



Round : Radiology

Group no : A4

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CHEST IMAGING

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CHEST IMAGING

□ Chest imaging remains major component of diagnostic radiology.

□ The chest x-ray is the most commonly performed diagnostic x-ray examination.

□ A chest x-ray makes images of the heart, lungs, airways, blood vessels and the bones of the spine and chest.

Primary study » you may need other studies

Vertebra, lungs, shoulder joint

bone metastasis ممكن اشوف

thyroid or breast cancer من

→ Women x-ray we can see breast shadow on both sides

Anatomy of the lungs

The Right lung is larger than the left, because most of the heart encroaches on the left lung

□ The right lung has three lobes:

upper lobe -

Middle lobe -

Lower lobe -

□ The left lung has two lobes:

upper lobe-

lower lobe -

Anatomy of the lungs / 2

Adjacent lobes are separated by an interlobar fissure

↓ ك normal variation ممكن يكون فيه minor

fissures ب اي وحدة من ال lungs ممكن

يكون superior or inferior زيادة

In the right lung

- ❑ The **minor (transverse) fissure** separates the upper lobe from the middle lobe.
- ❑ The **major (oblique) fissure** separates the upper and middle lobes from the lower lobe.

In the left lung:

- ❖ The major or oblique fissure separates the upper lobe from the lower lobe.

ال segments ببينوا على ال CT و مهم تحفظوهم للفاينال

Segmental anatomy

Segments of the right lung

:Upper lobe segments

- Apical segment
- Anterior segment
- Posterior segment

Middle lobe segments

- Lateral segment
- Medial segment

و انت تقرا اي X-ray انت مش بس لازم تحدد انه في pathology لازم كمان تعمله localization و تكون دقيق (و هاد الحكي عليه نص علامة الجواب بالامتحان بكل المحاضرات)

بال X-ray ما ببينوا ال fissures ولا ال segments تاعت ال lung ف بالتحديد بنحكي upper, middle, lower zone

Segmental anatomy / 2

:Right lower lobe segments

- Superior segment
- Medial basal
- Anterior basal
- Lateral basal
- Posterior basal

Segmental anatomy / 3

:Left lung segments

Upper lobe

- Apical posterior segment
- Anterior segment
- Superior lingular segment
- Inferior lingular segment

The lingular segment in the left lung is
.similar in position to the right middle lobe

Segmental anatomy / 4

:Left lower lobe segments

- Superior segment
- Medial basal
- Anterior basal
- Lateral basal
- Posterior basal

Routine plain chest radiography:

كل صورة X-ray لازم تتصور من ٢ views

- ❖ Postero-anterior view (PA)
- ❖ Lateral view.

□ The term **PA** refers to the **direction of the x-ray beam which traverses the patient from posterior to anterior.**

✚ لا تصور PA لازم المريض يعمل abduction لل shoulder قد ما يقدر عشان تبعد ال scapula بعيد عن ال lung field



PA chest radiography is preferred to AP, why ?

- ❑ Less magnification of the heart.
- ❑ More lung fields are visualized.
- ❑ The PA projects the scapula away from the lung fields.
- ❑ The apices of the lungs are closer to the film in the PA and appear more clear.

Other plain chest radiography:

Antero-posterior view (AP) → Frontal

- **very ill patients who are unable to stand.** → زي مرضى ال ICU بنصوره على سريرهم زي ما هم

بالعادة ال X-ray بنصورها during

- **infants and small children.**

ال inspiration بنحكي للمريض

ياخد deep breath بعدين بنصوره،

Inspiration-expiration films

ما عدا الحالتين هدول بنصوره

during inspiration and expiration

- **suspected bronchial foreign body aspiration.**
- **suspected small pneumothorax.**

Before reading the x-ray film, the following should be checked

مهم عشان اتأكد انه المريض الصح اولاً و ثانياً في امراض بتتعلق ب اسامي عائلات معينة

Request form. 1

- name, age, sex and date

- clinical information

:Technical factors. 2

- markers

- centering (patient position)

- degree of inspiration

- exposure (penetration)

بين من عدد ال ribs ال ribs anteriorly يكونوا oblique ولازم

يكون عددهم ٦ او اكثر مش متعددين نص الحجاب الحاجز، اما

posteriorly يكونوا horizontal ولازم بين منهم ١٠ او اكثر

Skeletal maturation (growth plate)

Breast shadow

مثلاً مريض عنده lung contusion نتيجة trauma بتبين على ال X-ray

زي ال consolidation تاعت ال pneumonia ف الاشوي الوحيد الي

بخليني اميز بينهم هي ال medical data الهستوري يعني

Malrotation » difference in lung densities

يعني في lung راح يكون سوادها اكثر من الثانية فمممكن تفكر

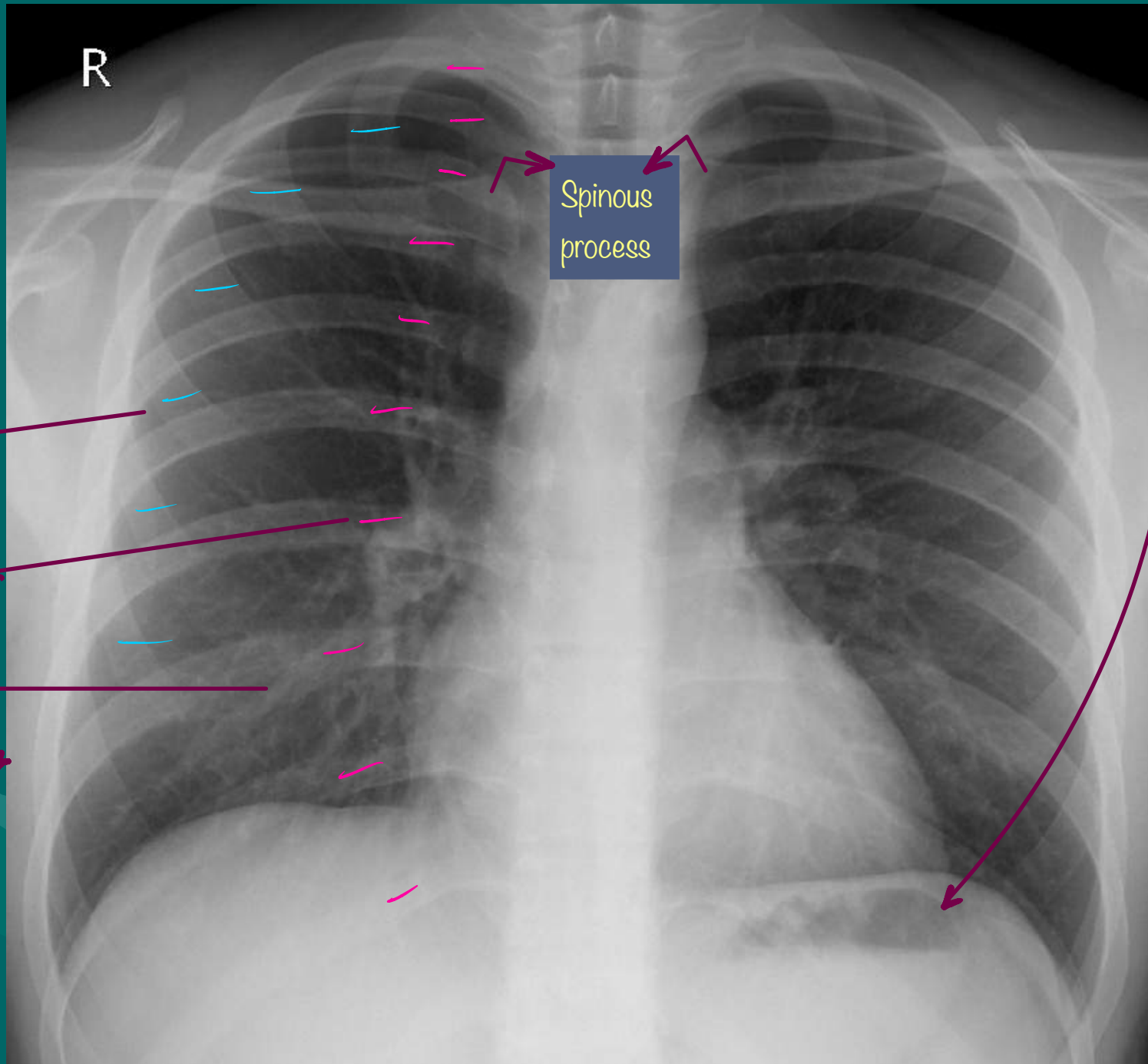
السودة انها pneumothorax او الي على بياض انها pneumonia

ال optimal exposure يكون ال vertebral disc

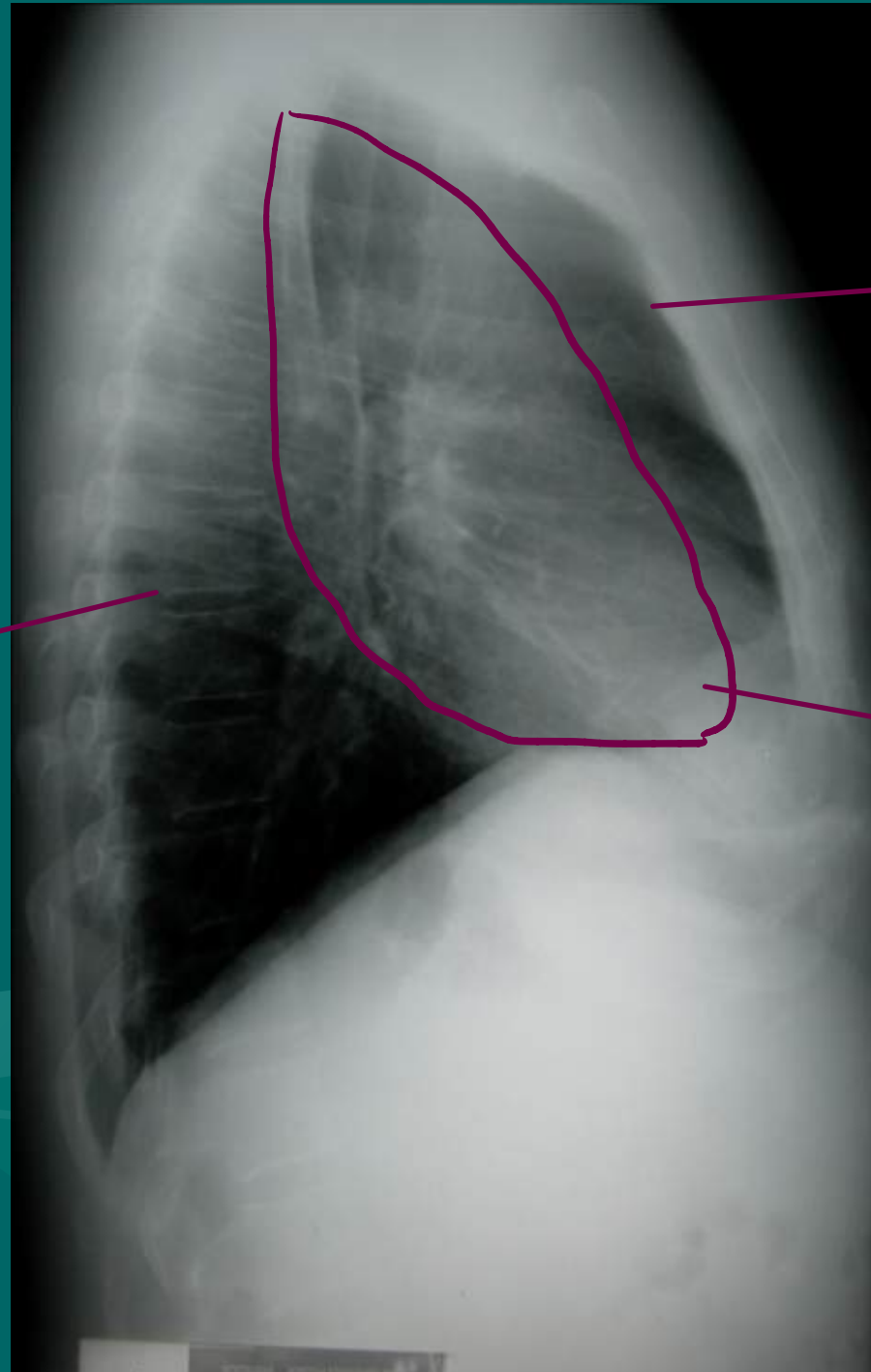
and body يا دوب مبيين، اذا كانوا كثير

واضحين بتكون الصورة under exposure

كيف يعرف انه
 الصورة مأخوذة
 centrally بقيس
 المسافة من ال
 spinous process
 medial end of the
 clavicle لازم يكونوا
 قد بعض
 Anterior ribs
 Posterior ribs
 هذول اسمهم
 vascular marking
 هاد normal هيكل، اذا
 ما كانوا مبيينين
 الصورة بتكون over-
 exposure



لازم ال heart
 يكون بالنص، ال
 apex towards
 the left و جزء
 منه يكون على ال
 right side
 لازم اشوف gastric
 bubble على ال
 right .. left
 hemi-diaphragm
 يكون اعلى من ال
 left ب 1.5 - 2 cm
 عشان ال liver



✦ ال space الي امام ال

pericardium هو ال
anterior mediastinum

✦ ال space الي خلف ال

pericardium هو ال
posterior mediastinum

✦ هاد هو ال pericardium او بنحكي عنه

ال middle mediastinal space بحتوي
على ال great vessels

PNEUMONIA

- Is an inflammation of the lung, which can be caused by a variety of micro-organisms, including bacterias, viruses, and fungi.
- Lobar pneumonia: inflammation confined to a lobe of the lung.
- Bronchopneumonia: refers to bilateral multifocal areas of consolidation.
→ Inflammation » fluid » area of opacity

Pneumonia can be classified into:

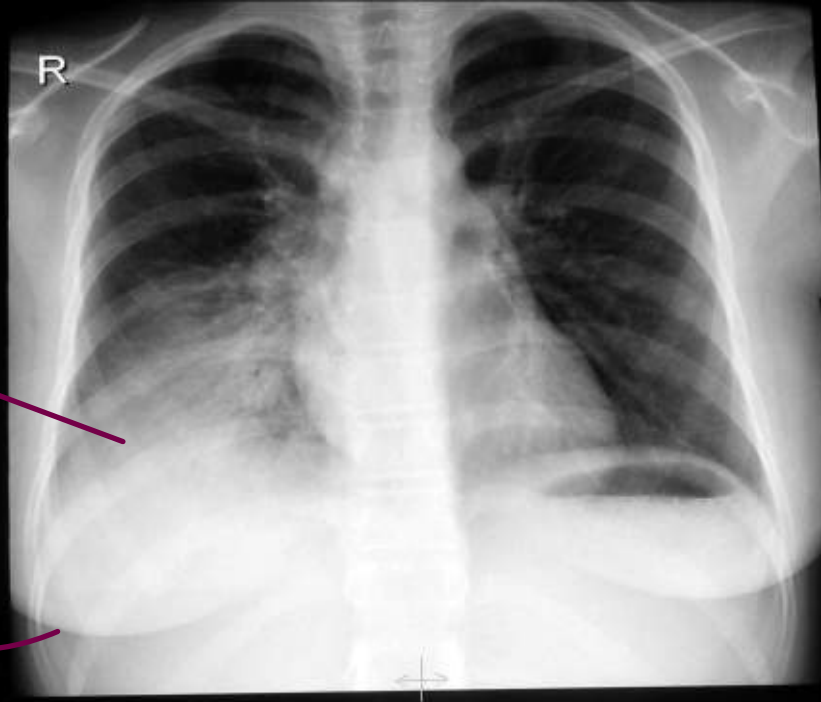
- ❖ **Primary pneumonia** : arising in a normal lung.
- ❖ **Secondary pneumonia** → Mass or congenital anomaly
result of a disease or abnormality already present in the lung.

Pneumonia / 2

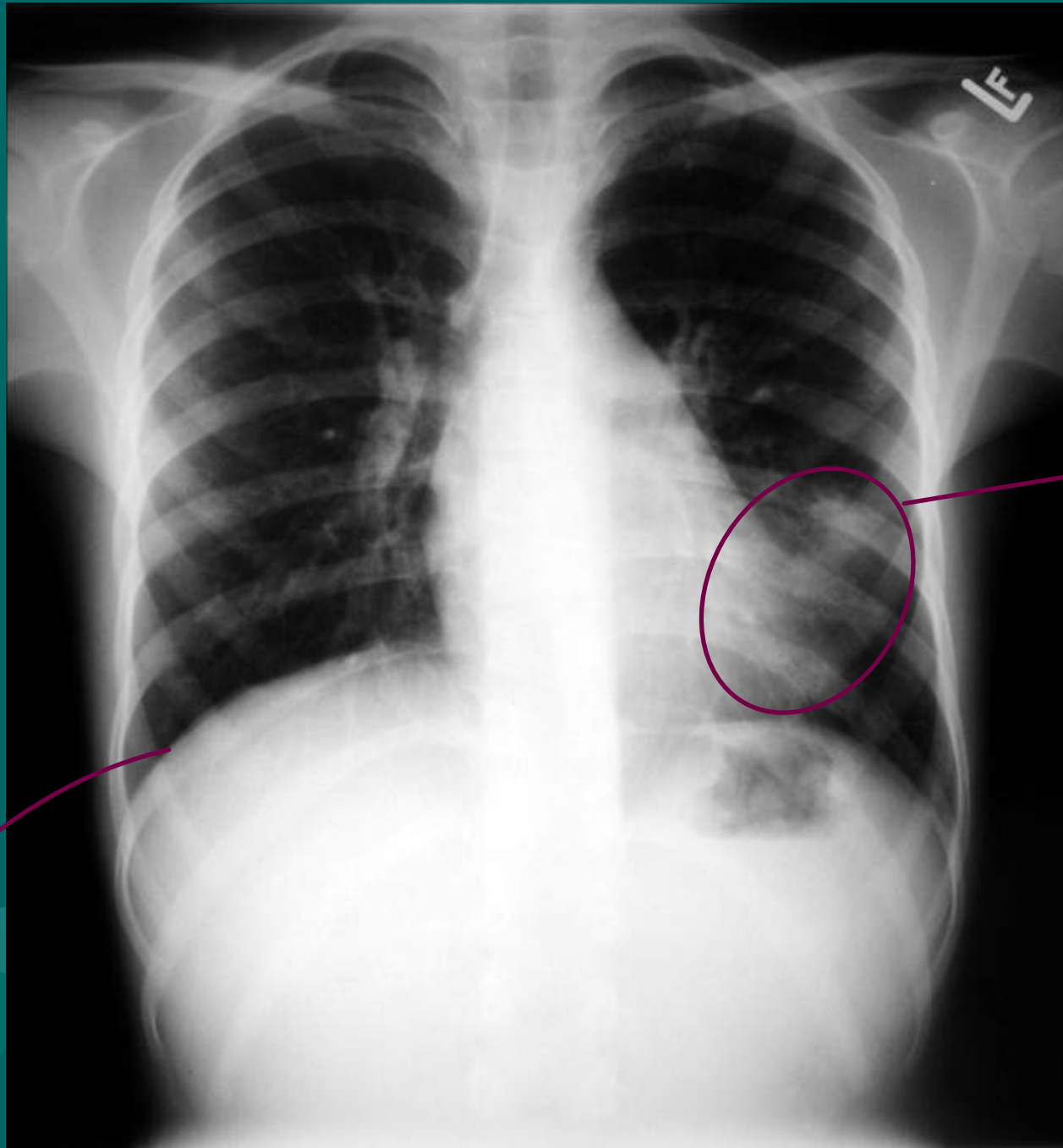
- ❖ With treatment most types of bacterial pneumonia can be resolved within 2 weeks. → In case of primary pneumonias
- ❖ Viral pneumonia may last longer.
- ❖ Mycoplasmal pneumonia may take 4 weeks to resolve completely.
- ❑ What examinations should be considered in patients with pneumonia that does not resolve as promptly as it should ?
 - CT scan
 - Bronchoscopy

✦ Area of opacity in
right lower zone

✦ Breast shadow

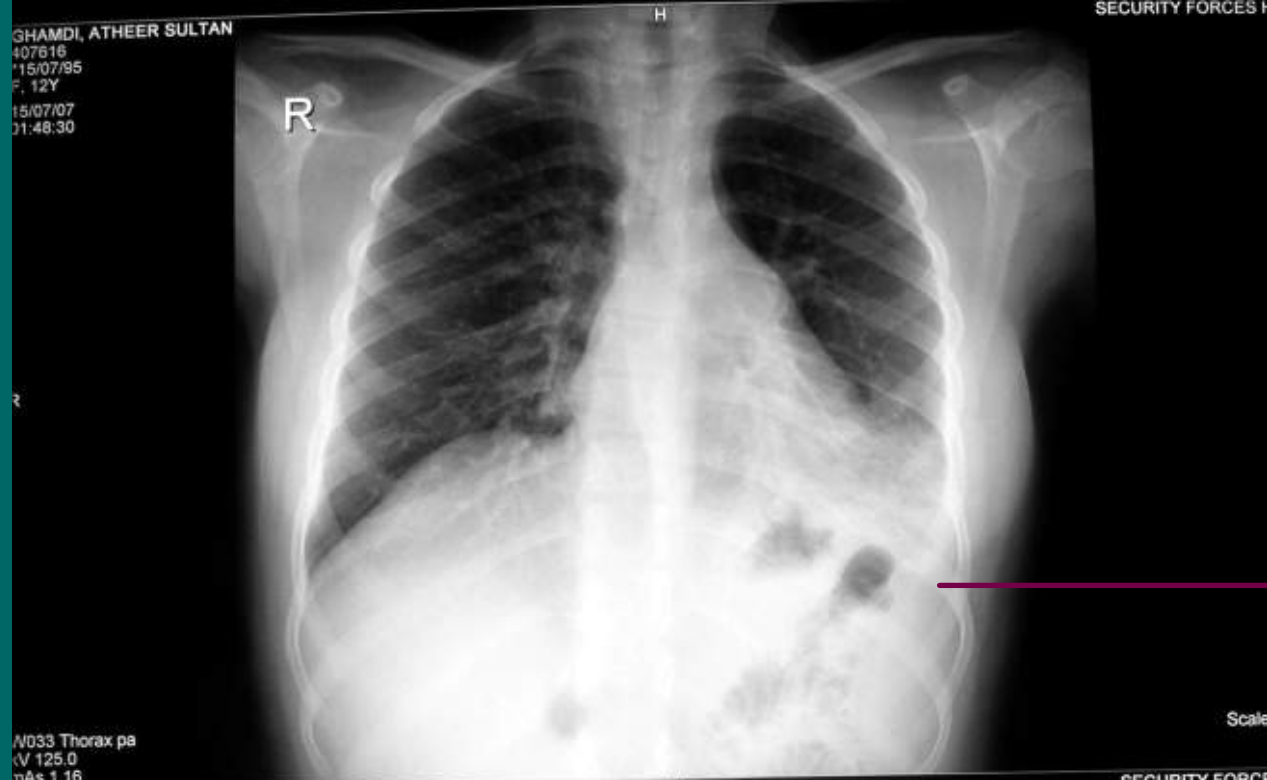


✦ Over-exposure



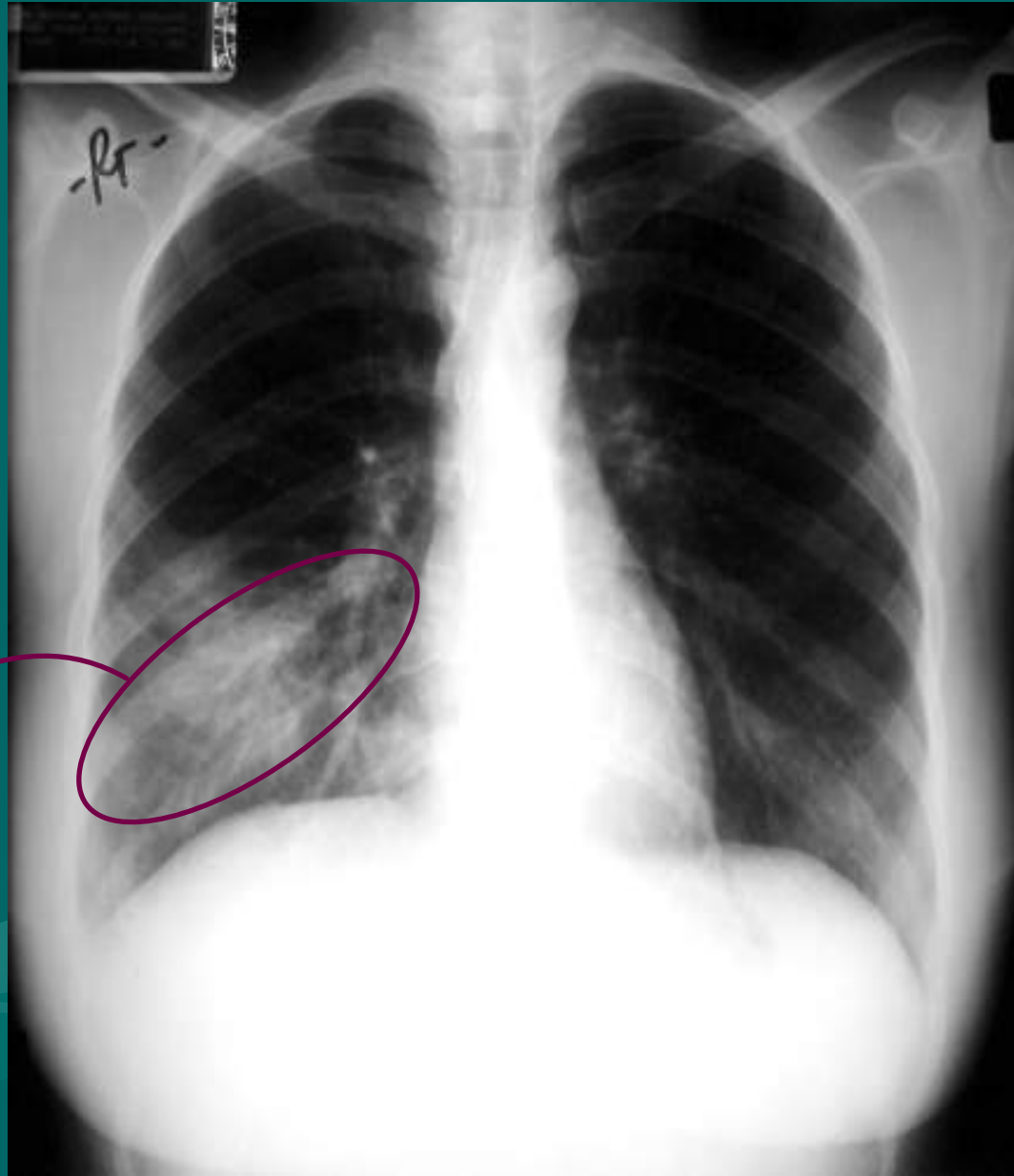
✦ Opacity in left side

✦ ارتفاع ال diaphragm
على اليمين بزيادة عن
الشمال هو طبيعي و
بكون بمقدار 1.5-2 cm



Opacity in left
lung, lower zone





✚ Opacity in lower zone
of right side lung

✦ Bronco Pneumonia
↓
Bilateral opacity





✦ Over-exposure

✦ Finding » left white lung

✦ Left sided lung
pneumonia



Finding » right white lung

Pulmonary collapse

✦ Epsi-lateral shifting

- ❖ Pulmonary collapse or atelectasis refers to a decrease in volume of a lung, lobe or segment.
- ❖ Obstruction to flow of air is the most common cause of collapse.
- ❖ Air in the alveoli is absorbed and because no further air enters the alveoli distal to the obstruction, the lung tissue collapses and becomes more opaque

Pulmonary collapse / 2

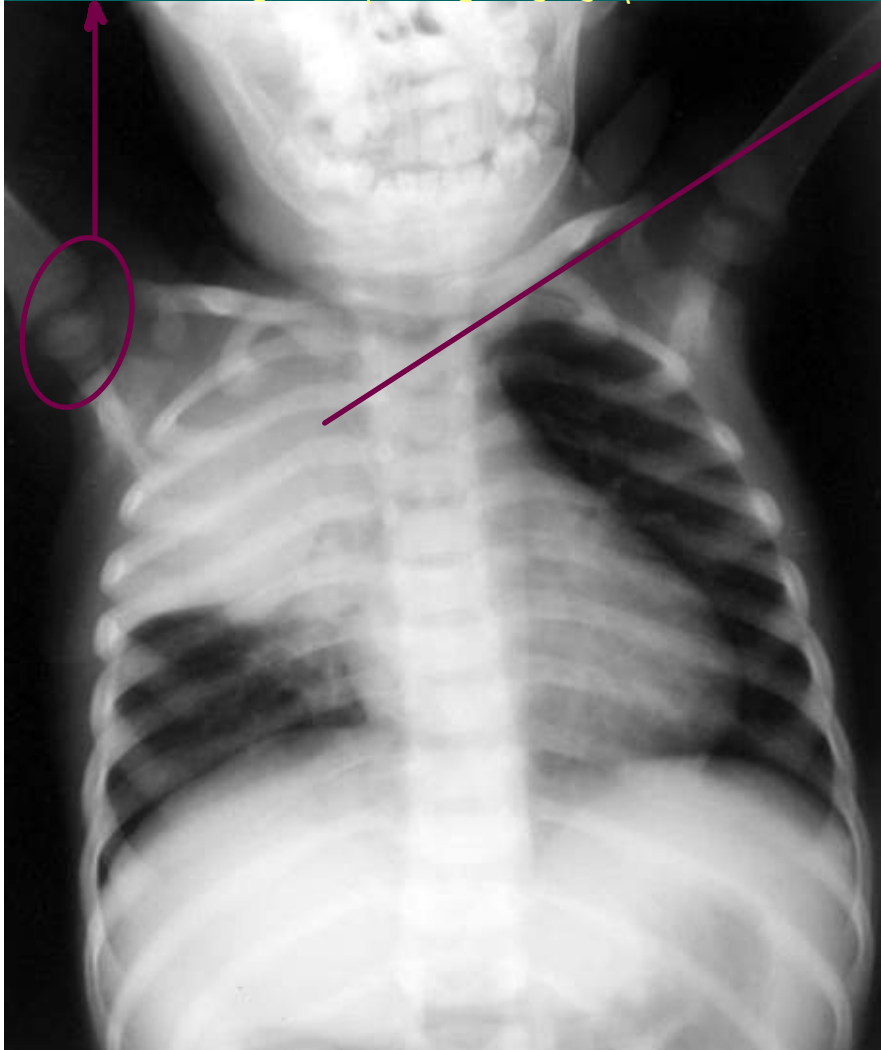
- ❑ Common causes of bronchial obstruction causing collapse:
- ❑ Bronchial carcinoma → Most common cause in adults
- ❑ Mucus plug (pneumonia, postoperative).
- ❑ Foreign body. → Most common cause in children
- ❑ Inflammatory bronchial disease (bronchial tuberculosis).
- ❑ Extrinsic compression of airway by tumor or enlarged lymph nodes.

✦ Decreased in size of affected lung

✦ Homogenous opacity → دائما حدها بكون على ال fissure

✦ We can see growth plate (young age patient)

✦ Condensed » there's no air



Emphysema

هون ال lung يكون يدخل فيها هوا
زيادة فبتكون more translucent
بتشبهه over exposure

- Is an increase in the size of the air spaces distal to the terminal bronchioles, with dilatation or destruction of their walls.
- The lung appear more translucent with reduction in size and number of the small vascular markings.
- The diaphragms are low and flat.
- The heart shadow is long and narrow.
- The postero-anterior diameter of the chest is increased in the lateral view resulting in barrel chest.

✦ Vascular marking are not showing



Low flat diaphragm

✦ Mediastinum long and narrow

Pleural effusion

✚ Normally fluid = 15 -20 ml

Is fluid collection in the space between the parietal and visceral layers of the pleura, usually contains .serous fluid, but may have differing contents

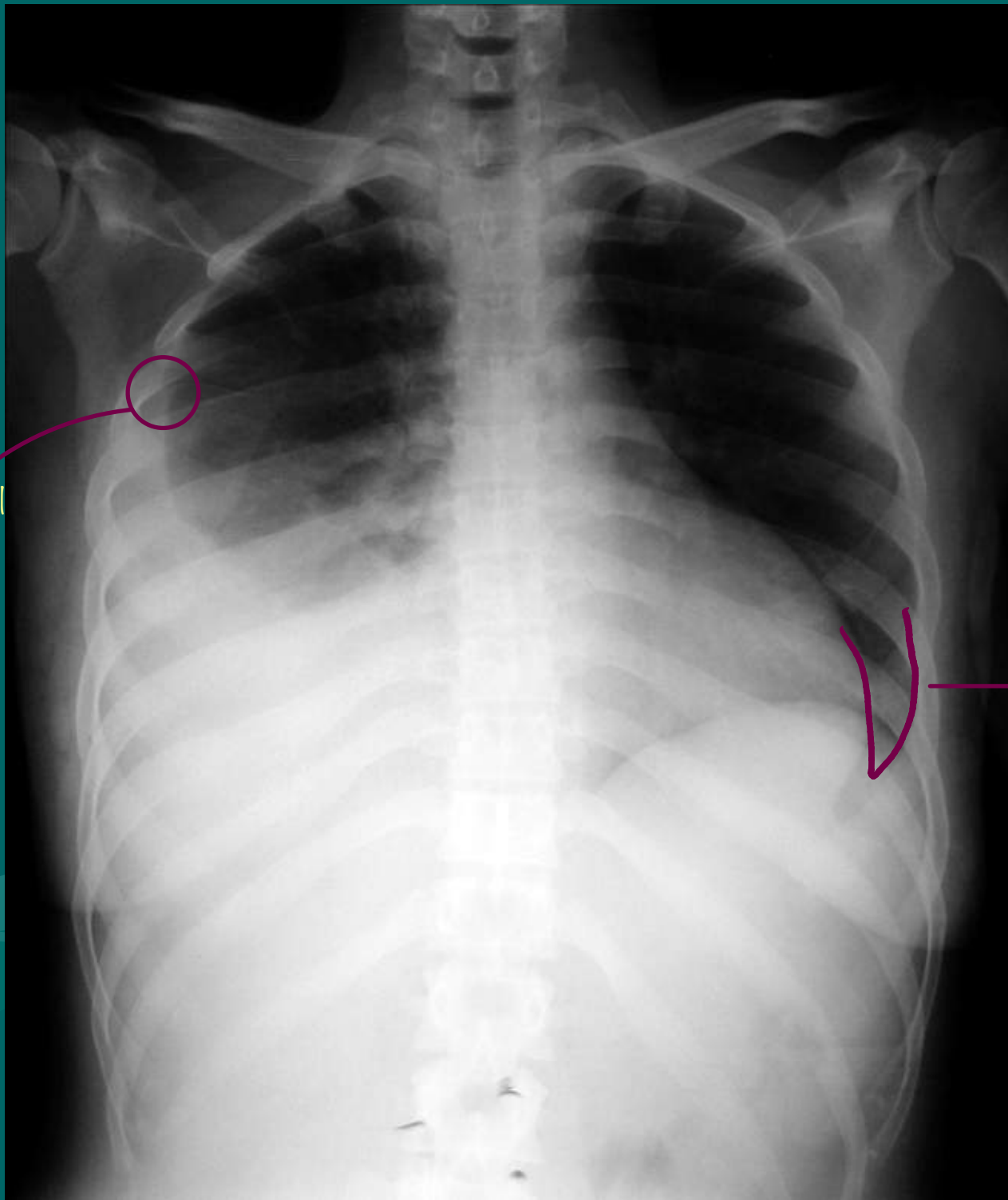
1. Haemothorax: blood, usually following trauma- -
2. Empyema: purulent fluid (pus)- -
3. Hydropneumothorax: fluid and air- -

Pleural effusion / 2

Radiological features of pleural effusion on a chest x- ray

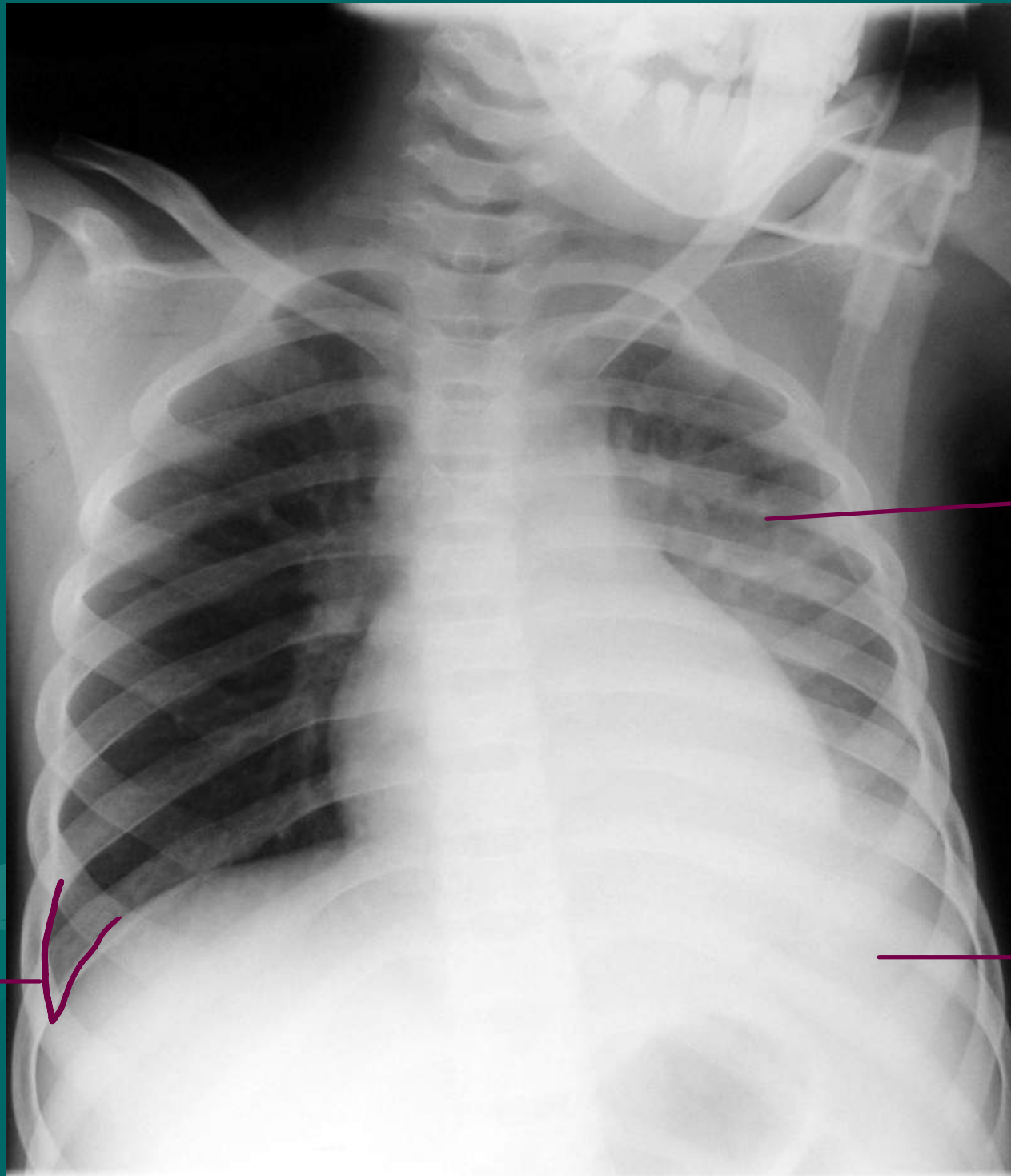
- Homogeneous opacification.
- Loss of the diaphragm outline.
- No visible pulmonary or bronchial markings.
- Concave upper border which appear higher laterally.
- blunting or obliteration of the costophrenic angle.

لأنها اوطى بمكان بال chest cavity فبيلش تجمع السوائل منها و بيلش يطلع لفوق



Laterally higher than medial

Angle



Pneumonia

Pleural effusion

Angle

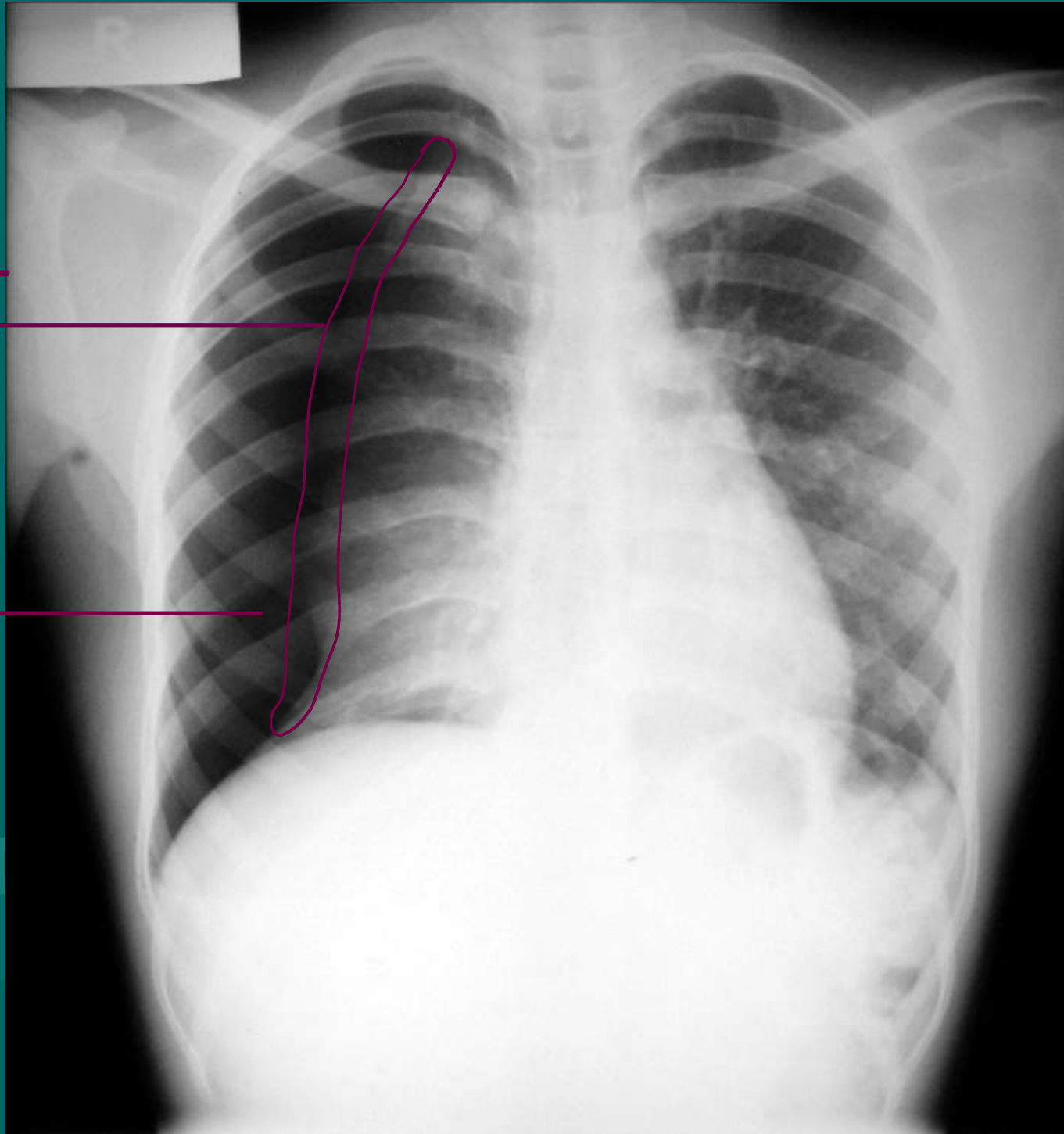
Pneumothorax

- Is the presence of free air in the pleural space, by a tear in either the parietal or visceral pleura.
- The most common cause of pneumothorax is chest injury, but the most common cause of spontaneous pneumothorax is rupture of sub-pleural emphysematous bullae (bleb).

Radiological features of pneumothorax

- Lung edge: a thin white line at the lung margin, represent the visceral pleura.
- Absent lung markings between the lung edge and chest wall.
- Mediastinal shift: occur when a tension pneumothorax develops. 

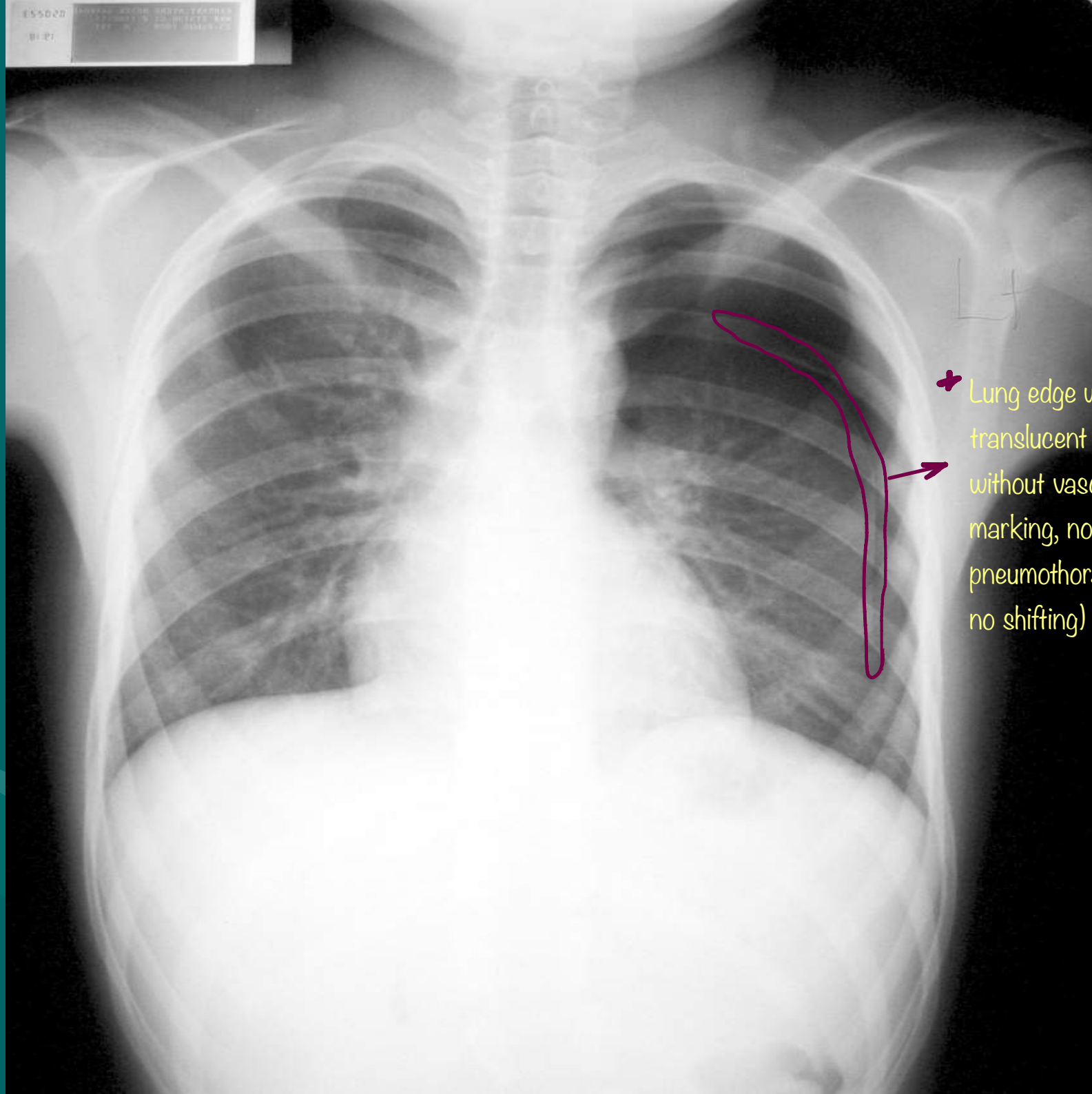
✦ Diagnosis » right sided tensional pneumothorax



هون ظاهرة ال lung
edge الي هي حدود
ال visceral pleura

✦ Air without
vascular marking

✦ جزء من القلب لازم
يكون مبين على
اليمن .. هون بالصورة
مش مبين يعني صارت
tensional
pneumothorax عشان
ال shifting



+ Lung edge with translucent area without vascular marking, non-tensional pneumothorax other's (no shifting)

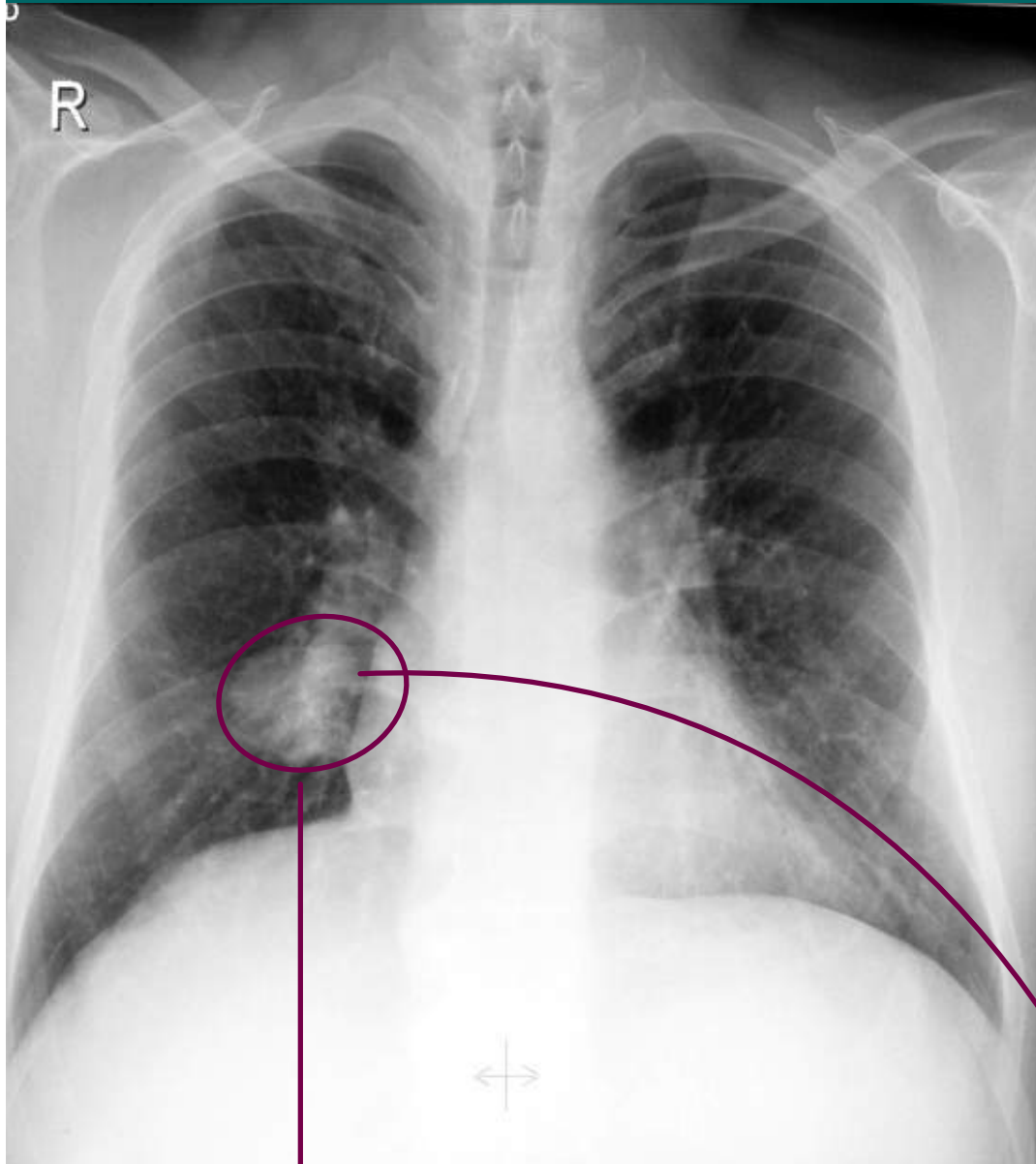
WHAT IS SOLITARY PULMONARY ?NODULE

- It must be nodular or roughly spherical.
- Not larger than 3cm in diameter.
- About 40% of solitary pulmonary nodules are malignant.
- A nodule is assessed for its:
 - size ✦ Multiple nodules = metastasis
The larger the nodule, the greater the likelihood of malignancy.
 - Margins
Irregular contour or spiculated margins increase the probability of malignancy
 - Calcification
The presence of calcification within a nodule are in favor of benign lesion.

CAUSES OF SOLITARY PULMONARY NODULE

- Bronchial carcinoma.
- Metastasis.
- Hamartoma.
- Bronchial adenoma.
- Granuloma.
- Abscess.
- Hydatid cyst.
- Bronchogenic cyst
- Arterio-venous malformation.
- Rheumatoid nodule.

✚ Frontal



✚ Central, solitary, regular mass in lower zone of right lung

✚ Lateral



✚ في خط/سواد يفصل بين ال mass و ال mediastinum

مخبر مطوية



THE MEDIASTINUM

The mediastinum is situated between the lungs and extends from the thoracic inlet superiorly to the diaphragm inferiorly.

The mediastinum is divided into three parts:

1- Anterior mediastinum

Is the space in front of the anterior pericardium and trachea.

2- Middle mediastinum

Lies within the pericardial cavity.

3- Posterior mediastinum

Lies behind the posterior pericardium.

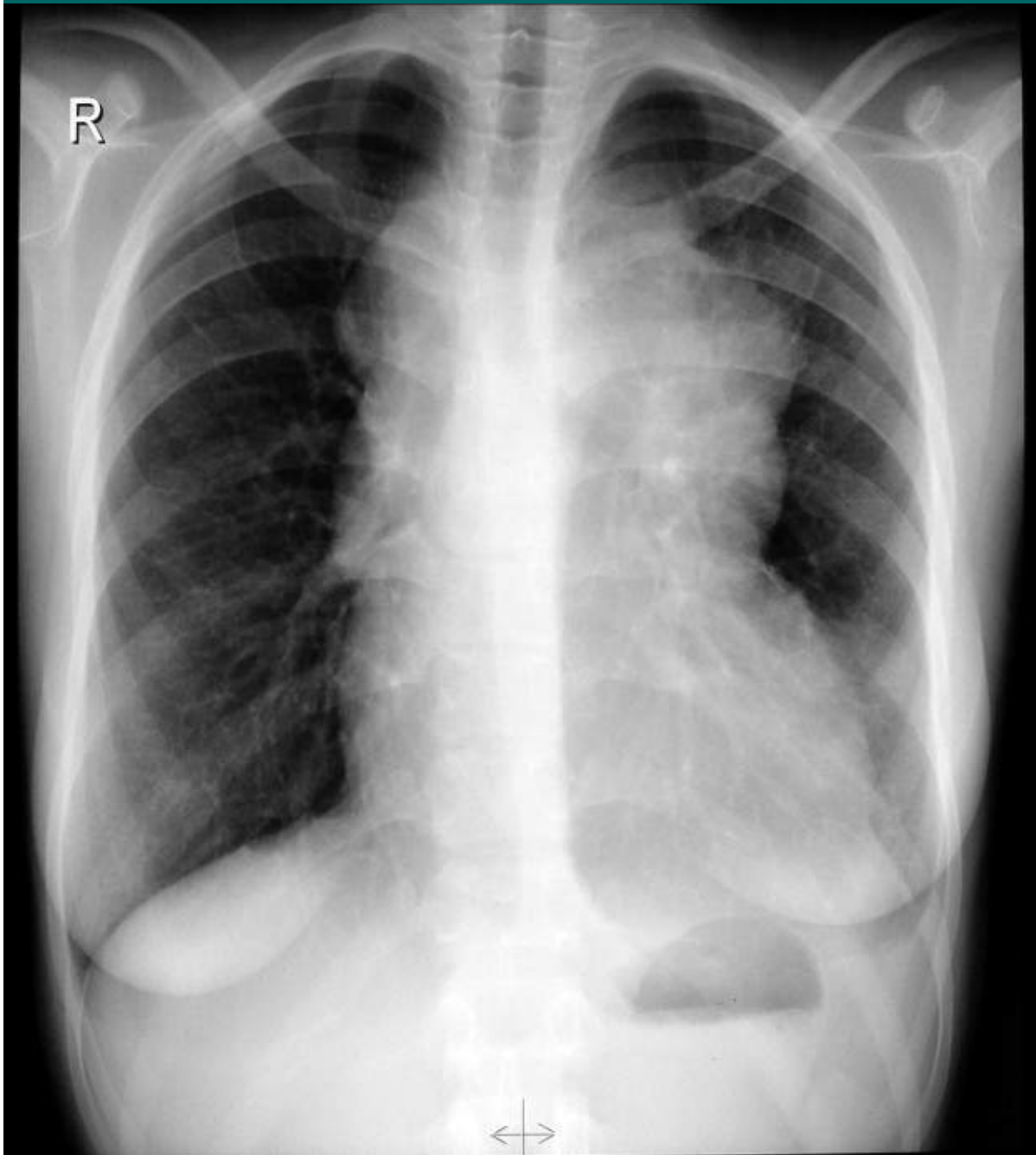
ANTERIOR MEDIASTINAL MASSES

- Lymphoma.
- Thyroid (Retrosternal goiter).
- Teratoma.
- Thymic tumor.
- Pericardial cyst.
- Diaphragmatic hernia (morgagni hernia).



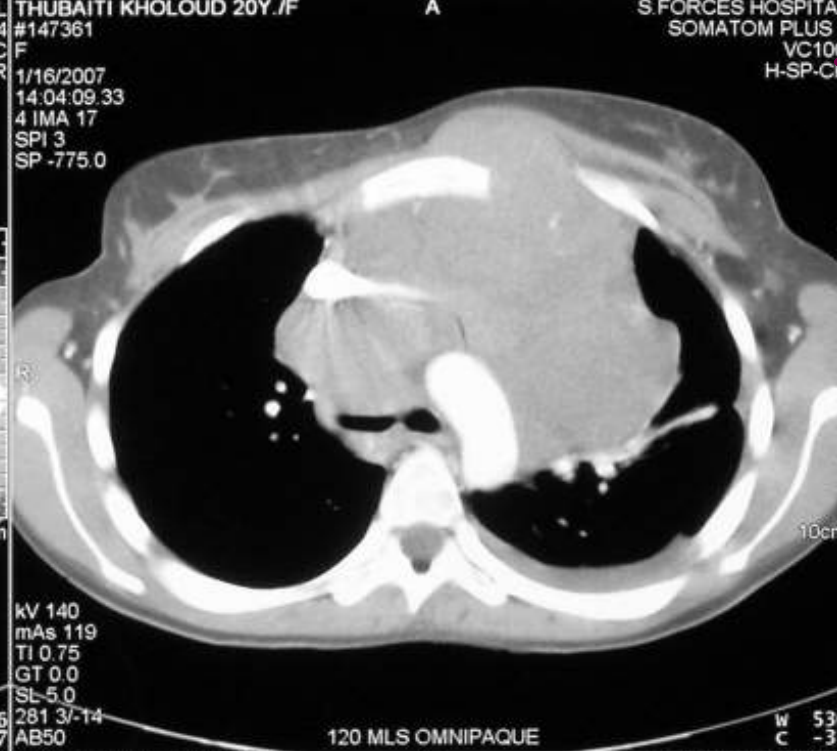
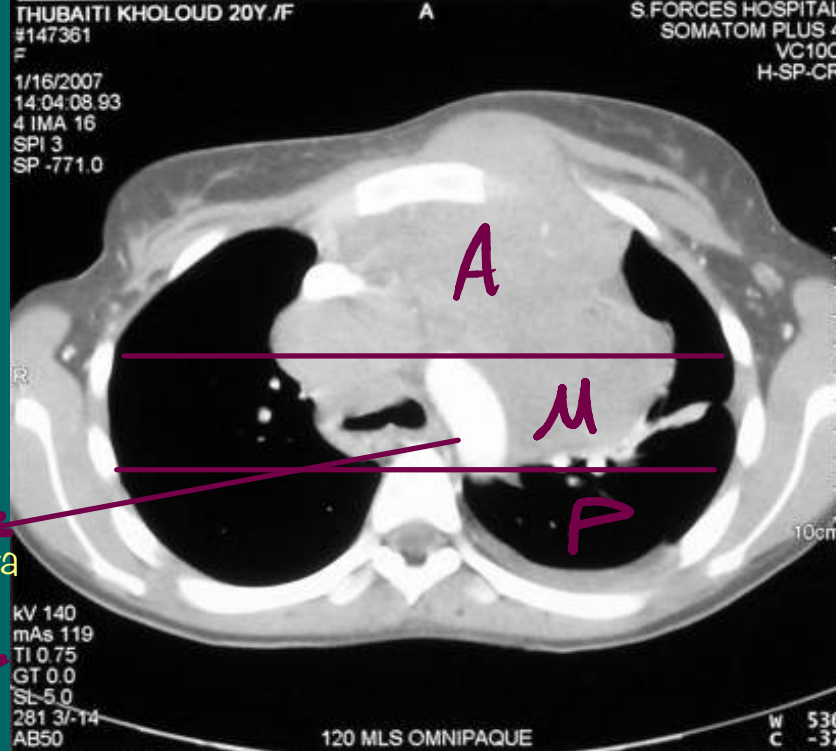
MIDDLE MEDIASTINAL MASSES

- Lymph node enlargement:
 - lymphoma
 - primary tuberculosis
 - sarcoidosis
- Bronchogenic cyst.
- Aneurysm of aortic arch.



+ Middle and anterior





With contrast

Arch of aorta

اي اشي

على نفس

مستوى ال

arch بكون

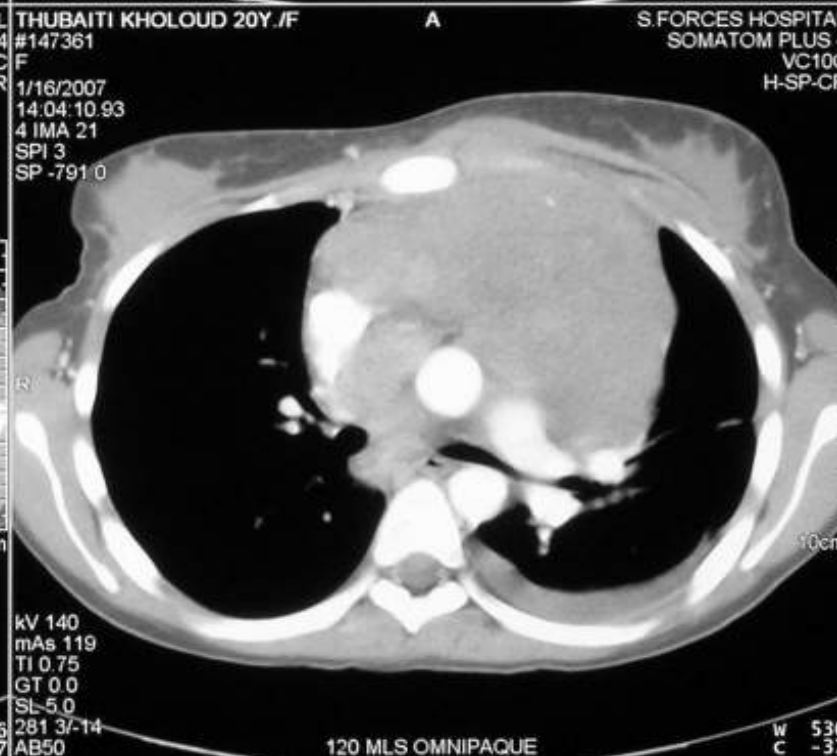
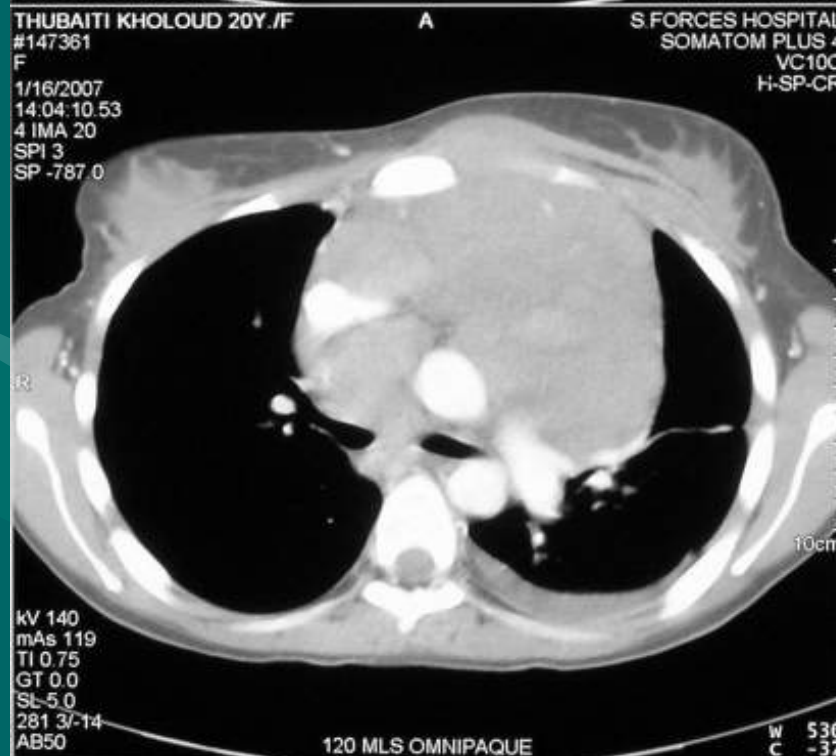
اي middle

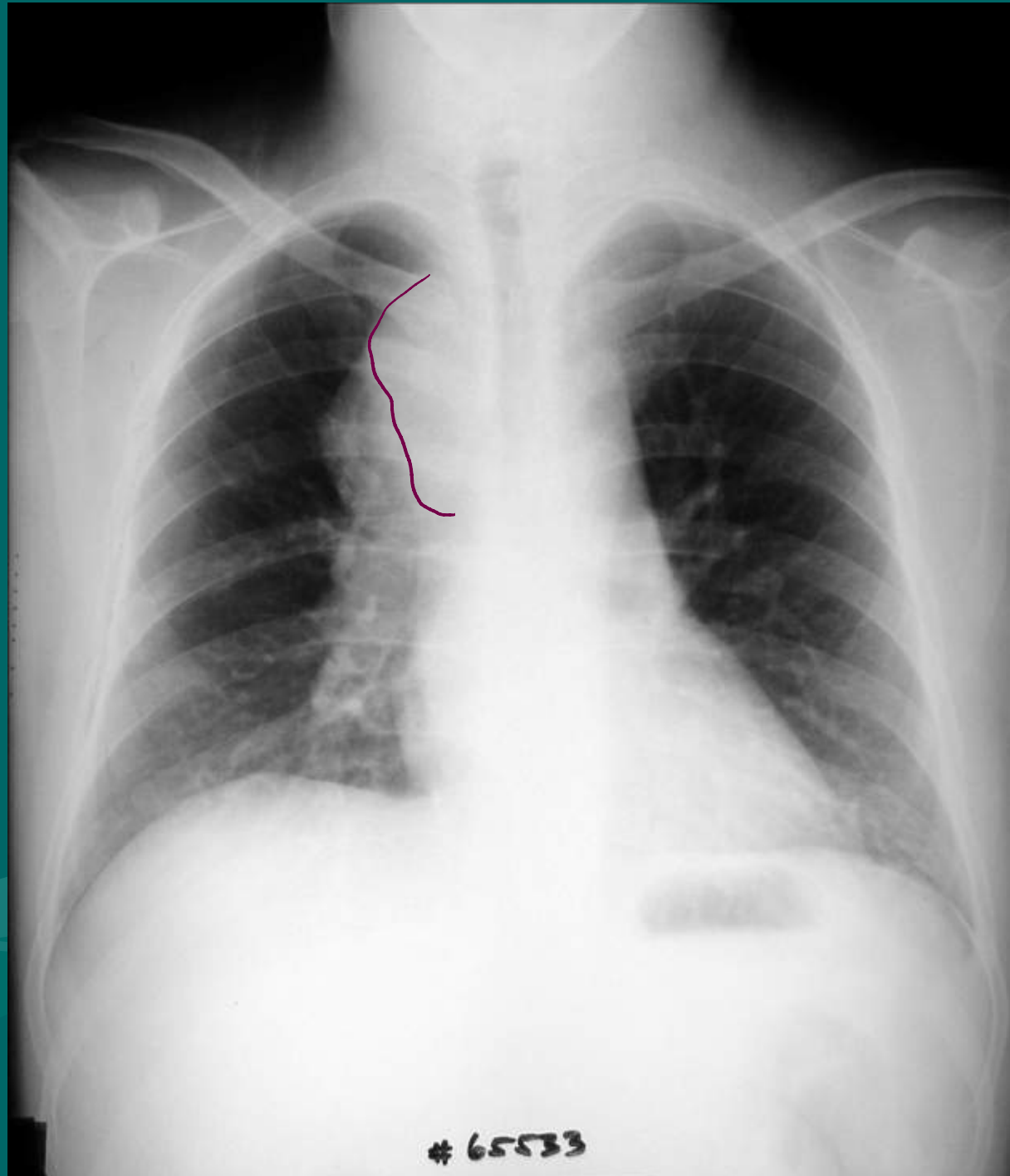
اشي قدامه

اي anterior

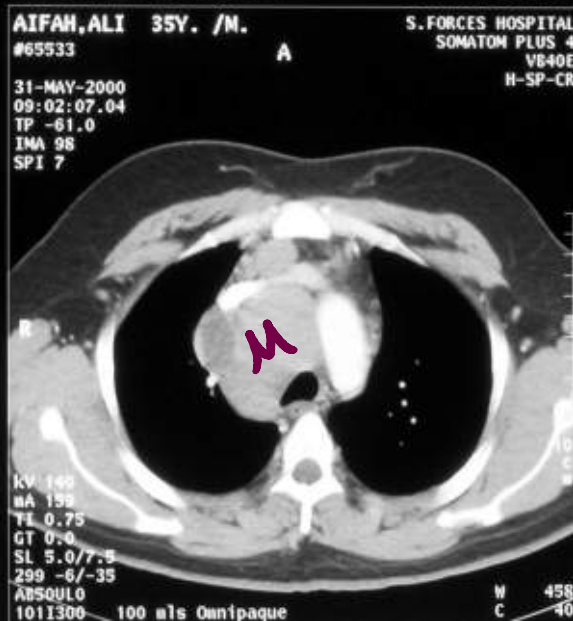
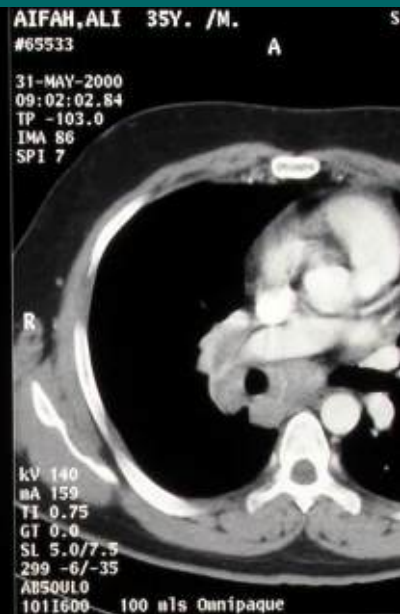
اشي وراه

posterior





+ ما بييجي زي هيل جالا متعان



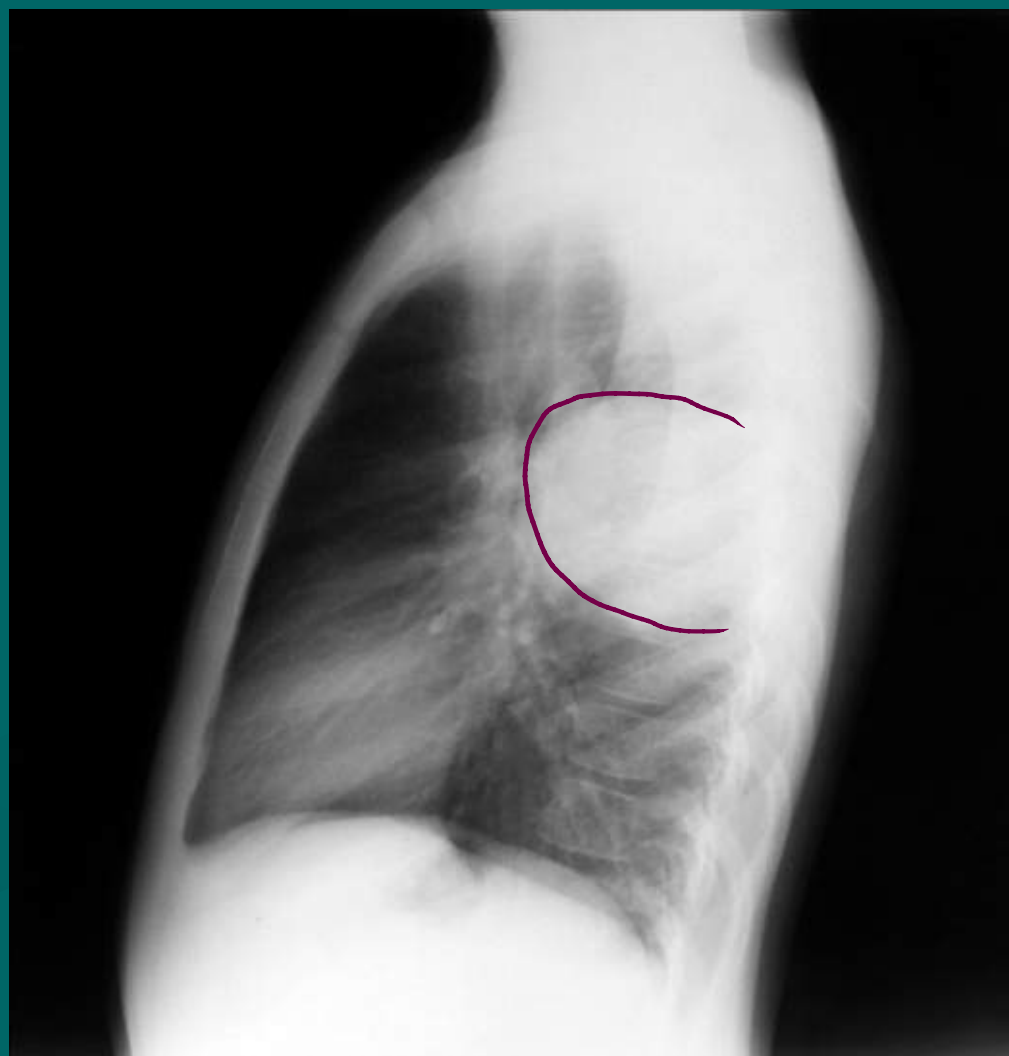
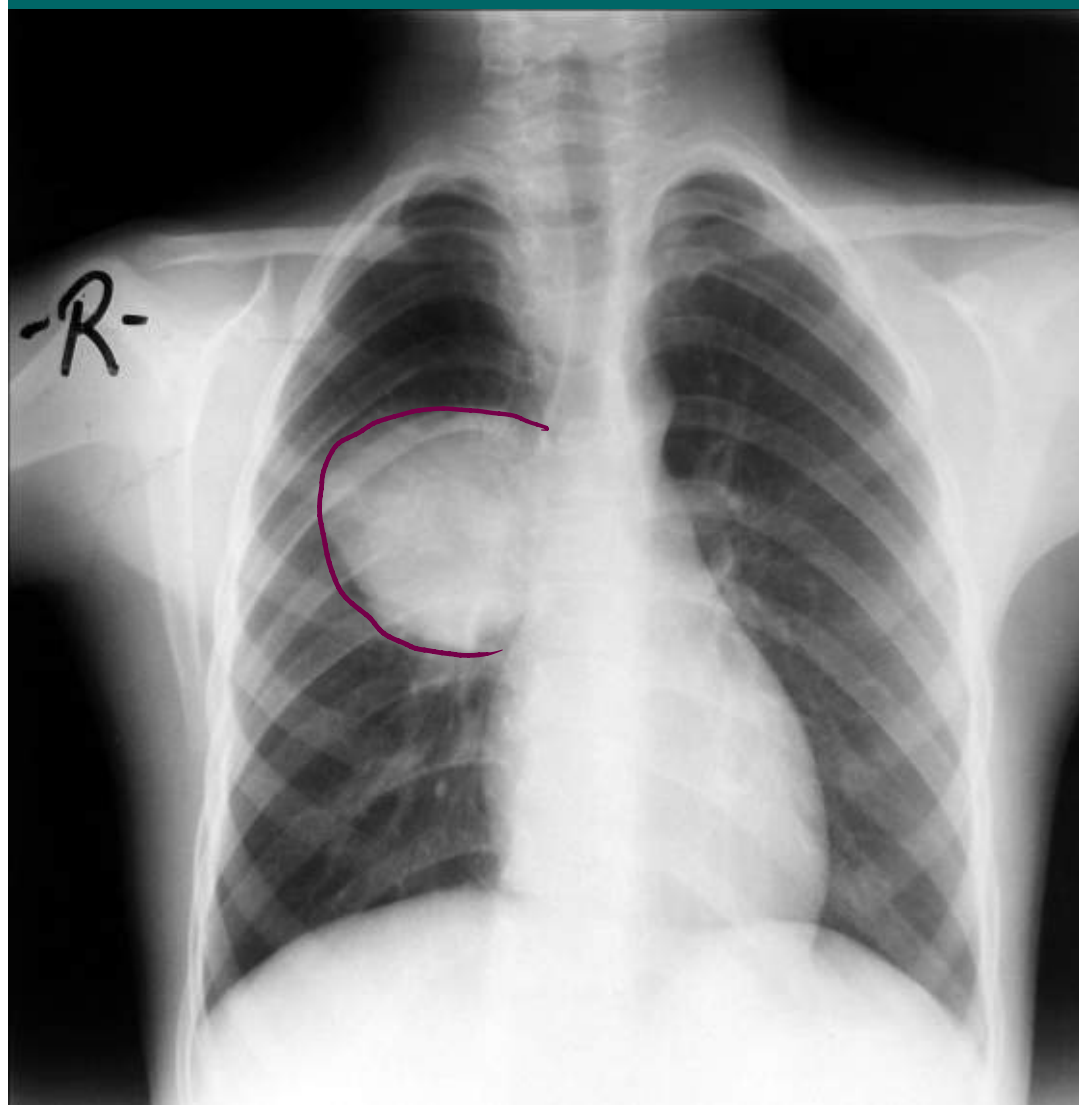
POSTERIOR MEDIASTINAL MASSES

- Neurogenic tumors
 - Neurofibroma
 - Ganglioneuroma
- Aneurysm of descending aorta.
- Hiatus hernia.
- Dilated esophagus (especially achalasia).
- Paravertebral mass or abscess.

بهدول الحالتين بتكون

longitudinal mass على

شكل ال organ





✦ Axial CT with contrast ↴

SOMATOM DR H SFH RIYADH
OTAIBI AMEDH DAKHILULLAH 97Y.&403008 HC3
17-AUG-97 1 27 FRONT H/SP
08:33:04
DA0:039
SCAN 61
CAL.REQ.

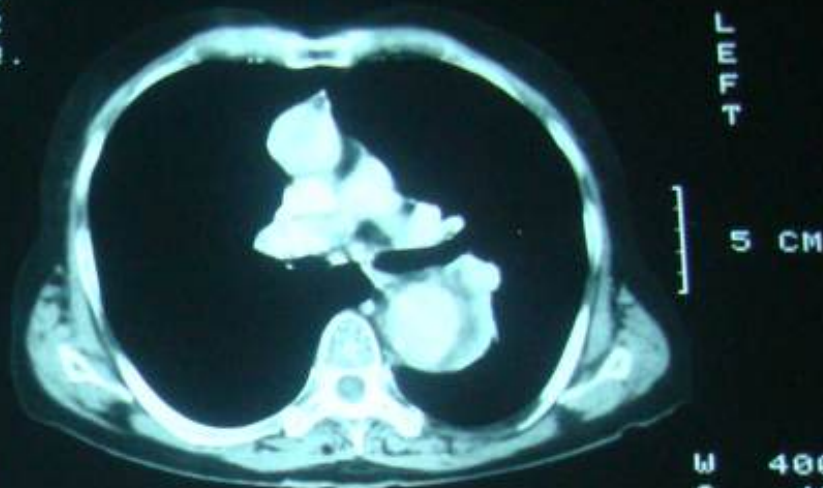


TI 4
KV 125
AS .21
SL 8
GT 0
TP 105

100MLS/OMNIPAQUE/BOLUS
INFUSION GASTROGRAFIN

W 400
C 40

SOMATOM DR H SFH RIYADH
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DA0:040
SCAN 62
CAL.REQ.

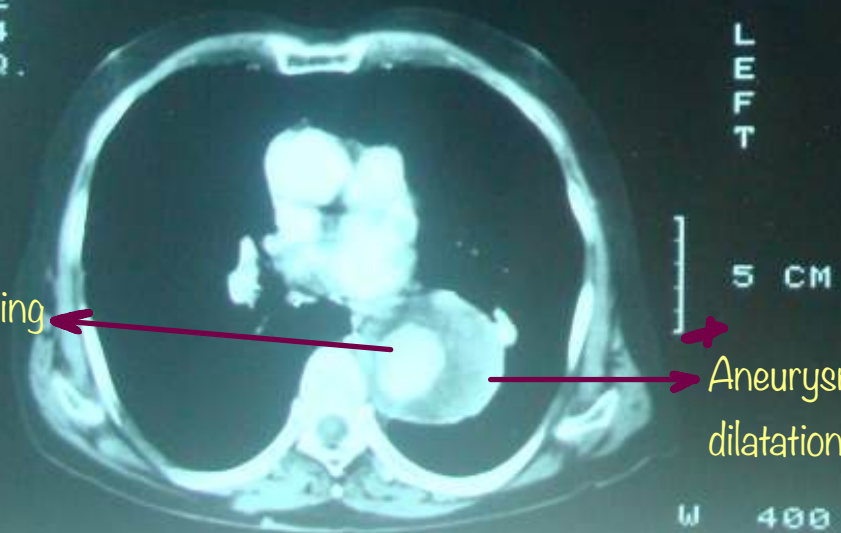


TI 4
KV 125
AS .21
SL 8
GT 0
TP 113

100MLS/OMNIPAQUE/BOLUS
INFUSION GASTROGRAFIN

W 400
C 40

SOMATOM DR H SFH RIYADH
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DA0:042
SCAN 64
CAL.REQ.

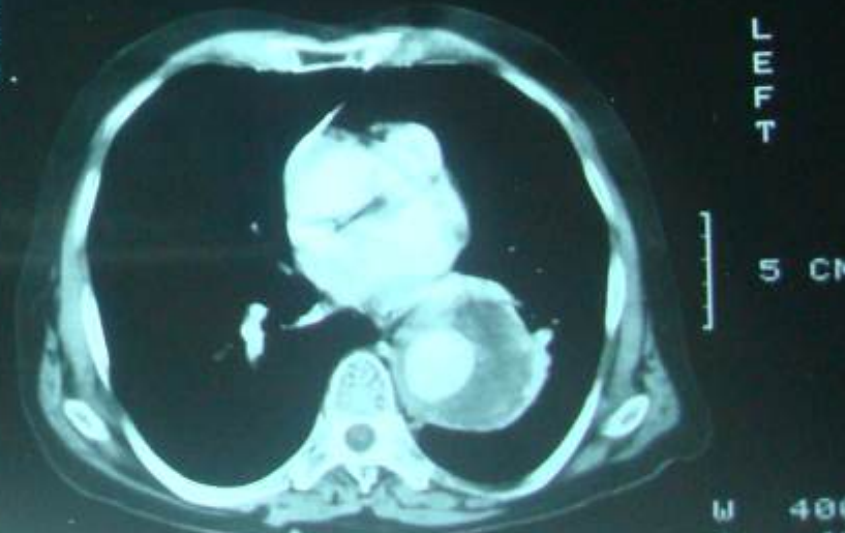


I 4
V 125
S .21
L 8
T 0
P 129

100MLS/OMNIPAQUE/BOLUS
INFUSION GASTROGRAFIN

W 400
C 40

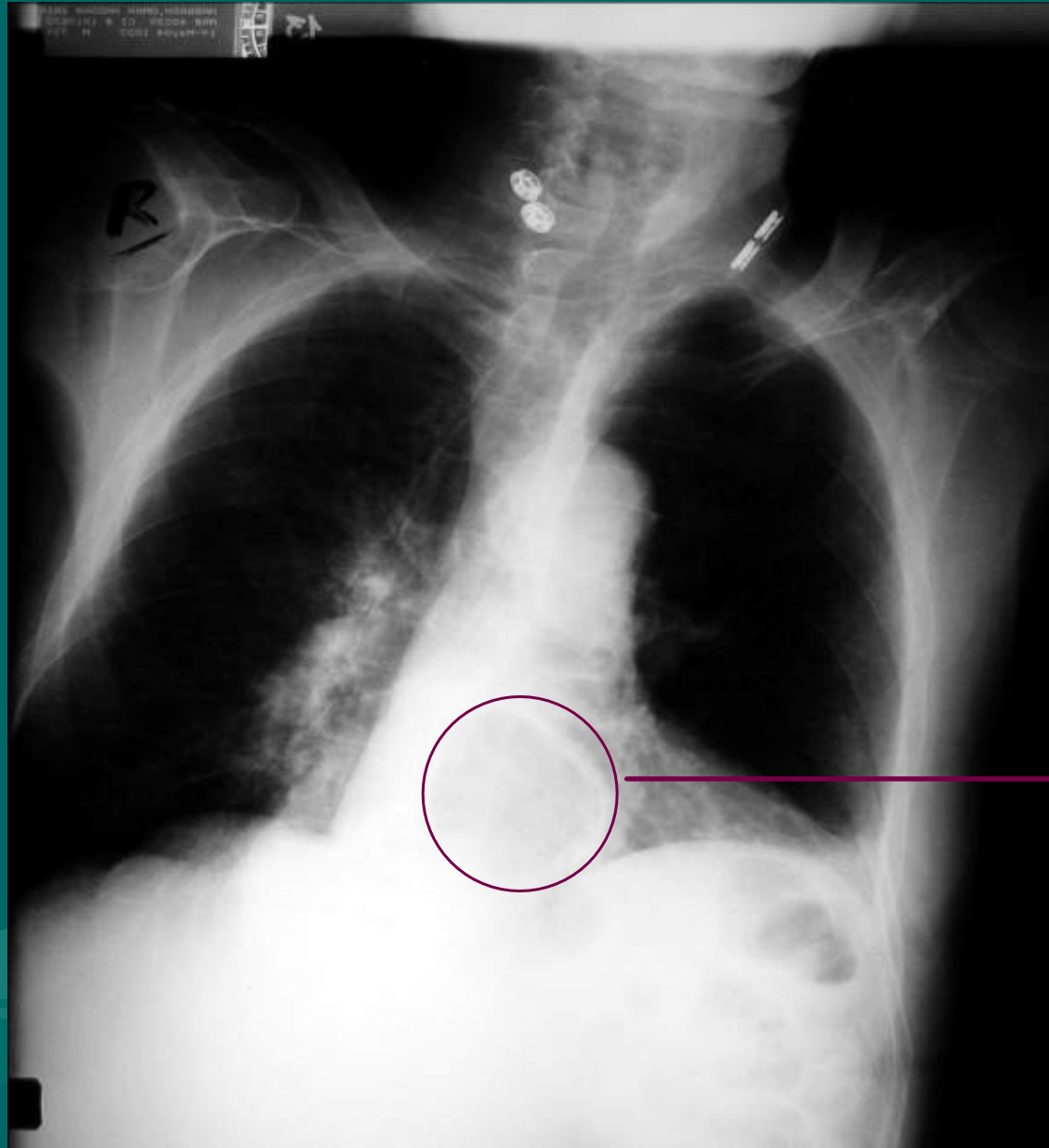
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DA0:043
SCAN 65
CAL.REQ.



TI 4
KV 125
AS .21
SL 8
GT 0

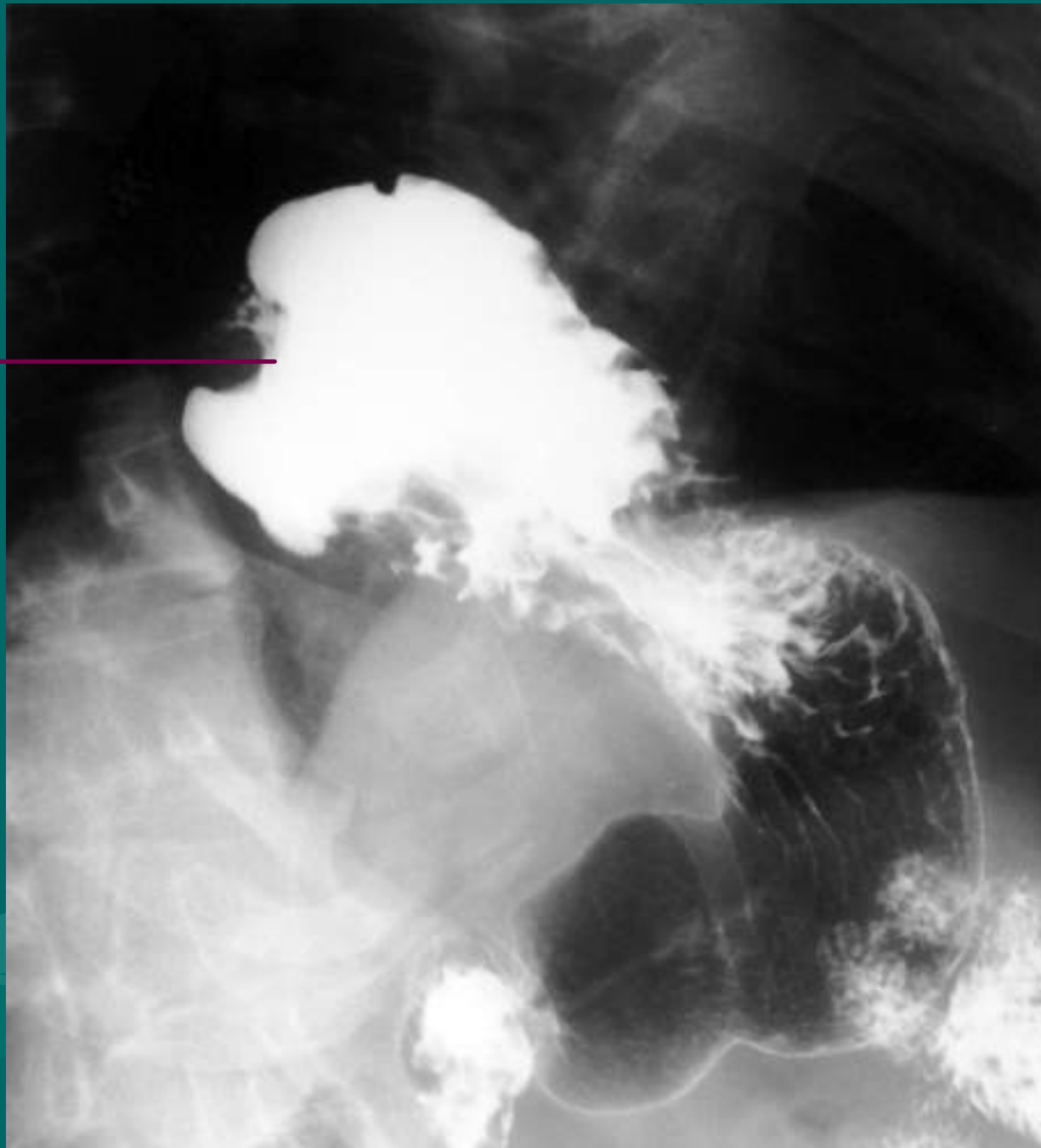
100MLS/OMNIPAQUE/BOLUS

W 400
C 40

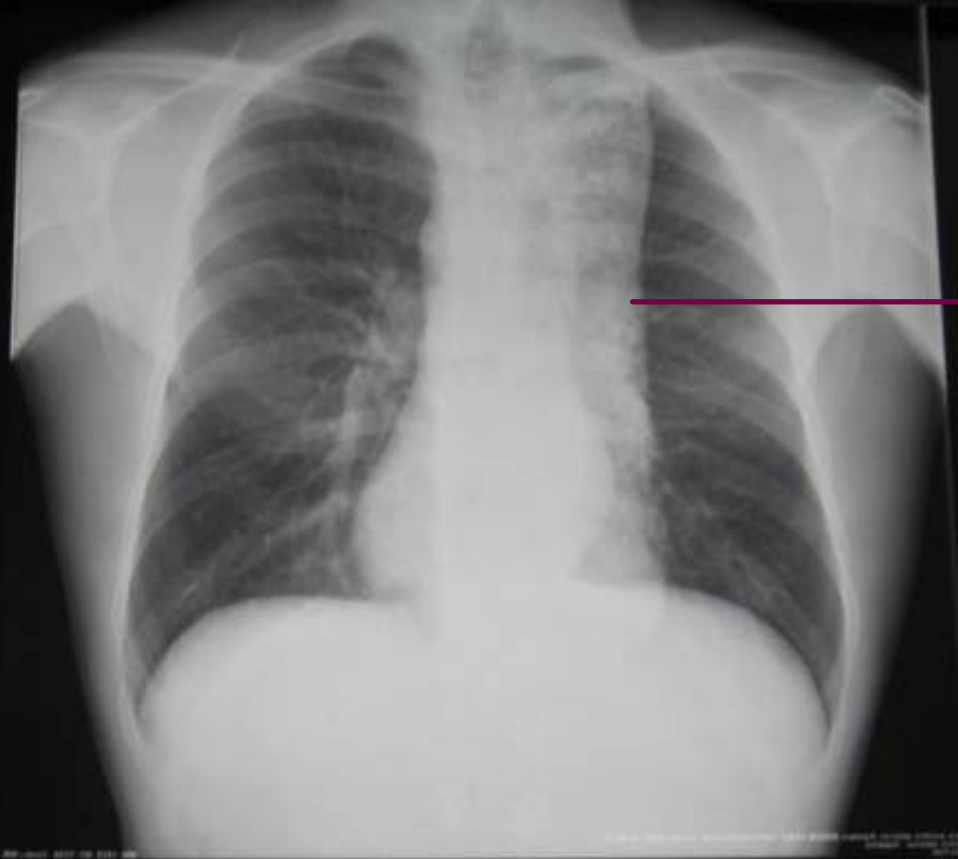


هون ال mass عبارة عن
كيس جواته هوا يعني
حتكون hiatus hernia

✦ Contrast above
the diaphragm



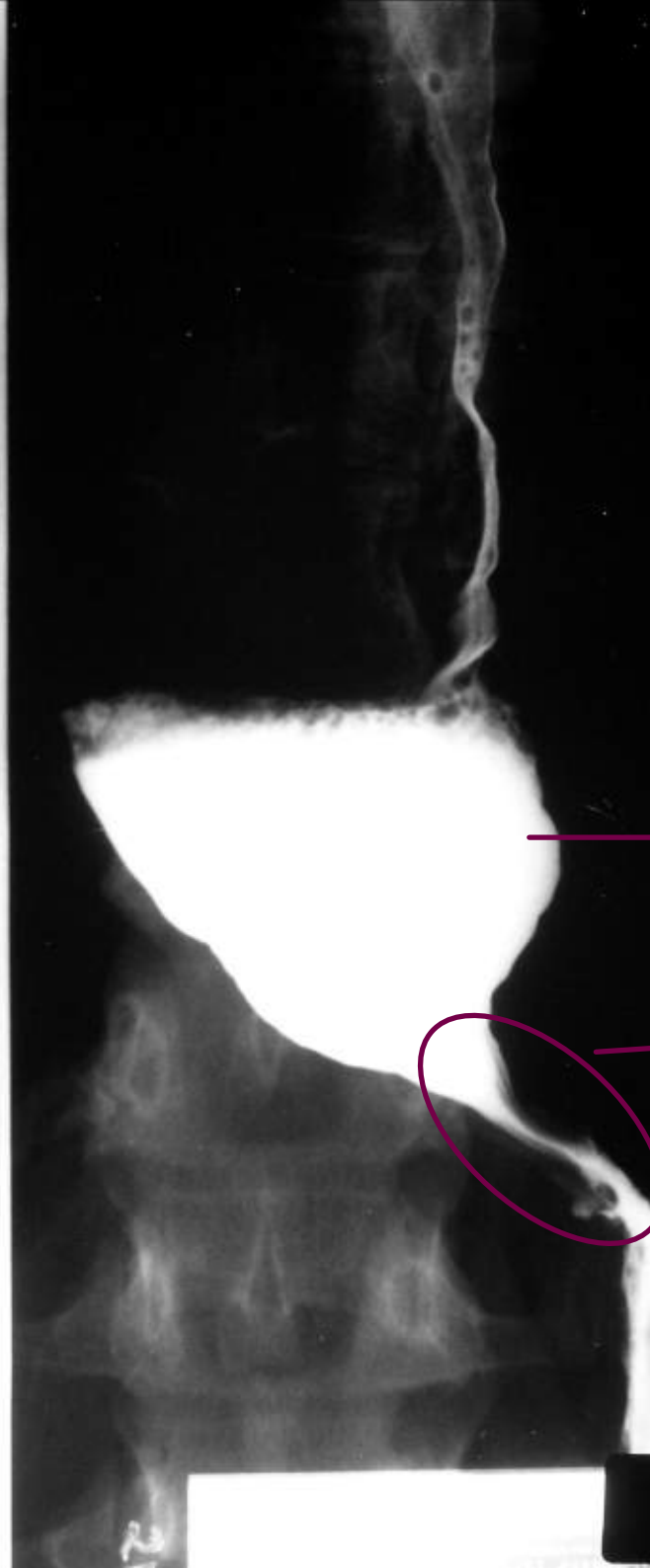
✦ Barium meal



Longitudinal mass



+ Posterior mass



✚ Barium swallow

→ Dilated esophagus

→ Achalasia



X

TUMORS OF THE LUNG

- Lung cancer is the commonest fatal malignancy.
- The strongest risk factor is cigarette smoking.
- More than 95% of malignant tumors arise from the respiratory epithelium and are termed bronchogenic carcinoma.
- Less than 5% of lung cancers are of rare cell types, such as carcinoid tumors, lymphoma, or metastasis.

Types of lung cancers

1- Adenocarcinoma

- ❖ Is the most common type of lung cancer, making up 30-40% of all cases.
- ❖ Usually arise peripherally as solitary pulmonary nodule.

✦ Area of consolidation

The alveolar cell carcinoma is a subtype of adenocarcinoma and arise within the alveoli producing areas of consolidation and the appearance resemble bronchopneumonia.

Types of lung cancers / 2

2- Squamous cell carcinoma

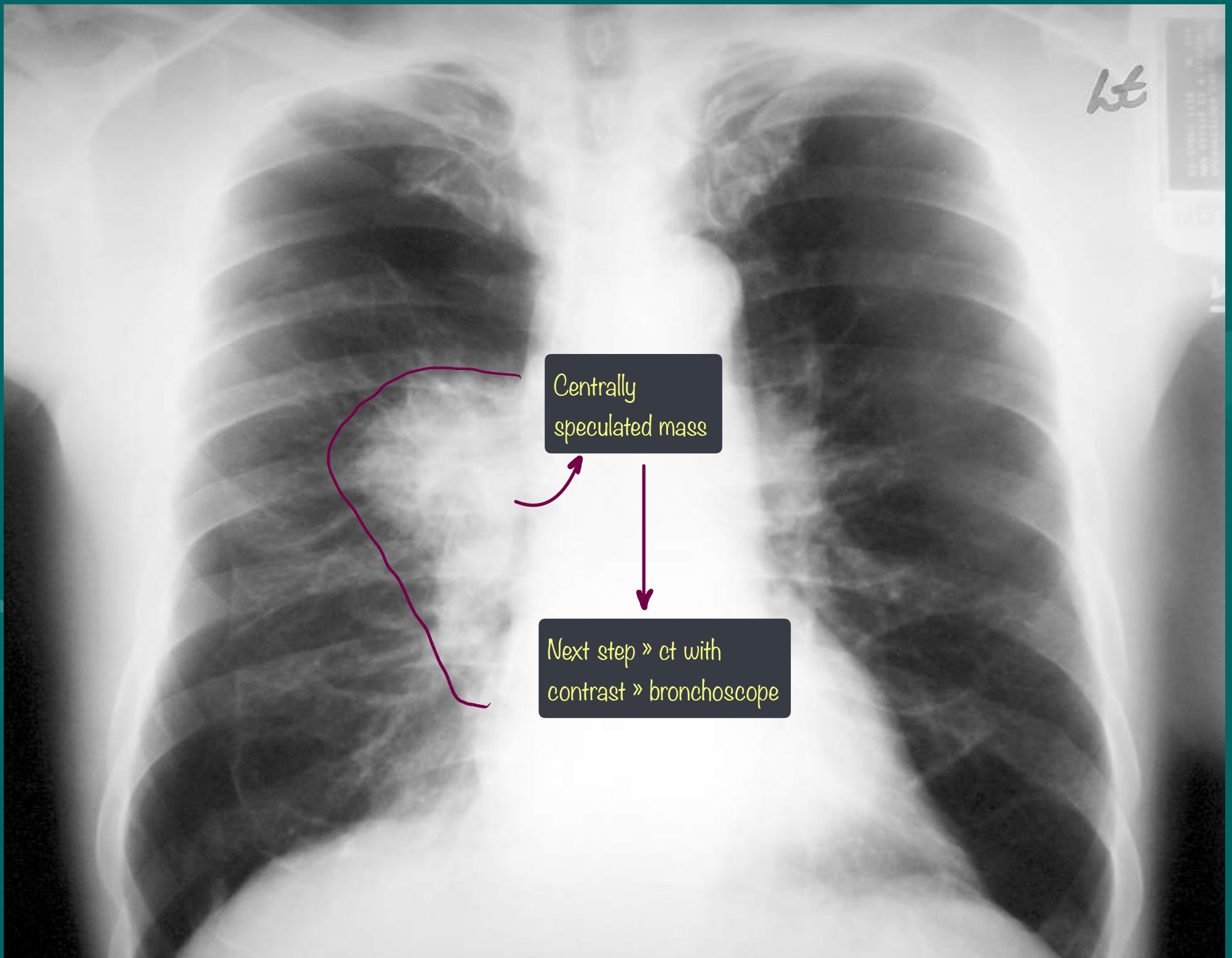
- They typically occur in central bronchi.
- Grow slowly and cavitate more often than other cell types.

3- Small (oat) cell carcinoma.

- Are usually central in location.
- Have the fastest rate of growth.
- Typically associated with mediastinal adenopathy.

4- Large cell carcinoma.

- Usually arise at the periphery of the lung.



Centrally
speculated mass

Next step » ct with
contrast » bronchoscope

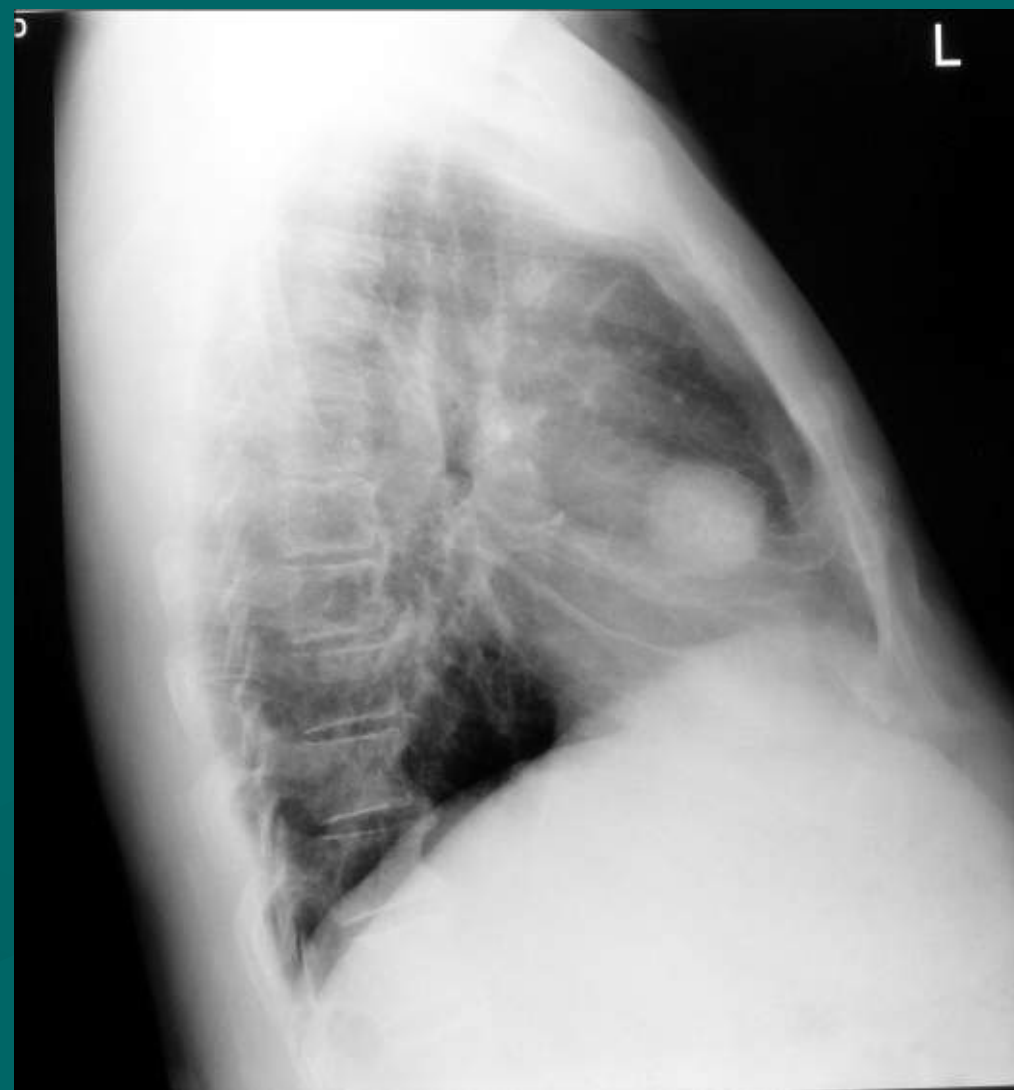
BENIGN TUMORS OF THE LUNG

- Hamartoma.

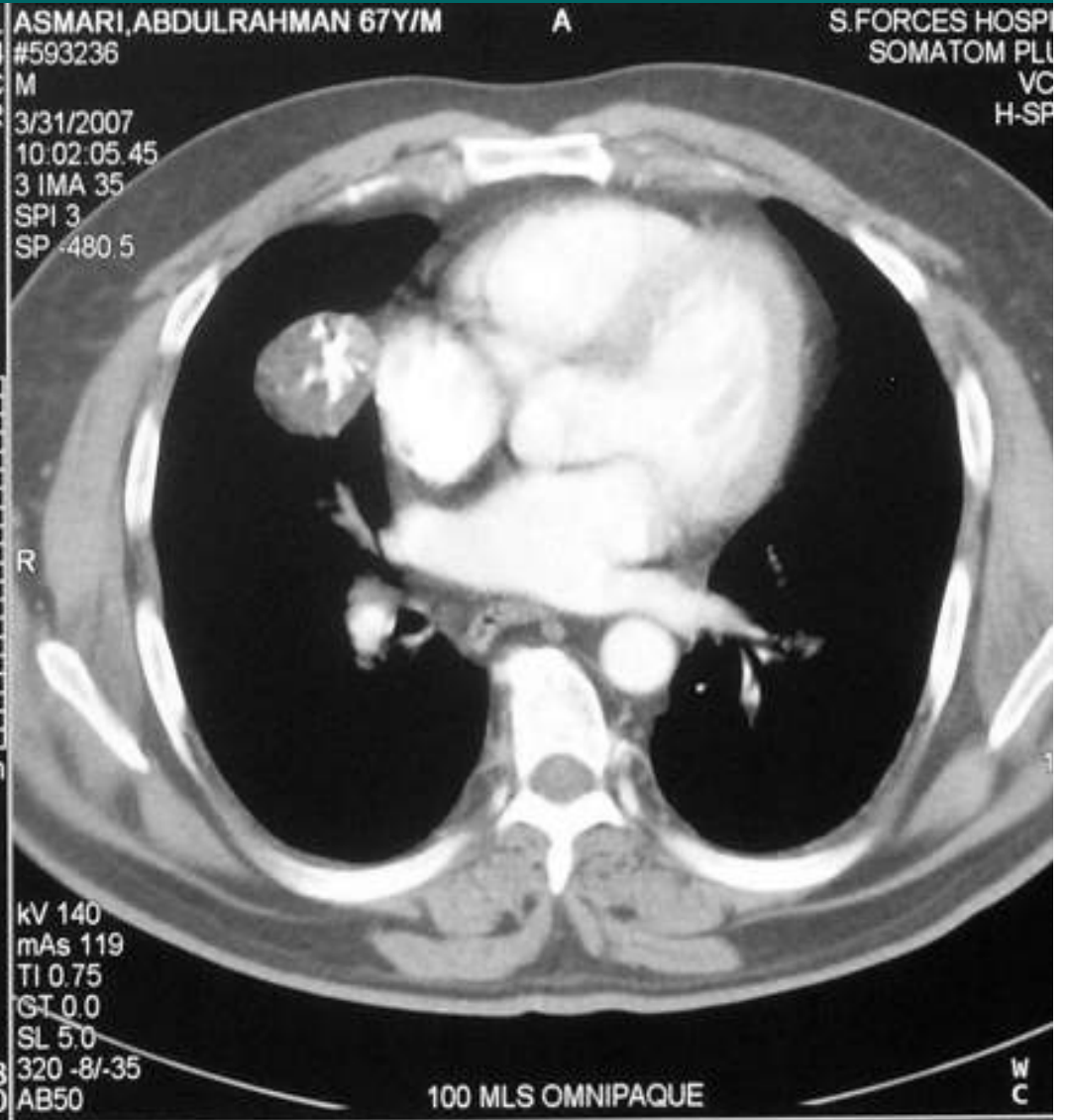
- Is the most common benign tumor of the lung.
- Appear as solitary, well marginated, rounded mass.
- Calcification (popcorn) is present in 40% of cases.
- Fat is seen in up to 50% of hamartomas.

- Adenoma.

- The vast majority of cases occur around the hilum and appear as round, well-defined nodule.



✦ Popcorn calcification

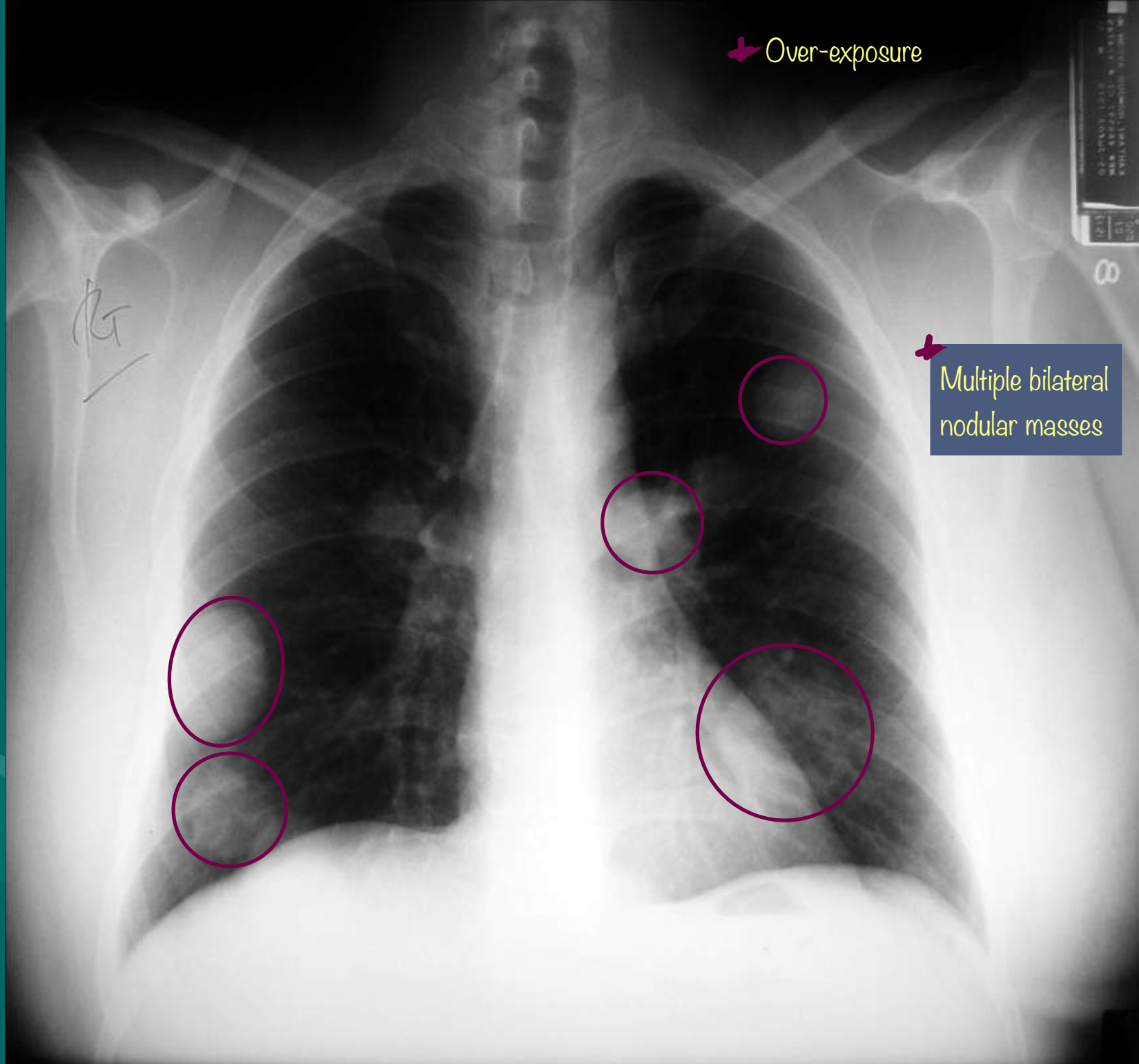


Lung metastasis

- The commonest primary tumors producing lung metastasis are breast, renal tract, thyroid, bone, and testicular tumors.
- Metastasis to the lung are usually bilateral and tend to be peripheral and more numerous at the lung bases.
- Lung metastasis are spherical in shape with a well-defined margin.

✚ Over-exposure

✚ Multiple bilateral
nodular masses





SAQER, ABDULLAH 40Y/M
#286830

S. FORCES HOSPITAL
SOMATOM PLUS 4
VC10C
H-SP-CR

A

28-MAR-2006
11:40:52.19
TP -268.5

Multiple nodules

I 3



SAQER, ABDULLAH 40Y/M
#286830

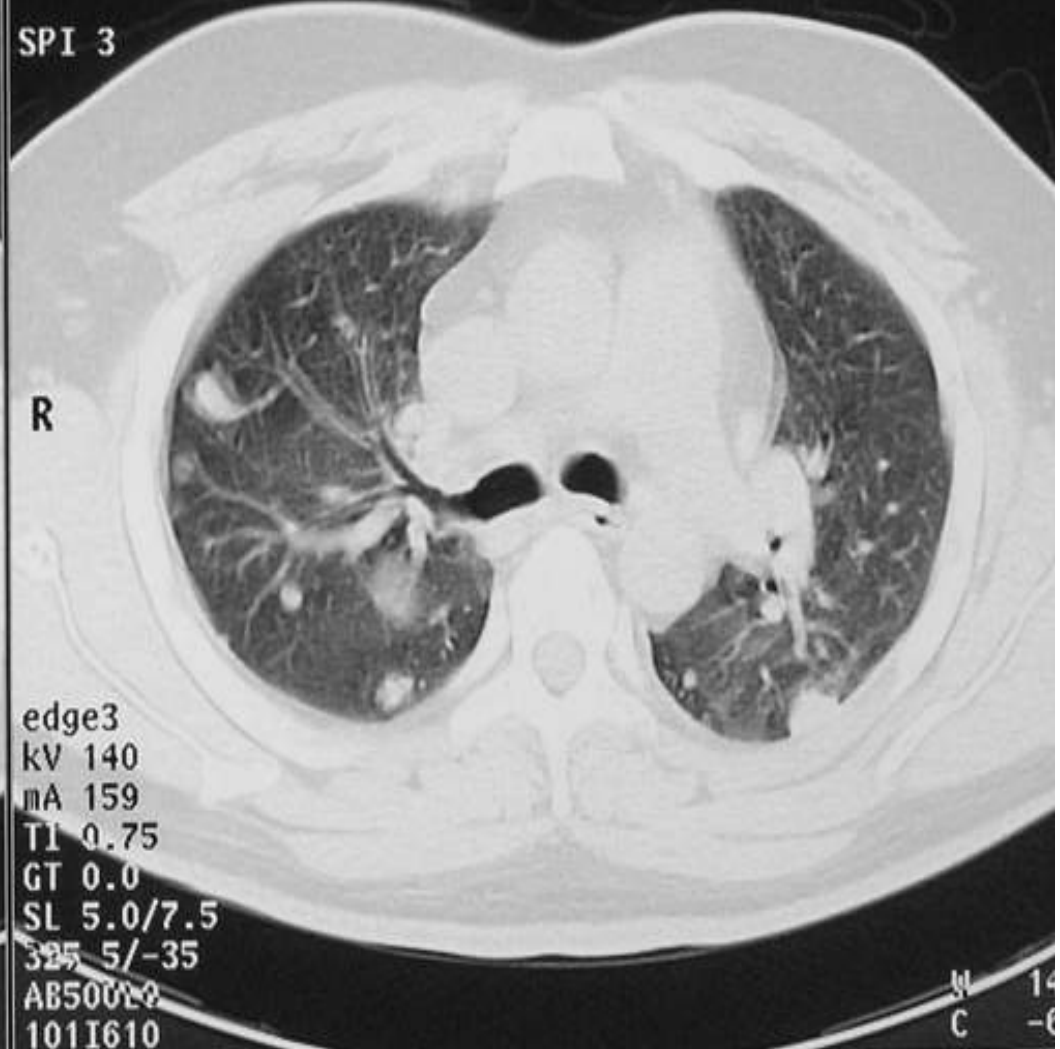
S. FORCES HOSPITAL
SOMATOM PLUS
VC1
H-SP-

A

28-MAR-2006
11:40:52.59
TP -272.5

Lung window

SPI 3



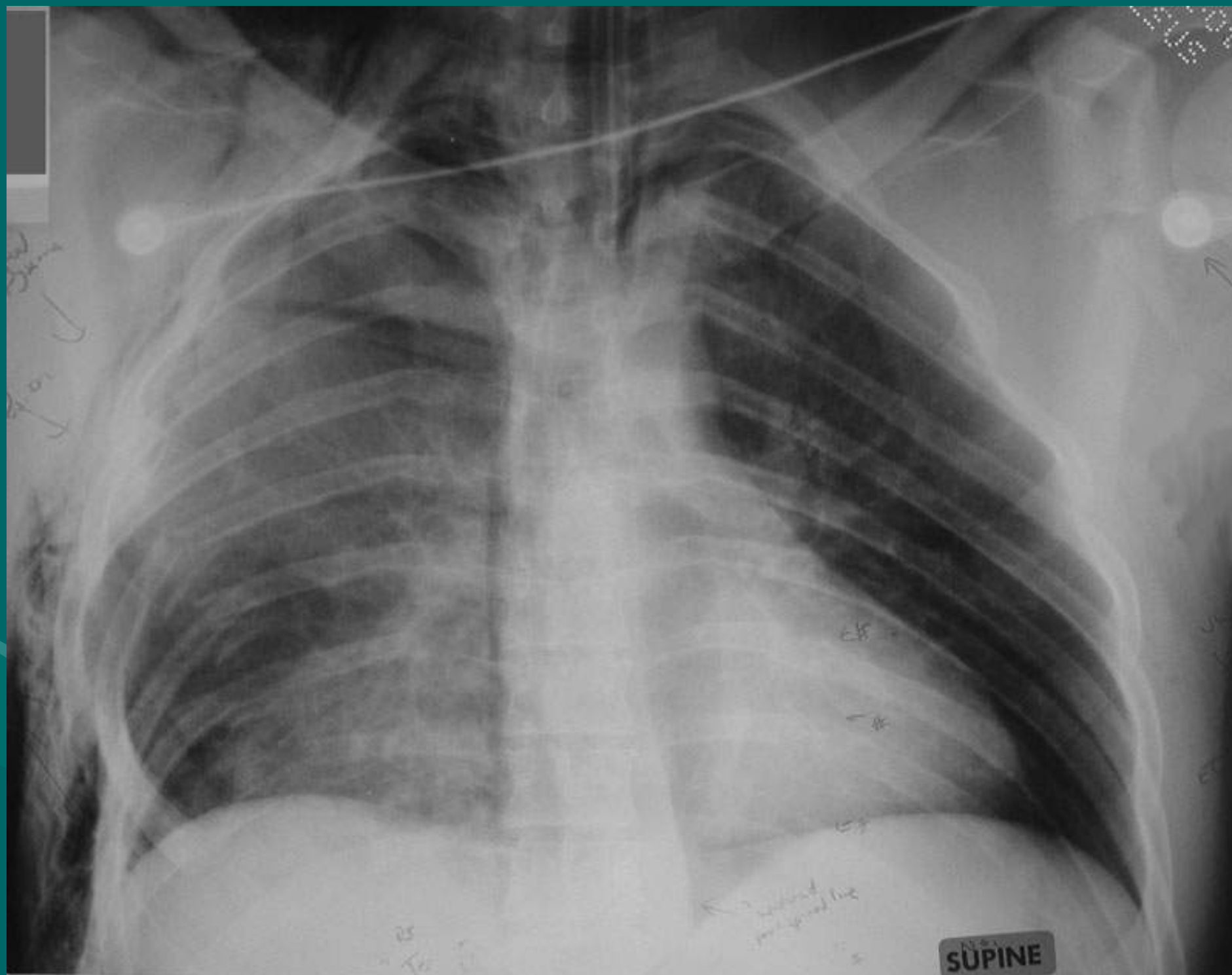
Chest trauma

- ❑ Chest trauma can be as blunt or penetrating.
- ❑ Penetrating chest trauma can injure vital organs such as the heart and lungs.
- ❑ The common clinical problems associated with chest injury include pulmonary contusion, pneumothorax and hemothorax.
- ❑ Fractures of the lower ribs may be associated with diaphragmatic tears and spleen or liver injuries
- ❑ Fractures of the upper ribs can be associated with injuries to adjacent great vessels.

Chest trauma / 2

What is the ABCDE approach to guide the ?radiographic search for thoracic injury

- Air : extra pulmonary (pneumothorax, subcutaneous emphysema, pneumomediastinum).
- Bones — rib fracture, thoracic spine, scapula and sternum fractures.
- Contusions and lacerations in the lung.
- Diaphragm - rupture.
- Effusions — hemothorax.





A scenic landscape photograph featuring a large body of water in the foreground, reflecting light. In the background, there is a dense forest of evergreen trees, and further back, a range of mountains with patches of snow or light-colored rock. The scene is framed by dark, out-of-focus evergreen branches on the left and right sides. The text "Thank You" is overlaid in the center in a large, red, sans-serif font with a white outline.

Thank You