Cardiac Radiography

Jared D. Christensen, M.D.

Duke Radiology

CARDIAC RADIOGRAPHY

Jared D. Christensen, M.D.

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Overview

- Basic Concepts
- Technique
- Normal anatomy
- Cases

Technique

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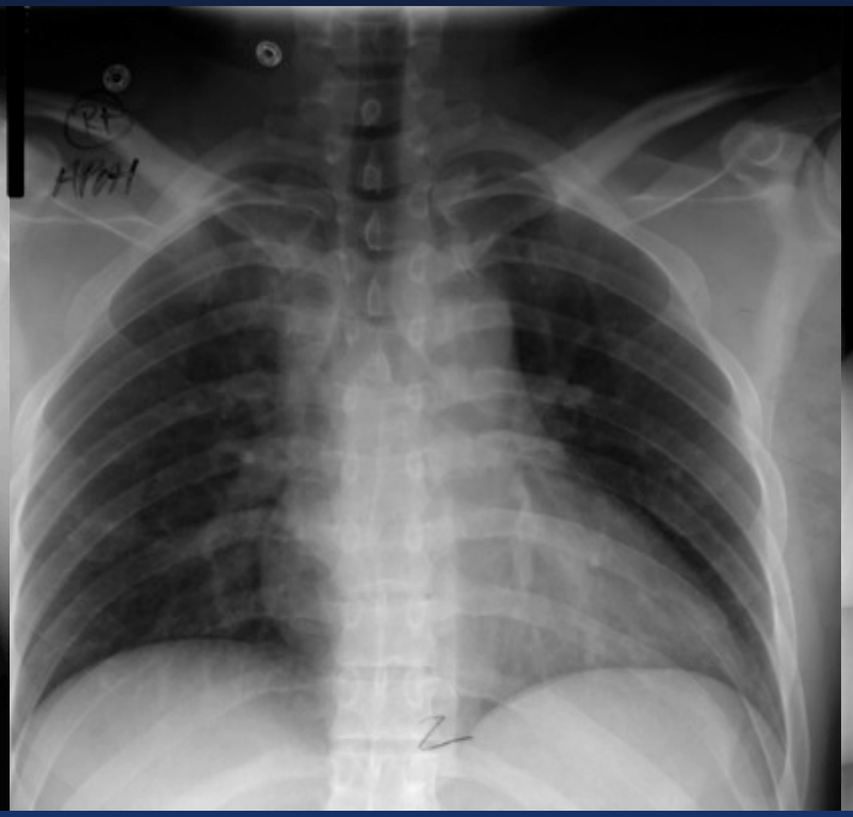
3 Standard Views

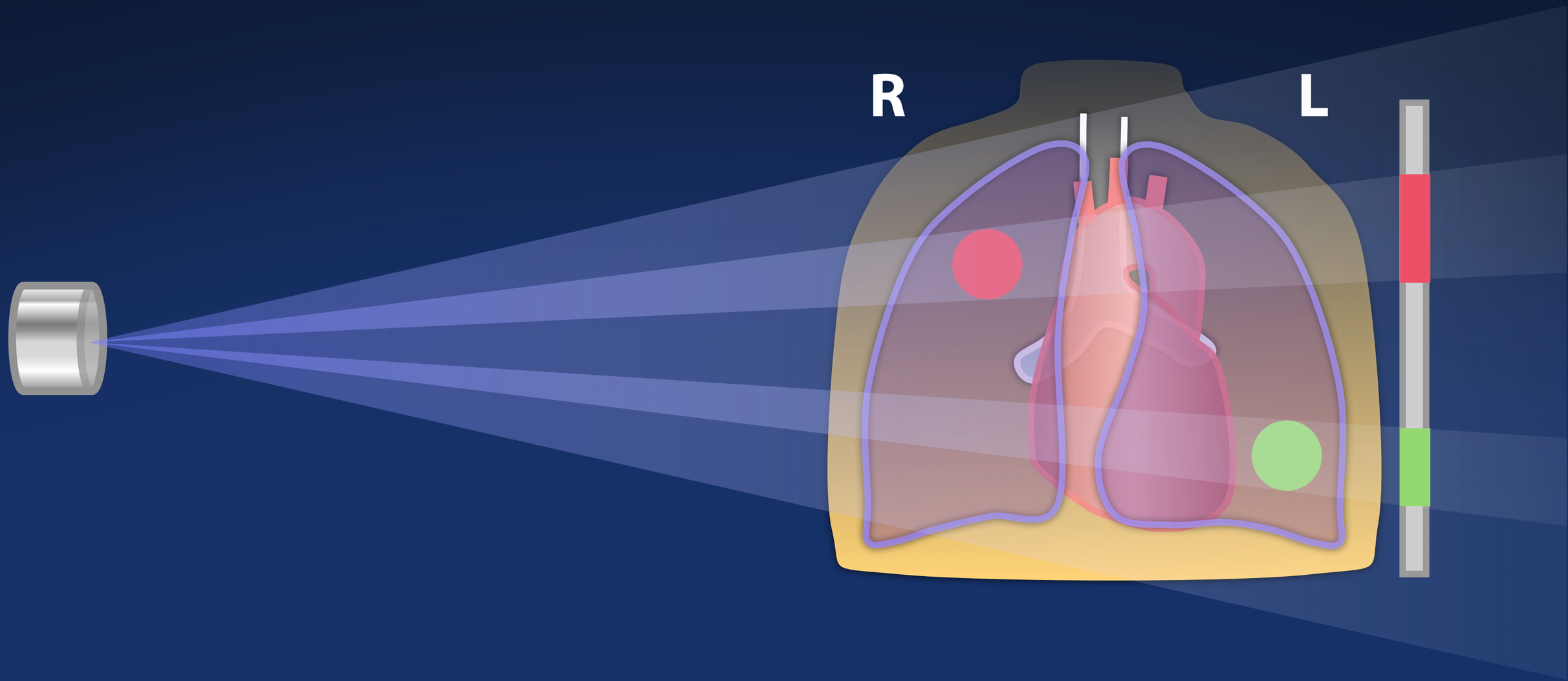
Posterior-Anterior (PA)

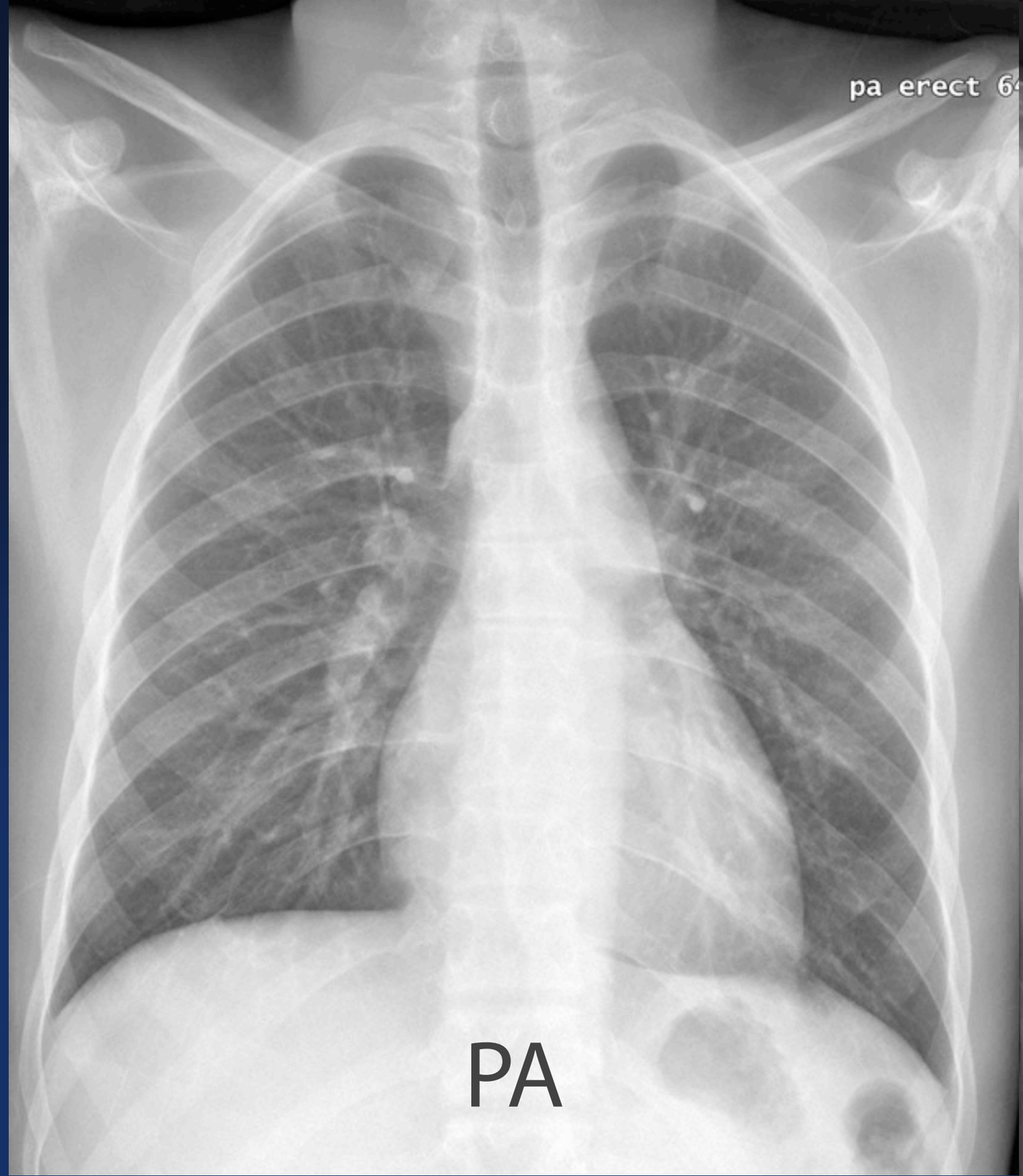


Anterior-Posterior (AP)

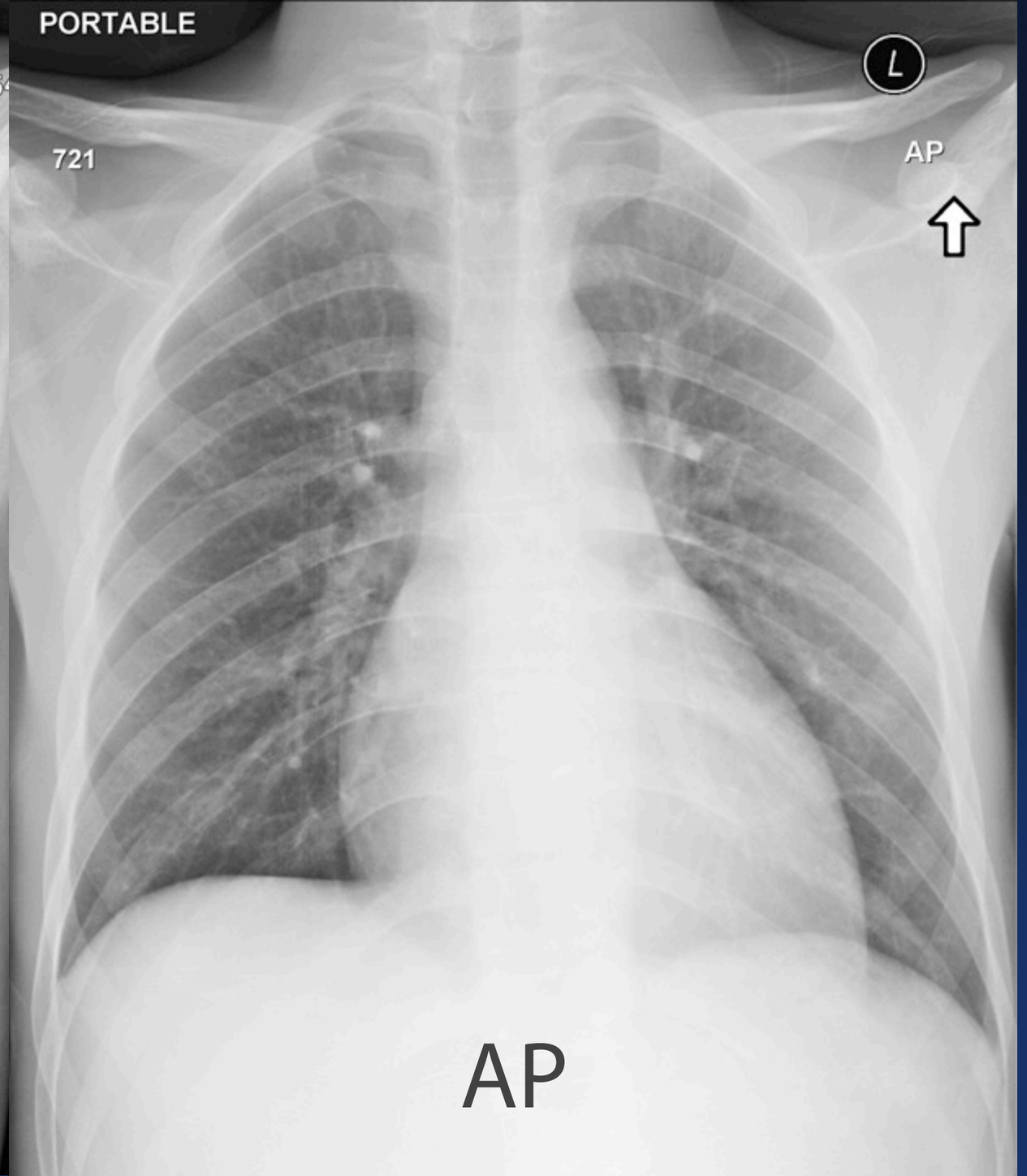
Lateral

Magnification





PA



AP

Cardiac Anatomy

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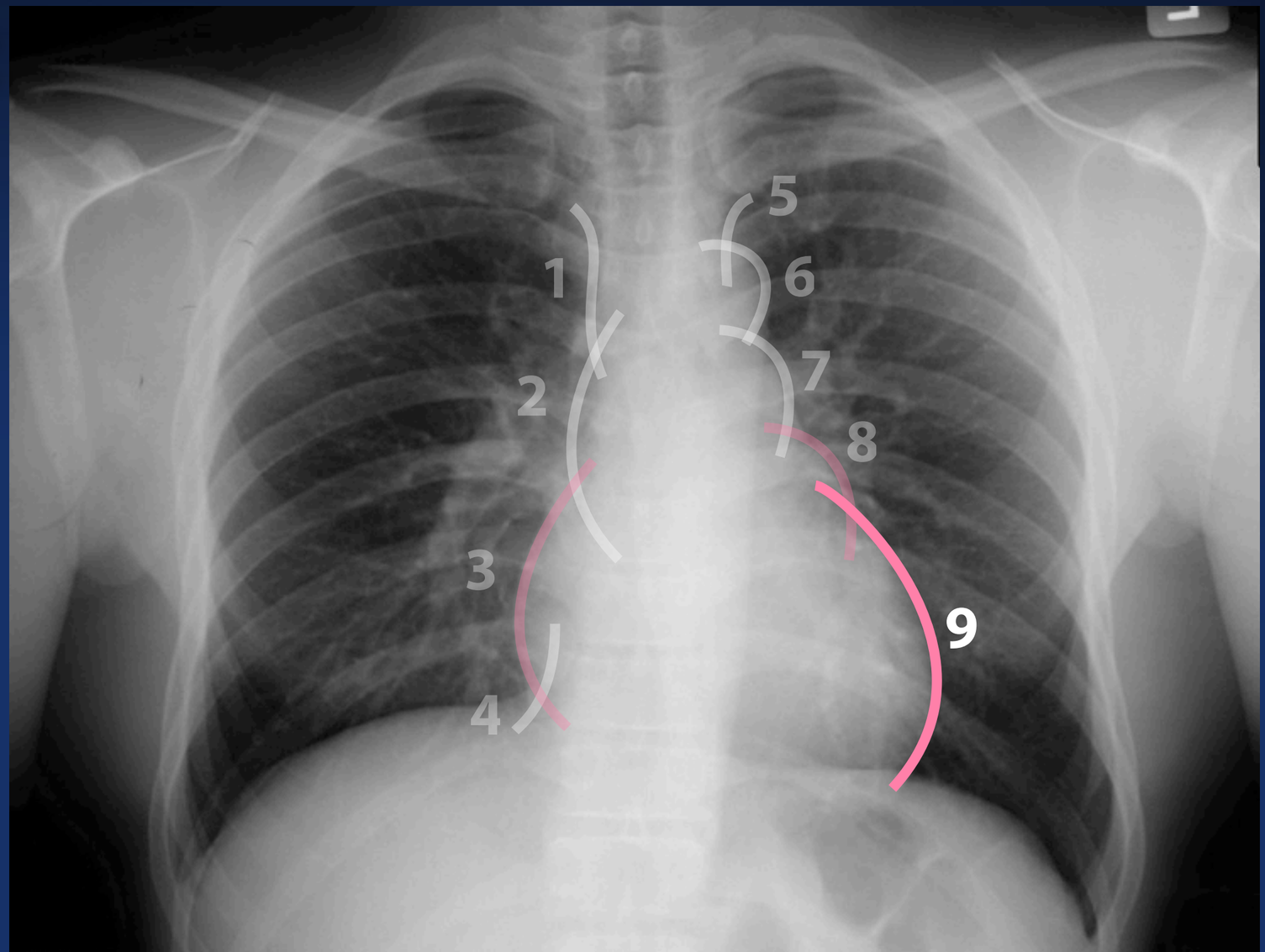
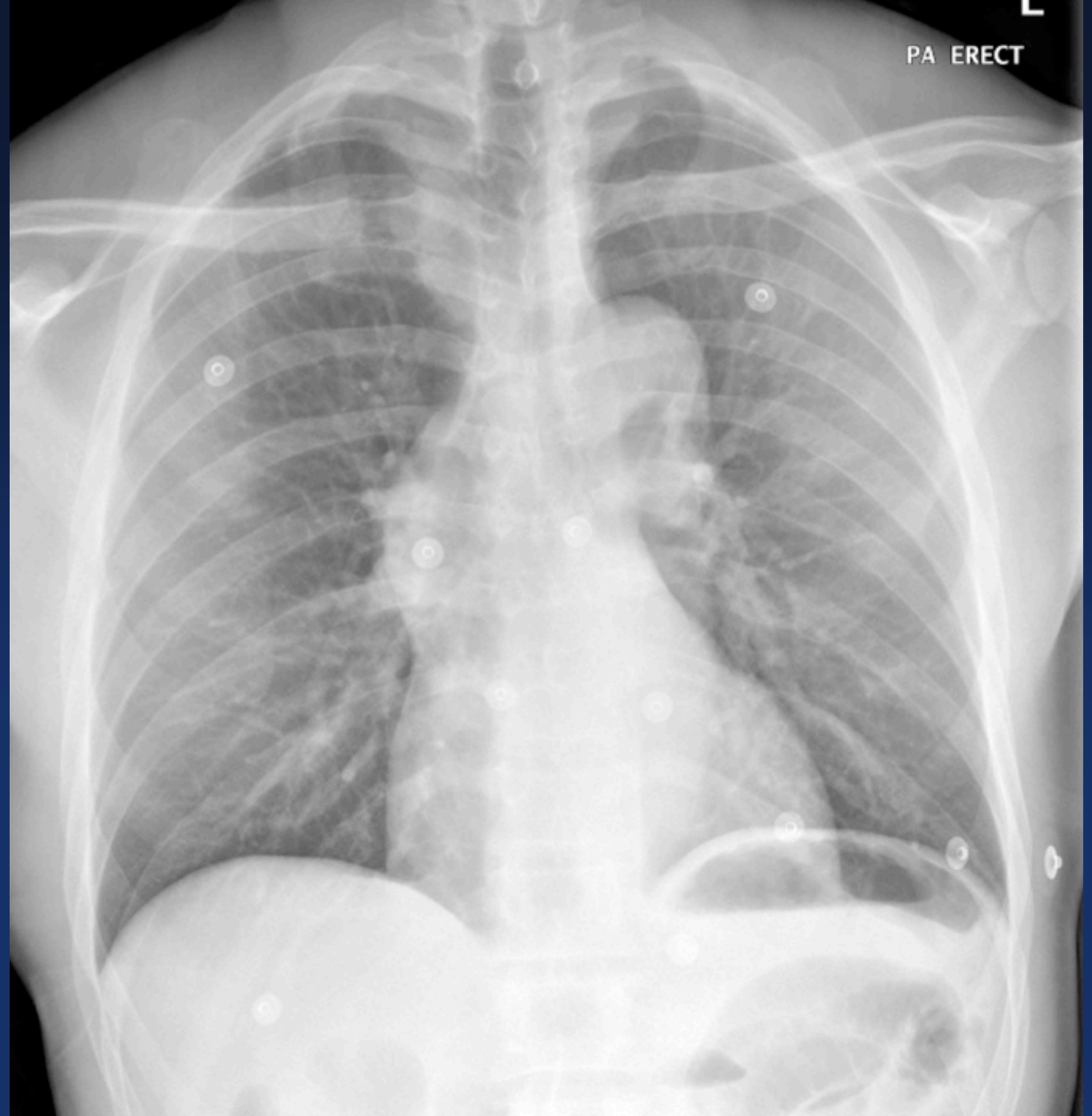
Cardiac Anatomy

1. R brachiocephalic v./ SVC
2. Ascending Aorta
3. R atrium
4. IVC
5. L brachiocephalic v./ L subclavian a.
6. Aortic arch
7. Main pulmonary a.
8. L atrial appendage
9. L ventricle



23-year old male with acute chest pain


L
PA ERECT

Where is the abnormality?

D. It's normal

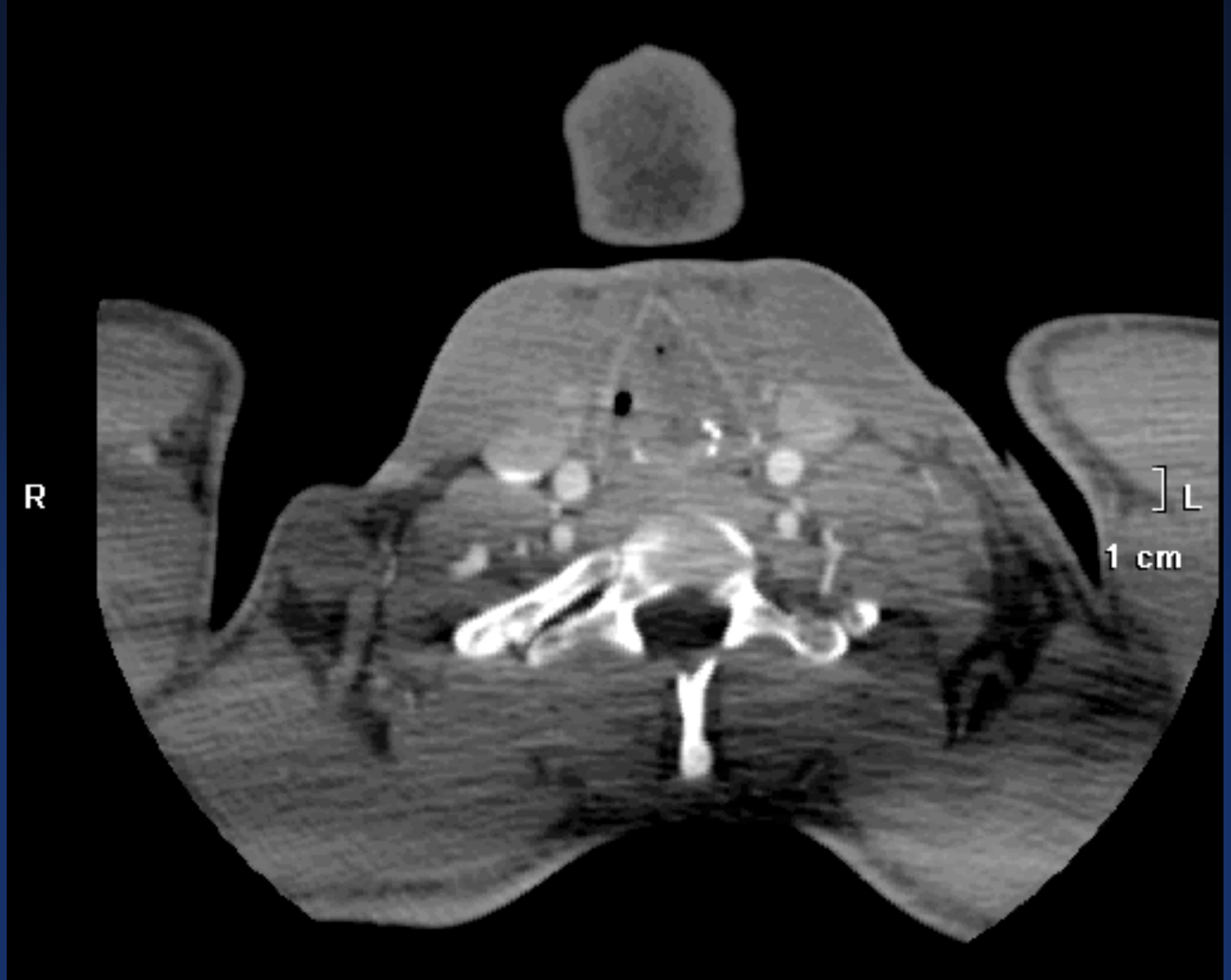
Where is the abnormality?

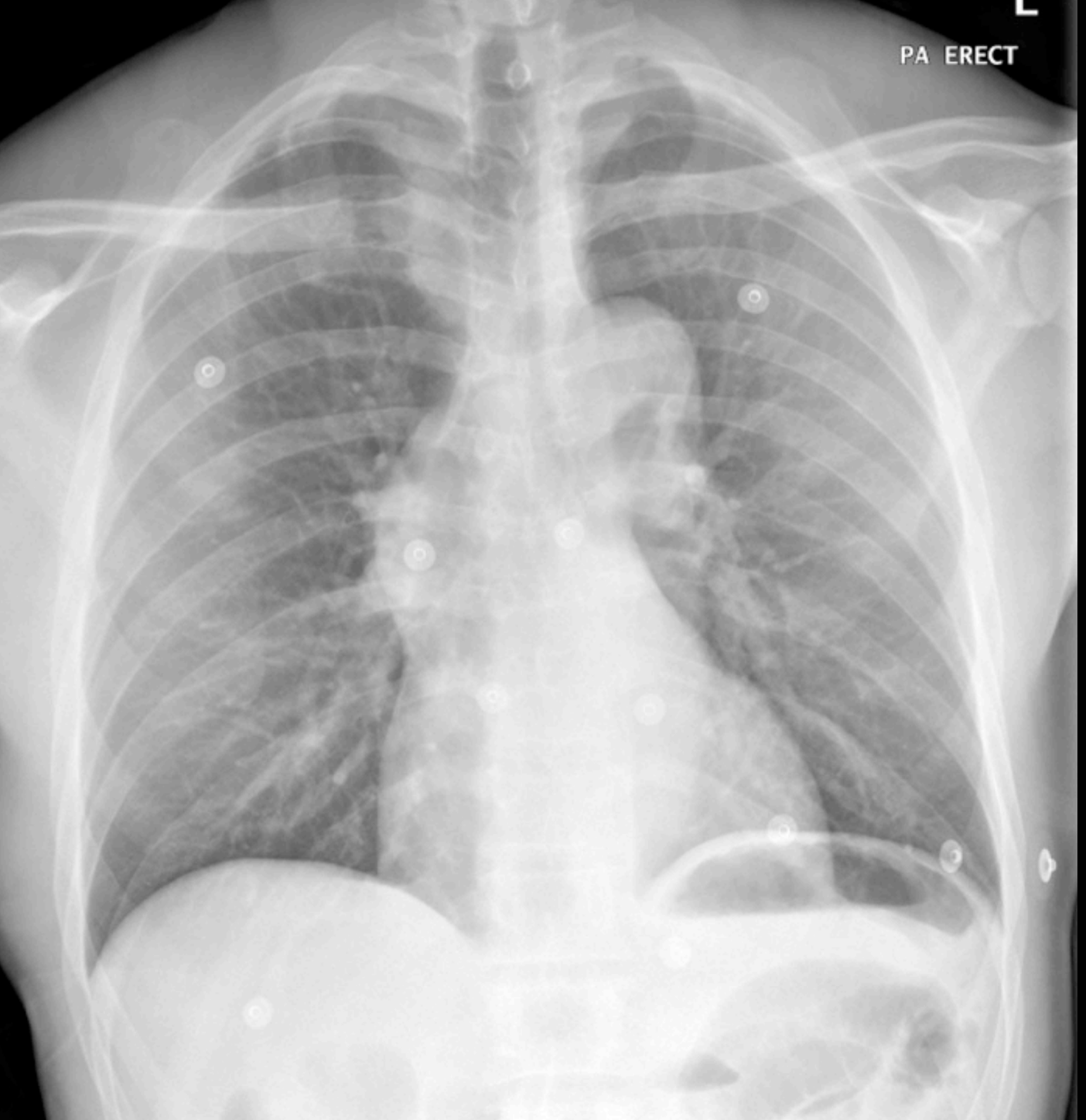
D. It's normal

Where is the abnormality?

What is the most likely diagnosis?

A. Mediastinal mass
B. Aortic dissection
C. Pulmonary embolism
D. Lymphadenopathy


R
L
1 cm


L
PA ERECT


S

Aortic Dissection - Marfan Syndrome

Chambers

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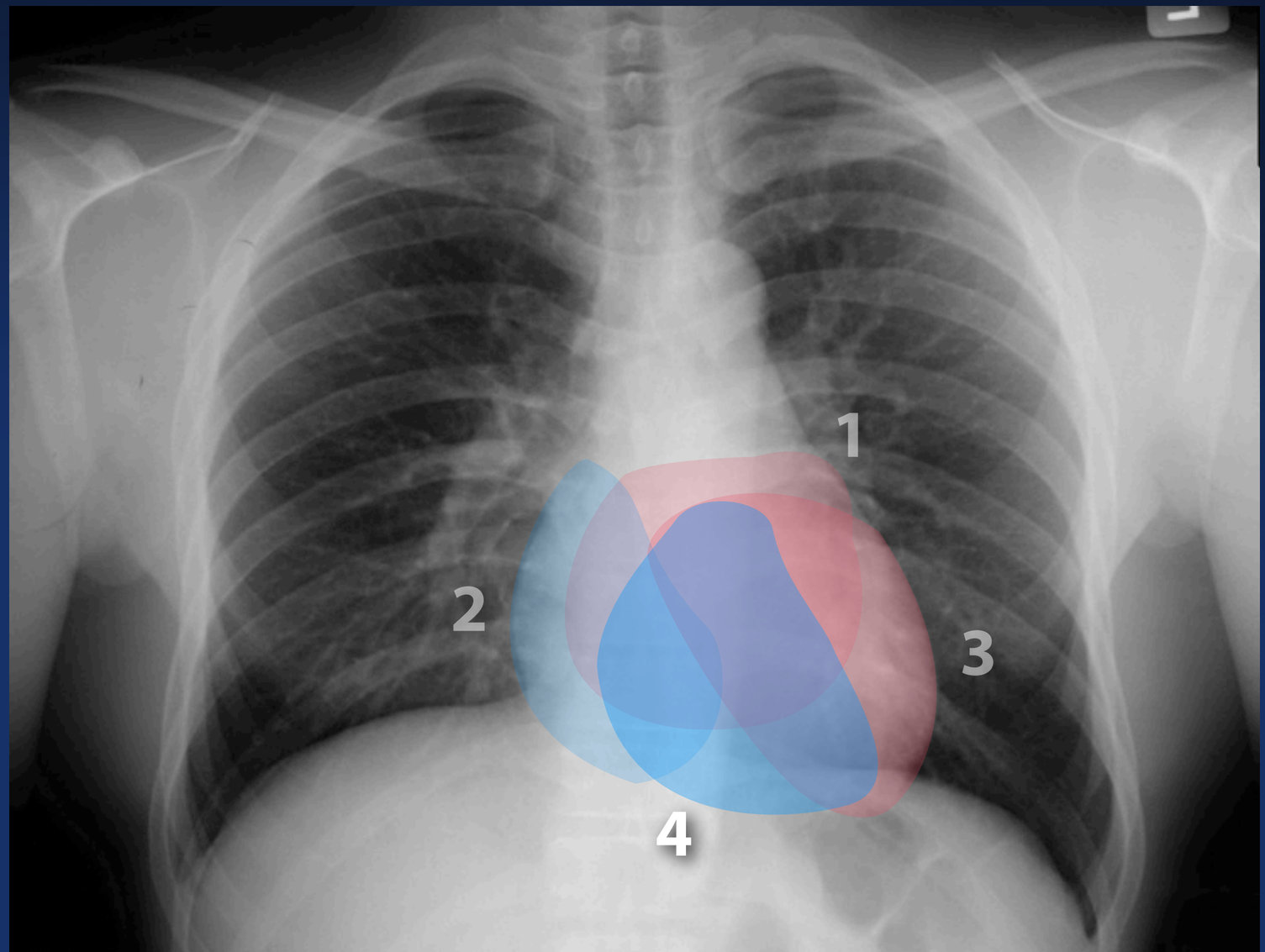
Cardiac Chambers

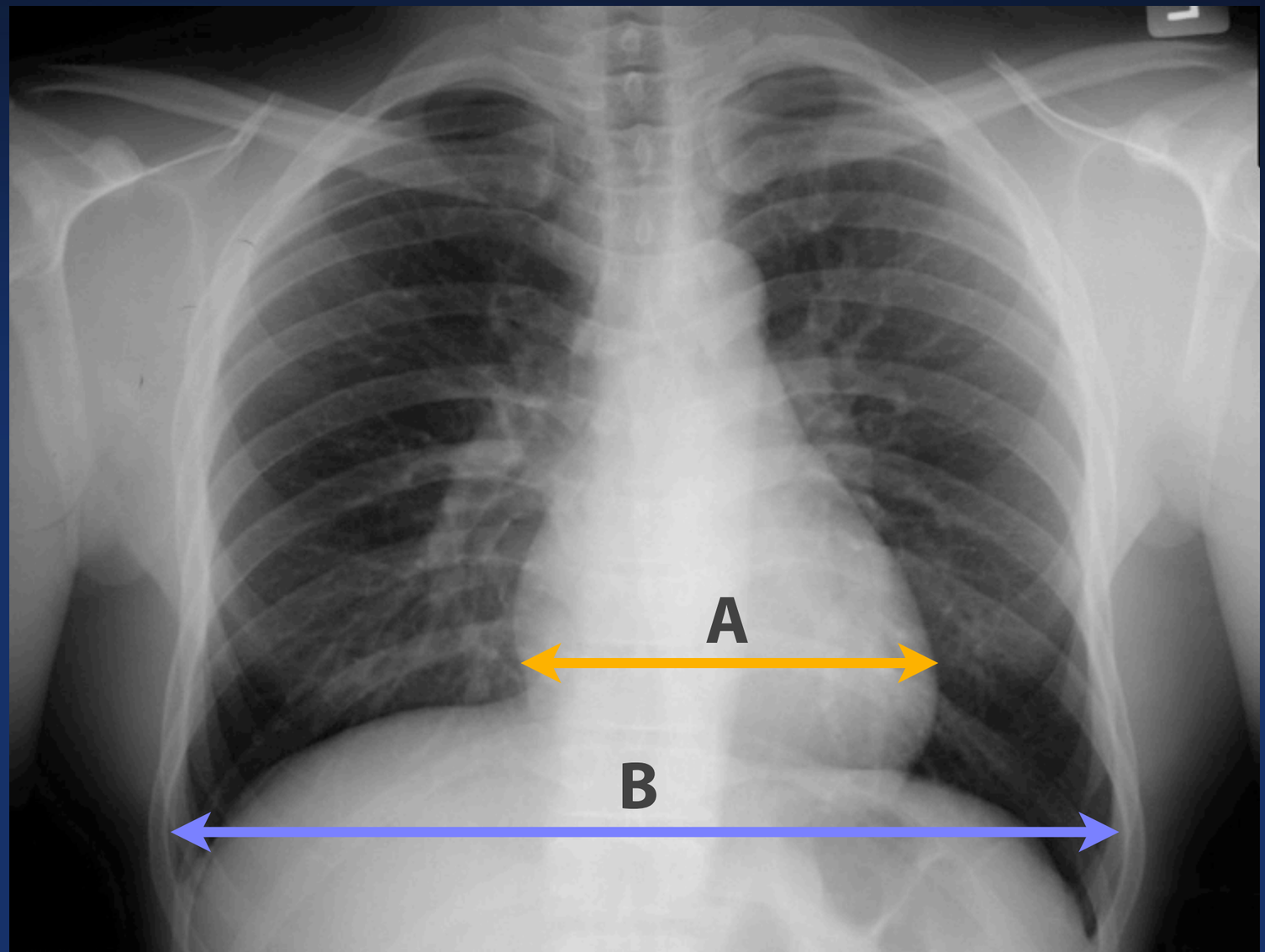
1. L Atrium
2. R Atrium
3. L Ventricle
4. R Ventricle



Heart Size

- Cardiac Index:

$$\frac{A}{B}$$

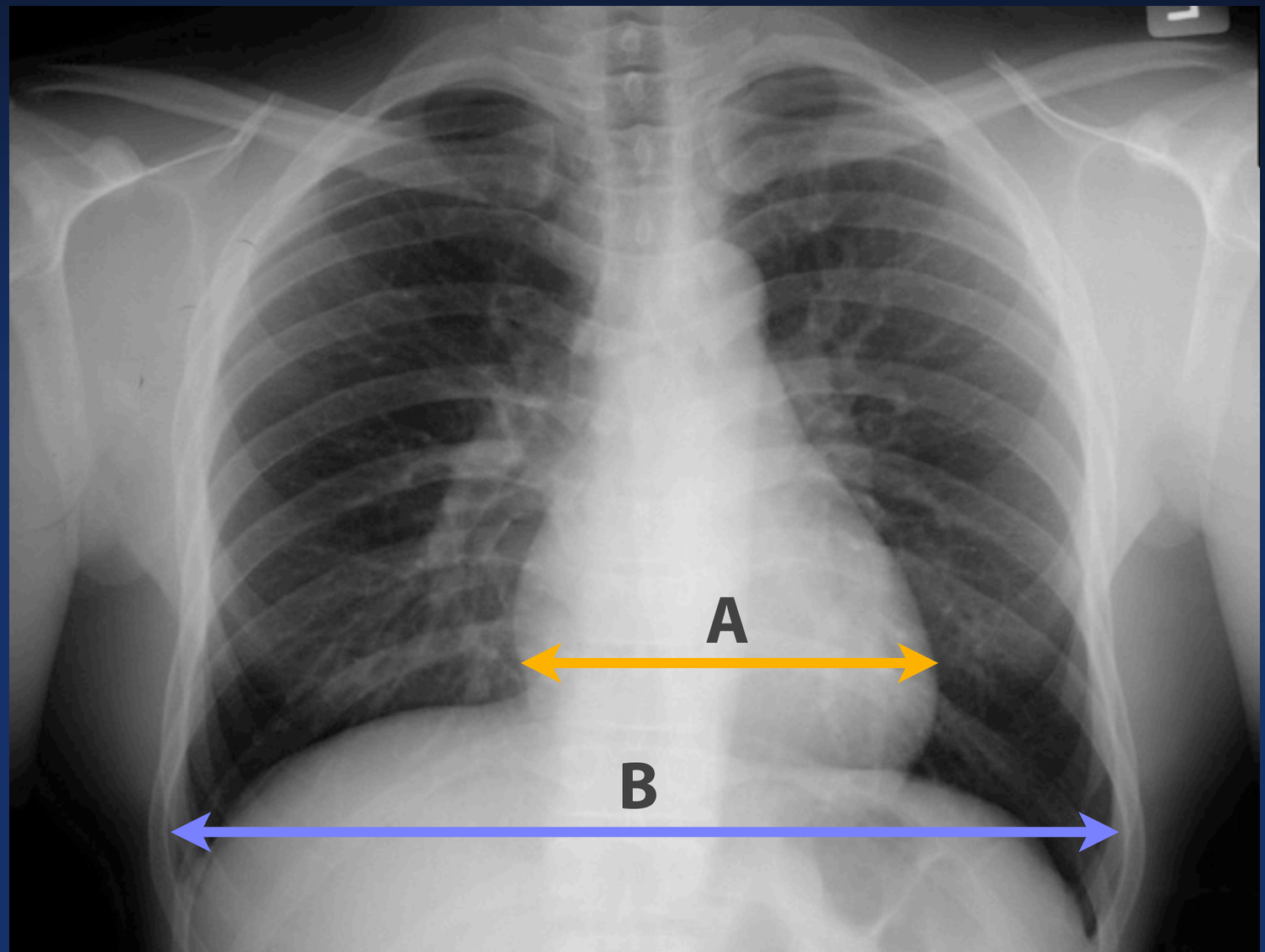


Heart Size

- Cardiac Index:

$$\frac{A}{B}$$

Normal: ≤ 50%



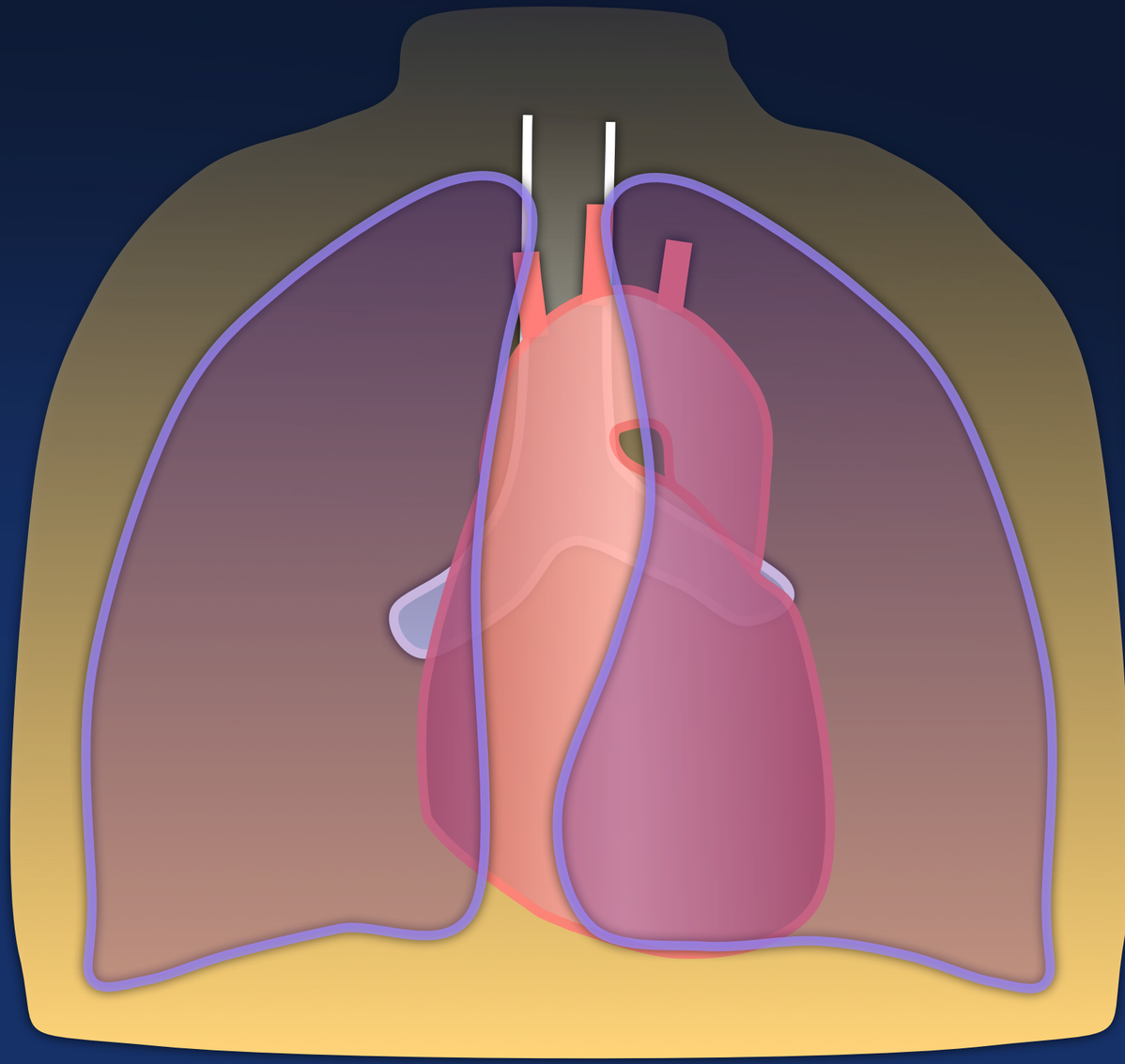
Heart Size

Volume → D i l a t i o n

Pressure → **Hypertrophy**

Left Atrium

- Big left atrial appendage
- Retrocardiac double density
- Elevated left mainstem bronchus



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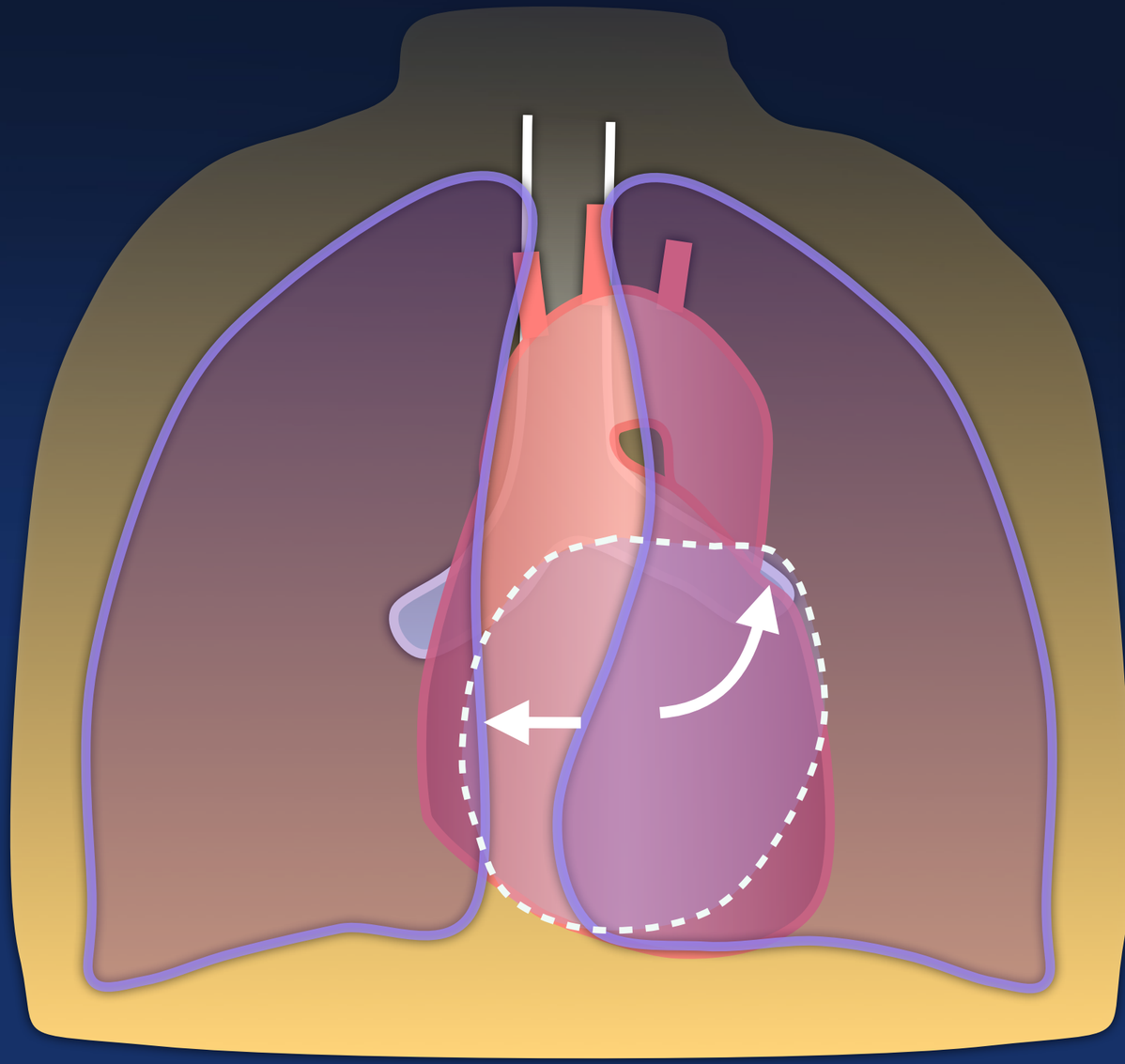

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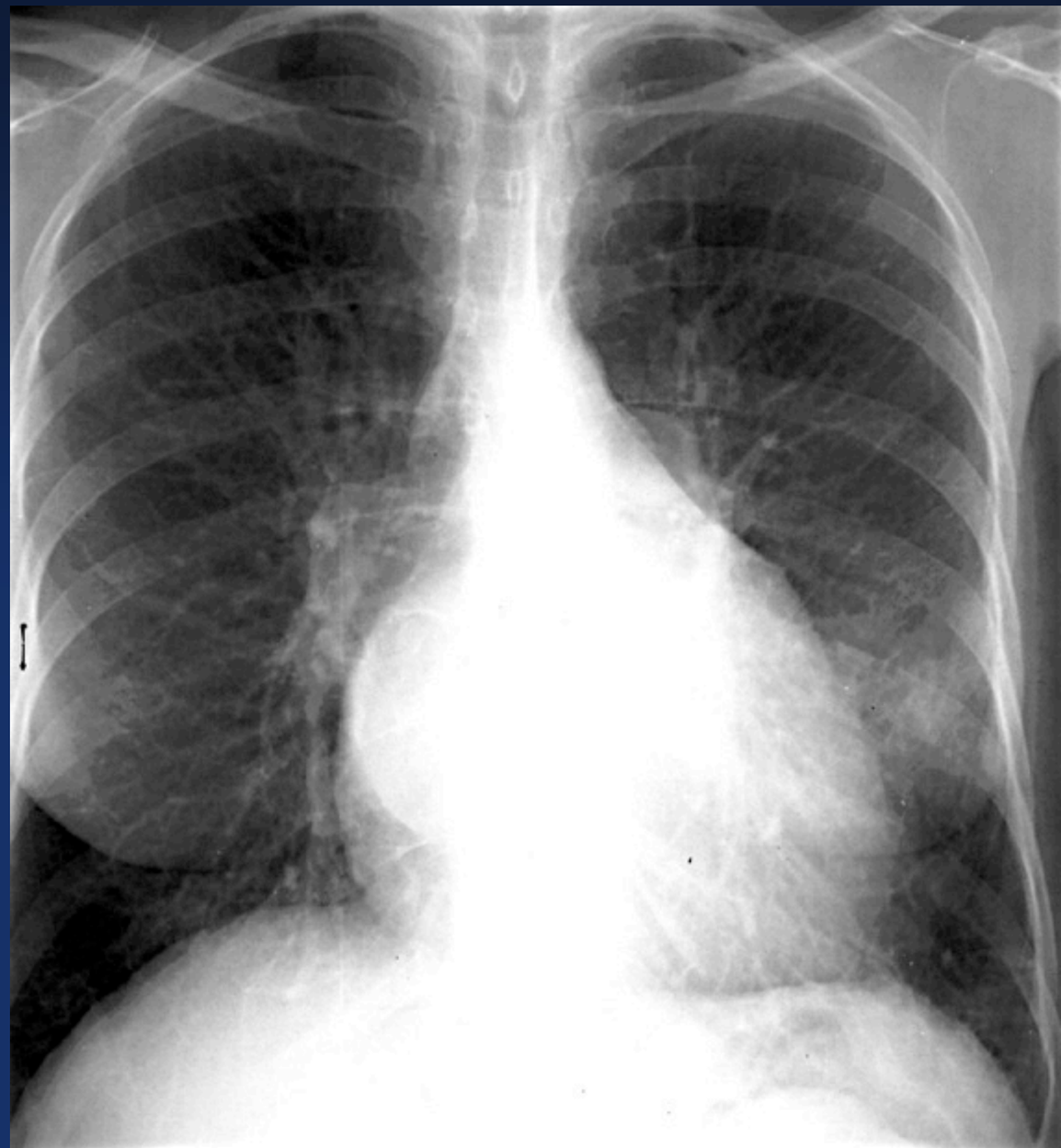

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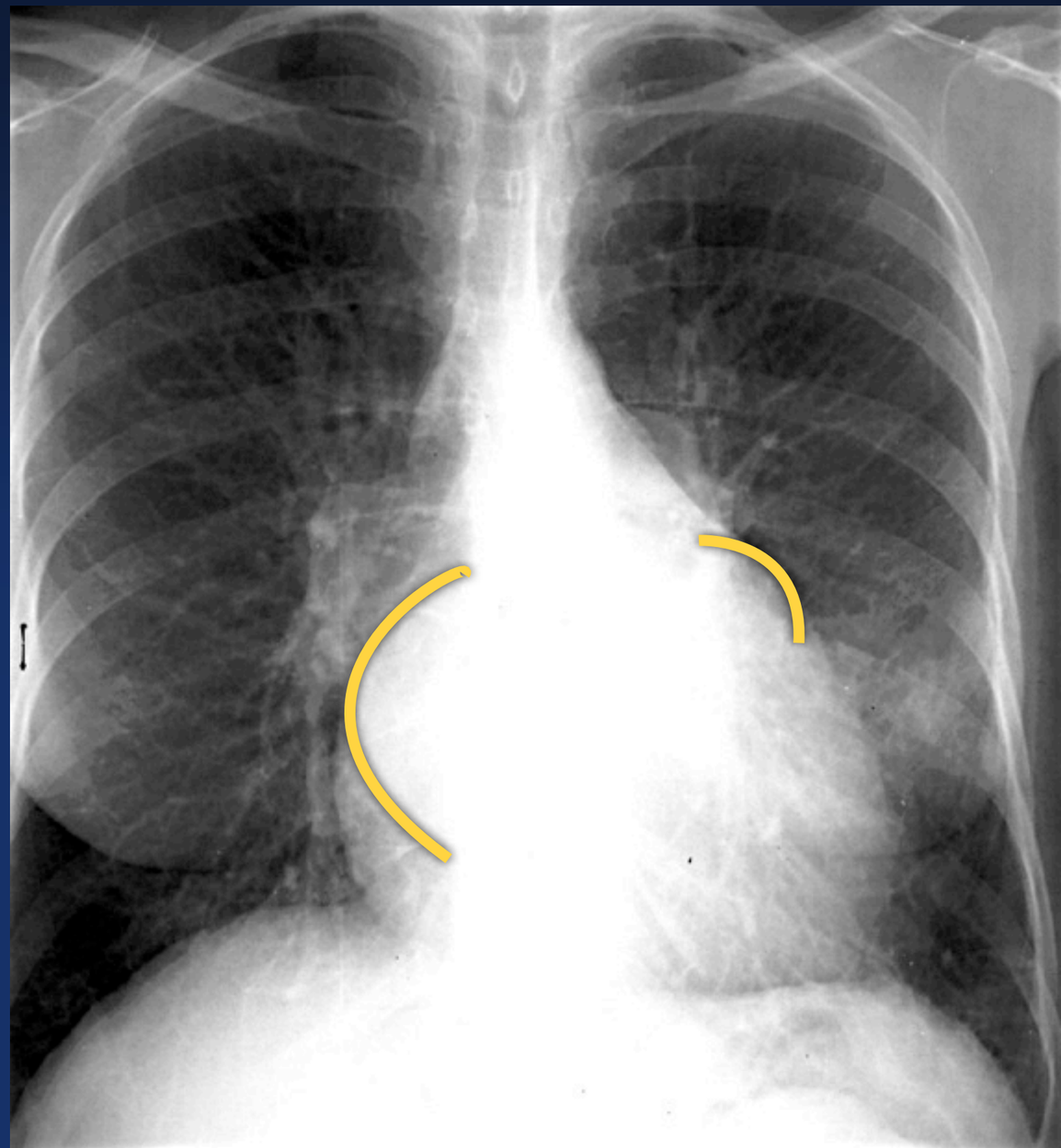

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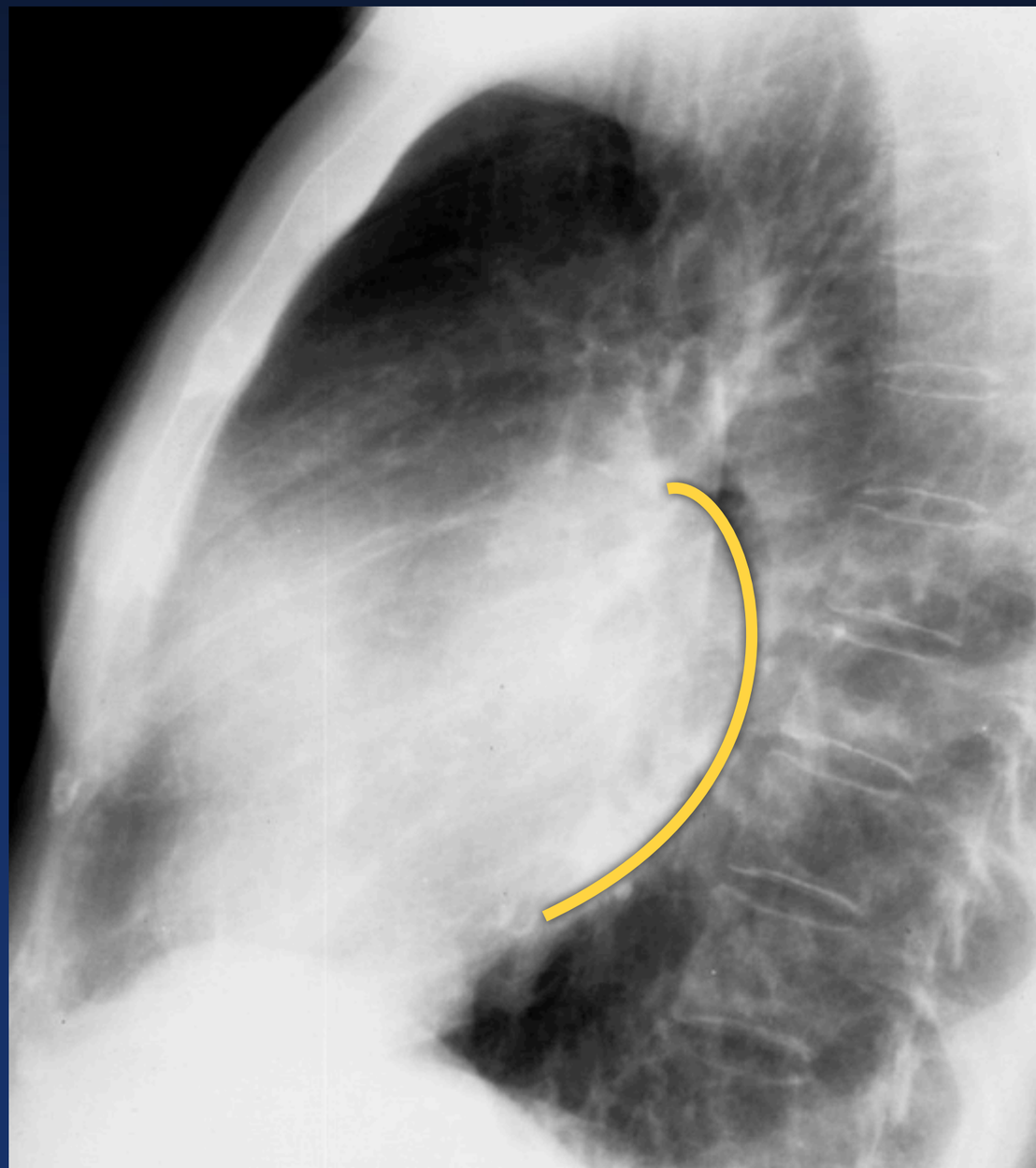
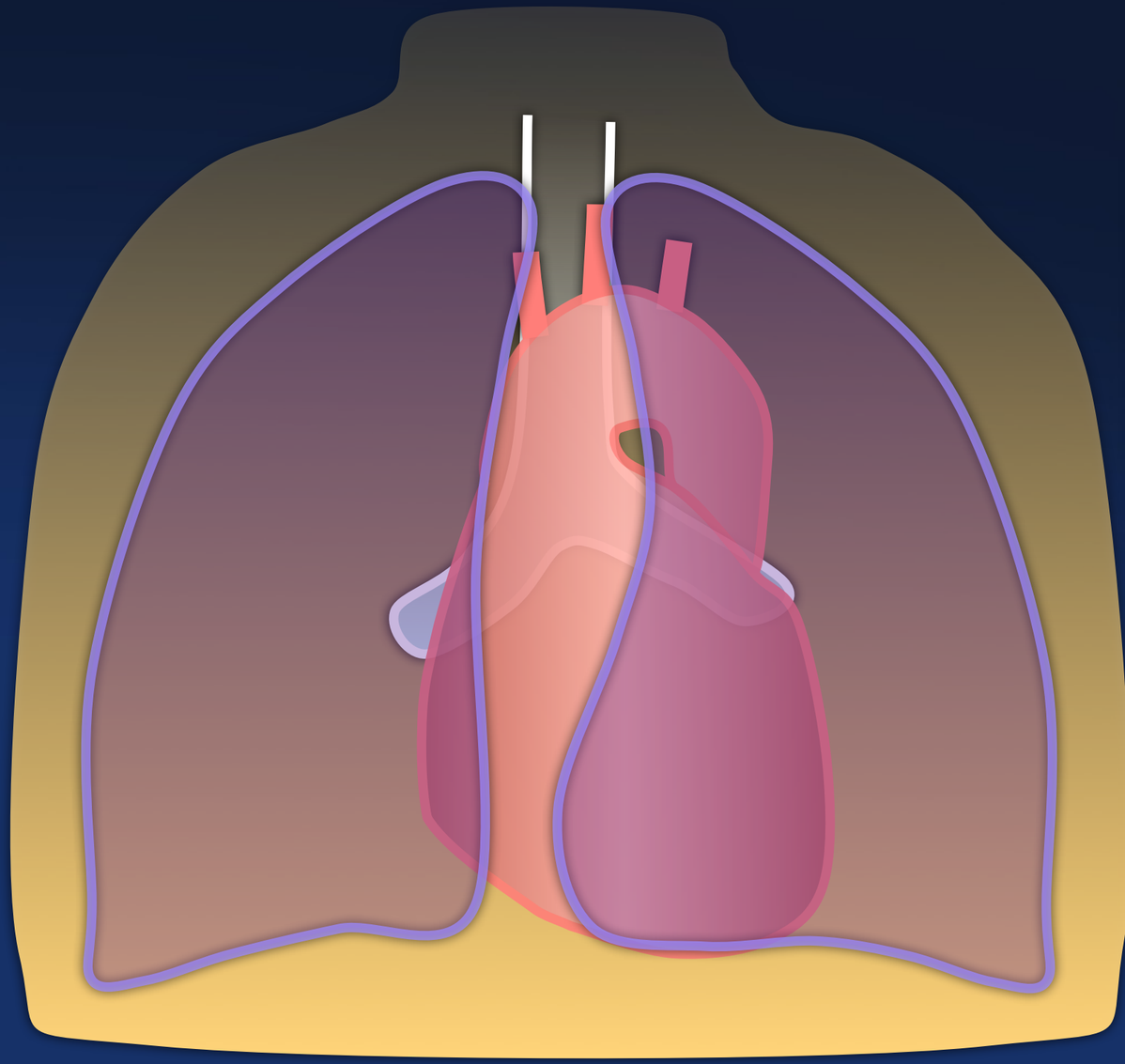


Left Ventricle

- Enlarged left heart border
- Apex moves down and leftward



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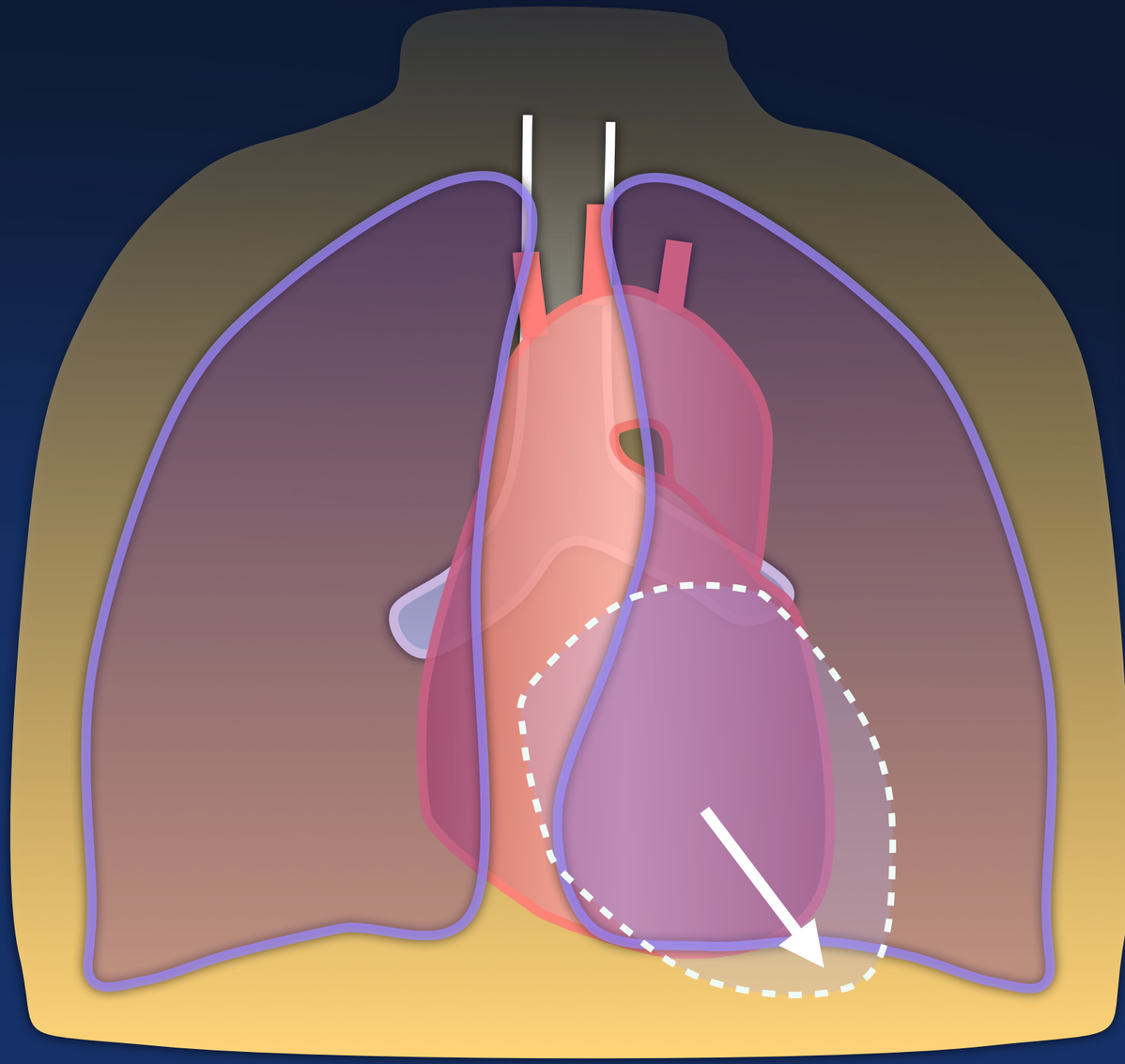

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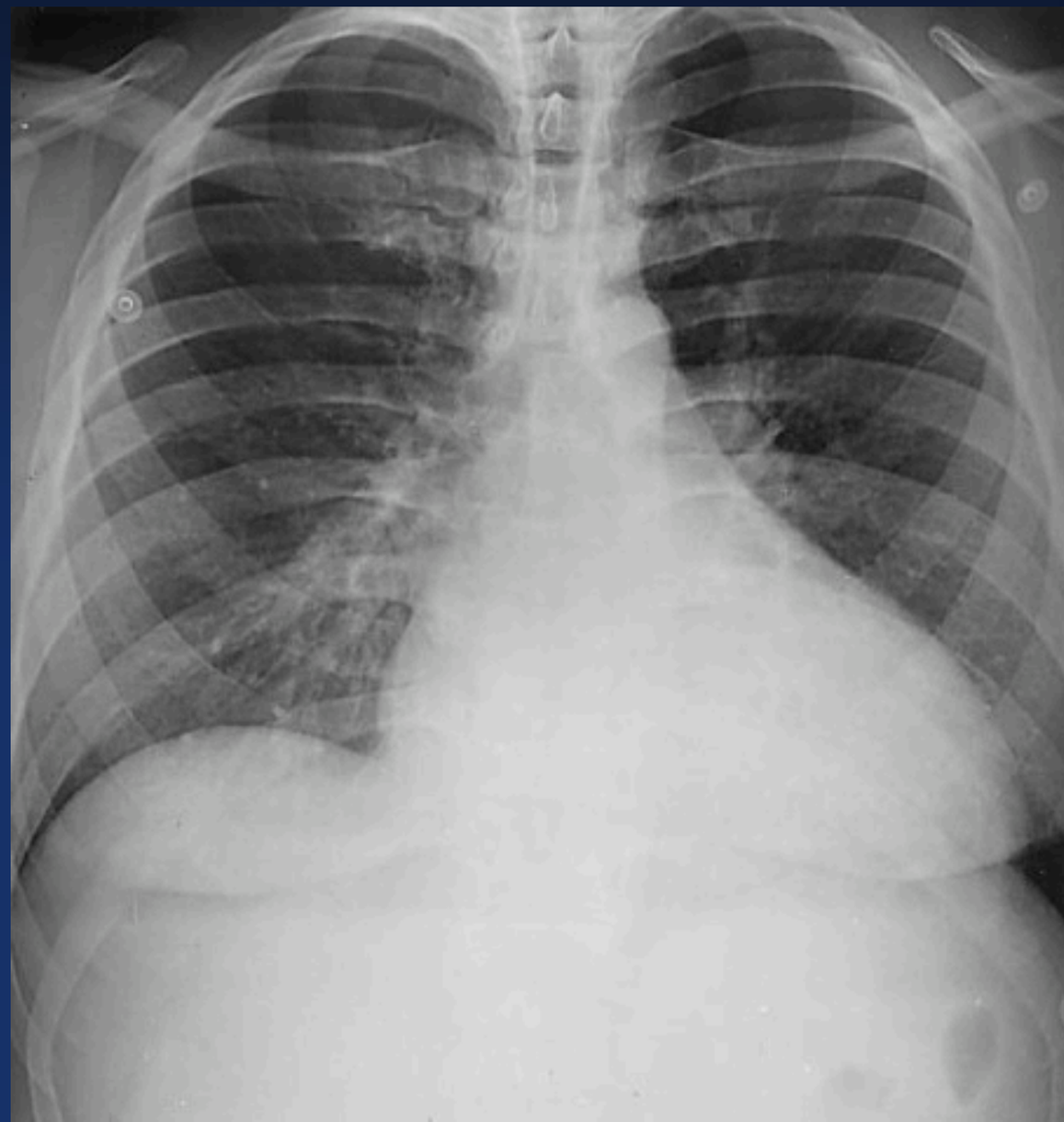
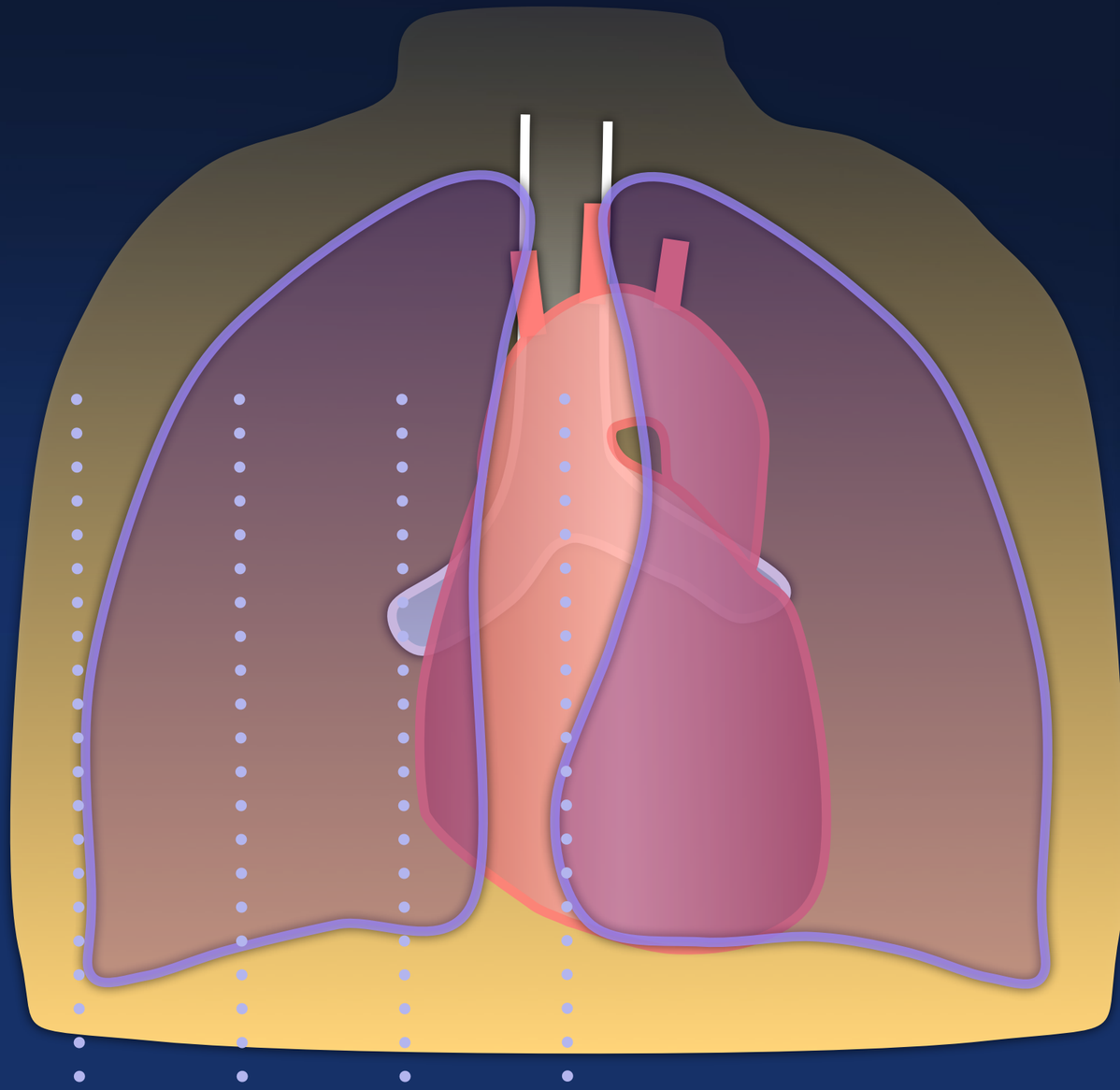


Right Atrium

- Divide hemithorax into thirds
- Right heart border is > ⅓



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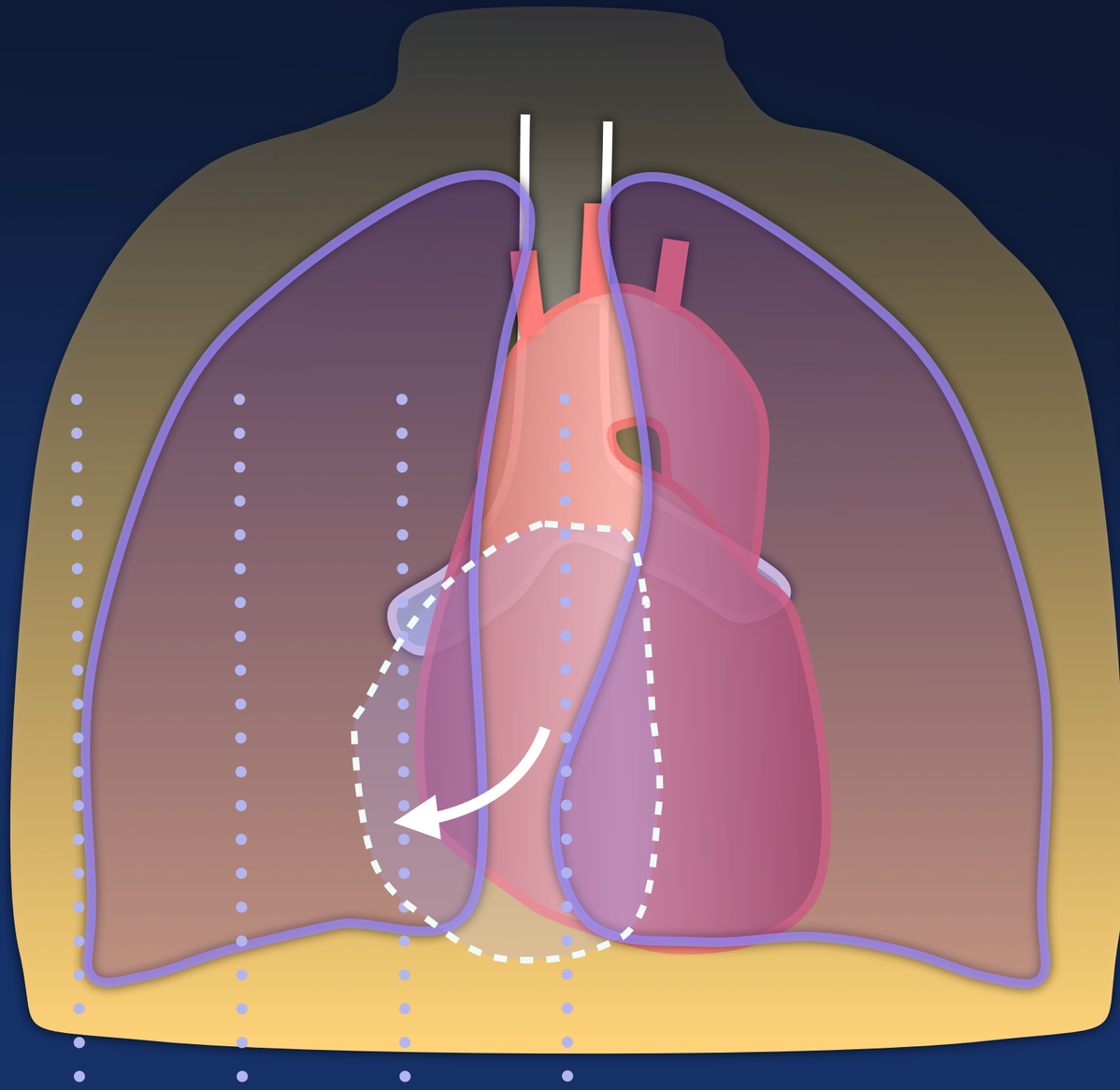

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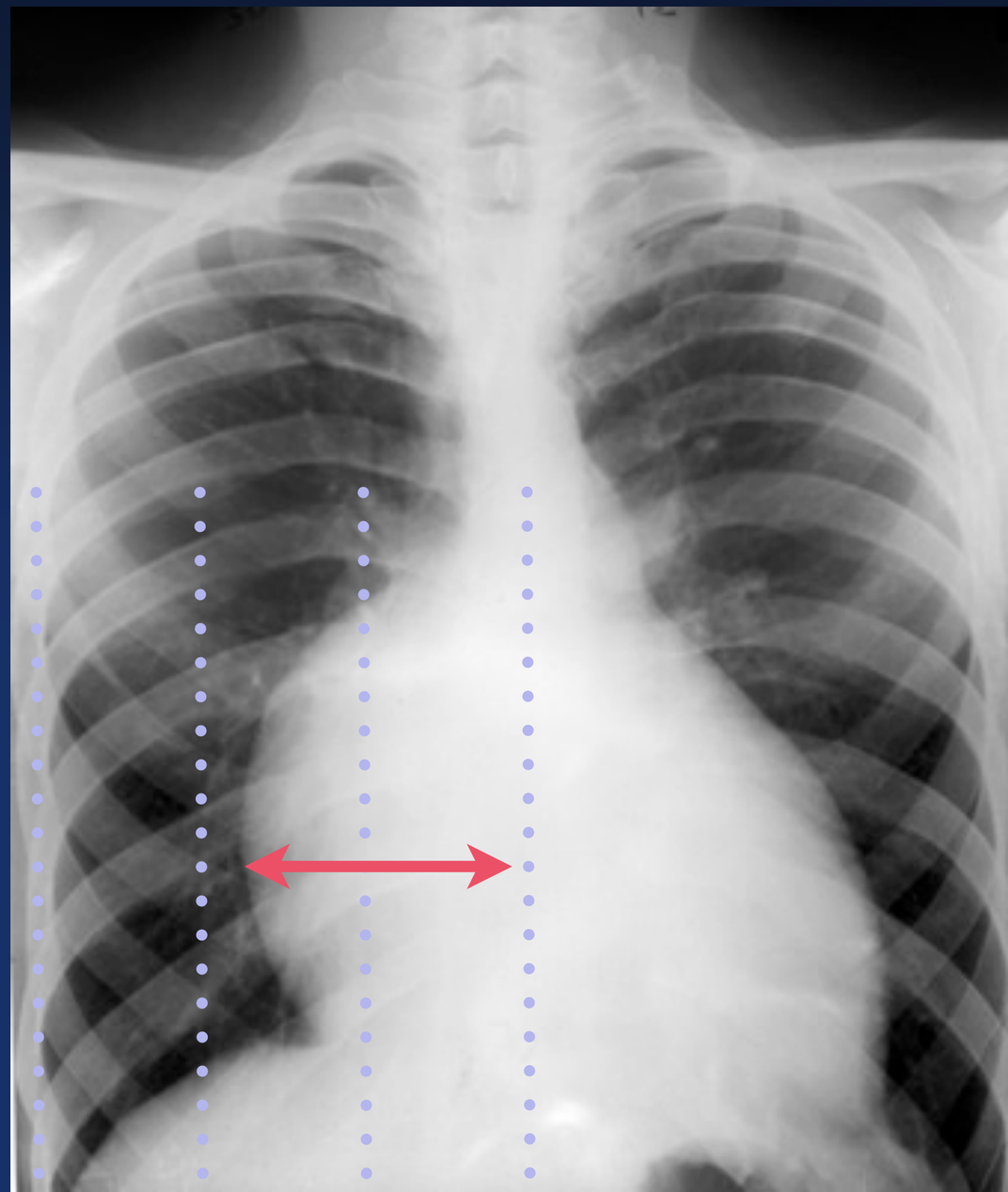
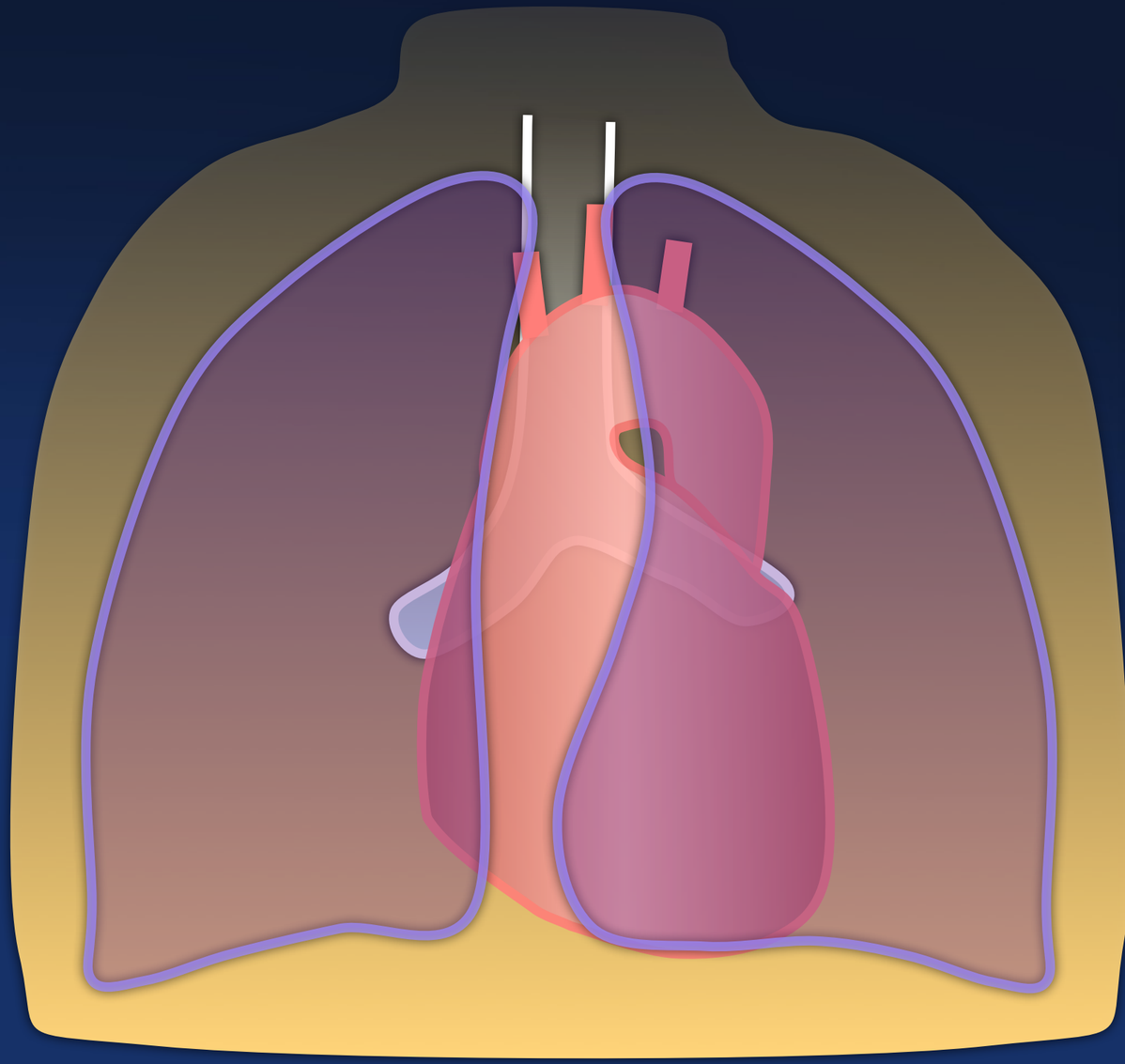


Right Ventricle

- Elevated cardiac apex
- “Boot-shaped” heart



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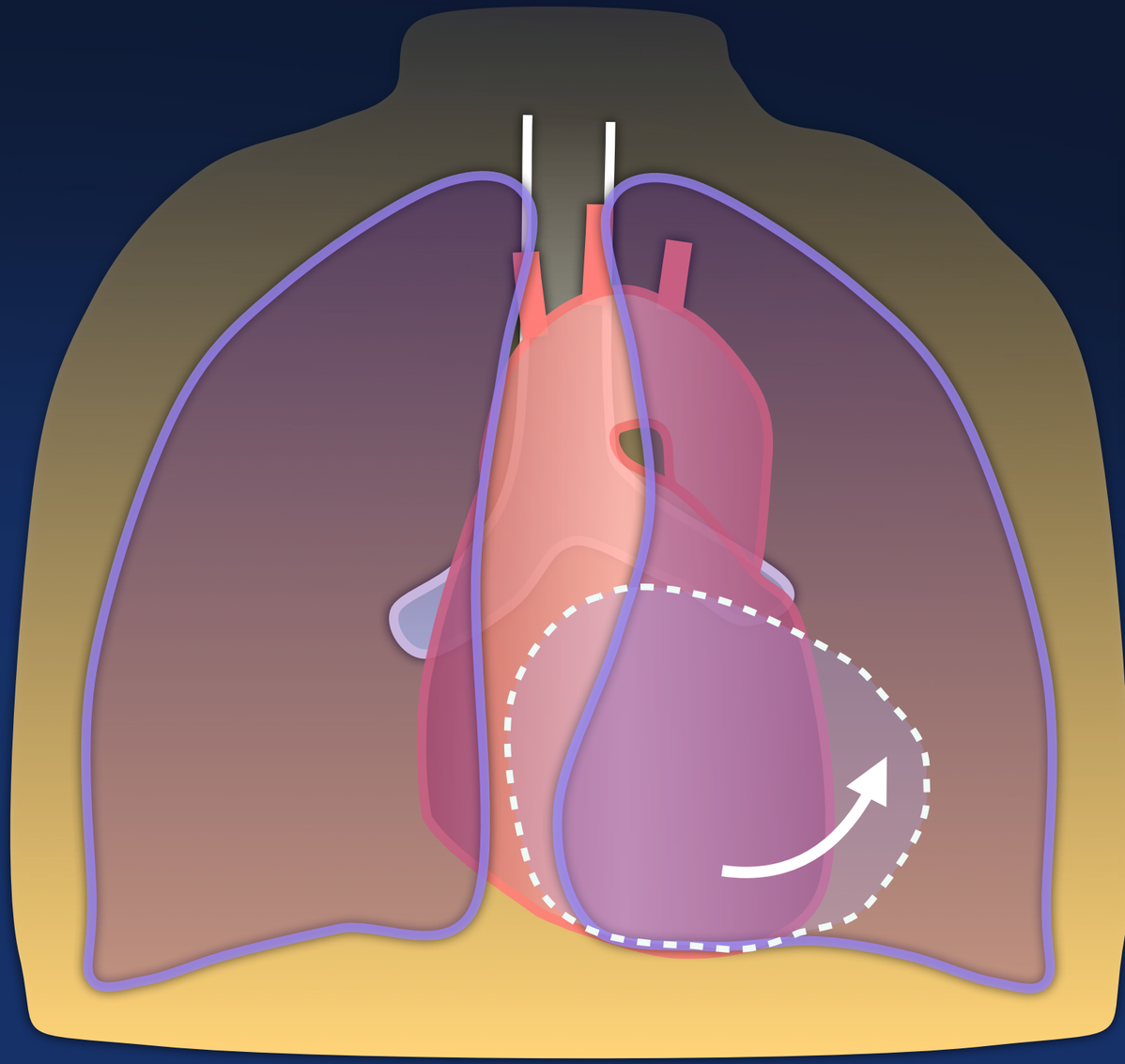

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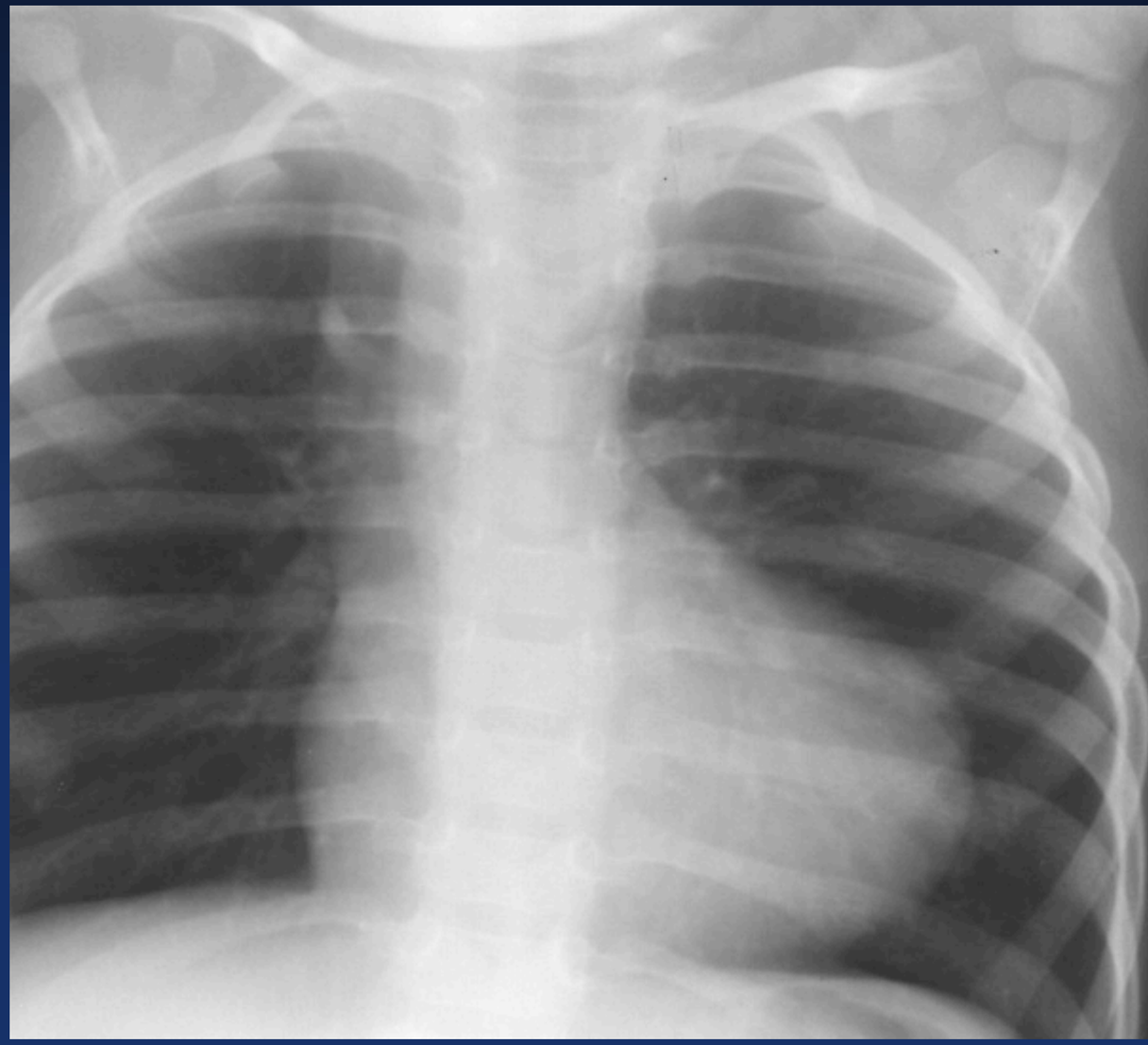

Valves

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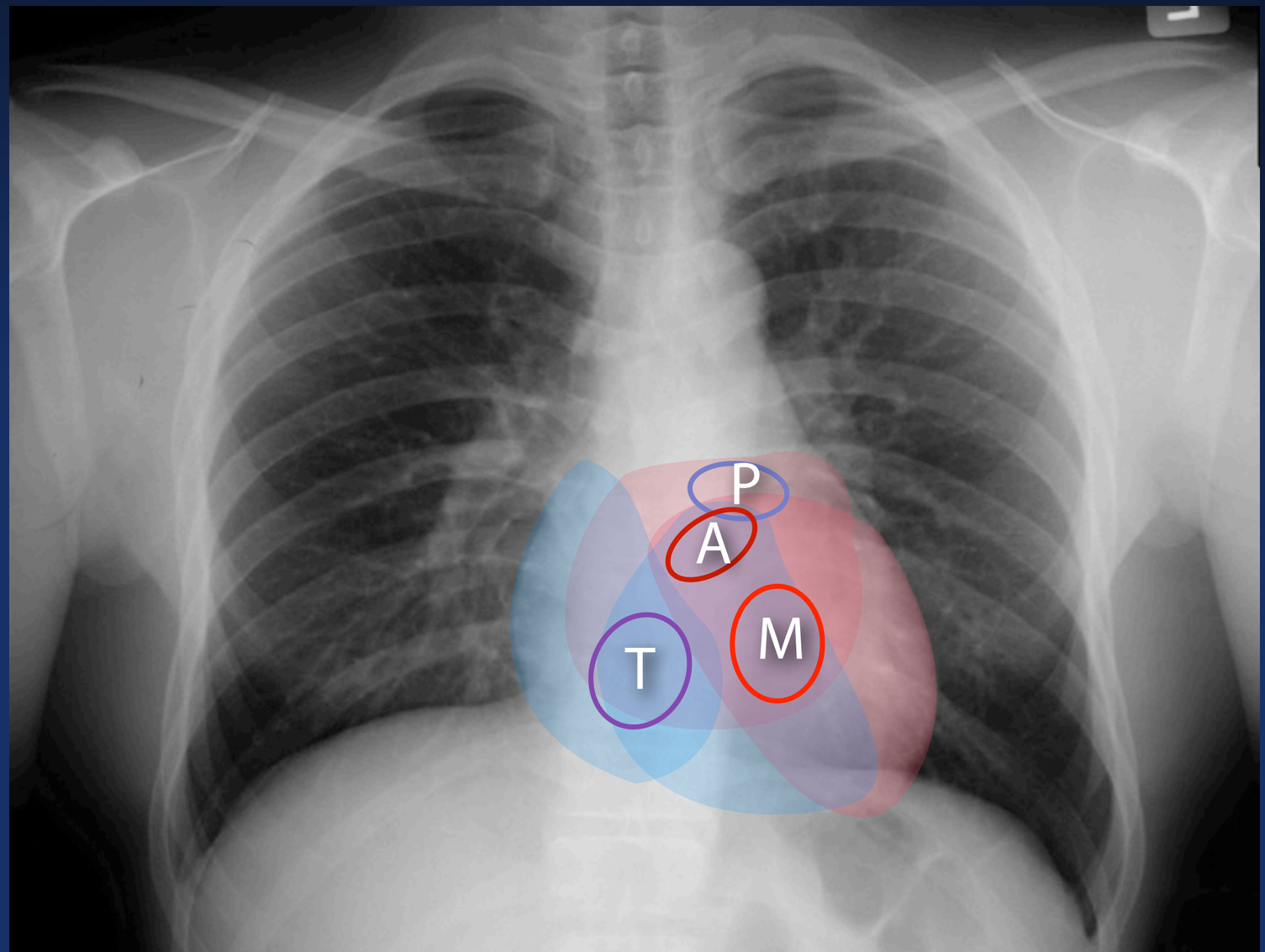
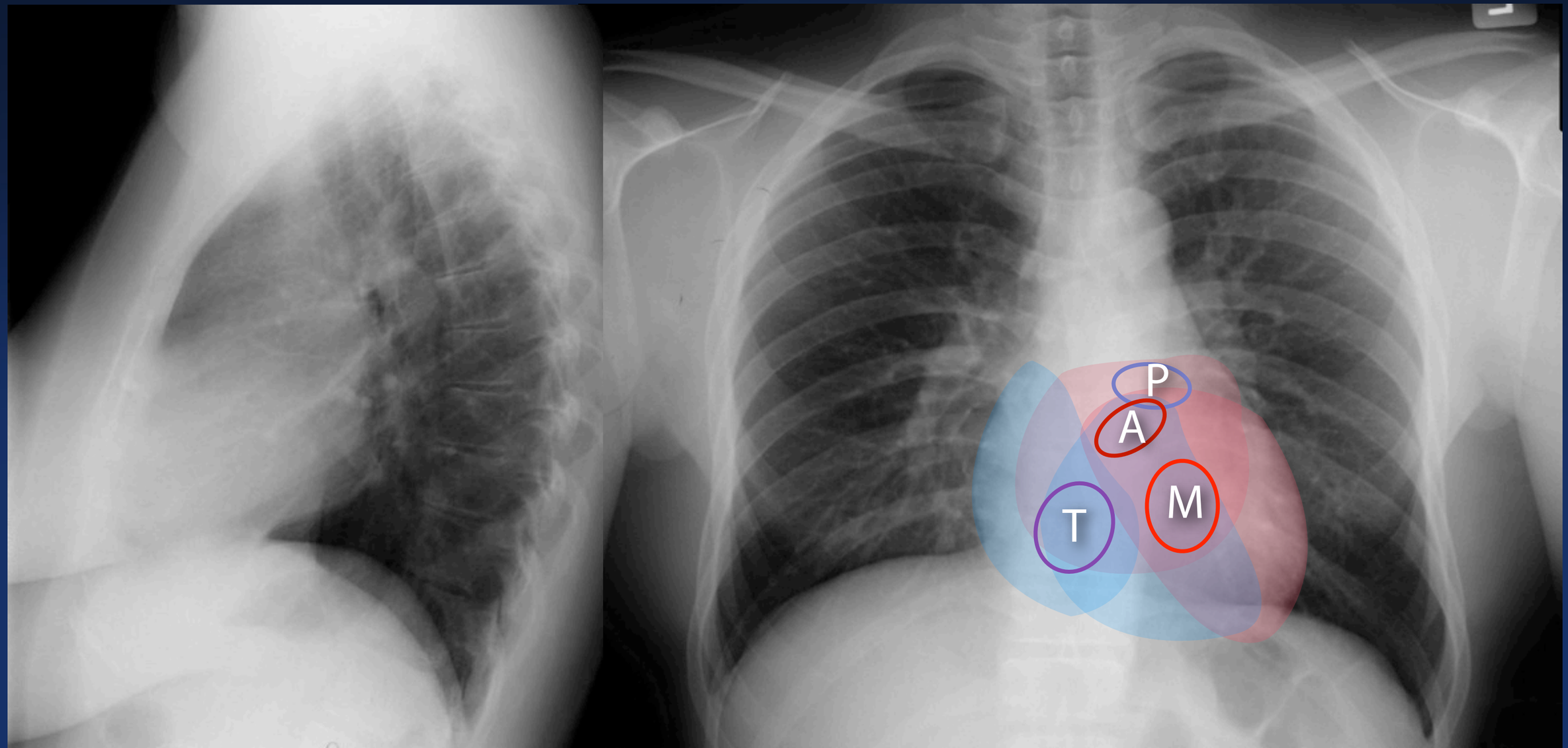
Valves

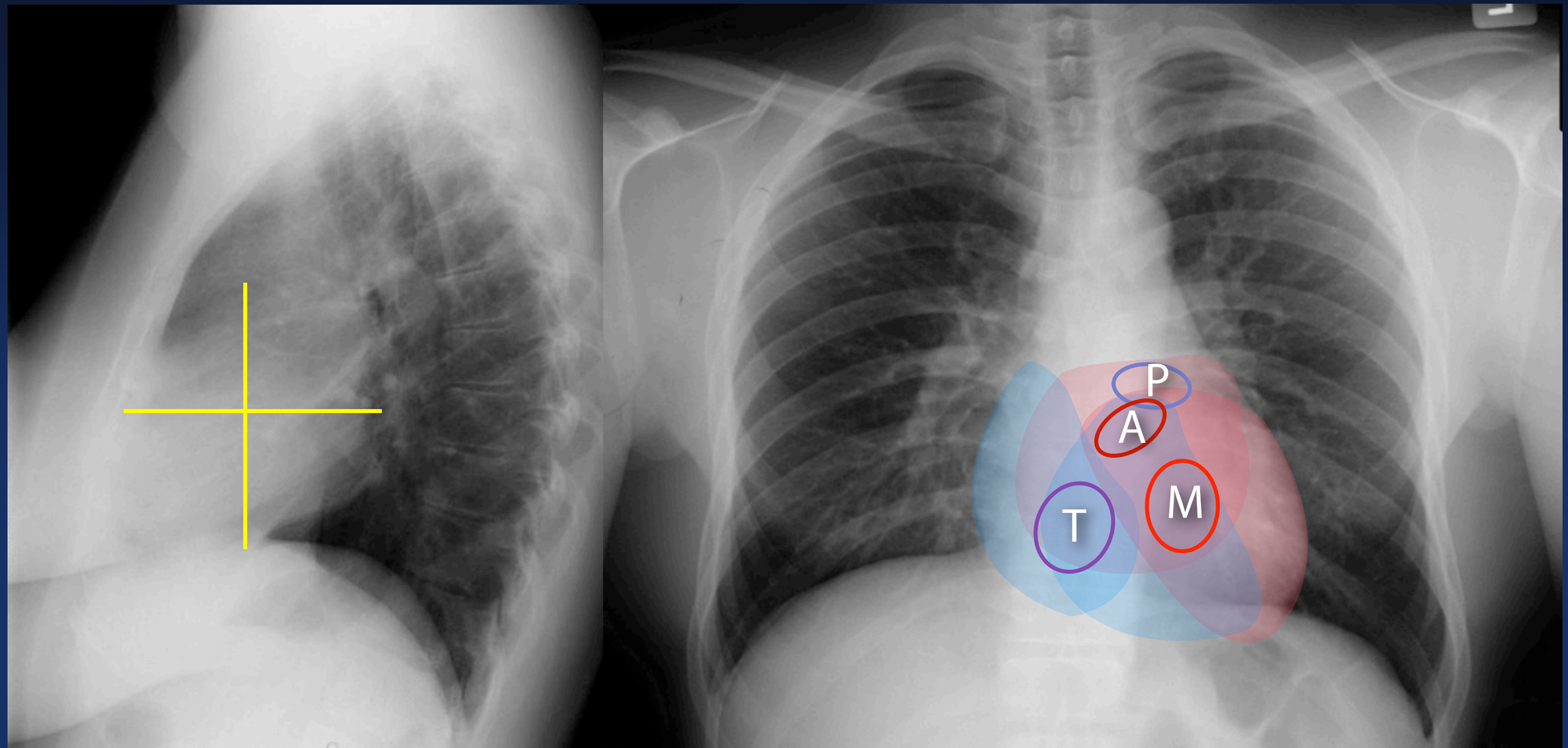
- Tricuspid
- Mitral
- Aortic
- Pulmonic



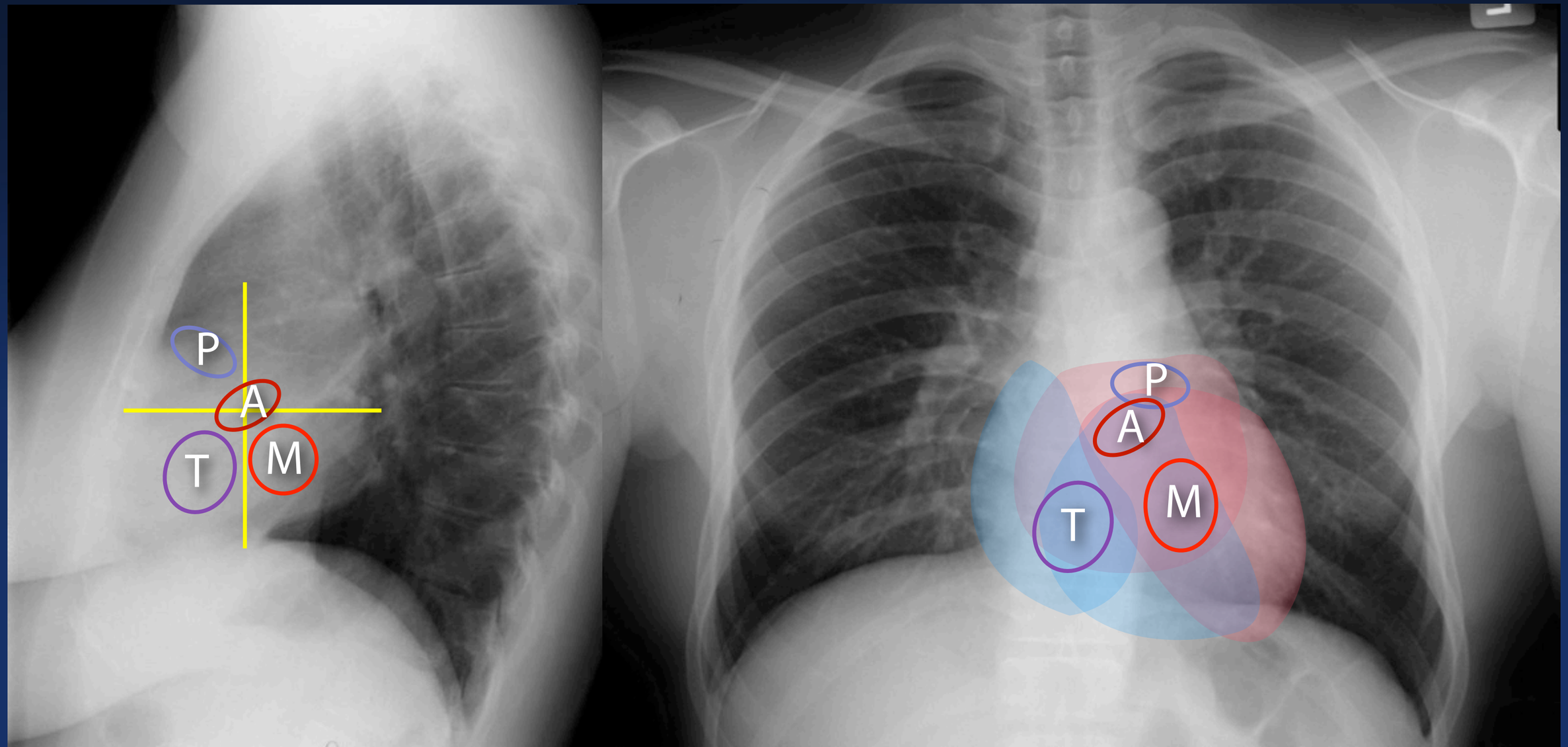
Valves



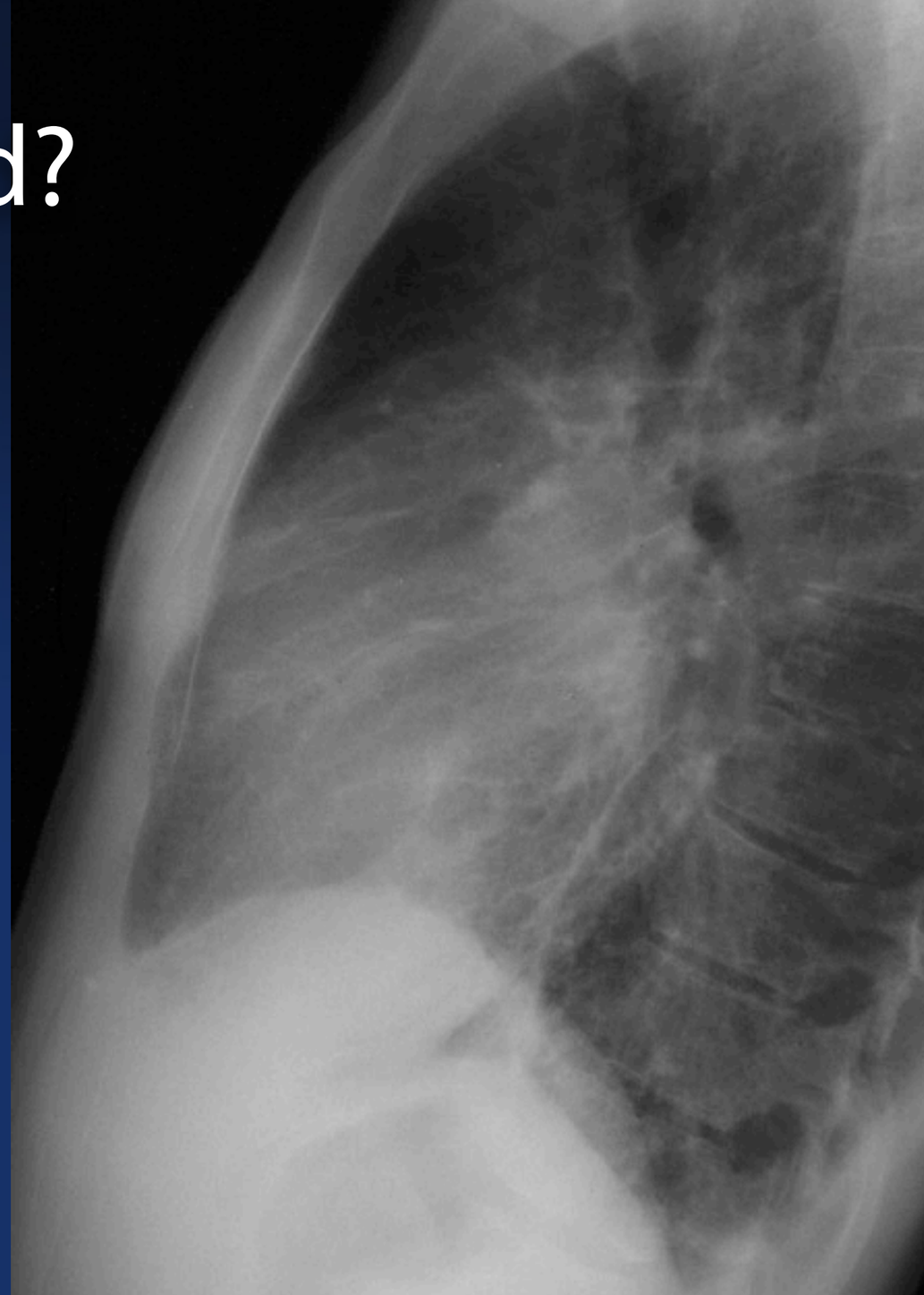
Valves



Valves

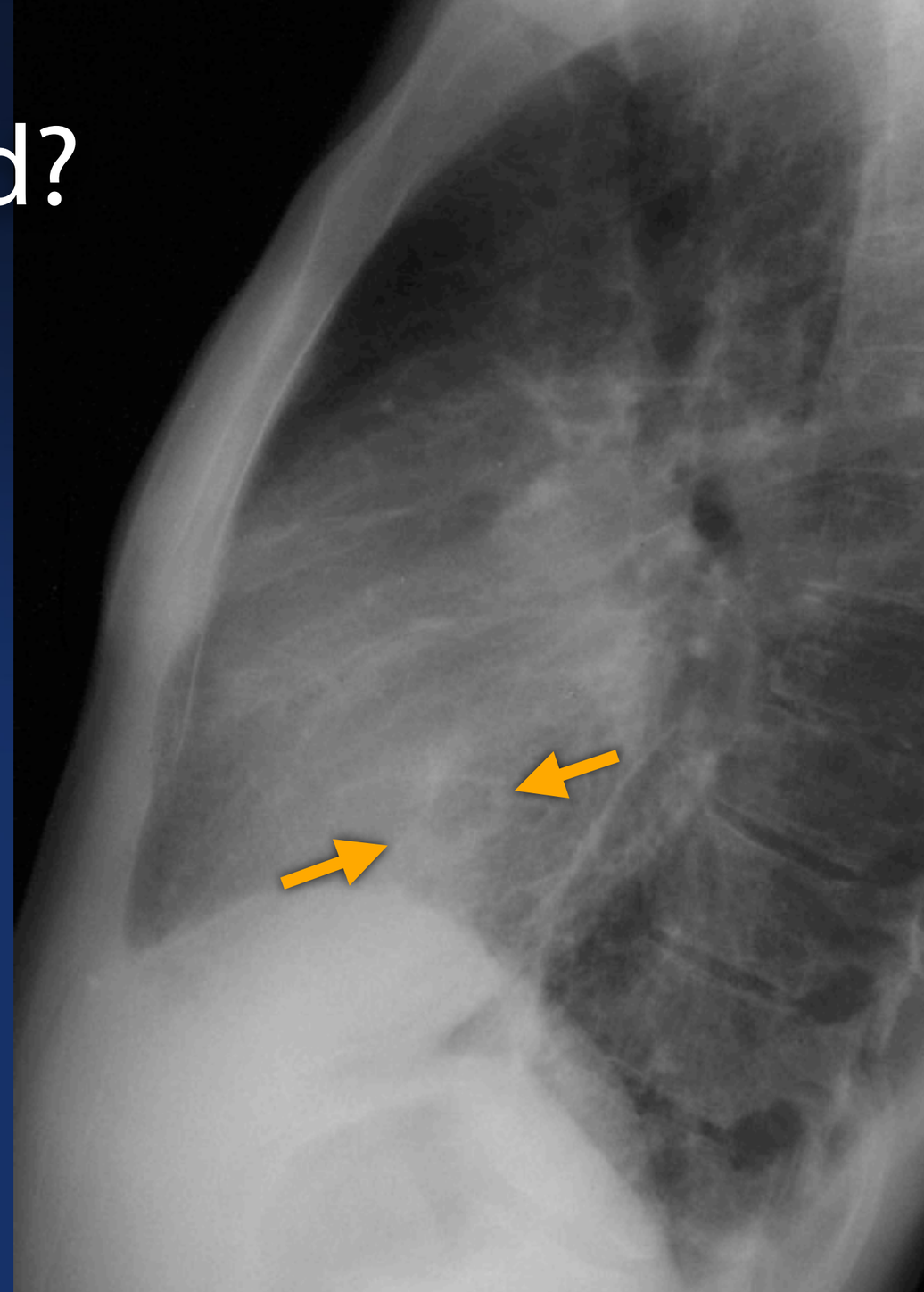


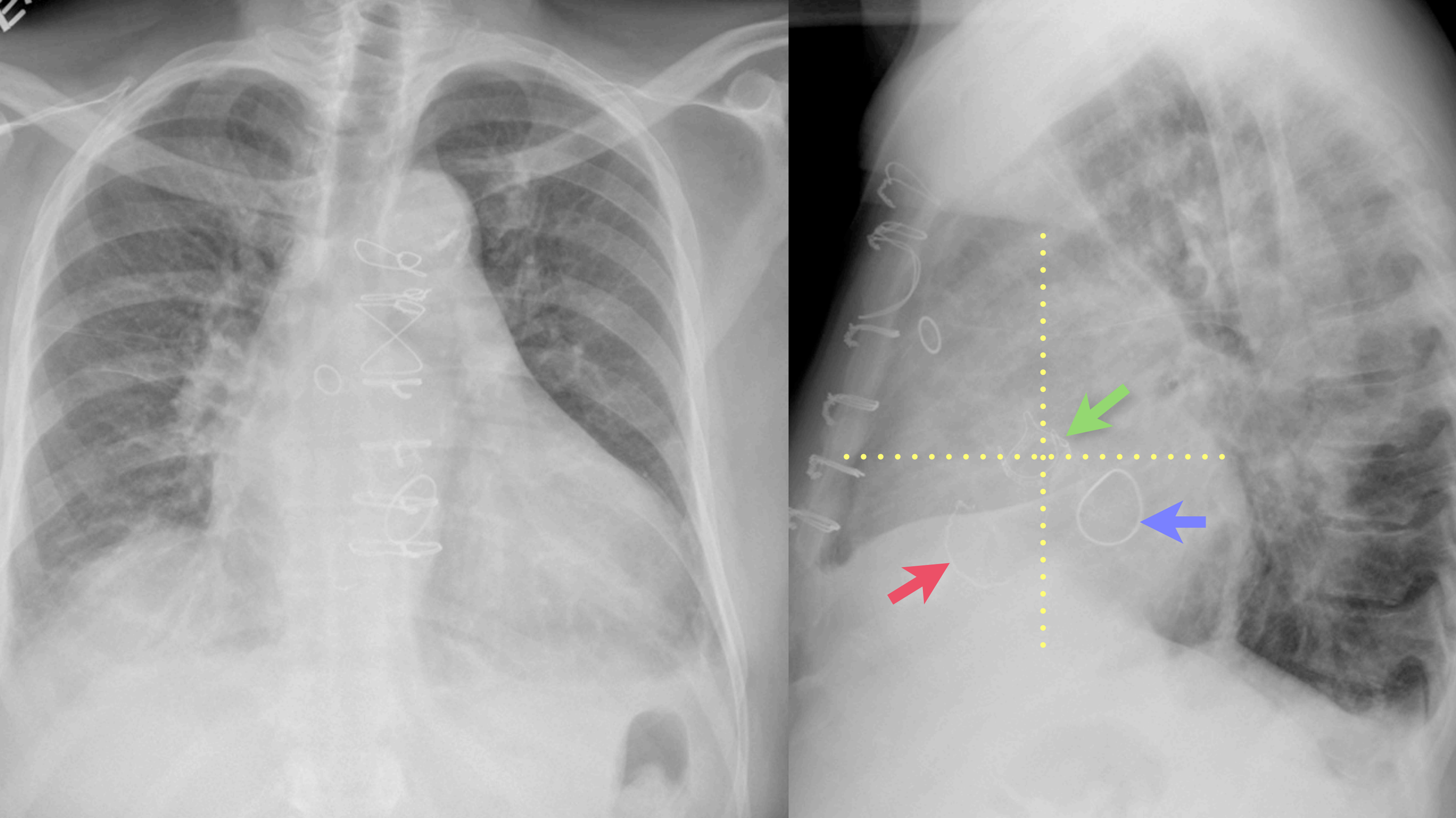
Which valve is calcified?



Which valve is calcified?

A. Aortic
B. Pulmonic
C. Mitral
D. Tricuspid





Heart Size

Volume → D i l a t i o n

Pressure → **Hypertrophy**

Valve Disease

Stenosis
Valve doesn't fully open

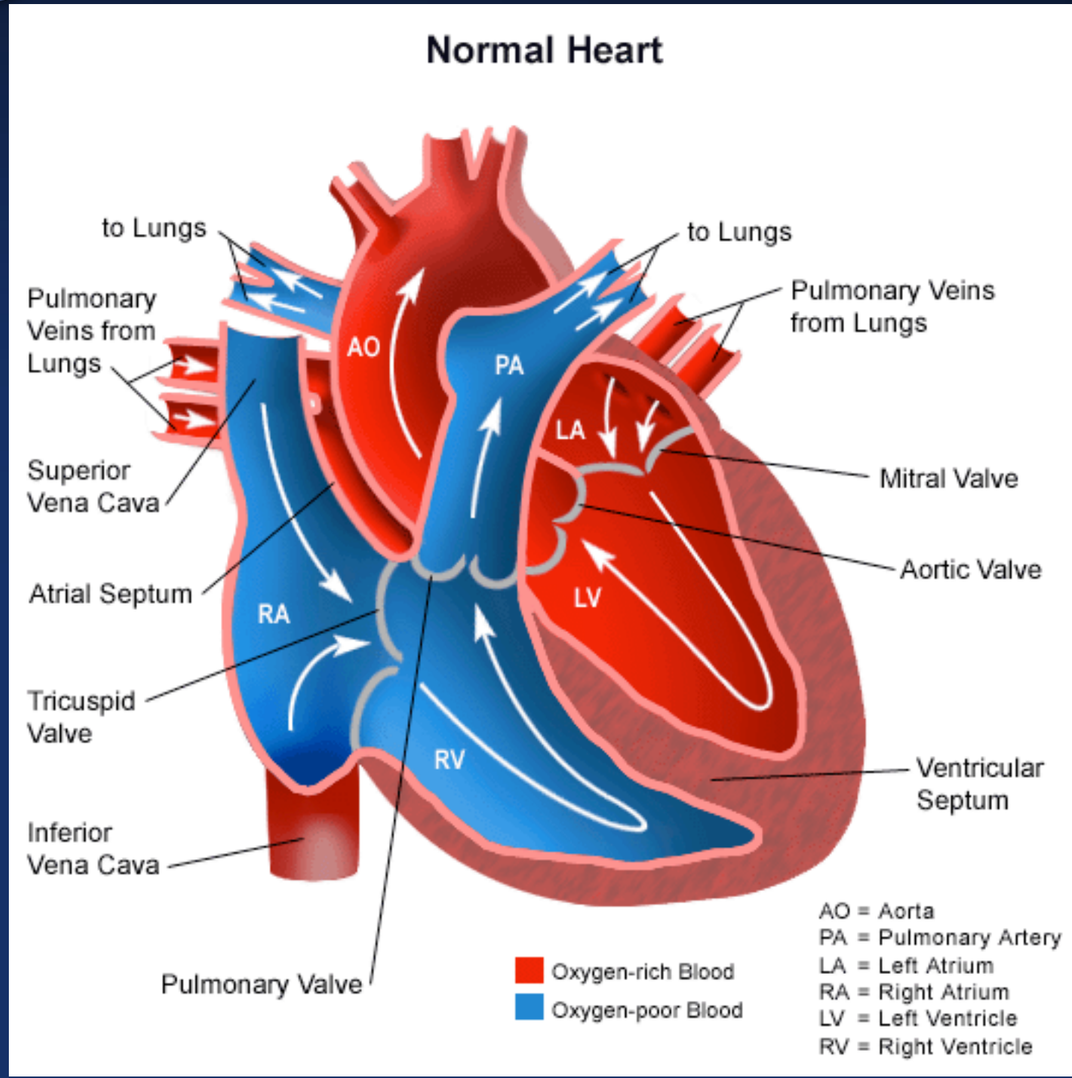
→ Normal directional flow

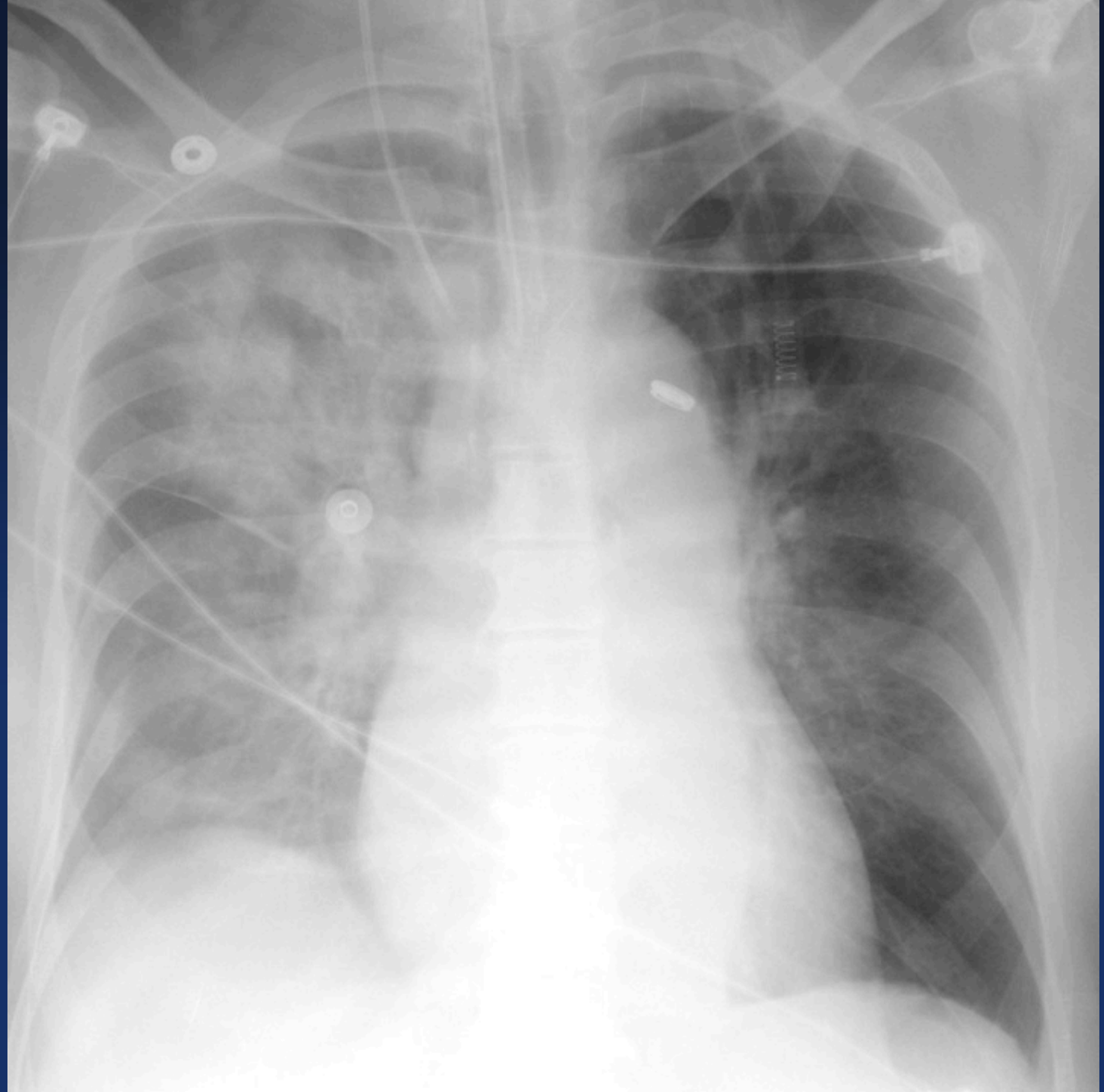
Insufficiency
Valve doesn't fully close

← Reversed directional flow

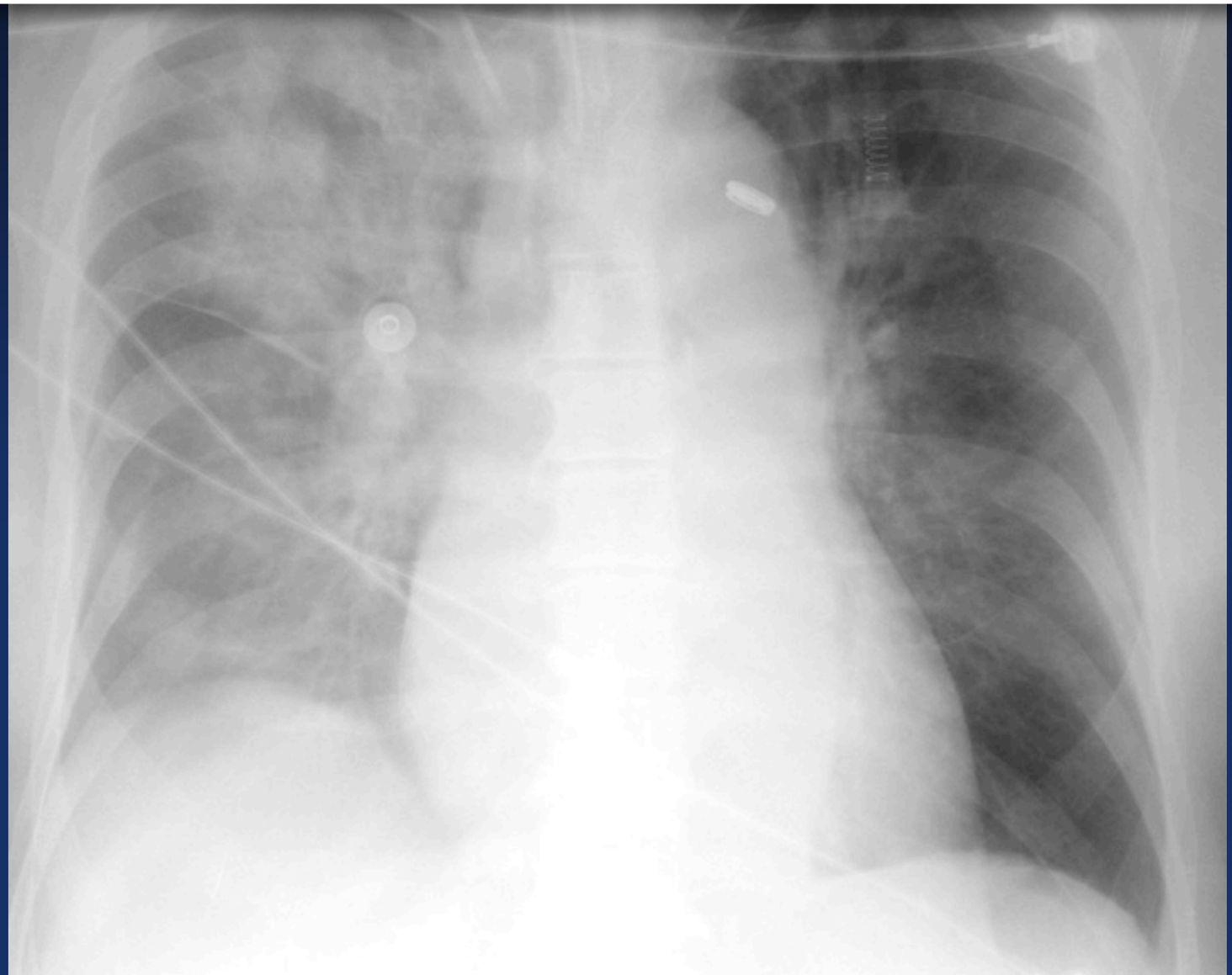
Mitral Insufficiency

- Left atrium dilates
- Left ventricle dilates (over time)
- Normal pulmonary vasculature



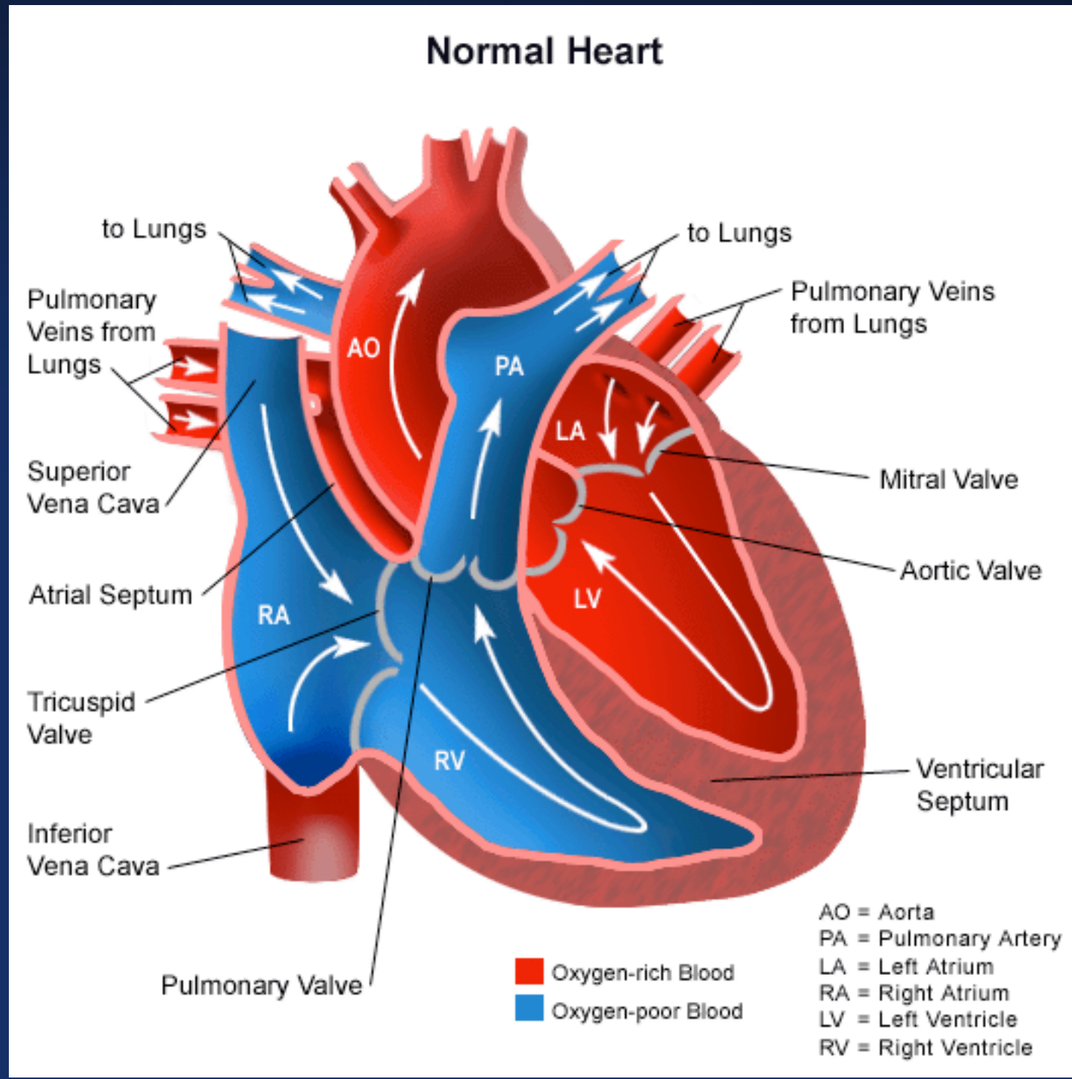


Mitral Insufficiency - Acute MI



Mitral Stenosis

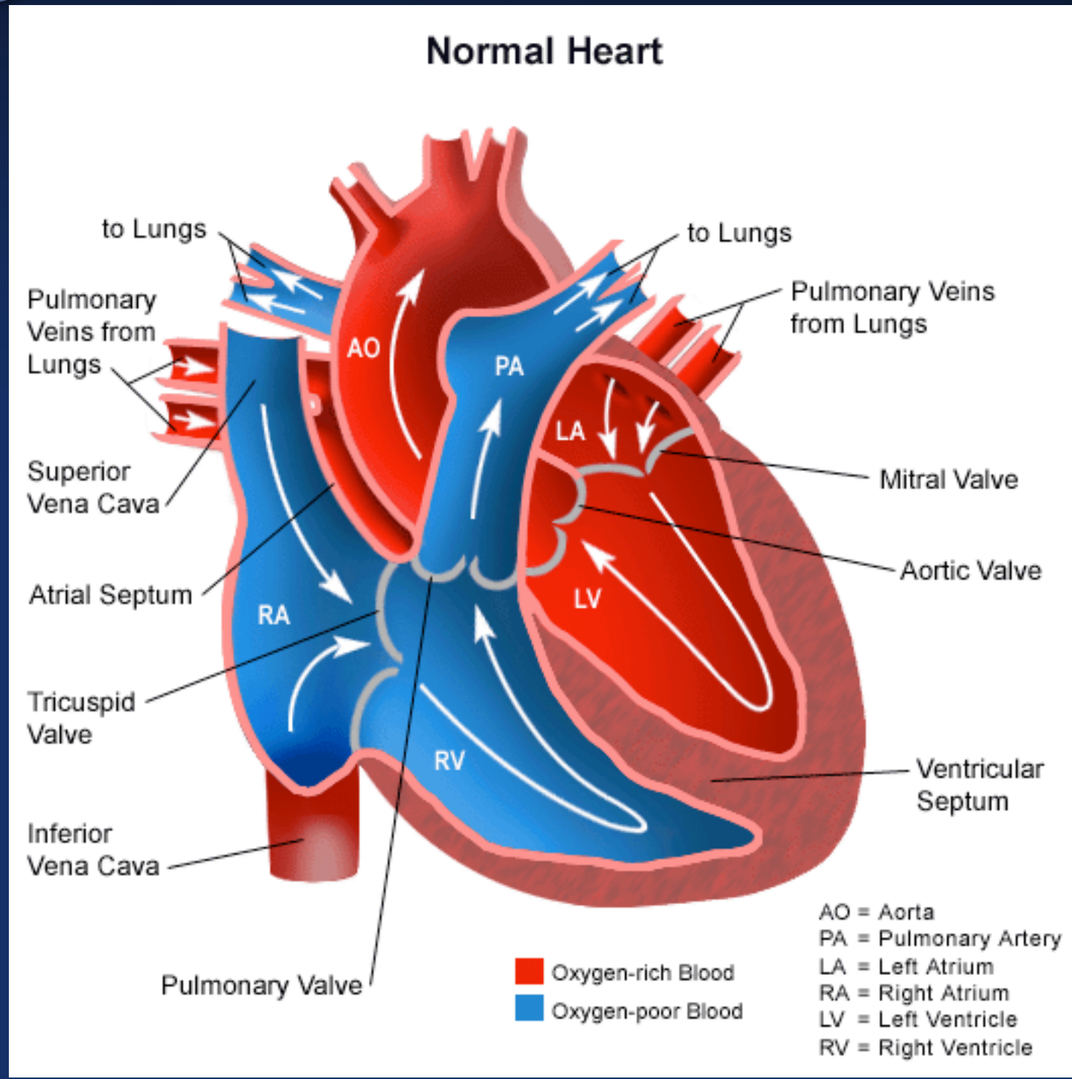
- Left atrial hypertrophy/dilation
- Dilated pulmonary veins, then arteries
- Dilated right ventricle

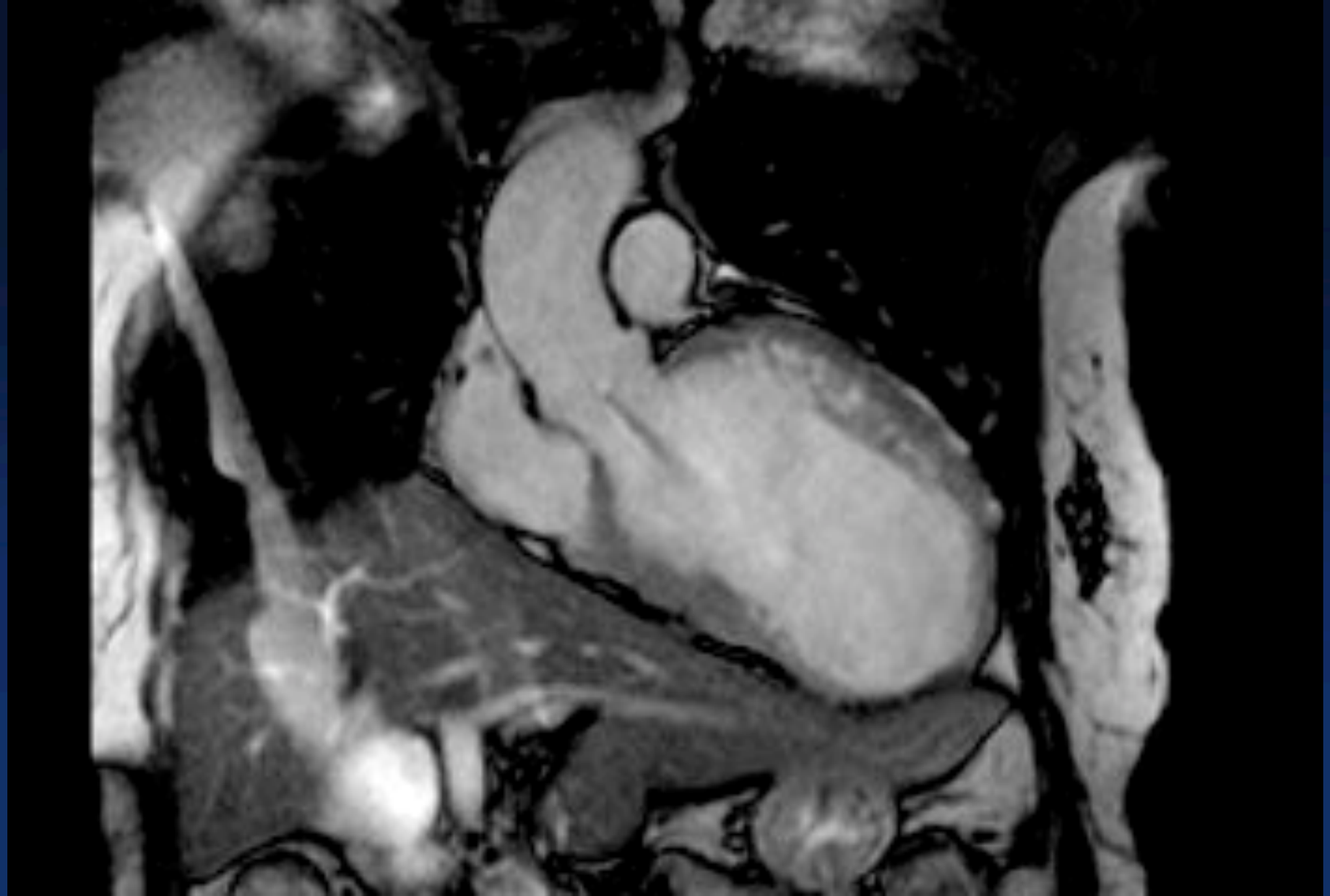


Mitral Stenosis

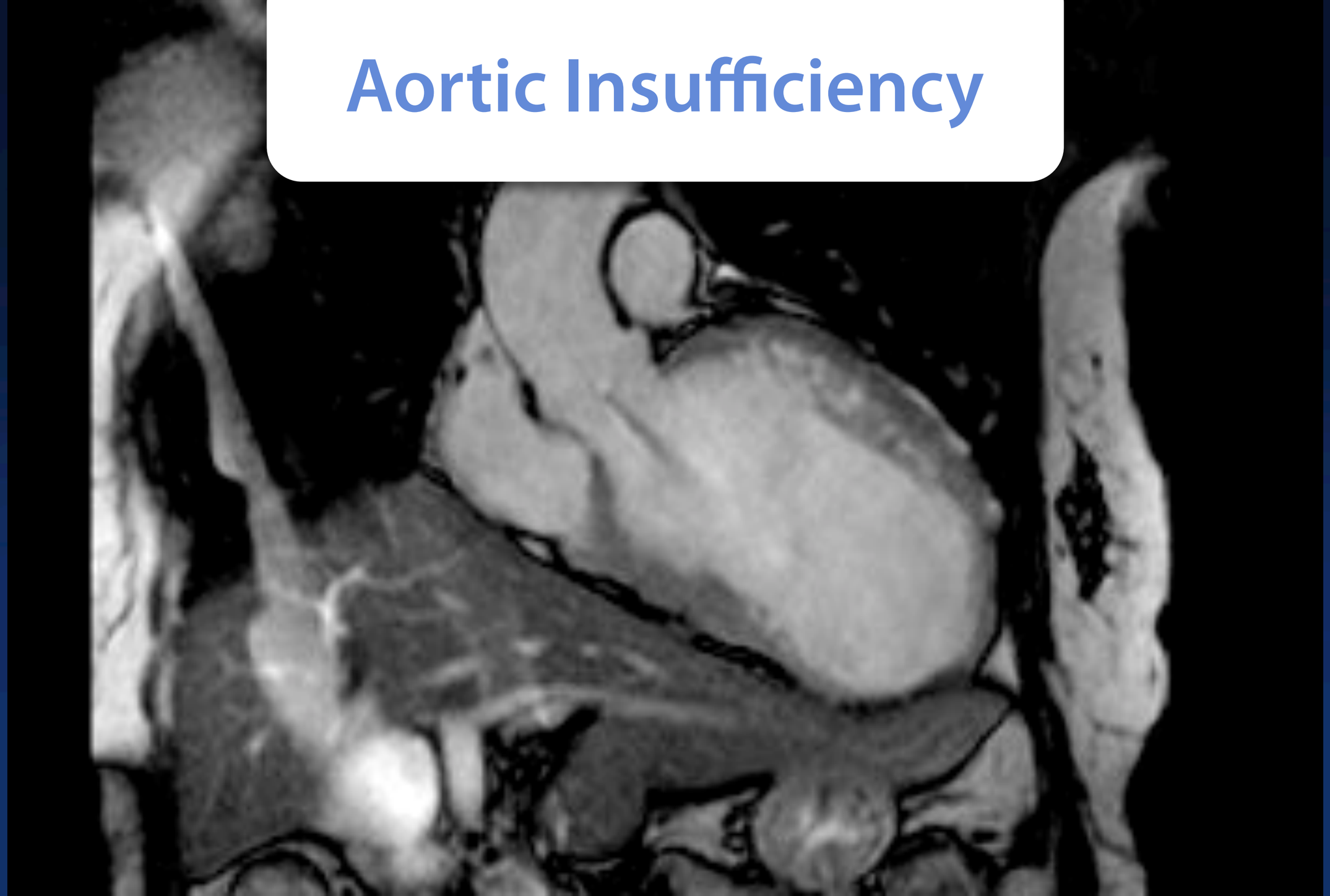
Aortic Insufficiency

- Left ventricle dilates
- Aorta may eventually dilate due to increased LV volumes



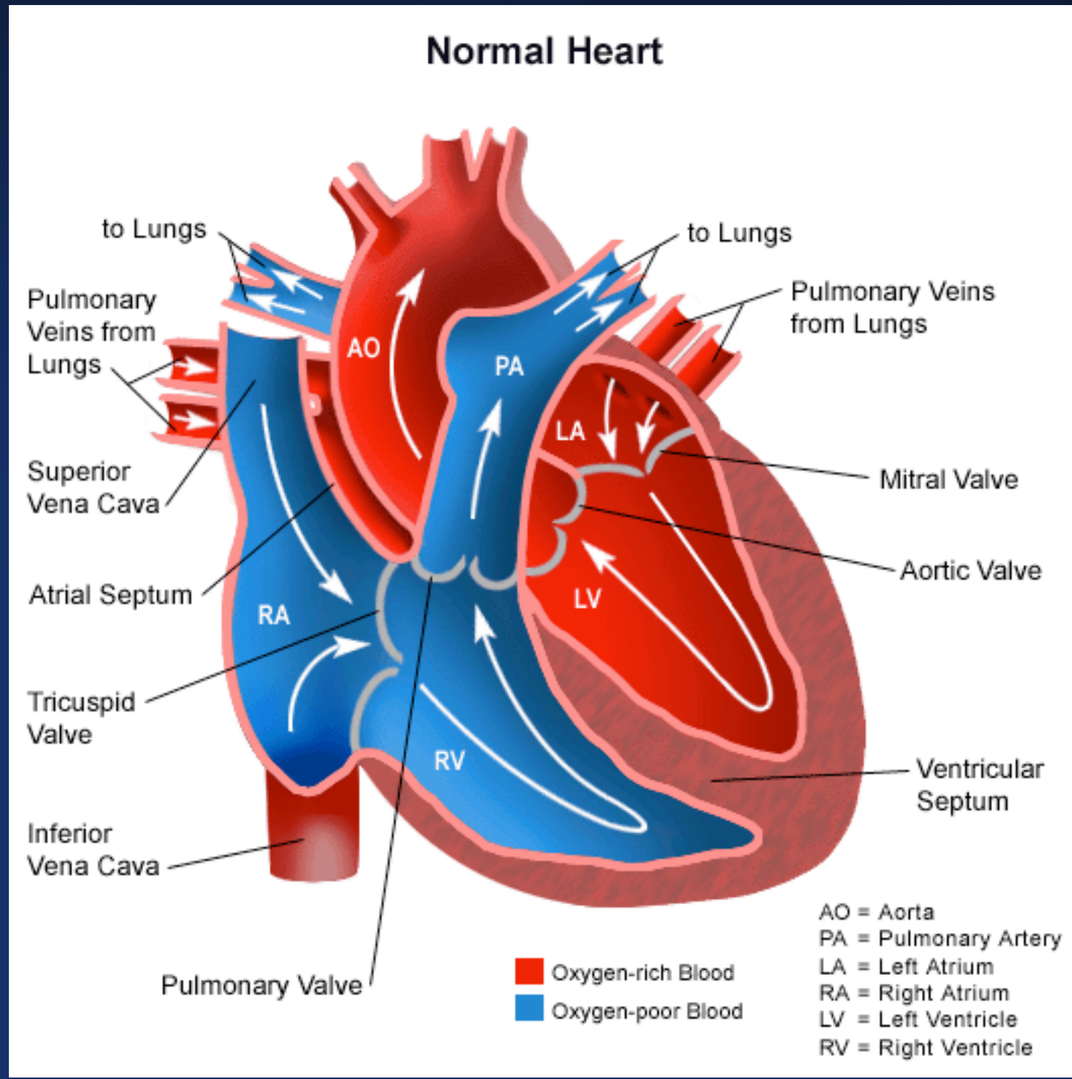


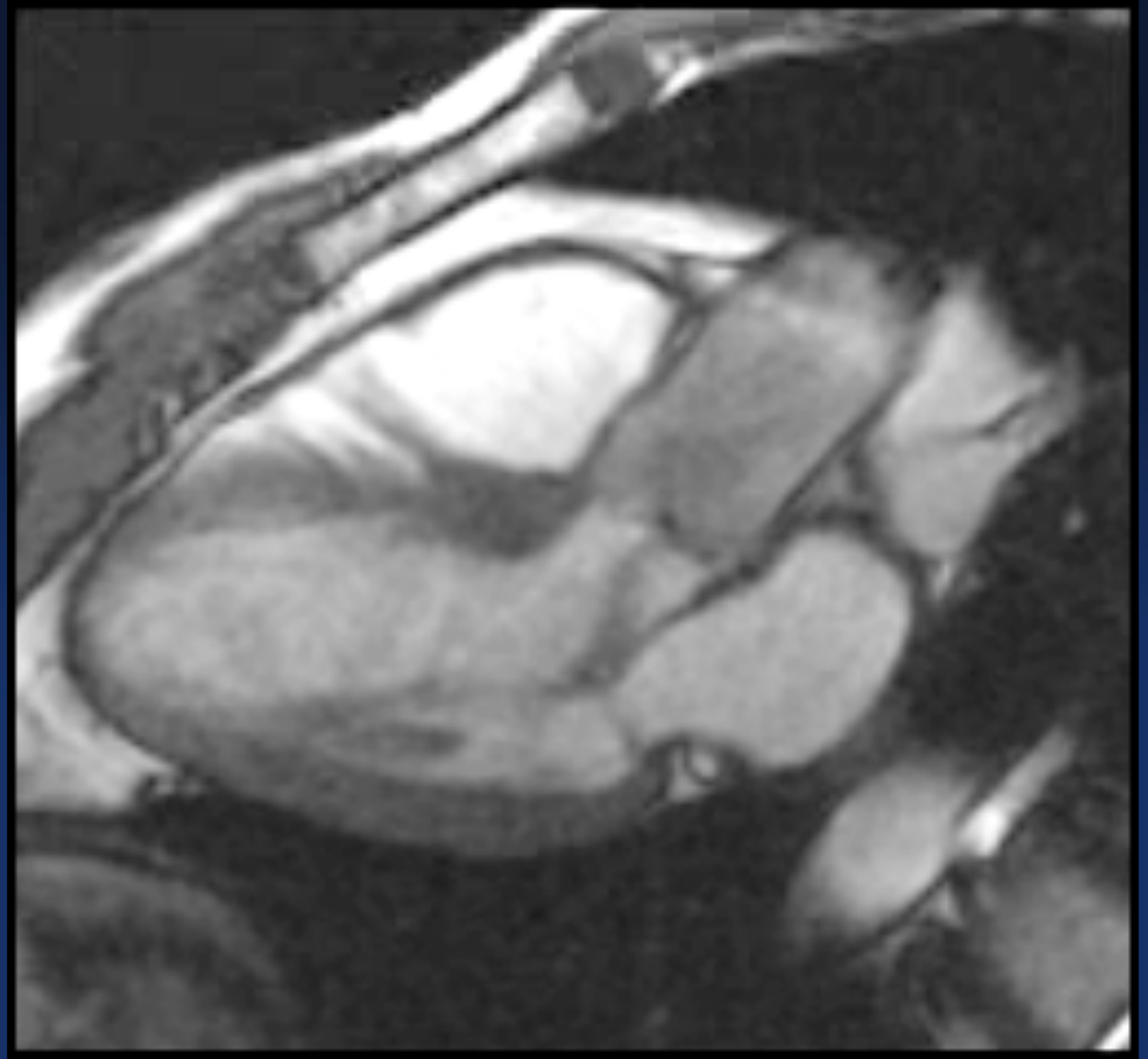
Aortic Insufficiency



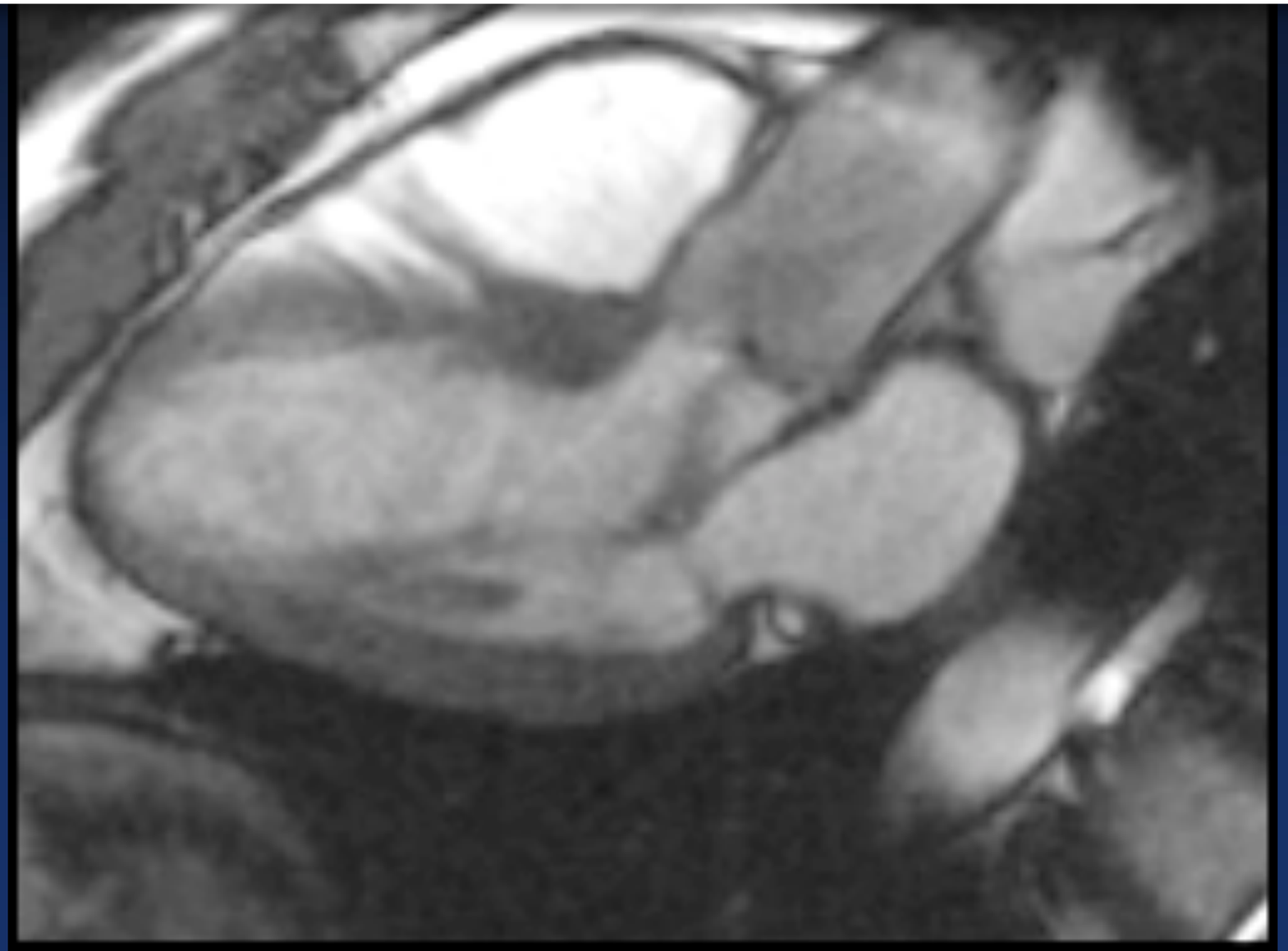
Aortic Stenosis

- Left ventricle hypertrophy/dilation
- Post-stenotic dilation of ascending aorta
- Pulmonary vessels are normal



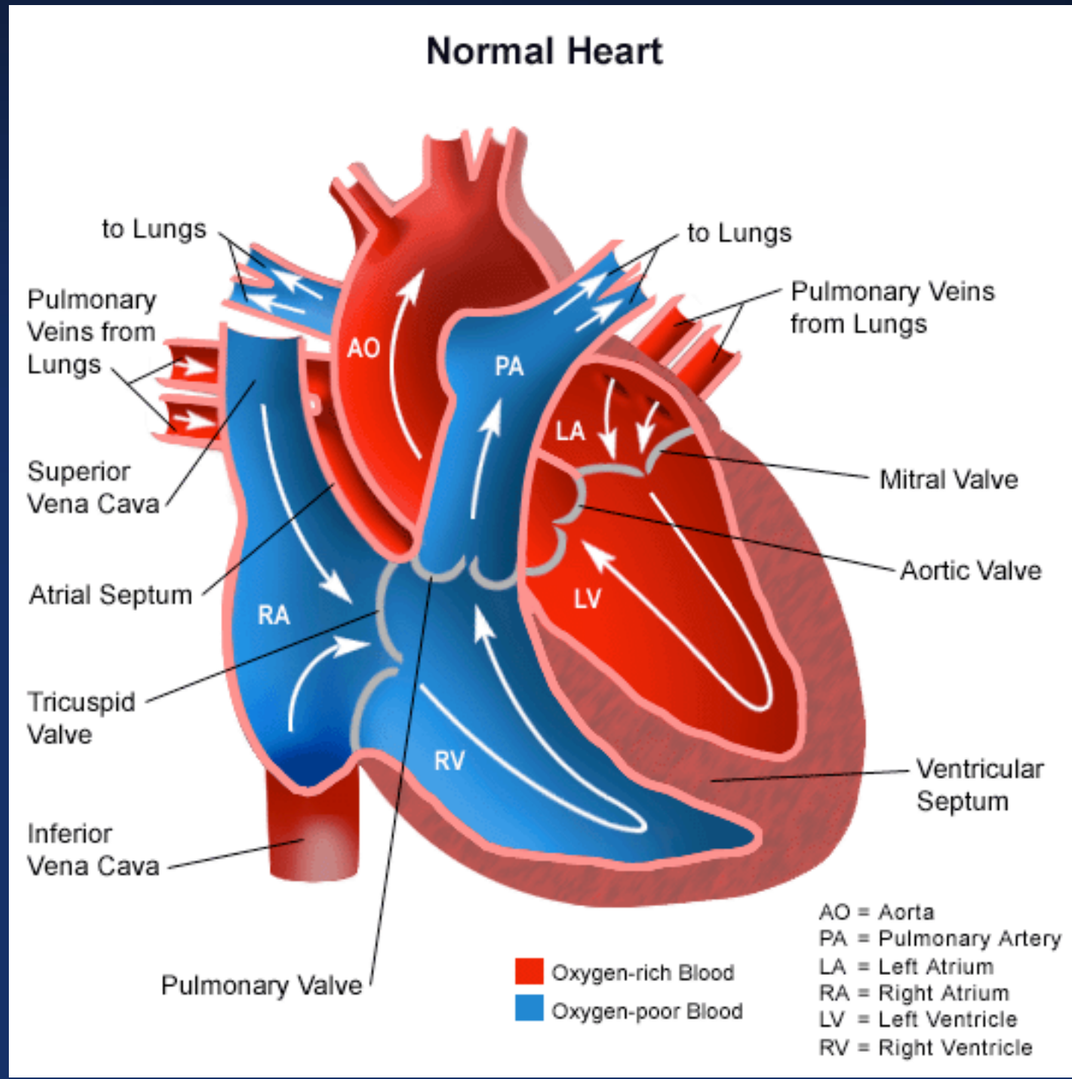


Aortic Stenosis (& Insufficiency)

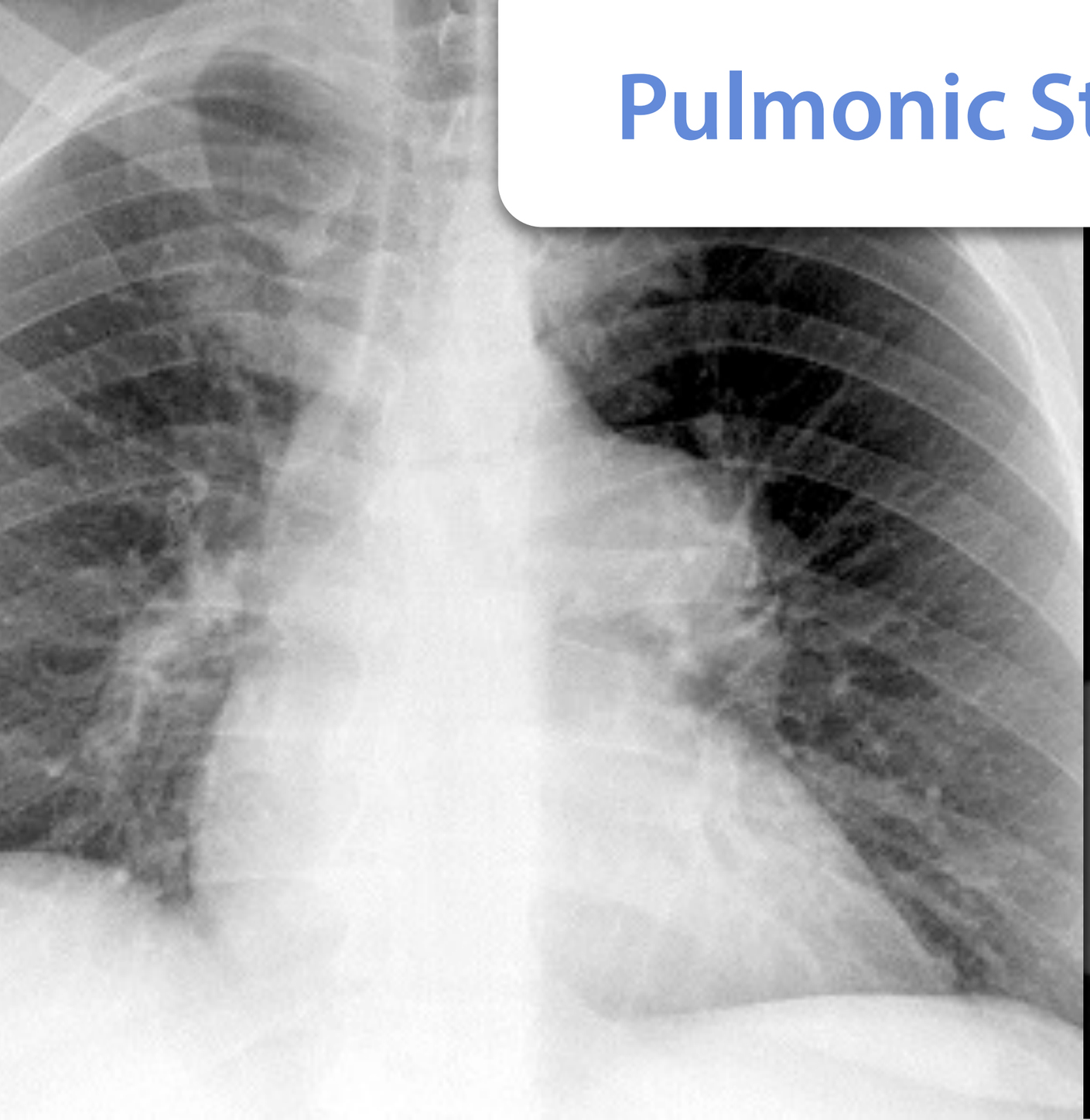


Pulmonic Stenosis

- Right ventricle hypertrophy/dilation
- Post-stenotic dilation of pulmonary artery



Pulmonic Stenosis



Pericardium

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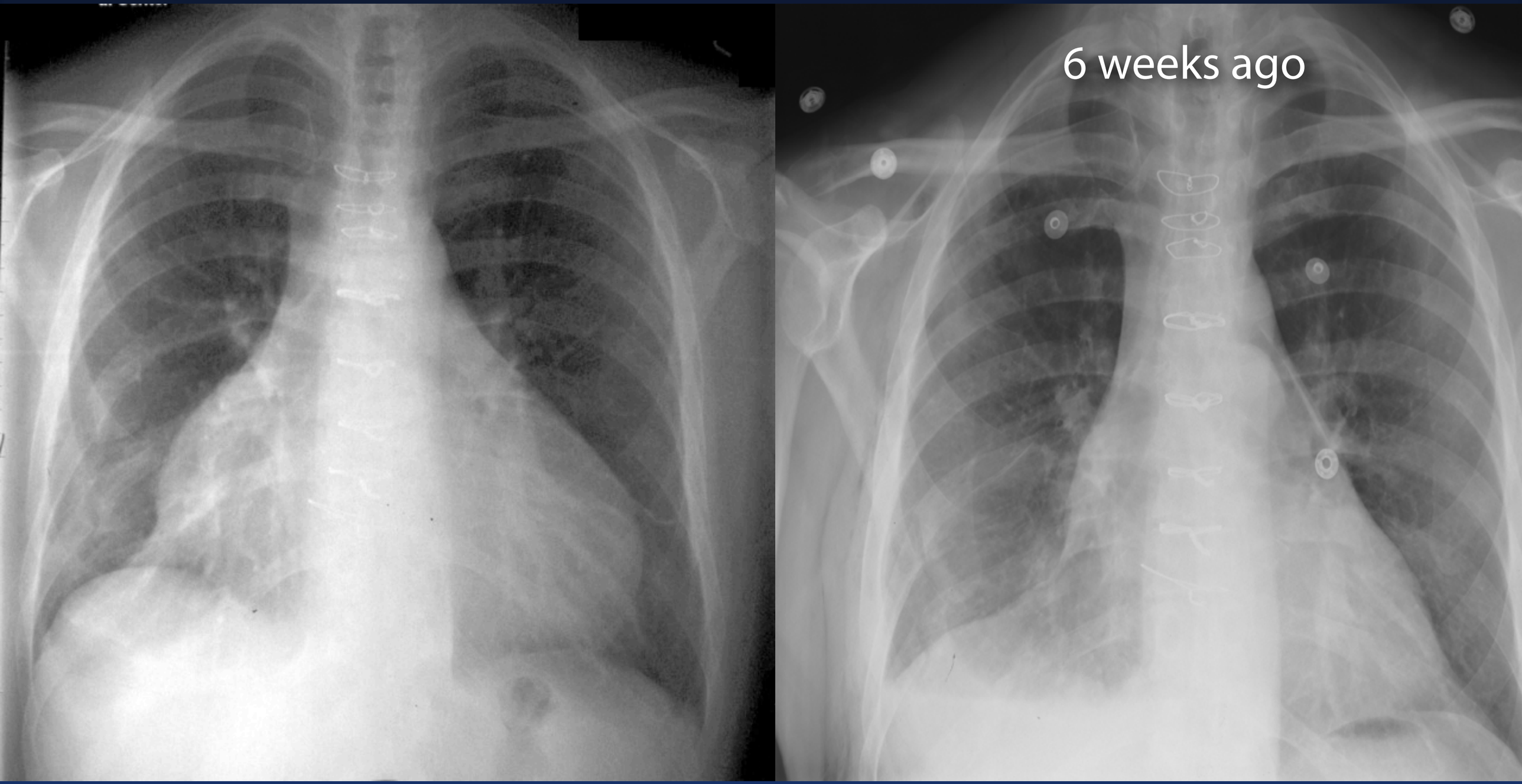
Pericardium

- Anatomy:
  - Visceral
  - Space
  - Parietal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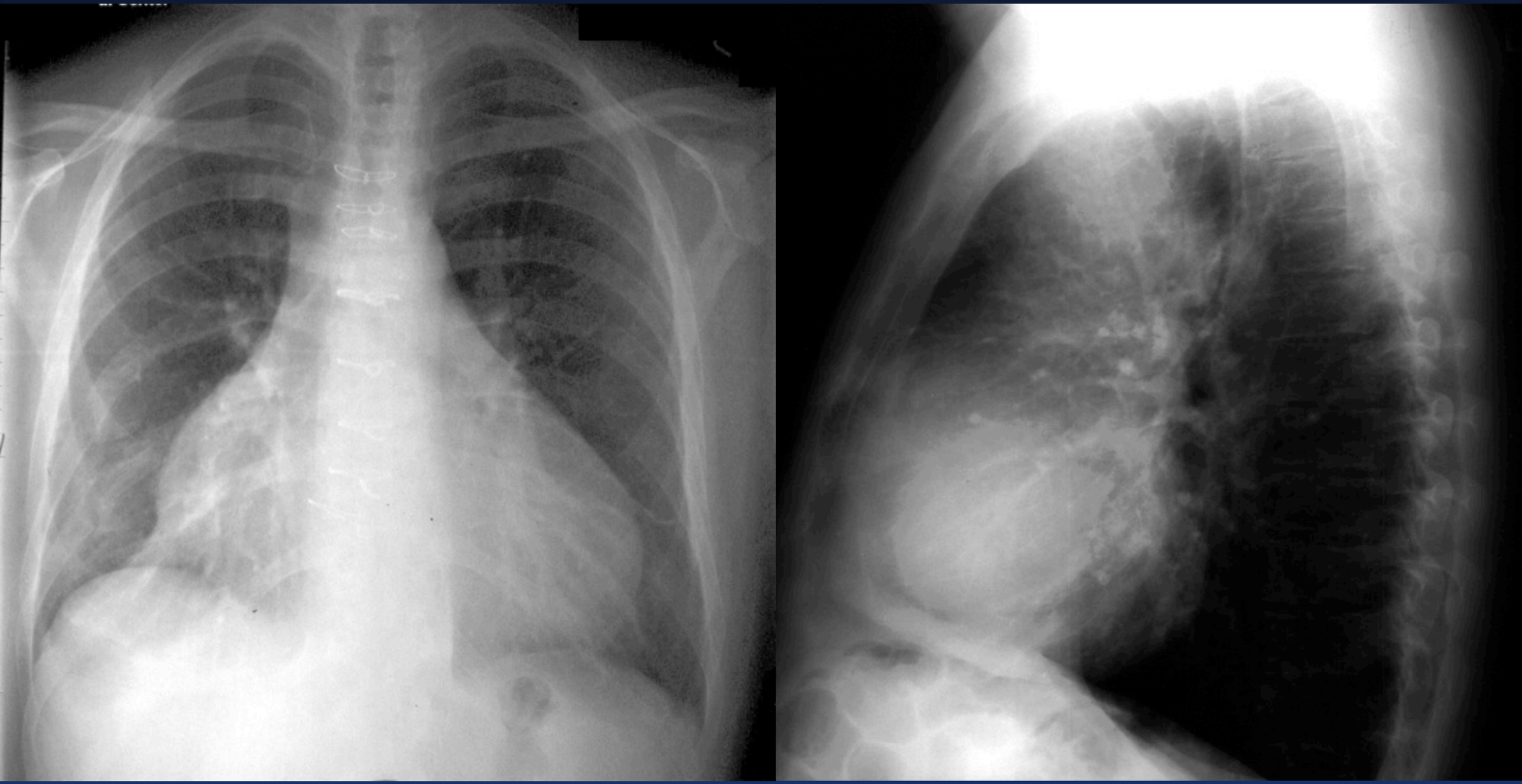
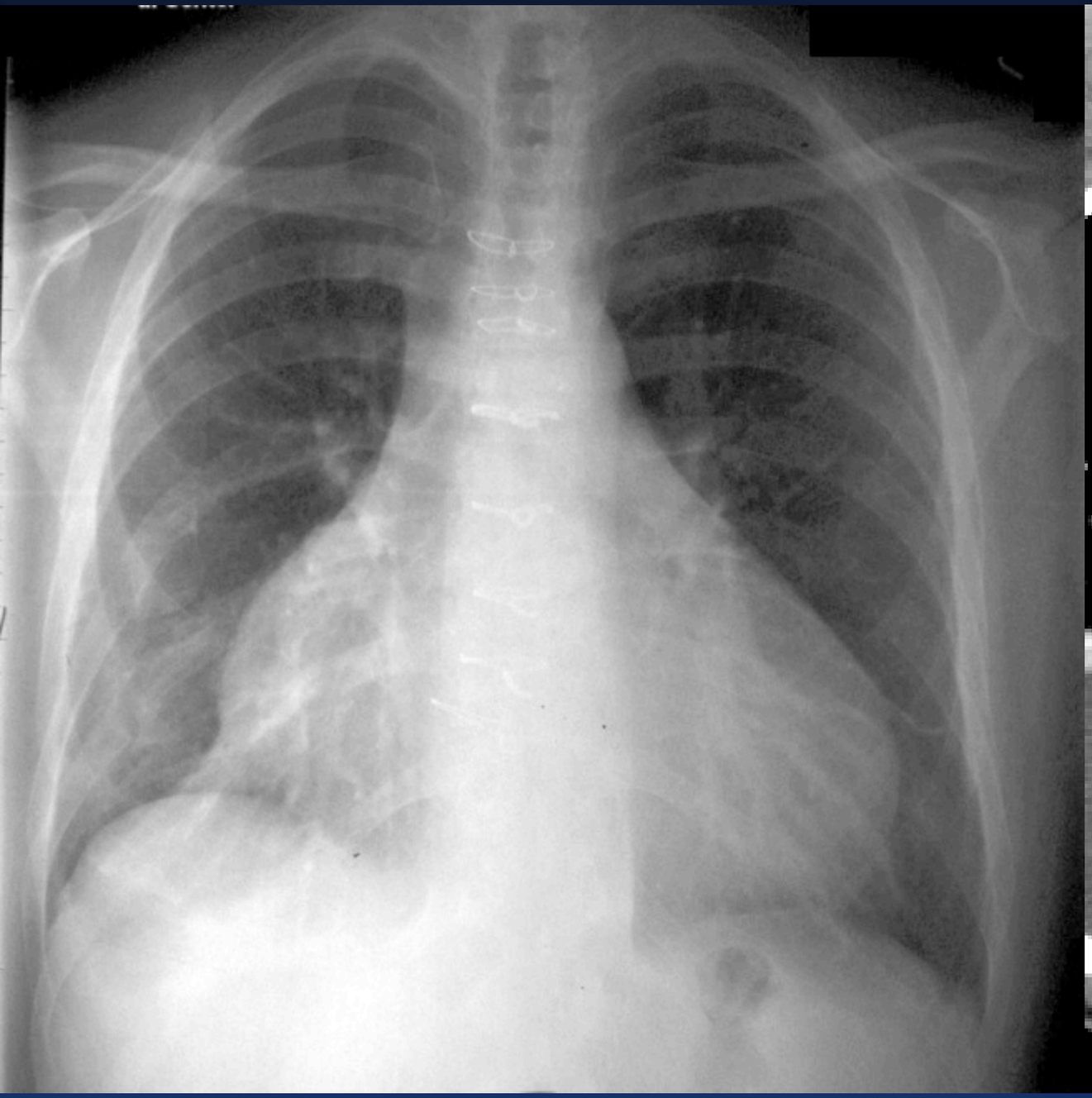
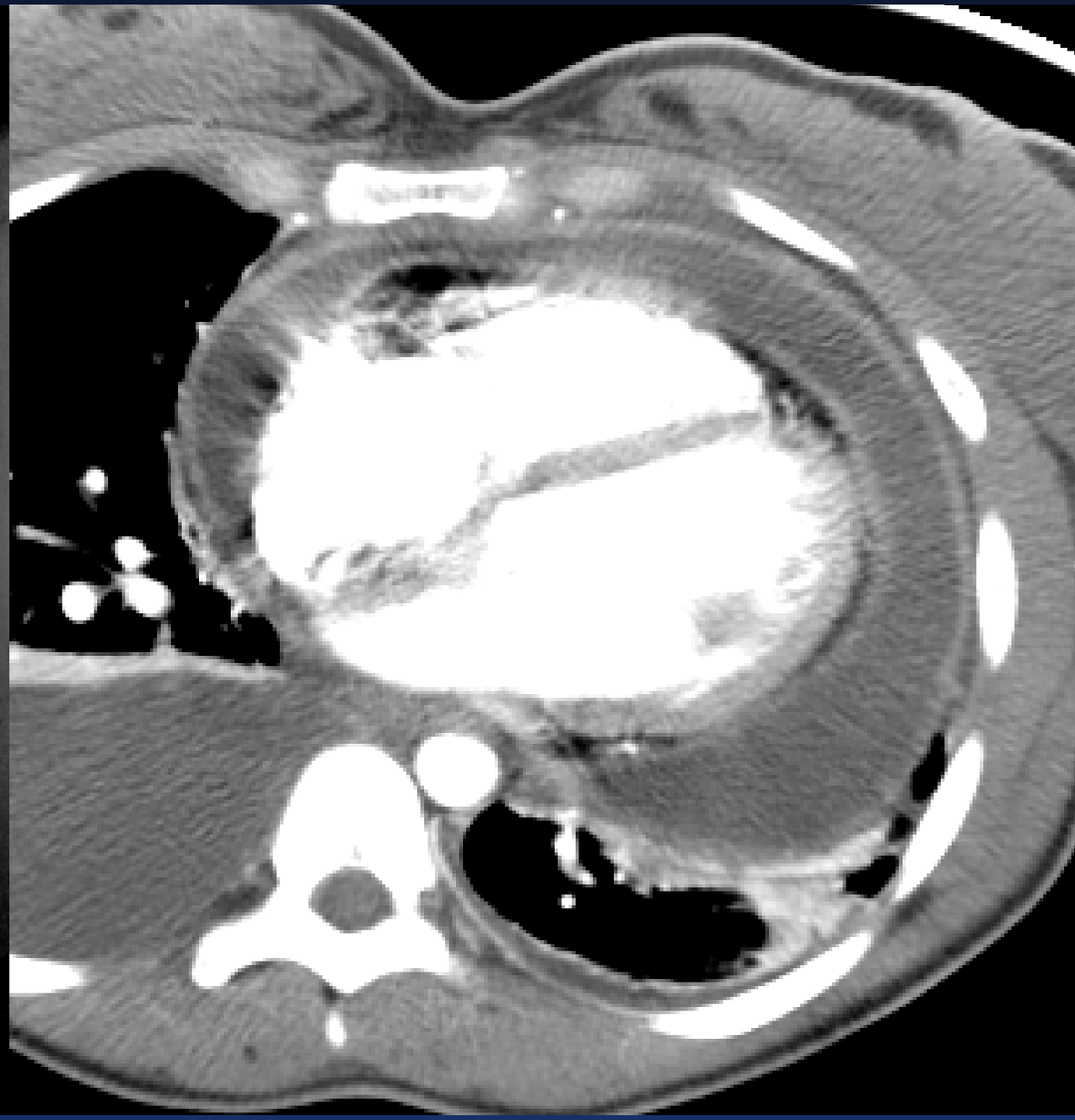
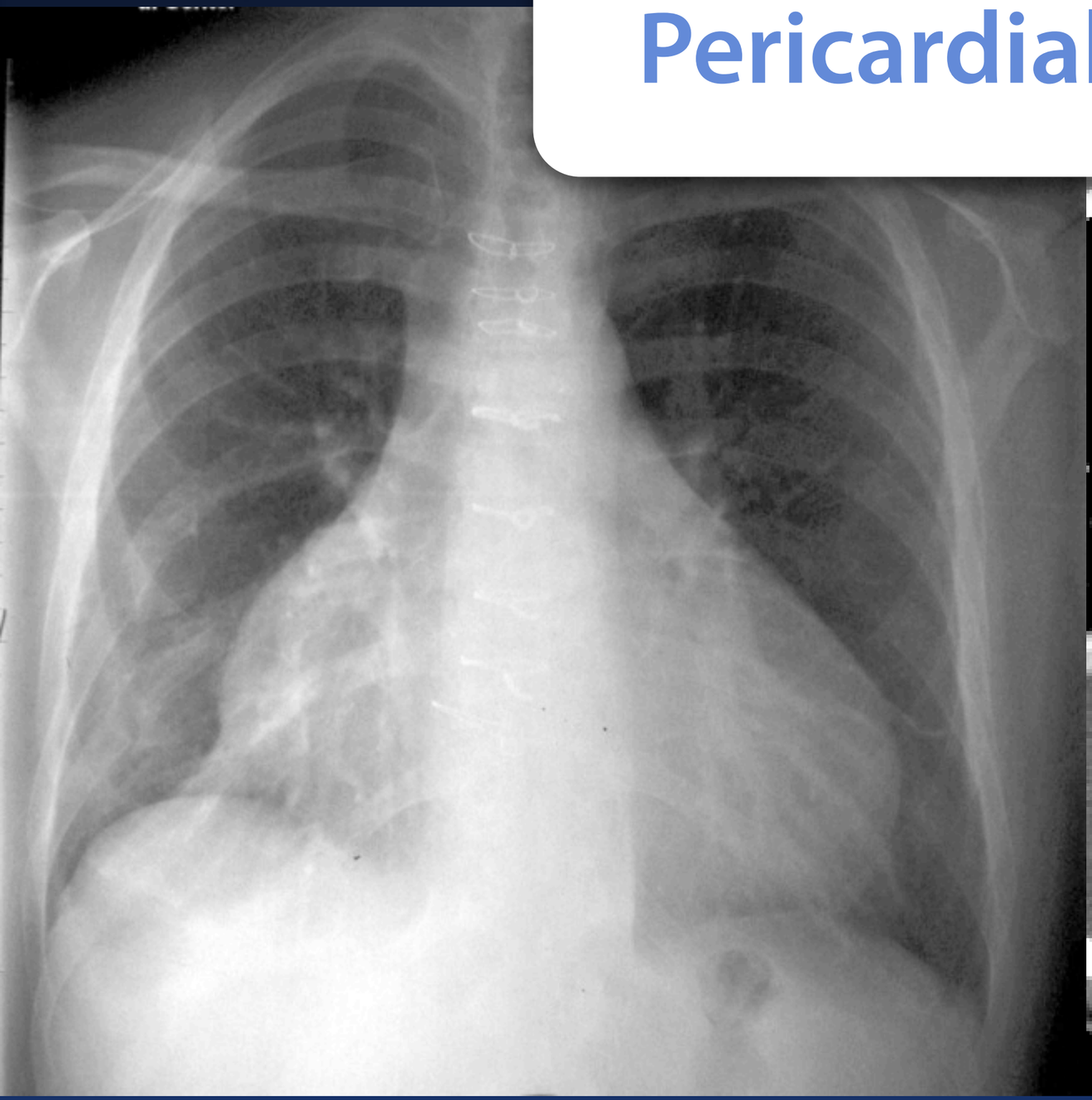
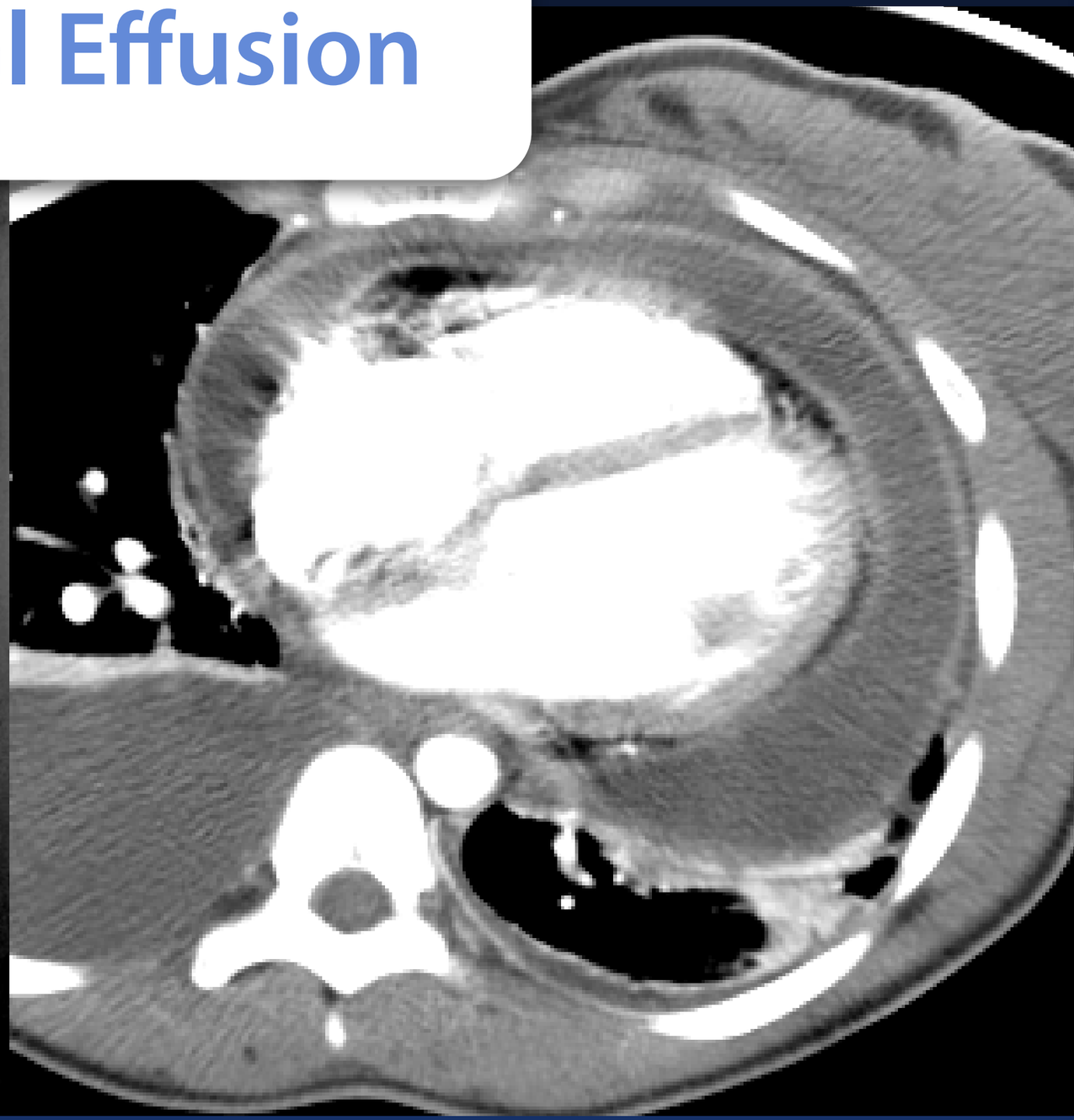






Pericardial Effusion





Vasculature

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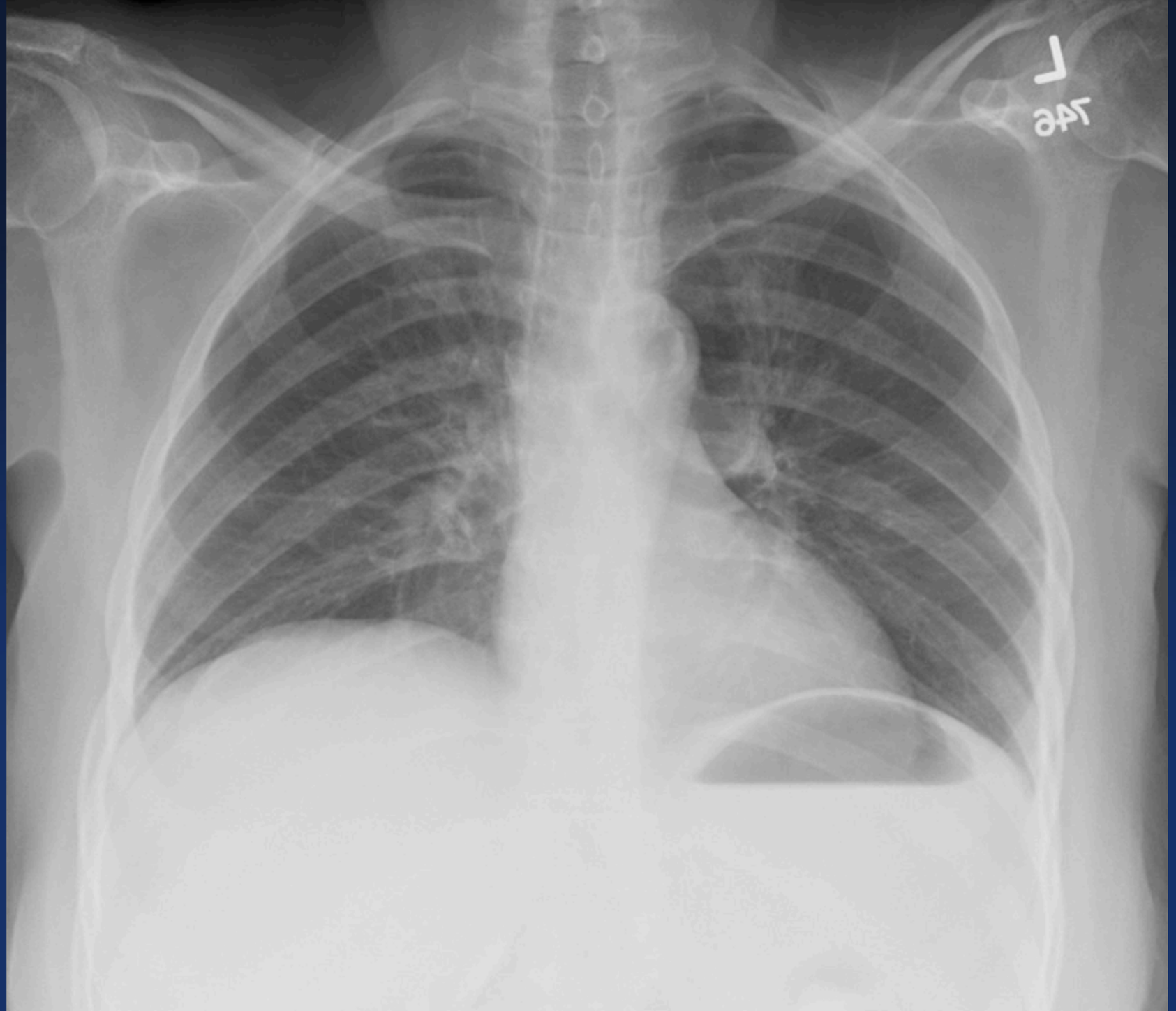
Vasculature

- Thoracic Aorta
- Pulmonary Arteries
- Pulmonary Veins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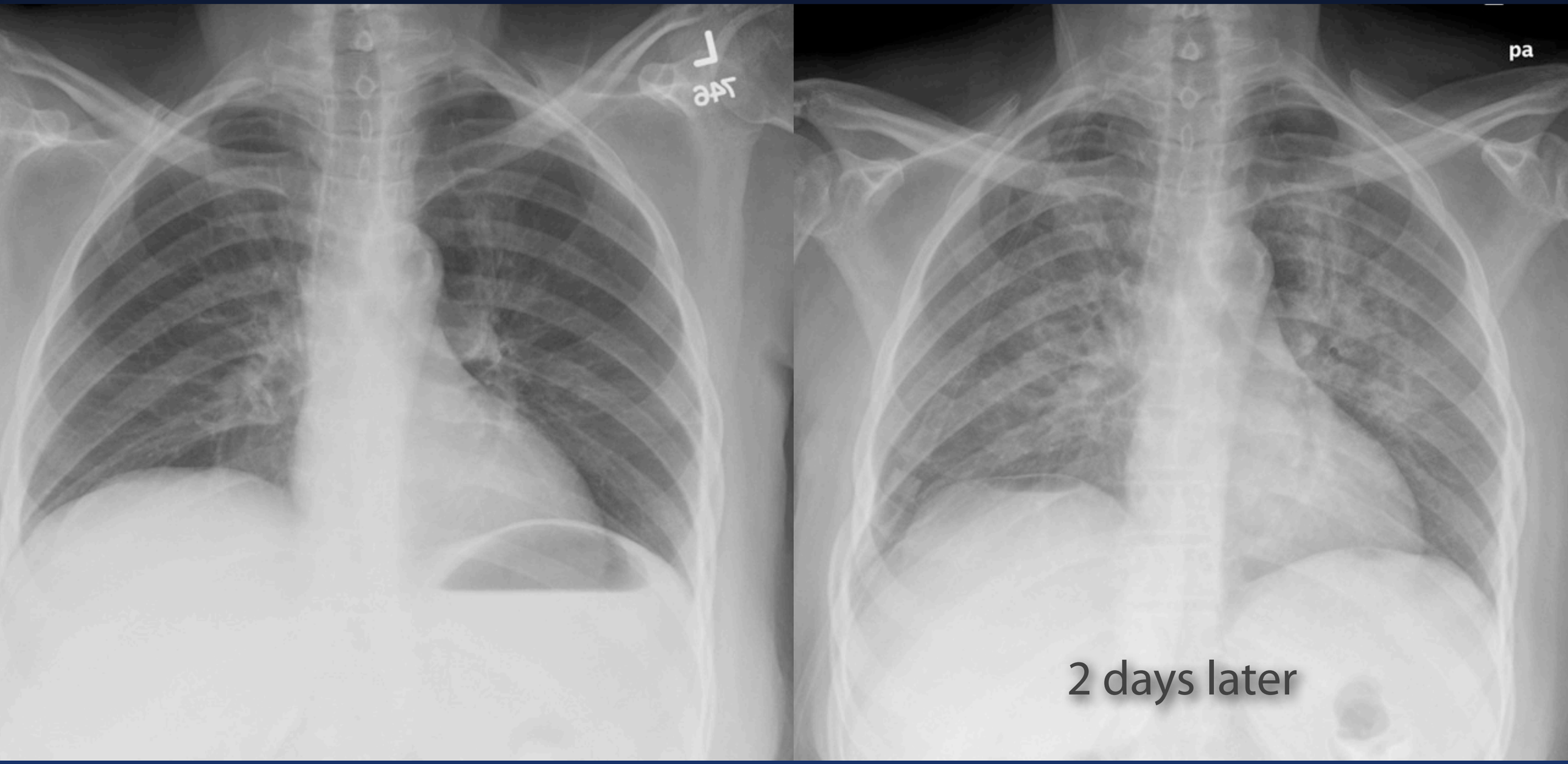
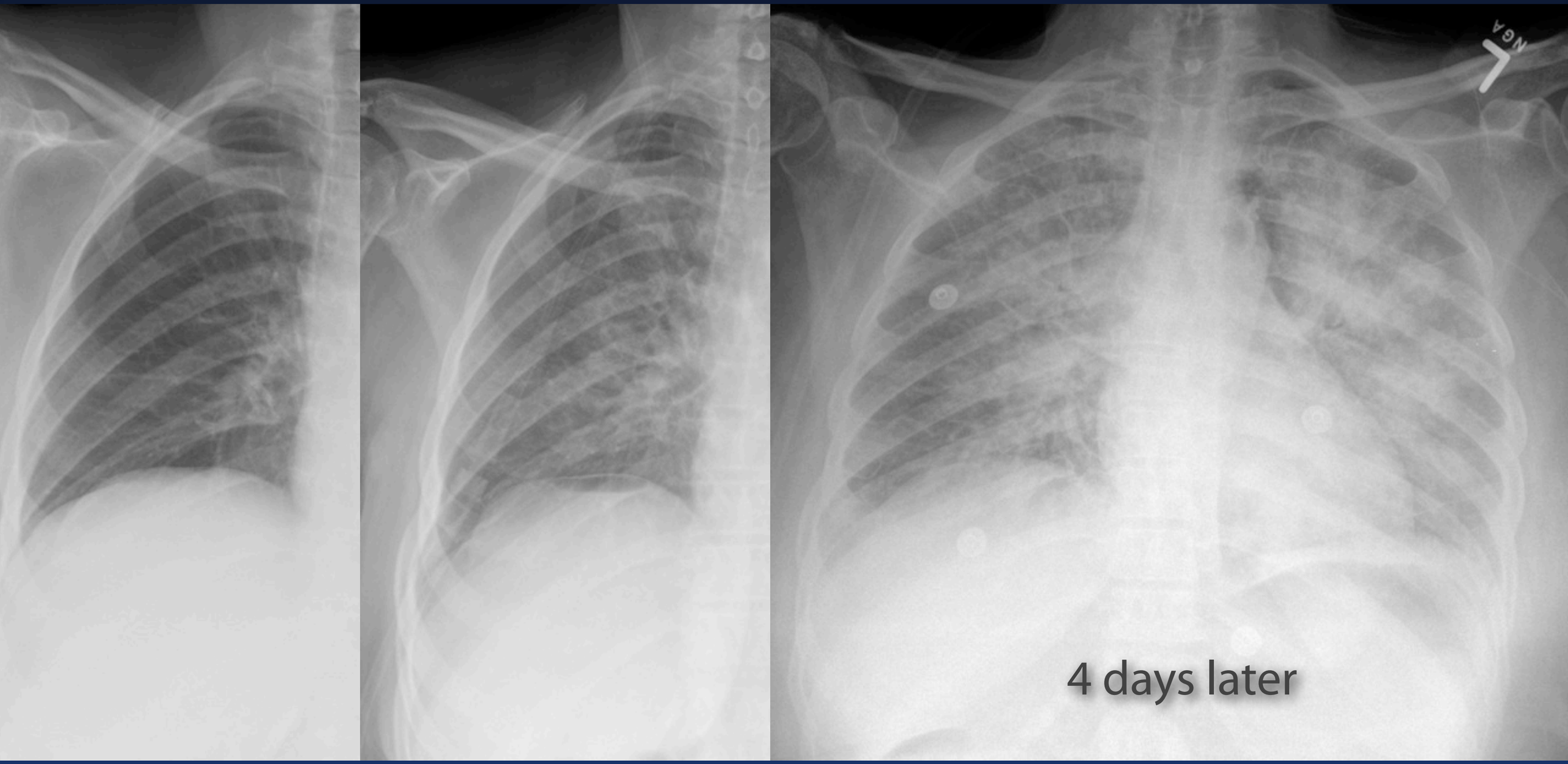
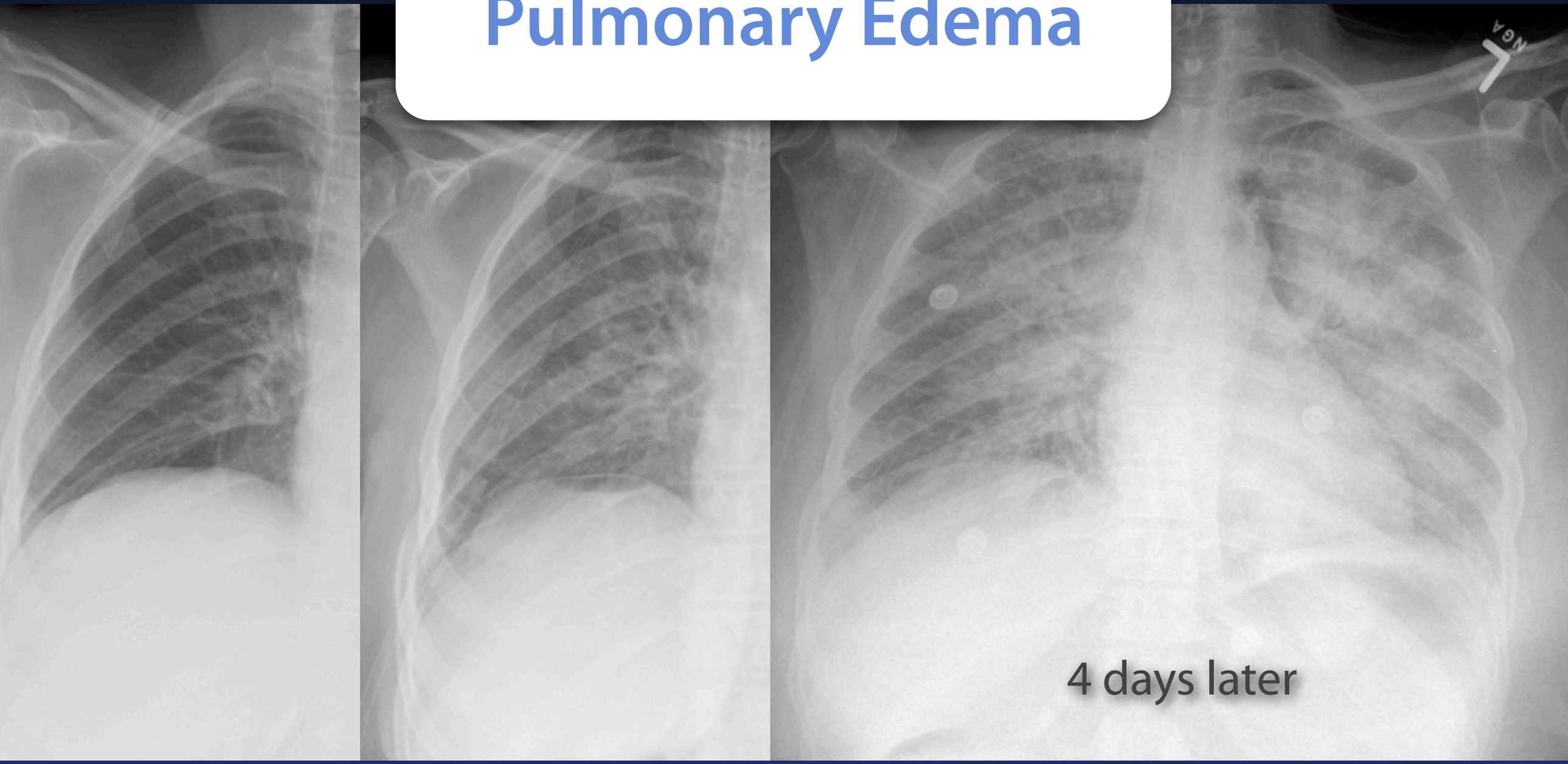
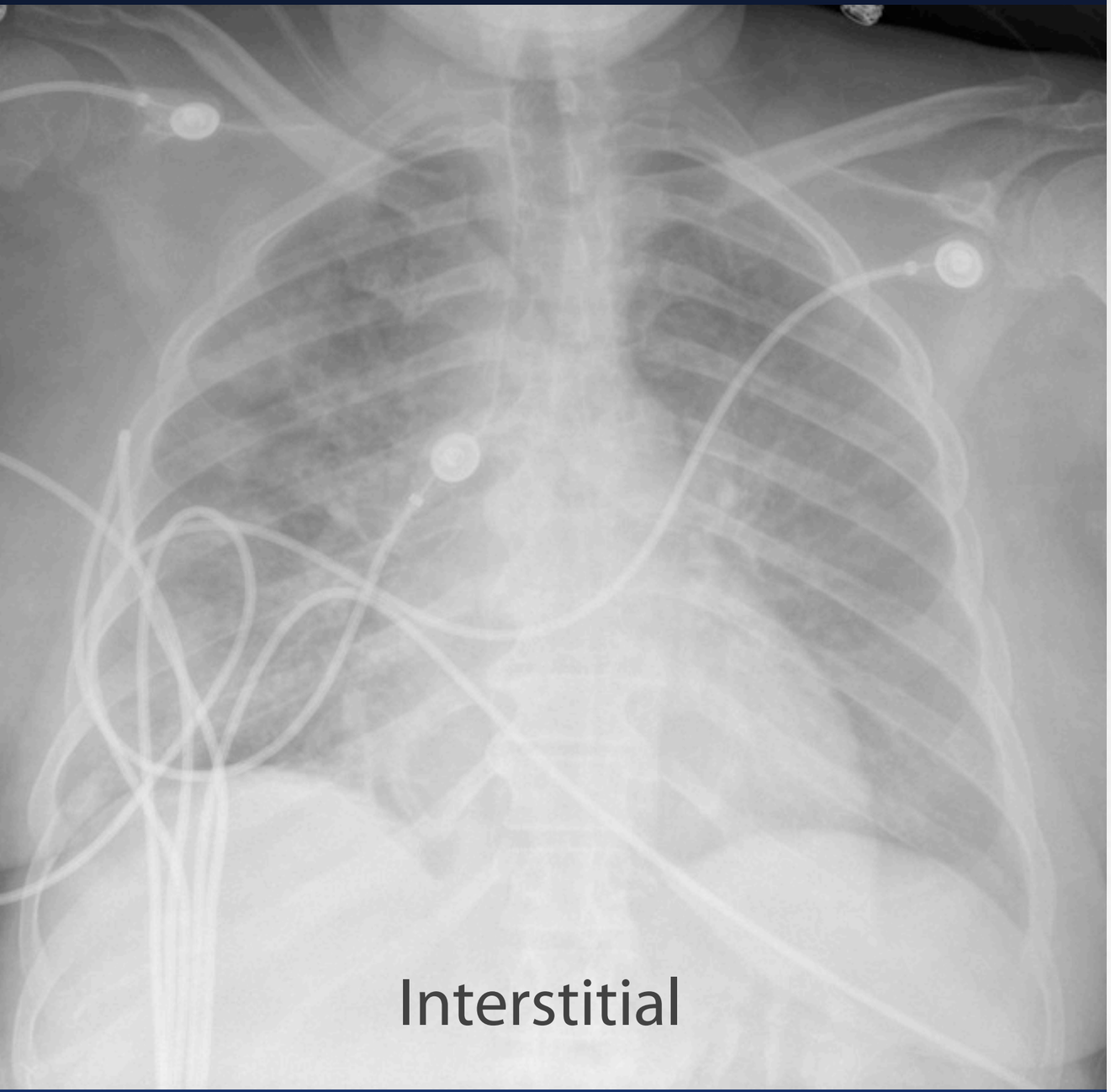

pa
2 days later


4 days later

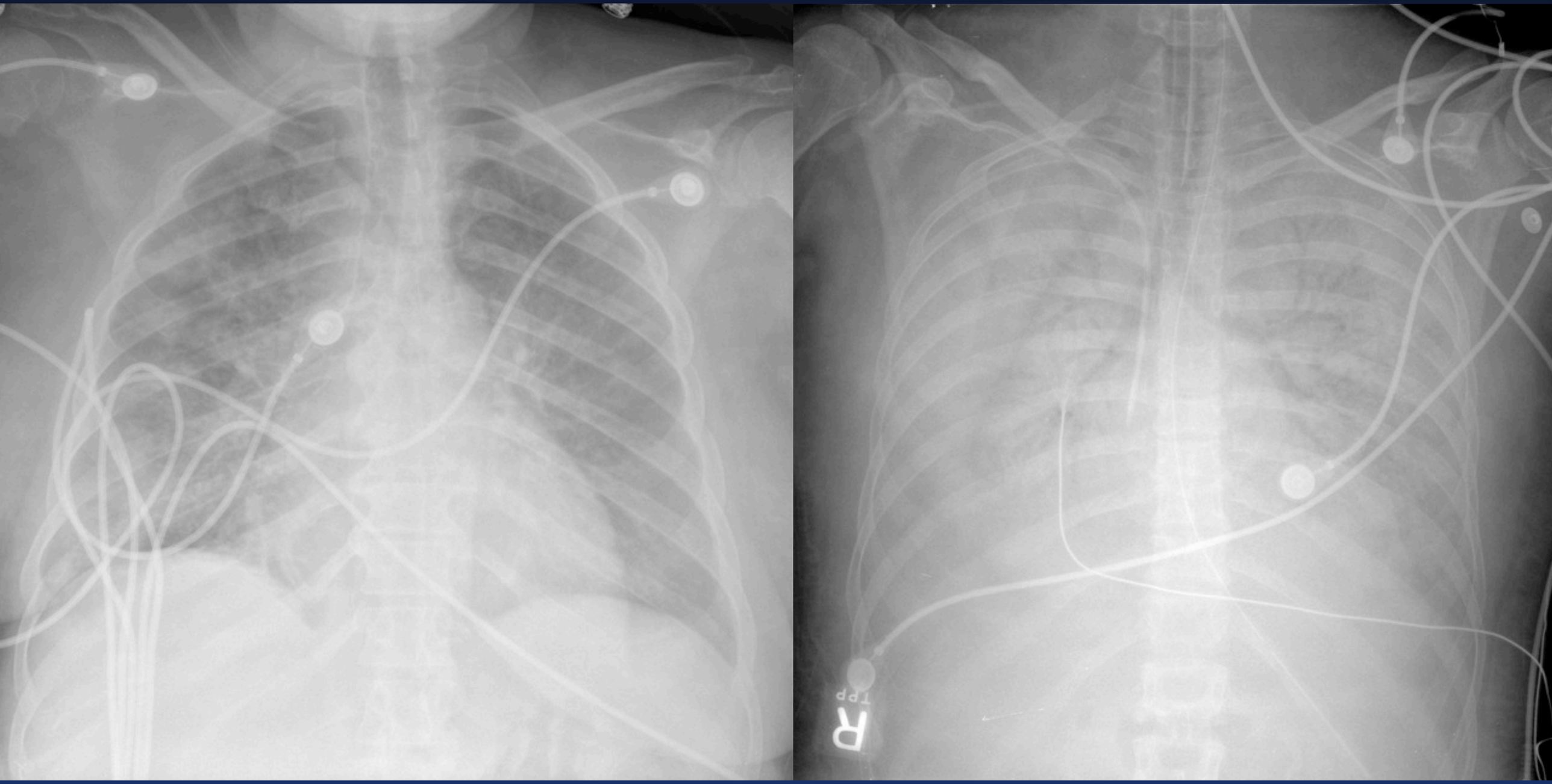
Pulmonary Edema

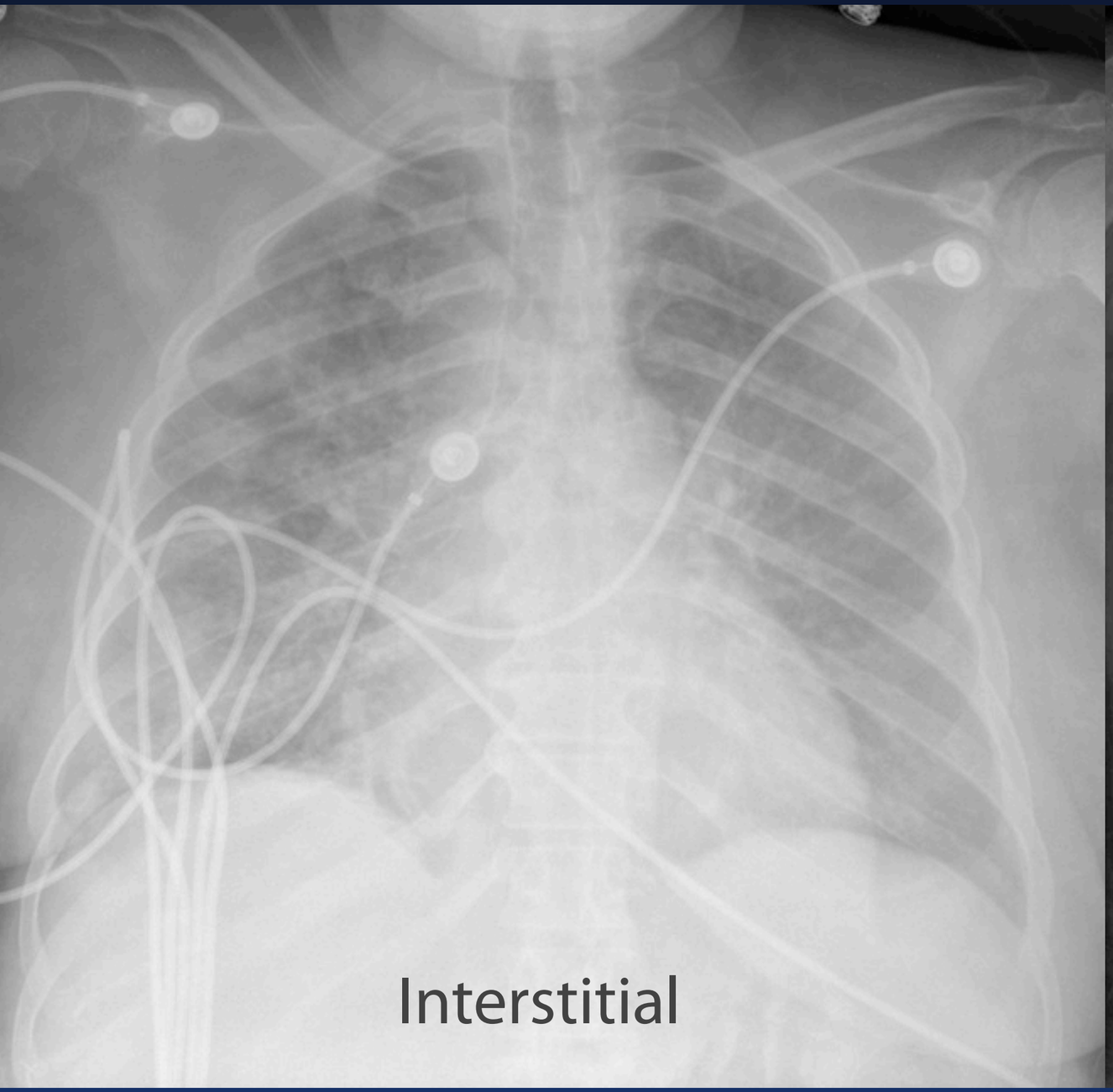




Interstitial

Kerley B Lines


R
TPP



Interstitial

Alveolar

Cases

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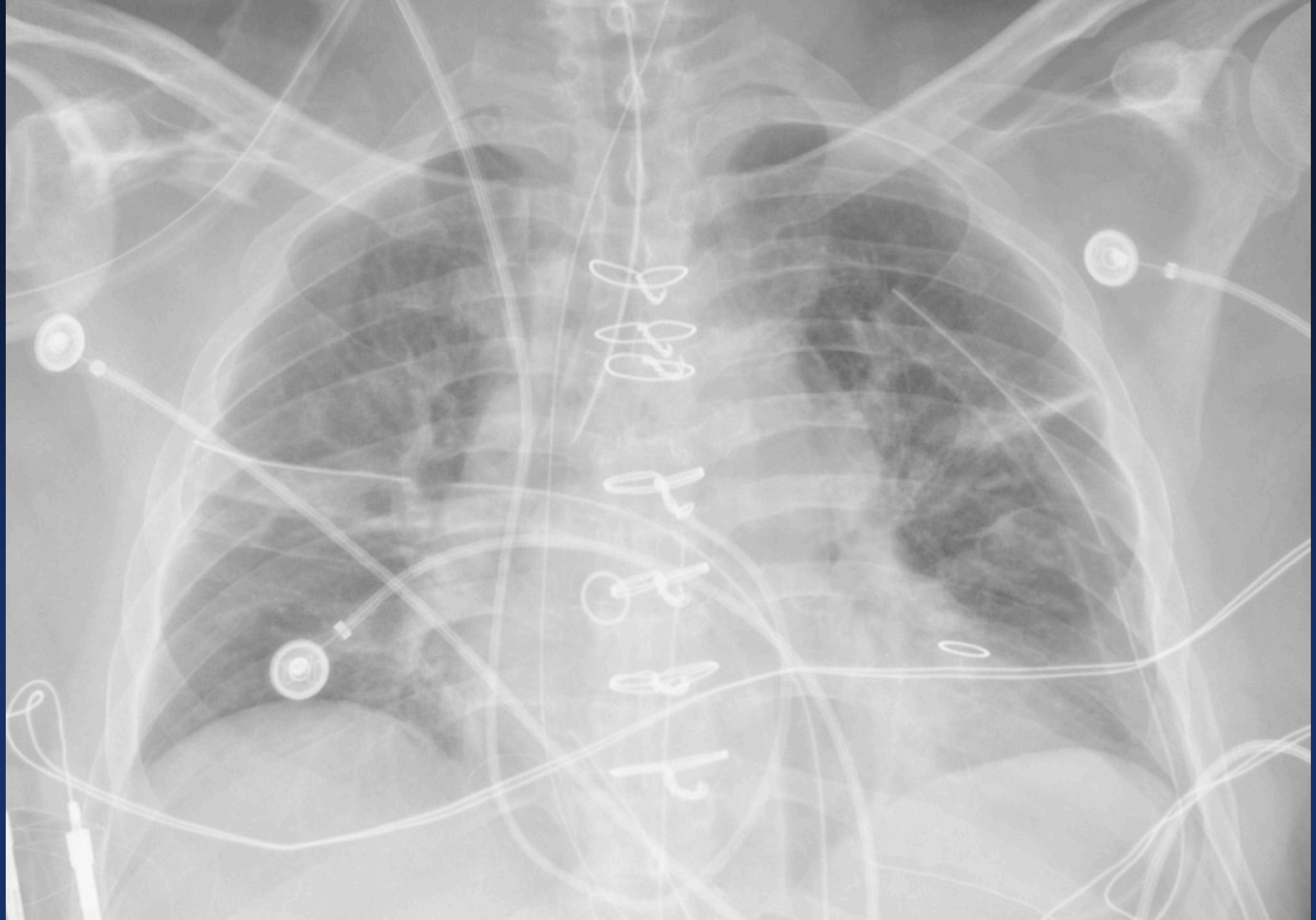

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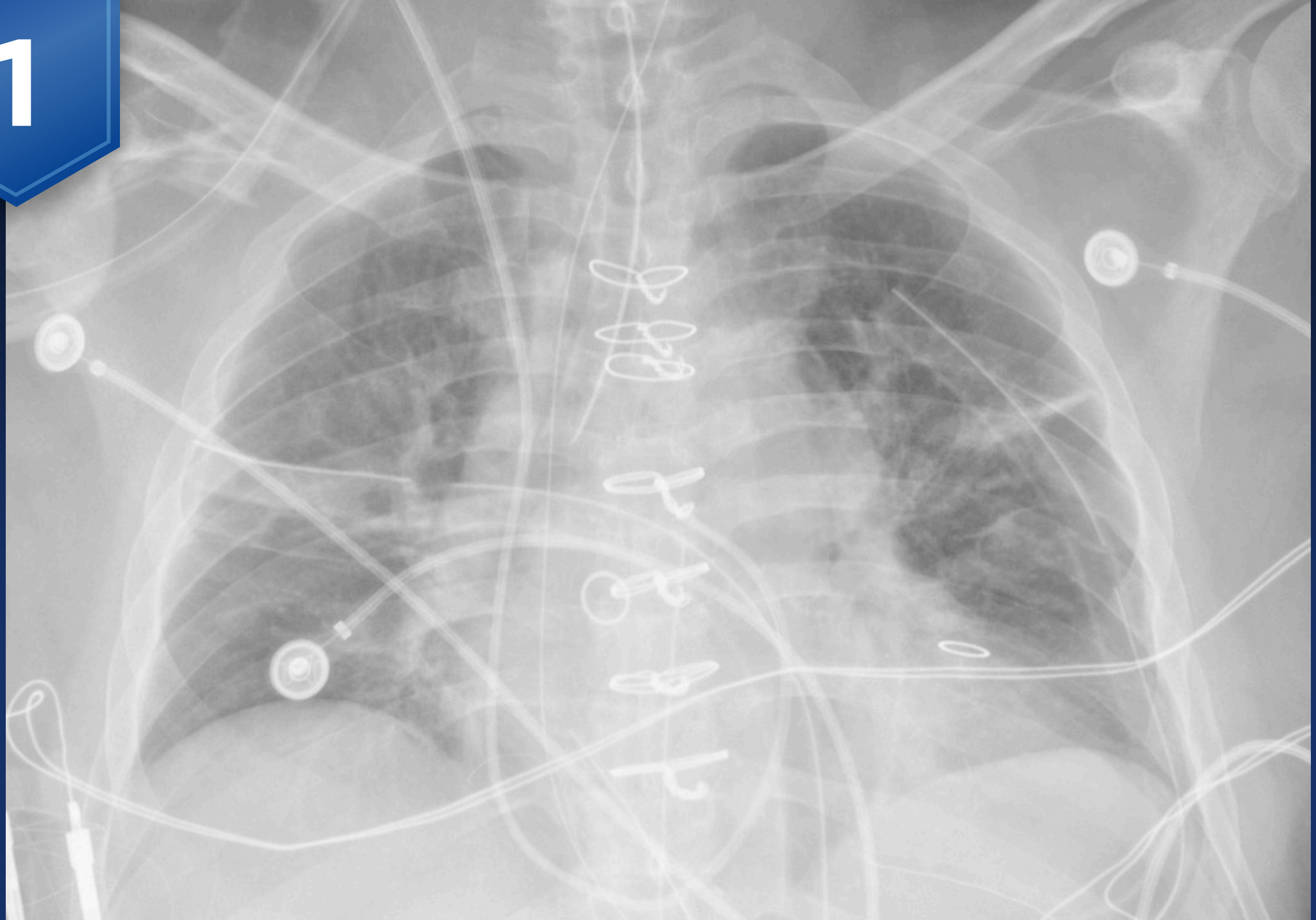
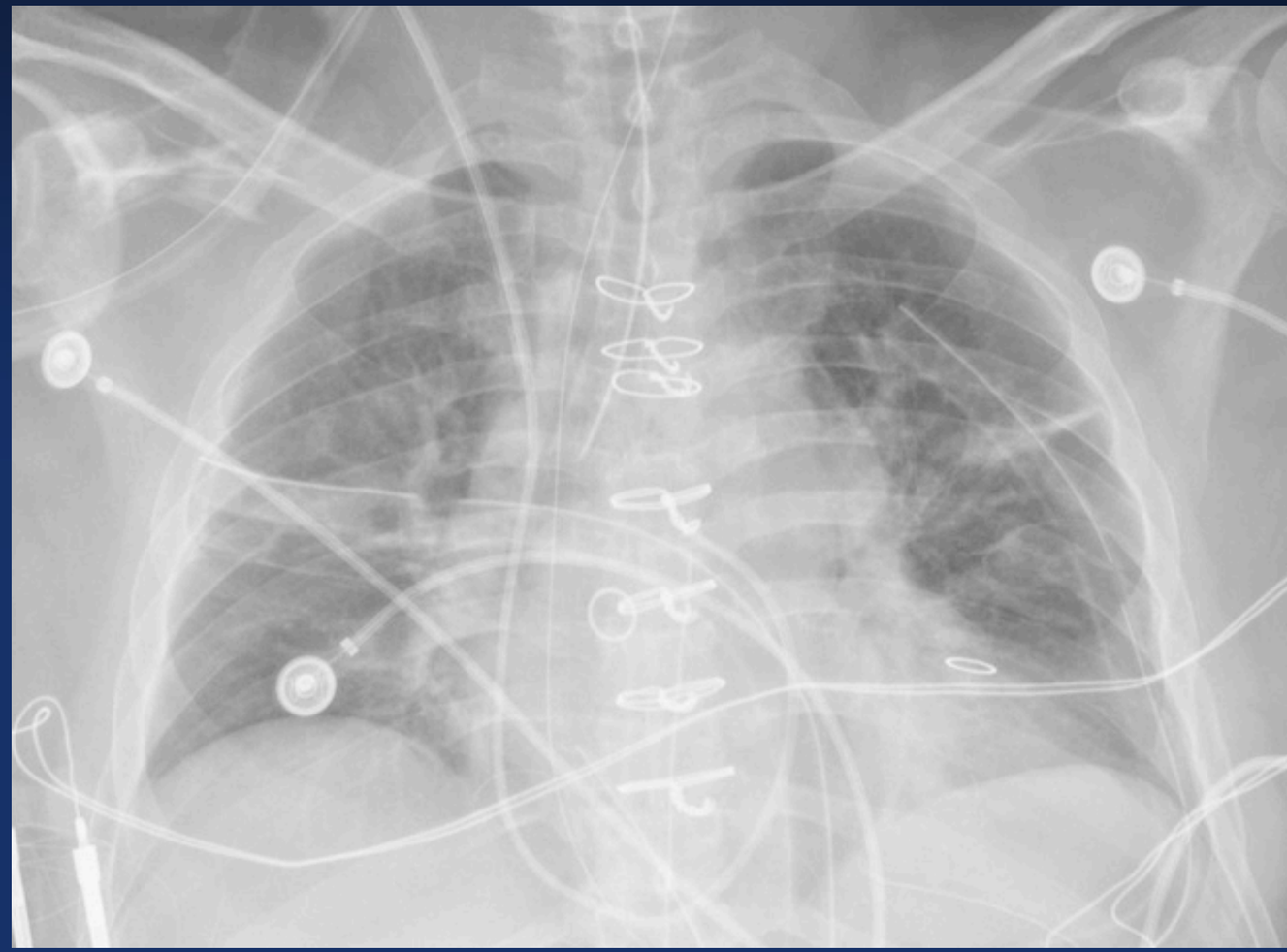
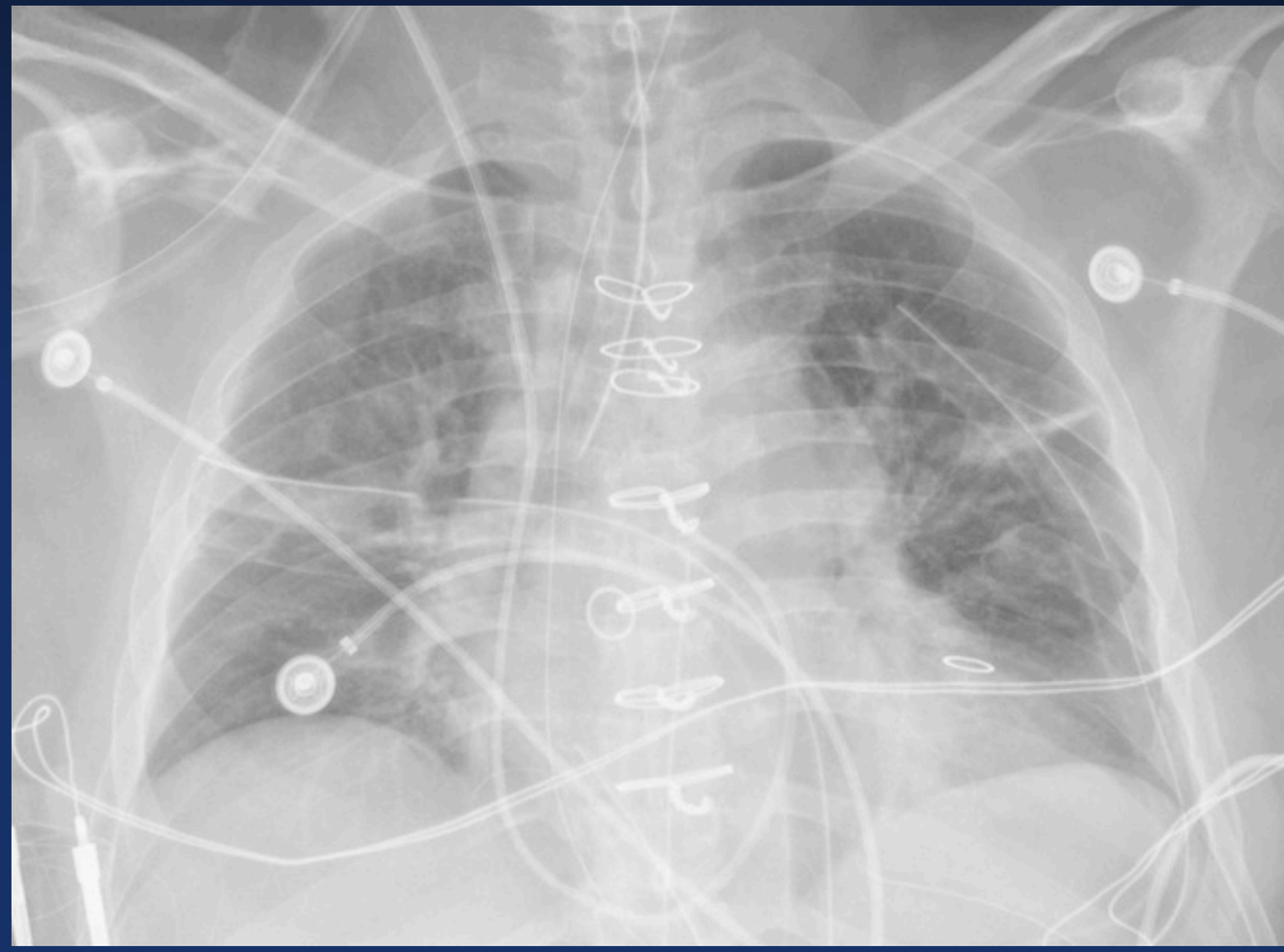


What surgery has this patient had?



What surgery has this patient had?

A. AVR
B. Cardiac Txp
C. CABG
D. Lung Txp



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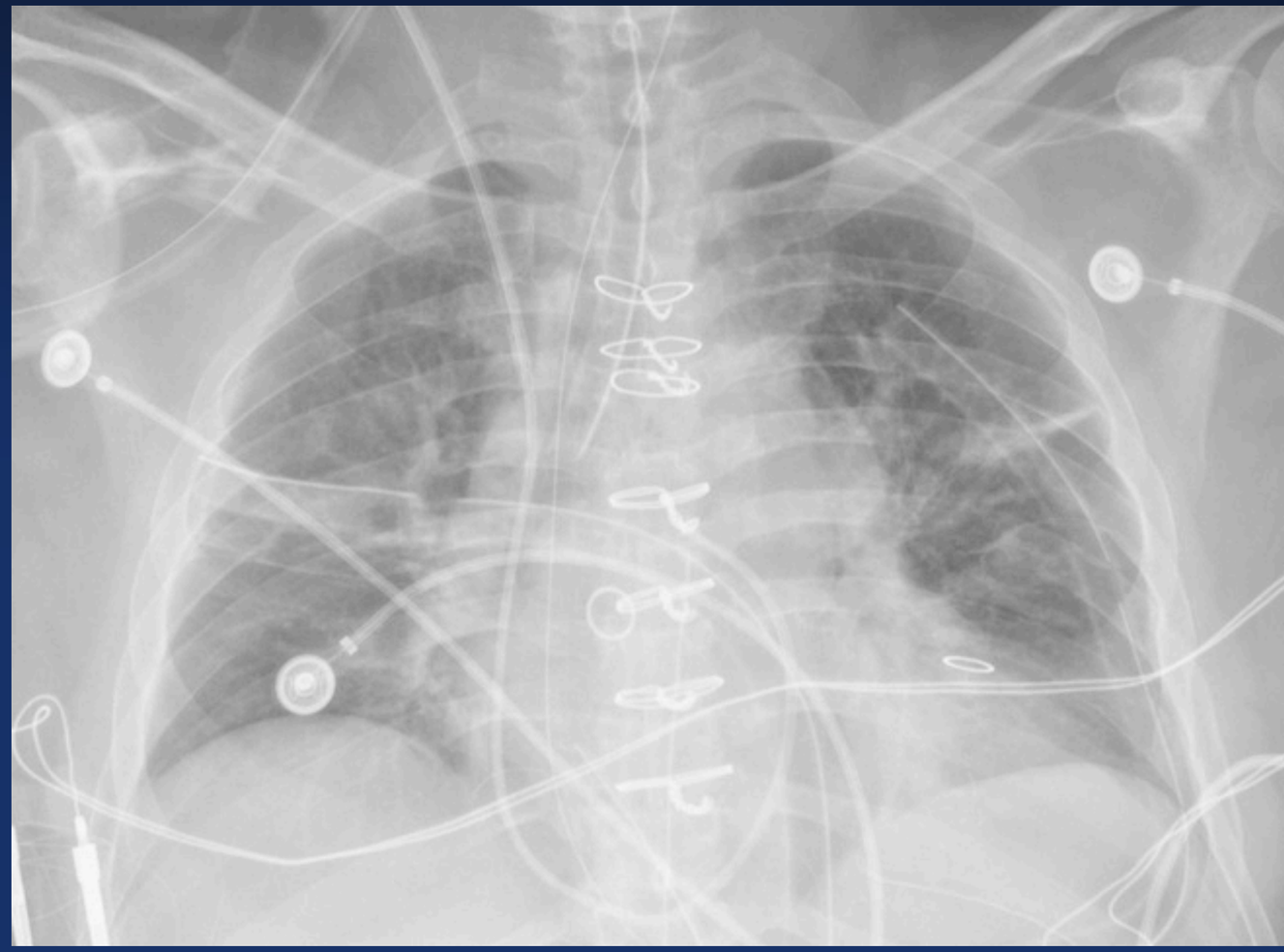

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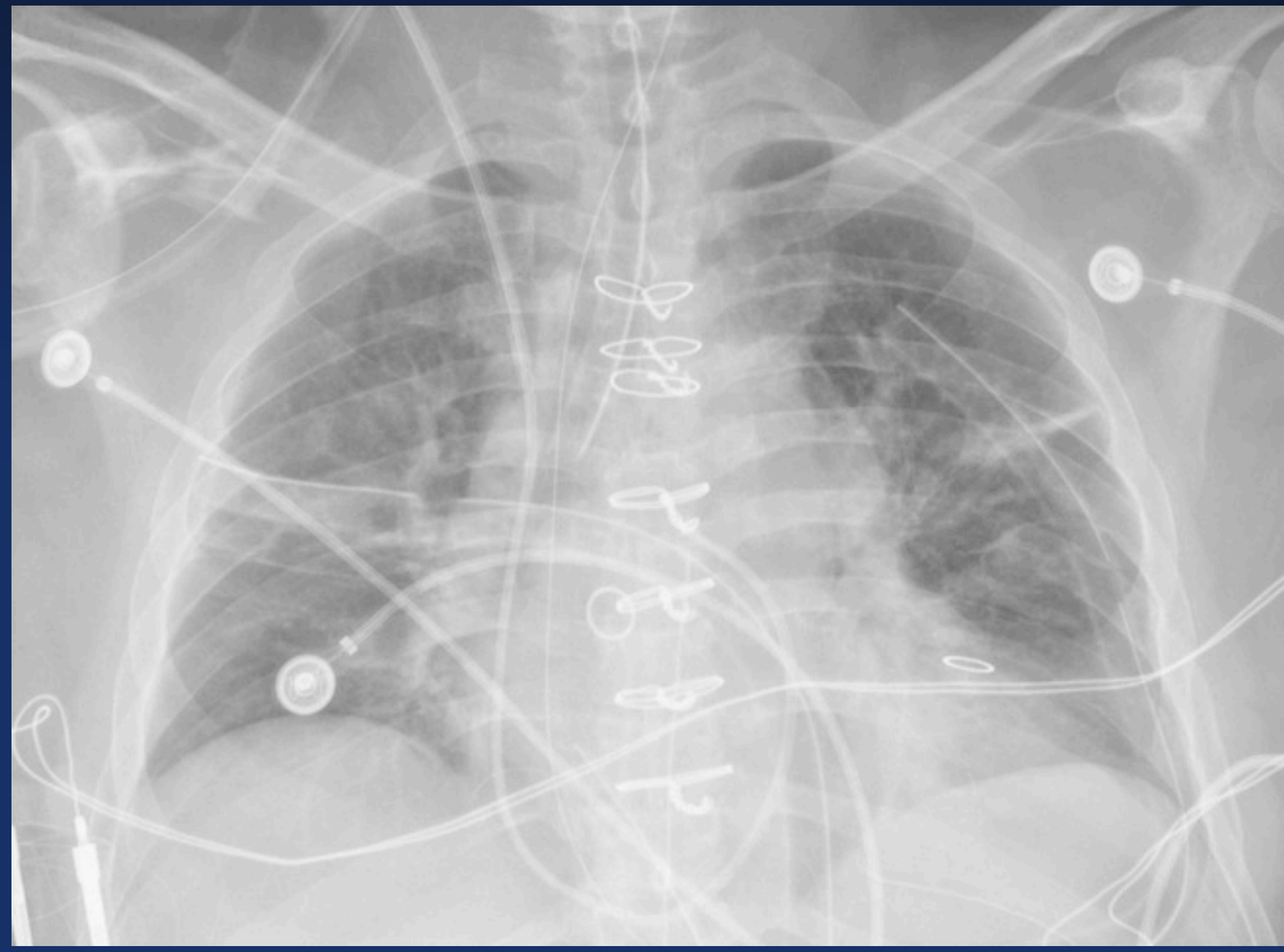
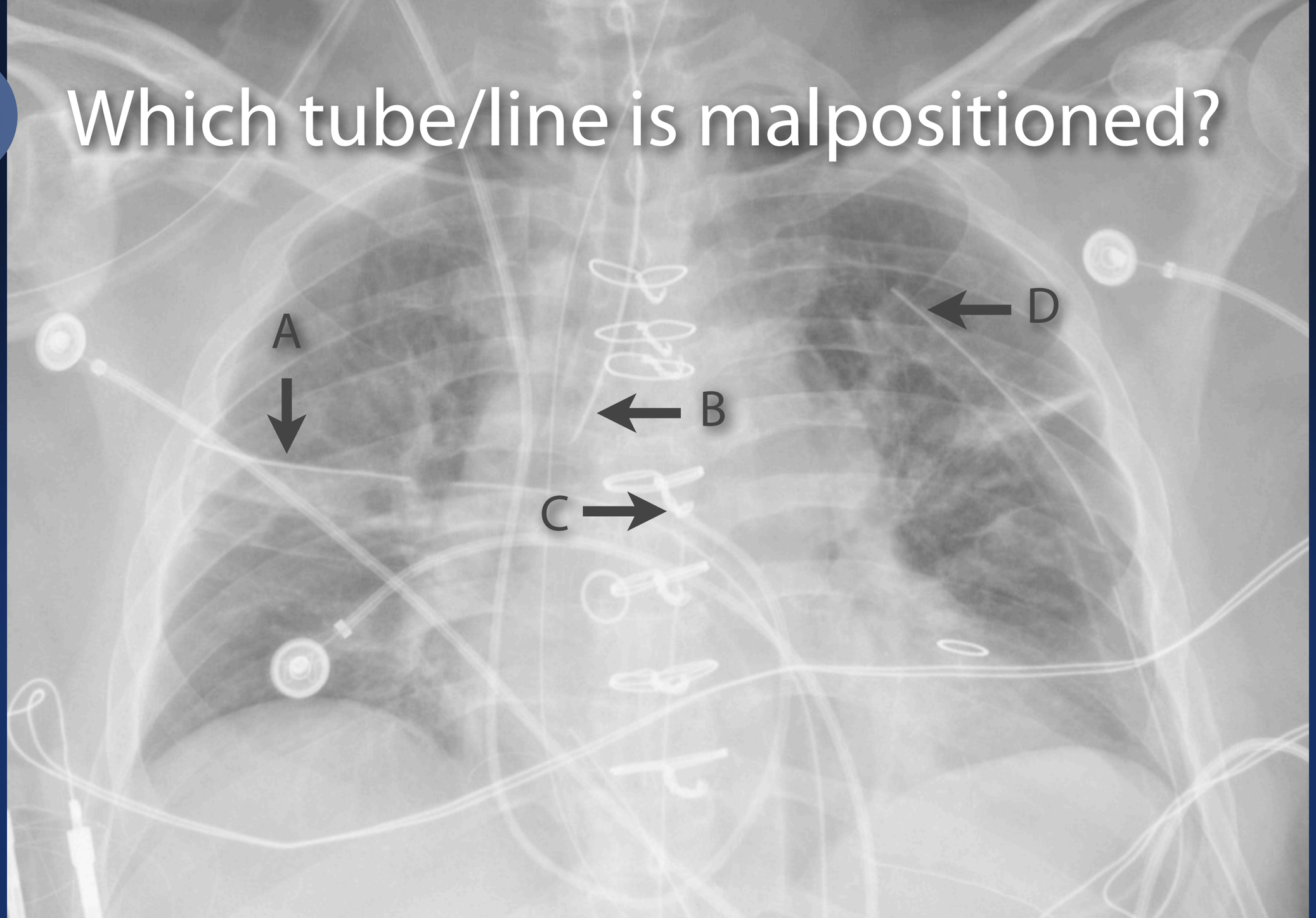


Which tube/line is malpositioned?



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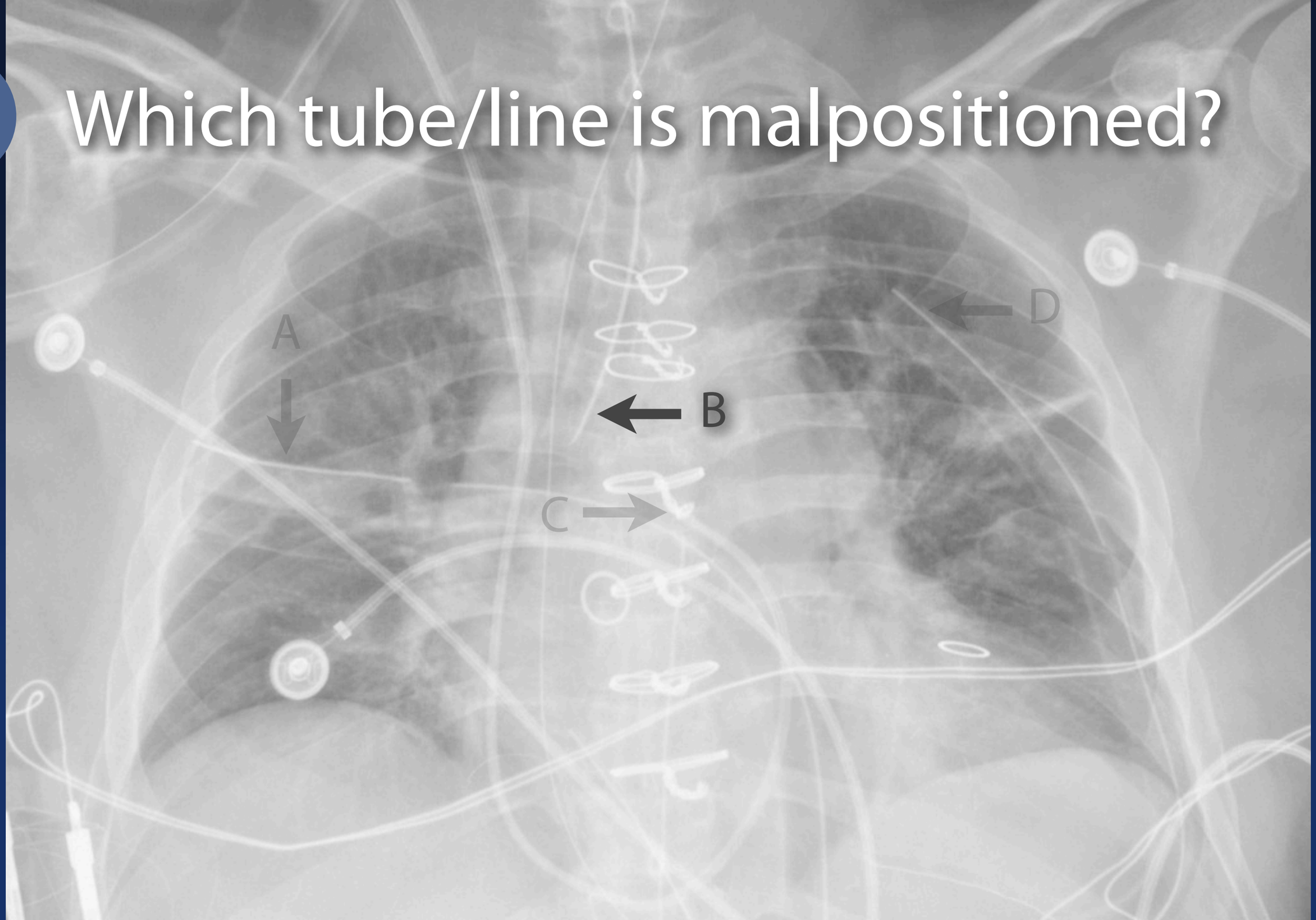

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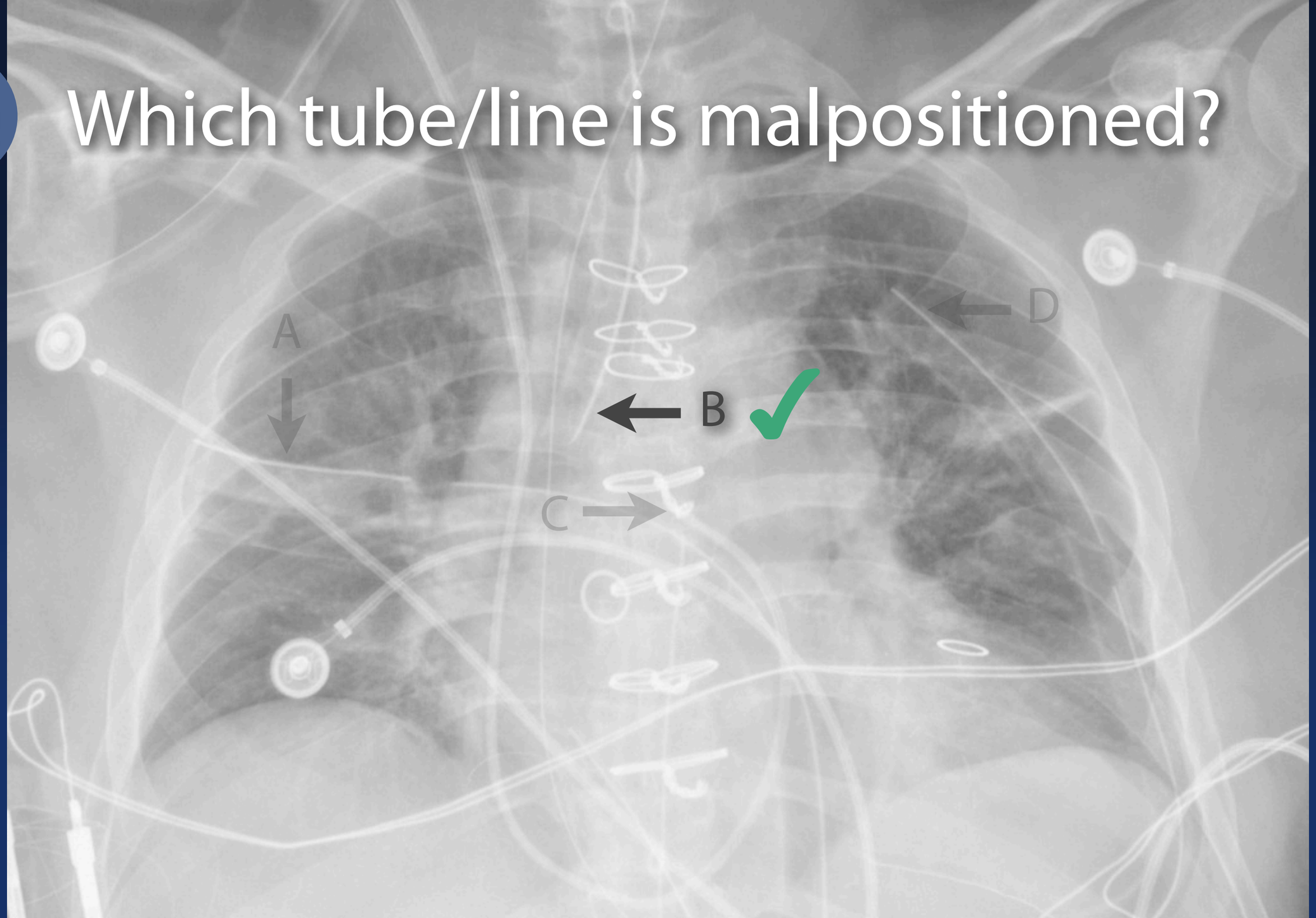
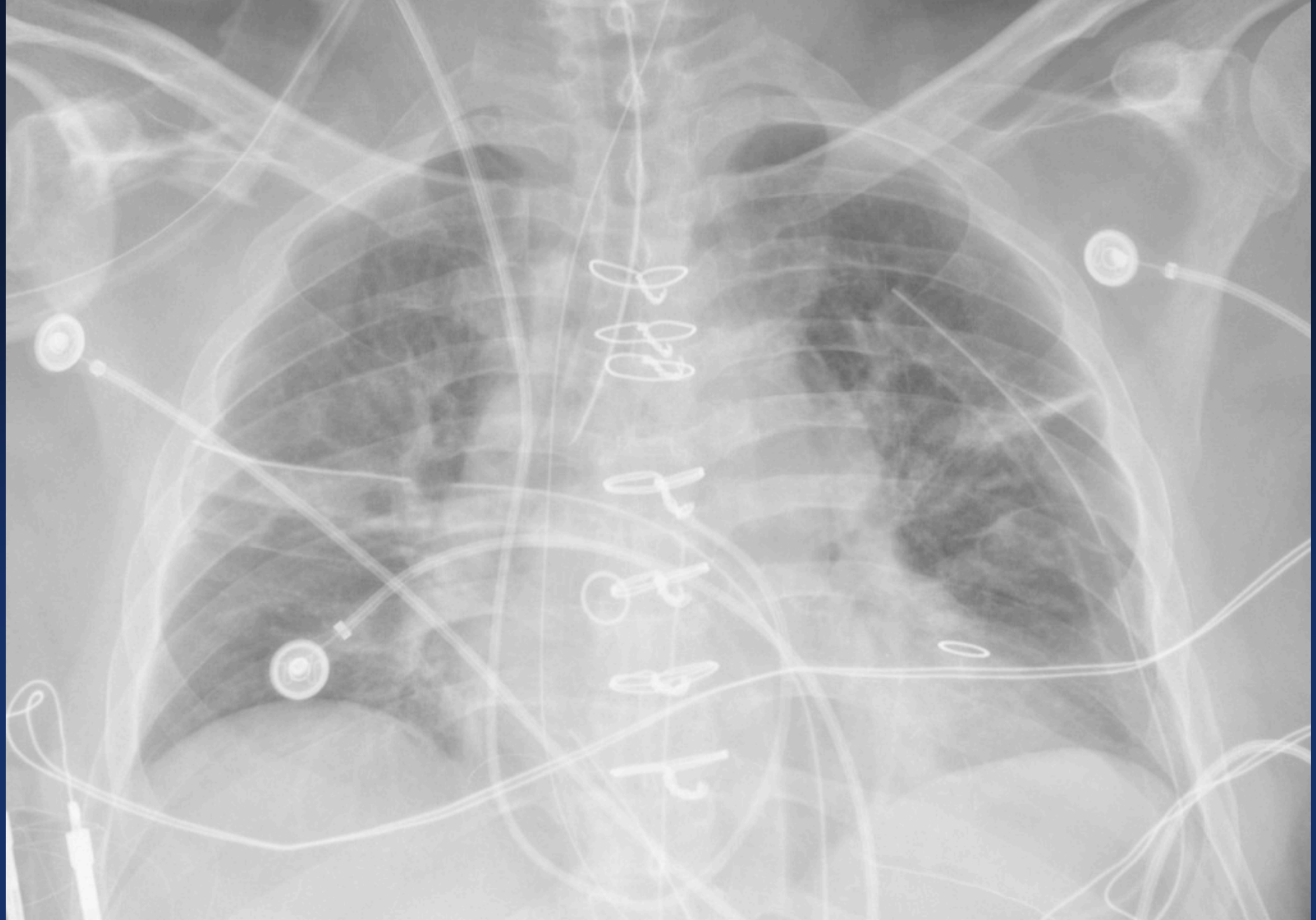
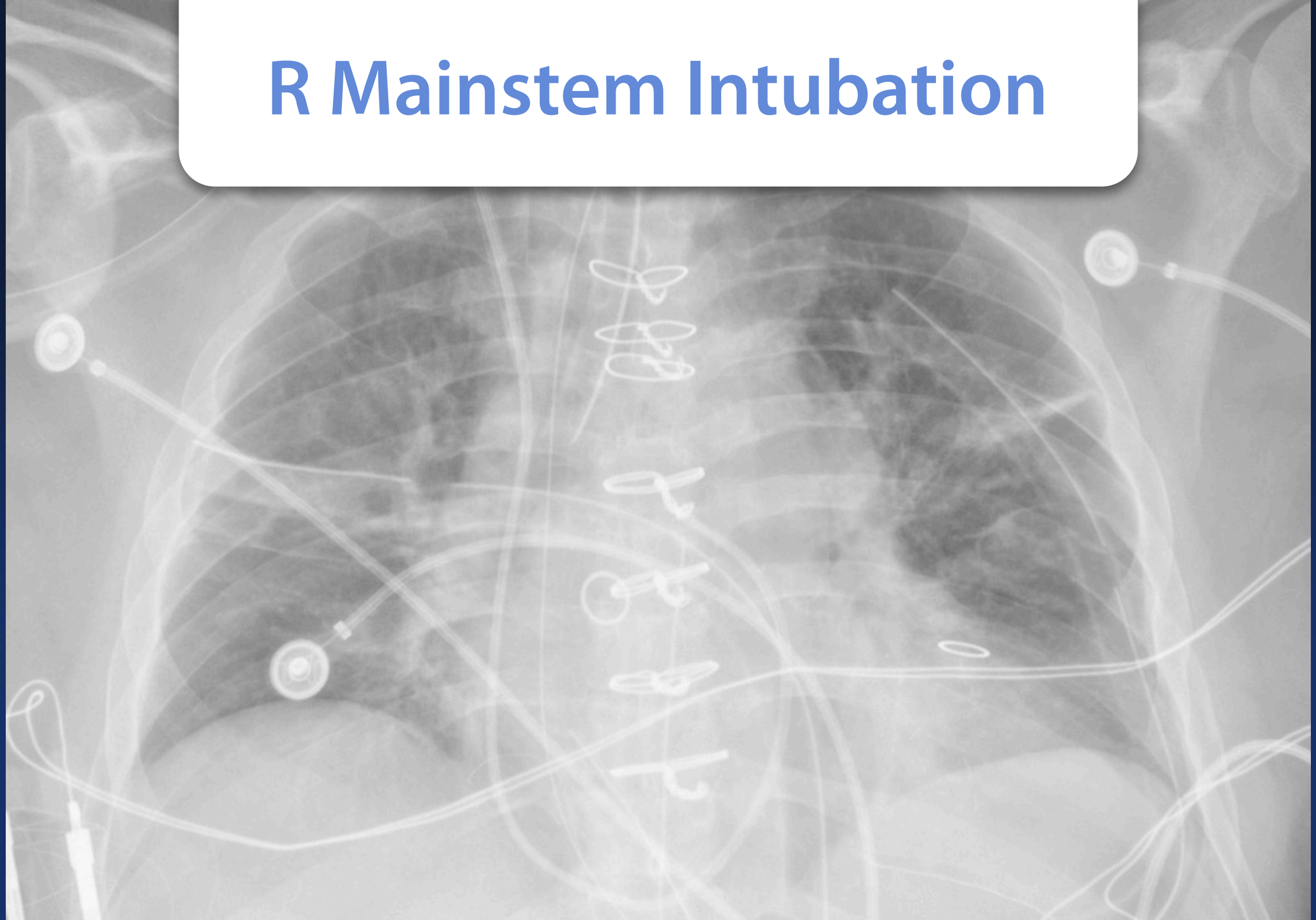
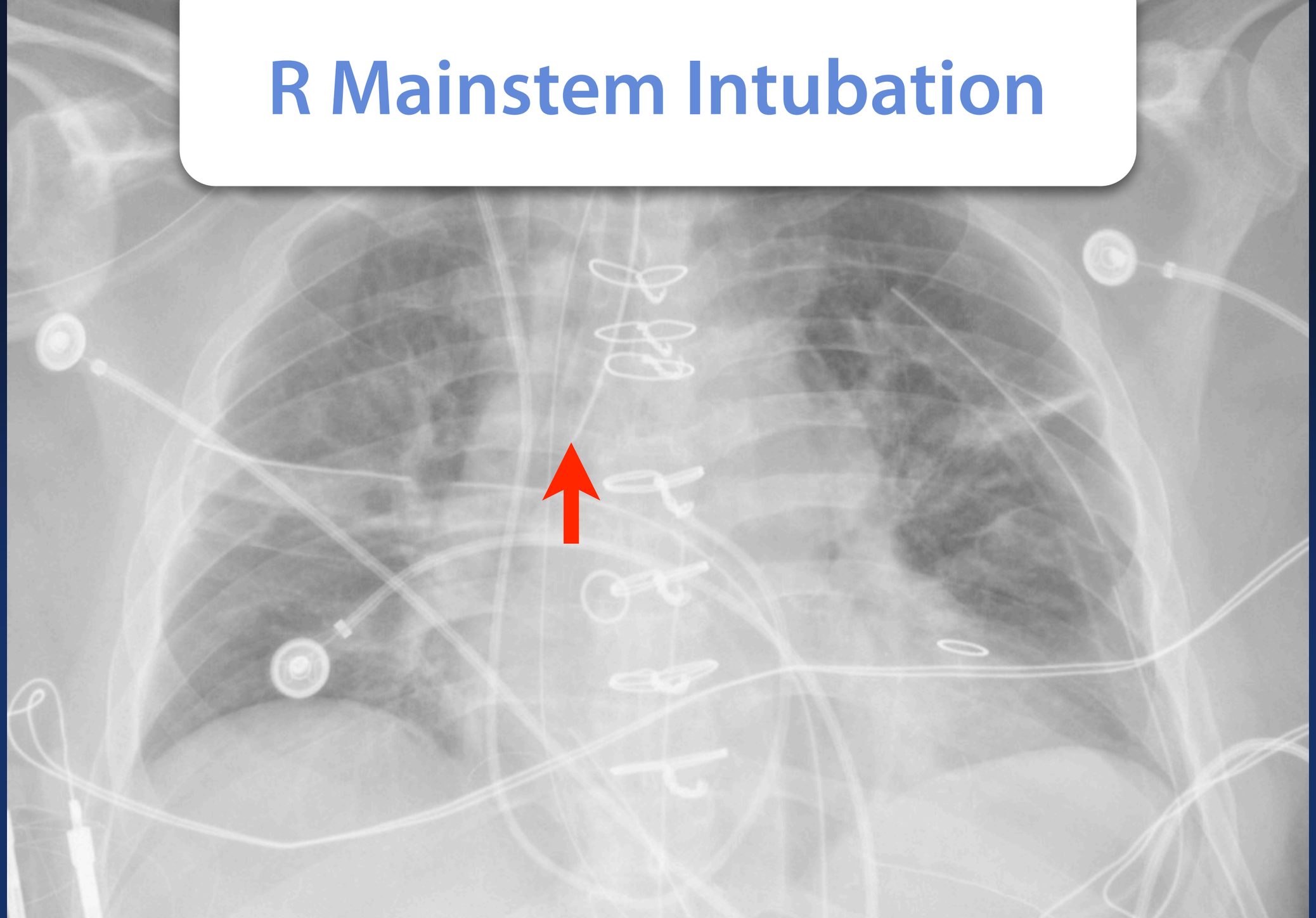




R Mainstem Intubation



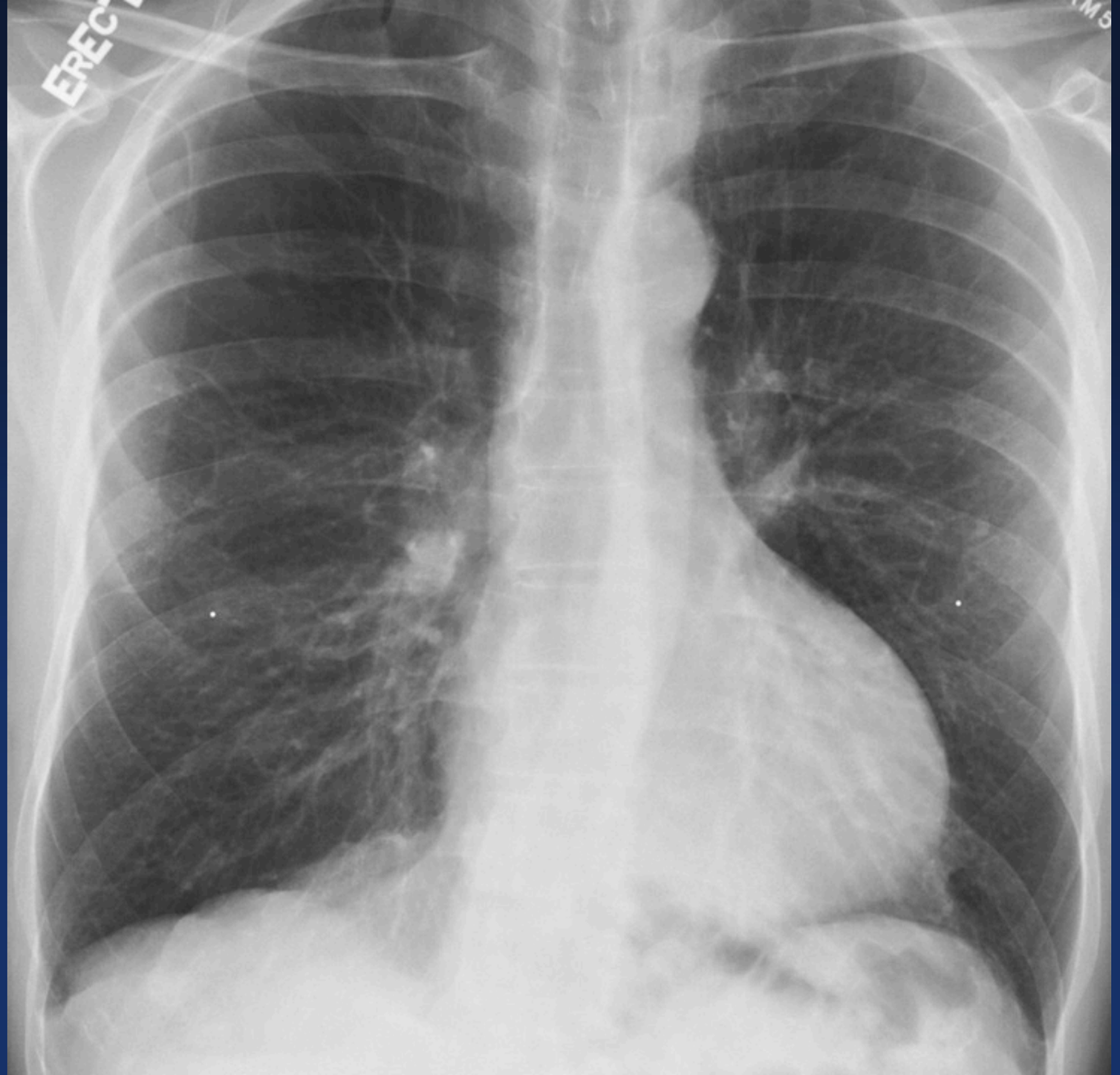
R Mainstem Intubation

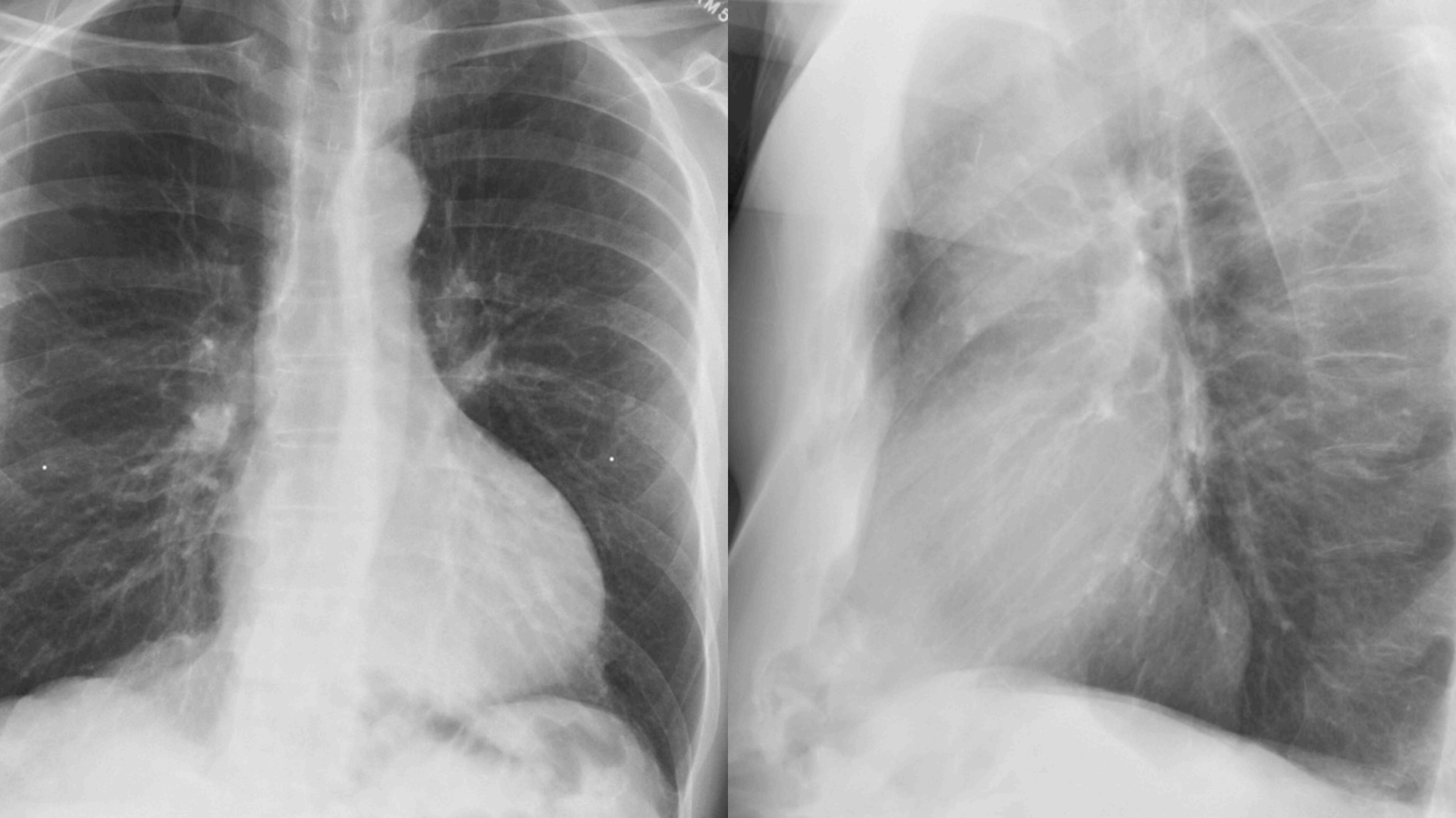


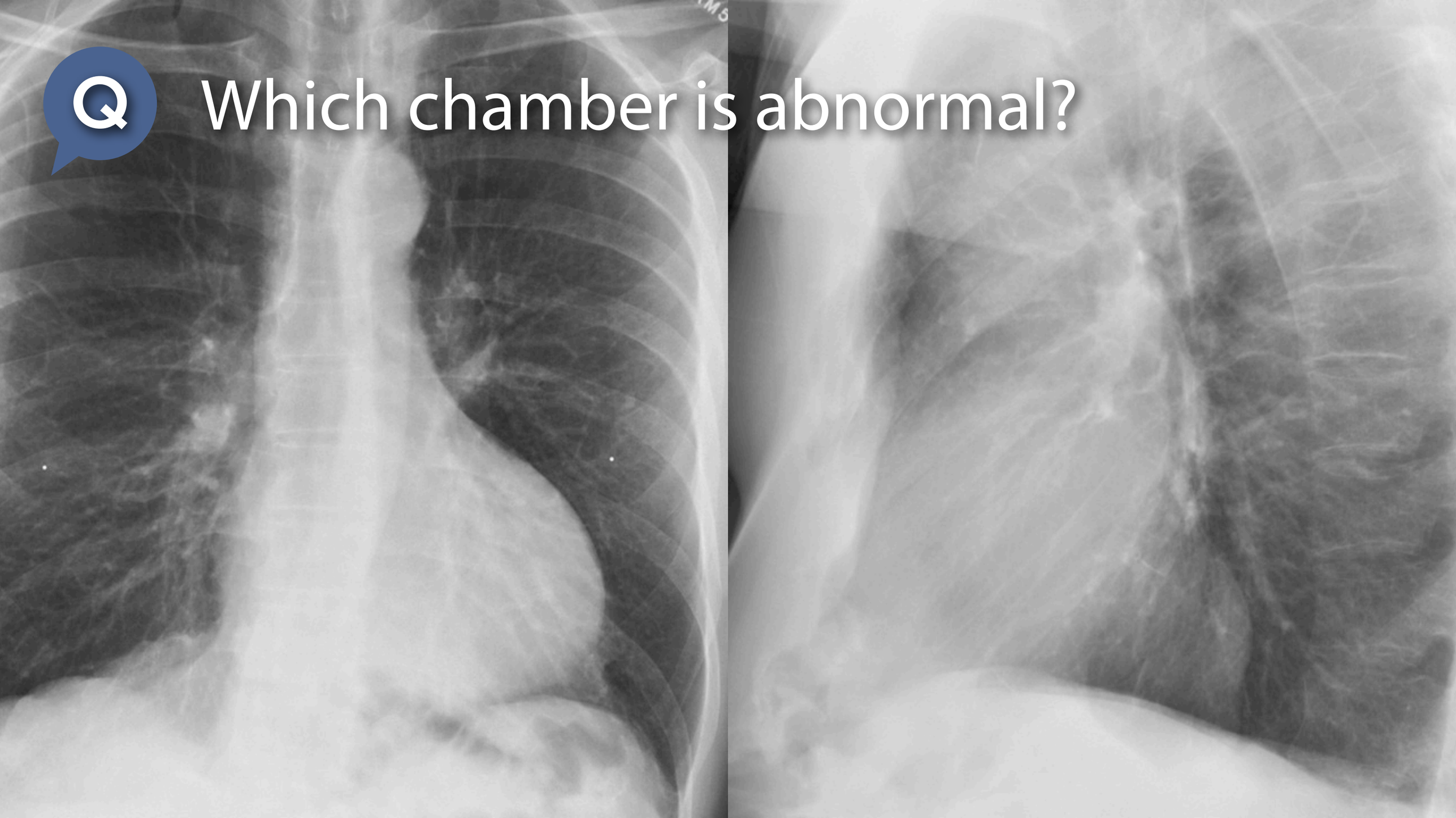
52-year-old male with chest pain and dyspnea.

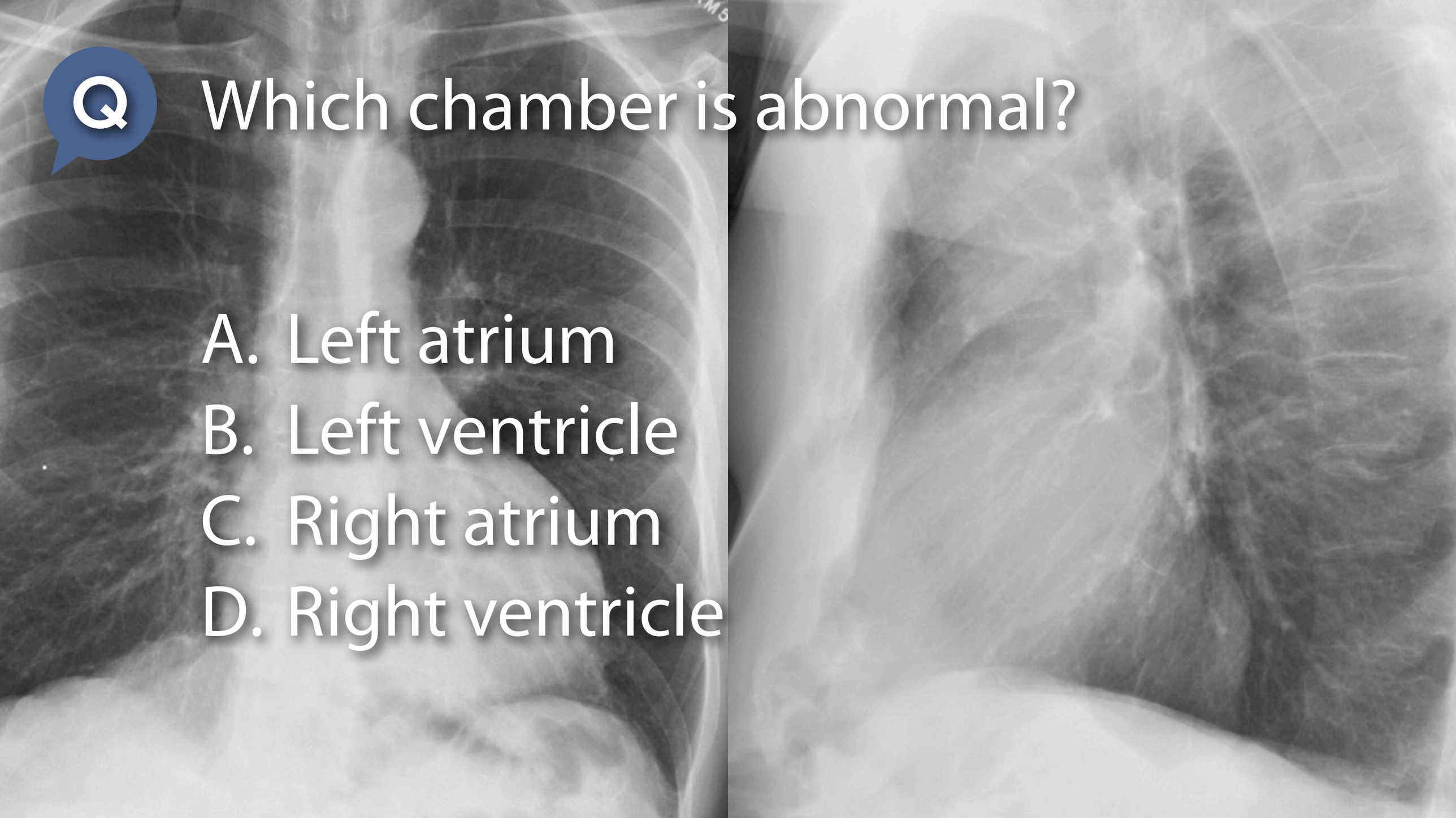
2

52-year-old male with chest pain and dyspnea.


ERECT

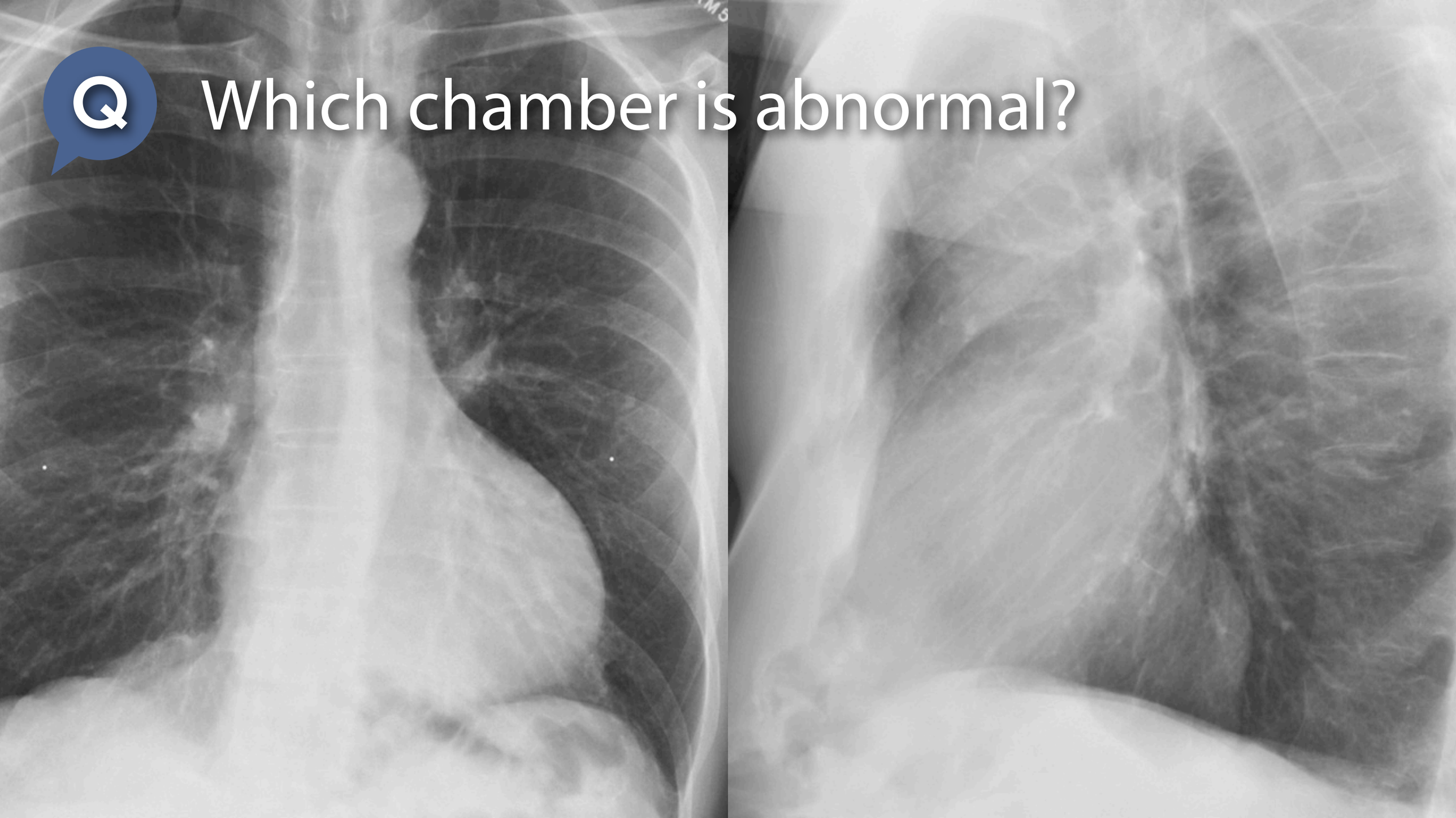



Q
Which chamber is abnormal?



Which chamber is abnormal?

A. Left atrium
B. Left ventricle
C. Right atrium
D. Right ventricle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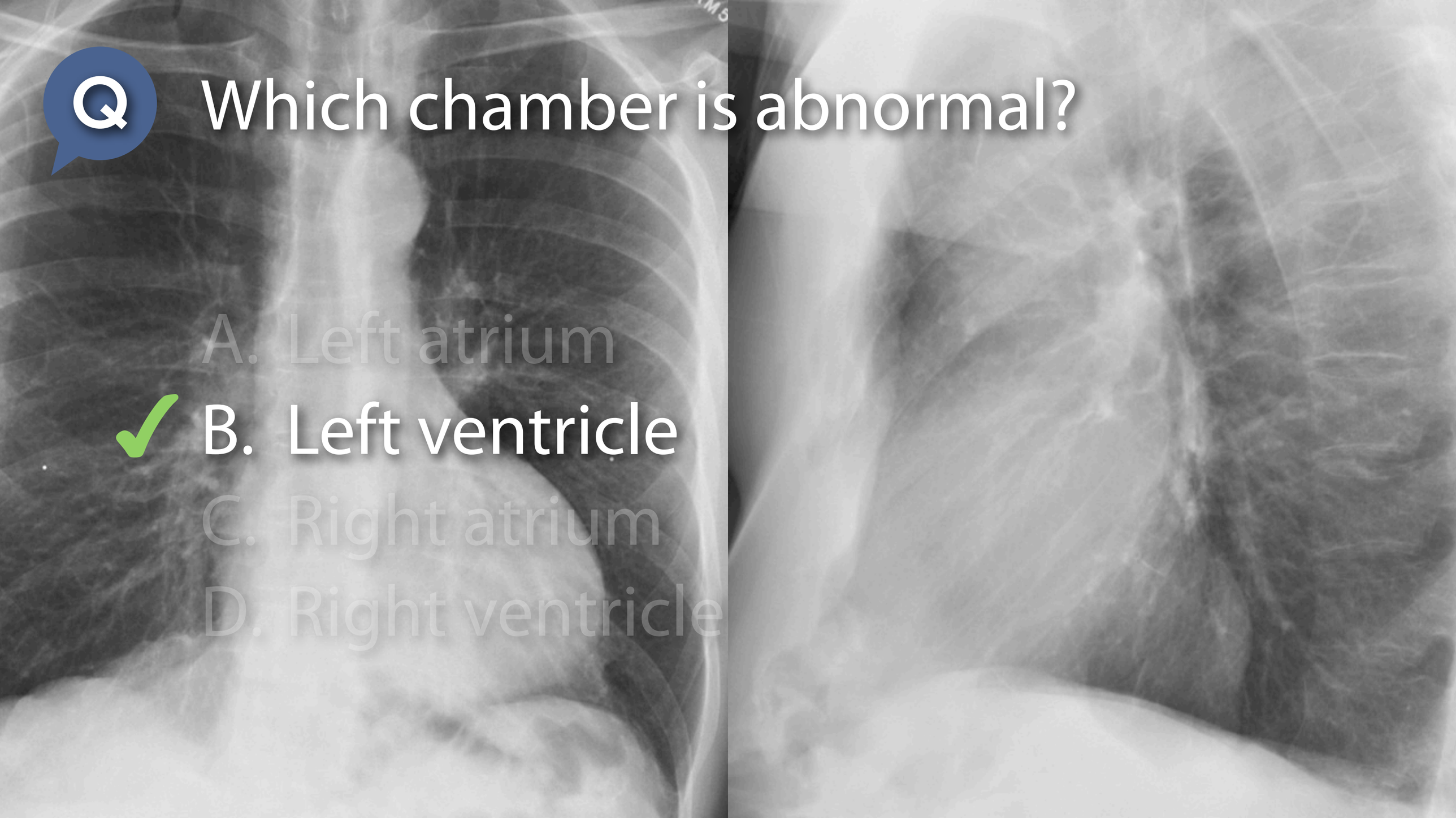
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C. Right atrium
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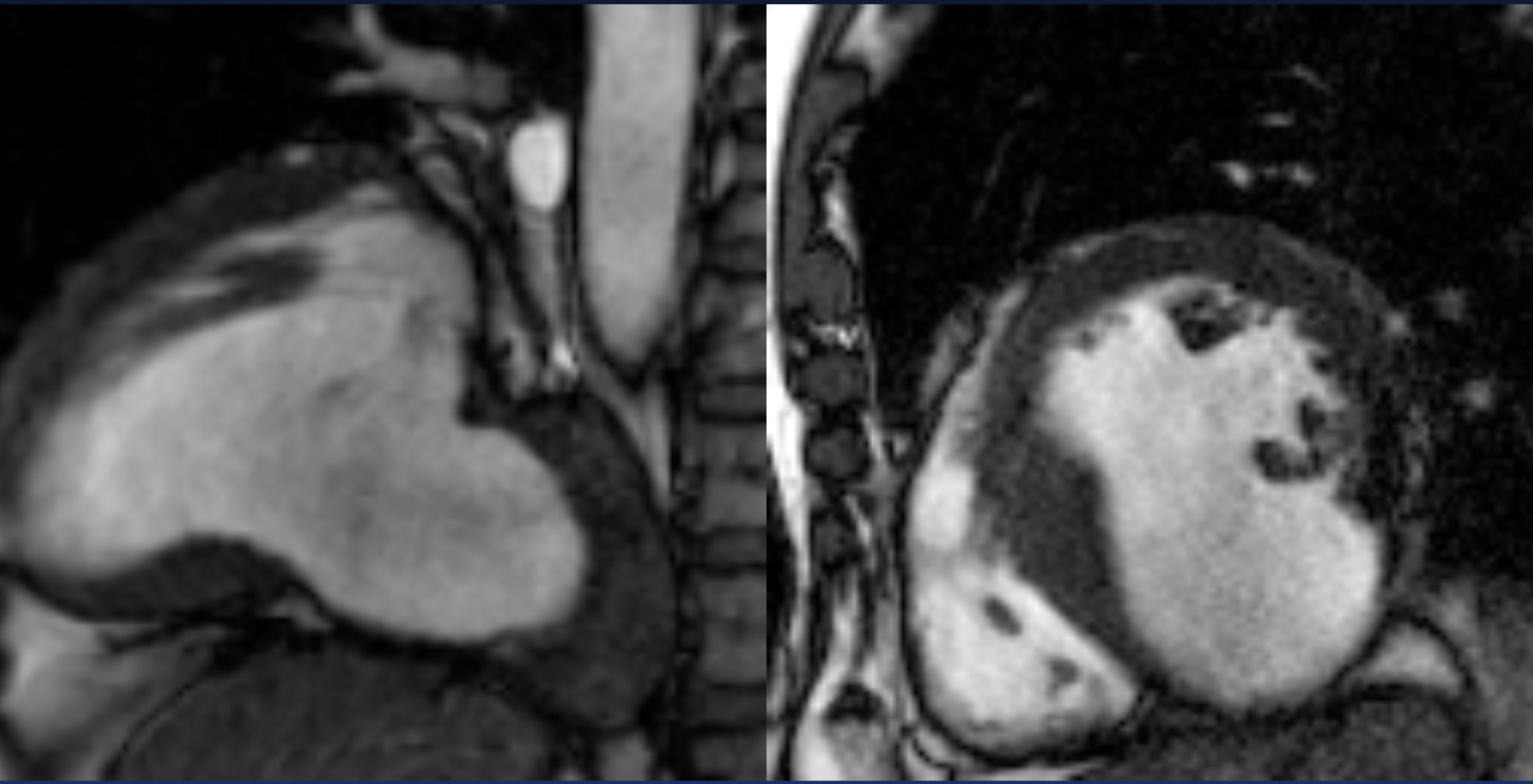
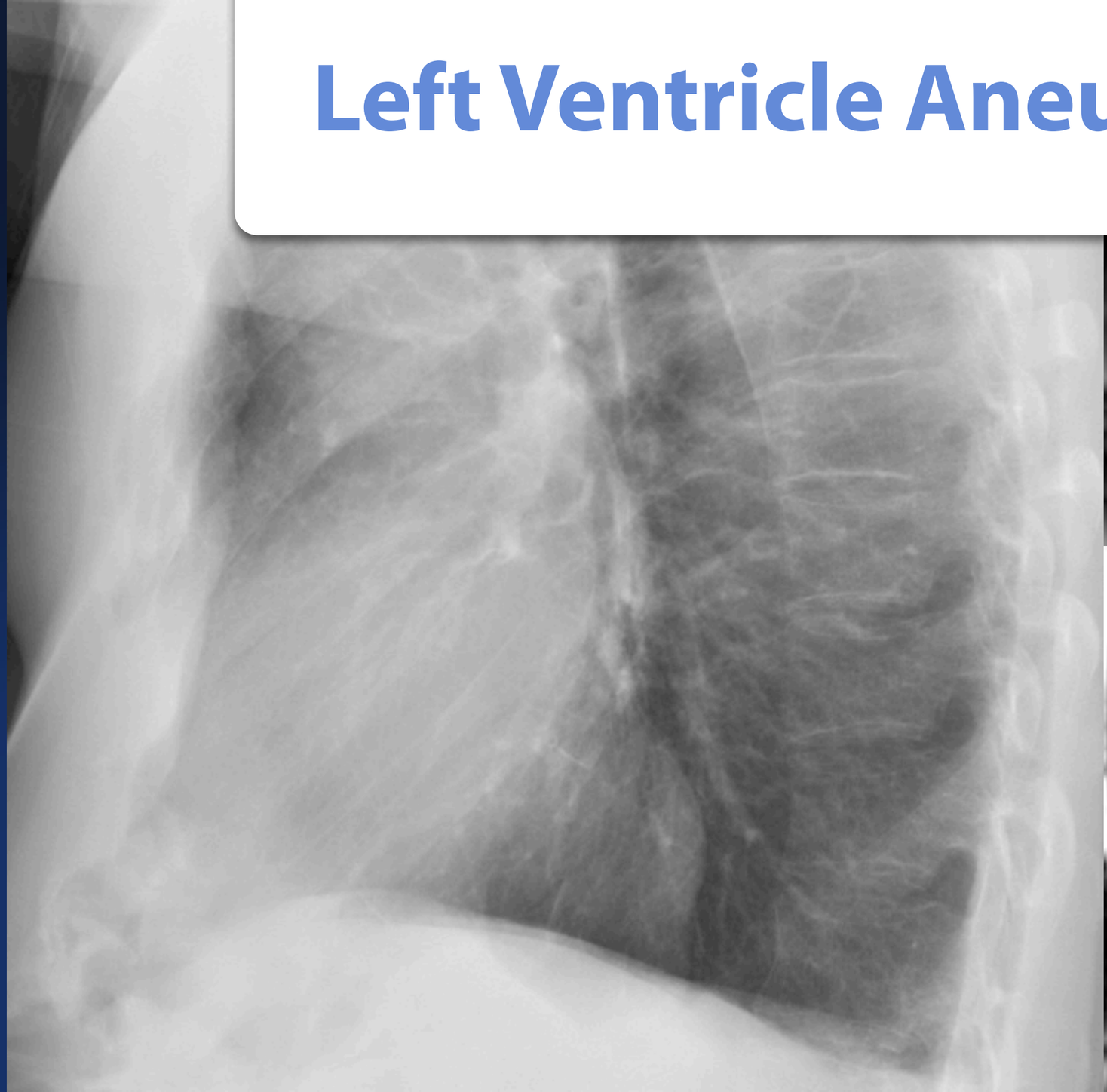
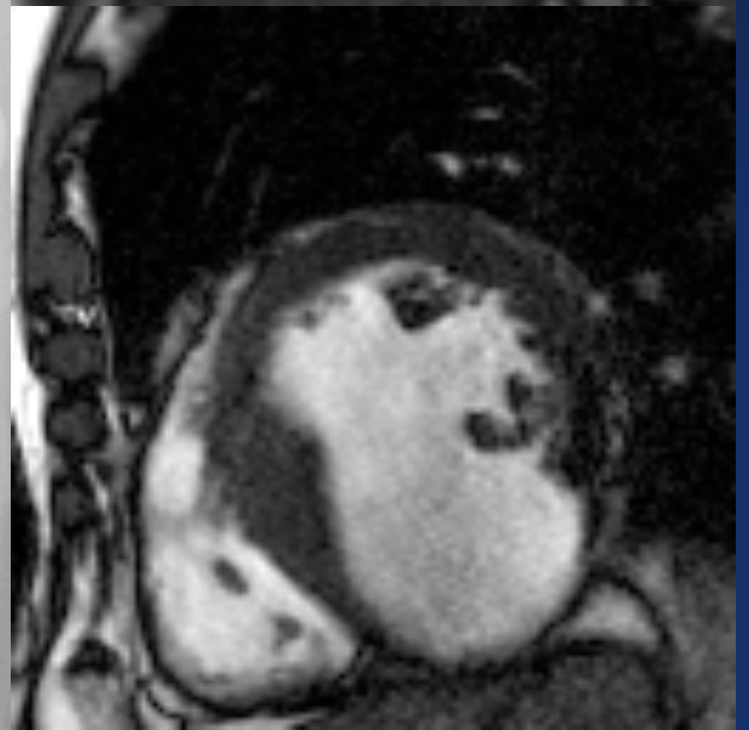


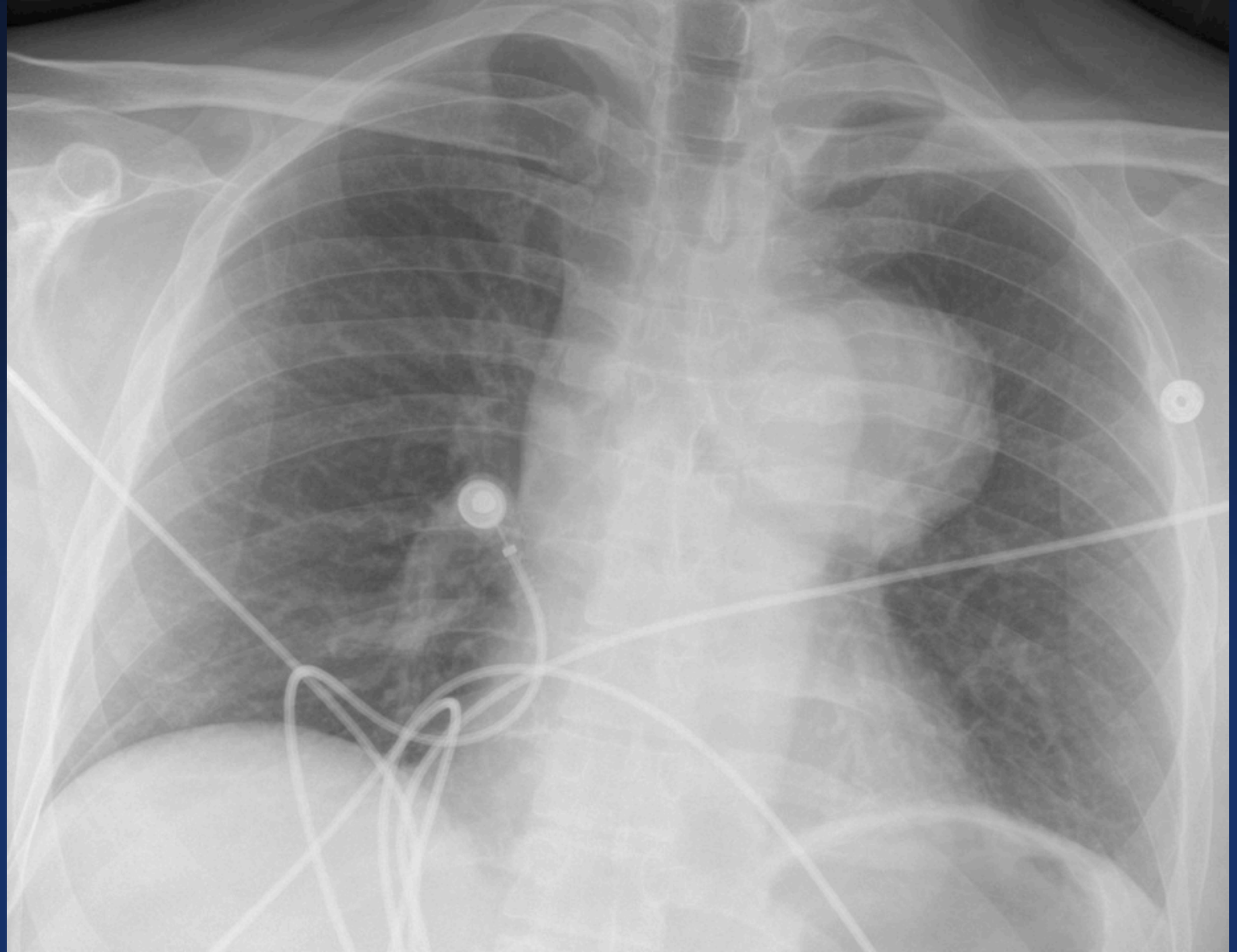
Left Ventricle Aneurysm

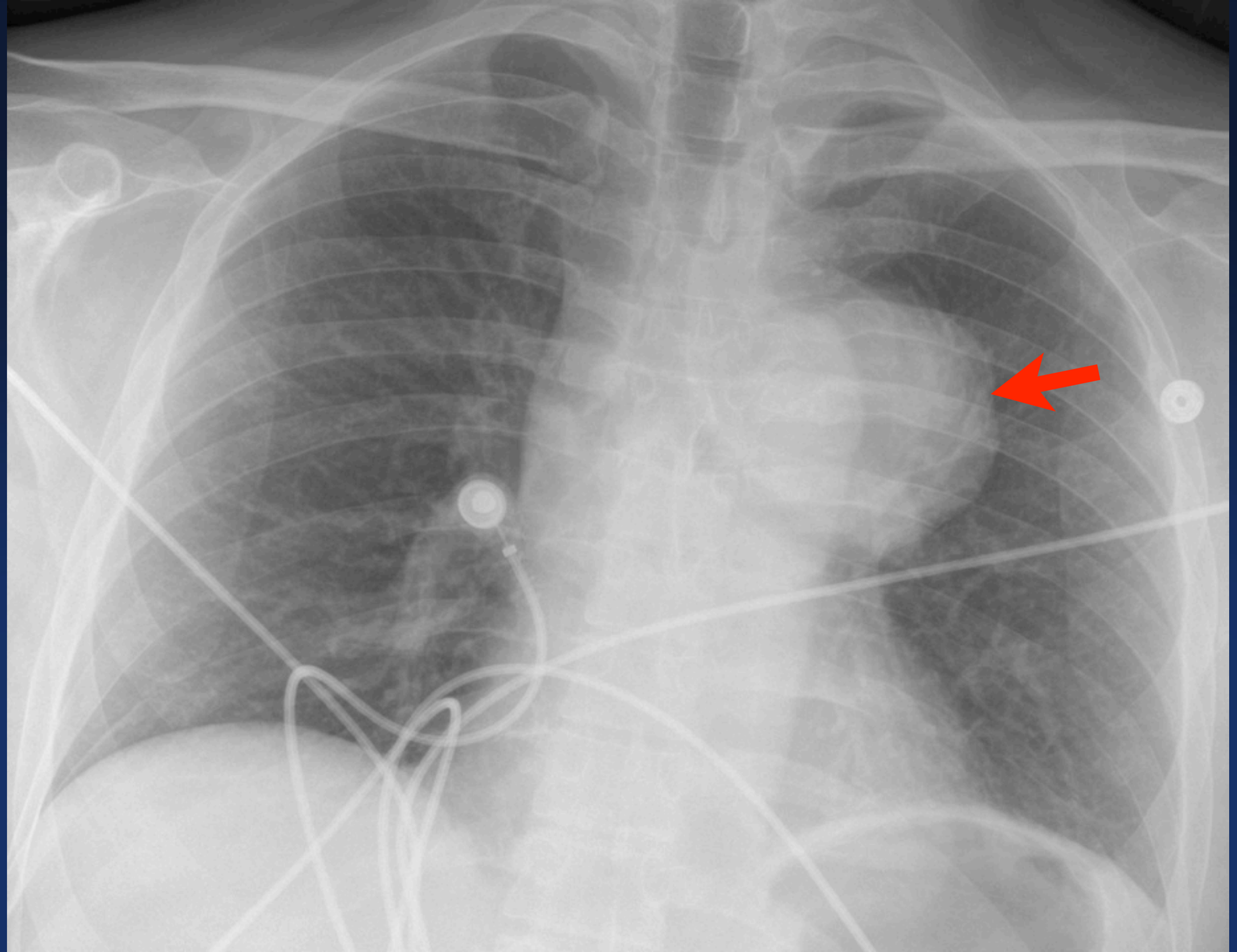


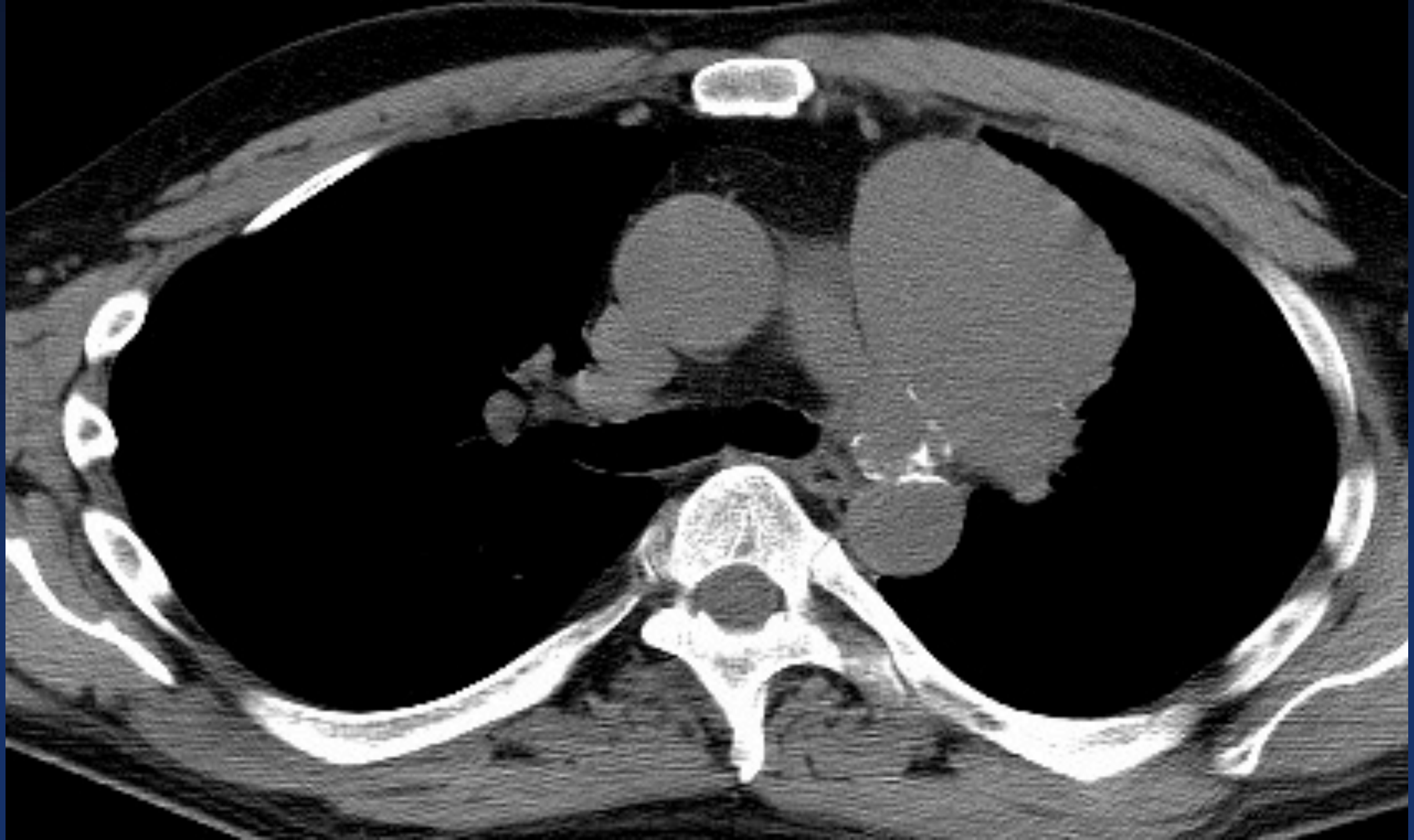


3

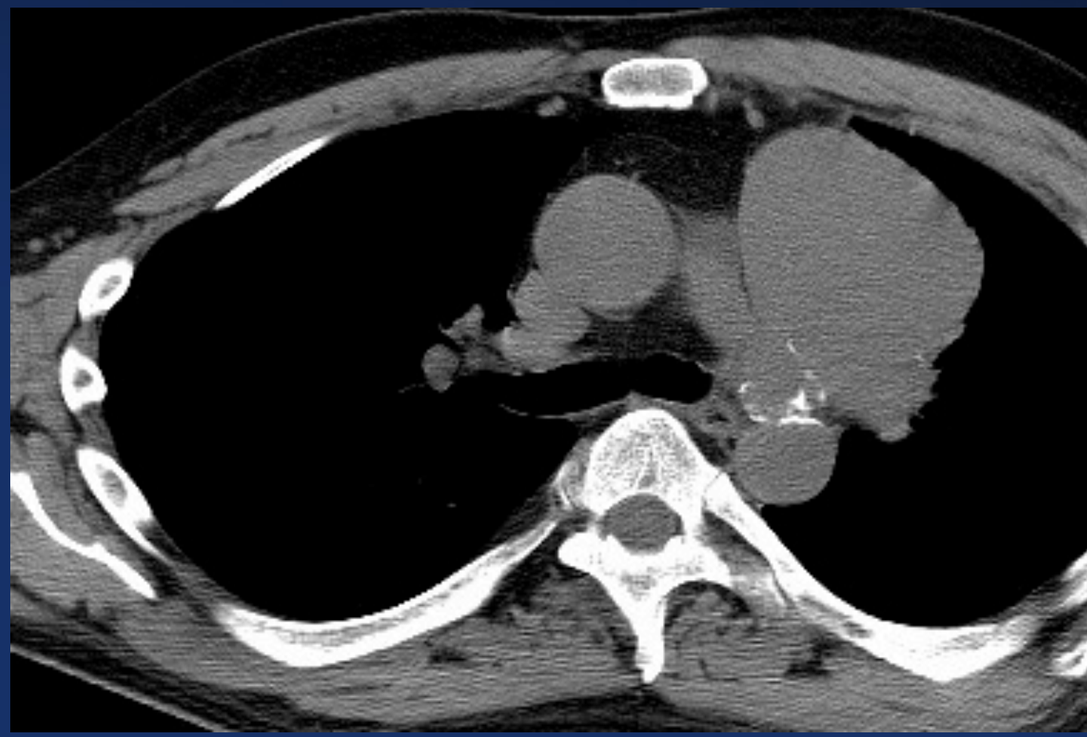
54-year old male with chest pain and dyspnea







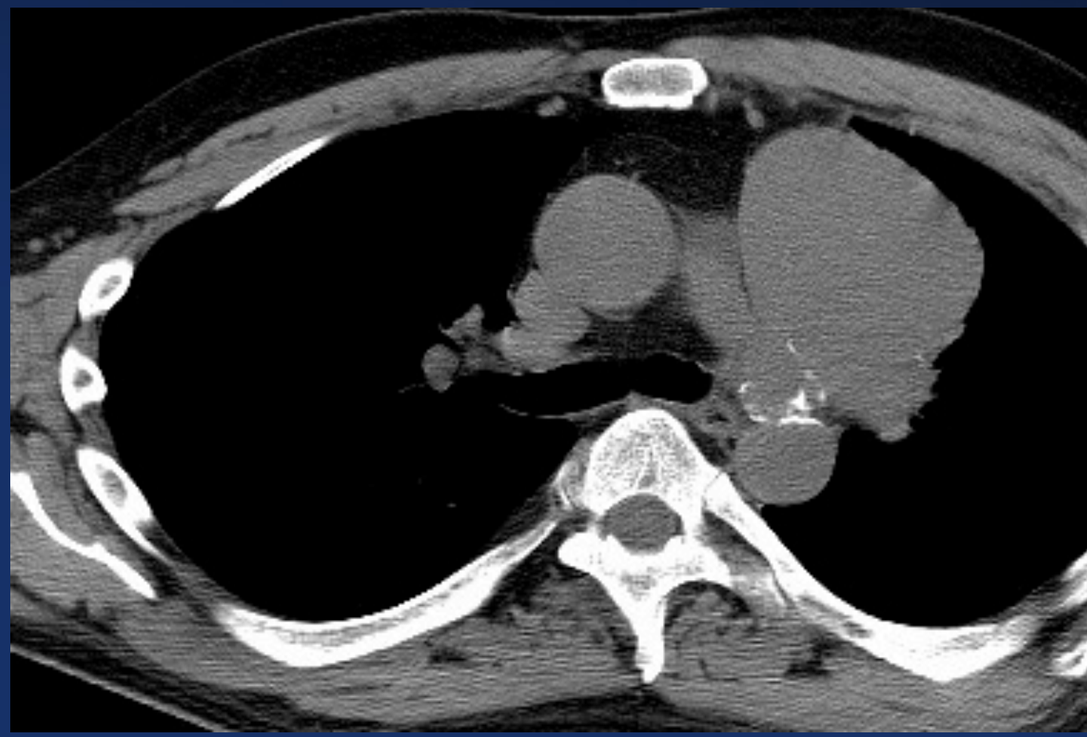
Which is the next most appropriate step in management?



Q

Which is the next most appropriate step in management?

A. Biopsy
B. PET-CT
C. CTA
D. Surgical resection



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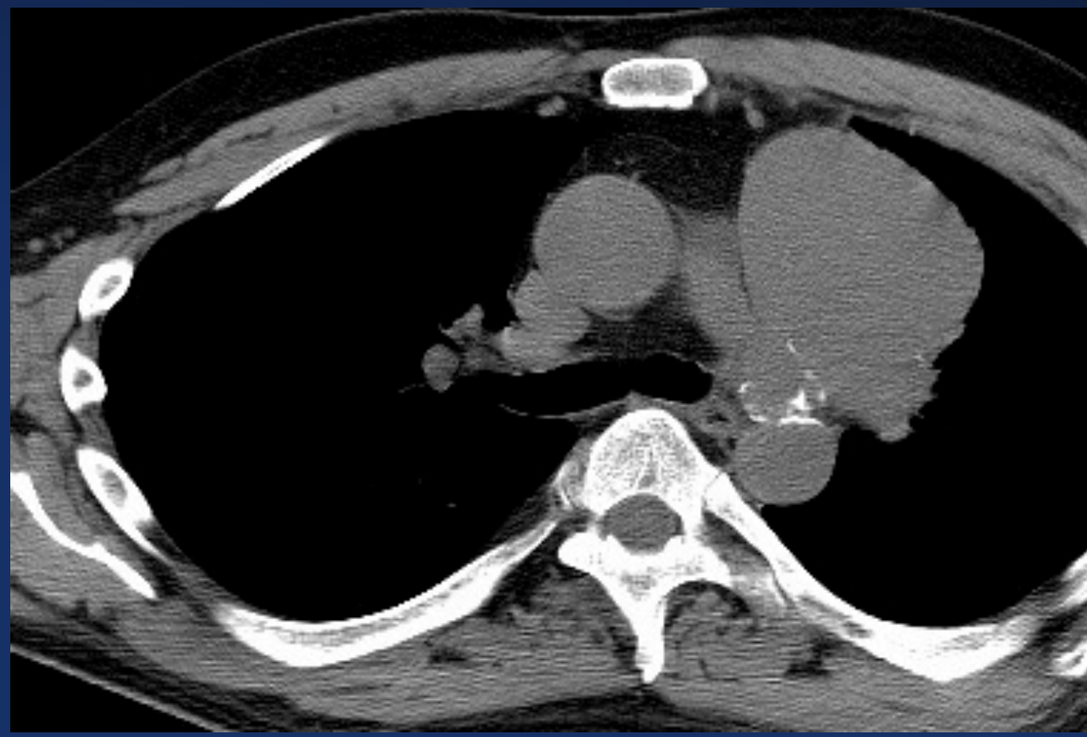

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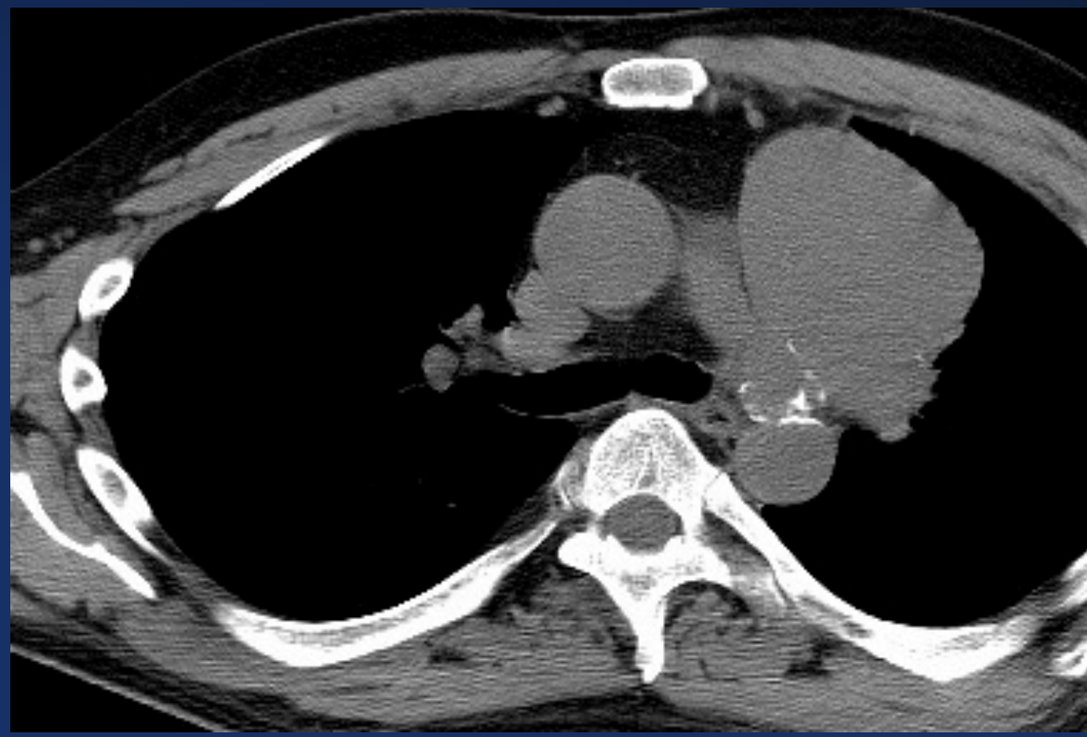
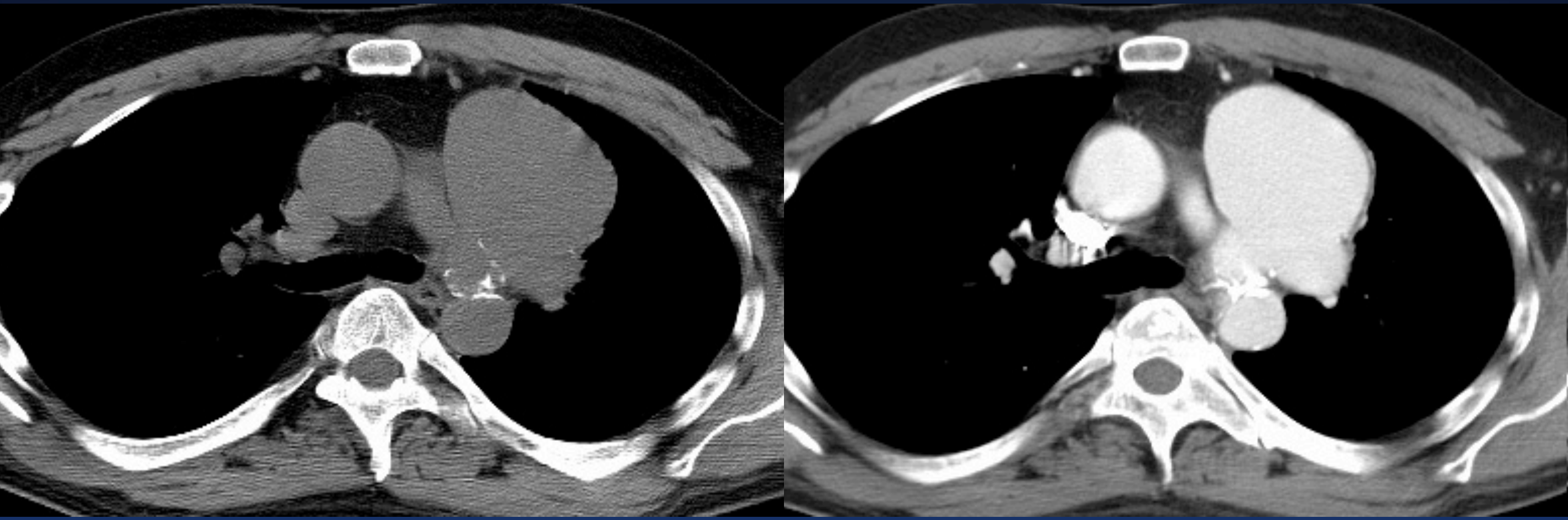
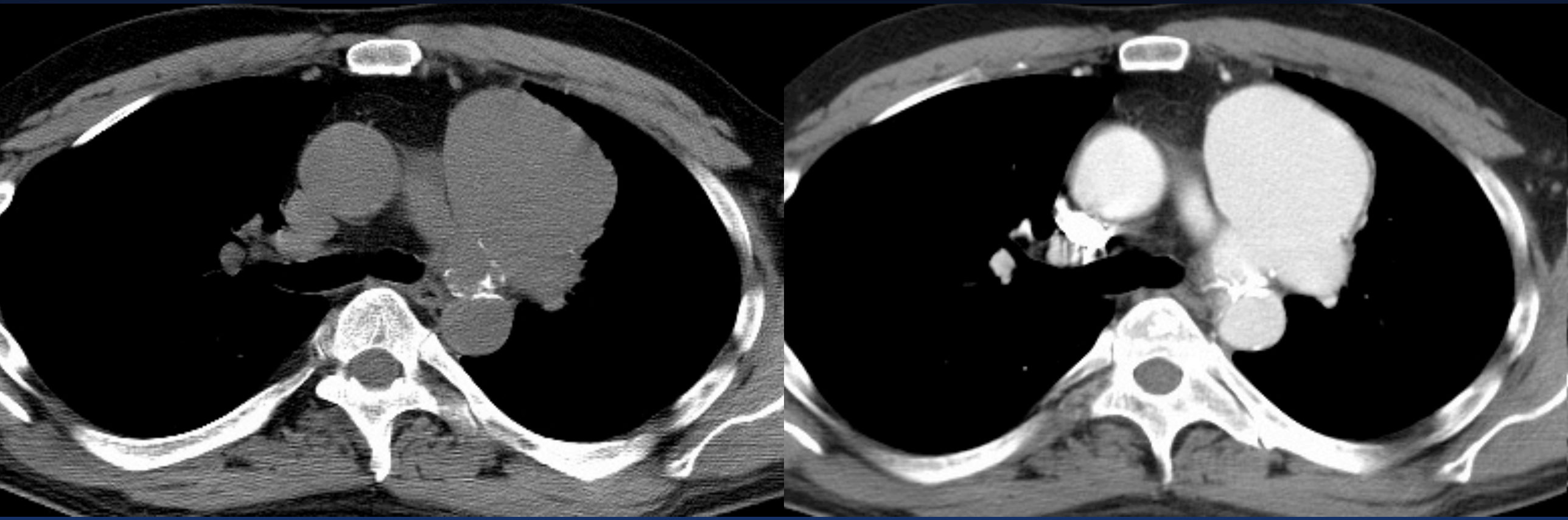
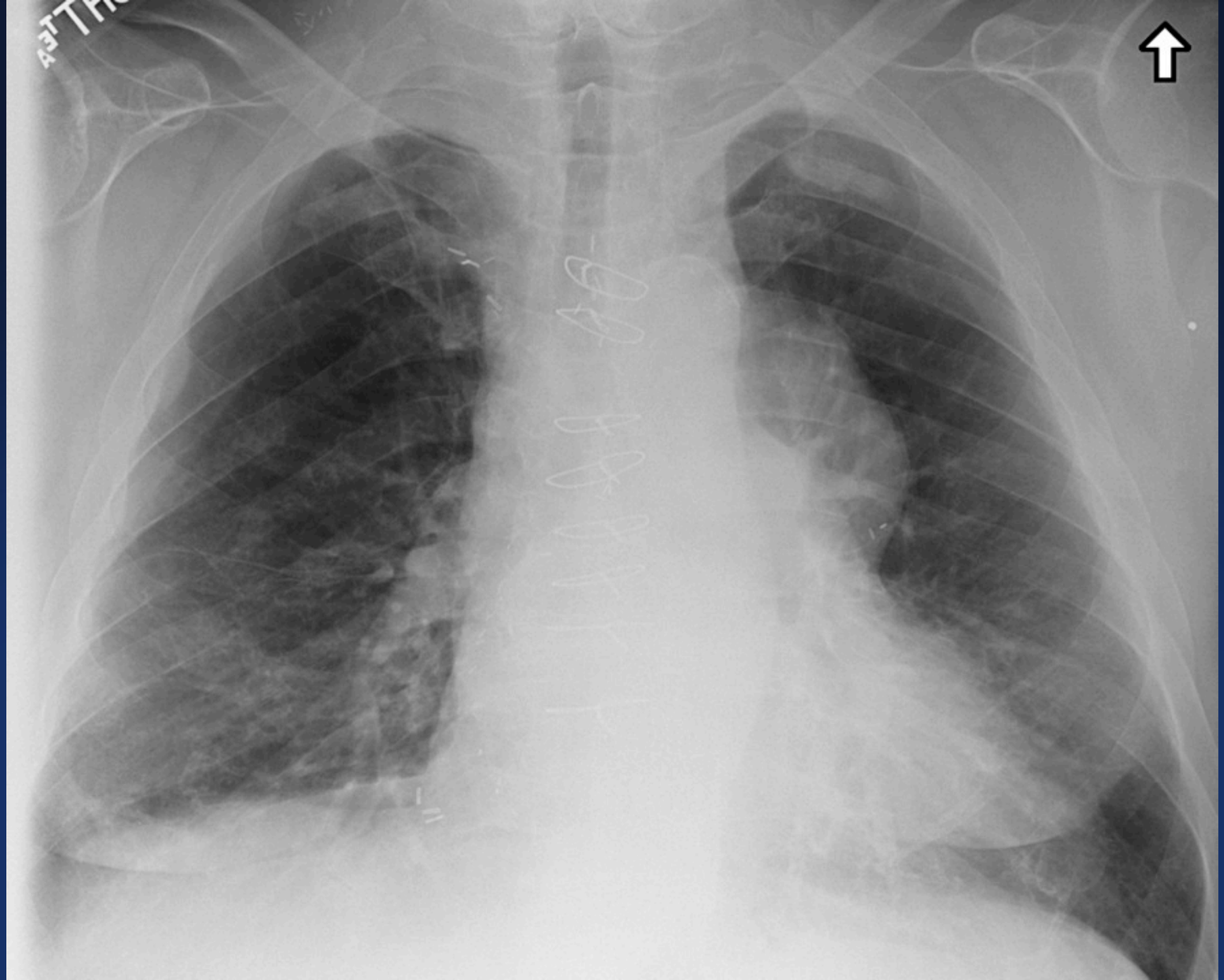
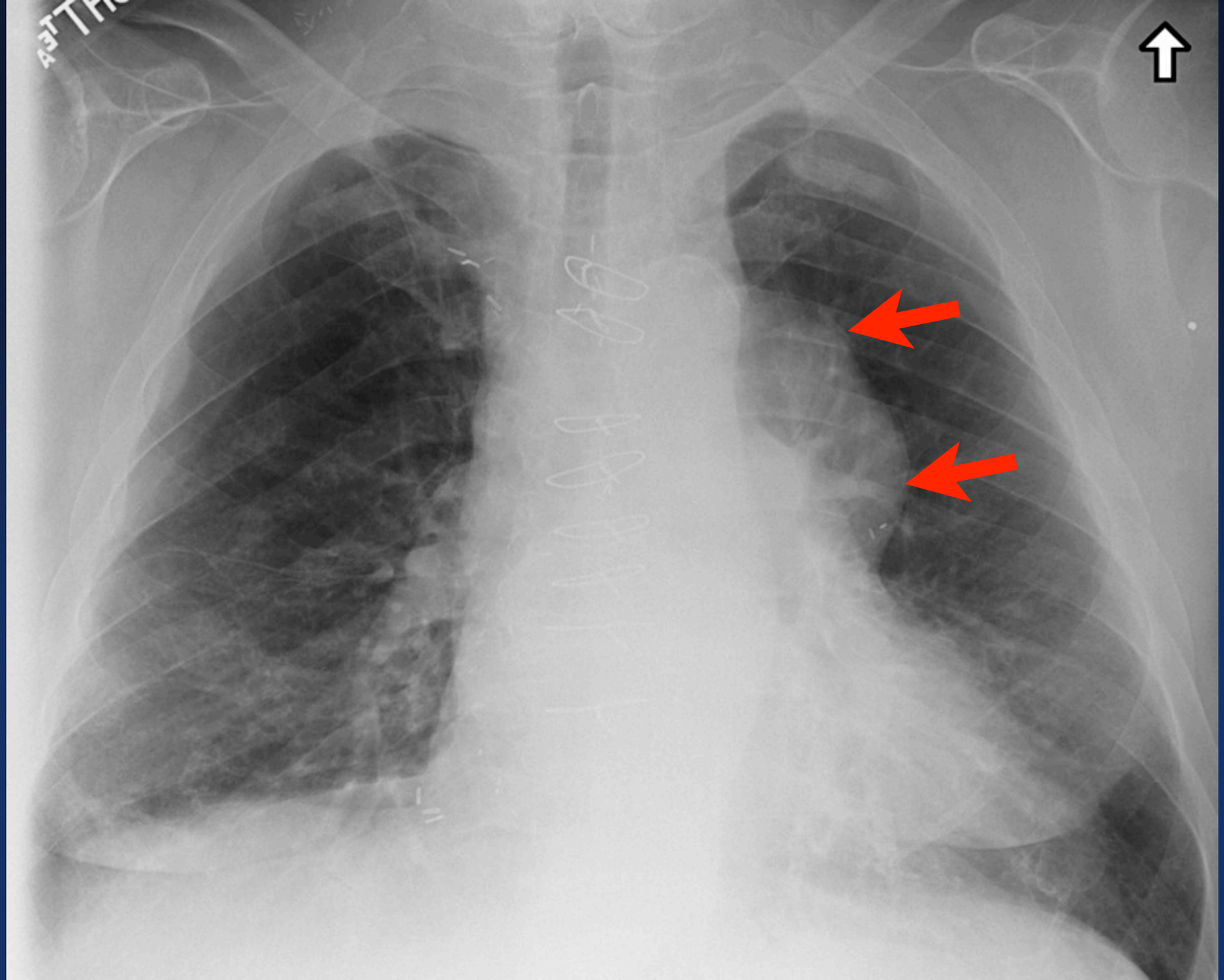


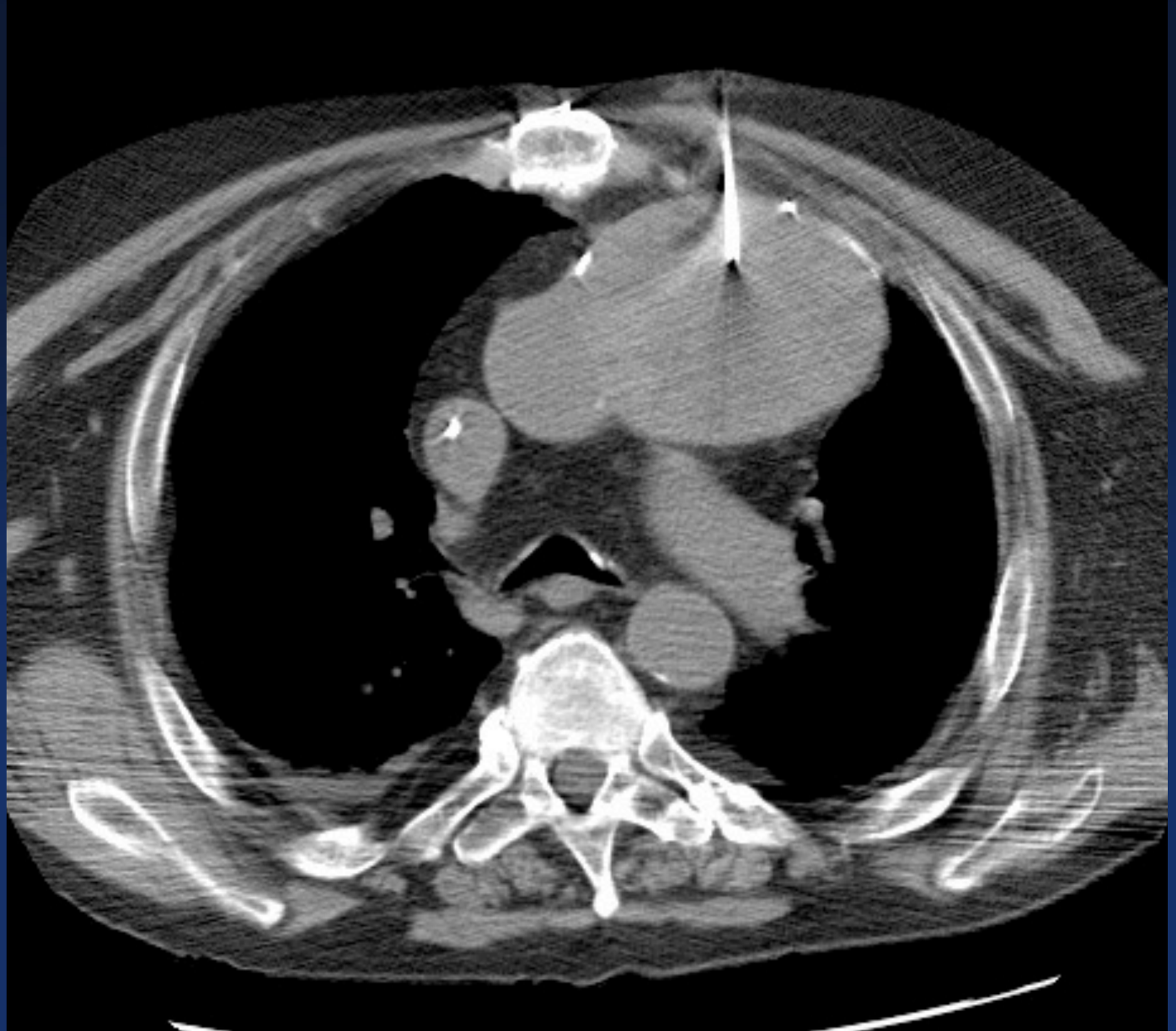


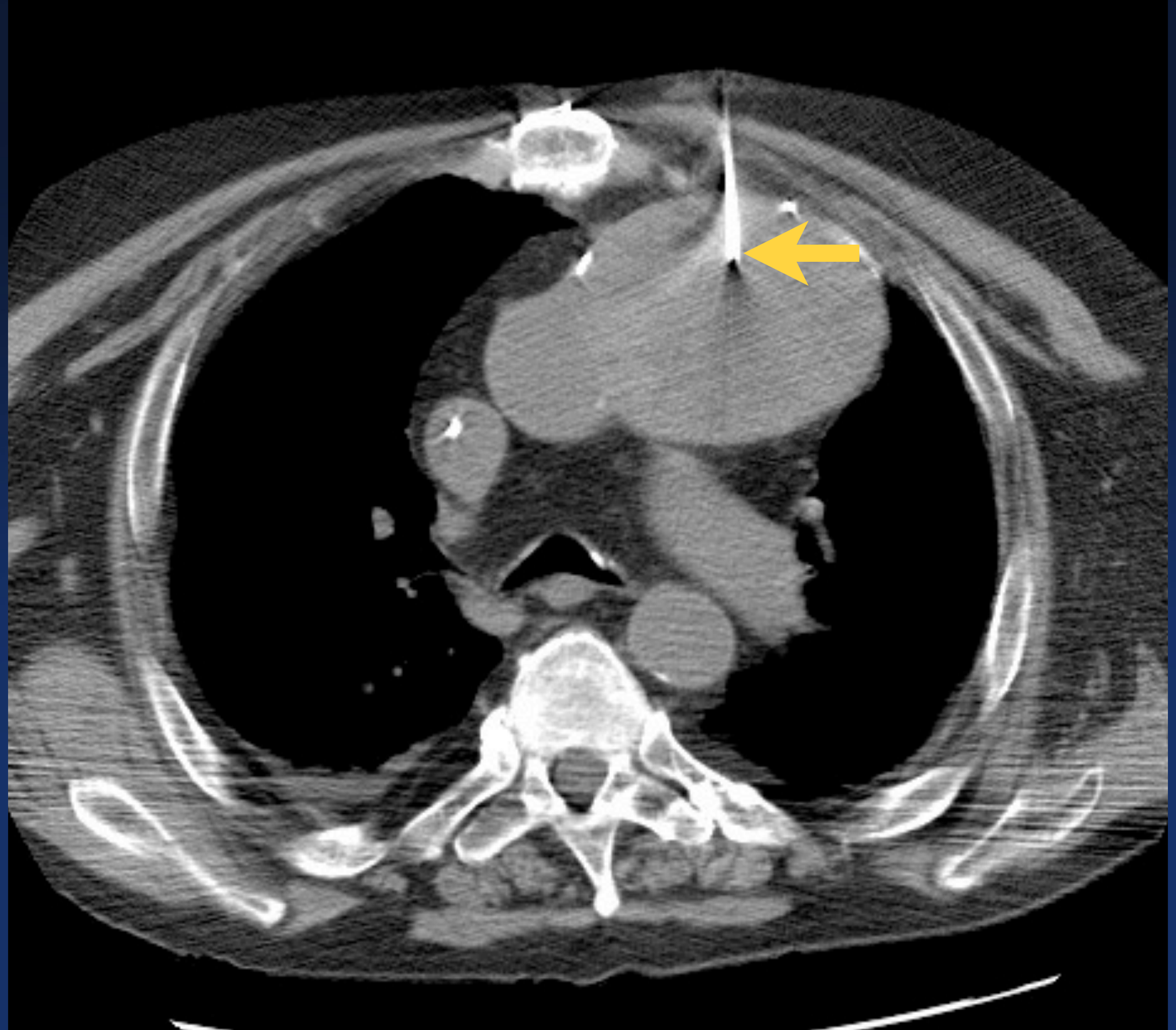
Aortic Arch Pseudoaneurysm











Conclusions

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Conclusions

- Learn what is normal
- Be systematic in your interpretation
  - Contours, Chambers, Valves
- Physiology predicts pathology

Jared D. Christensen, M.D.

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CARDIAC RADIOGRAPHY

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