Radiology 101: Clues to Get You Through Call

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Disclosure of Financial Interest

I have no financial relationship with a commercial organization that may have a direct or indirect interest in the content of this presentation.

Introduction

- Identify Tubes/Lines
- Recognize common emergent findings on radiography
- Improve ability to order the correct study
- Radiology potpourri and cases

Pretest

- CT contrast
  A. All contains organically bound iodine
  B. Most contain variations of Na, Cl, and Ca in addition
  C. No longer contains iodine
  D. A and B
  E. B and C

Pretest

- Pediatric Imaging
  A. We should always limit the number of views to be taken
  B. Combine exams when possible (example: Ankle and Tibia/Fibula can be combined into one exam)
  C. Do exactly what the ordering physician orders
  D. Discuss with the ordering MD and radiologist when needed, to obtain the right images and the least amount of radiation

Pretest

- CT positioning:
  A. Is not as important as for radiography because we can post-process/reformat to “look” like true axials
  B. Is as important as with radiography
  C. Should be attempted whenever possible, given patient condition constraints

Pretest

- The best imaging for osteomyelitis
  A. MRI with and without contrast
  B. CT with and without contrast
  C. Conventional radiography
  D. Ultrasound

Pretest

- Contrast Allergies
  A. Should pre-medicate at 13, 7, and 1 hour before scan
  B. Premedication is no longer needed for most allergies
  C. Is administered 1 hour prior to scan
  D. Is given if certain radiologists are working that day

Pretest

- Typical allergic reactions to contrast include:
  A. Hives and itching
  B. Shortness of breath and wheezing
  C. Feelings of warmth
  D. All of the above
  E. A and B

Pretest

- Treatment of contrast reactions
  A. May include albuterol inhaler (MDI) if the patient is wheezing/short of breath
  B. May include diphenhydramine if hives/itching
  C. May include epinephrine if the patient has signs of anaphylaxis (e.g.—hypotension, hypoxia, confusion, stridor)
  D. All of the above
  E. None of the above

Pretest

- How is epinephrine given?
  A. IM
  B. IV
  C. ETT
  D. SQ
  E. A and B
  F. All of the above

Pretest

- Which side should be down on a lateral decubitus abdomen?
  A. Left
  B. Right
  C. Supine
  D. Prone

Pretest

- Which side should be down on a lateral decubitus chest?
  A. Left
  B. Right
  C. Either
  D. It depends upon what you're looking for

Pretest

- How long do we wait prior to shooting a decubitus abdomen film, after the patient is on his/her side?
  A. 0-5 minutes
  B. No need to wait
  C. 30 minutes
  D. 5-10 minutes minimum

Pretest

- What to order if concerned about possible Ptx seen on PCXR?
  A. PA and Lat Chest
  B. Chest Decubitus Views
  C. CT
  D. MRI

Pretest

- What to order if worried about free air?
  A. Upright CXR
  B. Acute Abdominal Series to include upright CXR and flat/upright abdomen
  C. Abdomen US
  D. CT
  E. All of the above
  F. A, B, or D

Pretest

- What to order RUQ pain 30 y.o. female?
  A. CT A/P
  B. RUQ US
  C. Pelvic US
  D. Abdomen MRI

Pretest

- What to order acute abdominal pain?
  A. CT Abd w/ contrast
  B. CT A/P w/ contrast
  C. Abdomen XR
  D. Abdomen MRI

Pretest

- The densities seen on XR, as classically taught, include?
  A. Fat
  B. Bones/Calcium
  C. Soft Tissue
  D. Air
  E. All of the Above
  F. B,C, and D

Pretest

- US suggested possible renal mass. Correct order is?
  A. CT A/P with
  B. CT A/P w/ and w/o
  C. CT Abd with
  D. CT Abd without
  E. CT A/P without
  F. CT abdomen w/ and w/o

Pretest

- Concern for Aortic Dissection. Correct order is?
  A. CT Chest w/ (could add A/P)
  B. CT Chest w/o (could add A/P)
  C. CT Chest w/ and w/o (could add A/P)

Radiology Lingo

- Leaning the Language
  - “FDG Uptake” “T1 Marrow replacement”
- Get acquainted with recurring themes/terms
- Look up the words you don’t know
  - Many unusual terms and diagnoses (pseudopseudohypoparathyroidism, Galeazzi fracture, Kienbock’s Disease, Maisonneuve fracture)
- Call your radiologist

Chest Radiography

- PA Chest
  - PA refers to the direction of the beam
  - Full inspiration
  - Upright
  - Tube 6 feet from film
- AP Chest
  - AKA “Portable chest”
  - Supine or sitting
  - Usually taken at shorter distance from the film
  - Increases magnification
  - Reduces sharpness of the image

Chest Radiography

- Lateral
  - Left side against cassette by convention
  - Thus more magnification of right sided structures on a left lateral

- Decubitus views
  - Typically assessing free flowing pleural effusion or sometimes pneumothorax
  - Which side decubitus?
    - Left lateral decubitus if left pleural effusion, for e.g.
    - Right lateral debubitus if left pneumothorax, for e.g.

Radiography

- Four main densities (in increasing order of absorption)
- Air
- Fat
- Soft Tissue (Water)
- Bone (Metal)
- Two structures cannot be separated on x-ray if same density
  - "Silhouette Sign"

Radiography Interpretation

- MUST know the anatomy
- General knowledge of the technique used
- Artifacts
- Recognize expected physiology
- Recognize pathophysiology
  - Common vs uncommon
  - Recognize demographics and hedge bets
- 2D
  - It is NOT easy
  - Radiography often more challenging than cross sectional imaging

Radiography Interpretation

- Old Studies are key
- Correlation with history is key
  - Recent surgery
  - Fever
  - Acuity of the problem/rate of change
  - Age
  - Comorbidities
  - Other clues (even from image)
- Correlation with other imaging studies (i.e.—even if no old chest x-ray) is key

ON CALL

- Know what kills (notable on CXR)
  - Pneumothorax
  - Pneumoperitoneum
  - Dislodged tubes/lines
  - Pericardial effusion/Tamponade

Definitions

- Airspace Disease
  - Water, pus, blood, or cells
- Interstitial Disease
  - Edema, interstitial lung disease, atypical infection, lymphangitic spread of tumor
- Pleural Disease
  - Water, Pus, Blood, Soft tissue mass, air
  - Obtuse angles with lateral chest wall
  - Tapered margins

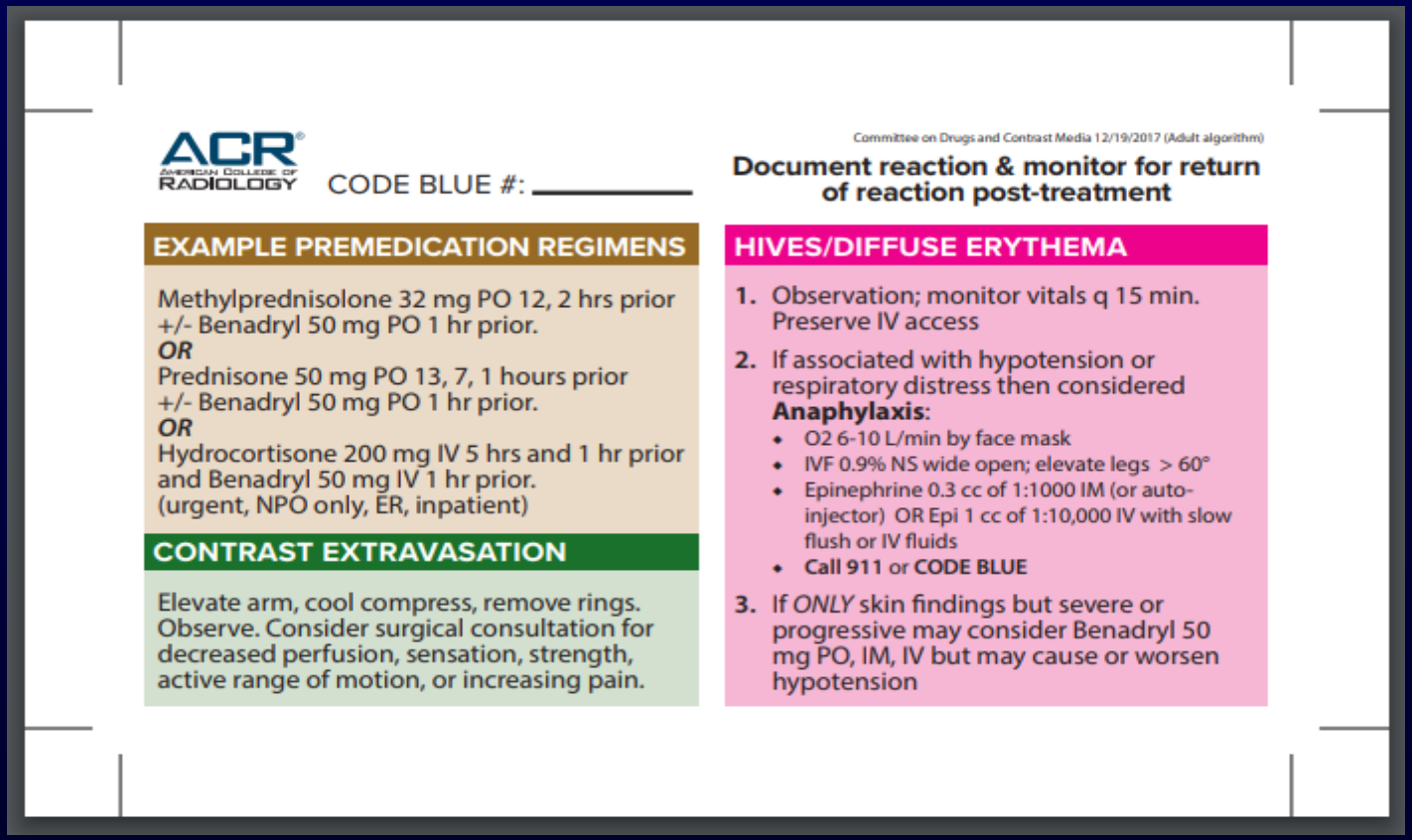
Ordering Studies

- Often Protocol specifically to the indication
- Technologists (and residents in academia) are taught to call and talk through order if question
- Radiology 322-1600
- ACR Appropriateness Criteria (acr.org)

Contrast Reactions

- Know how to recognize and treat
- Differentiate mild from severe
- If a CT scanner is nearby, either memorize or have the treatment protocol in your pocket
- Contrast reactions are VERY RARE
- Contrast reactions can KILL

Contrast Reactions



ACR American College of Radiology

CODE BLUE #: _____

Committee on Drugs and Contrast Media 12/19/2017 (Adult algorithm)

Document reaction & monitor for return of reaction post-treatment

EXAMPLE PREMEDICATION REGIMENS

Methylprednisolone 32 mg PO 12, 2 hrs prior
+/- Benadryl 50 mg PO 1 hr prior.
OR
Prednisone 50 mg PO 13, 7, 1 hours prior
+/- Benadryl 50 mg PO 1 hr prior.
OR
Hydrocortisone 200 mg IV 5 hrs and 1 hr prior and Benadryl 50 mg IV 1 hr prior.
(urgent, NPO only, ER, inpatient)

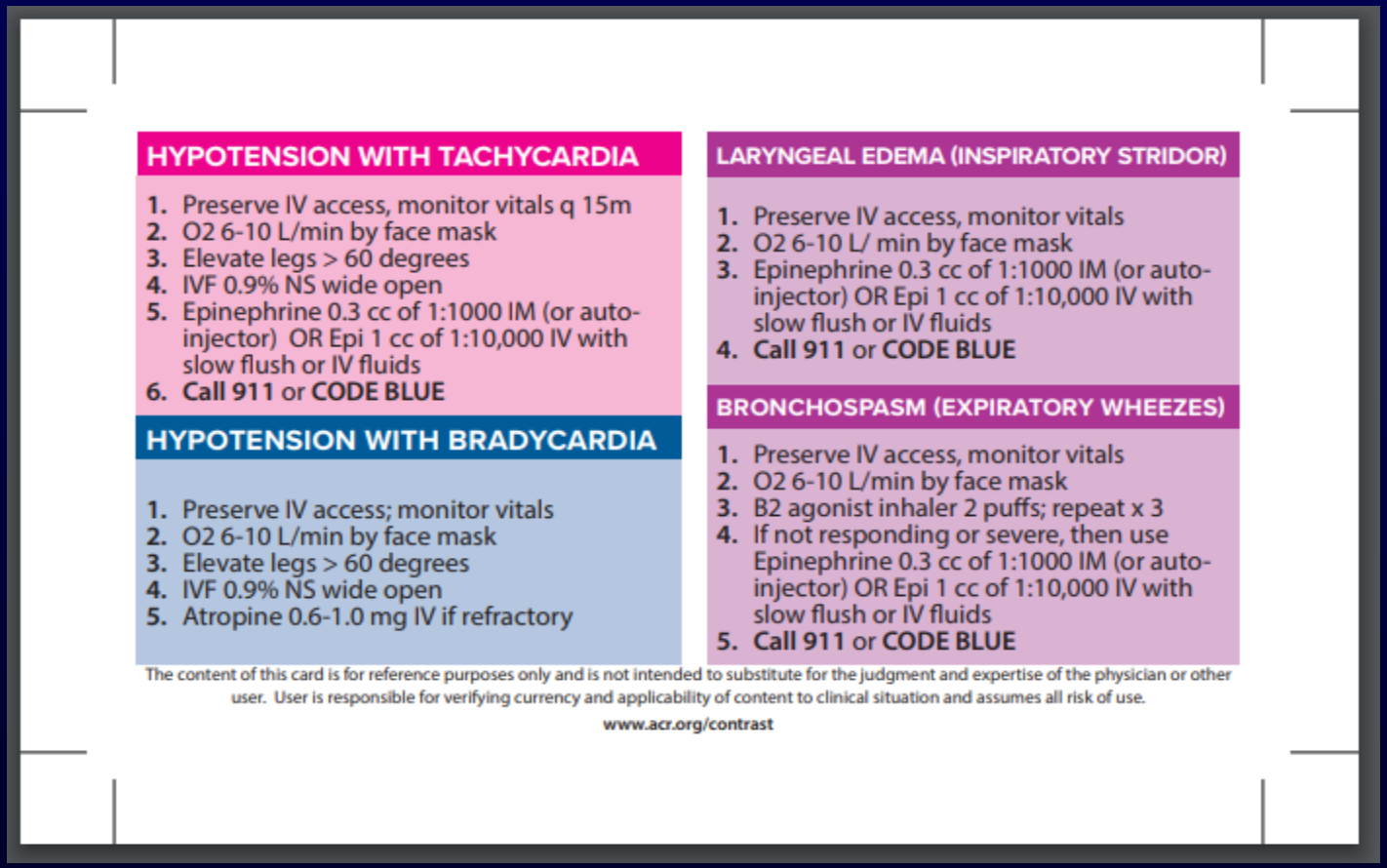
CONTRAST EXTRAVASATION

Elevate arm, cool compress, remove rings. Observe. Consider surgical consultation for decreased perfusion, sensation, strength, active range of motion, or increasing pain.

HIVES/DIFFUSE ERYTHEMA

1. Observation; monitor vitals q 15 min. Preserve IV access
2. If associated with hypotension or respiratory distress then considered **Anaphylaxis**:
   - O2 6-10 L/min by face mask
   - IVF 0.9% NS wide open; elevate legs > 60°
   - Epinephrine 0.3 cc of 1:1000 IM (or auto-injector) OR Epi 1 cc of 1:10,000 IV with slow flush or IV fluids
   - **Call 911** or **CODE BLUE**
3. If *ONLY* skin findings but severe or progressive may consider Benadryl 50 mg PO, IM, IV but may cause or worsen hypotension

Contrast Reactions



HYPOTENSION WITH TACHYCARDIA

1. Preserve IV access, monitor vitals q 15m
2. O2 6-10 L/min by face mask
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HYPOTENSION WITH BRADYCARDIA

1. Preserve IV access; monitor vitals
2. O2 6-10 L/min by face mask
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5. Atropine 0.6-1.0 mg IV if refractory

LARYNGEAL EDEMA (INSPIRATORY STRIDOR)

1. Preserve IV access, monitor vitals
2. O2 6-10 L/ min by face mask
3. Epinephrine 0.3 cc of 1:1000 IM (or auto-injector) OR Epi 1 cc of 1:10,000 IV with slow flush or IV fluids
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BRONCHOSPASM (EXPIRATORY WHEEZES)

1. Preserve IV access, monitor vitals
2. O2 6-10 L/min by face mask
3. B2 agonist inhaler 2 puffs; repeat x 3
4. If not responding or severe, then use Epinephrine 0.3 cc of 1:1000 IM (or auto-injector) OR Epi 1 cc of 1:10,000 IV with slow flush or IV fluids
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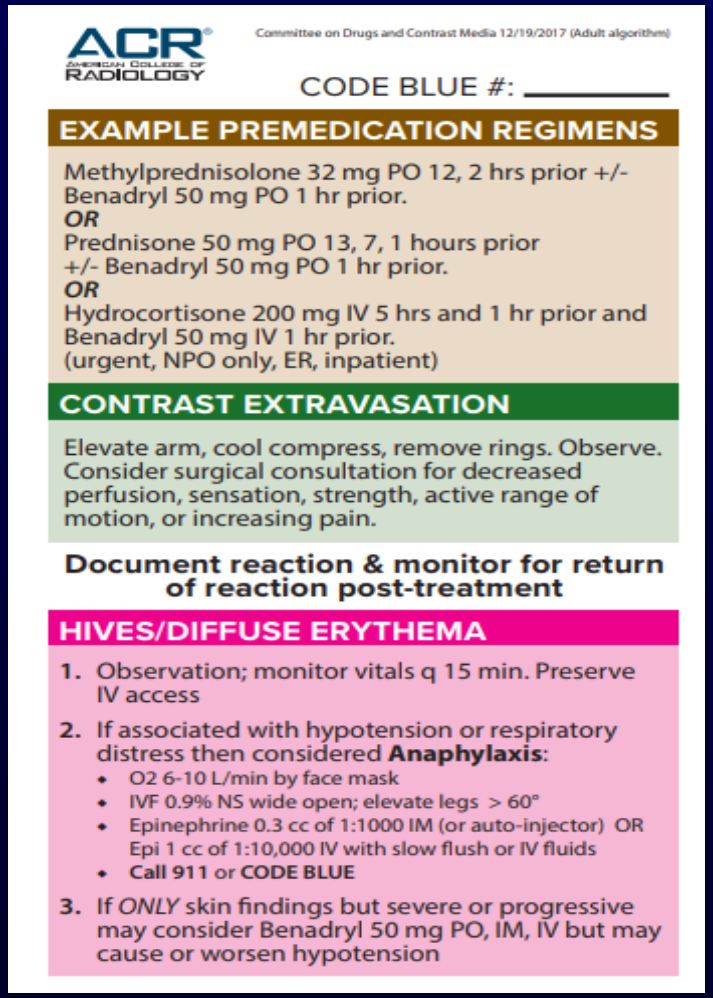
www.acr.org/contrast

Contrast Reactions



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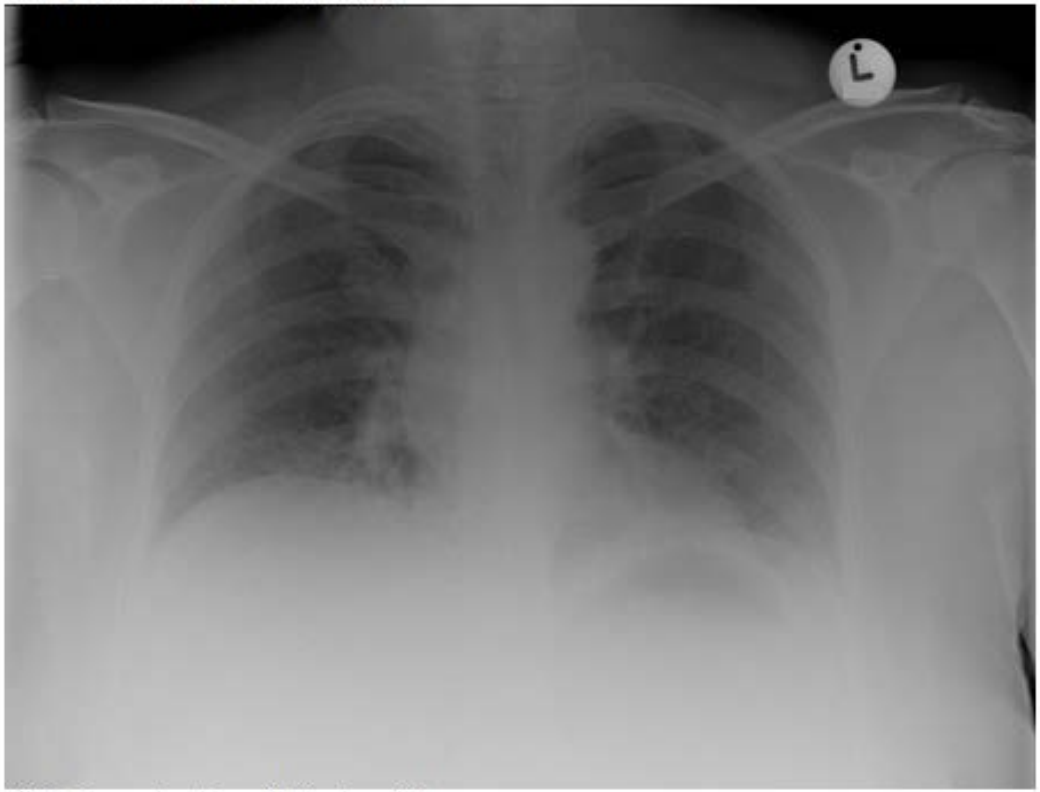
Lines and Tubes

- ETT
- NG
- PICC
- Central Lines
- Pacer/AICD
- Chest tubes
- Drains
- Epicardial Leads
- VAD

Expiration

Hover over image to show findings



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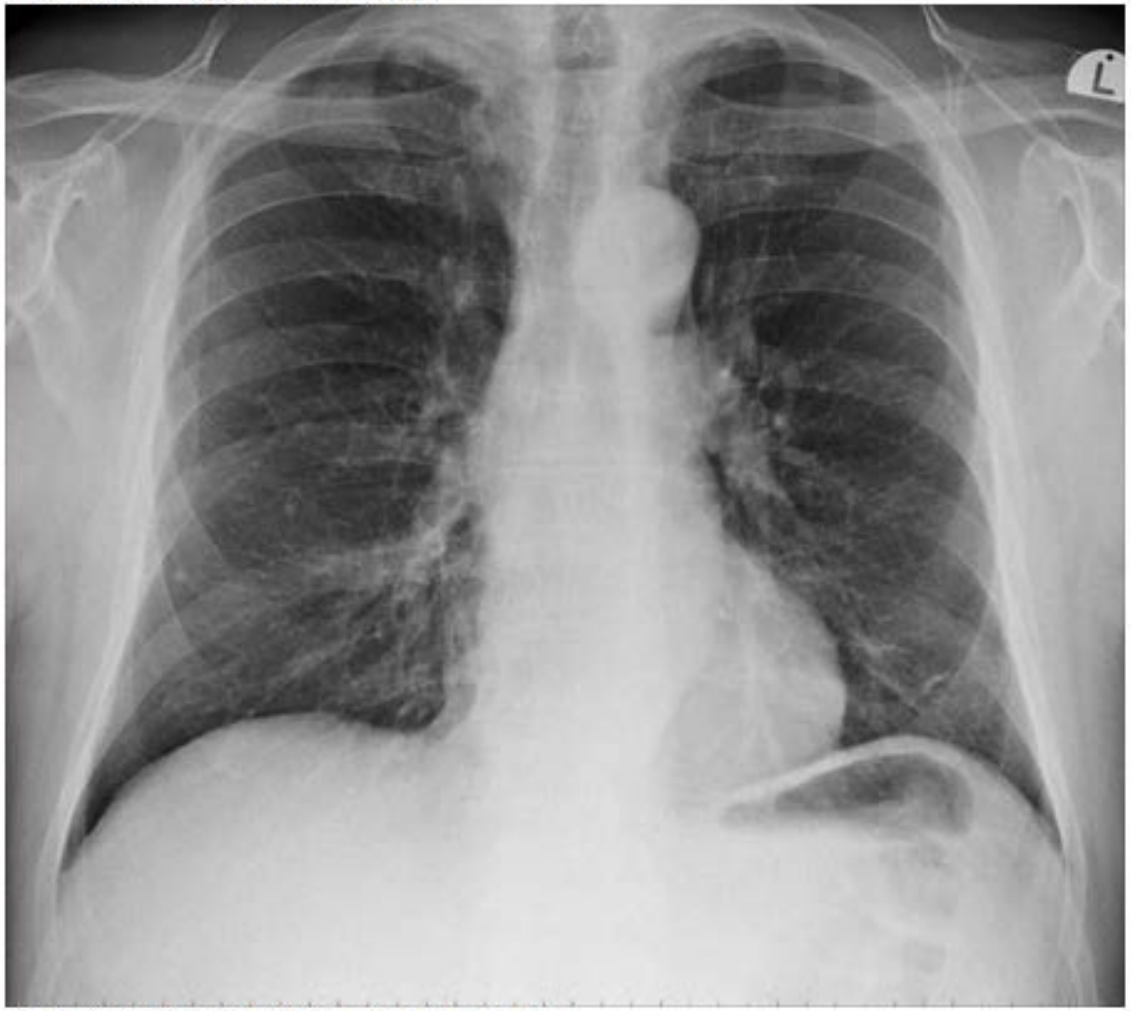

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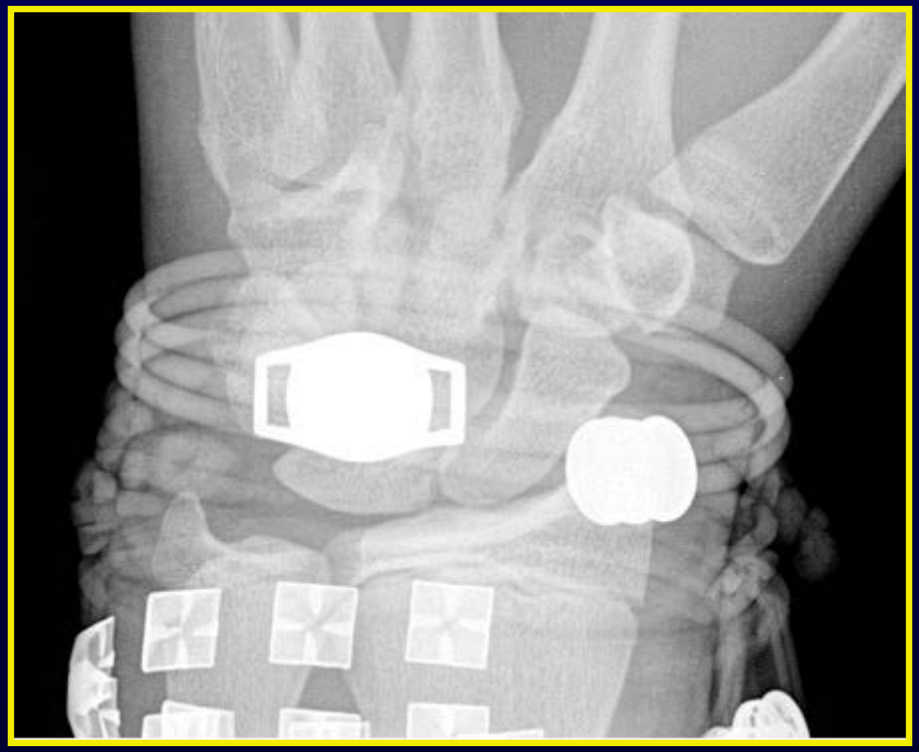

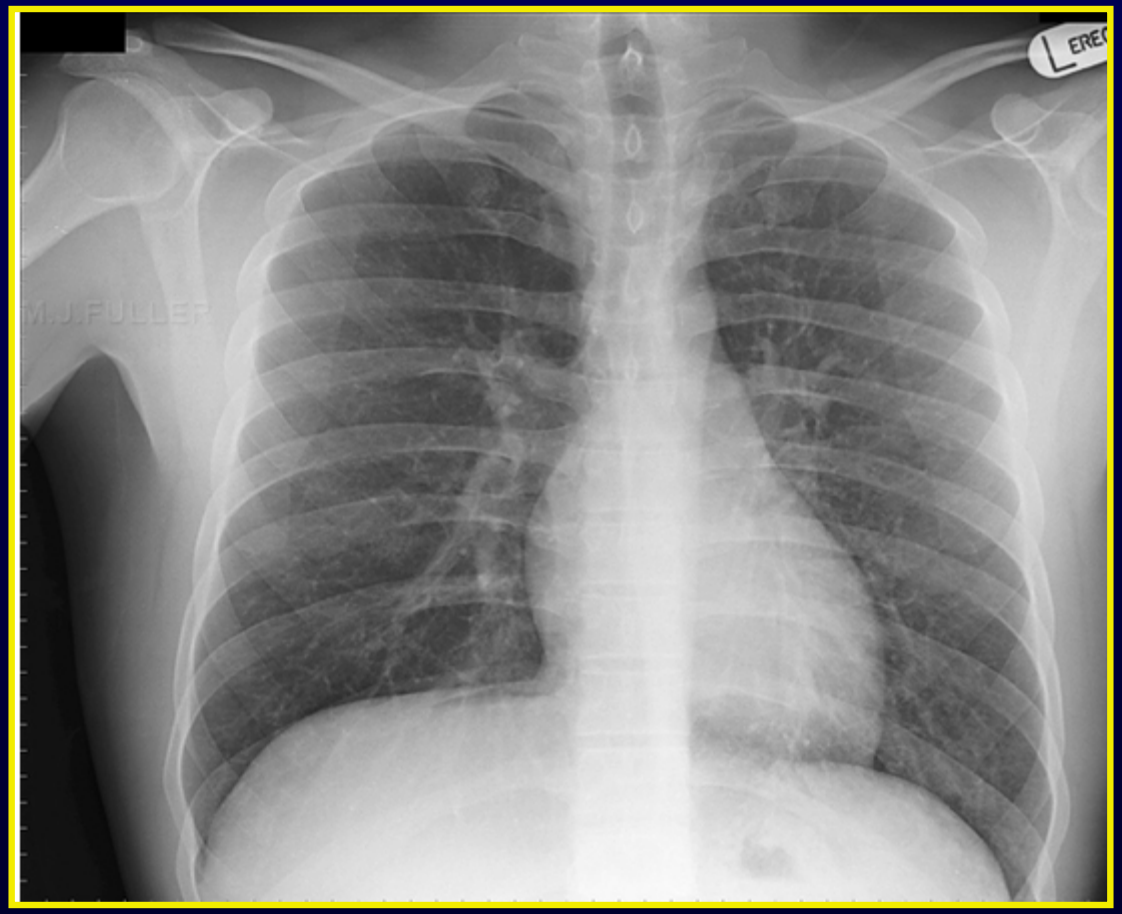
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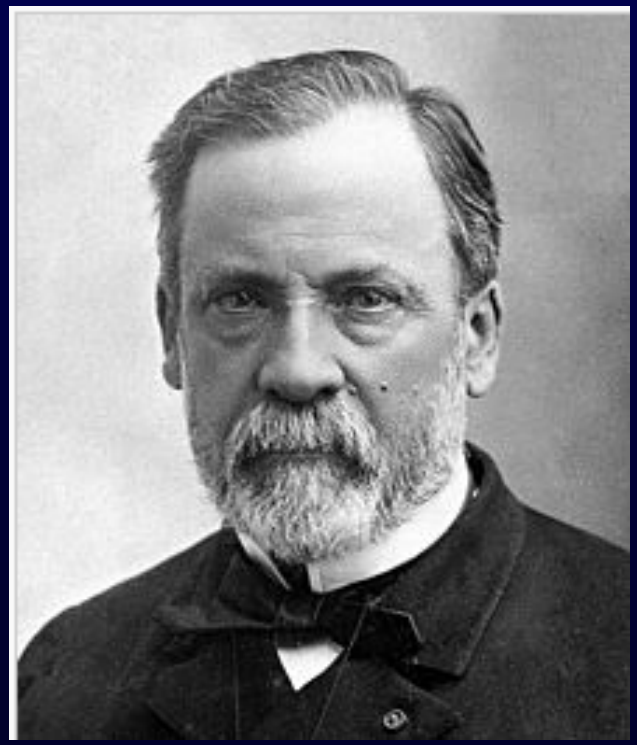
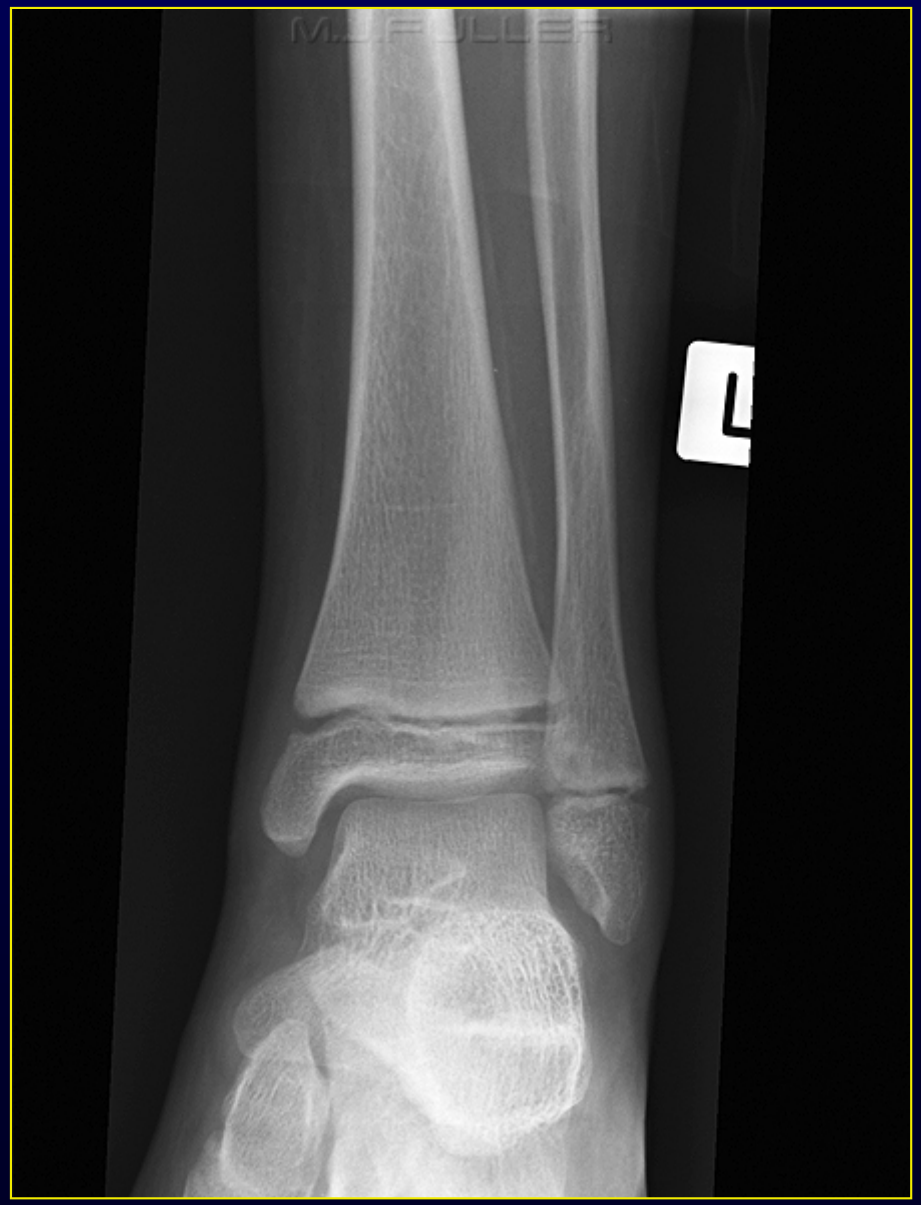
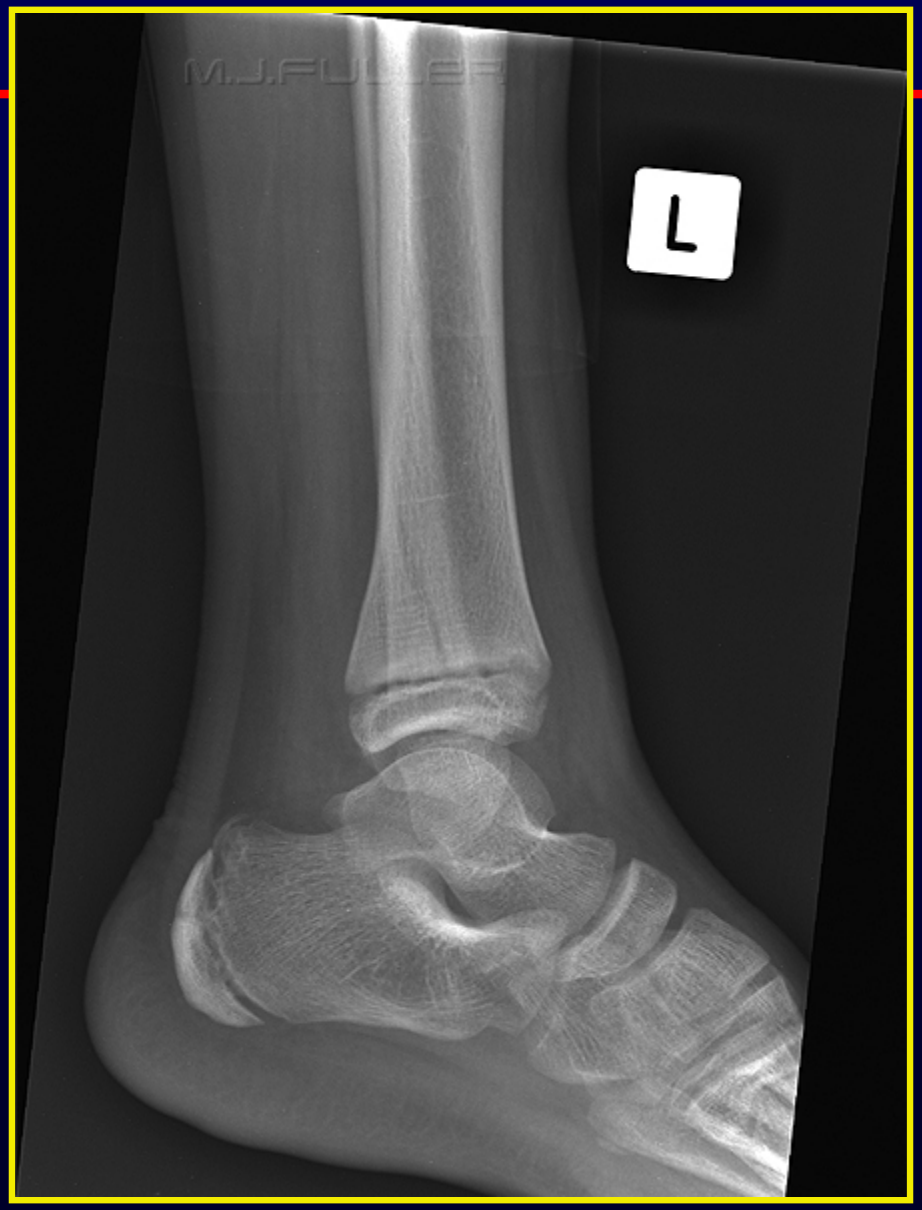
Pasteur: “…Chance (observation) favours the prepared mind.”



One View is NO View

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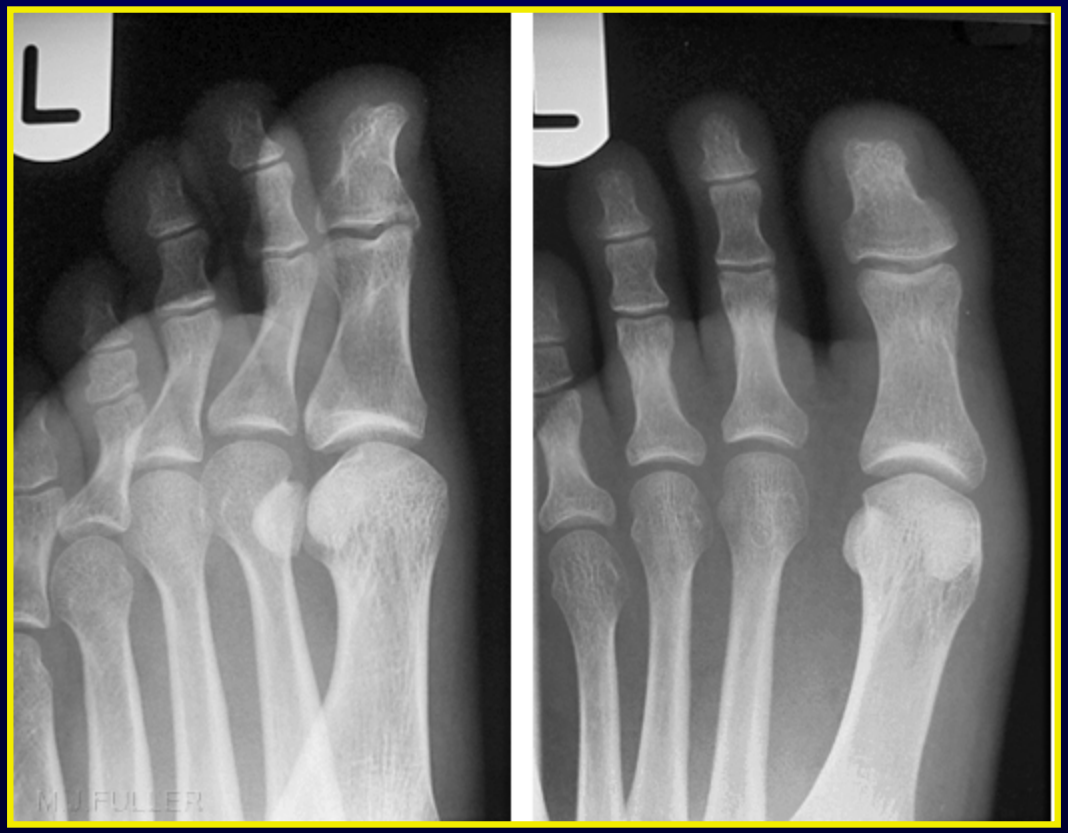
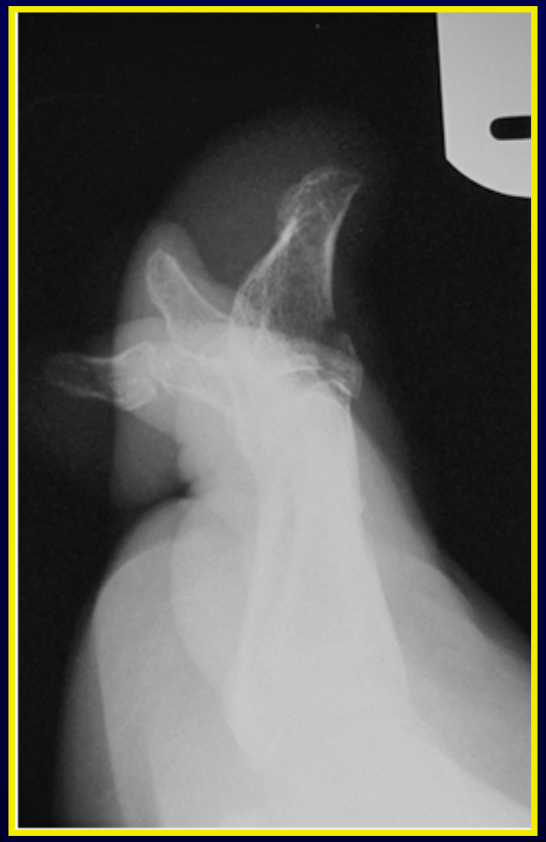
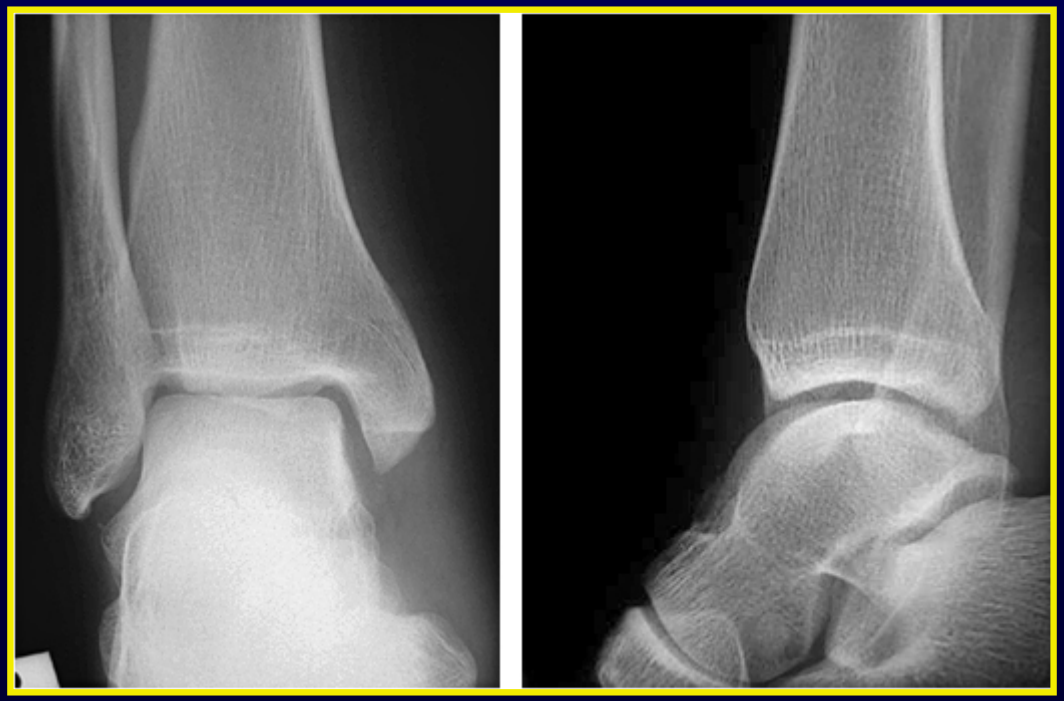
Fracture?

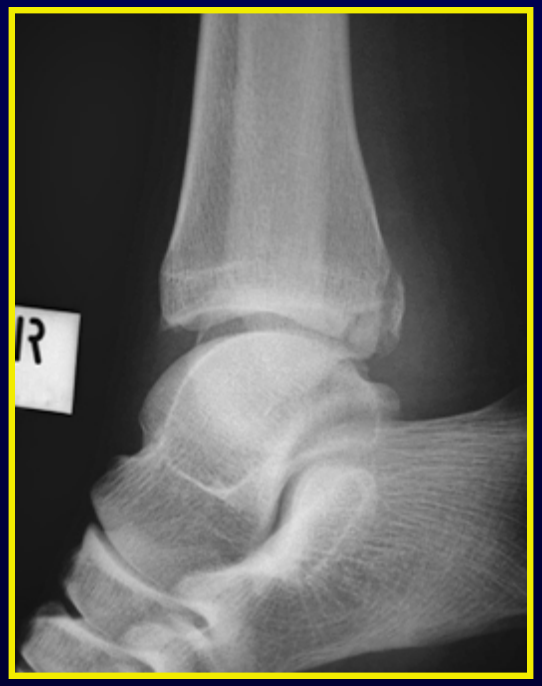


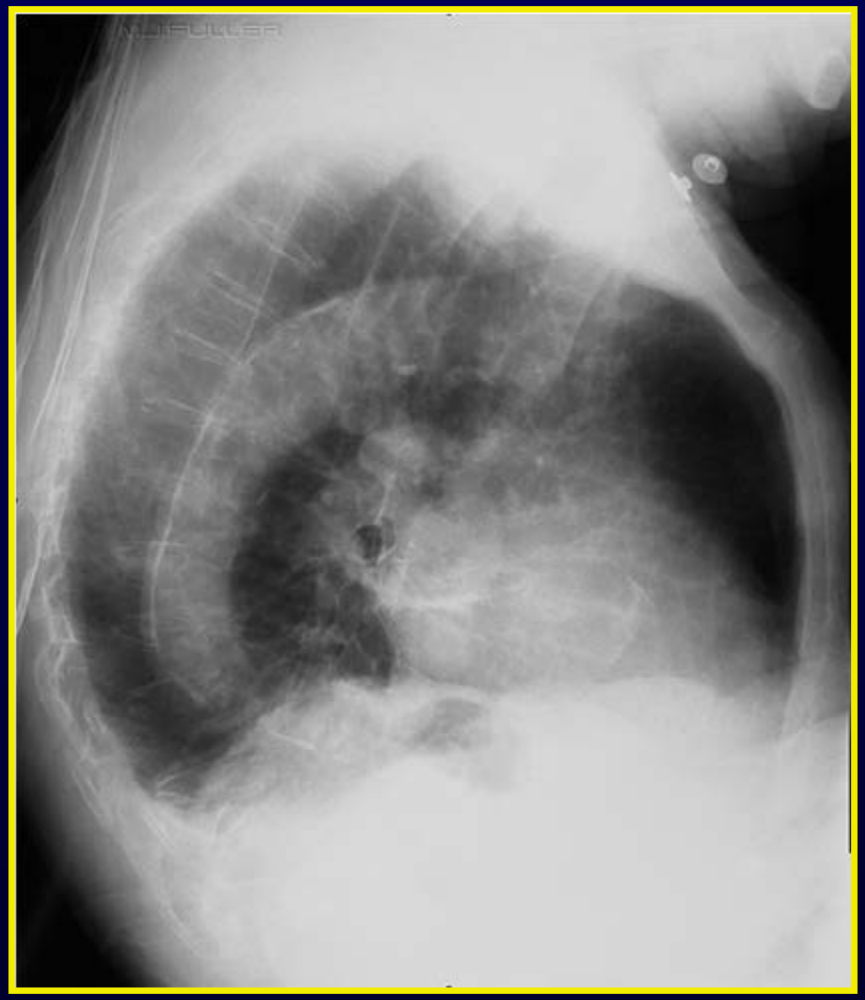
Sometimes, 2 Views are Inadequate!

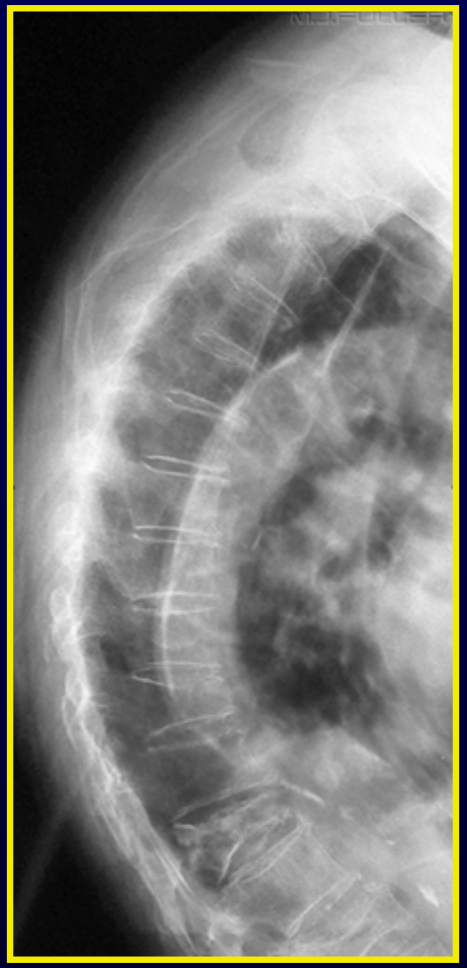


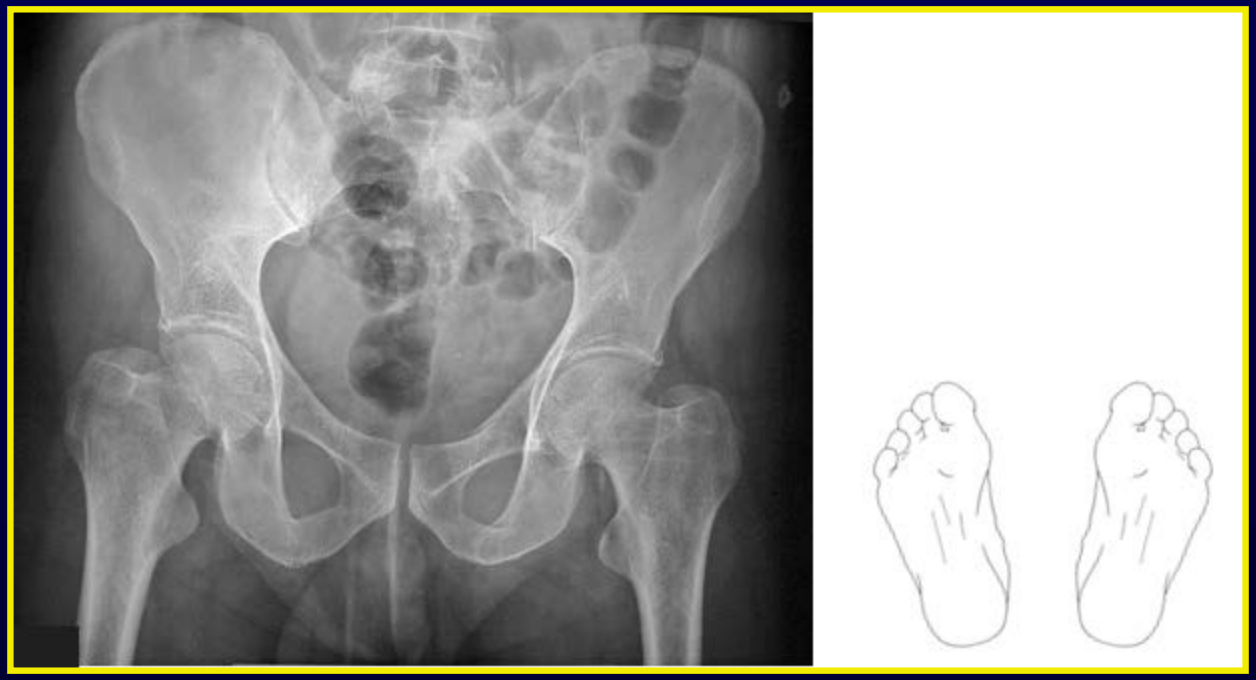


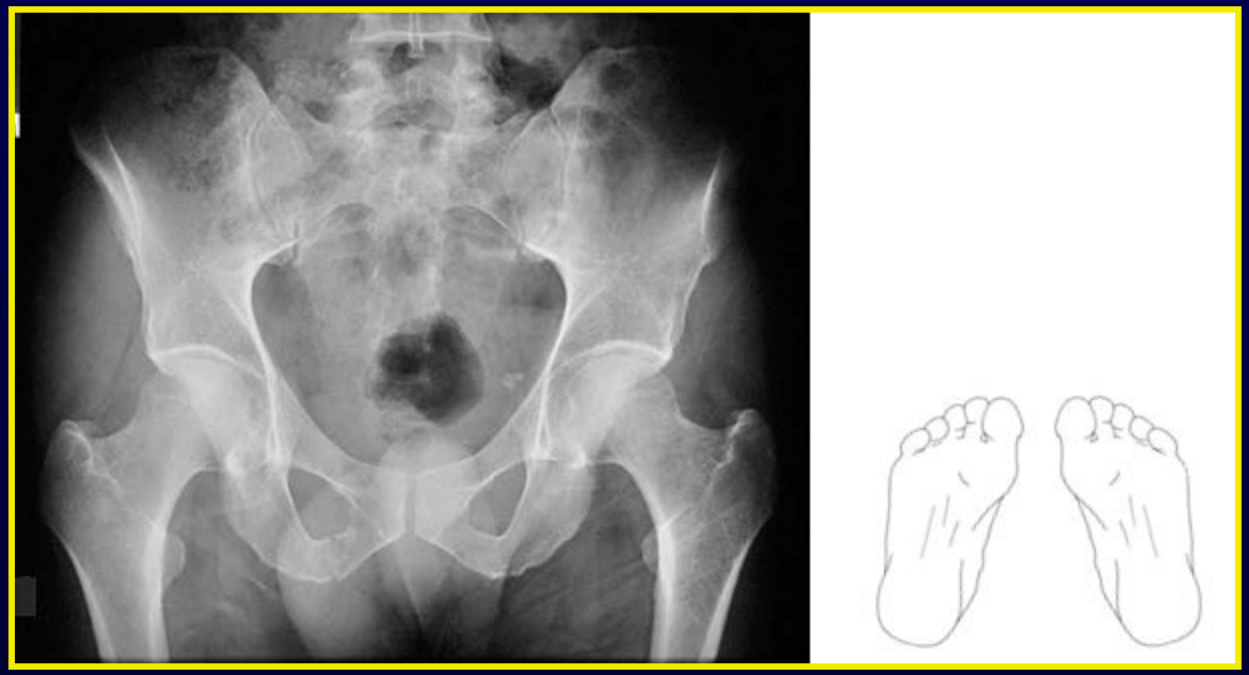
Repeat lateral

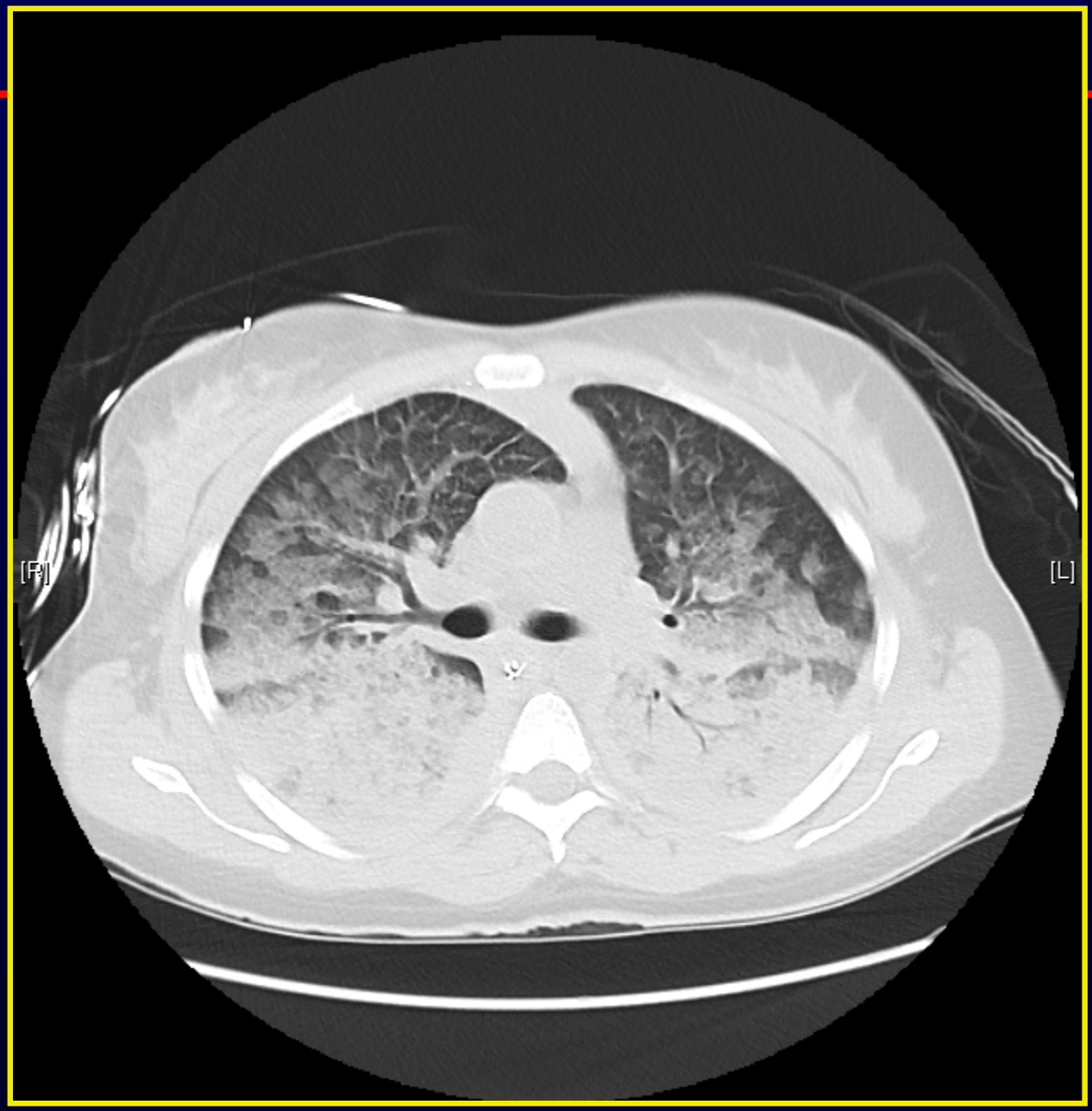








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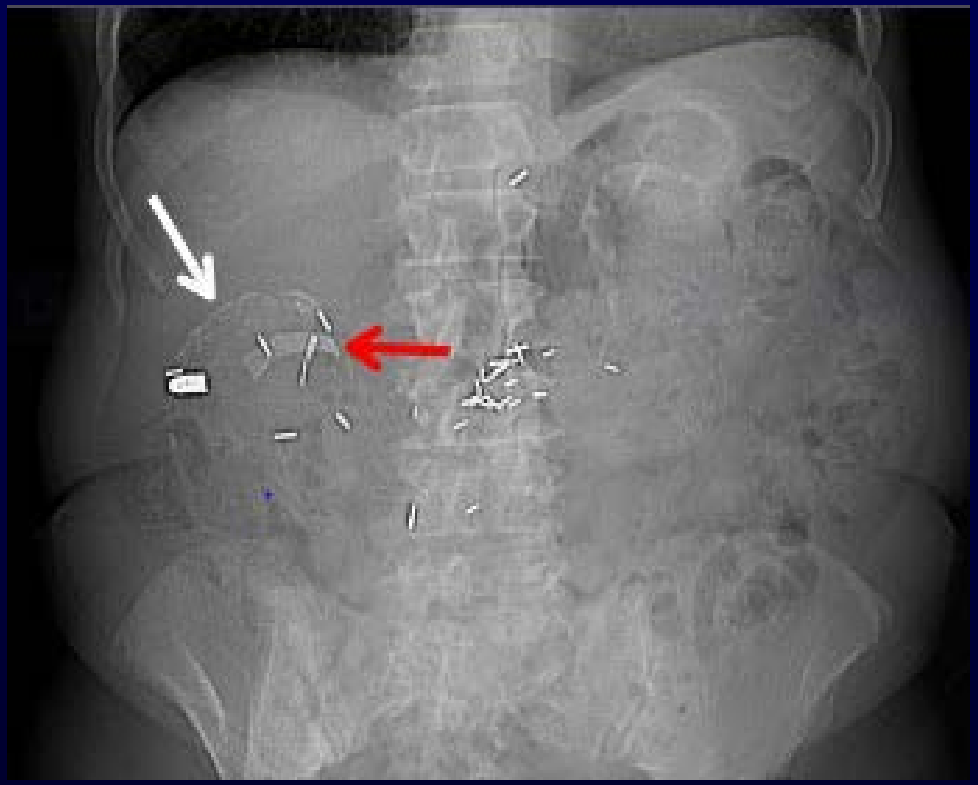
Emergency 101



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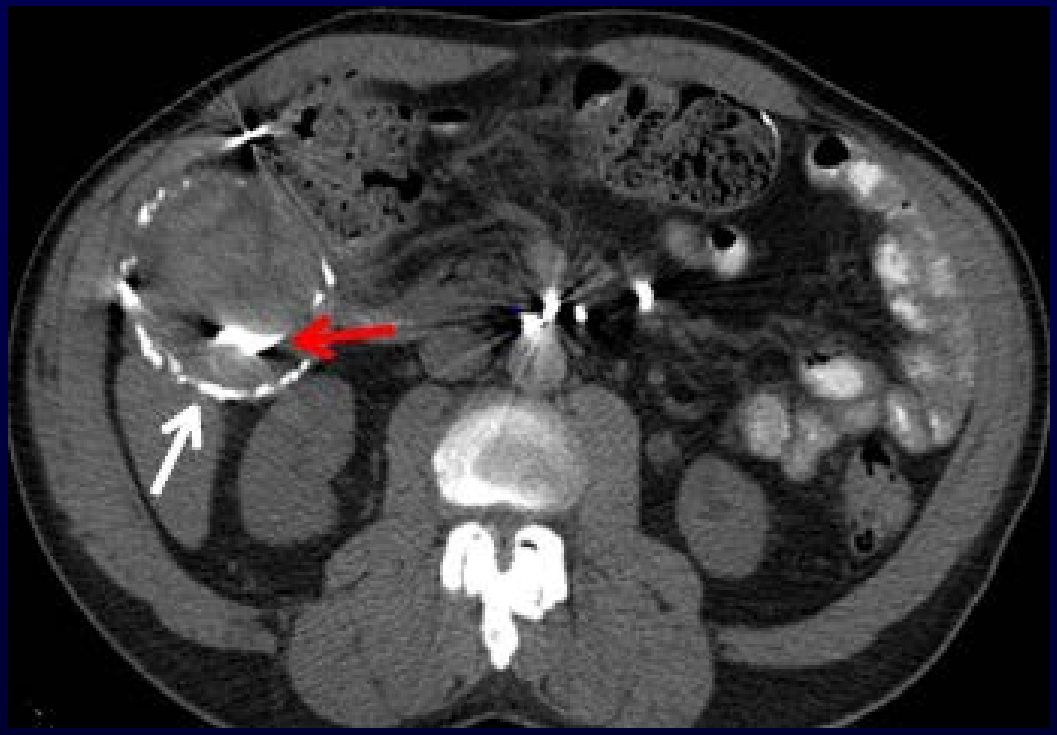

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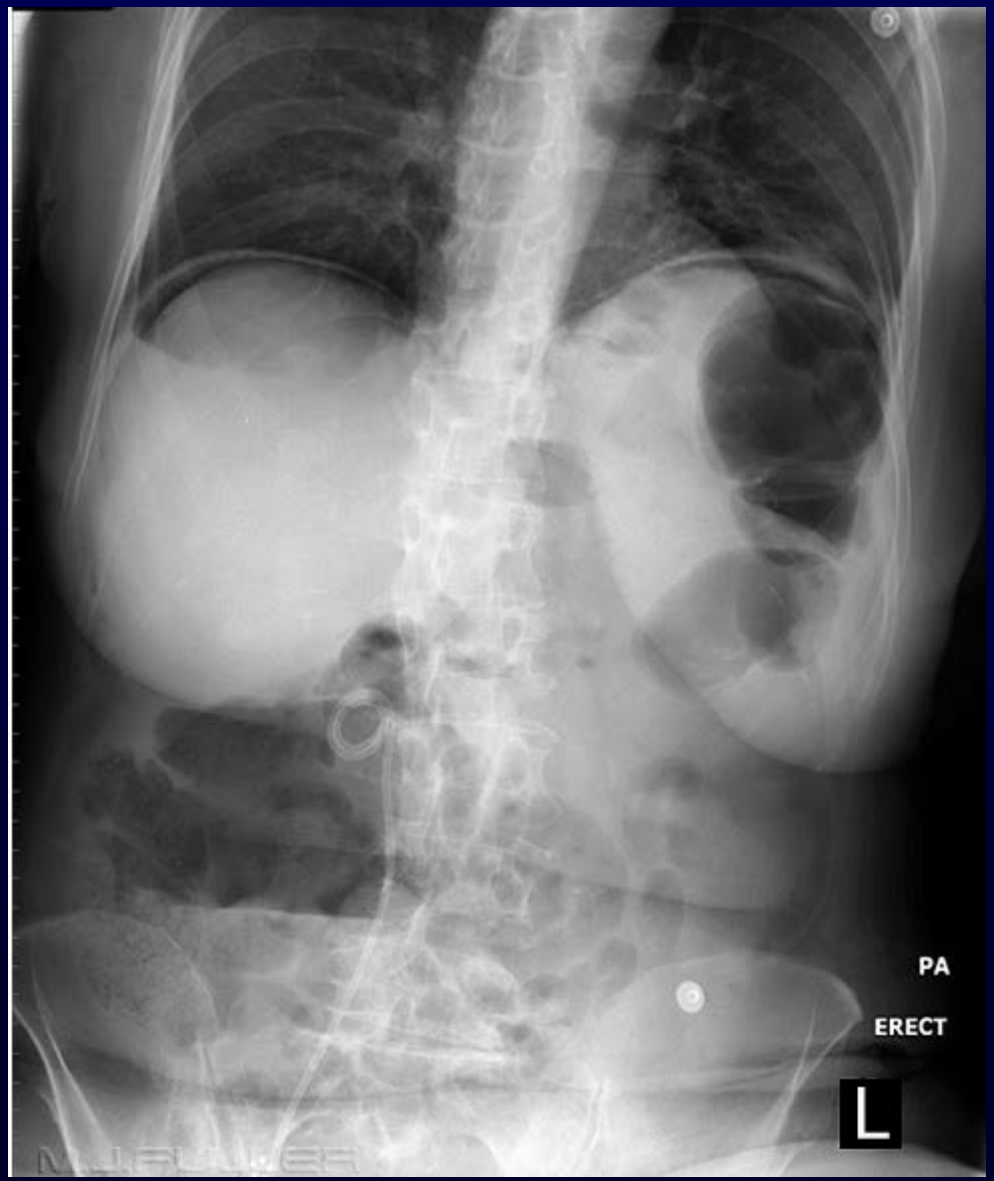

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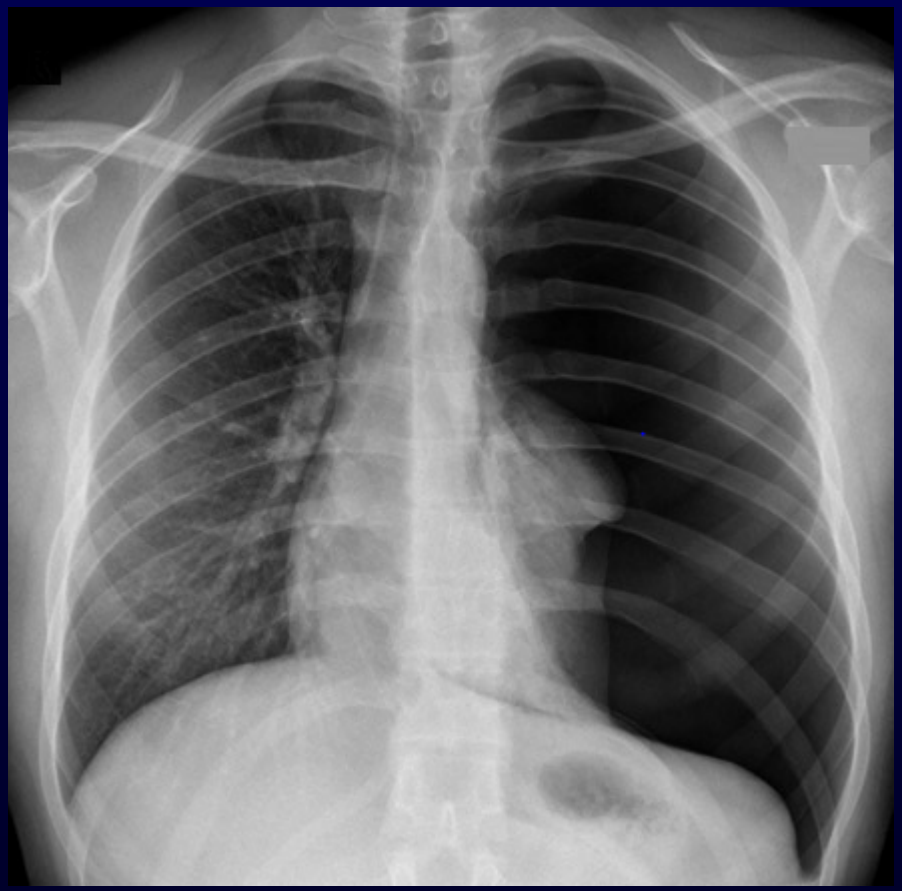

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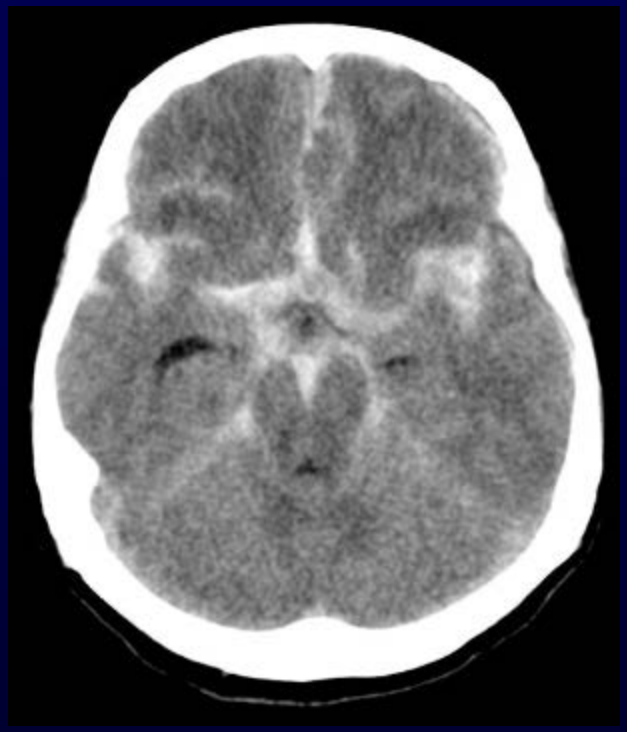

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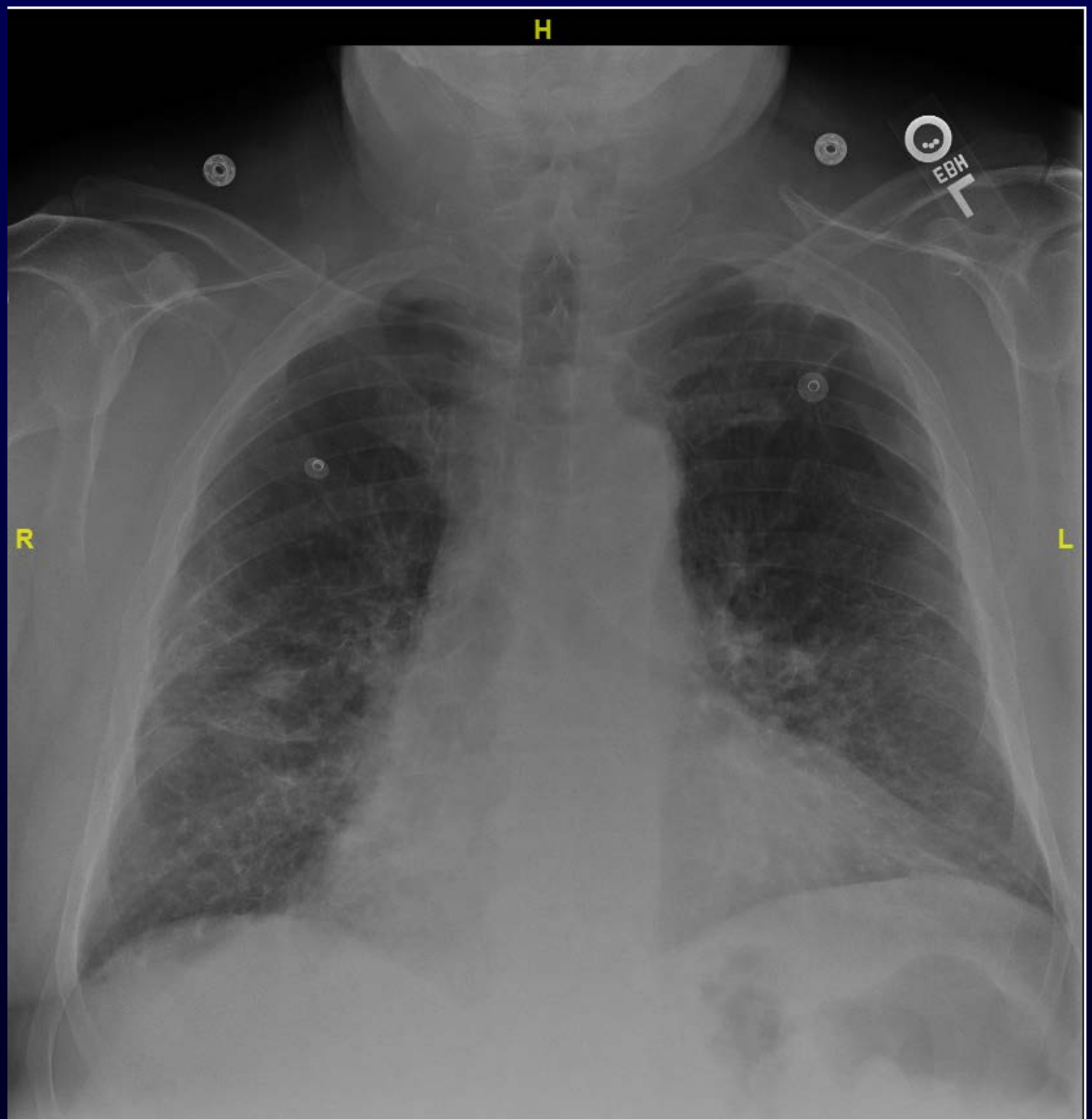

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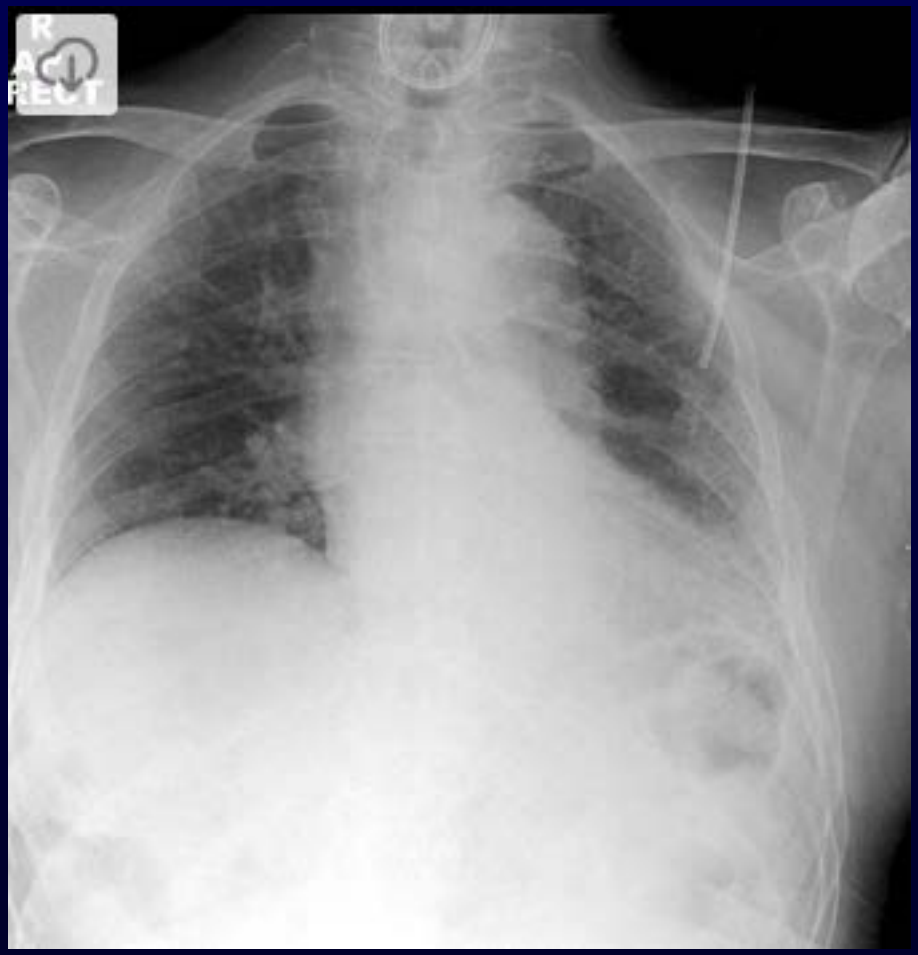

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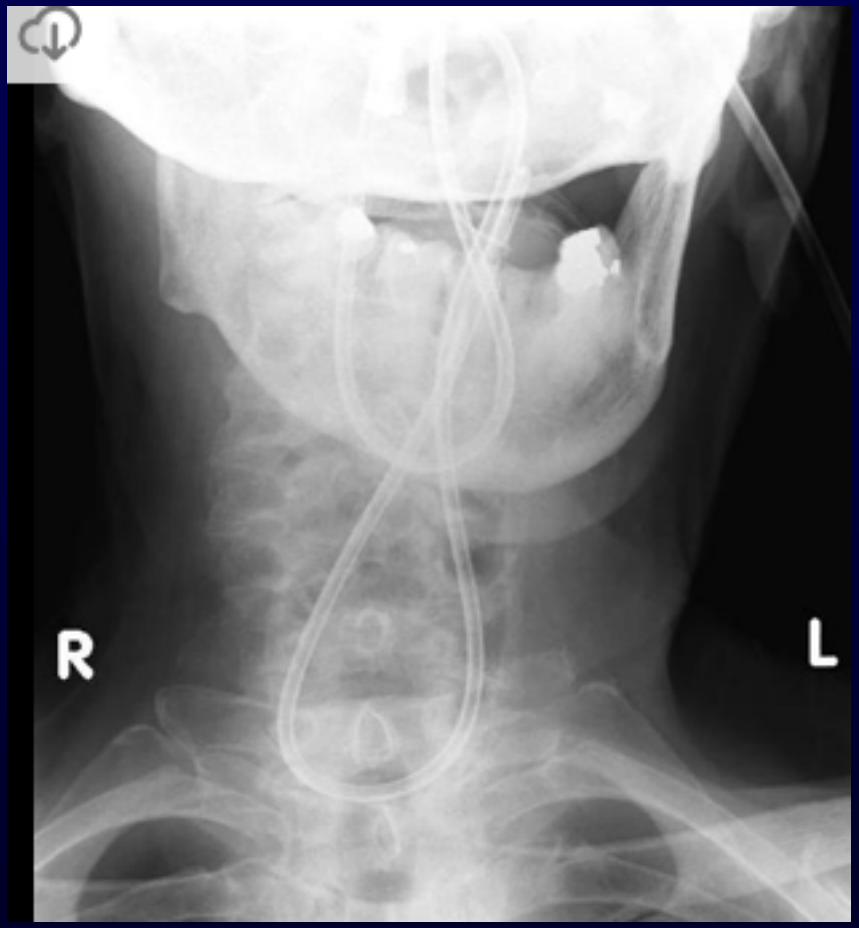

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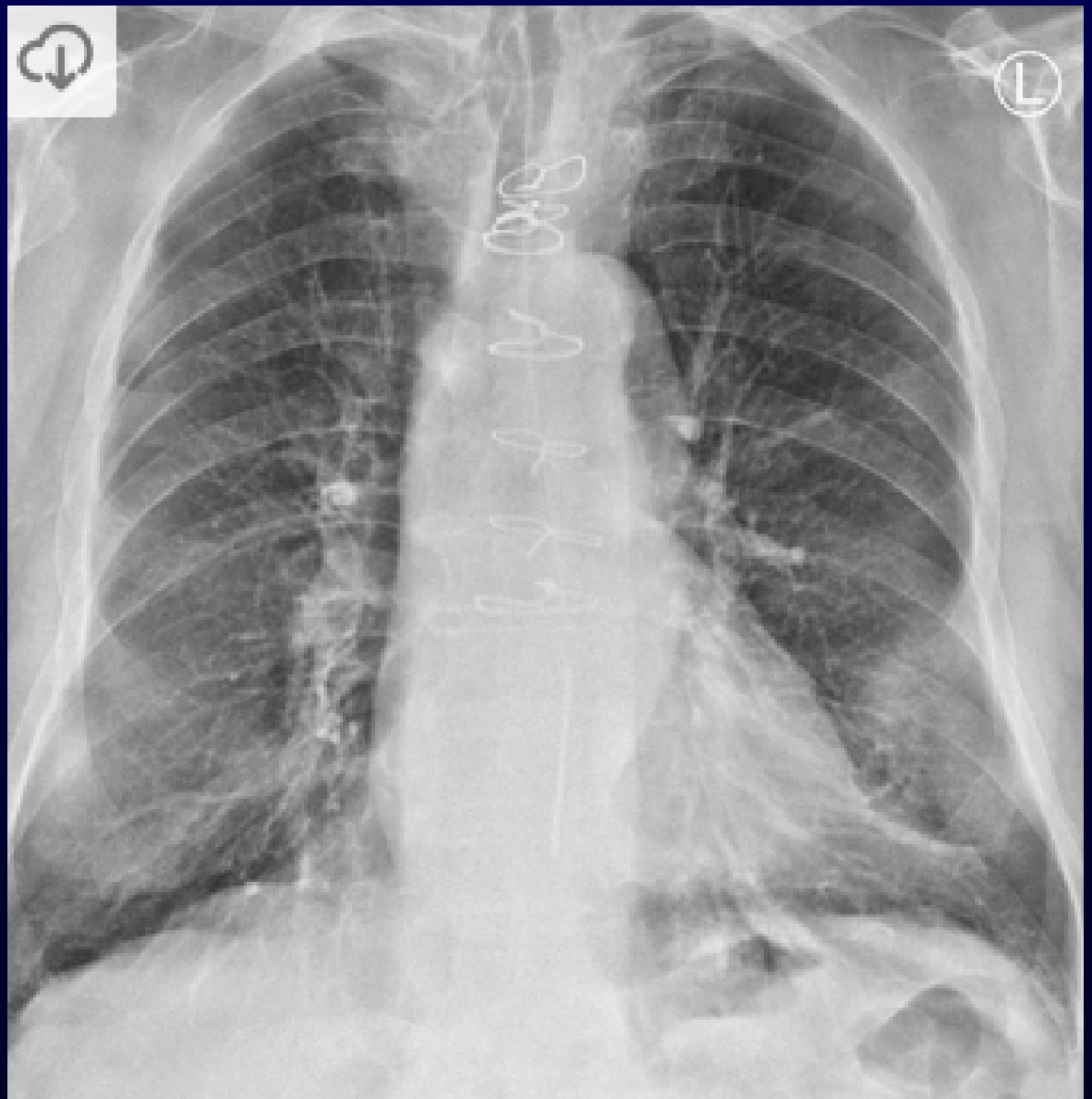

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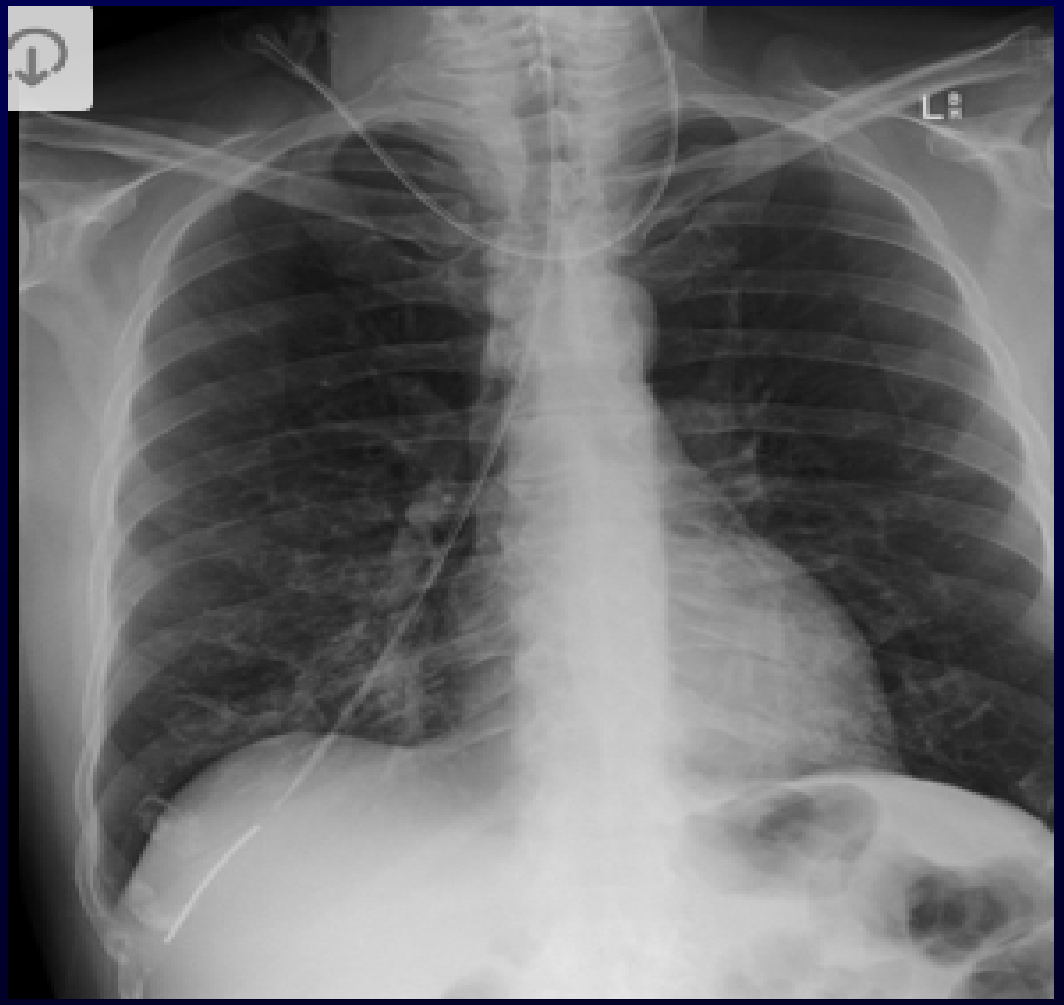

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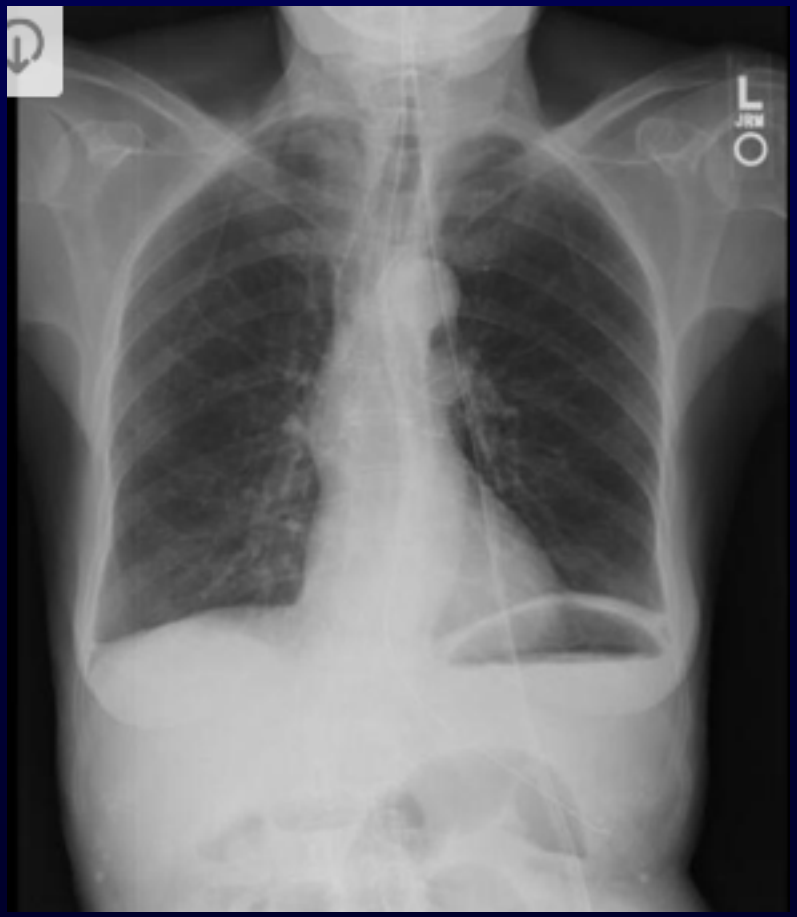

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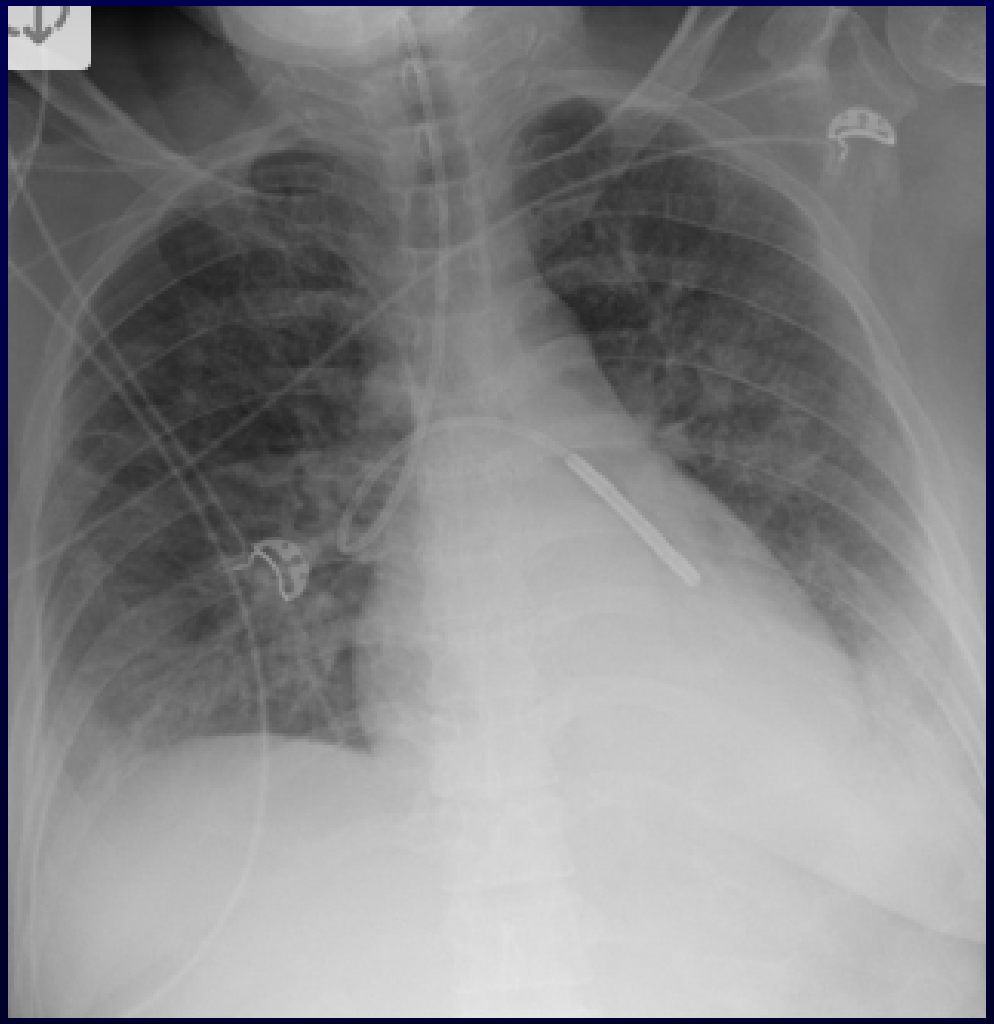

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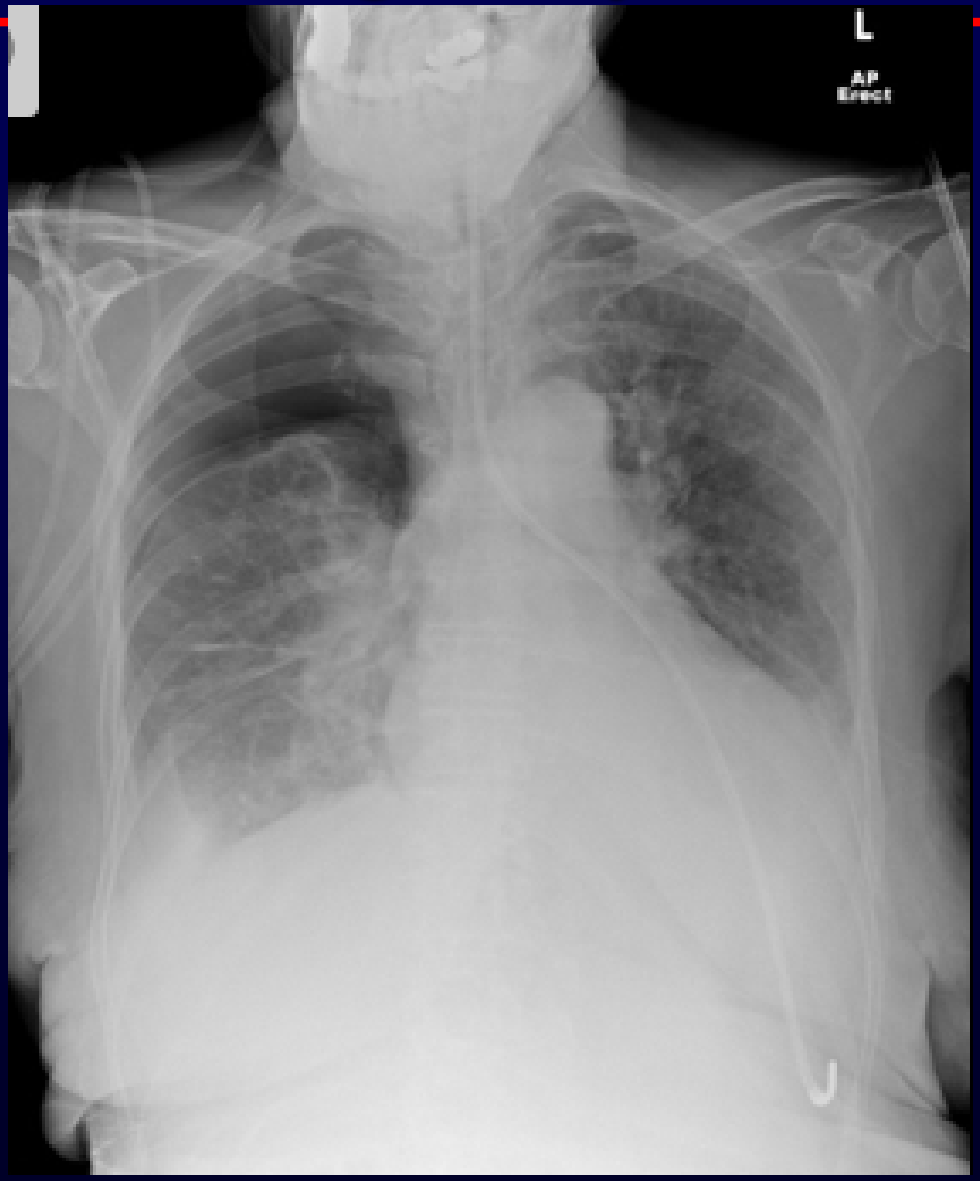

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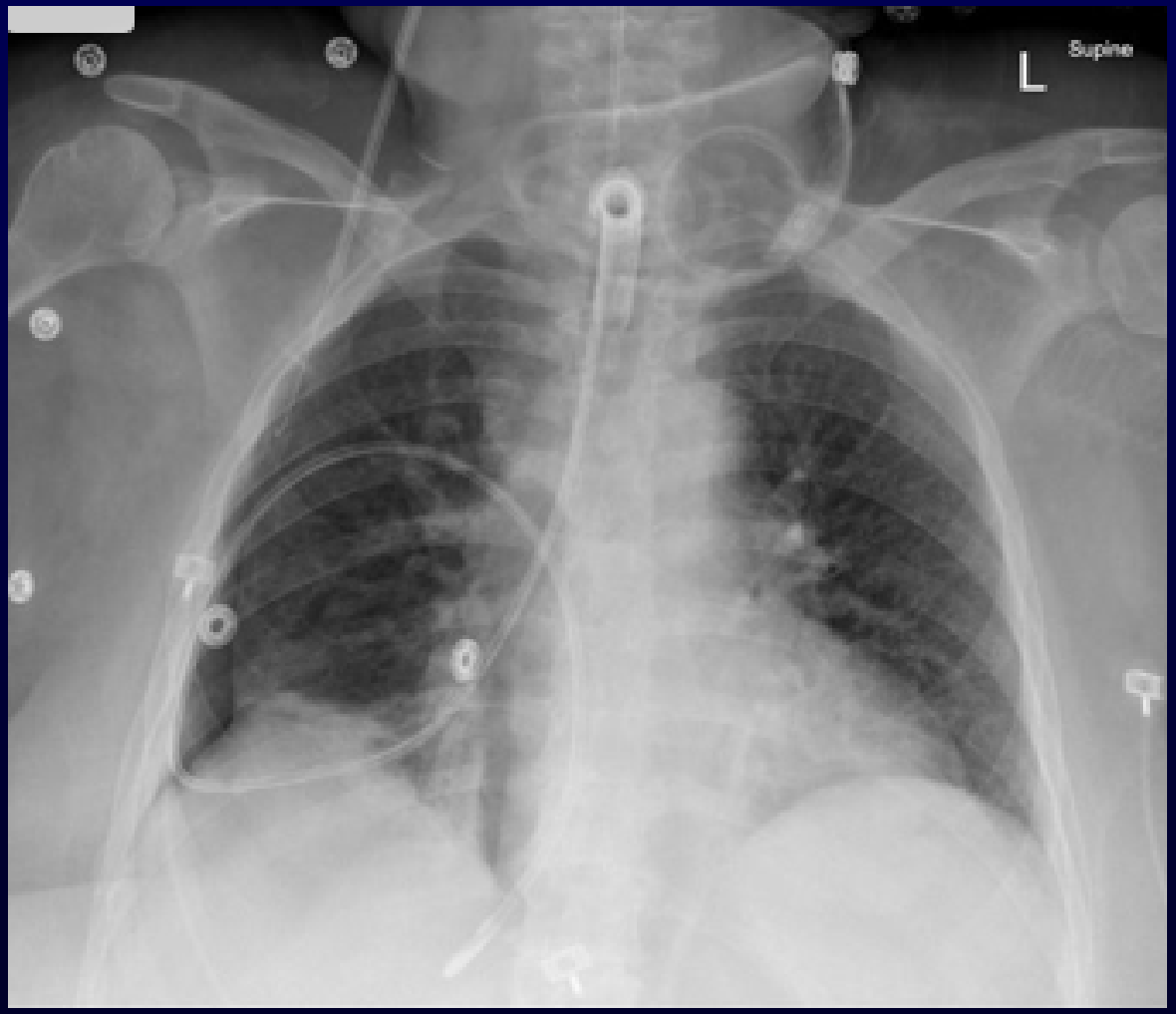

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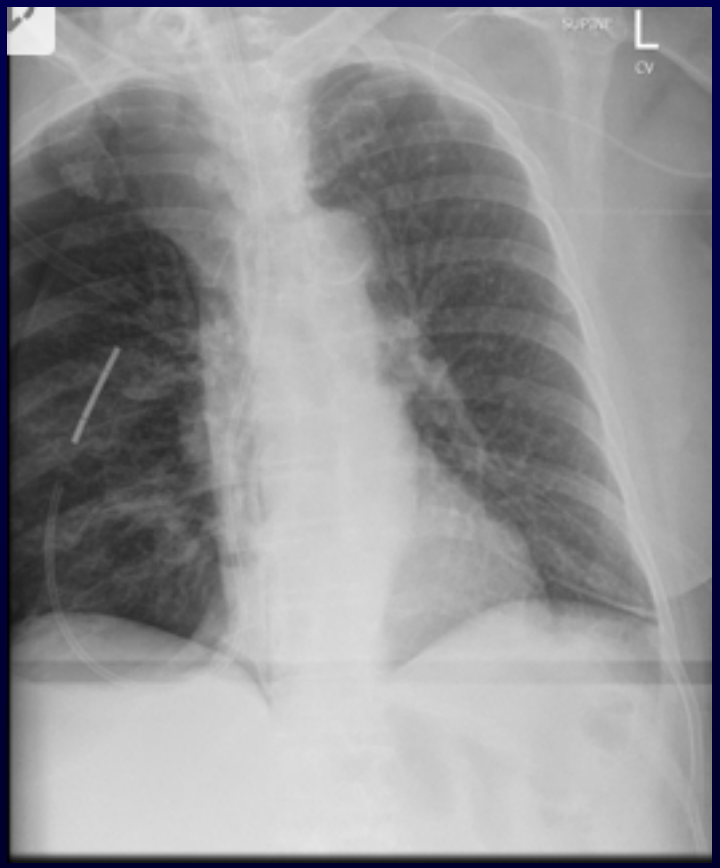

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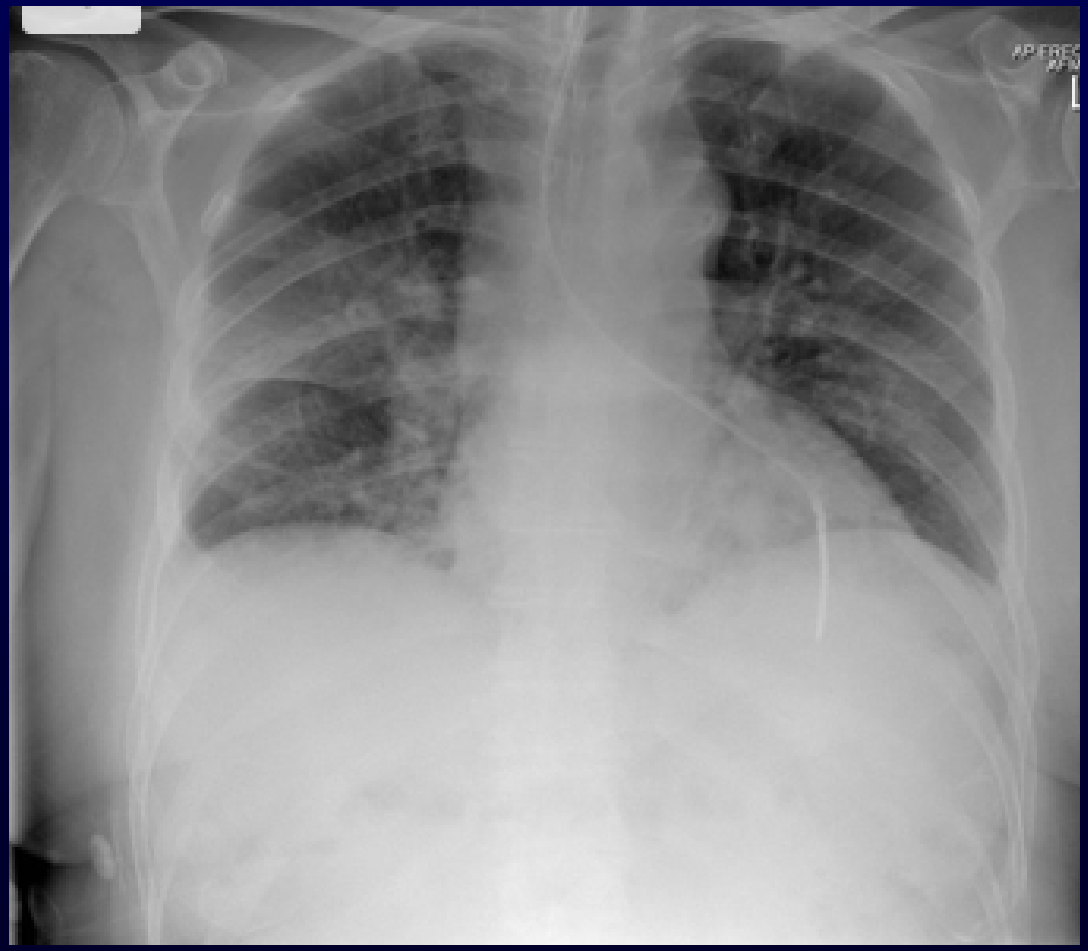

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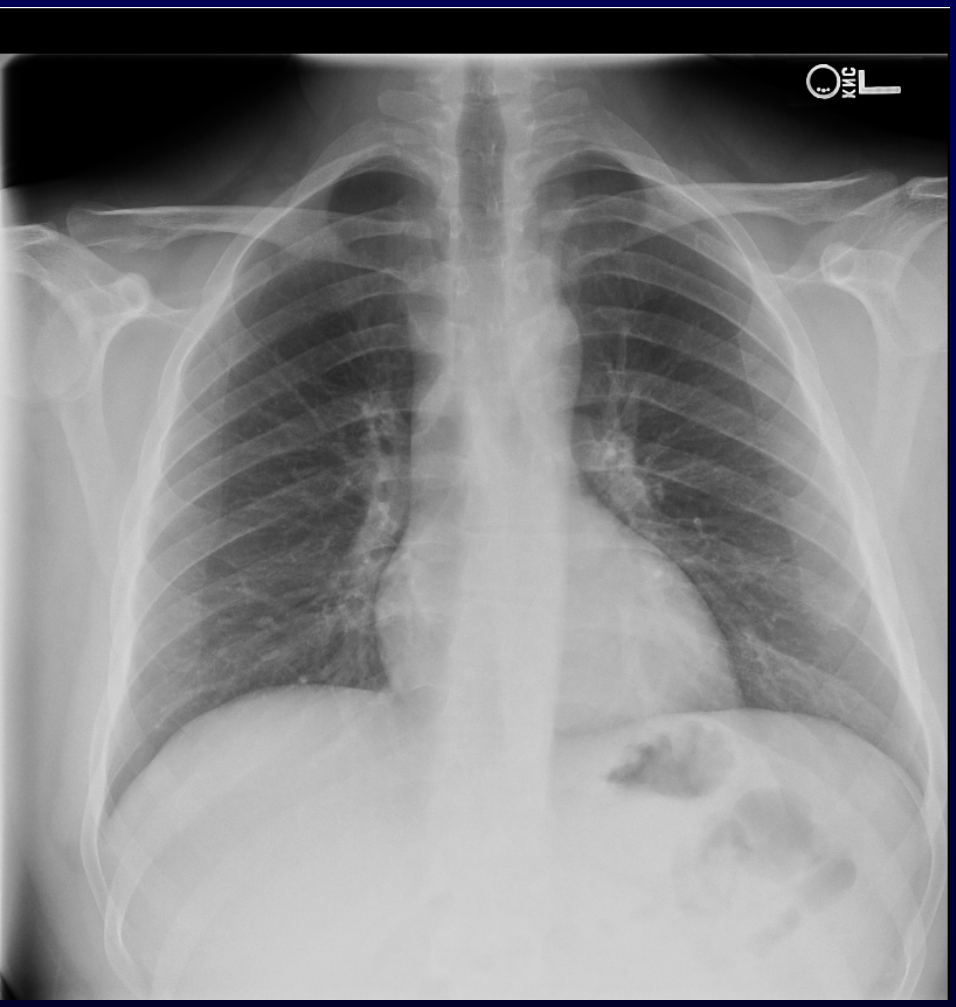

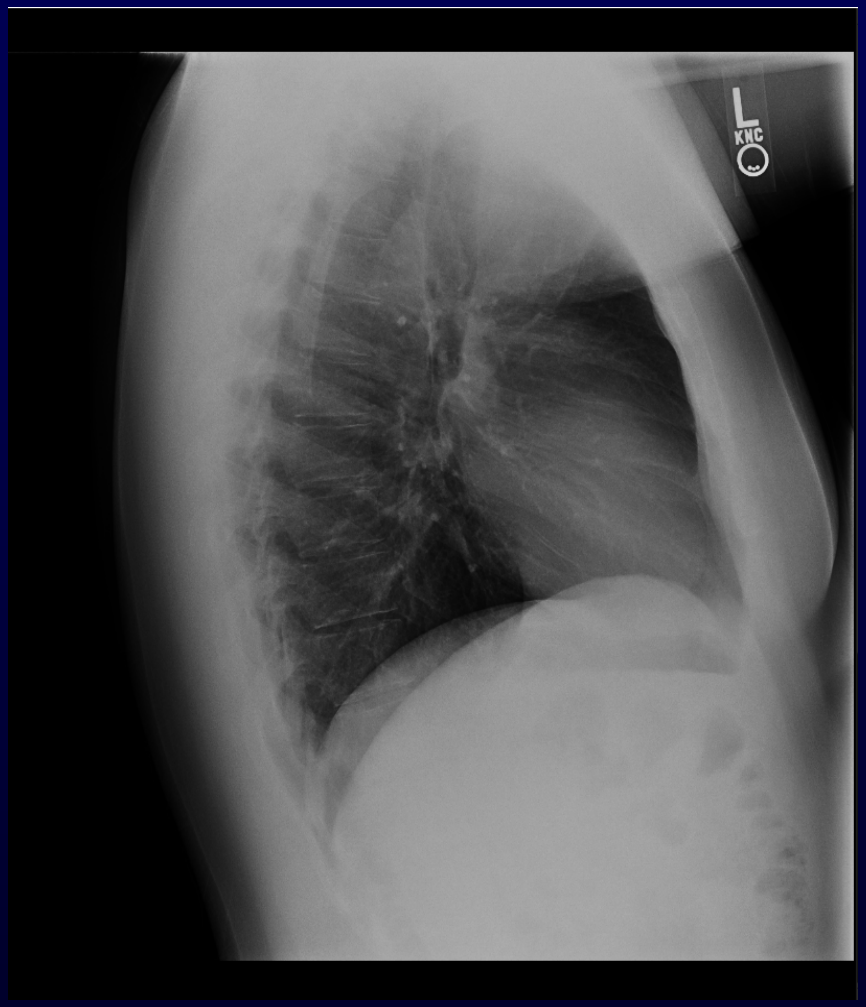

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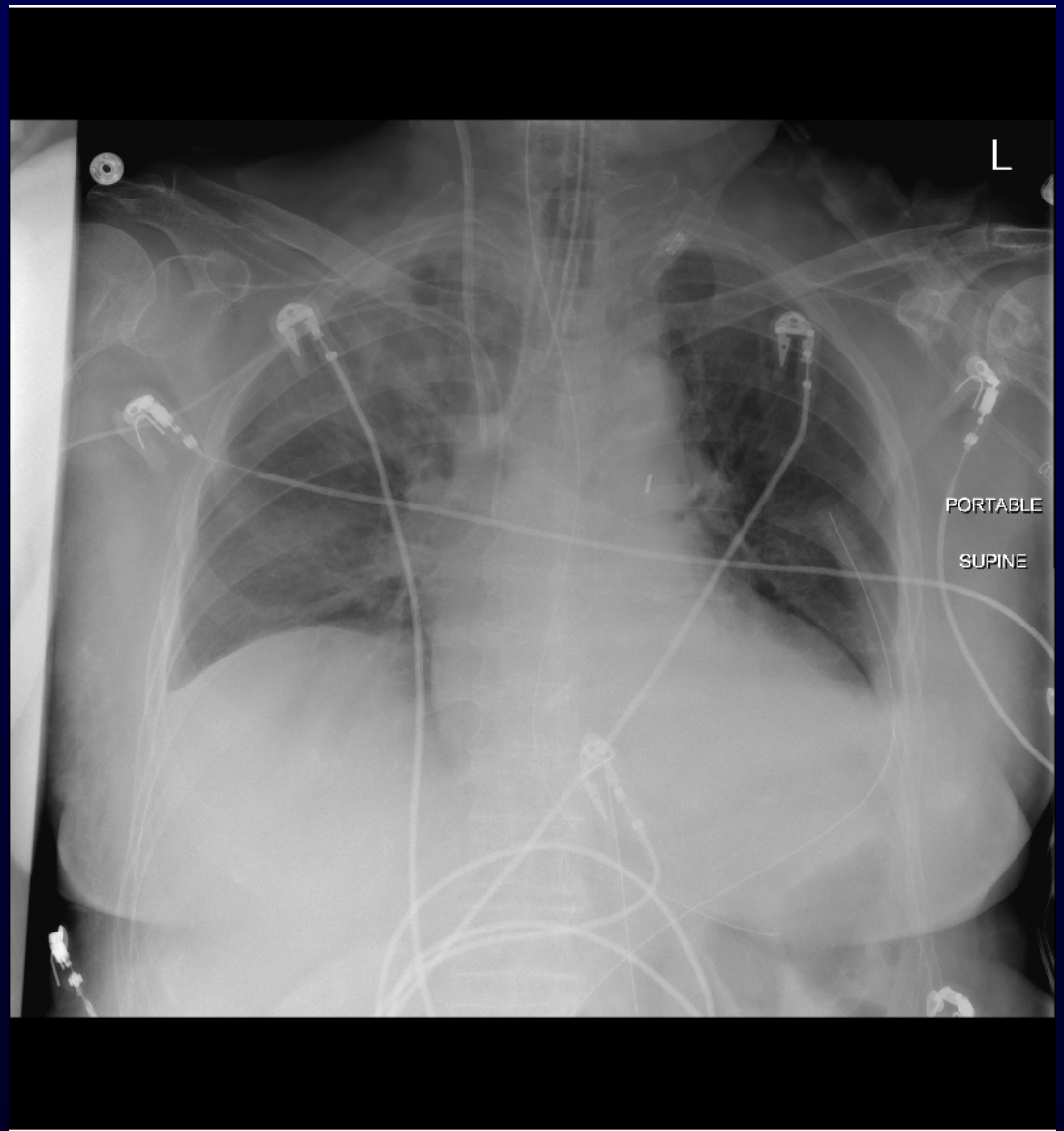

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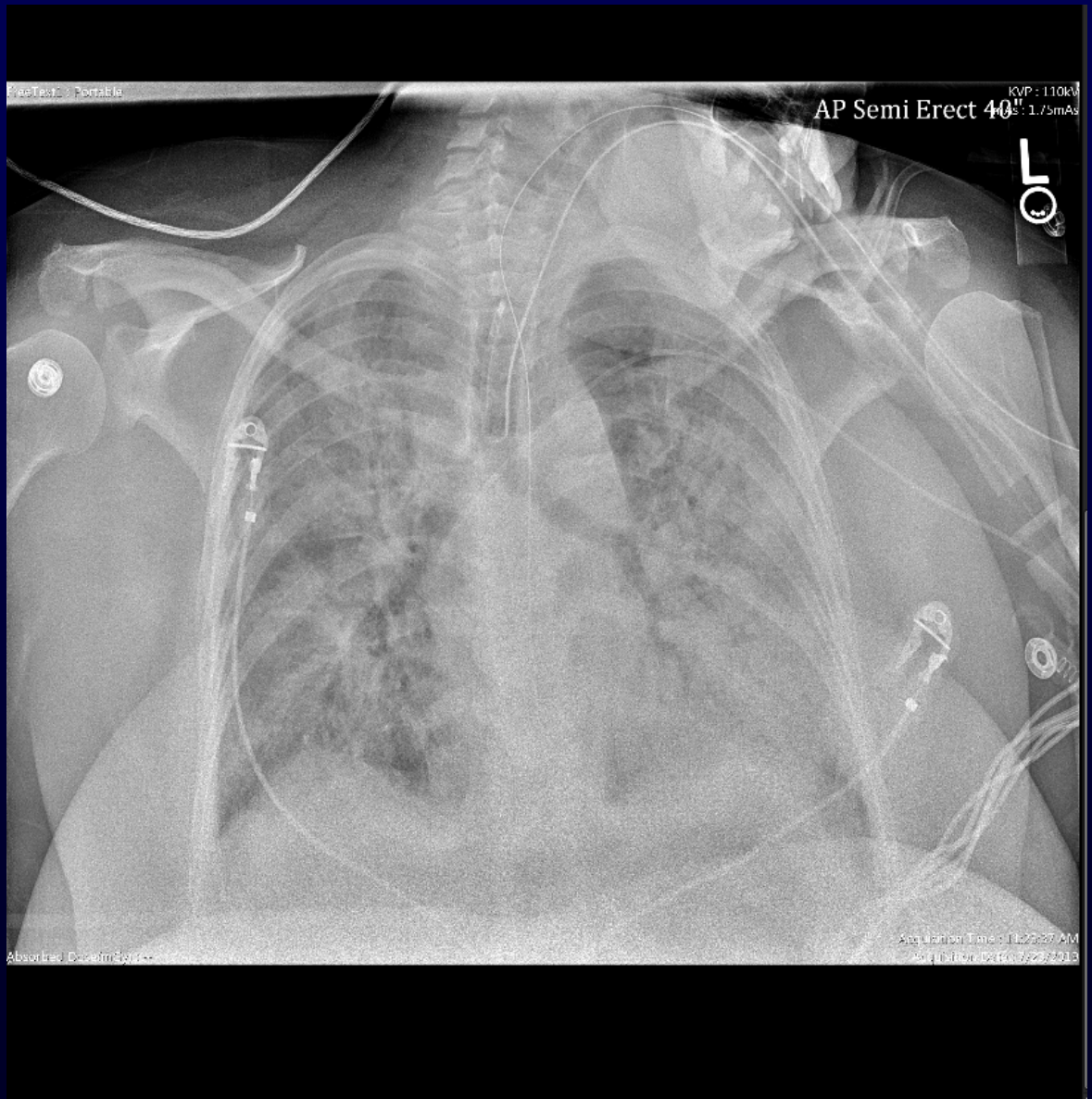

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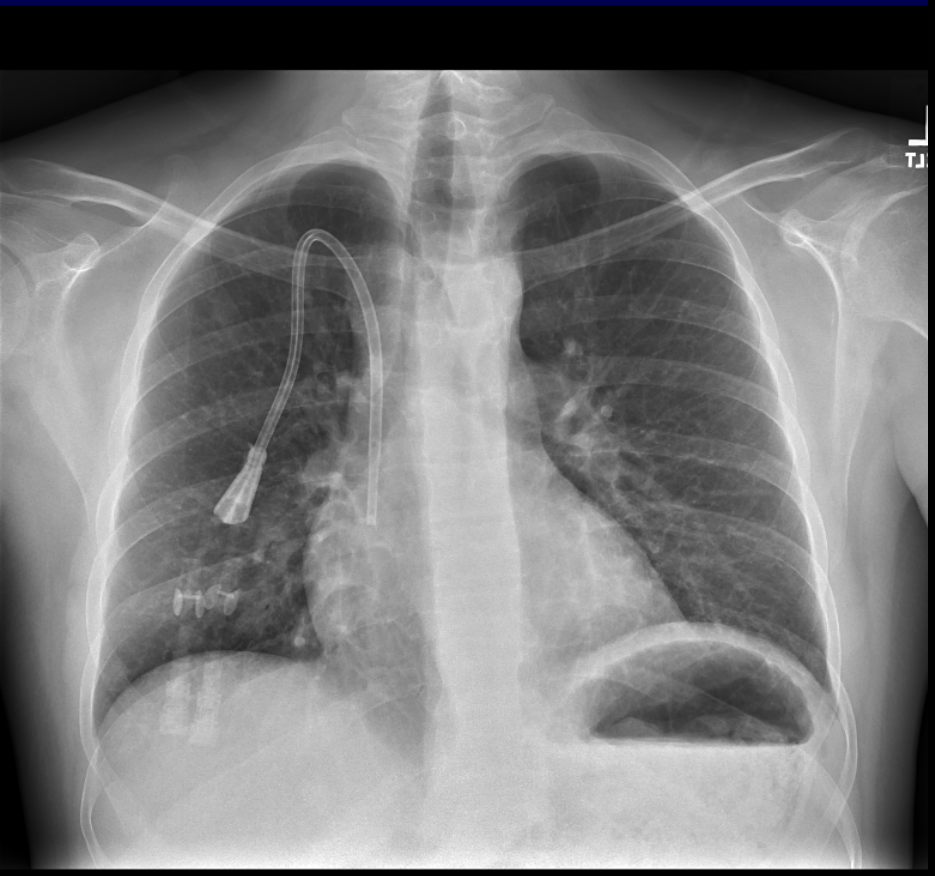

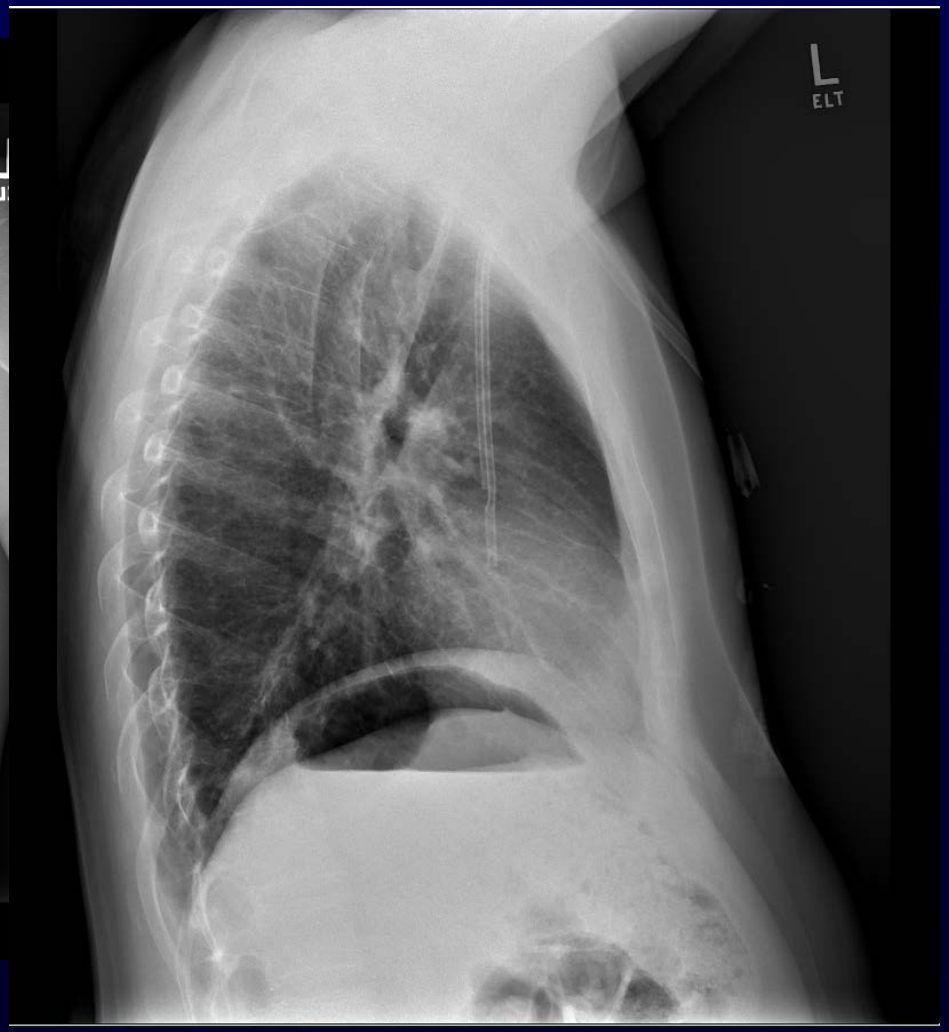

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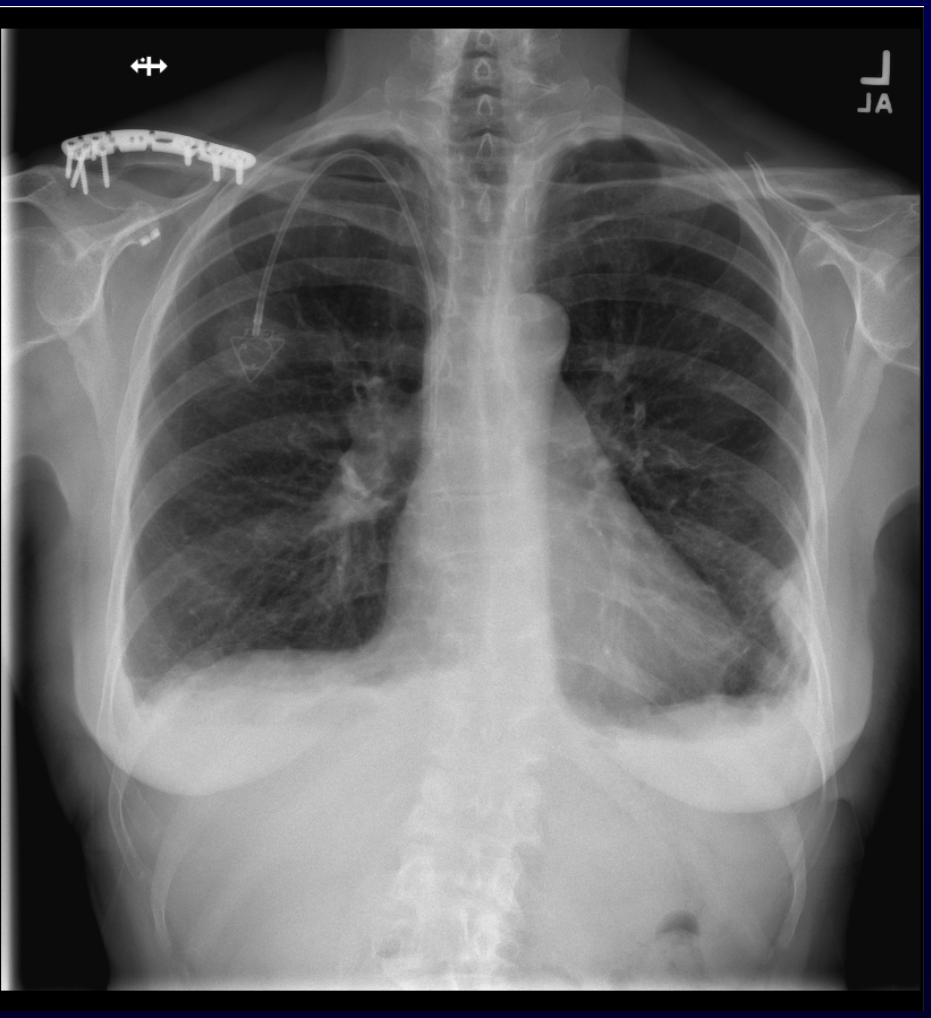

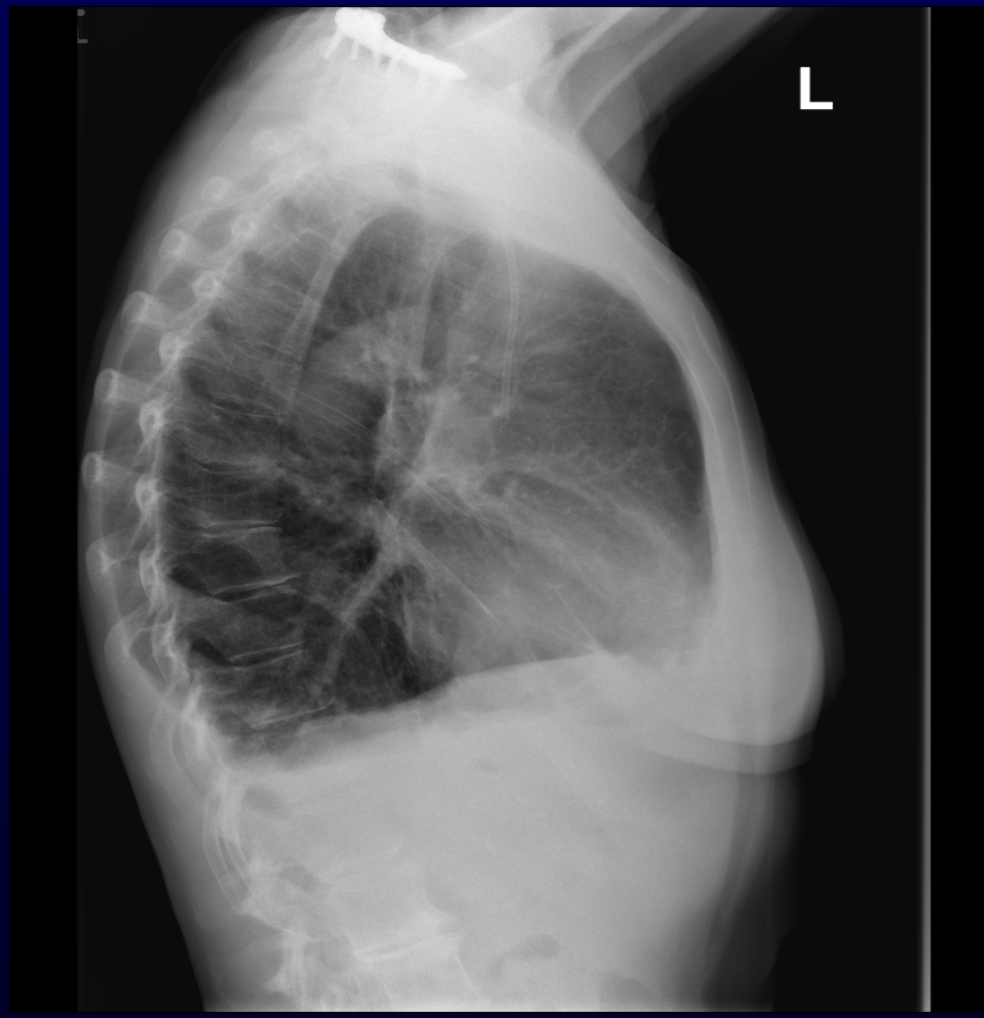

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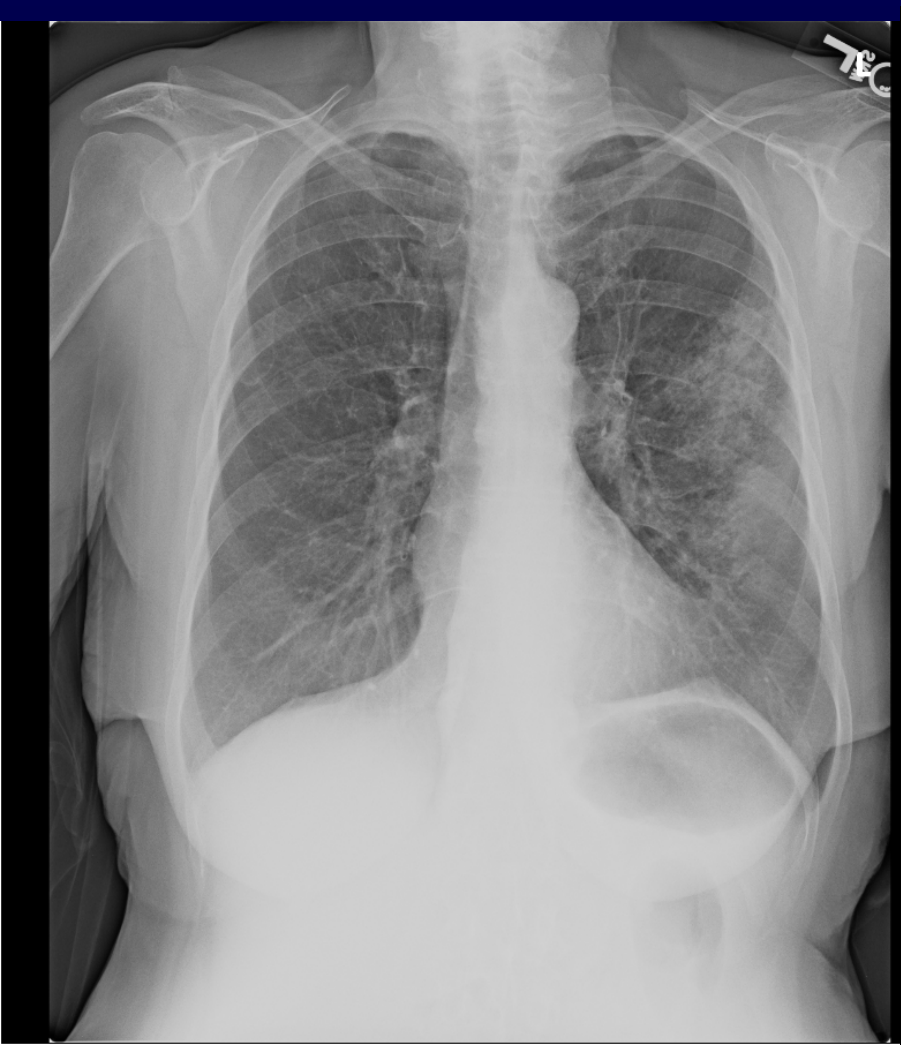

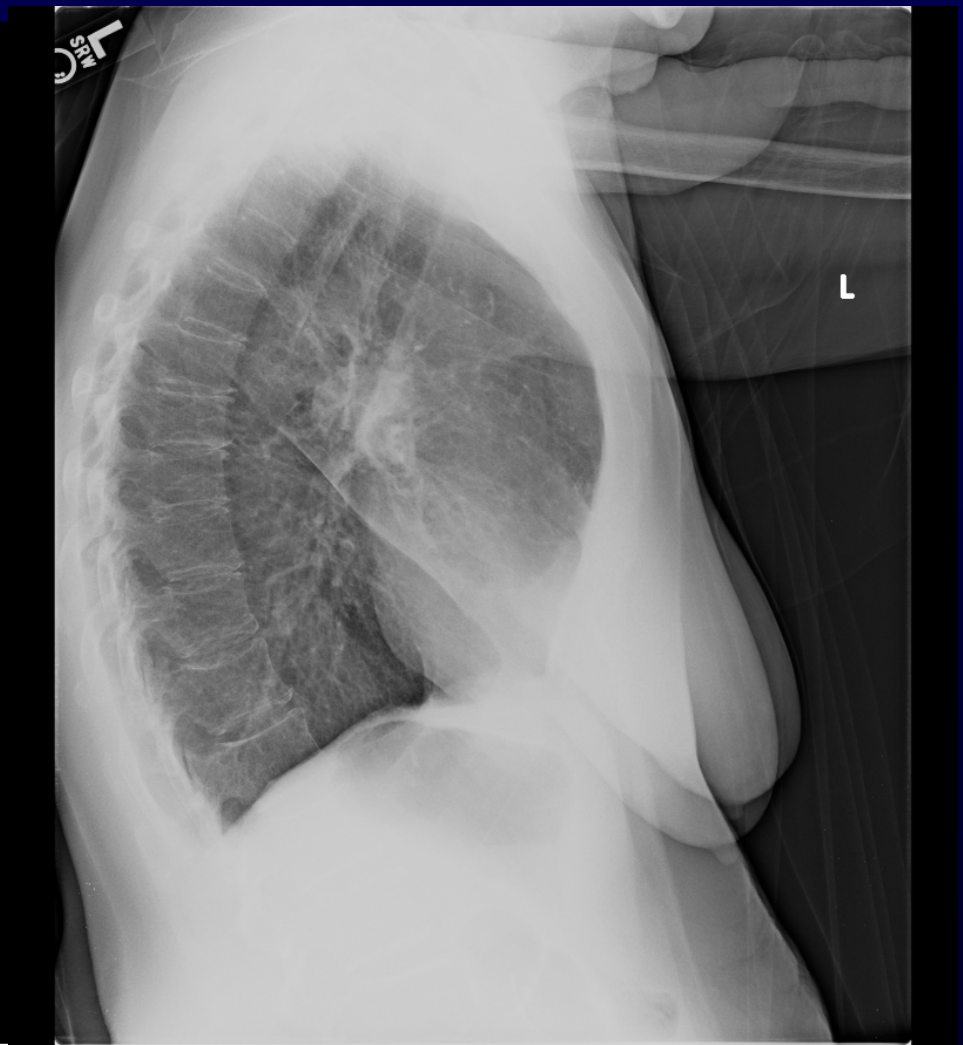

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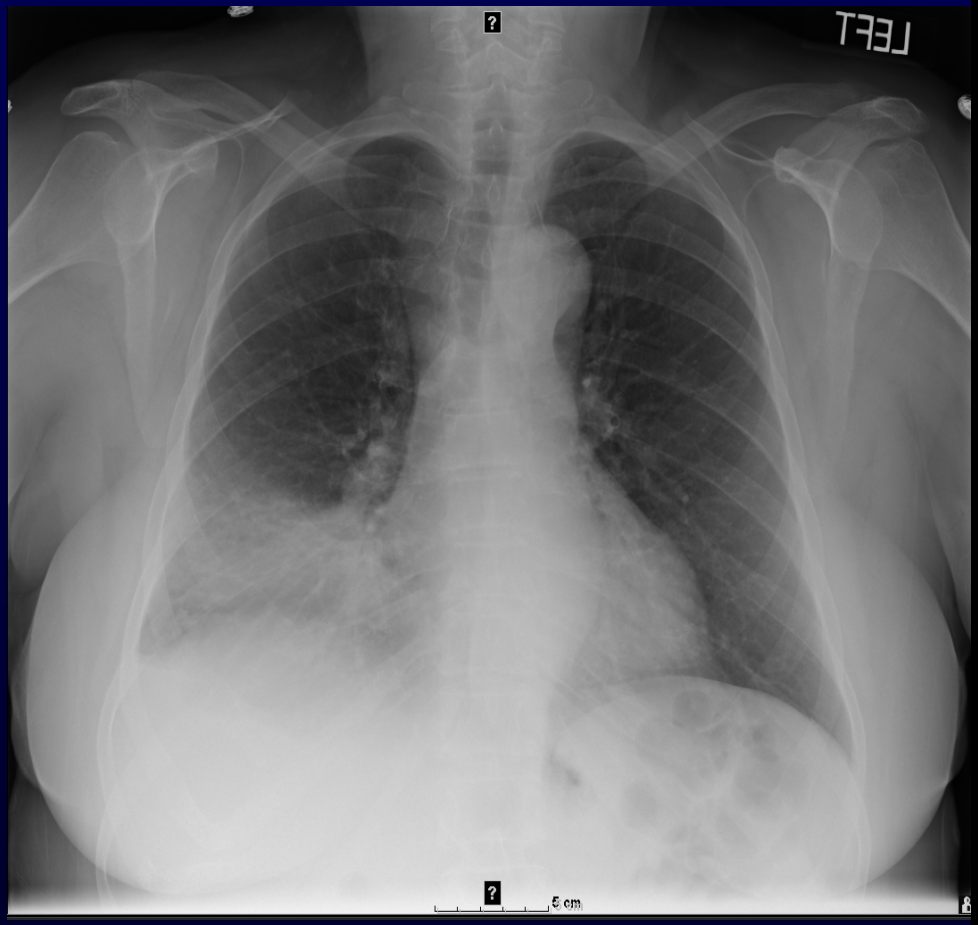

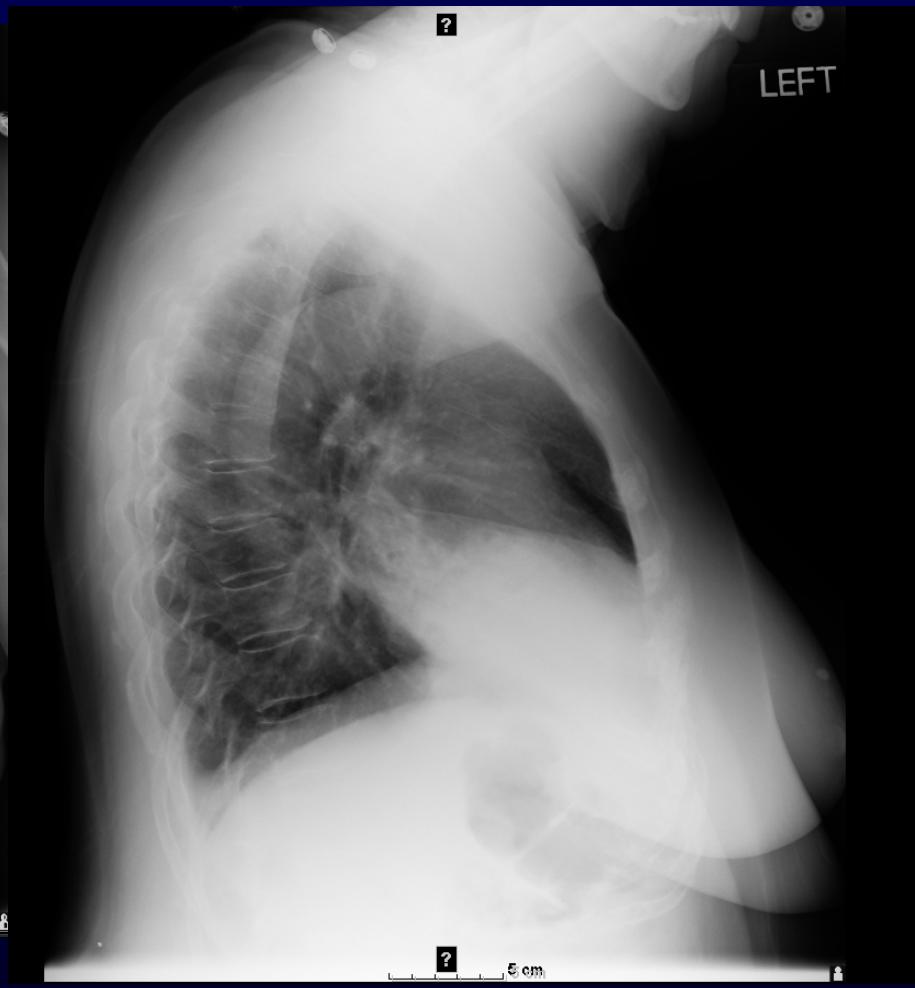

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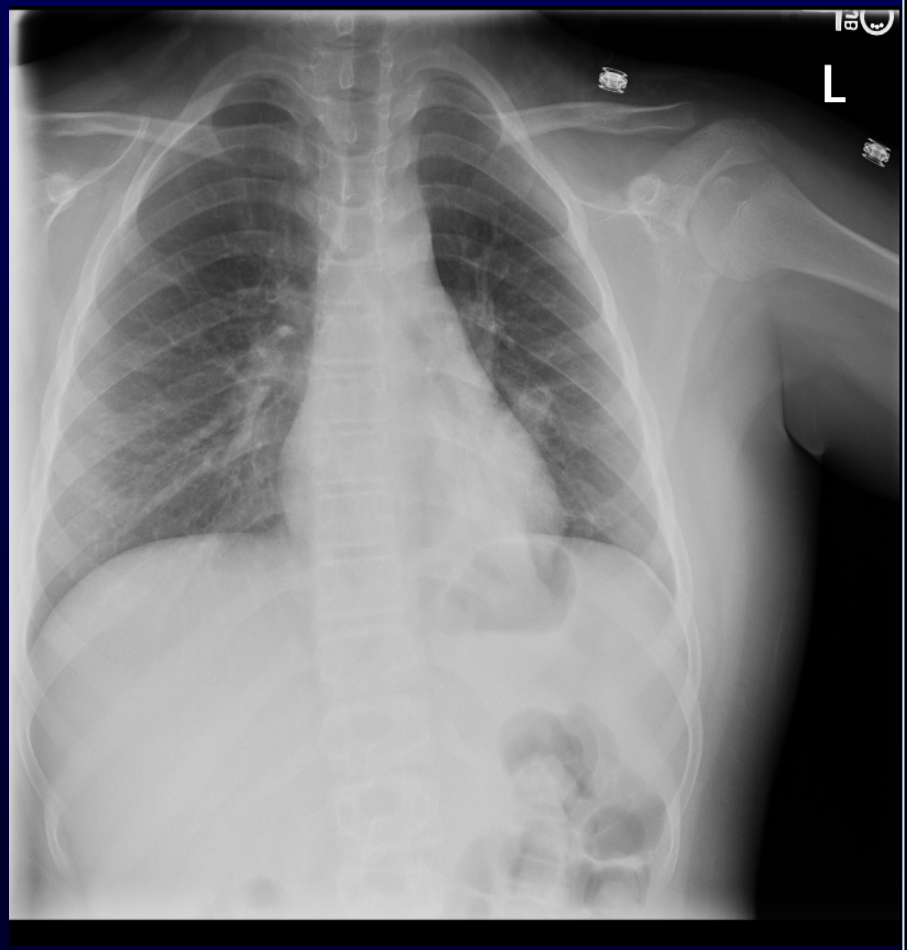

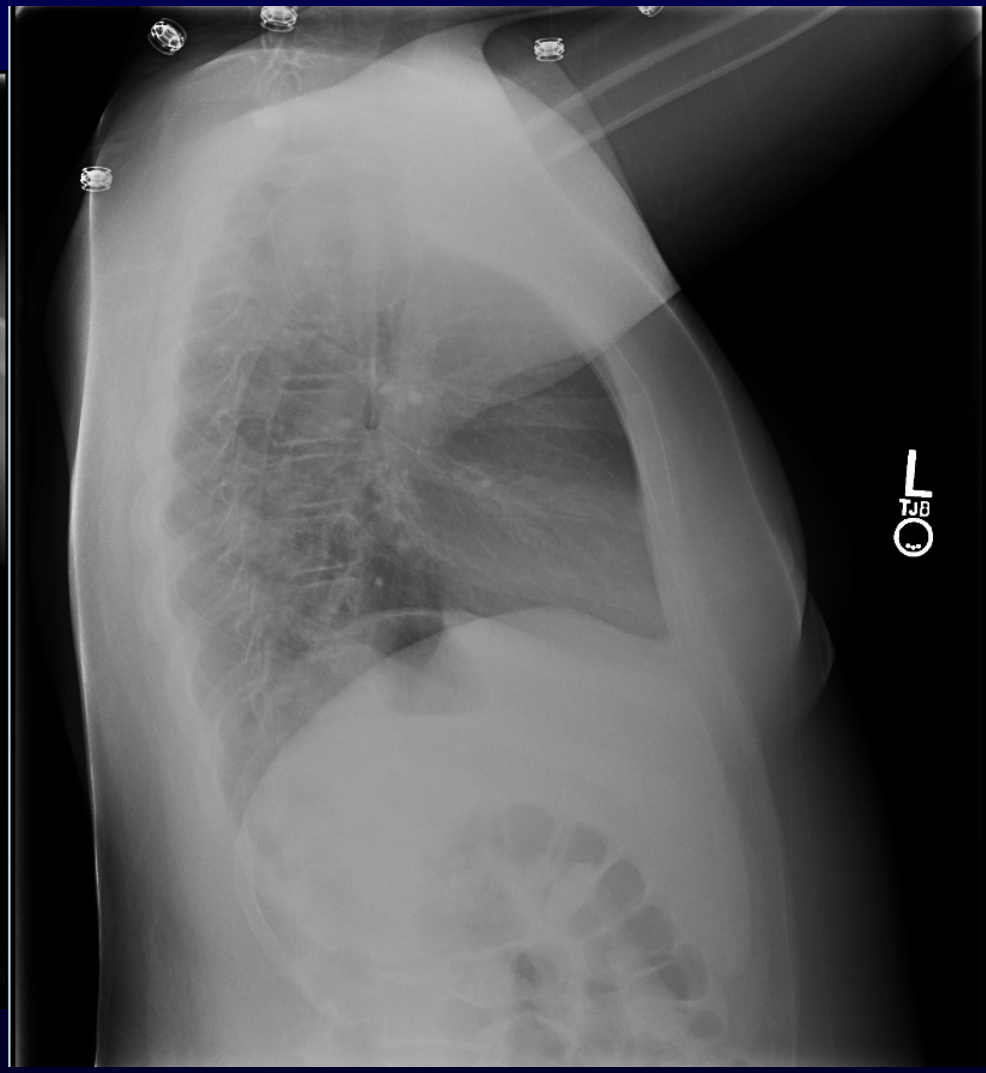

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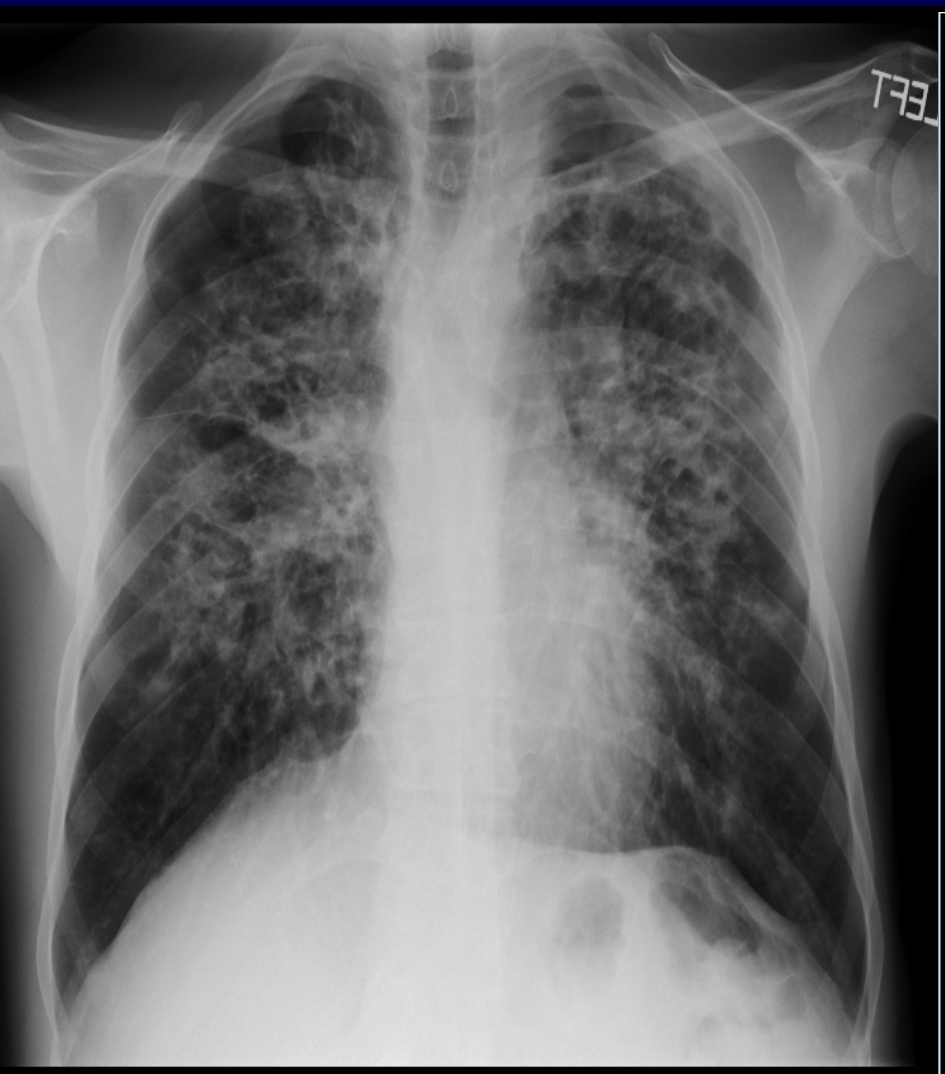

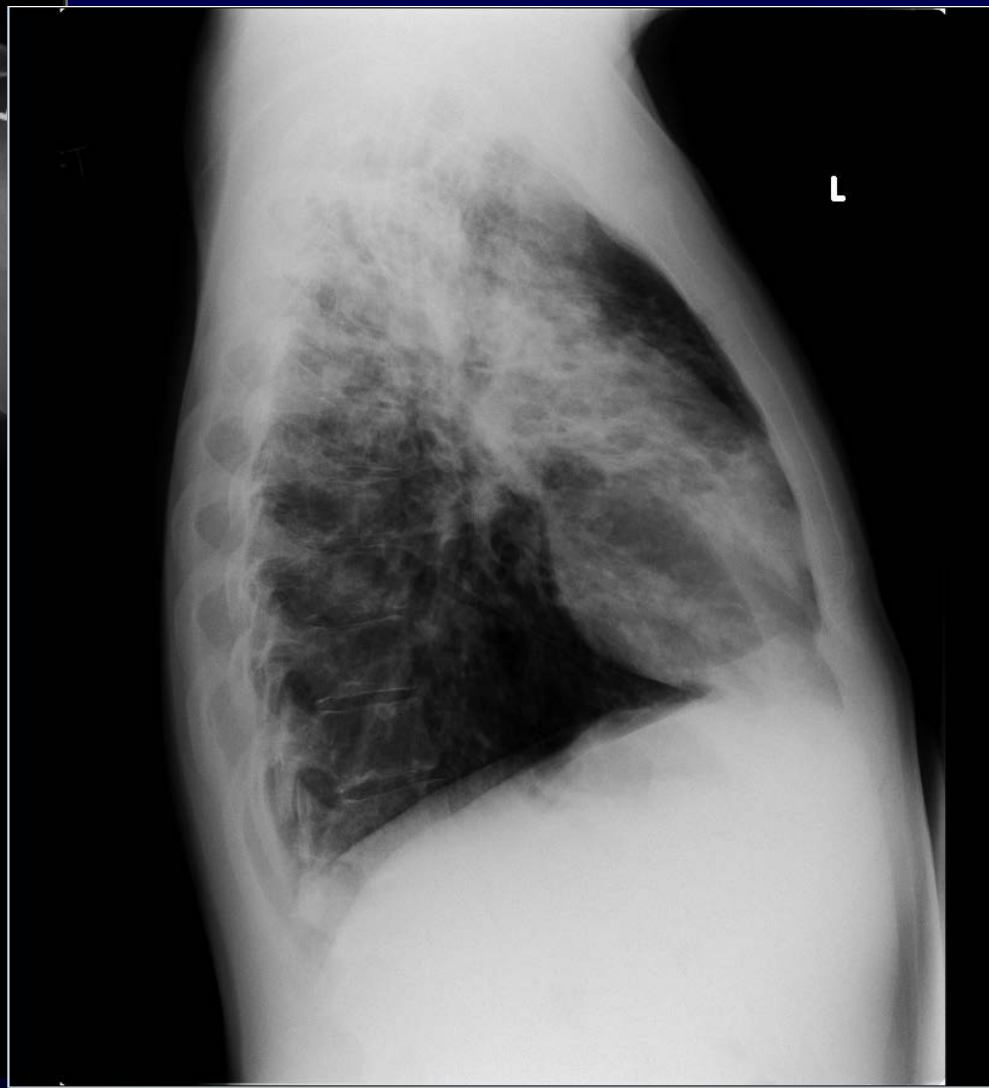

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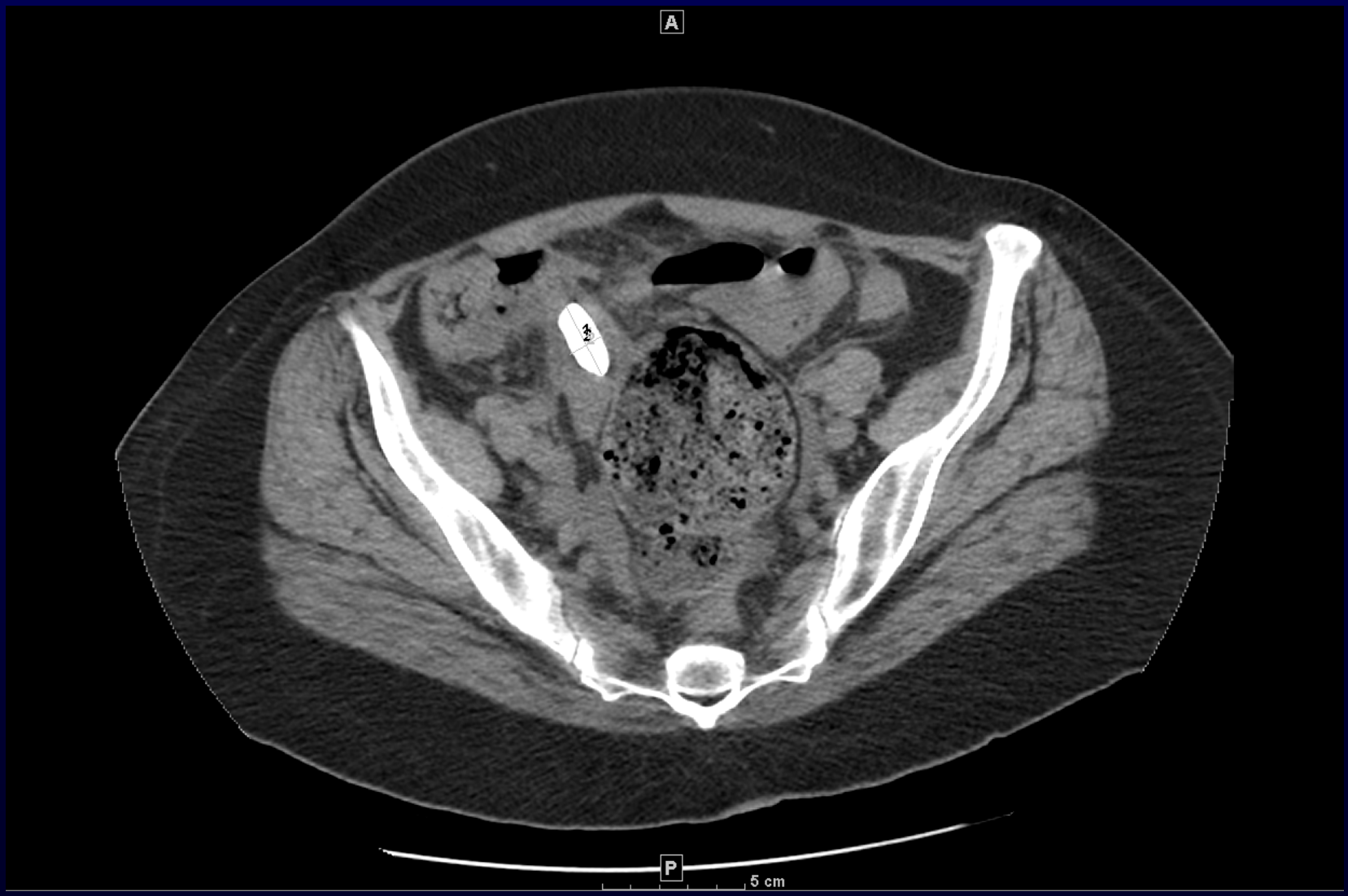

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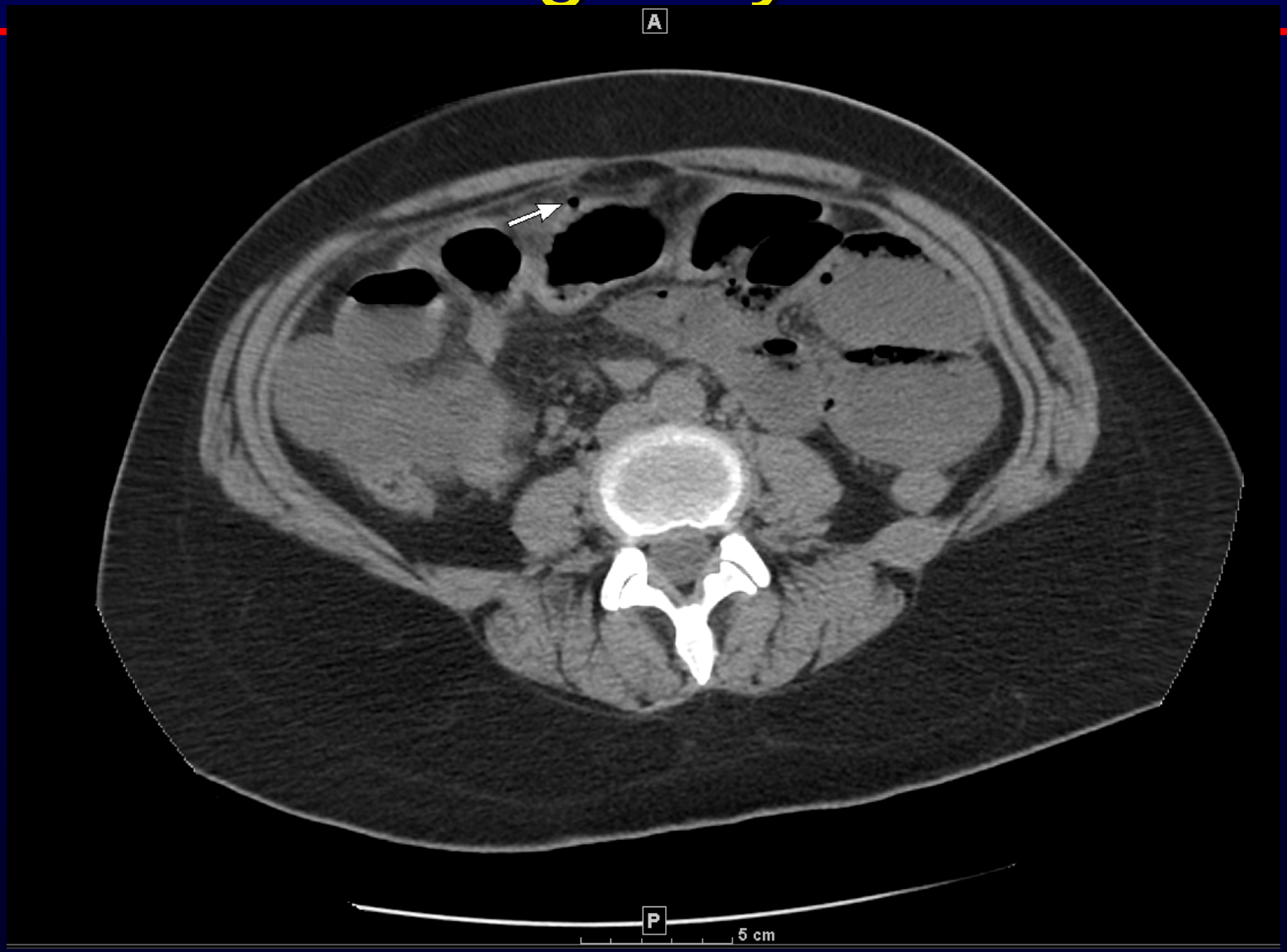

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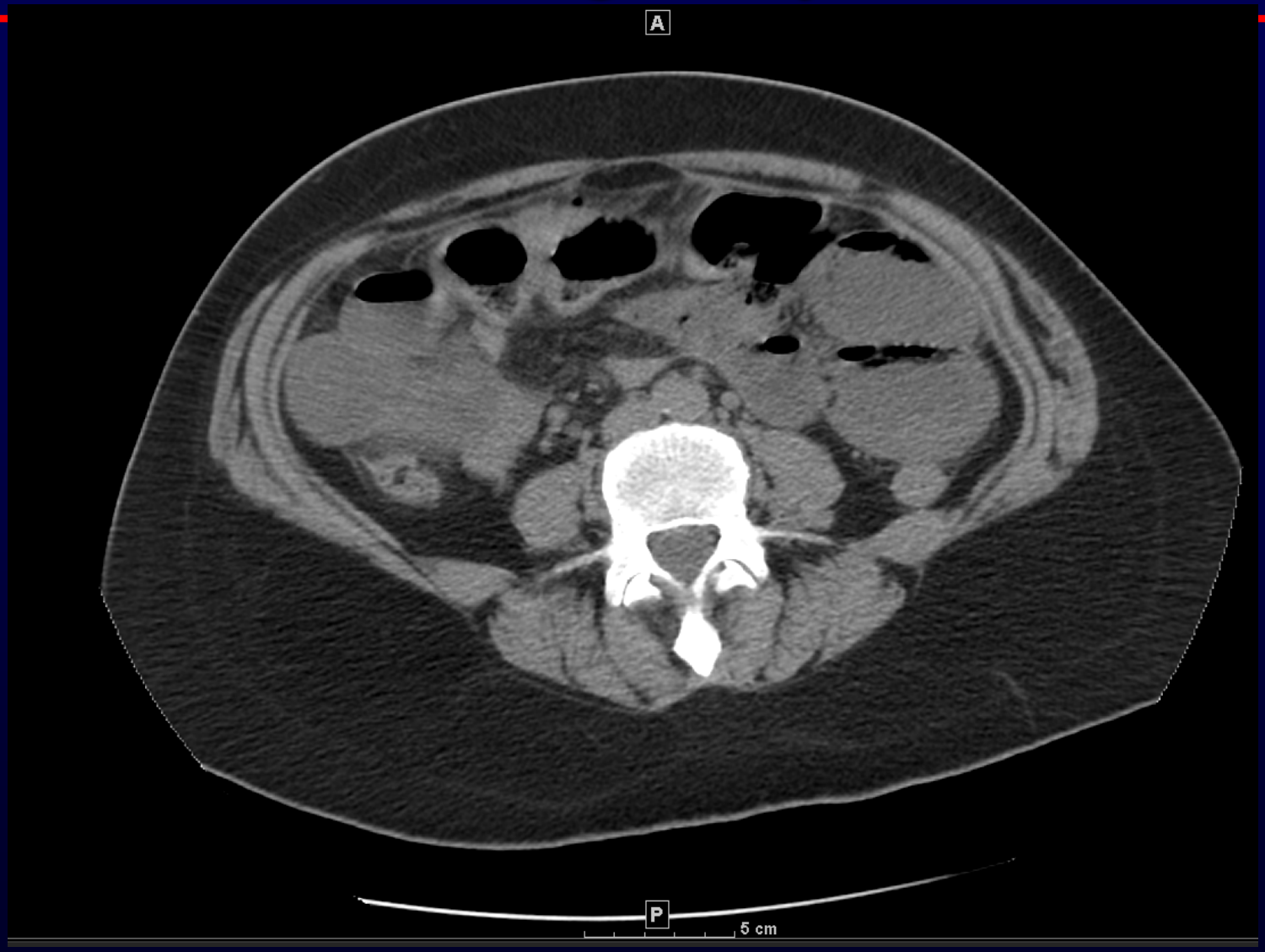

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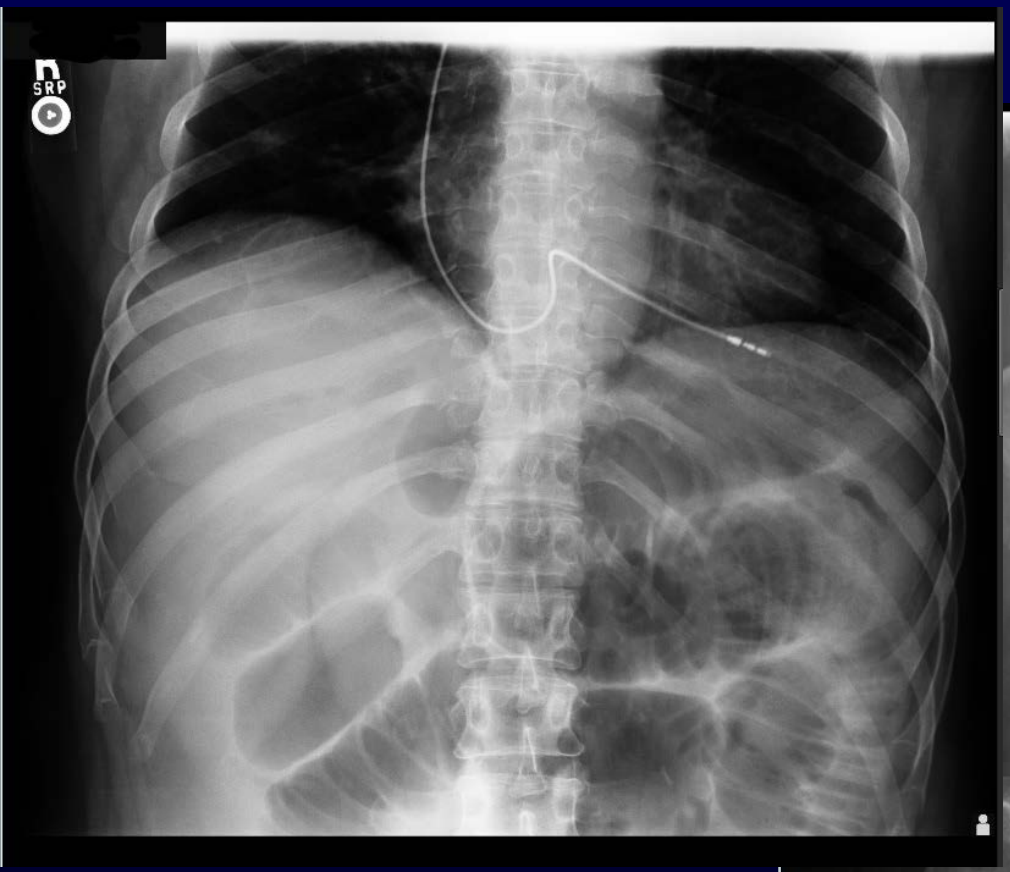

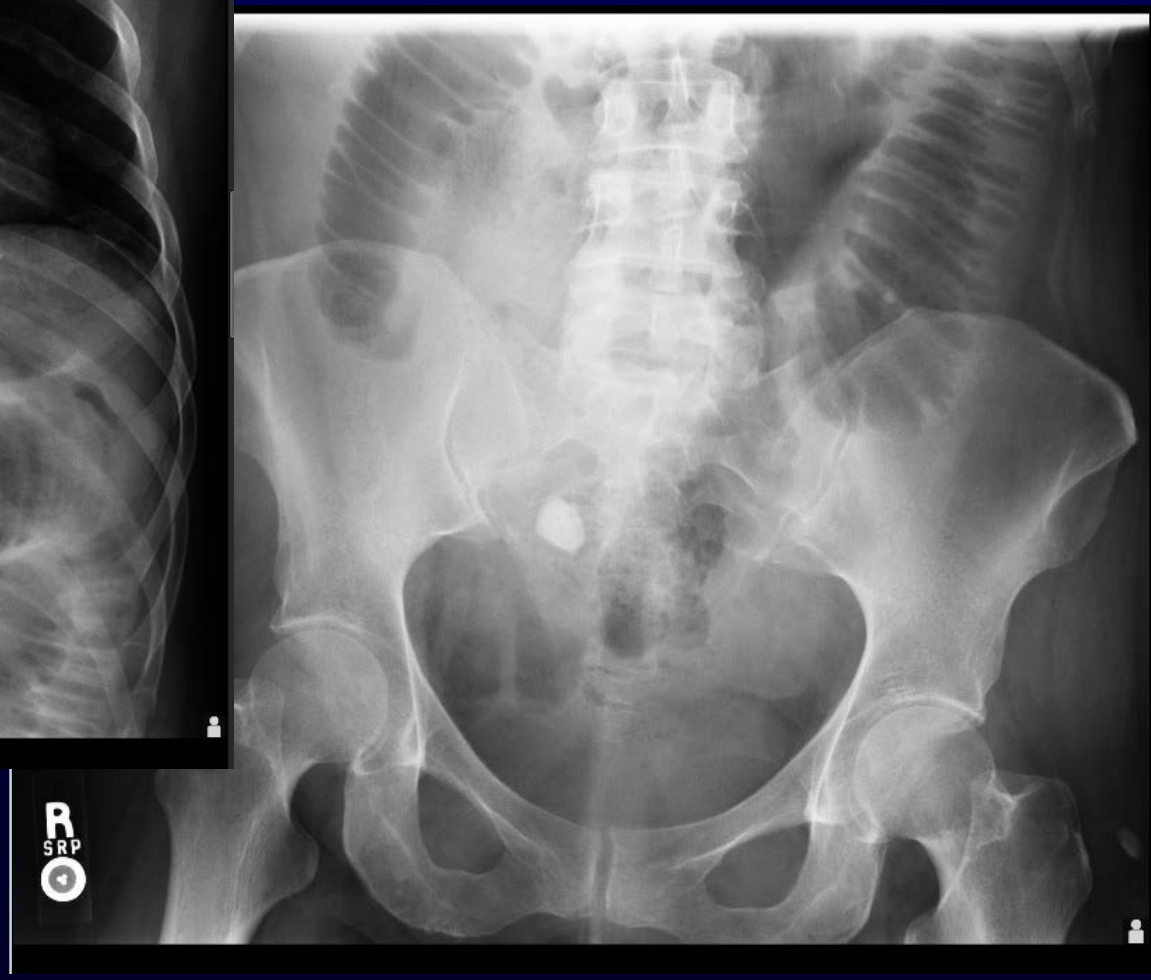

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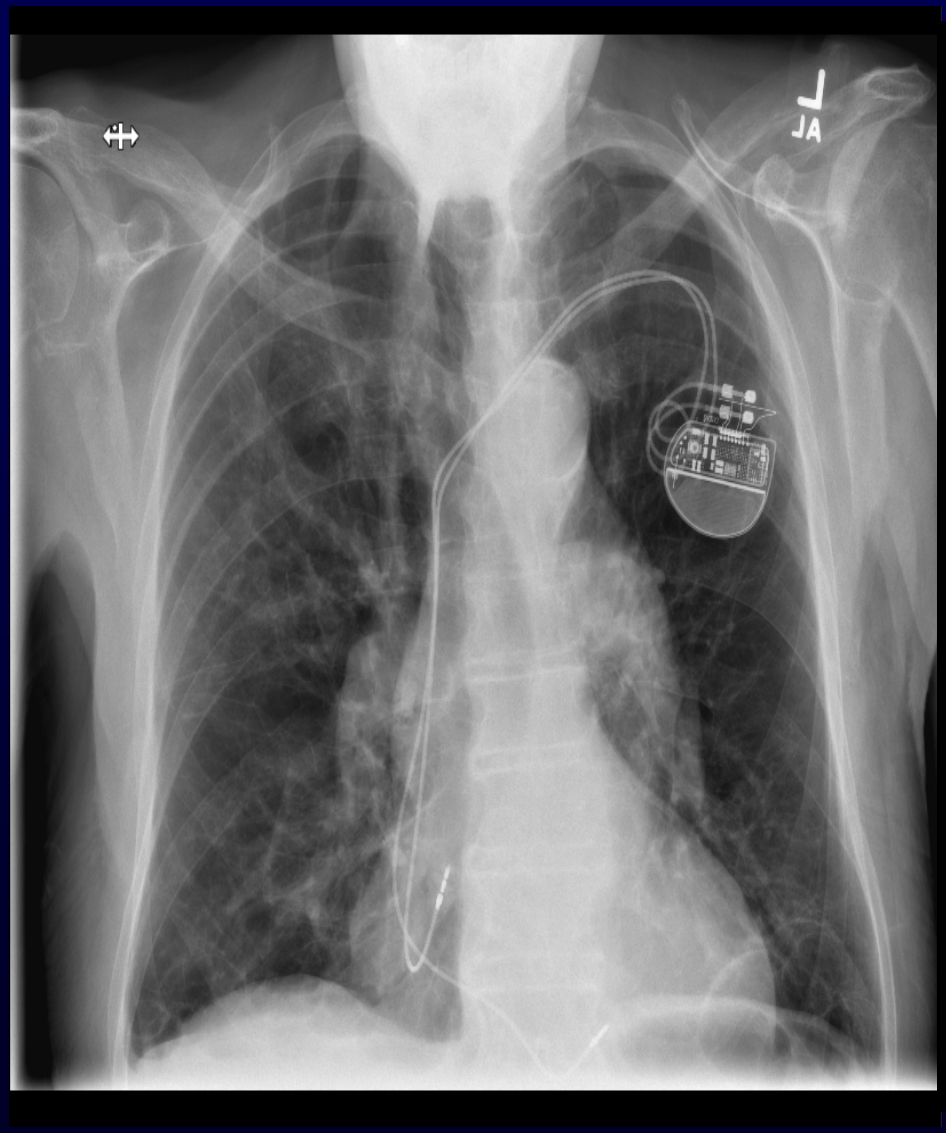

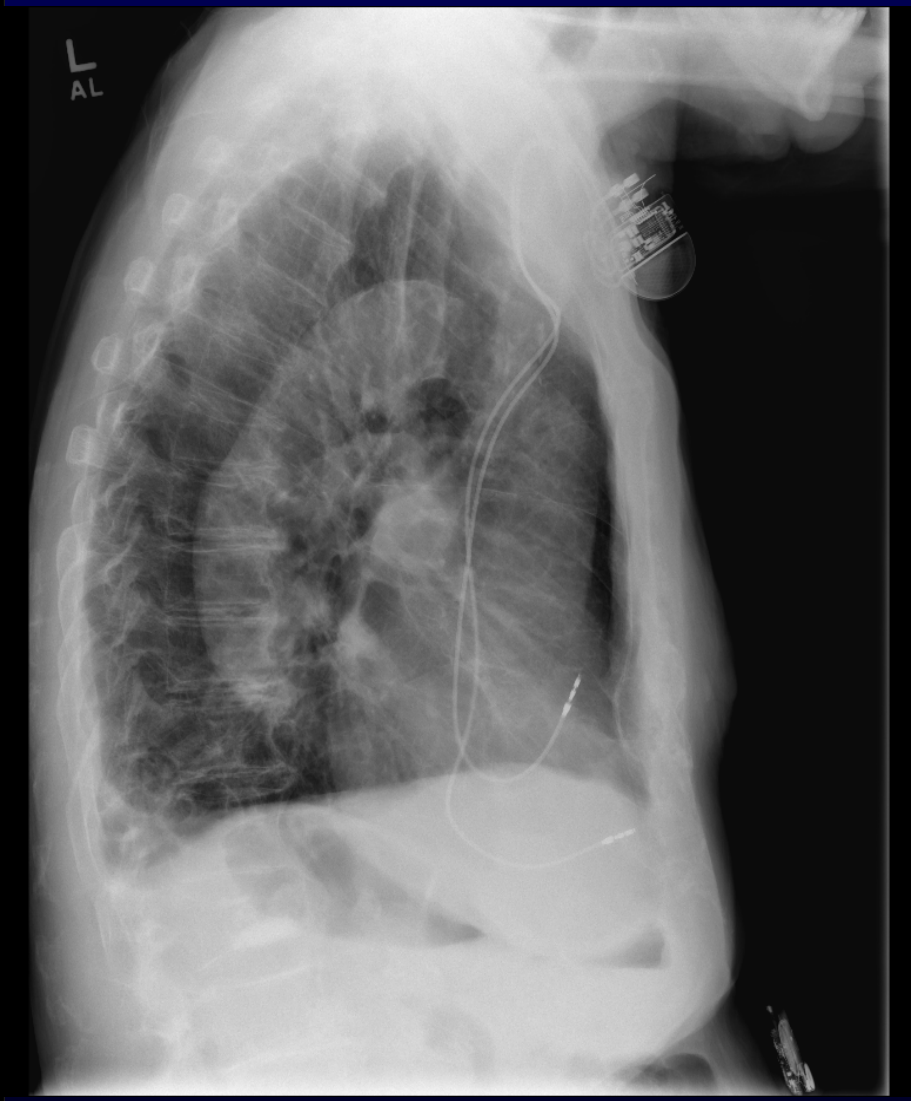

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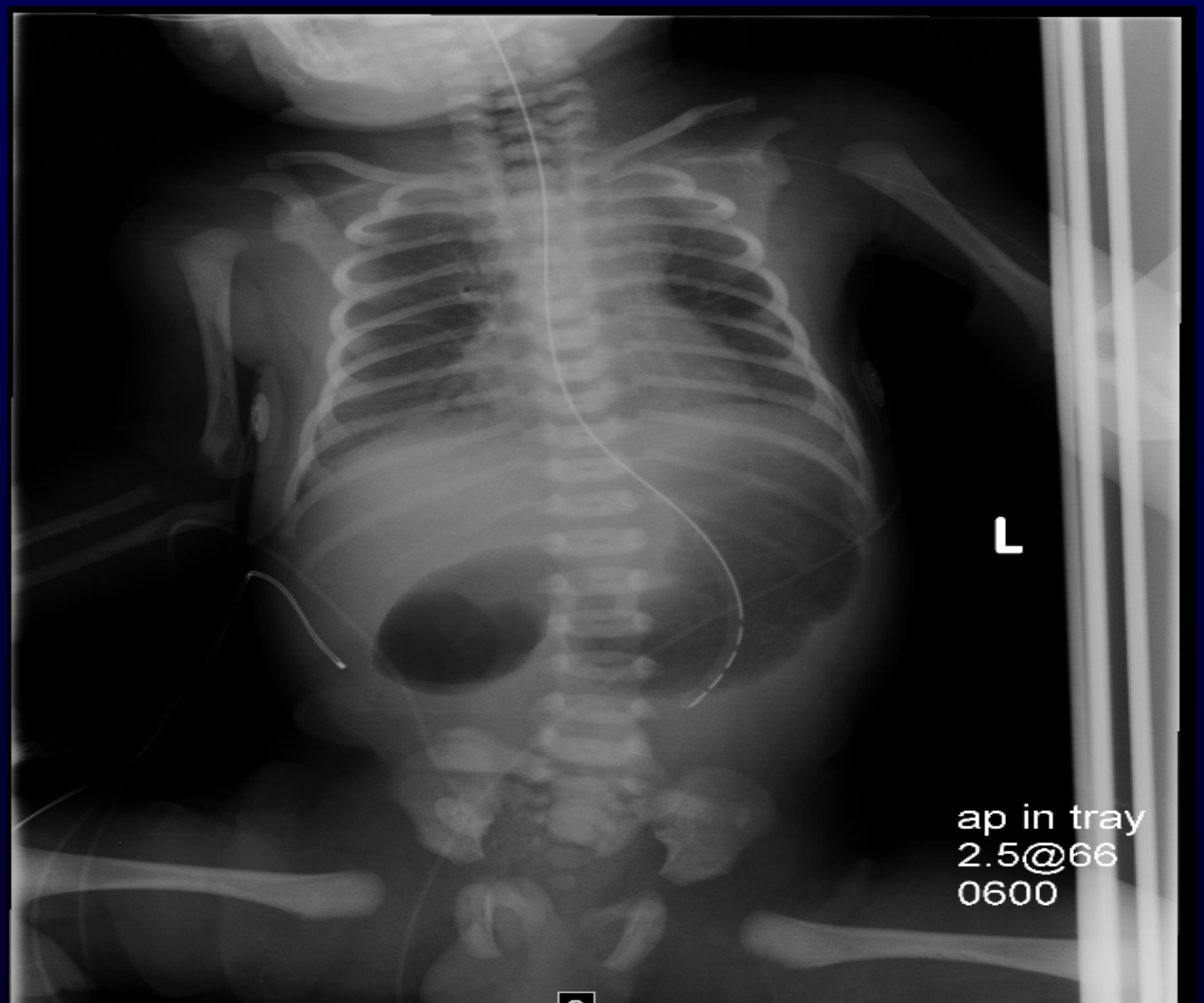

Posttest

- CT contrast
  A. All contains organically bound iodine
  B. Most contain variations of Na, Cl, and Ca in addition
  C. No longer contains iodine
  D. A and B
  E. B and C

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- Pediatric Imaging
  A. We should always limit the number of views to be taken
  B. Combine exams when possible (example: Ankle and Tibia/Fibula can be combined into one exam)
  C. Do exactly what the ordering physician orders
  D. Discuss with the ordering MD and radiologist when needed, to obtain the right images and the least amount of radiation

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Posttest

- CT positioning:
  A. Is not as important as for radiography because we can post-process/reformat to “look” like true axials
  B. Is as important as with radiography
  C. Should be attempted whenever possible, given patient condition constraints

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Posttest

- The best imaging for osteomyelitis
  A. MRI with and without contrast
  B. CT with and without contrast
  C. Conventional radiography
  D. Ultrasound

Posttest

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  A. MRI with and without contrast
  B. CT with and without contrast
  C. Conventional radiography
  D. Ultrasound

Posttest

- Contrast Allergies
  A. Should pre-medicate at 13, 7, and 1 hour before scan
  B. Premedication is no longer needed for most allergies
  C. Is administered 1 hour prior to scan
  D. Is given if certain radiologists are working that day

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Posttest

- Typical allergic reactions to contrast include:
  A. Hives and itching
  B. Shortness of breath and wheezing
  C. Feelings of warmth
  D. All of the above
  E. A and B

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  - A. Hives and itching
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  - C. Feelings of warmth
  - D. All of the above
  - E. A and B

Posttest

- Treatment of contrast reactions
  A. May include albuterol inhaler (MDI) if the patient is wheezing/short of breath
  B. May include diphenhydramine if hives/itching
  C. May include epinephrine if the patient has signs of anaphylaxis (e.g.—hypotension, hypoxia, confusion, stridor)
  D. All of the above
  E. None of the above

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  - A. May include albuterol inhaler (MDI) if the patient is wheezing/short of breath
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  - D. All of the above
  - E. None of the above

Posttest

- How is epinephrine given?
  A. IM
  B. IV
  C. ETT
  D. SQ
  E. A and B
  F. All of the above

Posttest

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  A. IM
  B. IV
  C. ETT
  D. SQ
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Posttest

- Which side should be down on a lateral decubitus abdomen?
  A. Left
  B. Right
  C. Supine
  D. Prone

Posttest

- Which side should be down on a lateral decubitus abdomen?
  A. Left
  B. Right
  C. Supine
  D. Prone

Posttest

- Which side should be down on a lateral decubitus chest?
  A. Left
  B. Right
  C. Either
  D. It depends upon what you're looking for

Posttest

- Which side should be down on a lateral decubitus chest?
  A. Left
  B. Right
  C. Either
  D. It depends upon what you're looking for

Posttest

- How long do we wait prior to shooting a decubitus abdomen film, after the patient is on his/her side?
  A. 0-5 minutes
  B. No need to wait
  C. 30 minutes
  D. 5-10 minutes minimum

Posttest

- How long do we wait prior to shooting a decubitus abdomen film, after the patient is on his/her side?
  A. 0-5 minutes
  B. No need to wait
  C. 30 minutes
  D. 5-10 minutes minimum

Pretest

- What to order if concerned about possible Ptx seen on PCXR?
  A. PA and Lat Chest
  B. Chest Decubitus Views
  C. CT
  D. MRI

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Pretest

- What to order if worried about free air?
  A. Upright CXR
  B. Acute Abdominal Series to include upright CXR and flat/upright abdomen
  C. Abdomen US
  D. CT
  E. All of the above
  F. A, B, or D

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  C. Abdomen US
  D. CT
  E. All of the above
  F. A, B, or D

Pretest

- What to order RUQ pain 30 y.o. female?
  A. CT A/P
  B. RUQ US
  C. Pelvic US
  D. Abdomen MRI

Pretest

- What to order RUQ pain 30 y.o. female?
  A. CT A/P
  B. RUQ US
  C. Pelvic US
  D. Abdomen MRI

Pretest

- What to order acute abdominal pain?
  A. CT Abd w/ contrast
  B. CT A/P w/ contrast
  C. Abdomen XR
  D. Abdomen MRI

Pretest

- What to order acute abdominal pain?
  A. CT Abd w/ contrast
  B. CT A/P w/ contrast
  C. Abdomen XR
  D. Abdomen MRI

Pretest

- The densities seen on XR, as classically taught, include?
  A. Fat
  B. Bones/Calcium
  C. Soft Tissue
  D. Air
  E. All of the Above
  F. B,C, and D

Pretest

- The densities seen on XR, as classically taught, include?
  A. Fat
  B. Bones/Calcium
  C. Soft Tissue
  D. Air
  E. All of the Above
  F. B,C, and D

Pretest

- US suggested possible renal mass. Correct order is?
  A. CT A/P with
  B. CT A/P w/ and w/o
  C. CT Abd with
  D. CT Abd without
  E. CT A/P without
  F. CT abdomen w/ and w/o

Pretest

- US suggested possible renal mass. Correct order is?
  A. CT A/P with
  B. CT A/P w/ and w/o
  C. CT Abd with
  D. CT Abd without
  E. CT A/P without
  F. CT abdomen w/ and w/o

Pretest

- Concern for Aortic Dissection. Correct order is?
  A. CT Chest w/ (could add A/P)
  B. CT Chest w/o (could add A/P)
  C. CT Chest w/ and w/o (could add A/P)

Pretest

- Concern for Aortic Dissection. Correct order is?
  A. CT Chest w/ (could add A/P)
  B. CT Chest w/o (could add A/P)
  C. CT Chest w/ and w/o (could add A/P)

Summary

- Call 322-1600 or go to ACR.org (appropriateness criteria)
- Recognize pneumothoraces and pneumoperitoneum
- Recognize malpositioned lines
- Call your radiologist


UNDER ARMOUR
Twins
CHARGERS