

XRAY SCENARIOS

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February 2012

Welcome to this series of chest radiograph scenarios.

Each of these scenarios is based upon a real patient, using their notes and their chest x-rays to test your knowledge. Each scenario focuses on the major, stand-out abnormality on the x-ray.

There is a range of difficulty within this set of scenarios. How difficult you find them may depend on your experience so far. If you are finding some of them difficult, keep going as there will certainly be others that will be much easier.

There are answers for each x-ray so even if you didn't find the abnormality yourself, it will be marked out on the answers slide and will help you spot it in the future.

BIG HINT: the key to spotting some of these abnormalities is to
SYSTEMATICALLY ASSESS the x-rays.

Not every abnormality is within the lung fields.

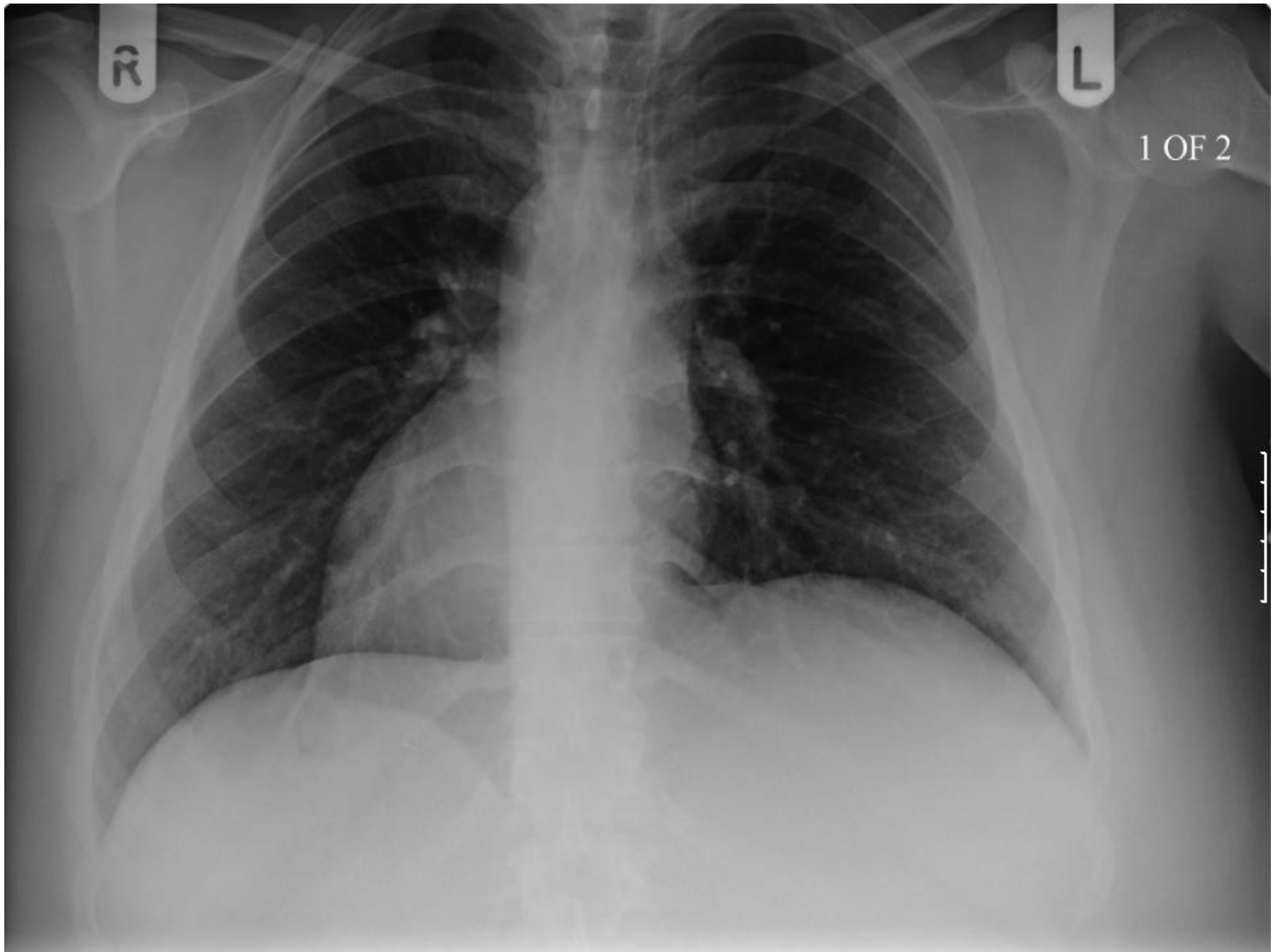
(There is a guide to assessing chest x-rays on the website that may be useful)

PATIENT 1

- 45 year old male
- Right sided chest pain

Chest x-ray done as part of the work up...

WHAT IS THE MAJOR ANOMALY ON THIS CHEST X-RAY



What does the x-ray show?

- Pneumonia
- Dextracardia
- Pneumothorax
- Right sided mass

What does the x-ray show?

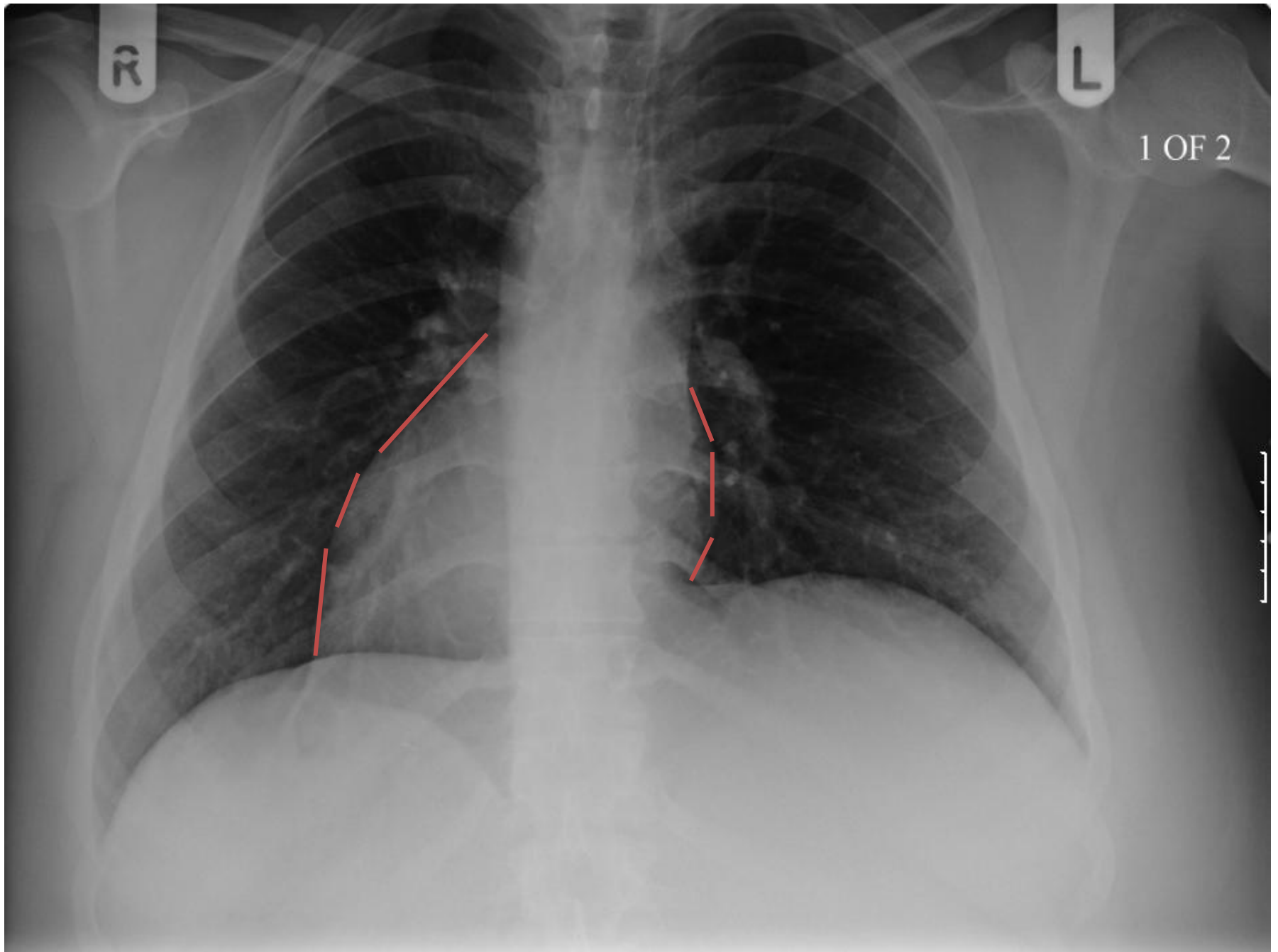
X Pneumonia

✓ Dextrocardia

X Pneumothorax

X Right sided mass

WHAT IS THE MAJOR ANOMALY ON THIS CHEST X-RAY



PATIENT 2

- 32 year old male
- Well
- New entrant to UK
- Mantoux screening test on entrance: 12mm

What is the cut-off for a positive Mantoux test?

- Induration 6mm or greater
- Induration 15mm or greater
- Induration <6mm
- No reaction

What is the cut-off for a positive Mantoux test?

- ✓ Induration 6mm or greater
- X Induration 15mm or greater
- X Induration <6mm
- X No reaction

What does the patient's result of 12mm indicate?

- Suggests tuberculosis infection or disease
- No significant hypersensitivity to tuberculin
- Possible previous exposure to TB or BCG

What does the patient's result indicate?

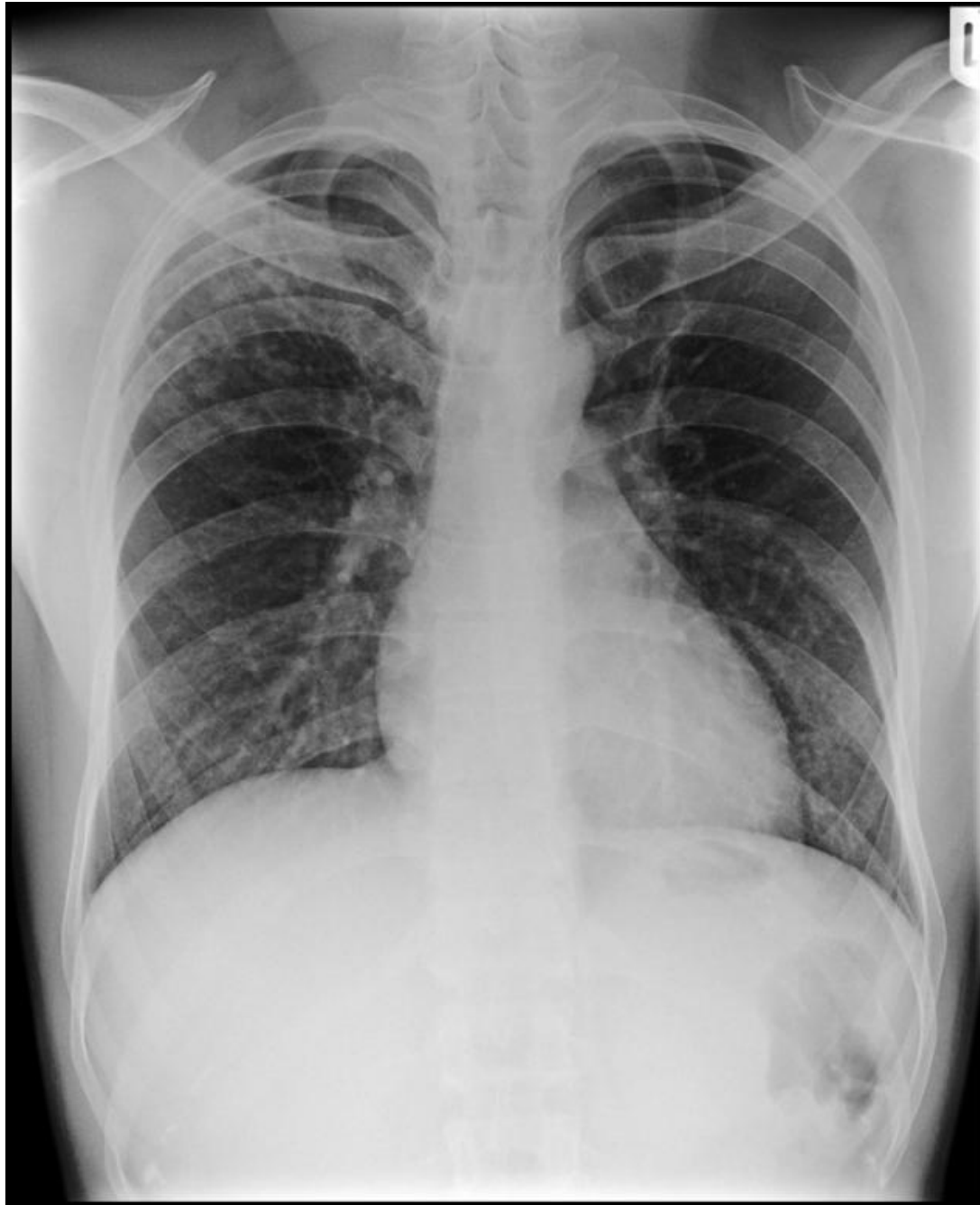
- X Suggests tuberculosis infection or disease
- X No significant hypersensitivity to tuberculin
- ✓ Possible previous exposure to TB or BCG

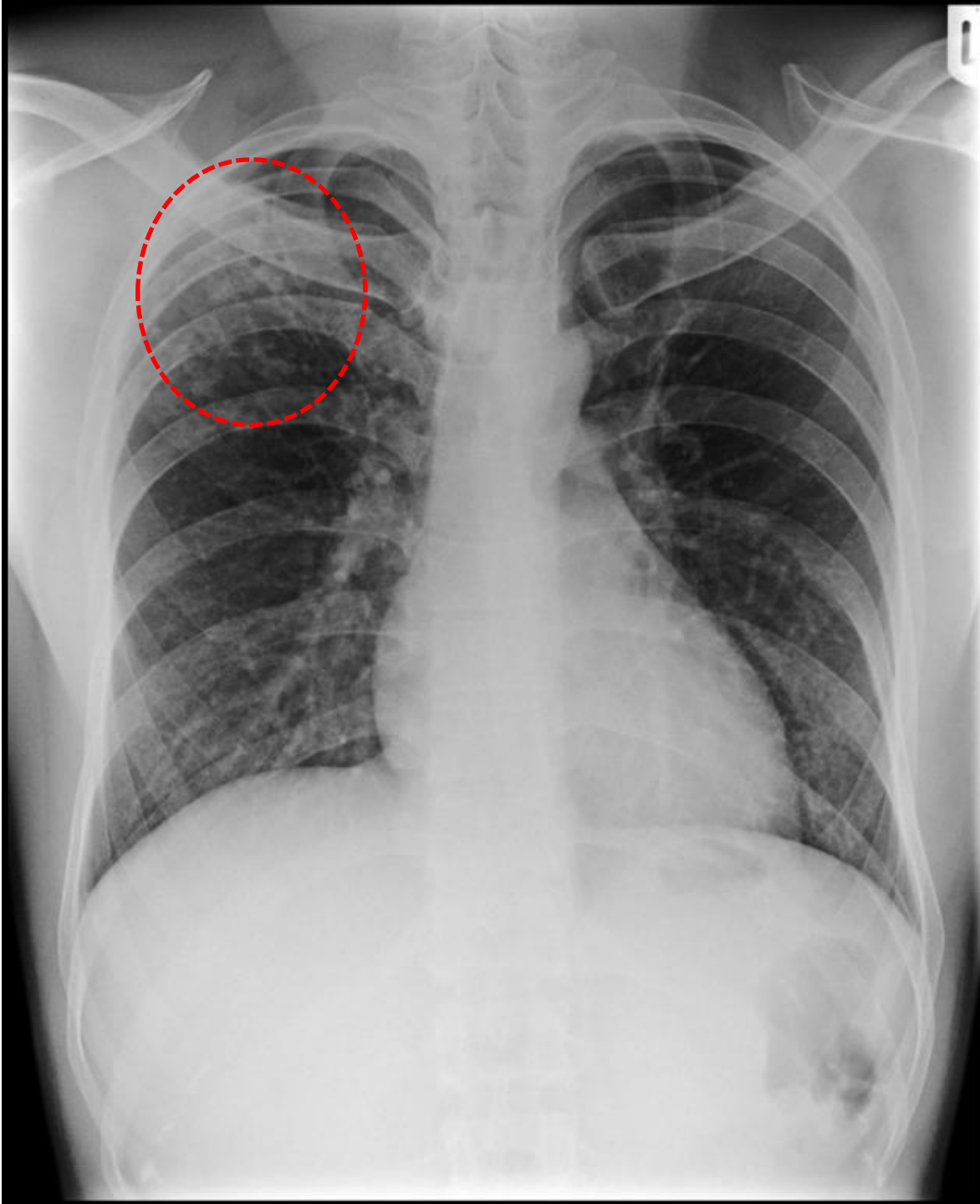
Diameter of induration	Positivity	Interpretation
Less than 6mm	Negative – no significant hypersensitivity to tuberculin protein	Previously unvaccinated individuals may be given BCG provided there are no contraindications
6mm or greater, but less than 15mm	Positive – hypersensitive to tuberculin protein	Should not be given BCG.* May be due to previous TB infection or BCG or exposure to non-tuberculous mycobacteria
15mm and above	Strongly positive – strongly hypersensitive to tuberculin protein	Suggests tuberculosis infection or disease. Should be referred for further investigation and supervision (which may include preventive chemotherapy)

* When Mantoux tests are being performed as part of an immunisation programme, no further action is required for people with a reaction in this range. In other contexts (e.g. new immigrant screening, contact-tracing programmes), where the subject has not previously been vaccinated with BCG, and taking account of the precise size of the reaction and the circumstances of the case, referral to a chest clinic may be indicated for further investigation.

The patient was referred for a CXR as part of the new immigrant screening program.

Normal or abnormal?





REPORT:

- Infiltration seen in the right upper lobe
- Underlying tuberculosis is possible
- Advice: chest clinic referral

1 year later...

Patient presented with:

- Cough
- Fever (temperature 38°C)
- SOB
- Weight loss

On examination:

- Cervical lymphadenopathy

Bloods:

- WCC – 9.3
- CRP – 64.9
- Sodium – 126

CHEST X-RAY REPEATED



What does the x-ray show?

- Pulmonary oedema
- Primary lung cancer
- Metastatic lung cancer
- TB
- Fibrosis
- Pneumonia

What is the appropriate treatment?

- Chemotherapy
- Radiotherapy
- Piperacillin and gentamicin
- Isoniazid, rifampicin, pyrazinamine and ethambutol
- Furosemide

What does the x-ray show?

- X Pulmonary oedema
- X Primary lung cancer
- X Metastatic lung cancer
- ✓ TB
- X Fibrosis
- X Pneumonia

What is the appropriate treatment?

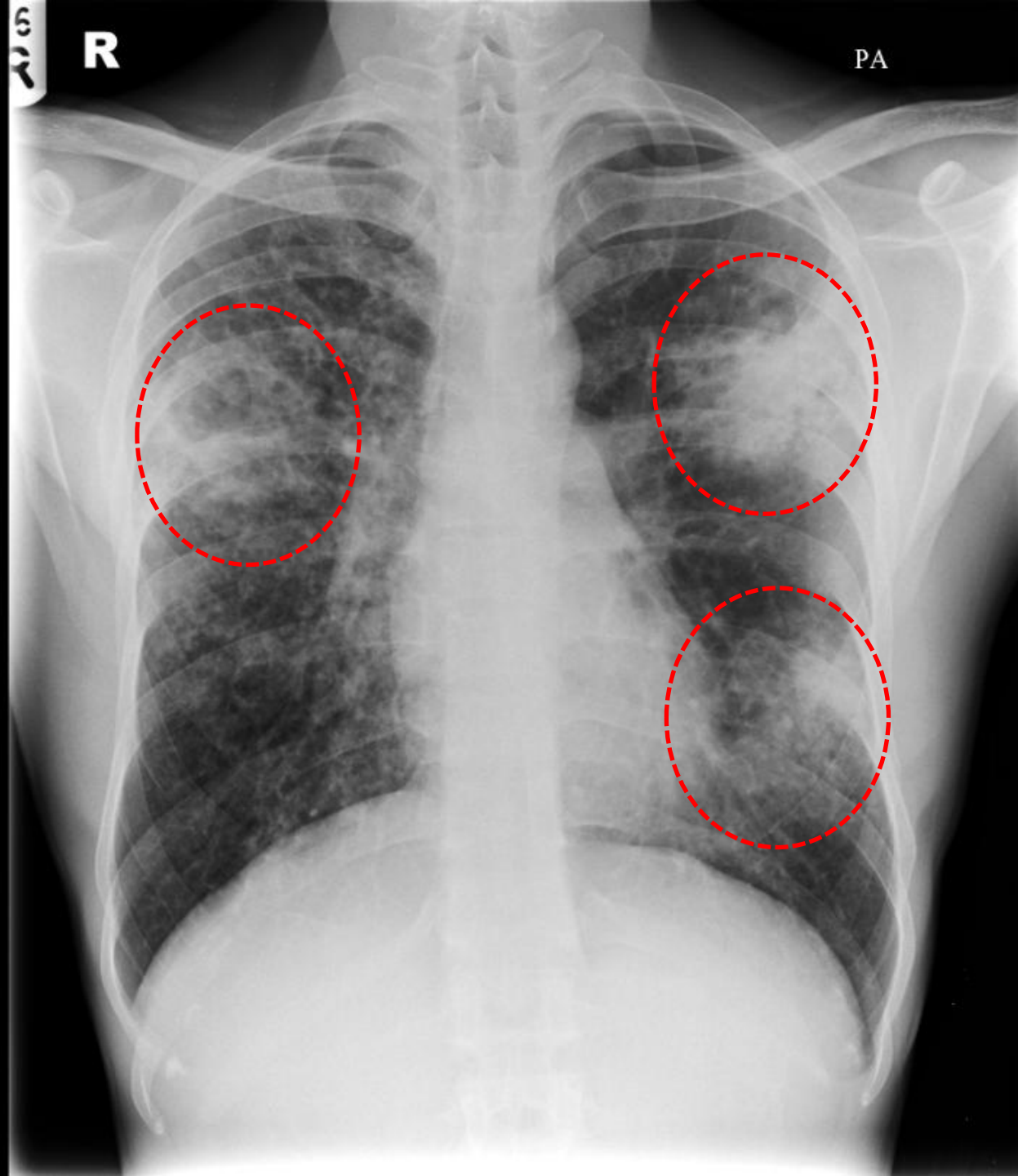
X Chemotherapy

X Radiotherapy

X Piperacillin and gentamicin

✓ Isoniazid, rifampicin, pyrazinamine and ethambutol

X Furosemide



What treatment should be offered to the patient's wife?

She is asymptomatic and had a 12mm Mantoux

- No treatment
- Penicillin
- Isoniazid 300mg OD 6 months
- Isoniazid, rifampicin, pyrazinamine and ethambutol
- Paracetamol

What treatment should be offered to the patient's wife?

She is asymptomatic and had a 12mm Mantoux

X No treatment

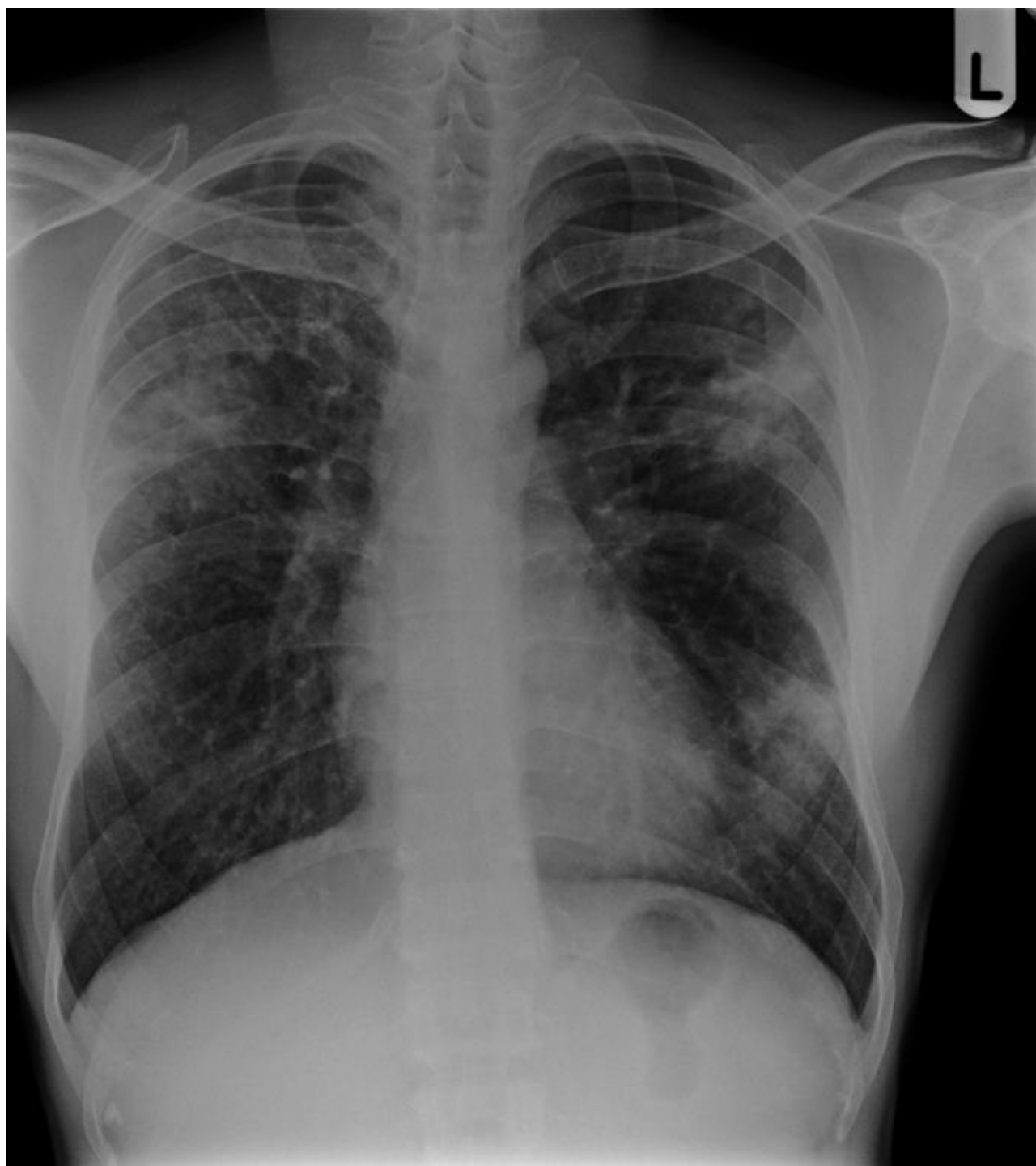
X Penicillin

✓ Isoniazid 300mg OD 6 months

X Isoniazid, rifampicin, pyrazinamine and ethambutol

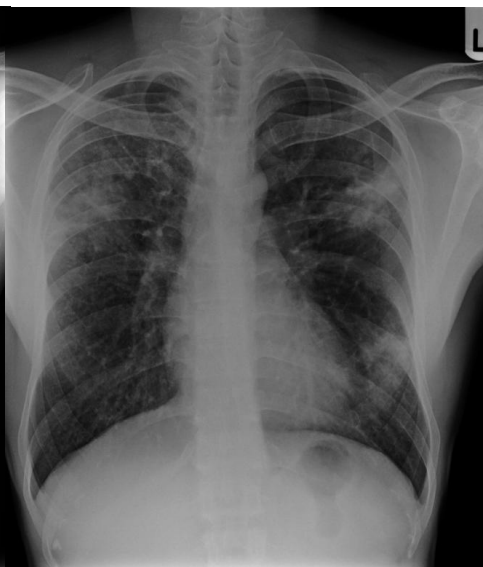
X Paracetamol

Patient's
x-ray two
months
later:



Six months
later:





Asymptomatic
Mantoux 12mm

1 year later
Symptomatic

2 months
treatment

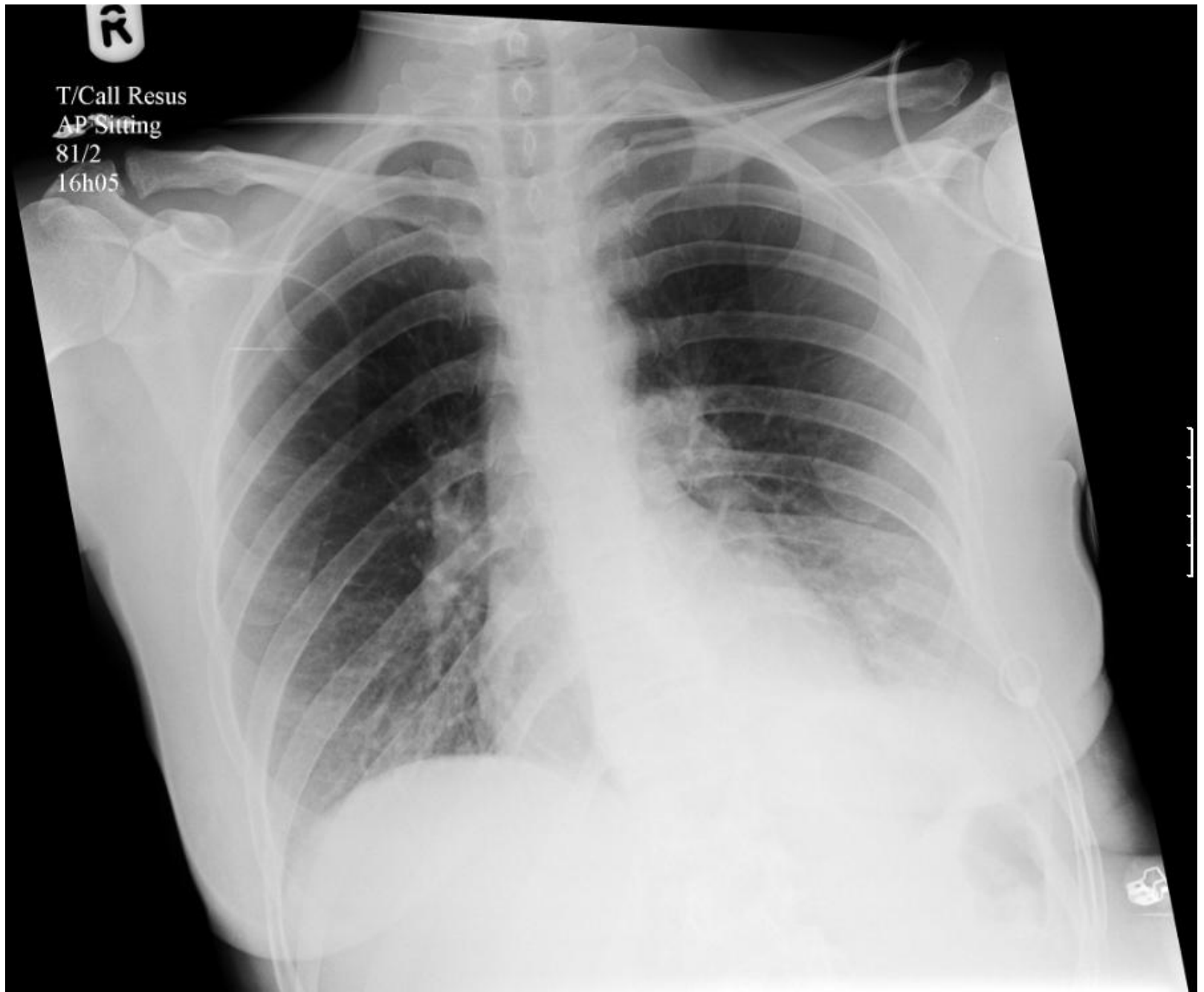
6 months
treatment

PATIENT 3

- 42 year old female
- Presented to A&E
- Severe left sided chest pain
- Fell 2m from a ladder

Chest x-ray taken...

WHAT DOES THIS CHEST X-RAY SHOW



What does the x-ray show?

Select all that apply

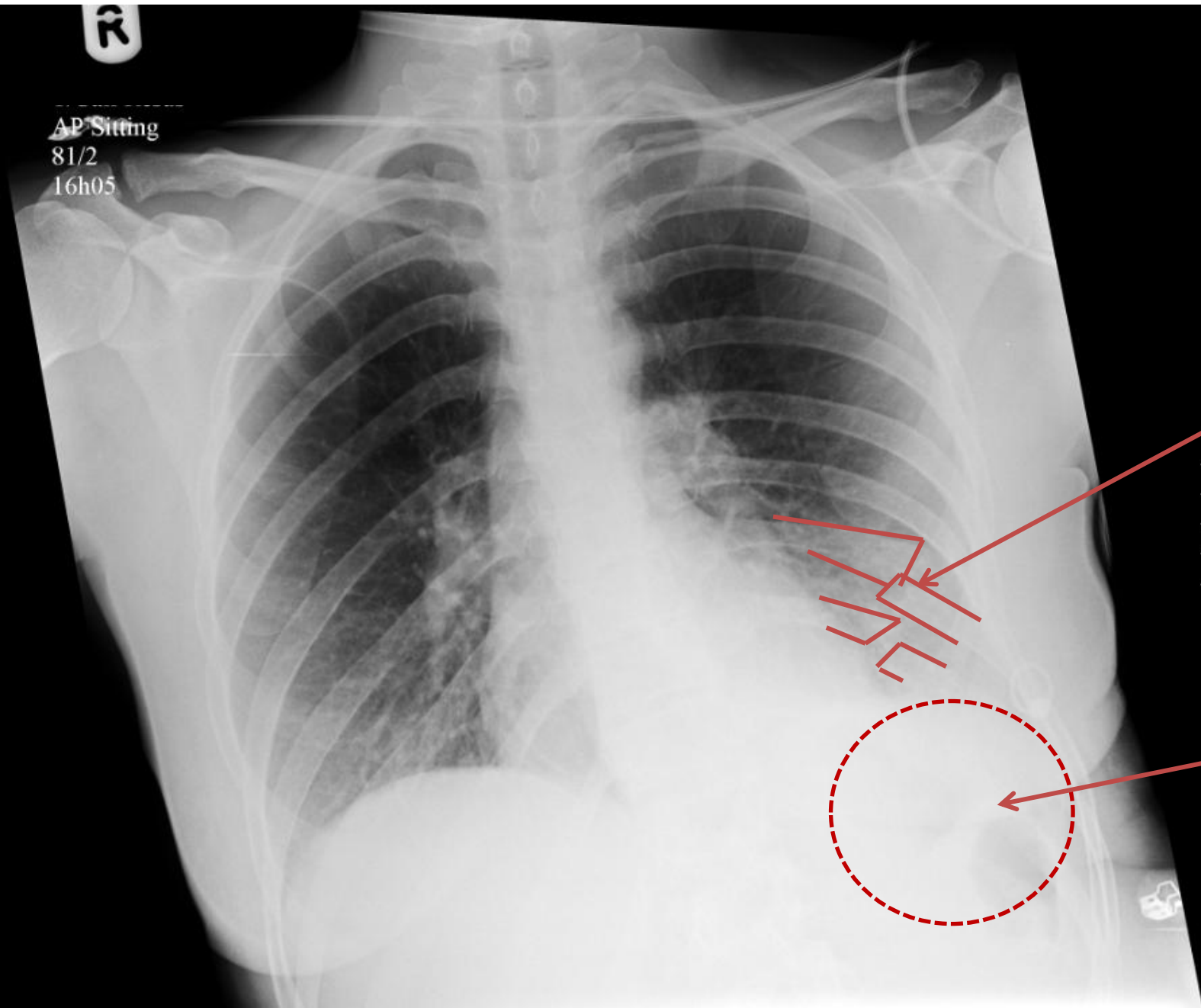
- Tension pneumothorax
- Pneumonia
- Fractured ribs on the right
- Fractured ribs on the left
- Haemothorax on the right
- Haemothorax on the left

What does the x-ray show?

Select all that apply

- X Tension pneumothorax
- X Pneumonia
- X Fractured ribs on the right
- ✓ Fractured ribs on the left
- X Haemothorax on the right
- ✓ Haemothorax on the left

WHAT DOES THIS CHEST X-RAY SHOW



Fractured ribs

Left costophrenic angle obscured

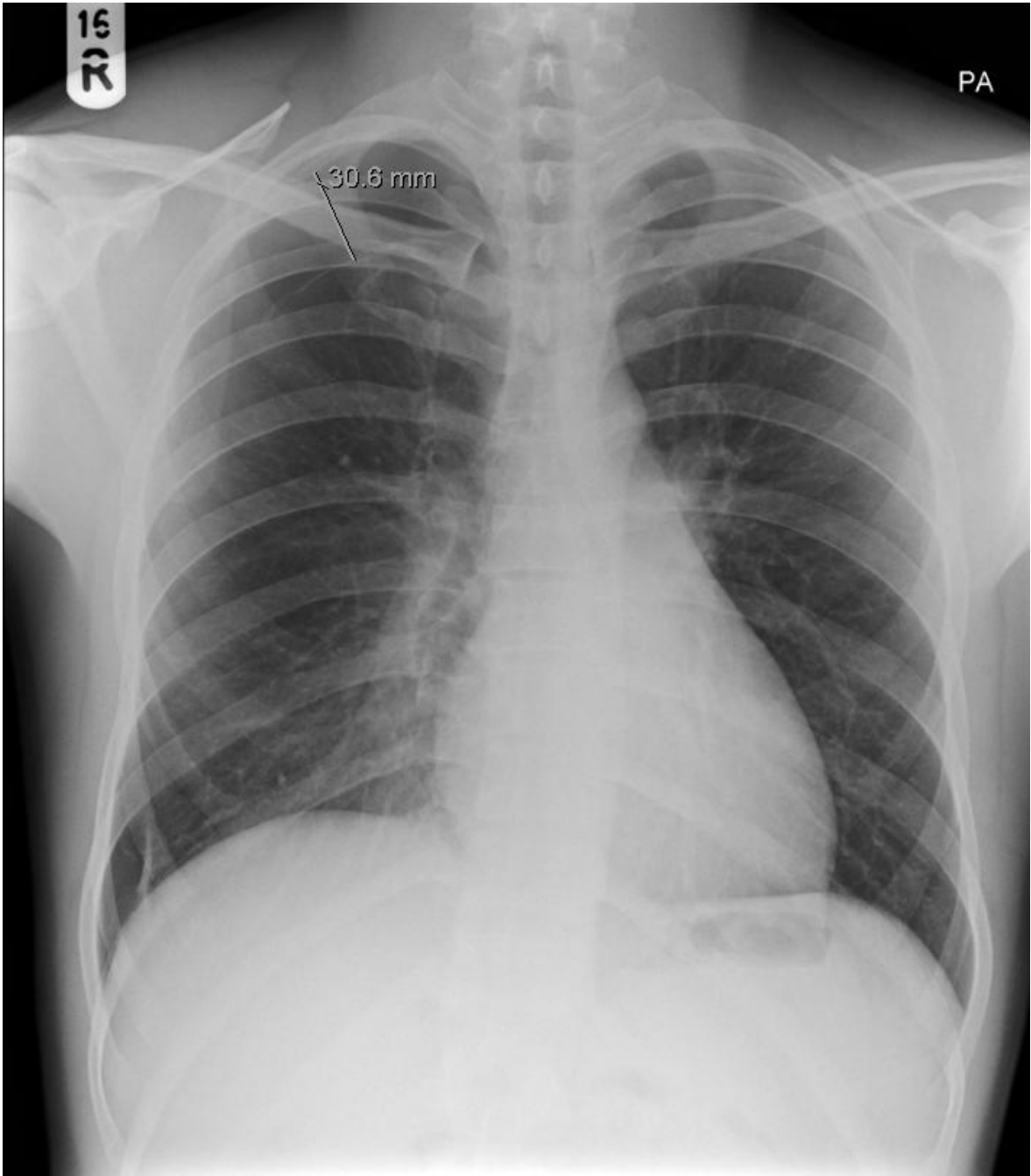
Differential includes: pleural effusion, haemothorax. Haemothorax most likely given history.

PATIENT 4

- 28 year old male
- One week history of flu-like symptoms and severe cough
- Presents with difficulty of breathing and shortness of breath
- Severe right sided chest pain

Chest x-ray taken...

WHAT IS THE MAJOR ABNORMALITY ON THIS CHEST X-RAY?



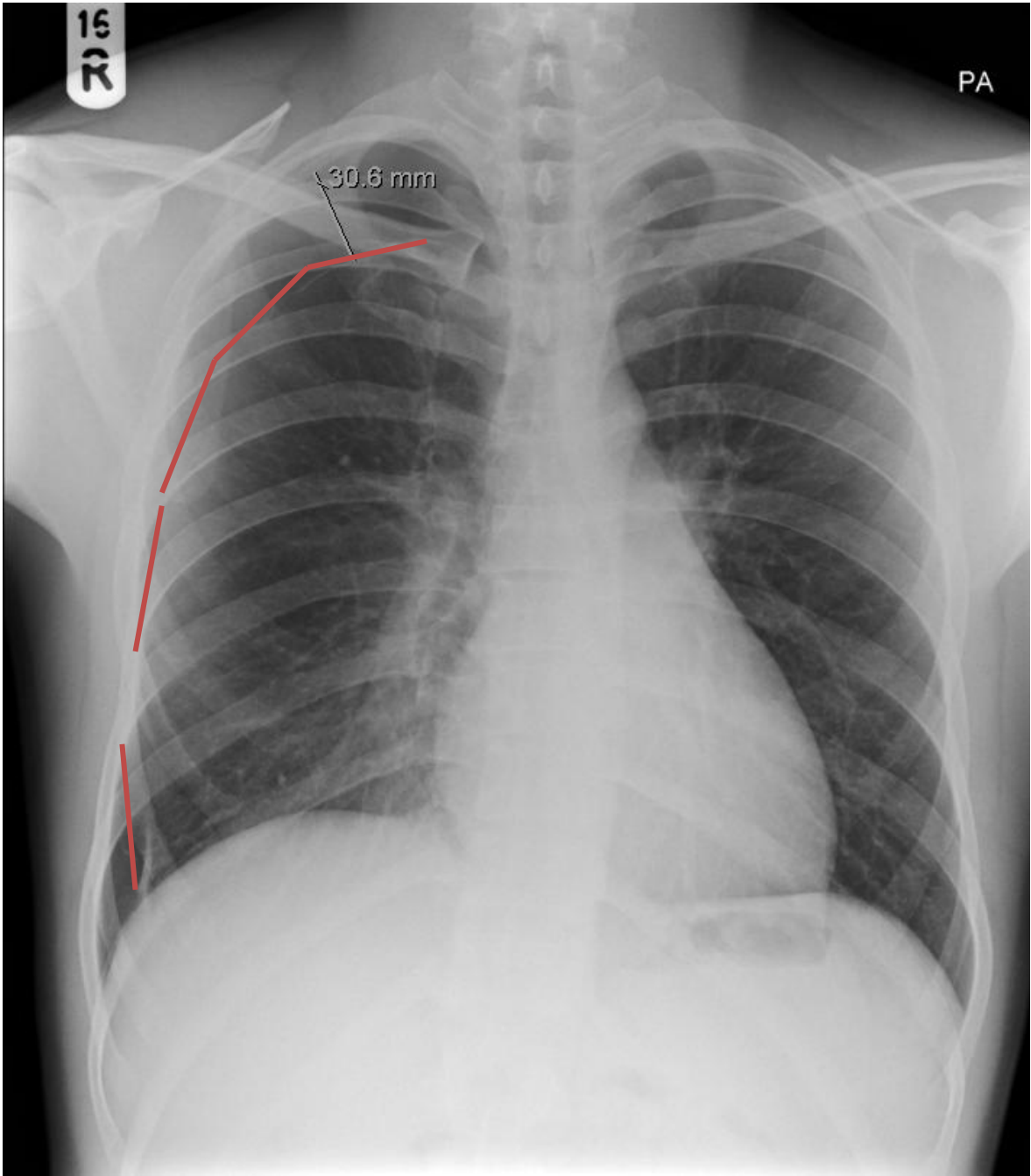
What does the x-ray show?

- Foreign body on the right
- Foreign body on the left
- Pneumothorax on the right
- Pneumothorax on the left
- Fractured ribs on the right
- Fractured ribs on the left

What does the x-ray show?

- X Foreign body on the right
- X Foreign body on the left
- ✓ Pneumothorax on the right
- X Pneumothorax on the left
- X Fractured ribs on the right
- X Fractured ribs on the left

WHAT IS THE MAJOR ABNORMALITY ON THIS CHEST X-RAY?



WHAT KIND OF PNEUMOTHORAX IS THIS?

- Tension pneumothorax
- Simple pneumothorax

WHAT KIND OF PNEUMOTHORAX IS THIS?

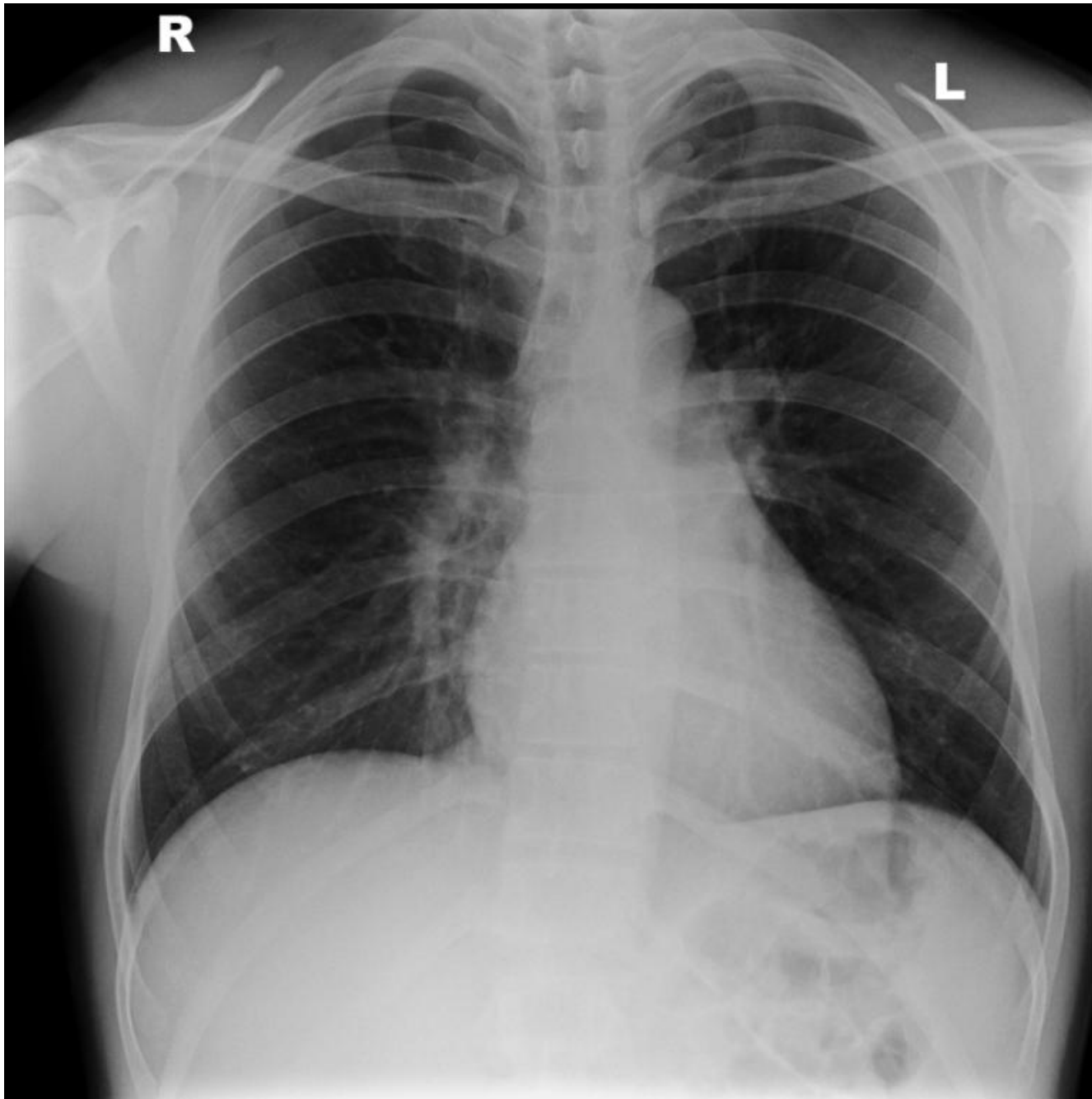
- X Tension pneumothorax
- ✓ Simple pneumothorax

In this case this is likely to be secondary to the patient's cough.

TREATMENT

- A chest drain was inserted and 900ml air was drained from the right chest.
- A chest x-ray was taken following drainage to assess response.....

HAS THE PNEUMOTHORAX COMPLETELY RESOLVED?



HAS THE PNEUMOTHORAX COMPLETELY RESOLVED FOLLOWING DRAINAGED?

- Yes
- No

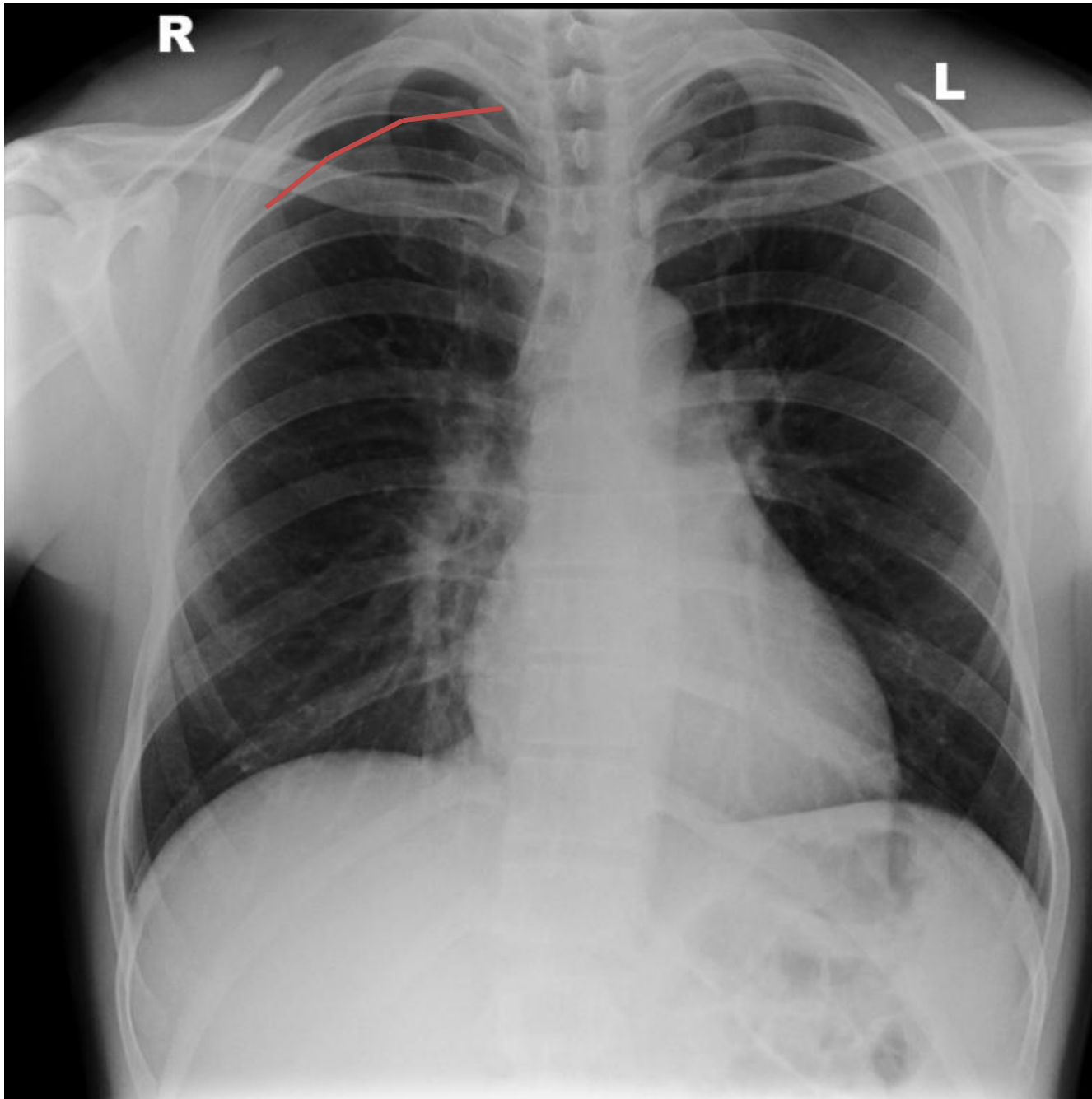
HAS THE PNEUMOTHORAX COMPLETELY RESOLVED FOLLOWING DRAINAGED?

X Yes

✓ No

No, although the pneumothorax has improved and now
measures 1.8cm

HAS THE PNEUMOTHORAX RESOLVED?



What sign on the chest x-ray would indicate a tension pneumothorax

- Mediastinal shift
- Air under the diaphragm
- Loss of the costophrenic angle
- Air in the mediastinum

What sign on the chest x-ray would indicate a tension pneumothorax

- ✓ Mediastinal shift
- X Air under the diaphragm
- X Loss of the costophrenic angle
- X Air in the mediastinum

WHAT IS THE EMERGENCY TREATMENT OF A TENSION PNEUMOTHORAX

- Needle thoracostomy in the 2nd intercostal space, mid-clavicular line
- Needle thoracostomy in the 2nd intercostal space, mid-axillary line
- Needle thoracostomy in the 5th intercostal space, mid-clavicular line
- Chest drain insertion
- Midline sternotomy
- Adrenaline IV

WHAT IS THE EMERGENCY TREATMENT OF A TENSION PNEUMOTHORAX

- ✓ Needle thoracostomy in the 2nd intercostal space, mid-clavicular line
- X Needle thoracostomy in the 2nd intercostal space, mid-axillary line
- X Needle thoracostomy in the 5th intercostal space, mid-clavicular line
- X Chest drain insertion
- X Midline sternotomy
- X Adrenaline IV

Emergency decompression of the chest is carried out by insertion of a 14G or 16G needle, attached to a syringe part filled with saline into the 2nd intercostal space in the mid-clavicular line.

A rush of air may be heard.

WHAT IS THE DEFINITIVE TREATMENT OF A TENSION PNEUMOTHORAX

- Needle thoracostomy in the 2nd intercostal space, mid-clavicular line
- Needle thoracostomy in the 5th intercostal space, mid-clavicular line
- Chest drain insertion
- Midline sternotomy
- Adrenaline IV

WHAT IS THE DEFINITIVE TREATMENT OF A TENSION PNEUMOTHORAX

- X Needle thoracostomy in the 2nd intercostal space, mid-clavicular line
- X Needle thoracostomy in the 5th intercostal space, mid-clavicular line
- ✓ Chest drain insertion
- X Midline sternotomy
- X Adrenaline IV

Emergency decompression of the chest by needle thoracostomy converts a tension pneumothorax to a simple pneumothorax. This is a short term measure.

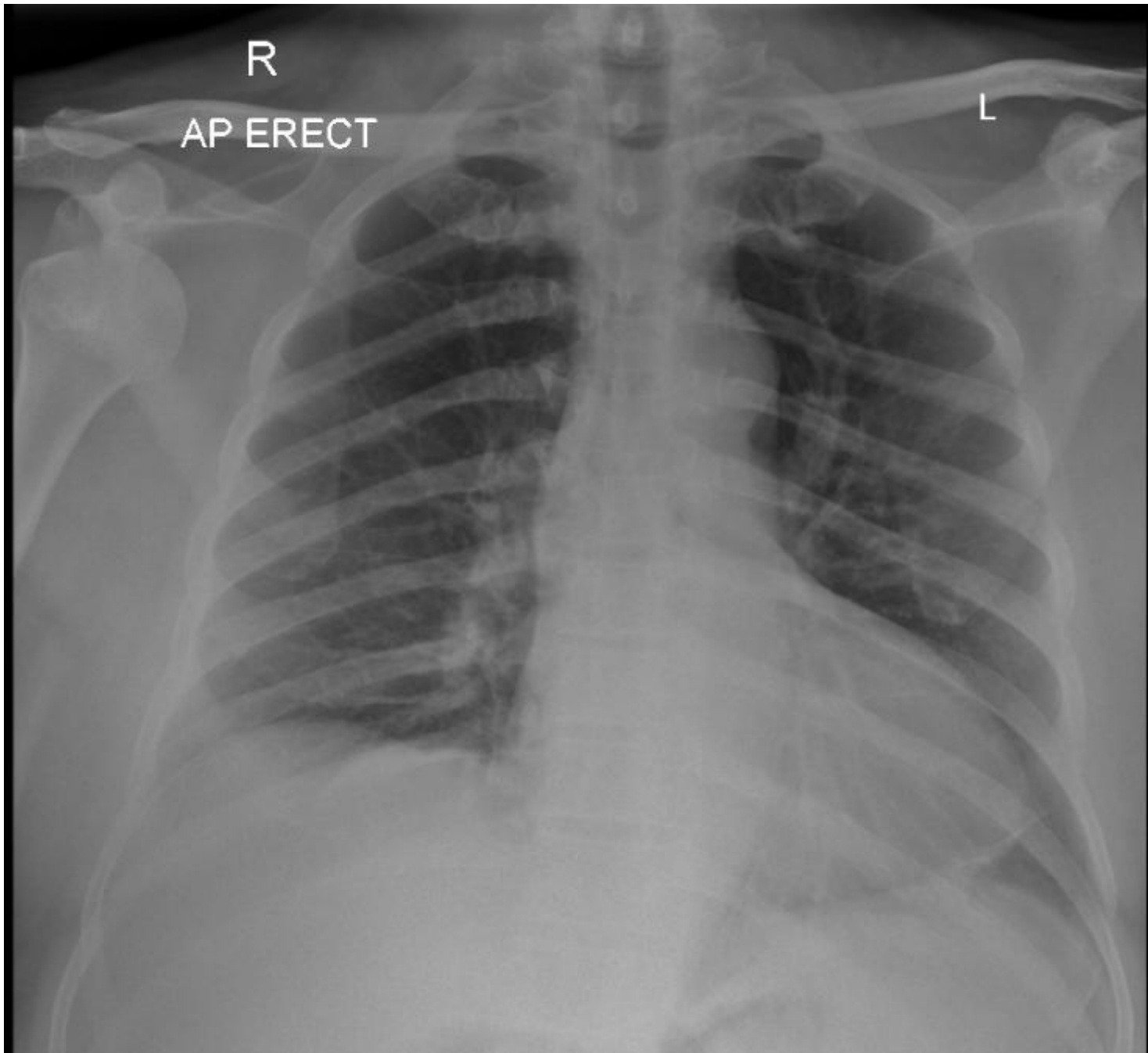
PATIENT 5

- 64 year old female
- Admitted following a fall

Chest x-ray taken....

Systematically assess this x-ray

WHAT IS THE MAJOR ABNORMALITY ON THIS CHEST X-RAY?



What does the x-ray show?

Select all that apply

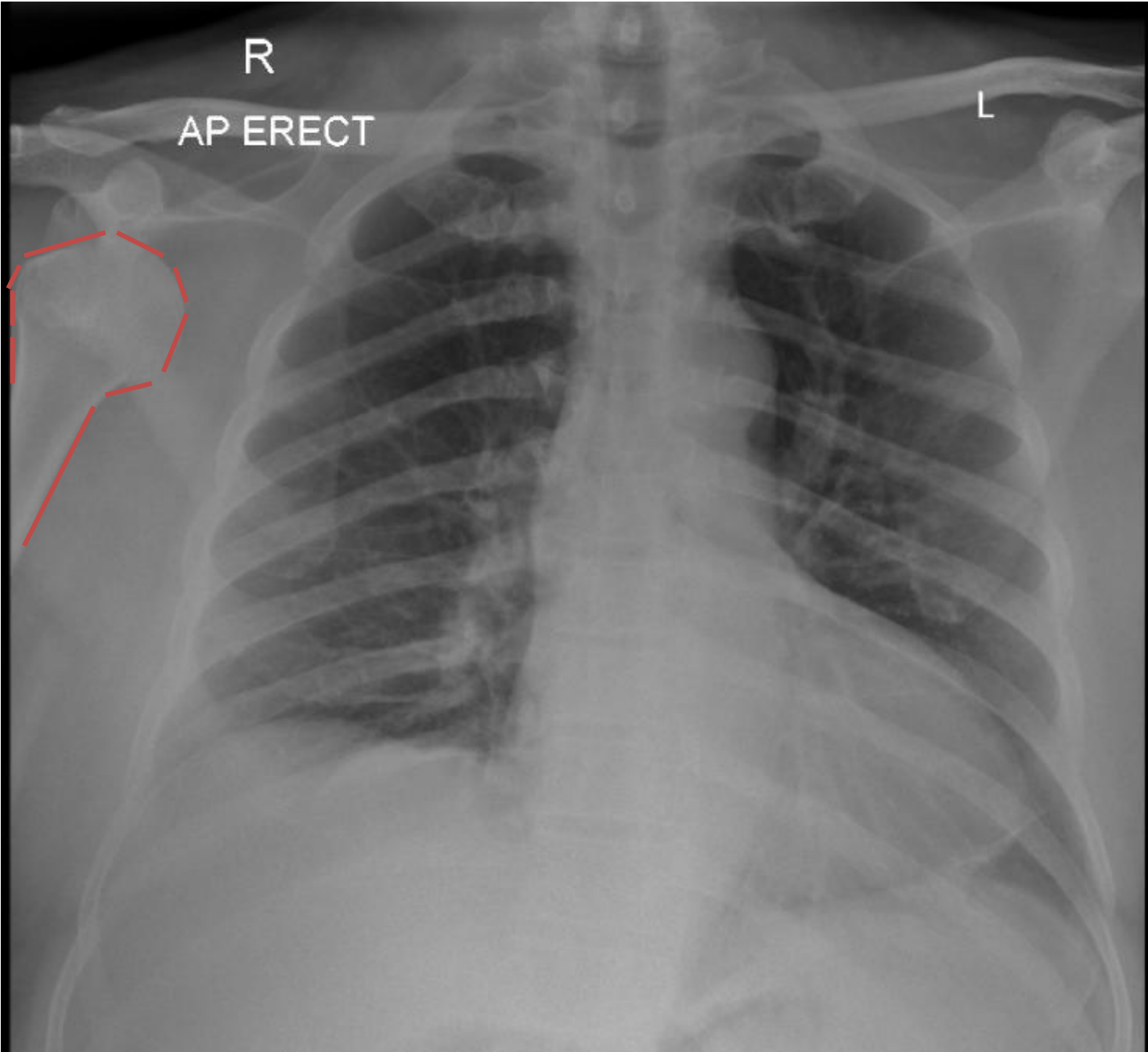
- Anterior dislocation of right humerus
- Posterior dislocation of right humerus
- Anterior dislocation of left humerus
- Posterior dislocation of left humerus
- Fractured ribs on the left
- Fractured ribs on the right

What does the x-ray show?

Select all that apply

- ✓ Anterior dislocation of right humerus
- X Posterior dislocation of right humerus
- X Anterior dislocation of left humerus
- X Posterior dislocation of left humerus
- X Fractured ribs on the left
- X Fractured ribs on the right

WHAT IS THE MAJOR ABNORMALITY ON THIS CHEST X-RAY?



What presentation may indicate a common complication of this injury?

- Loss of sensation over 5th finger and medial 4th finger. Weakness of flexion of 4th and 5th fingers.
- Loss of sensation over deltoid muscle and weakness of arm abduction
- Loss of sensation over the first 3 fingers and lateral 4th finger. Weakness of abduction of the thumb.

What presentation may indicate a common complication of this injury?

- X Loss of sensation over 5th finger and medial 4th finger. Weakness of flexion of 4th and 5th fingers.
- ✓ Loss of sensation over deltoid muscle and weakness of arm abduction
- X Loss of sensation over the first 3 fingers and lateral 4th finger. Weakness of abduction of the thumb.

Axillary nerve injury occurs in around 3 per cent of dislocations of the humerus

PATIENT 6

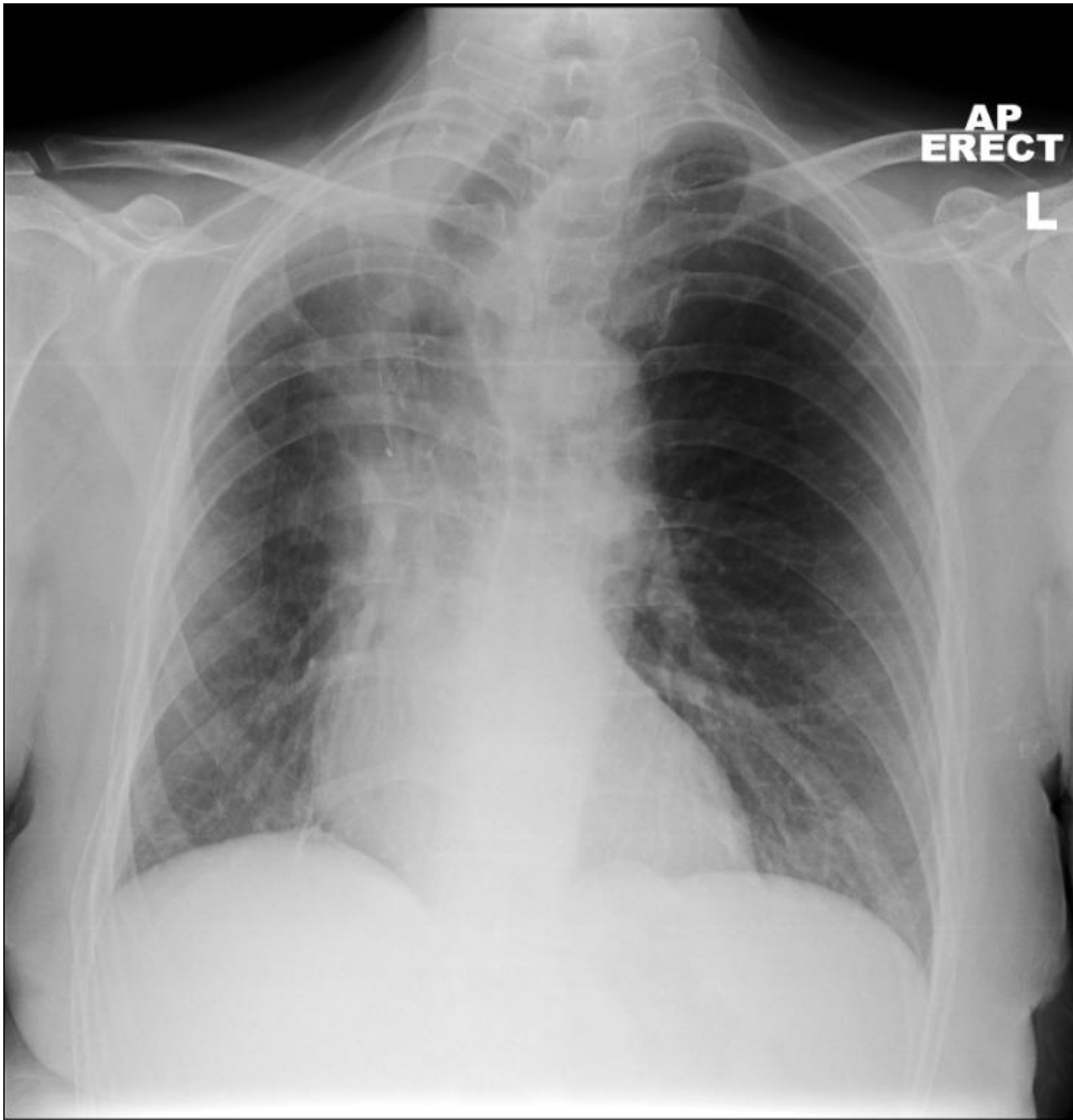
INITIAL PRESENTATION

- GP referral
- 60 year old female
- Smoker – 40 pack years
- 1 month history of cough and malaise
- 1 stone weight loss over past 3 months
- Clubbing

The patient was investigated, diagnosed and treatment undertaken.

Following treatment, a routine CXR was taken....

WHAT IS THE MAJOR ABNORMALITY ON THIS CHEST X-RAY TAKEN AFTER TREATMENT



WHAT IS THE MAJOR ABNORMALITY ON THIS CHEST X-RAY?

- Abdominal perforation
- Fractured ribs
- Tracheal deviation
- Cardiomegaly
- Dextrocardia

WHAT IS THE MAJOR ABNORMALITY ON THIS CHEST X-RAY?

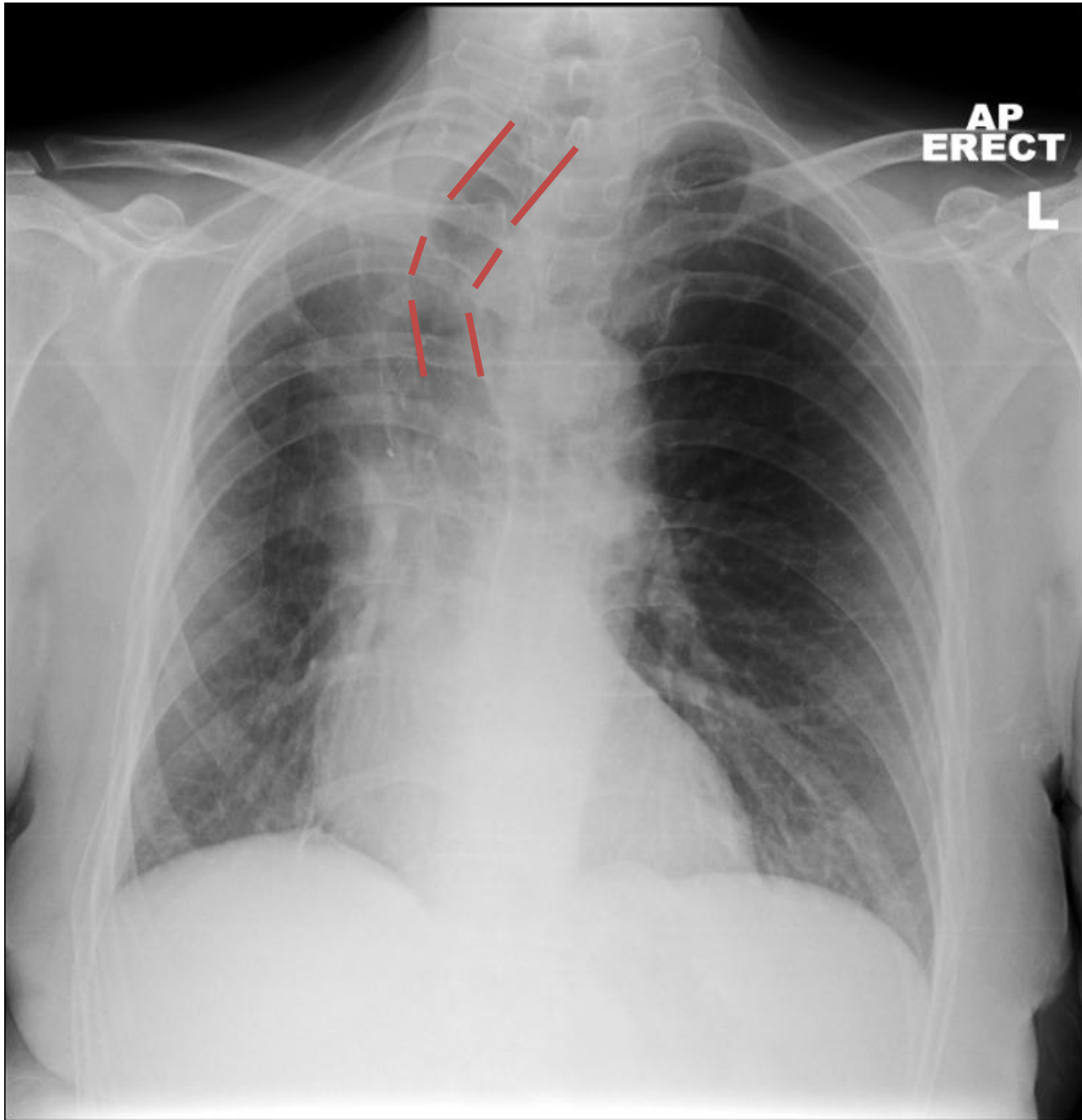
X Abdominal perforation

X Fractured ribs

✓ Tracheal deviation

X Cardiomegaly

X Dextrocardia



What is the most likely cause of this patient's post-treatment tracheal deviation in view of the history?

- Pleural effusion
- Collapse
- Fibrosis
- Pneumothorax
- Retrosternal goitre
- Lobe resection

What is the most likely cause of this patient's post-treatment tracheal deviation in view of the history?

- X Pleural effusion
- X Collapse
- X Fibrosis
- X Pneumothorax
- X Retrosternal goitre
- ✓ Lobe resection

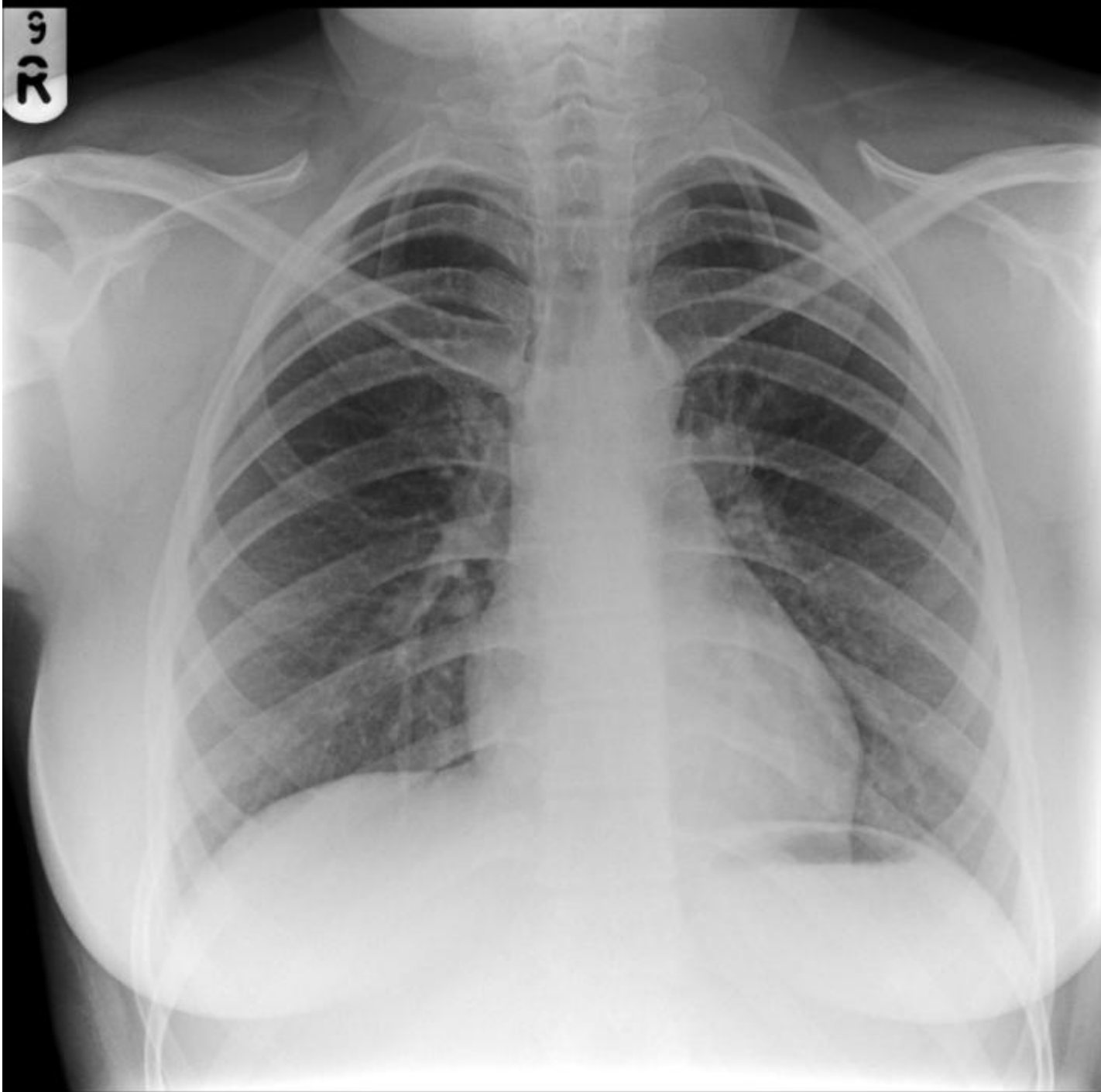
This patient had a diagnosis of lung cancer and has had a lobe resection

PATIENT 7

- 24 year old female
- Well
- Chest x-ray for occupational health check

Systematically assess this x-ray

303



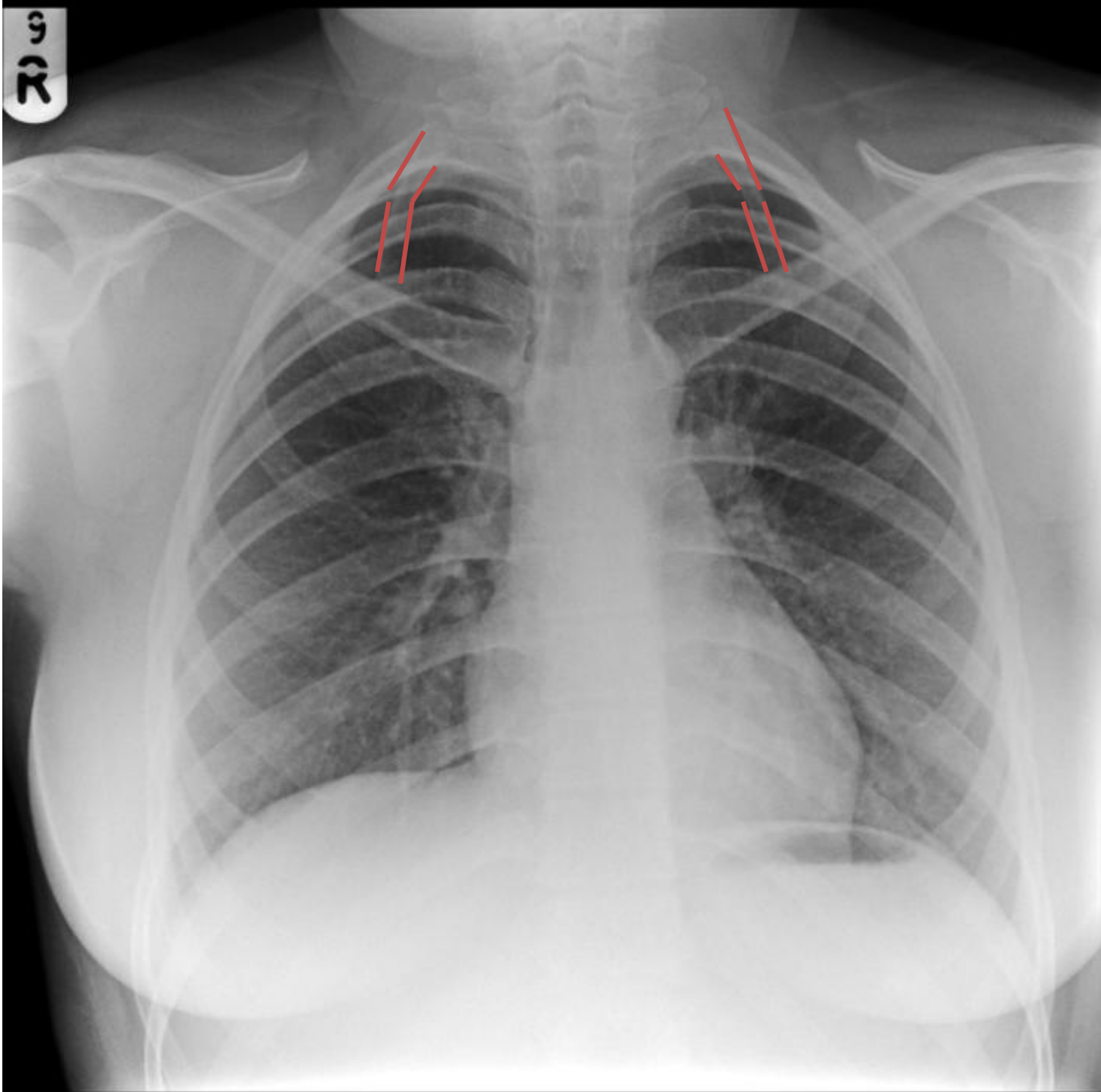
Is there an abnormality?

- No abnormality
- Abnormality within the lung fields
- Mediastinal abnormality
- Soft tissue abnormality
- Bony abnormality

Is there an abnormality?

- X No abnormality
- X Abnormality within the lung fields
- X Mediastinal abnormality
- X Soft tissue abnormality
- ✓ Bony abnormality

R 20 5



CERVICAL RIBS

- Congenital abnormality
- 1 in 500 population
- Arise from 7th cervical vertebra

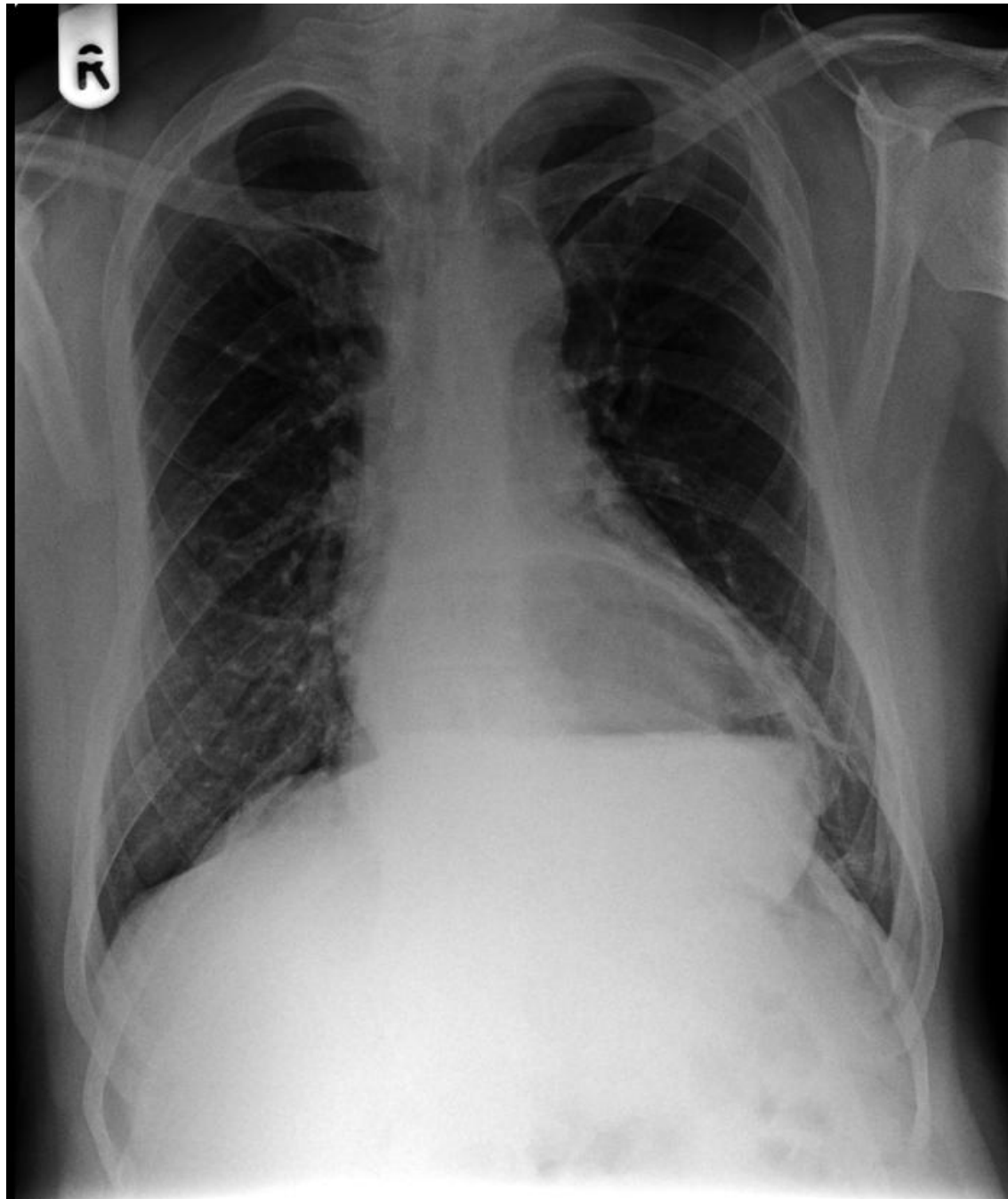
Potential complication: thoracic outlet obstruction. Compression of subclavian artery/ branches of brachial plexus.

PATIENT 8

- 39 year old male
- Retrosternal chest pain
- No radiation
- Worse on bending, stooping and lying down
- Worse with hot drinks or alcohol
- Relieved by antacids

Chest x-ray carried out as part of work-up....

WHAT IS THE MAJOR ABNORMALITY ON THIS CHEST X-RAY?

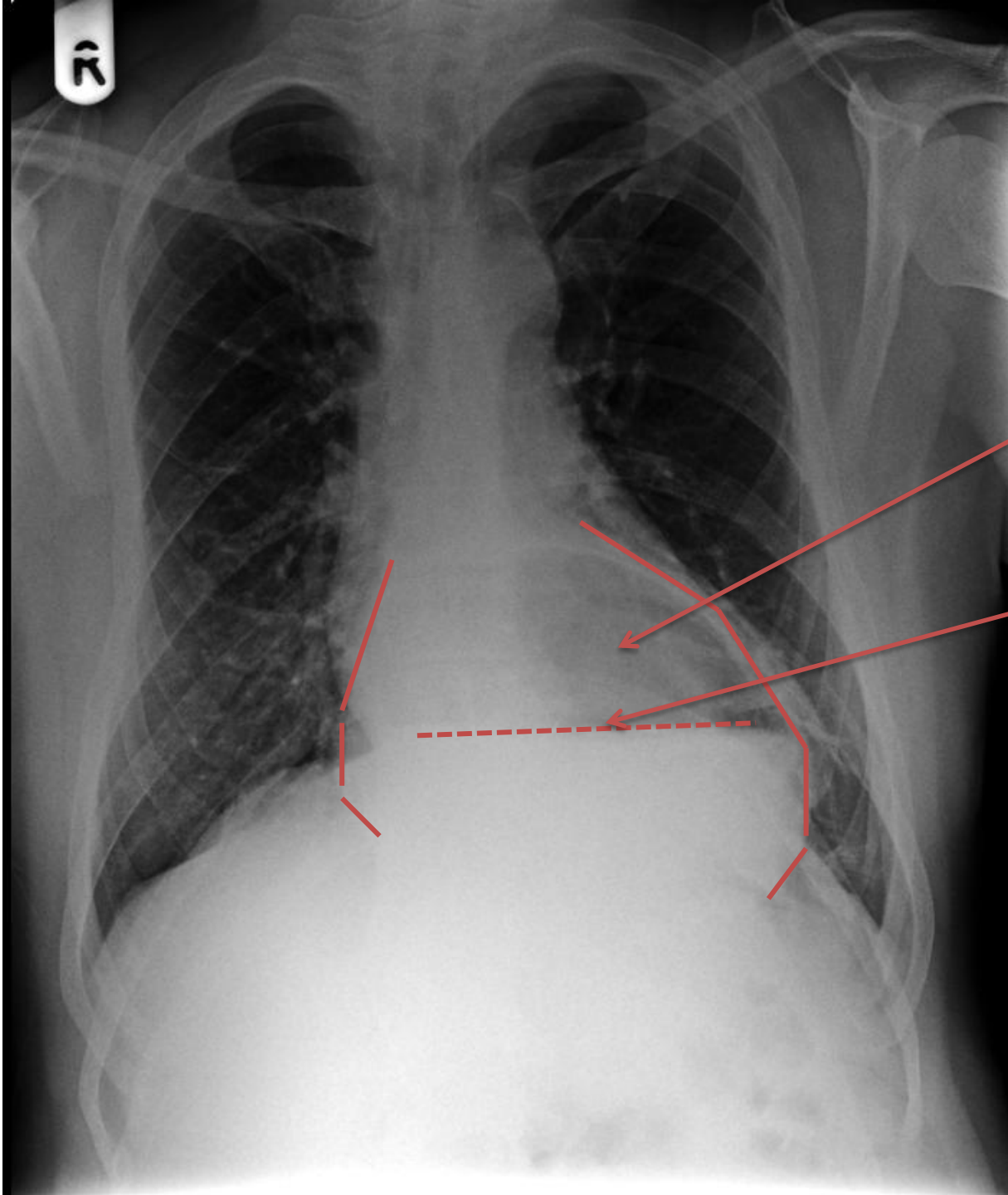


WHAT IS THE DIAGNOSIS BASED ON THE HISTORY AND CHEST X-RAY?

- Pericarditis
- Cardiac tamponade
- Large hiatus hernia
- Aortic aneurysm

WHAT IS THE DIAGNOSIS BASED ON THE HISTORY AND CHEST X-RAY?

- X Pericarditis
- X Cardiac tamponade
- ✓ Large hiatus hernia
- X Aortic aneurysm



Gastric bubble

Fluid level

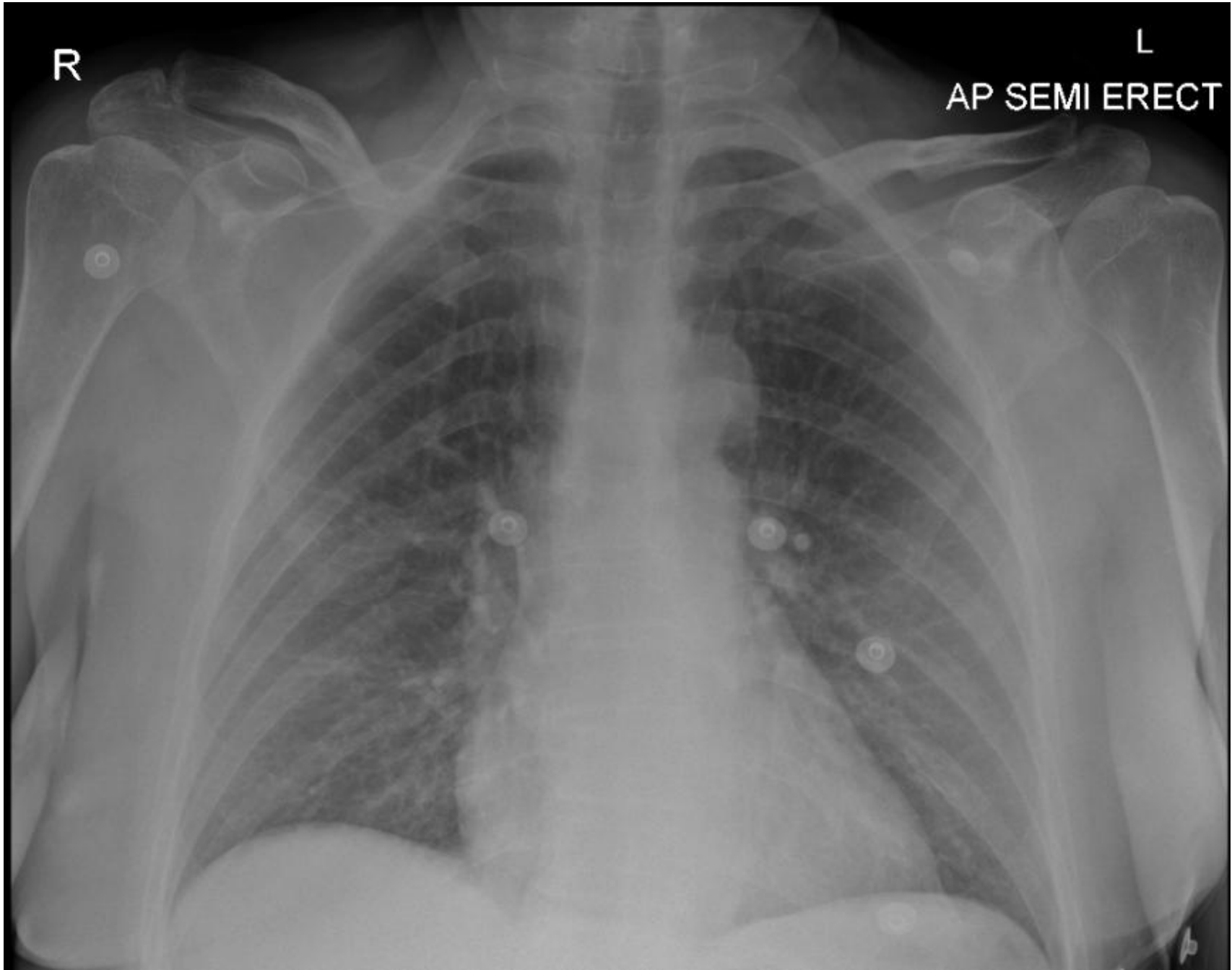
PATIENT 9

- 59 year old female
- Assessed in A&E following a road traffic accident

Chest x-ray taken....

Systematically assess this x-ray

WHAT IS THE MAJOR ABNORMALITY ON THIS CHEST X-RAY?



What does the x-ray show?

Select all that apply

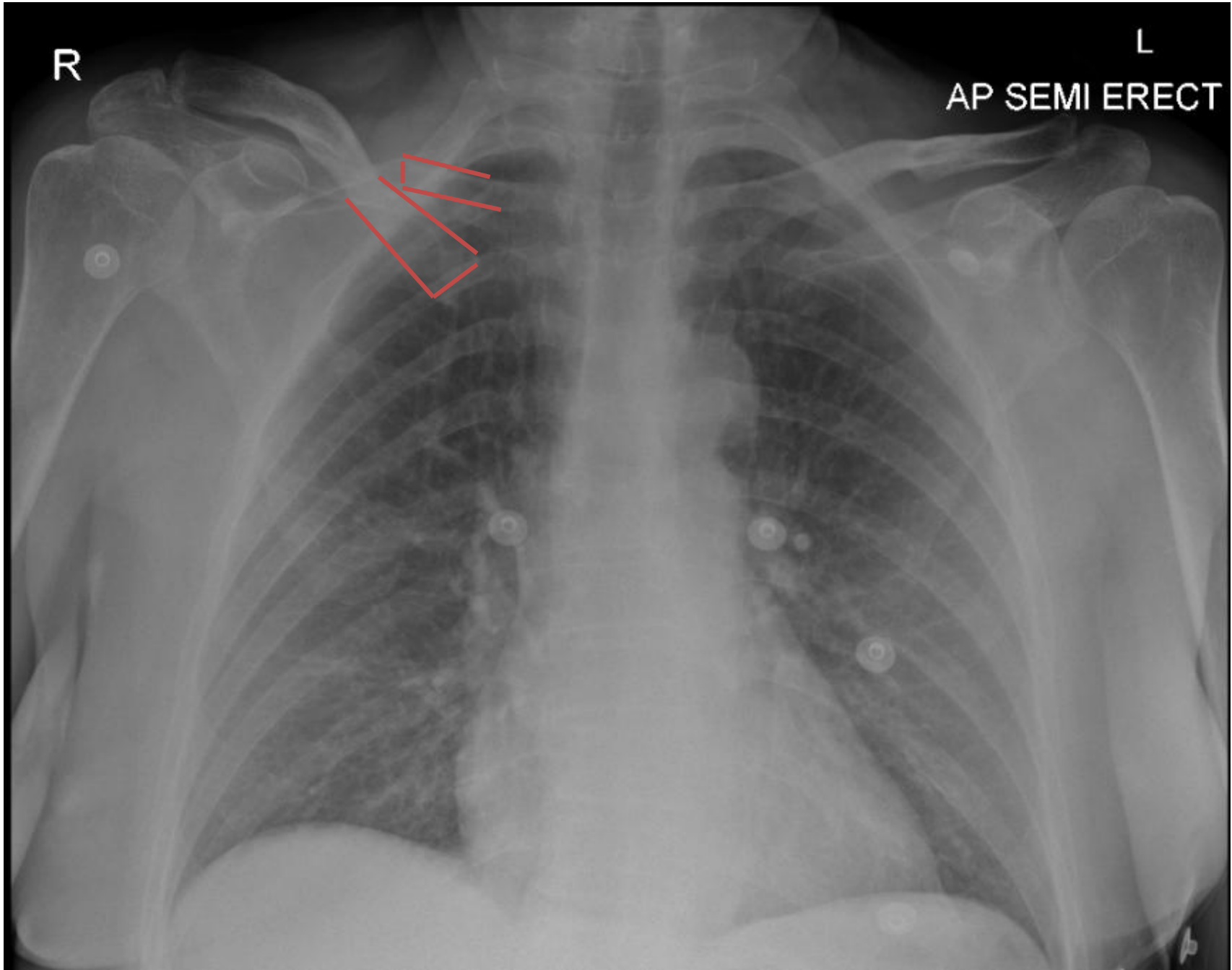
- Dislocation of the right humerus
- Dislocation of the left humerus
- Fracture of the right clavicle
- Fracture of the left clavicle
- Haemothorax on the left
- Haemothorax on the right
- Tension pneumothorax
- Foreign bodies within the chest cavity

What does the x-ray show?

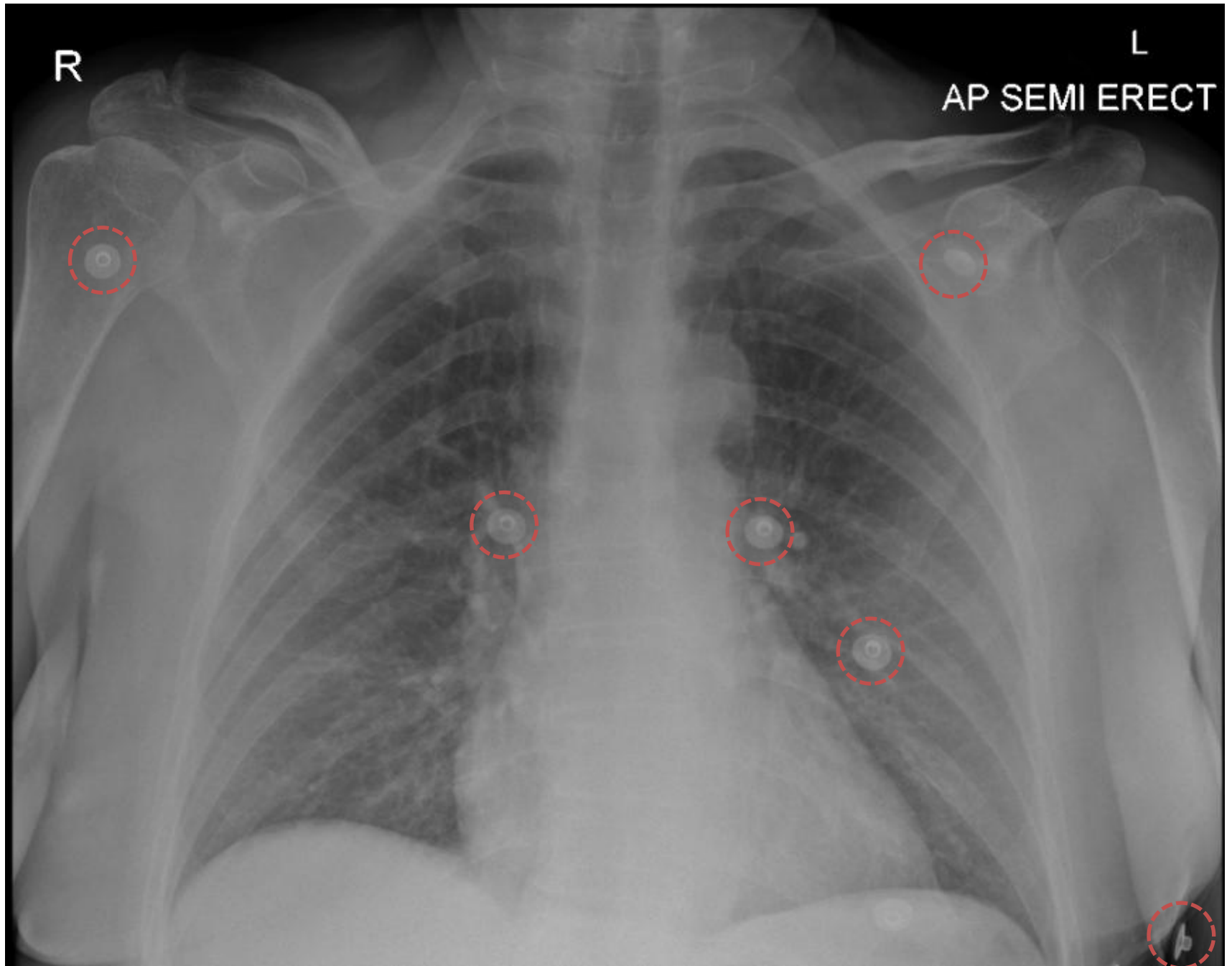
Select all that apply

- X Dislocation of the right humerus
- X Dislocation of the left humerus
- ✓ Fracture of the right clavicle
- X Fracture of the left clavicle
- X Haemothorax on the left
- X Haemothorax on the right
- X Tension pneumothorax

WHAT IS THE MAJOR ABNORMALITY ON THIS CHEST X-RAY?



WHAT ARE THESE?



WHAT ARE THESE?

- Internal foreign bodies within the thorax
- External foreign objects

WHAT ARE THESE?

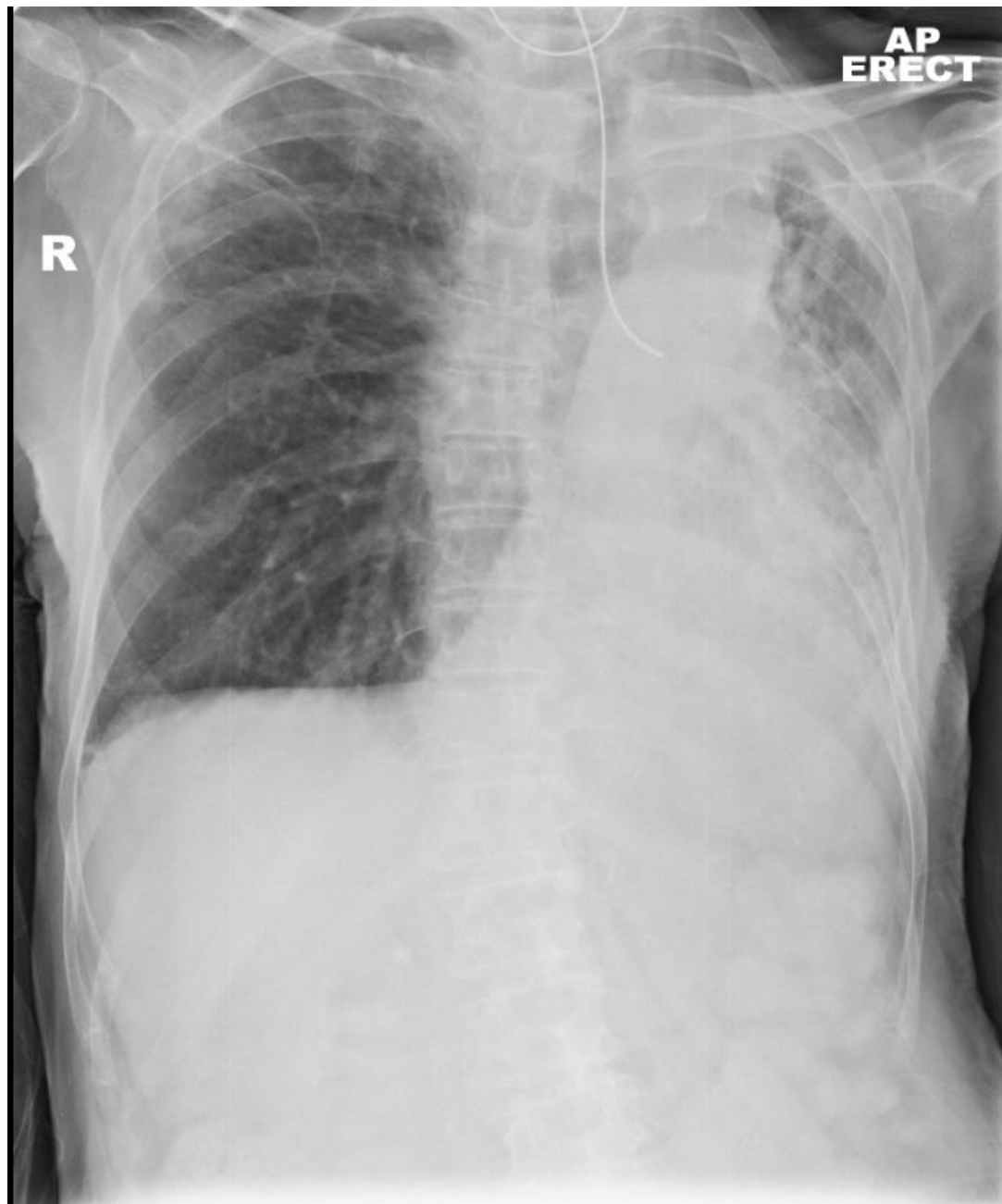
- X Internal foreign bodies within the thorax
- ✓ External foreign objects

ECG CLIPS!

PATIENT 10

- 85 year old male
- Admitted with collapse
- On examination: right hemiparesis, expressive aphasia, up-going right plantar reflex.
- Swallow judged unsafe and nasogastric tube inserted
- PMHx: TB left lung
- Chest x-ray taken as part of the work up.....

What are the major abnormalities on this x-ray?



WHAT DOES THIS CHEST X-RAY SHOW?

Select all that apply

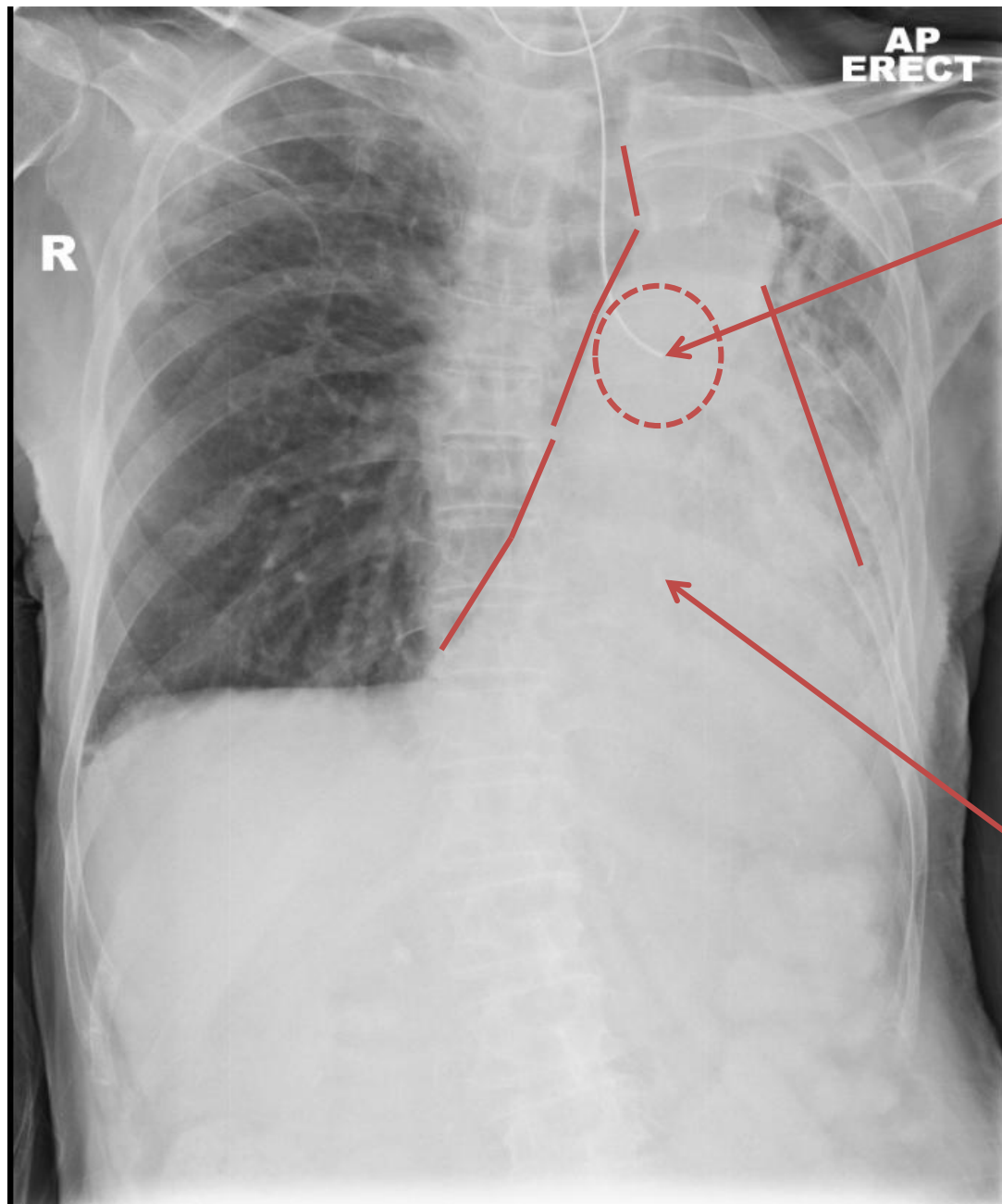
- Mediastinal shift to the left
- Mediastinal shift to the right
- Correctly placed NG-tube
- Incorrectly placed NG tube
- Rib fractures on the left
- Rib fractures on the right

WHAT DOES THIS CHEST X-RAY SHOW?

Select all that apply

- ✓ Mediastinal shift to the left
- X Mediastinal shift to the right
- X Correctly placed NG-tube
- ✓ Incorrectly placed NG tube
- X Rib fractures on the left
- X Rib fractures on the right

What are the major abnormalities on this x-ray?



NG Tube
misplaced into
the lungs

Mediastinal
shift

WHAT IS THE MOST LIKELY CAUSE OF THIS PATIENT'S MEDIASTINAL SHIFT?

- Tension pneumothorax
- Large pleural effusion
- Chronic fibrotic changes
- Mass
- Pneumonectomy

WHAT IS THE MOST LIKELY CAUSE OF THIS PATIENT'S MEDIASTINAL SHIFT?

- X Tension pneumothorax
- X Large pleural effusion
- ✓ Chronic fibrotic changes
- X Mass
- X Pneumonectomy

There is no evidence of any of the other options on this x-ray: lung markings are visible throughout the right lung field, there is no loss of the costophrenic angle on the right therefore there is no effusion or pneumothorax pushing the mediastinum away. Similarly, there is no mass visible on the x-ray and although the left lung volume is severely reduced, lung markings are still visible and there has not been a pneumonectomy.

This gentleman has long-standing fibrotic changes in the left lung most likely secondary to old TB.

WHAT ARE THE LIKELY CONSEQUENCES IF FEED
WAS PLACED INTO THE NG-TUBE IN IT'S
CURRENT POSITION

Select all that apply

- None
- Death
- Pneumothorax
- Pulmonary haemorrhage
- Severe pneumonia
- Empyema

WHAT ARE THE LIKELY CONSEQUENCES IF FEED WAS PLACED INTO THE NG-TUBE IN IT'S CURRENT POSITION

Select all that apply

- None
- Death
- Pneumothorax
- Pulmonary haemorrhage
- Severe pneumonia
- Empyema

“Naso or orogastric tubes placed in the respiratory tract rather than the gastrointestinal tract and not detected prior to commencing feeding or other use” is listed as a **“Never Event”** by the National Patient Safety Agency (NSPA).

Never Events are “serious, largely preventable patient safety incidents.” Misplaced NG-tubes can result in serious harm and/or death.

Always confirm the location of the tube before use.

The incorrect placement of the NG-tube was recognised and the tube was removed.

A new NG-tube was inserted and another chest x-ray taken...

Would you clear this NG-tube for use for feeding?



Would you use this NG-tube for feeding?

- Yes
- No

Would you use this NG-tube for feeding?

✓ Yes

X No

The tip of this NG-tube is clearly visible in the upper left quadrant of the abdomen.

There is no danger that this is in the lungs.

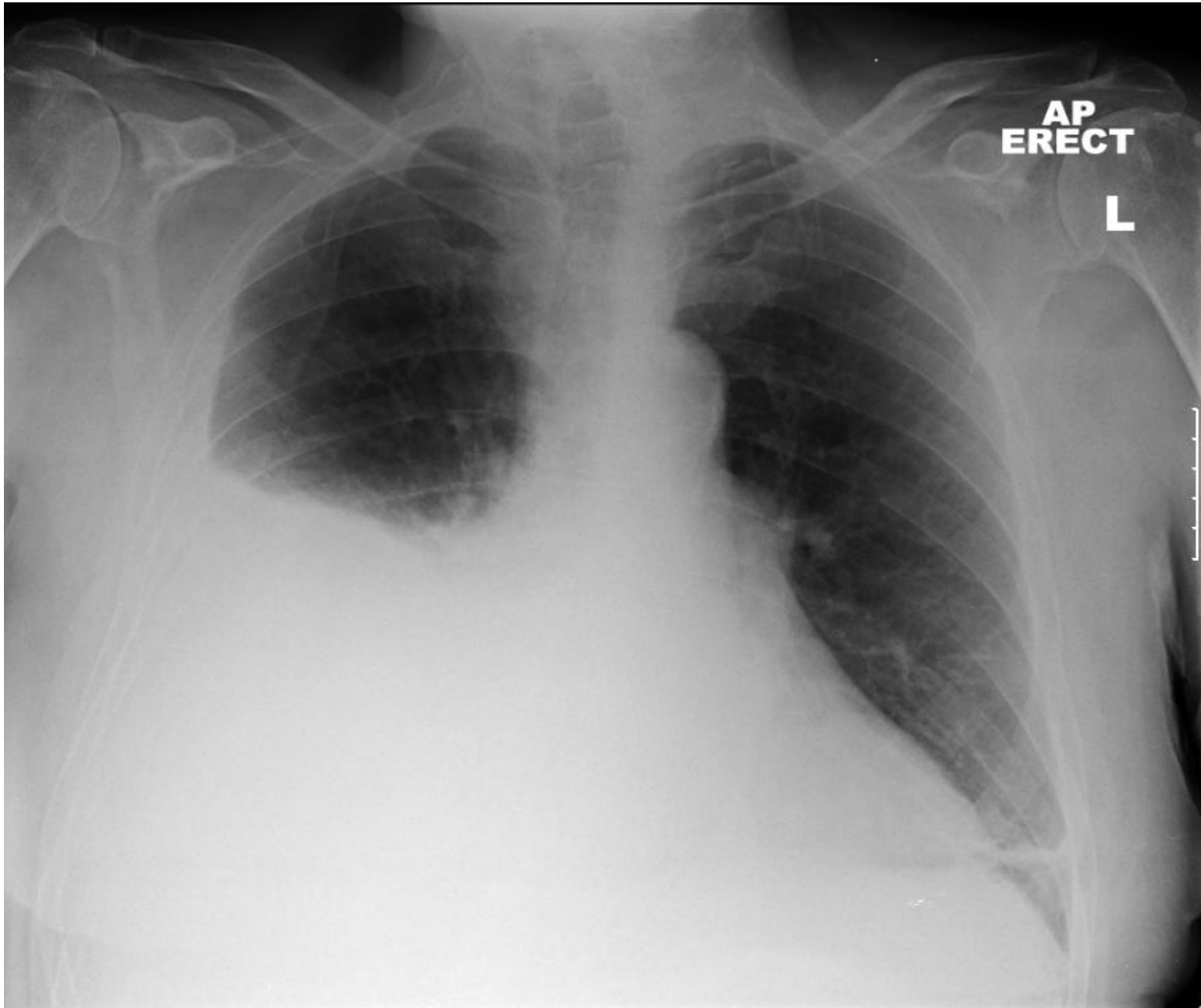
It is therefore safe to use.

PATIENT 11

- 91 year old male
- Presented with increased shortness of breath
- 3 week history of cough productive of yellow sputum
- On examination:
 - Reduced chest expansion on the right
 - Dullness to percussion on the right
 - Reduced vocal resonance on the right
 - Decreased breath sounds at the right base

A chest x-ray was taken...

WHAT IS THE MAJOR ABNORMALITY ON THIS X-RAY



WHAT DOES THE X-RAY SHOW

- Pleural effusion
- Mass
- Consolidation
- Pneumothorax
- Cardiomegaly

Plus bonus points for the smaller abnormality on the left....

WHAT DOES THE X-RAY SHOW

✓ Pleural effusion

X Mass

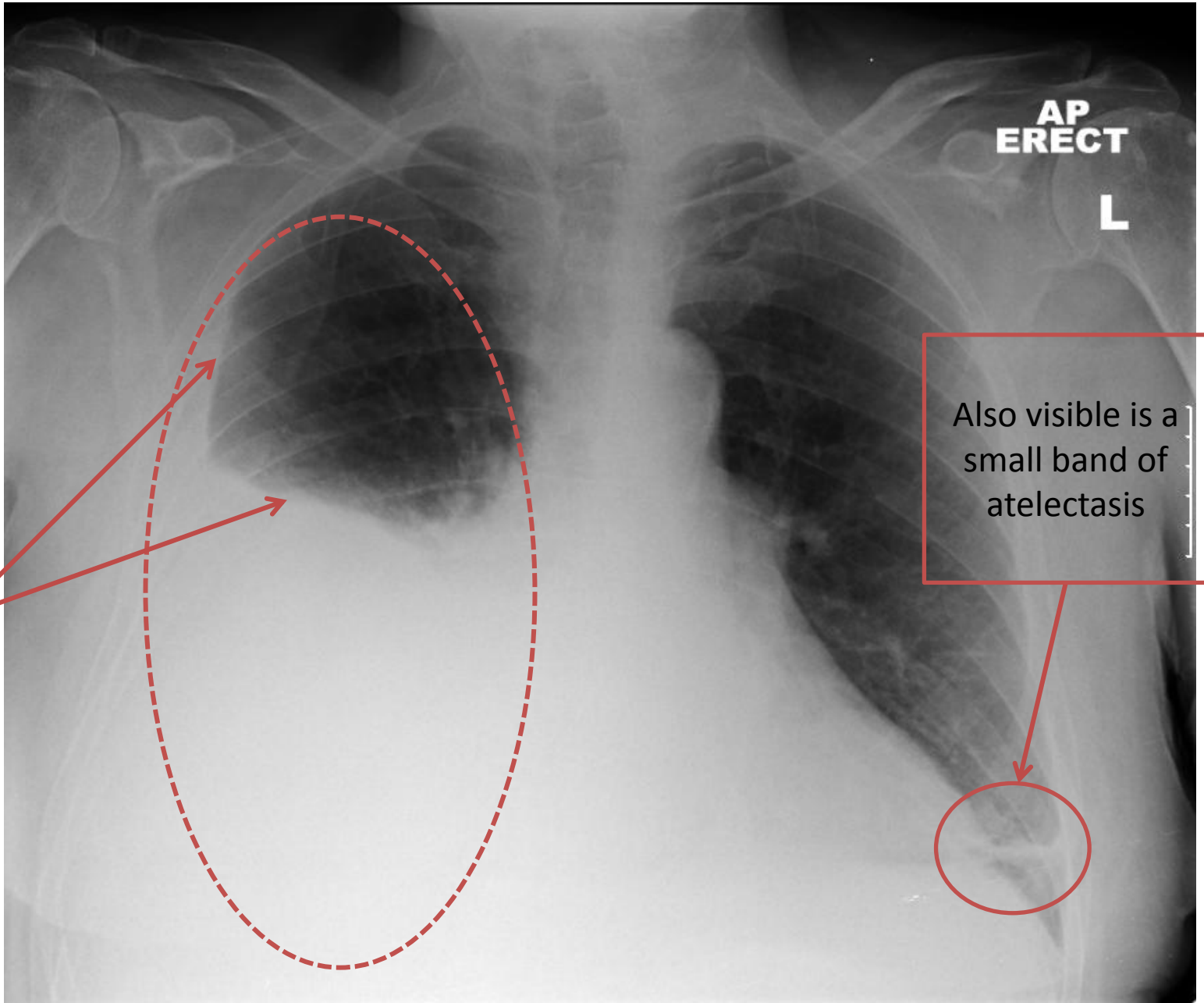
X Consolidation

X Pneumothorax

X Cardiomegaly

Plus bonus points for the smaller abnormality on the left.... small band of atelectasis (collapse)

WHAT IS THE MAJOR ABNORMALITY ON THIS X-RAY



Fluid
meniscus

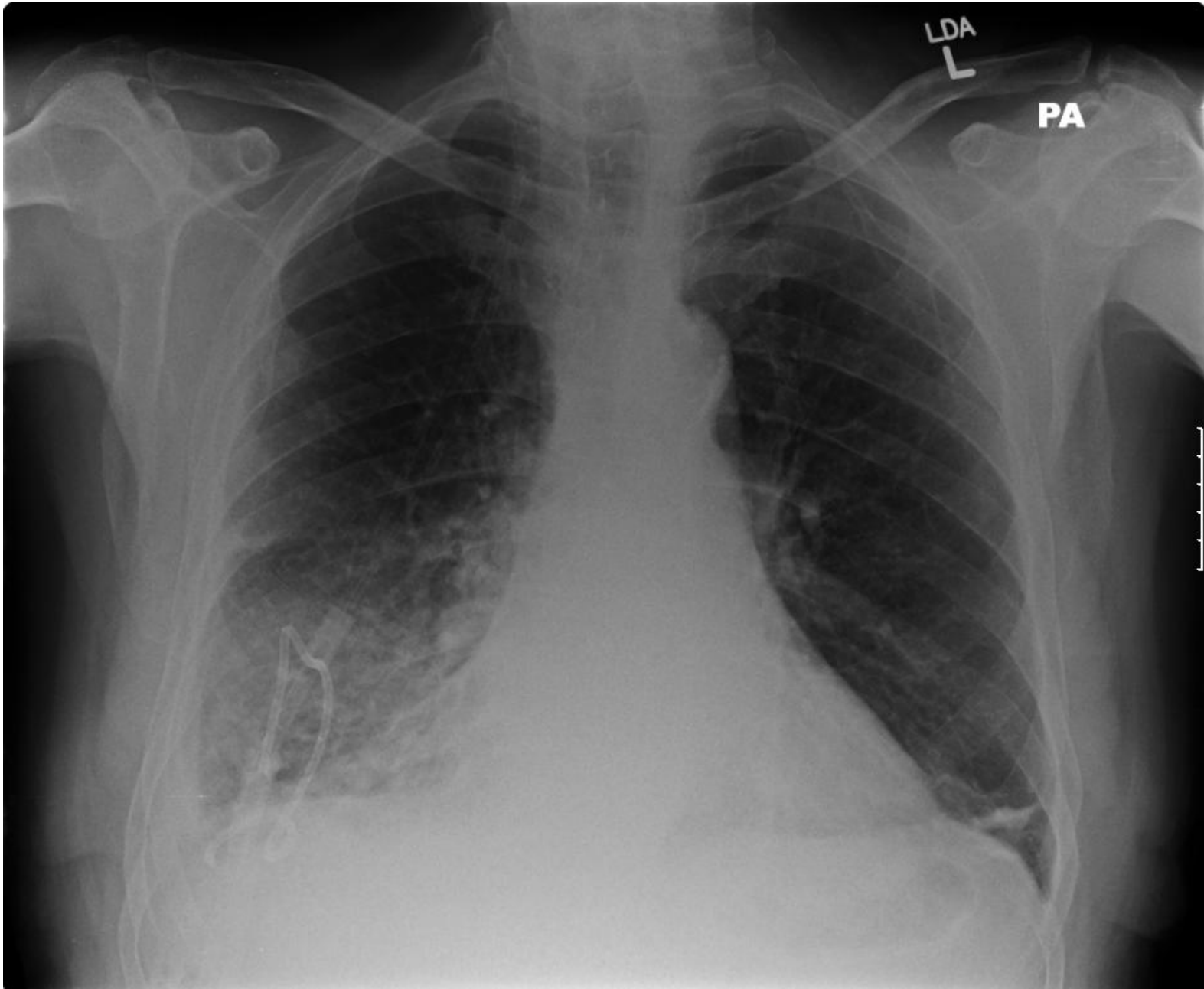
Also visible is a
small band of
atelectasis

TREATMENT

- A chest drain was inserted and 3475ml was drained from the patient's chest
- A repeat chest x-ray was taken....

Q 1. WHAT DOES THE X-RAY SHOW

Q 2. WHAT HOSPITAL KIT IS VISIBLE ON THIS X-RAY



Q1. WHAT DOES THE CHEST X-RAY SHOW?

SELECT ALL THAT APPLY

- Effusion completely resolved
- Small effusion on the right
- Consolidation
- Mass
- Pneumothorax

Q2. WHAT HOSPITAL KIT IS VISIBLE ON THE X-RAY?
SELECT ALL THAT APPLY

- NG tube
- ET tube
- Chest drain (atypical location)
- Nasal cannula
- Pacemaker

Q1. WHAT DOES THE CHEST X-RAY SHOW?

SELECT ALL THAT APPLY

X Effusion completely resolved

✓ Small effusion on the right

✓ Consolidation

X Mass

X Pneumothorax

Q2. WHAT HOSPITAL KIT IS VISIBLE ON THE X-RAY?
SELECT ALL THAT APPLY

X NG tube

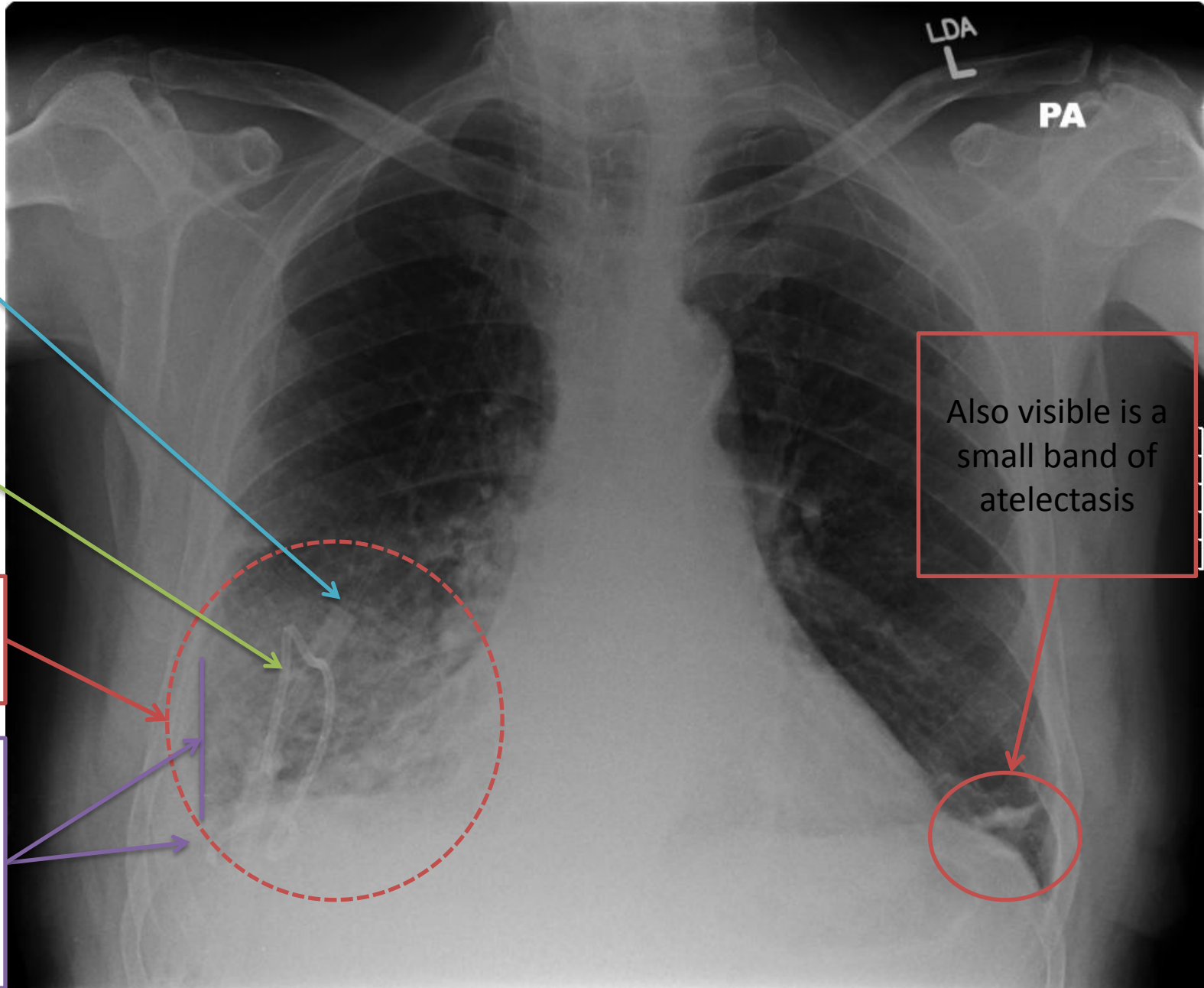
X ET tube

✓ Chest drain (atypical location)

✓ Nasal cannula

X Pacemaker

Q 1. WHAT DOES THE X-RAY SHOW
Q 2. WHAT HOSPITAL KIT IS VISIBLE ON THIS X-RAY



NG Tube

Chest drain

Area of consolidation

Loss of R costophrenic angle. Fluid meniscus.

Also visible is a small band of atelectasis

WHAT IS THE LIKELY UNDERLYING CAUSE OF THE PATIENT'S EFFUSION

PUT THE X-RAY TOGETHER WITH THE HISTORY

- Pneumonia
- Lung cancer
- Trauma (haemothorax)
- Mesothelioma
- Meig's syndrome

WHAT IS THE LIKELY UNDERLYING CAUSE OF THE PATIENT'S EFFUSION

PUT THE X-RAY TOGETHER WITH THE HISTORY

✓ Pneumonia

X Lung cancer

X Trauma (haemothorax)

X Mesothelioma

X Meig's syndrome

The patient's 3 week history of a cough productive of yellow sputum is suggestive of pneumonia.

There is no history of weight loss or any other signs of malignancy and no history of trauma.

Meig's syndrome is a right sided pleural effusion with an ovarian tumour (very unlikely in a male patient!).

THE PATIENT IS ALLERGIC TO PENICILLIN.

WHICH ANTIBIOTIC(S) WOULD BE SAFE TO USE TO TREAT HIS PNEUMONIA?

- Amoxicillin
- Tazocin
- Gentamicin
- Co-amoxiclav
- Augmentin
- Clarithromycin
- Benzylpenicillin

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WHICH ANTIBIOTIC(S) WOULD BE SAFE TO USE TO TREAT HIS PNEUMONIA?

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X Tazocin

X Ampicillin

X Co-amoxiclav

X Augmentin

✓ Clarithromycin

X Flucoxacillin

Clarithromycin is the only safe antibiotic for treating penicillin allergic patients on this list.

All of the other antibiotics contain penicillins.