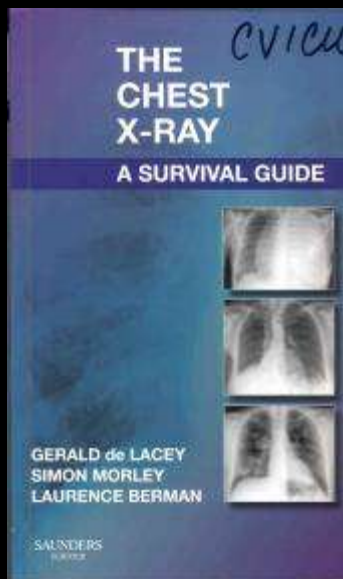


As Easy as Black & White: CXR Interpretation

Cheryl Herrmann
CARDIAC CLINICAL NURSE SPECIALIST
APN, CCRN, CCNS-CSC/CMC

cherrmann@frontier.com
www.cherylherrmann.com



Power Point Handout available at
www.cherylherrmann.com

References

- Connolly M A. Black, white, and shades of gray: Common Abnormalities in chest radiographs. *AACN Clinical Issues*. 2001;12(2):259-289.
- **Lacey G, Morley S , et Berman L. *The Chest X-ray: A Survival Guide*. Philadelphia: Saunders/Elsevier.2008**
- **Siela D. Chest radiograph evaluation and interpretation. *Advanced Critical Care*. 2008;19(4):444-475.**
- Siela D. Advanced Chest Imaging Interpretation of Acute Pulmonary Disorders. *AACN Advanced Critical Care*. 2015;25(4):365-386
- Huseby JS, Ledoux D. Radiologic Examination of the Chest. In: Woods SL, Froelicher S, Motzer SA, Bridges, E J,ed. *Cardiac Nursing*, 5th ed. Philadelphia: Lippincott Williams & Wilkens. 2005: 296-306.
- <http://radiologymasterclass.co.uk/tutorials/tutorials.html>
- www.medmastery.com

Basics of Xrays

- Photograph negative principle
- White color indicates lack of exposure
- Black color indicates intense exposure
- Dense substances absorb all the rays and appear white on the film
- Soft tissues and air absorb part of the beam and appear gray or black

Whitest

- Bone: Ribs, Sternum, Spine, Clavicle
- Barium
- Calcium Deposits
- Prosthetic valves
- Surgical wires, clips

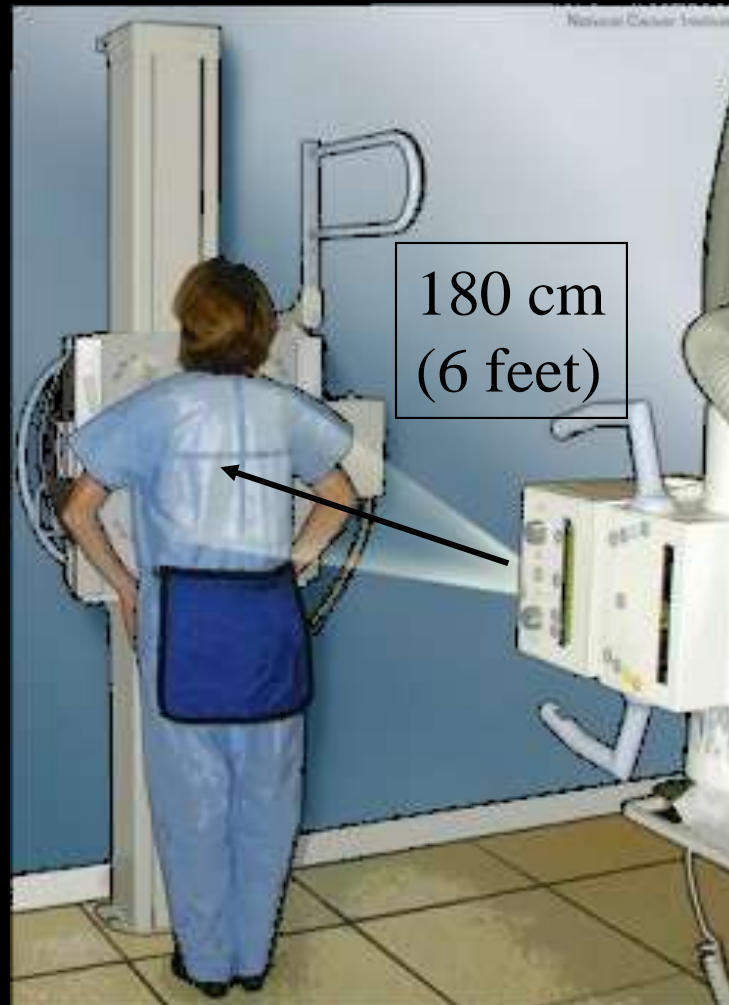
Off White -- Gray

- Fluid
- Blood
- Heart
- Veins/arteries
- Aorta
- Skin/fat

Blackest

- Air
- Lungs
- Trachea
- Stomach
- Bowel

PA = Posterior to Anterior



AP = Anterior to Posterior

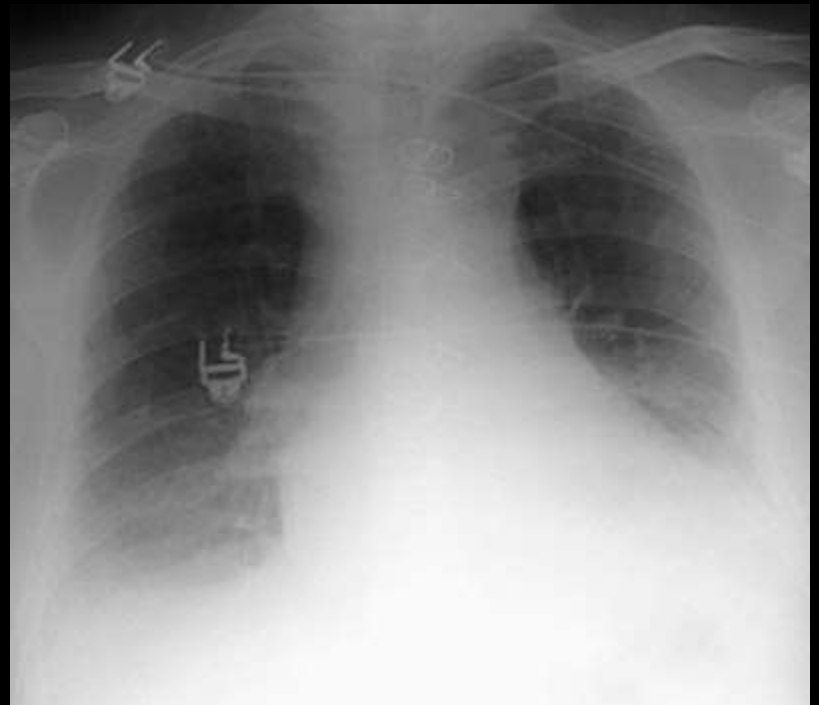


Projections

- PA – 6 feet



- AP -- Heart and mediastinum are magnified at 40 inches compared to PA at 6 feet



Lateral:
Named for the part of the anatomy closest to the film



Right Lateral Decubitus position



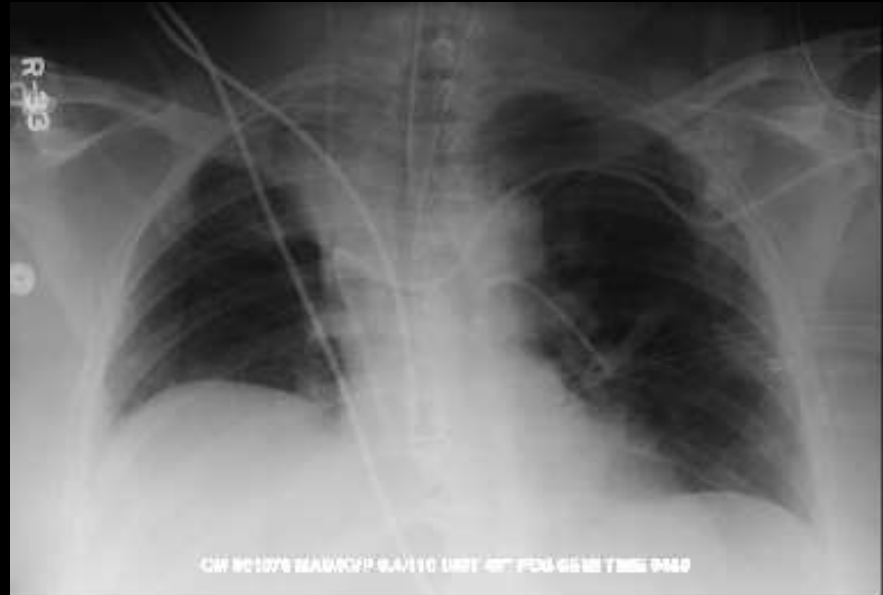
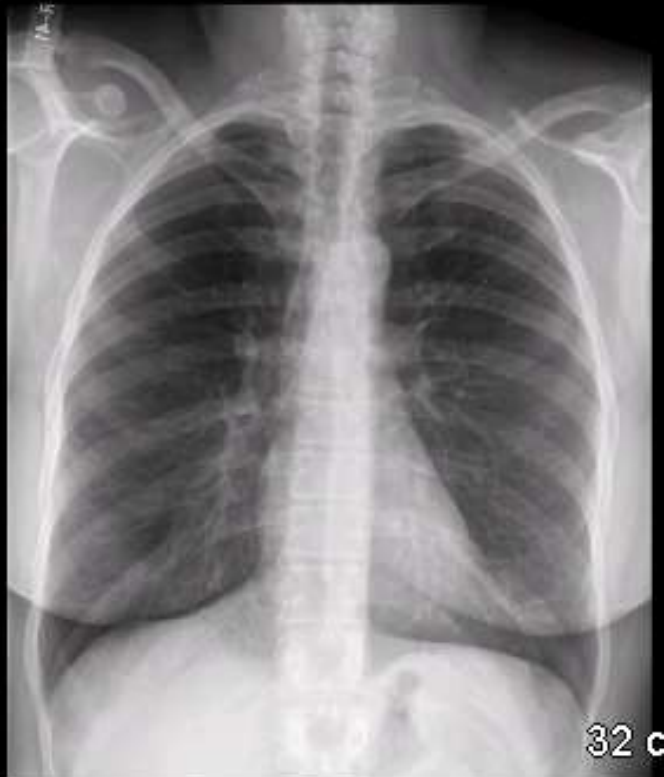
- Lateral: Named for the part of the anatomy closest to the film
- Decubitus: Side lying

Good technique is essential

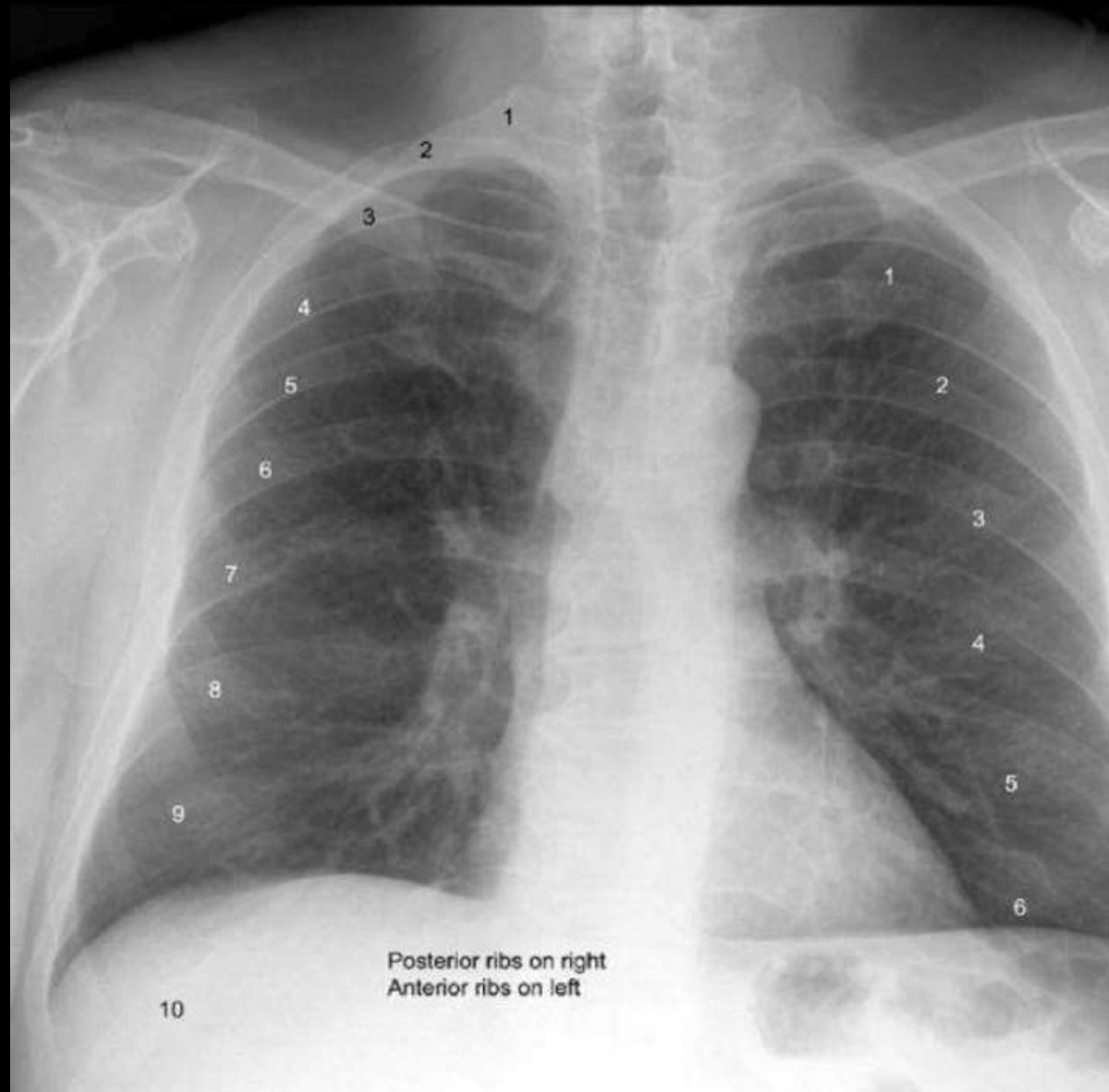
- Take in an upright position
 - Fluid will go to the bases and form a line
 - Air rises
- Remove unnecessary lines and wires to prevent obscuring the underlying structures
- Ensure all structures including bases of the lungs are visible

Full Inspiration 9 – 10 ribs should be visible

- Good Inspiration
- Poor inspiration



Ribs



Systematic Approach of Reading Chest Xray

1. Technique & rotation
2. Bony structures
3. Soft tissues
4. Lungs/trachea/pulmonary vasculature
5. Diaphragm and pleura
6. Mediastinum
7. Heart and great vessels
8. Non-physiological structures

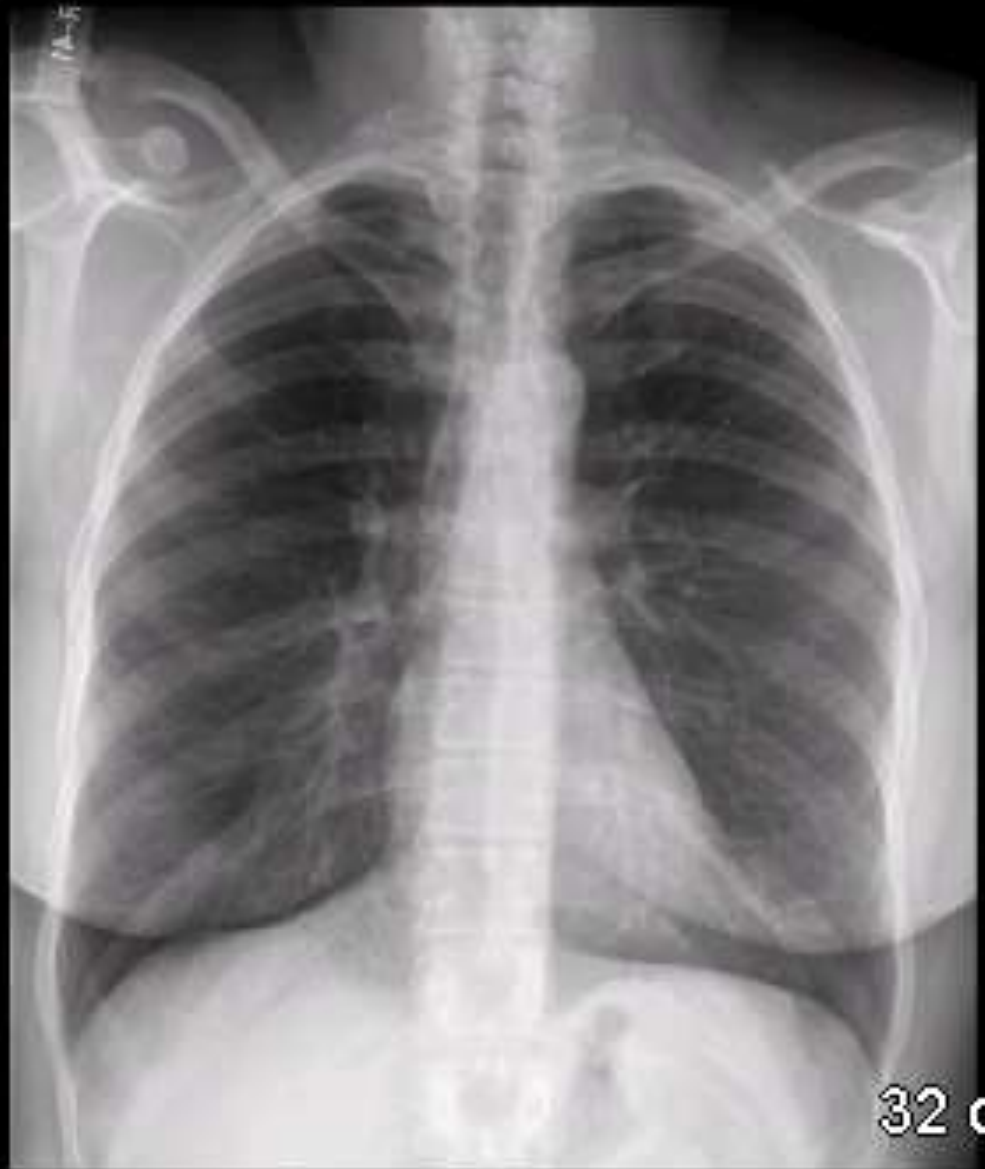
The obvious abnormality

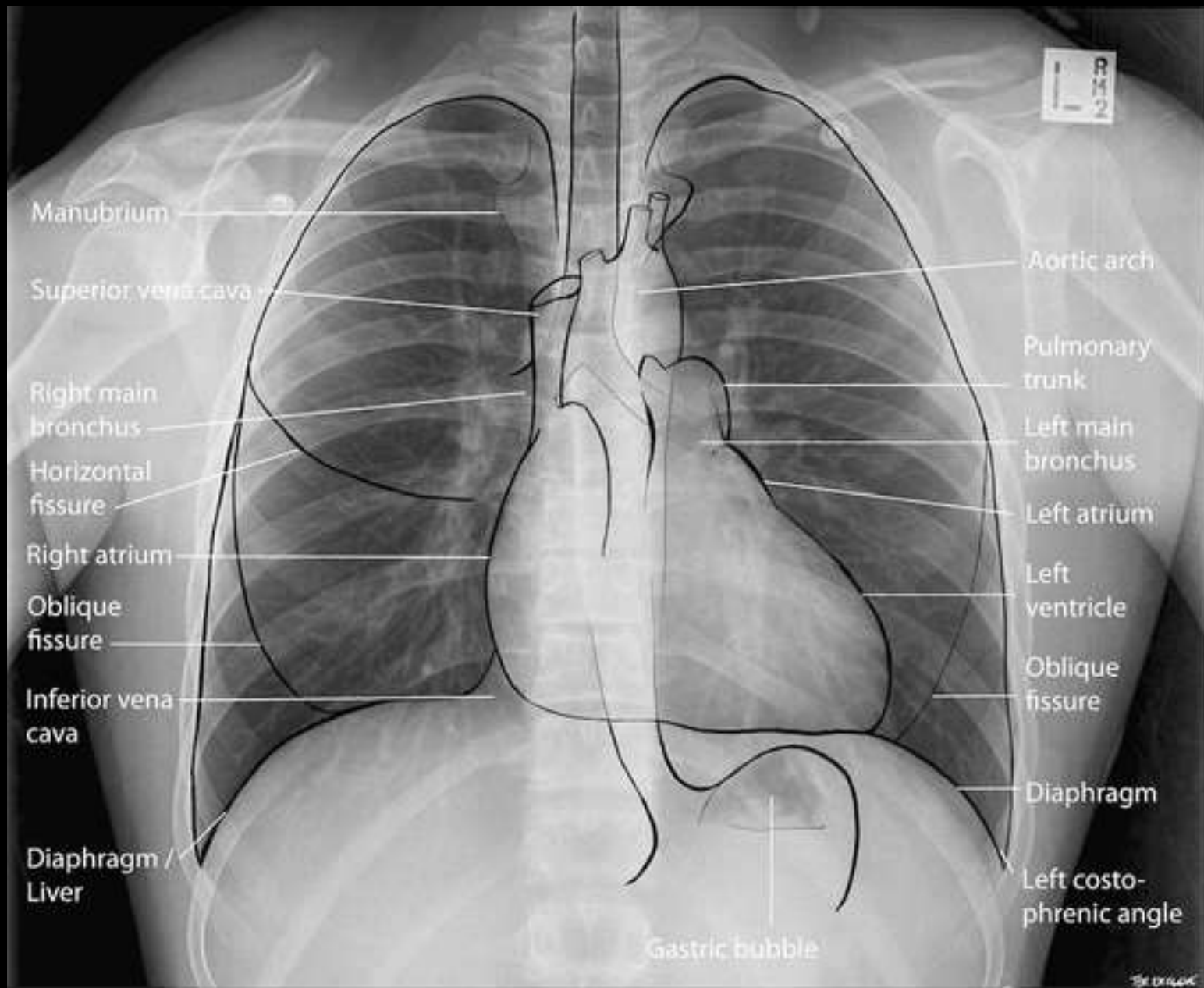
- The rule is - don't ignore the 'elephant' on the image - describe its long trunk, its big ears, its tusks, and its rough, grey skin.
- Once you've done this you stand a better chance of diagnosing the 'animal' you are dealing with, but you should then continue by using a systematic approach to look at the rest of the image.



http://radiologymasterclass.co.uk/tutorials/chest/chest_system/chest_system_03.html

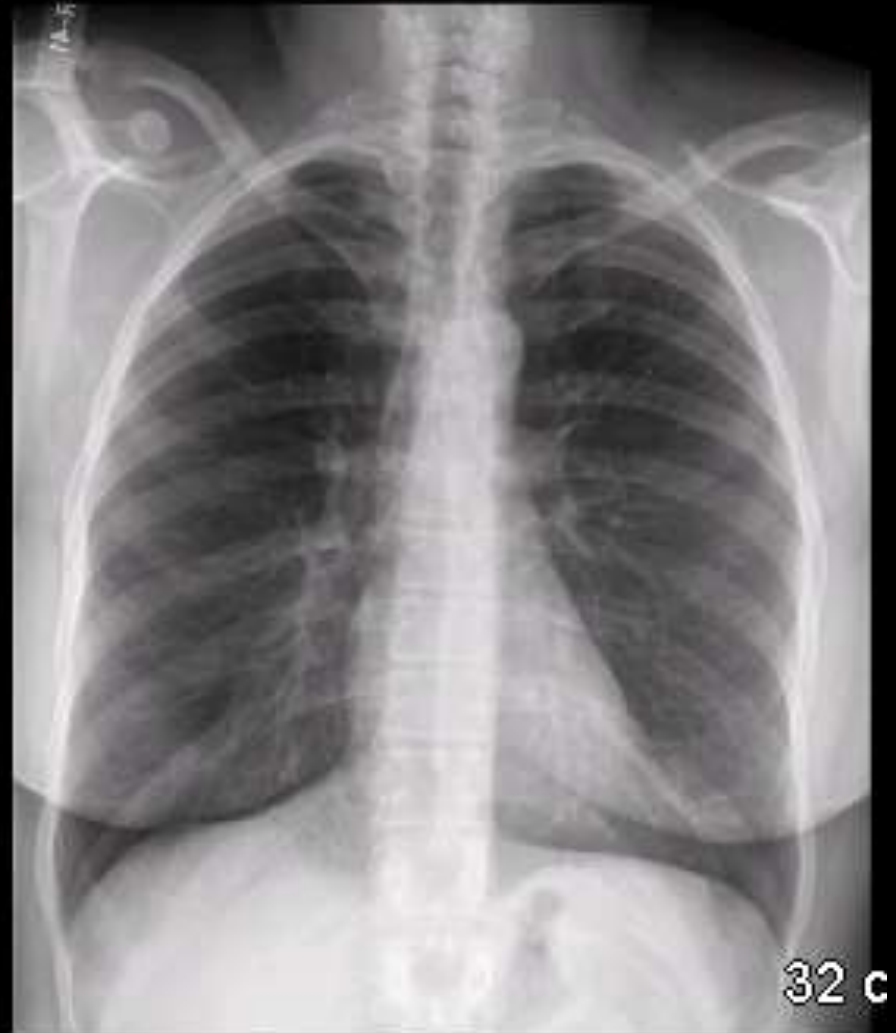
Normal AP

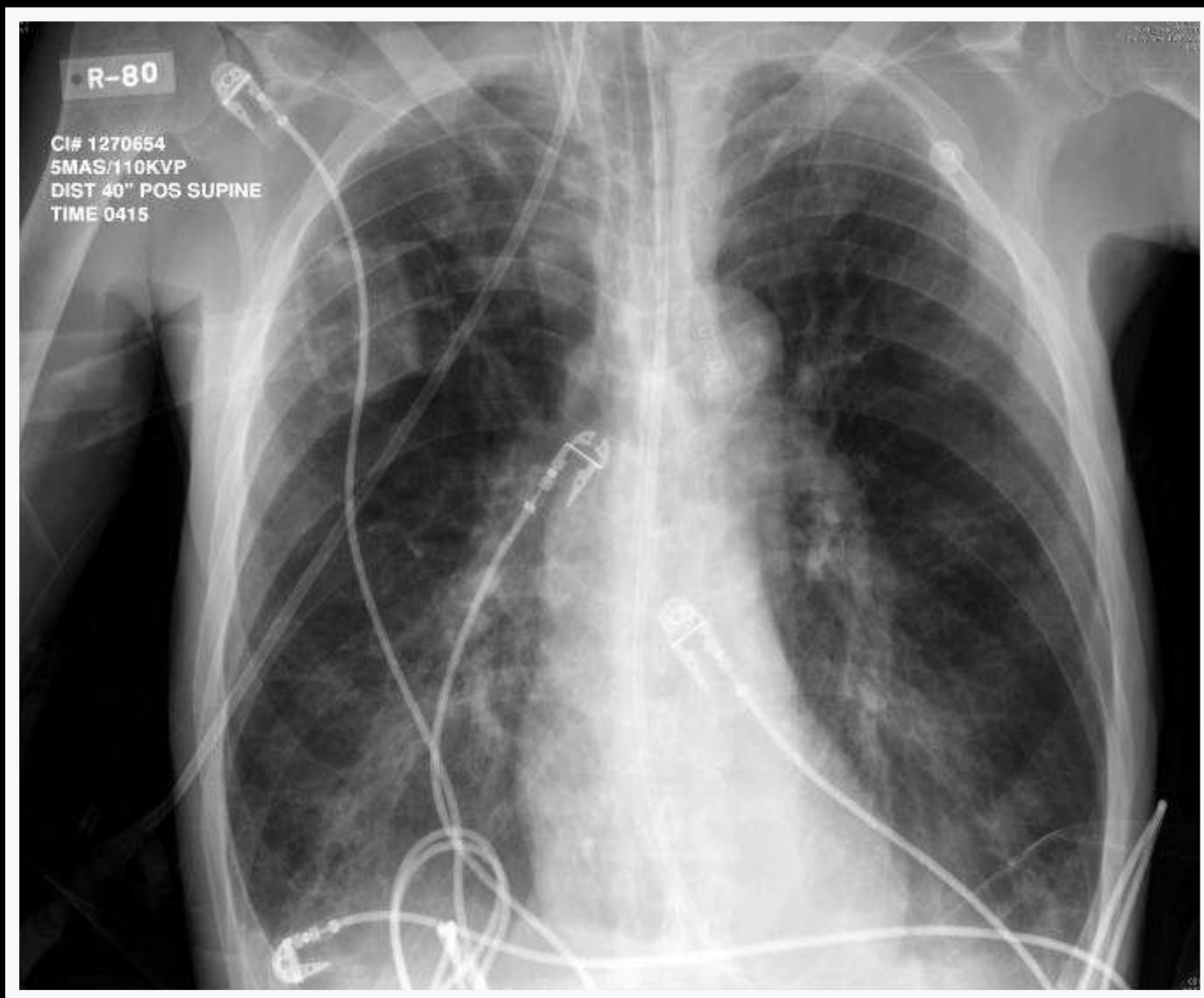




Boney Structures

- Is the entire thorax visible?
- Shape of the thorax – emphysema, polio, scoliosis?
- Any rib fractures?





Hyperexpanded lungs consistend with emphysematous change, Bibasilar fibrosis

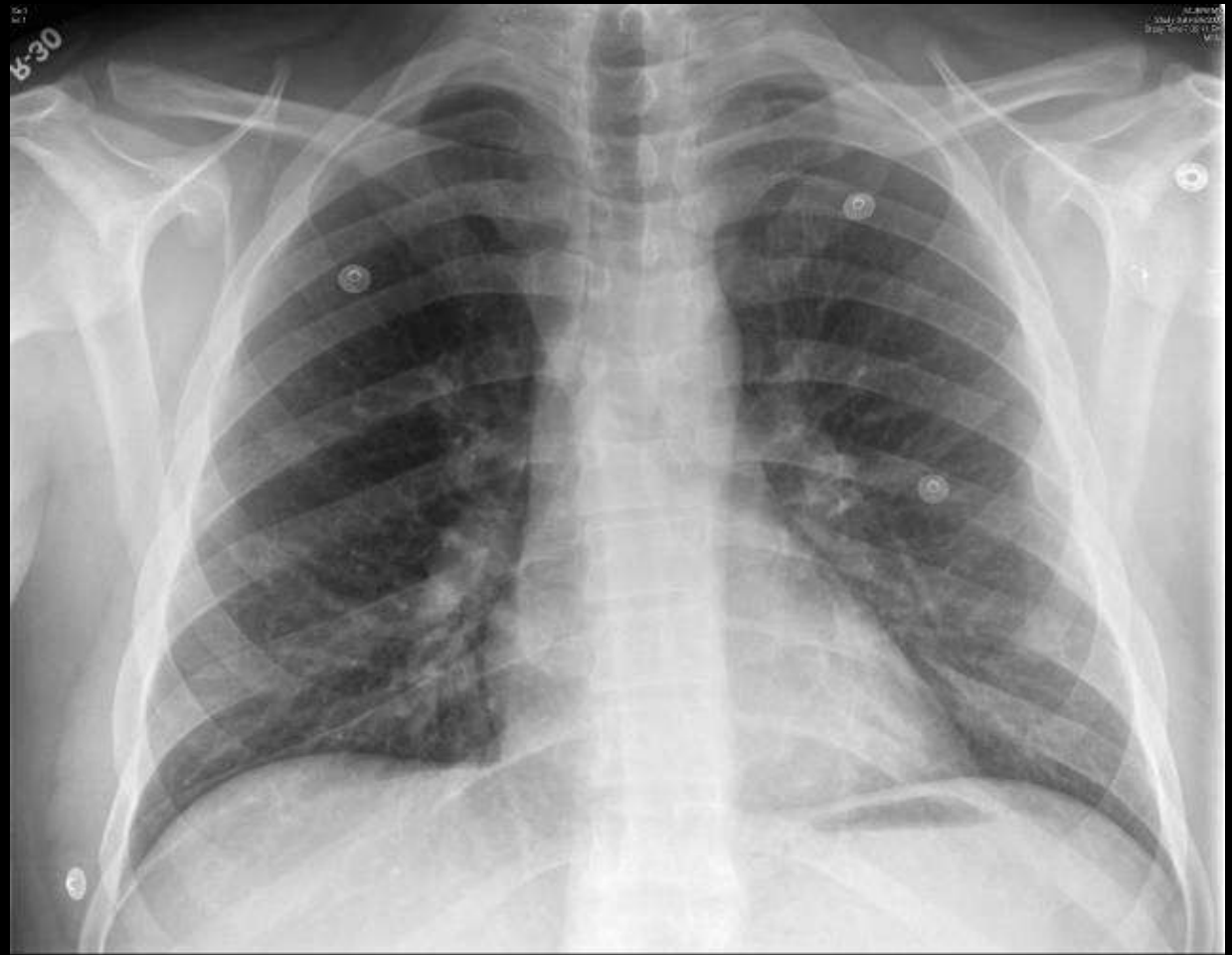
Severe dextro-convex curvature of midthoracic spine



Right rib fractures



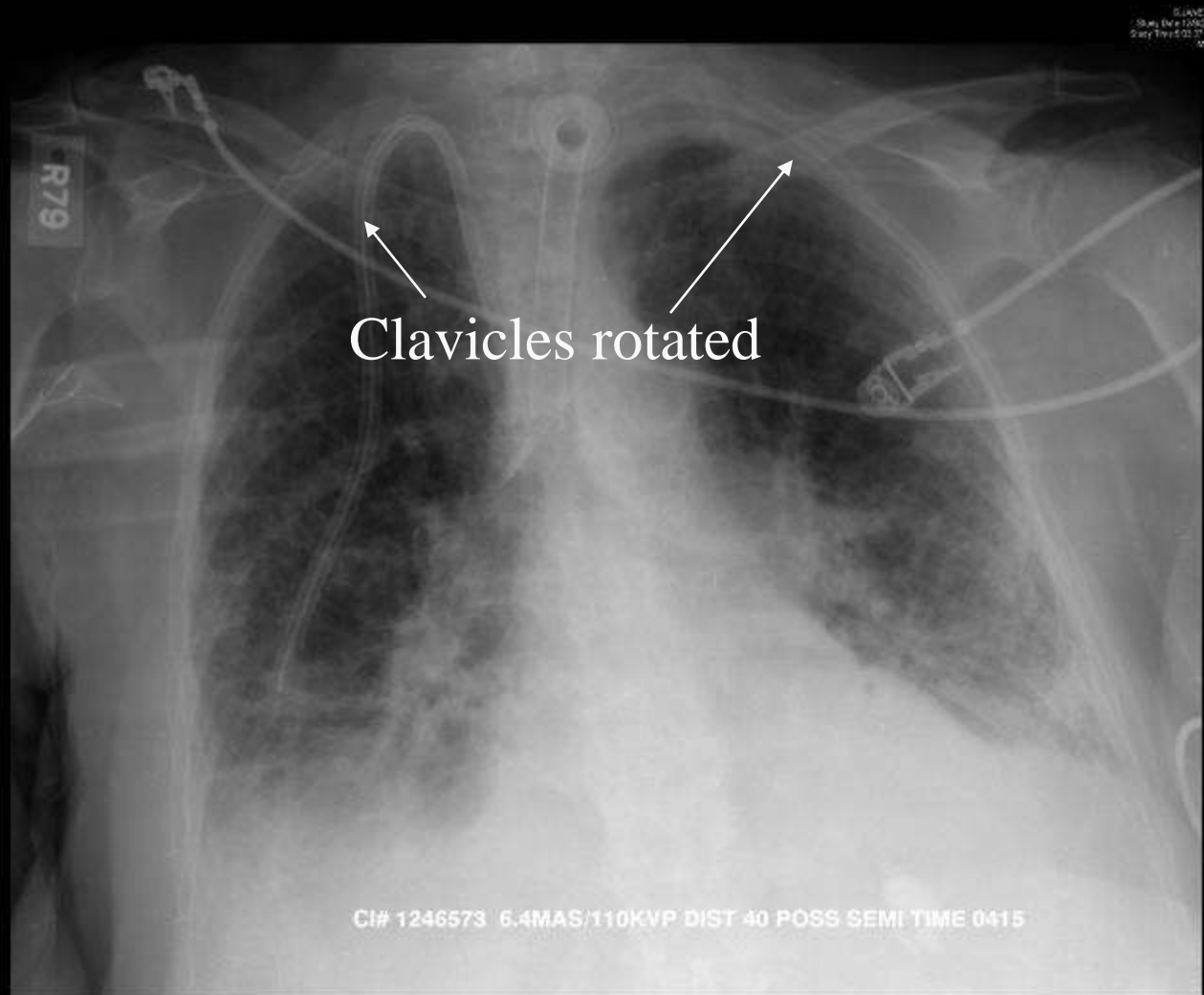
- Old healed
Fx Left
Clavicle and
left ribs



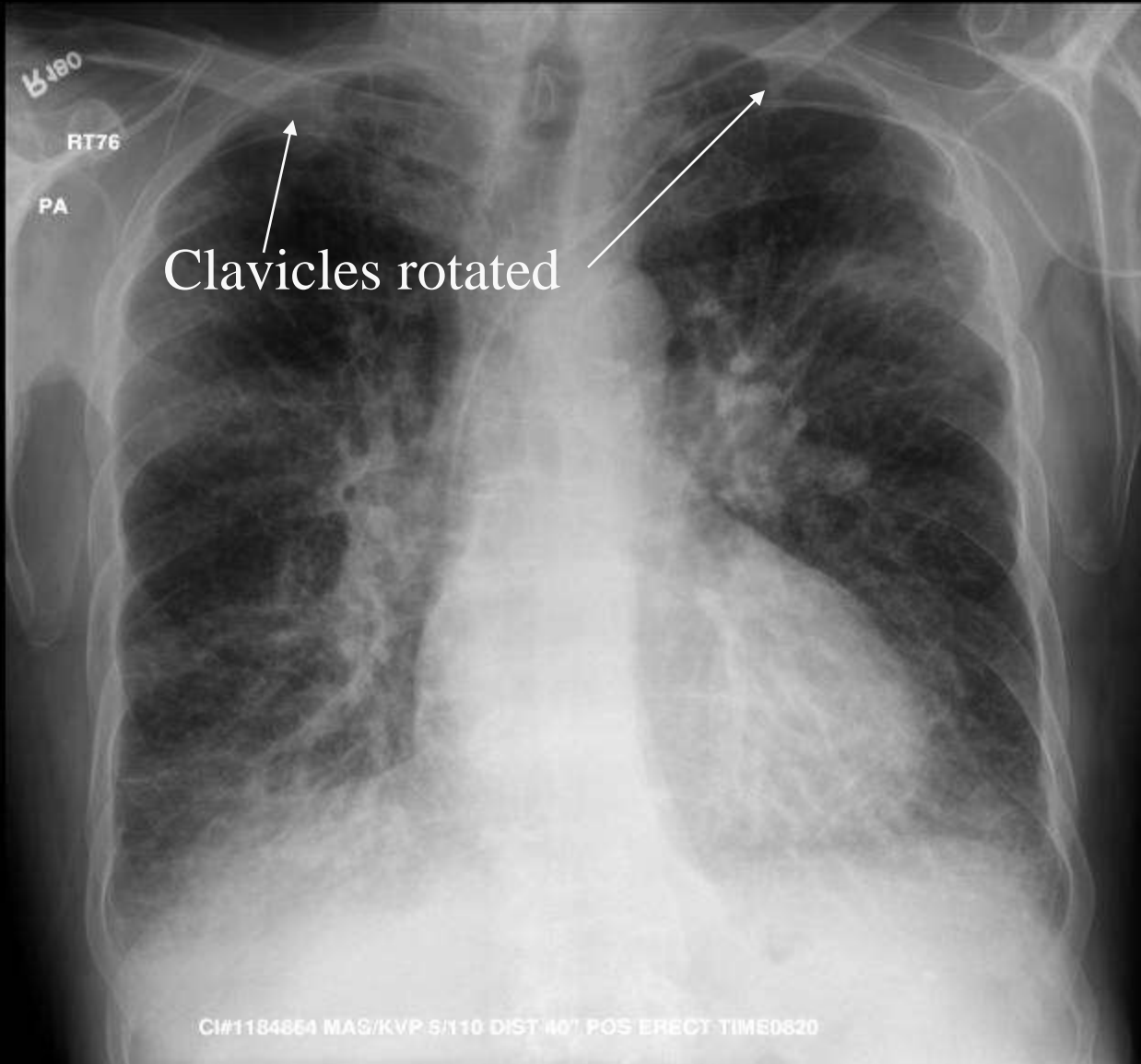
- Clavicles help identify patient rotation
- Should be symmetrical



Rotation



54-1
10/1/1



G. ROBERT, D.
Study Date: 10/1/10
Study Time: 08:20 AM
MRS.

0011
WJCR

Soft Tissues

- Check neck and axilla for SQ emphysema, hematomas, tumors
- Large breast tissue may obscure lung field to some extent

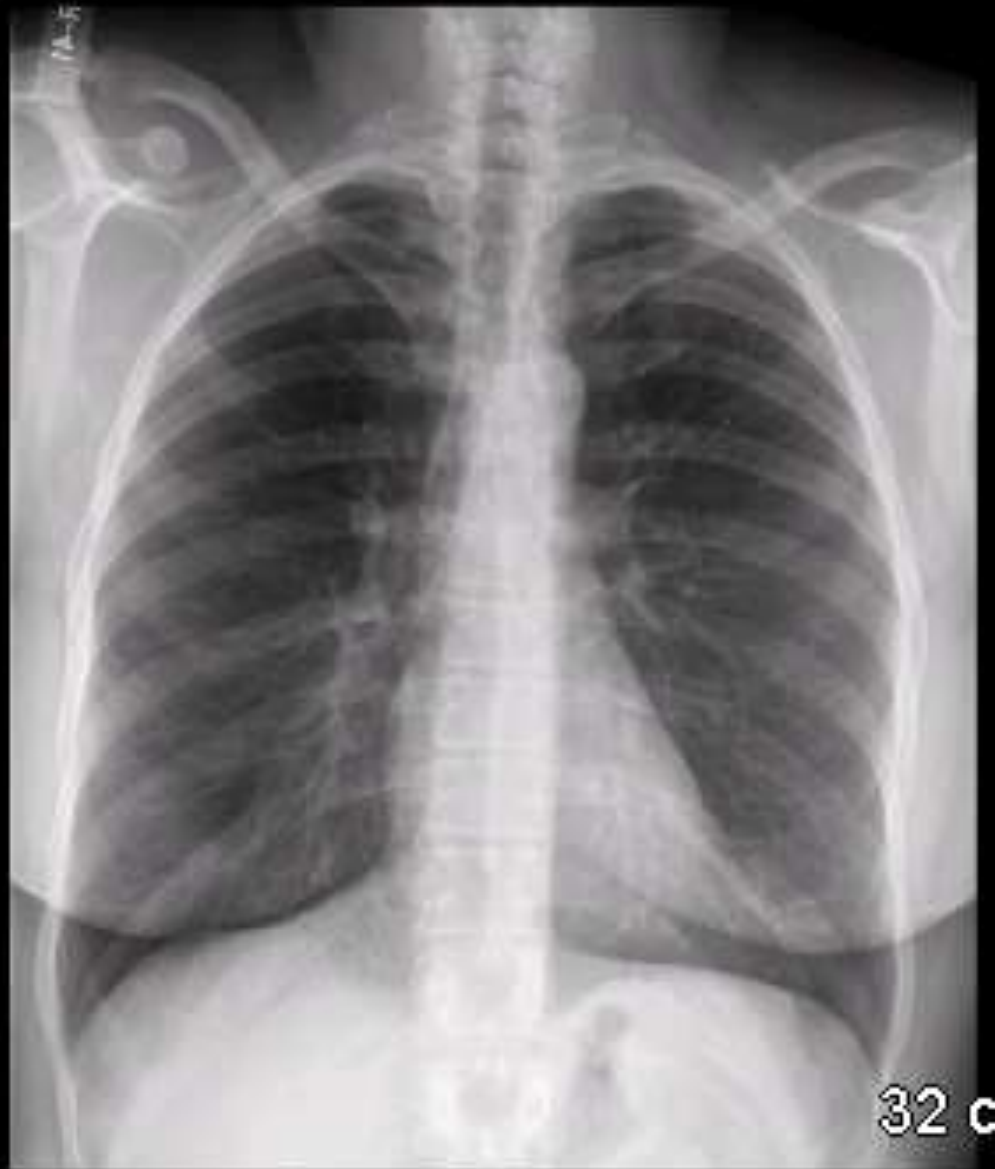
Breast Tissue

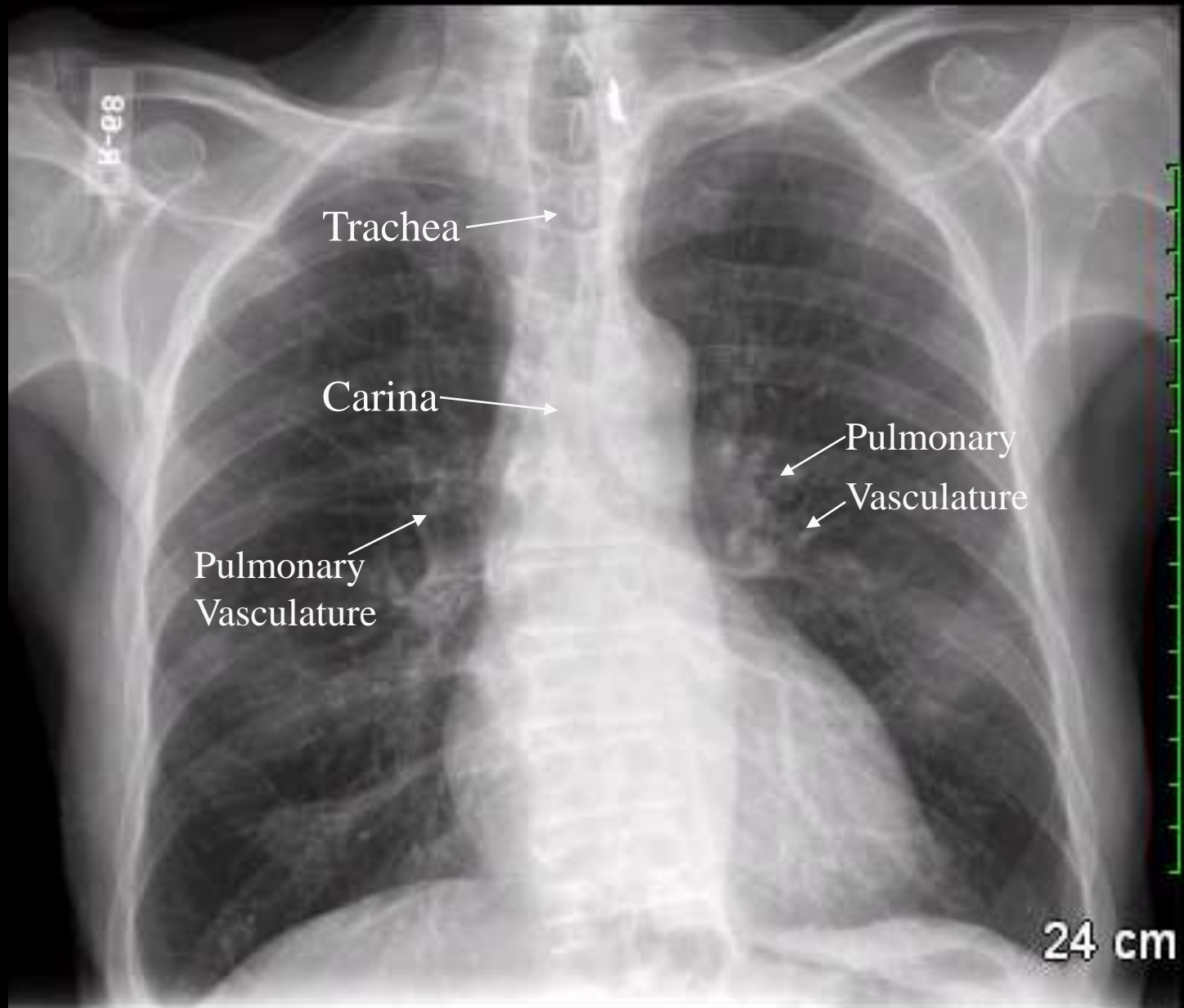


Lungs/Trachea/pulmonary vasculature

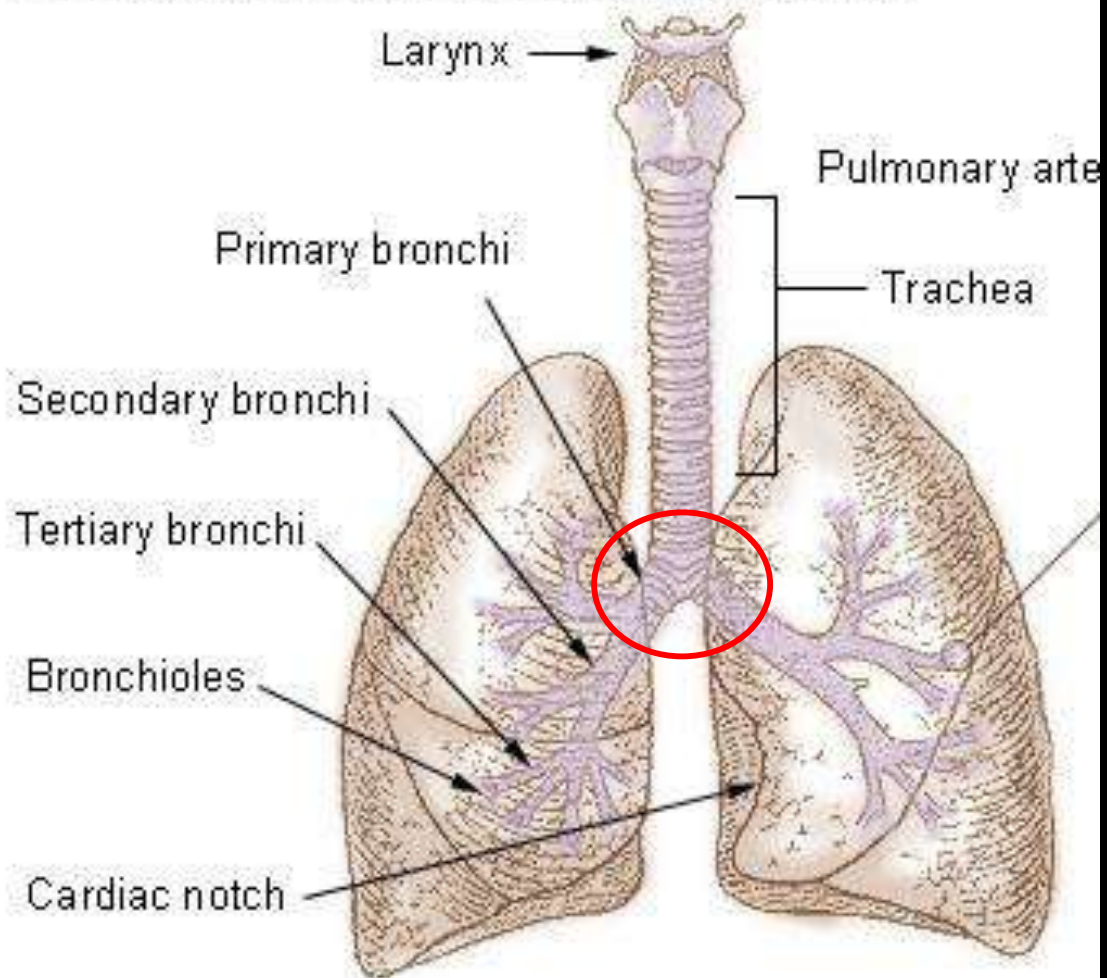
- Check expansion of lungs
- Is the entire thorax visible?
- The lungs are radiolucent with traces of gray linear marking which are blood vessels
- Carina (where trachea divides into right and left bronchus) should be visible with slightly blacker outline over the lung fields themselves. May need to slightly elevate the film to visualize the carina.

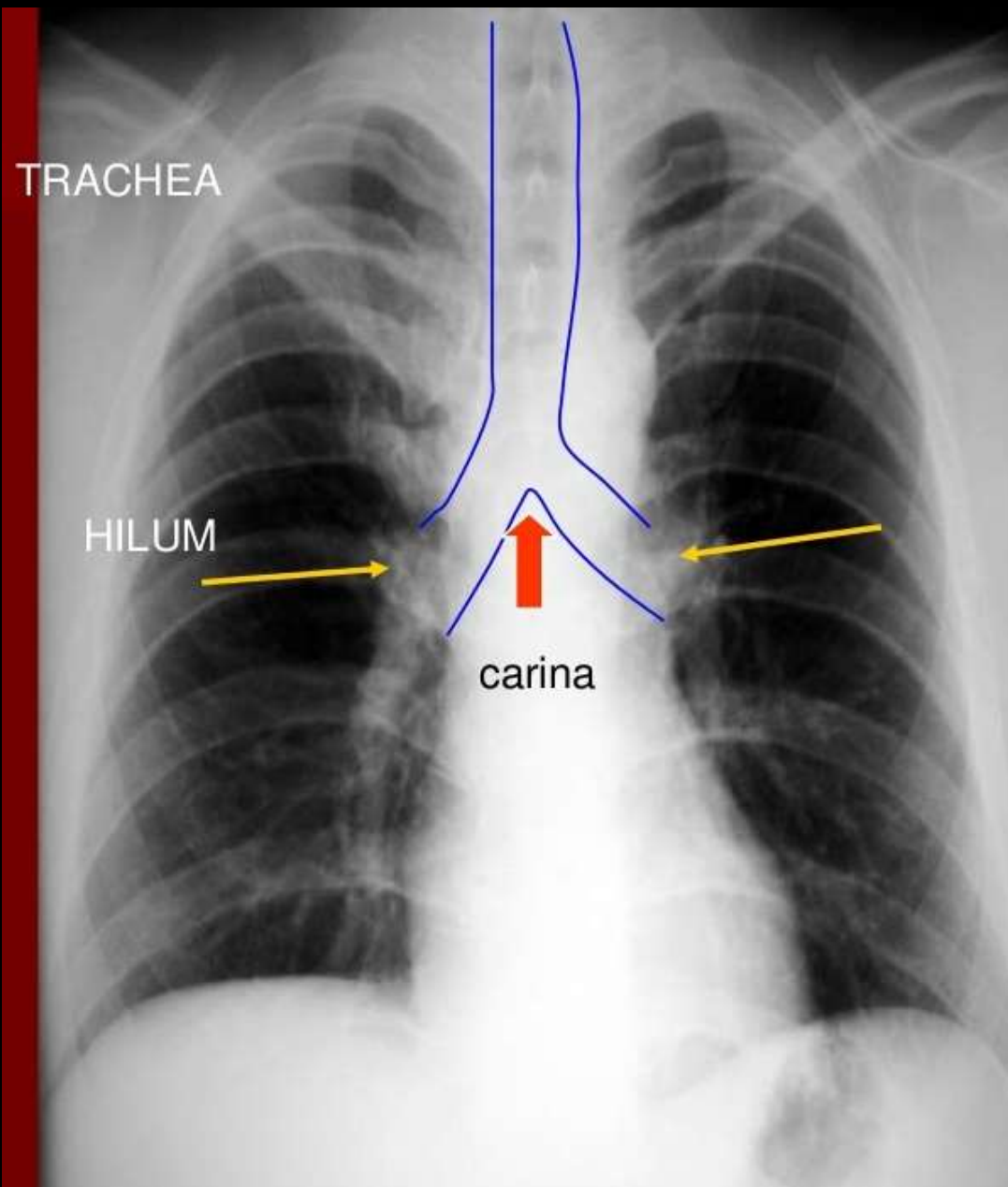
Normal AP

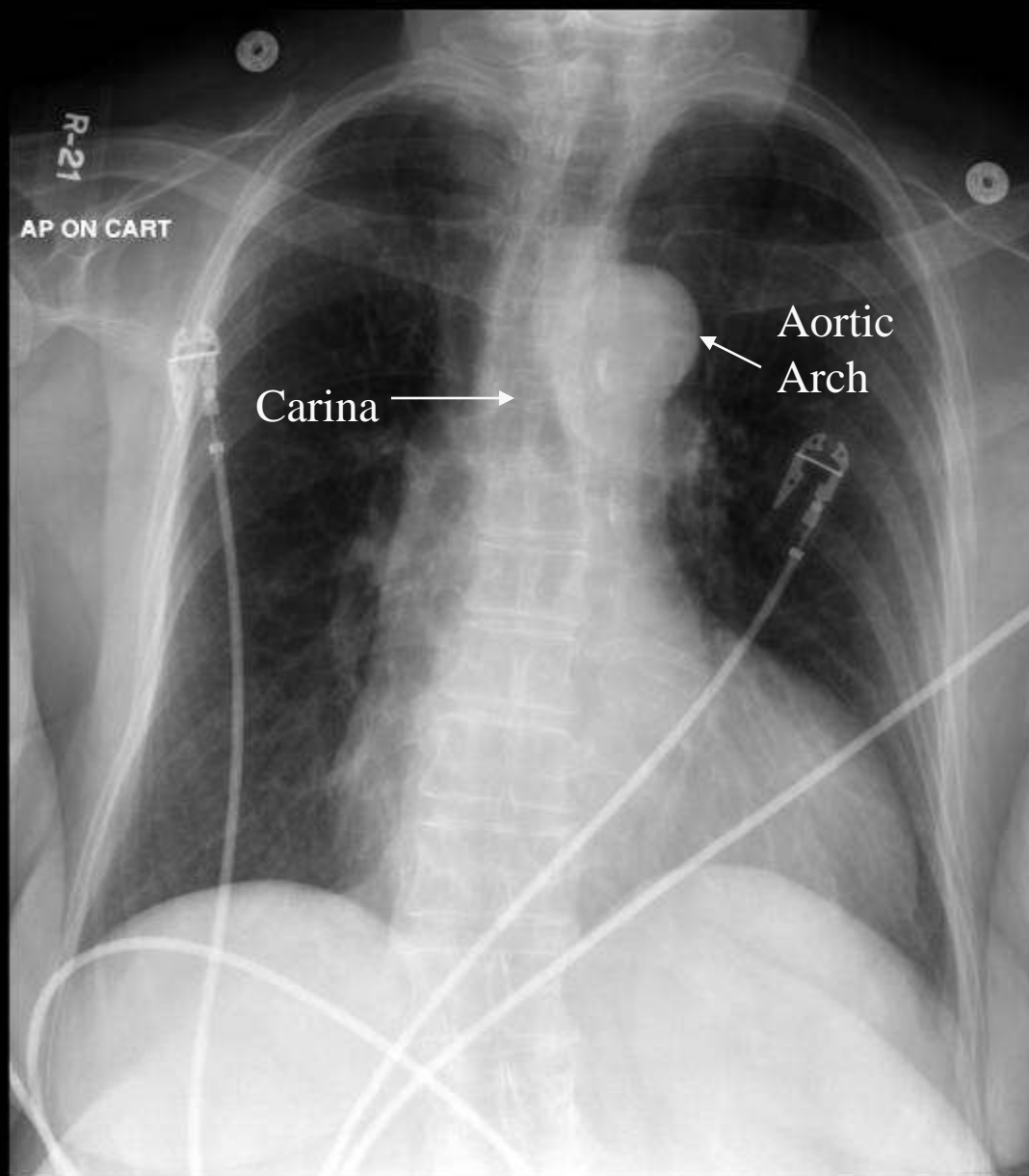




Bronchi, Bronchial Tree, and Lungs







309MCRAD086

Ex: 000001

Se: 1/1

In: 2/23

CVICU

2006 Jan 01 test

Acc: 000001

2006 May 31

Study Tm: 10:00:25

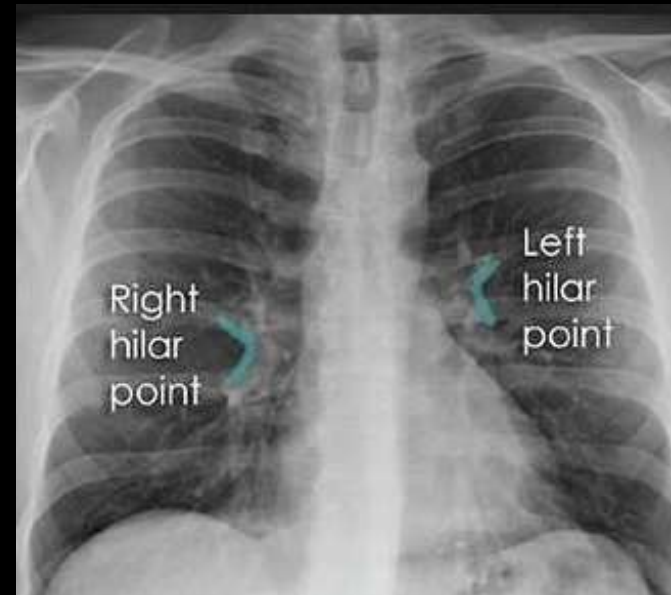
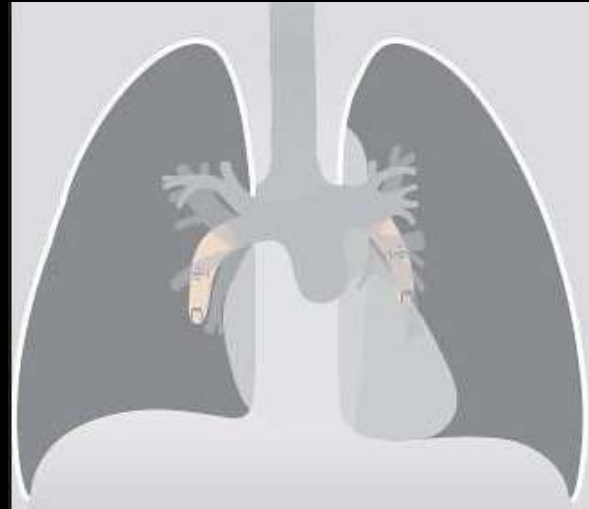
Id:DCM / Lin:DCM / Id:ID

W:3036 L:2476

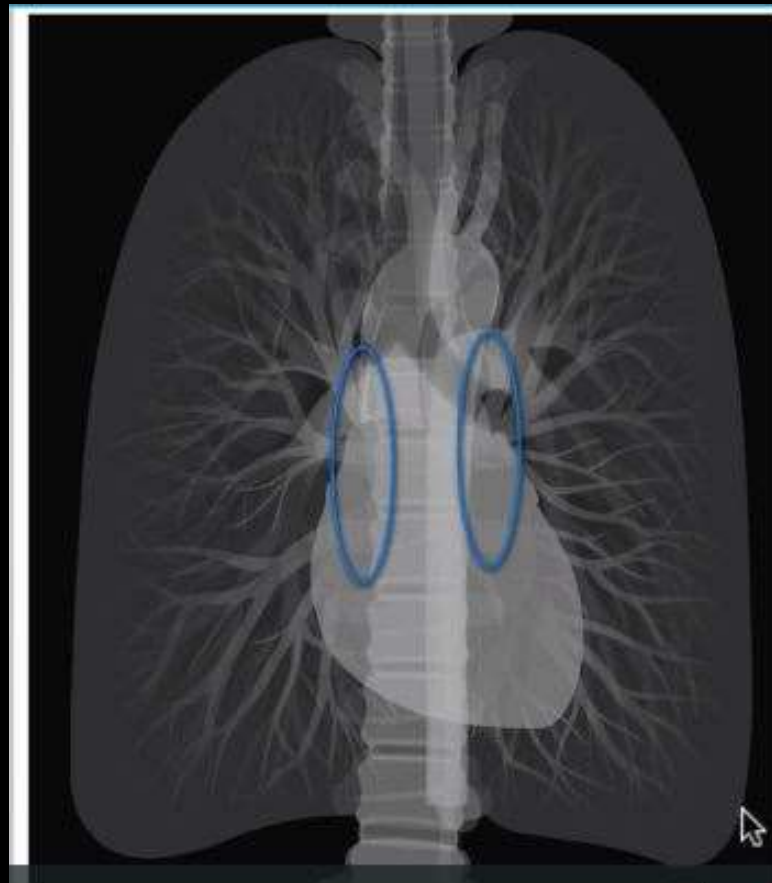
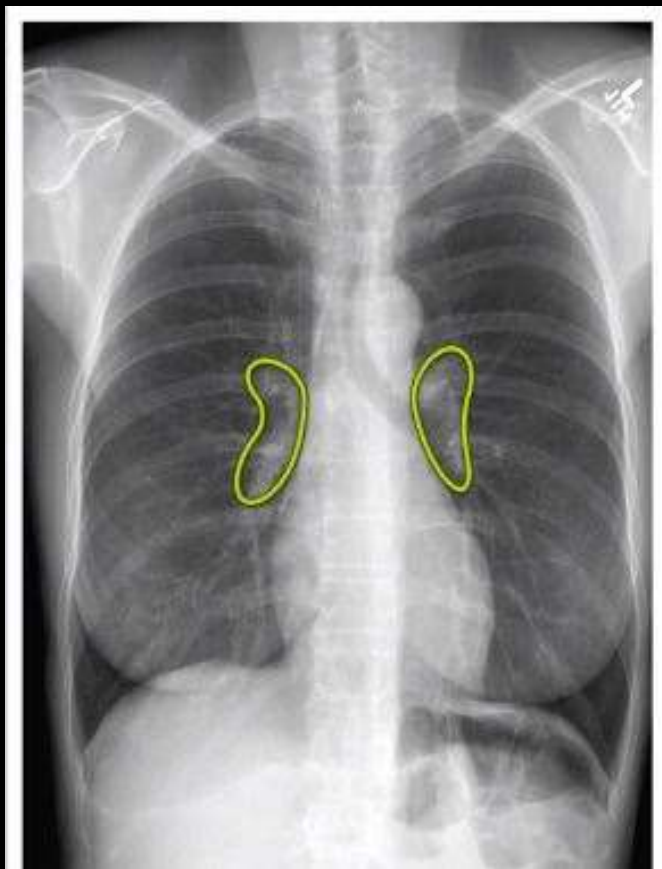


Hila – Lung roots

- Consists of
 - Major bronchi
 - Pulmonary veins
 - Pulmonary arteries
- The above structures pass through the narrow hila & then widen and branch out into the lungs
- Left hilum is typically higher than right



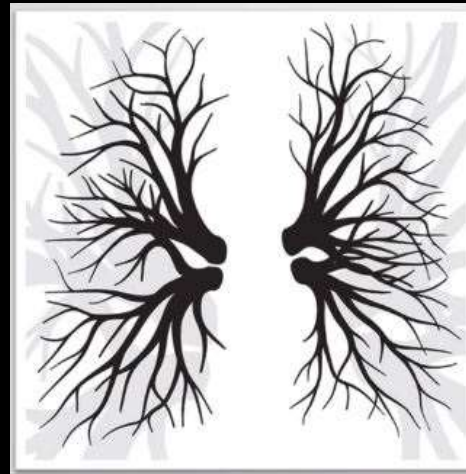
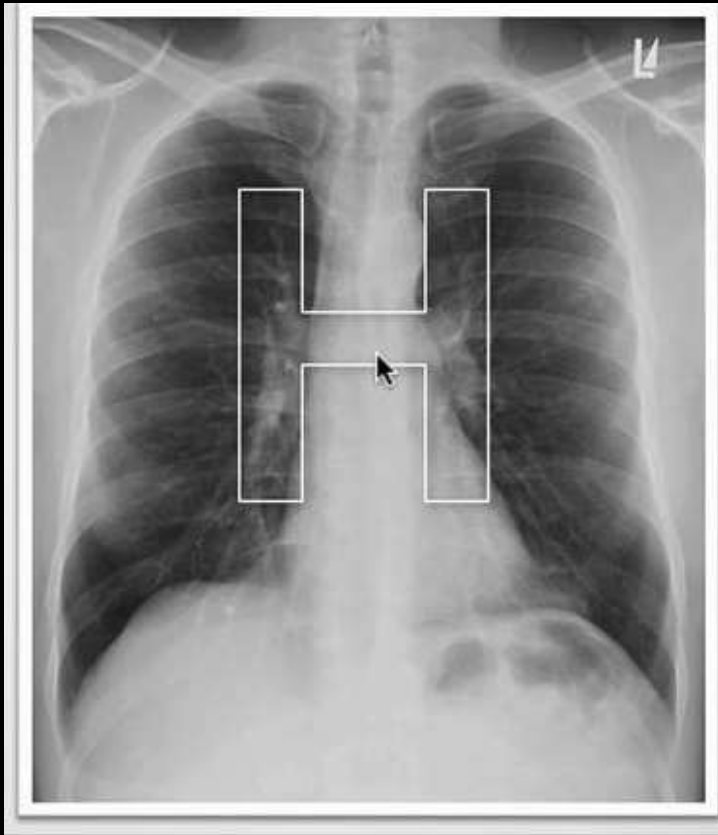
Normal Hila



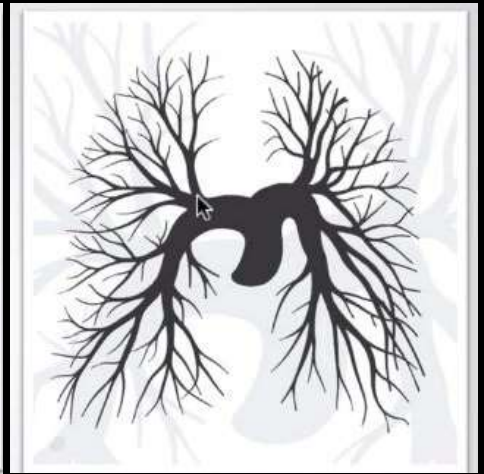
Normal Hila



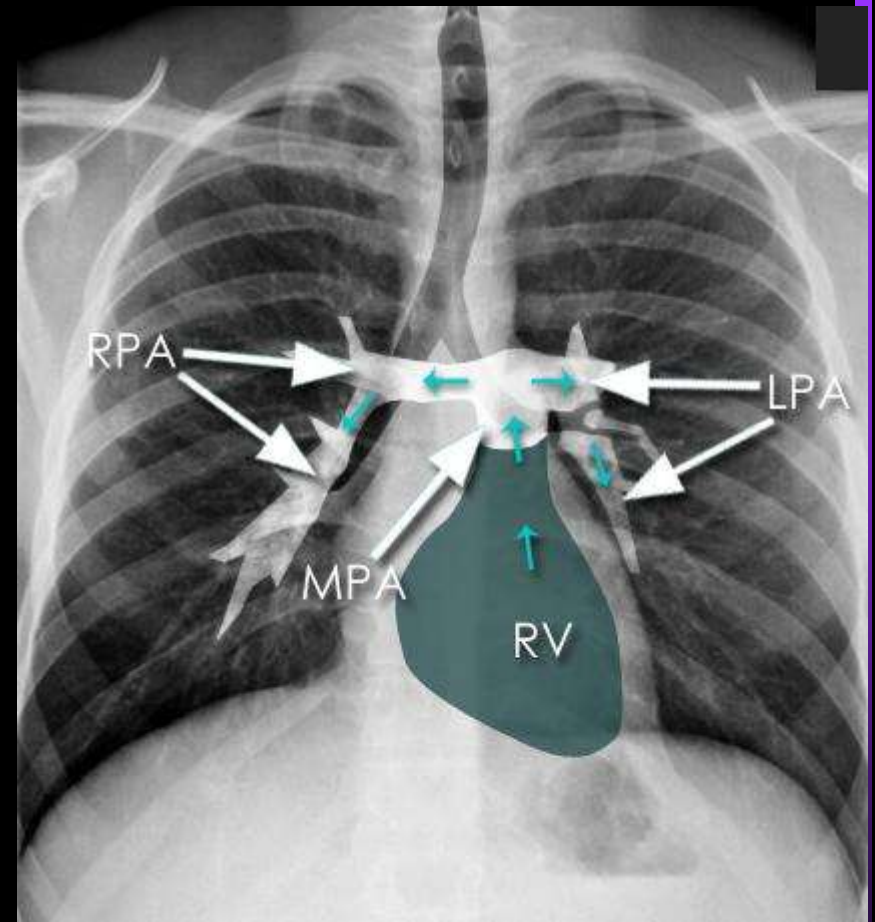
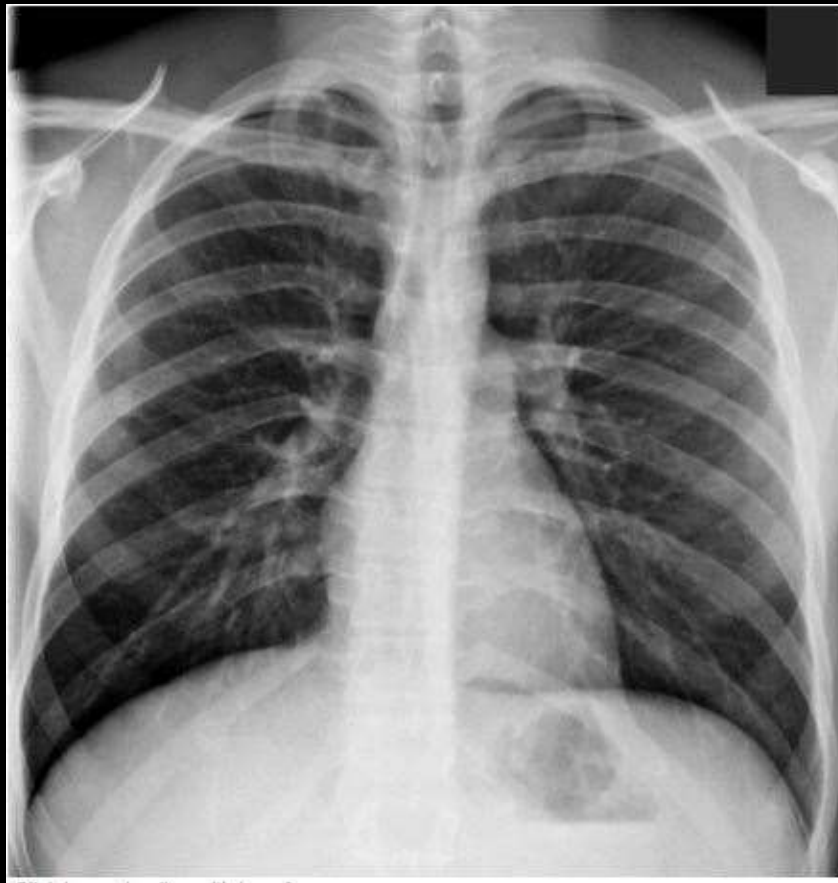
Proximal Pulmonary Arteries Form H-Shape on Frontal CXR



Pulmonary Veins



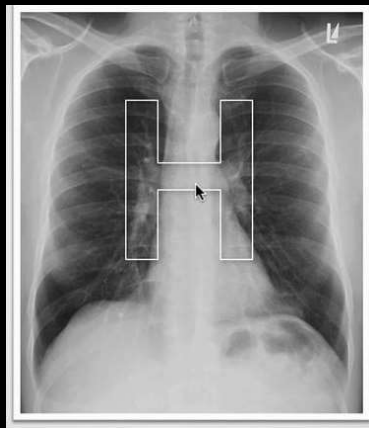
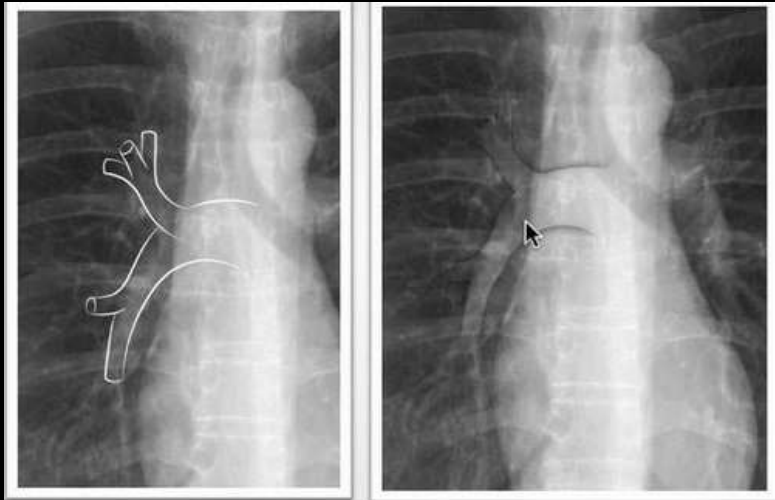
Pulmonary Arteries



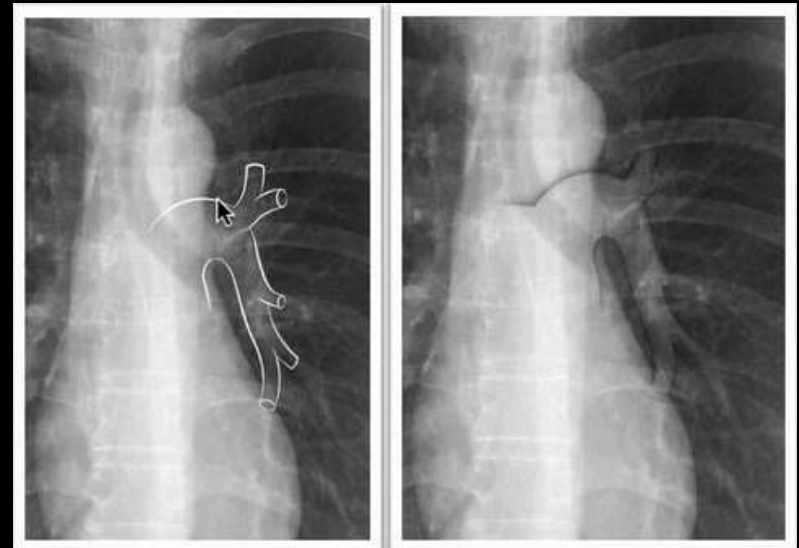


HILAR REGION
ON
CHEST X-RAY

Right Pulmonary Artery



Left Pulmonary Artery



Normal Hila



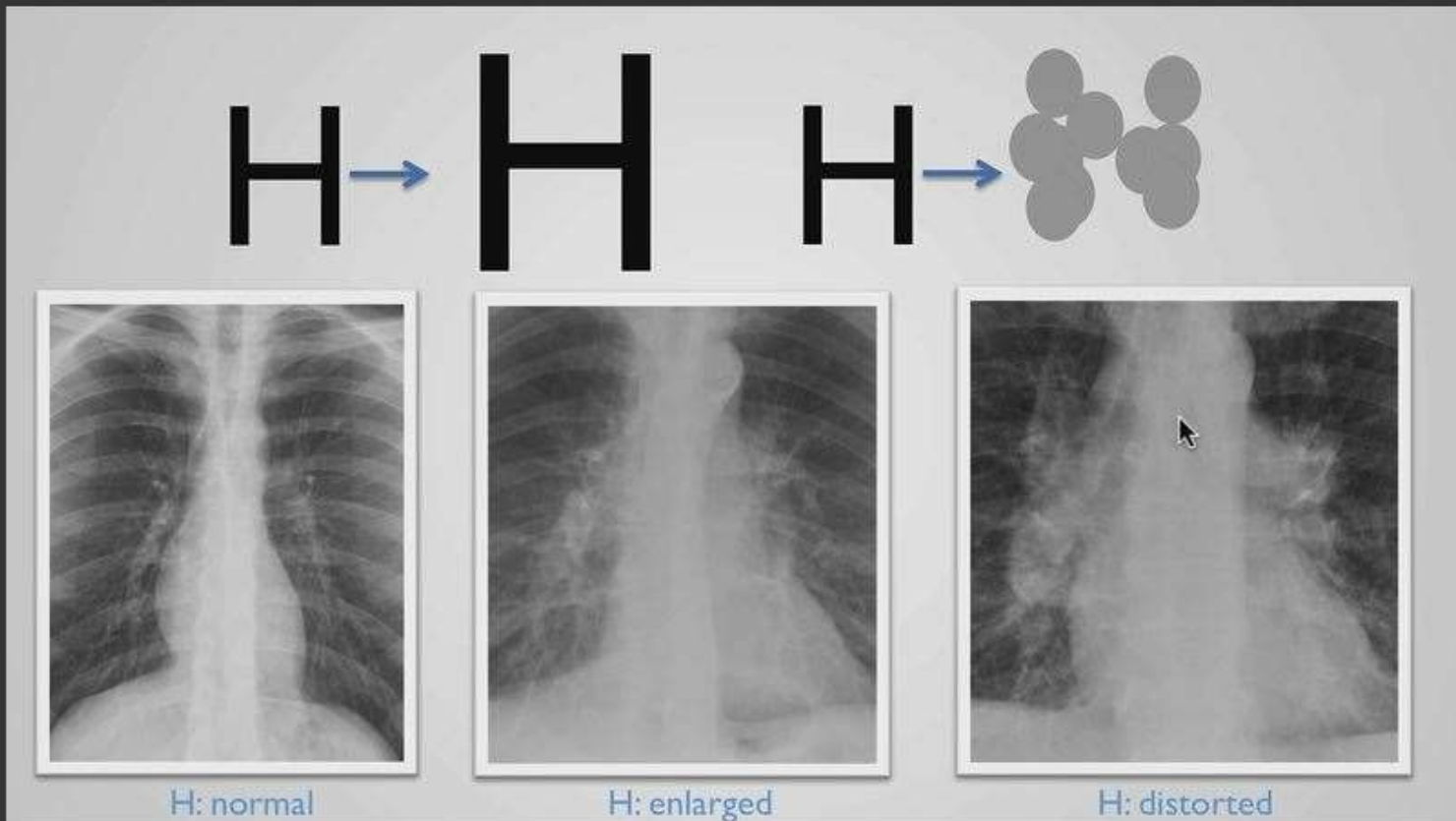
Normal Hila



Abnormal Hila

- Increase in density
 - Is it too white?
- Change in size
- Abnormal Position
- Abnormal Shape

Abnormal Hila



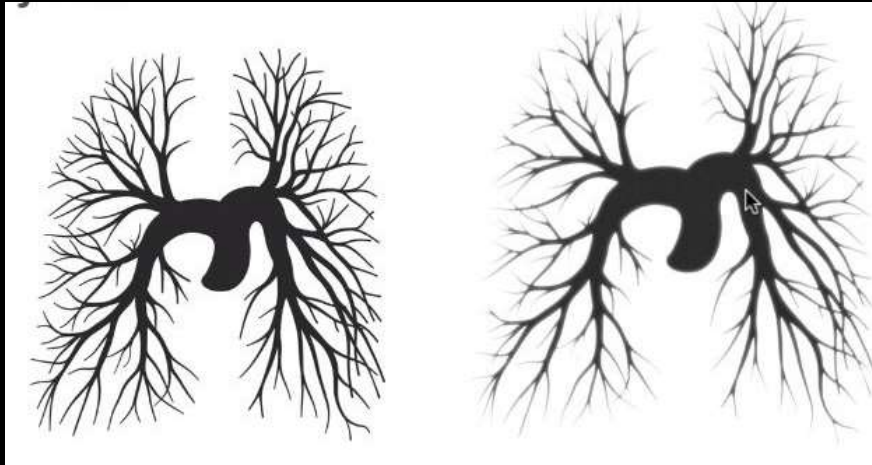
Normal

Enlarged

Distorted

Hazy Hila

Pulmonary Edema



Normal

Hazy



Hilar Enlargement

Unilateral Hilar Enlargement

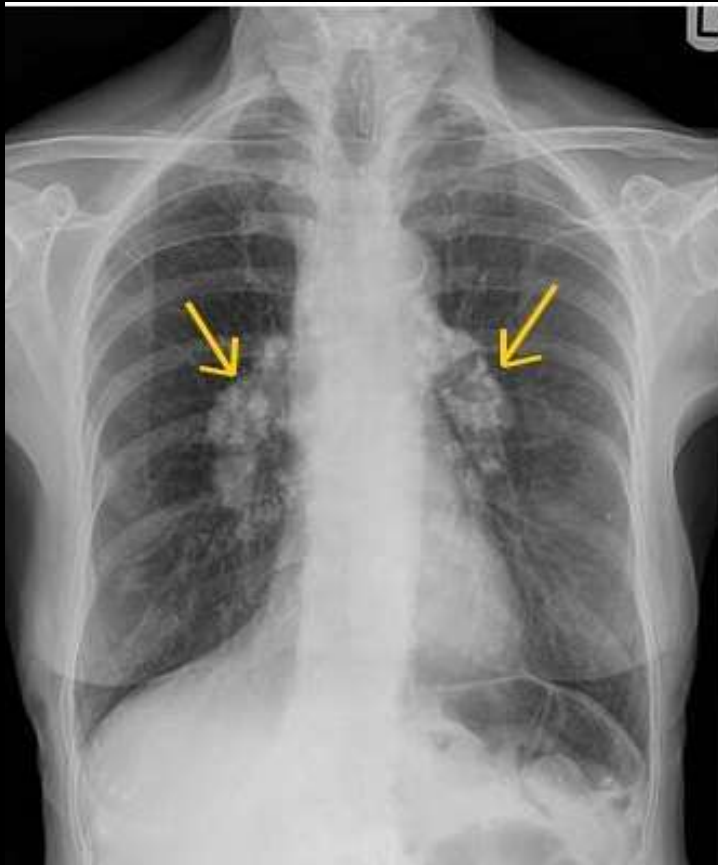
- Tumor
 - Lung Cancer -- Lymphoma
 - Metastasis
- Enlarged nodes
- Infection
 - TB-viral-infection
- Pulmonary arterial aneurysm/stenosis

Bilateral Hilar Enlargement

- Pulmonary Hypertension
- Adenopathy
 - Sarcoidosis
 - Lymphoma
 - Metastasis
 - Infection
 - TB-viral-bacterial

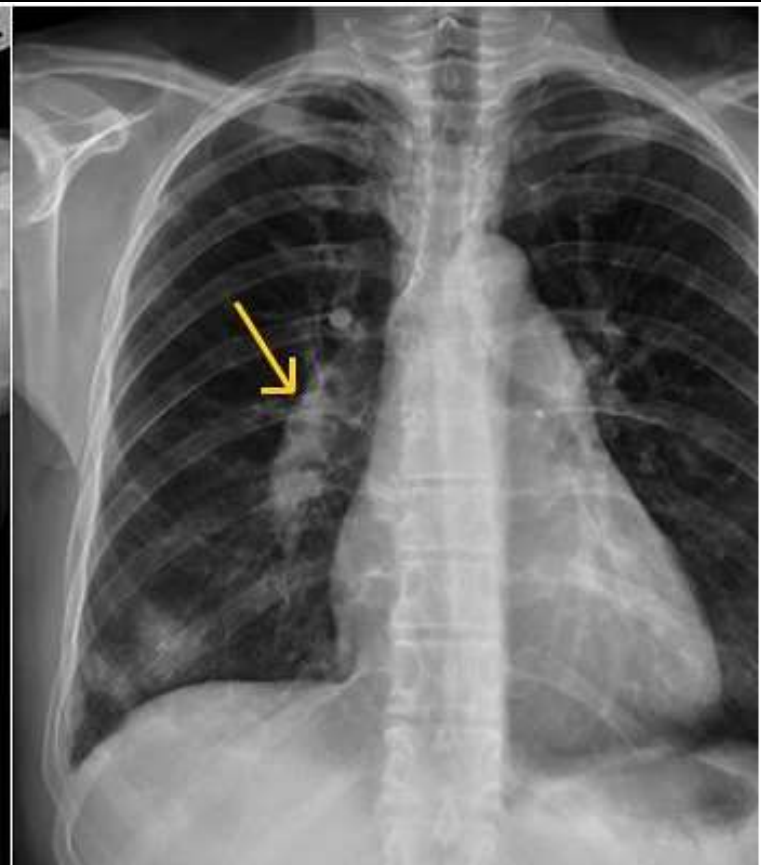
Calcified Bilateral Hilar Lymphadenopathy

Sarcoidosis



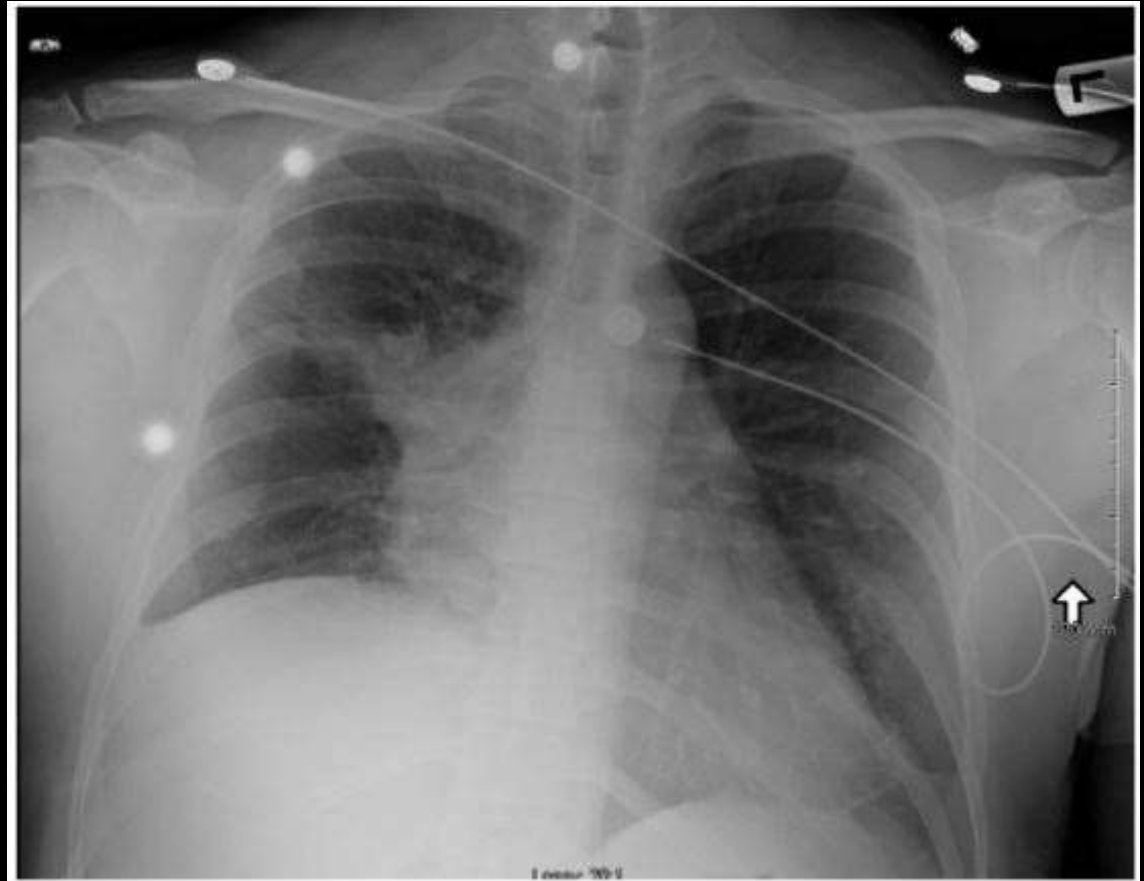
Unilateral Enlargement

Pulmonary Artery Hypertension



Unilateral Hilar Enlargement

- Large right hilar mass extending to the right upper lobe
- Right pleural effusion



Bilateral Hilar Lymph Node Enlargement

Sarcoidosis



Pulmonary Hypertension & Cardiomegaly



Diaphragm

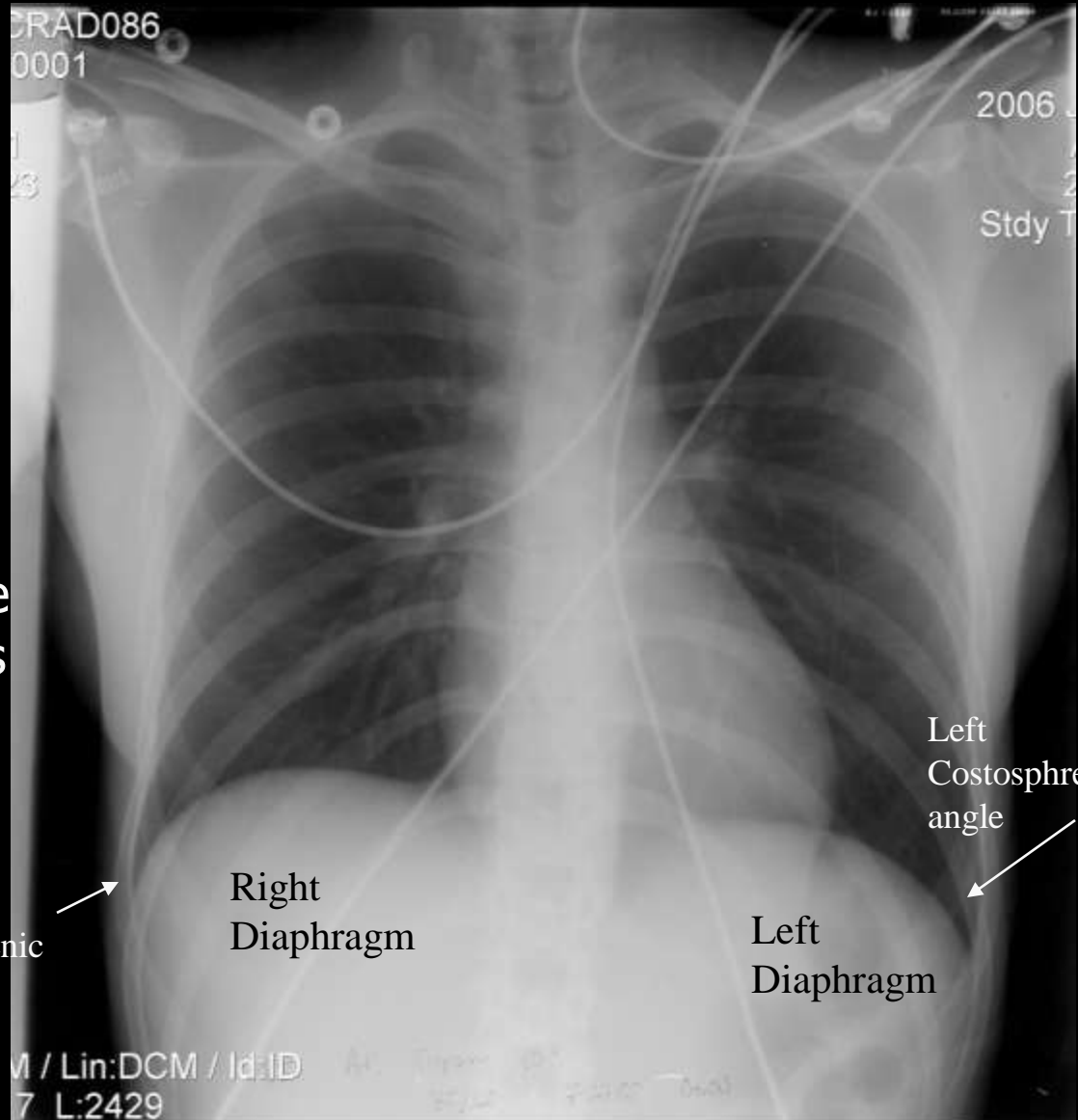
- Diaphragm is normally rounded and concave (domeshaped)
- The right hemidiaphragm is usually higher than the left due to the liver.
- Costophrenic angles are very sharp acute angles formed by the water density of the diaphragm and chest wall

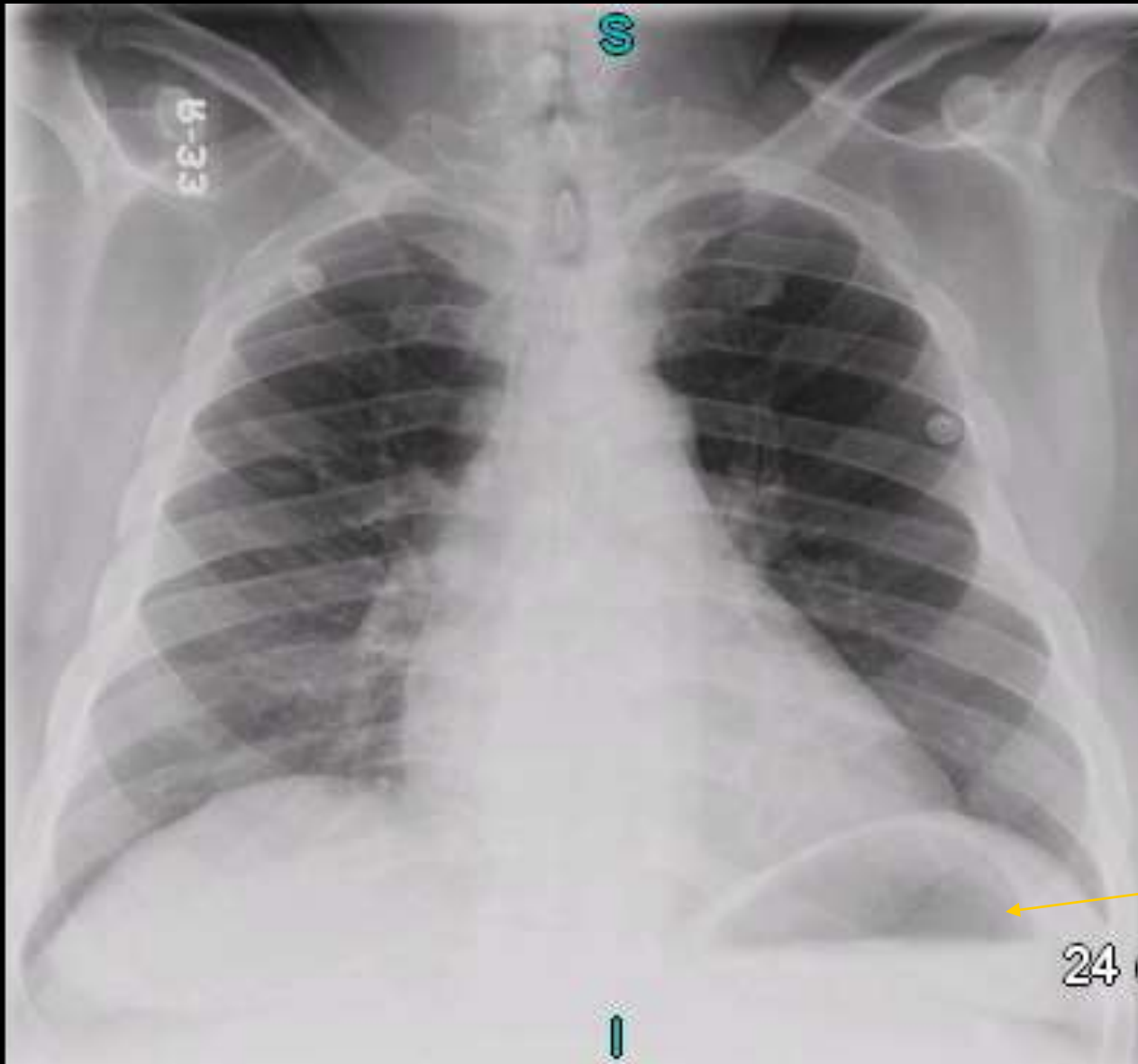
Right Costophrenic
angle

Right
Diaphragm

Left
Diaphragm

Left
Costophrenic
angle





Air under
diaphragm

Diaphragm Variations

- Normal diaphragm elevations occur with
 - obesity
 - pregnancy
 - pain
 - bowel obstruction
- Flatten diaphragms
 - emphysema
- Unilateral diaphragm changes
 - abdominal organ distention or paralysis

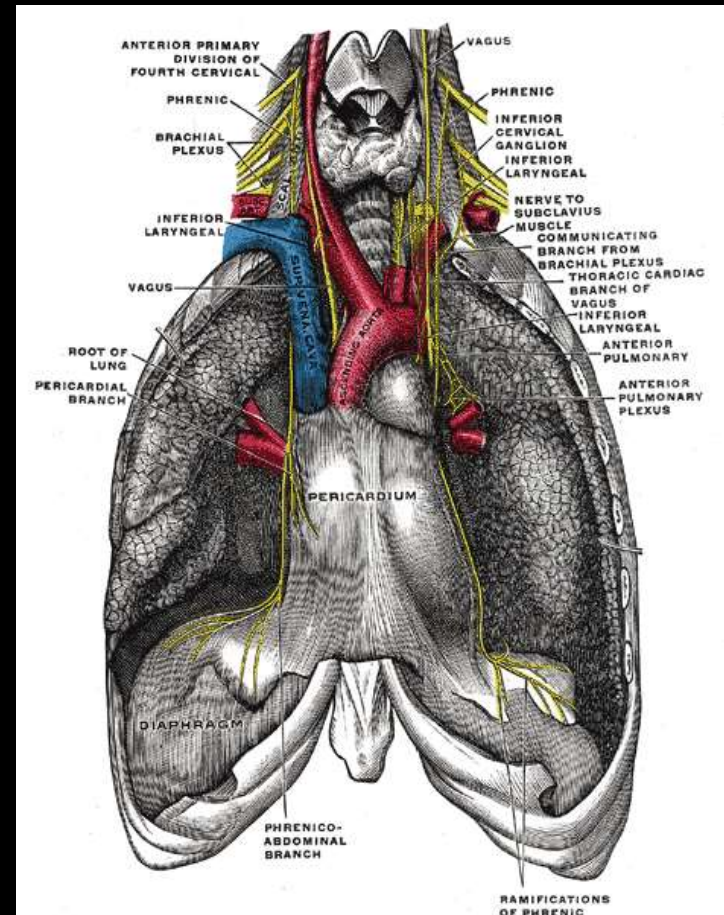


Elevated right diaphragm....
Maybe phrenic nerve cut during surgery.



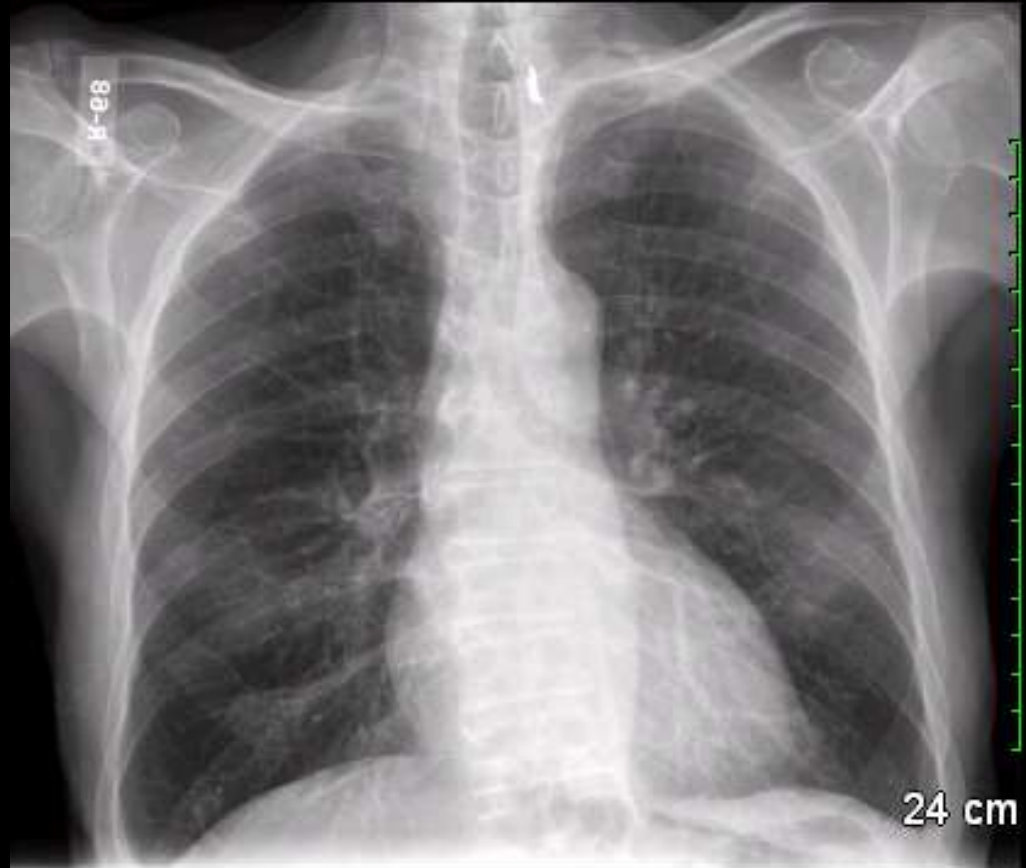
Phrenic Nerve Injury Causes

- Cold injury to nerve from cardioplegia solution
- Surgical trauma during takedown of IMA



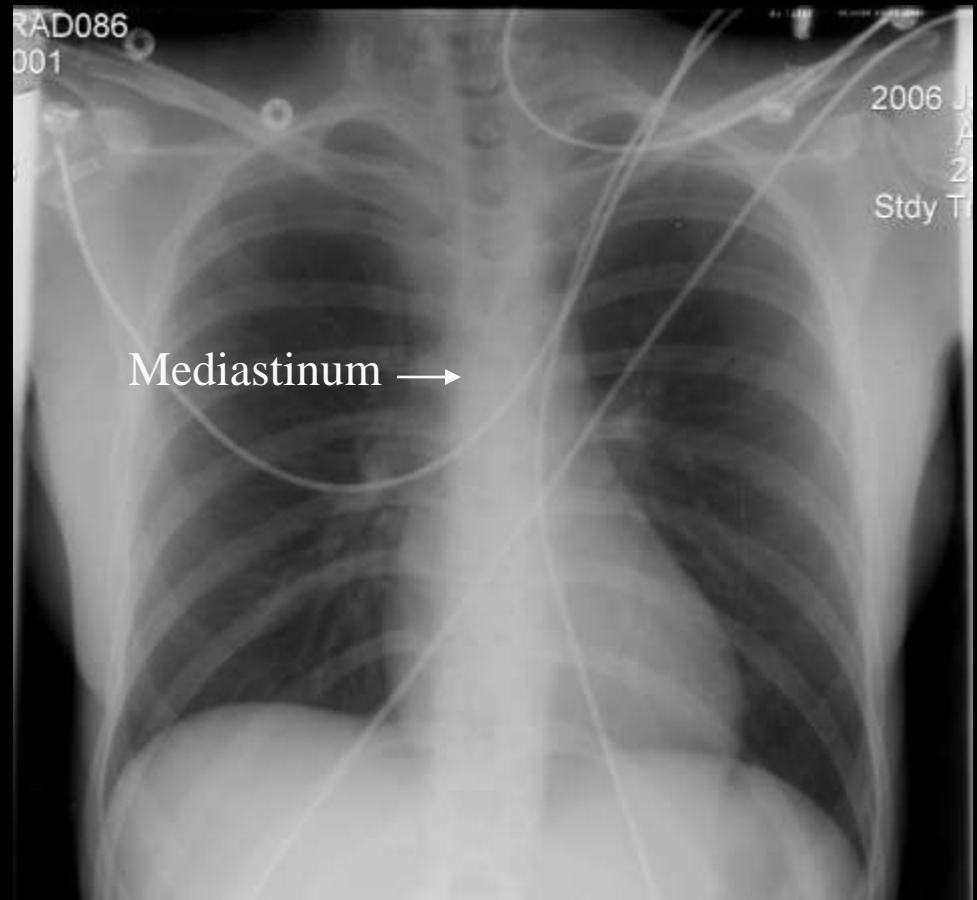
Pleura

- Pleural is only able to be identified if separated from the thoracic lining by fluid or air



Mediastinum

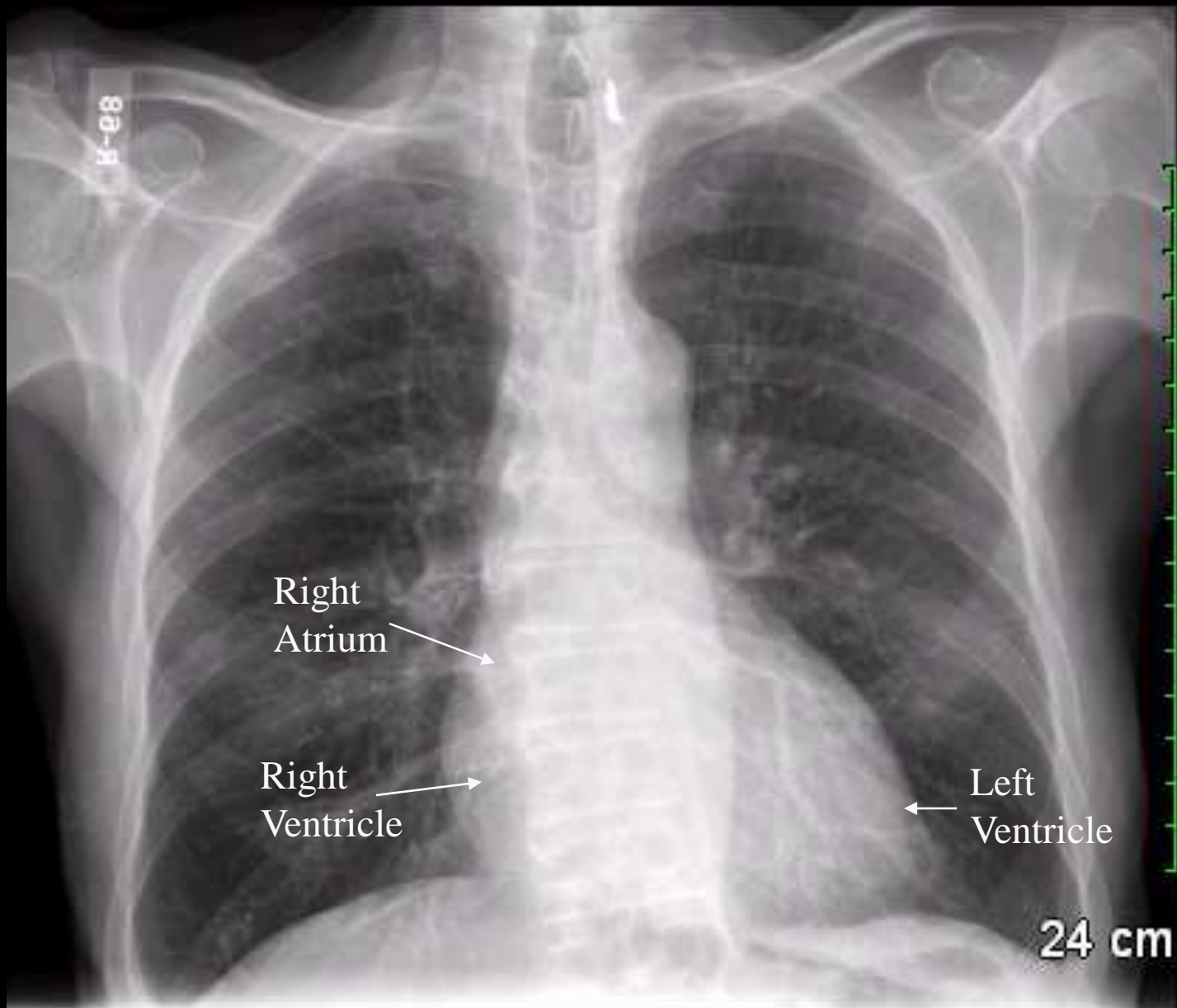
- Check for mediastinal shifts
- Check for increasing shadows from tamponade, aneurysms, tumors



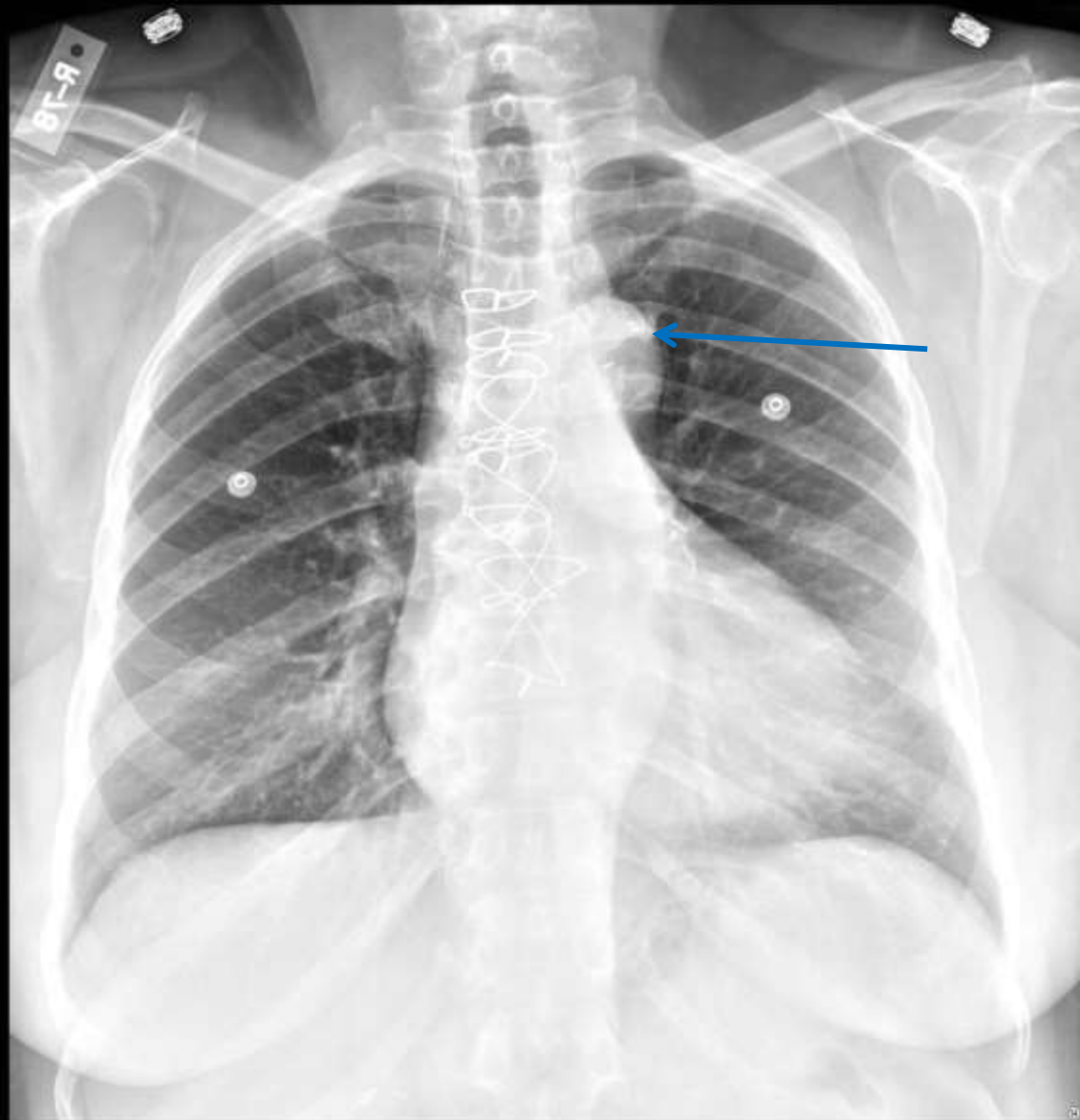
Heart and great vessels

- Check size
 - Should be $< 50\%$ of the Cardiothoracic ratio (CTR)
 - $\text{CTR} = \frac{\text{Horizontal width of the heart}}{\text{widest thoracic interval}}$
- Check aortic arch for aneurysm
- Check for prosthetic valves

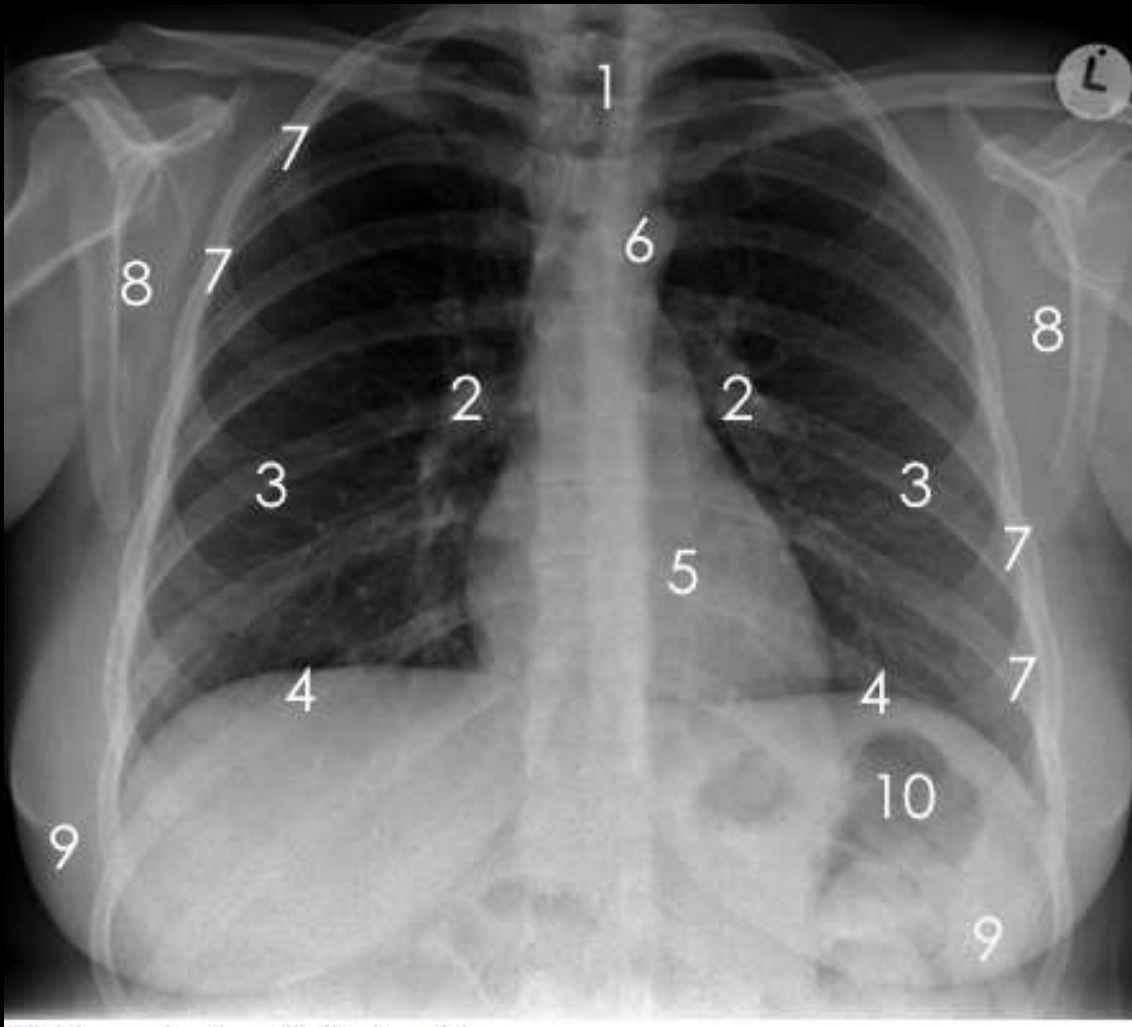




Prominent Aorta



Chest x-ray anatomy



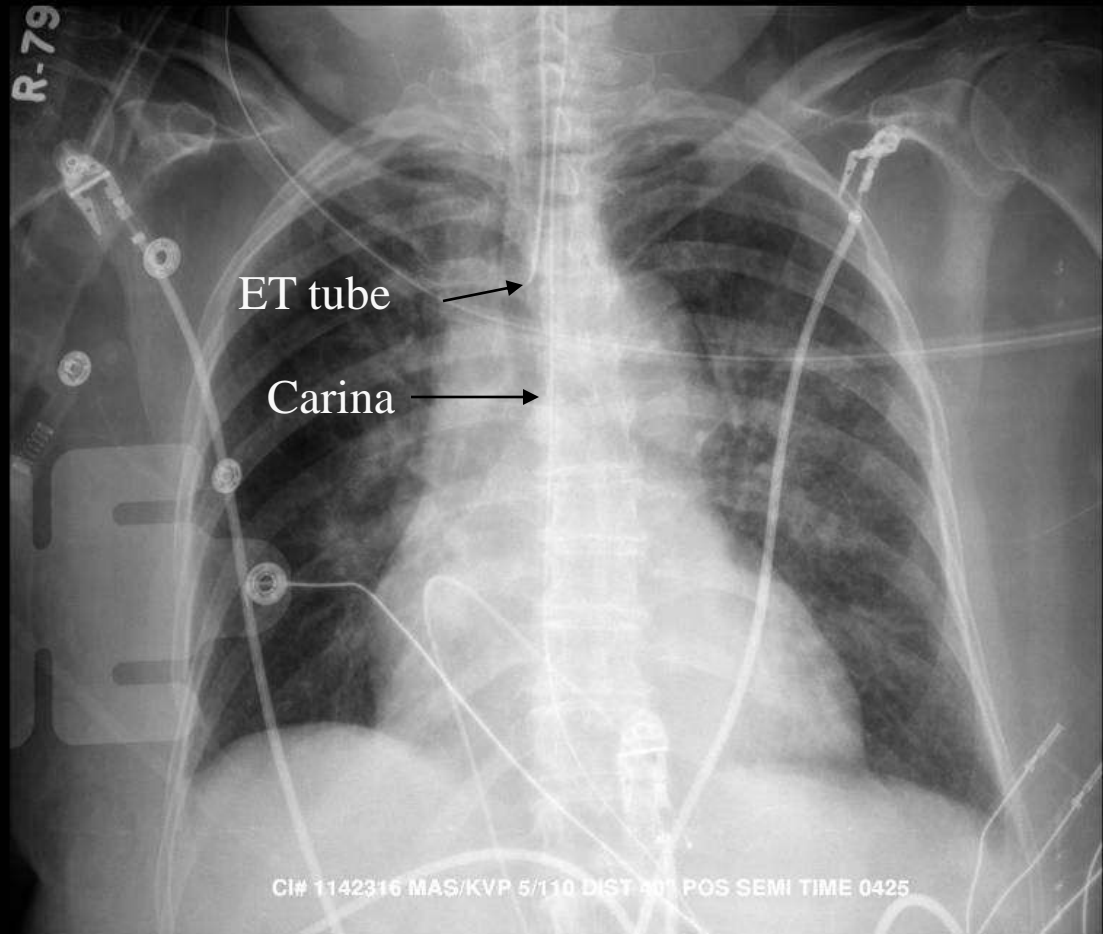
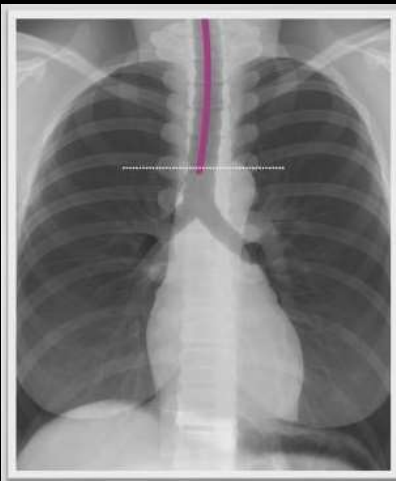
- 1 - Trachea
- 2 - Hila
- 3 - Lungs
- 4 - Diaphragm
- 5 - Heart
- 6 - Aortic knuckle
- 7 - Ribs
- 8 - Scapulae
- 9 - Breasts
- 10 - Bowel gas

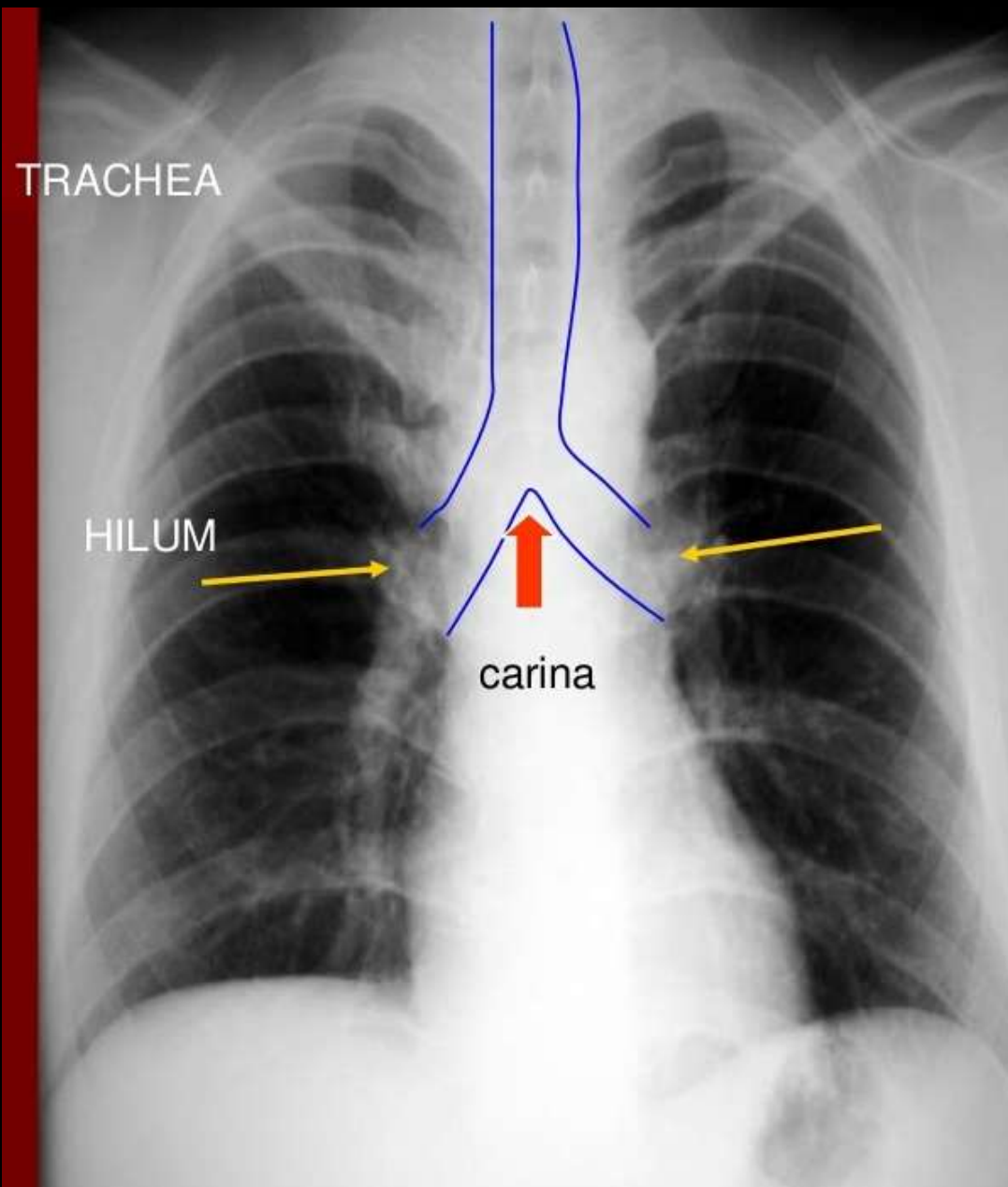
Nonphysiological structures -- lines, etc

- ET tube: Correct placement is usually 5 cm above the carina but can be 2 – 8cm above carina
- Trach tubes: Position
- Nasogastric tubes: Thin radiopaque line down in the esophagus to the stomach
- Central venous line: Tip should be in right atrium
- Swan ganz catheter: Tip should be in pulmonary artery
- Pacemaker: Look for point of origin, location of wires – transvenous, epicardial, or permanent , generator
- Prosthesis: Valves, bone pinnings,
- Sutures: Clips, metal rings, wire sutures
- Chest tubes: Location – inserted high in apex for pneumothorax, low in bases for effusions or hemothorax.
- Intraaortic Balloon Catheter: Tip should be in the aorta – 2 cm below the aortic arch
- Foreign bodies --- bullets, inhaled objects, swallowed objects, safety pins, hemostats

ET tube

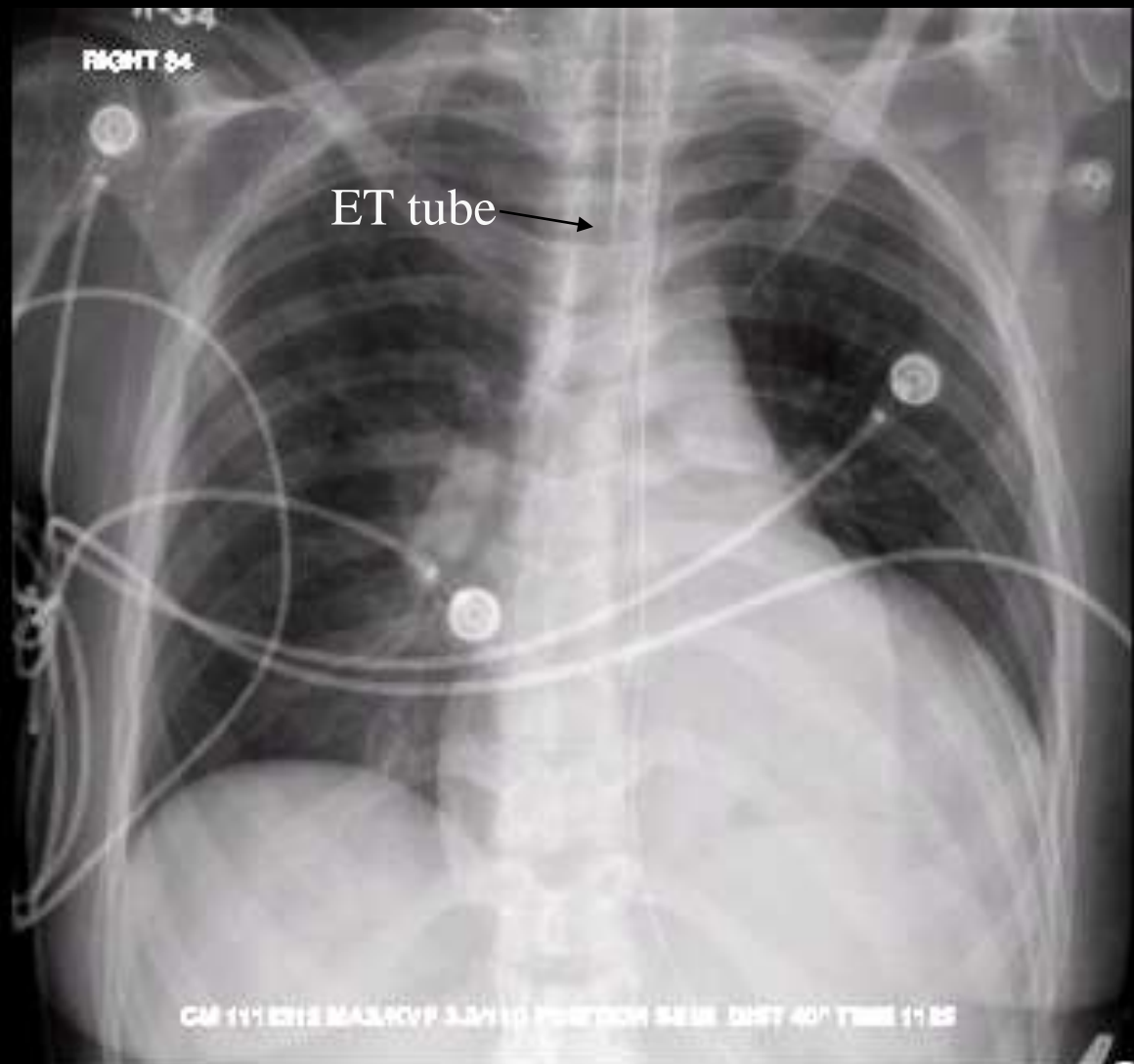
- Correct placement 4 - 5 cm above the carina
- Can be 2 – 8 cm above carina

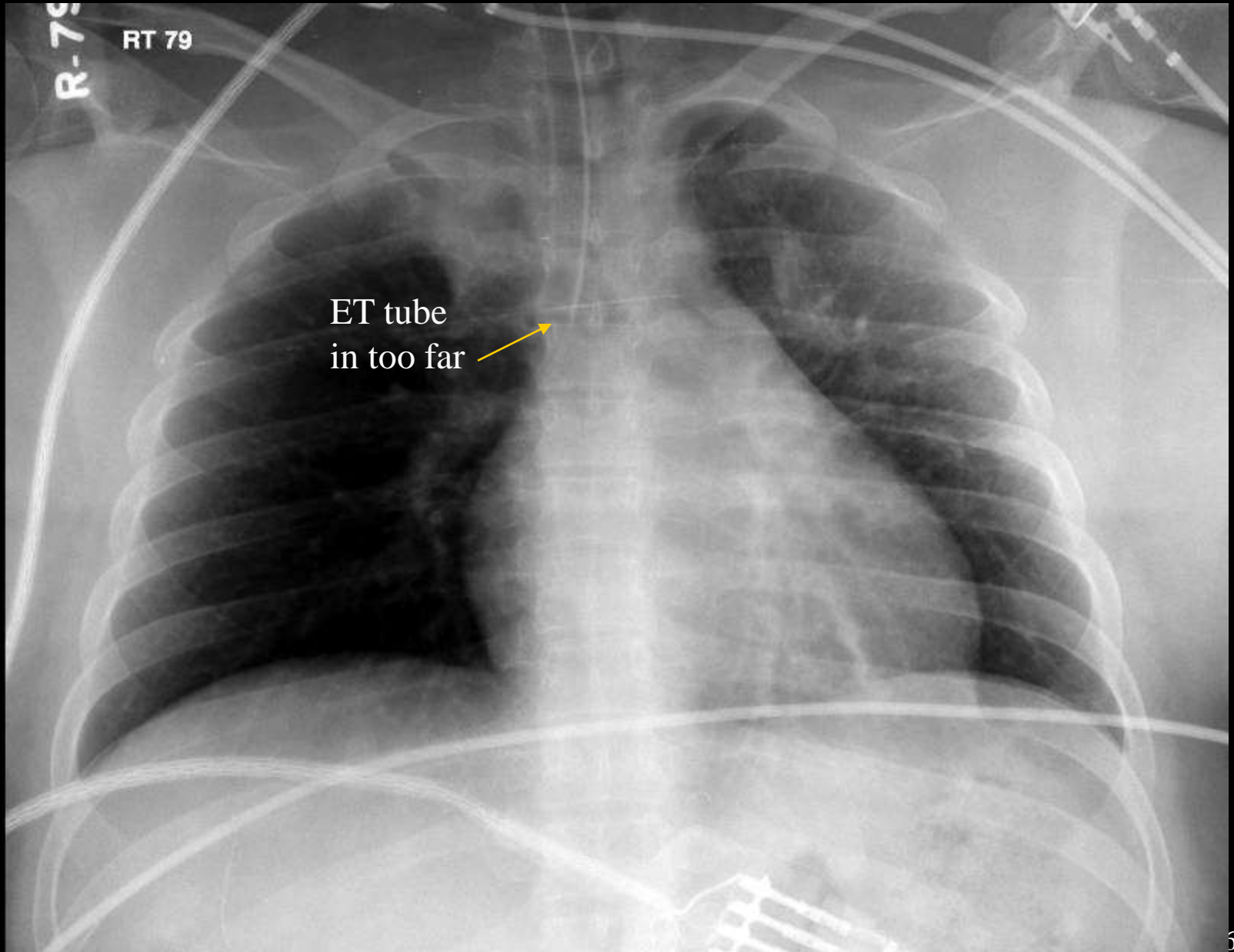




ET tube correct position

Cardiomegaly



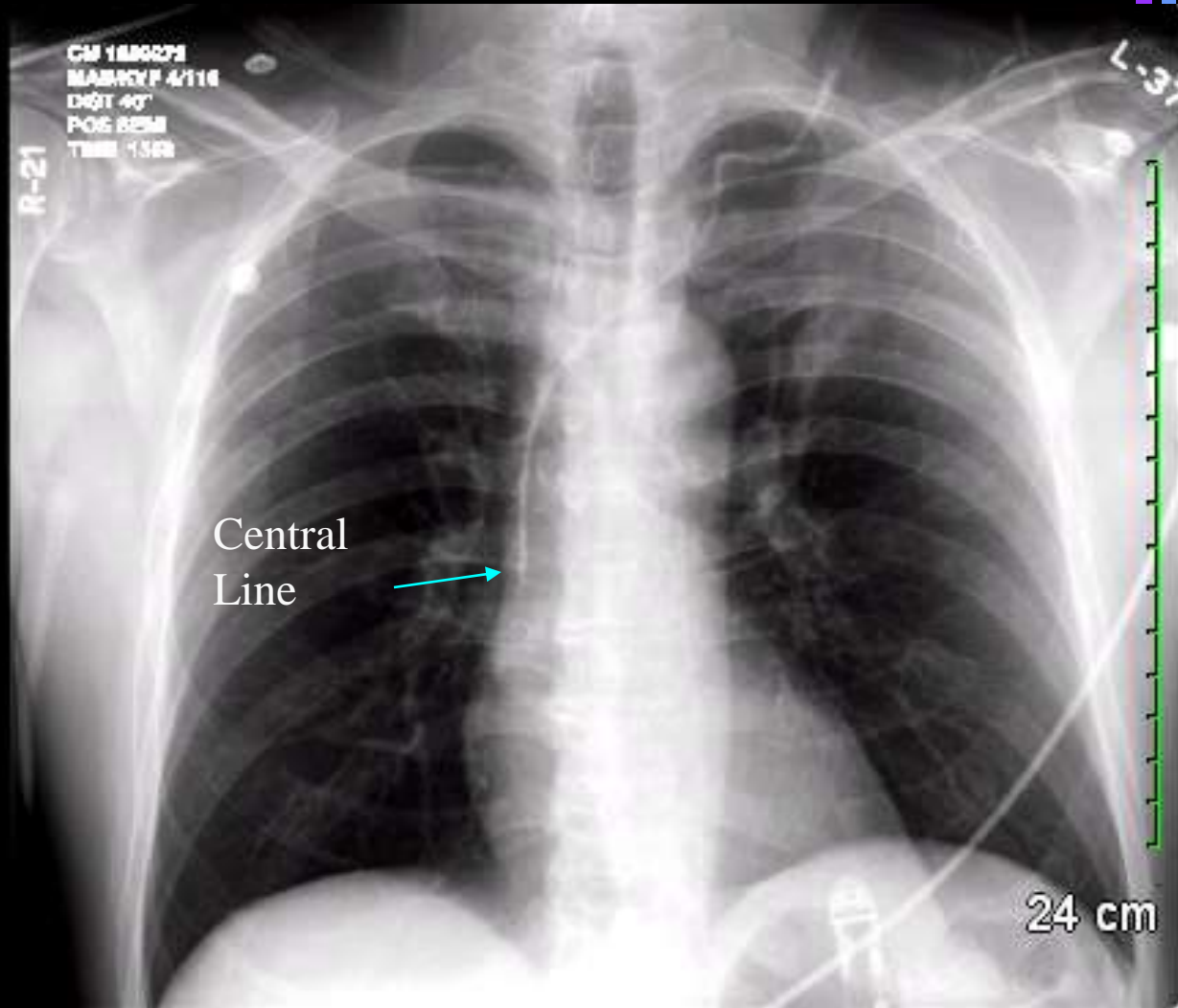


Right mainstem
intubation



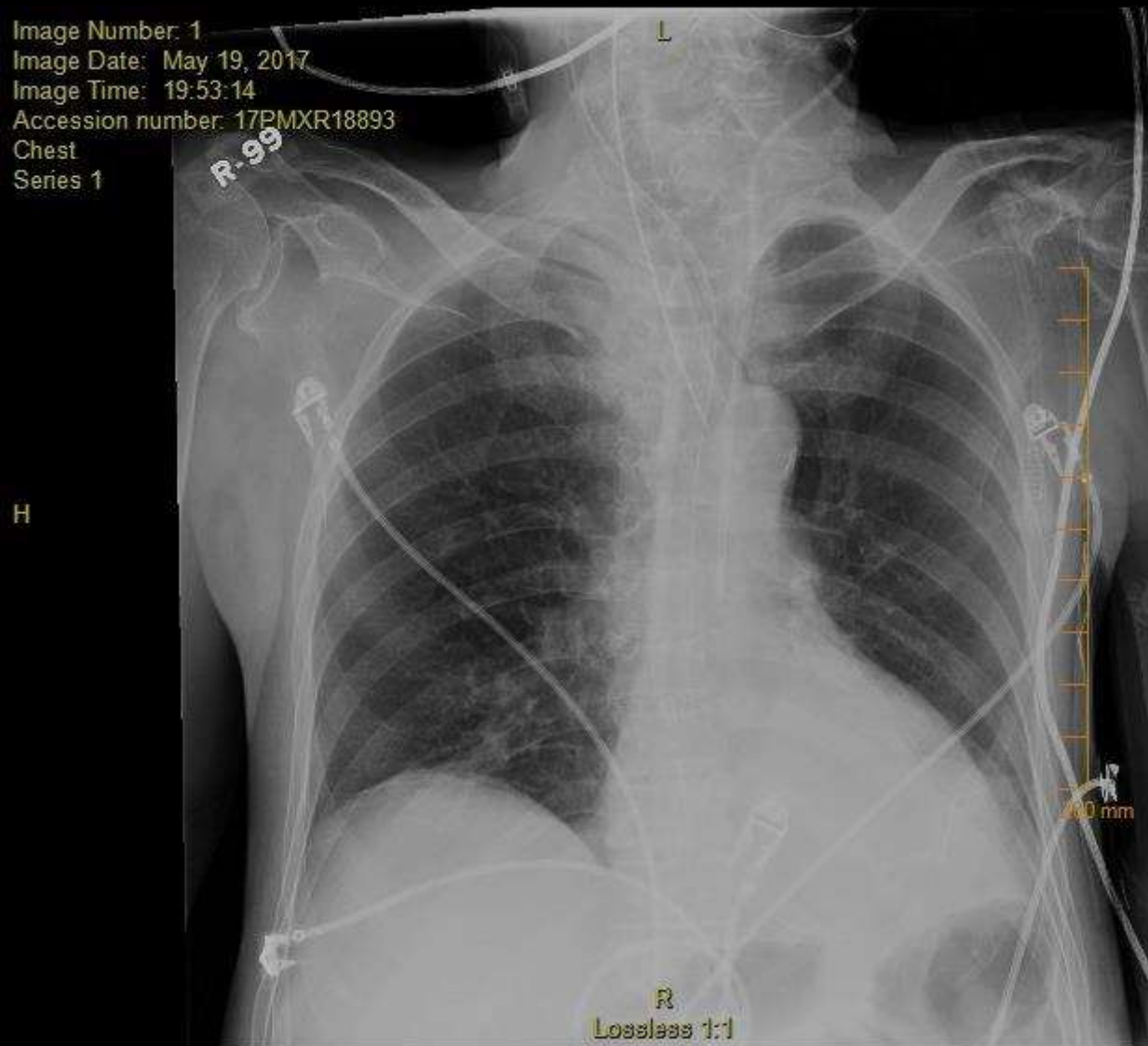
Central venous line:

- Tip should be in right atrium



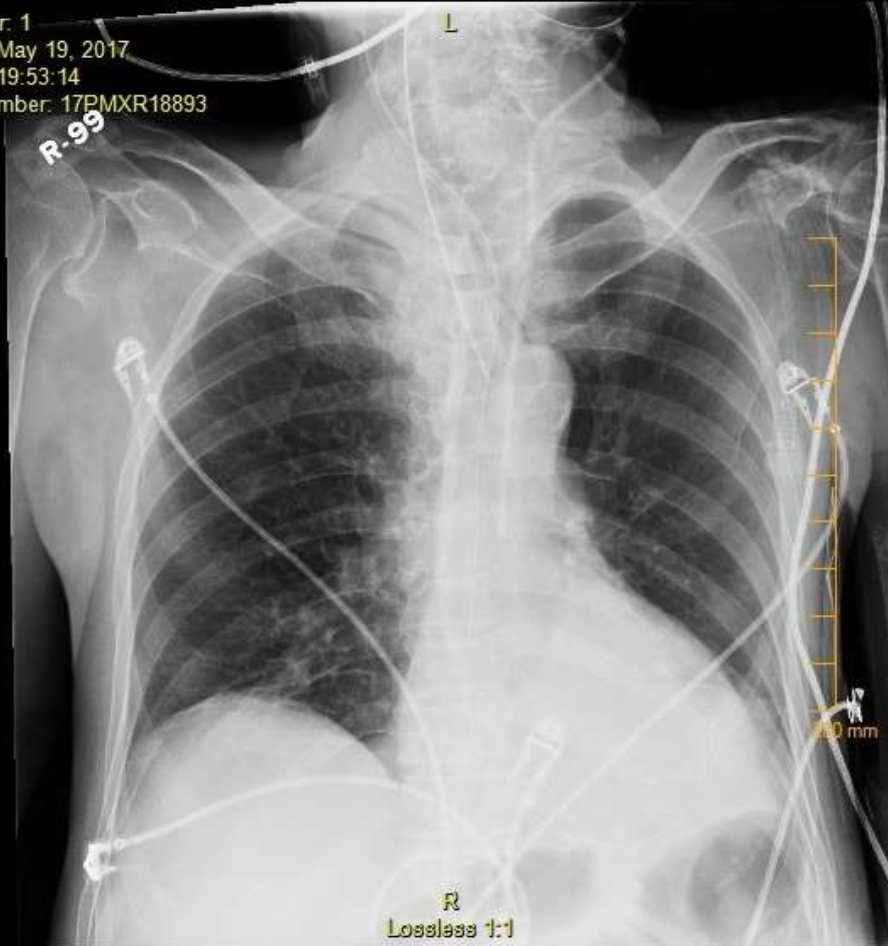
CXR for ET tube and central line insertion

Image Number: 1
Image Date: May 19, 2017
Image Time: 19:53:14
Accession number: 17PMXR18893
Chest
Series 1



If CL is inserted in the left, it should cross over to the right to get to the inferior vena cava

ber: 1
: May 19, 2017
: 19:53:14
number: 17PMXR18893

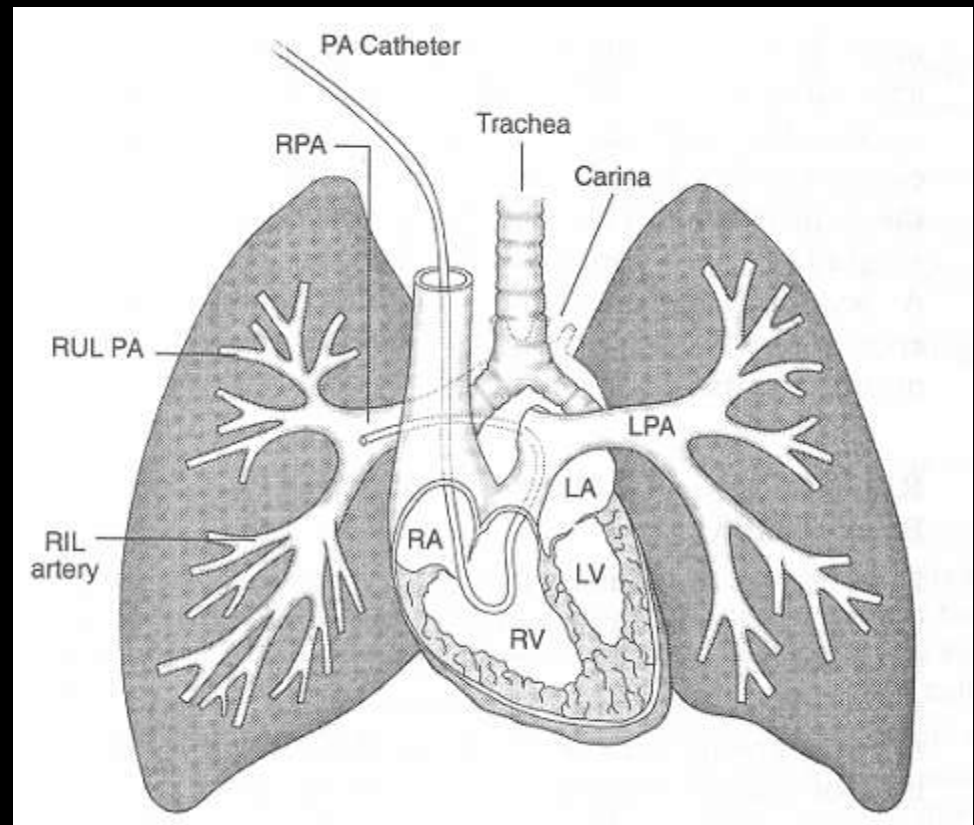


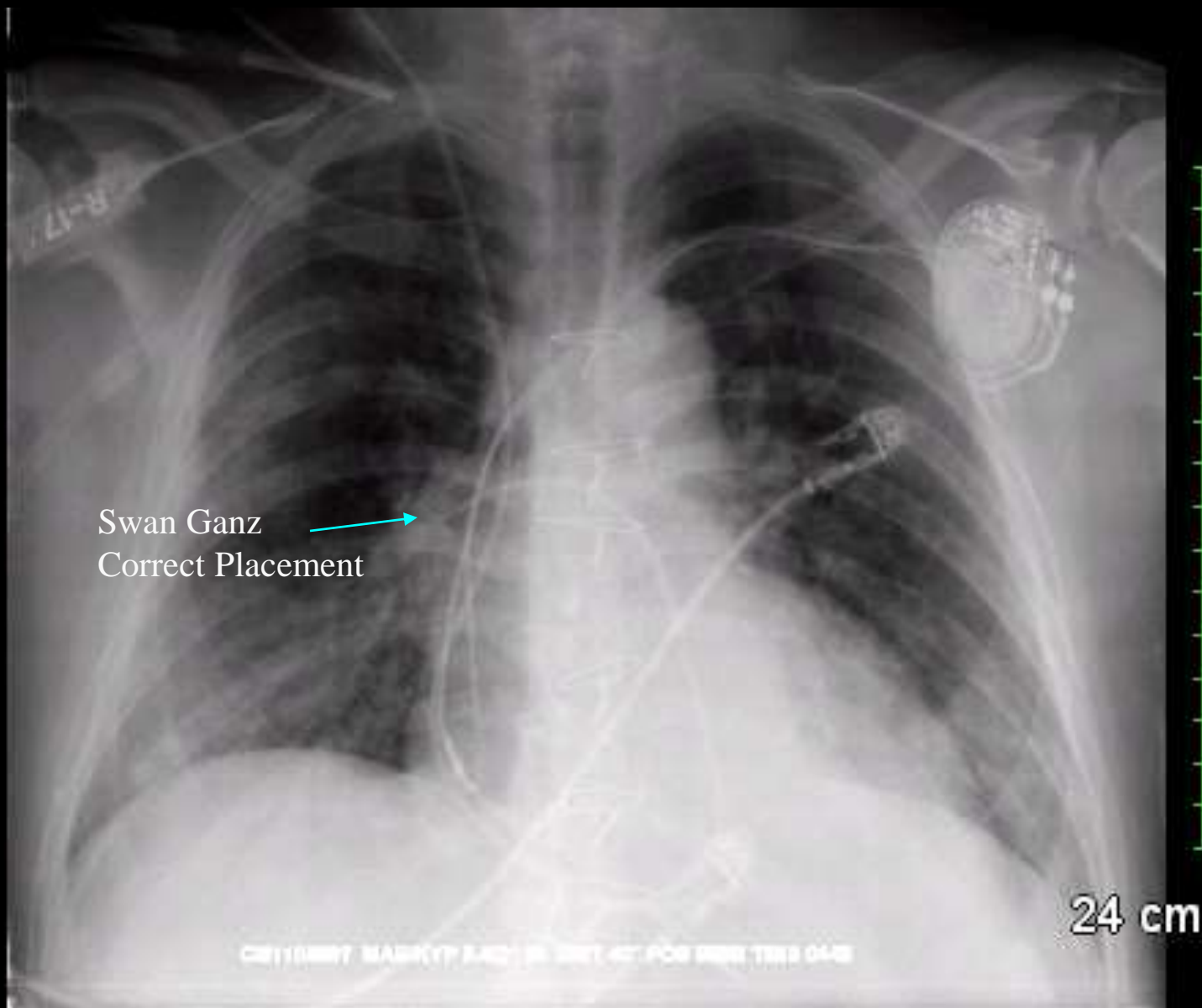
Mediport

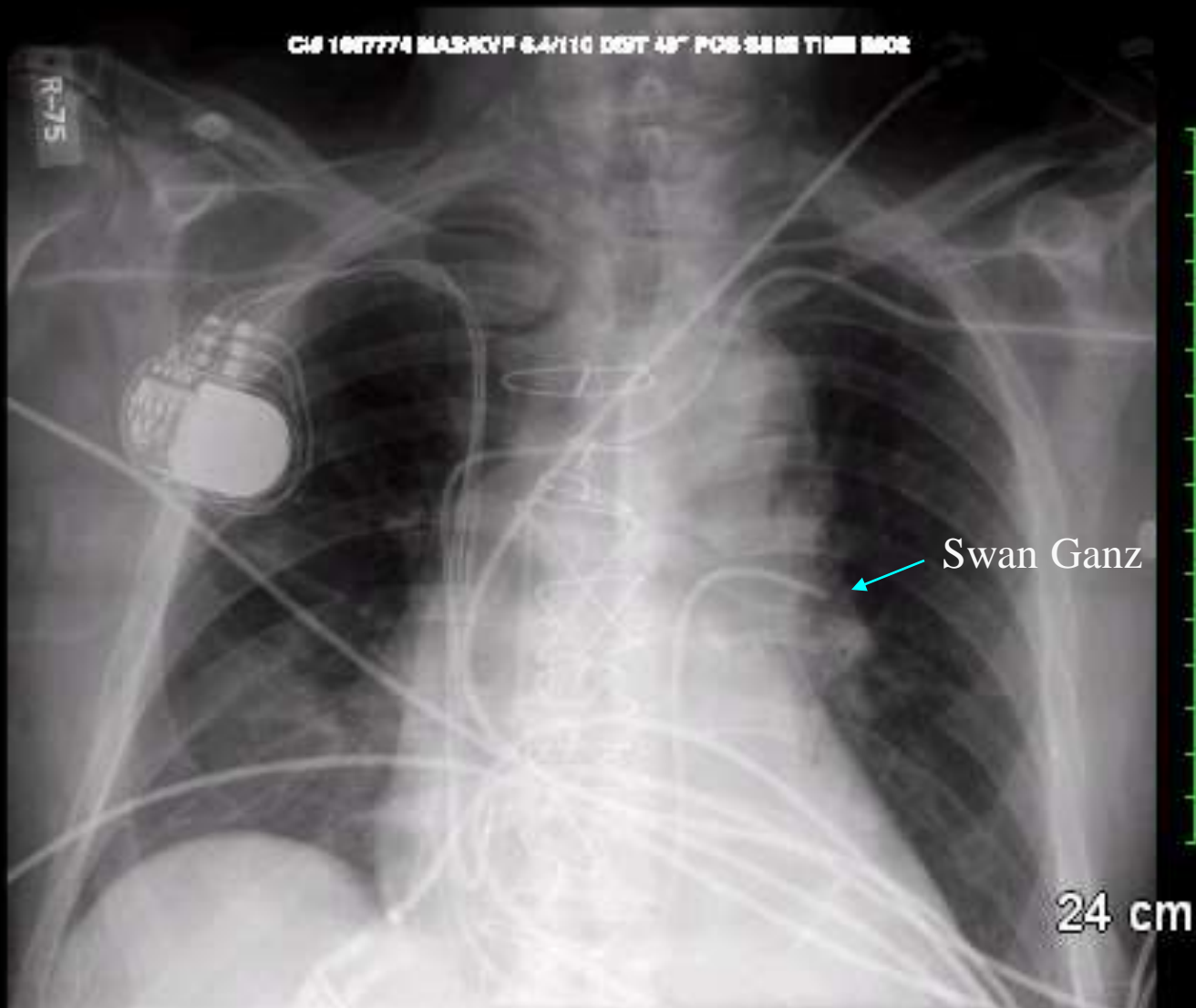


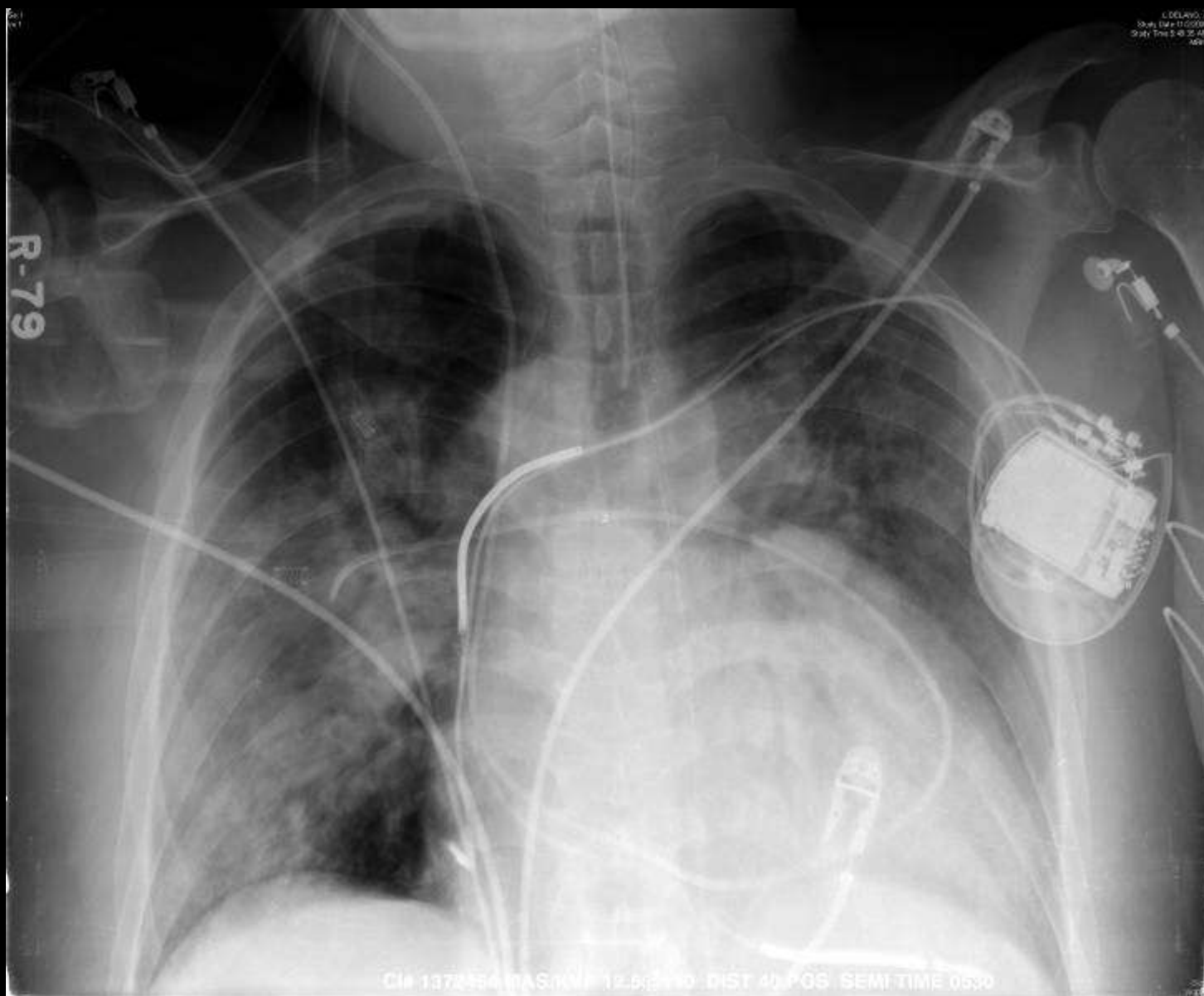
Pulmonary Artery Catheter Swan Ganz Catheter

- Tip should be in the proximal right or left pulmonary artery
- Tip should be about 2 cm from the hilum or no more than 2 – 4 cm beyond the vertebral midline

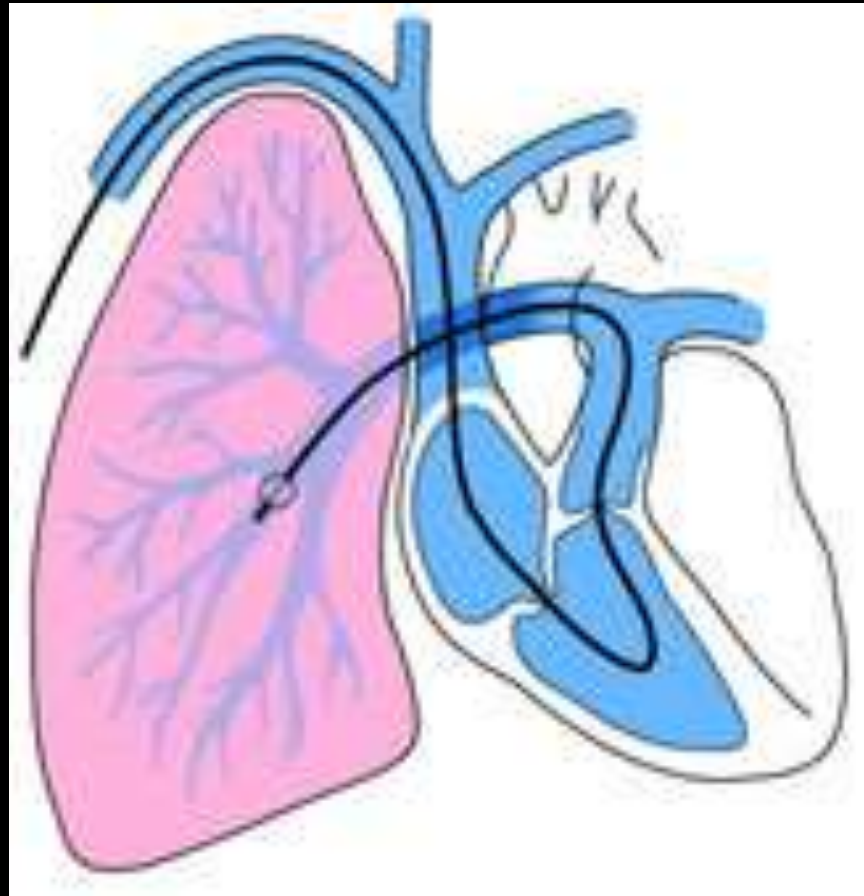








- Tip should not be in the peripheral or distal pulmonary artery
- May cause pulmonary infarction or pulmonary artery rupture



309MCRAD086

Ex: 000001

Se: 1/1

Im: 13/23

S4 L CVICU

2006 Jan 01 test

Acc: 000001

2006 May 31

StdY Tm: 10:00:25

Swan Ganz
In too far



Id:DCM / Lin:DCM / Id:ID

W:3064 L:2724

03 7/95 40" AP Sino 7-20-85 0530

309MCRAD086

Ex: 000001

Se: 1/1

Im: 14/23

CVICU

2006 Jan 01 test

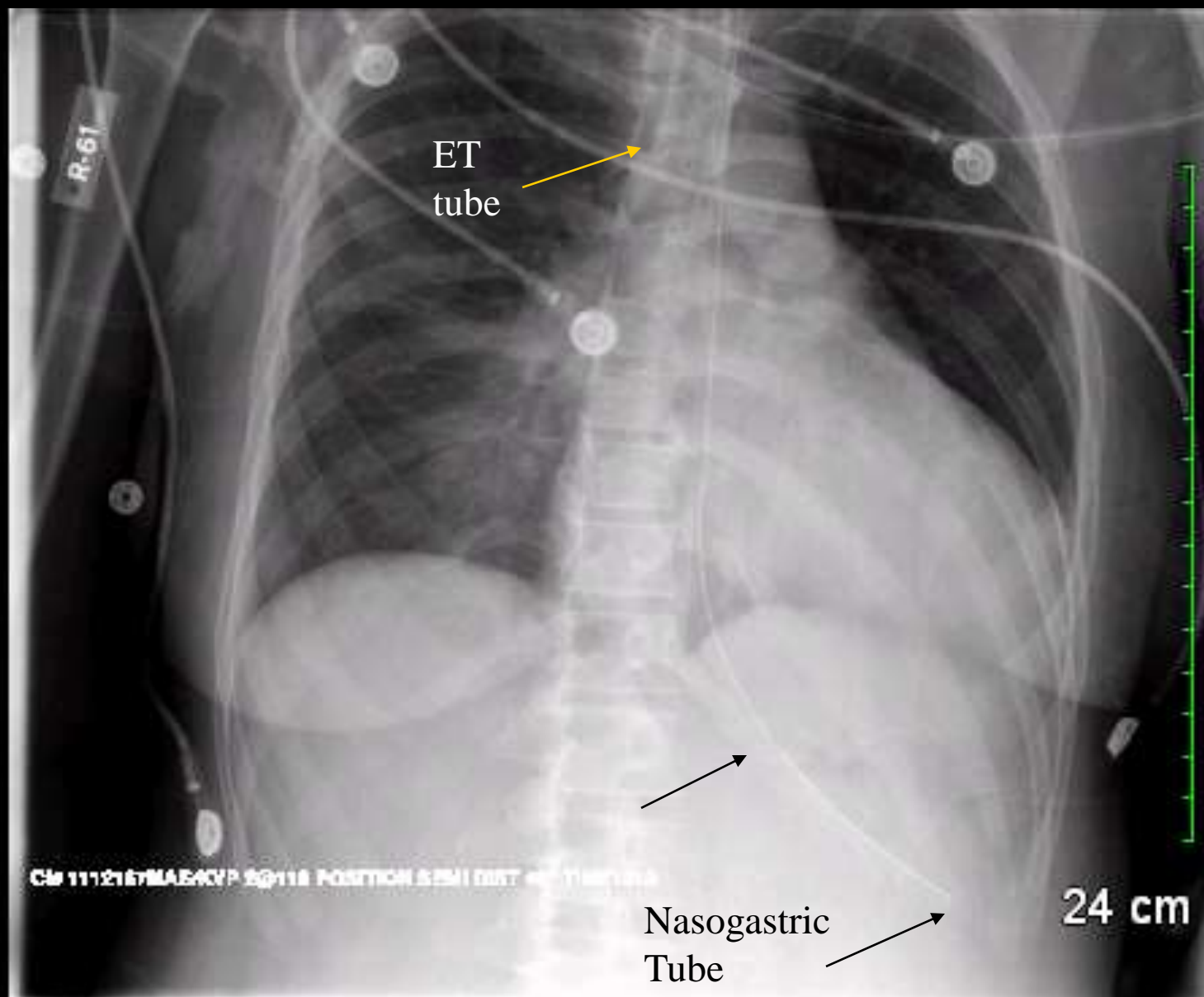
Acc: 000001

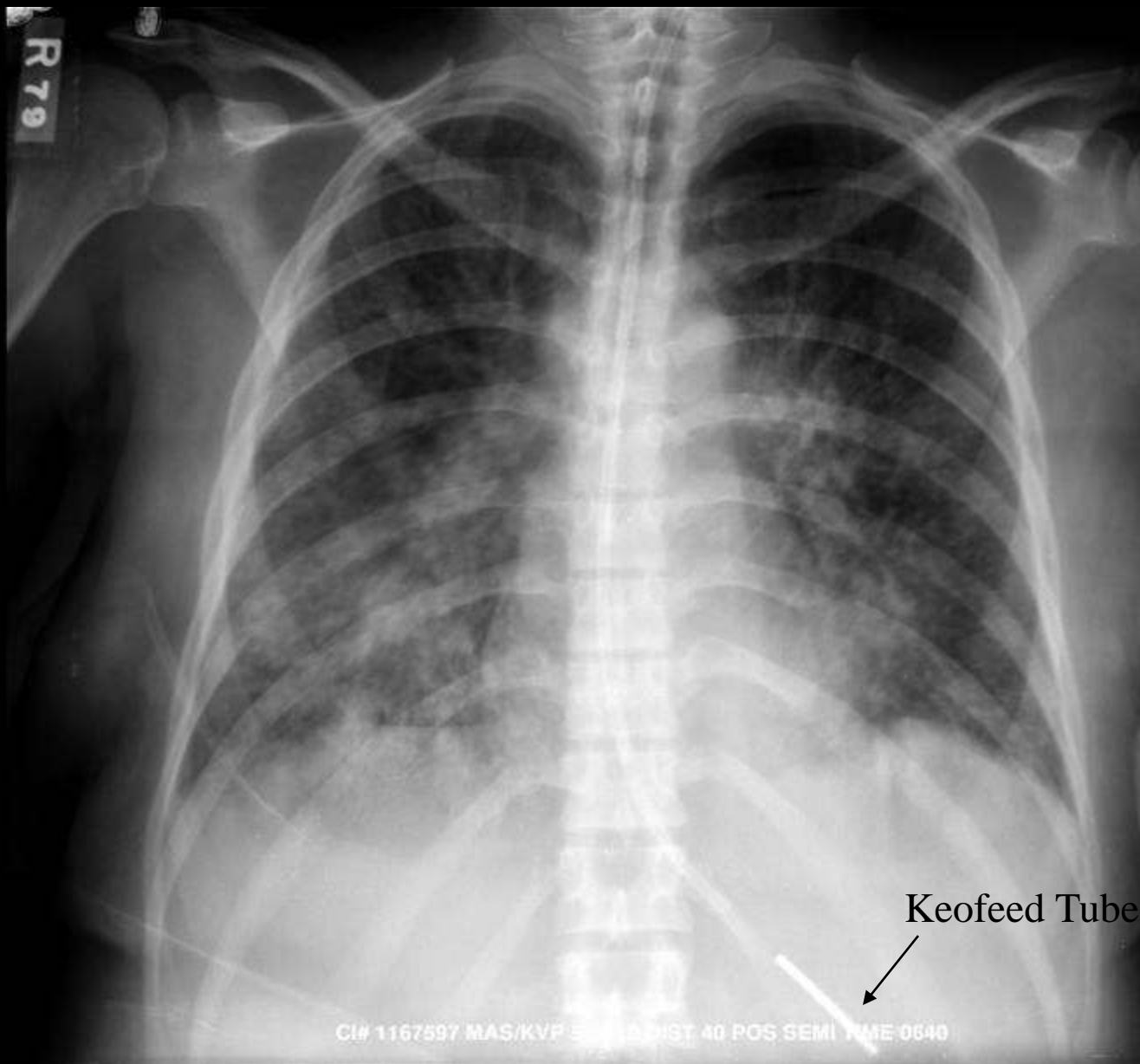
2006 May 31

StdY Tm: 10:00:25

Id:DCM / Lin:DCM / Id:ID

W:2741 L:3053





Keofeed Tube

0086

CVICU

2006 Jan 01 test

Acc: 000001

2006 May 31

StdY Tm: 10:00:25

NG tube
Right lung



in:DCM / Id:ID
2493

DF Supine 1529
3-30-89 @75

309MCRAD086

Ex: 000001

Se: 1/1

Im: 19/23

CVICU

2006 Jan 01 test

Acc: 000001

2006 May 31

StdY Tm: 10:00:25

1-3-00
Semi
AP 40"
0602
3.2A0
DDF

Keofed Tube
Right Lung

Id:DCM / Lin:DCM / Id:ID
W:3064 L:2580



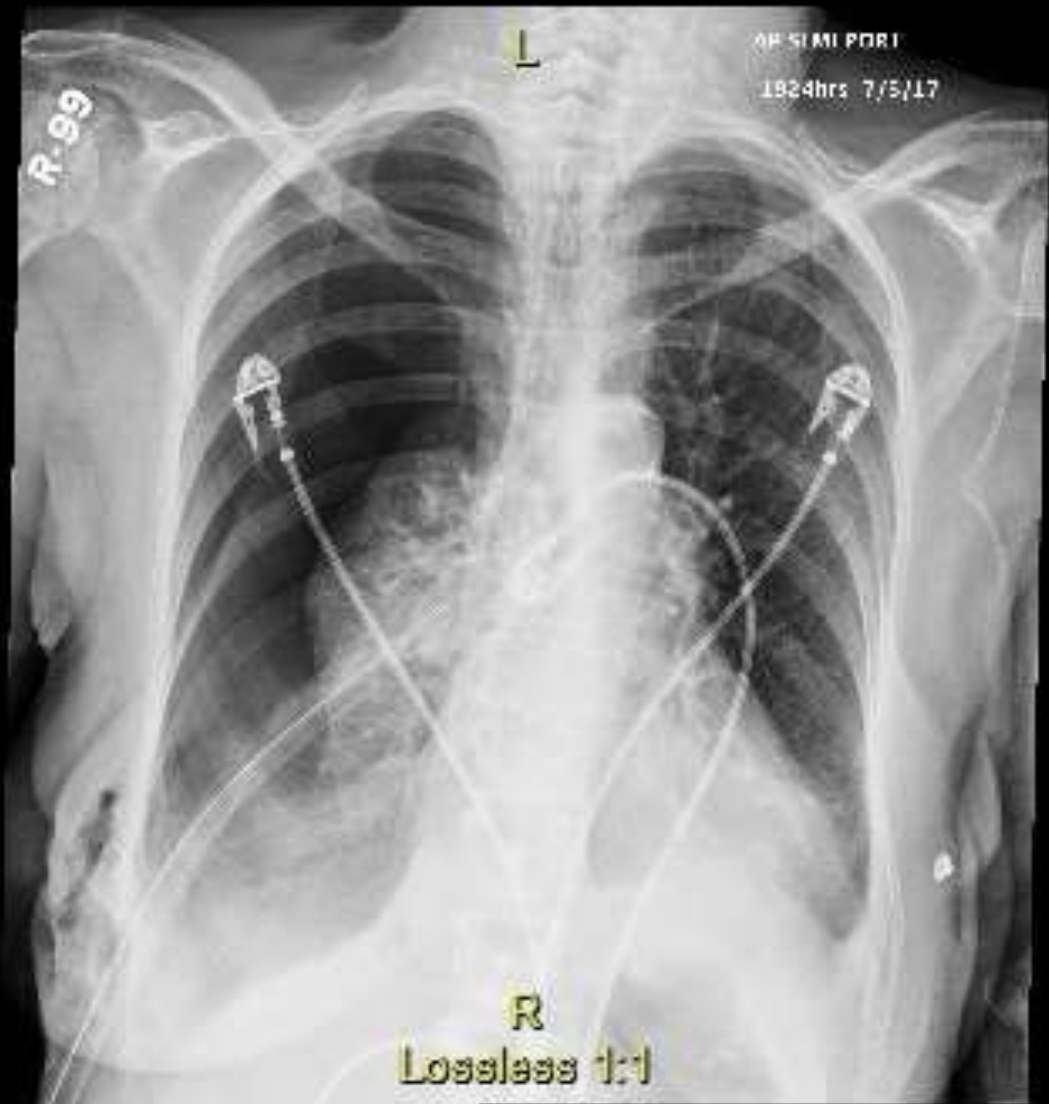
Lossless 1:1

KUB after NG inserted



CXR NG

CXR
2 hours later

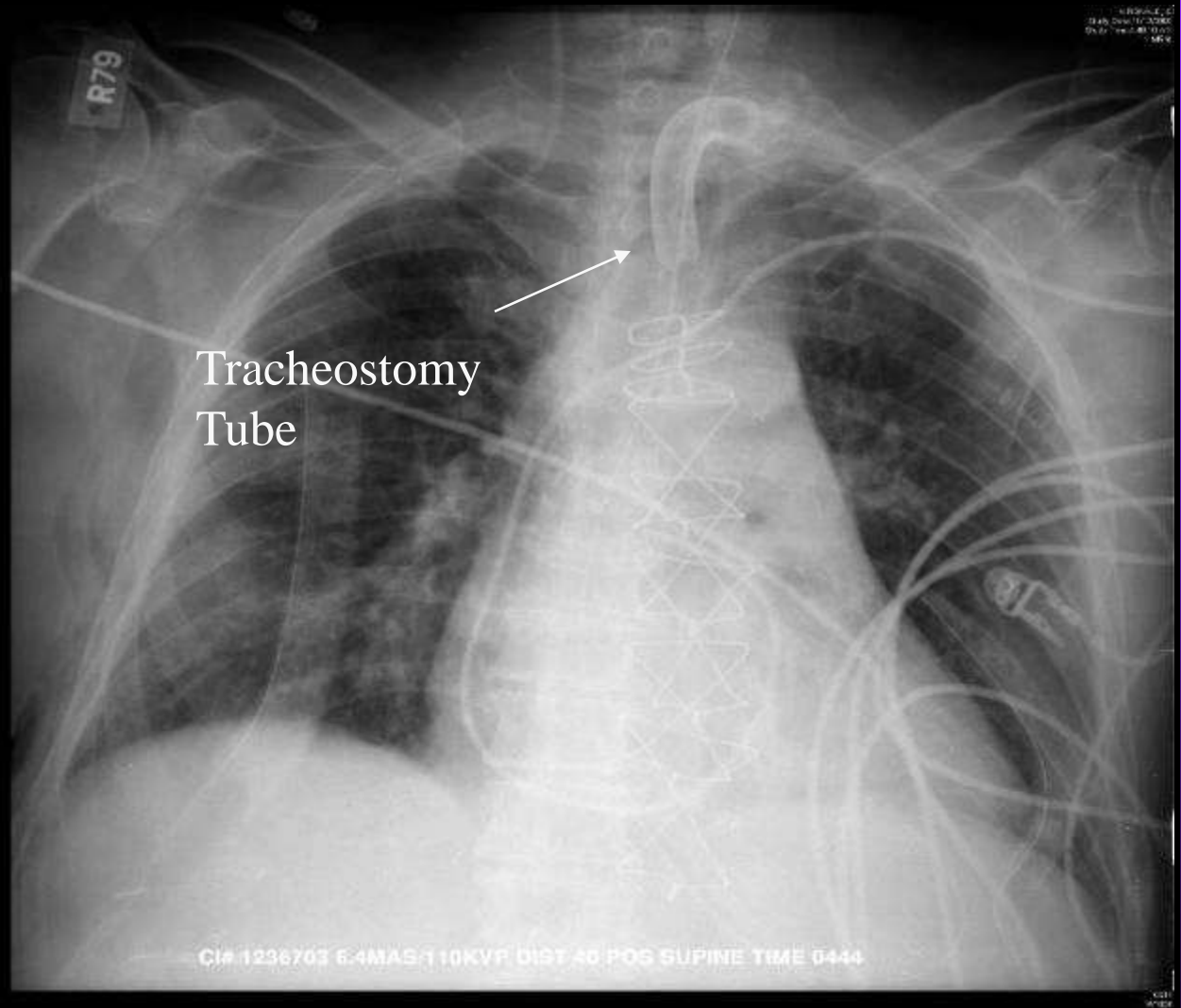


F



CXR after CT inserted

Tracheostomy tubes: Check Position



309IMCRAD086
Ex: 000005

Se: 171
Im: 4/14

CVICU

2006 Jan 01 test

Acc: 000001

2006 May 31

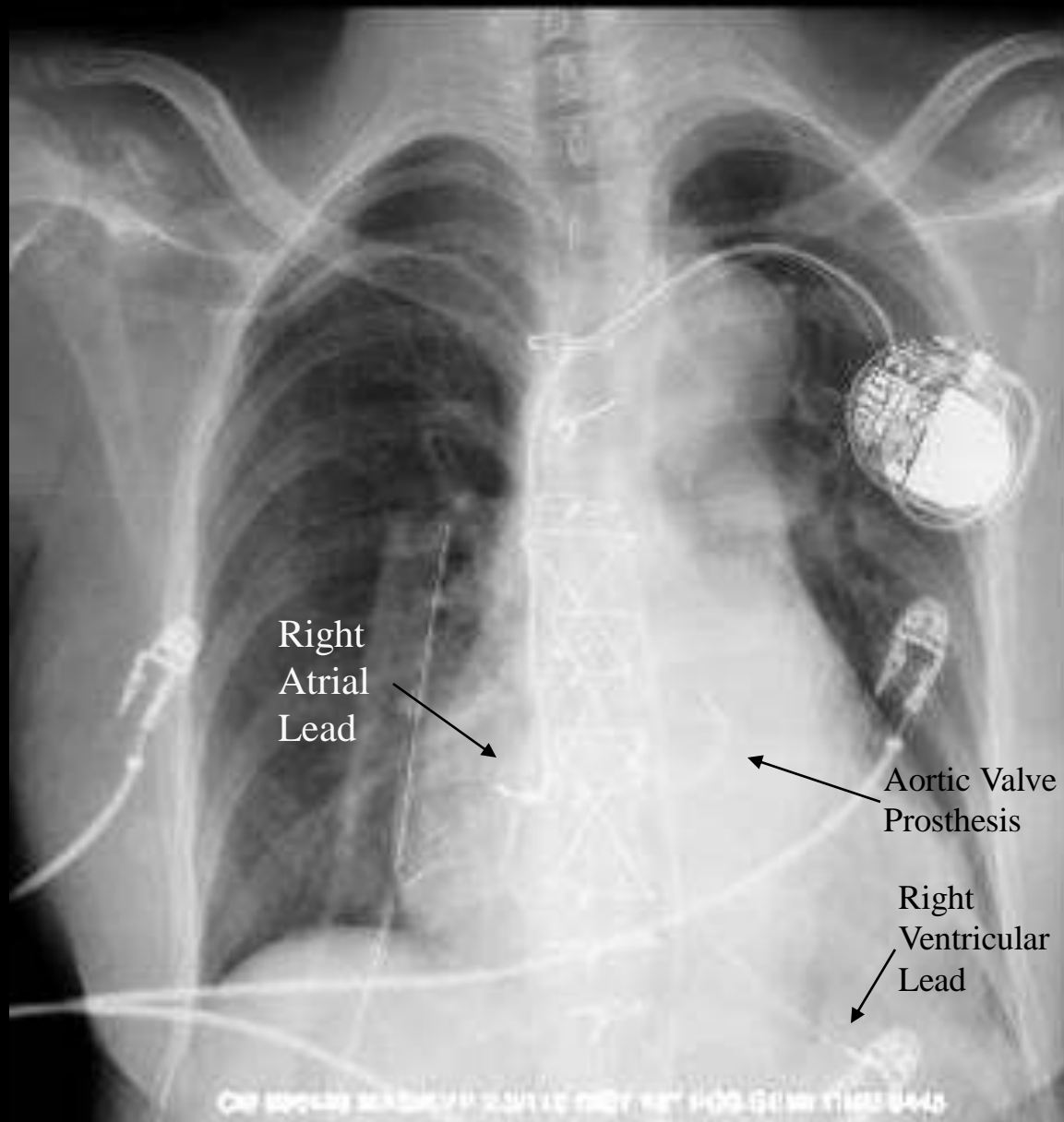
StdY Tm: 07:50:09

DDF
6/25/18
AP Erect
140
2005

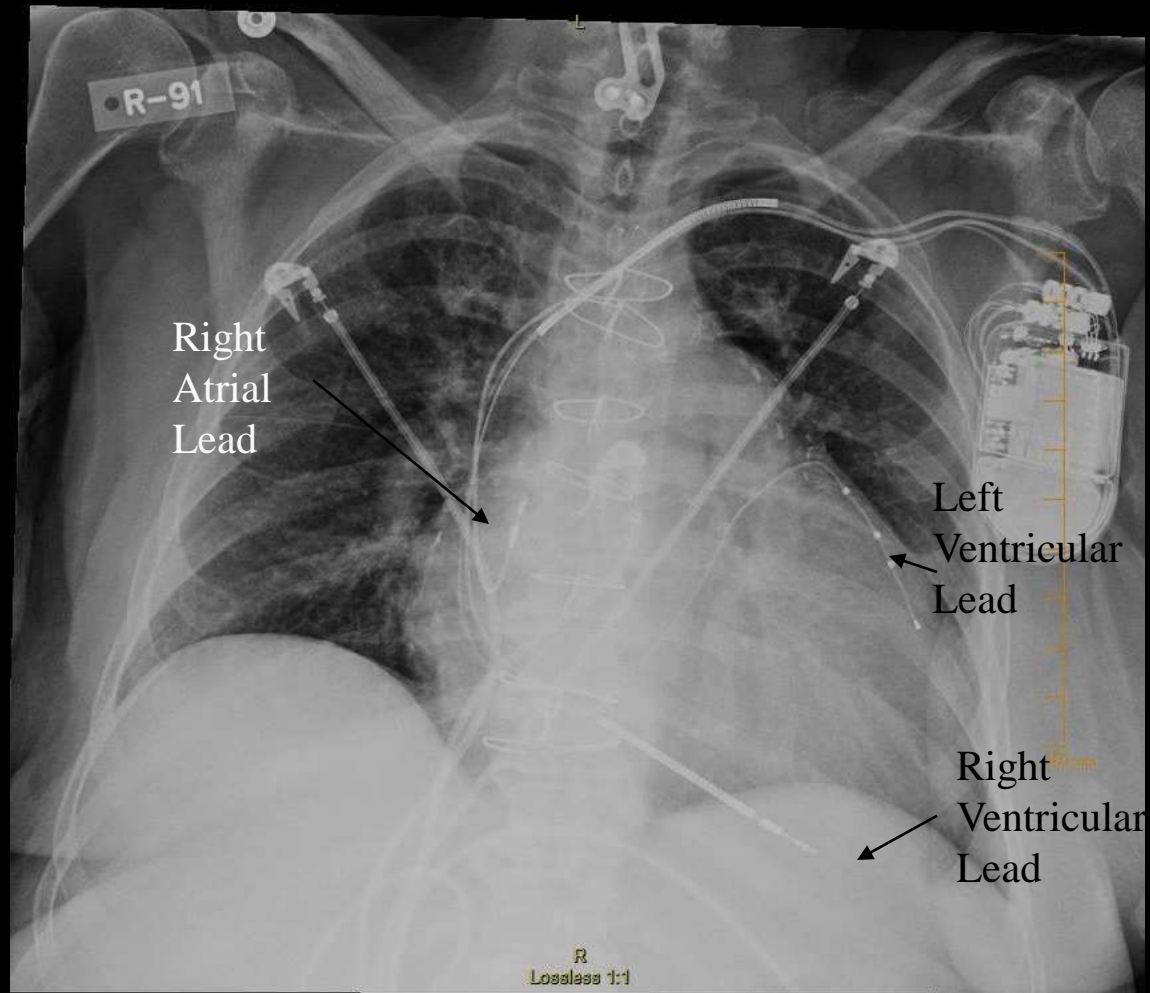
Right
Atrial Lead

Right
Ventricular
Lead

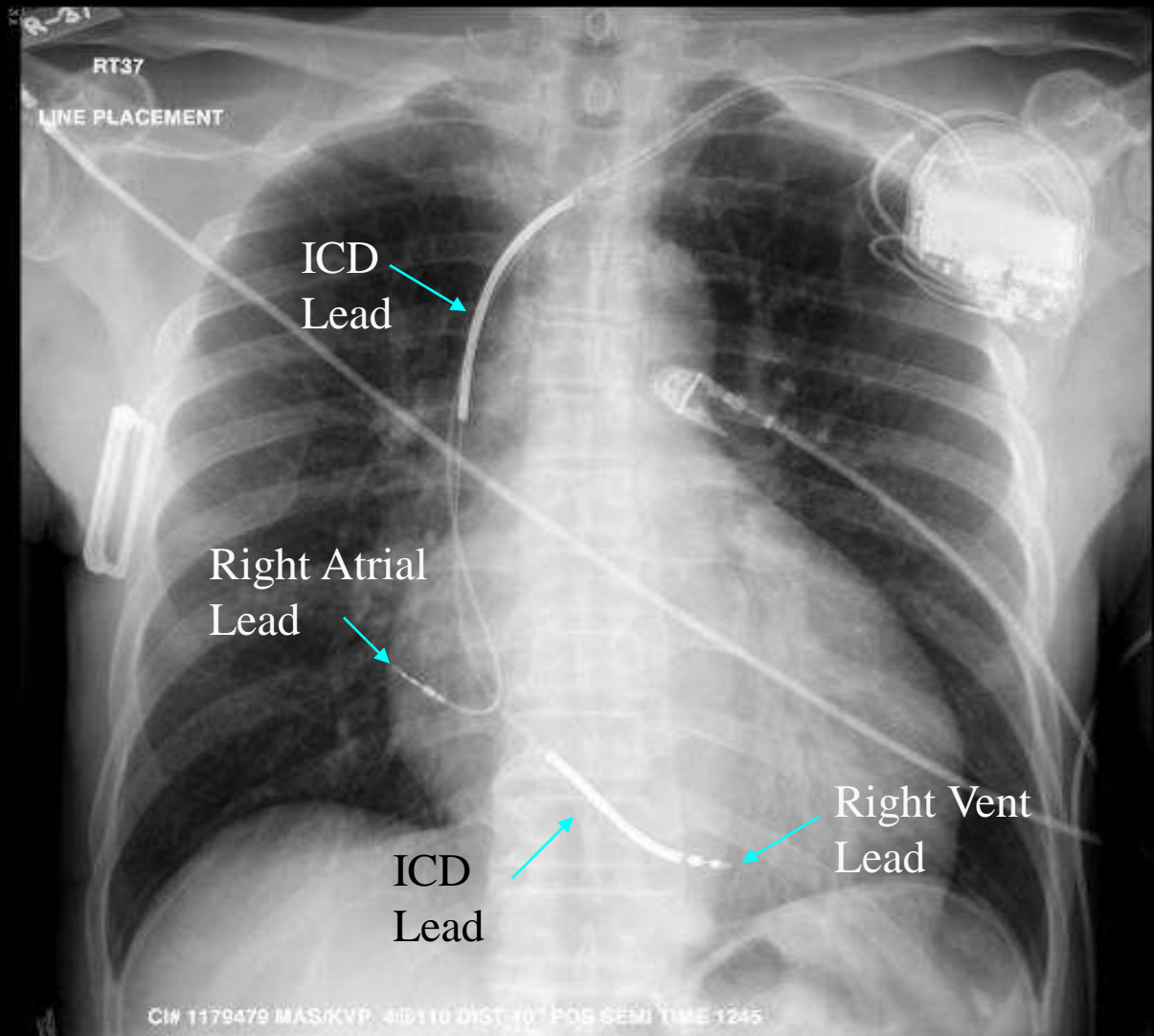
Id:DCM / Lin:DCM / Id:ID
W:3395 L:2381



Biventricular Pacemaker

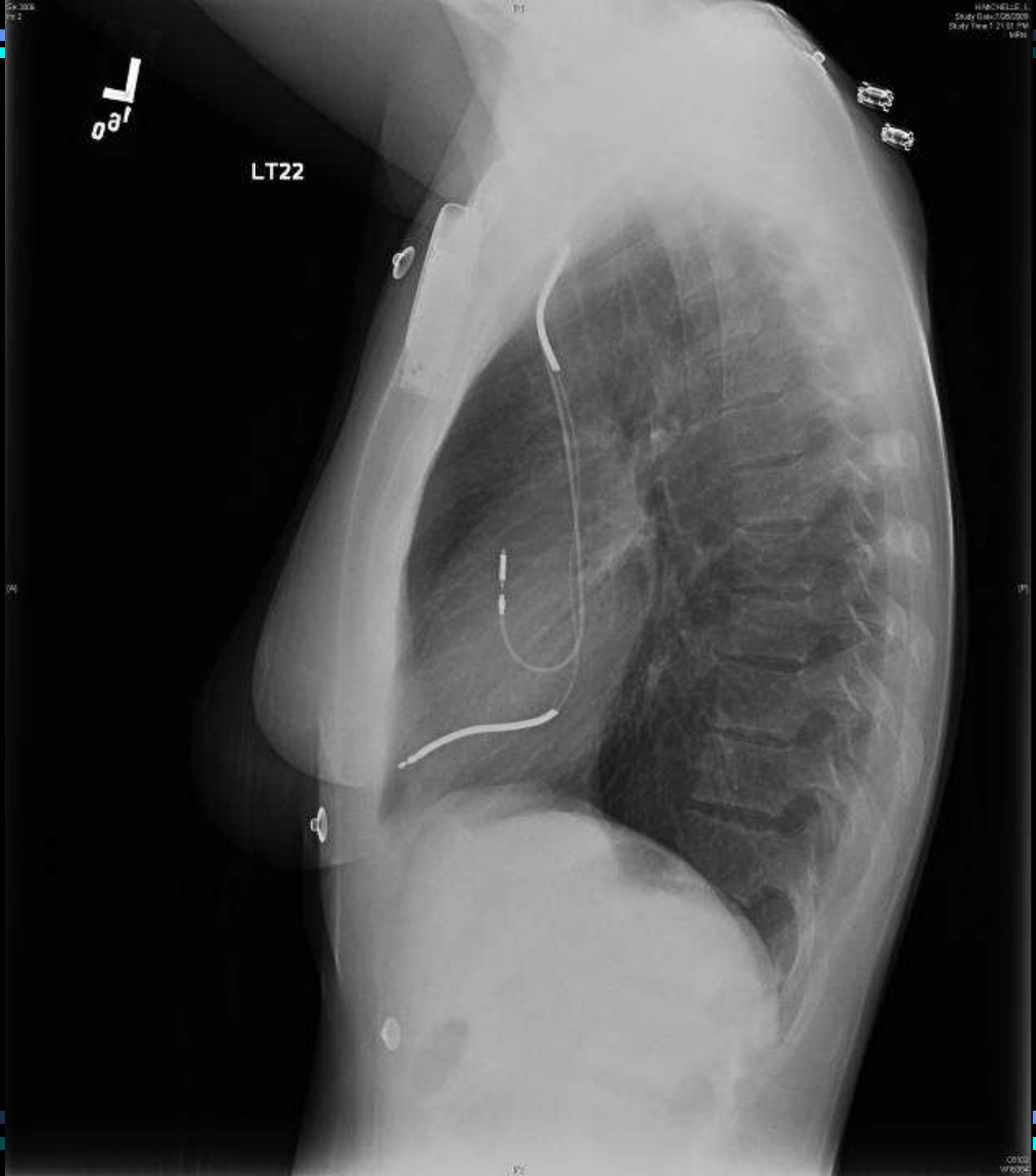


DDD pacer and ICD



L
001

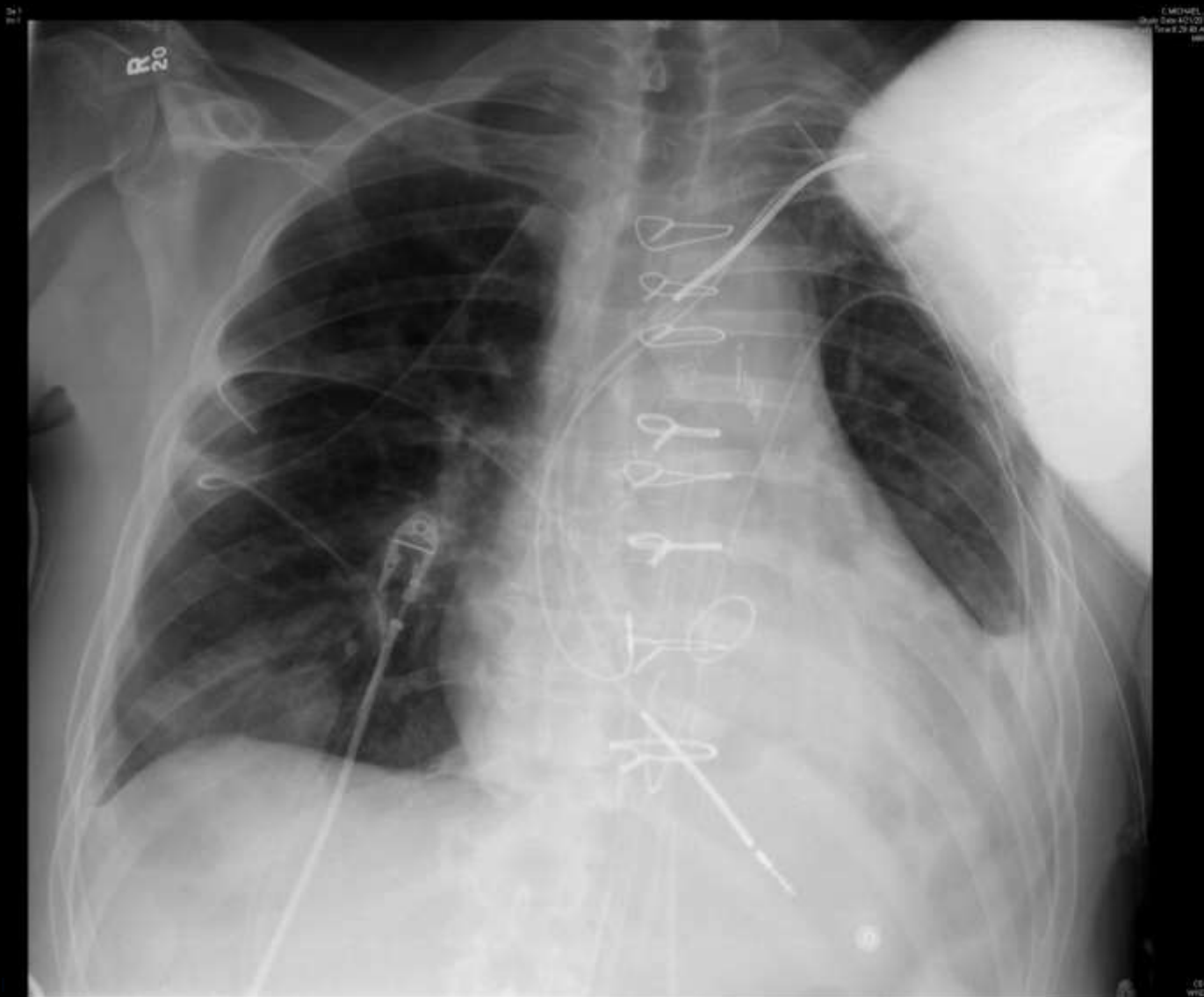
LT22



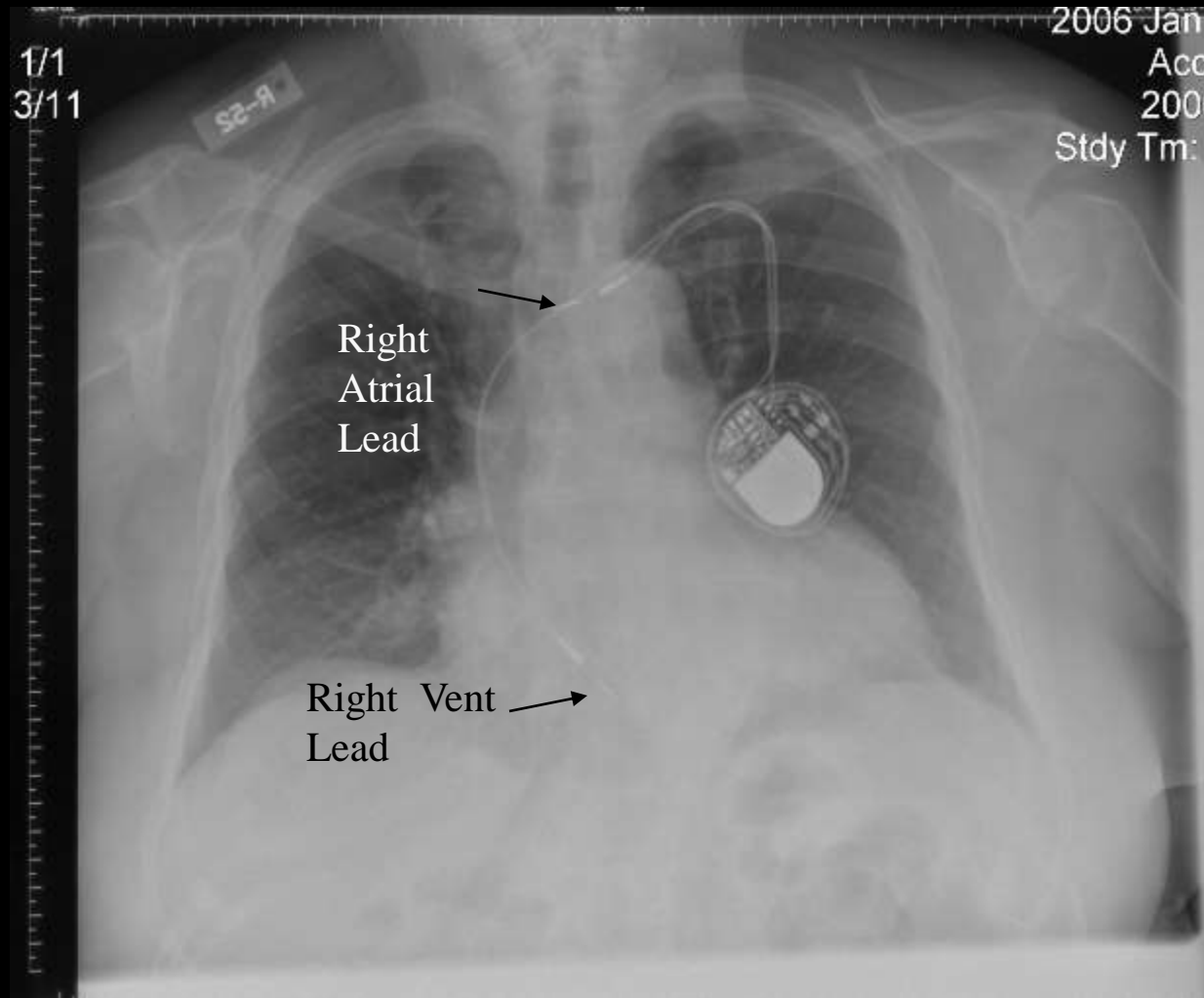
CXR post DDD placement



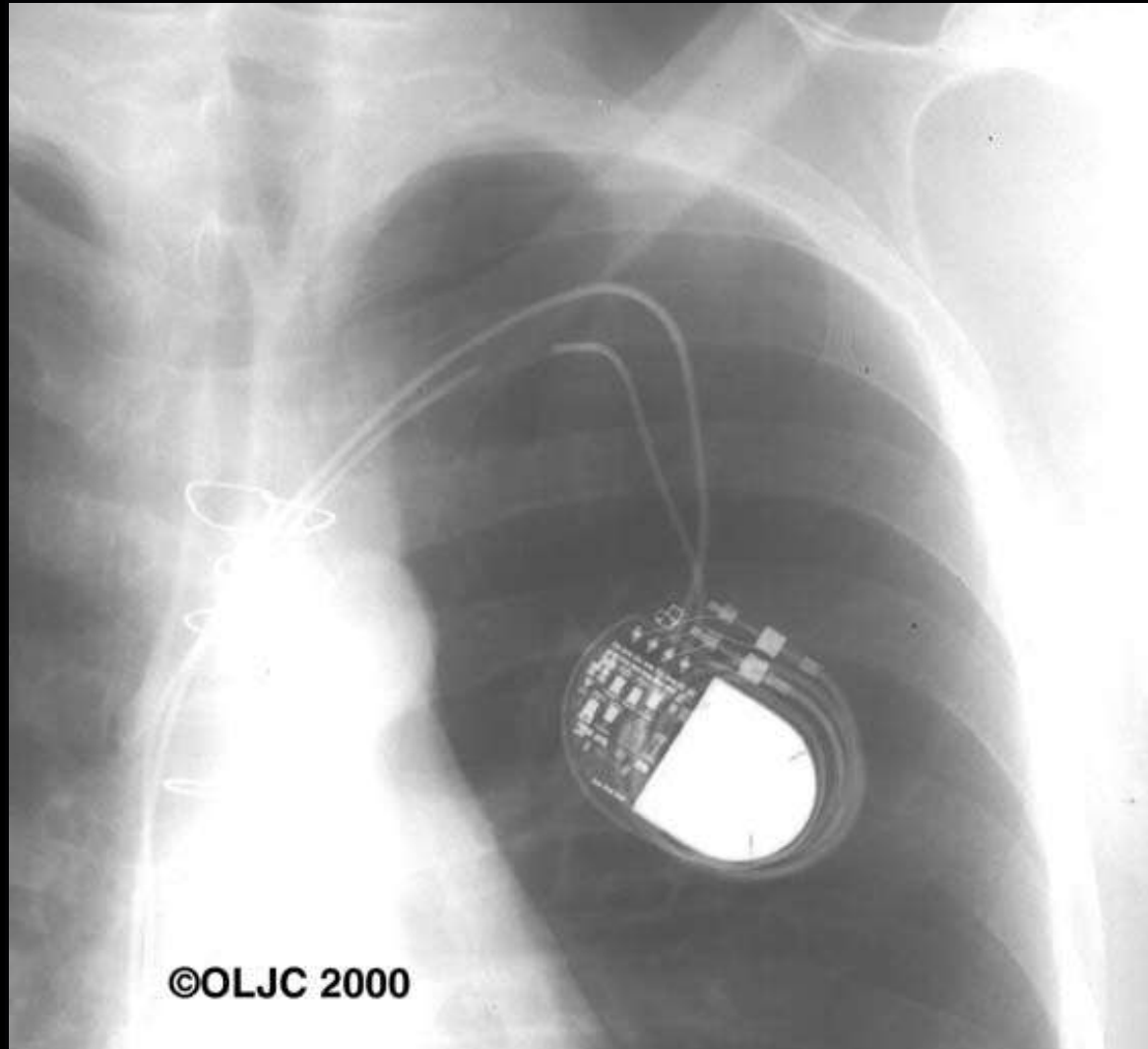
Same patient after atrial lead repositioned



Patient c/o syncope



Lead Fracture

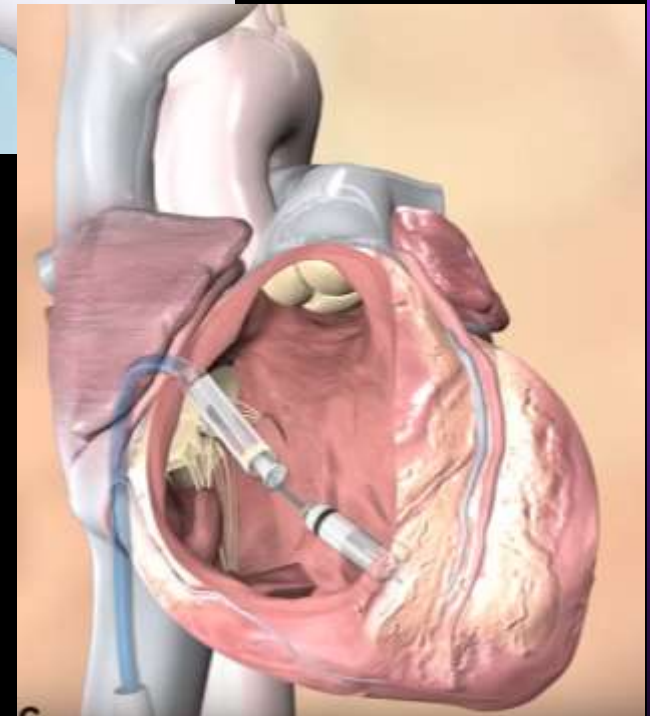


Micra Pacemaker by Medtronic

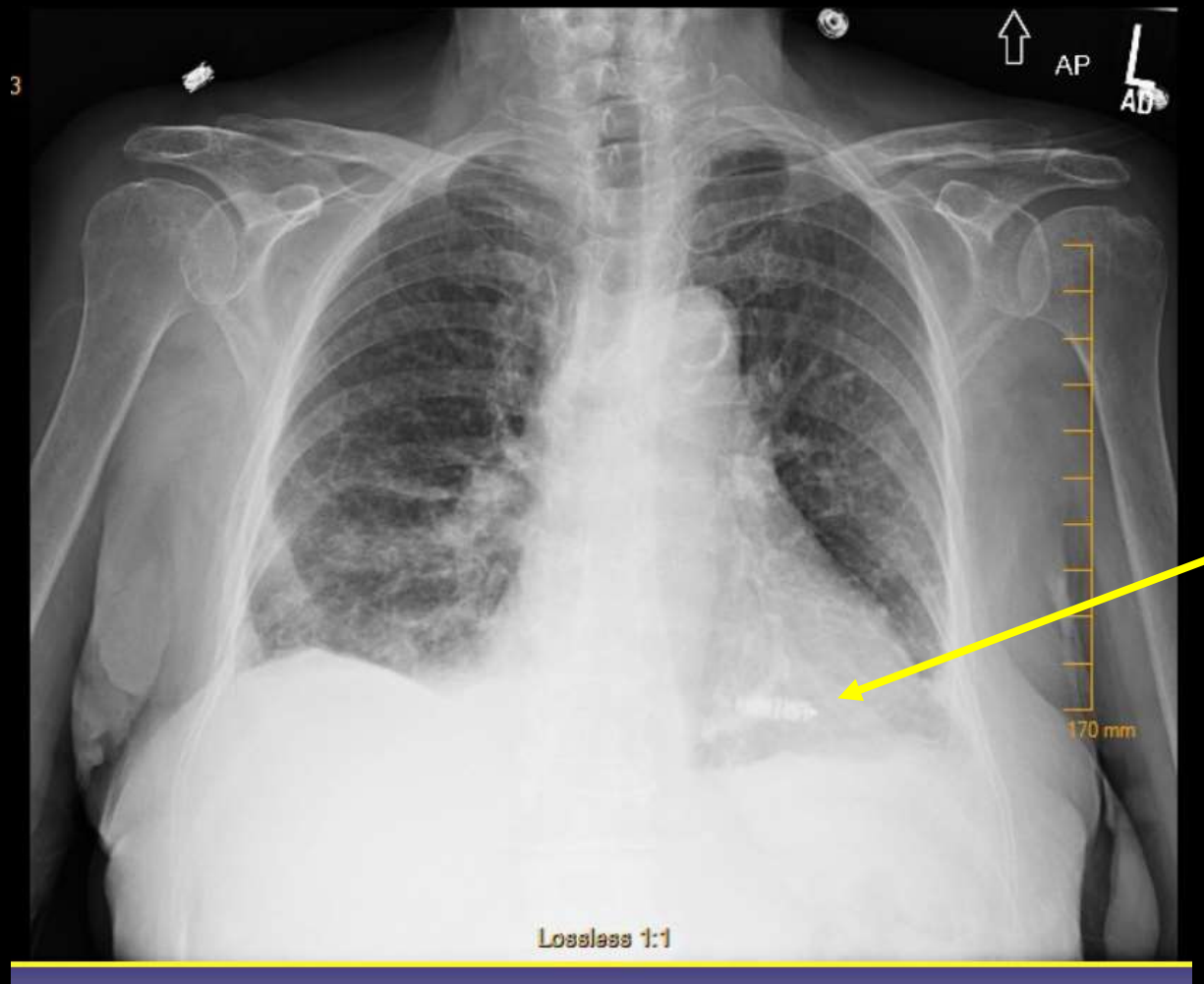
FDA Approved April 2016

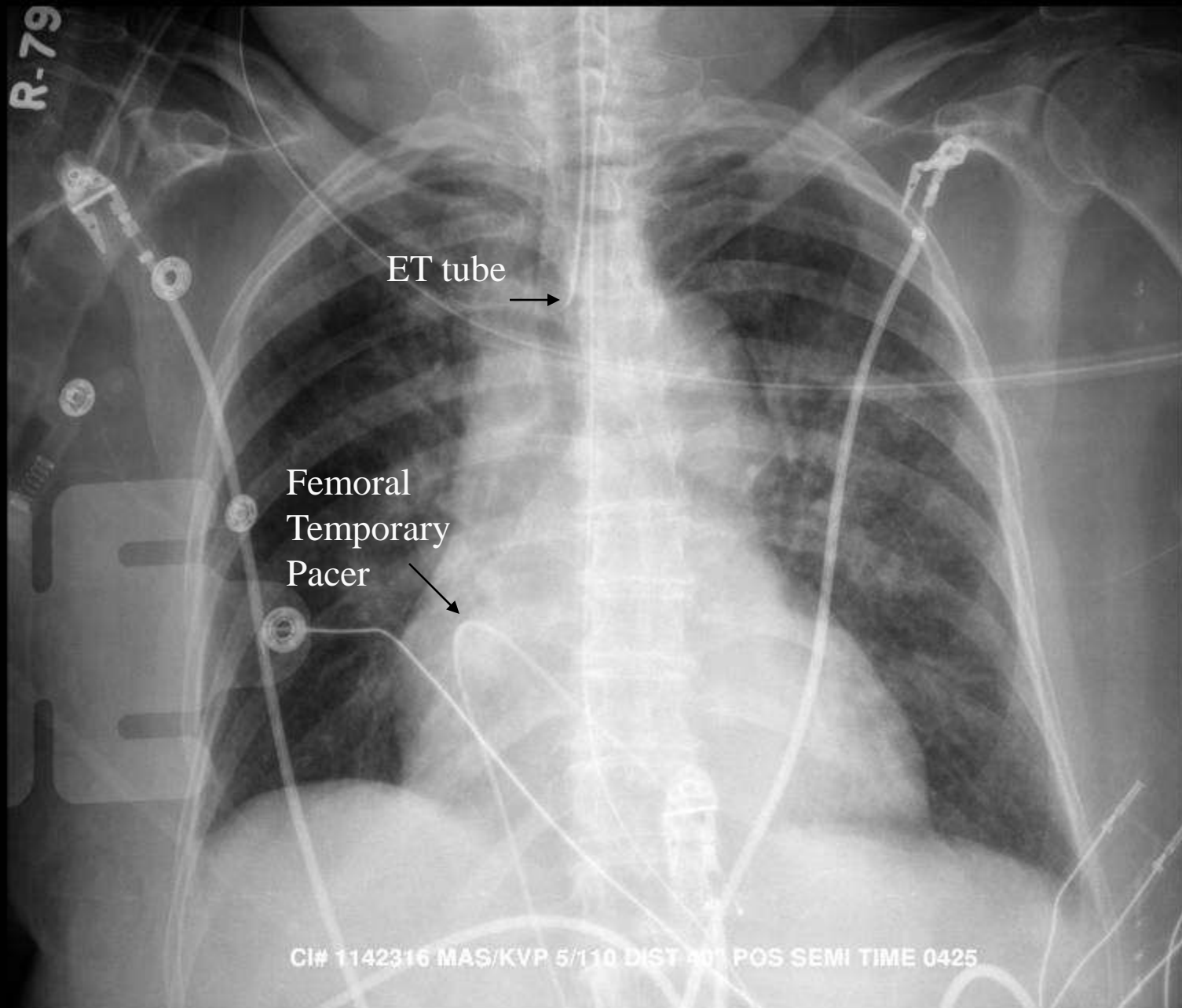
- Less invasive — Micra is placed in the heart via a vein in the leg, thus no chest incision, scar, or bump that results from conventional pacemakers.
- Micra is completely self-contained within the heart
- Single chamber pacemaker (VVI) for bradycardia
- MRI safe
- 12 year battery life

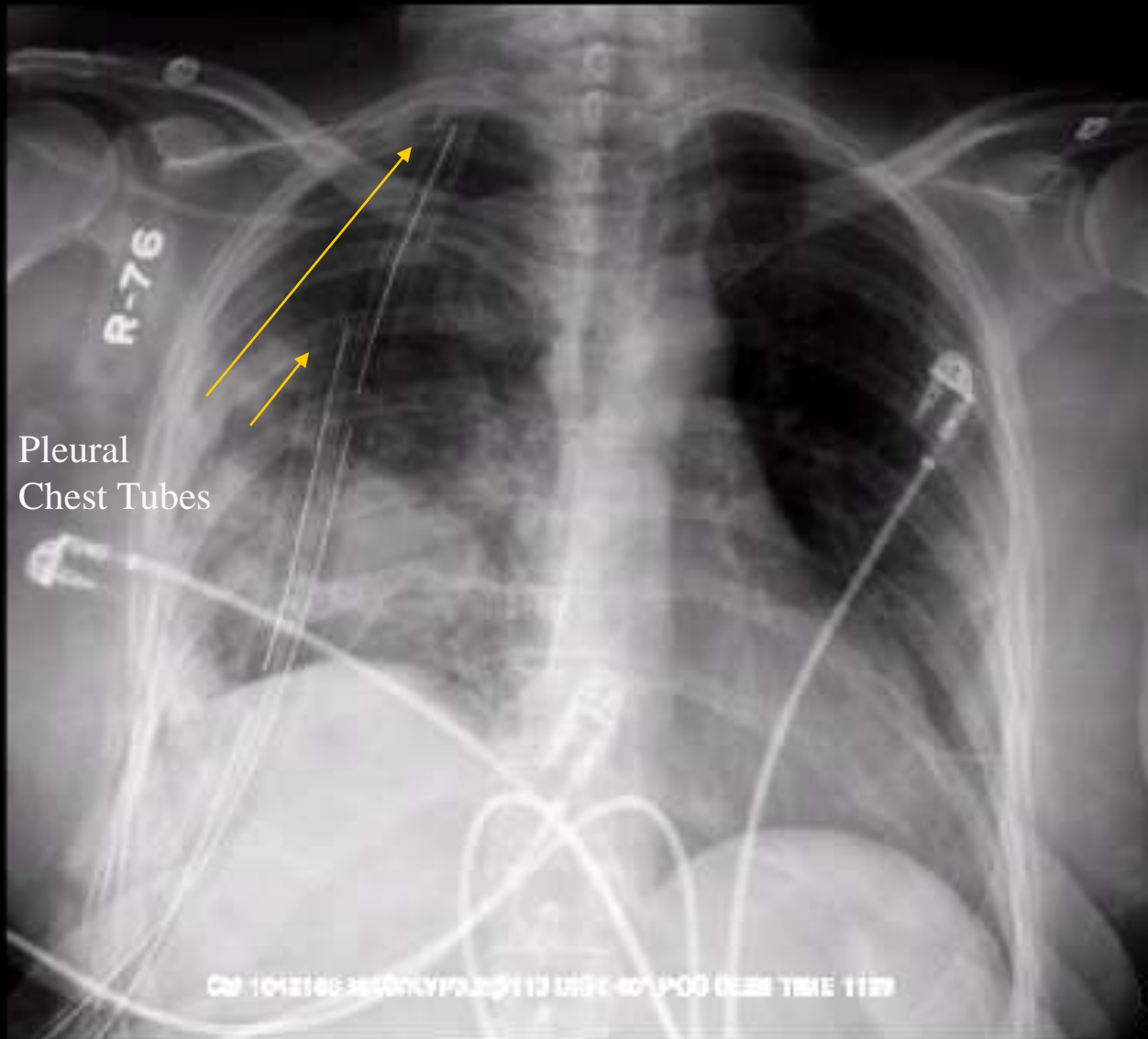
Reference: www.medtronic.com

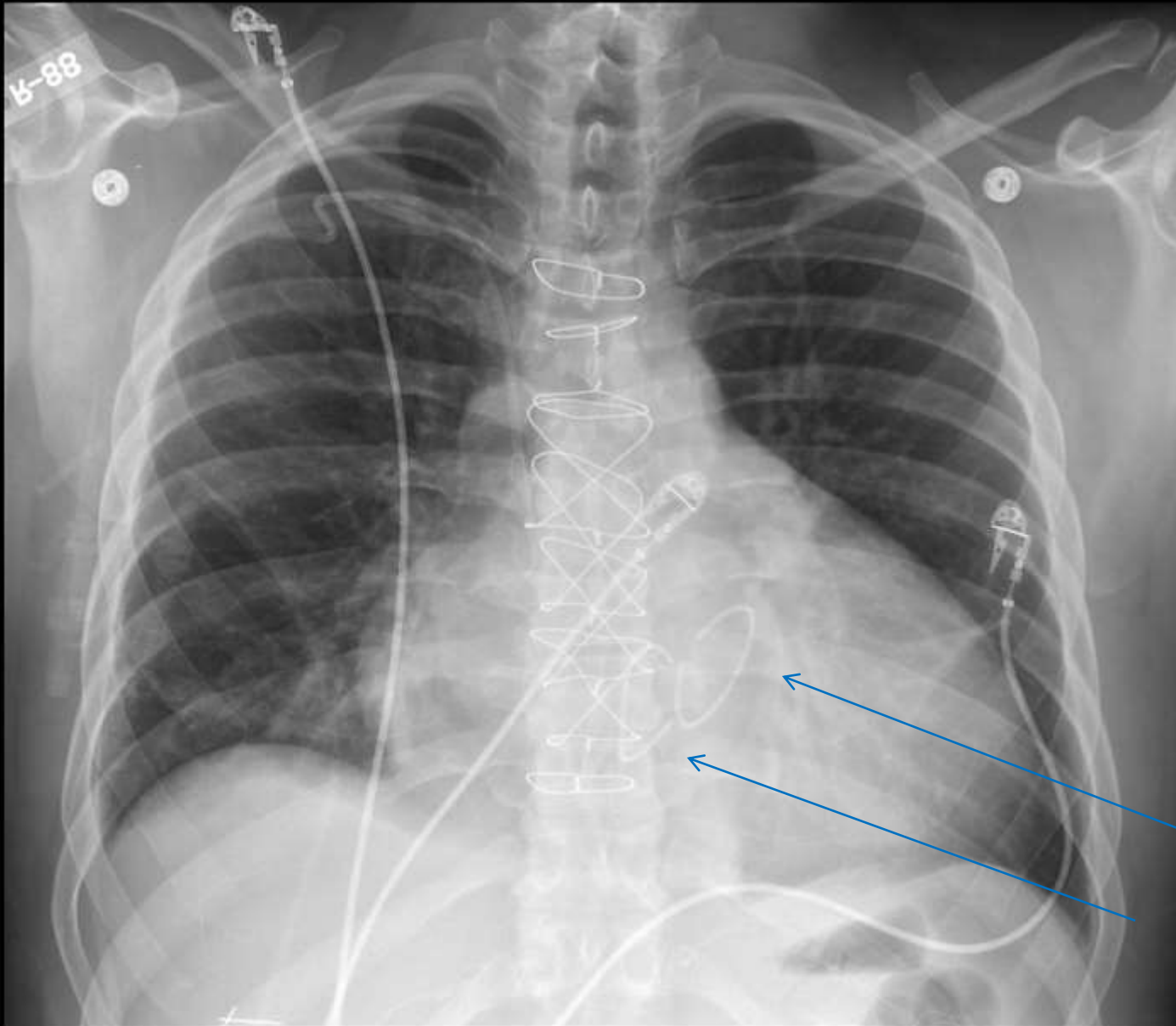


Micra pacemaker









Mitral and
Tricuspid
Valve
repair
rings

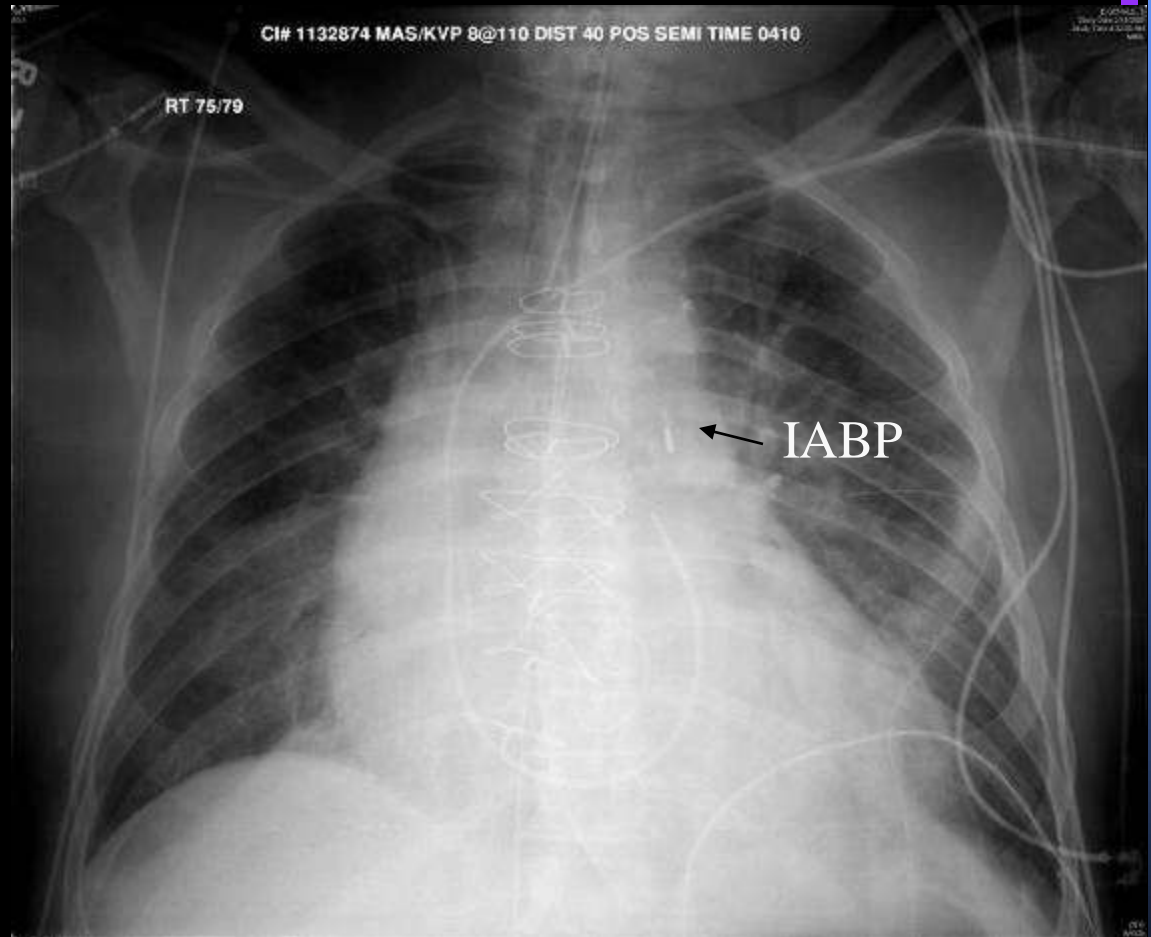
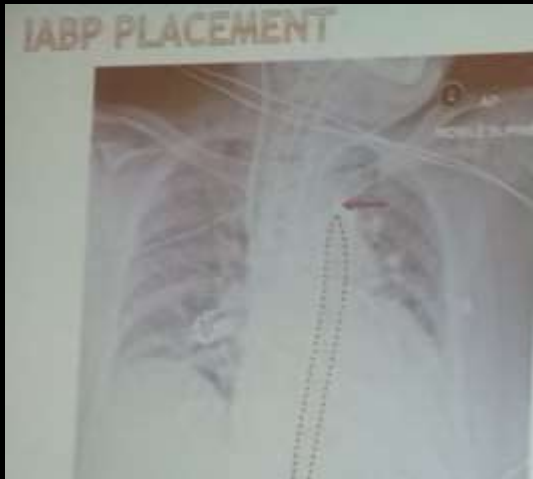
Lateral view of same
patient with mitral
and tricuspid valve
ring repair

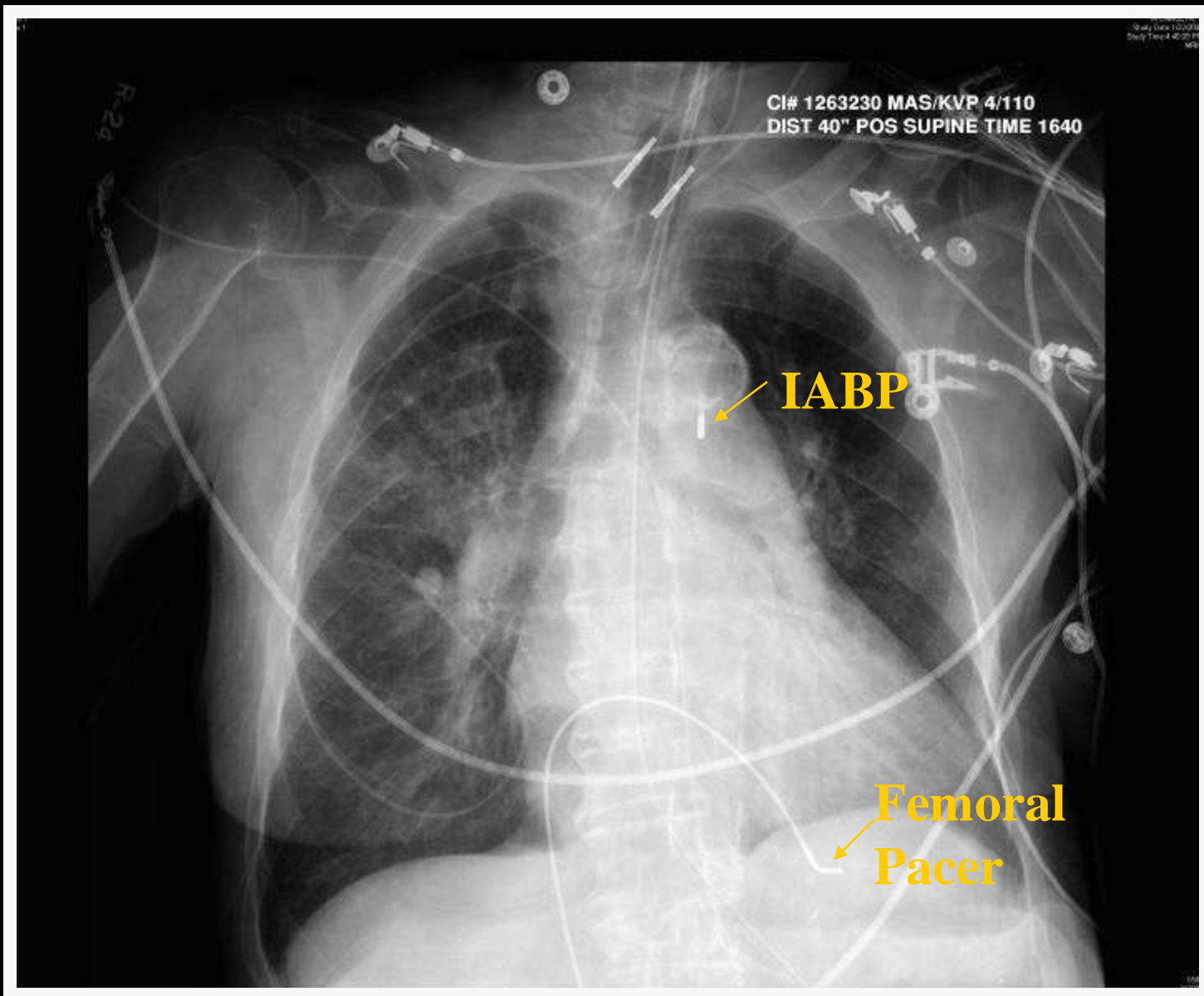


IABP

Intra-aortic balloon pump

- Tip should lie distal to the origin of the left subclavian artery

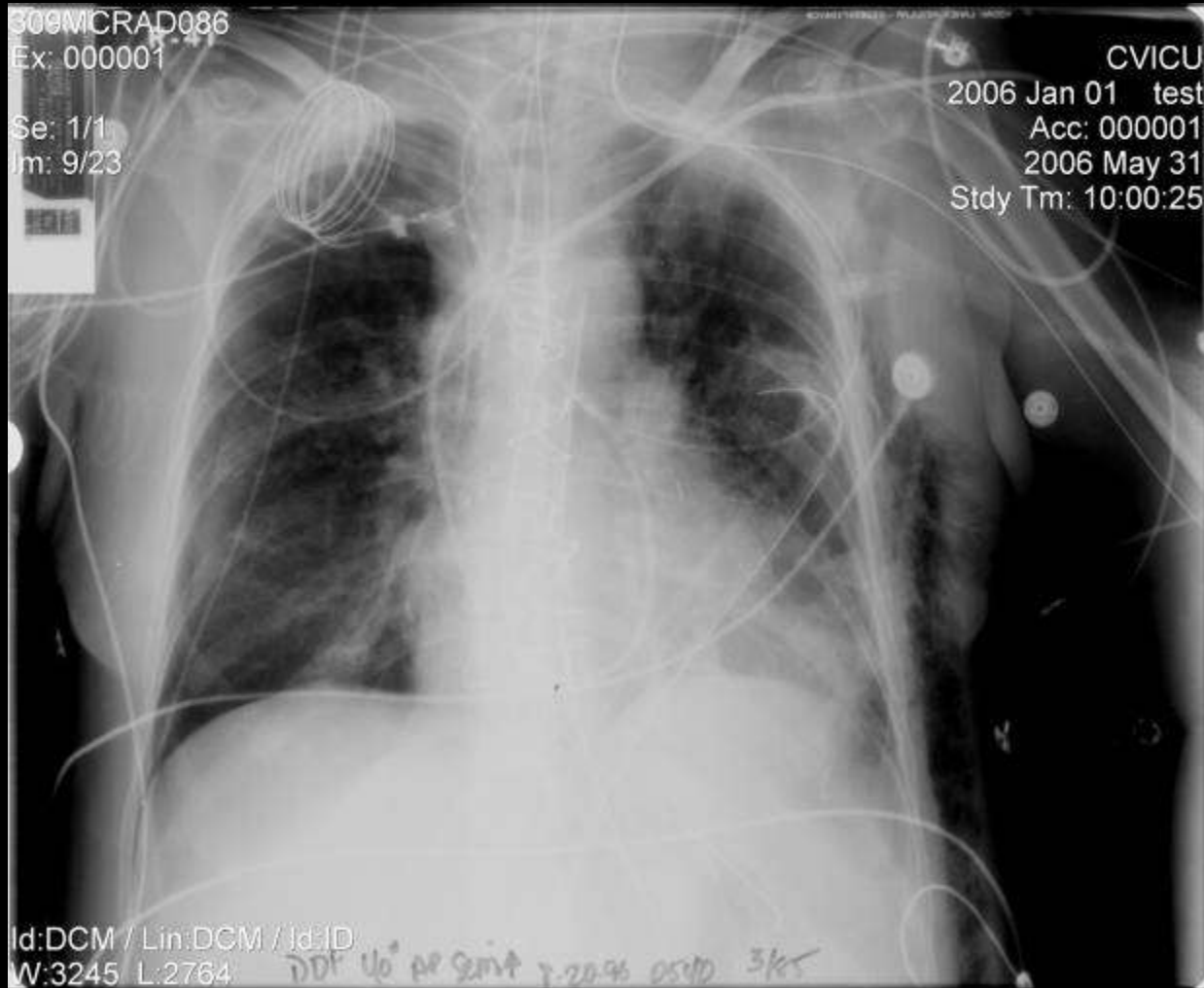


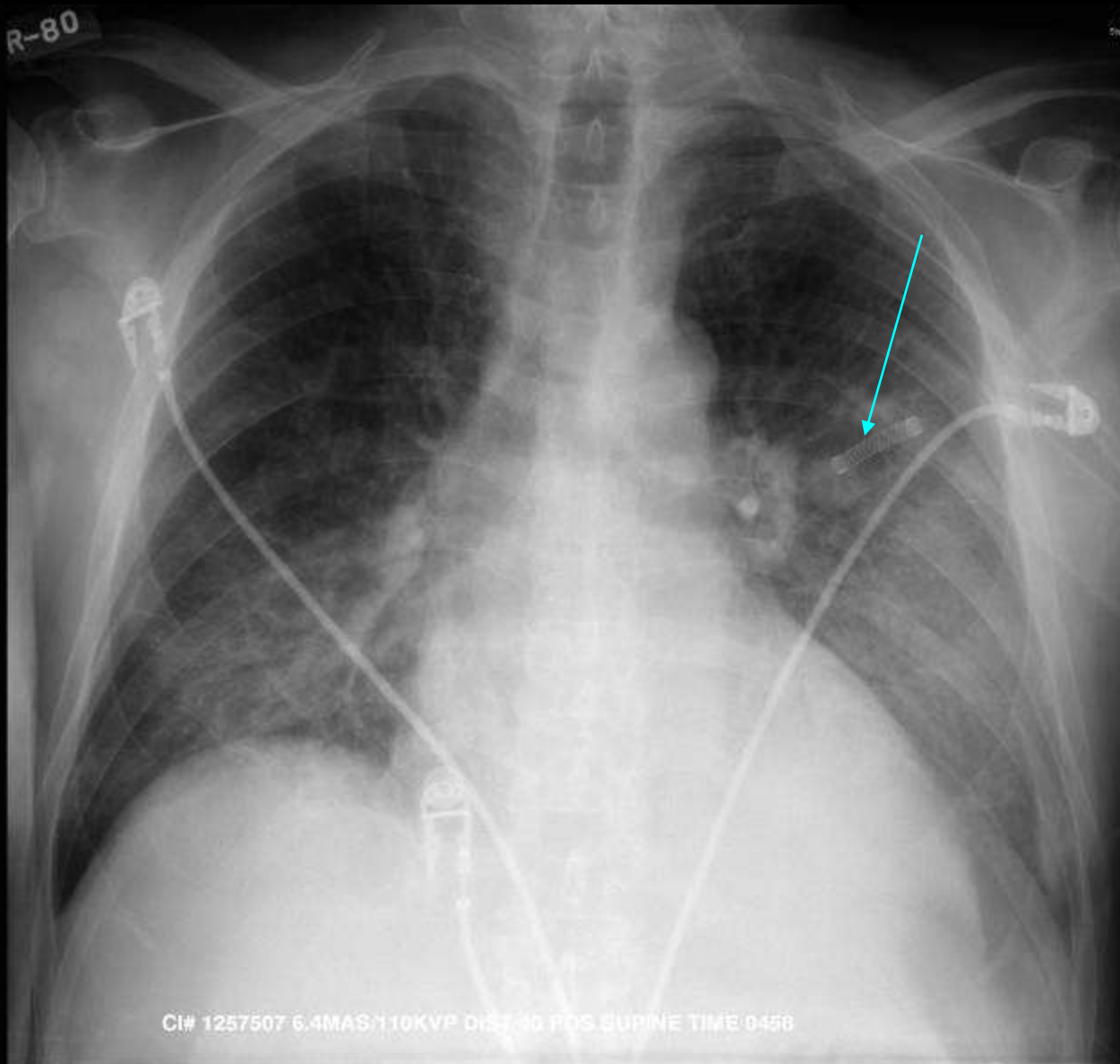


IABP Inflated



ICU RN responsibility to clear lines off chest

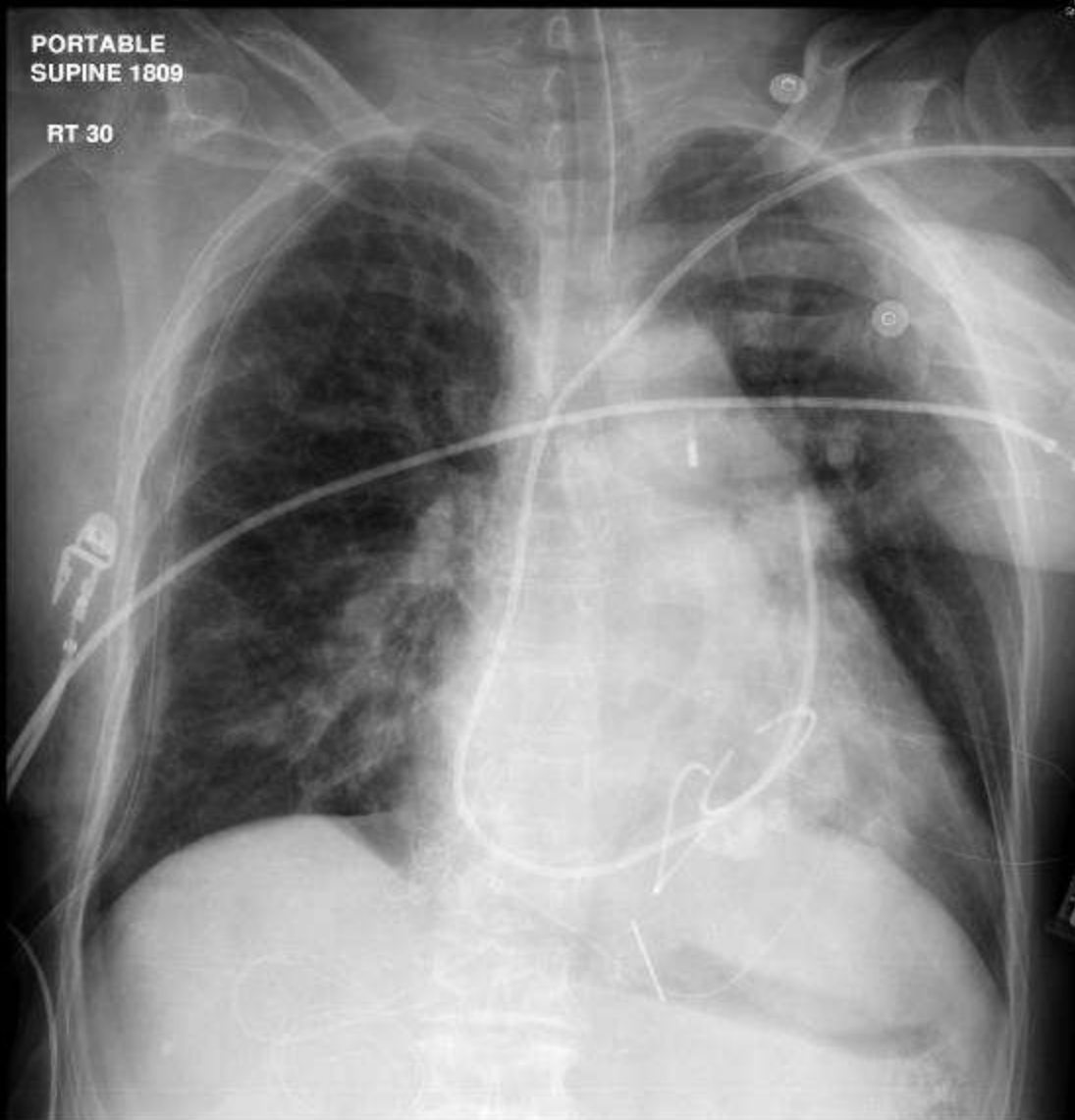




- Spring from nebulizer

PORTABLE
SUPINE 1809

RT 30



Hand on chest

Clinical Findings

As Easy As White





Clinical Findings that show up ***White***

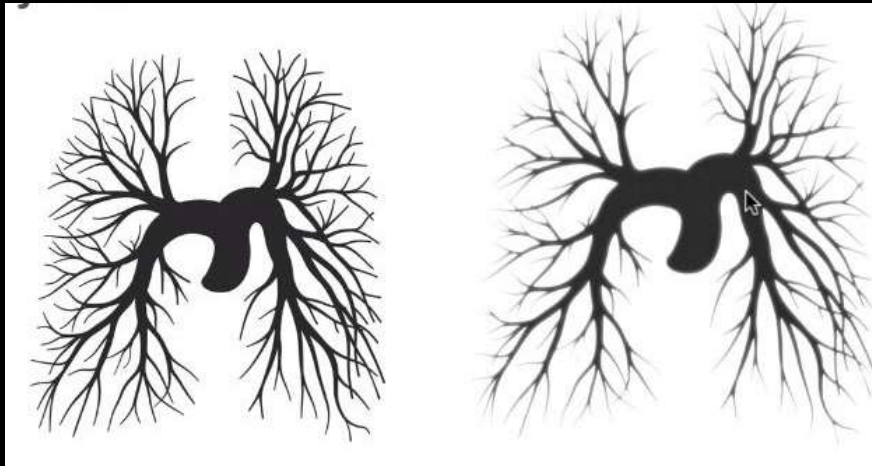
- Pulmonary Edema
- Pneumonia
- Pleural Effusion
- Atelectasis
- Tumors
- ARDS

Pulmonary Edema

- Fluid in the pulmonary vasculature
- Will appear white on CXR
- Butterfly or batwing pattern
- Kerley B lines: thin linear pulmonary opacities caused for fluid or cellular infiltration into the interstitium of the lungs
- Treatment:
 - Diuretics

Hazy Hila

Pulmonary Edema



Normal

Hazy



309MCRAD086

EX: 000002 R 54

Se: 1/1

Im: 1/14

CVICU

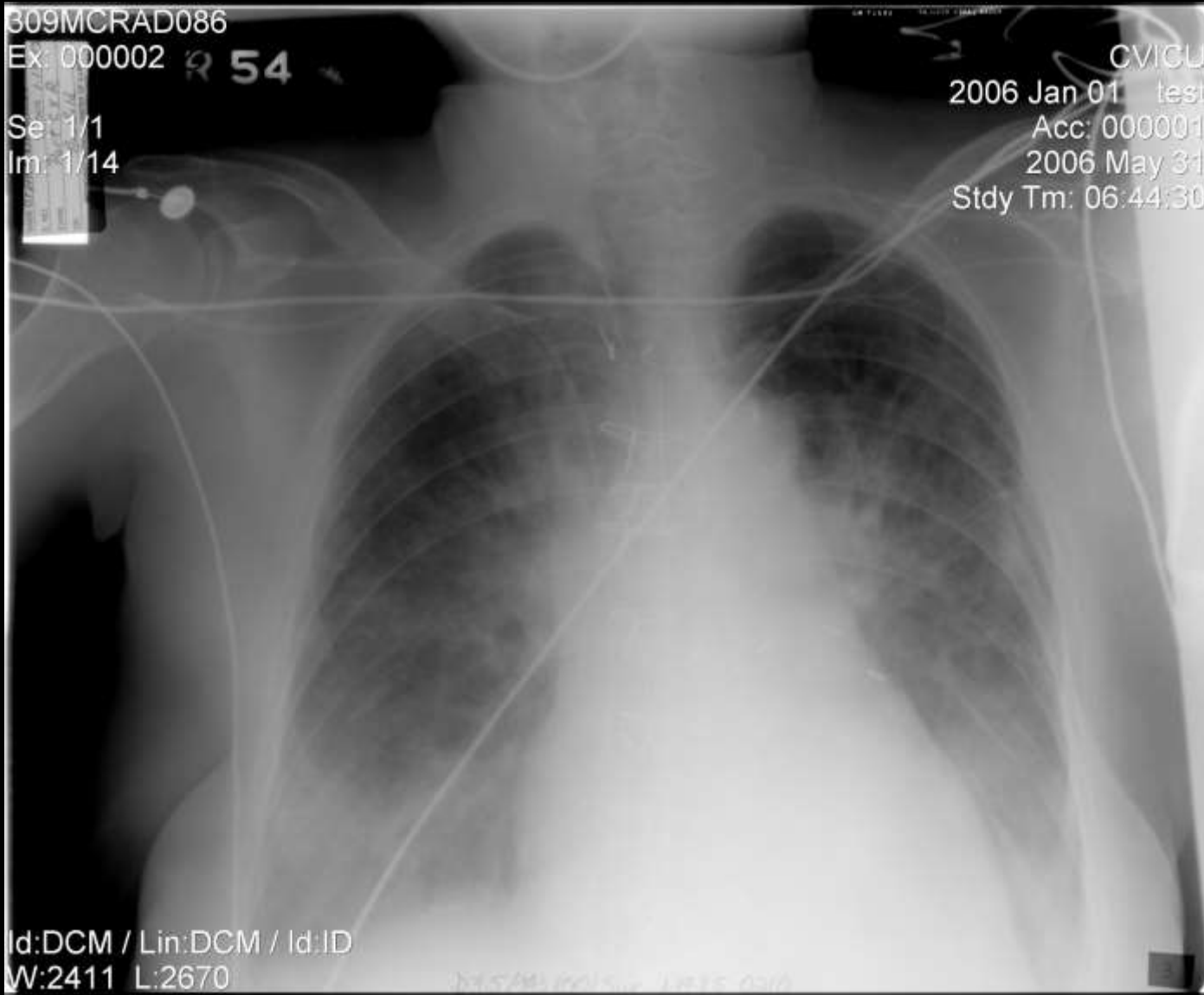
2006 Jan 01 test

Acc: 000001

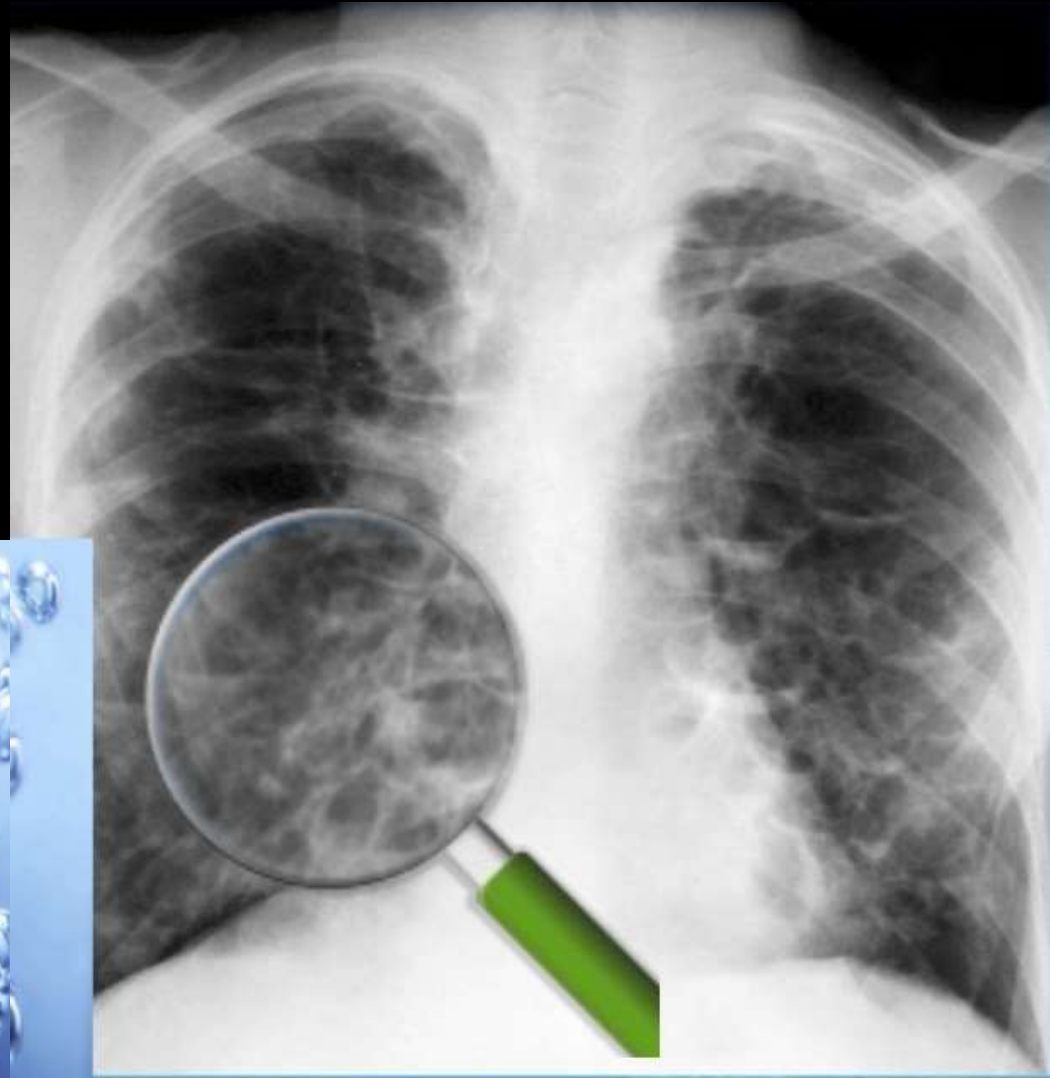
2006 May 31

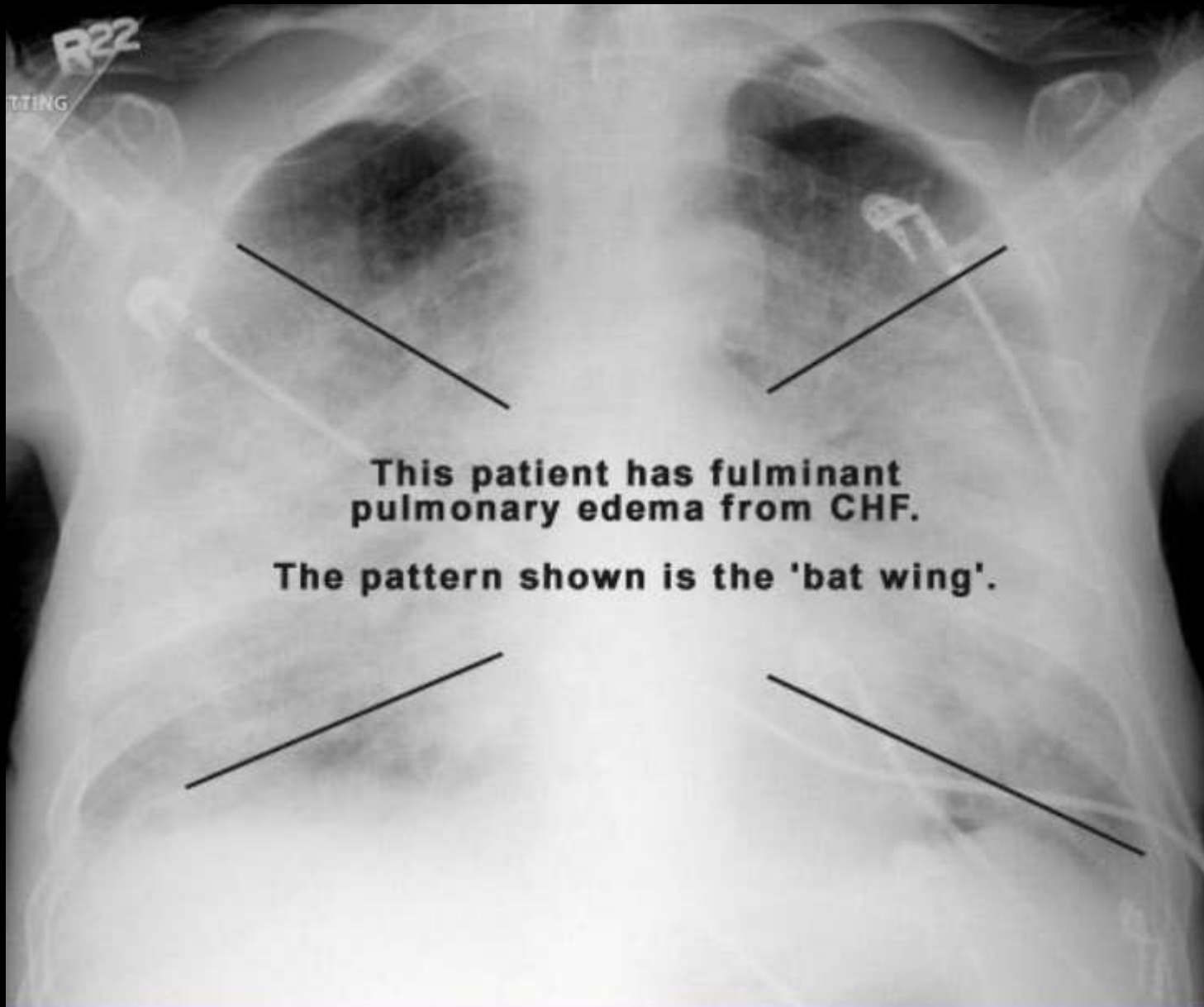
StdY Tm: 06:44:30

Id:DCM / Lin:DCM / Id:ID
W:2411 L:2670



Pulmonary Edema





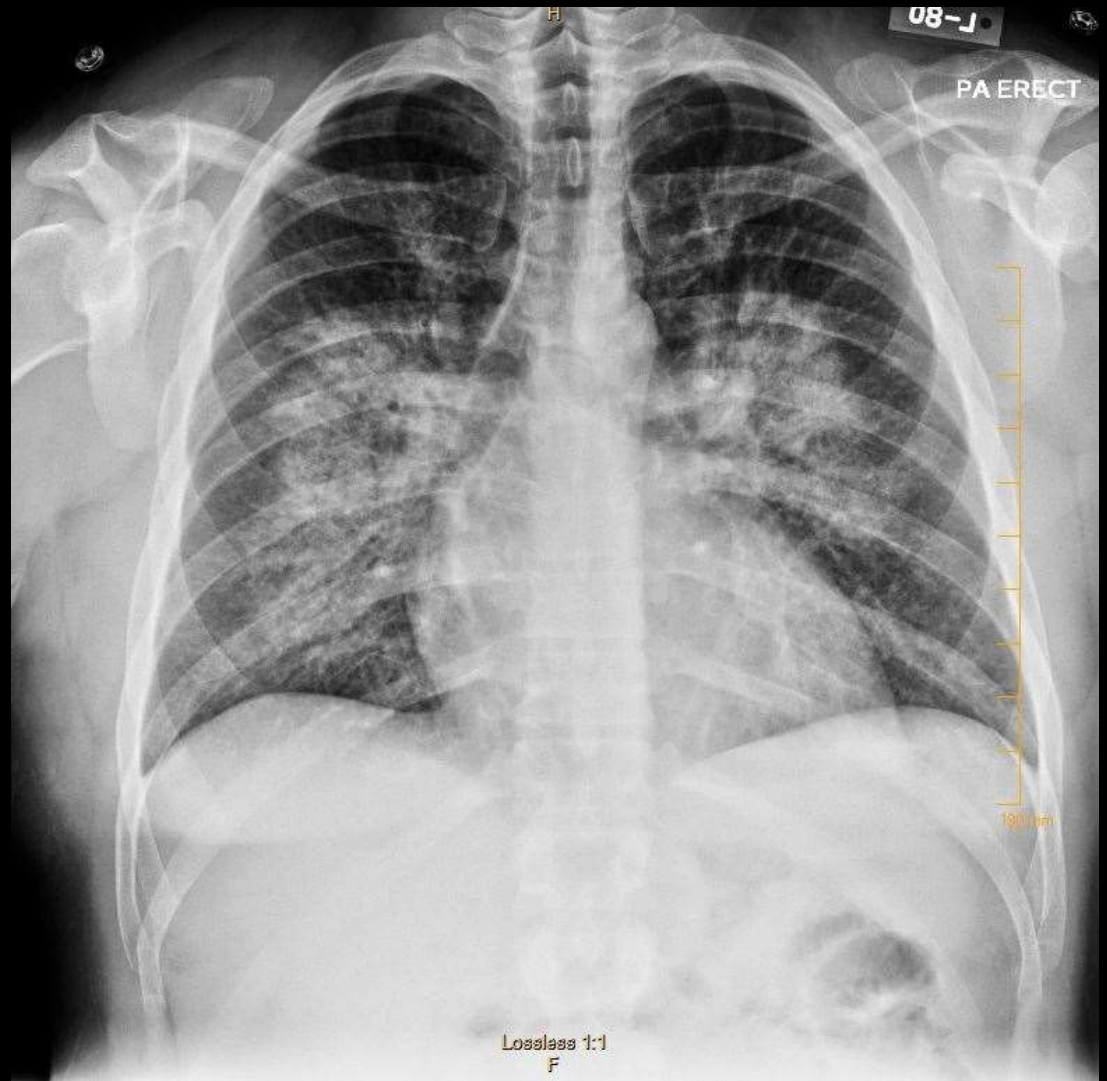
Butterfly or batwing pattern

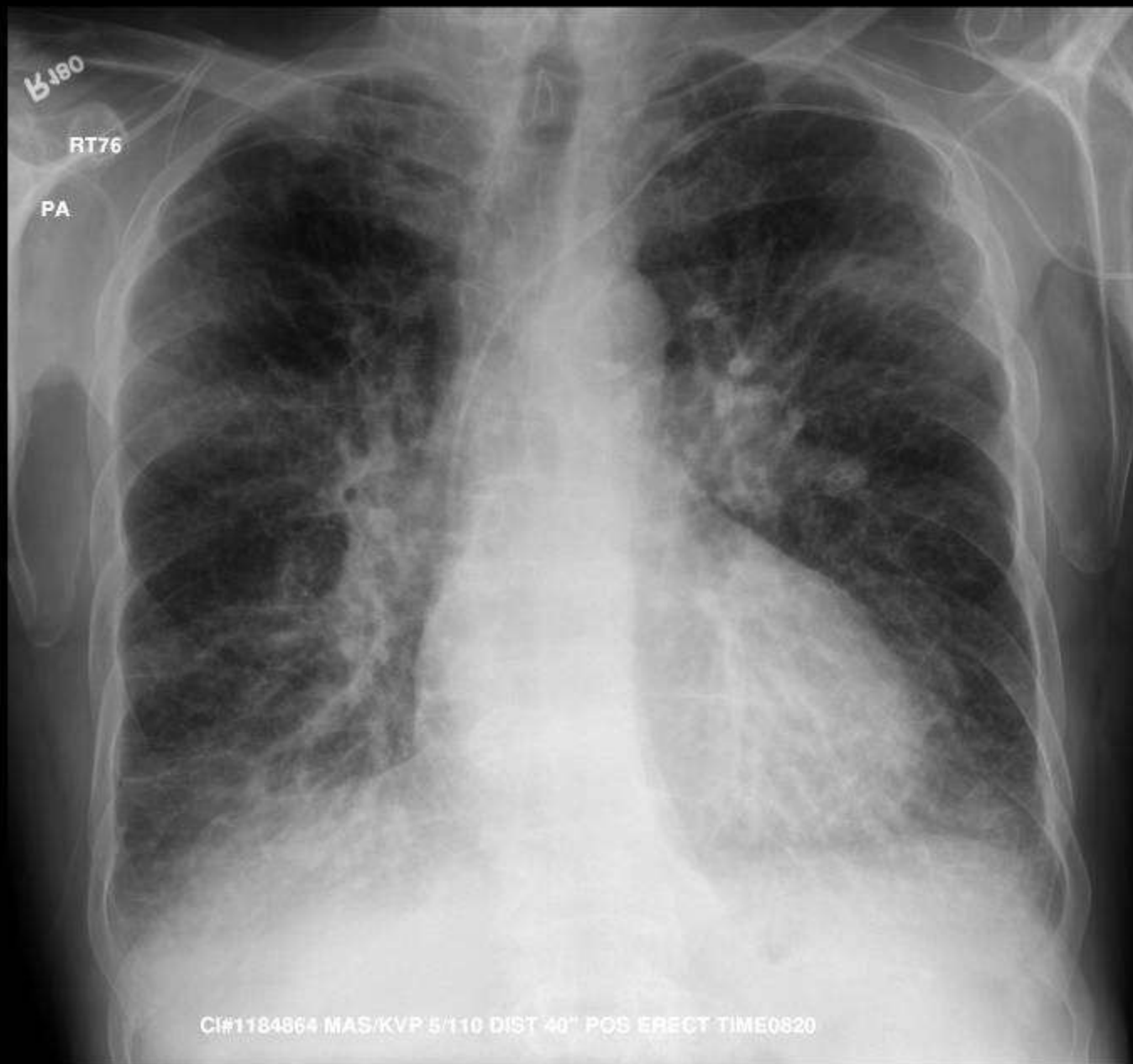


Pulmonary Edema
with batwing pattern

New diagnosis Systolic
heart failure with EF
10%

Probably alcohol
induced





309MCRAD086

Ex: 000002

Se: 1/1

Im: 2/14

130

CVICU

2006 Jan 01 test

Acc: 000001

2006 May 31

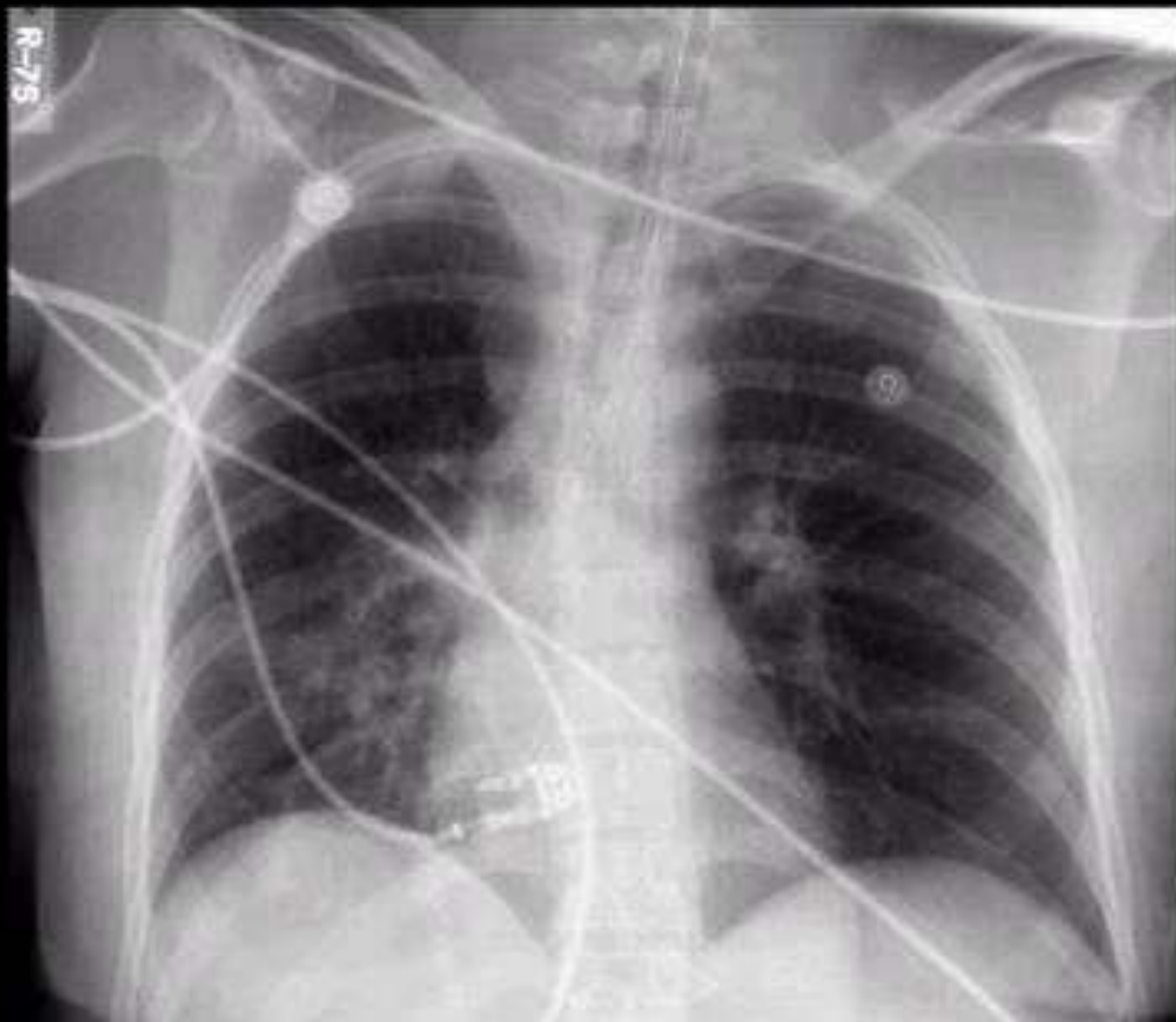
StdY Tm: 06:44:30

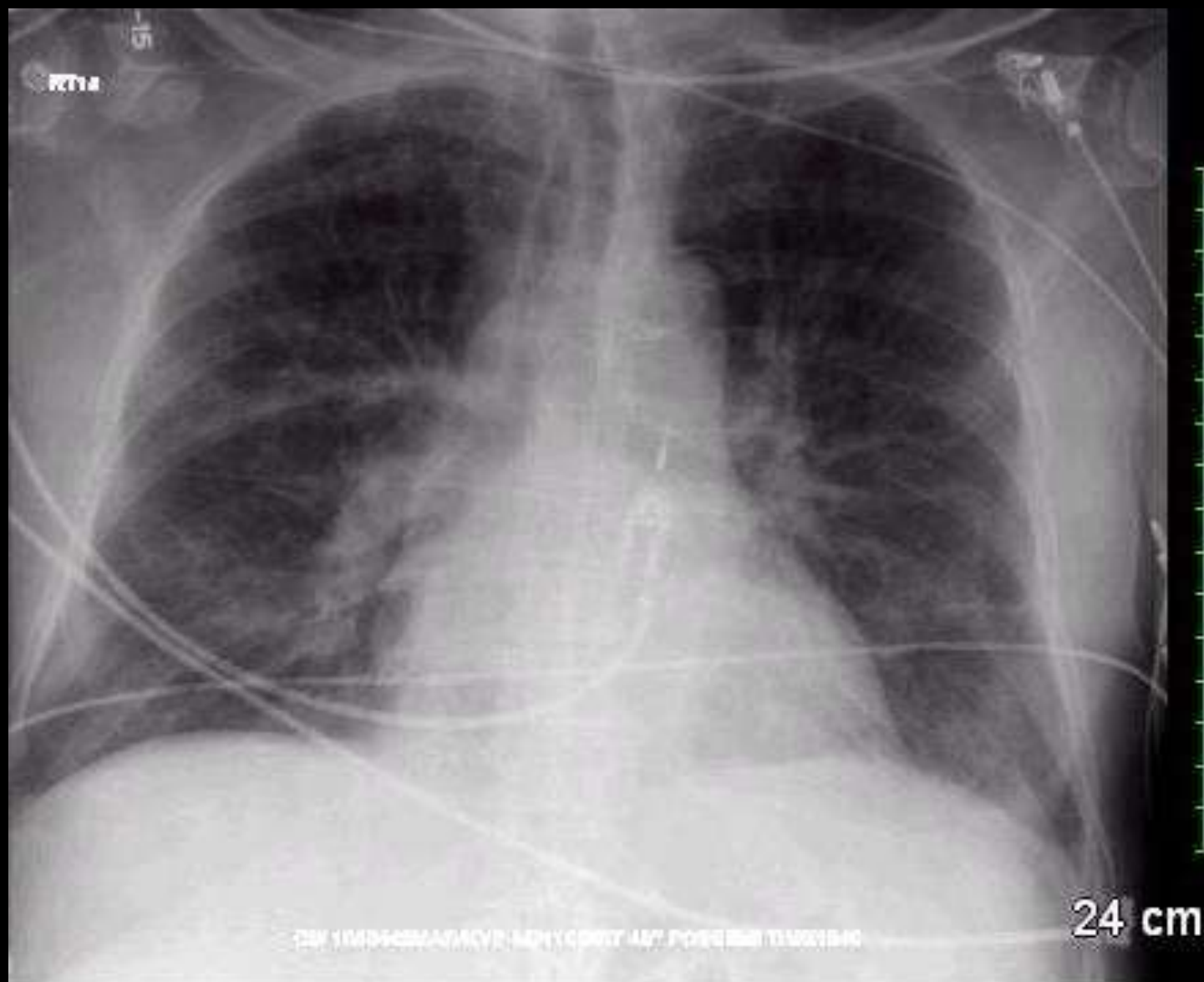
Id:DCM / Lin:DCM / Id:ID

W:4037 L:2019

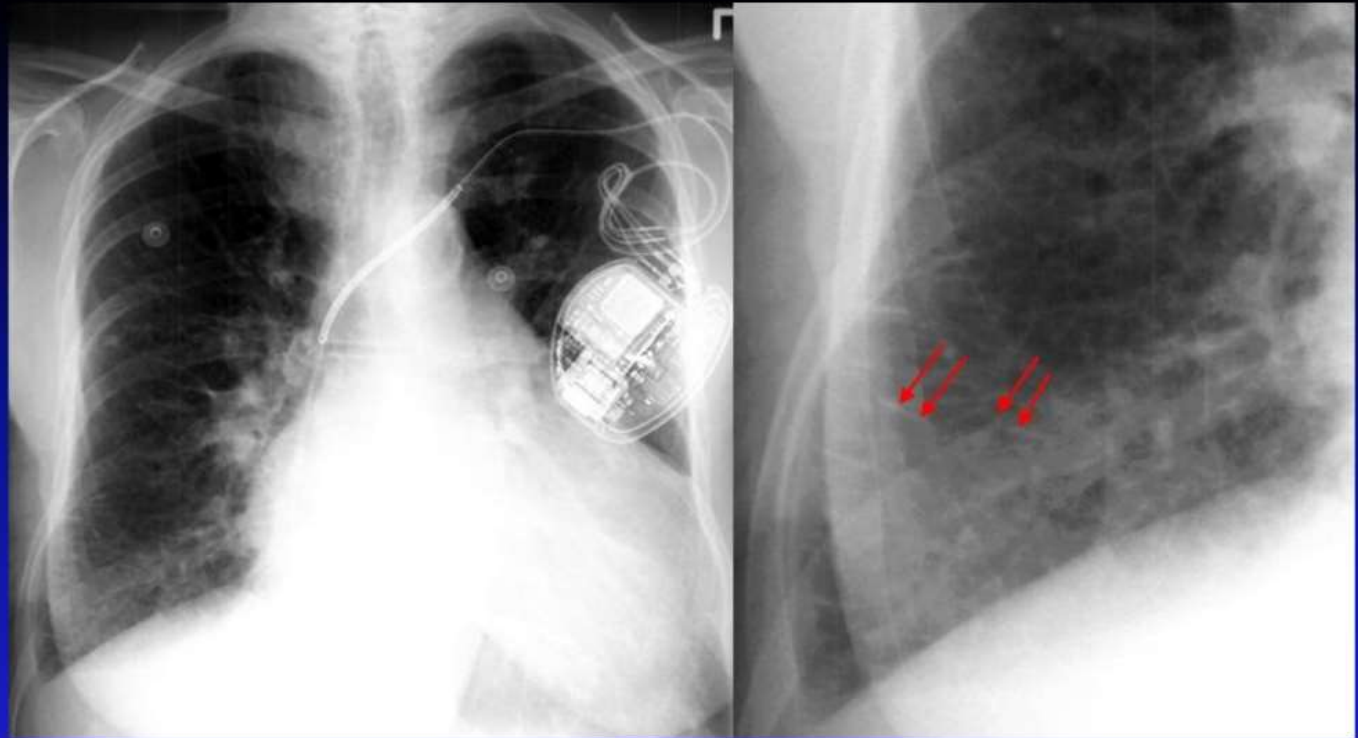
2006 May 31 06:44:30 4/30 5-2

Save

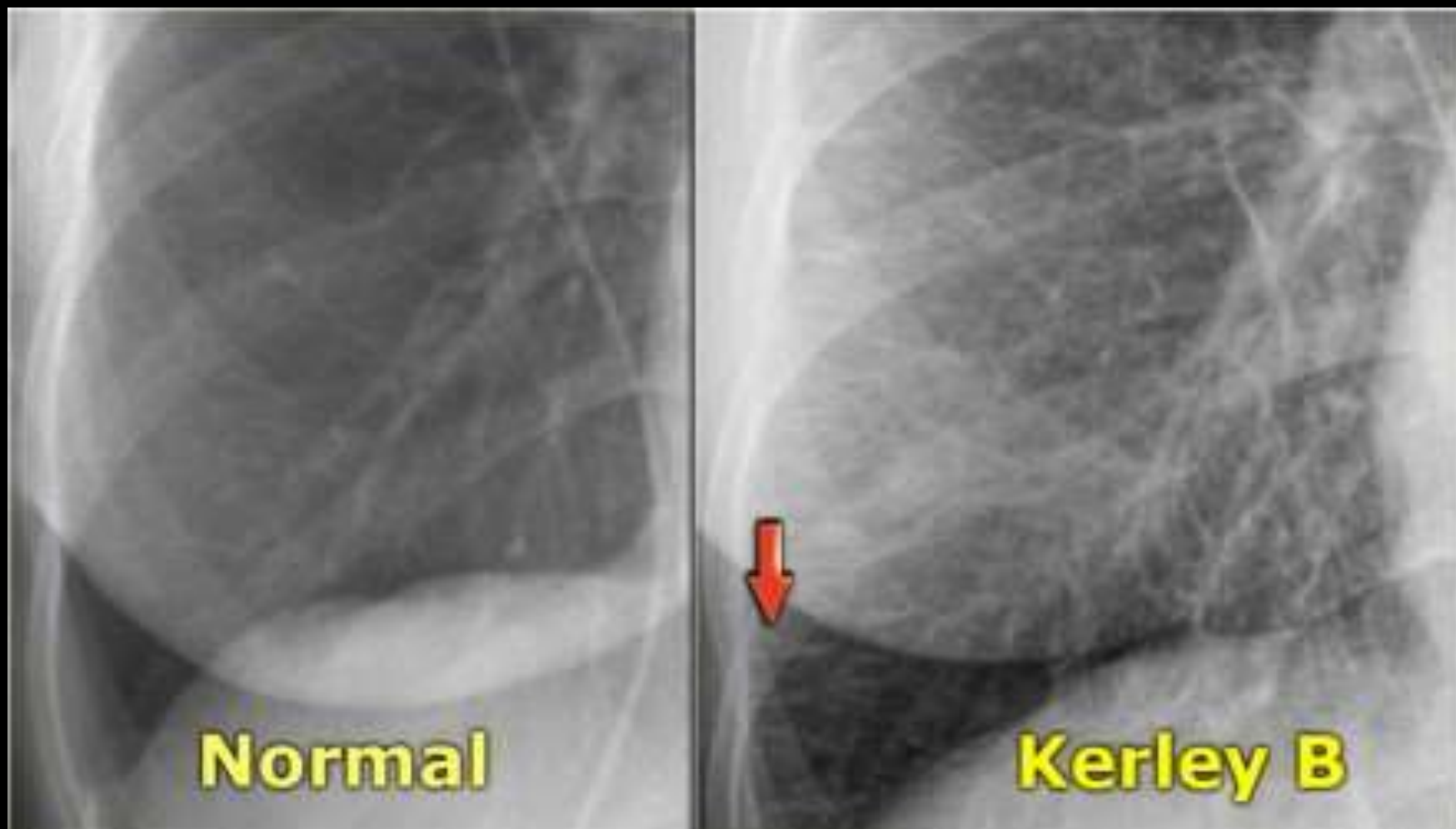




- Kerley B Lines -- Horizontal lines < 2 cm long found in the lower zone periphery
- These lines are the thickened, edematous interlobular septa



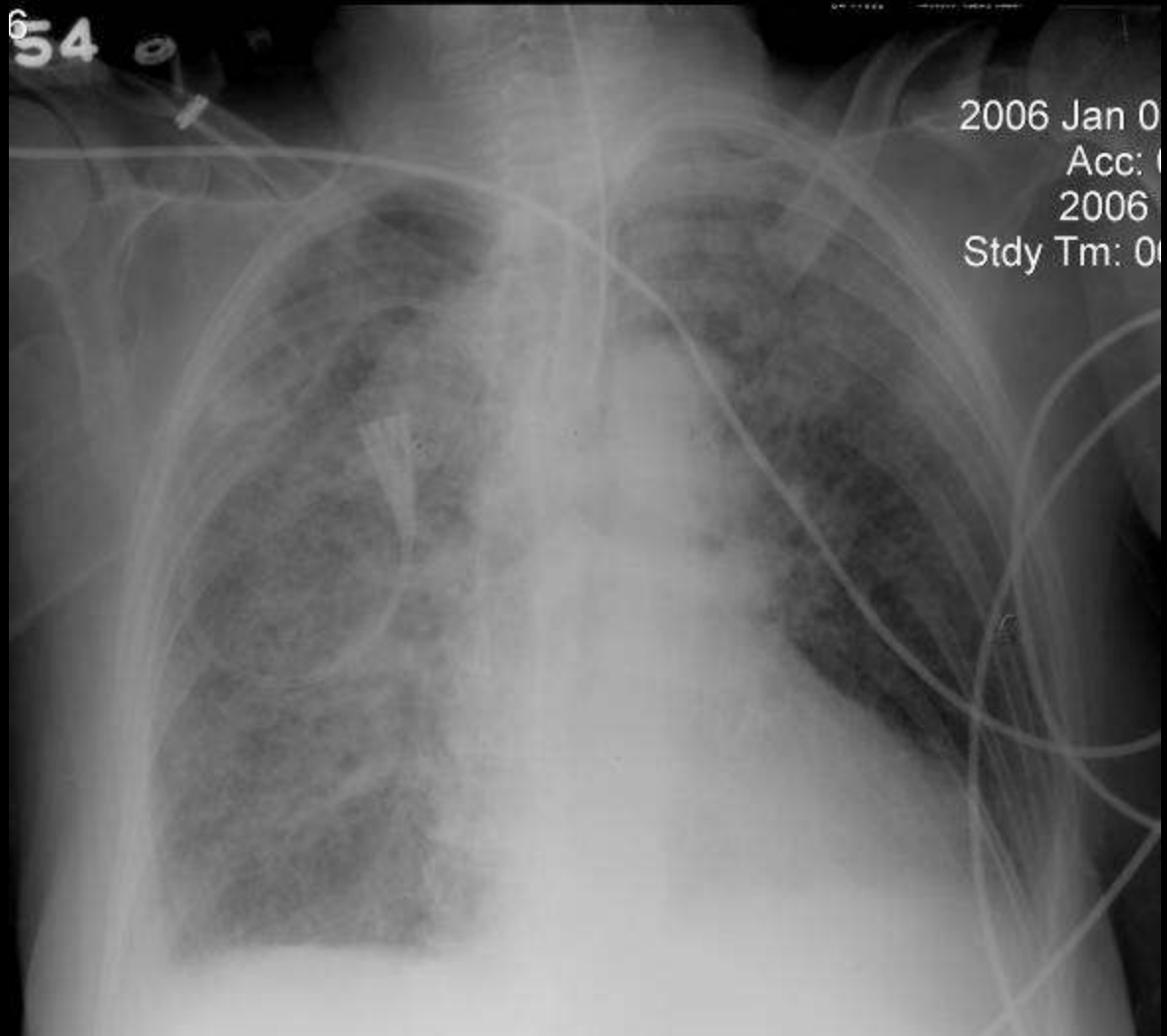
The patient above is suffering from congestive heart failure resulting in interstitial edema. Notice the Kerley's B lines in right periphery (arrows).



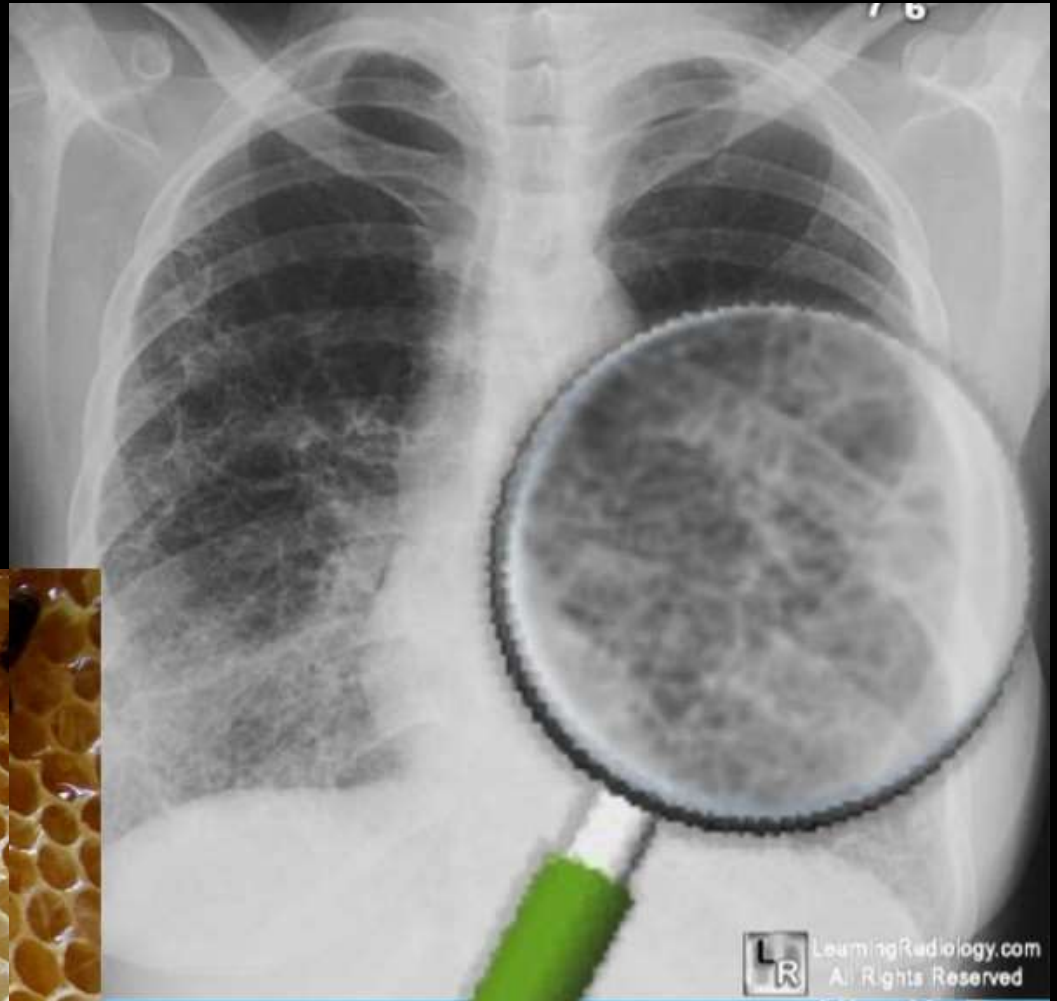
Pneumonia

- A pattern of localized alveolar infiltrates
- May be localized to a single lobe or be more diffuse
- Will appear white on CXR
- Cause:
 - Infection
- Treatment
 - Antibiotics

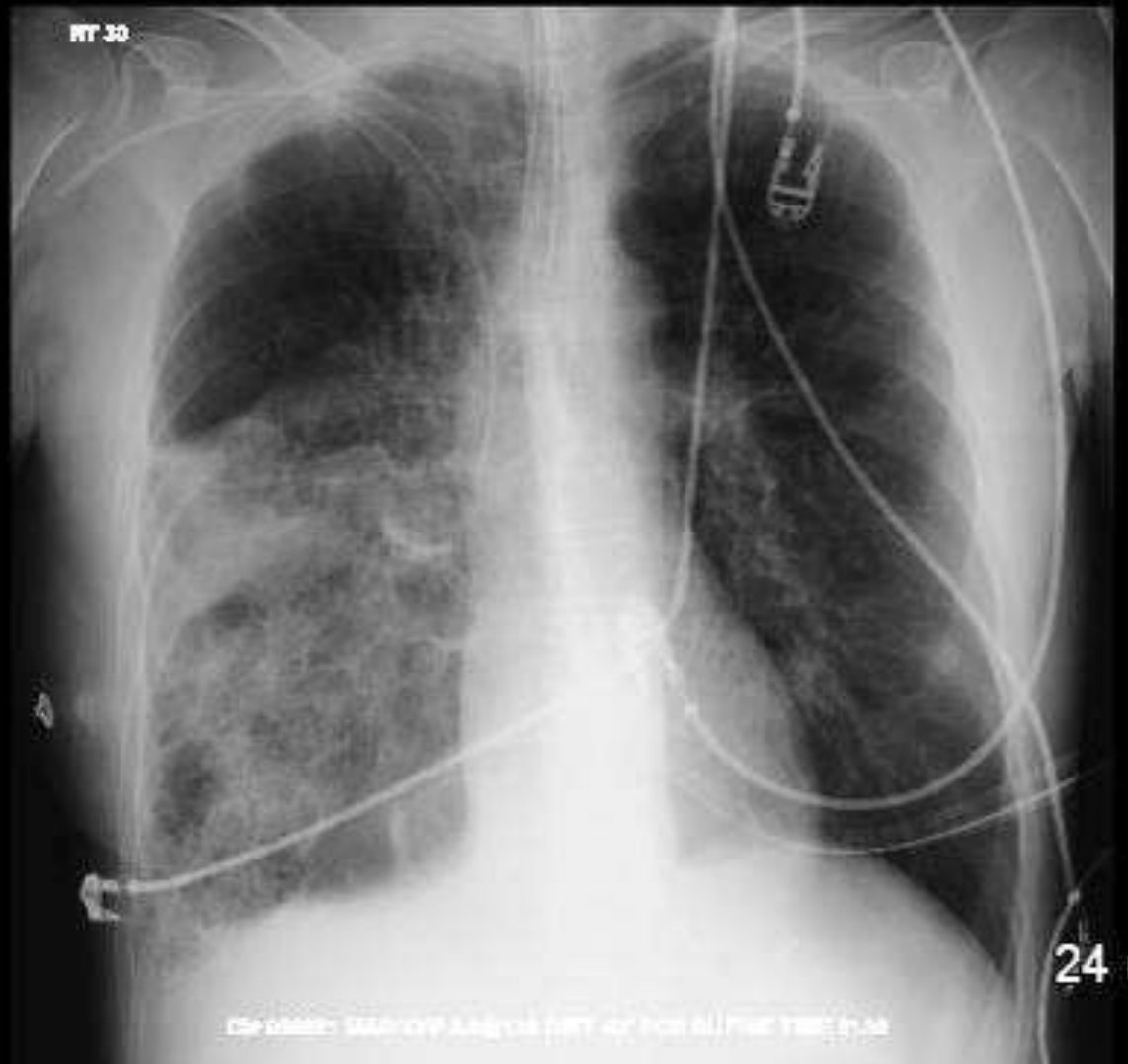
Pneumonia



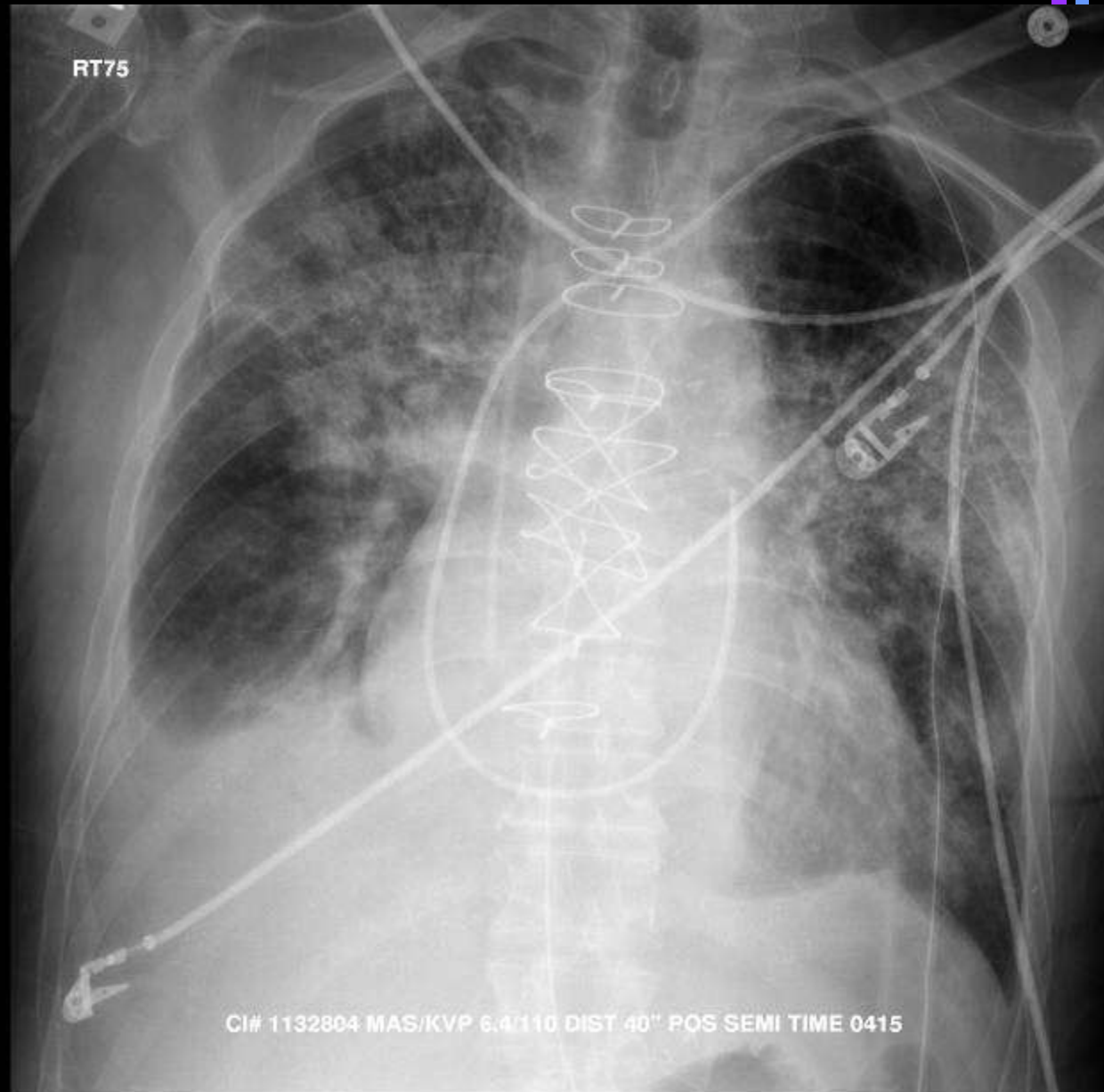
Pneumonia



Aspiration Pneumonia



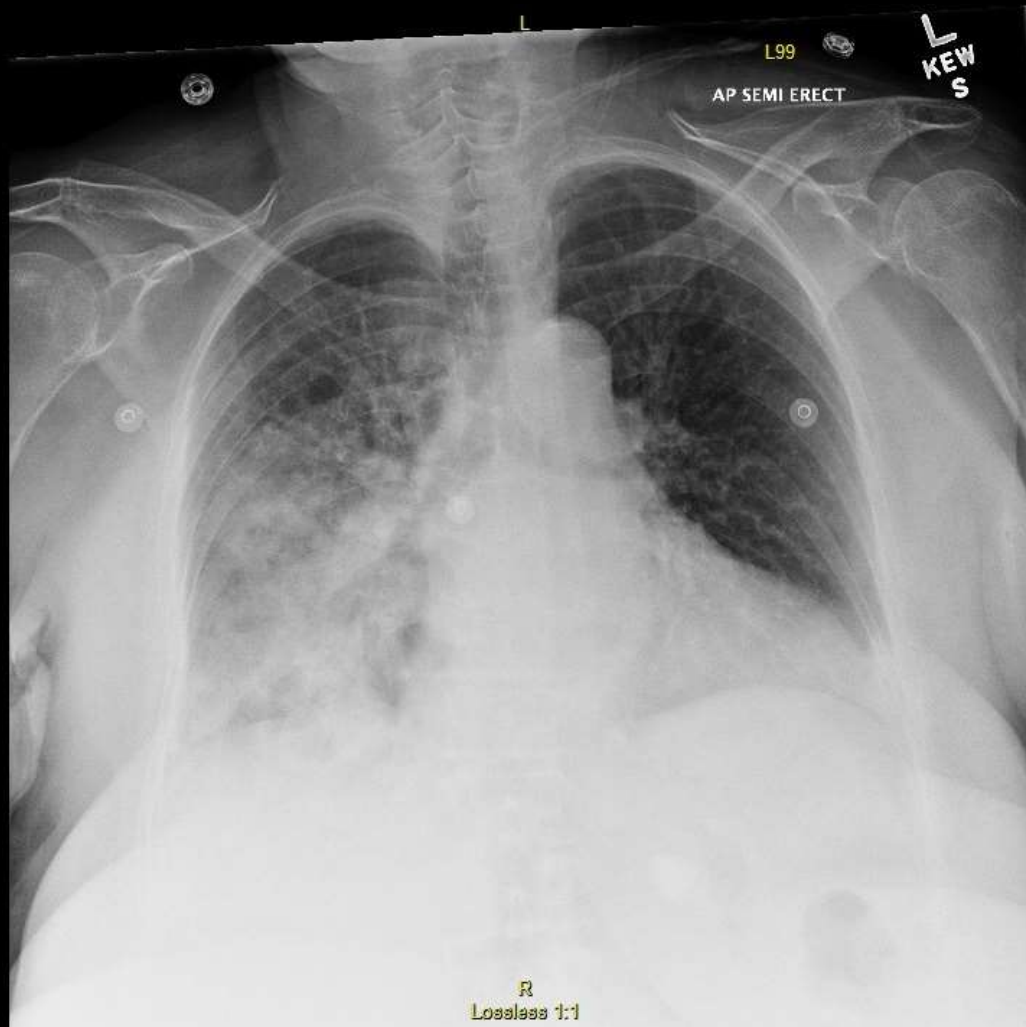
Pneumonia



Pneumonia



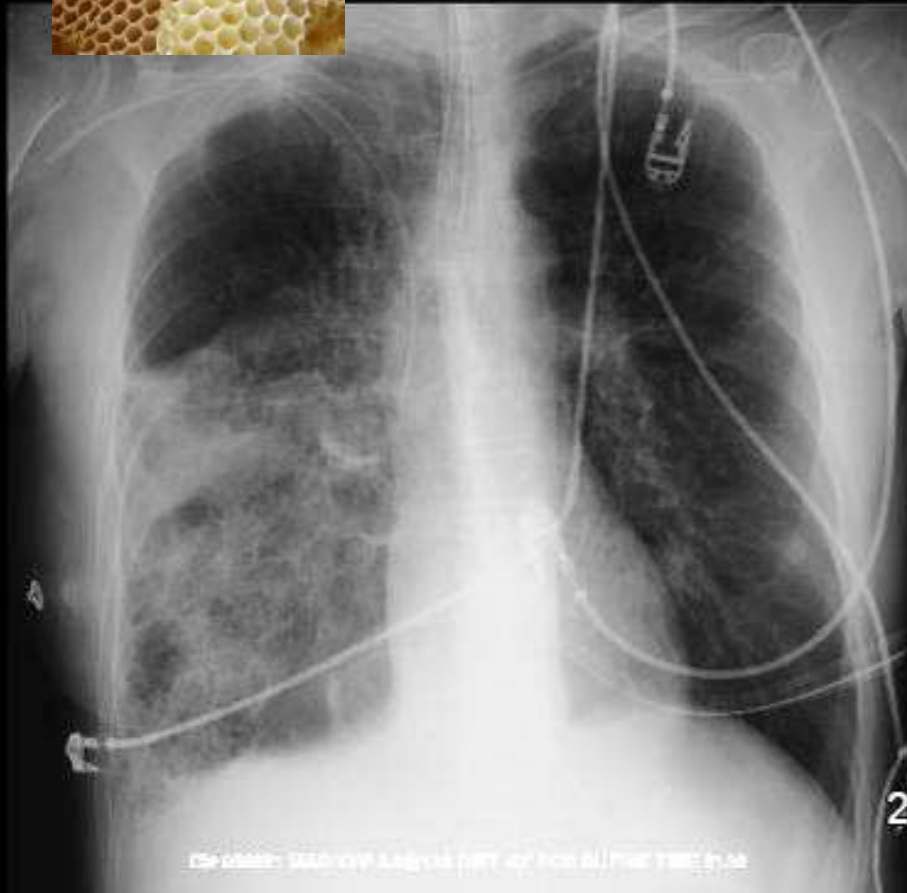
Pneumonia



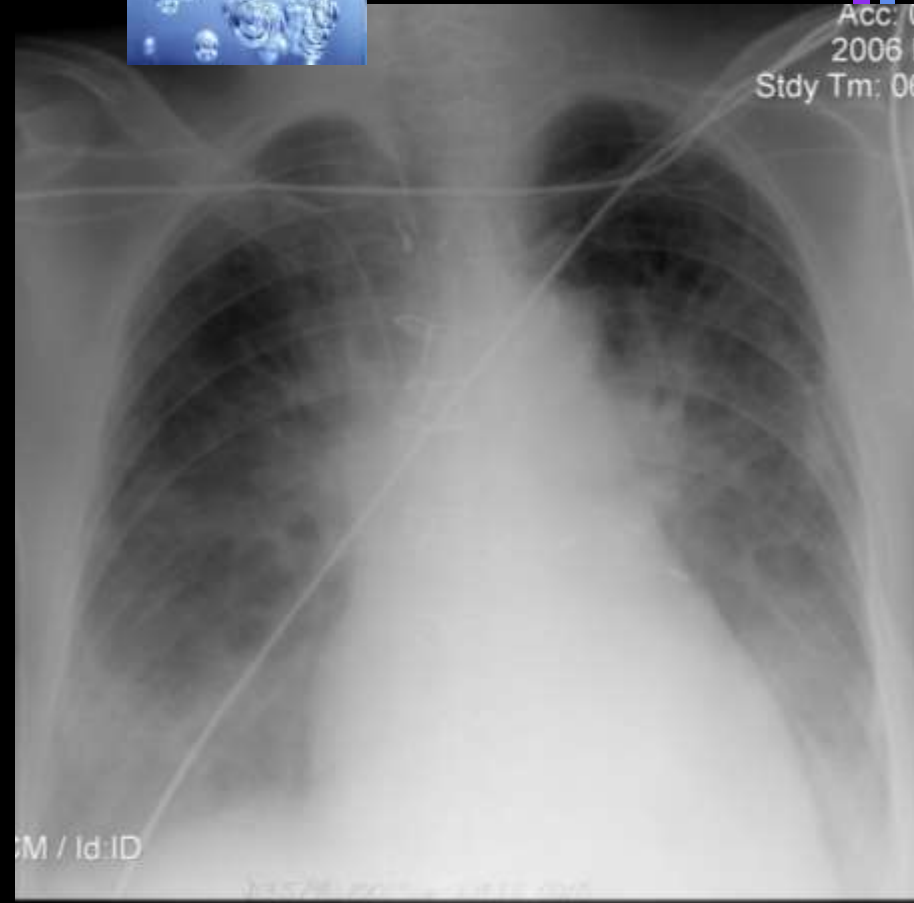
RLL Pneumonia



- Pneumonia



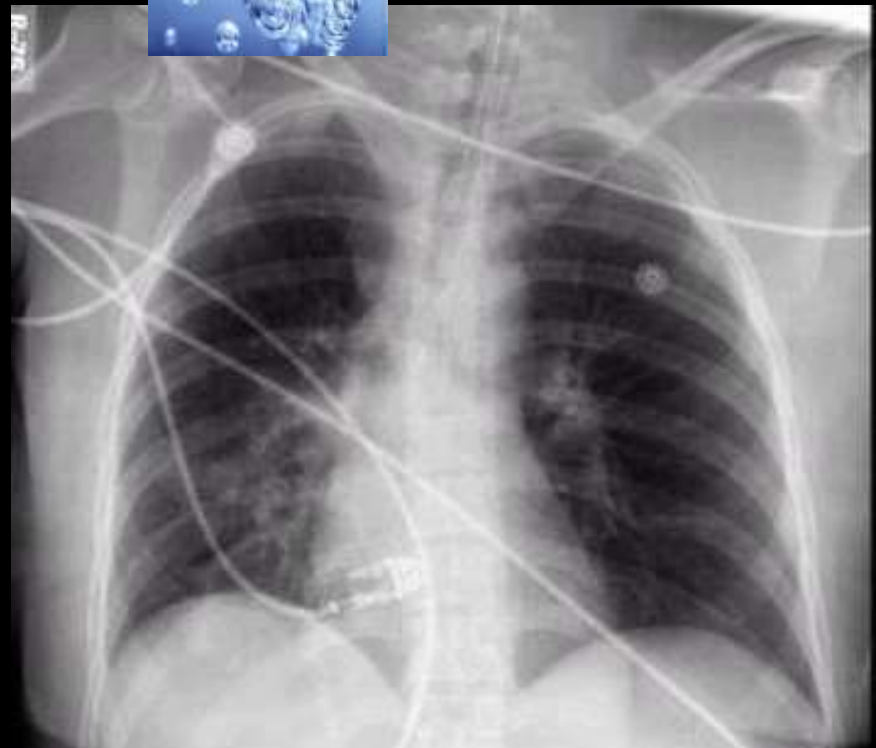
- Pulmonary Edema



- Pneumonia



- Pulmonary Edema





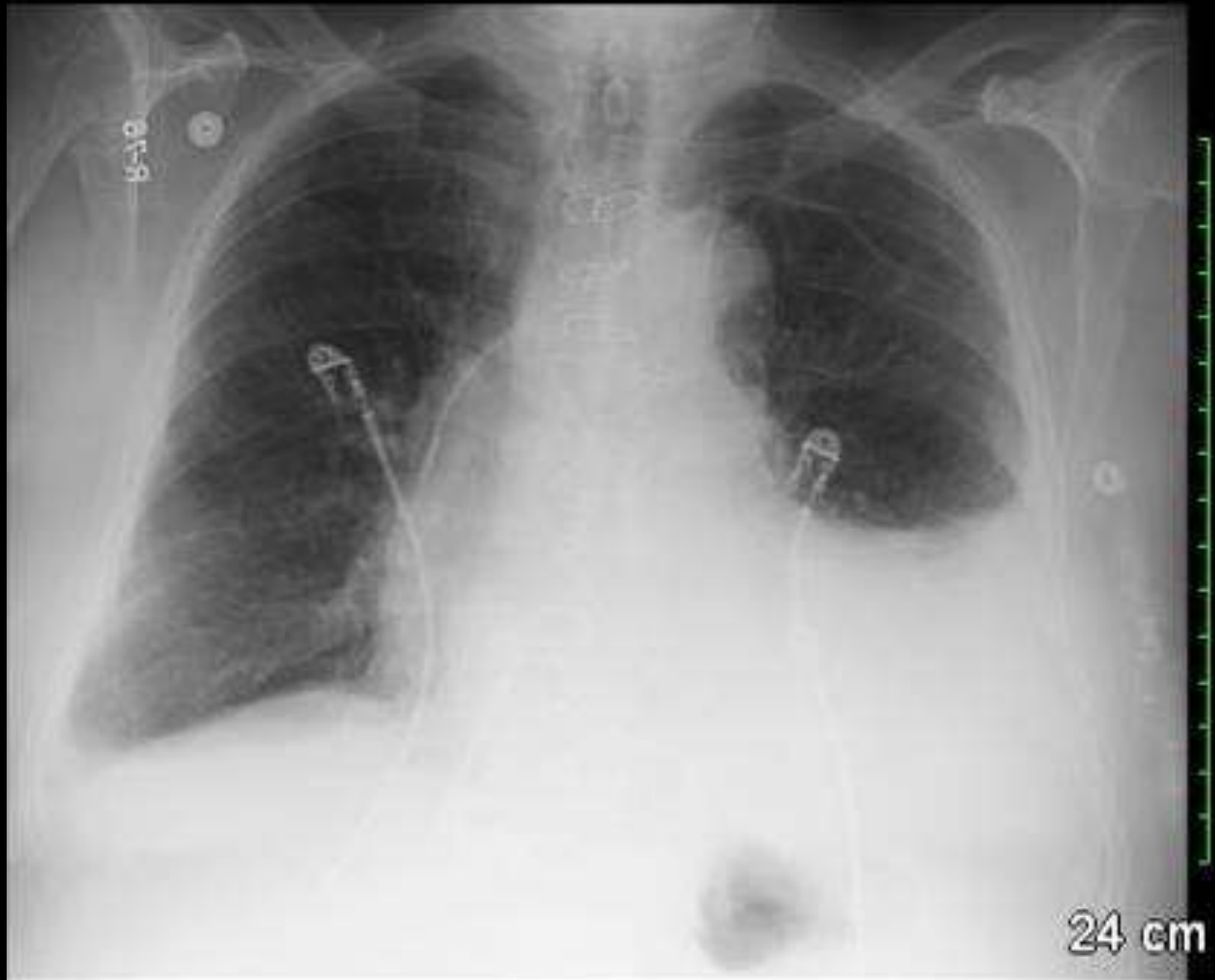
Pneumonia vs Pulmonary Edema
Looking for polar bear in a snowstorm

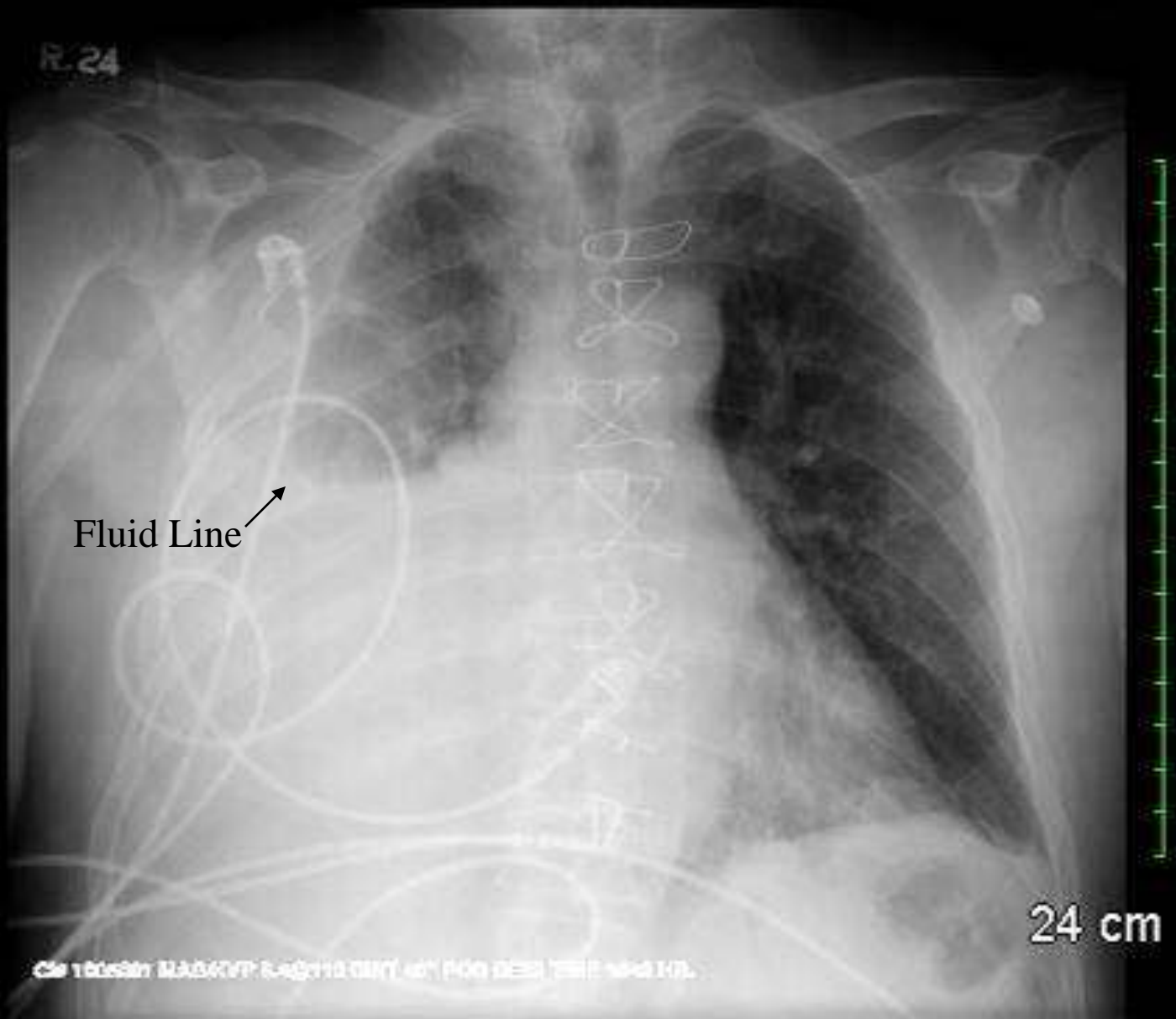
Pleural Effusion

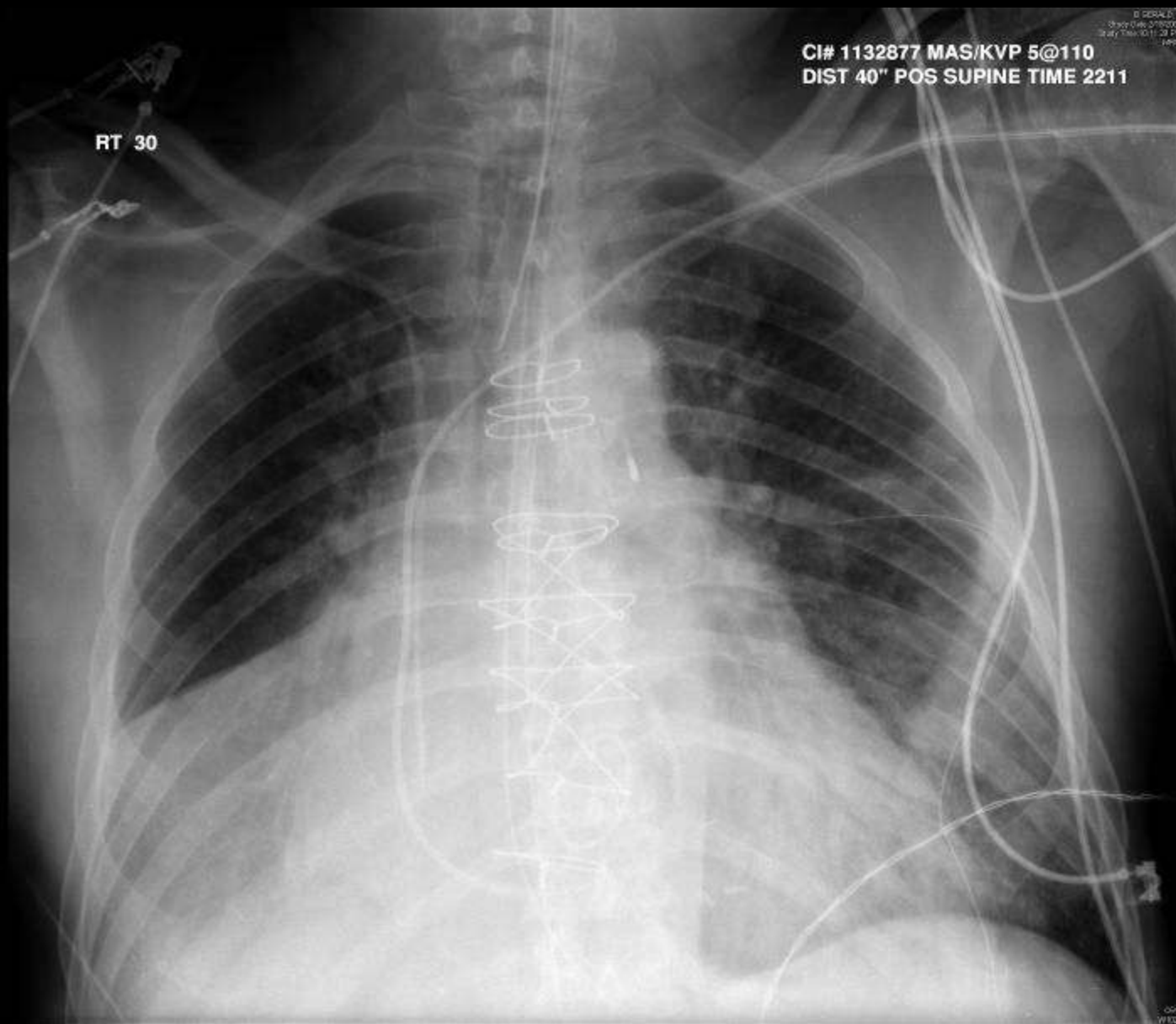
- Fluid in the pleural space
- At least 200 – 300 ml must be present in the pleural space to cause costophrenic blunting
- Treatment
 - Chest tube or thoracentesis to remove the fluid

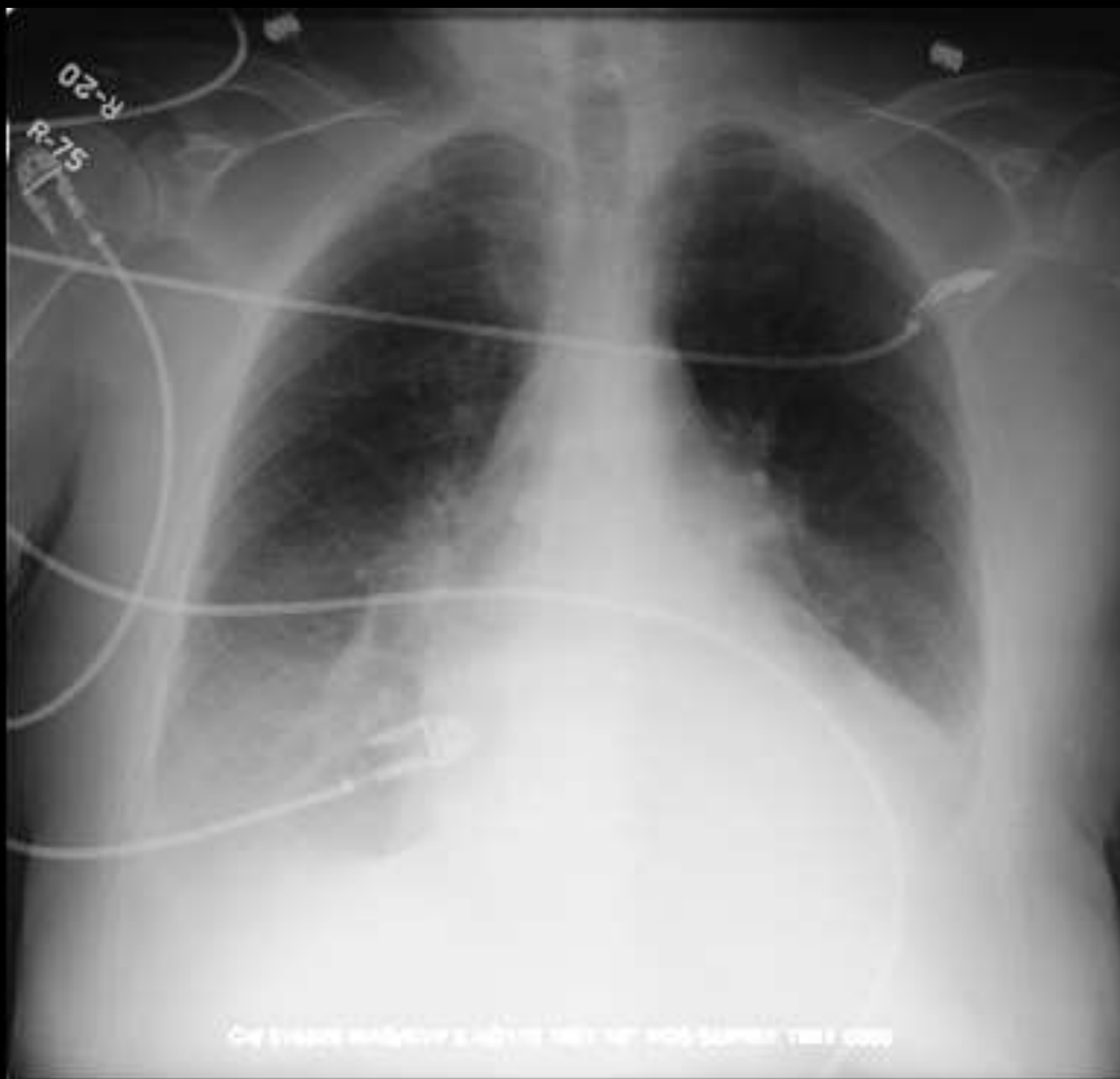
Pleural Effusion

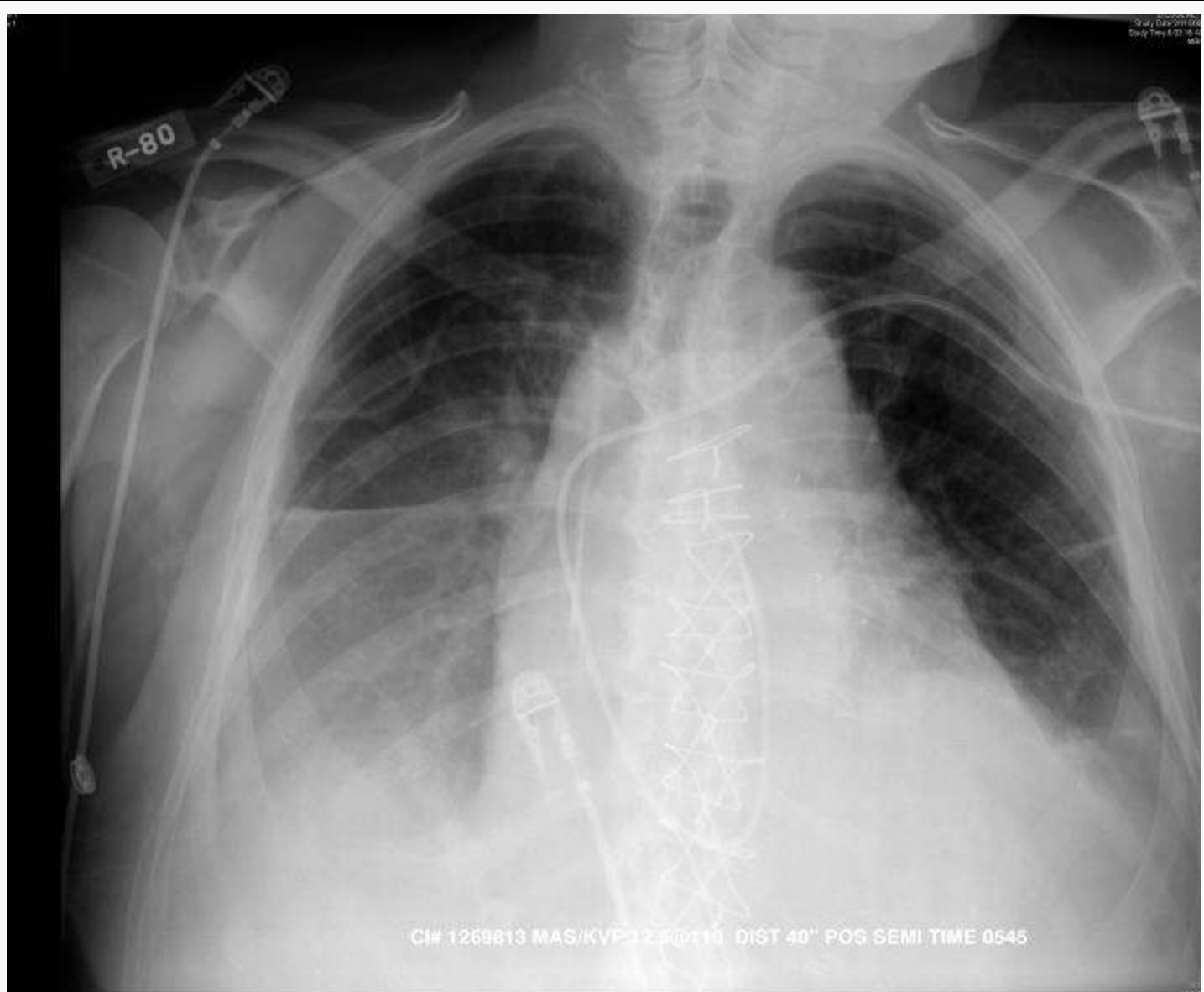
- Fluid will be white or greyish in color
- Expect to see white in the pleural space
- Fluid Levels:
 - An upright CXR will ensure that fluid levels will drop to the bottom of the cavity.
 - Fluid levels taken on a patient lying will displace the fluid laterally over the cavity and will therefore not be detected as a distinct line



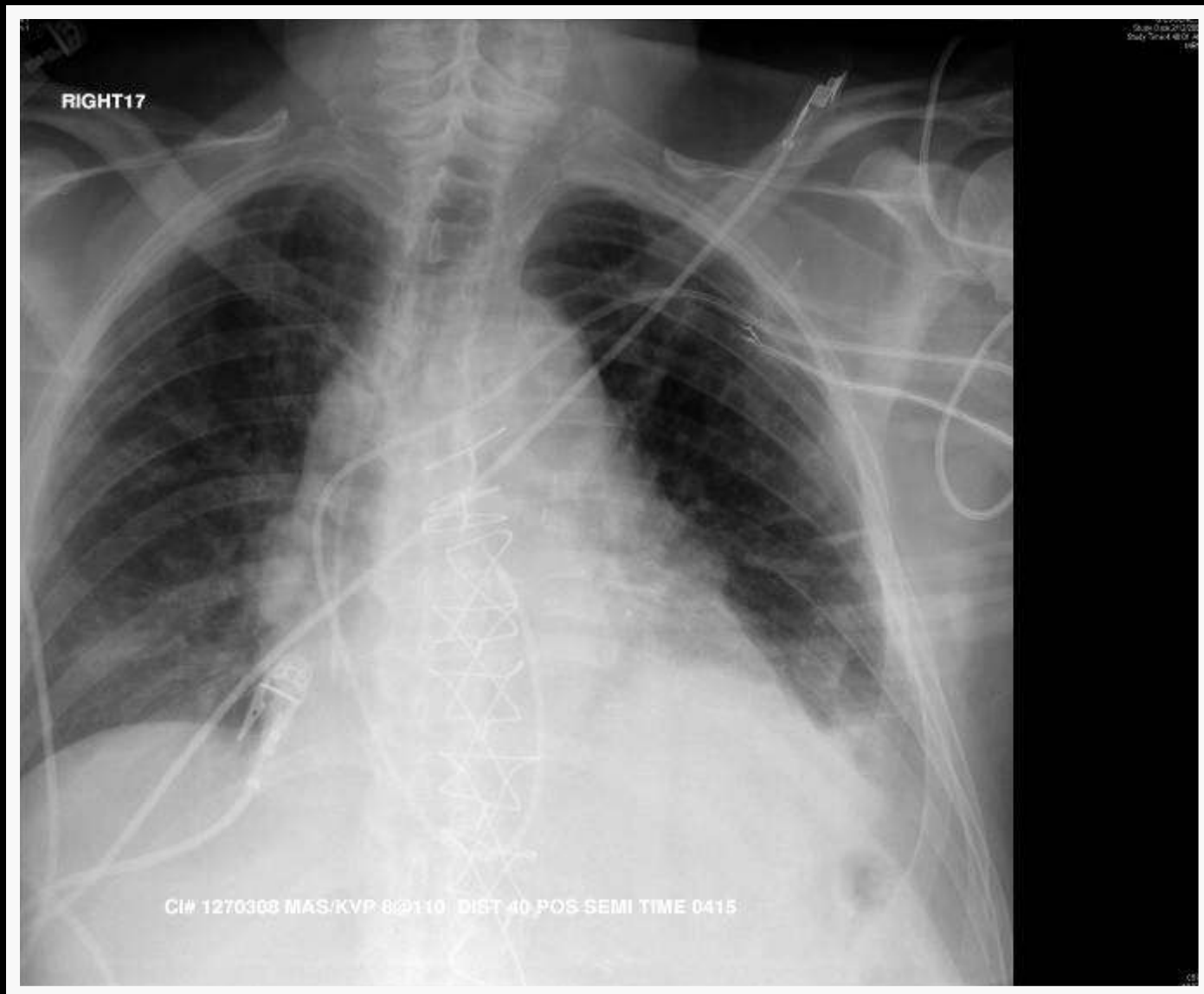






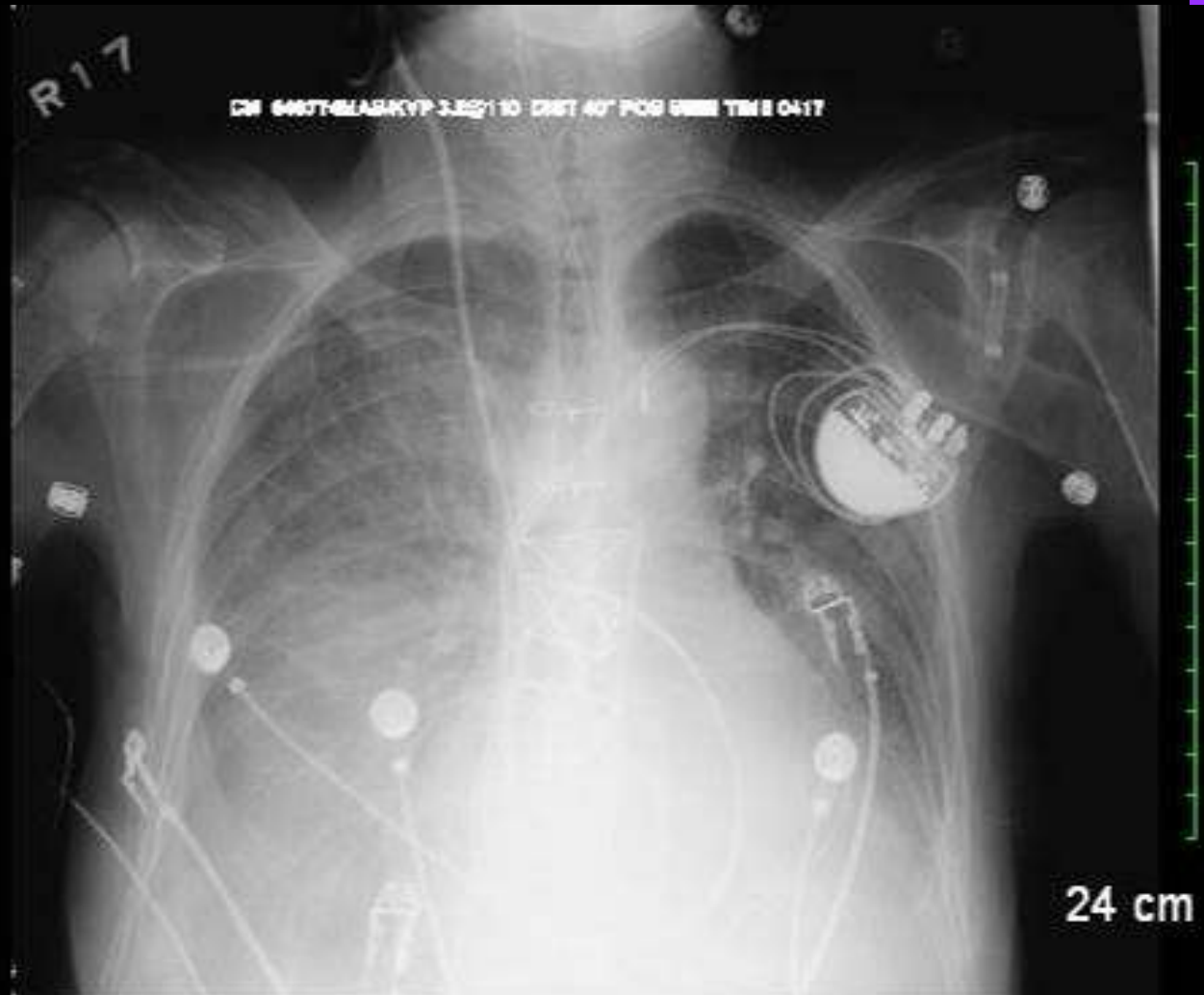


GB pleural effusion

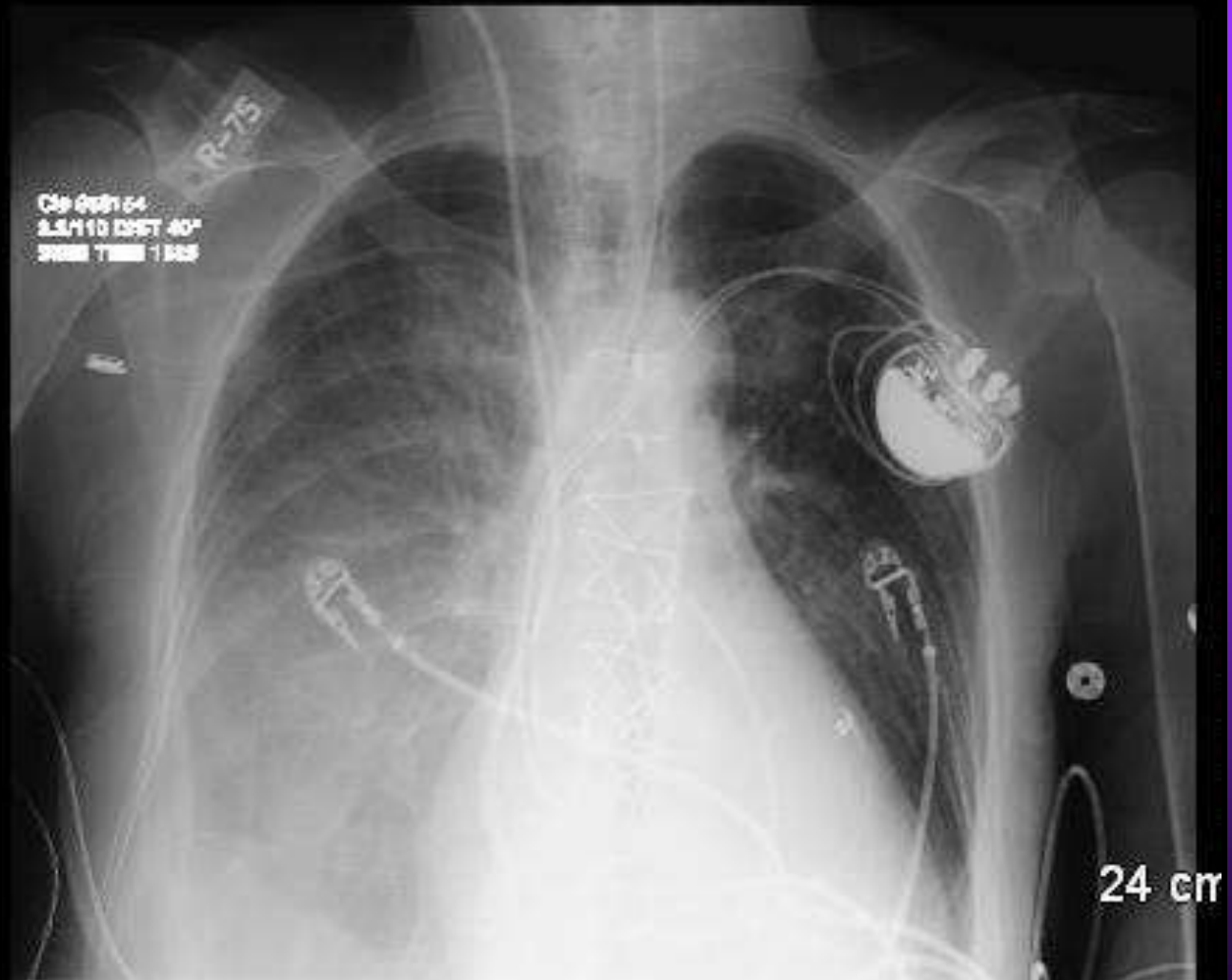


GB pleural effusion post removal 900 ml

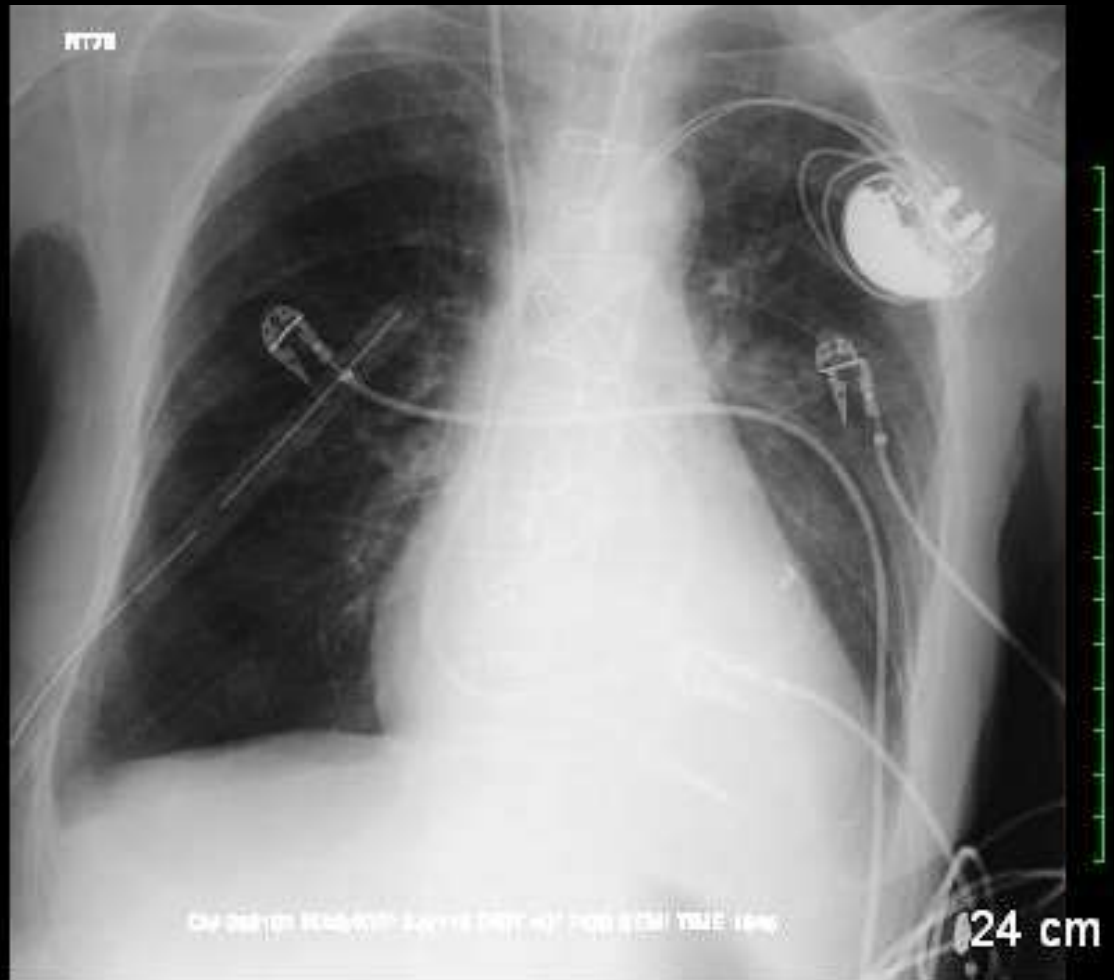
- Post Cardiac Surgery Patient (SS)
- 0400 CXR



- Post Cardiac Surgery Patient (SS)
- 1600 CXR



- Post Cardiac Surgery Patient (SS)
- 1630 after chest tube insertion and 1 liter fluid removal



- Pt (CM) right pleural effusion from cancer metastasis

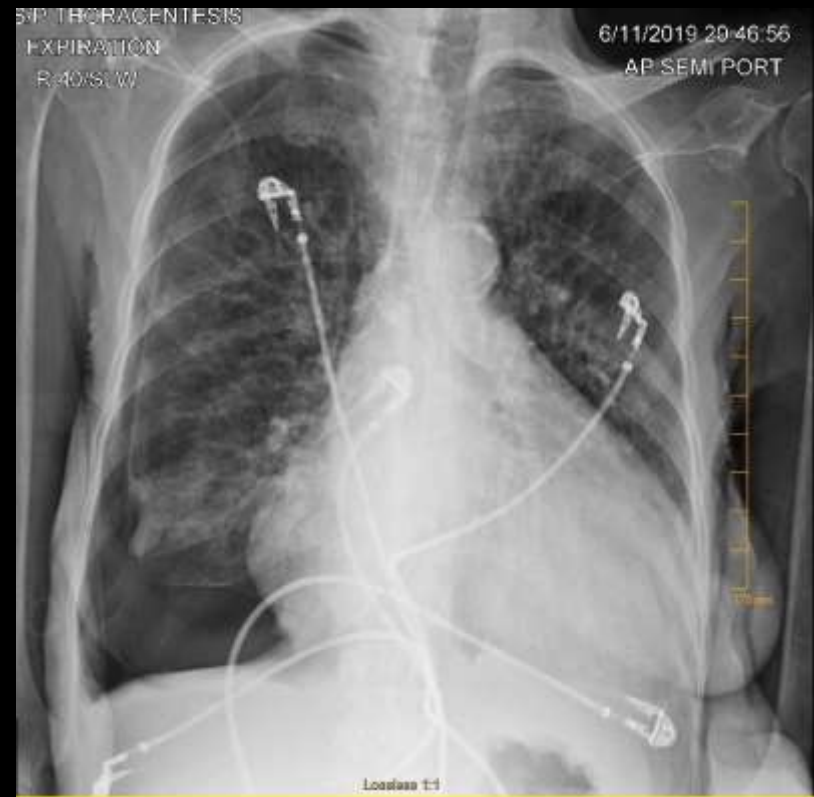


- Pt (CM) Day after 3 liters removed on right.
- Pleural effusion from cancer metastasis

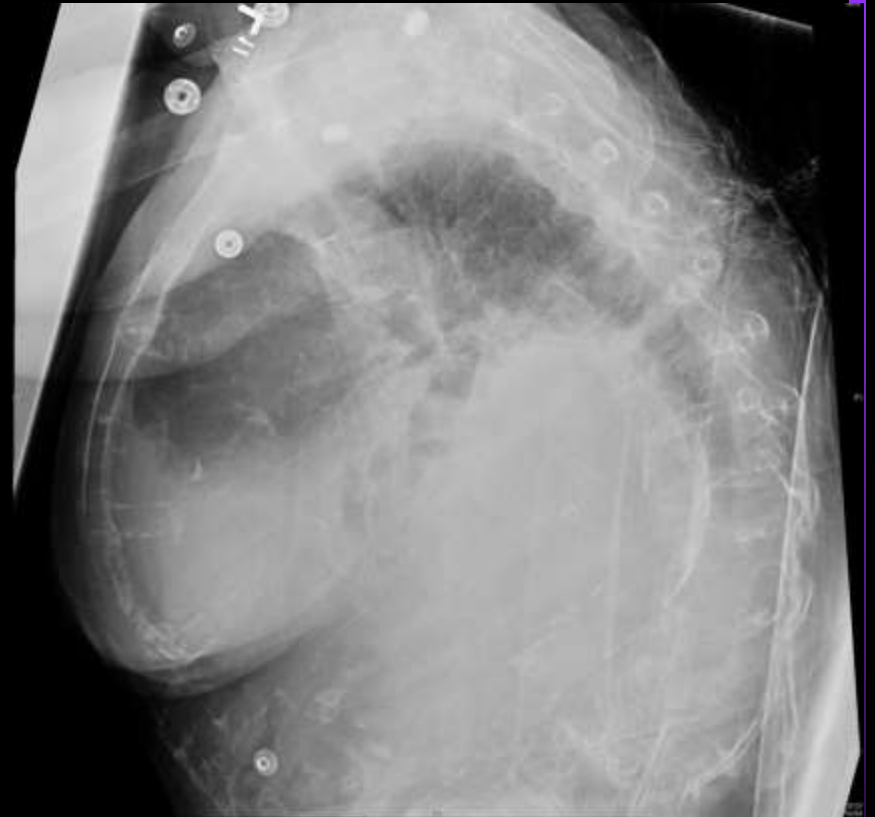


Bilateral Pleural Effusions

Drainage of 1500 ml on right and 500 ml on left



Kyphosis with right pleural effusion

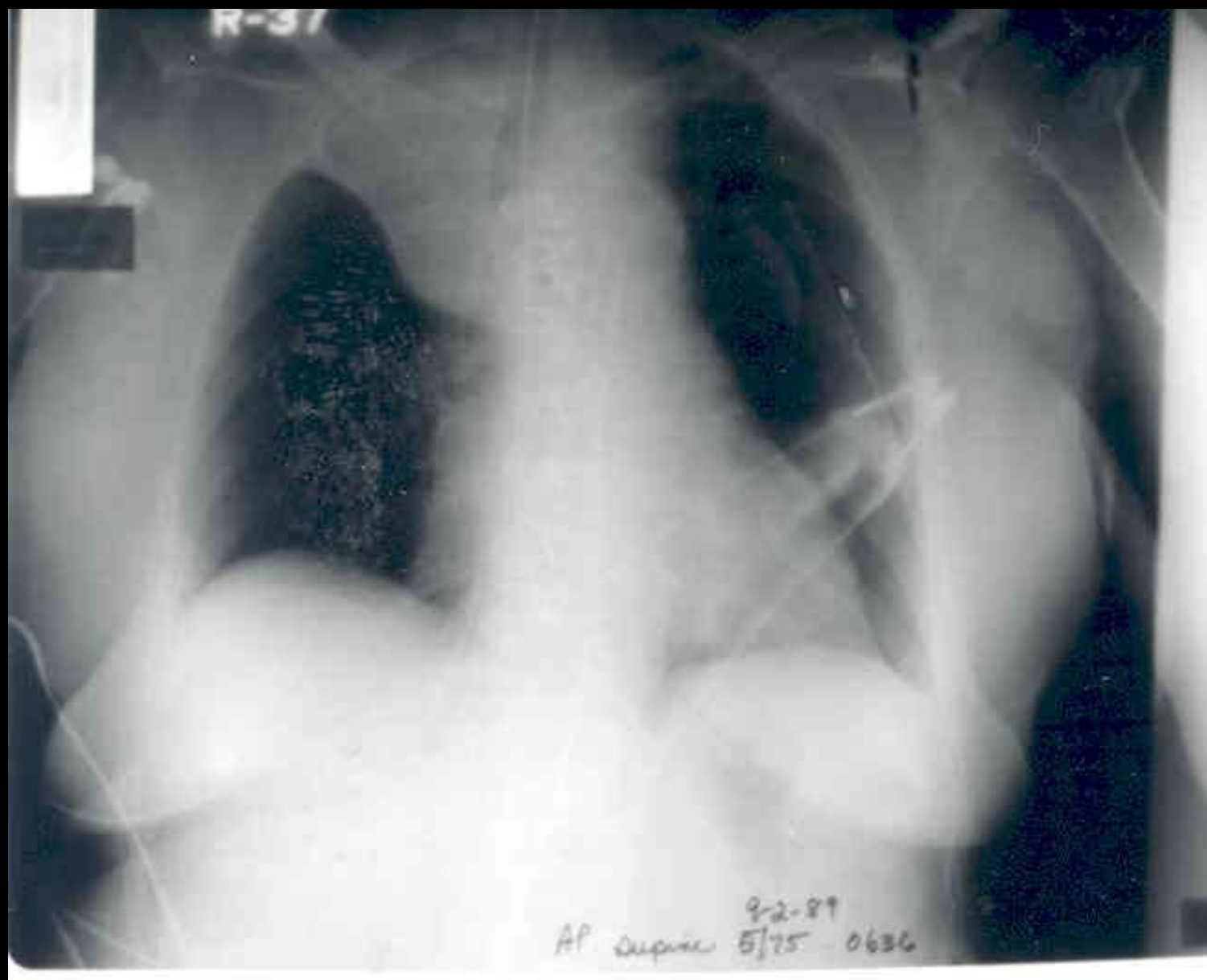


Atelectasis

- Collapsed or airless state of the alveoli (no oxygen in alveoli)
- Will appear white on the CXR
- Causes densities (white areas) of the lobes but usually not symmetrical changes in each lung field.
- To confirm atelectasis in lower lobe, a lateral CXR may be necessary

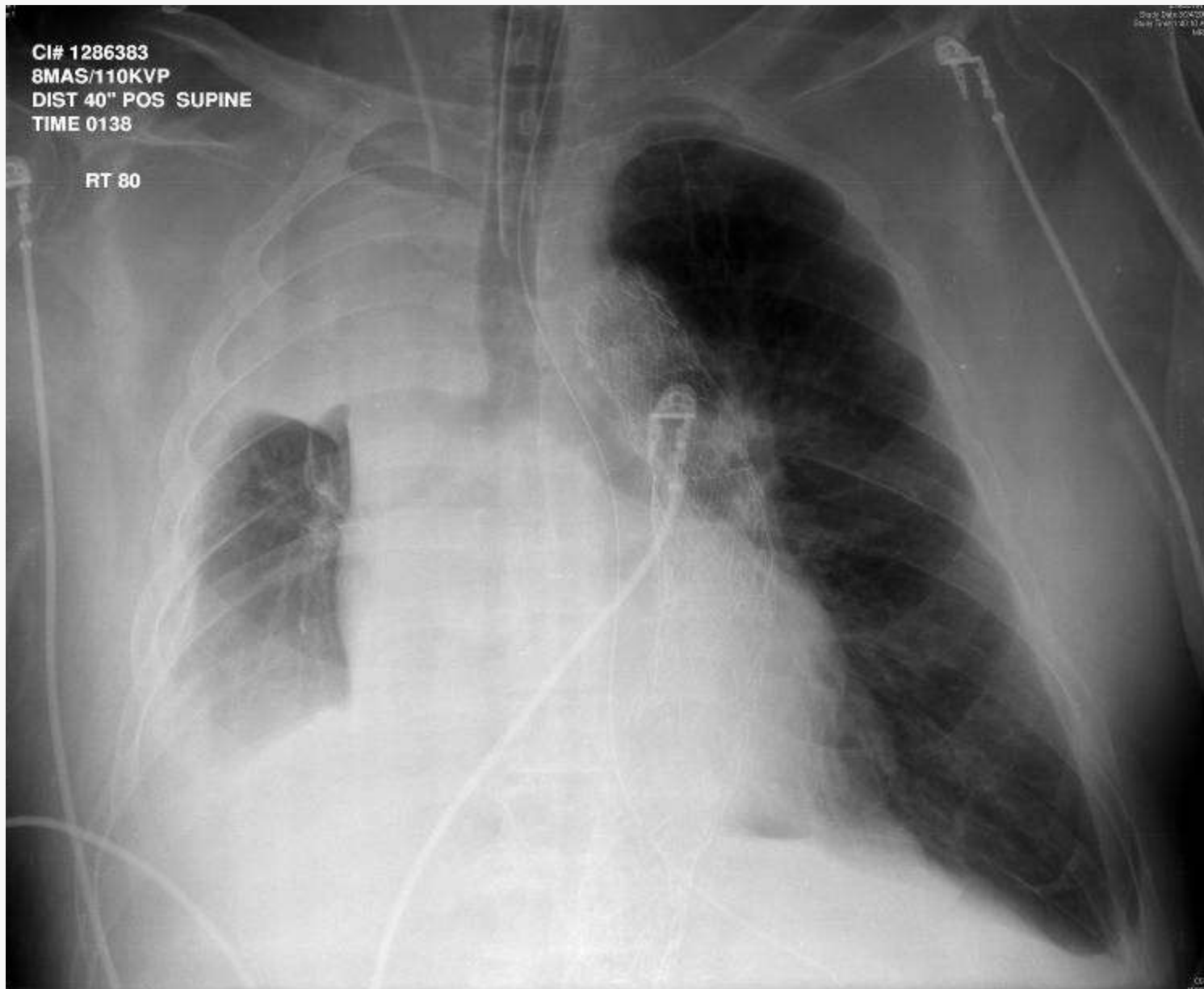
Atelectasis

- Causes:
 - Right mainstem intubation with ET tube
 - Secretions or mucous plugs
 - Hypoventilation of alveoli
- Treatment: Reexpand the alveoli
 - Ascertain proper ET tube placement
 - CPAP/BIPAP
 - Incentive spirometry
 - Bronchoscopy



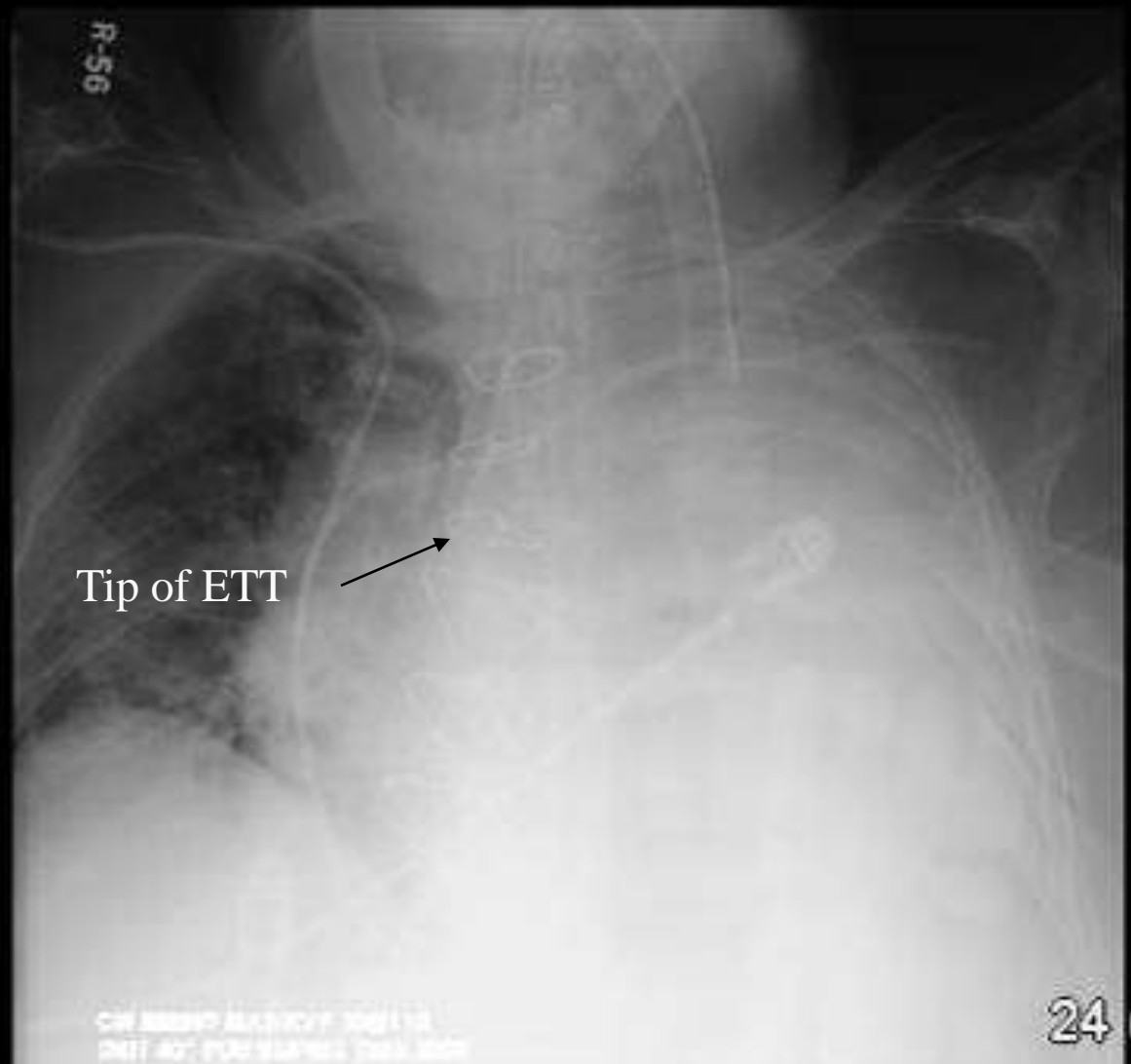
CI# 1286383
8MAS/110KVP
DIST 40" POS SUPINE
TIME 0138

RT 80

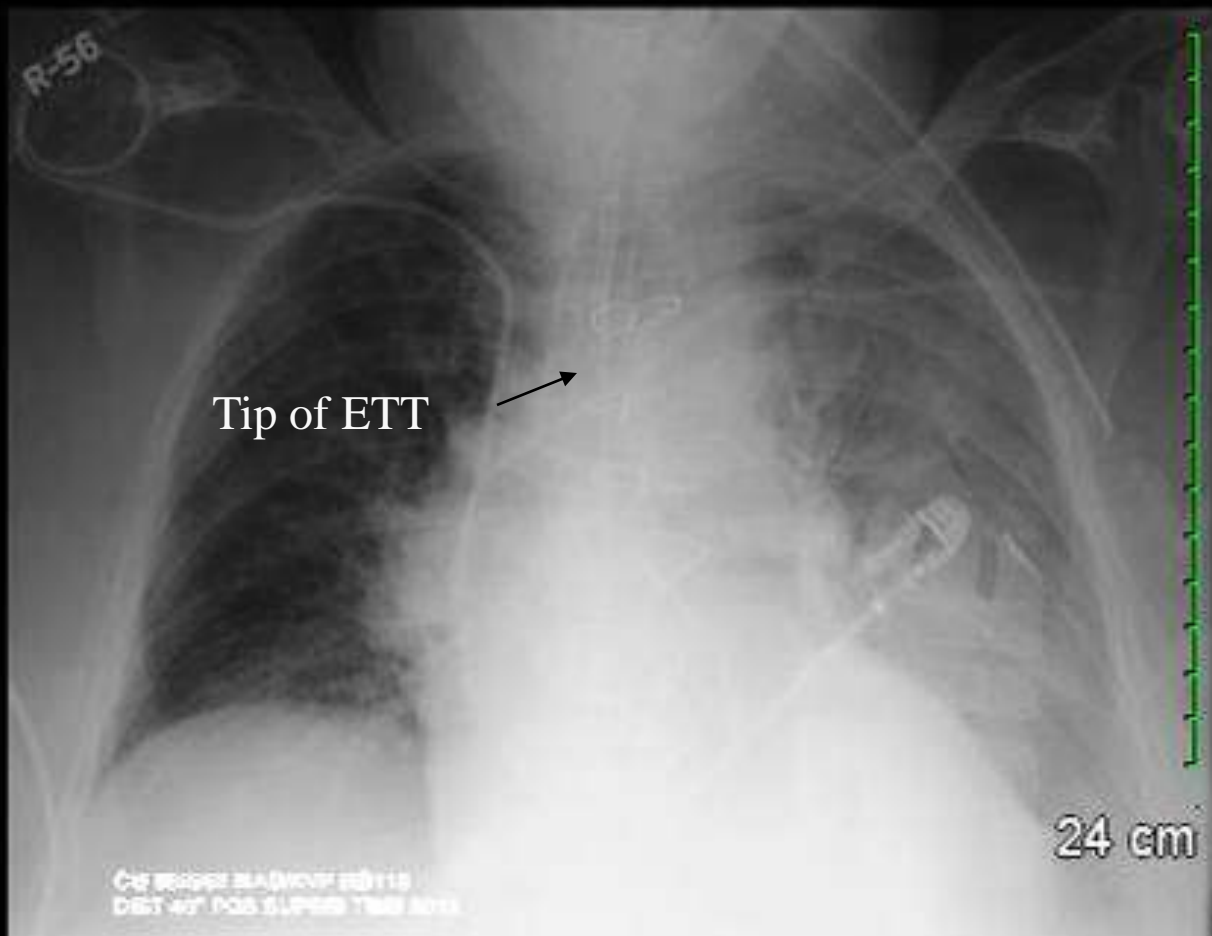


Atelectasis Right Upper Lobe

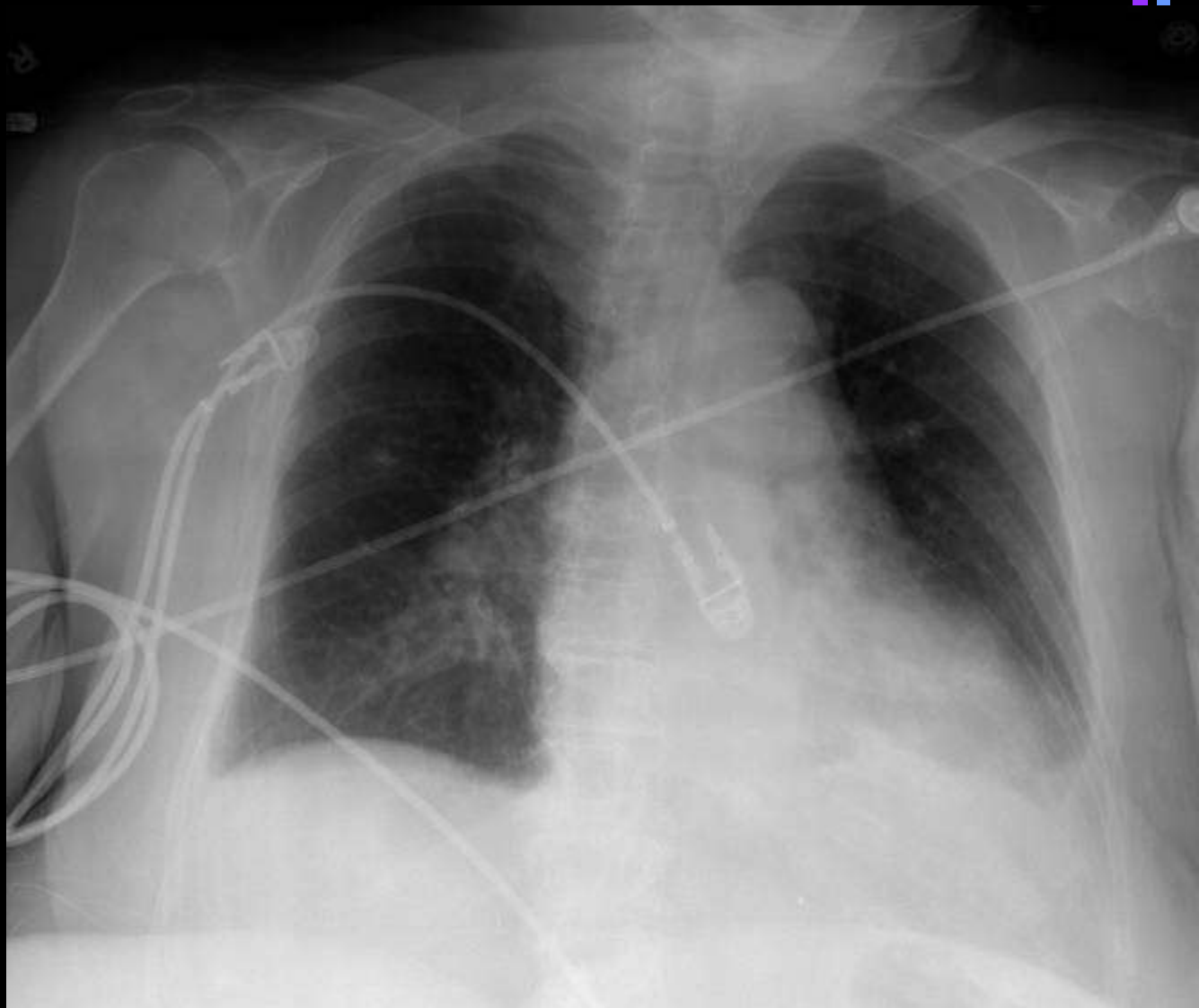
- Atelectasis from right mainstem intubation
- LM #1



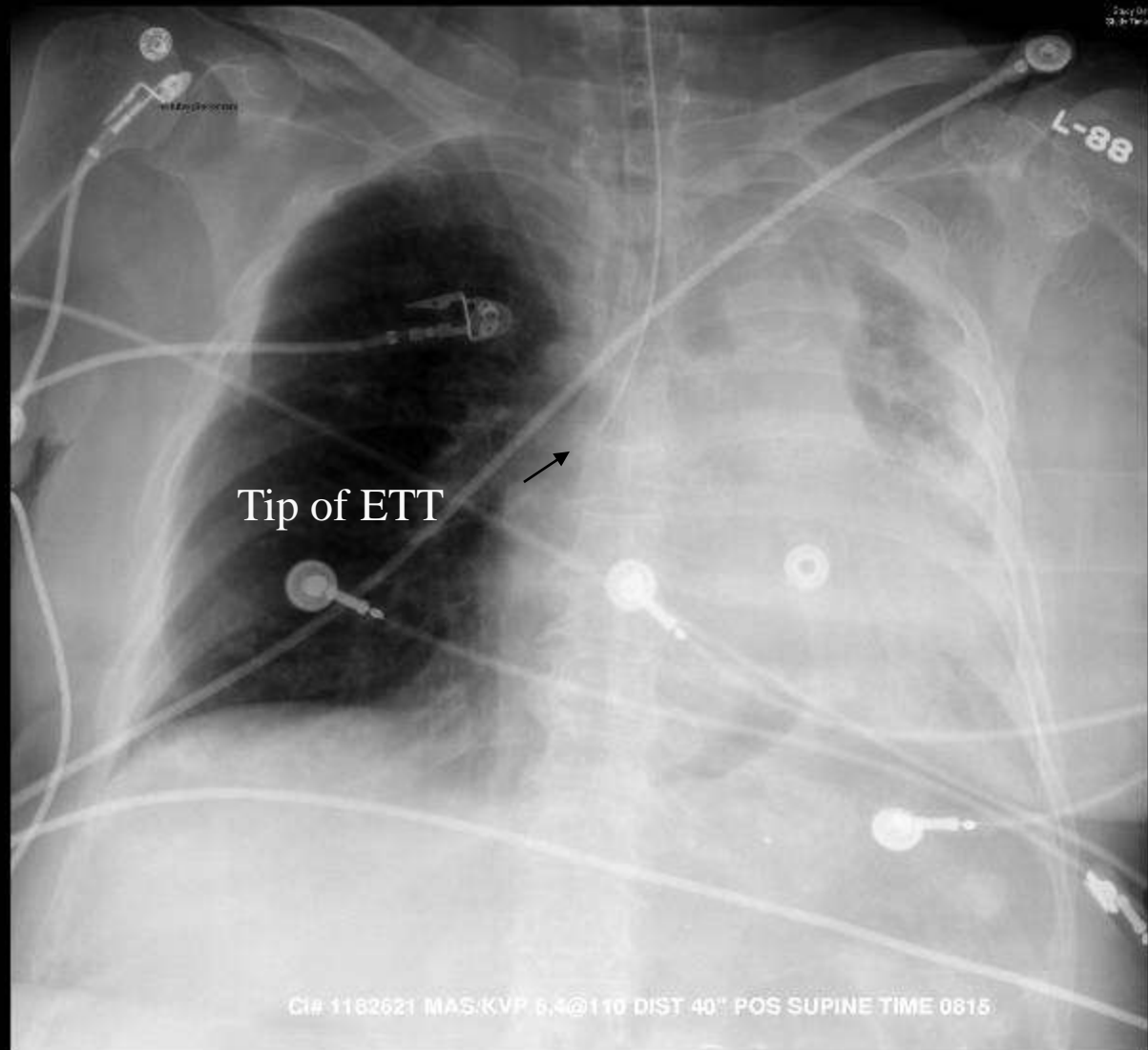
- Atelectasis resolved when ET tube in correct placement
- LM #2



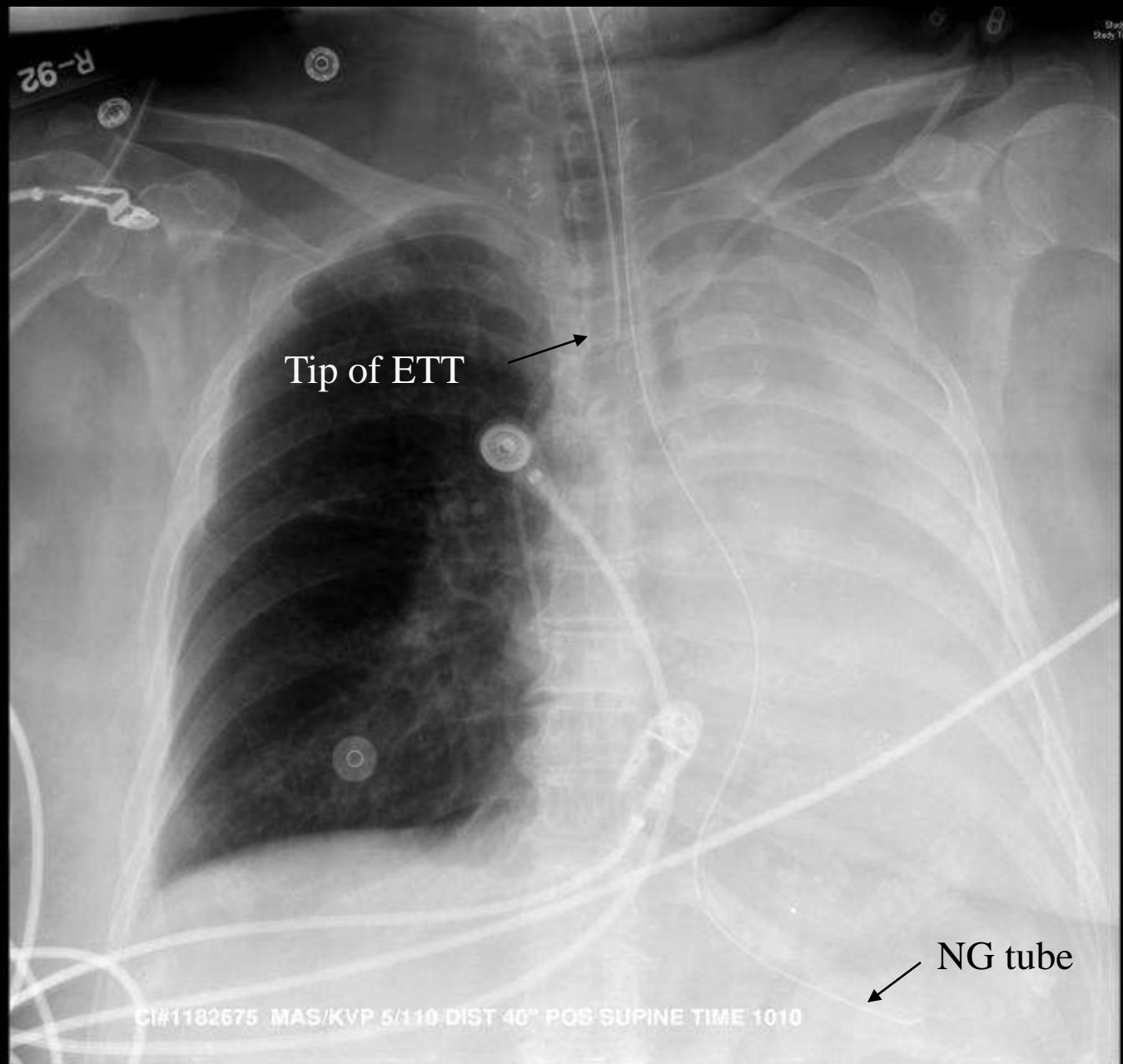
- AK #1
- At 0500
- atelectasis
vs small
pleural
effusion on
left



- AK # 2
- Respiratory arrested at 0800 and intubated
- CXR 0820
- Right mainstem intubation



- AK #3
- ET tube correct position
- 10:20 am

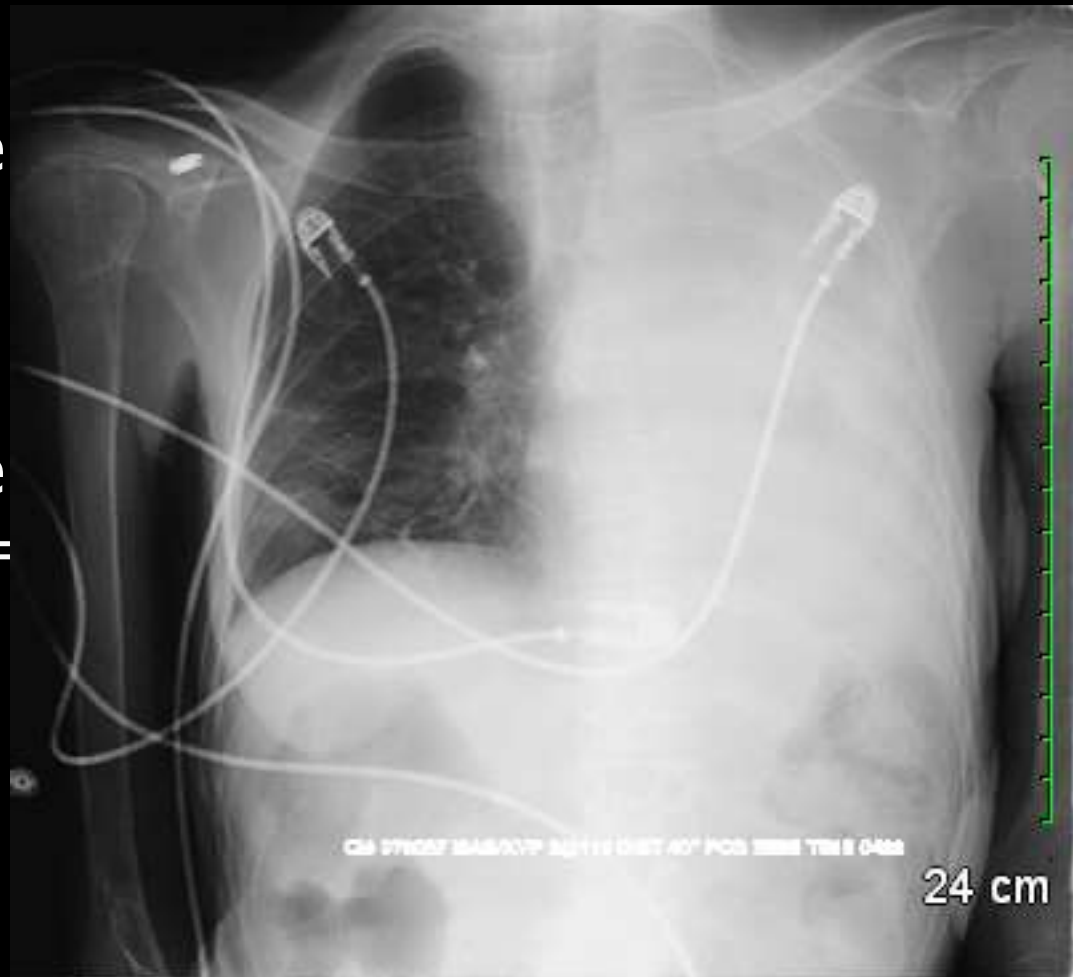


- AK #4
- Post Bronch to remove mucous plug



Pleural Effusion versus Atelectasis

- Mediastinum displaced to the opposite side = large effusion
- Mediastinum displaced to the ipsilateral side = lung collapse



ARDS

Acute Respiratory Distress Syndrome

- Acute alveolar insult causing pulmonary inflammation and small vessel injury
- Diffuse bilateral patchy infiltrates
- White infiltrates on CXR
- “Blizzard snowstorm”
- “Bilateral whiteout”

309MCRAD086

Ex: 000002

Se: 1/1

Im: 9/14

L-37

2006 Jan 01 test

Acc: 000001

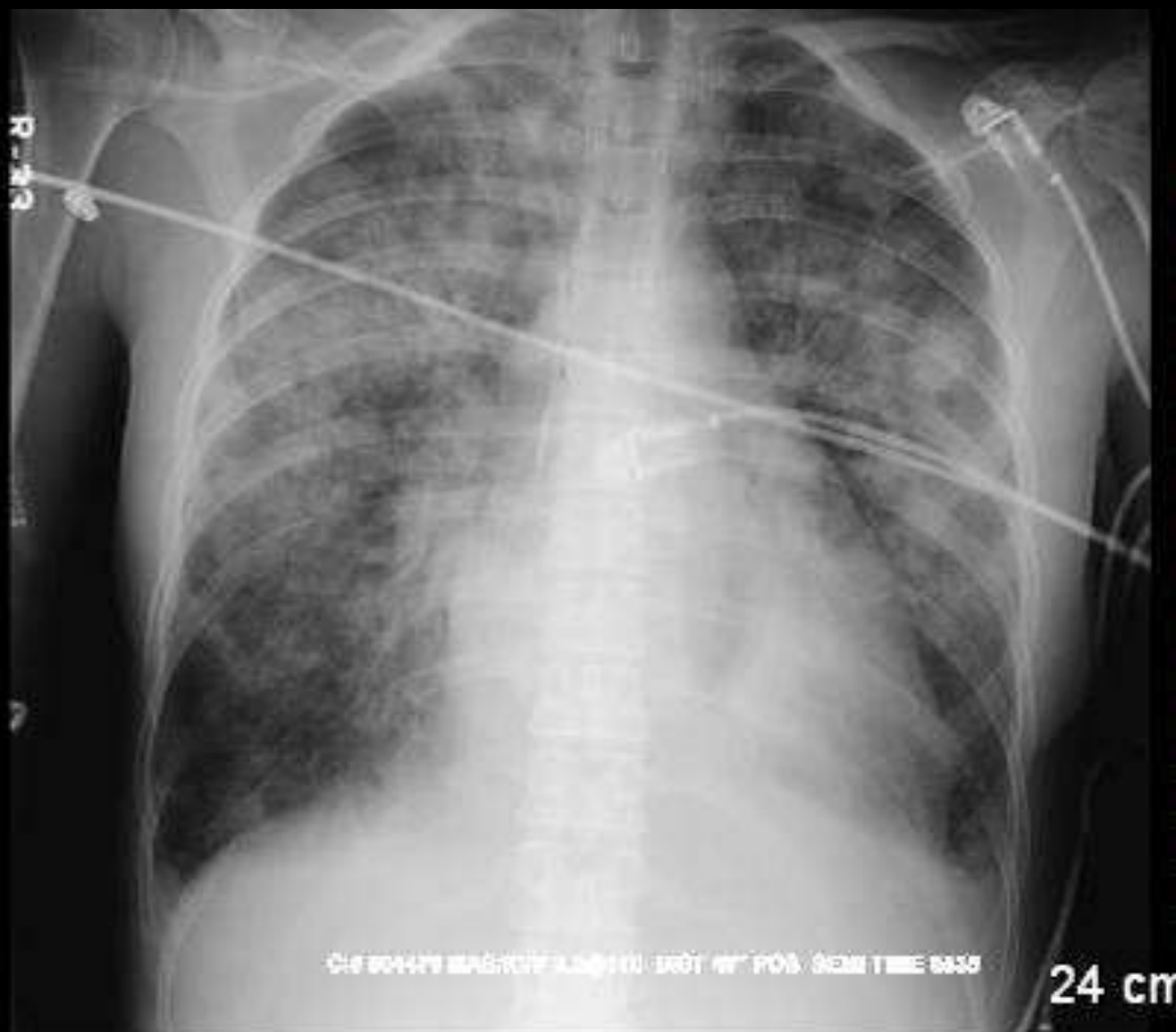
2006 May 31

Stdy Tm: 06:44:30

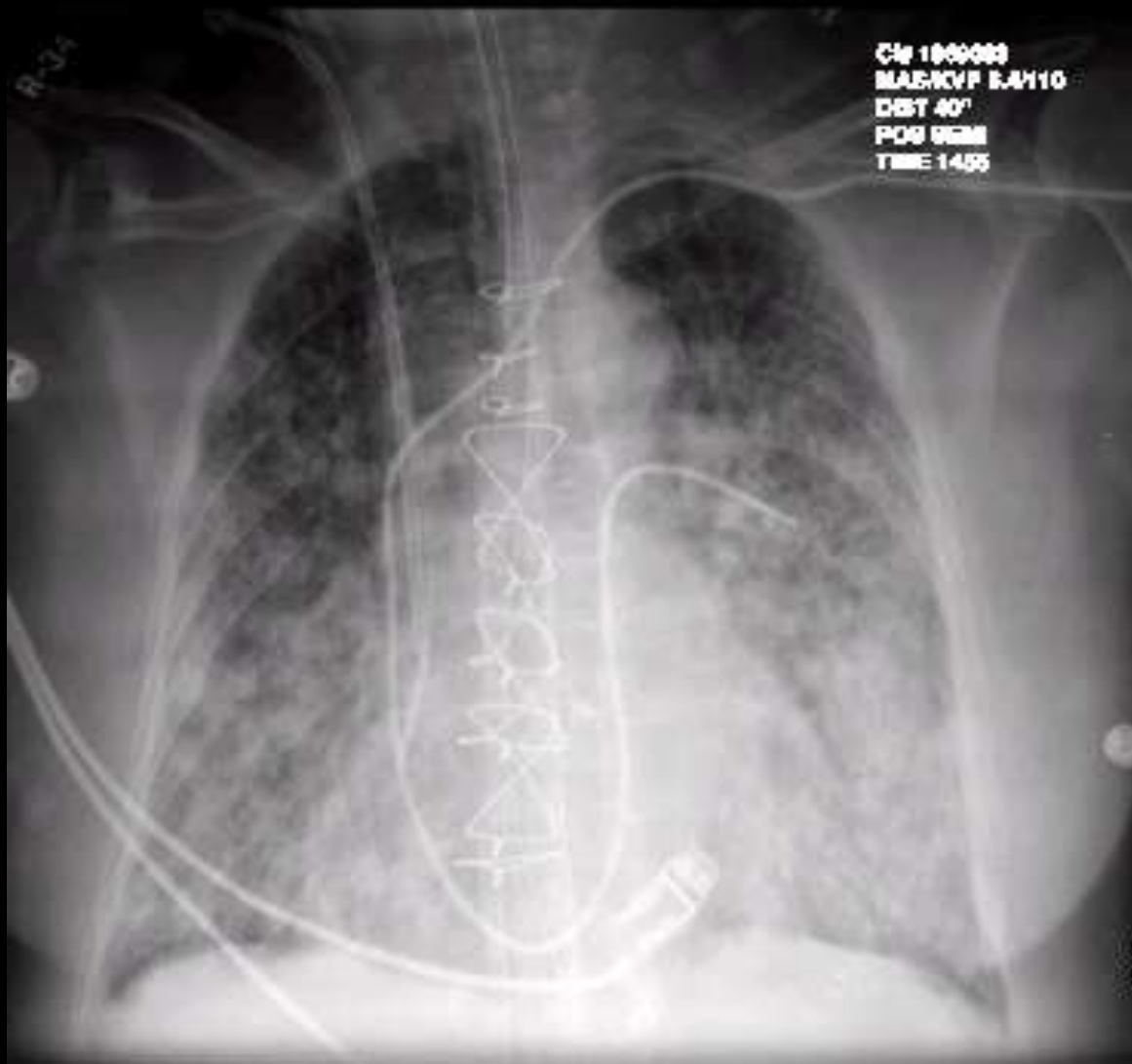
Id:DCM / Lin:DCM / Id:ID

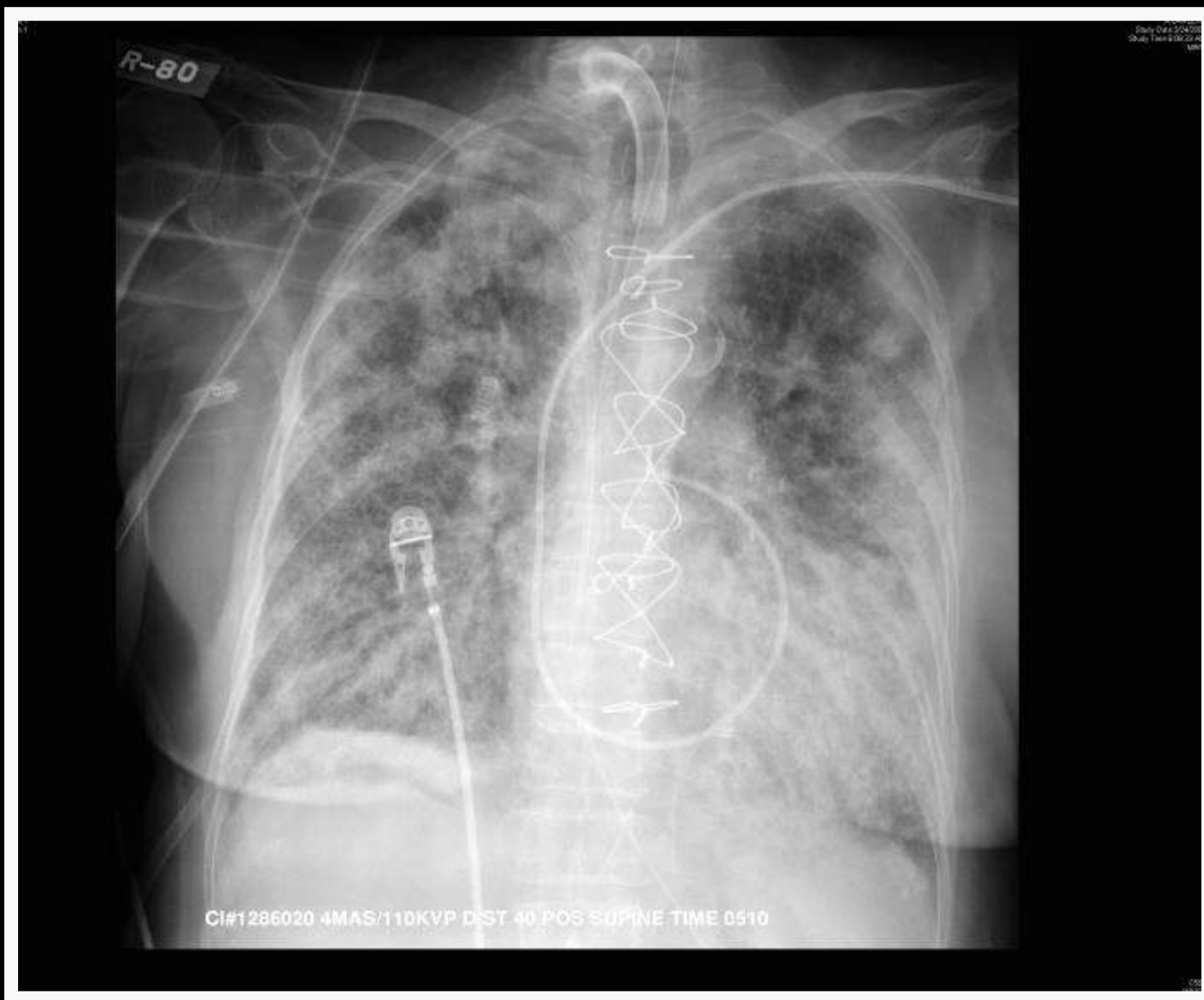
W:2340 L:2925

AP pri 2.5/15 0.600 kV



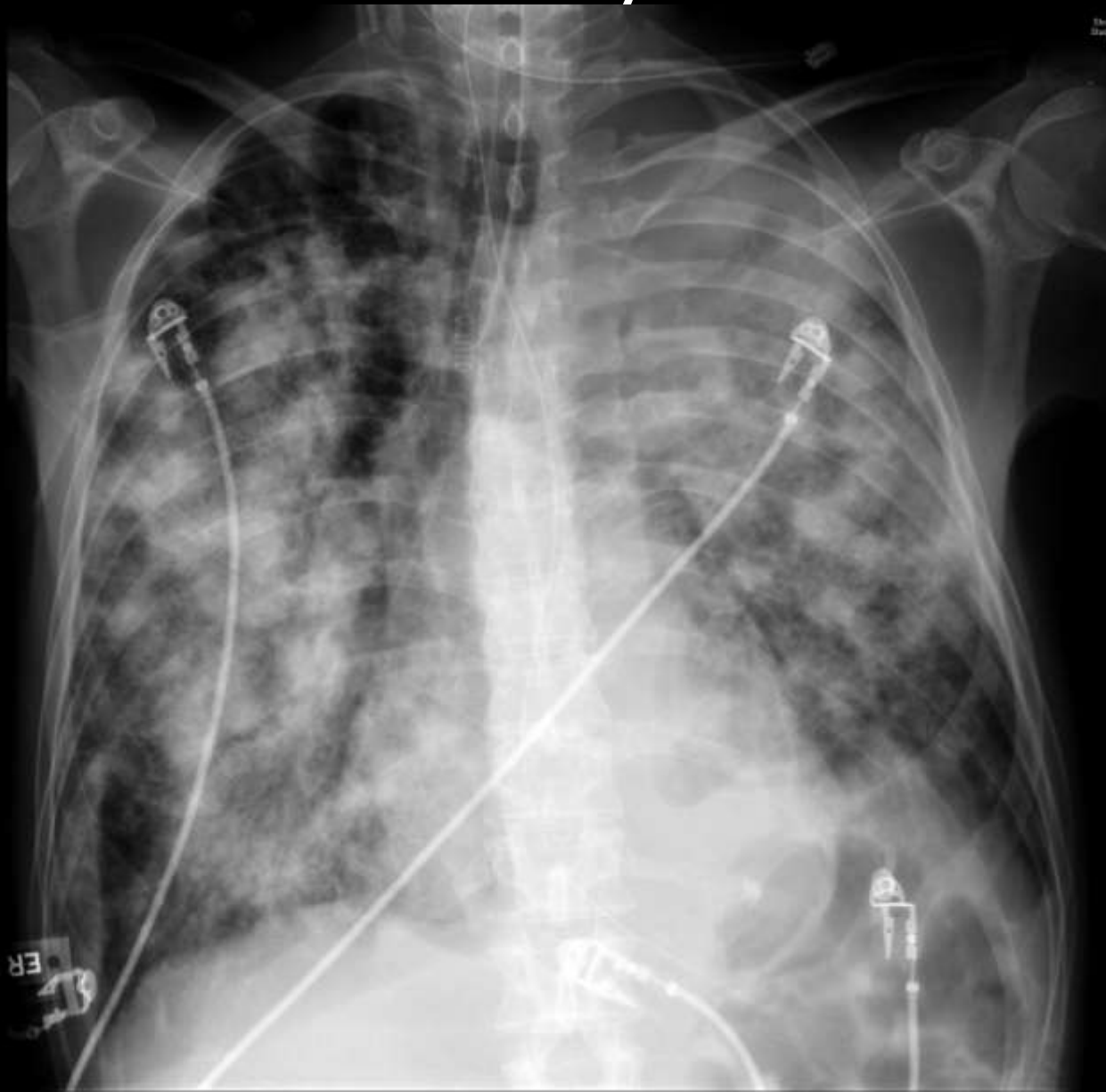
24 cm





ARDS, trach

Pneumocystis carini



History TB



As Easy As Black

Clinical
Findings
that show
up Black

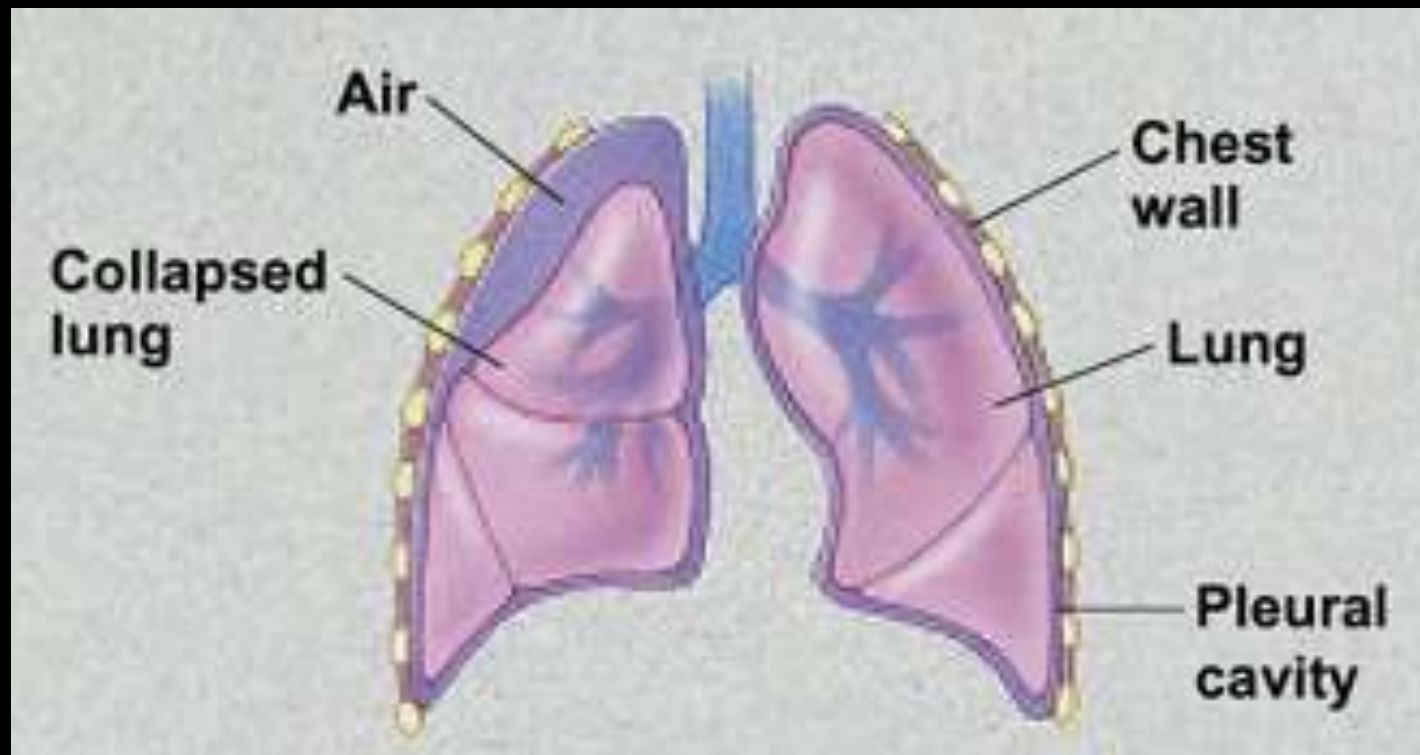


Pneumothorax

Is there an area too black?

Pneumothorax

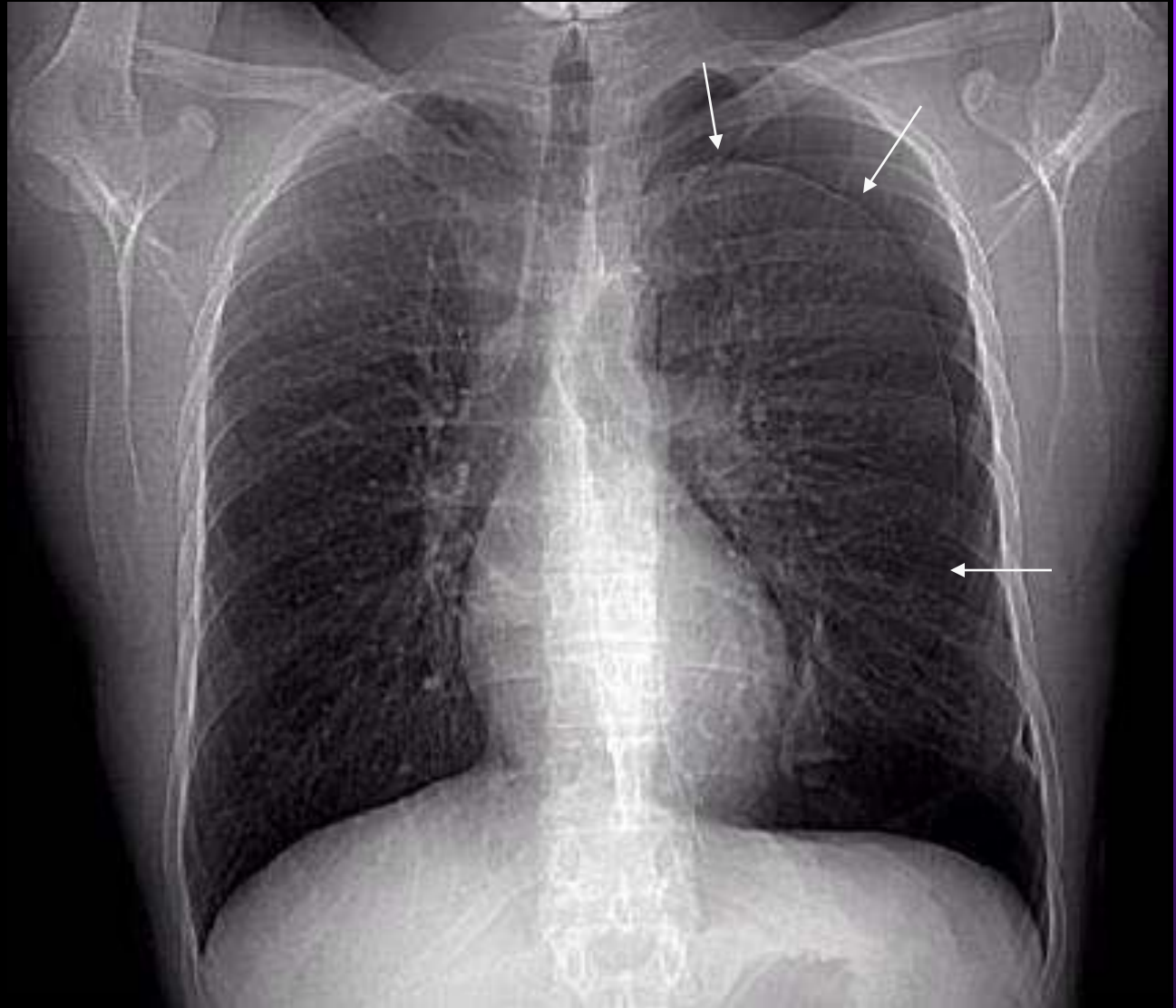
- Air in the pleural space that inhibits complete lung expansion
- A thin, white line represents the displaced visceral pleura
- Small pneumothorax
 - Veil like line evident below the thoracic cage beyond which there are no lung markings.
- Large pneumothorax
 - Black area over entire lung field with no lung markings evident
- ICS may be farther apart on the side with pneumothorax



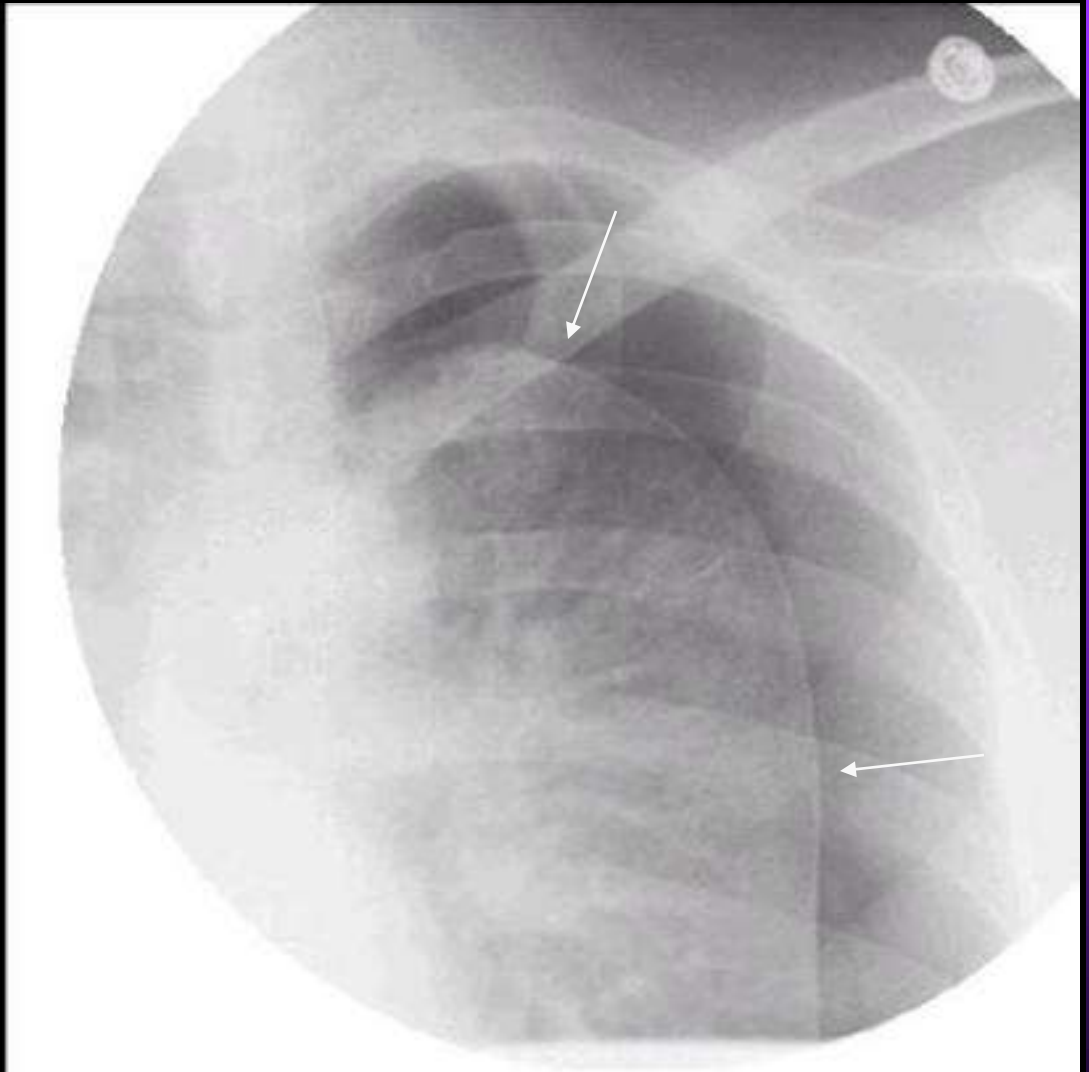
Pneumothorax

- Causes:
 - Anything that causes a tear in the lung: line insertion, rib fracture
- Treatment:
 - Chest tube insertion if greater than 10 – 15 %
 - If tension pneumothorax ---- it is a medical **EMERGENCY** and needs immediate needle decompression

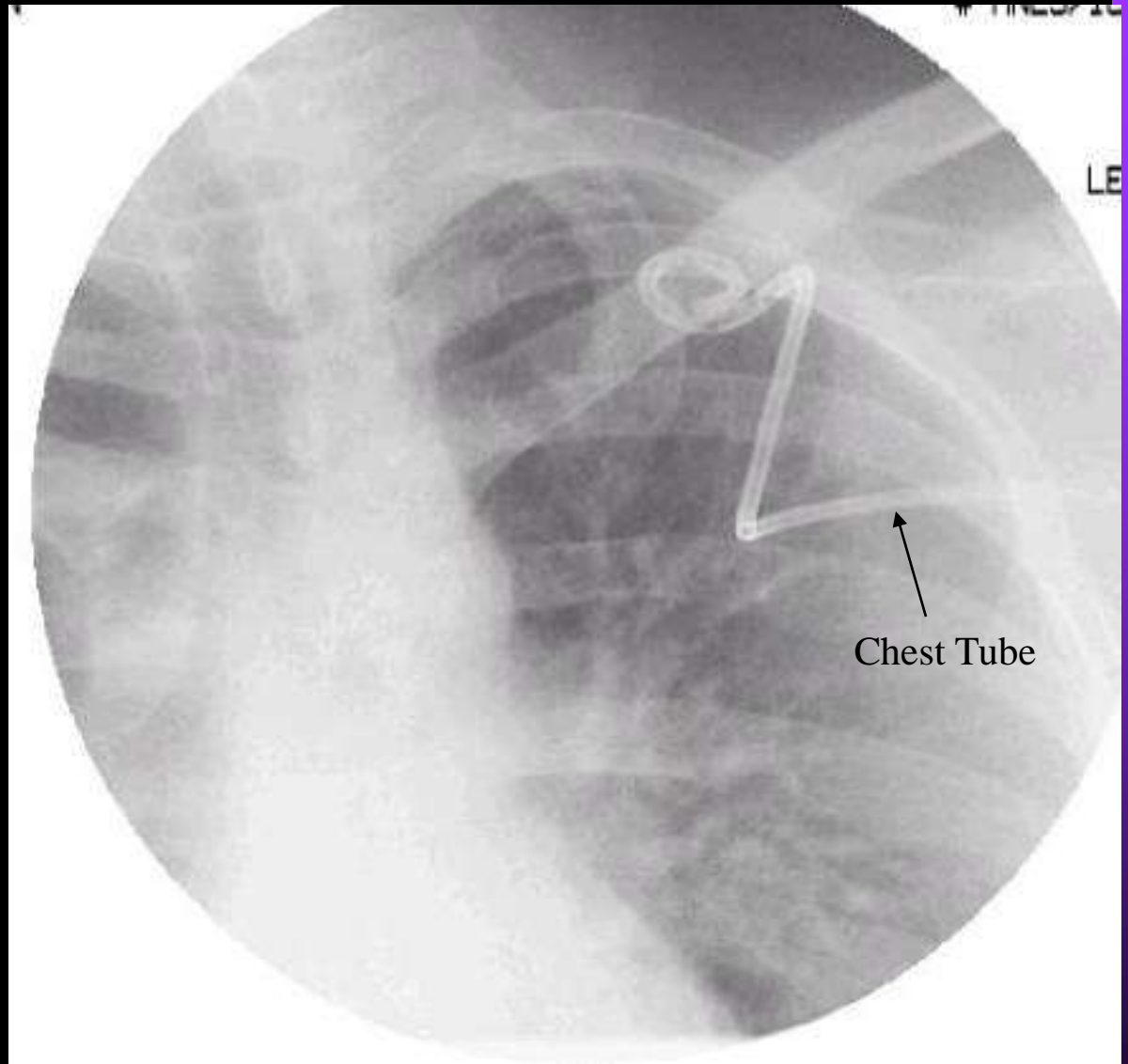
- Left
Pneumothorax
on CT scan
- 7-16 AK



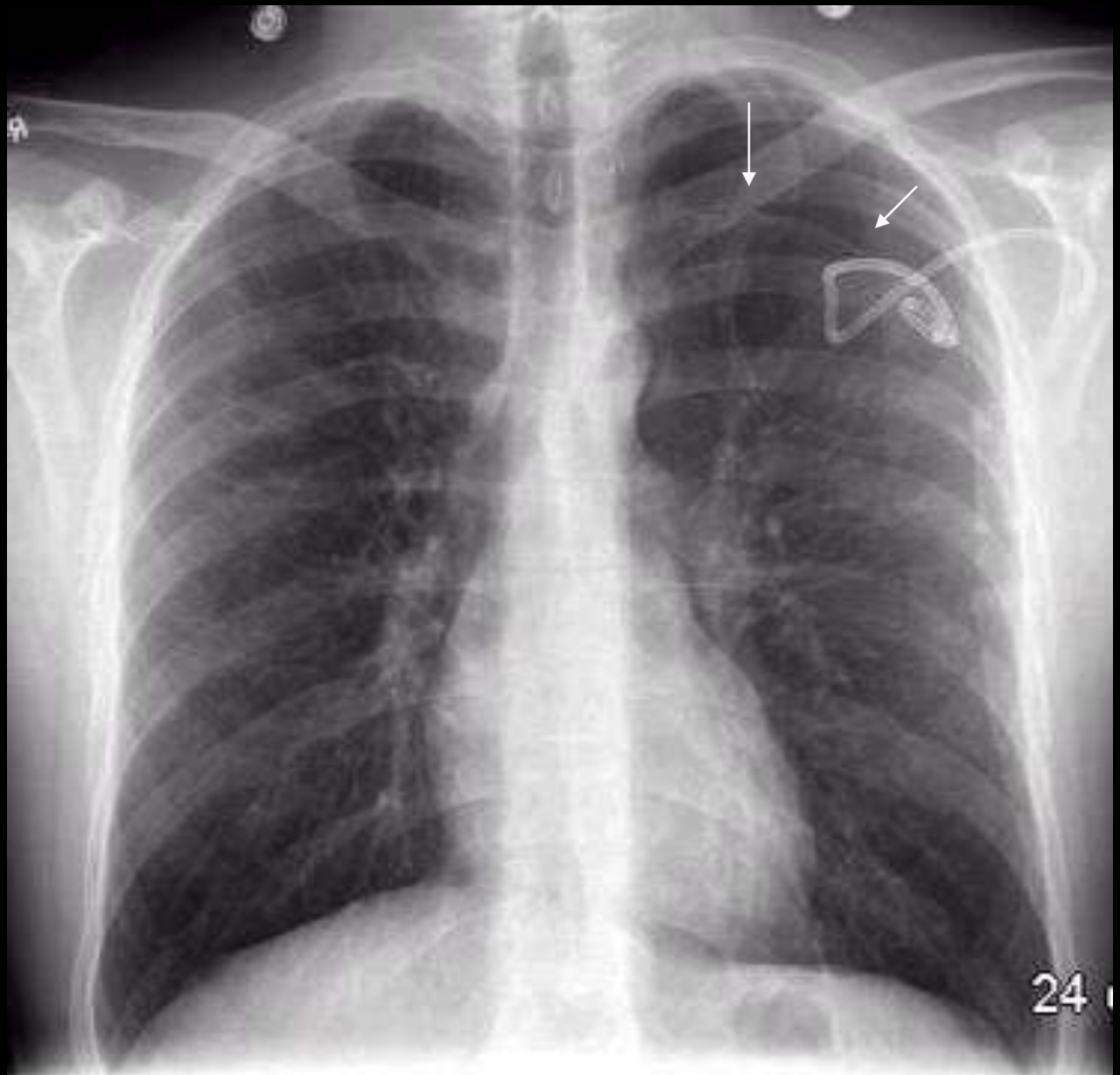
- Left Pneumo under fluro
- 7-16 AK

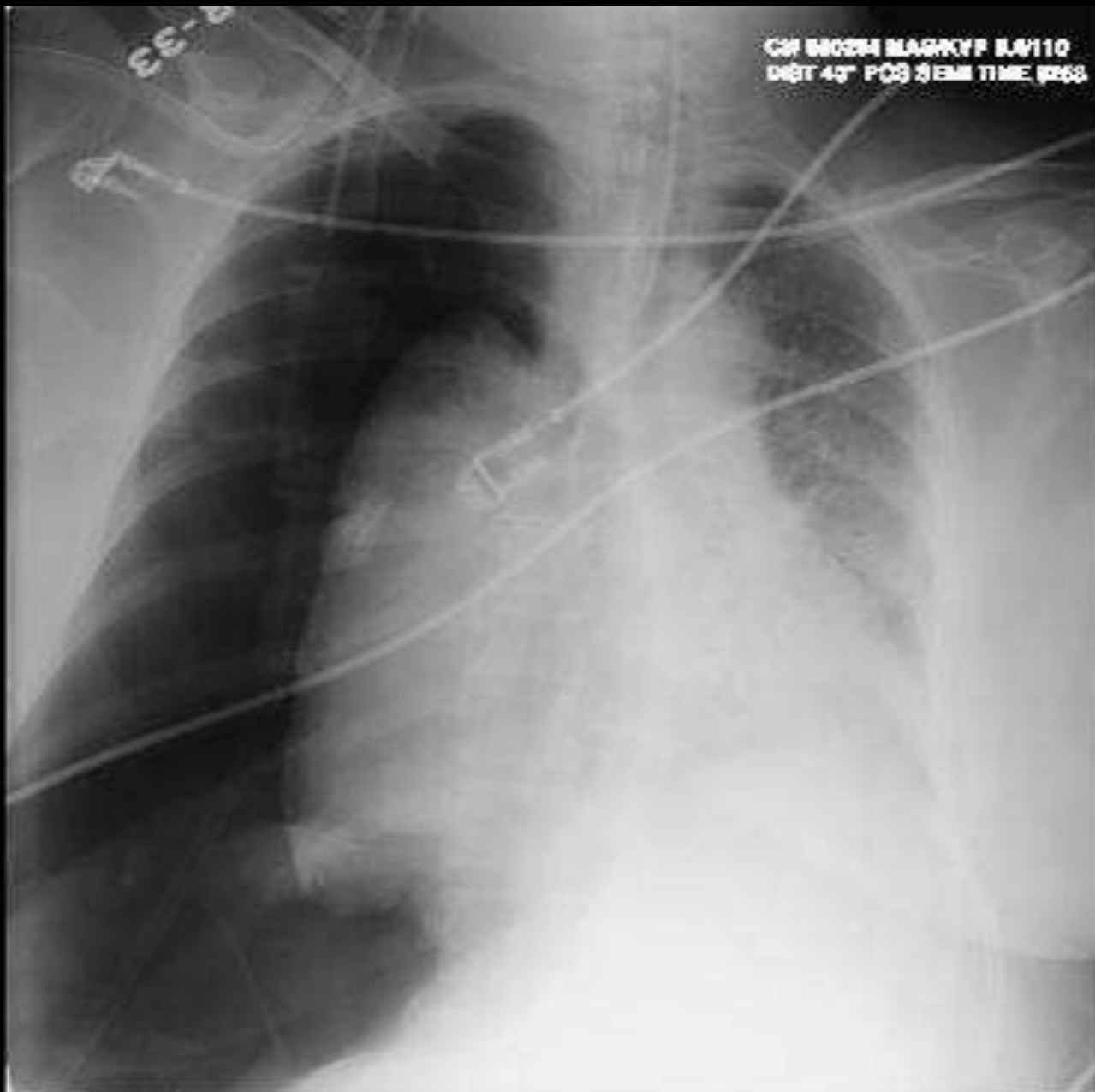


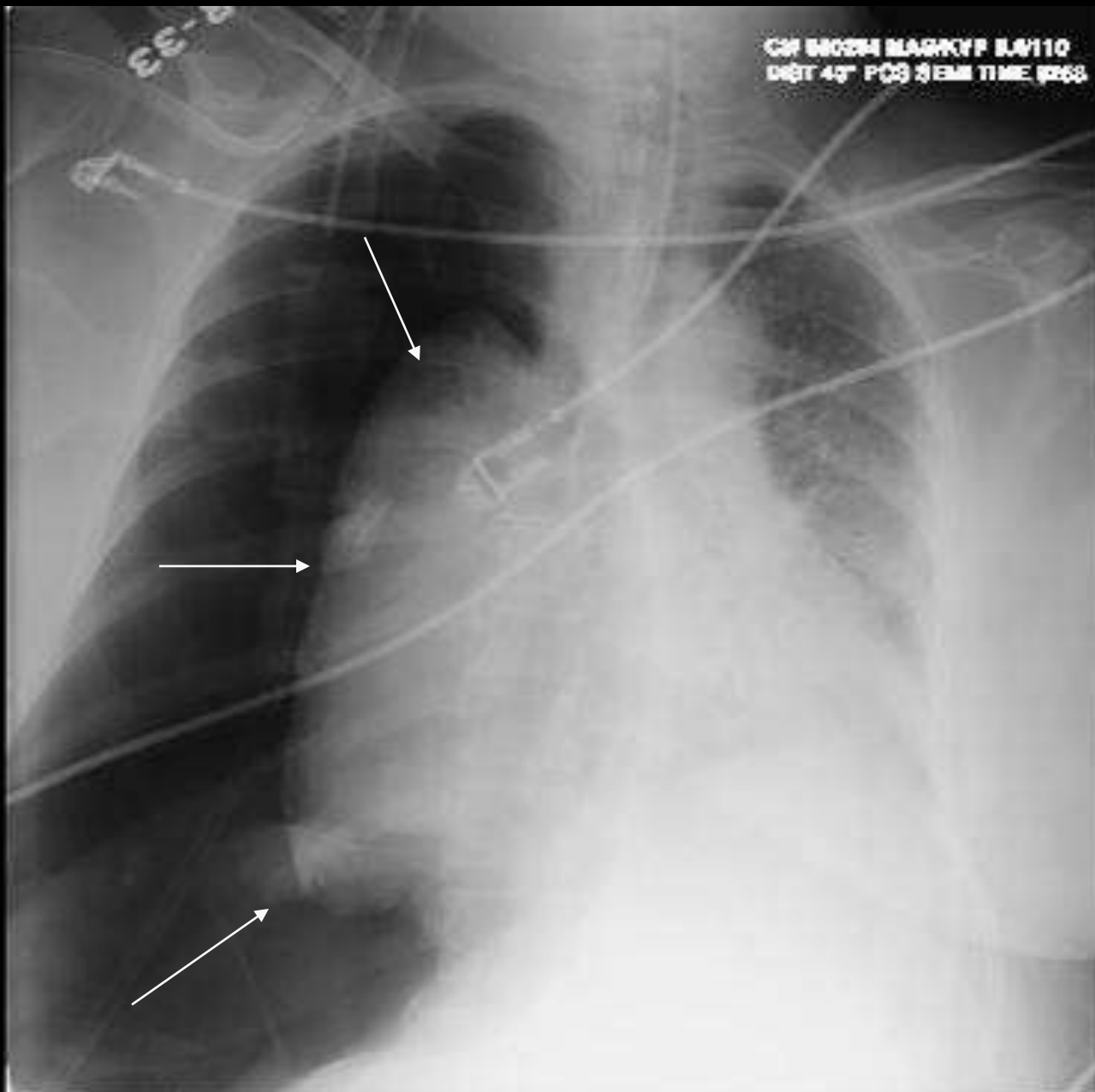
- Left pneumo resolved after CT insertion under fluro
- 7-16 AK



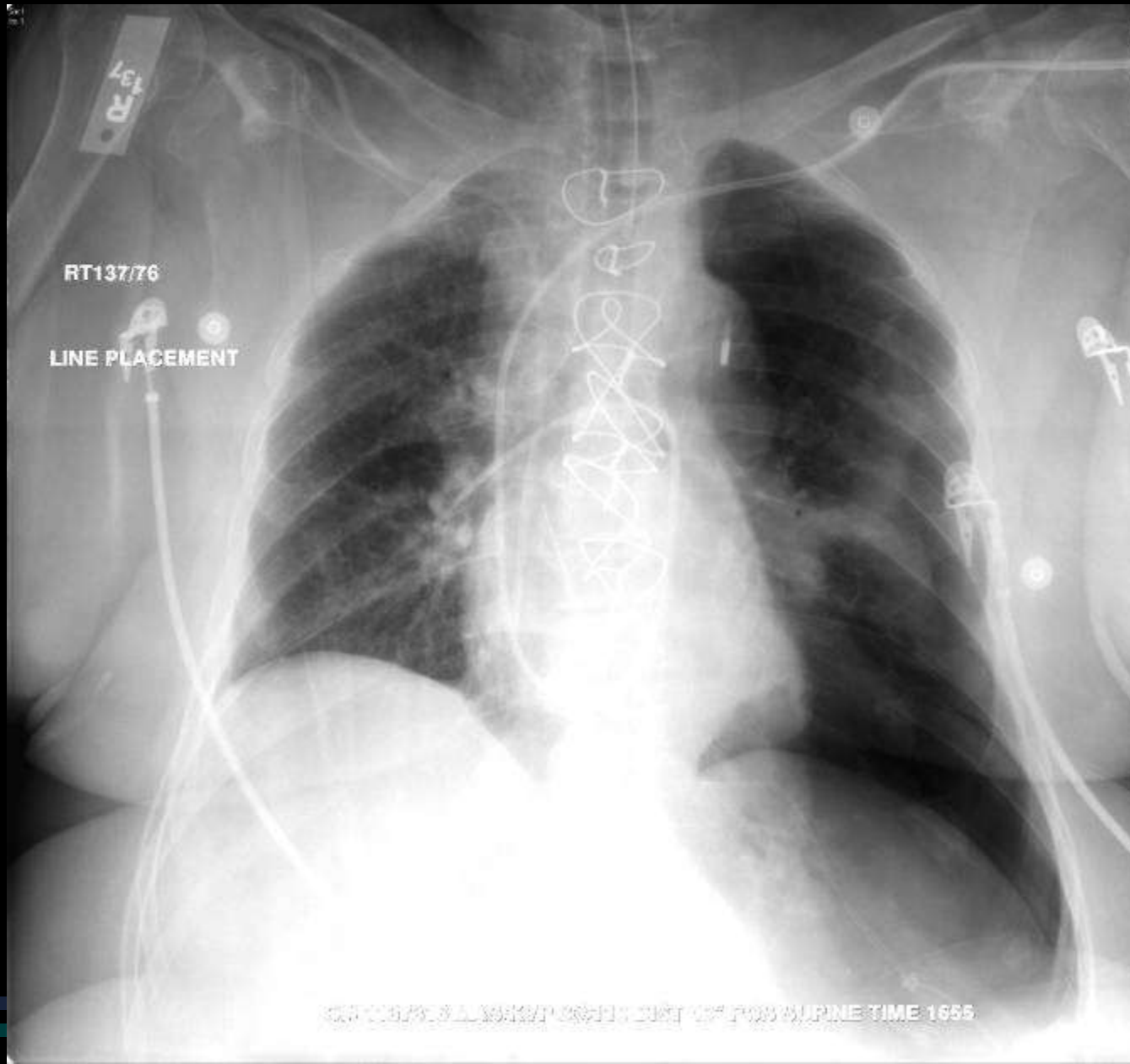
- Left pneumo even with Chest Tube
- 7-17 AK



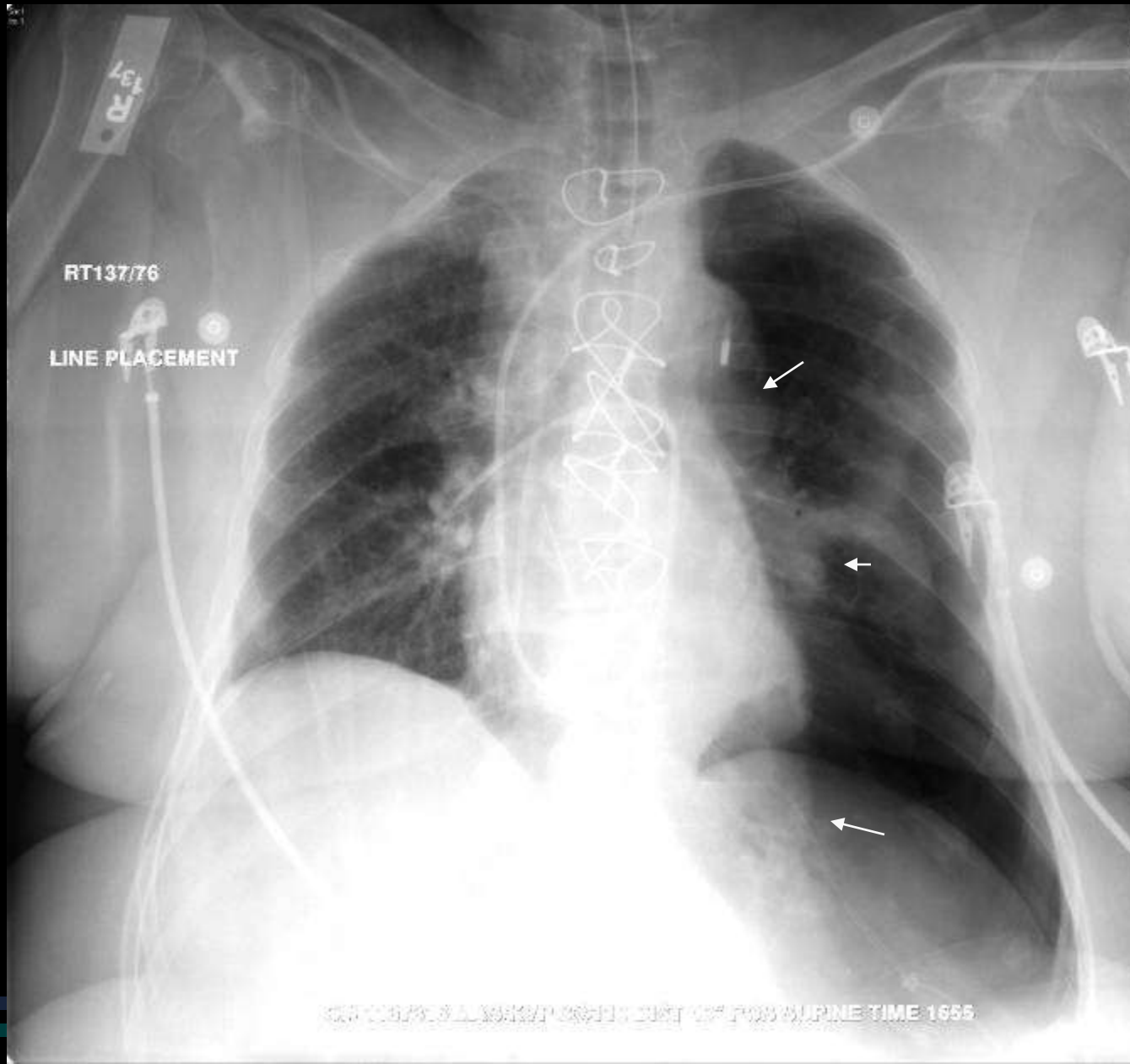




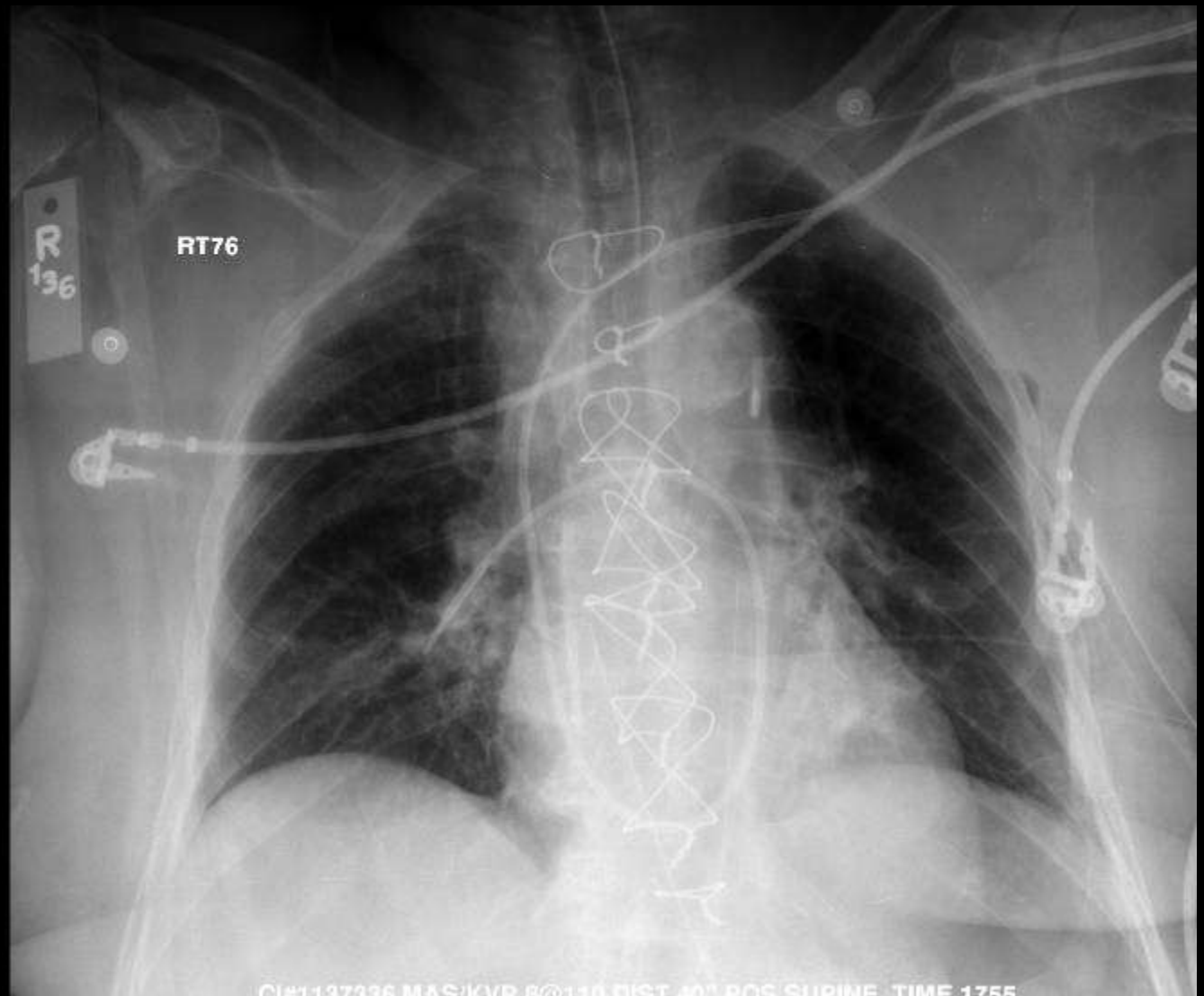
- DM



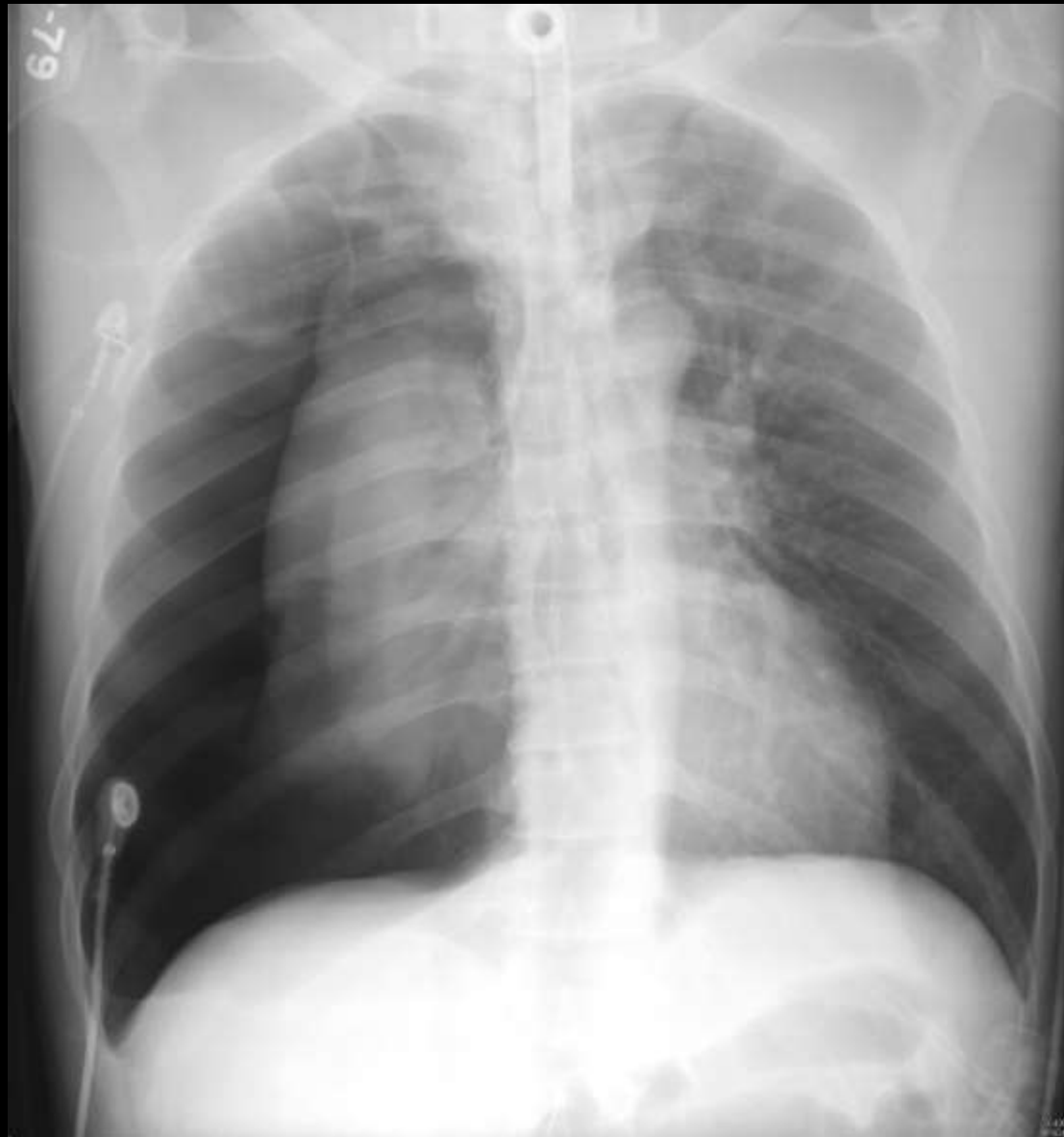
- DM



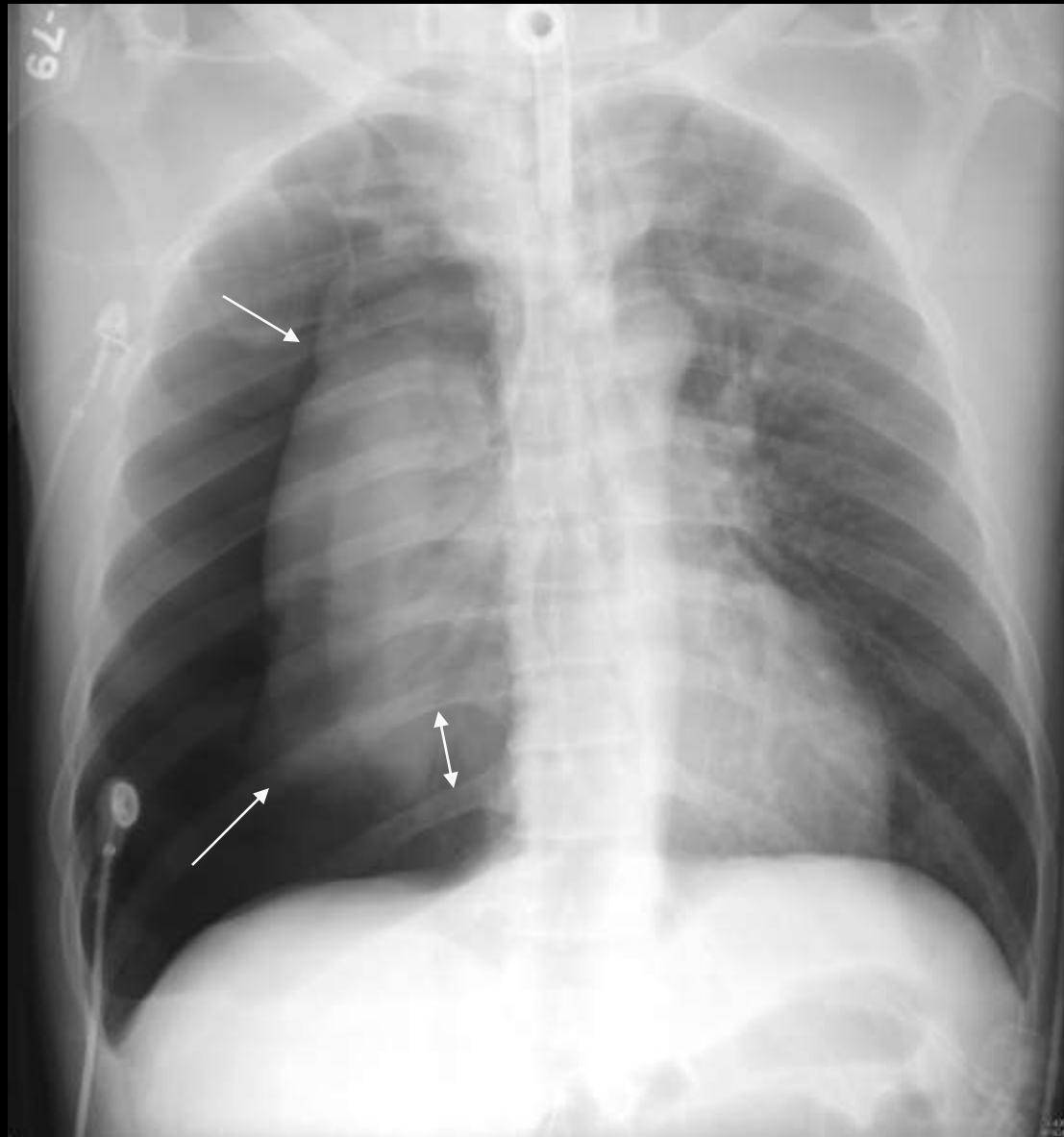
- DM after CT insertion



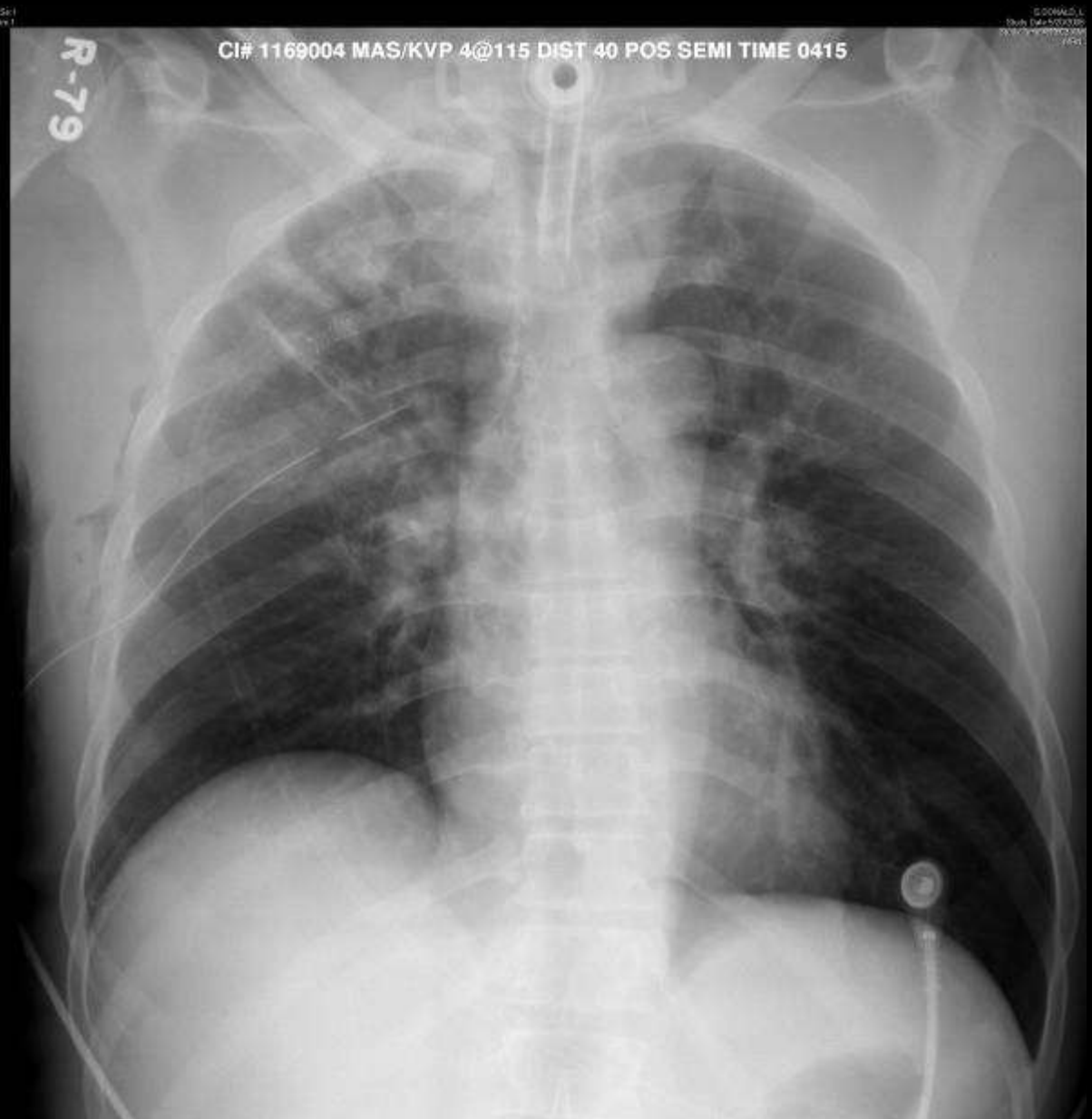
- DS



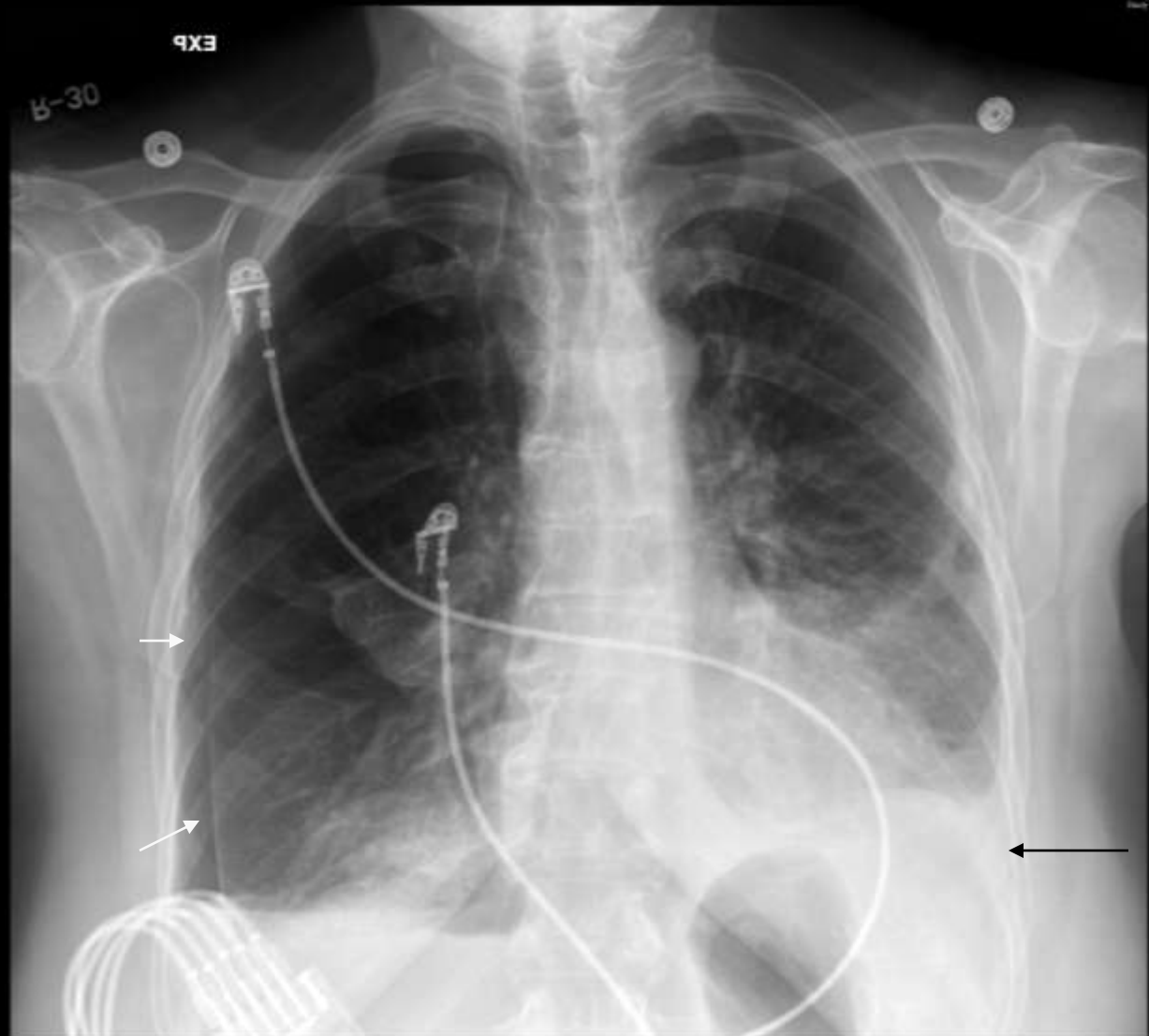
- DS



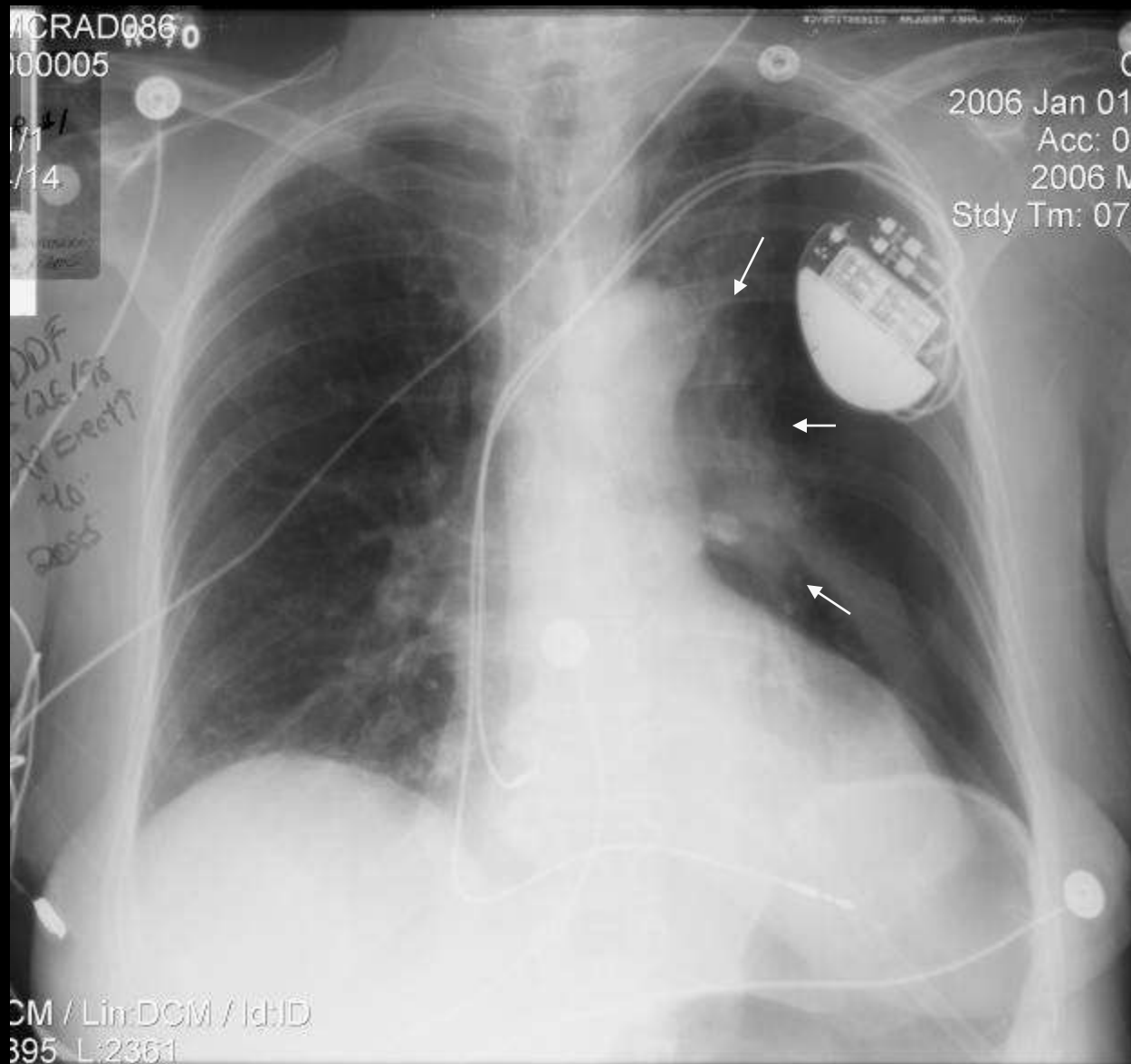
- DS post CT insertion

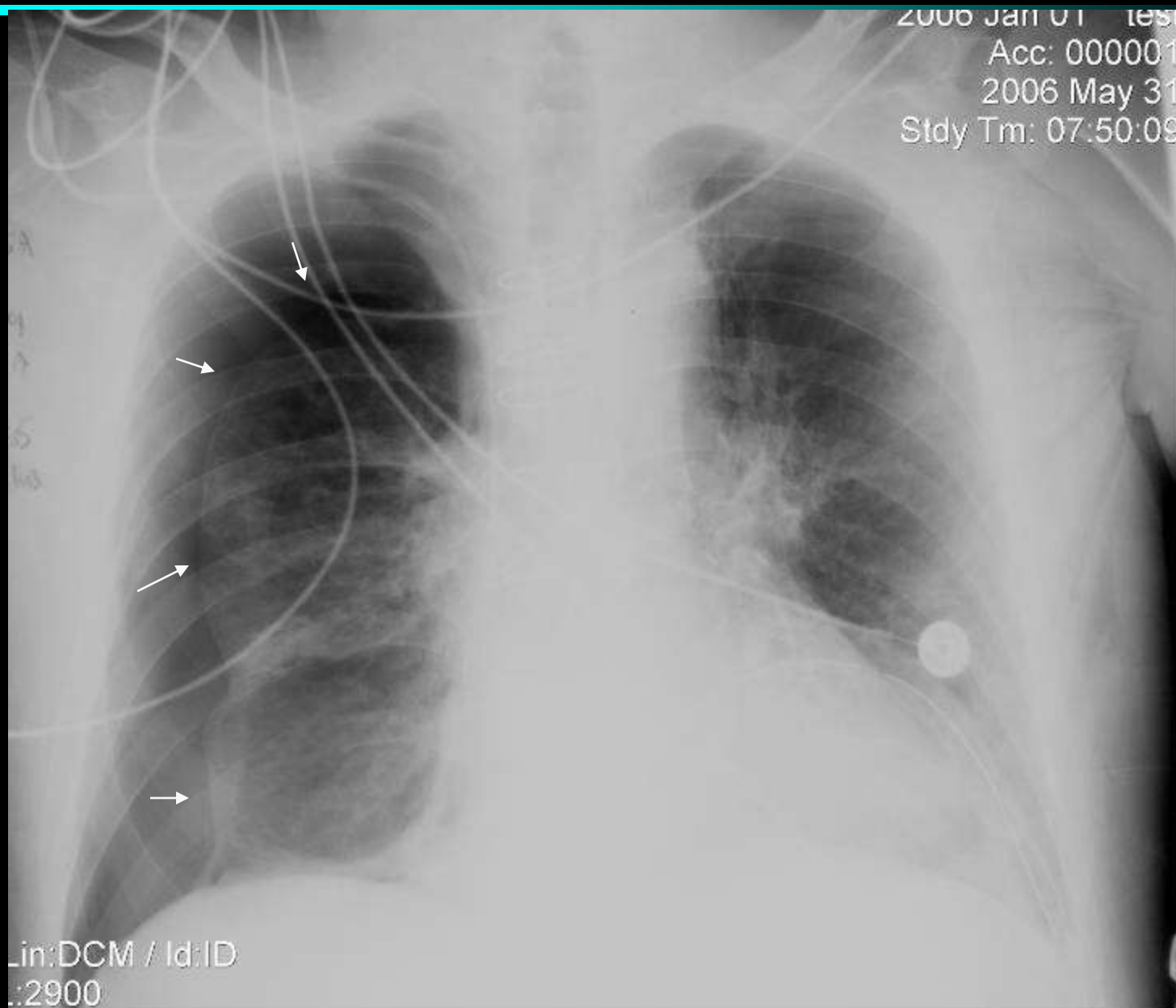


- Right pneumothorax
- Left pleural effusion
- AW #1



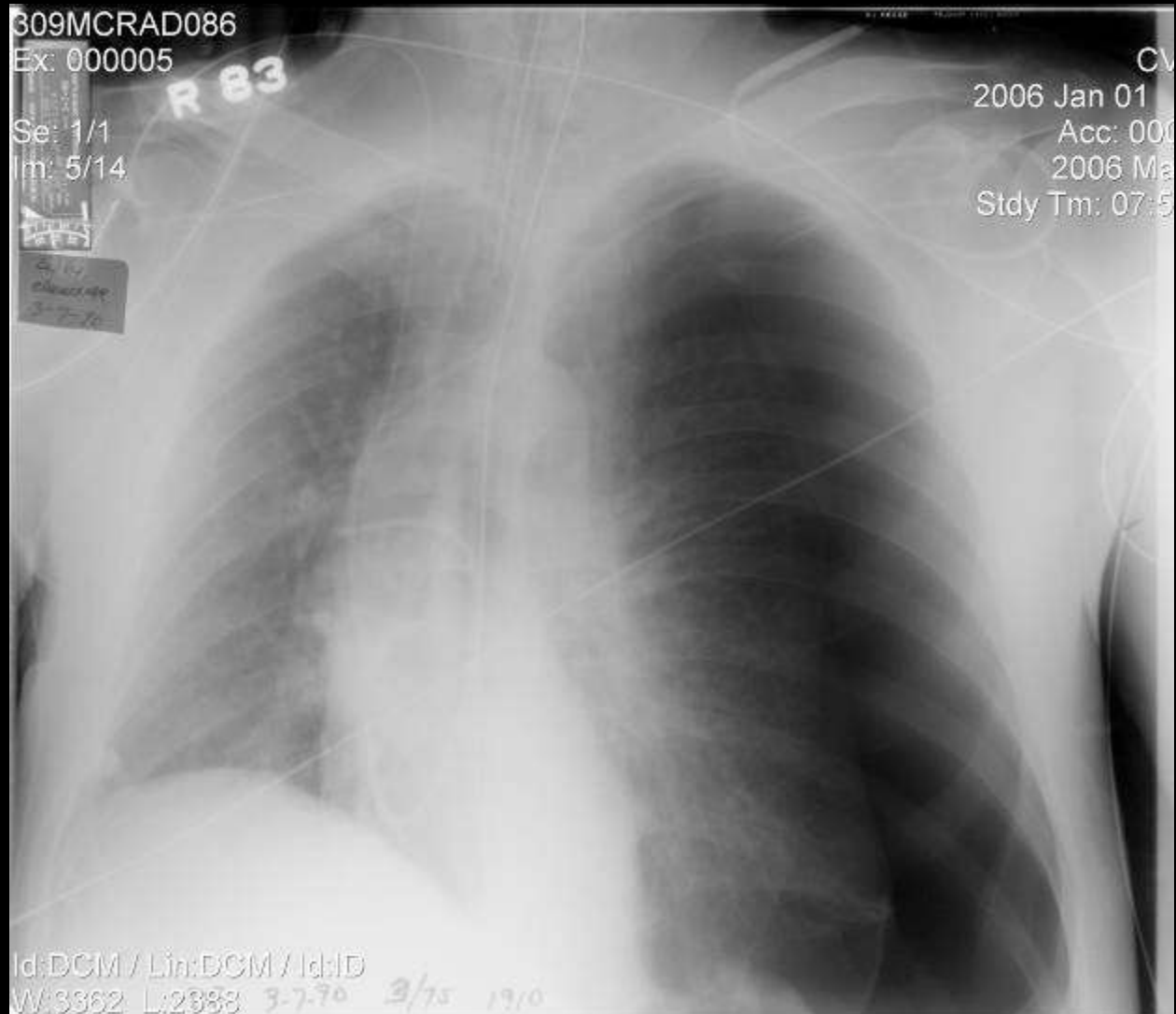
- Left pneumo from pacer insertion





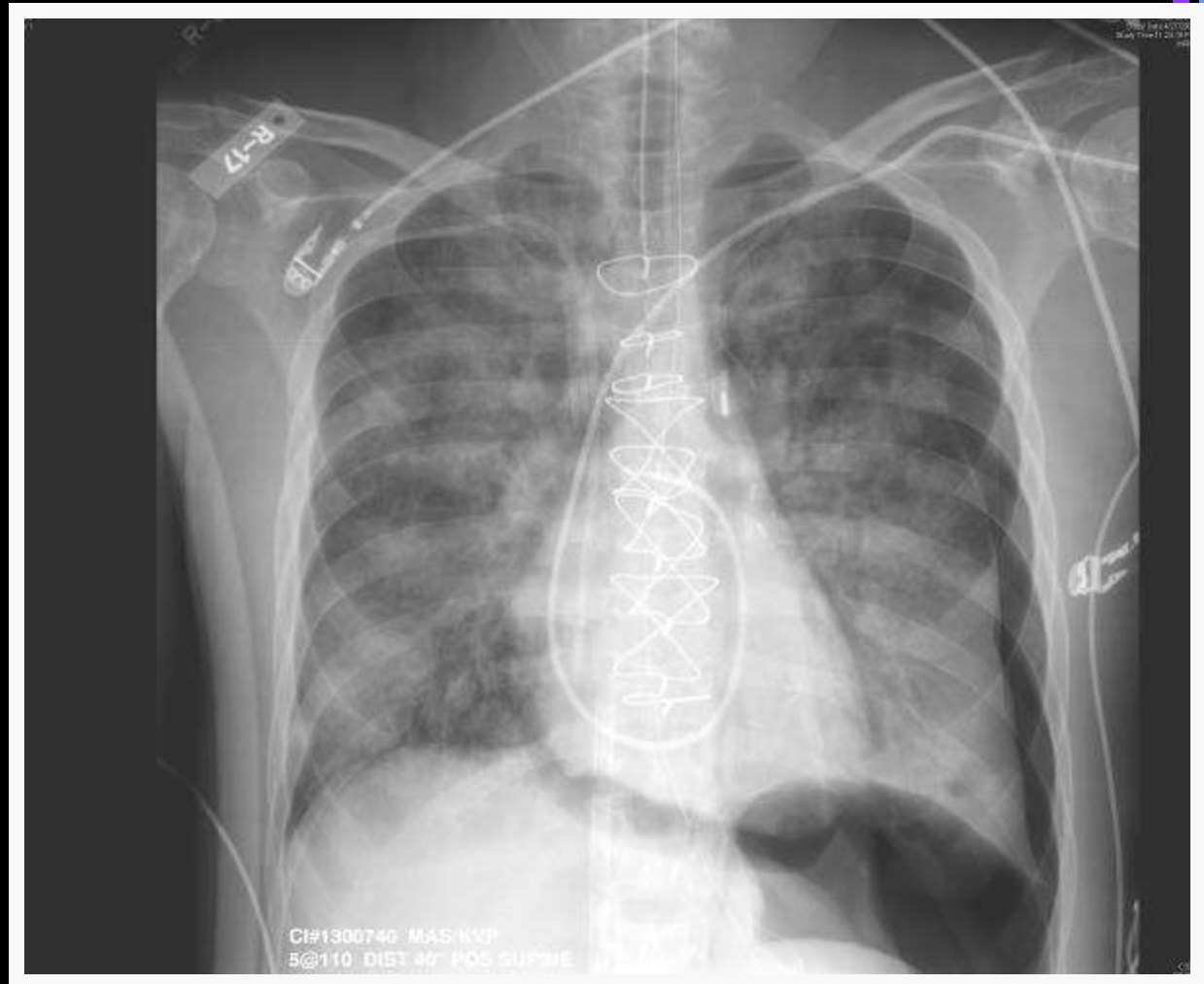
Tension Pneumothorax

- Note swan



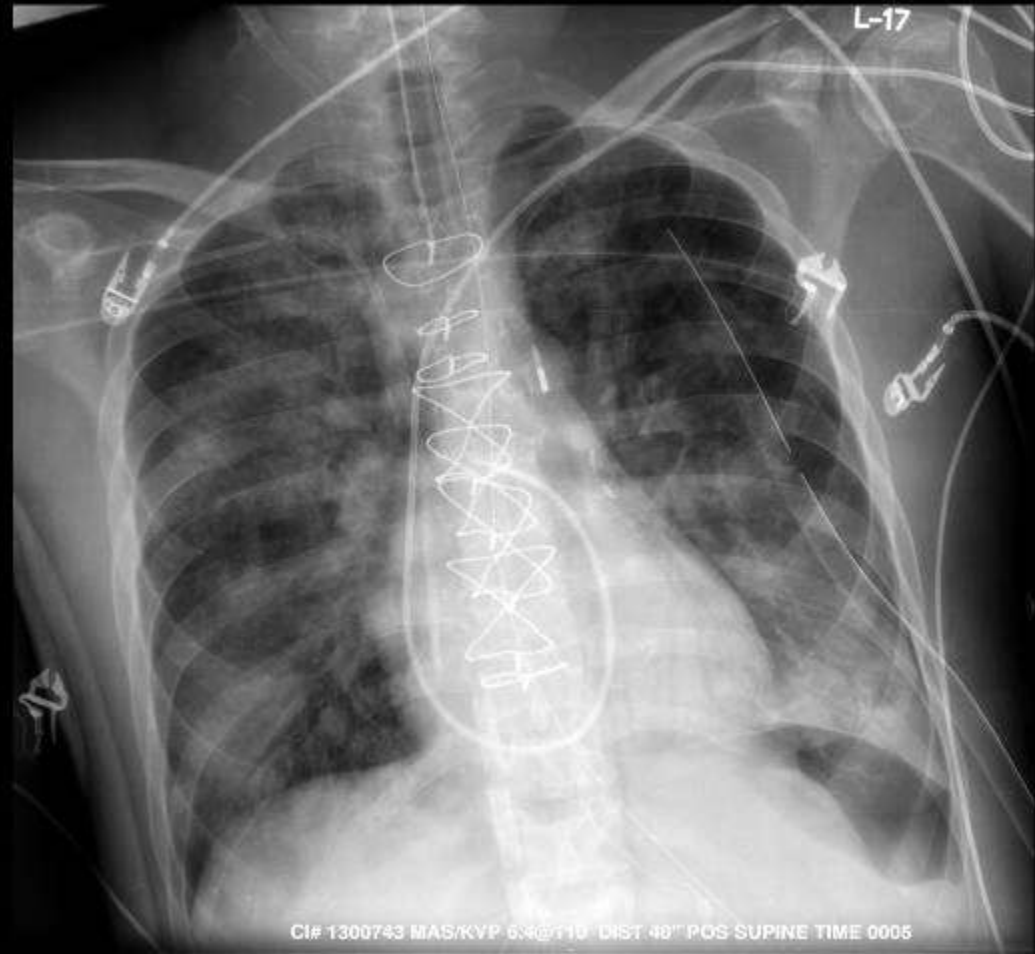
Tension Pneumothorax & Pneumopericardium

- Pt (MR) on ECMO
- BP dropped
- PAS/PAD & CVP pressures equalized within a few minutes



After chest tube inserted Pneumothorax & Pneumopericardium starting to resolve

- Pt (MR)



ICRAD086
000005

/1
/14

50
es
00

DR2 P000P000 M/LUGER 33WPU 110004

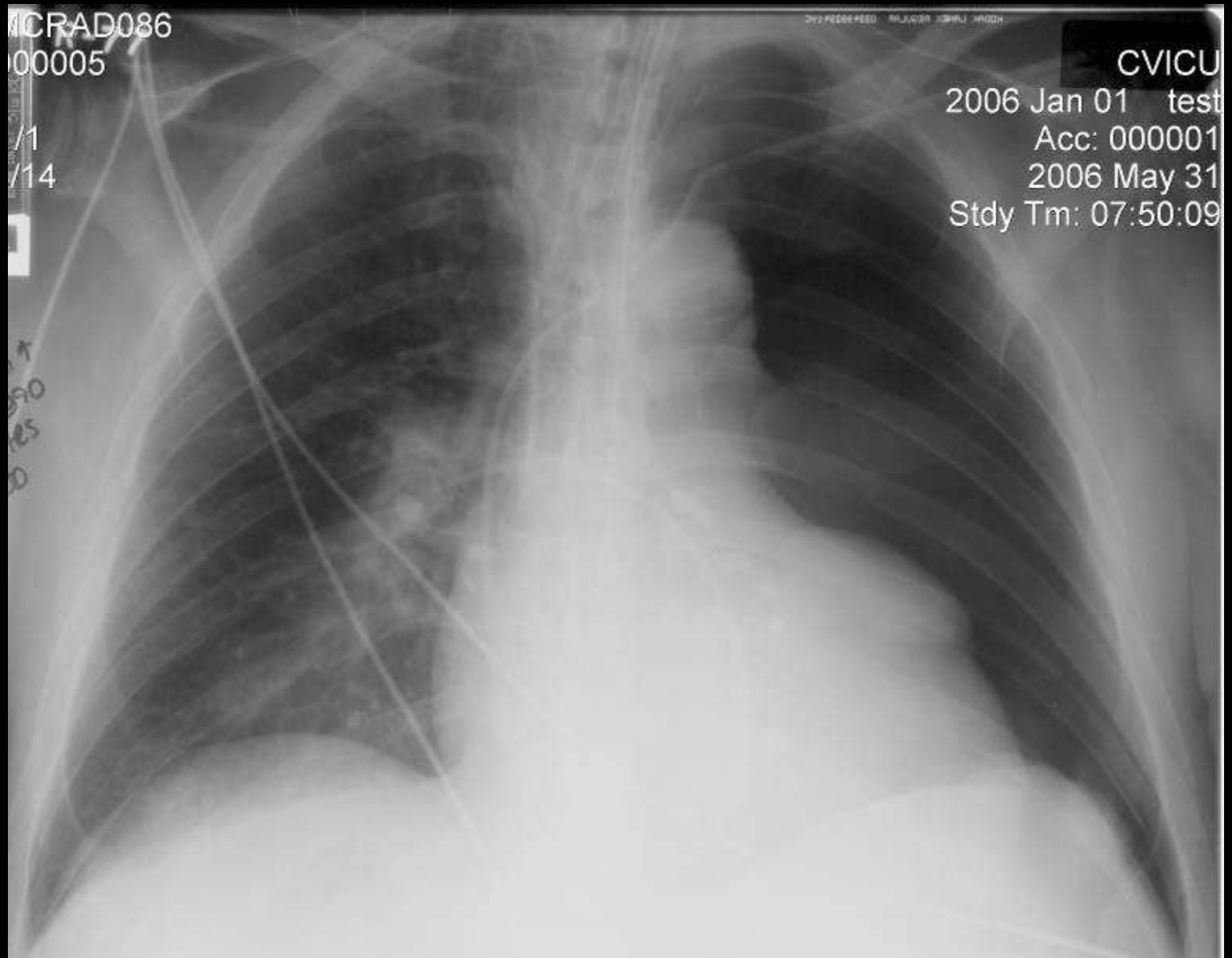
CVICU

2006 Jan 01 test

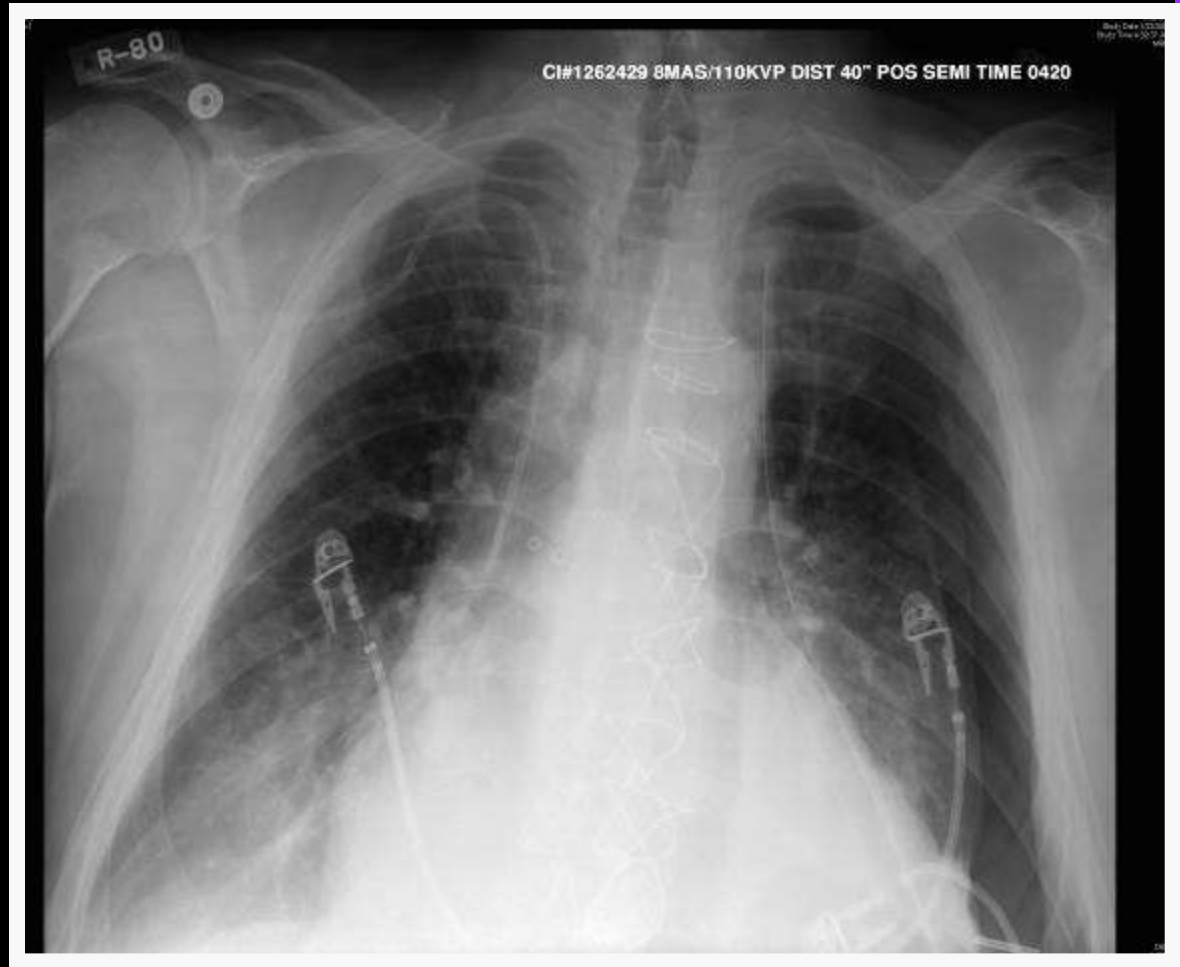
Acc: 000001

2006 May 31

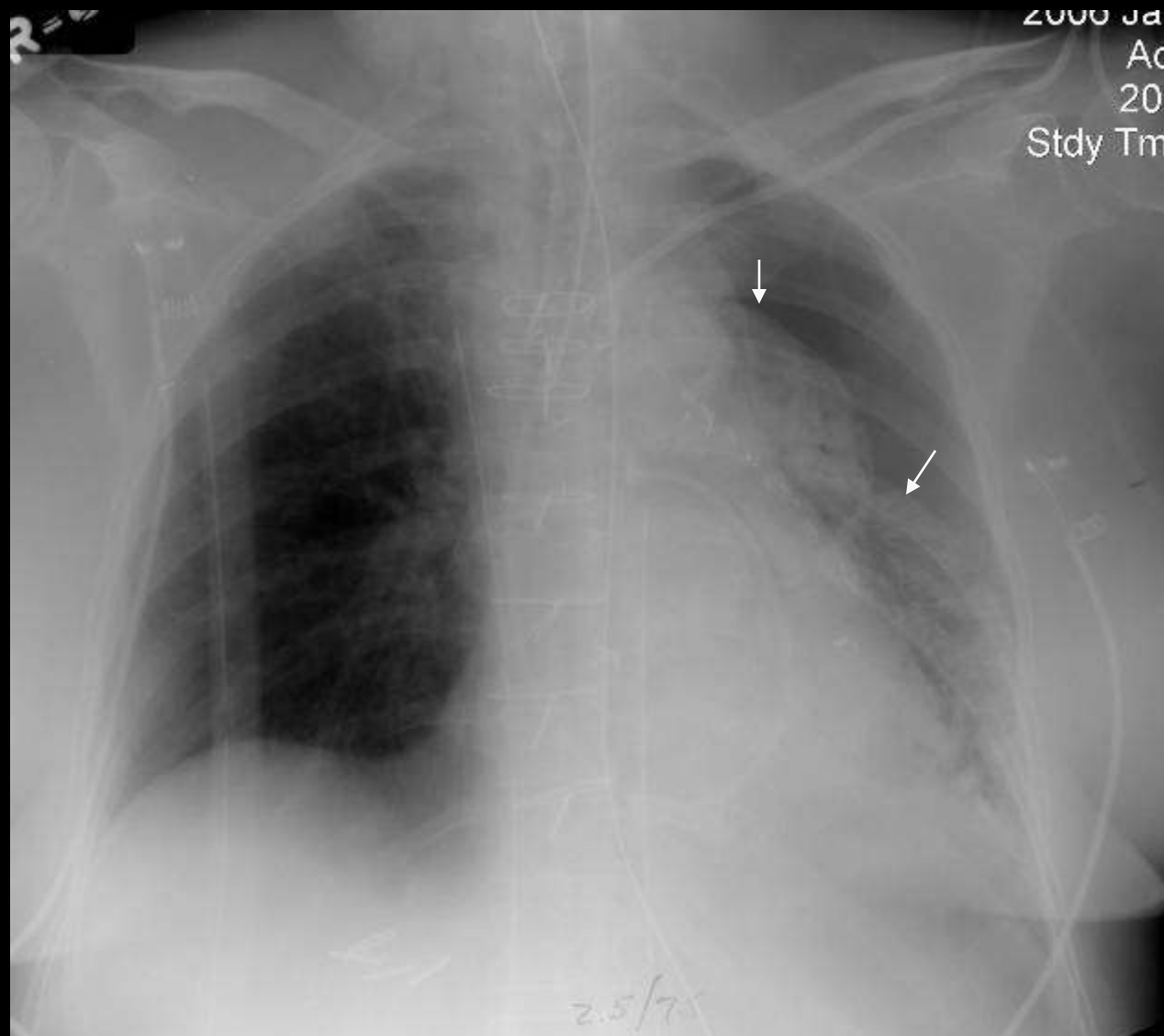
Stdy Tm: 07:50:09

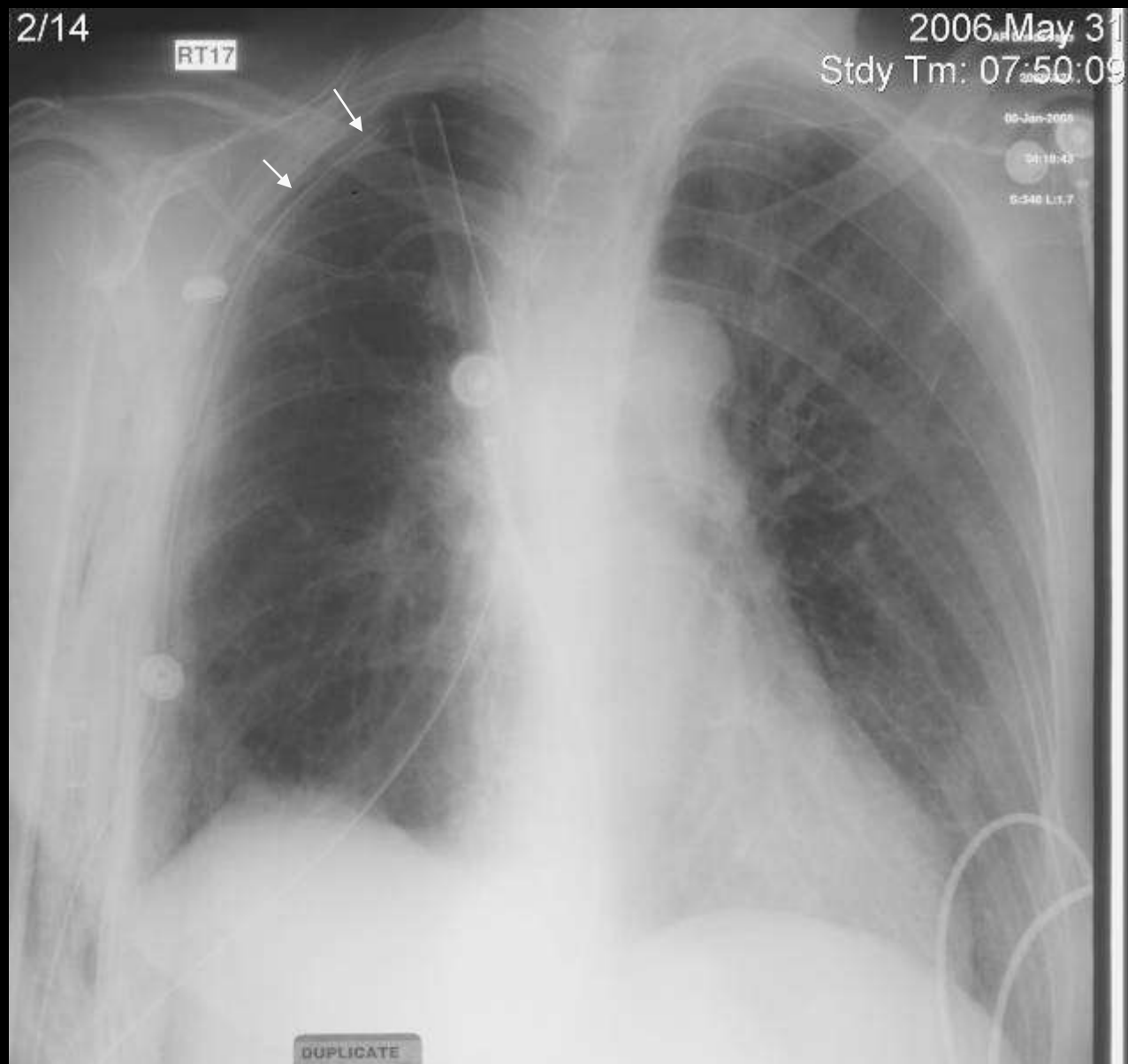


- Patient became severely dyspnic after CXR.
- CT was accidentally disconnected from bottle during CXR.

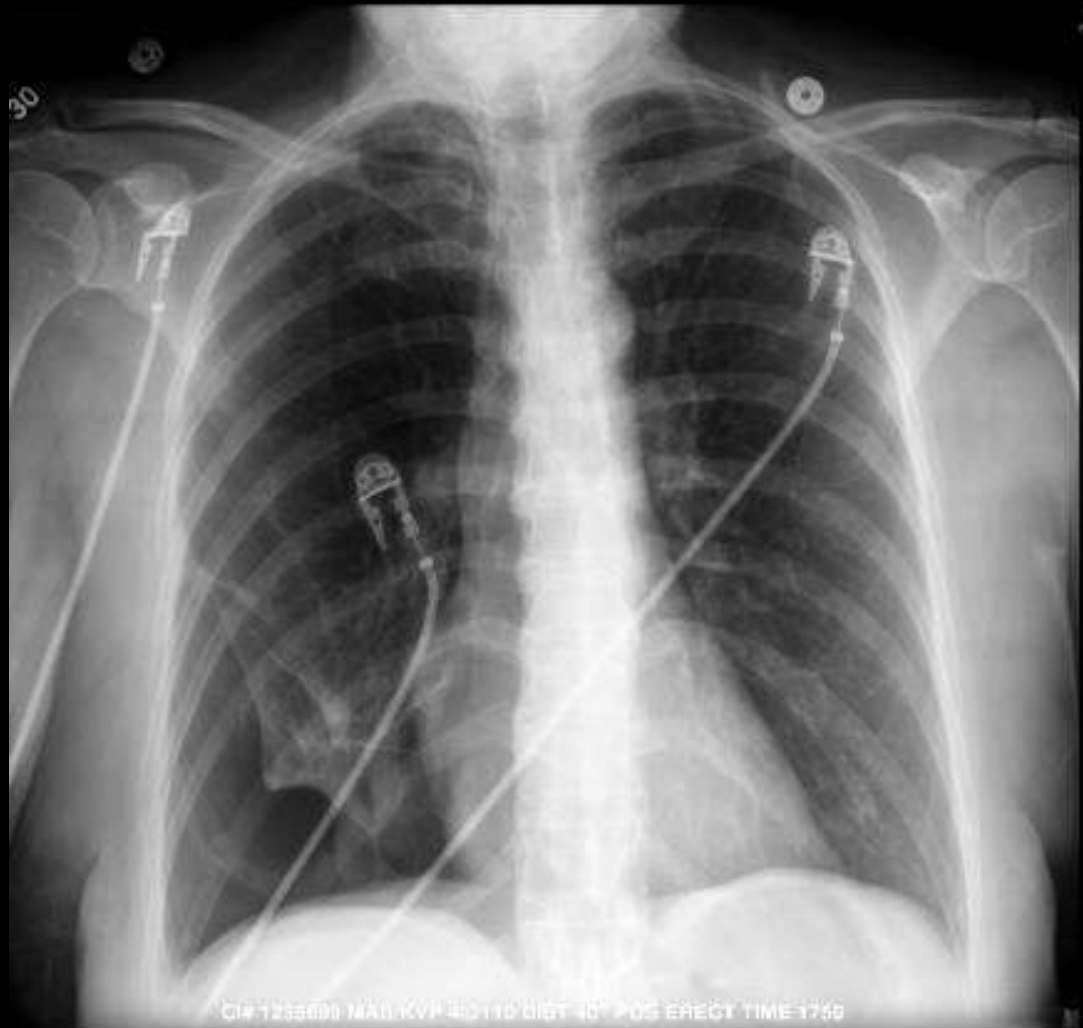


- Post upper lobectomy





- Loculated right pneumothorax 30%
- Needs decortication



Application Time



CRAD086
000005

/1
/14

50
es
00

DR2 P000P000 M/LUGER 33WPU 110004

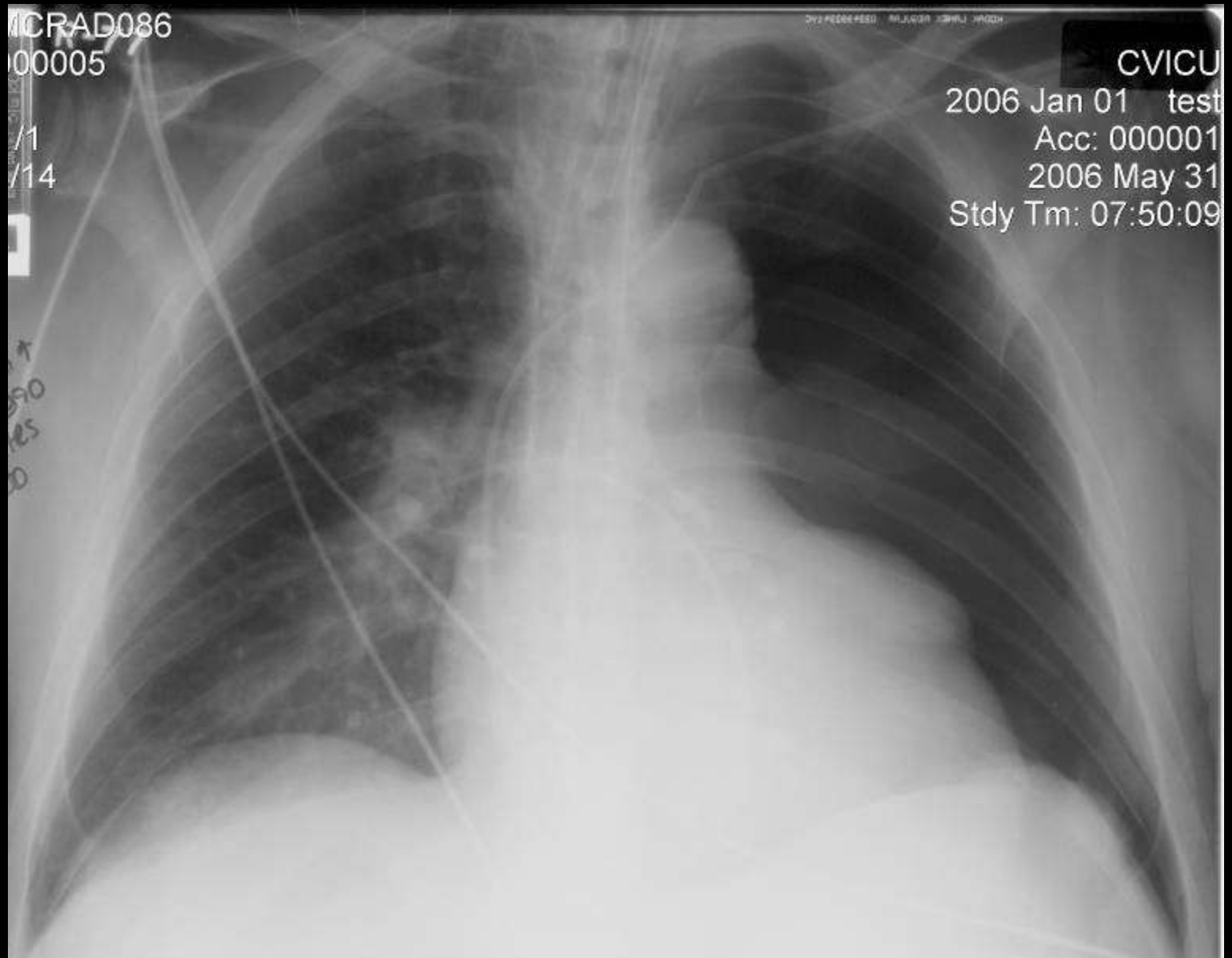
CVICU

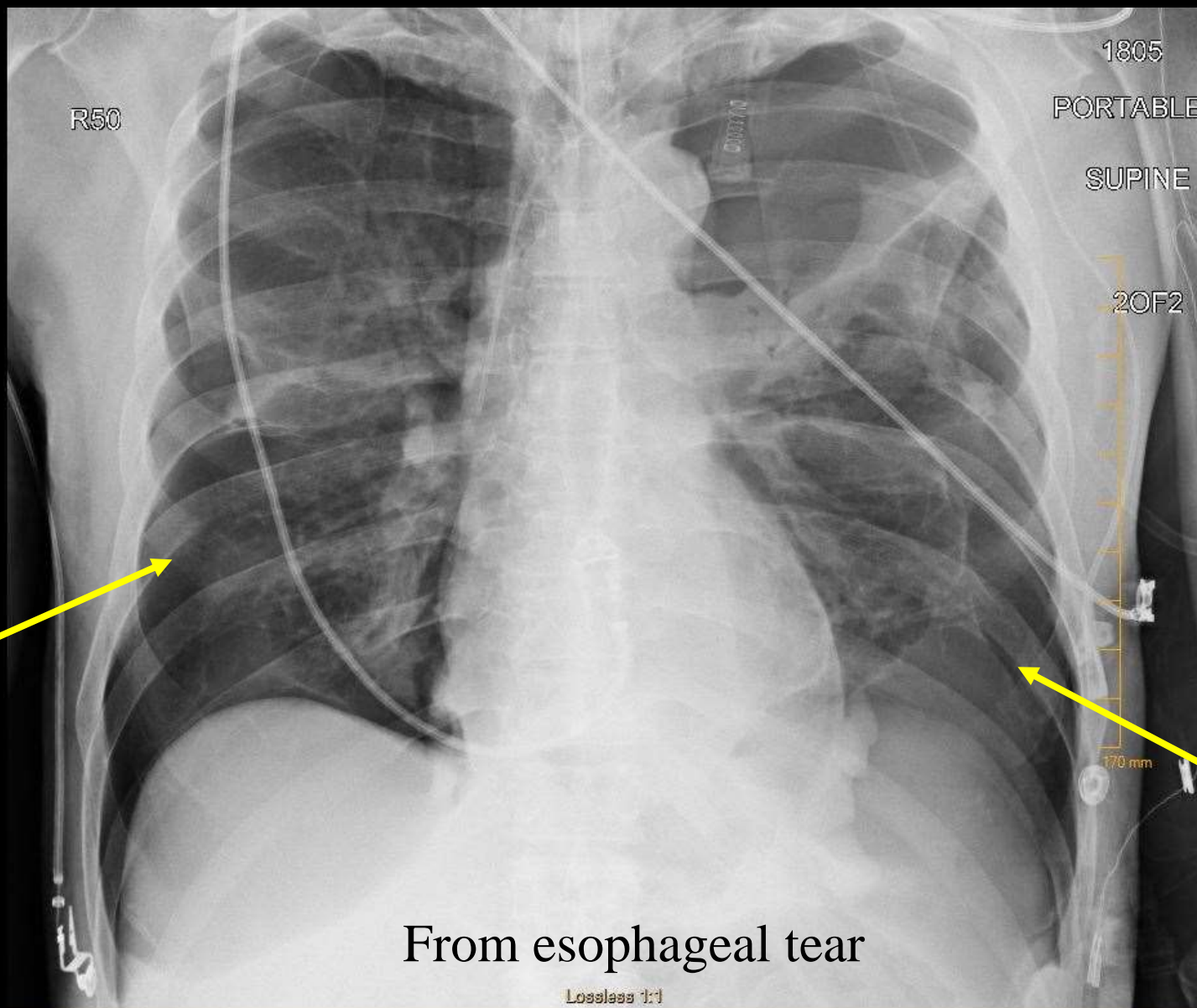
2006 Jan 01 test

Acc: 000001

2006 May 31

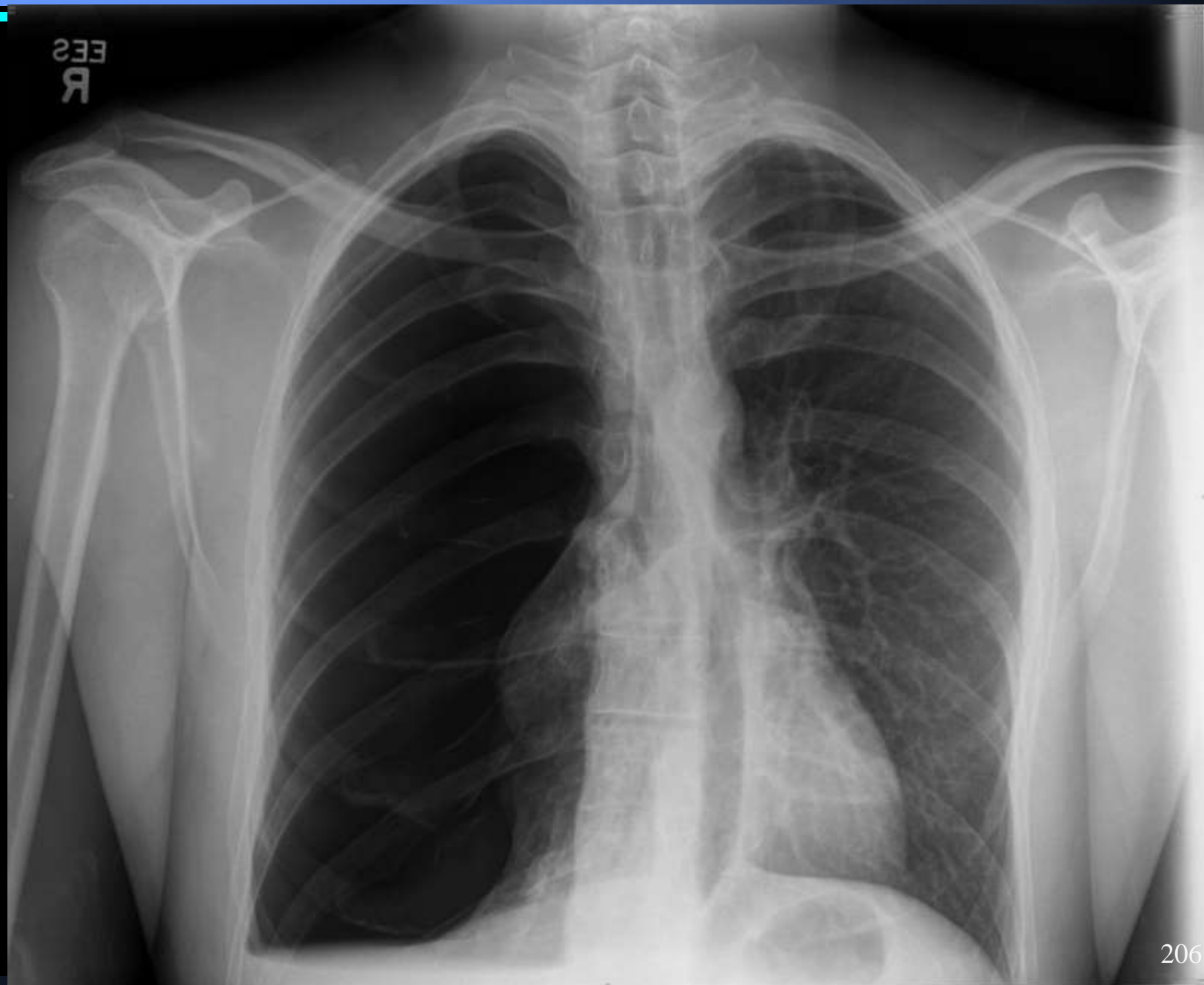
StdY Tm: 07:50:09





From esophageal tear

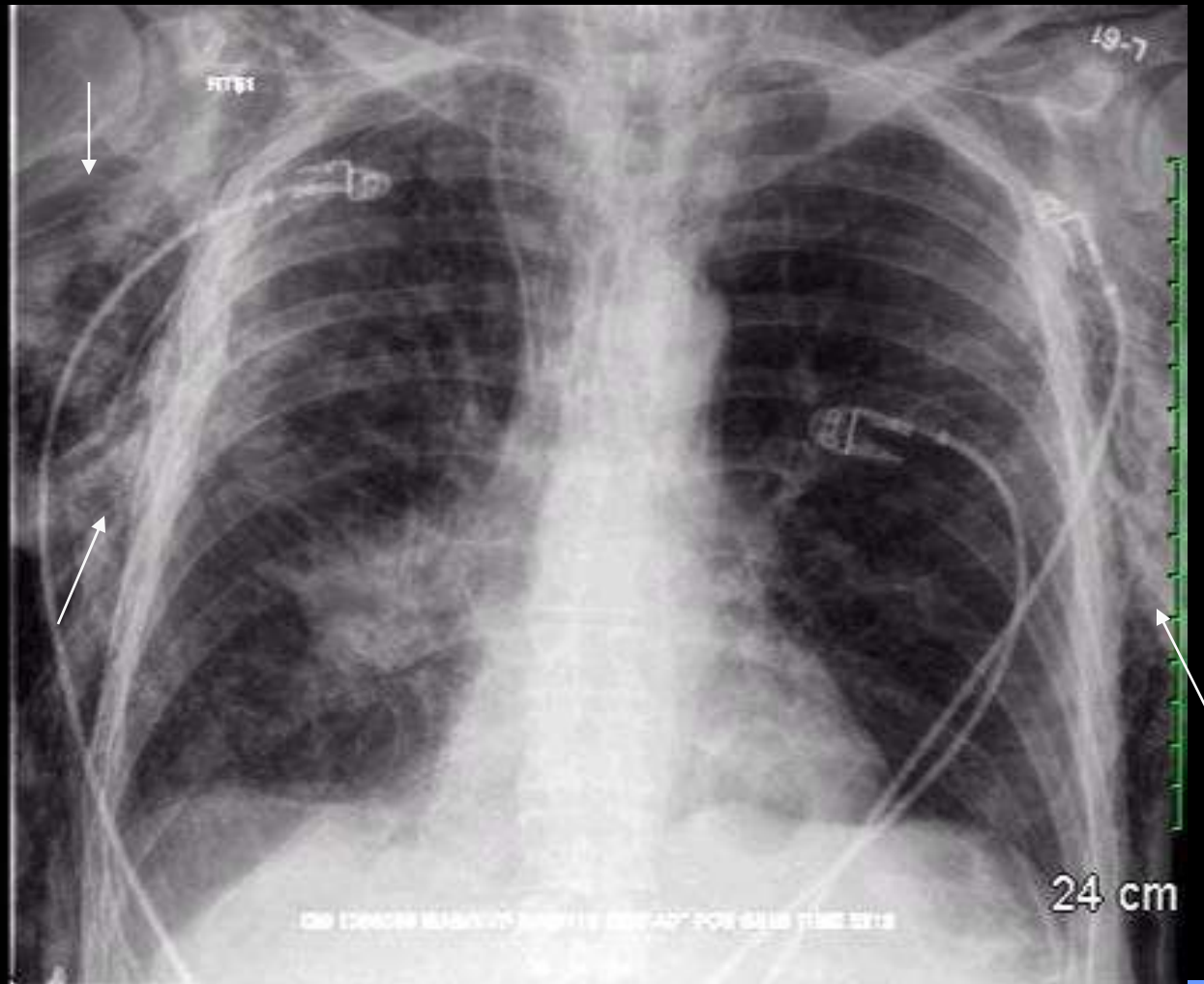
Lossless 1:1





Subcutaneous Emphysema

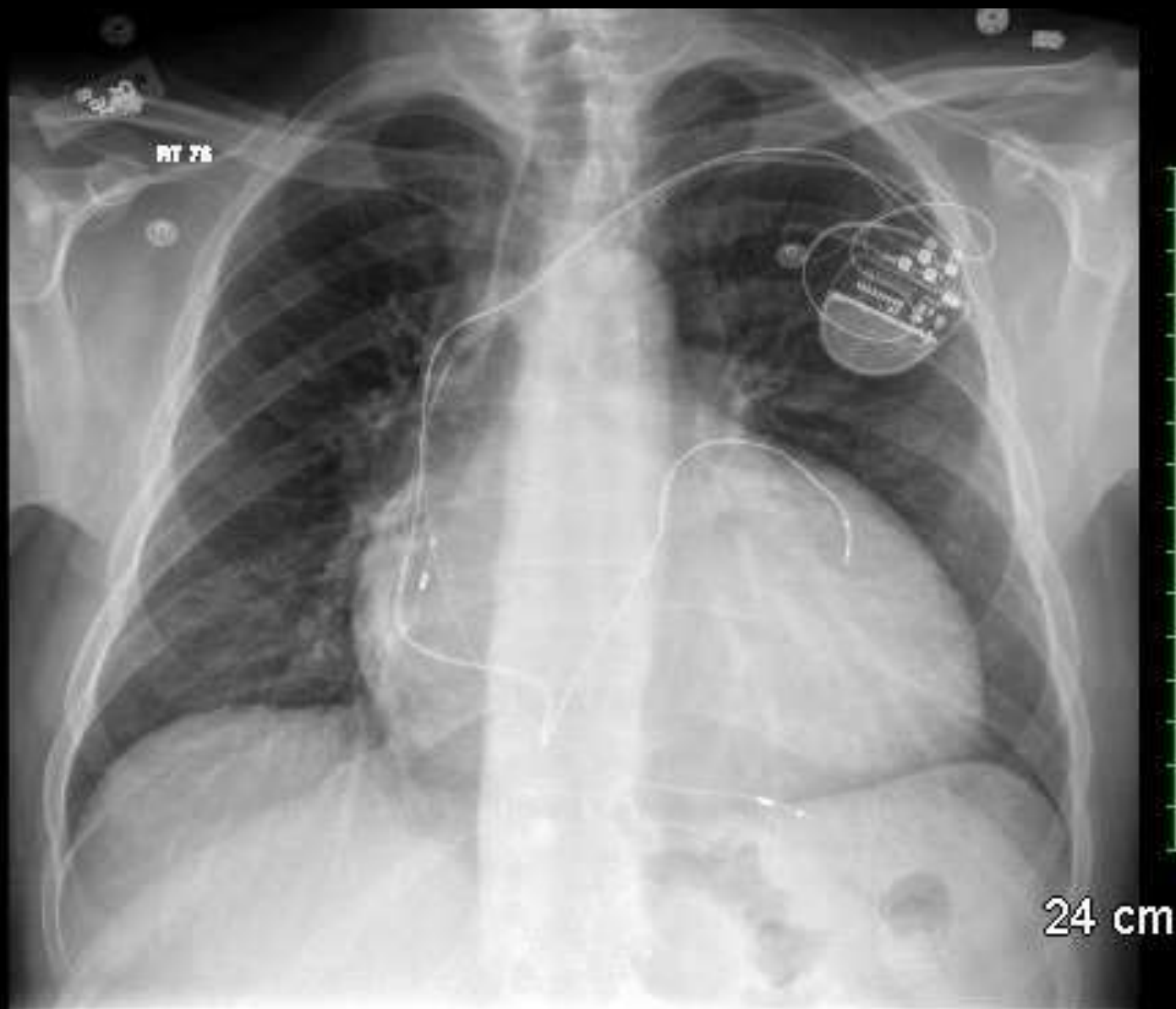
- Air in tissues
- Appears black in areas that should be white, especially in skin

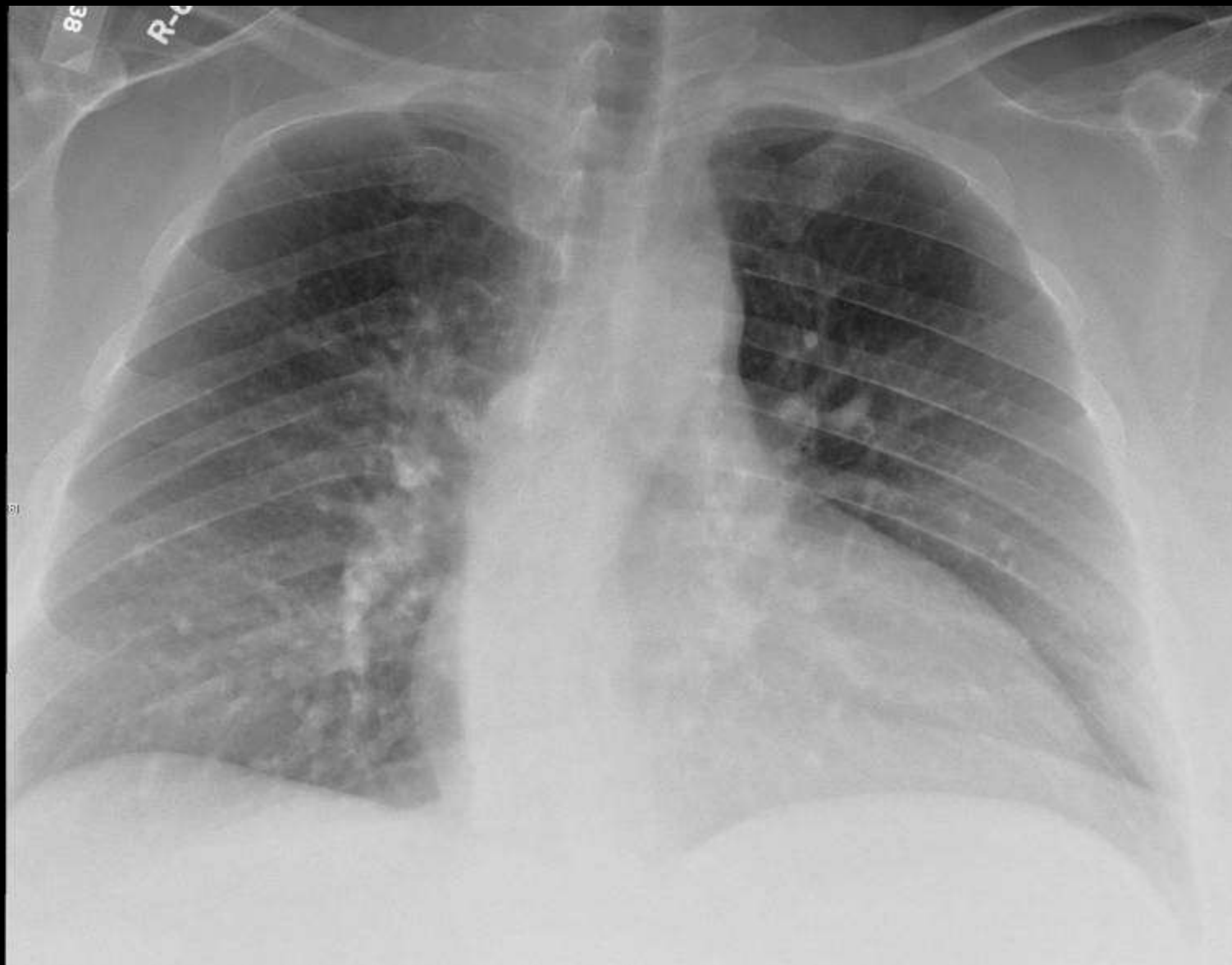


Pneumothorax after Pacemaker SQ Emphysema

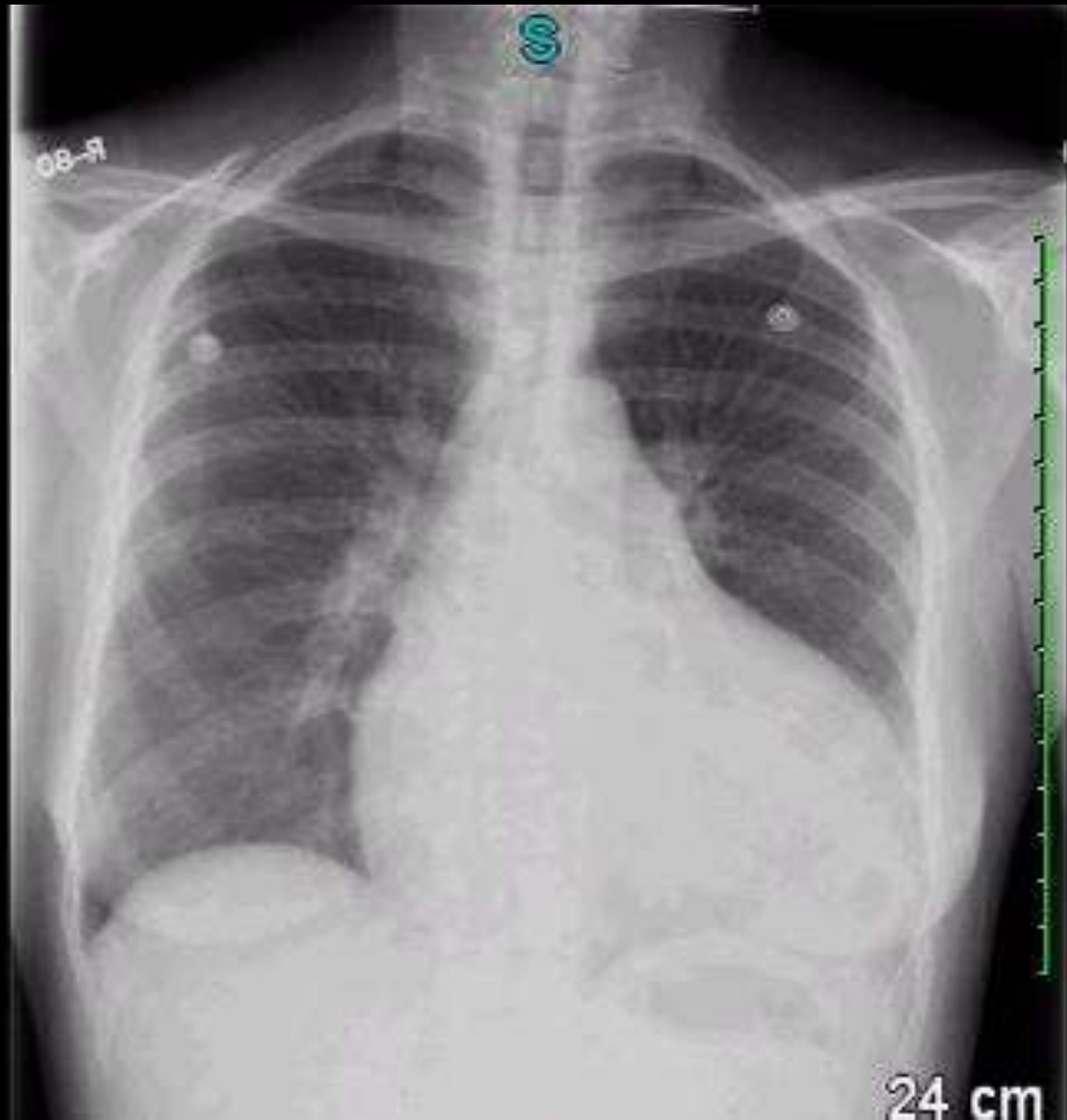


Cardiomyopathy & Pericardial Effusion



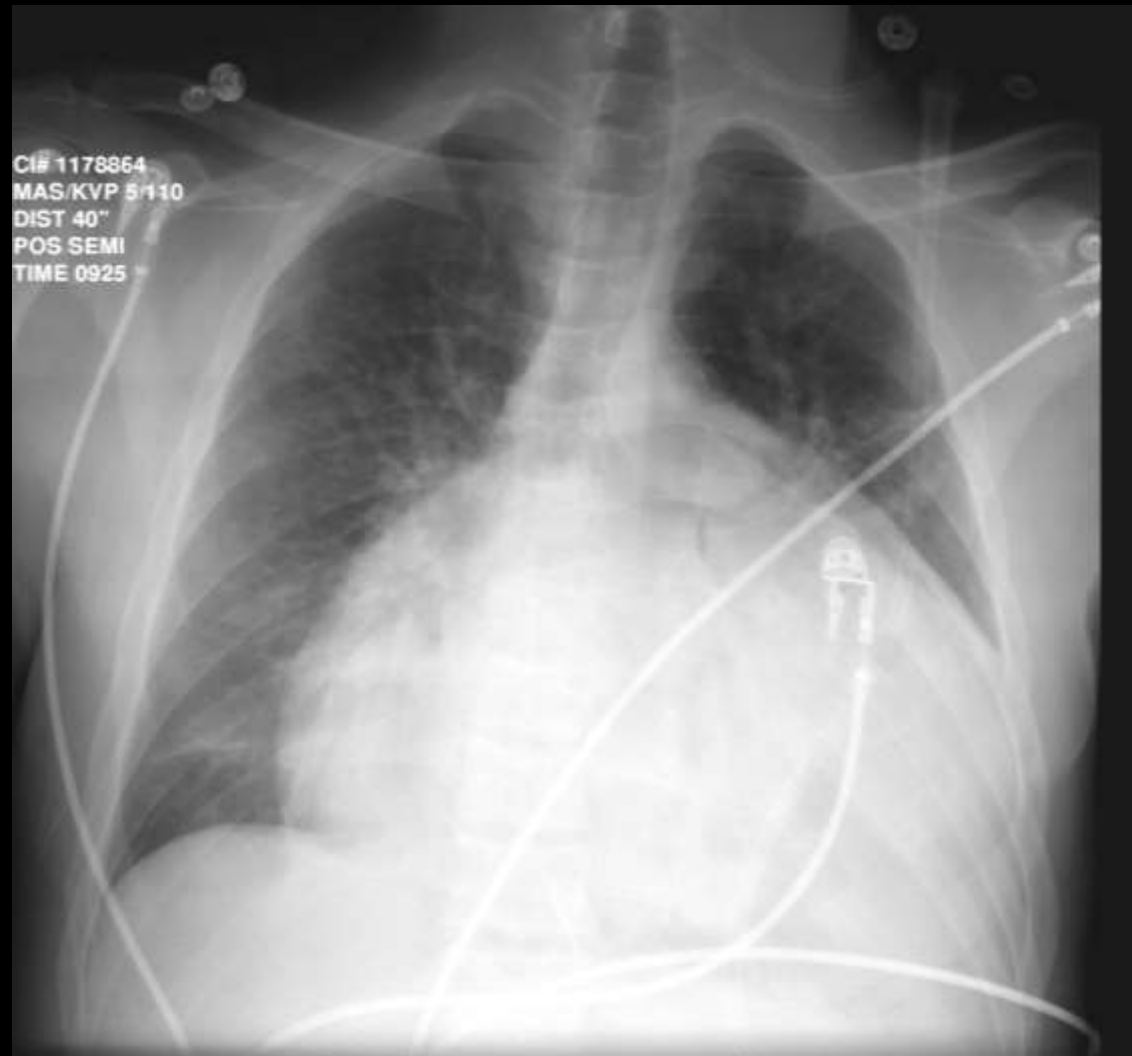


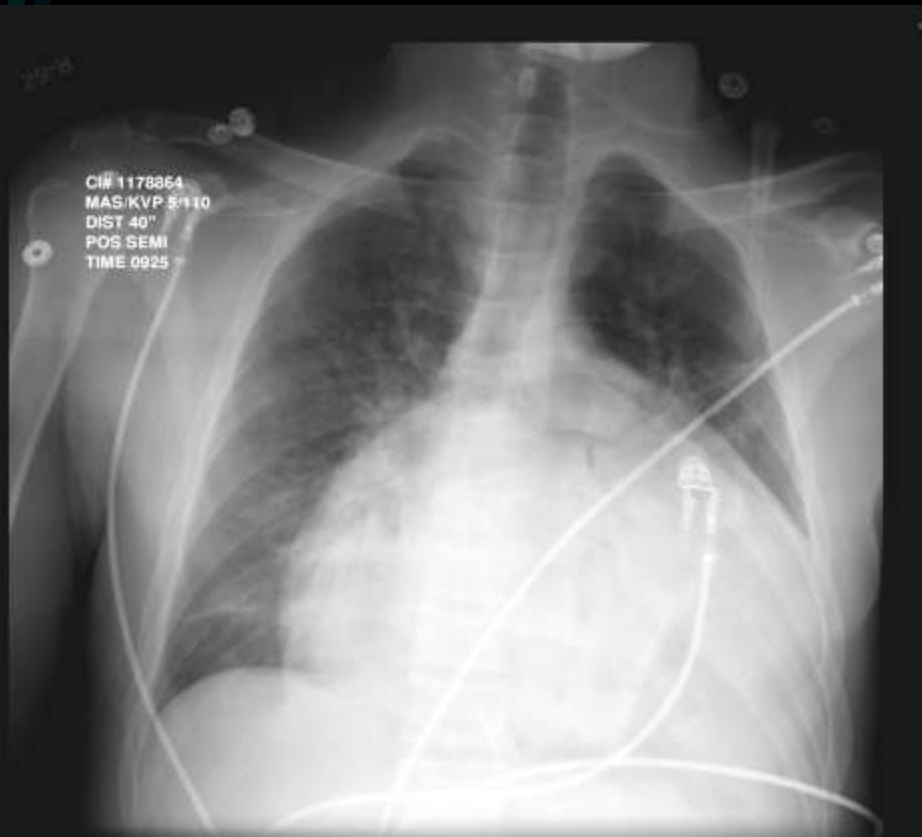
- EF 10%



Pericardial Effusion

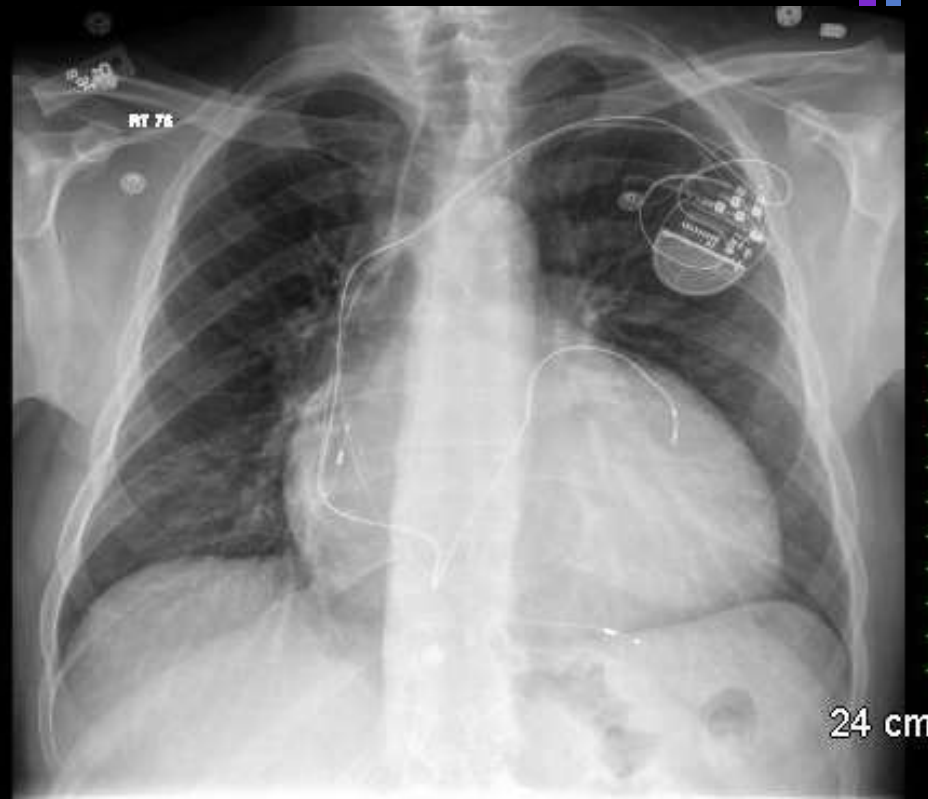
- 1600 ml fluid drained from the pericardium
- Fluid causes loss of pulmonary hiatus (vasculature)



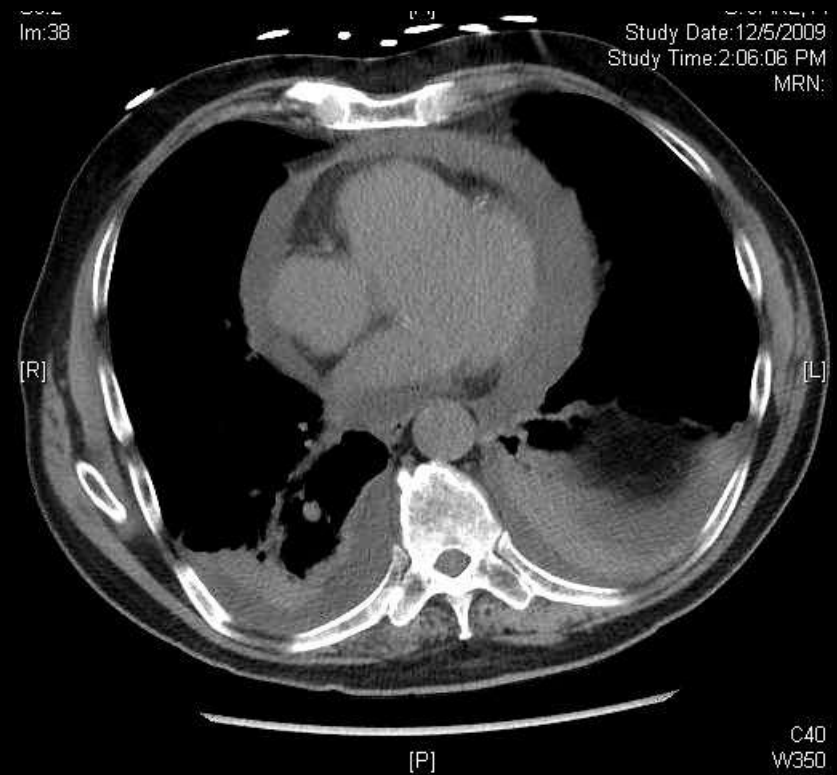
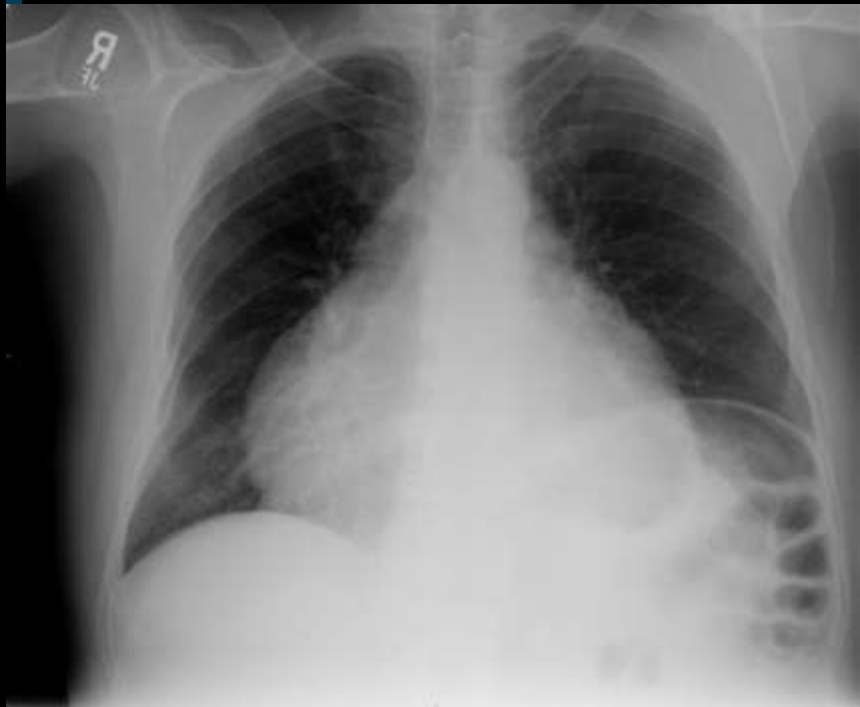


- Pericardial Effusion
- Water bottle
- (Above)

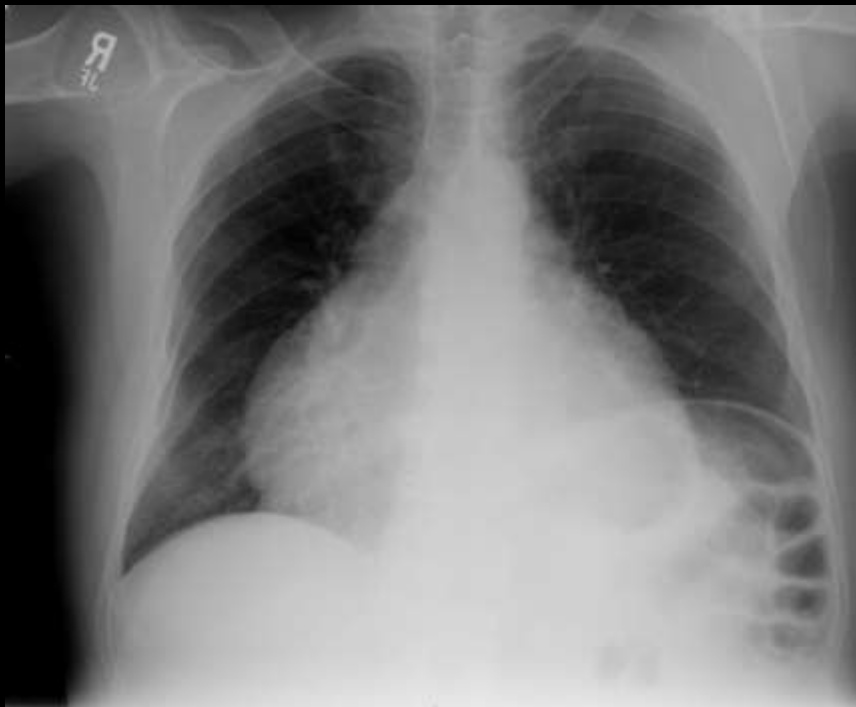
- Cardiomyopathy --- will see the pulmonary hiatus (vasculature)



Pericardial Effusion



Pericardial Effusion



Post pericardial window for pericardial effusion

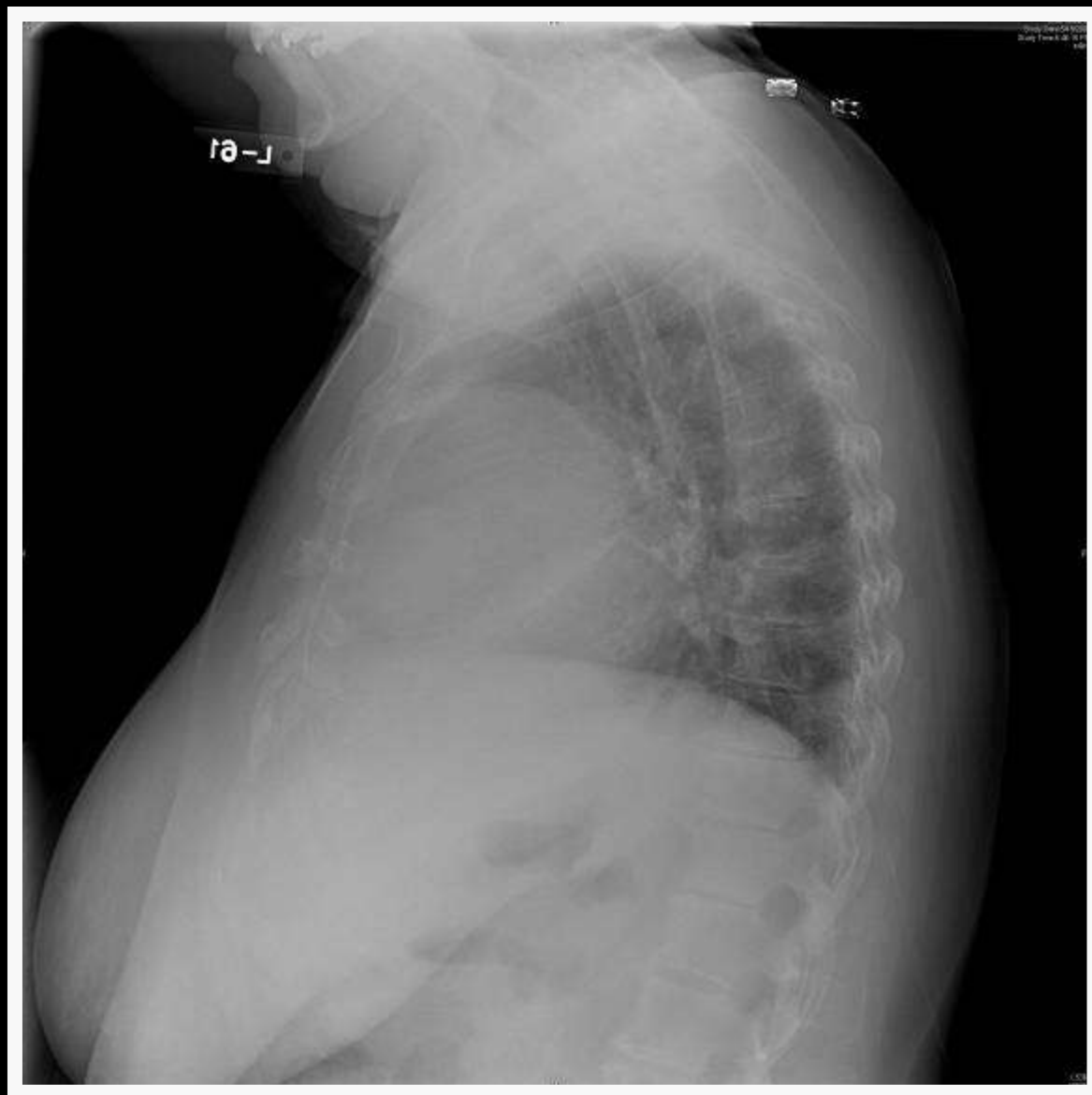


Lung Tumor

Is there an area too white?



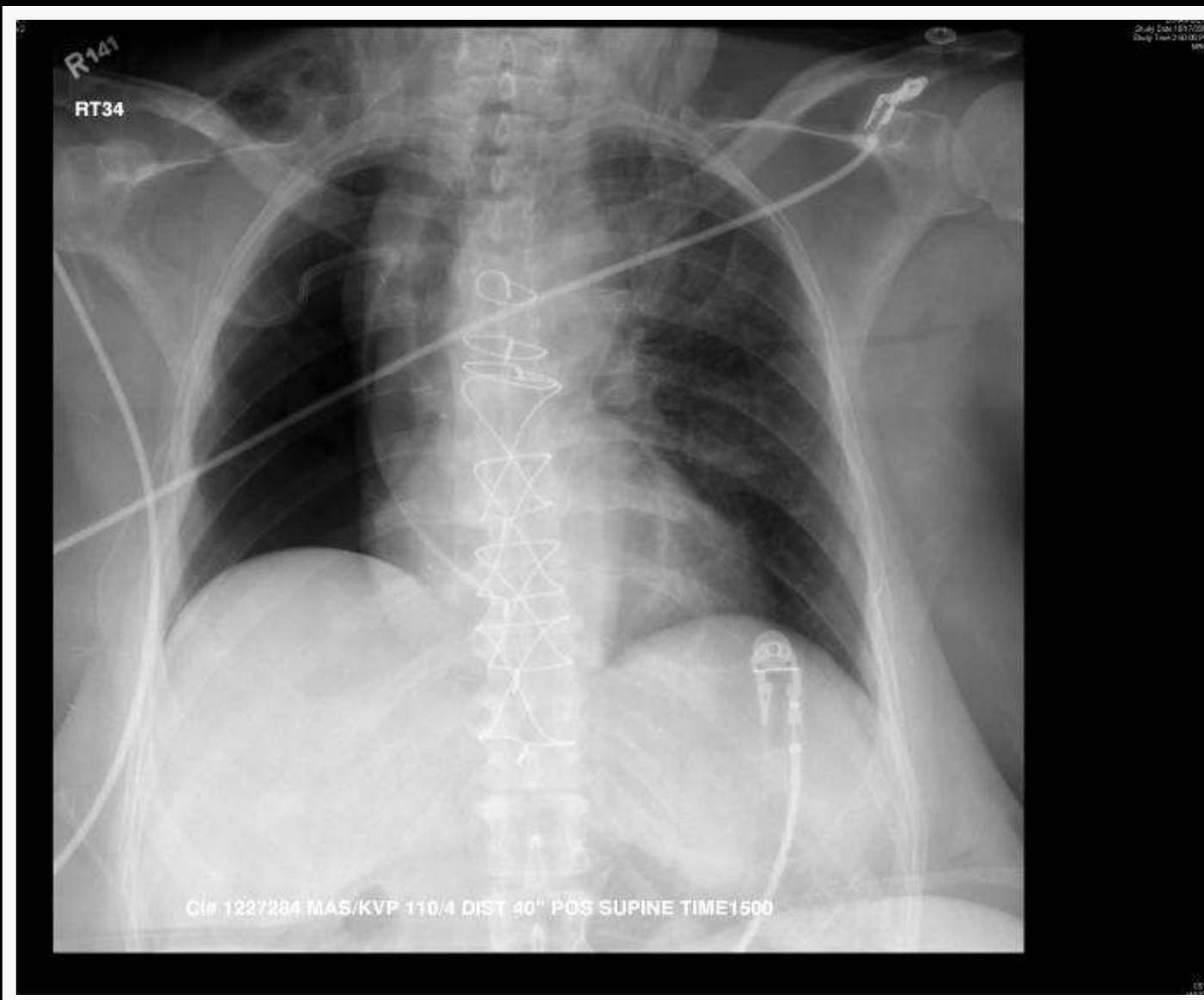
MD 5-18 lung tumor



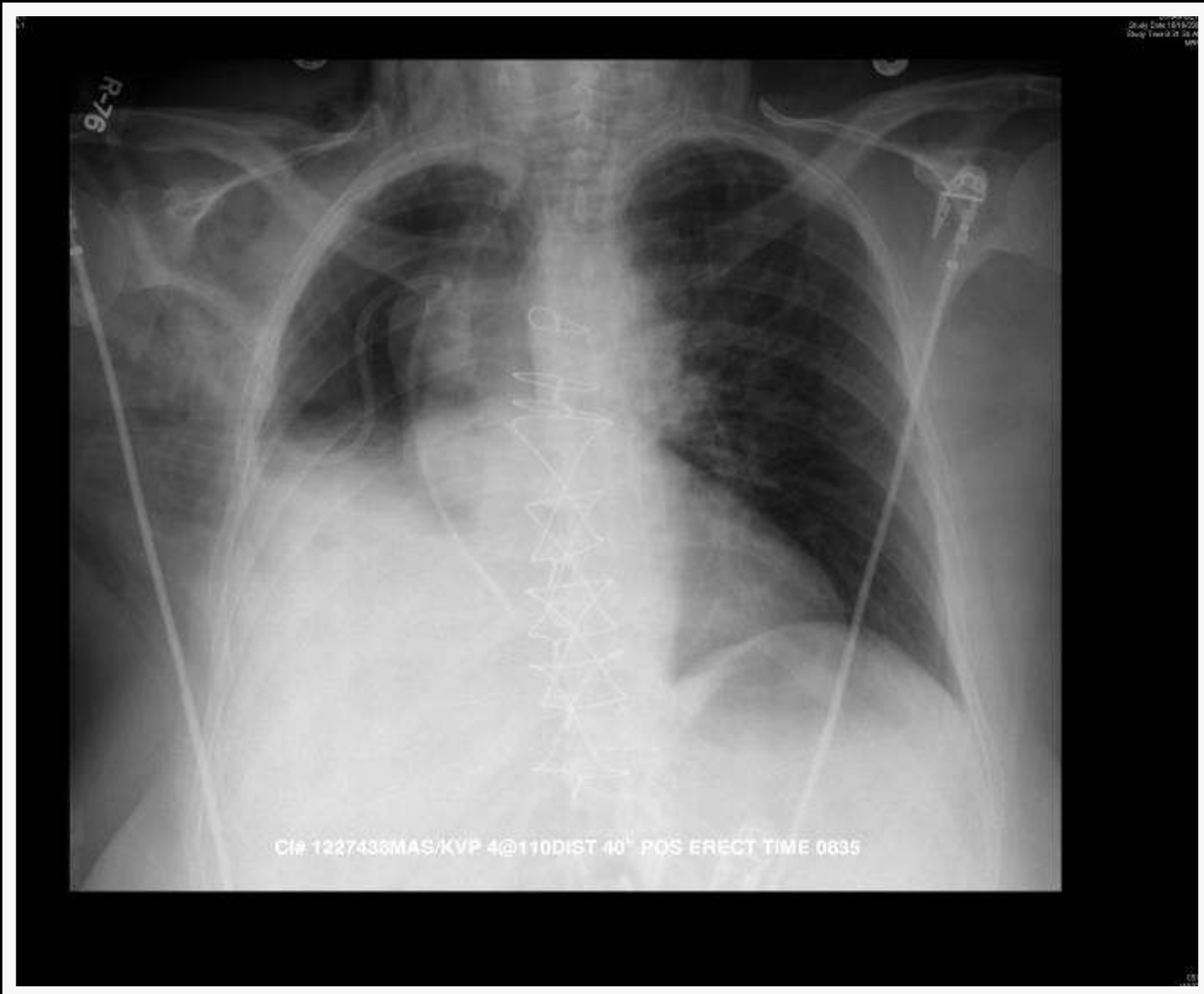
MD 5-18 lateral lung tumor



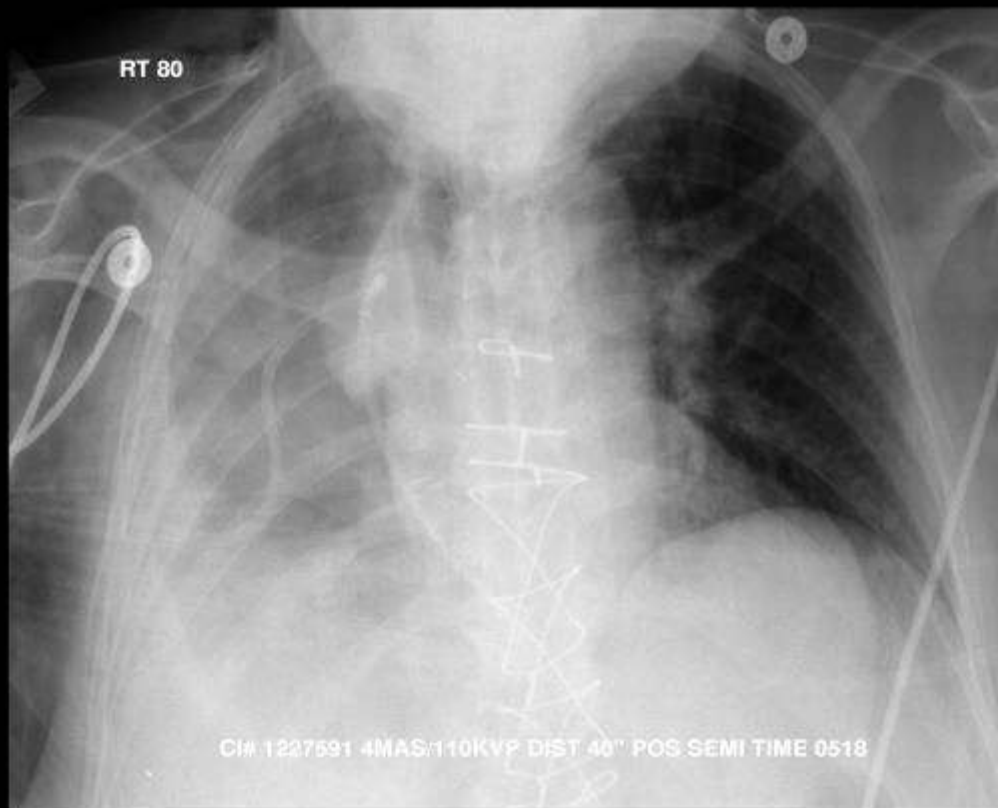
MD 10-9 lung tumor smaller post radiation



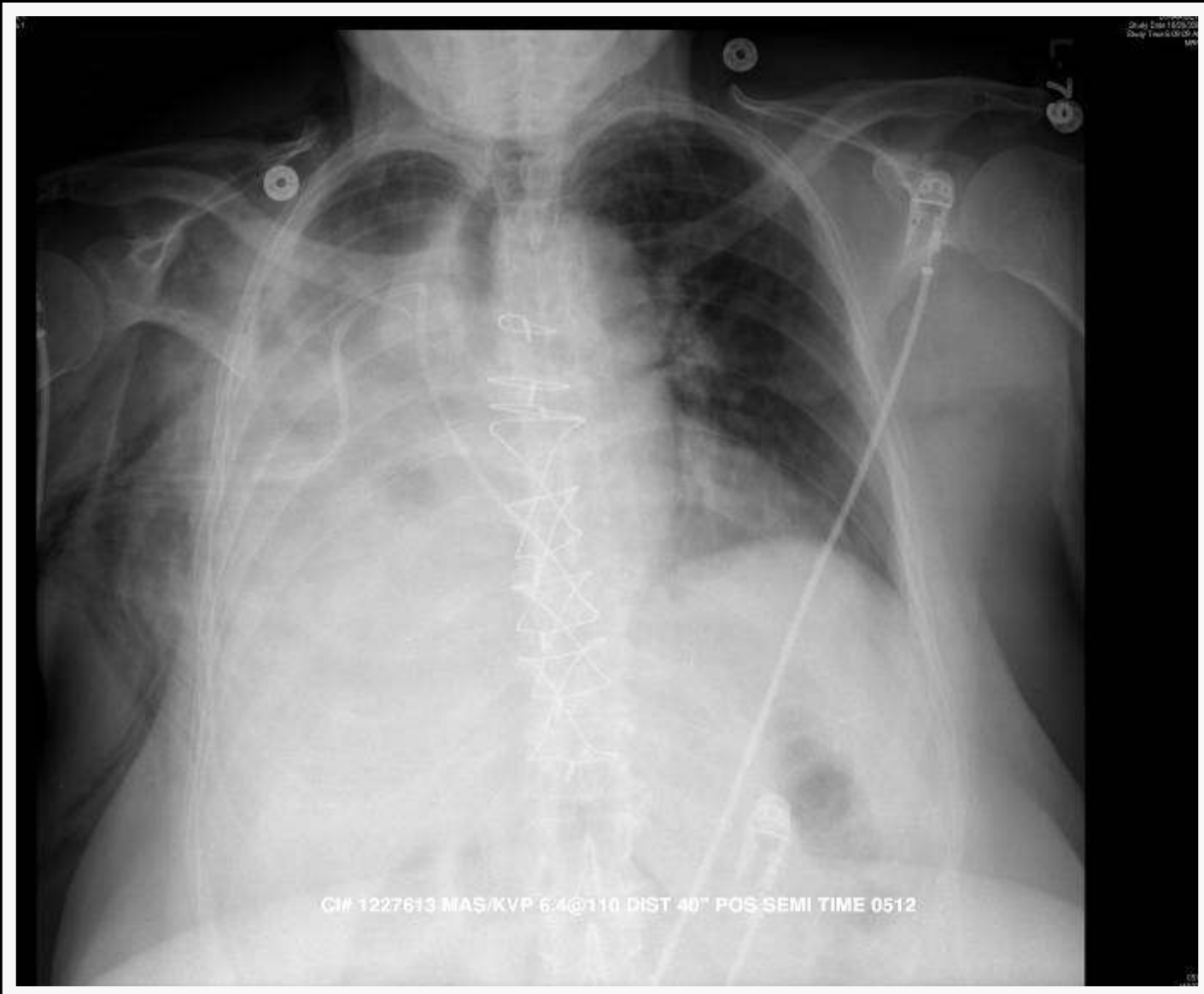
MD 10-17 DOS post op pneumonectomy



MD 10-18 POD 1 post op pneumonectomy



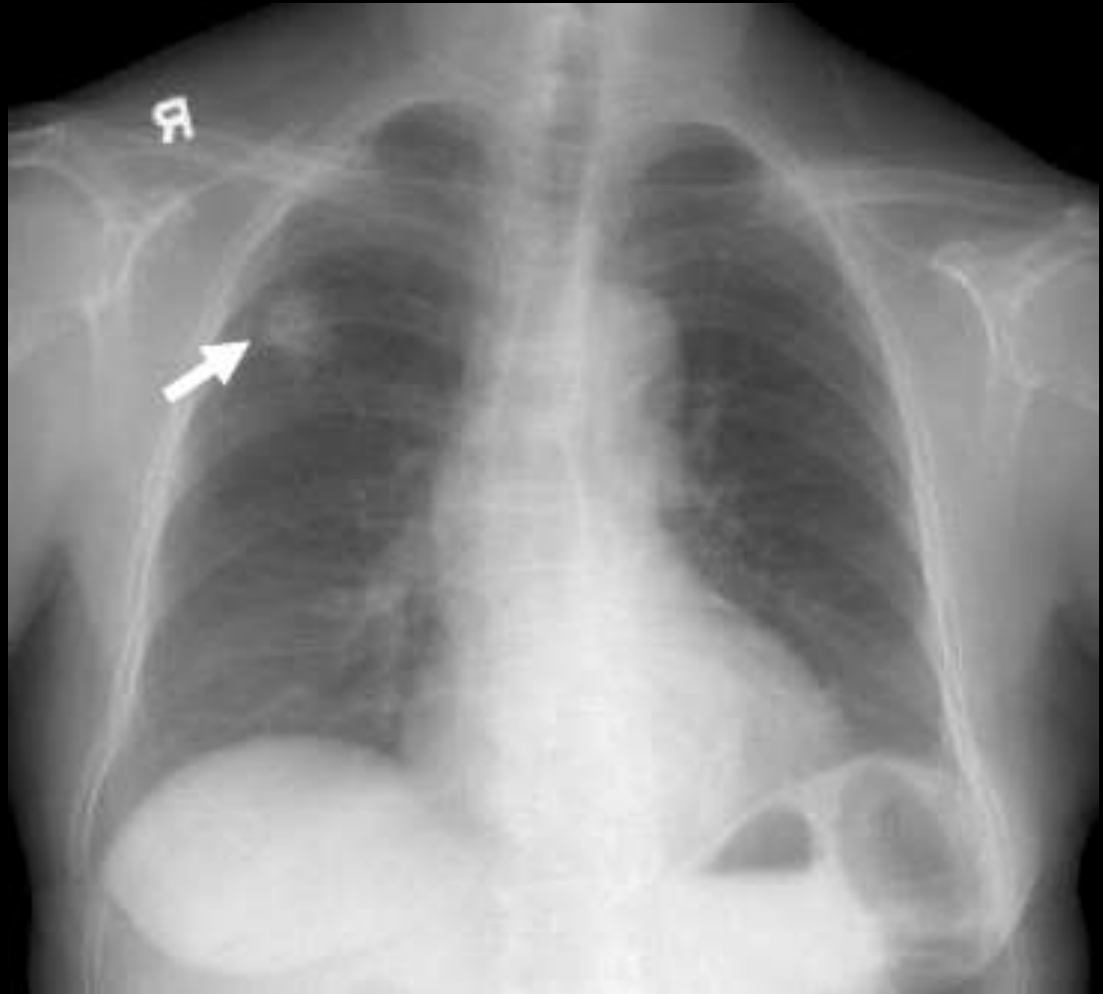
MD 10-19 POD 2 post op pneumonectomy



MD 10-20 POD 3 post op pneumonectomy

Lung Tumor

Is there an
area too white?

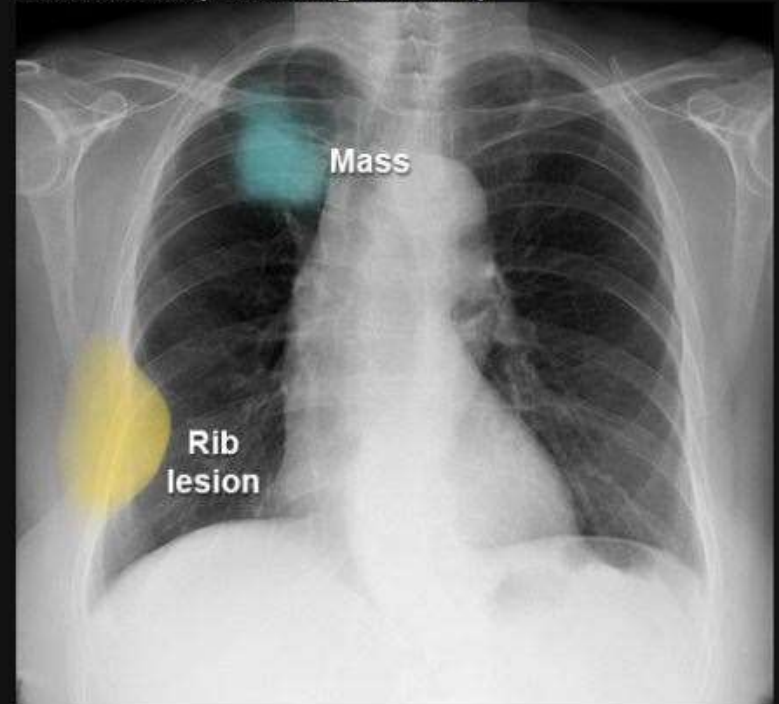


Lung Cancer with Metastasis to Ribs

Metastases (from lung to bone)

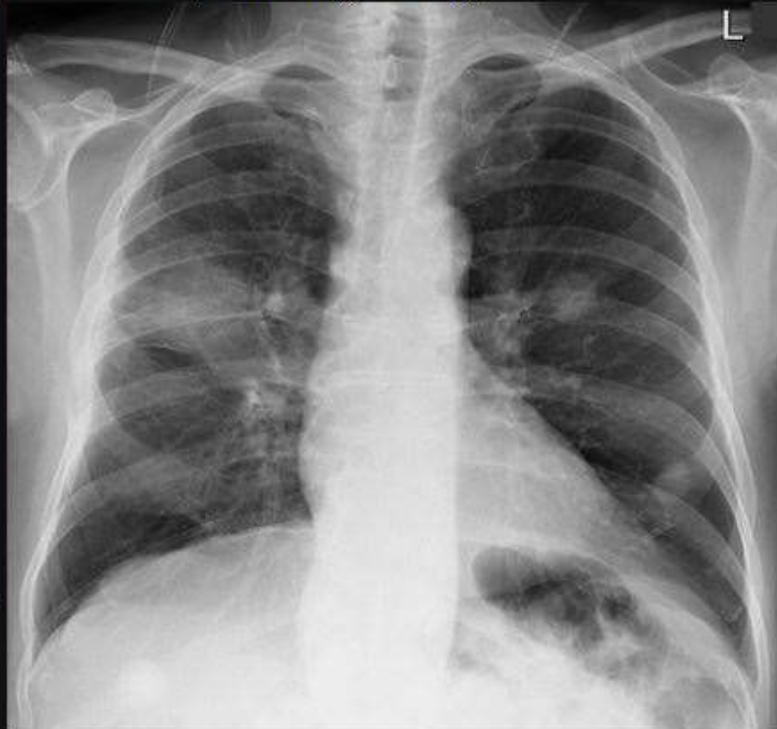


Metastases (from lung to bone)

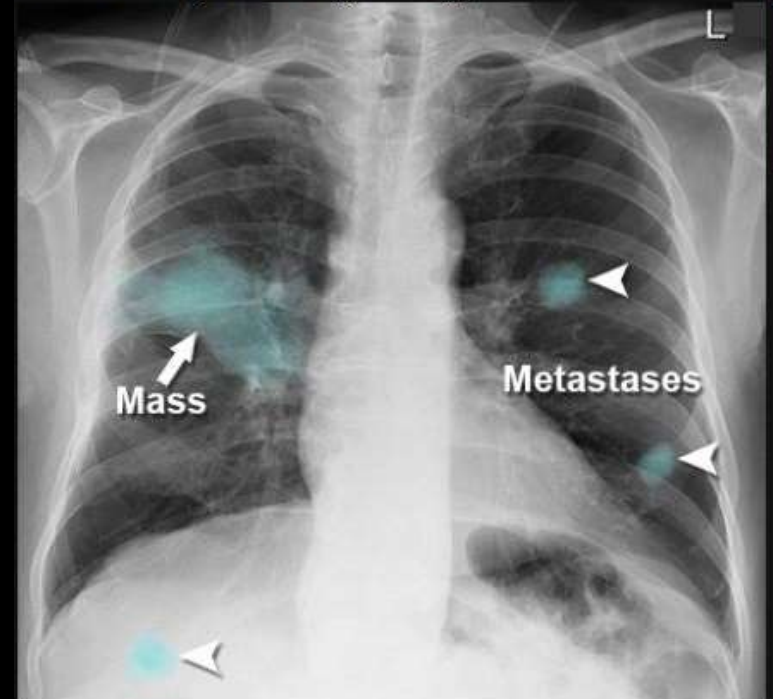


Primary Lung Tumor with Metastasis

Metastases (from lung to lung)



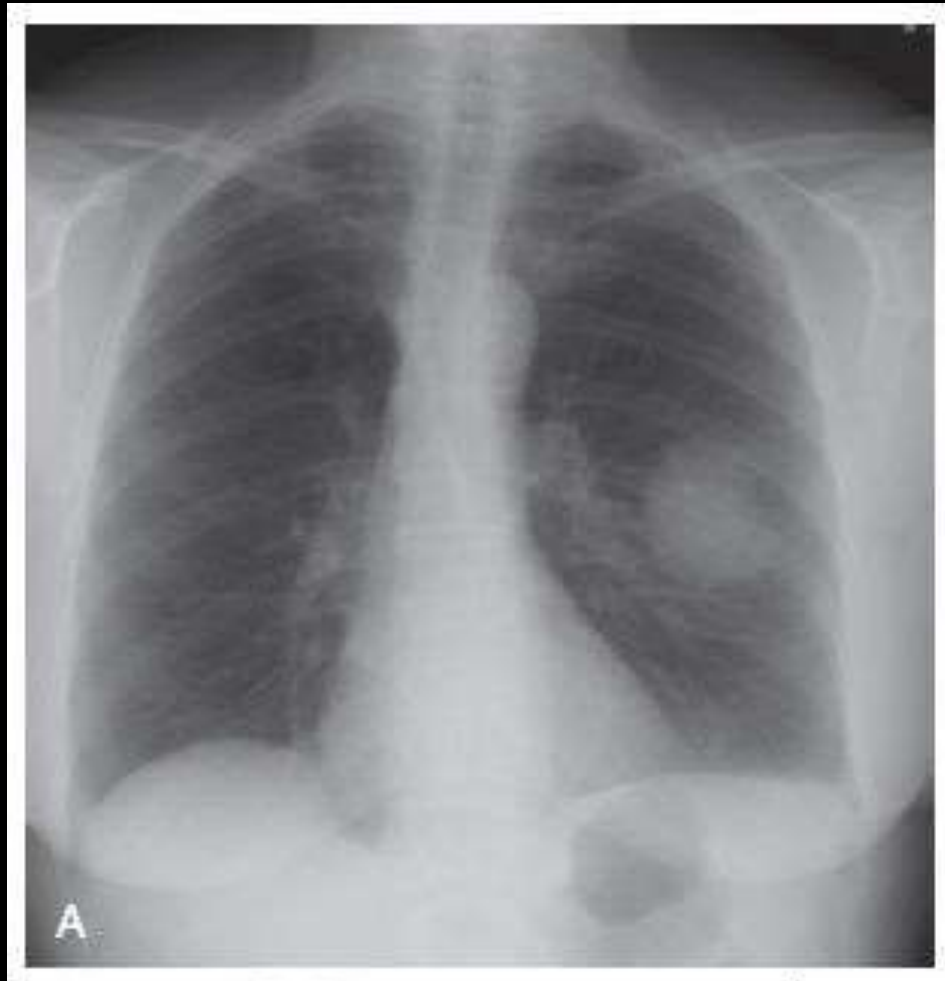
Metastases (from lung to lung)



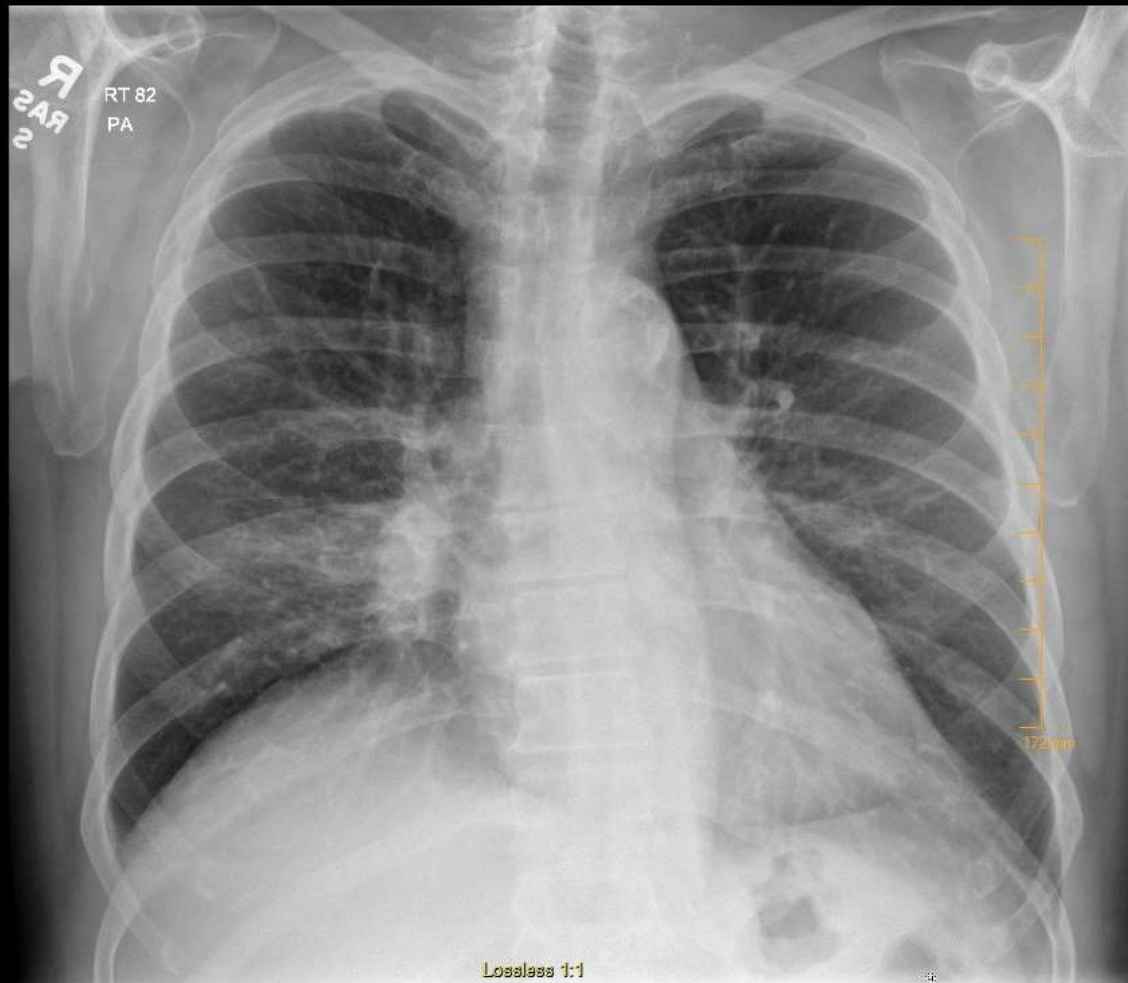
Lung Tumor



Lung tumor



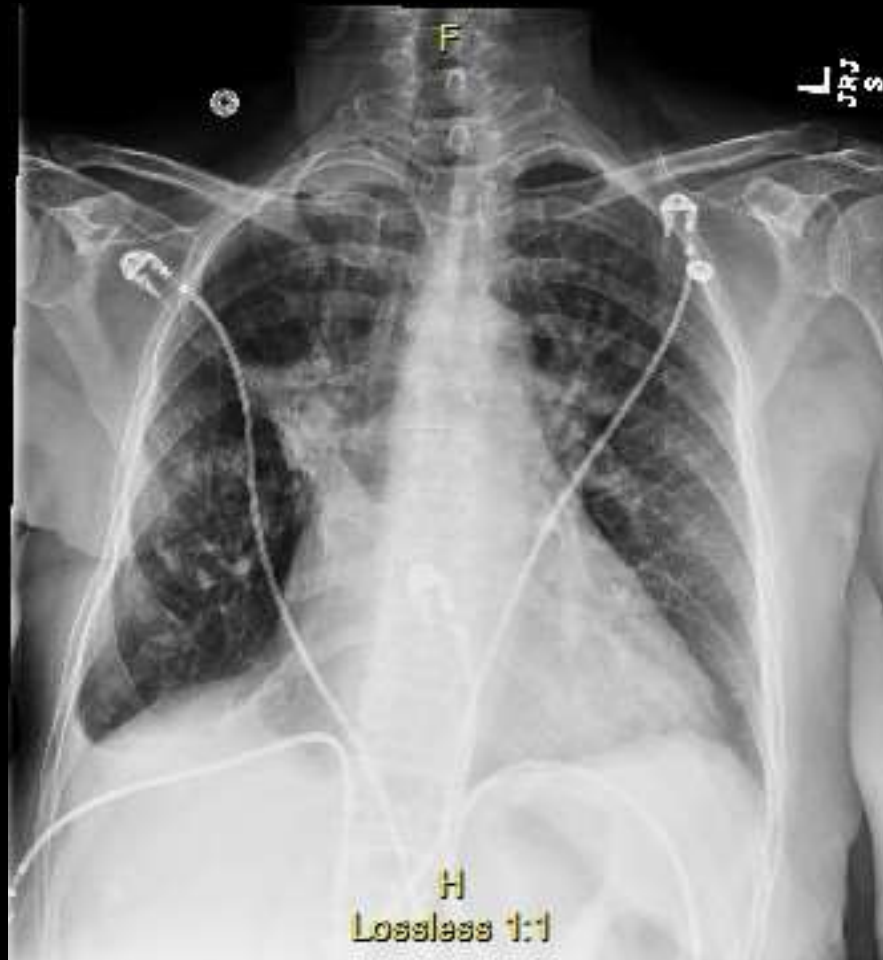
Lung Tumor Right



Lung Tumor and pleural effusion

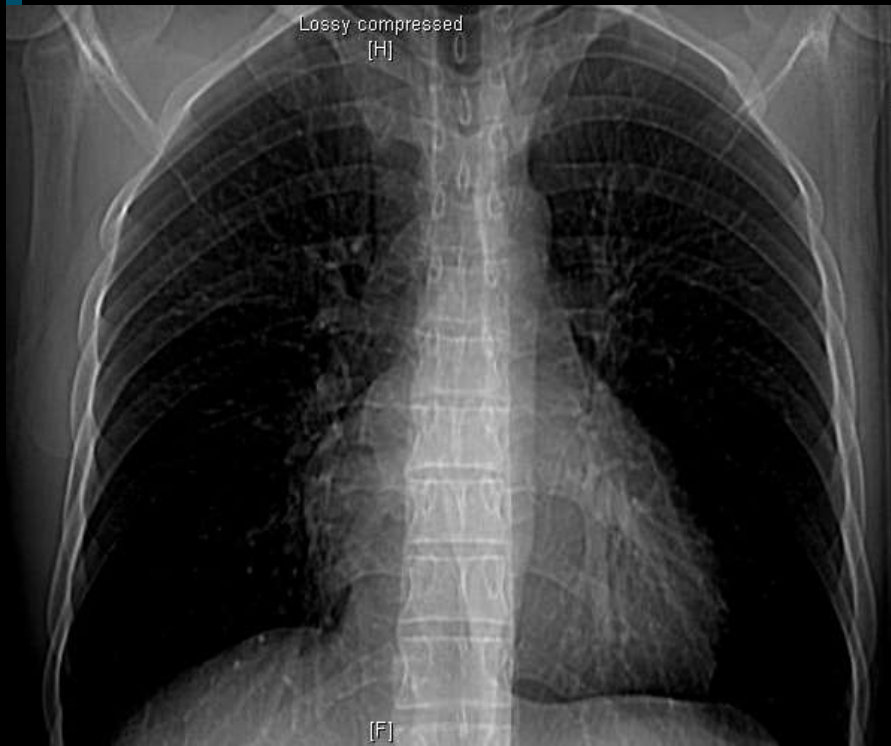


Lung tumor.... After 1900 ml removed



Ewing Sarcoma Stage 4 with lung metastasis.

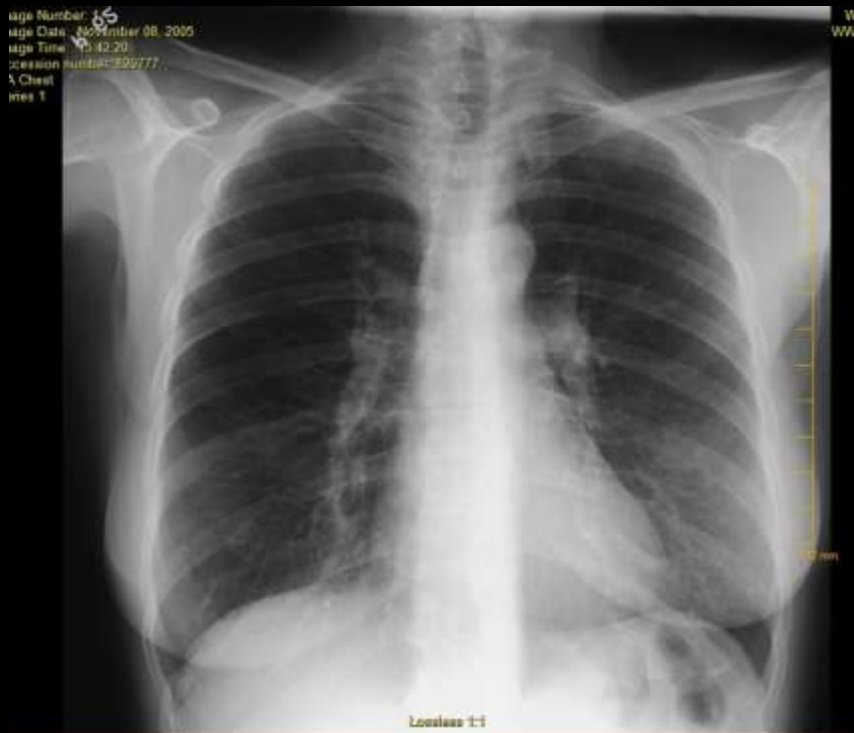
4 – 6 months earlier



Hila Case Study

CXR done for upper respiratory symptoms

Previous CXR



CXR now 12/1



12/1 Emphysematous changes are seen. Bilateral hila are prominent when compared to the previous study

Lateral view



Lateral View



Impression

1. Large number of nodules in the right lung with a few in the left lung. This is worrisome for metastatic disease.
2. Mediastinal adenopathy
3. Enlarged lymph node in the left supraclavicular space.

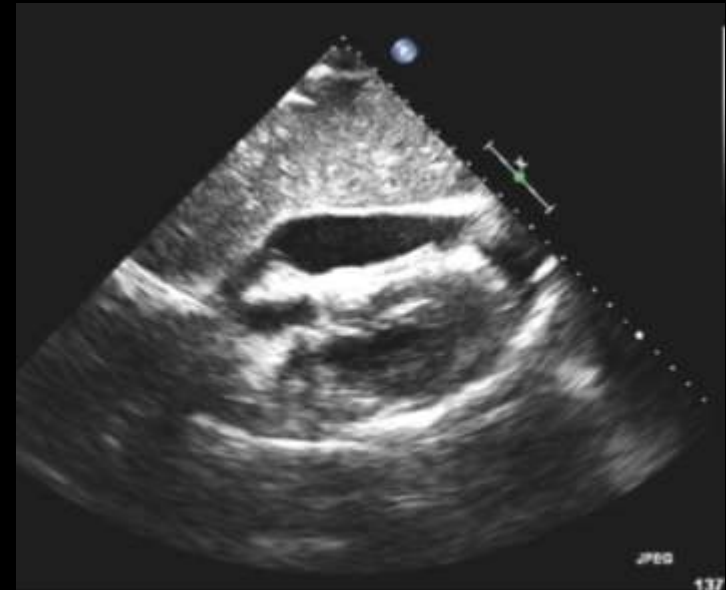
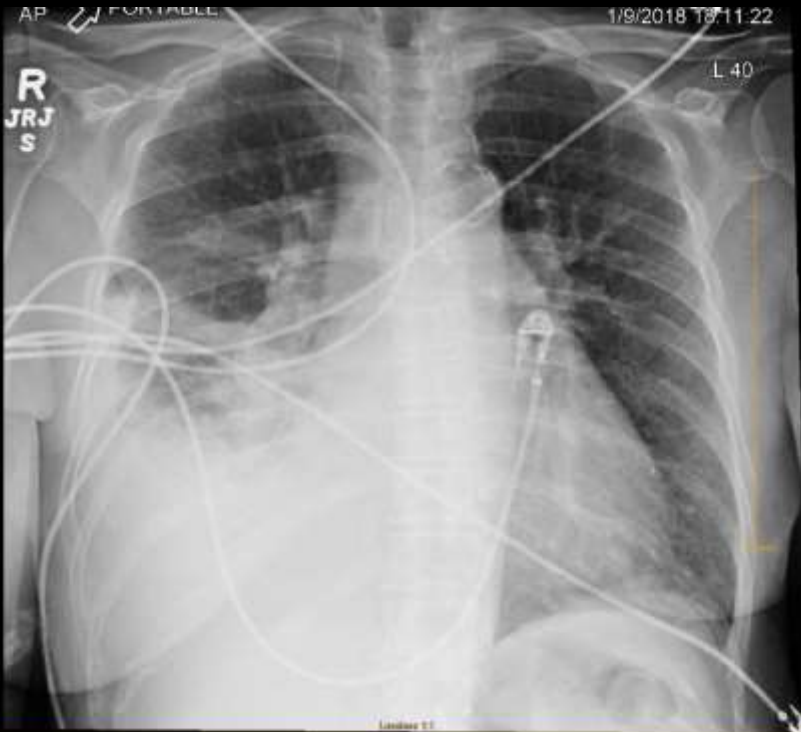
CT 12/11



- 12/1/2017–chest x-ray–widened mediastinum
- 12/6/2017–CT abdomen pelvis–bilateral lung nodules RIGHT pleural effusion thickening of the GE junction
- 12/11/2017–CT chest–multiple nodules RIGHT lung, nodules LEFT lung, supraclavicular lymph nodes, mediastinal lymph nodes,
- 12/15/2017–biopsy–adenocarcinoma, TTF-1 positive consistent with lung primary
- 1/2/2018–PET scan–bilateral lung nodules, pleural deposits, mediastinal lymph nodes, pericardial effusion, uptake within the distal pylorus

1-9 unable to walk up a flight of stairs

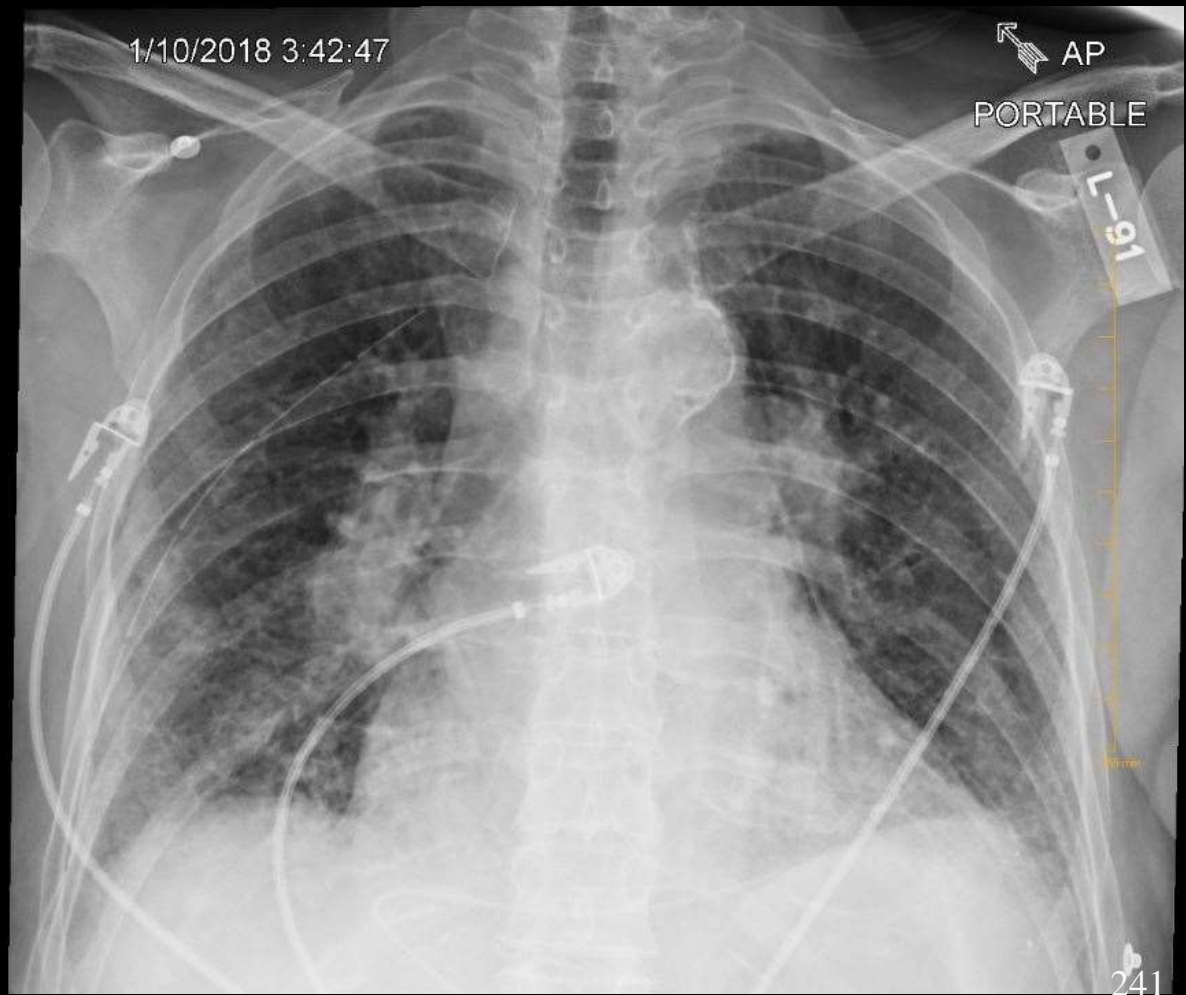
- Exertional Dyspnea
- BP 80/60, HR 108
- SpO2 92% on room air
- STAT echo
- Large pericardial effusion



Emergent Pericardial Window

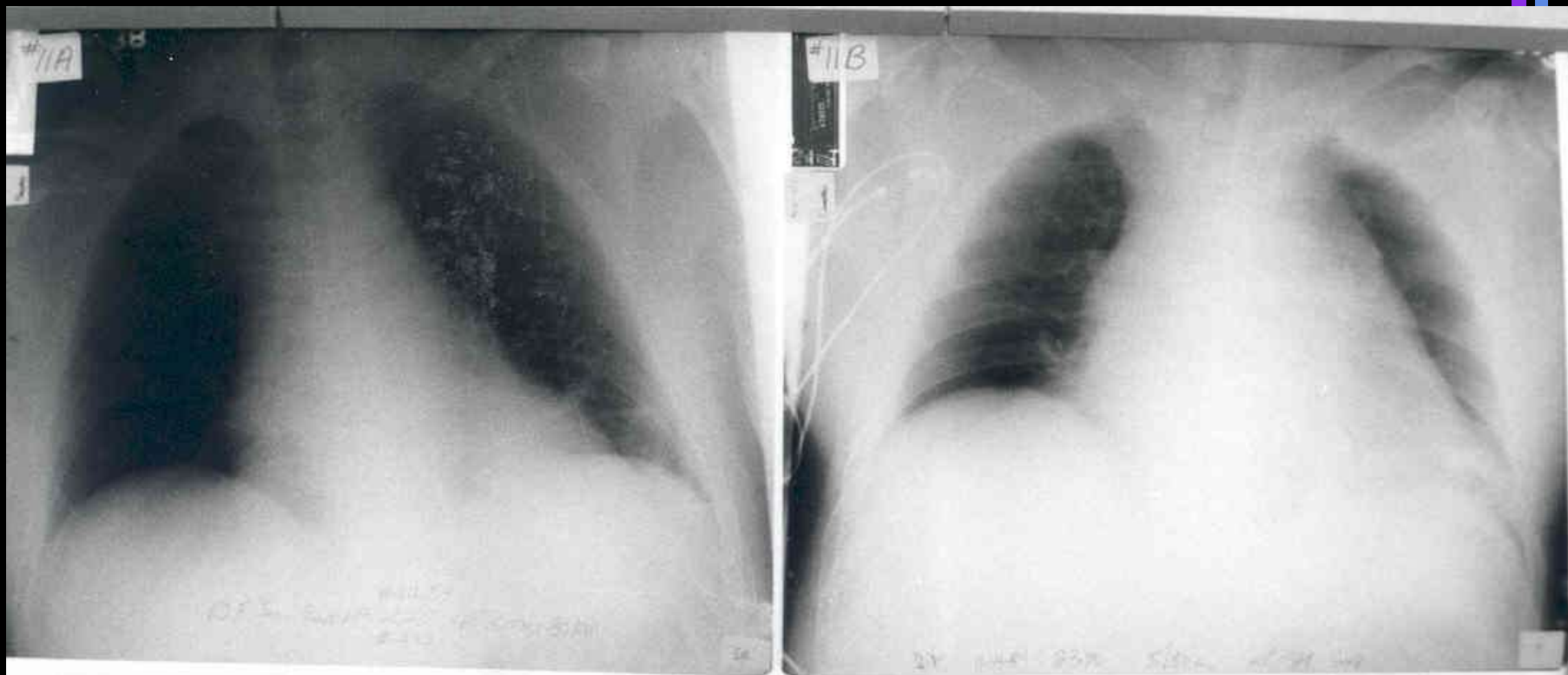
Post Pericardial Window

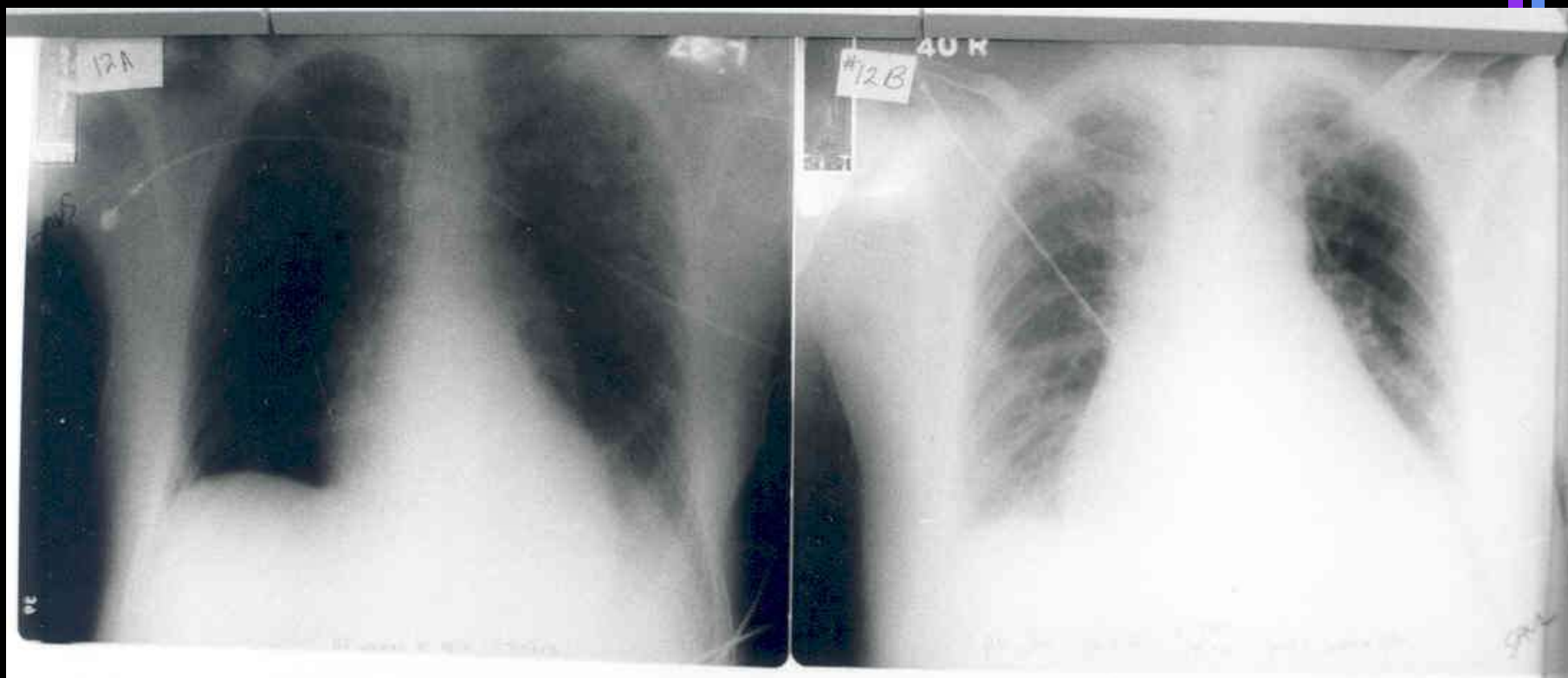
- Drained 800 ml from pericardial sac
- Drained 2400 from right pleural space
- PleurX catheter left in right pleural space



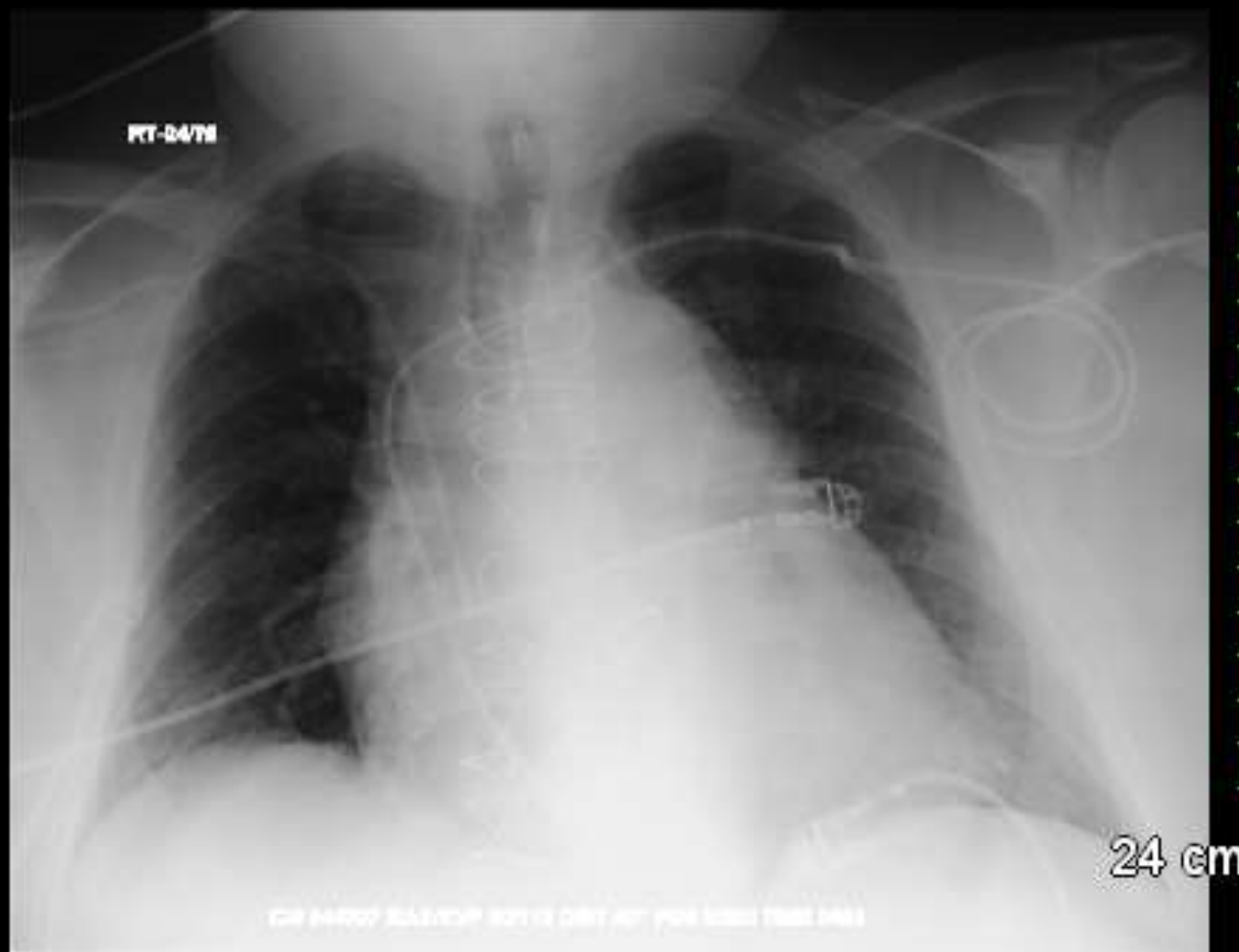
Cardiac Tamponade

- Fluid around the heart
- Appears white on the CXR
- Mediastinum gets wider and squares off
- Compare to older CXRs
- Causes
 - Chest trauma
 - Bleeding Post op Cardiac surgery



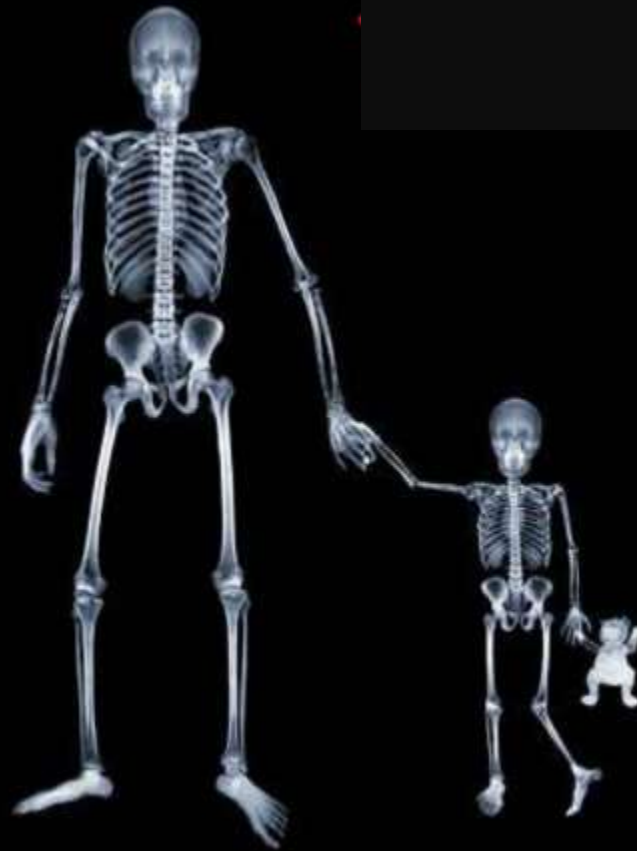




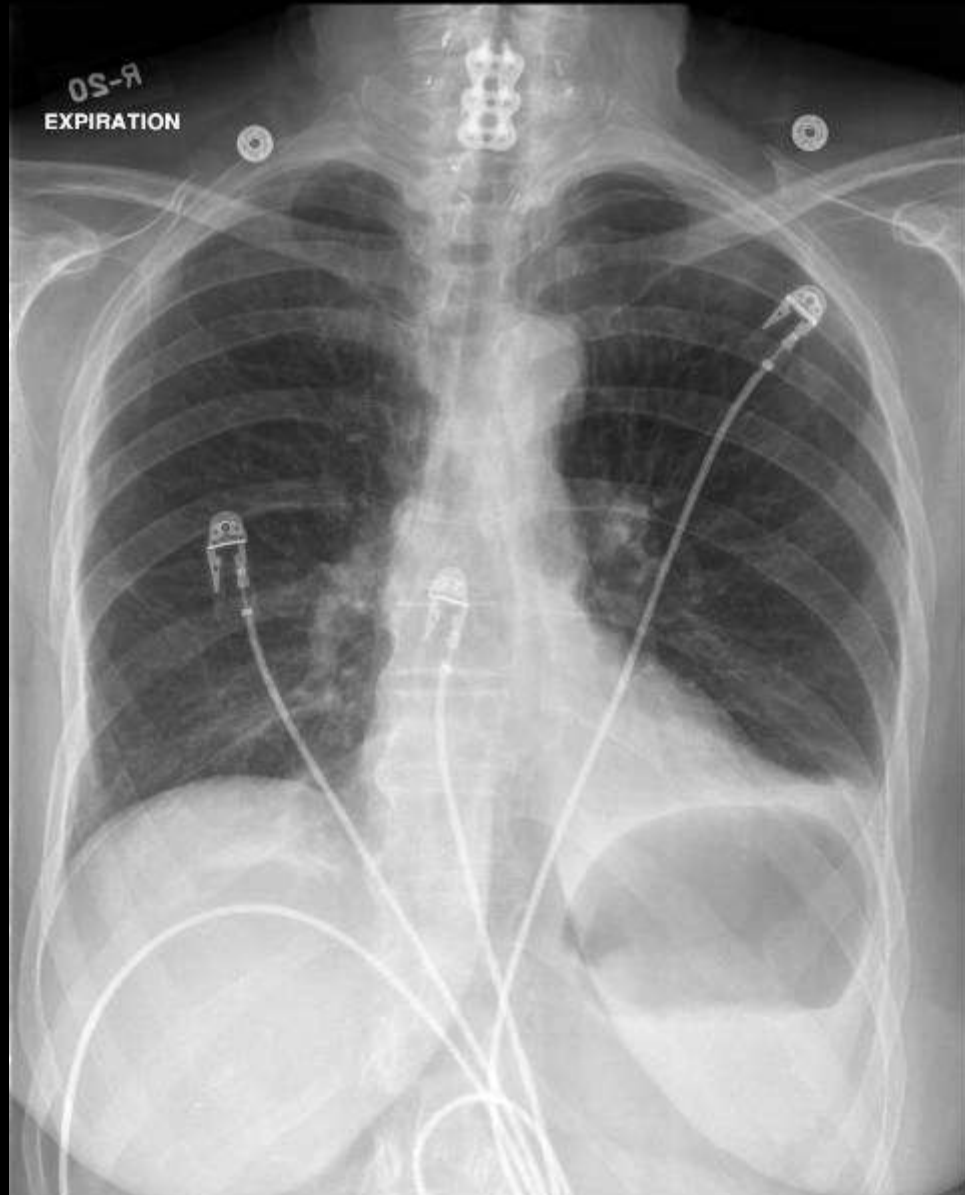




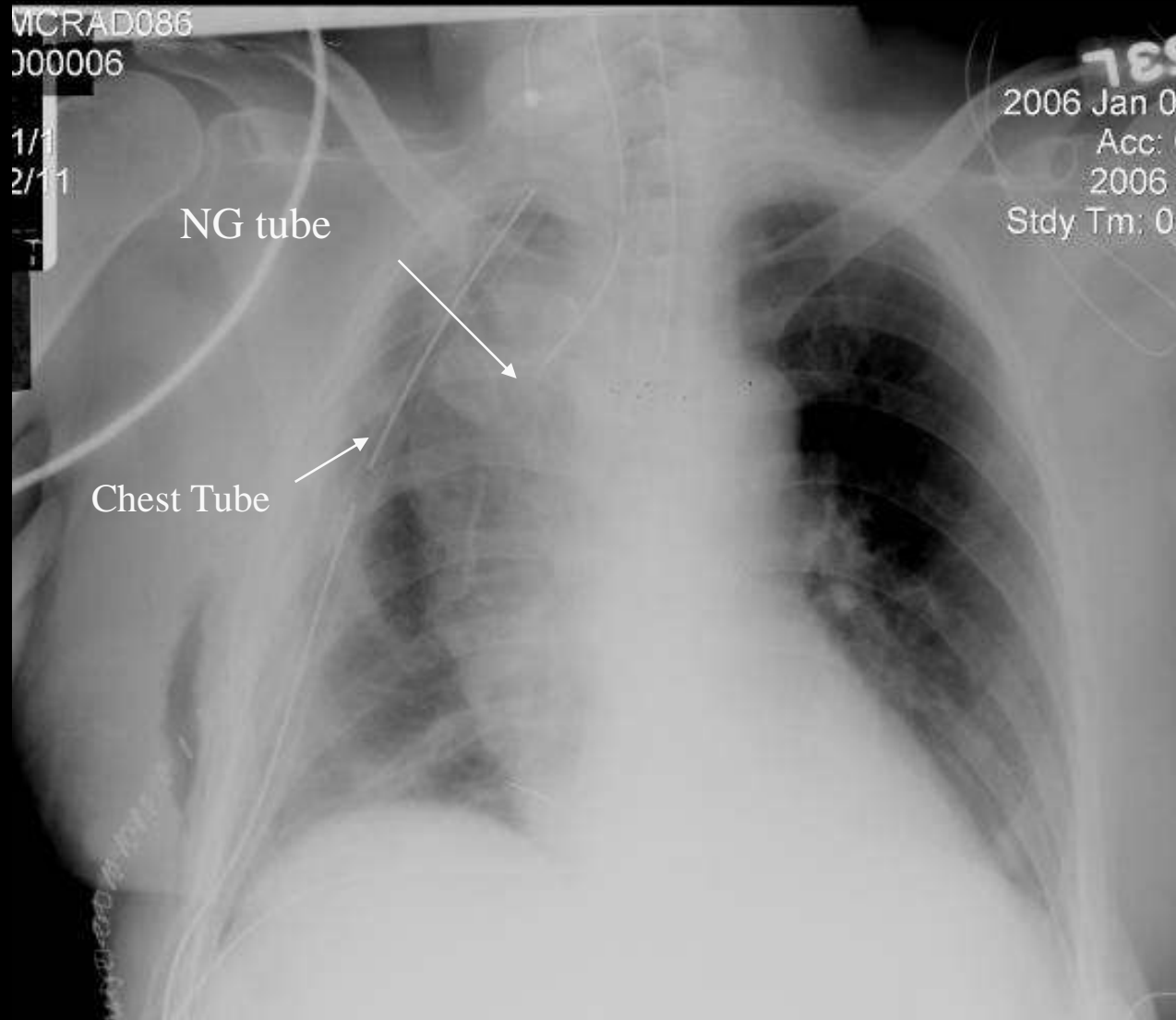
Miscellaneous



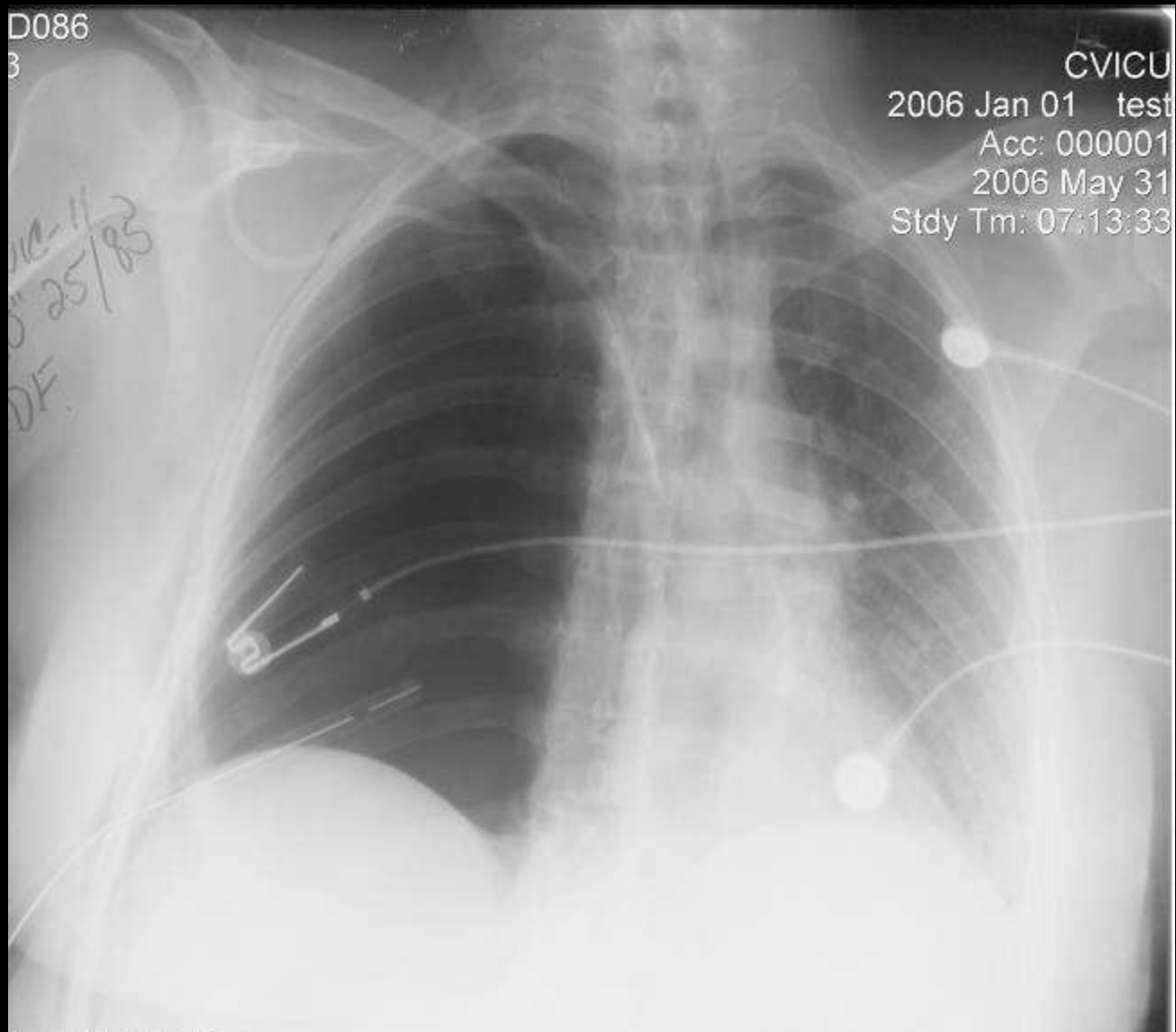
- Air in Stomach



Esophgastrectomy



Pneumonectomy



300MCRAD086

Ex: 000003

Se: 1/1

In: 2/6



CVICU

2006 Jan 01 test

Acc: 000001

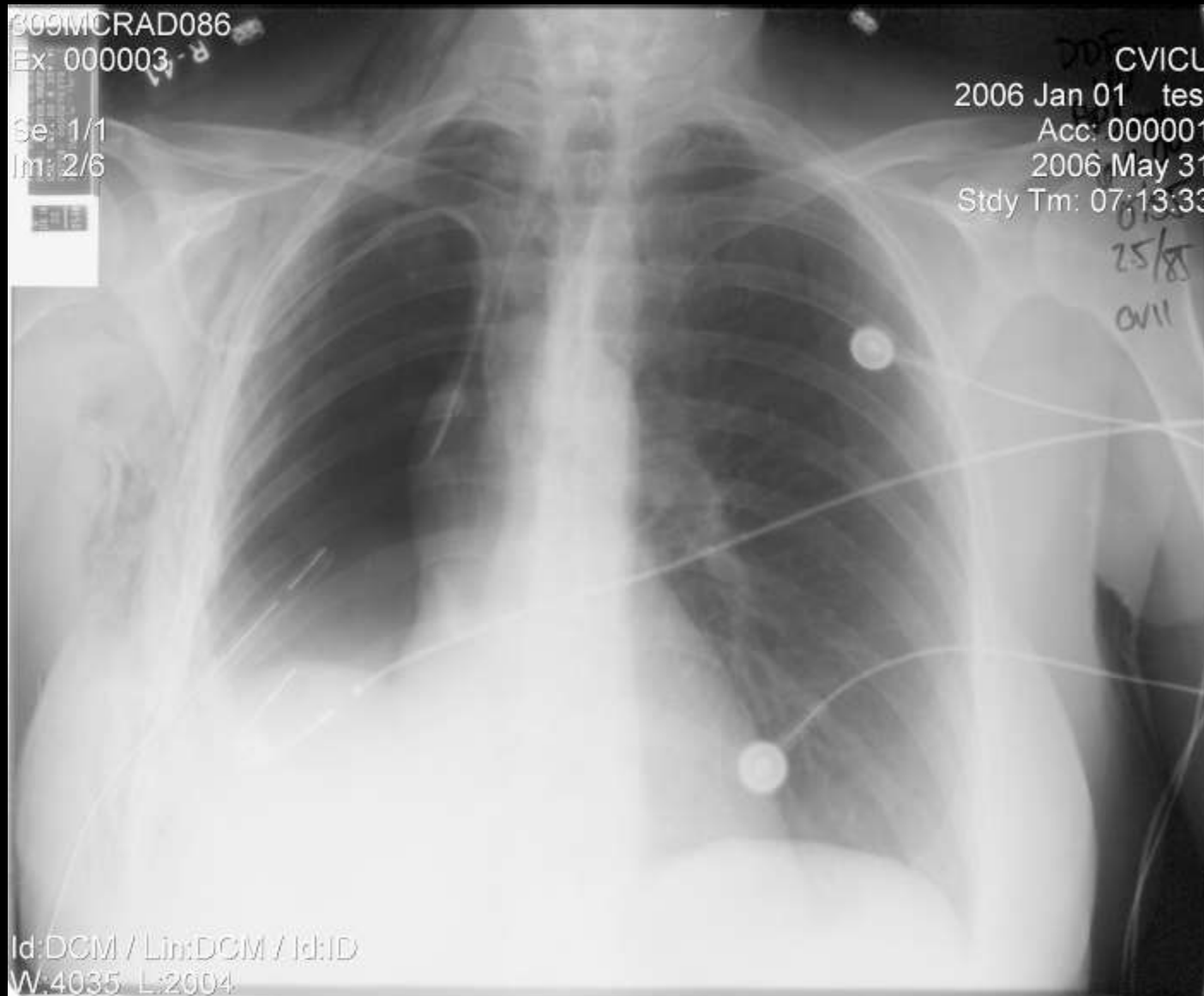
2006 May 31

StdY Tm: 07:13:33

01/31/06
25/8
CVII

Id:DCM / Lin:DCM / Id:ID

W:4035 L:2004



309MCRAD086

Ex: 000003

Se: 1/1

Im: 3/6

CVICU

2006 Jan 01 test

Acc: 000001

2006 May 31

StdY Tm: 07:13:33

Id:DCM / Lin:DCM / Id:ID

W:3391 L:2630

309MCRAD086

Ex: 000003

Se: 1/1

Im: 4/6

CVICU

2006 Jan 01 test

Acc: 000001

2006 May 31

StdY Tm: 07:13:33

Id:DCM / Lin:DCM / Id:ID
W:3513 L:2797

309MICRAD086

Ex: 000003

Se: 1/1

Im: 6/6

CVICU

2006 Jan 01 test

Acc: 000001

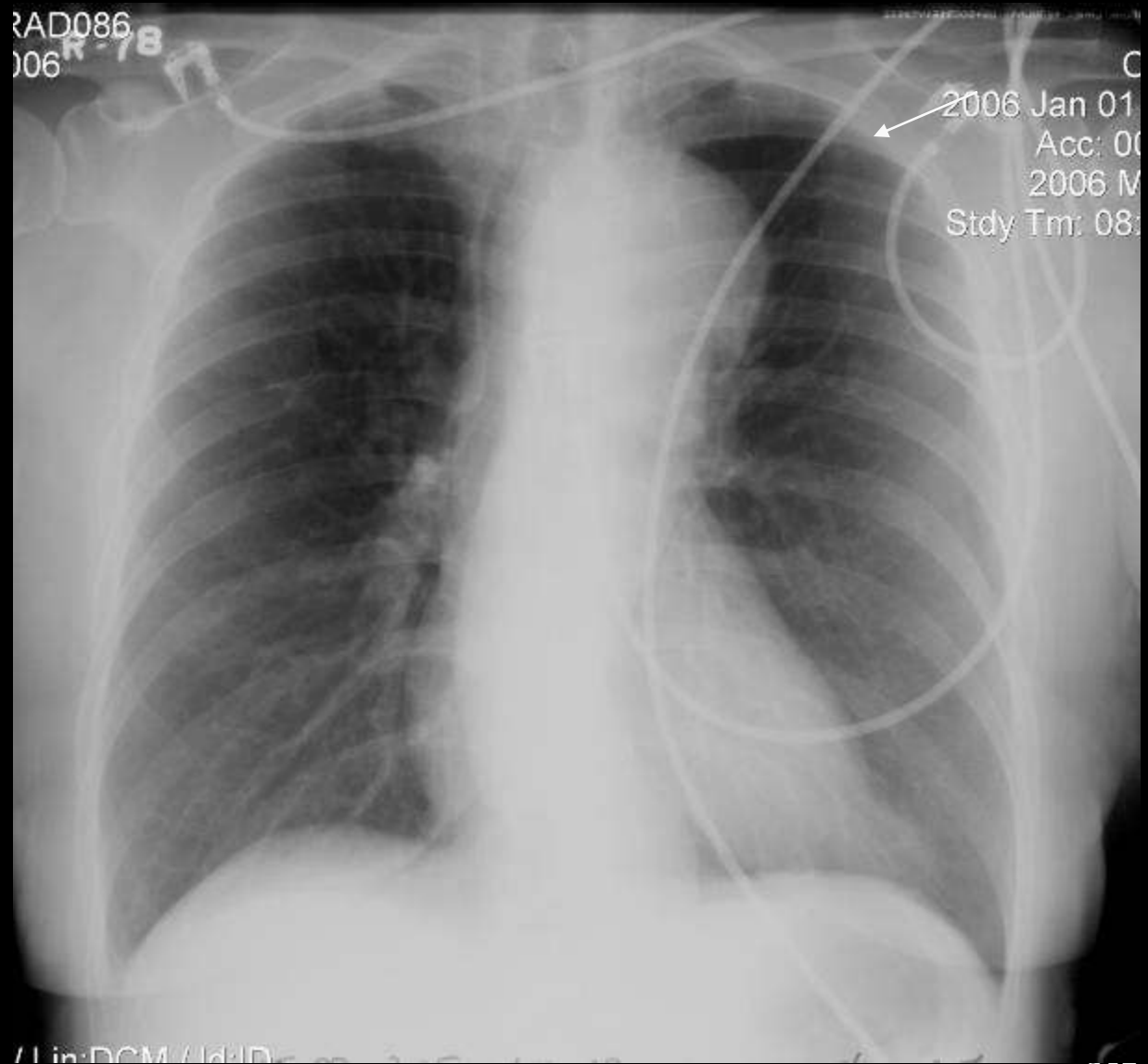
2006 May 31

Stdy Tm: 07:13:33

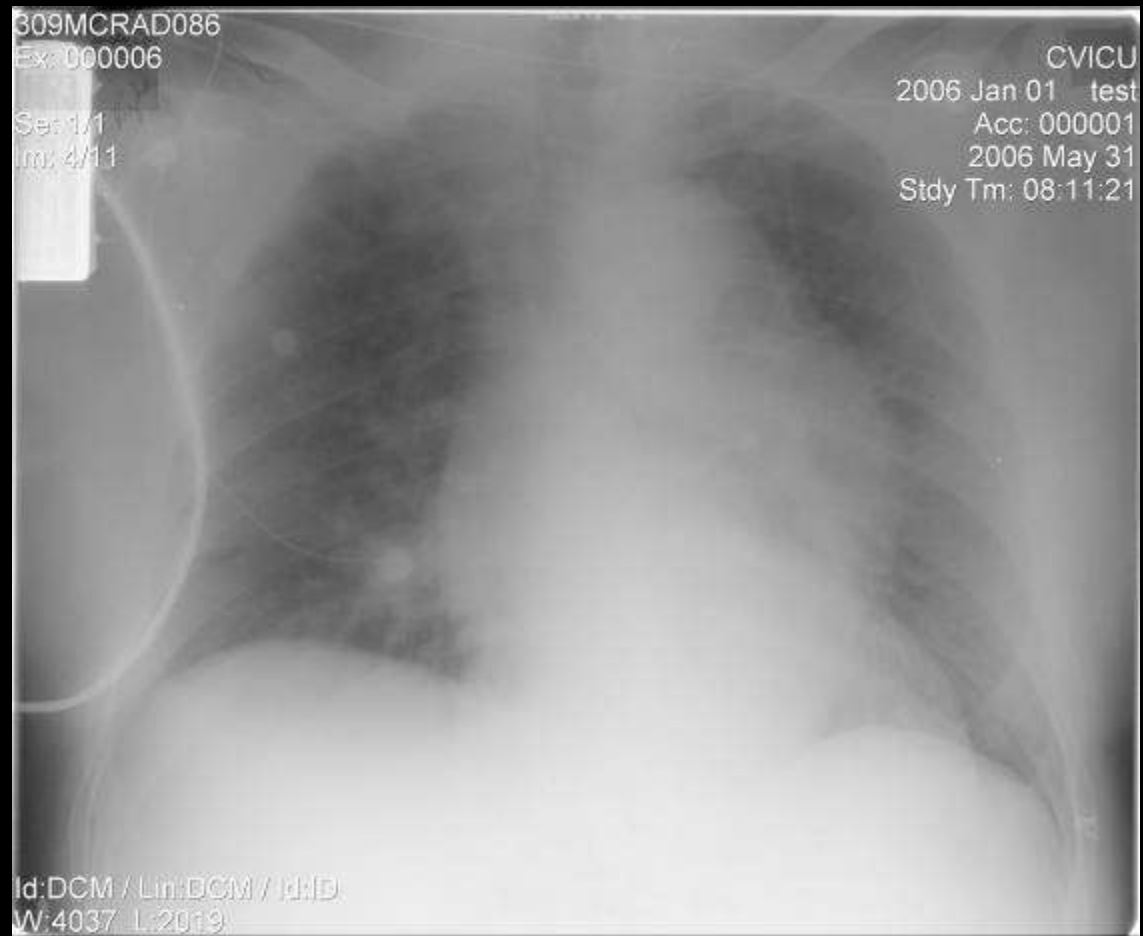
DDF
AP semi
40"
2@40
0457403
6-23-00
074

Id:DCM / Lin:DCM / Id:ID
W:3641 L:2458

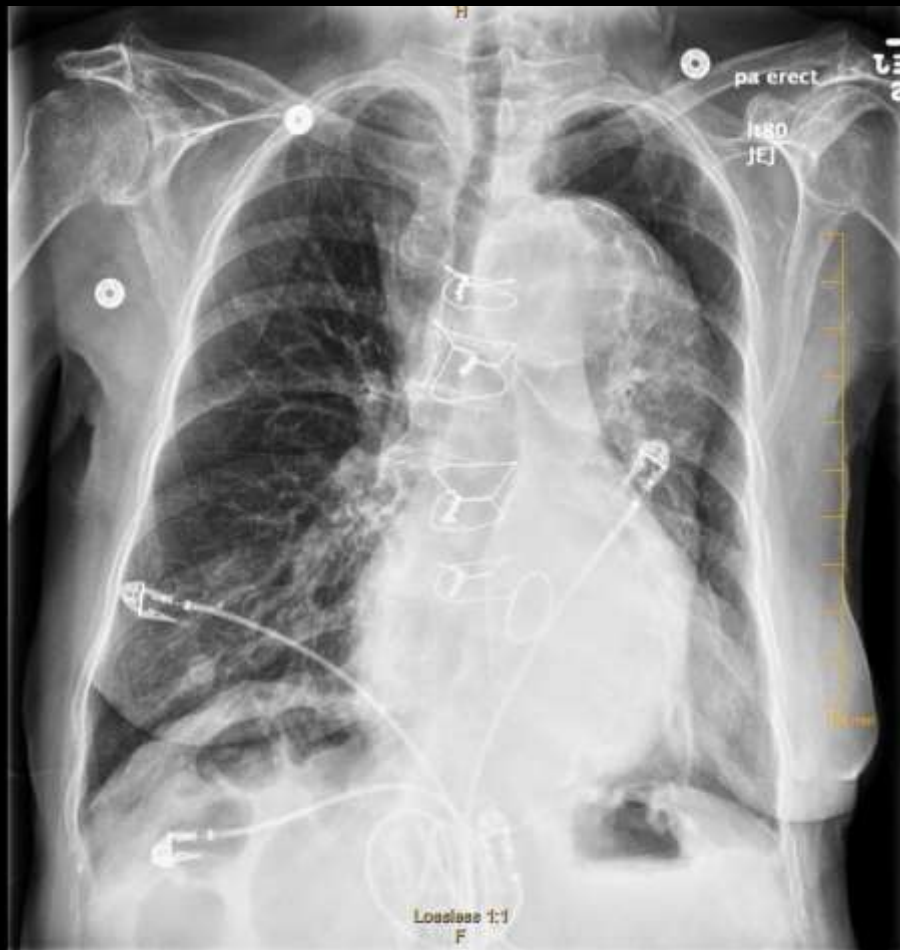
- Thoracic Aneurysm



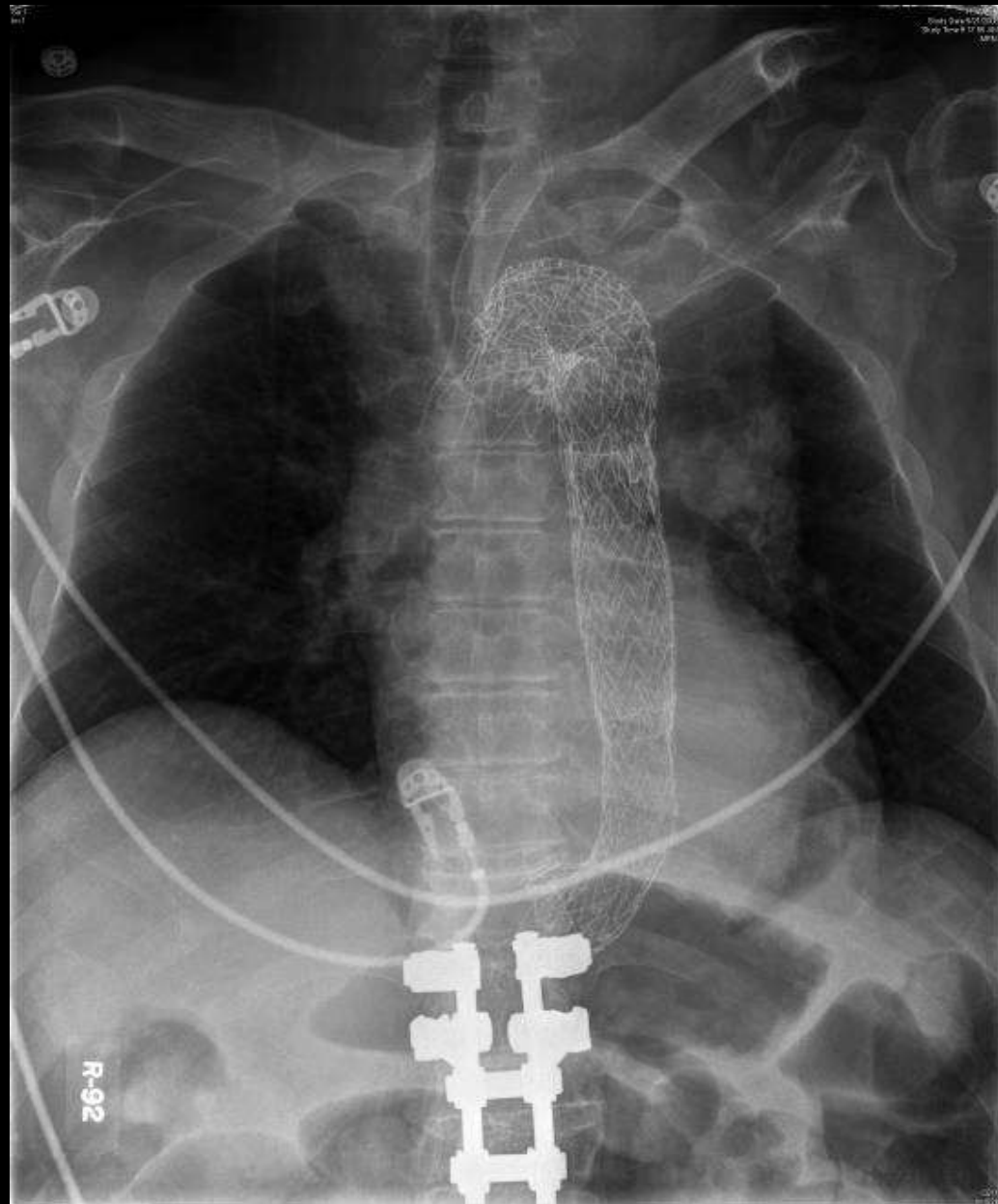
- Thoracic Aneurysm



Descending 5 cm Aortic Aneurysm



- TAG Thoracic Aortic Graft

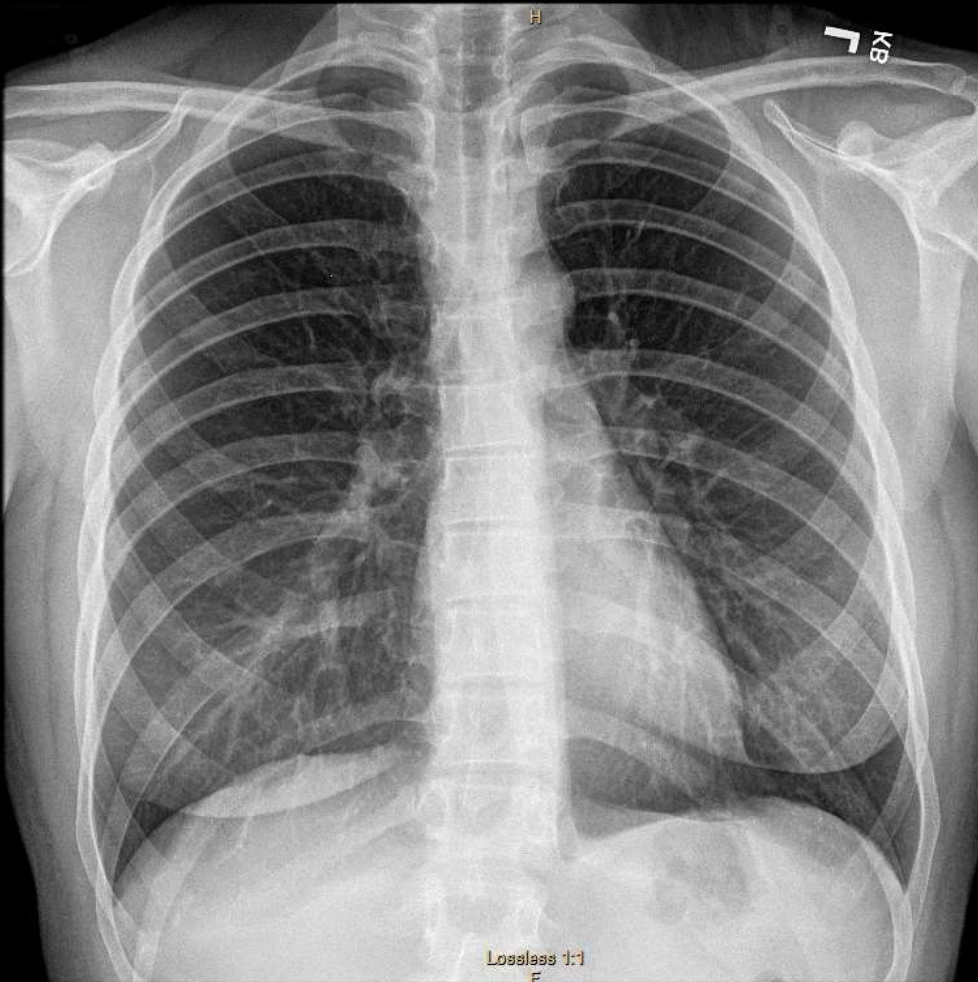


Mediastinal Mass Case Study

History of Skin Cancer

Previous chest x-ray showed nodular density over the right anterior third rib

Yearly checkup. Nonsmoker.



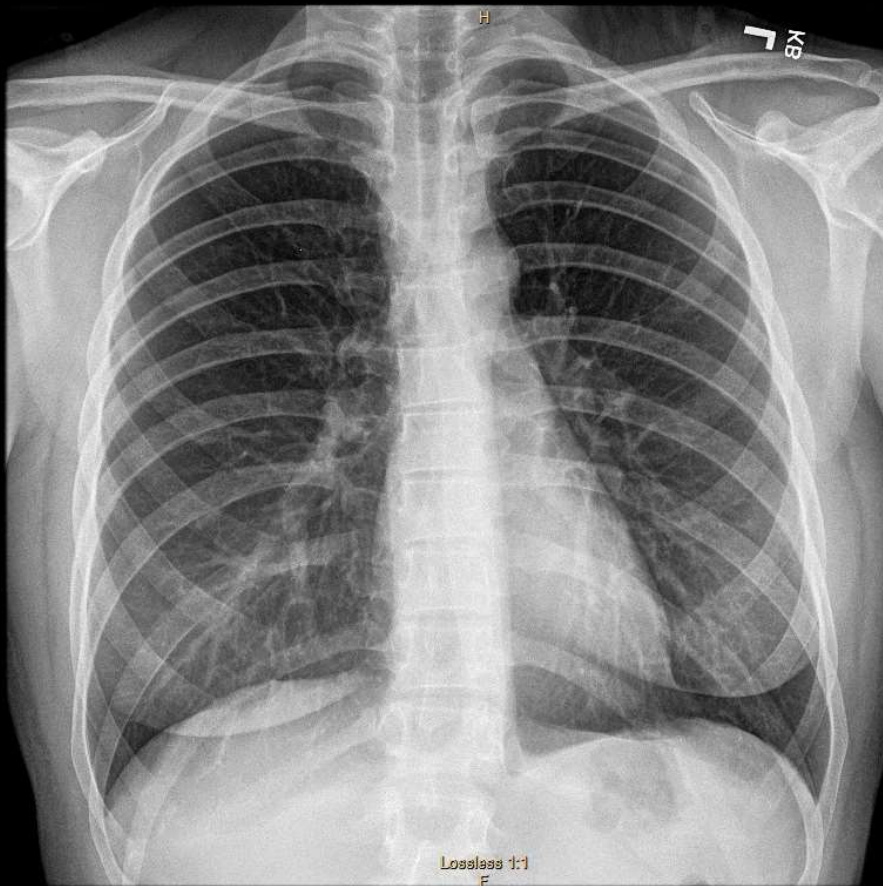
Impression

- No previously-noted nodular change overlying the anterior right third rib is noted. No new parenchymal nodule is seen.
- No active cardiopulmonary abnormality seen.

March 3 at PCP – 15 months later

- Nonproductive Cough
 - *Pt states that she has a cough that has been going on since before Christmas; dry cough*
- No fever, no sweat, no chills, no rashes, just a cough.
- History of melanoma
- CXR ordered

15 months ago

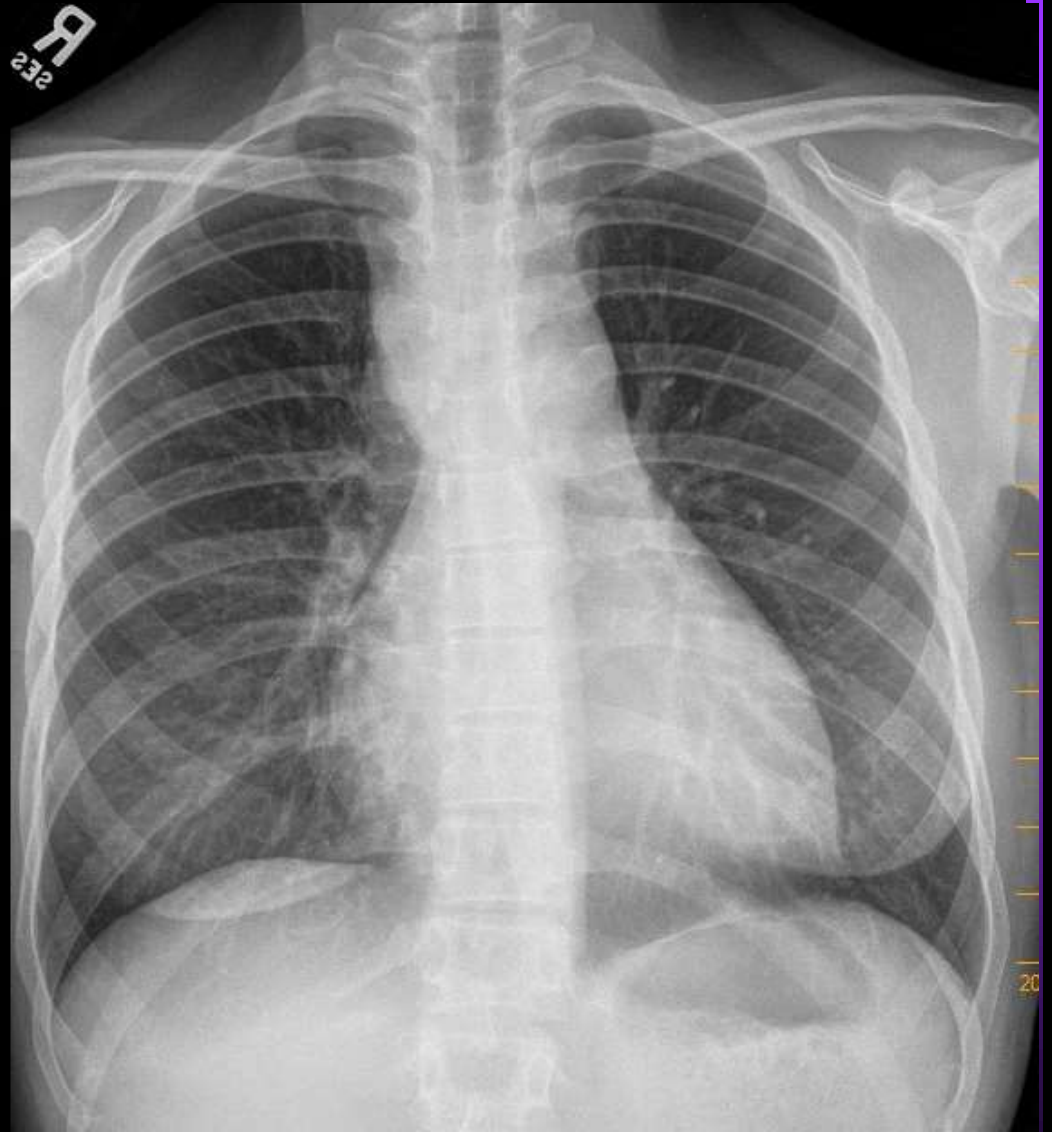


Now



3/16

- Prominent mediastinal soft tissues, not present on previous chest x-rays.
- Given the patient's history of melanoma, recommend a chest CT with IV contrast to assess for neoplasia.
- Borderline cardiomegaly, normal sized on previous studies.
- Negative exam for an active pulmonary process.



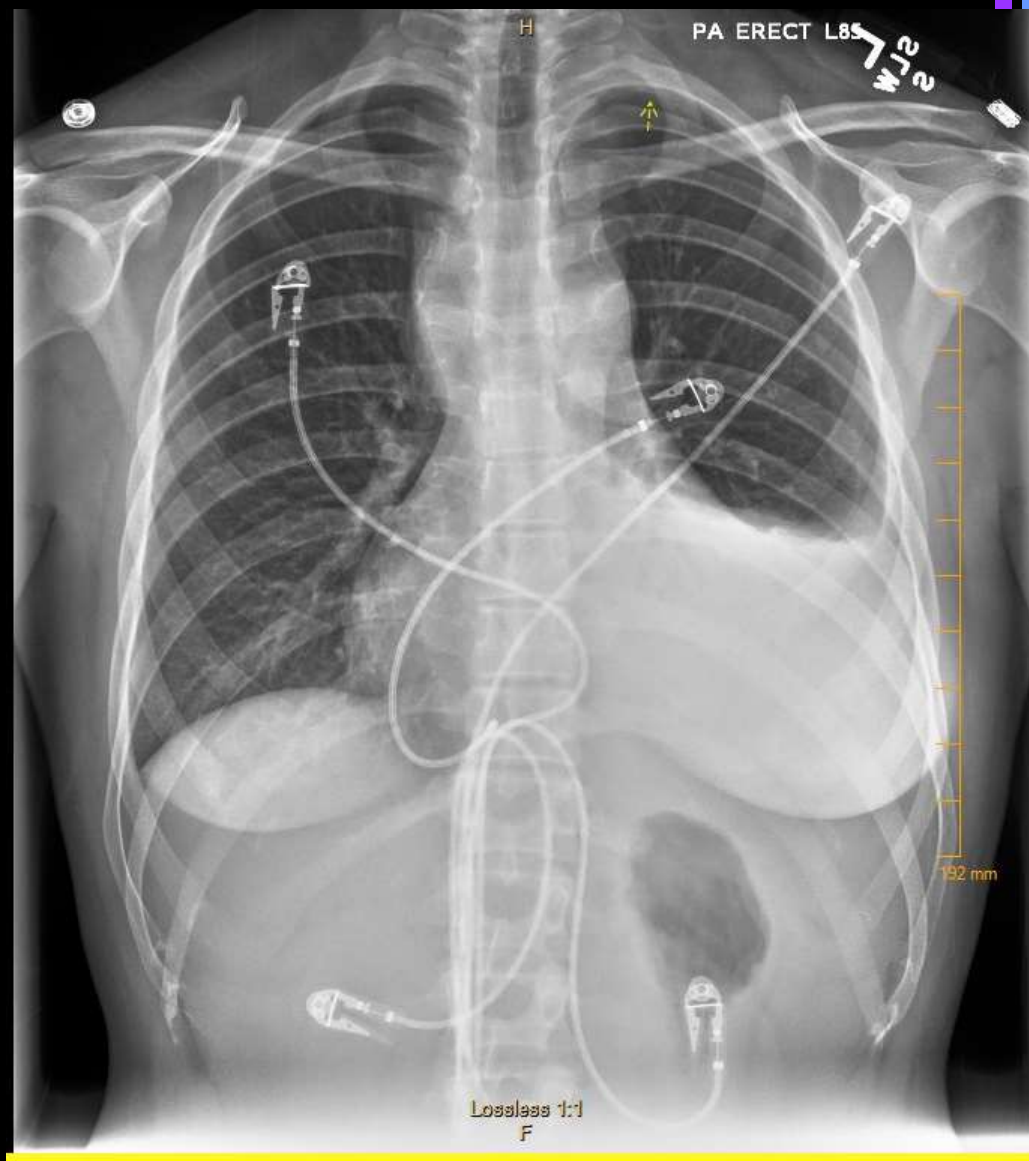
CT scan 3/22 – 6 days later

- Interval development of a large pericardial effusion.
- Bulky upper anterior mediastinal and right paratracheal lymphadenopathy.
- Mild right upper lobe and left lower lobe posterior pleural thickening.



4/8

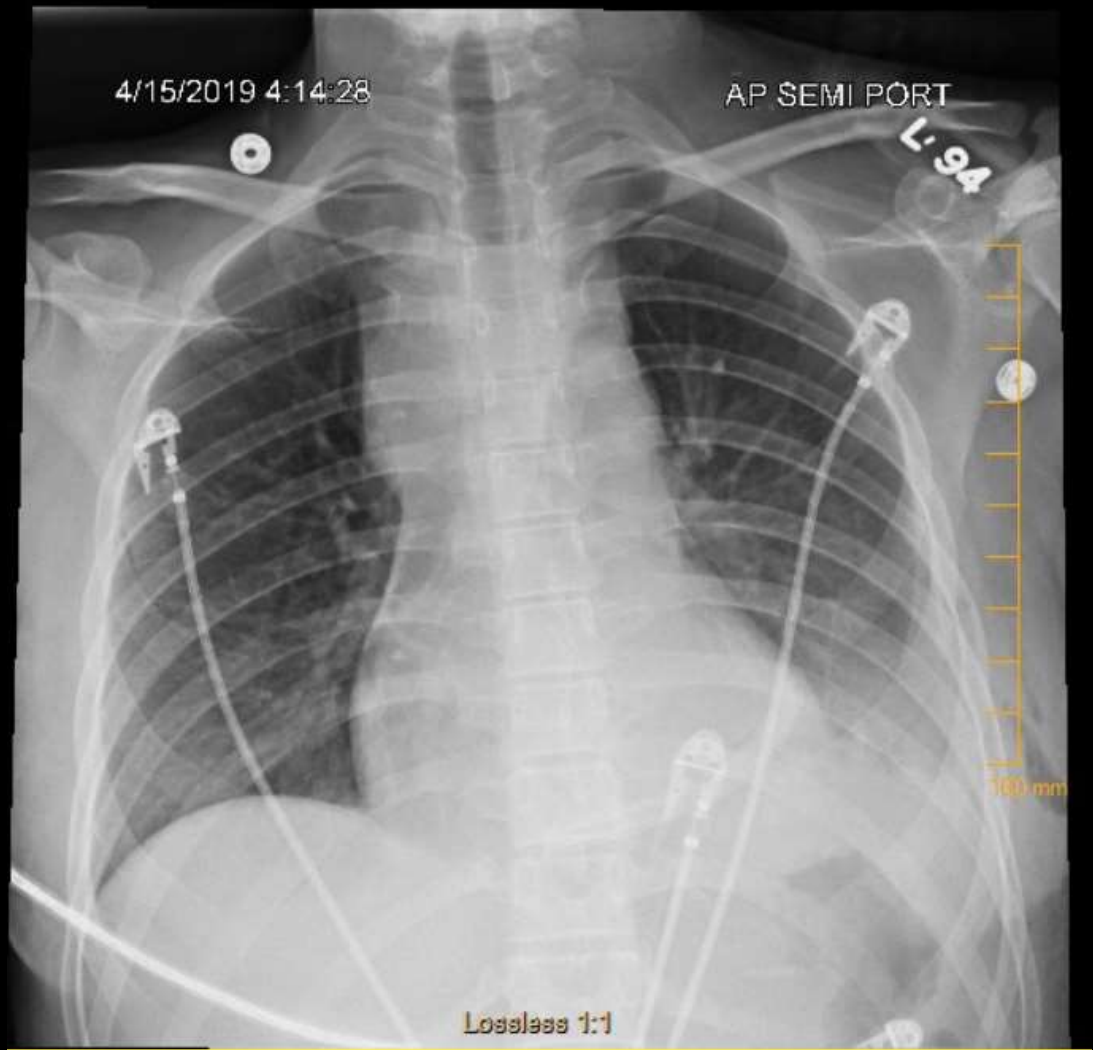
- Persistent moderate left pleural effusion with compressive atelectasis.
- Tiny left apical pneumothorax.
- Known mediastinal adenopathy.



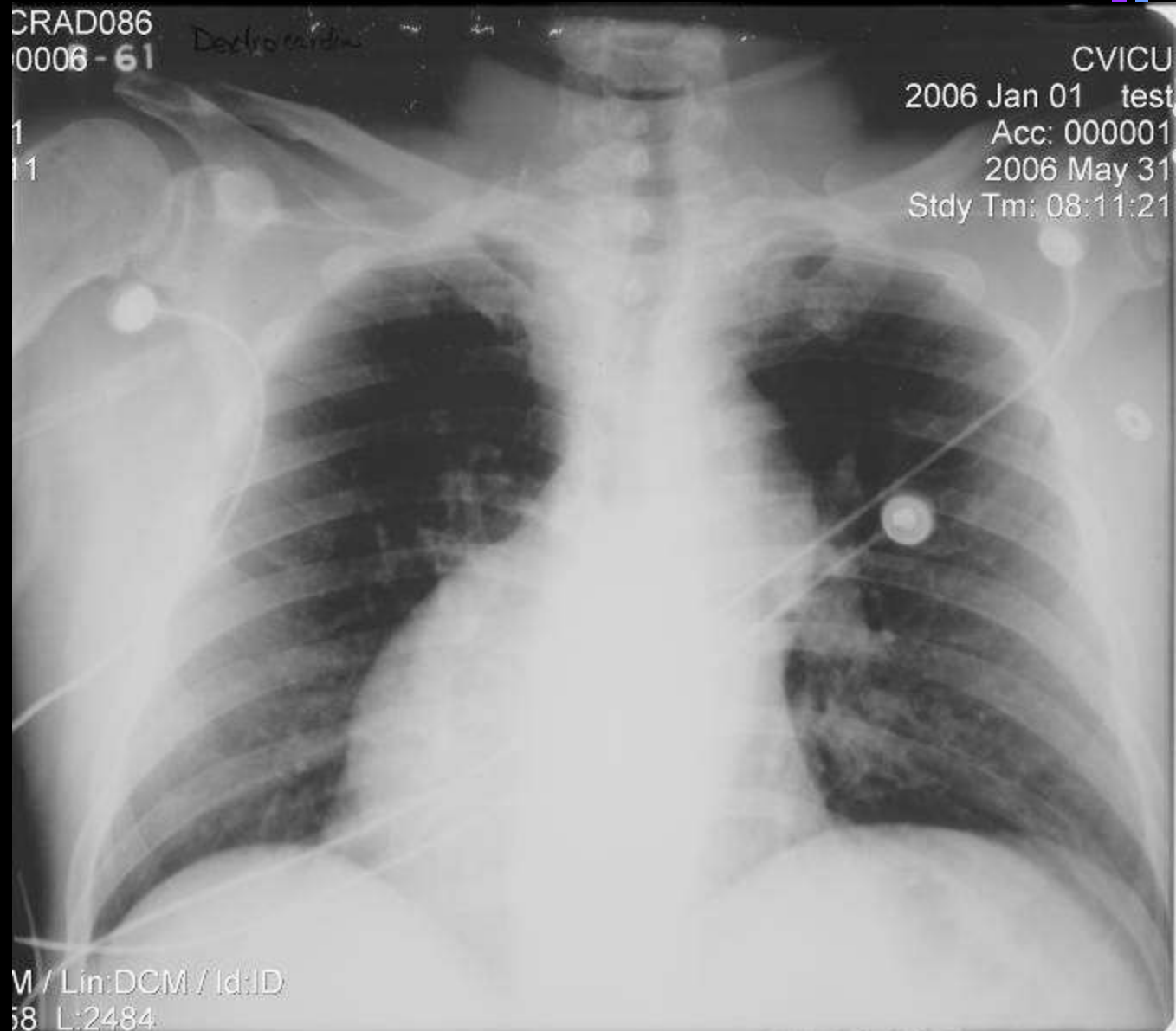
- Patient had excisional biopsy with 500 mL hemothorax release chest tube placed.
- Pericardiocentesis drain placed by cardiology with 500 cc removed sent to pathology which was positive cytology for metastatic melanoma.
- Pericardial window was performed on April 13, 2019. Sent home with pericardial drain
- Immunotherapy started
- Drain removed one month later

4/15

- Post pericardial window
- December – continuing immunotherapy treatments

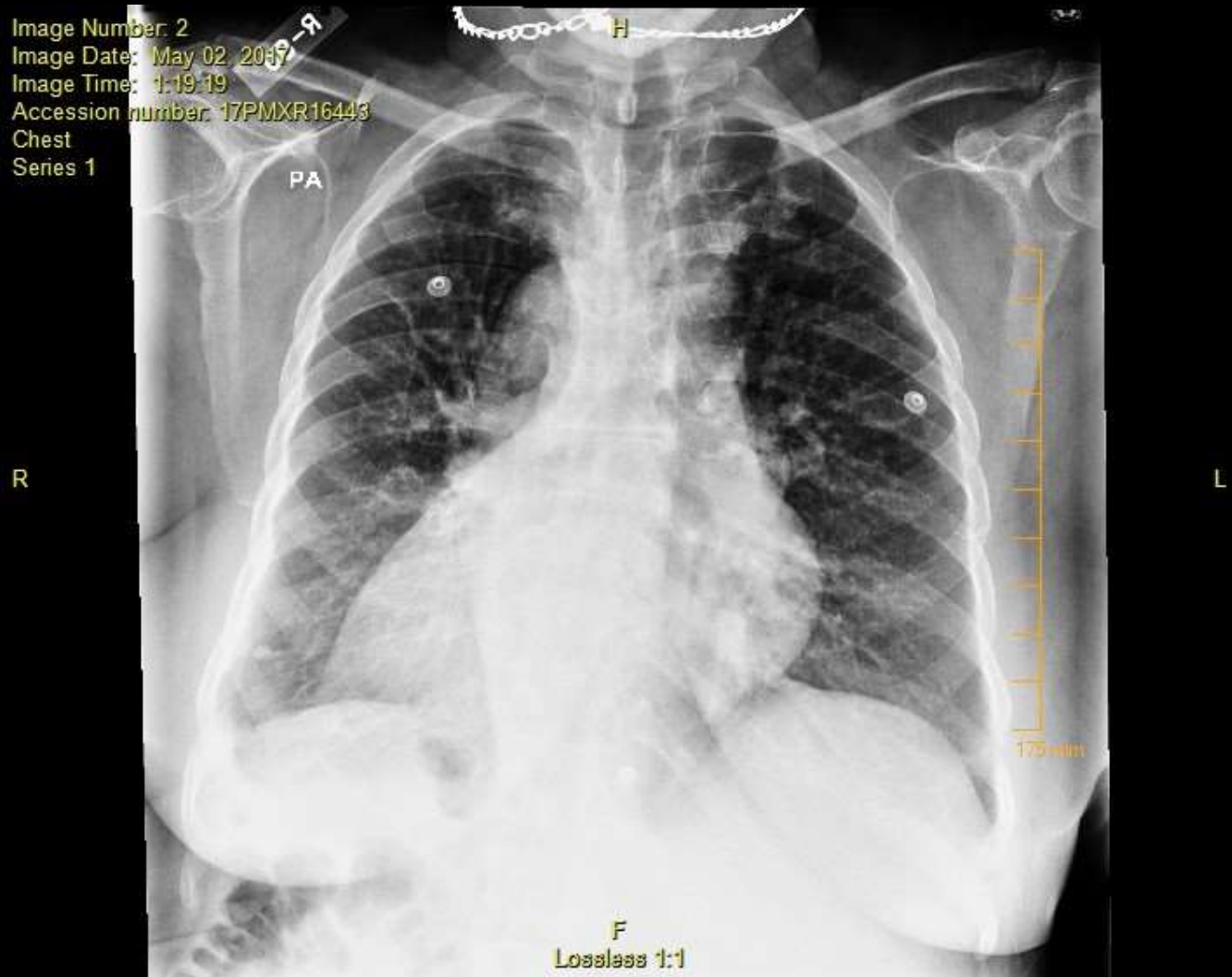


- Dextrocardia



Dextrocardia

Image Number: 2
Image Date: May 02, 2017
Image Time: 1:19:19
Accession number: 17PMXR16443
Chest
Series 1



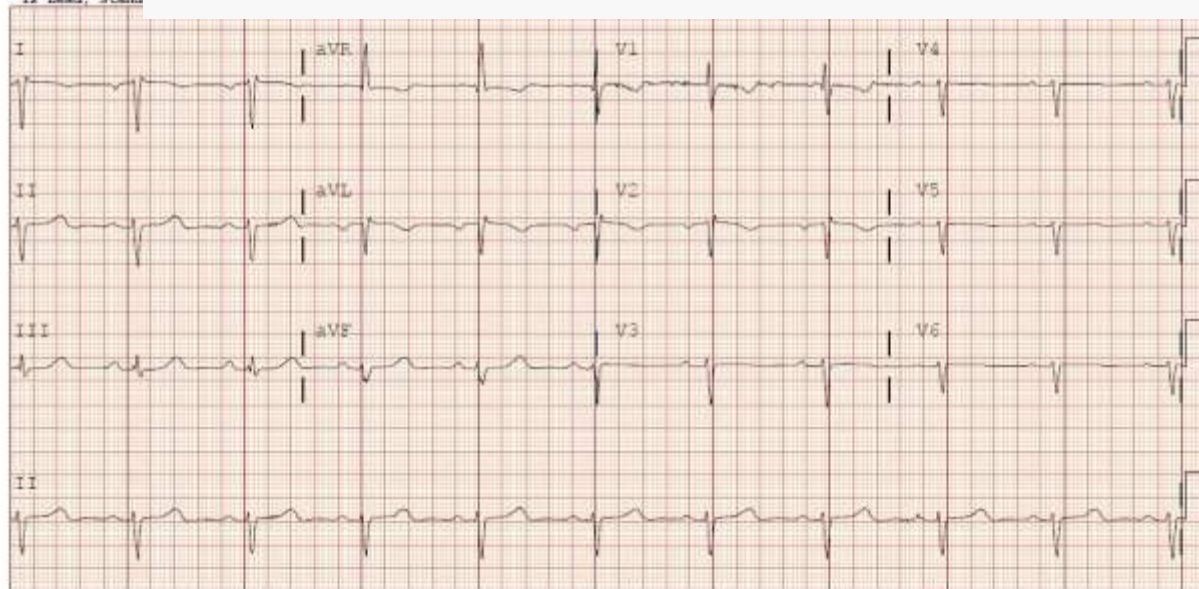
HR 61
PR 217
QRS 111
QT 475
QTc 479

-- AXIS --
P 124
QRS 204
T 92

Rc

Cc

12 Lead; Stand



Device: 1322154

Speed: 25 mm/sec

Sensitivity: 10 mm/mV

Chart: 10 mm/mV

F 60~0.5-100 Hz W

PBI00055 DEL P9

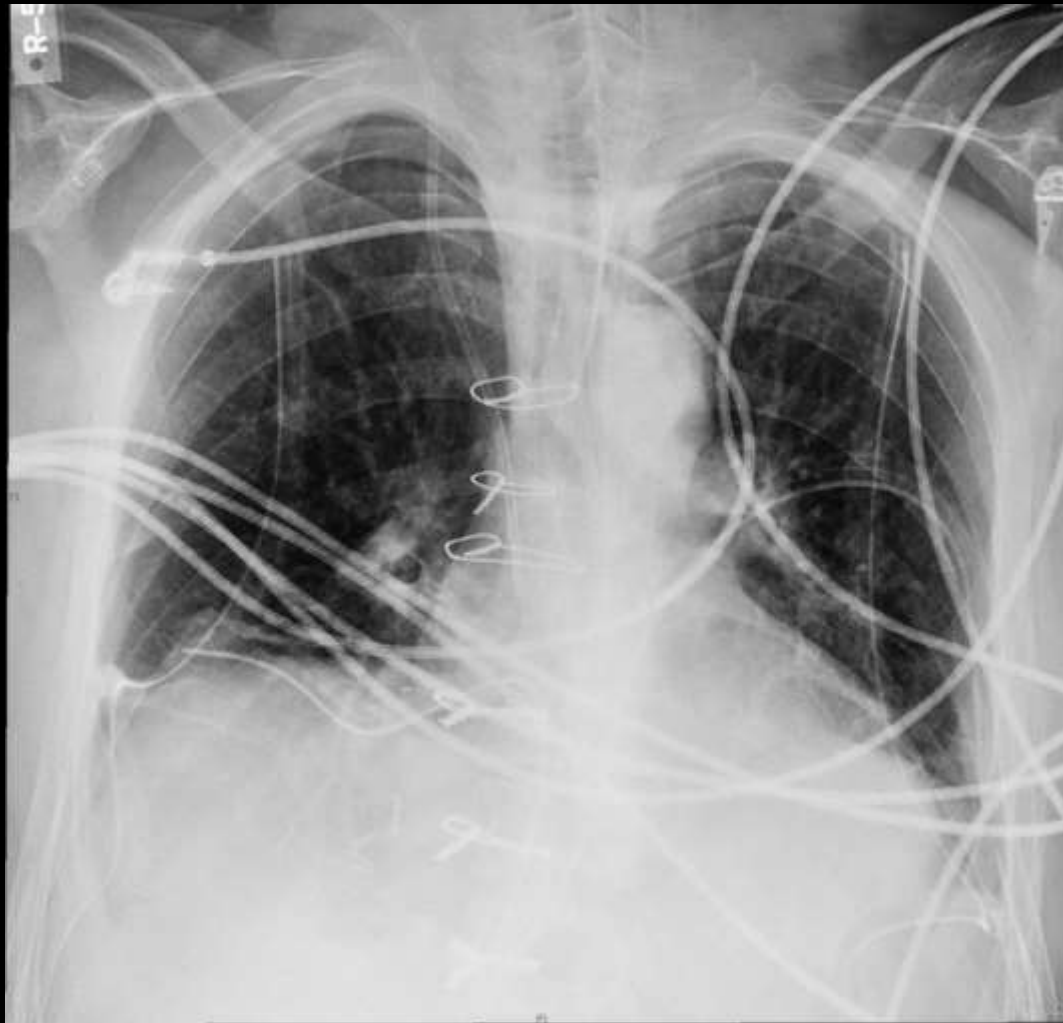
Pericardial Cyst



Pericardial Cyst Lateral view

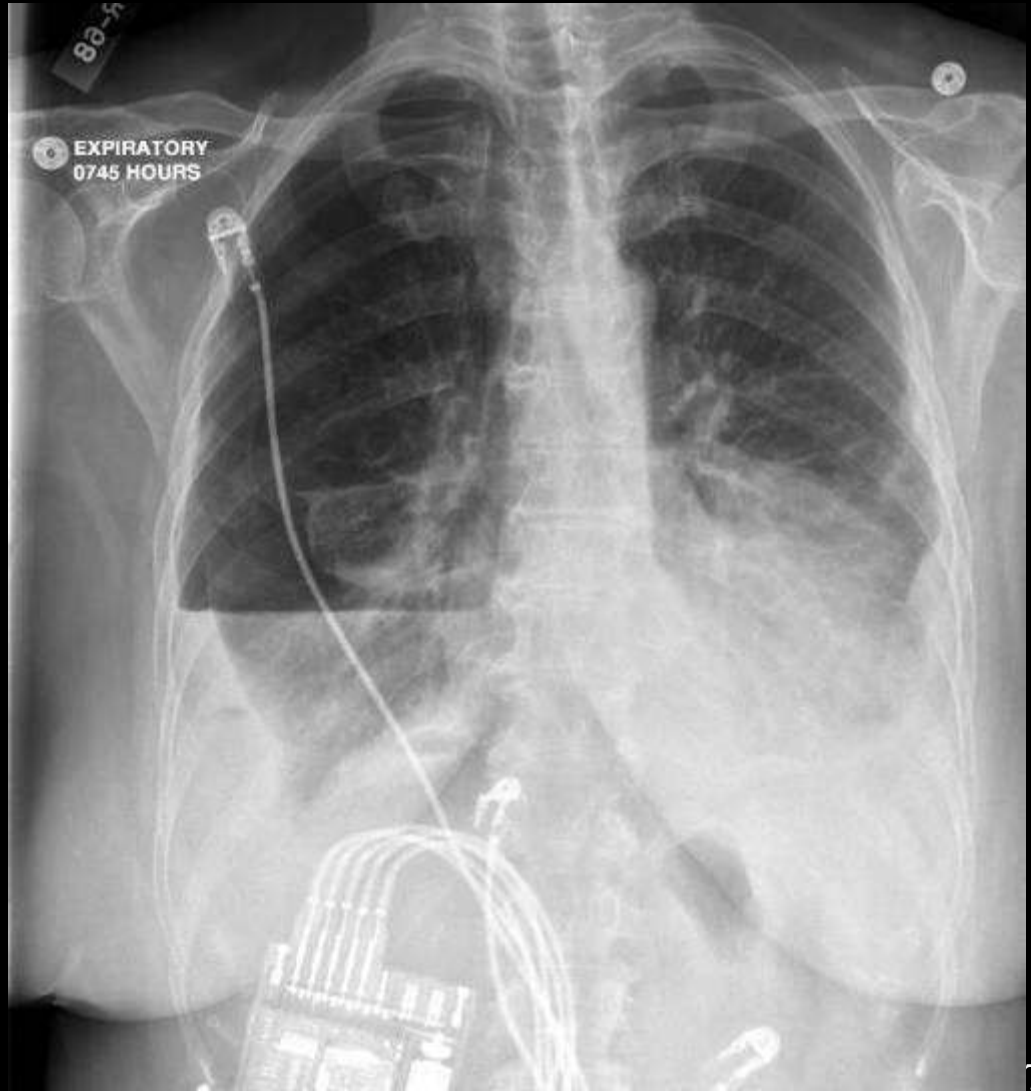


Pericardial cyst post removal



Hydropneumothorax

- Right hydropneumothorax
- Left pleural effusion
- (CW)

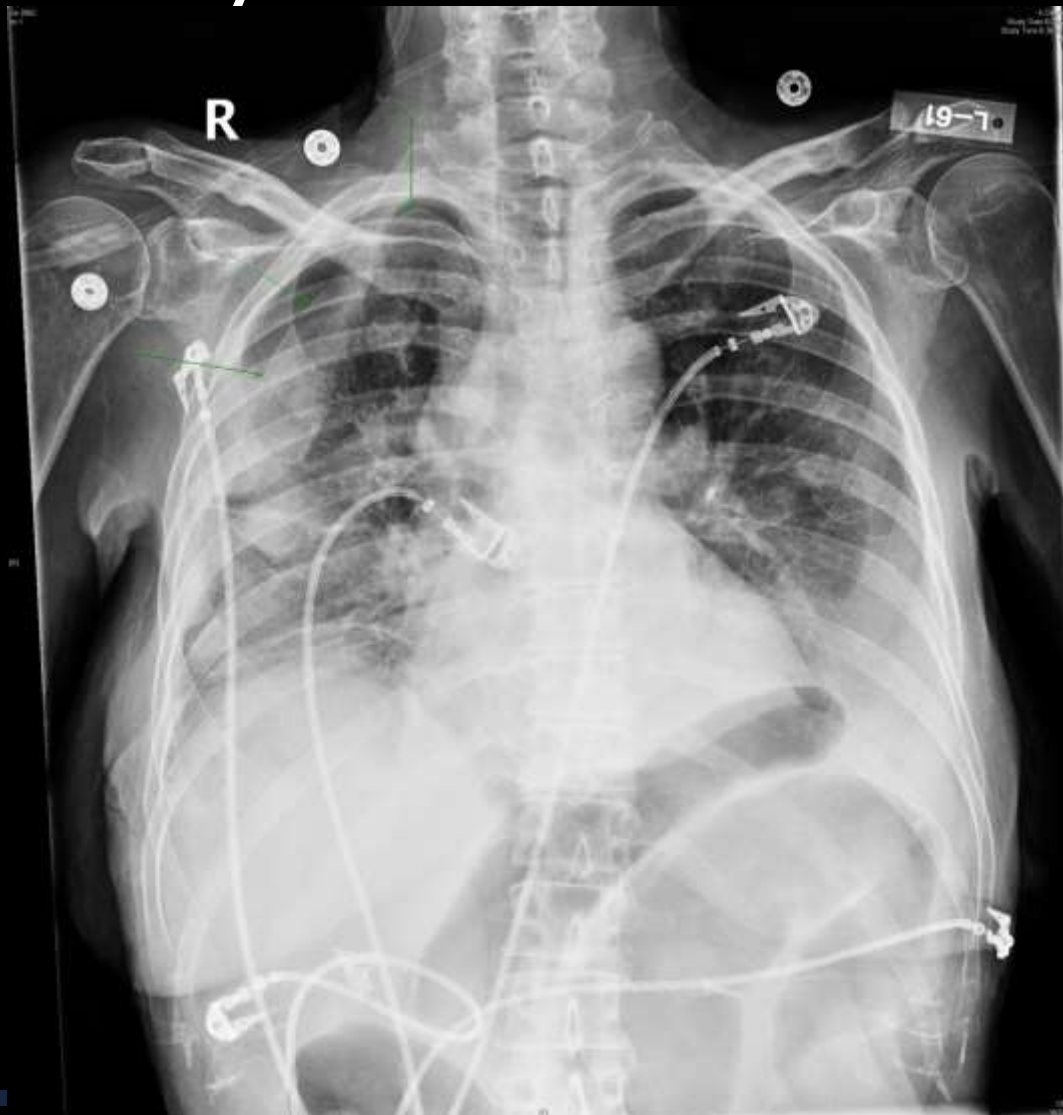


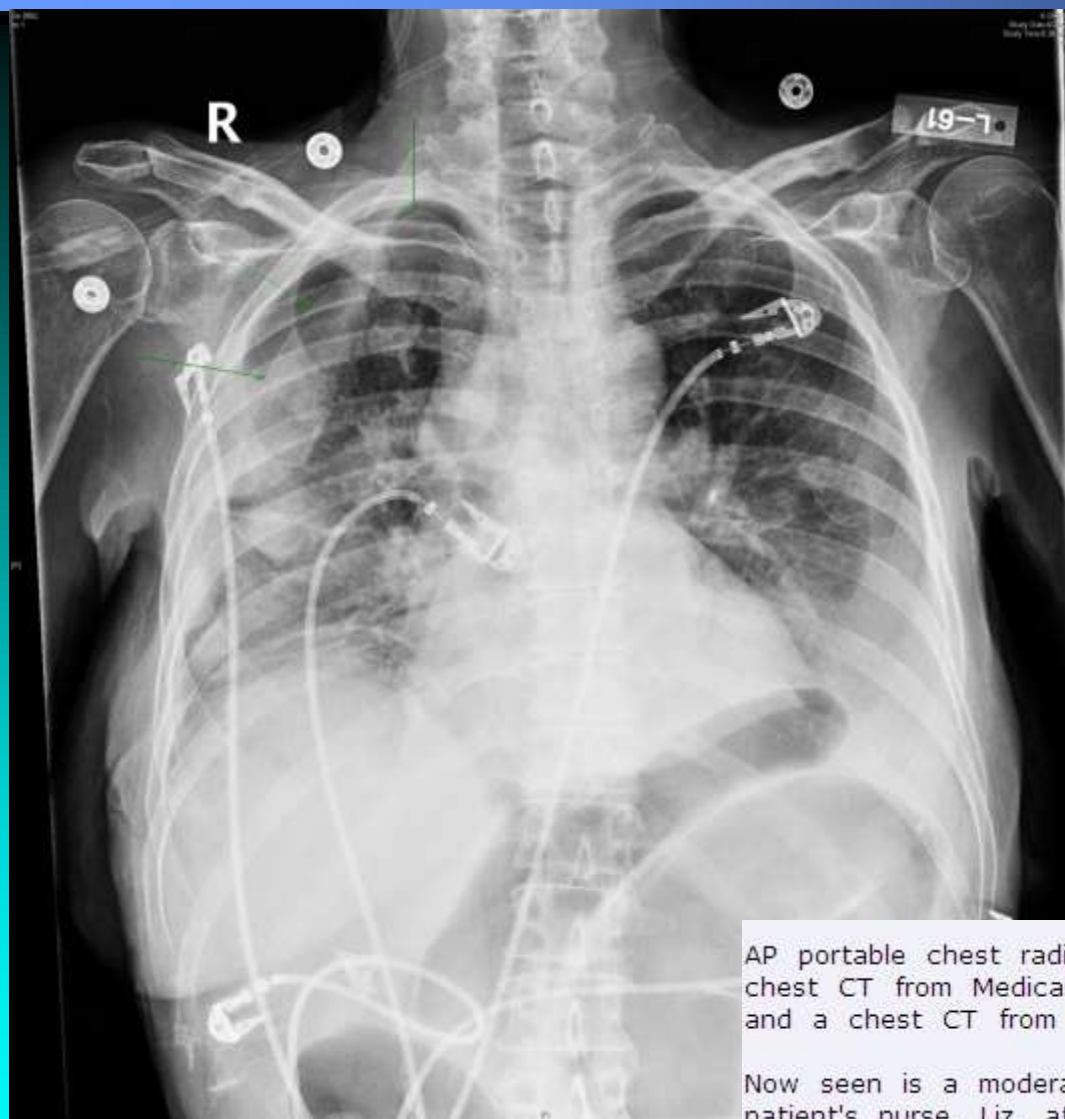
Esophageal
Stent
& PICC
line



Admission CXR Esophageal Tear

What do you see?





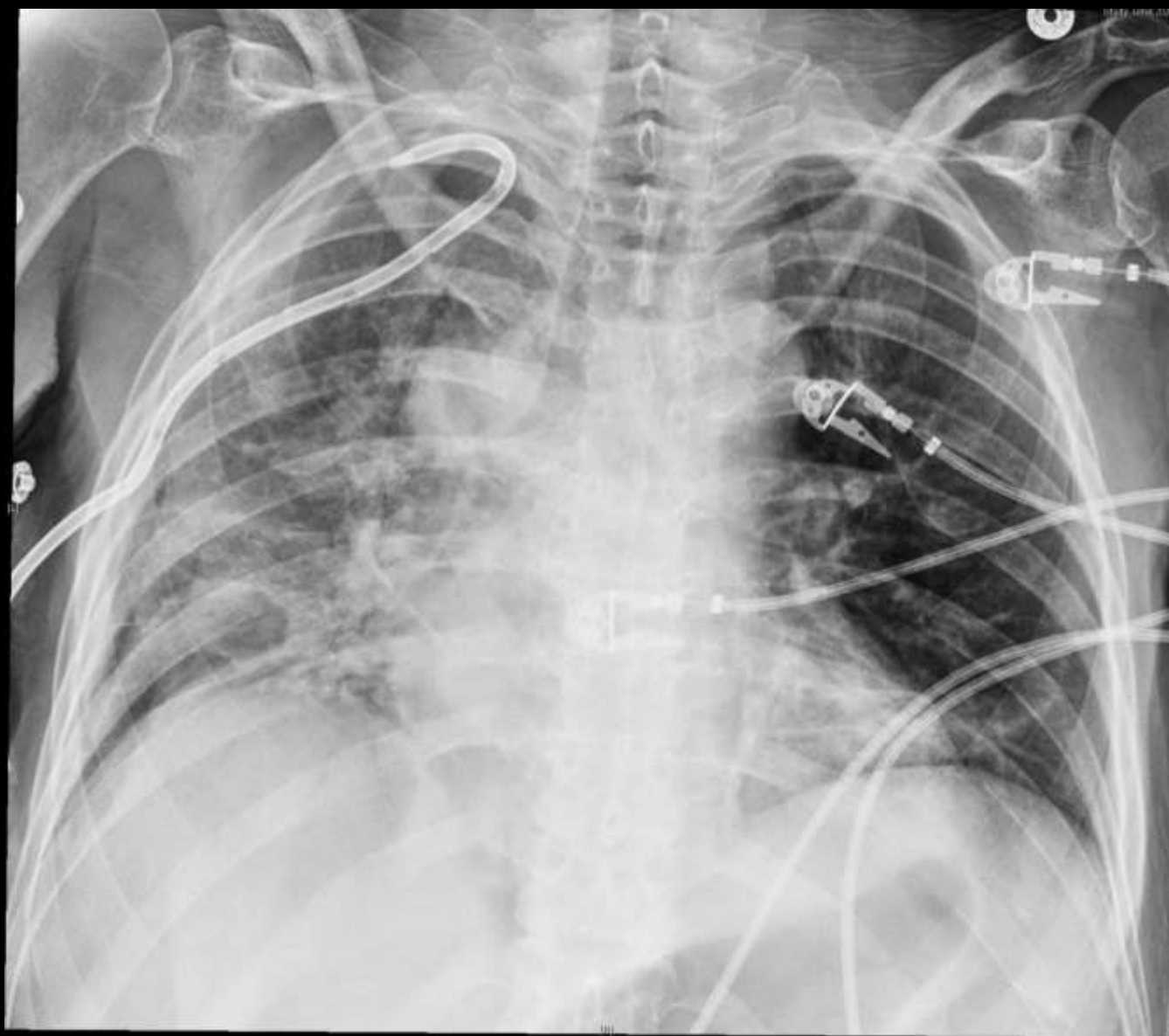
AP portable chest radiograph was obtained. Comparison is made with the chest CT from Medical and Surgical Specialists dated December 10, 2012 and a chest CT from this same date from Cottage hospital.

Now seen is a moderate sized right pneumothorax. I spoke with the patient's nurse, Liz, at 2255 hours and Liz told me she was aware of this finding. There are bilateral pleural fluid collections. There are bilateral pulmonary opacities, right greater than left. Heart is borderline in size. There is distention of bowel loops with air.

Impression- Moderate sized right pneumothorax. Bilateral pulmonary opacities. Pleural fluid collections.

CXR next day





DOS post op: What do you assess?





Did you see the pneumothorax?

History- Status post esophageal stent placement. Chest tubes. Check line placement.

AP portable chest radiograph was obtained and is compared with a prior study from June 30, 2013 at 1509 hours.

Now seen is an esophageal stent. There are new bilateral chest tubes. Endotracheal tube tip is in good position, 6.2 cm above the carina. Right subclavian line tip projects over the cavoatrial junction. Small subpulmonic pneumothorax on the right is seen. There is subsegmental atelectasis in both lower lungs and in the right mid lung. Residual contrast is seen in the fundus of the stomach.

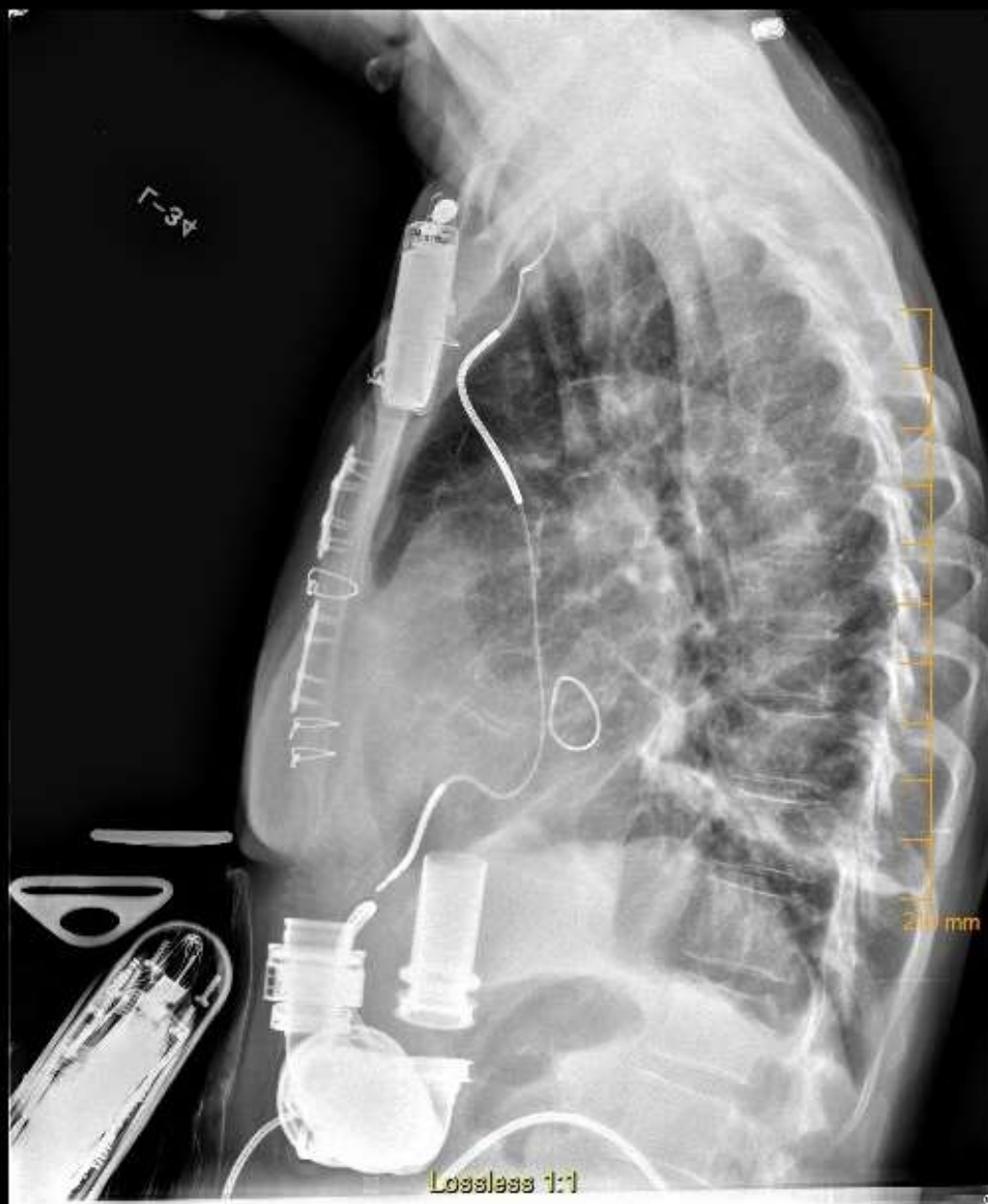
Impression- Postoperative changes. Status post esophageal stent placement. Additional two chest tubes are seen. Prior right chest tube noted. Central line tip is in good position projected over the right atrium.

What do you assess on POD # 1 CXR?



LVAD
VVI with
ICD





Femur Fracture from Fall



Quiz Time



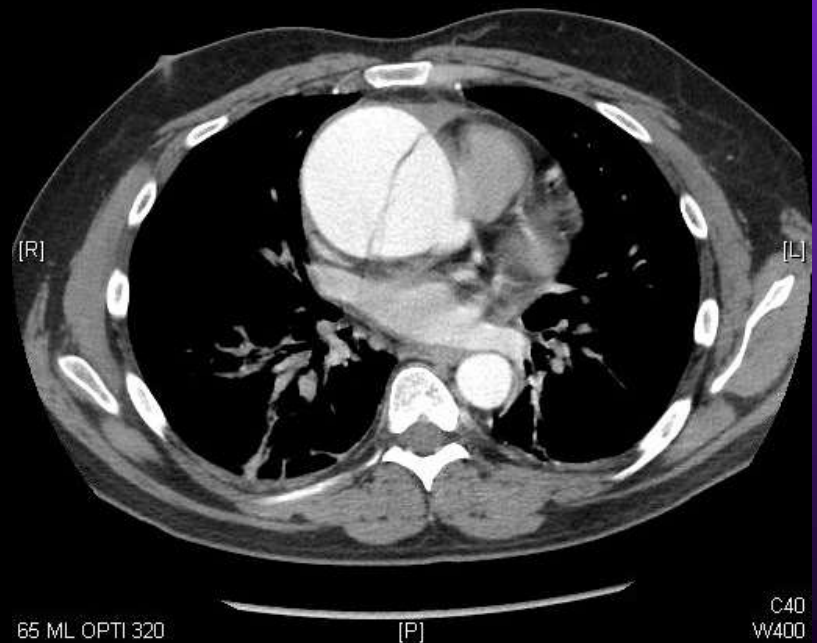
CXR #1



CXR # 1 Answer



- Thoracic Aneurysm
7.5 cm

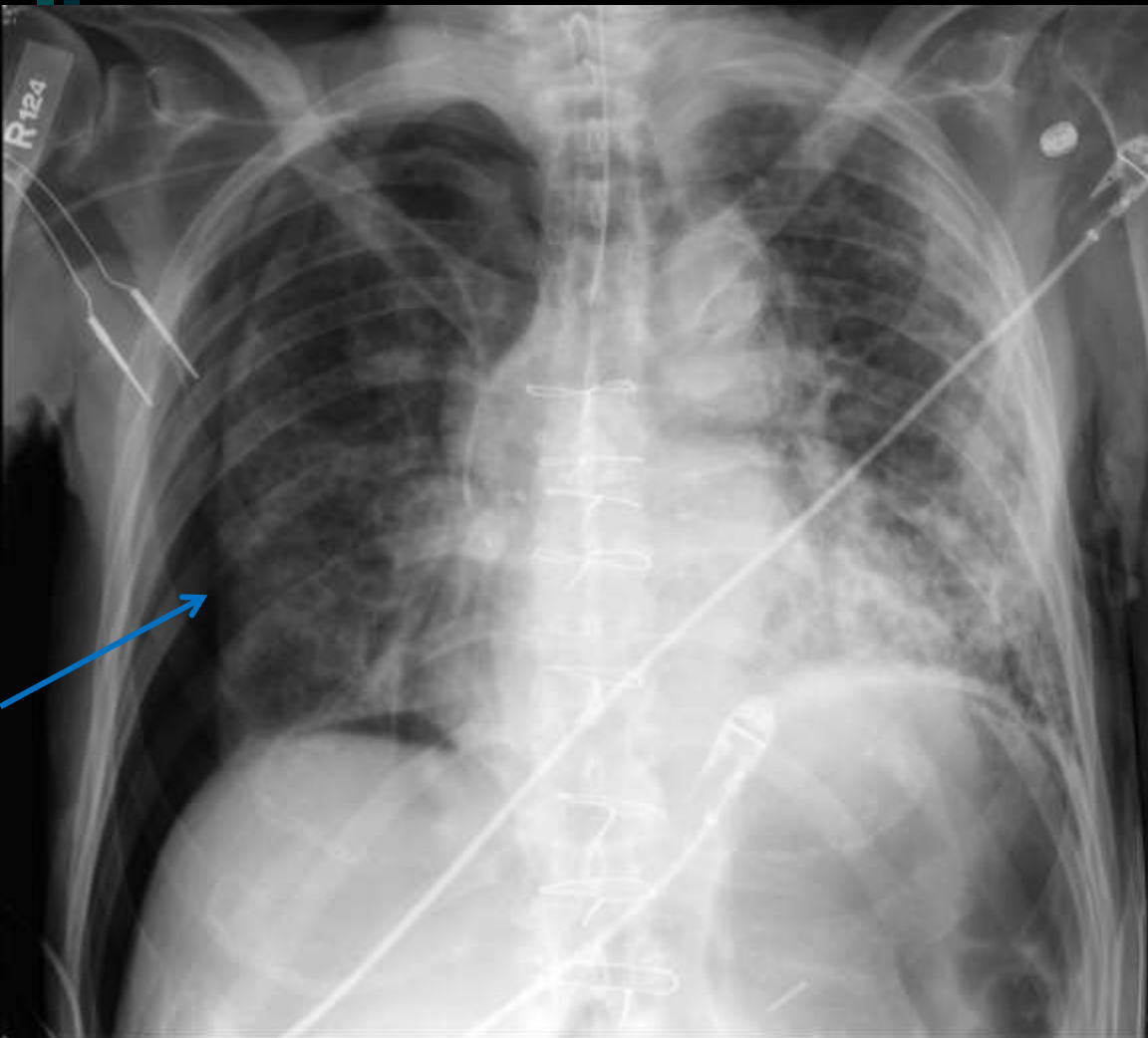


CXR # 2



- CXR for line placement of central line and ET tube

CXR # 2 Answer



- ET tube and central line in correct placement
- Right pneumothorax

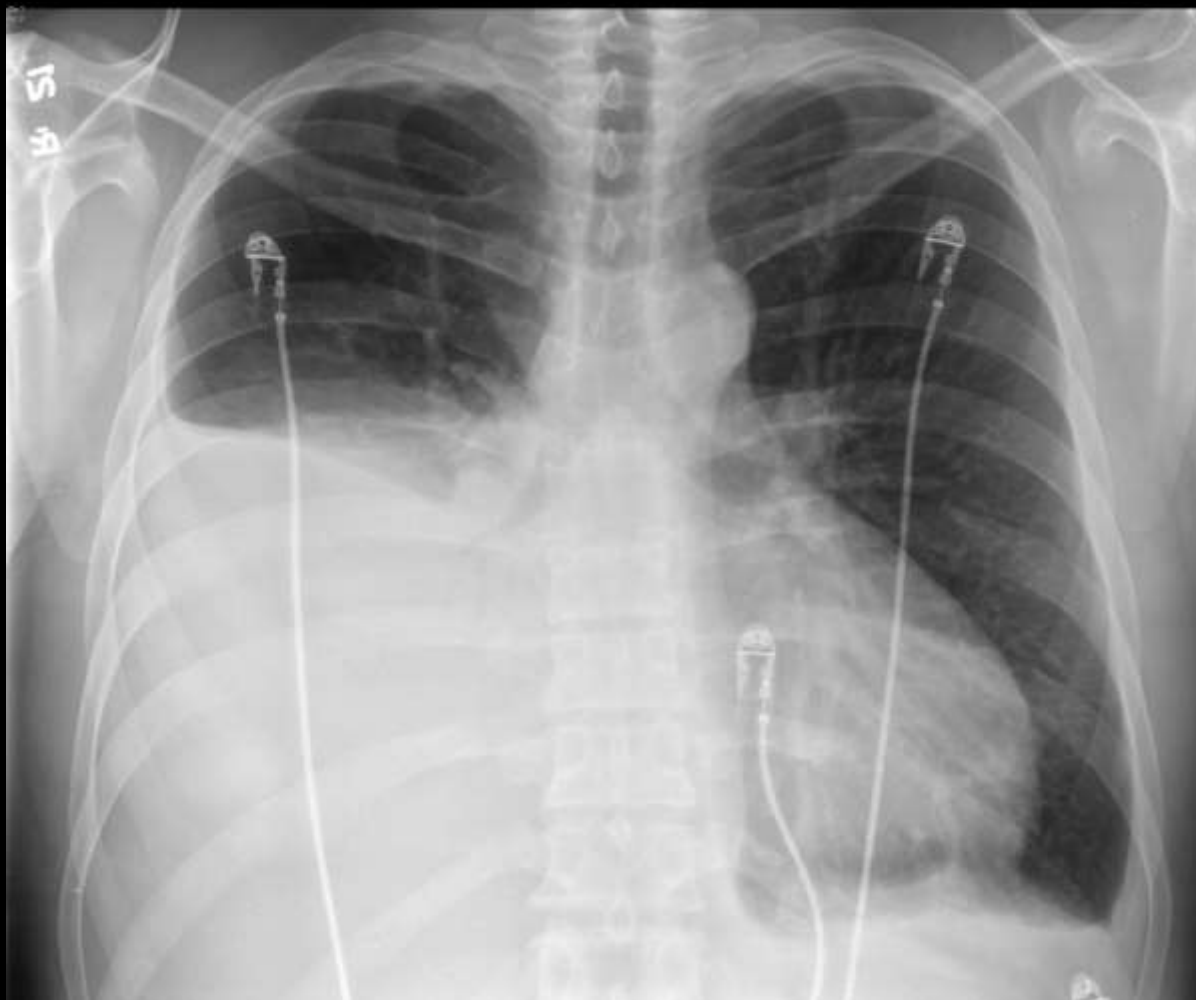
CXR # 3



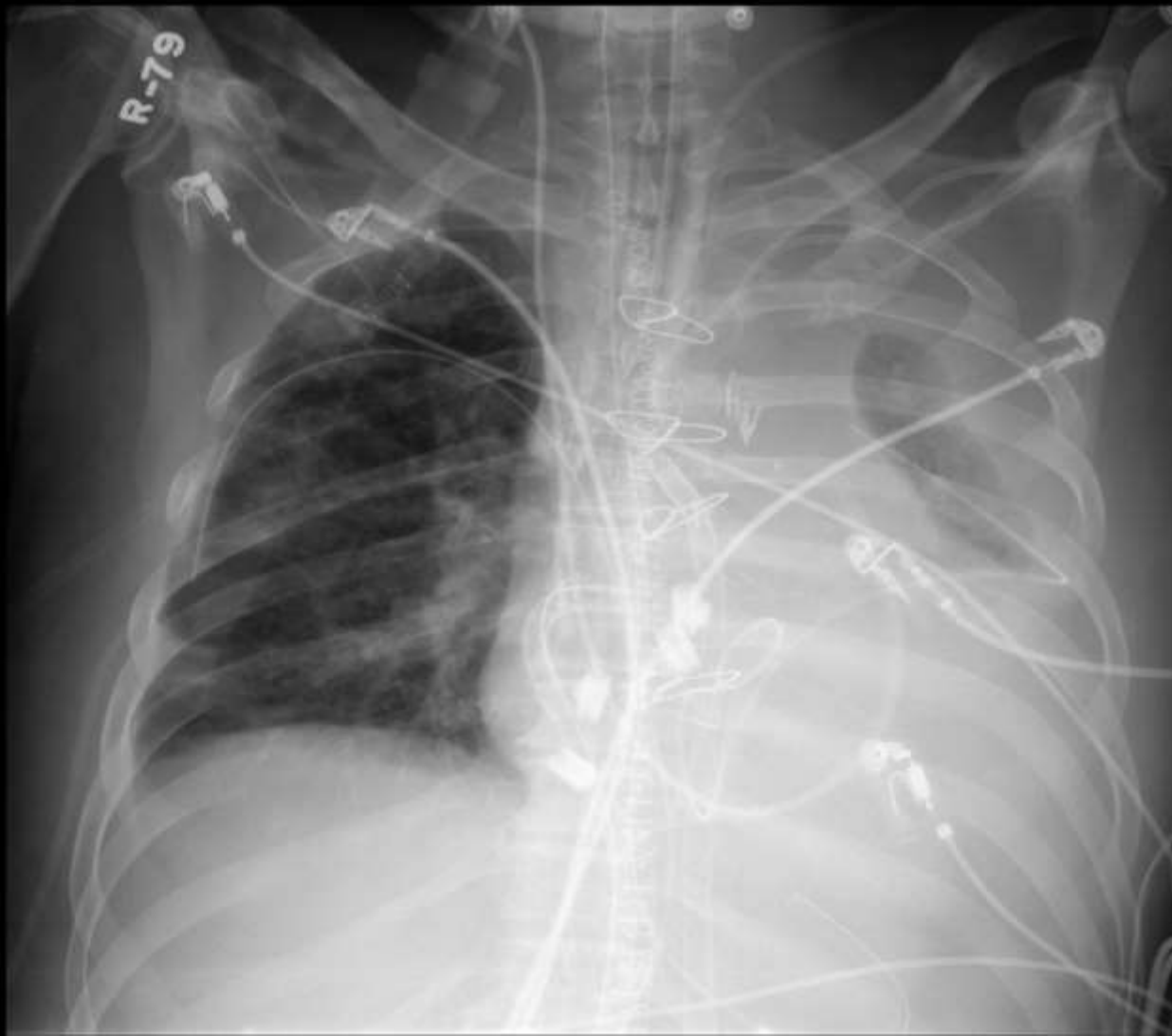
CXR# 4 Immediate post op CXR of abdominal surgery patient. ABGs show pO_2 59



CXR # 5



CXR #6 Post AVR patient on LVAD. Acutely becomes hypoxic



Same AVR patient post bronchoscopy



CXR #7

- 41 y/o comes to ED with SOB.
- 3 weeks post partum



CXR # 8



CXR #9

63 y/o white male (RK) comes to ED with SOB and left sided chest pain for the past hour

- Woke up “feeling weird and felt very SOB”
- The left sided chest pain, which does not radiate, started when the SOB started. The pain is mildly sharp and stabbing in quality.

- PMH

- COPD – wears continuous oxygen at home
- CHF
- AAA repair
- Hx PE
- PVD
- Idiopathic thrombocytopenia purpura
- Antiphospholipid antibody syndrome
- Recurrent small bowel syndrome

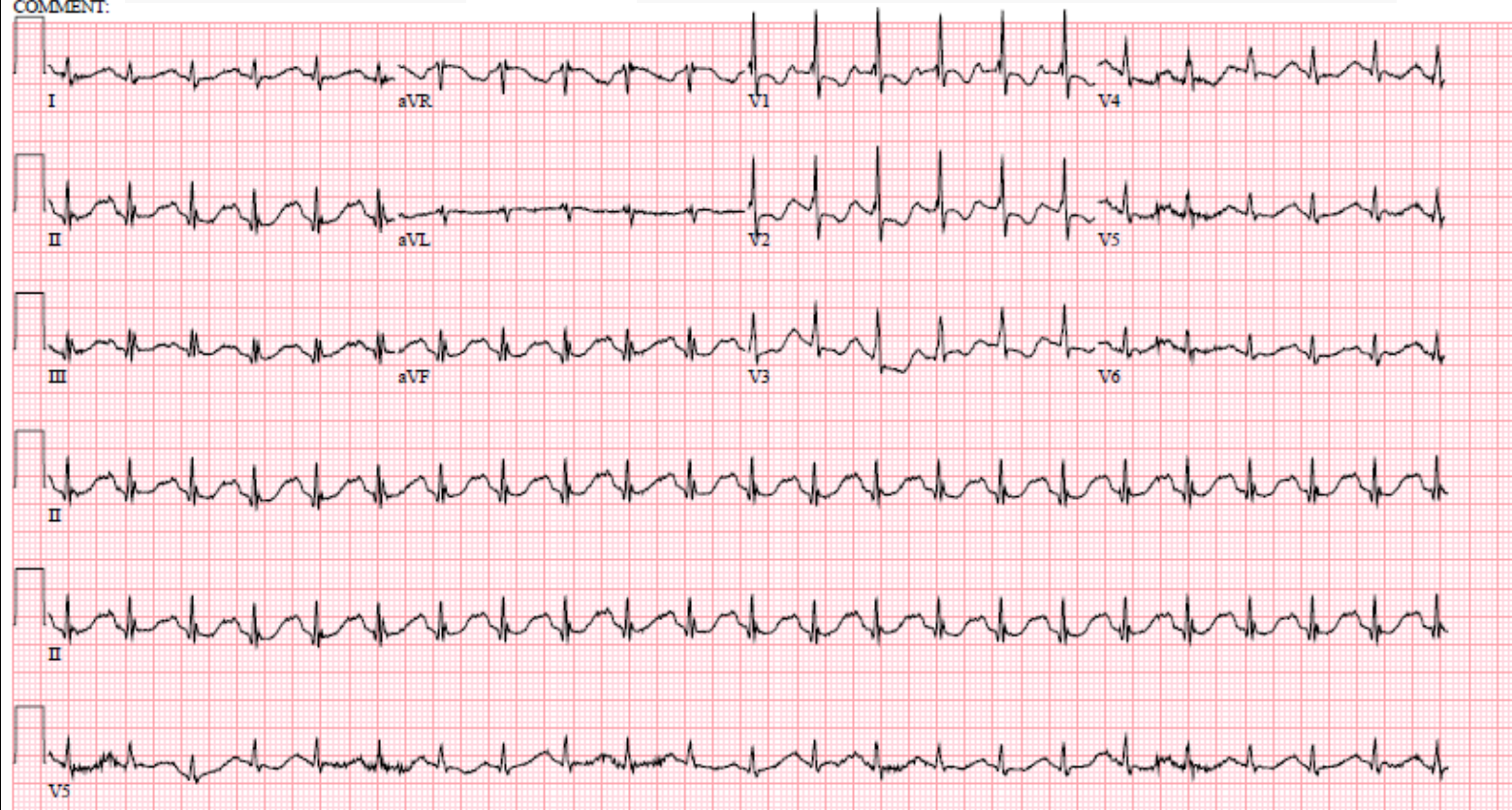
- BP 136/77
- HR 134, regular
- RR 32
- Temp 97 oral
- SpO2 91% on 15 liters nonrebreather
- Pain 7/10

RK 12- 2 at 2200

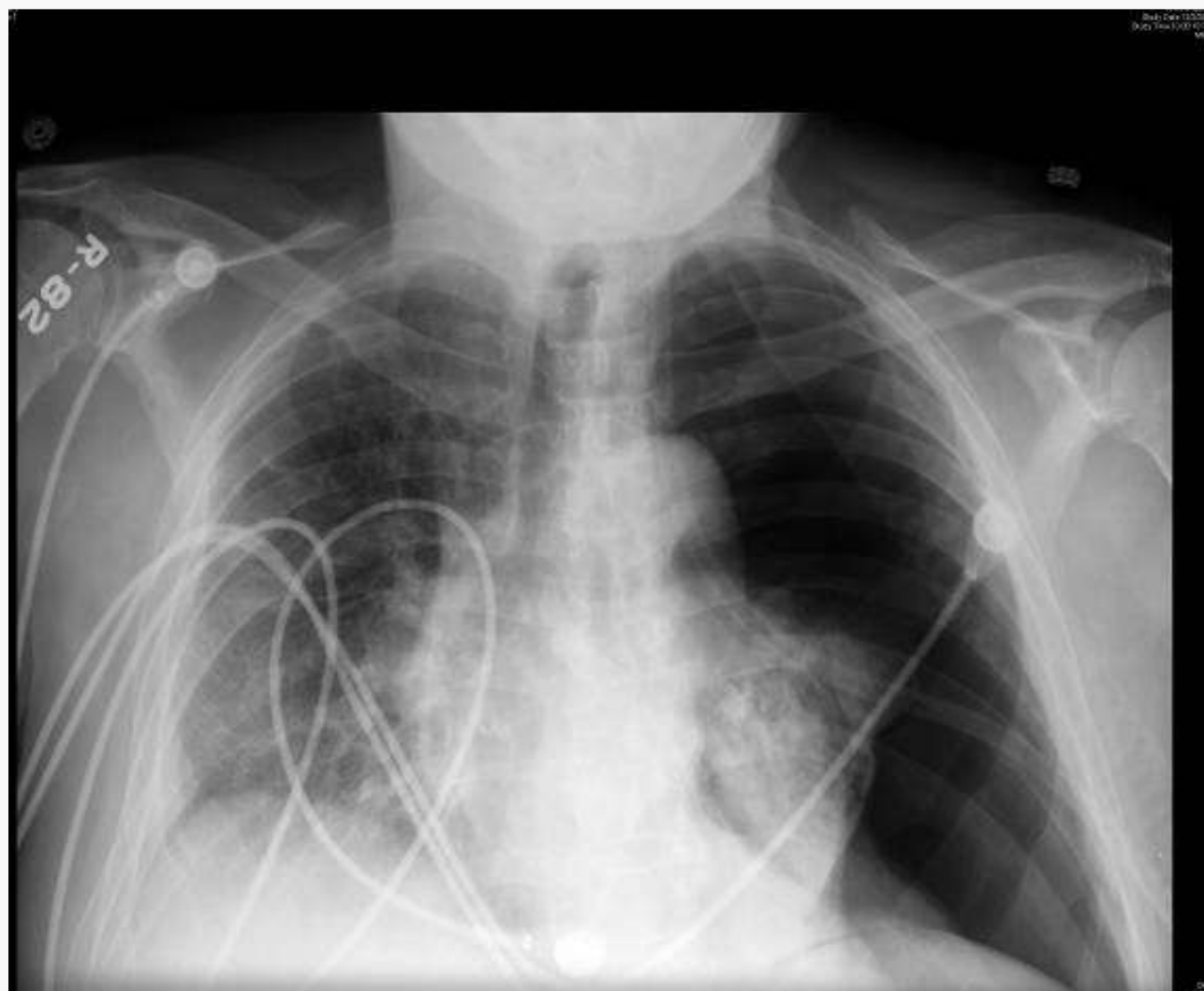
12-FEB-1946 (63 yr)
Male Caucasian
92in
Room: C615
Loc: 2

Vent. rate	135	BPM
PR interval	*	ms
QRS duration	88	ms
QT/QTc	382/573	ms
P-R-T axes	* 69	69

COMMENT:



RK 12-2 in ED



Spontaneous pneumothorax on 12 – 2 CT scan view post chest tube insertion



- BP 101/65
- HR 113, regular
- RR 20
- SpO2 100% on 15 liters nonrebreather
- Pain 2/10

Case # 10

52 y/o white male presents to MD office

- c/o SOB with exertion and cough for past month
- Cough productive two weeks ago – nonproductive now.
- Afebrile now. Reports fever two weeks ago
- Denies chest pain
- Crackles bilaterally. Diminished on right lower lobe
- PMH
 - Borderline hypertension
 - Does not smoke

1-12



Case # 11

43 y/o white female presents to ED with chest pain

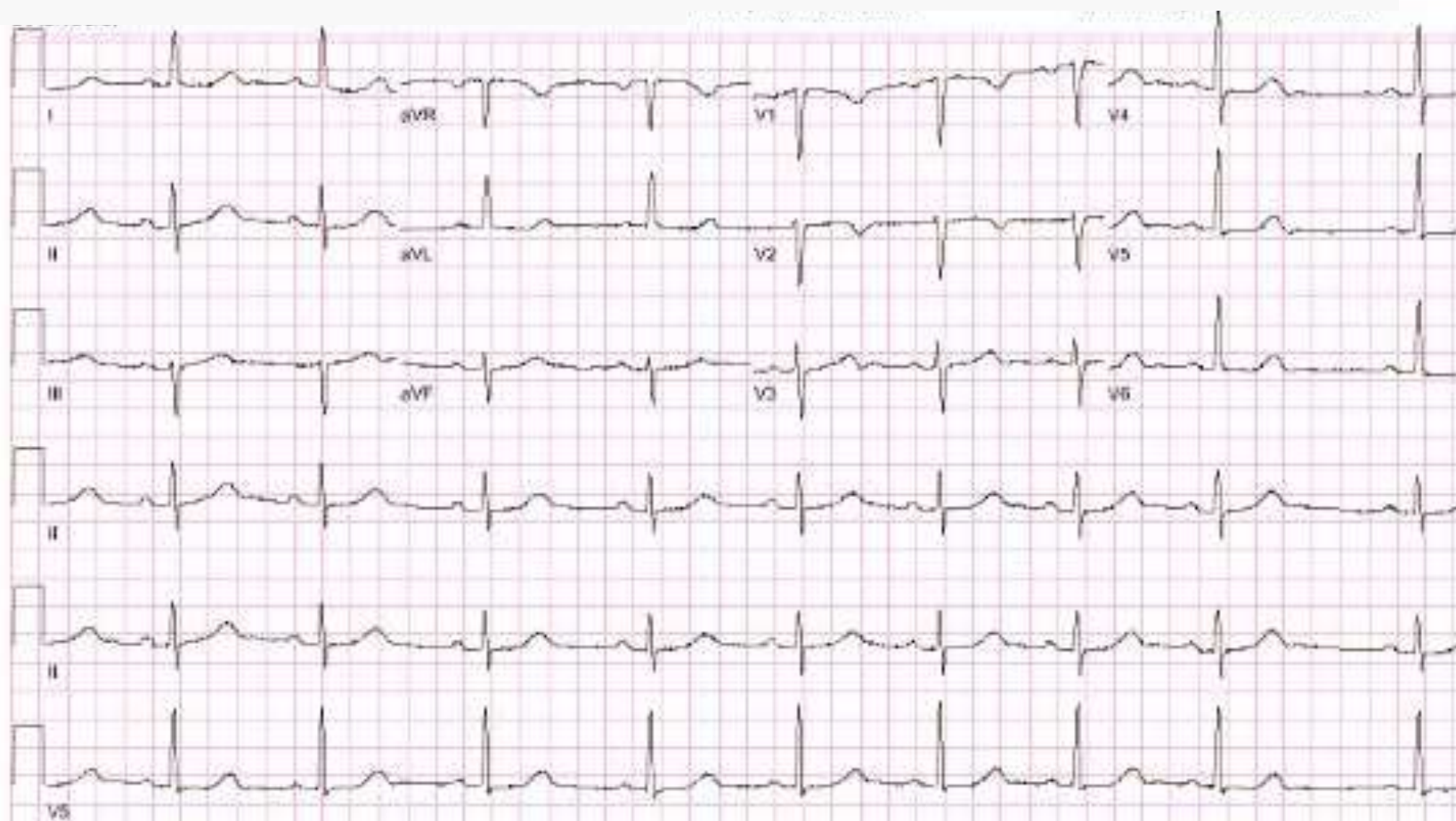
- Chest discomfort that radiated up into her neck and jaw.
- Very tight discomfort in her upper chest.
- Patient thought this was strange as she had just used her inhaler.
- Chest tightness and squeezing intensified and worsened with deep breaths.
- Was not particularly SOB and able to take deep breaths.

- BP 214/81. HR 55, RR 18, T 98
- Potassium 3.1
- Hemoglobin 9.7
- Troponin o.o2
- BNP 36

Heart rate 55 BPM
PR interval 206 ms
QRS duration 96 ms
QT/QTc 548/524 ms
P-R-T axes 47° -18° 62°

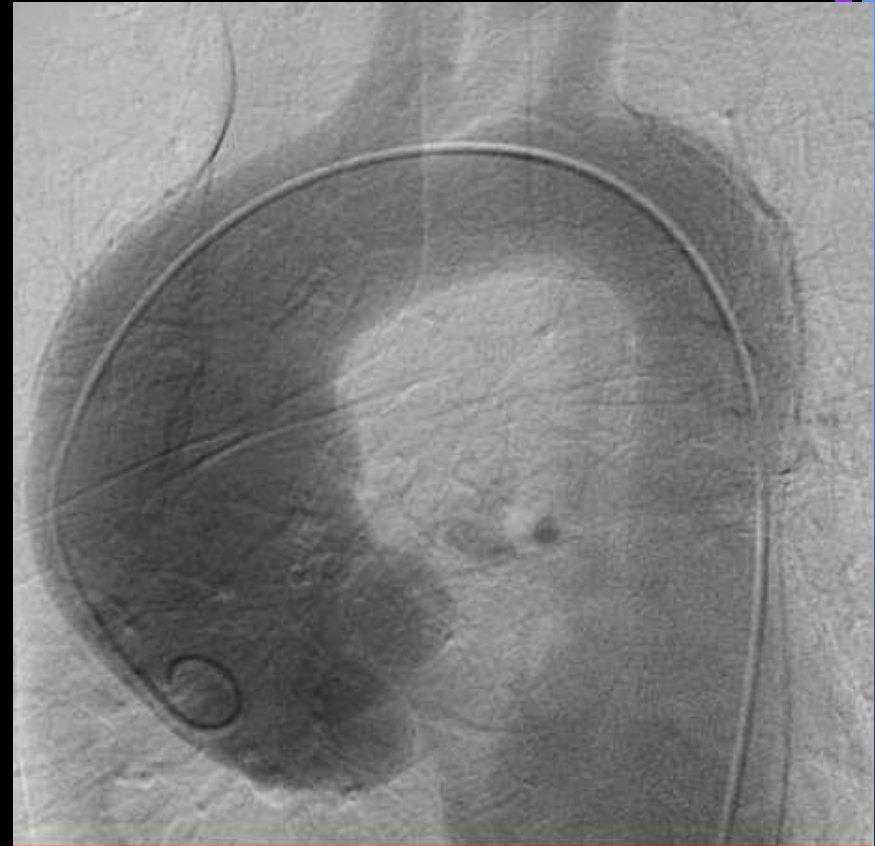
12-lead ECG (leads I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6)

ECG (leads I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6)





Thoracic Type A Aneurysm



Case #12: 85 y/o female presents to ED post ground level fall

- Was up in the middle of the night, lost her balance while walking to the bathroom
- Fell backwards into a wooden table
- Struck the right lower side of her back and experienced severe pain
- Unable to stand and had to call for help
- Pain was excruciating
- Denies any preceding symptoms of dizziness, lightheadedness, chest pain, or vomiting

Admission Vitals/Assessment

- BP 175/85, HR 84, irregular, RR 16, T 98
- SpO₂ 95 % on room air
- H & H 11/37
- Clear lung sounds, diminished in bases, No Wheezes
- MAE x 4 – with difficulty in right upper extremity
- Alert/ Oriented. Neuro assessment intact
- C/o SOB and severe pleuritic pain 7/10
- Can't move around in bed without aggravating the pain in her right side of chest
- Given Fentanyl

PMH

- Atrial Fibrillation – currently on Xarelto
- Asthma
- Vertigo
- Hypertension
- Anxiety
- Spine surgery
- Hip fracture surgery
- Colectomy

Admission CXR



What do you see?

1. Pleural effusion
2. Cardiomyopathy
3. Normal
4. Other

Admission CXR



- Acute rib fractures involving the right lateral and posterior 5th, 6th, 7th, 8th, 9th ribs with mild distraction at several of the rib fractures
- Small right pleural effusion and atelectasis

Diagnosis & Treatment

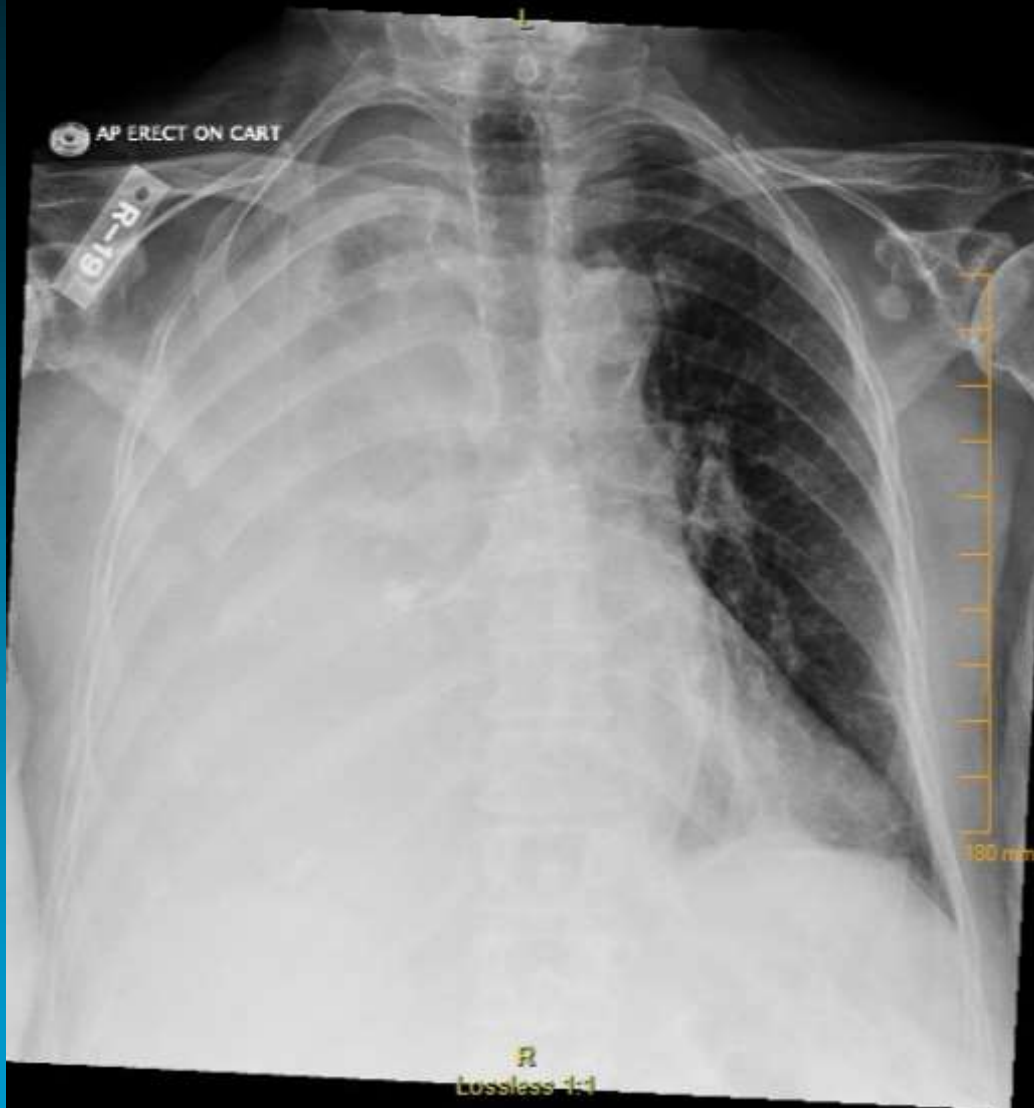
- Multiple right sided rib fractures
 - Low dose fentanyl patch and lidocaine patch to right side
- Acute hypoxemia failure – secondary to rib fractures
 - Incentive spirometer, oxygen 2 liters
- Atrial Fib – continue Xarelto
- DVT prophylaxis
 - Lovenox

Event progression

- 2000 (12 hours after admission)
 - SpO₂ 92% on 2 liters
- 2100
 - Acute SOB and increased pain on right side
 - Oxygen ↑ to 4 liters, SpO₂ 90%
- 2400
 - Became very SOB and pain with position change SpO₂ 90%
- 0800
 - SpO₂ 93% on 4 liters
 - BP 108/55, HR 89, RR 18, T 98
 - H & H = 8.7/28.2 from 11/37
 - Diminished lung sounds on right
 - CXR ordered

24 hours later

- 1200
 - Overnight has become more SOB
 - Oxygen ↑ from 4 liters to 6 liters SpO2 91%
 - Feels she “cannot take a deep breathe”
 - Diminished lung sounds on right
 - Cannot lie flat



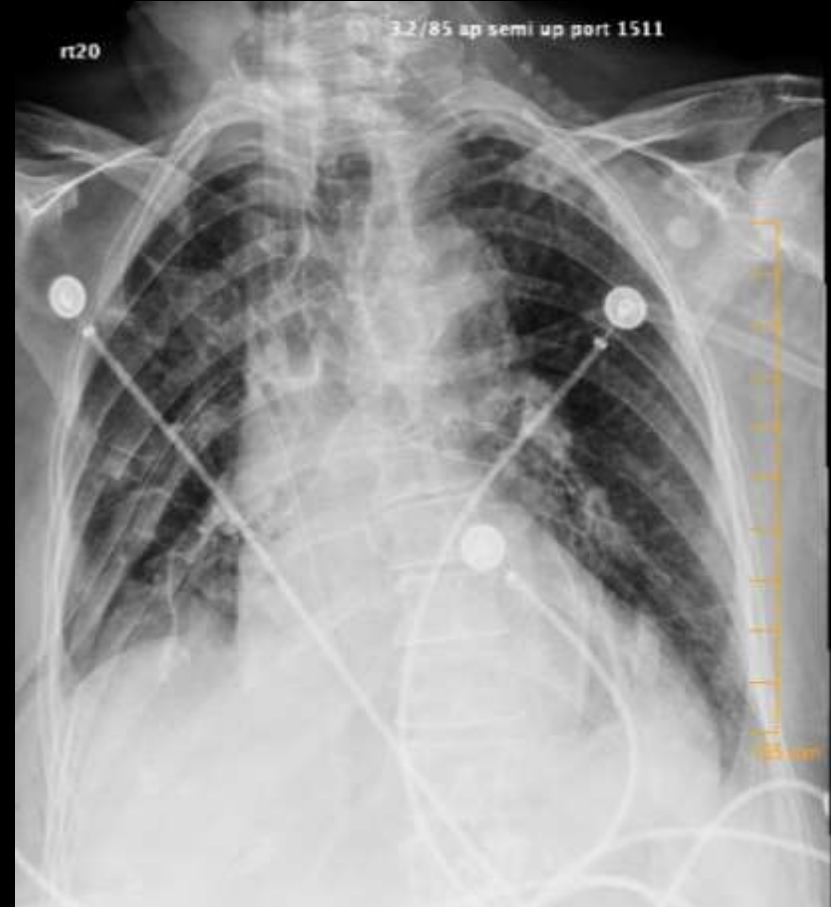
- Complete opacification of the right chest secondary to a right pleural effusion

1500 ml drained immediately, then another 300 ml

CXR after CT inserted



CXR 1 hour after CT inserted



In Summary....

As Easy as Black & White

- Black = Air
 - Pneumothorax
- White = Fluid or dense structures
 - Pleural effusion
 - Pneumonia
 - ARDS
 - Pulmonary edema
 - Tumor