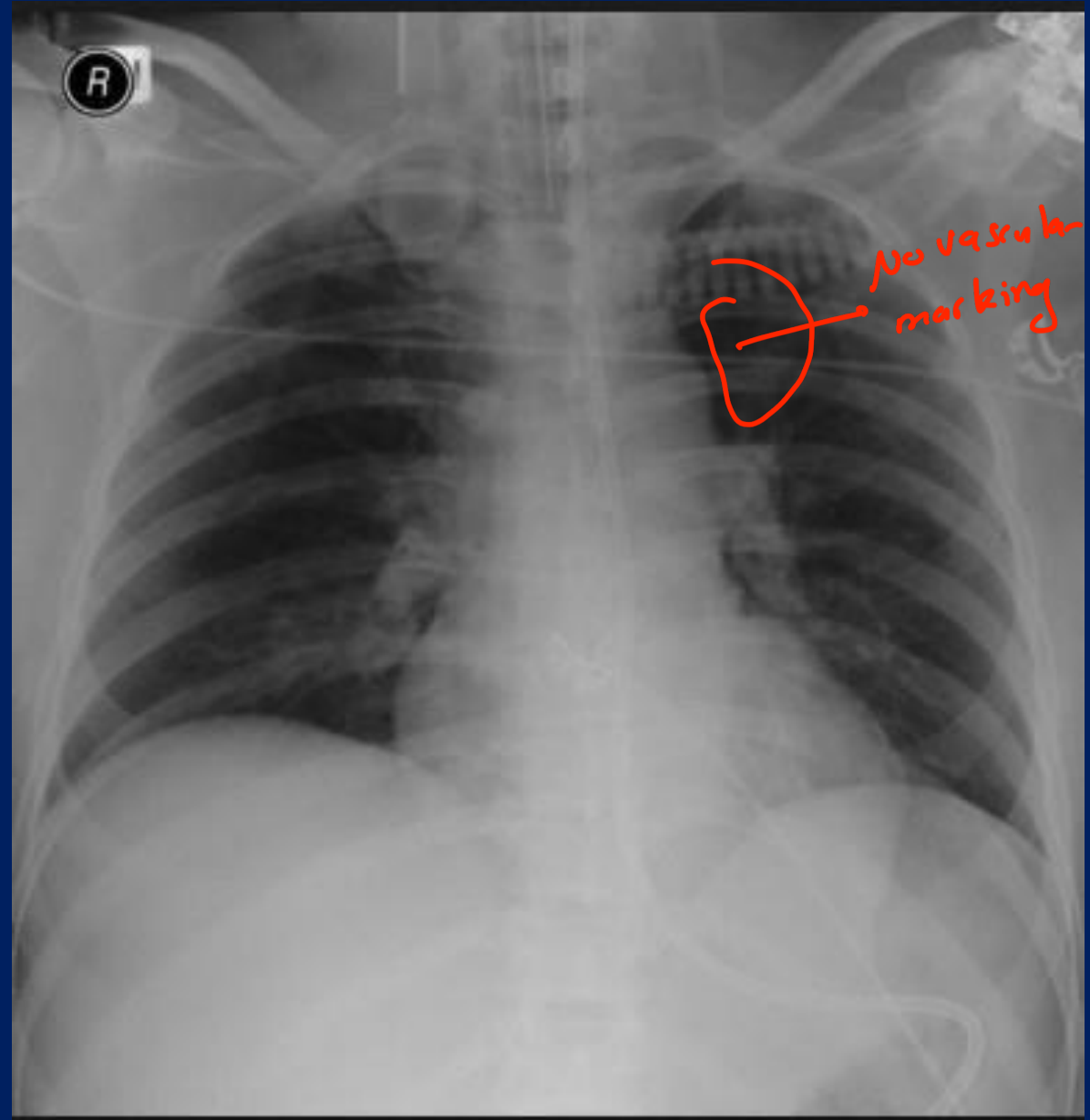
Figure 5. Hampton's hump.

Hampton's hump is a wedge-shaped pleural-based infiltrate that is occasionally seen with PE. Note the density at the right costophrenic angle in this film.

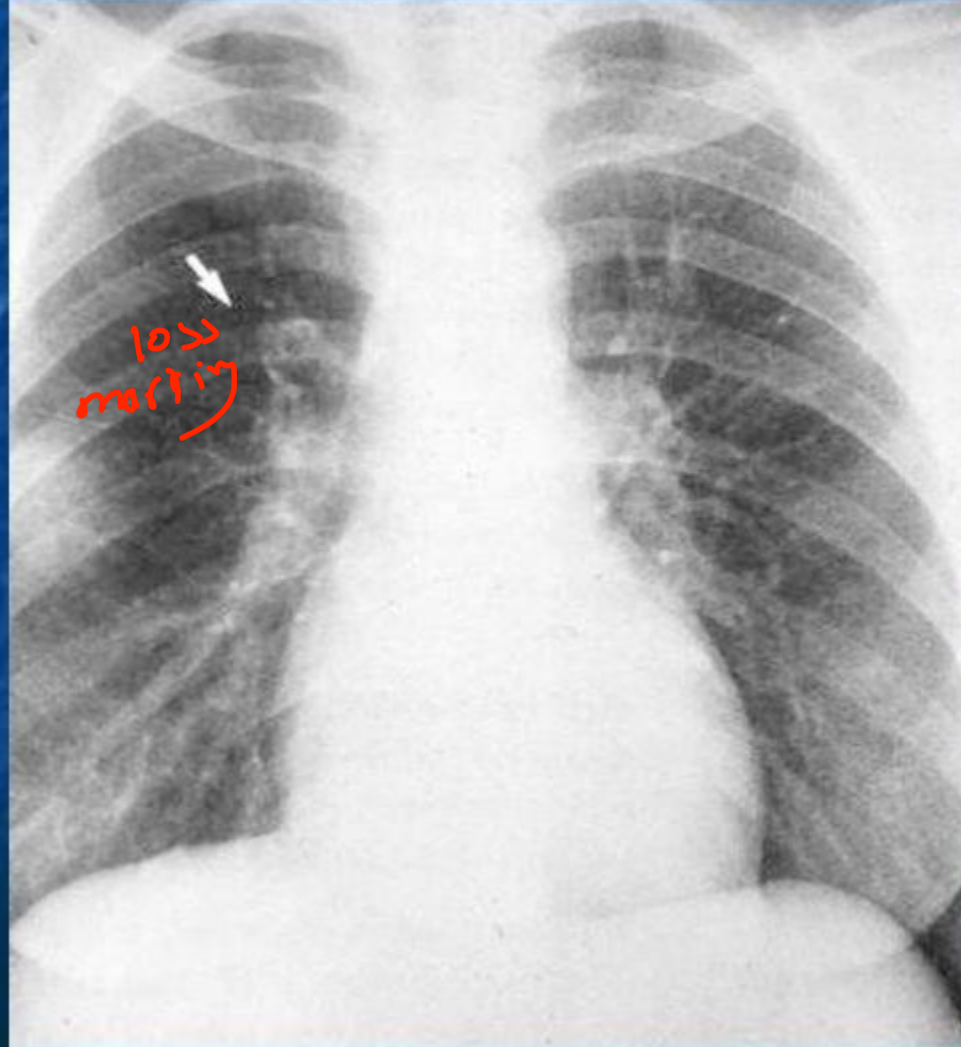


Westermark sign

abnormal prominence of the central pulmonary arteries with **abrupt cut-off** of the left pulmonary artery suggesting PE



PE – Westermark's Sign



Most common ECG finding is ?

Sinus tachycardia *mc*

right ventricle strain Or RBBB

On ECG, right heart strain = S I Q3 T3; that is, the S wave is large in I, the Q wave is large in III, and the T wave is inverted in III.

10-15% PE +

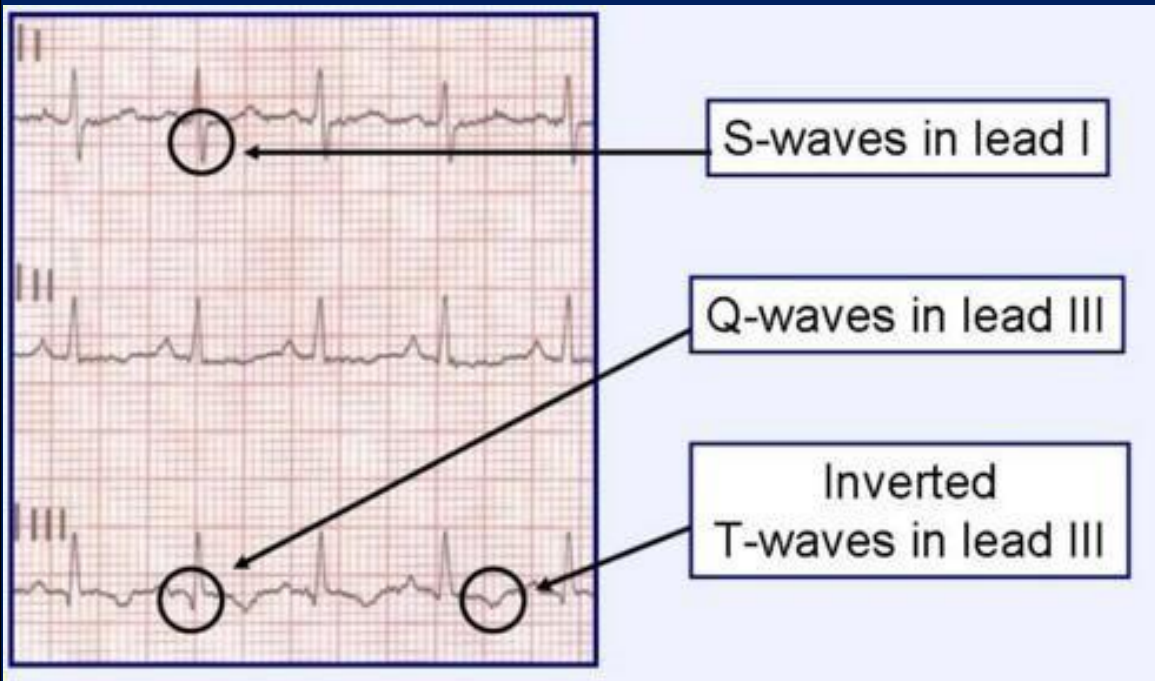
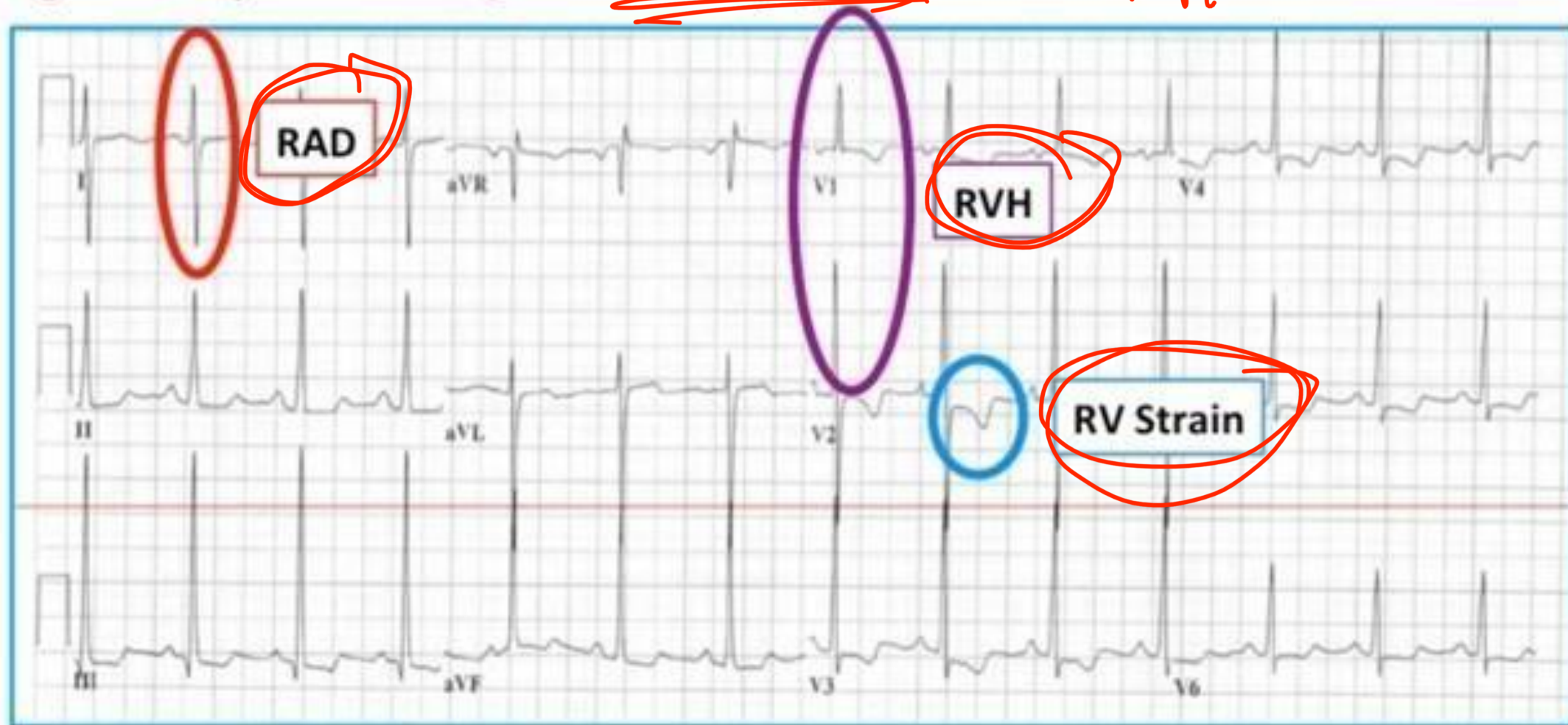


Figure 1. Sample ECG with Signs of Pulmonary Hypertension *due to PE*



PAH, pulmonary arterial hypertension; RAD, right axis deviation; RVH, right ventricular hypertrophy; RV, right ventricle.



Wells score

Criteria	Points
Clinical signs/symptoms of DVT	3
PE is most likely diagnosis	3
Tachycardia (>100 bpm)	1.5
Immobilization/surgery in previous 4 weeks	1.5
Prior DVT/PE	1.5
Hemoptysis	1
Active malignancy (trt w/in 6 month)	1

Low Risk
< 2 points

Intermediate risk
2-6 points

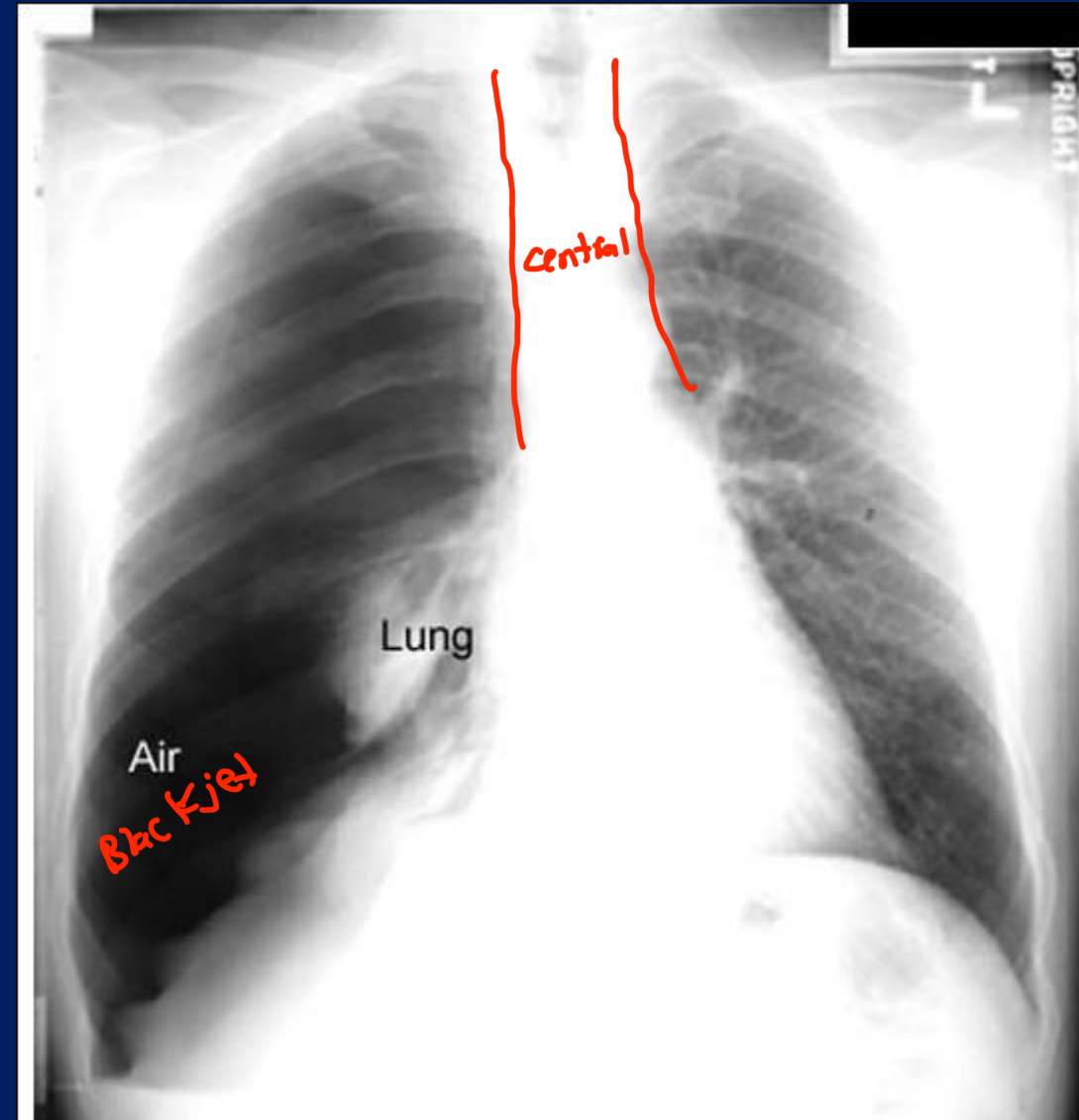
High risk
>6 points

PE unlikely
0-4 points

PE Likely
>4 points

- **Describe this CXR**

- No vascular markings on right (black jet)
- No shift of mediastinum to left
- Atelectatic right lung
- Increased haziness on left:
Diversion of entire cardiac output
- Small fluid level near costophrenic angle:
Hydropneumothorax



- **Primary spontaneous pneumothorax (PSP)** *without any trauma*

- without an apparent cause and in the absence of significant lung disease
- most commonly affects **tall, slender, smoking men** ages 20-40 years.
thin

- **Secondary spontaneous pneumothorax (SSP)**: *there is lung dz..*

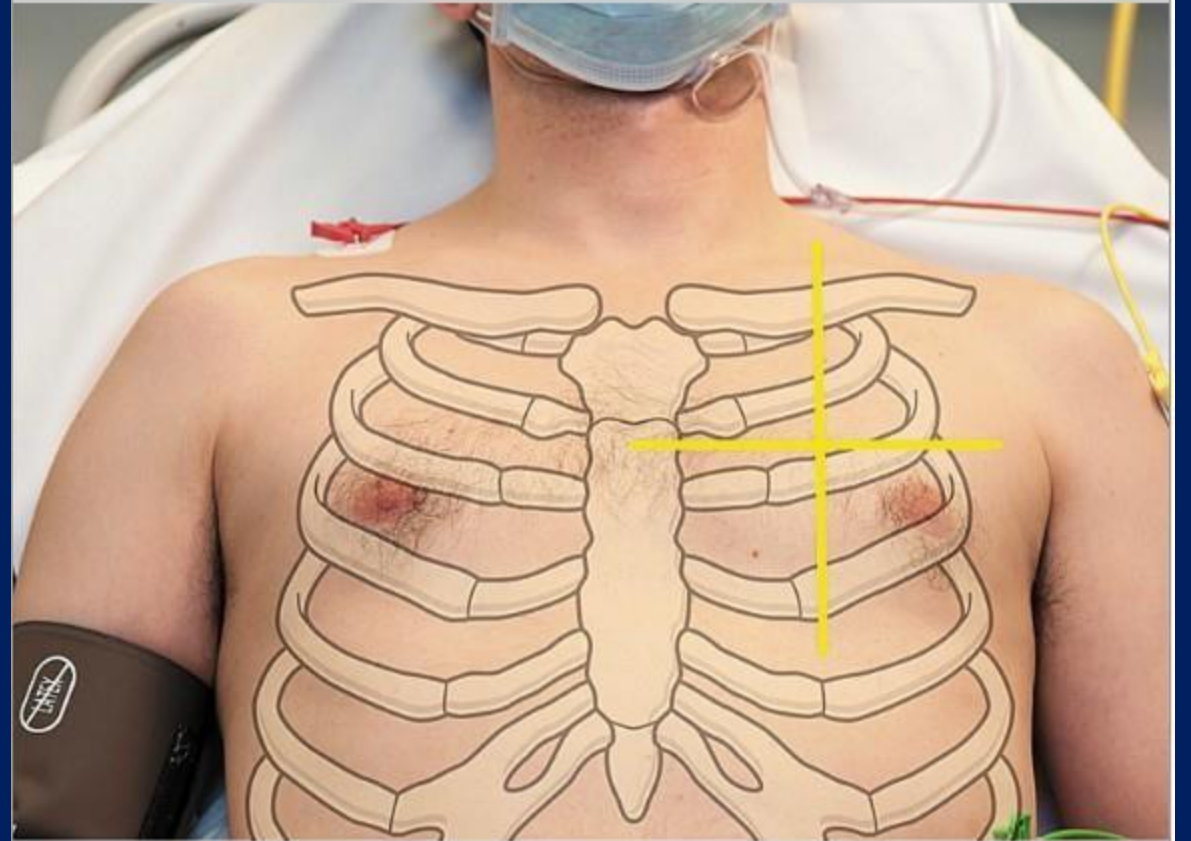
- presence of existing lung pathology.
- ✓• COPD is the most common cause.
- ✓• Pneumocystis pneumonia in AIDS patients occasionally causes a pneumothorax.
- ✓• Cystic fibrosis and acute severe asthma.
- ✓• Interstitial lung disease : Sarcoidosis, idiopathic pulmonary fibrosis ...
- ✓• Connective tissue diseases : Rheumatoid arthritis, ankylosing spondylitis , systemic sclerosis, Marfan's syndrome
- ✓• Barotrauma
 - Recurrence rate for PSP is 28%, while that for SSP is 43%.
 - Risk of mortality is 1-4% for PSP and up to 17% for SSP

2ry pneumothorax

pneumothorax



Needle decompression

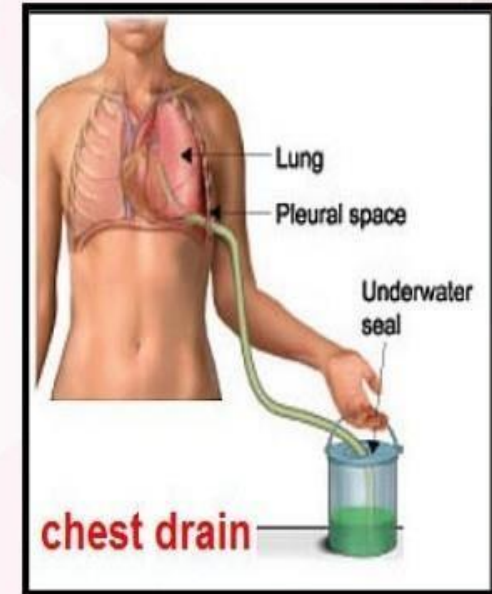
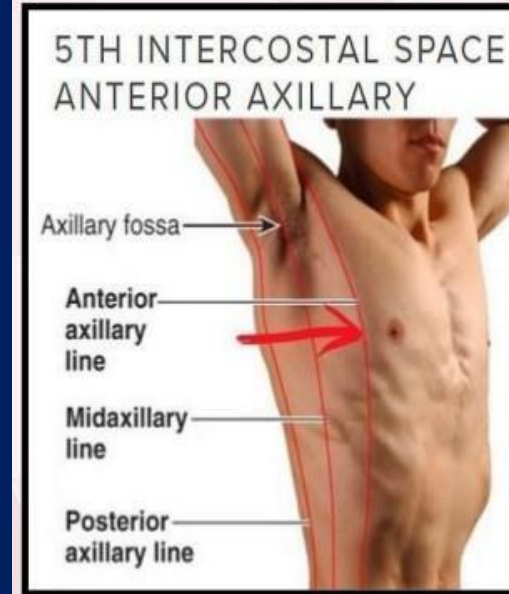


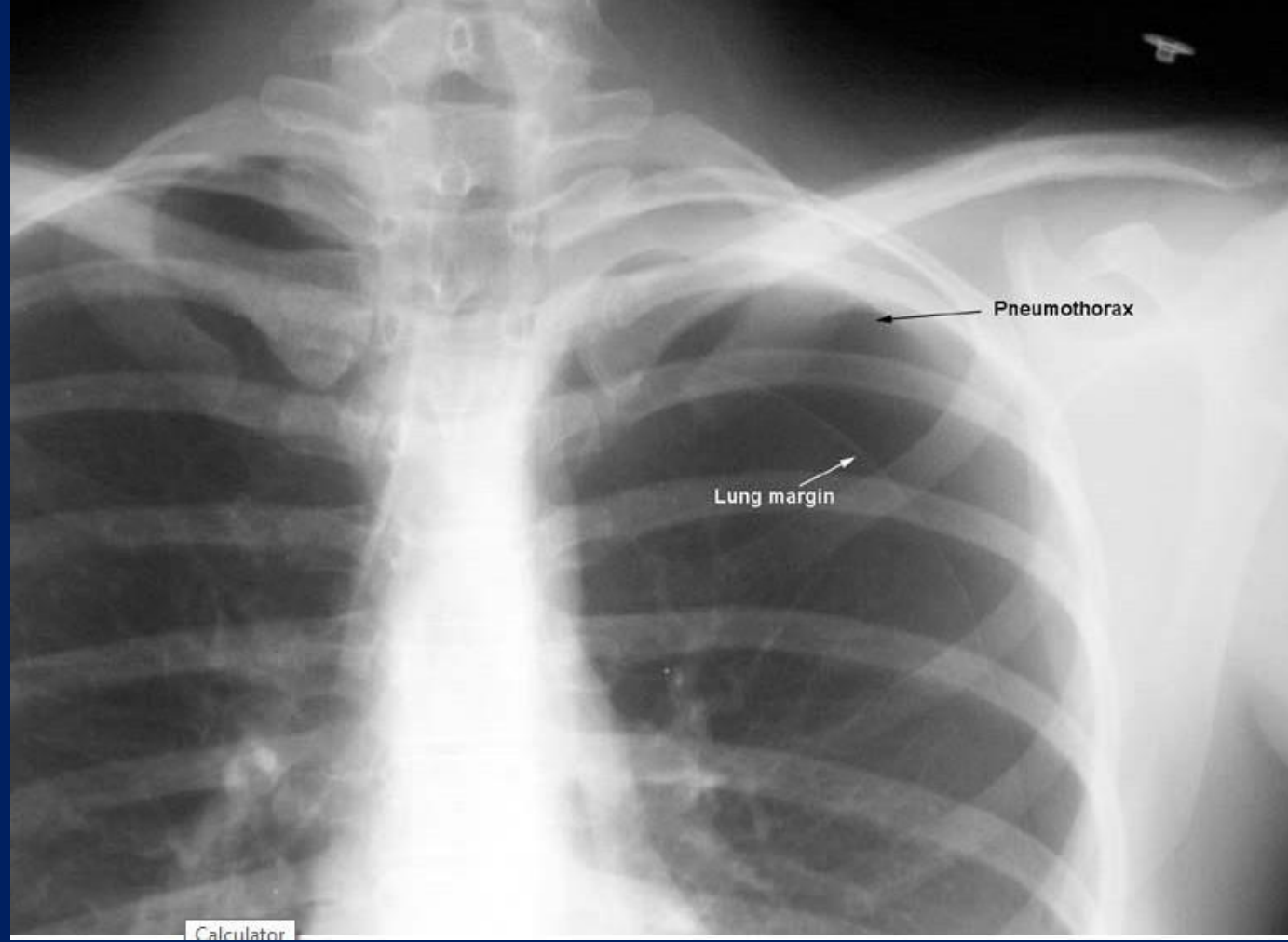
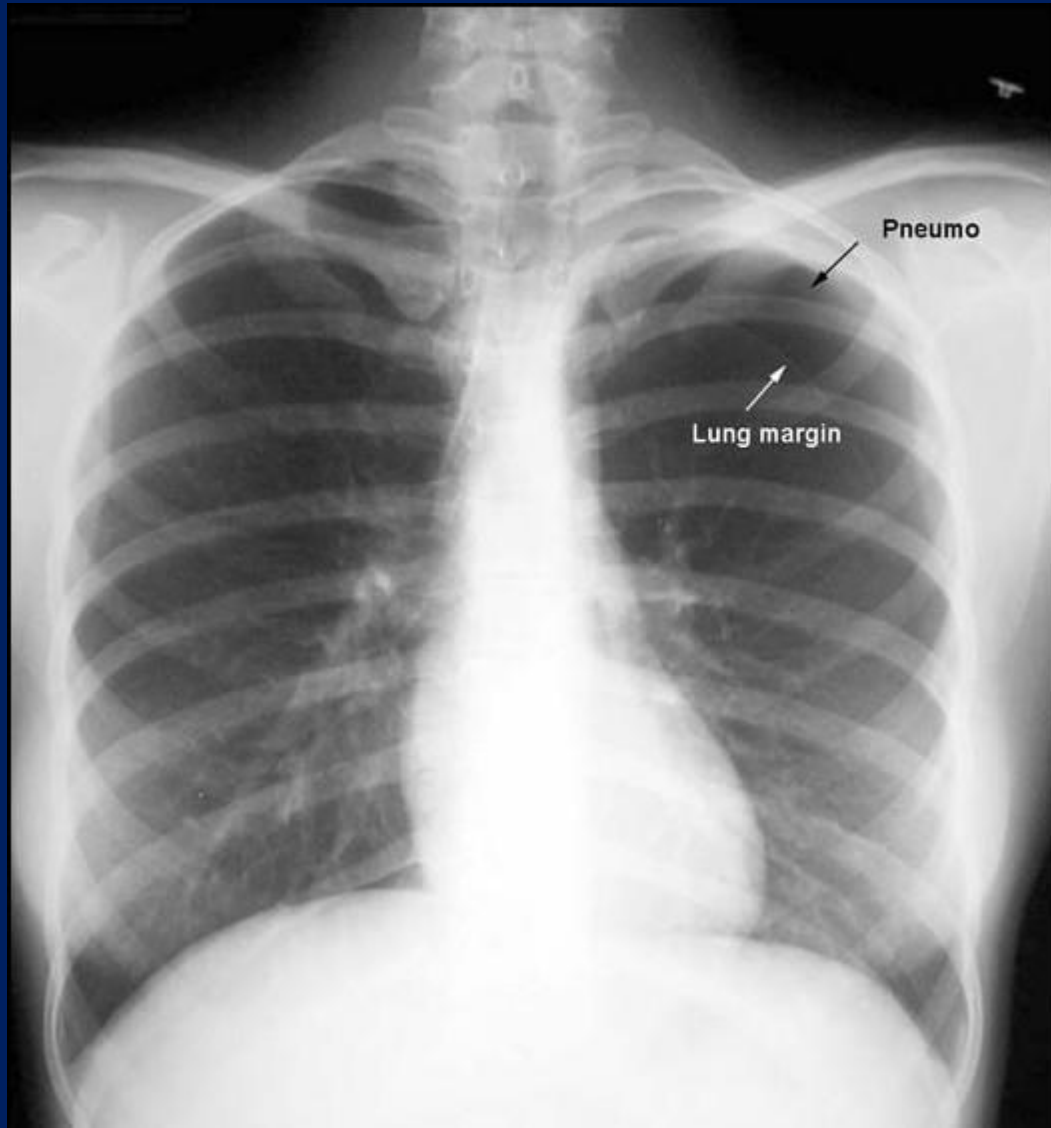
Indications for Chest Tube

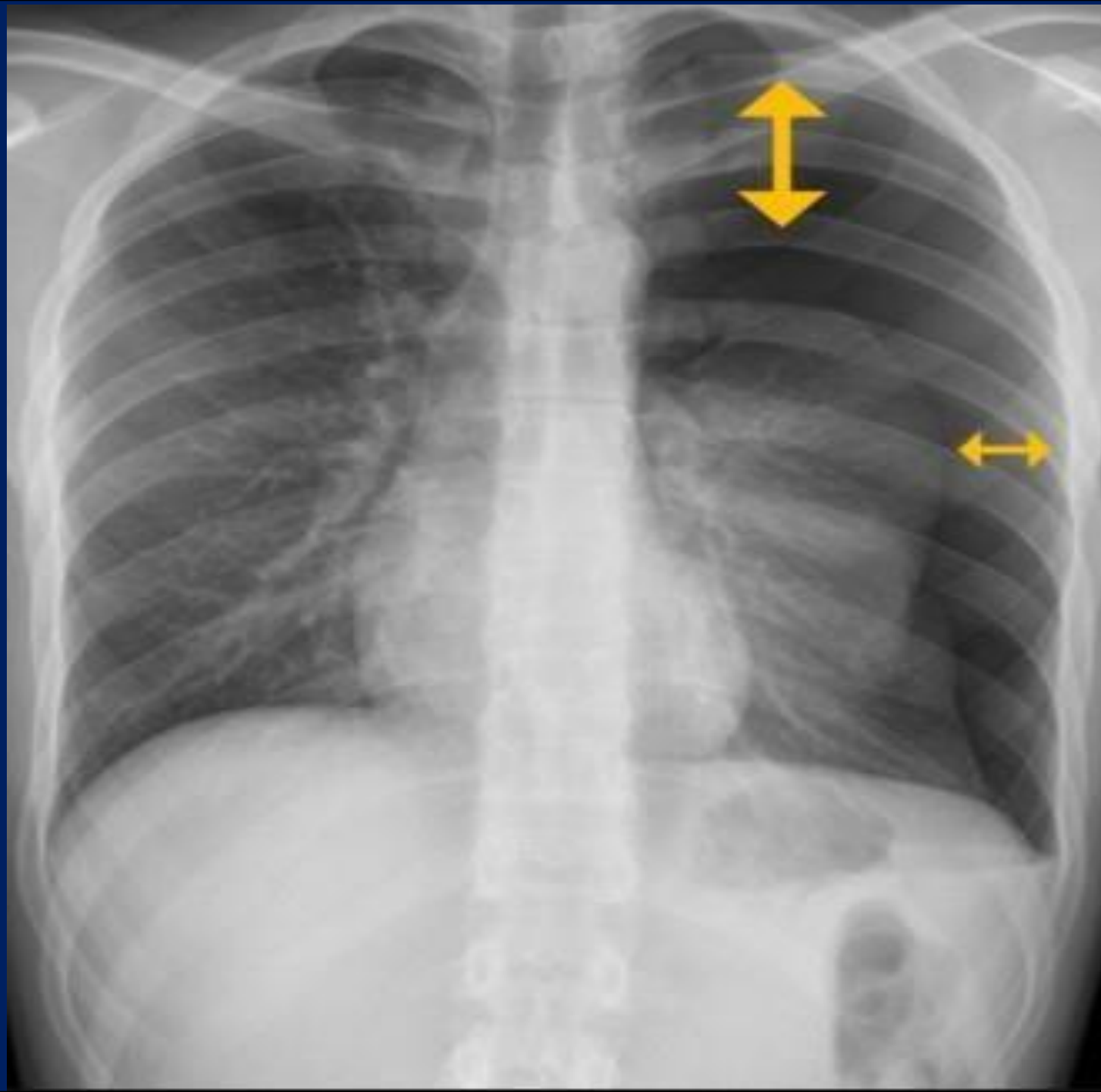
- Tension pneumothorax
- Lung disease
- > 50 year old + > 2cm air diameter
- > 2.5 L air aspirated or pneumothorax persists

Pneumothorax Treatment

Tube thoracostomy :







35-year-old male presented with fever, cough,
and purulent sputum for one week.

This was his CXR

Describe the abnormality in Pic A ?

Plan CXR diffuse opacities in the Rt middle
zone with air bronchogram .

Silhouette sign: The right heart border is not
seen due to airspace disease in the right
middle lobe which has a radiodensity
similar to the adjacent heart.

What is the Dx ?

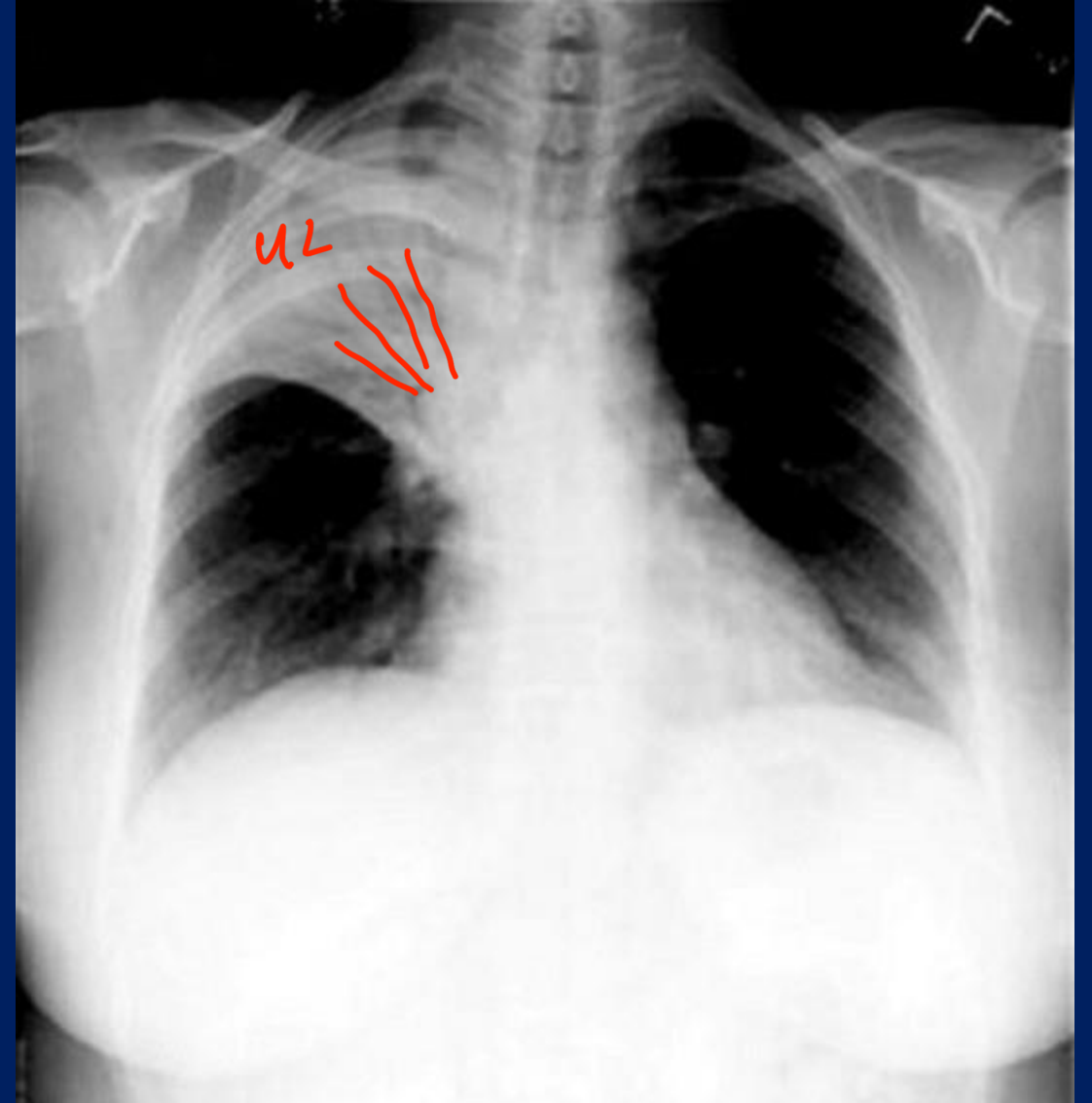
Rt middle lobe pneumonia

This X ray changes should resolved
within 6 weeks at least

↙ For out Pt



- **Consolidation Right Upper Lobe**
- Air Bronchogram
- Density in right upper lung field
- Lobar density
- No shift of mediastinum
- Transverse fissure not significantly shifted
- Air bronchogram



Describe the abnormality ?

homogeneous ^{upper} lobar consolidation (containing an air bronchogram) and bulging of an interlobar fissure.

Most likely causative organism ? *depend on history*

Klebsiella pneumoniae

Risk factors ?

alcoholics and patients with uncontrolled lung disease or diabetes and malignancy

Sputum usually called ?

Currant jelly sputum

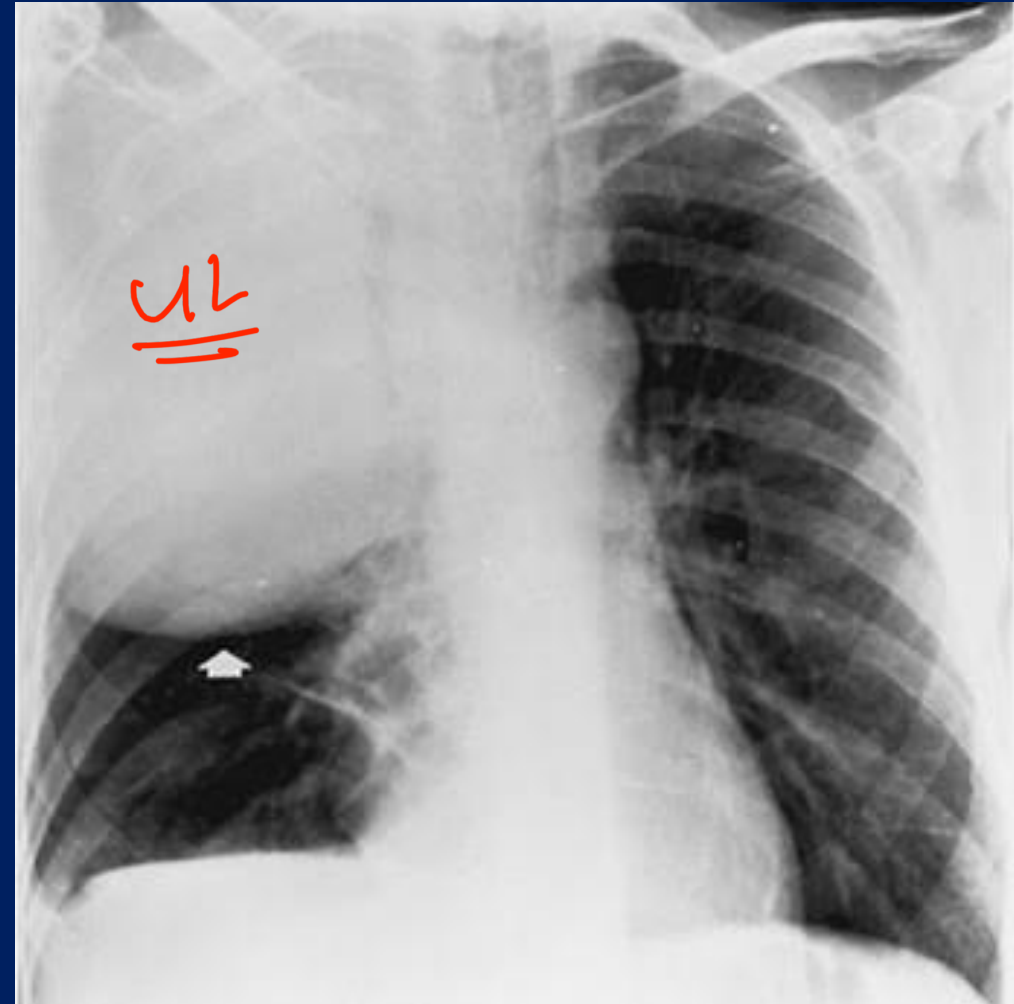


Image of chest x-ray displaying the interstitial pattern seen in **viral pneumonia**.
↳ mc in children.

The interstitial pattern shows fine lines radiating from the hila.

There is a hazy reduction of transparency.
be. tween the ribs there is black color.



+ lobar consolidation

If the patient has rusty sputum the most likely is ----- *Streptococcus pneumonia* ✓

If the pt has this skin lesion then the most likely organism is --- *Mycoplasma pneumonia* ✓

erythema multiforme



Legionella pneumophila

Three of the four following features:

- a prodromal virus-like illness
 - a dry cough, confusion or diarrhoea
 - lymphopenia without marked leucocytosis
 - hyponatraemia.
- *LFT, KFT high*

- **Indicators of severity ?**

- Confusion
- Urea > 20 mg/dl
- Respiratory rate $\geq 30/\text{min}$
- Blood pressure (systolic < 90 or diastolic ≤ 60 mmHg)
- Age > 65 years of age

Score 0–1 – Treat as outpatient Score 2 – Admit to hospital
Score 3+ – often require ICU care

- **Other markers of severe pneumonia**

- Chest X-ray – more than one lobe involved
- $\text{Pao}_2 < 60$ mmHg
- Low albumin (< 3.5 mg/dL)
- White cell count (< 4 000 or > 20 000)
- Blood culture – positive

Modifying factors = (age > 65 years, B-lactam Rx within past 3 months, alcoholism, immunosuppression or any of following comorbidities: COPD, diabetes, renal or congestive heart failure, malignancy)

Outpatient treatment

No modifying factors ----- Doxycycline or AZI or CLARI (Macrolide)

With modifying factors ----- respiratory quinolone (levofloxacin, gemifloxacin, or moxifloxacin) or B-lactam + Macrolide

Inpatient treatment

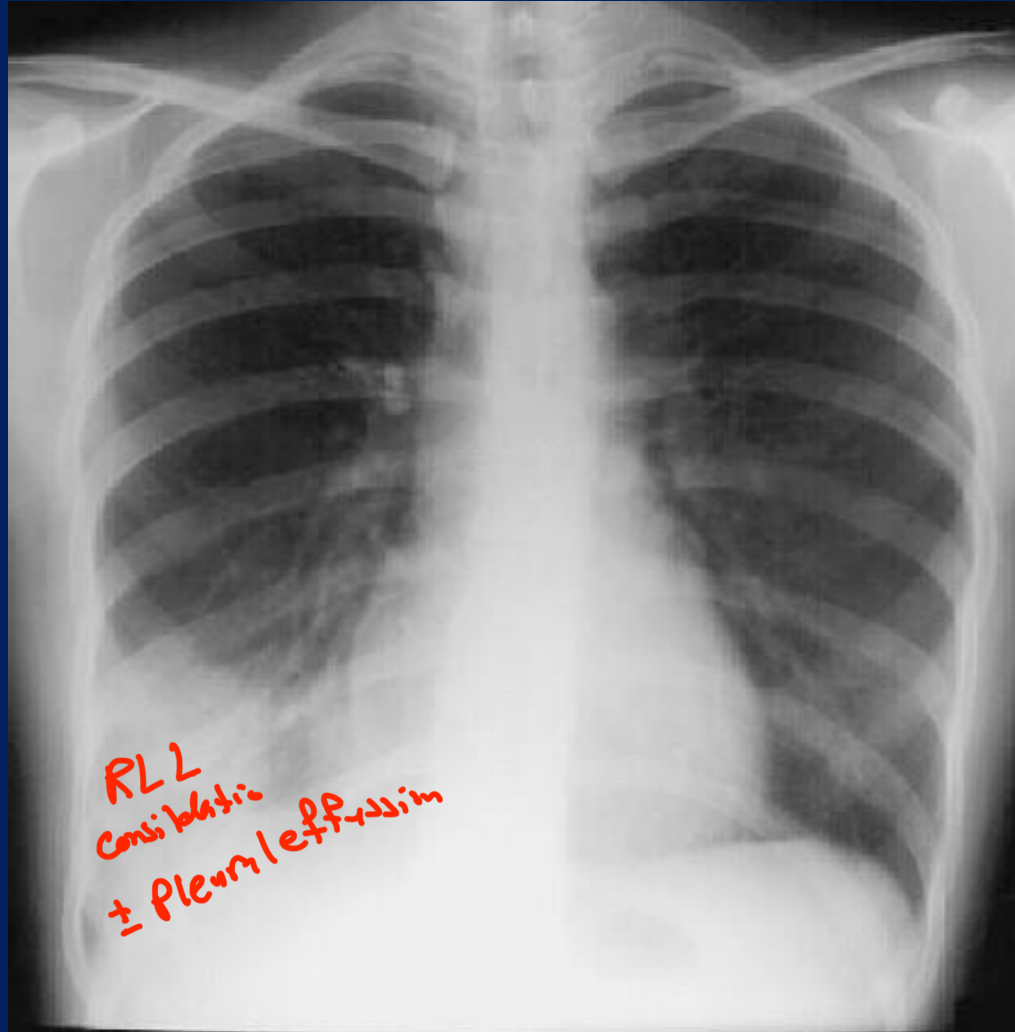
respiratory quinolone or (B-lactam + Macrolide) or (B-lactam + Doxycycline)

hospital-acquired pneumonia treatment

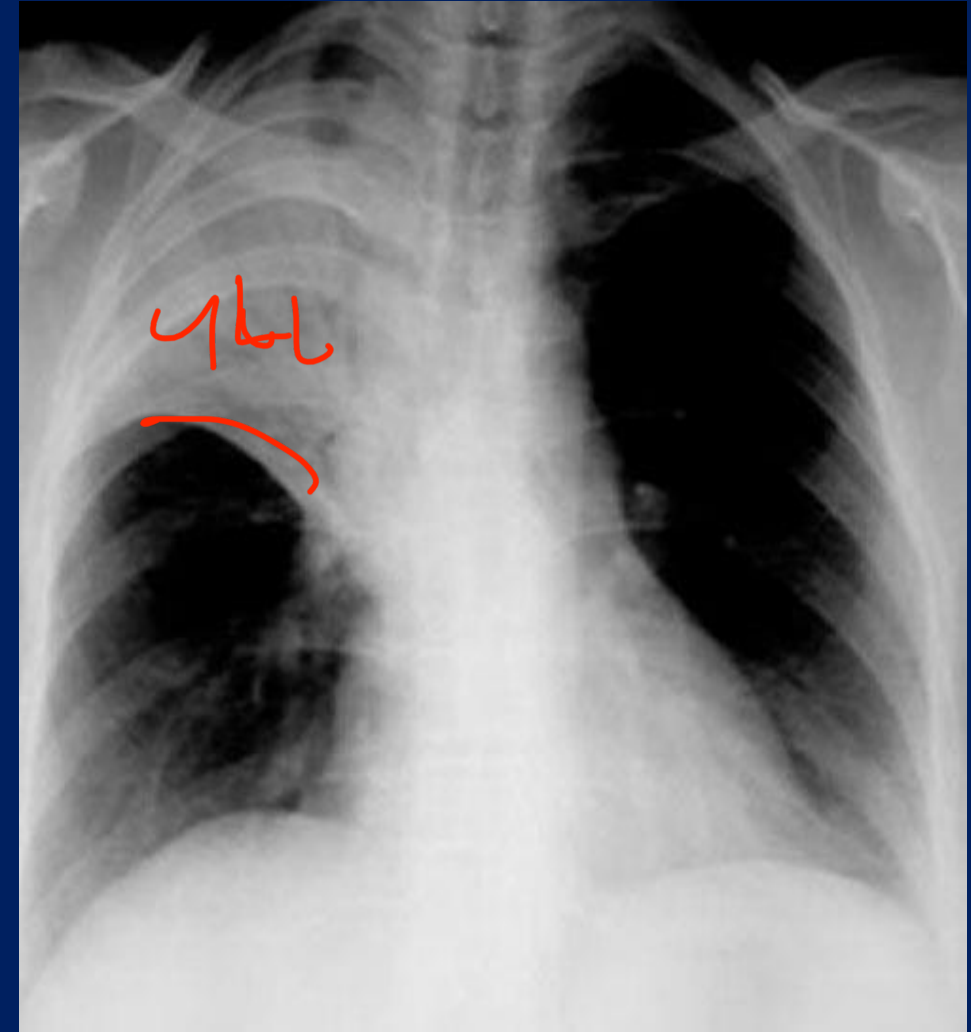
ceftazidime or imipenem or piperacillin/tazobactam) +
vancomycin or linezolid +

Aminoglycosides (gentamicin, tobramycin)

CAP setting	Recommended therapy
Outpatient	Healthy patients • Macrolide or doxycycline Comorbid conditions (e.g., diabetes, malignancy, etc.) • Fluoroquinolone or beta-lactam + macrolide
Inpatient (non-ICU)	Fluoroquinolone OR Beta-lactam + macrolide
Inpatient (ICU)	Beta-lactam + macrolide (IV) OR Beta-lactam + fluoroquinolone



right lower lobe
consolidation



right upper lobe
consolidation

- An 80-year-old male presented with massive hemoptysis and was intubated. This was his CXR. He gave a past history of being treated for tuberculosis many years ago.

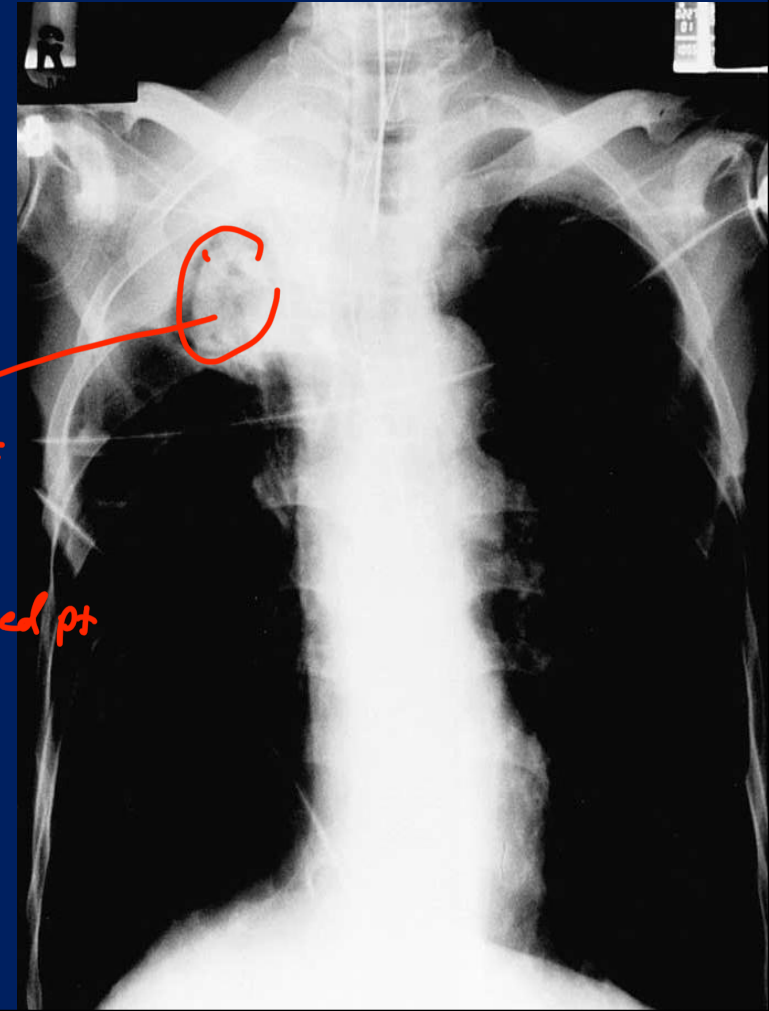
↳ immunosuppressed state

The CXR shows a right upper zone ball within a cavity

(air crescent sign)

Pathognomonic of a mycetoma (also called **aspergilloma**).

Ball with
tissue inside it
presented in ULL
in immunocompromised pt



Describe the abnormality ?

High resolution CT dilated bronchi with thickened walls

What is the Dx ?

Bronchiectasis

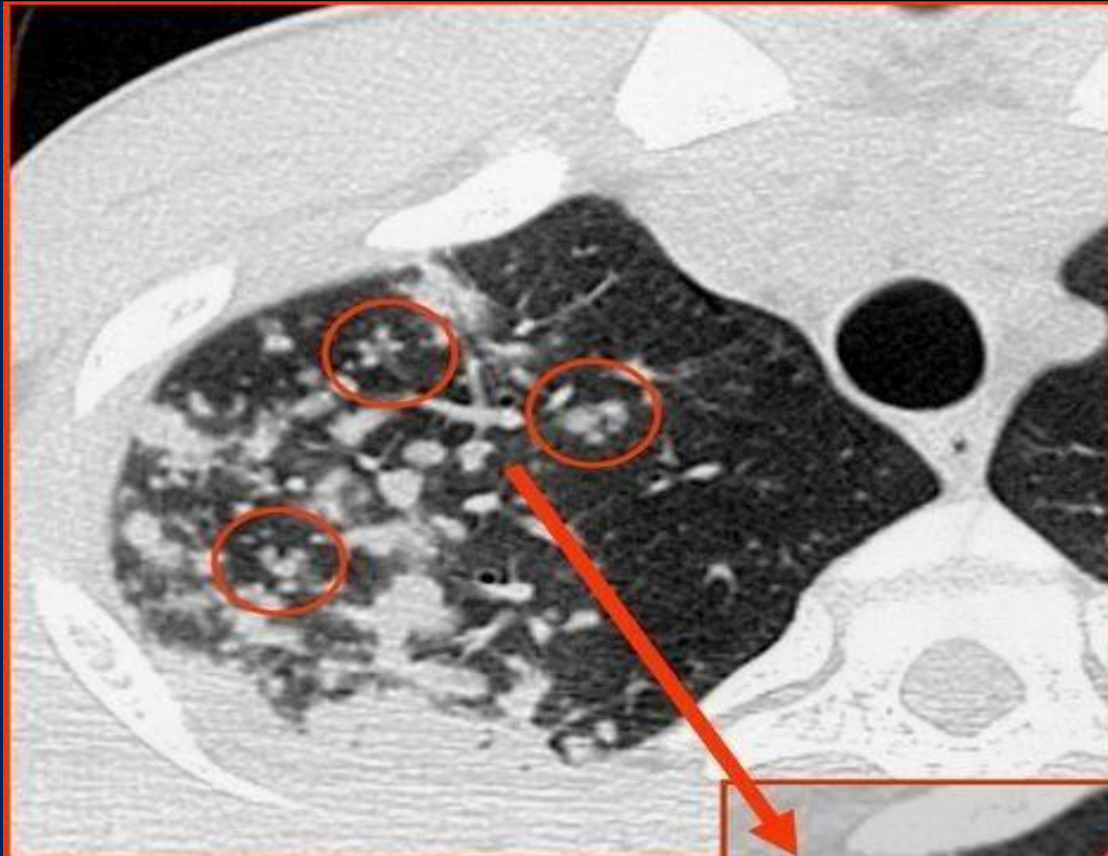
What are the causes ?

Cystic fibrosis is the most common cause in developed countries

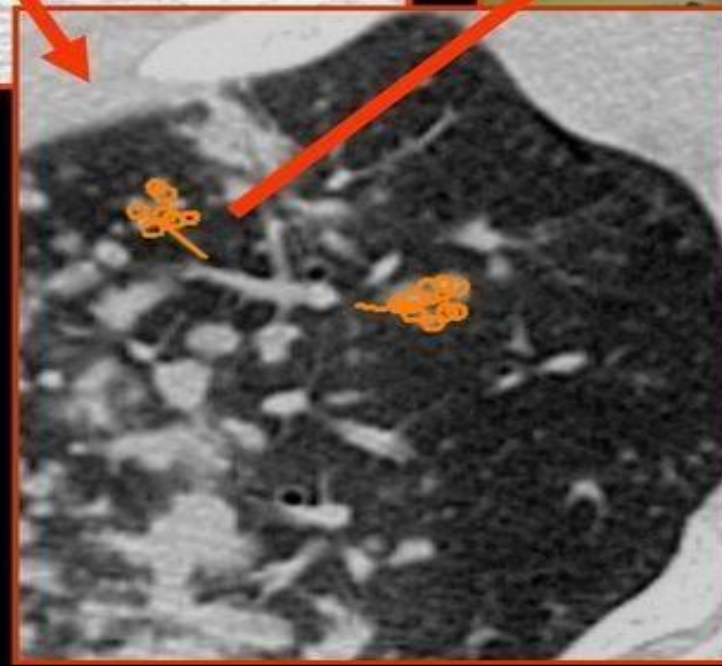
- 1- repeated pneumonic processes such as tuberculosis (TB), fungal infections, lung abscess, and pneumonia (focal bronchiectasis)
- 2- when the defense mechanisms of the lung are compromised as in cystic fibrosis and immotile cilia syndrome (diffuse bronchiectasis)



signet ring sign



TREE-IN-BUD SIGN



SIGNET RING SIGN

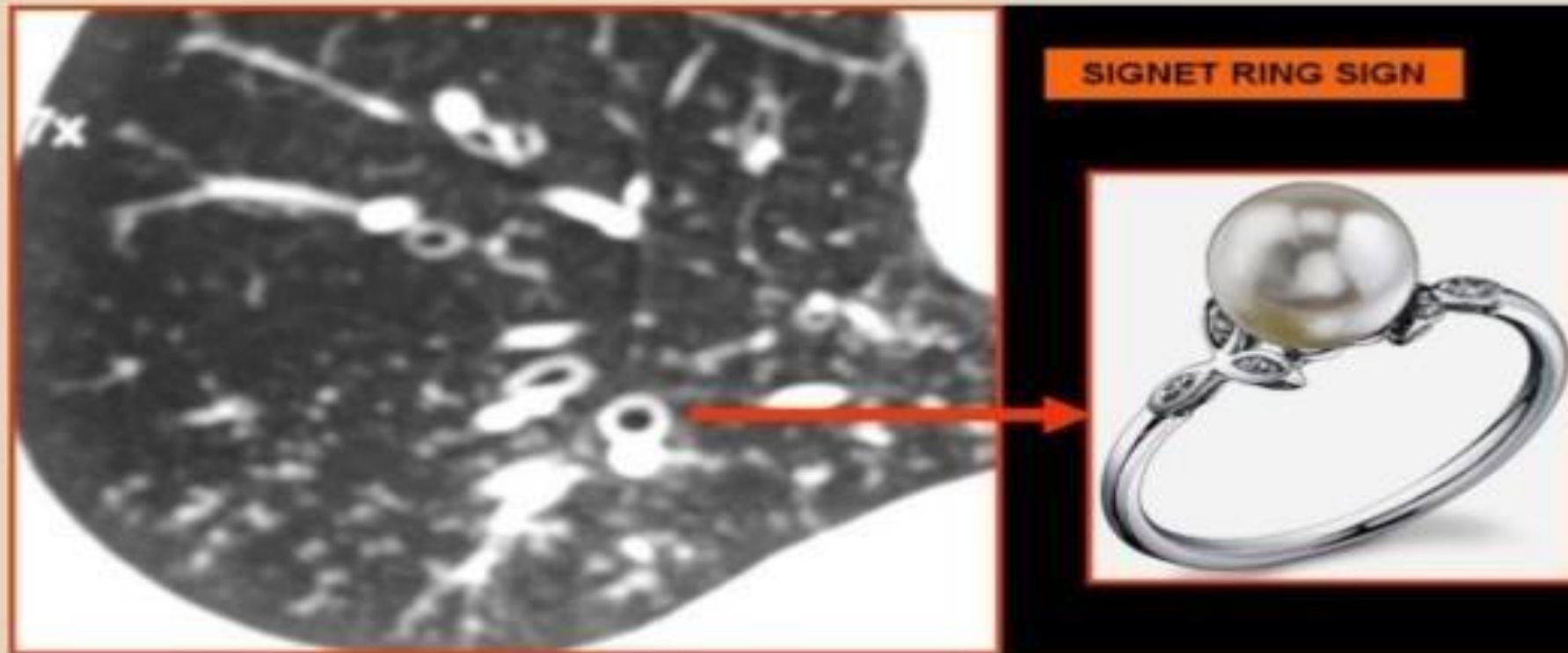
Bronchiectasis

Seen on CT/HRCT scans of chest

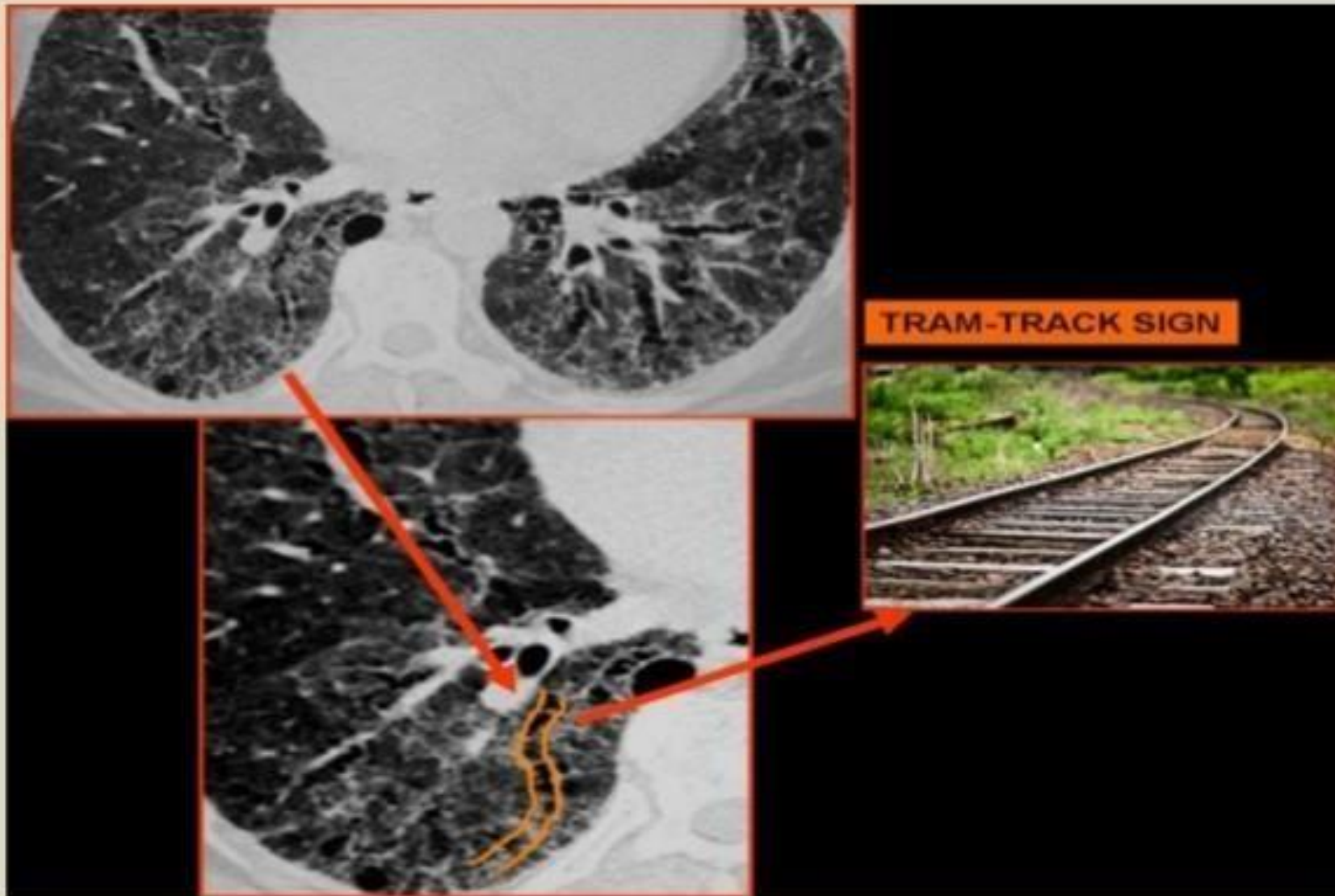
CT finding in patients with bronchiectasis

Ring shadow representing dilated thick-walled bronchus

associated with a nodular opacity representing pulmonary artery



SIGNET RING SIGN. Chest CT shows small bronchiectasis.



TRAM-TRACK SIGN. Chest CT demonstrates tram-track sign. Schematic drawing and corresponding picture.

Kartagener's syndrome

dextrocardia /situs
inversus + bronchiectasis +
sinusitis



Table 9-4. Causes of Pleural Effusion

Transudative	Exudative
Heart failure	Parapneumonic effusions (pneumonia)
Nephrotic syndrome	Malignancy (lung, breast, lymphoma)
Liver disease	Tuberculosis
Pulmonary embolism	Pulmonary embolism
Atelectasis	Collagen vascular disease (rheumatoid arthritis, systemic lupus erythematosus)
	Drug induced
	Pancreatitis

Exudative pleural effusion, along with pleural fluid acidosis (pH <7.20) and low pleural fluid glucose (< 60 mg/dL) complicated parapneumonic effusion, rheumatoid pleurisy, drug-induced lupus, tuberculosis, and malignancy.



Table 9-5. Light Criteria for Exudative Pleural Effusion

	Transudative	Exudative
LDH effusion	<200 IU/mL	>200 IU/mL
LDH effusion/serum ratio	<0.6	>0.6
Protein effusion/serum ratio	<0.5	>0.5

Parameter	Uncomplicated parapneumonic effusion	Complicated parapneumonic effusion	Empyema
Etiology	Movement of fluid from pneumonia into visceral pleura	Persistent bacterial invasion into pleural fluid	Bacterial colonization, purulent fluid
Pleural fluid analysis	pH > 7.20, ↓ to normal glucose, LDH ratio > 0.6	pH < 7.20, ↓ glucose, LDH ratio > 0.6	pH < 7.20, ↓ glucose, LDH ratio > 0.6
Pleural fluid Gram stain	Negative	Negative	Positive
Pleural fluid culture	Negative	Usually negative	Usually positive
Treatment	Antibiotics	Antibiotics, usually requires chest tube drainage	Antibiotics + chest tube drainage





Blood-stained pleural aspirate: This patient had pleural secondaries from carcinoma of the breast.



Pleural transudate: This pale effusion is typically found in patients with heart failure or other causes of generalized edema.



Chylous pleural effusion: This patient had bronchial carcinoma, which had invaded and obstructed the thoracic duct.

When pleural fluid protein concentrations are in the 70 to 80 g/L range, **Waldenstrom's macroglobulinemia and multiple myeloma should be considered.**

The protein content of exudates is > 30 g/L and the LDH is > 200 IU/L.

A low pleural fluid glucose concentration

(< 60 mg/dL or a pleural fluid/serum glucose ratio < 0.5)

1. Rheumatoid pleurisy.
2. Complicated parapneumonic effusion or empyema.
3. Malignant effusion.
4. Tuberculous pleurisy.
5. Lupus pleuritis.
6. Esophageal rupture.

The lowest glucose concentrations are found in **rheumatoid pleurisy and empyema**, with glucose being undetectable in some cases.

- Describe the abnormality in this X-ray ?

- Radio opacity all over the lung filed (patchy)
Cannonball sign (lung metastasis)

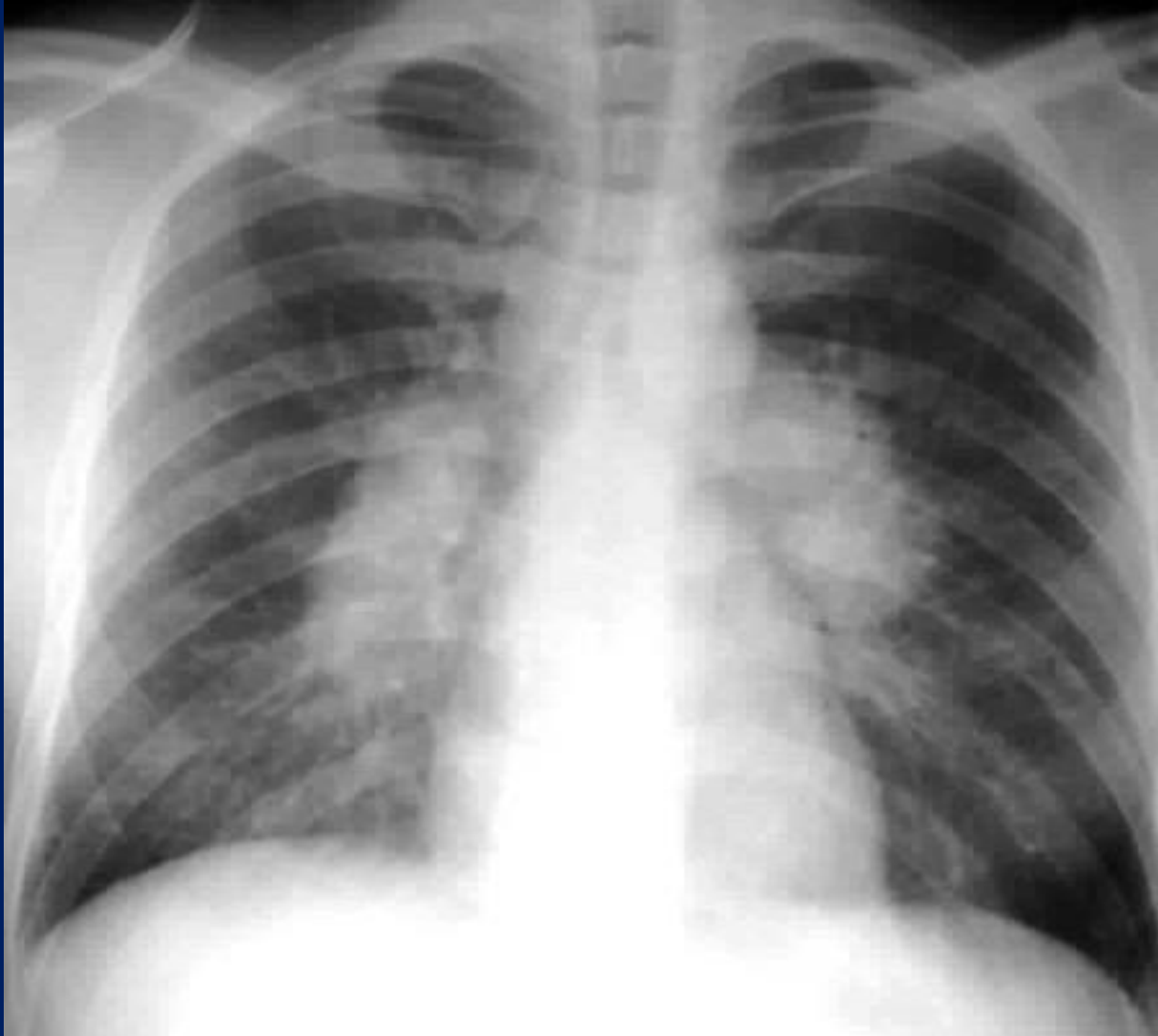
- List 3 causes predispose to this problem ?

1. GI tumor ✓
2. RCC ✓
3. Prostate cancer ✓

} Common.



Bilateral hilar LN + IS infiltrate.



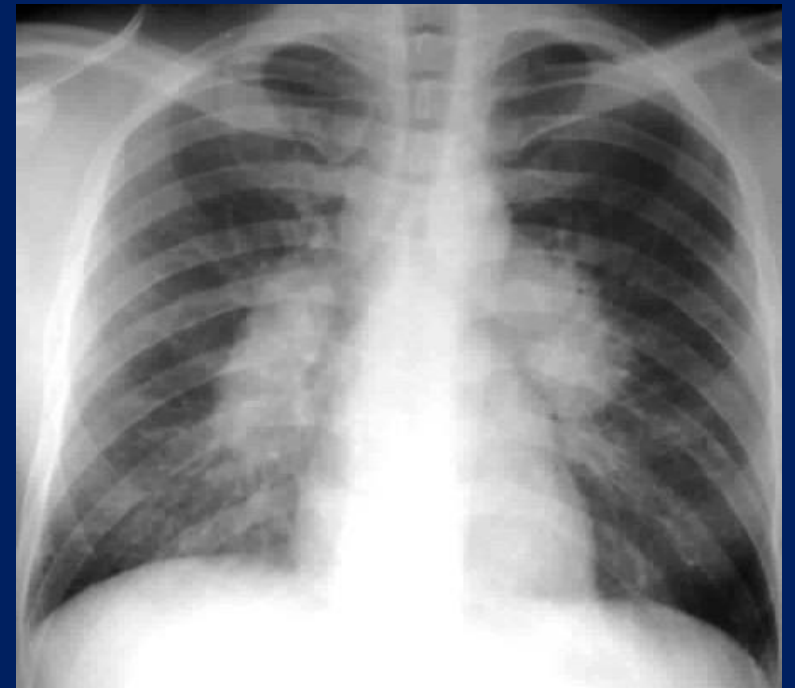
lupus pernio.

stage 0 = normal

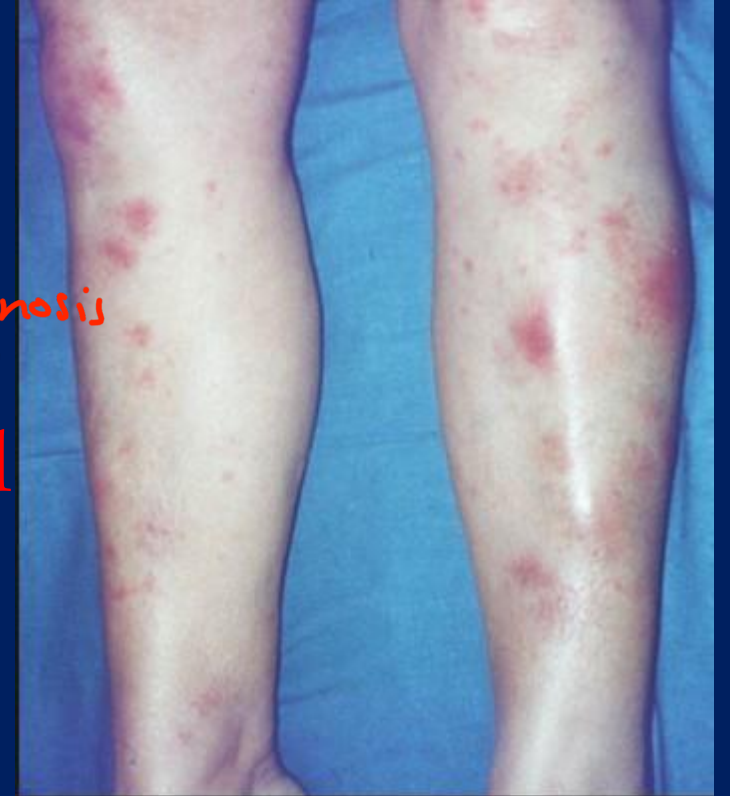
stage 1 = bilateral hilar lymphadenopathy

(BHL) stage 2 = BHL + interstitial
infiltrates

- stage 3 = diffuse interstitial infiltrates only stage 4 = diffuse fibrosis
- The most common causes of bilateral hilar lymphadenopathy are sarcoidosis and tuberculosis
- lupus pernio
- Erythematous–violaceous plaque on the dorsum of the nose



- **Lofgren's syndrome** is an acute form of sarcoidosis characterised by bilateral hilar lymphadenopathy (BHL), erythema nodosum, fever and polyarthralgia. *good prognosis*
- It typically occurs in young females and carries an excellent prognosis



Indications for
steroids

hypercalcaemia
worsening lung
function

eye, heart or neuro involvement

Pulmonary Hypertension



Prominent pulmonary
marking.
+ enlarged pulmonary A.

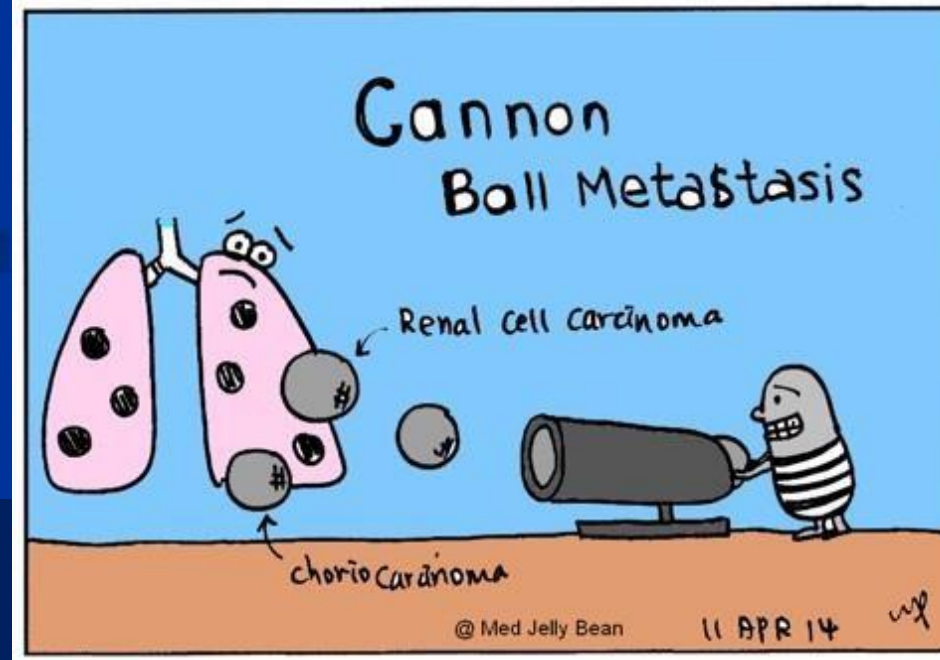
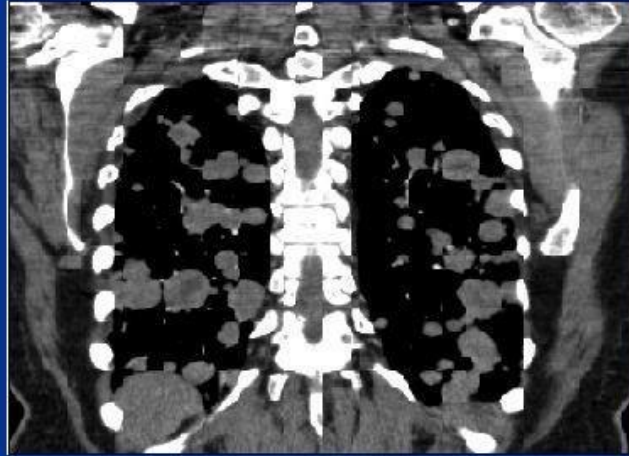
- Pulmonary hypertension. Chest radiograph in a patient with secondary pulmonary hypertension reveals enlarged pulmonary arteries. This patient was found to have an atrial septal defect.

TABLE 2. Clinical classification of pulmonary hypertension

GROUP 1	Primary pulmonary hypertension: idiopathic, familial, drug and toxin induced (appetite suppressant drugs), rare medical conditions
GROUP 2	Secondary to left ventricular disease: mitral valve disease, left ventricular systolic or diastolic failure.
GROUP 3	Secondary to pulmonary disease or hypoxia: COPD, sleep disordered breathing, obesity hypoventilation
GROUP 4	Secondary to chronic thromboembolism
GROUP 5	Unclear and multifactorial etiologies

Abbreviations: COPD: chronic obstructive pulmonary disease

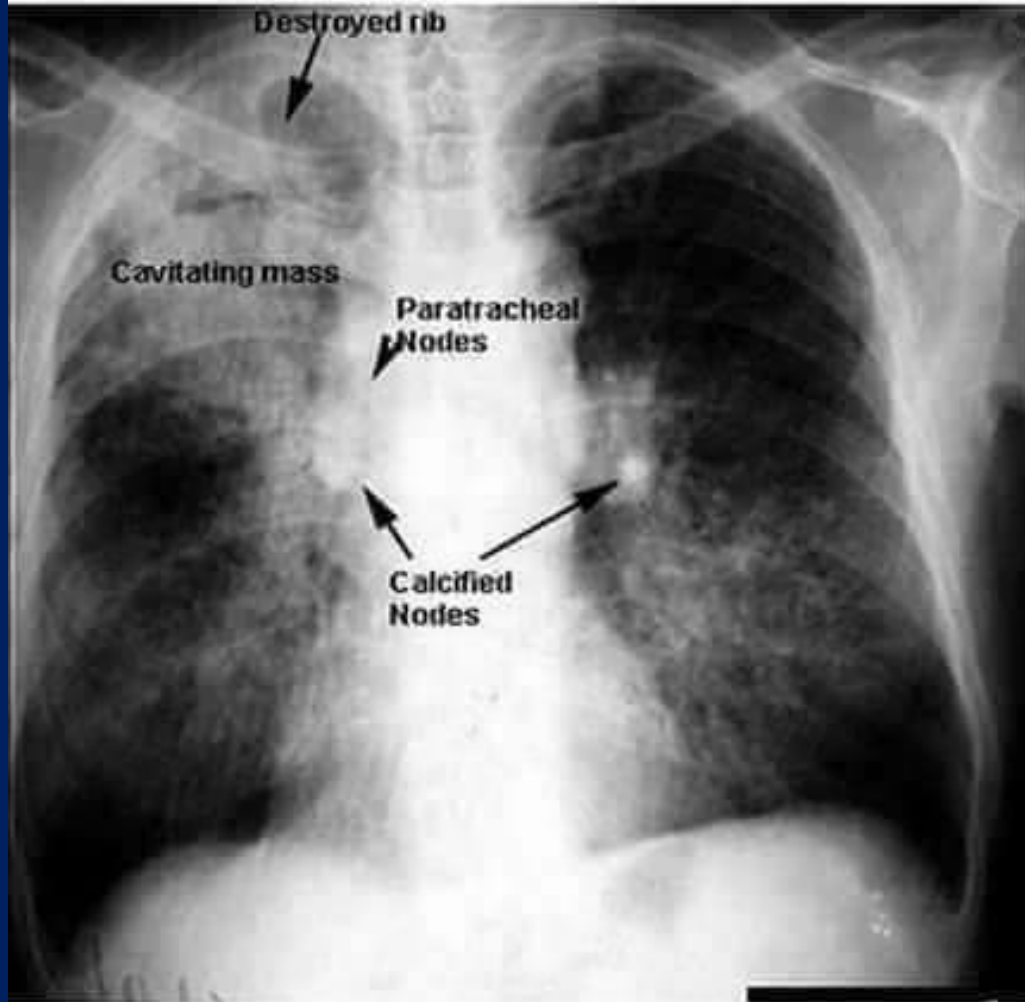
'Cannon Ball' Pulmonary Metastases





Pancoast Tumour *apical tumor.*

there is Bone lytic lesion



- Right apical mass
- Cavitating mass
- Para tracheal nodes
- 2nd rib destruction
- Calcified nodes (silicosis)



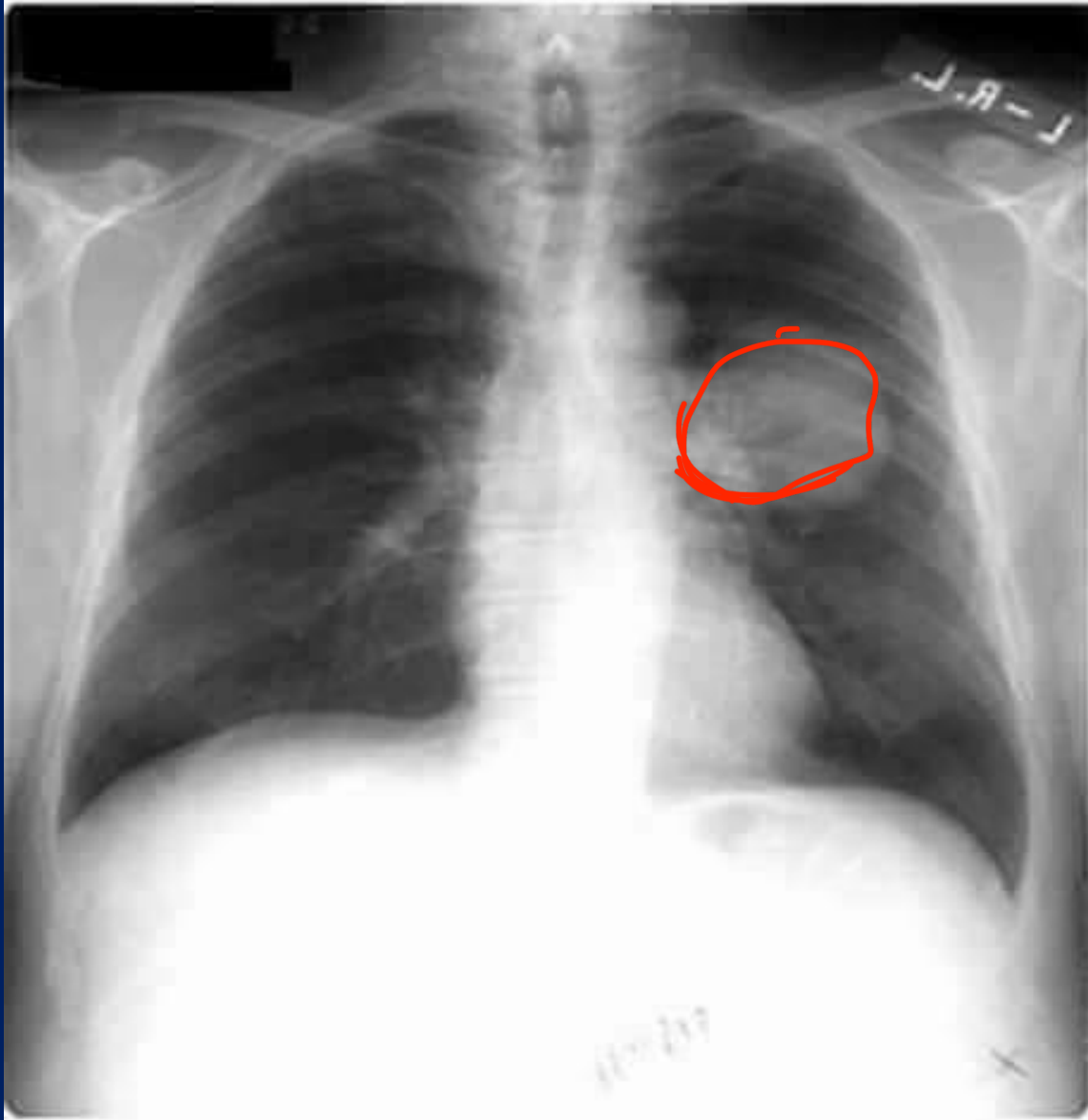
Large Cell Cancer



- Large Cell Cancer
- Mass RUL



Lung Mass



- Mass
- Round or oval
- Sharp margin
- Homogenous
- No respect for anatomy
- Lung Cancer: Large cell



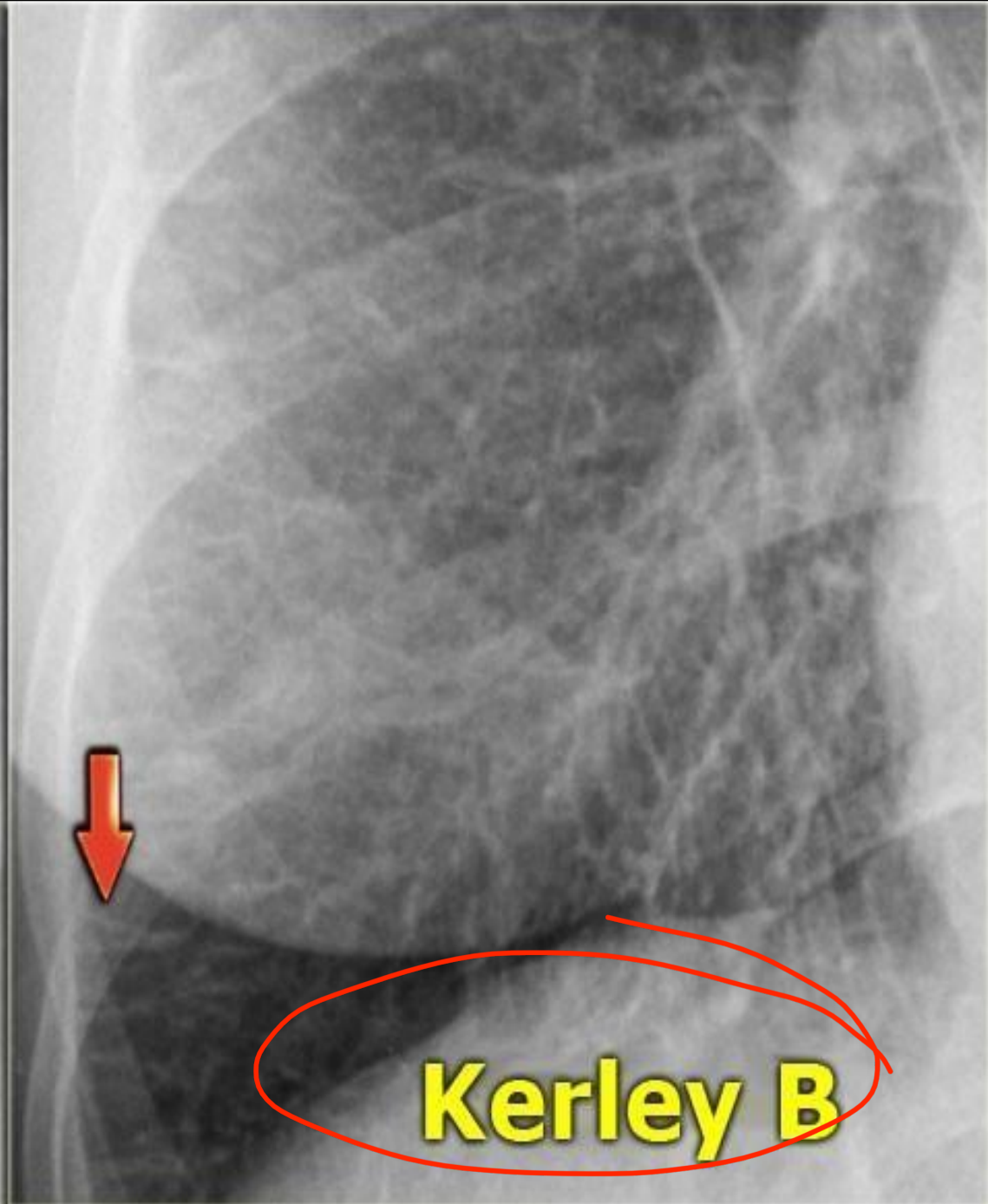
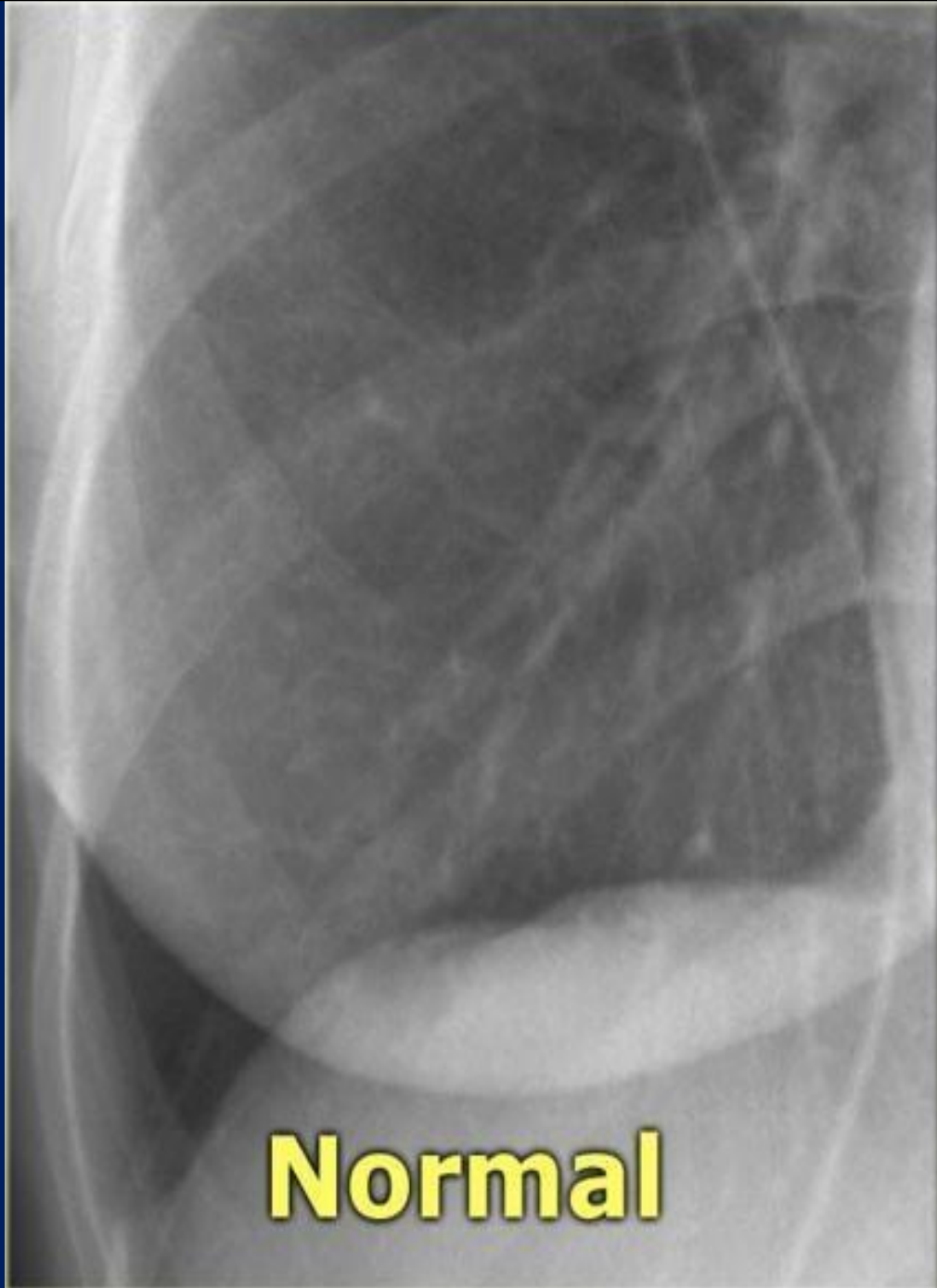
Pulmonary Edema in pt with R side HF

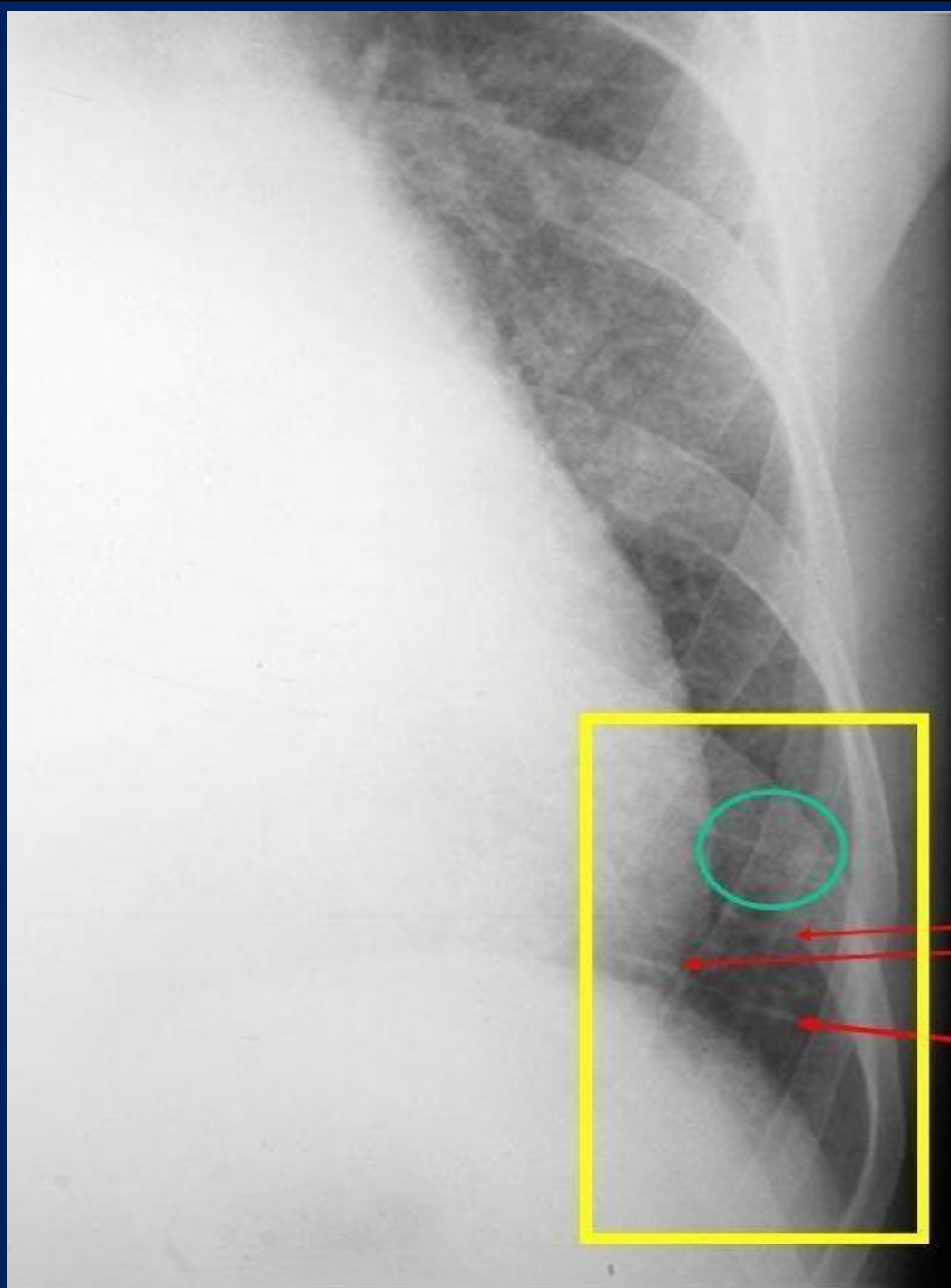


- Bilateral
- Diffuse
- Butterfly pattern
- Soft fluffy lesions
- Coalescing
- Air bronchogram

- cardiomegaly
- Kerley B line

— in the periphals





Kerley B-Lines

- Fine horizontal opacified lines representing pulmonary edema
- Seen in **CHF**, pulmonary fibrosis, heavy metal fibrosis, malignancy

Pulmonary edema signs

- Cardiomegaly ✓
- Fluffy opacity Bilateral ✓
- Kerly b lines ✓