

胸壁、肋膜及縱膈腔病變

廖信閔 醫師

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OUTLINES

- **Image Interpretation principles**
- **Abdomen and diaphragm lesions**
- **Thoracic cage and chest wall and lesions**
- **Pleural lesions**
- **Mediastinal diseases**

IMAGE INTERPRETATION PRINCIPLES TODAY

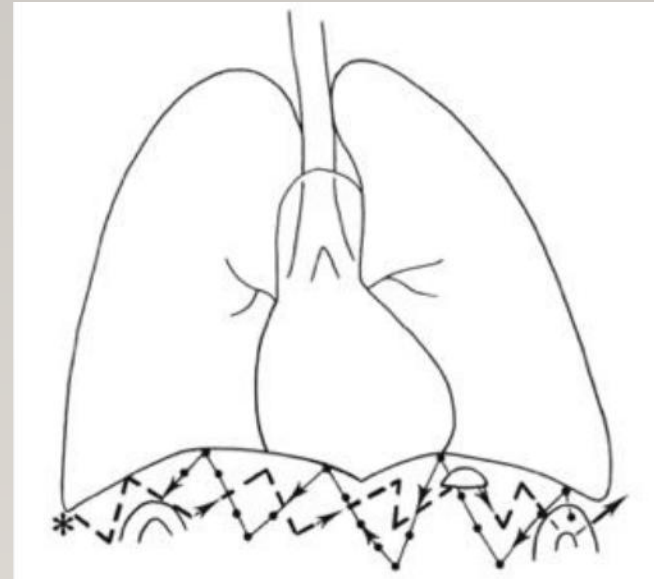
- **Chest X ray:**
 - helpful in examining chest wall, pleura, and diaphragm
- **Mediastinum:**
 - CT more useful
- **Chest wall masses:**
 - MRI (tissue characterization abilities)
- **Normally symmetrical**
 - Asymmetrical: most commonly patient rotation or thoracic kyphoscoliosis
- **Start from the outside and work inward**
 - Subcutaneous tissues, muscles, bones, pleura, and pulmonary parenchyma, diaphragm, and mediastinum

ABDOMEN AND DIAPHRAGM LESIONS



SCAN ACROSS THE ABDOMEN

- Start in the right upper quadrant
- You will see the following:
 - Liver
 - Stomach bubble
 - Splenic flexure of the colon
 - Diaphragm (right diaphragm is higher than left)
 - Spleen may or may not be visible



SUBPHRENIC AIR

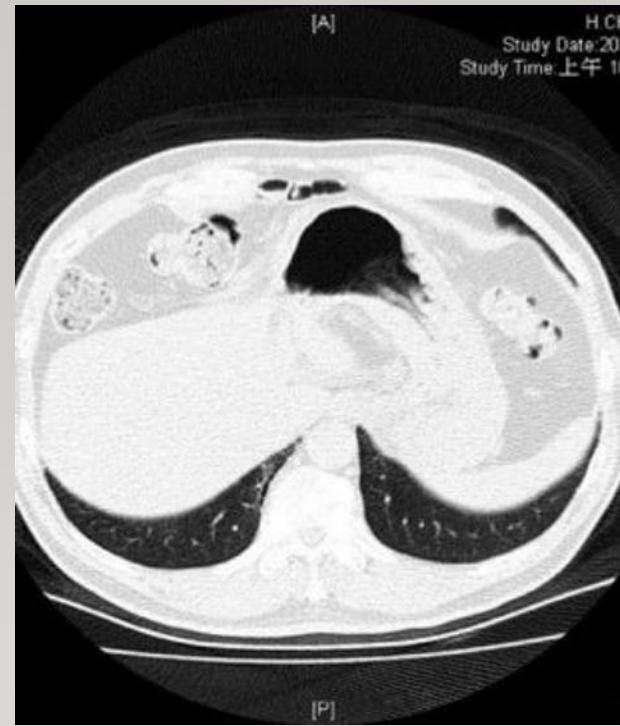


- Gastric ulcer with perforation

Continuous diaphragm signs →
pneumoperitoneum

From 成大醫院外科加護病房部落格
<http://icu-tainan.blogspot.com/2011/03/cxr-of-subphrenic-air.html>

COLON INTERPOSITION



CXR from CGMH

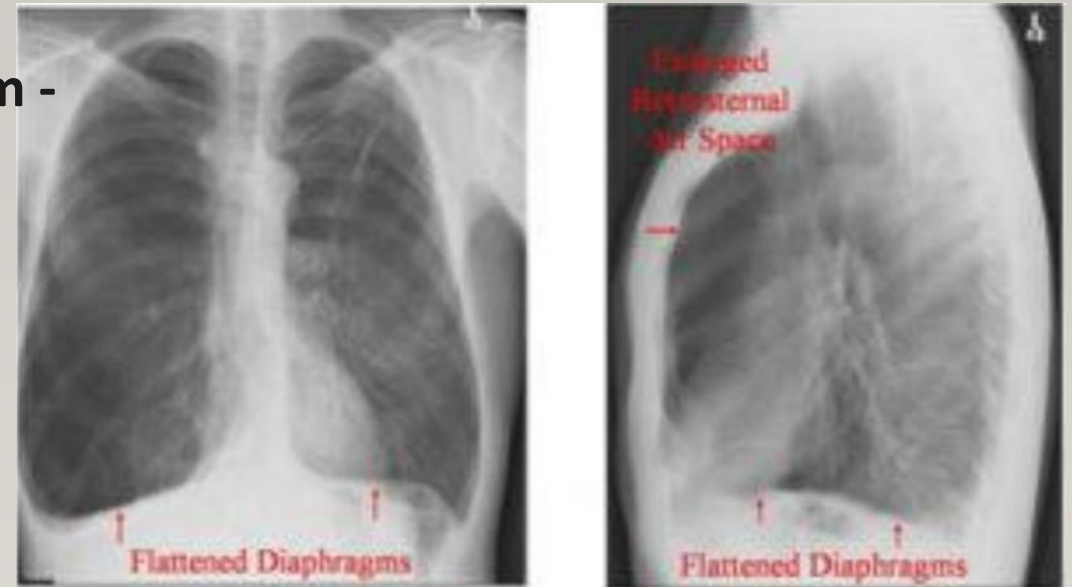
CHILAITITI SIGN

- **Anterior interposition of the colon to the liver**
- **Pseudopneumoperitoneum**
- Pain distinguishes Chilaiditi syndrome from asymptomatic colonic interposition, which is termed as Chilaiditi sign.



DIAPHRAGM

- Right diaphragm is higher than the left
- **Scalloping/Tenting/Flattening diaphragm** -
-- COPD
- The diaphragms form acute angles with the chest wall (costophrenic angles)
 - If these angles become blunted, consider **pleural fluid**



<https://afflovest.com/disorders-of-the-diaphragm-in-copd-patients/>

RETROCARDIAL LESION

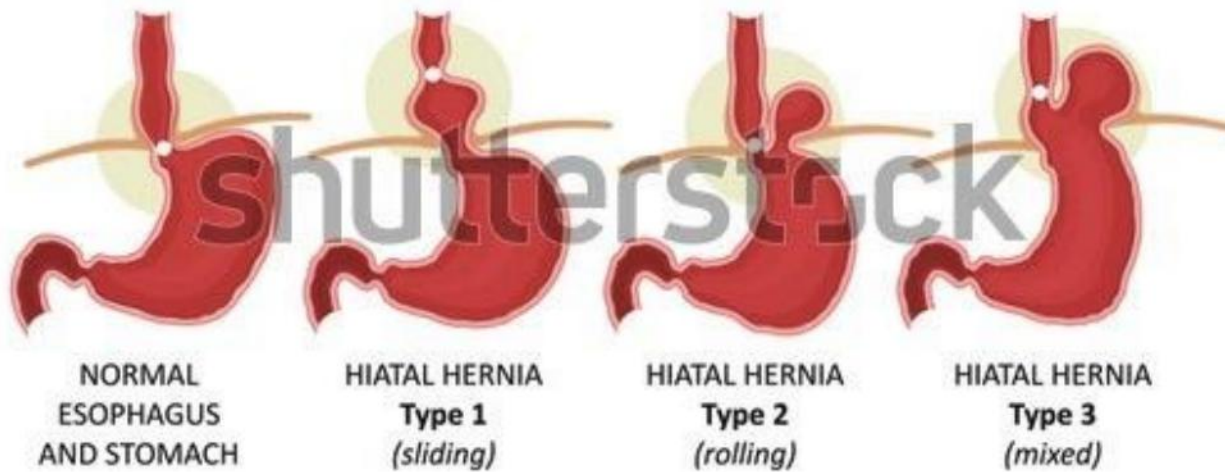


CXR from CGMH



HIATAL HERNIA

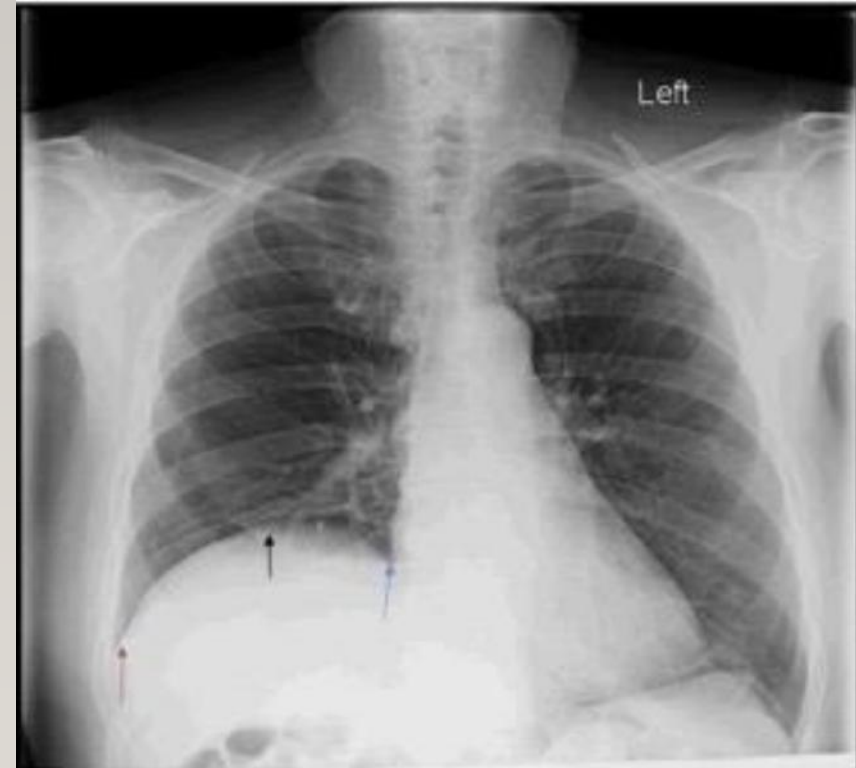
TYPES OF HIATAL HERNIA



www.shutterstock.com · 1194881548

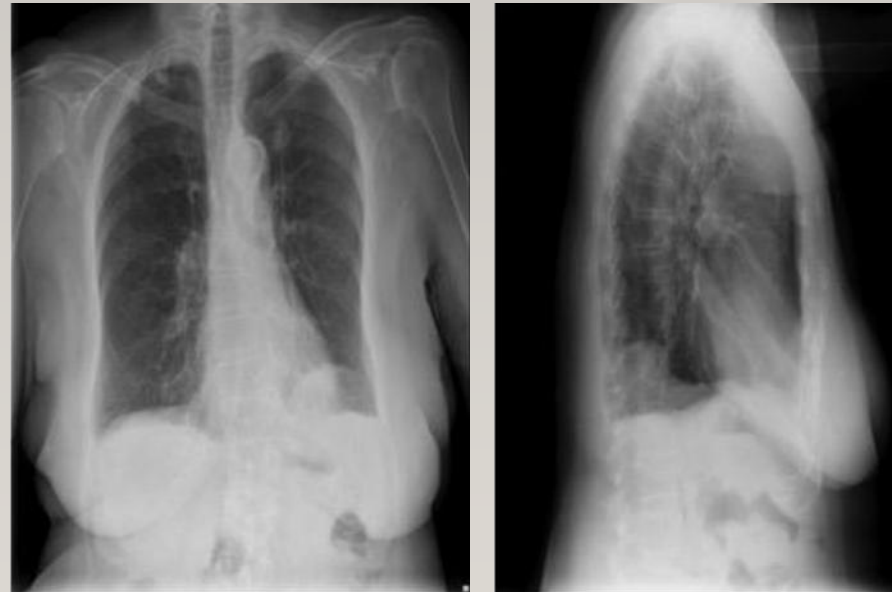
DIAPHRAGMATIC PARALYSIS

- **Cause:**
 - Central nervous disease
 - Local damage to the phrenic nerve from surgery or masses
 - Viral infections
- Respiratory compromise
- **Chest X ray:**
 - Decreased lung volume
 - Diaphragmatic elevation



DIAPHRAGMATIC EVENTRATION

- Congenital muscular aplasia or thinning of a portion of tendon
- Symptoms:
 - dyspnea, tachypnea, recurrent pneumonia, failure to thrive



BLUNT TRAUMATIC DIAPHRAGMATIC RUPTURE

- Chest X ray:
 - Elevation of hemidiaphragm
 - Altered, irregular, discontinuous, or obscured contour
 - Viscera containing air above the hemidiaphragm
 - Pneumothorax, hemothorax



THORACIC CAGE AND CHEST WALL LESIONS



CHEST WALL LESIONS: BONY TISSUE

- Sternum

- Pectus excavatum (Funnel chest)
- Pectus carinatum (Pigeon chest)

- Spine

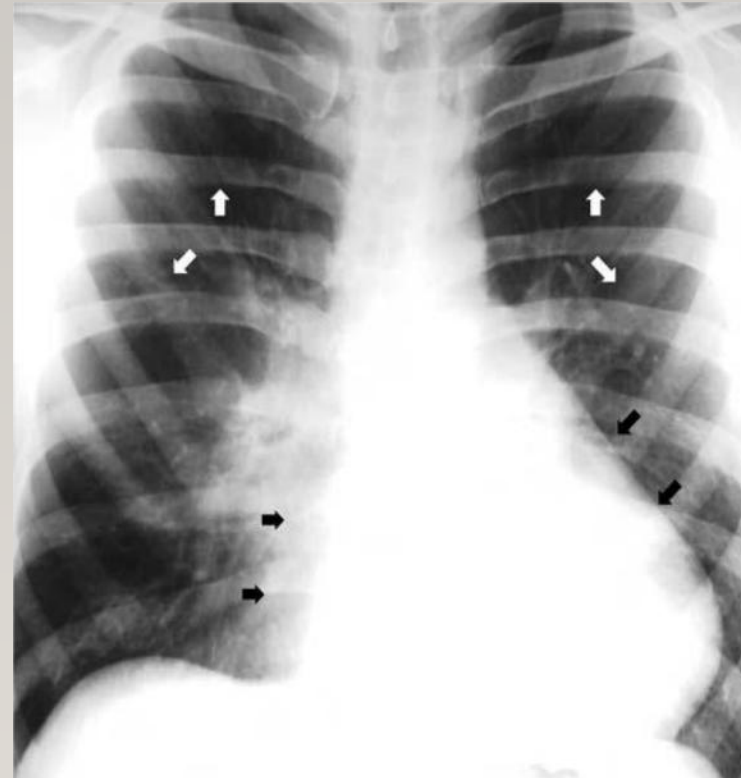
- Kyphoscoliosis
- Neurogenic lesion
- Paraspinal abscess
- Compression fracture
- Osteopenic/Osteogenic Metastasis

THORACIC CAGE: NORMAL VS PECTUS EXCAVATUM

Normal



Ribs: a figure “7” appearance

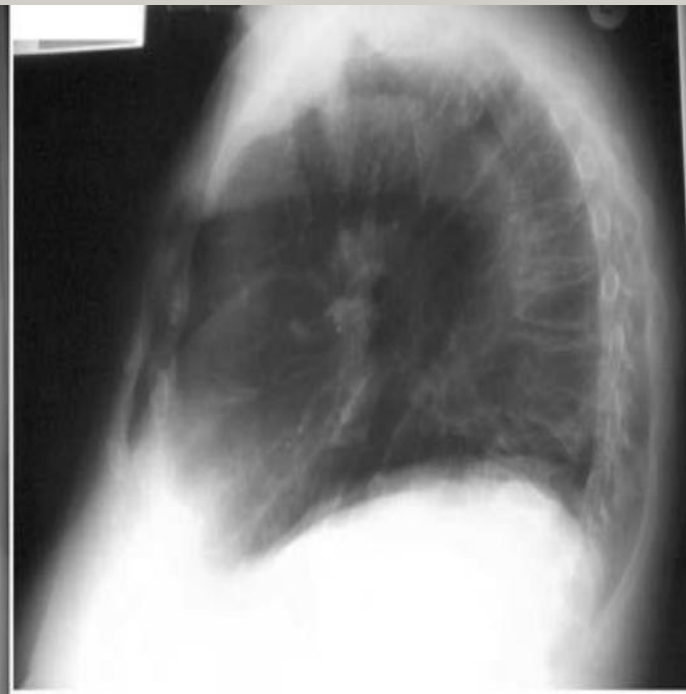


KYPHOSIS

SMALL VOLUME OF LUNGS ON THE
PA VIEW



INCREASE IN THE PA DIAMETER OF
THE CHEST



CHEST WALL LESIONS: RIBS

- 分辨性別、年齡 : Costal cartilage:
- Contour 異常: rib fracture (flail chest) ; funnel chest, barrel chest
- Rib notching (下緣): CoA, neurogenic tumor (benign)
- 先天發育異常: forked rib, fusion rib, cervical rib
- Rib變寬/size變大: thalassemia, bone tumor
- Density改變:
 - ↑ (變白): diffuse - **2M** (metastasis, myelofibrosis), **2O** (osteopetrosis, osteodystrophy); 鈣化 – Osteochondroma, chondrosarcoma, osteosarcoma
 - ↓ (變黑): osteolytic, osteoporosis
- Chest wall mass + rib destruction :
 - 成人: Multiple myeloma (plasmacytoma), metastasis, Pancoast tumor
 - 小孩: Ewing' s sarcoma, neuroblastoma
 - 感染: TB, aspergillosis, actinomycosis, nocardiosis

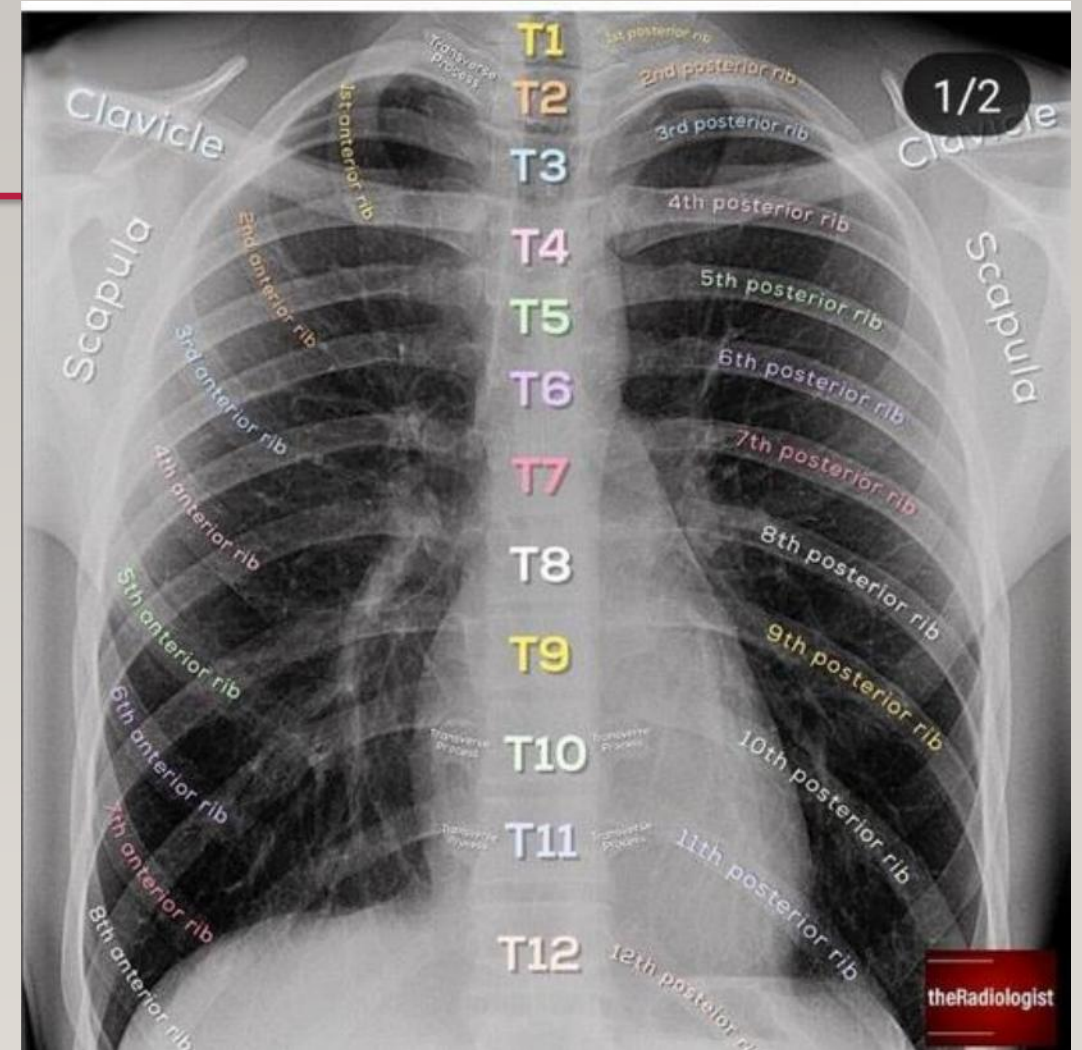
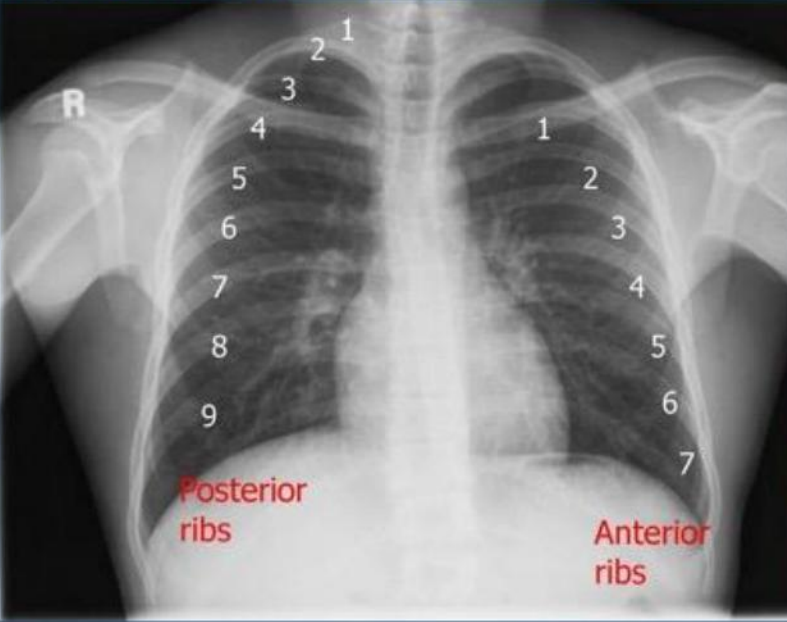
RIBS COUNTING

Technique

Normal CXR, should see 7 anterior ribs and 9 posterior. Do not need to count both.

➤ **RIPE**

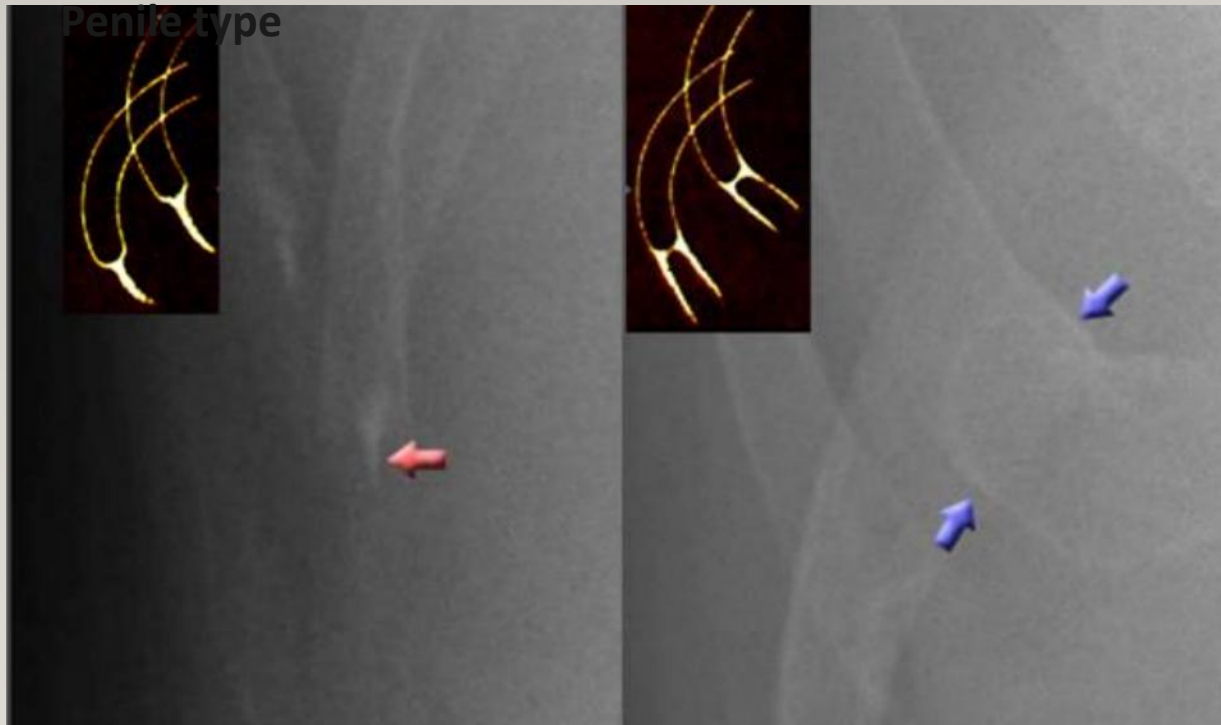
- Rotation
- Inspiration
- Picture
- Exposure



FLOATING RIB: FEMALE VS MALE BY CXR

Female ---Central
calcification

Male --- Peripheral calcification
Vaginal type



・第一根肋軟骨鈣化 : 30-40 y/o

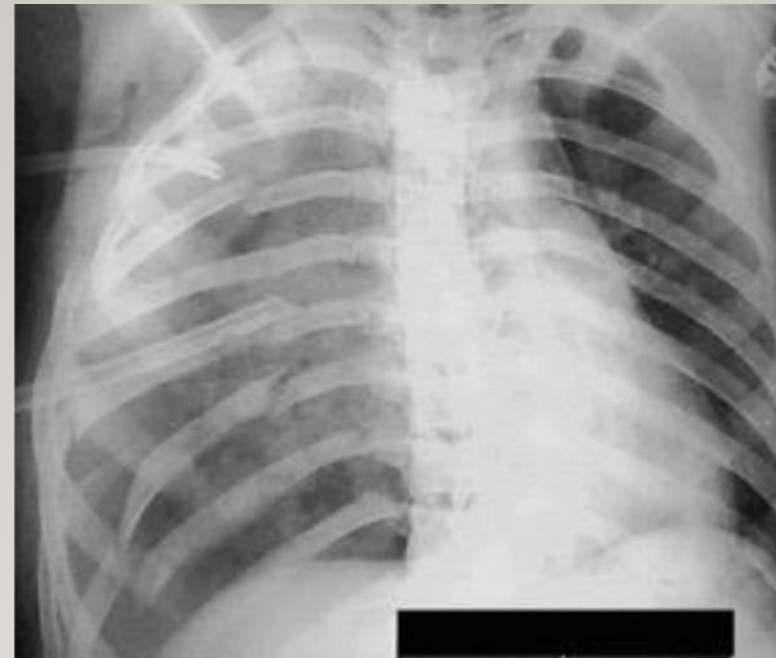
Behrang Amini, MD/PhD

INJURIES TO THE THORACIC SKELETON/RIB FRACTURES/TRAUMA

- **Flail chest**

- ≥ 5 consecutive ribs or ≥ 3 ribs fractured in 2 places

Prognostic factors in flail-chest patients
European journal of cardio-thoracic surgery: official journal of the European Association for Cardio-thoracic Surgery 38(4):466-71

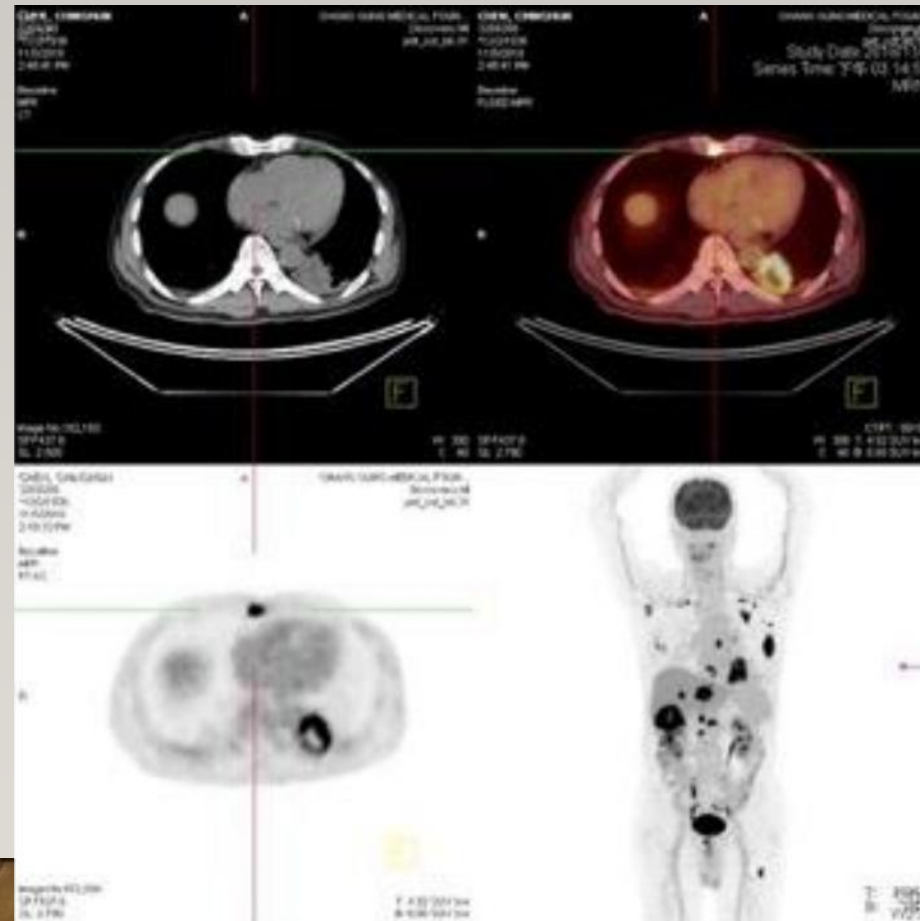


81 Y/O MALE: LEFT CHEST PAIN



CXR from CGMH

LLL SQUAMOUS CELL CARCINOMA WITH 5 TH RIB METASTASIS



CHEST WALL LESIONS: SOFT TISSUE

- **Skin Tumor**

- Neurofibromatosis, moles, melanoma, Kaposi's sarcoma

- **Soft tissue tumor**

- Fibroma, lipoma, hemangioma, muscle tumor

- **Foreign Body**

- Button, electrode, wires, tube, dressings and hair braids

- **Subcutaneous emphysema**

- Trauma, post-procedures, deep neck infection

- **Breasts/nipples**

- Mastectomy, mammoplasty, breast tumor

- **Calcification**

- Parasite (*Filaria cysticerci*), granulomatous LAP

- **Infection**

- Cellulitis, actinomycosis

CUTANEOUS NODULES

Neurofibromatosis. Well defined margins Not projected over the lungs, confirms their cutaneous origin



GINGKO LEAF SIGN



- Extensive bilateral **sub-cutaneous emphysema** throughout the visualized soft tissues of the chest and neck.
- It is more pronounced on the left with the air tracking between the fibers of the pectoralis major muscle, giving the appearance of a Gingko leaf.

C. Maneesh Ramki, Top 30 Signs in Chest X-Ray, EPOS,
<https://epos.myesr.org/poster/esr/ecr2017/C-1788/findings%20and%20procedure%20details>

HYPERLUCENT HEMITHORAX



- Left breast cancer s/p mastectomy
- Port-A setup

CXR from CGMH

INCOMPLETE BORDER SIGN

Mammoplasty



CXR from CGMH

Post Removal



CXR from CGMH

SOFT TISSUE MASSES

Extrapleural sign



- Fibrous dysplasia: most common tumor of thoracic skeleton
 - Posterolateral ribs



PLEURAL LESIONS



PLEURAL LESIONS

- Pneumothorax (Air)
- Pleural effusion (Water)
- Empyema (Pus)
- Chylothorax (Chyle)
- Pleural mass: mesothelioma (Tumor)
- Pleural thickening/calcification: fibrothorax (Calcification)

PNEUMOTHORAX

- **Upright patient:**

- Identify the pleural line
- Most often near the apex
- Lung marking 不見

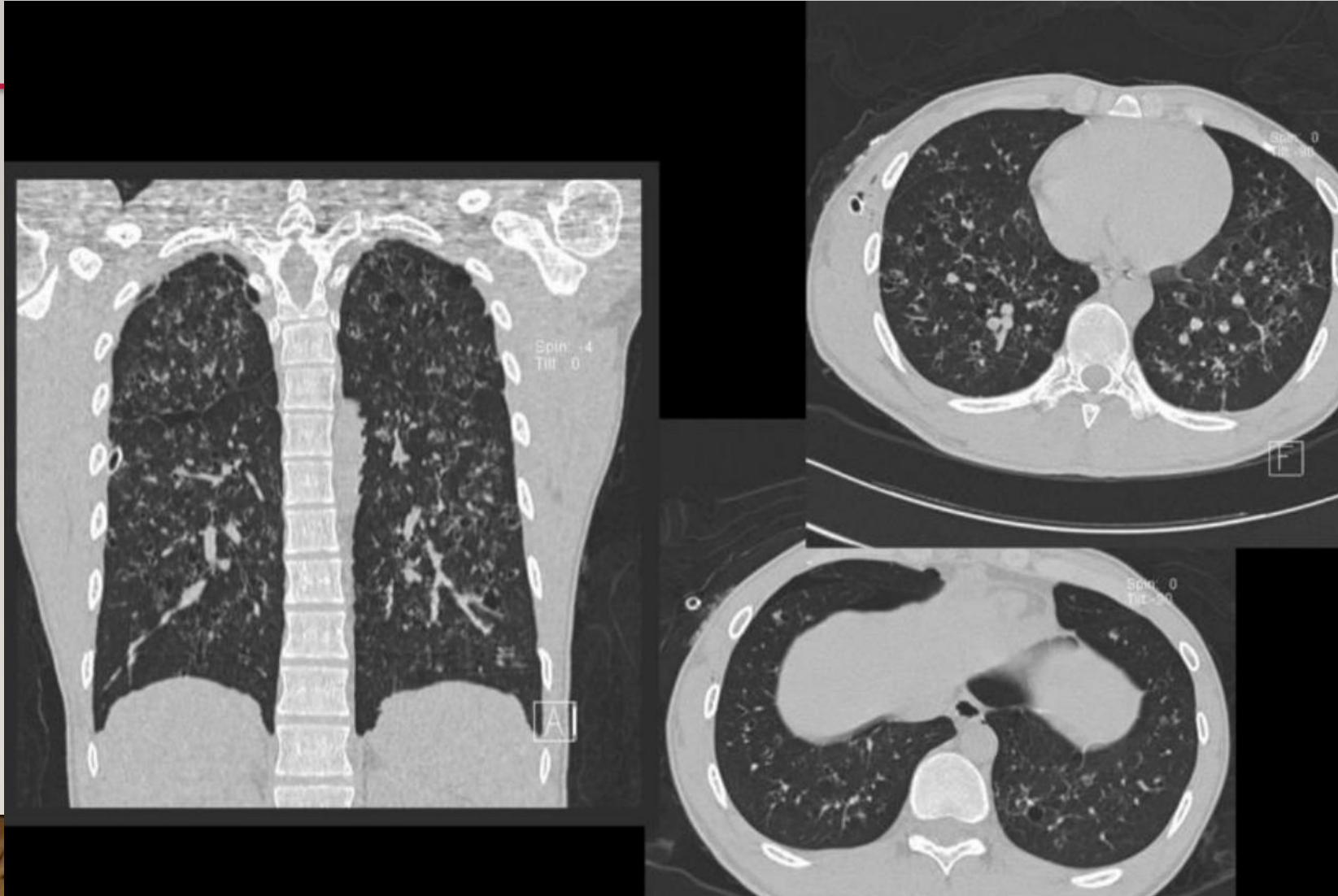
- **Supine patient:**

- 在 supine position ，胸腔最高處為 anterior C-P sulcus ，其次為 lateral CP sulcus 。所以發生氣胸時，air 最先填充至 anterior CP sulcus ，量更多時，lateral CP sulcus 亦被填滿。
- **Deep sulcus sign:** anterior 和lateral CP sulcus 顯得非常深，橫膈被襯托得很清晰
- Sharper than normal appearance of hemidiaphragm

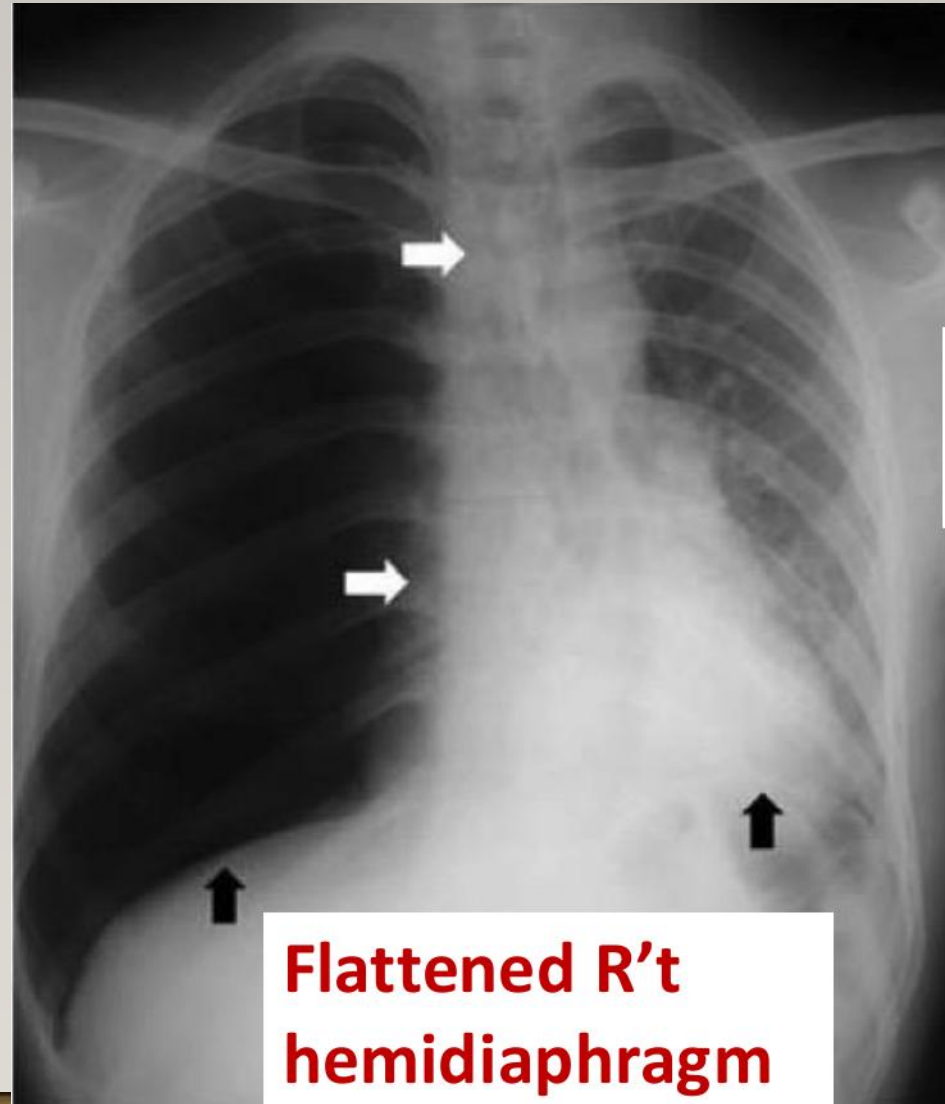
2 ND SPONTANEOUS PNEUMOTHORAX



RIGHT PNEUMOTHORAX AND PULMONARY LANGERHAN'S CELL HISTIOCYTOSIS



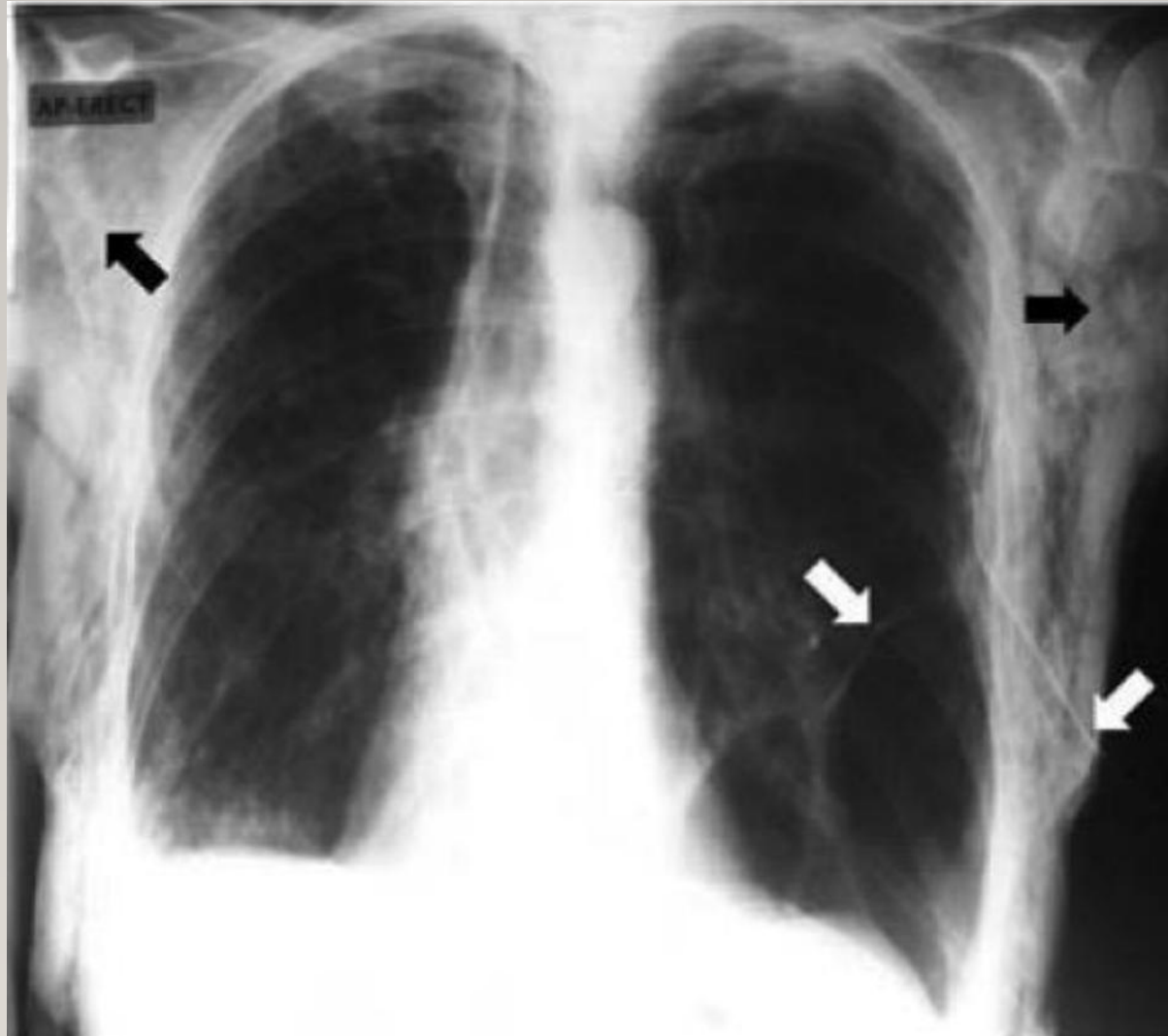
Tension pneumothorax



**Mediastinal
shift away**

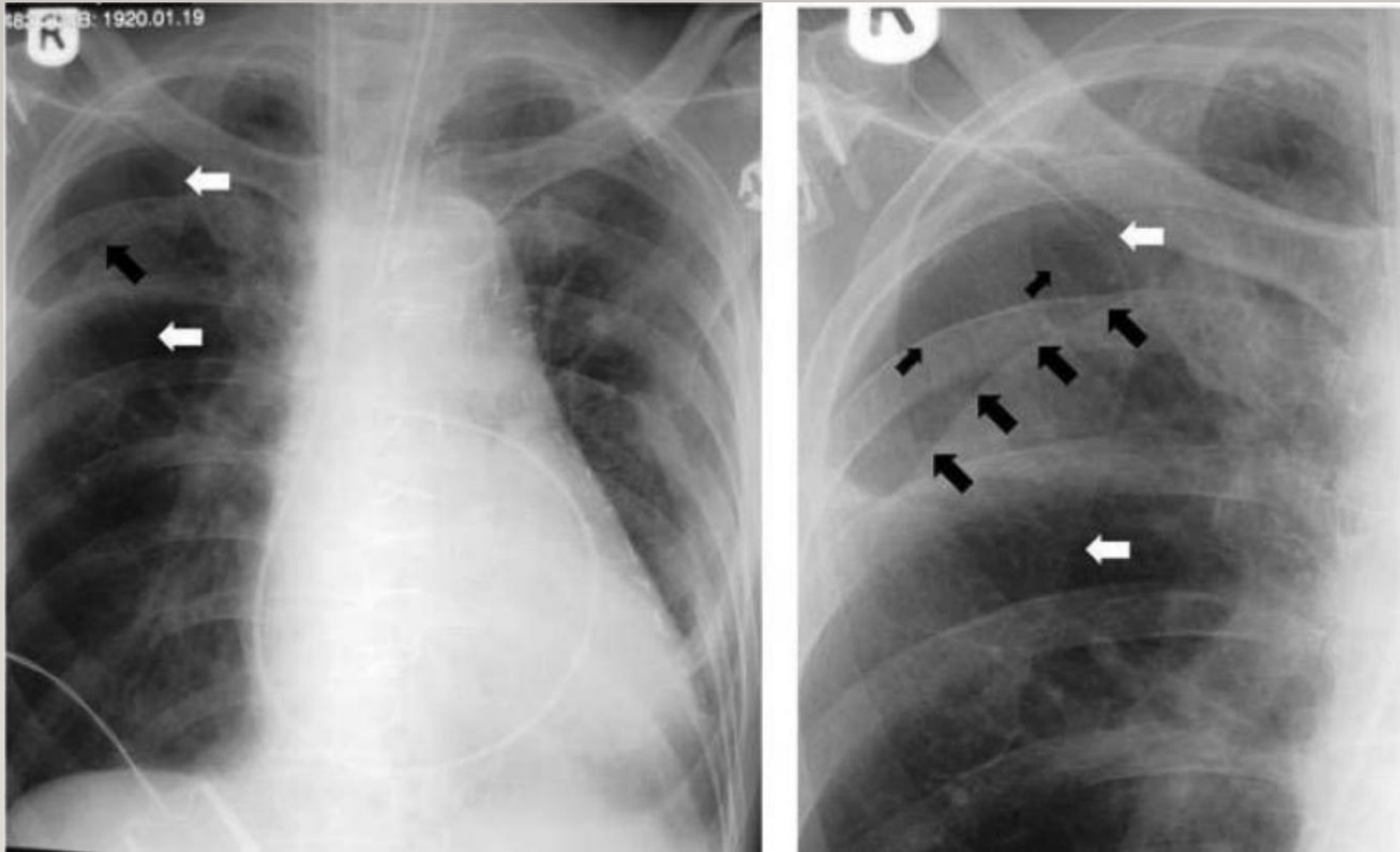
**Flattened R't
hemidiaphragm**

Tethered pneumothorax (Trapped lung)



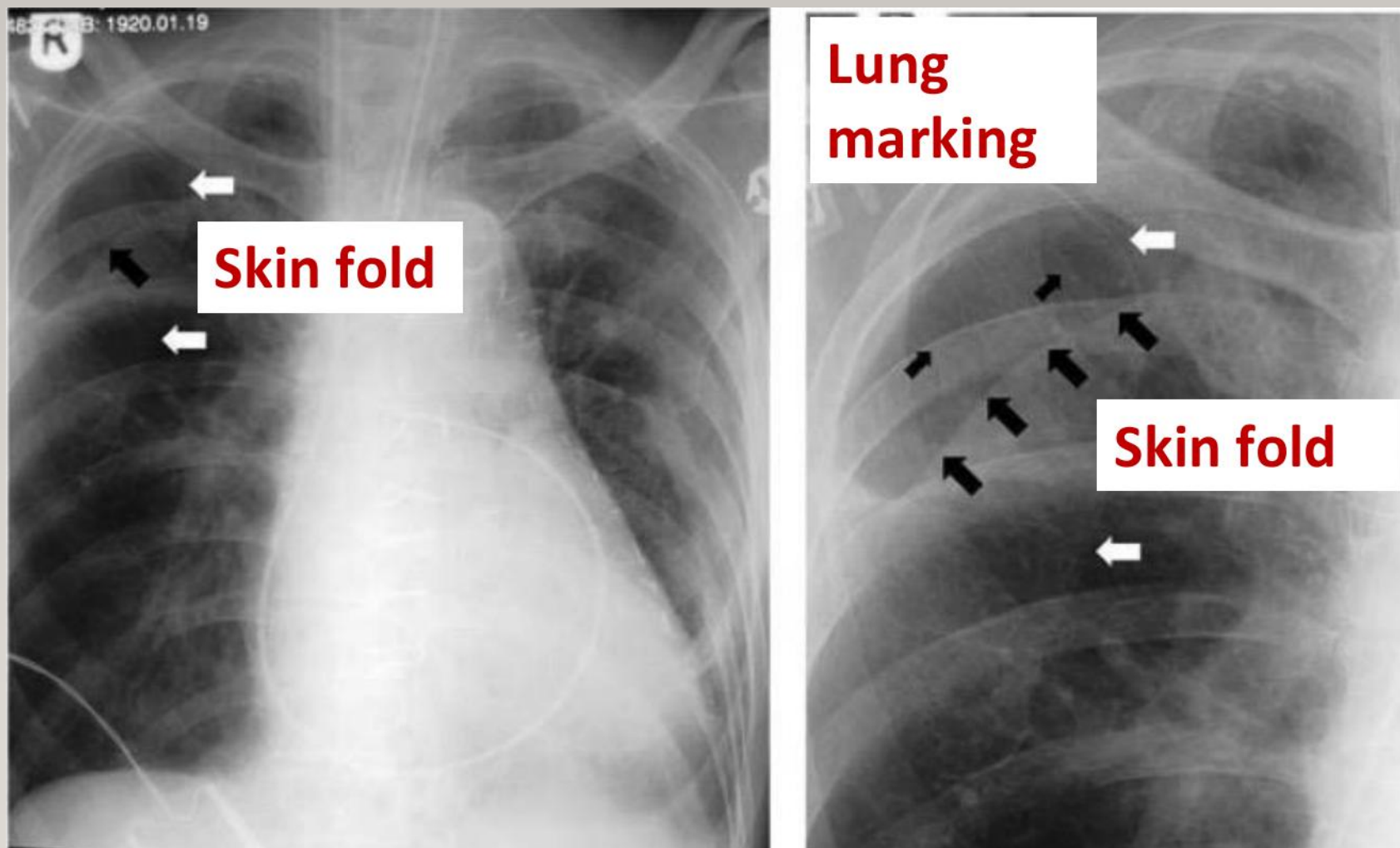
WHO manual of diagnostic imaging Chapter 10 Pleural disease

Portable AP view at ICU



WHO manual of diagnostic imaging Chapter 10 Pleural dx

Pseudo-pneumothorax



DEEP SULCUS SIGN



- 深溝徵候 (deep sulcus sign)
- Pneumothorax in AP CXR
- 當病人平躺時，胸腔的最高處是位於 subpulmonary area，故空氣會積在 Subpulmonary area，而將該側的 costophrenic sulcus 顯示得非常清晰，且能看得比正常時更深。

Deep Sulcus Sign
Saweera Sabbar, M.B., B.Ch., and Eric James
Nilles. N Engl J Med 2012; 366:552

PLEURAL EFFUSION



CAUSES OF PLEURAL EFFUSION

INTRATHORACIC

- Left heart failure
- Infection
- Neoplasm
- Pulmonary embolism
- Collagen vascular disease (SLE, RA)
- Trauma

EXTRATHORACIC

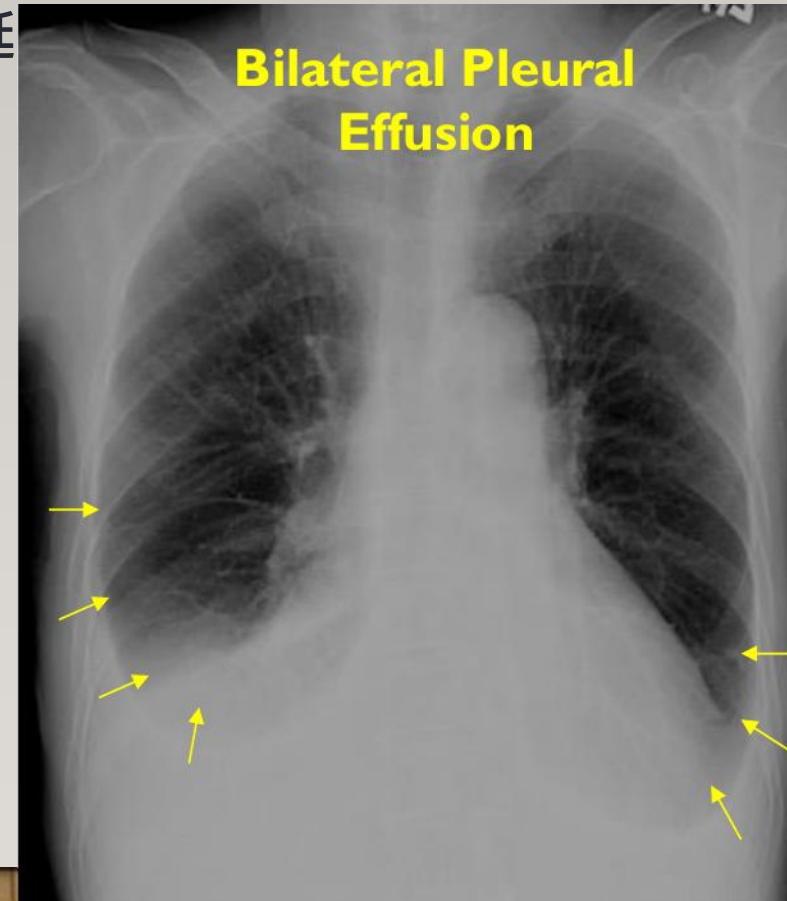
- Hepatic failure
- Nephrotic syndrome
- Meig's syndrome (Ovary cancer)
- Subphrenic abscess
- Pancreatitis

PLEURAL EFFUSION AMOUNT

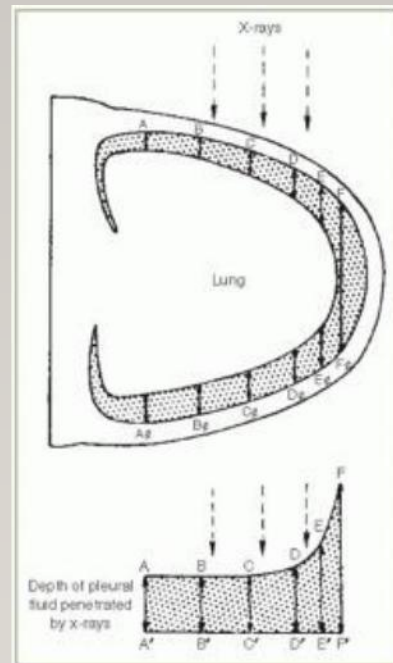
- Normally, 10-15cc in one pleural space
- PA view:
 - Meniscus sign or angle blunting
 - 通常積水量 **300-500**cc
- Lat view:
 - Posterior CP angle blunting ，積水量 > 150cc
 - More sensitive than PA view
- Supine view:
 - 由橫膈至肺尖呈現 homogenous GGO (略有漸層)
 - 當 lateral CP angle blunting 時，積水量約 500~1000cc
- Decubitus view:
 - Can detect pleural effusion less than **100cc**
- Chest CT or chest echo: 50 cc 可以偵測到

弦月徵候 (MENISCUS SIGN)

- 肋膜腔積液時，積液沿著兩層肋膜間向 上延伸，因而形成半月狀之空氣—水界面
- 圓柱筒投影現象
 - Cylindrical Projection Density
- 弦月徵候
 - Meniscus sign

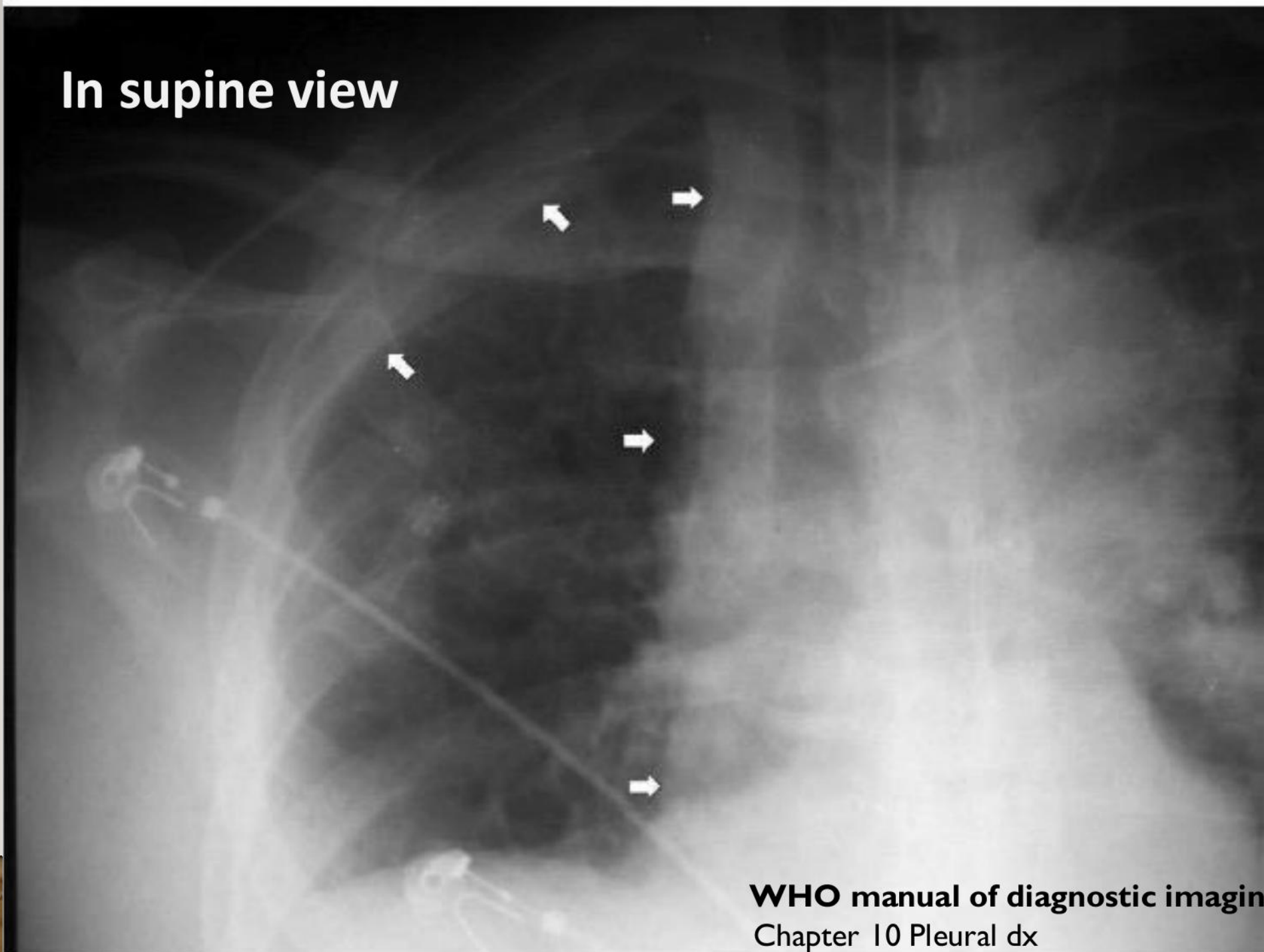


MENISCUS SHAPE OF PLEURAL EFFUSION



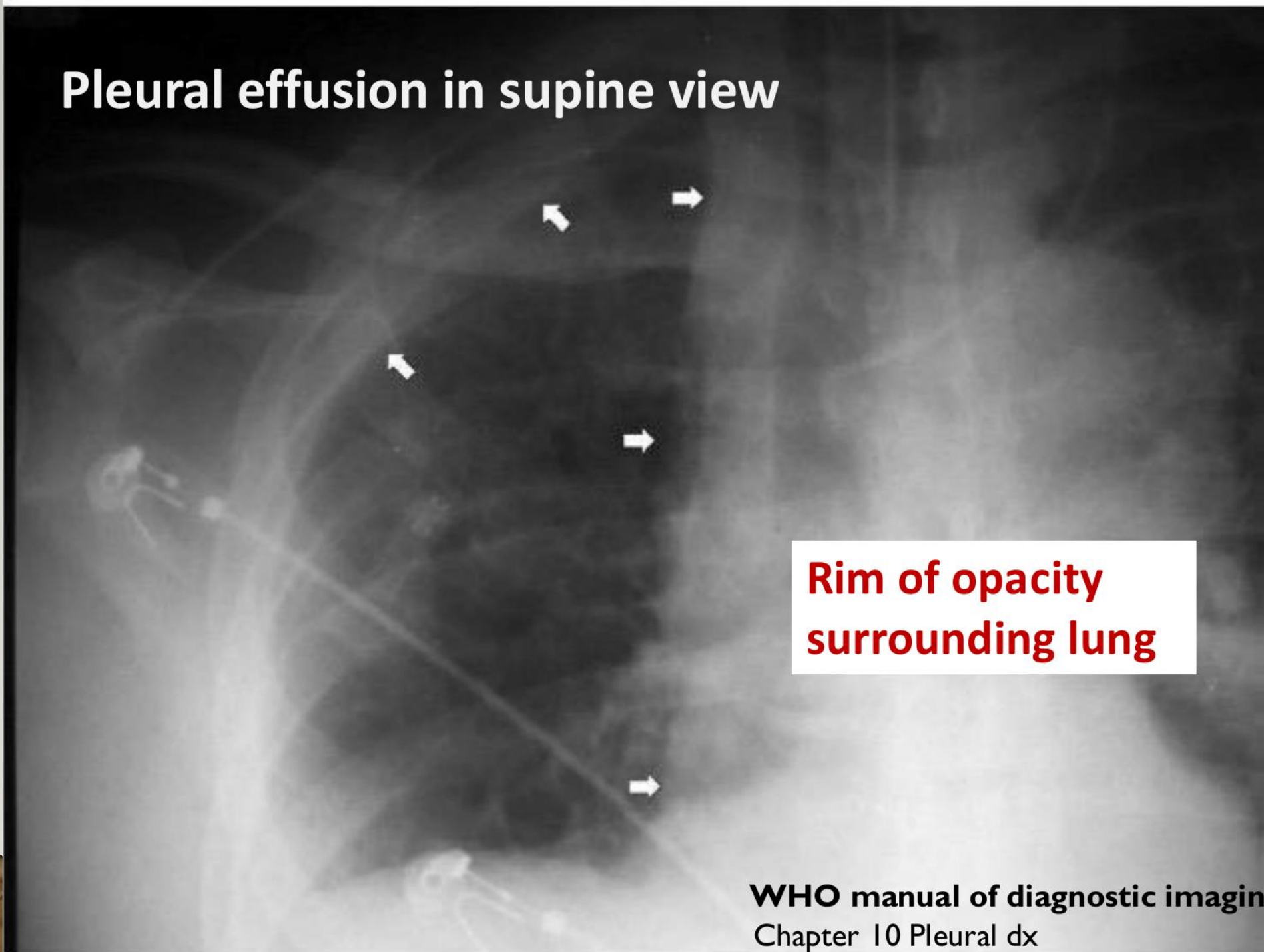
- The distance between the lung and the chest wall is the same around the entire lung.
- The depth of the fluid when viewed en face AA' to CC' is not sufficient to increase the radiodensity.
- More laterally at DD' to FF' , however, the x-ray beam passes through more and more pleural fluid, so that an increase in density is radiologically evident.

In supine view



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Chapter 10 Pleural dx

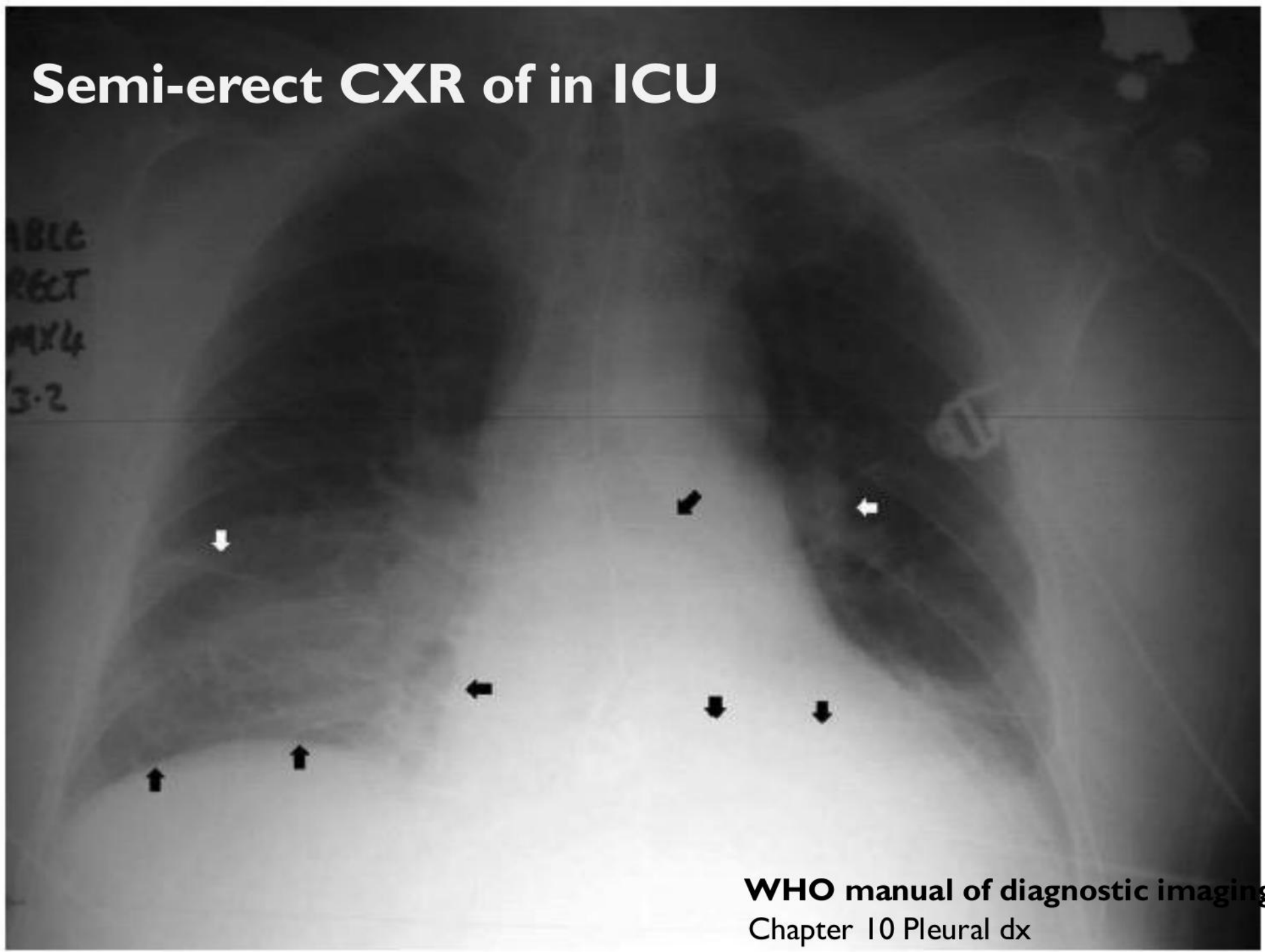
Pleural effusion in supine view



**Rim of opacity
surrounding lung**

Semi-erect CXR of in ICU

ABLE
RECT
MX4
3-2



R't large pleural effusion

Semi-erect CXR in ICU

**Fluid tracking into
minor fissure**

**Preserving diaphragmatic &
right heart border due to
posterior position of fluid**

PLEURAL EFFUSION: PHANTOM TUMOR

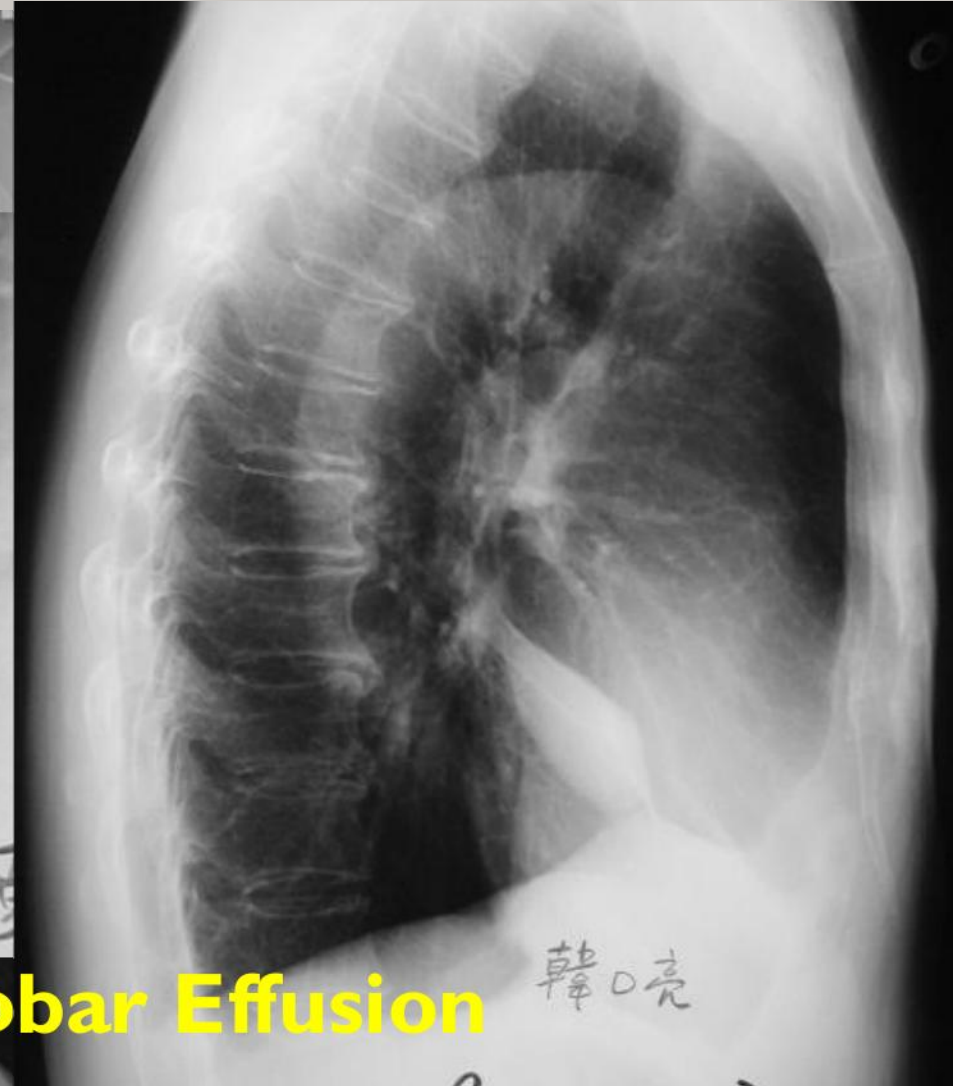
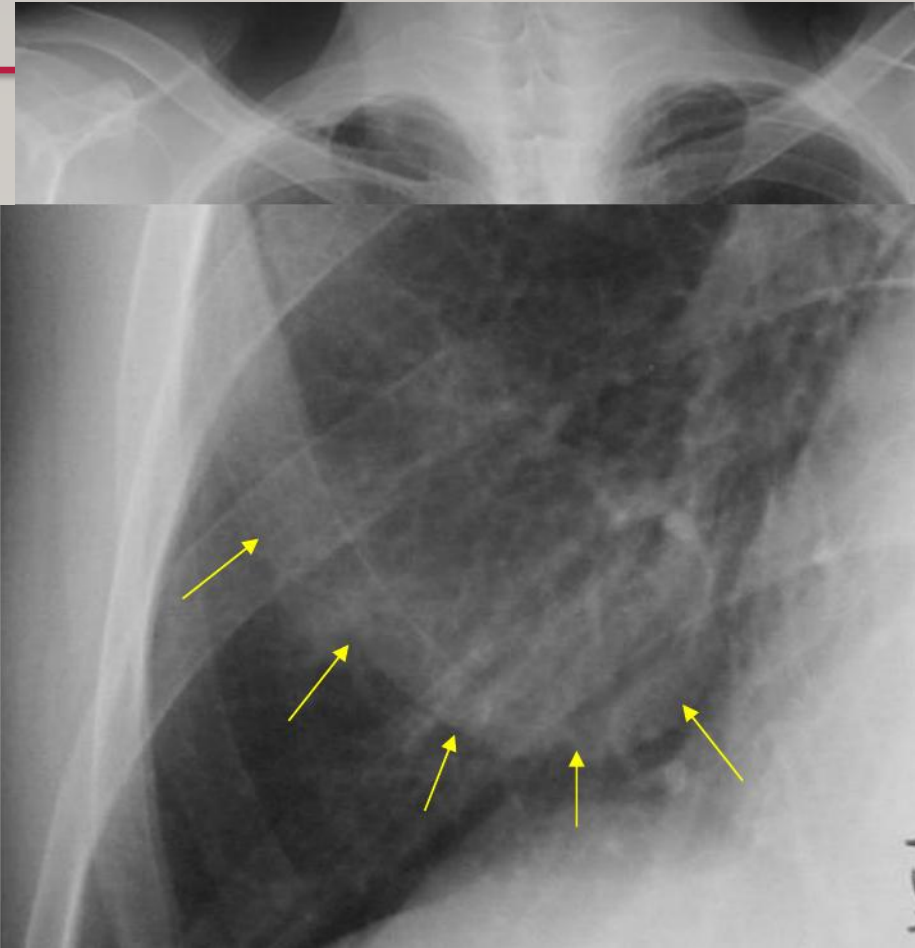
- Costophrenic angle blunting
- Fibrous adhesions or scars,
within fissures
- cigar shaped
- **Pseudotumor**
- **Phantom tumor**



Massive Pulmonary Pseudotumor:

Brian M. Haus, BA; Paul Stark, MD; Scott L. Shofer, MD
and Ware G. Kuschner, MD, FCCP Chest. 2003;124:758-
760

INCOMPLETE INTERLOBAR FISSURE SIGN



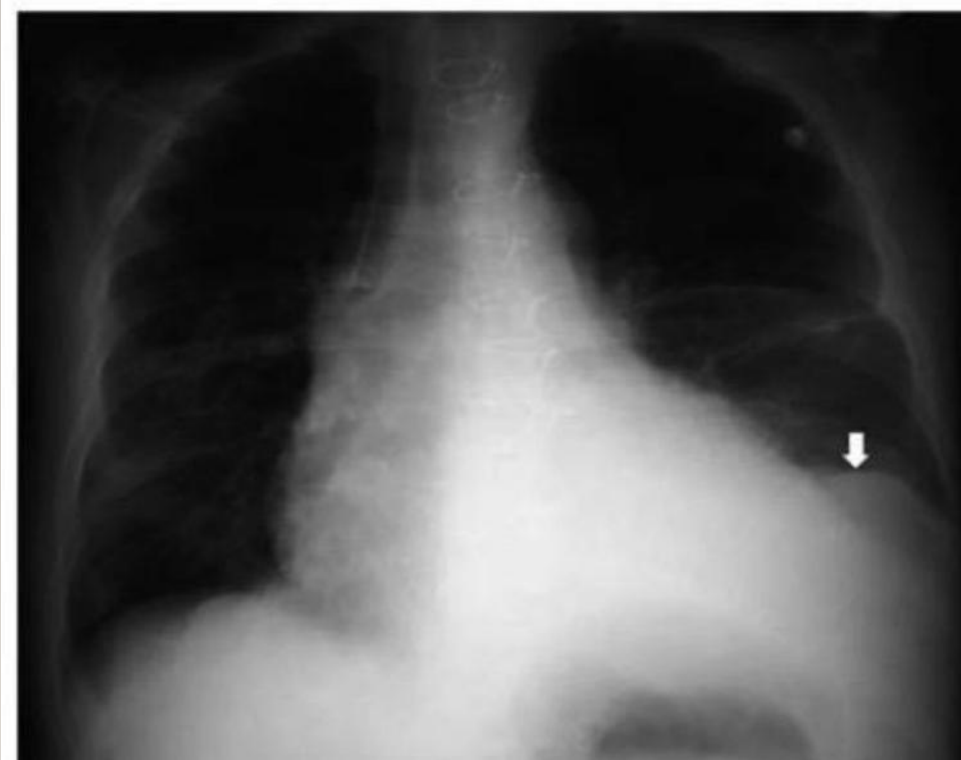
Interlobar Effusion

韓口亮

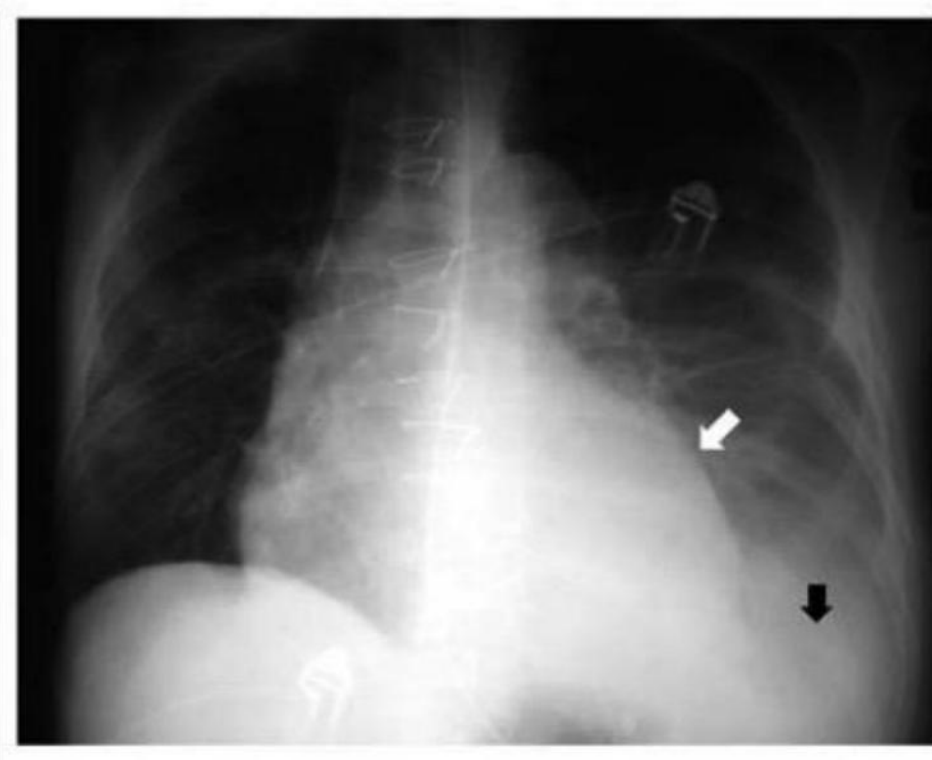
Subpulmonic pleural effusion

Erect

Supine



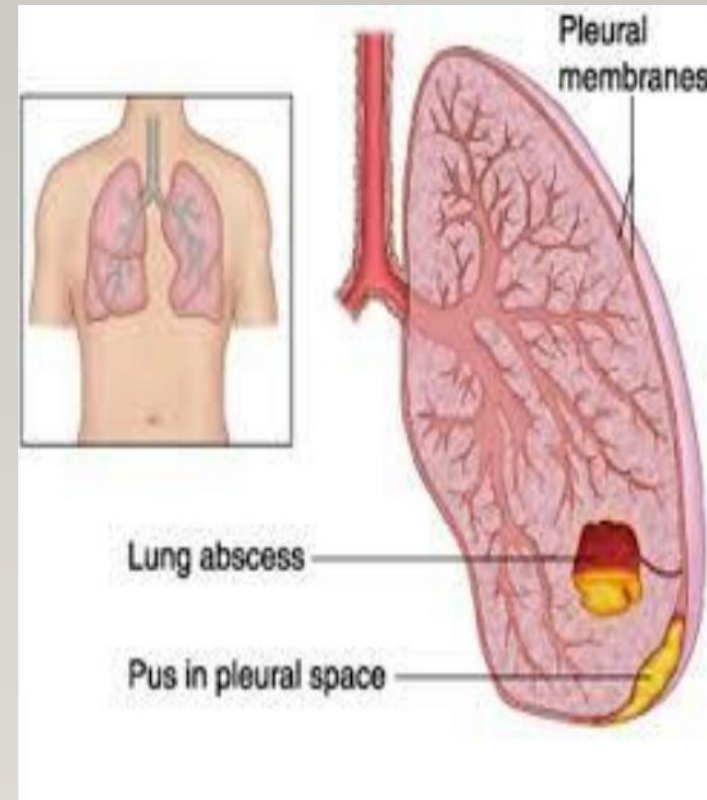
Raised left hemi-diaphragm



Preserving L't heart border

EMPHYEMA AND LUNG ABSCESS

- Empyema : collection of pus in the space between the lung and the inner surface of the chest wall **(pleural space)**
- **Lung abscess: pulmonary parenchyma infection**



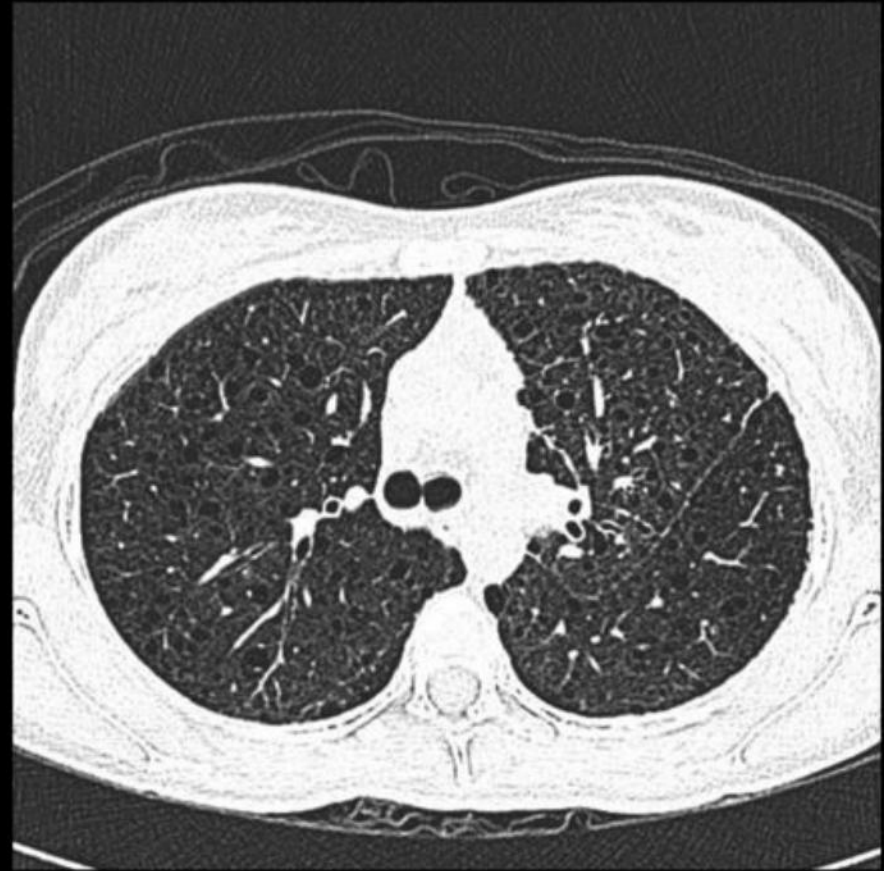
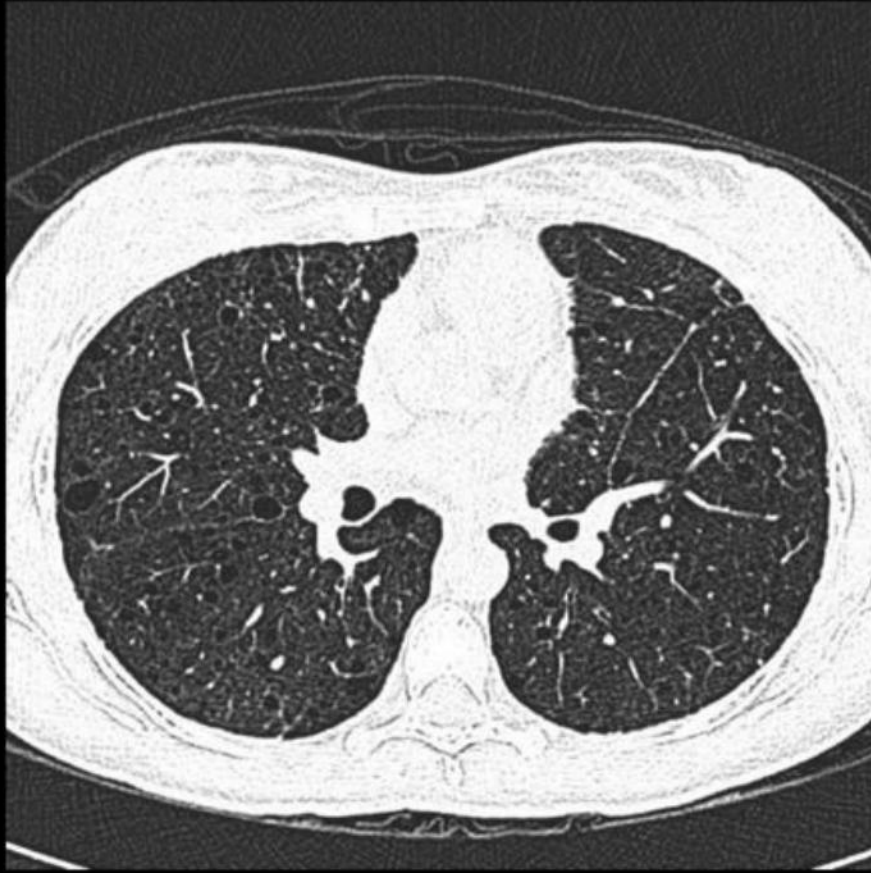
Empyema	Lung abscess
Obtuse angle	Acute angle
Oval, linear	Round
Space-occupying (bronchi, vessels deviation)	Cavitary change
Smoother margins	Ill defined



LEFT PLEURAL EFFUSION WITH INTERSTITIAL PATTERN

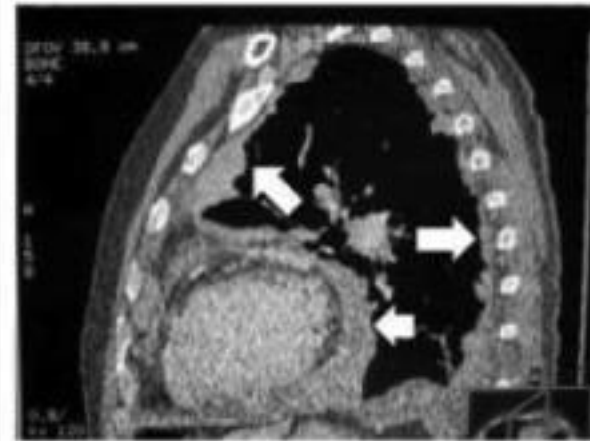
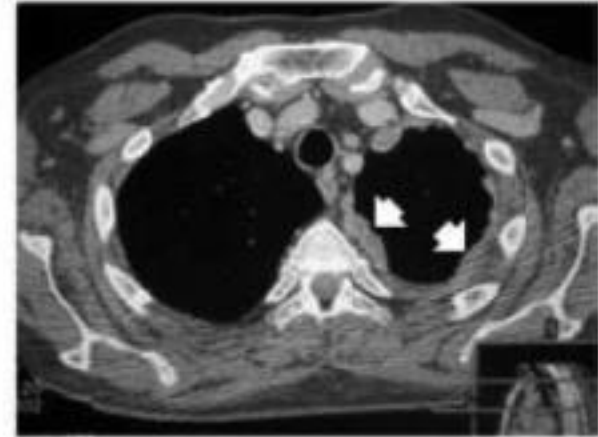
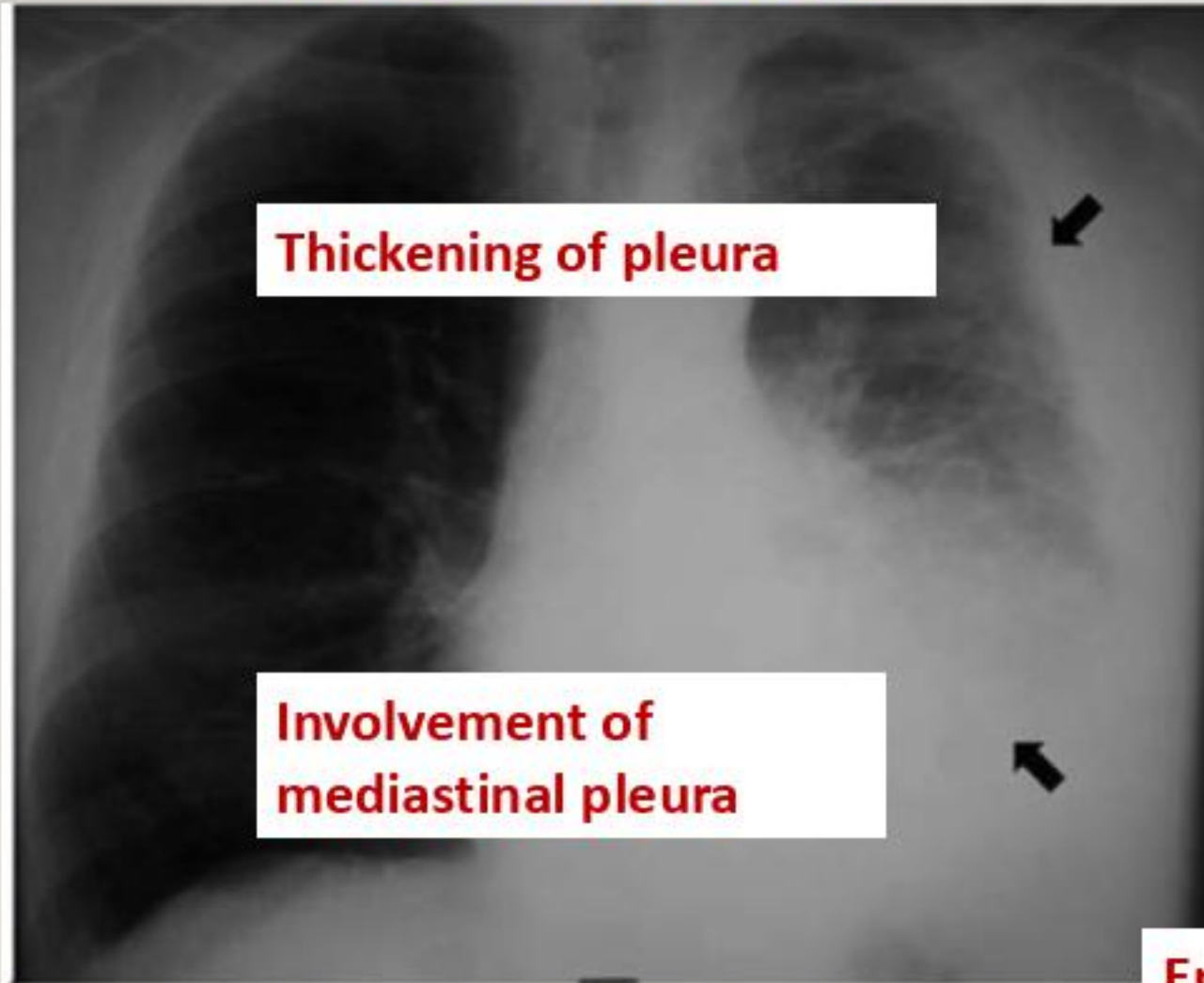


LAM with chylothorax





Mesothelioma



Encasement of lung



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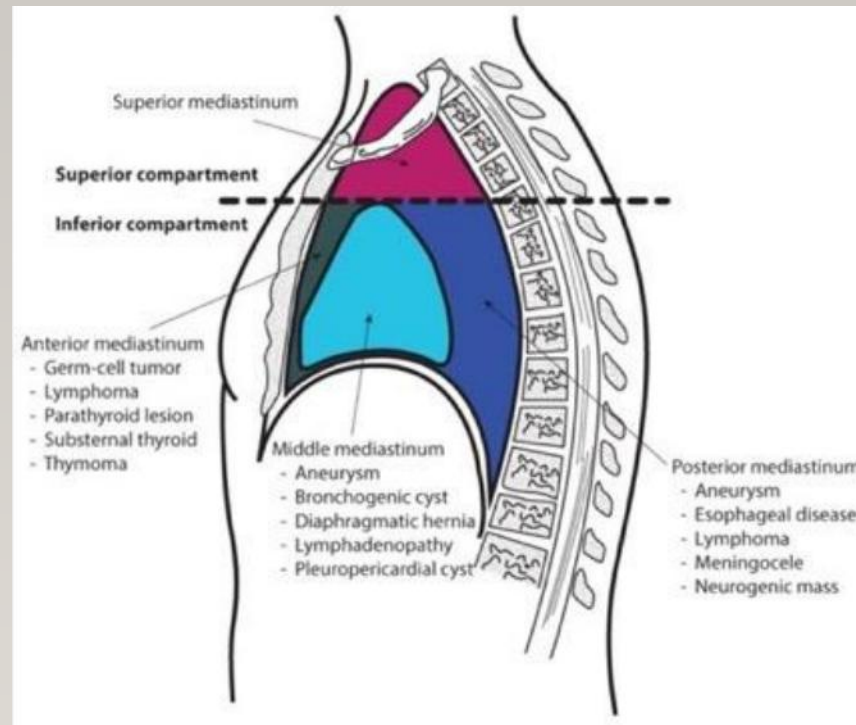
R't sided hemothorax

**Pleural thickening
& calcification**

MEDIASTINAL DISEASES



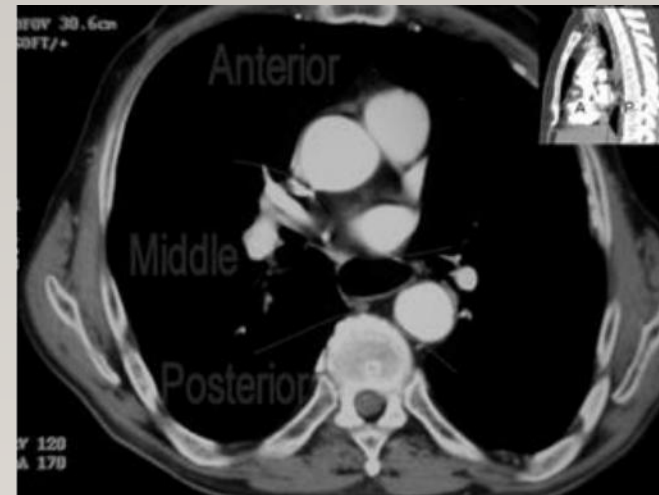
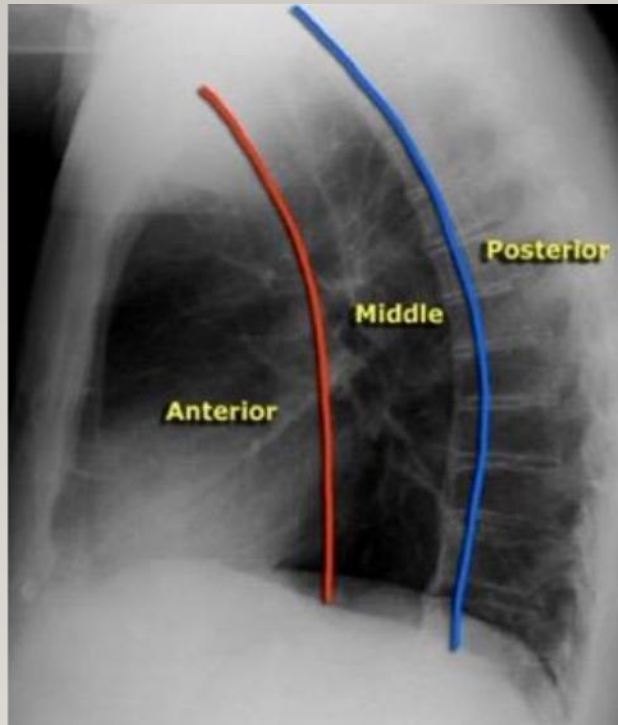
ANATOMY OF MEDIASTINUM



Contributed Illustration by Bryan Parker

<https://www.ncbi.nlm.nih.gov/books/NBK513231/figure/article-24850.image.f1/>

FELSON DIVISION

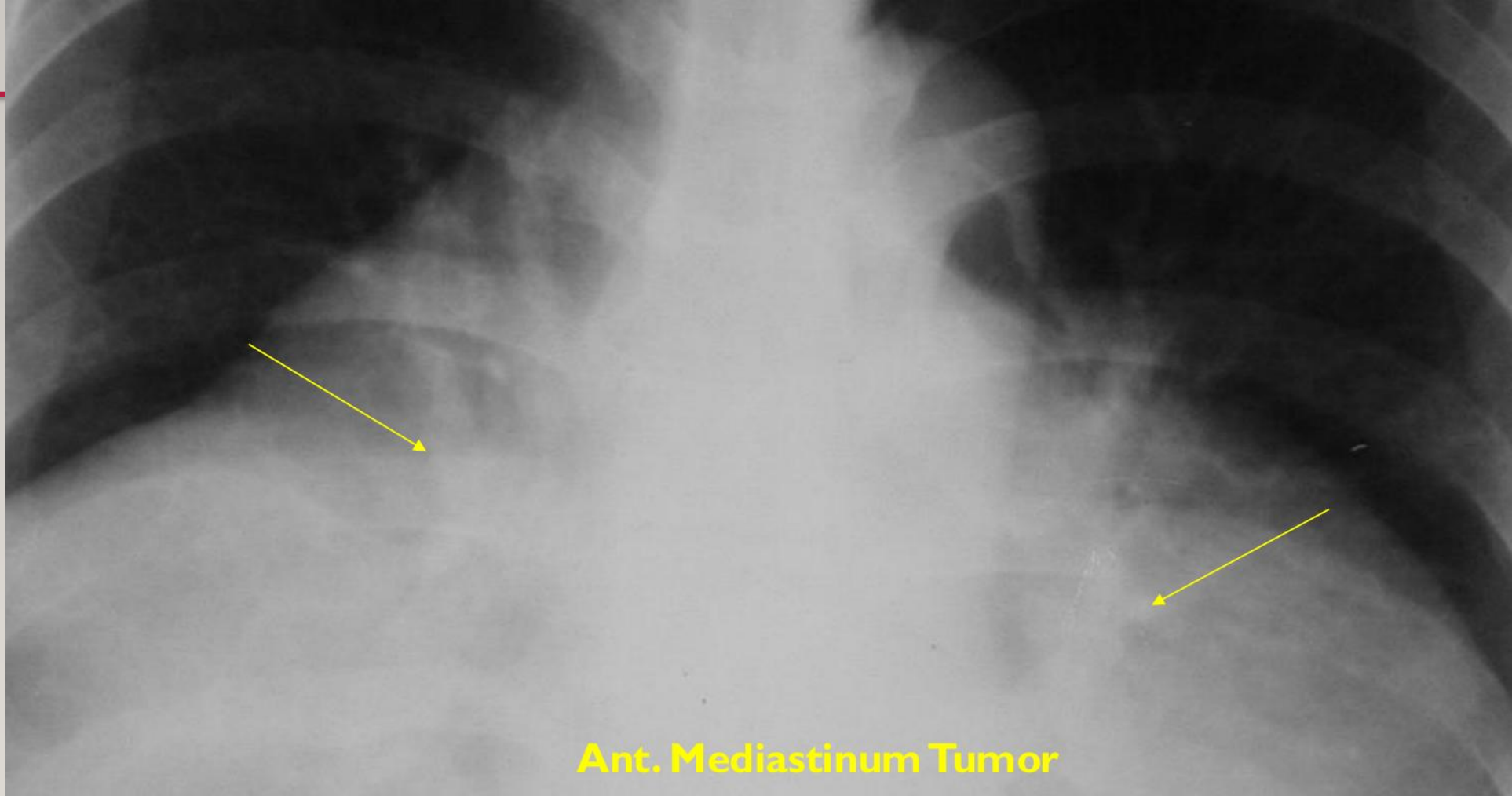


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Chapter 14 Mediastinal dx

MEDIASTINAL TUMORS

	Tumor type
Anterior	Thymic tumor (thymoma, cyst, fat, etc.) Thyroid (2/3 rd of retrosternal extension) Teratoma Lymphoma (terrible lymph nodes)
Middle	Aortic aneurysm, Trachea/main bronchus tumor, Sarcoidosis, TB, Esophageal cancer, Hiatal hernia, Achalasia, Bronchogenic cyst, Metastatic lymphadenopathy
Posterior	Neurogenic tumor Meningocele Extramedullary hematopoiesis (Thalassemia) Mass from spine (tumor, abscess, etc) Bochdalek hernia

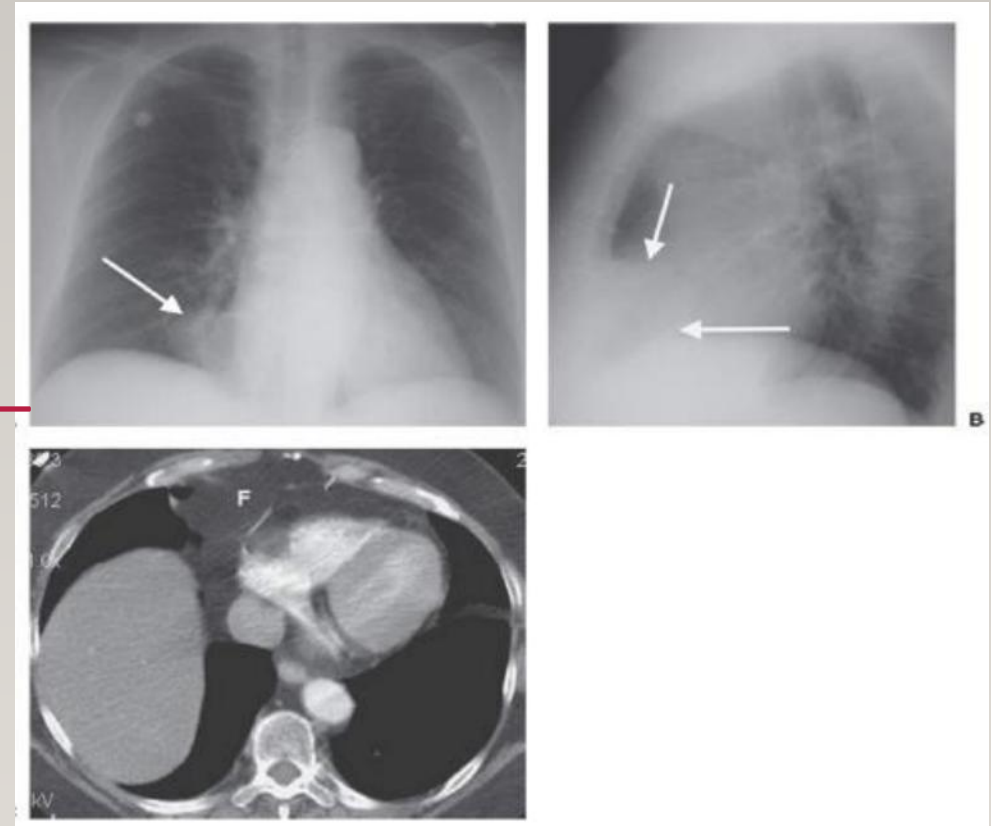
肺門覆蓋徵候 (HILUM OVERLAY SIGN)



* References 江自得主任--" 實用胸腔X光診斷學"

PROMINENT PERICARDIAC FAT

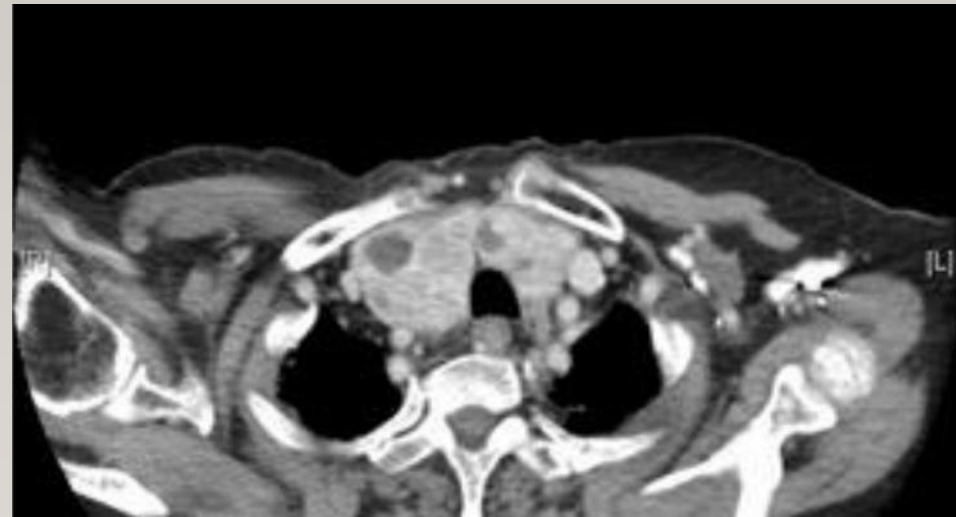
- A round mass at the right cardiophrenic angle (arrow)
- Lateral view: anterior – inferior heart (arrows)
- CT shows this mass to be of fat attenuation



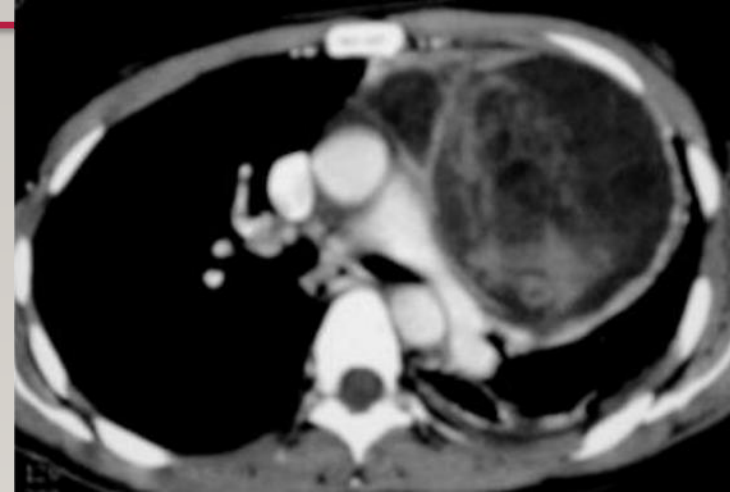
CERVICOTHORACIC SIGN: INTRATHORACIC GOITER



CXR from CGMH



MATURE TERATOMA



- Left anterior mediastinal mass
- Loss of aortic arch and heart border

長庚醫院胸腔科教學片

ANTERIOR MEDIASTINAL MASS: LYMPHOMA



CXR from CGMH



MIDDLE MEDIASTINUM: HILAR MASS

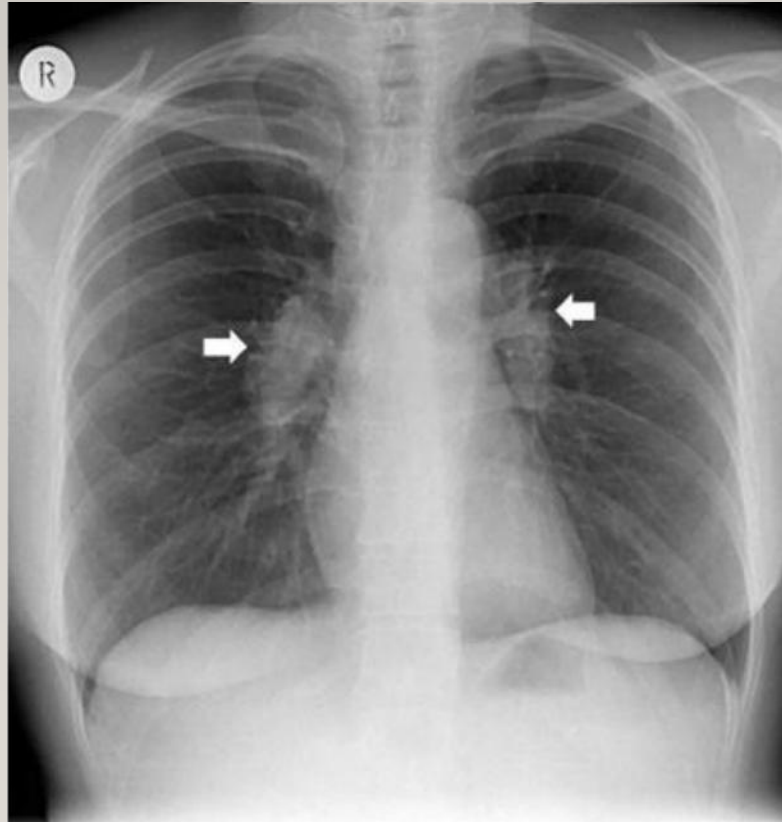
- Tumor: lung cancer, metastasis, lymphoma, bronchogenic cyst
- Infection: TB, fungus, viral
- Inhalation: sarcoidosis , silicosis, pneumoconiosis
- Connective tissue disease: scleroderma
- Vascular: pulmonary hypertension, aneurysm
- GI tract: esophageal cancer , hiatal hernia, achalasia

HILAR MASS



left hilar adenopathy secondary to renal cell carcinoma.

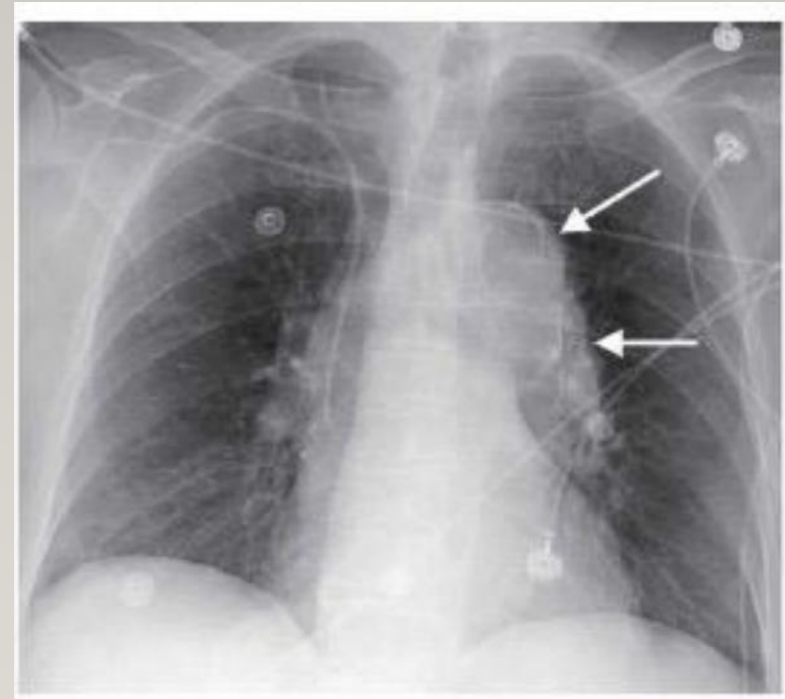
HILAR MASS: POTATO NODES



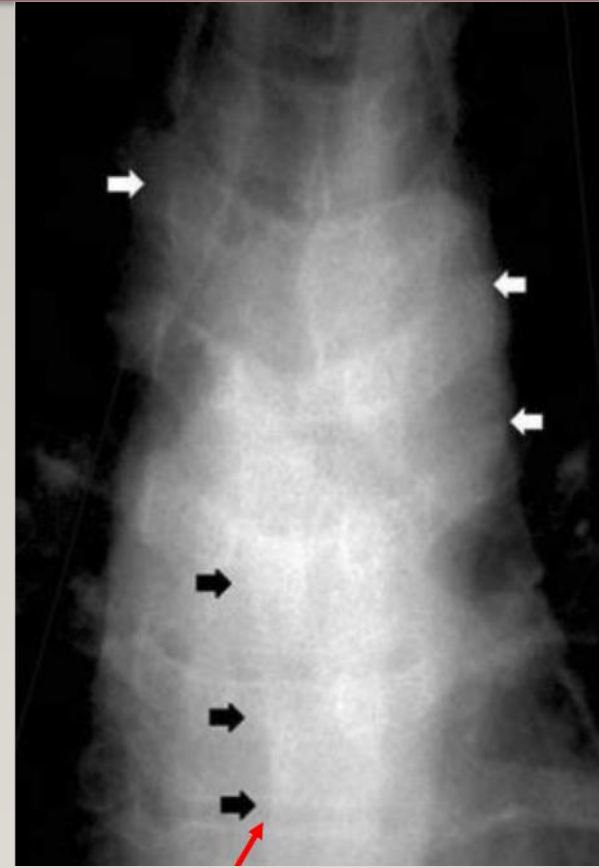
Sarcoidosis

LEAKING THORACIC AORTIC ANEURYSM

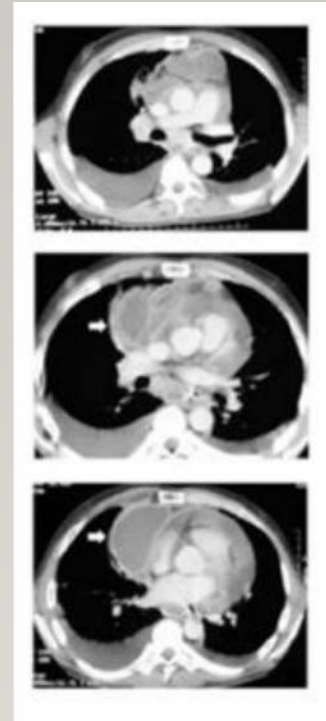
- Widened mediastinum
- Abnormal left mediastinal contour
- Focal aneurysm (arrow)



BILATERAL HILAR LYMPHADENOPATHY

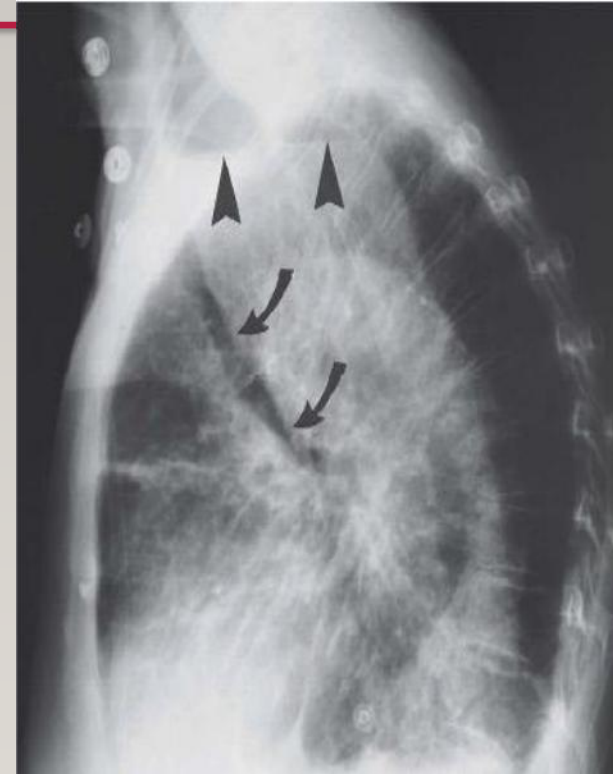
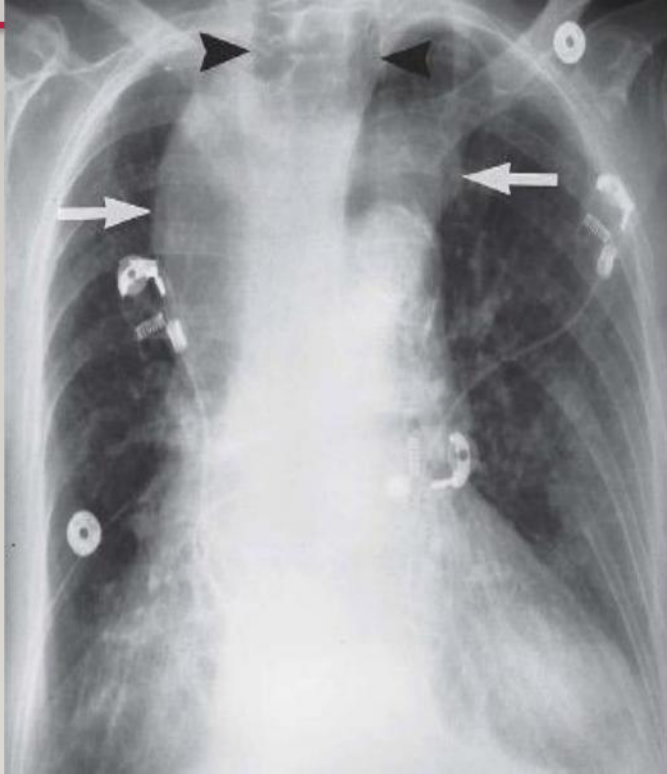


MEDIASTINAL ABSCESS



WHO manual of diagnostic imaging
Chapter 14 Mediastinal dx

ACHALASIA: DOUBLE AIR COLUMN

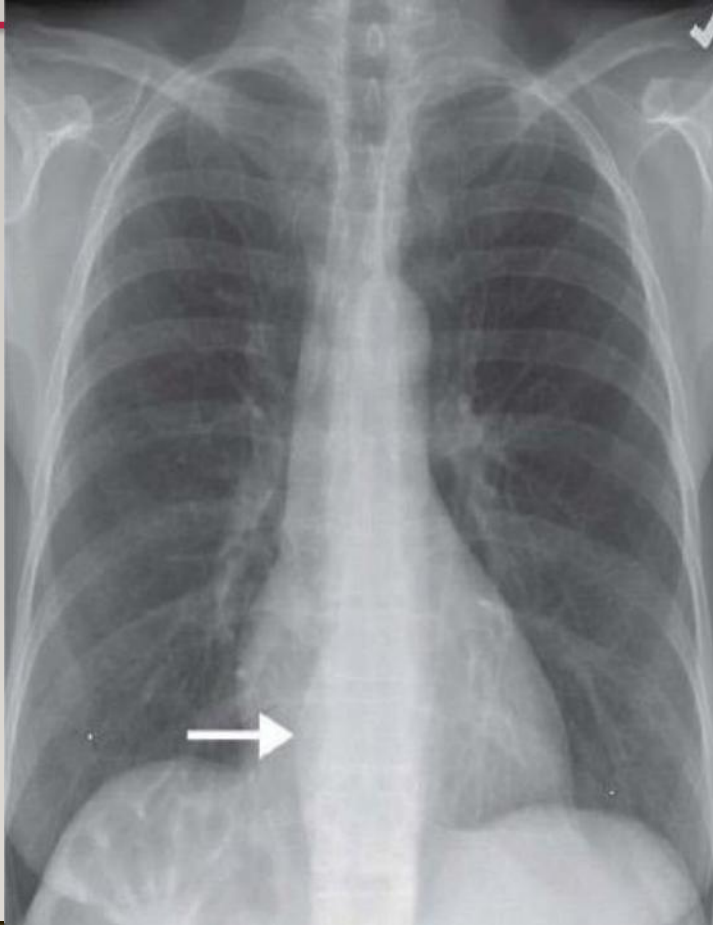


Widened mediastinum (arrows) and air within the dilated air-filled esophagus (arrowheads)

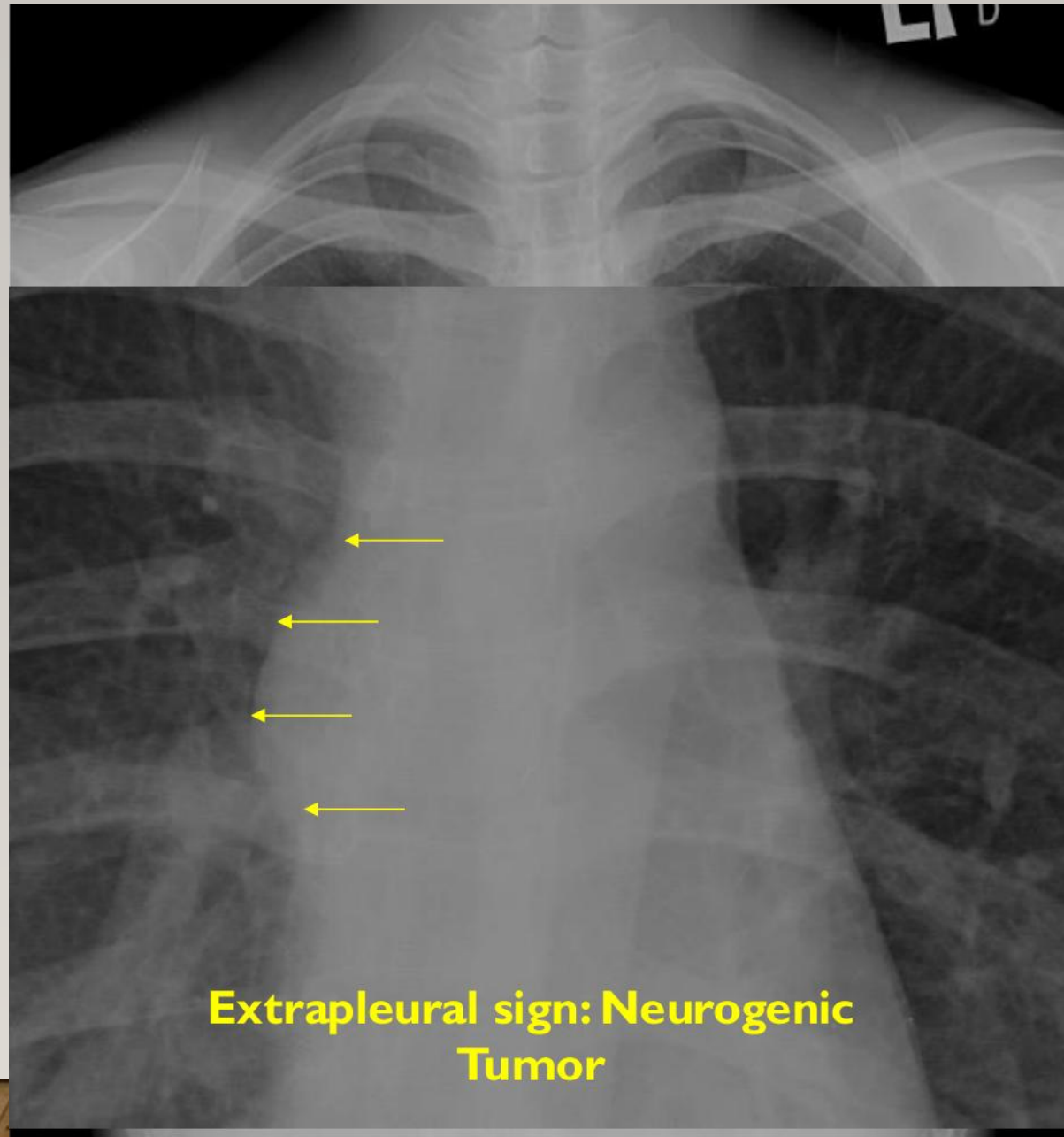
ESOPHAGEAL CANCER S/P RECONSTRUCTION



ESOPHAGEAL VARICES



Tubular structures (arrow) abutting the esophagus.



* References 江自得主任 -- "實用胸腔 X 光診斷學"

CONSULTATION FROM HEMATOLOGY



- Lower thoracic spine
 - Extrapleural sign
- Paravertebral mass

PARAVERTEBRAL EXTRAMEDULLARY HEMATOPOIESIS

Fig.2 Abdominal CT scan on Jan, 16, 2014
from St. Paul Hospital

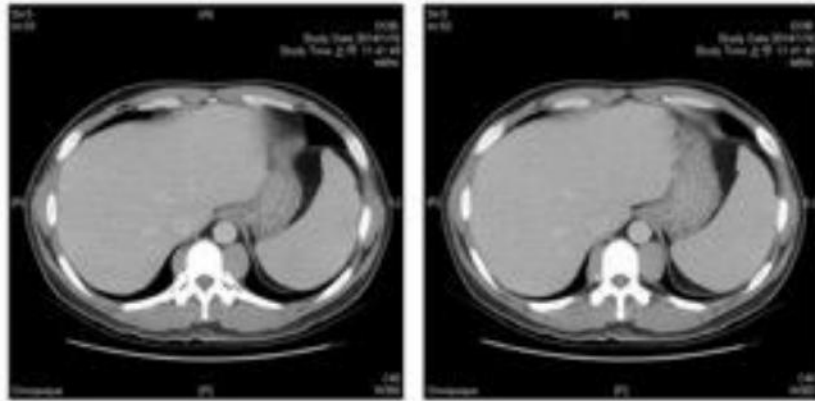
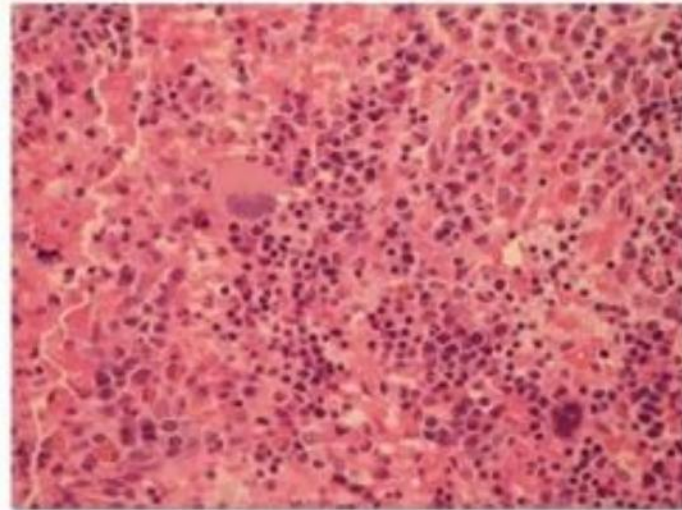


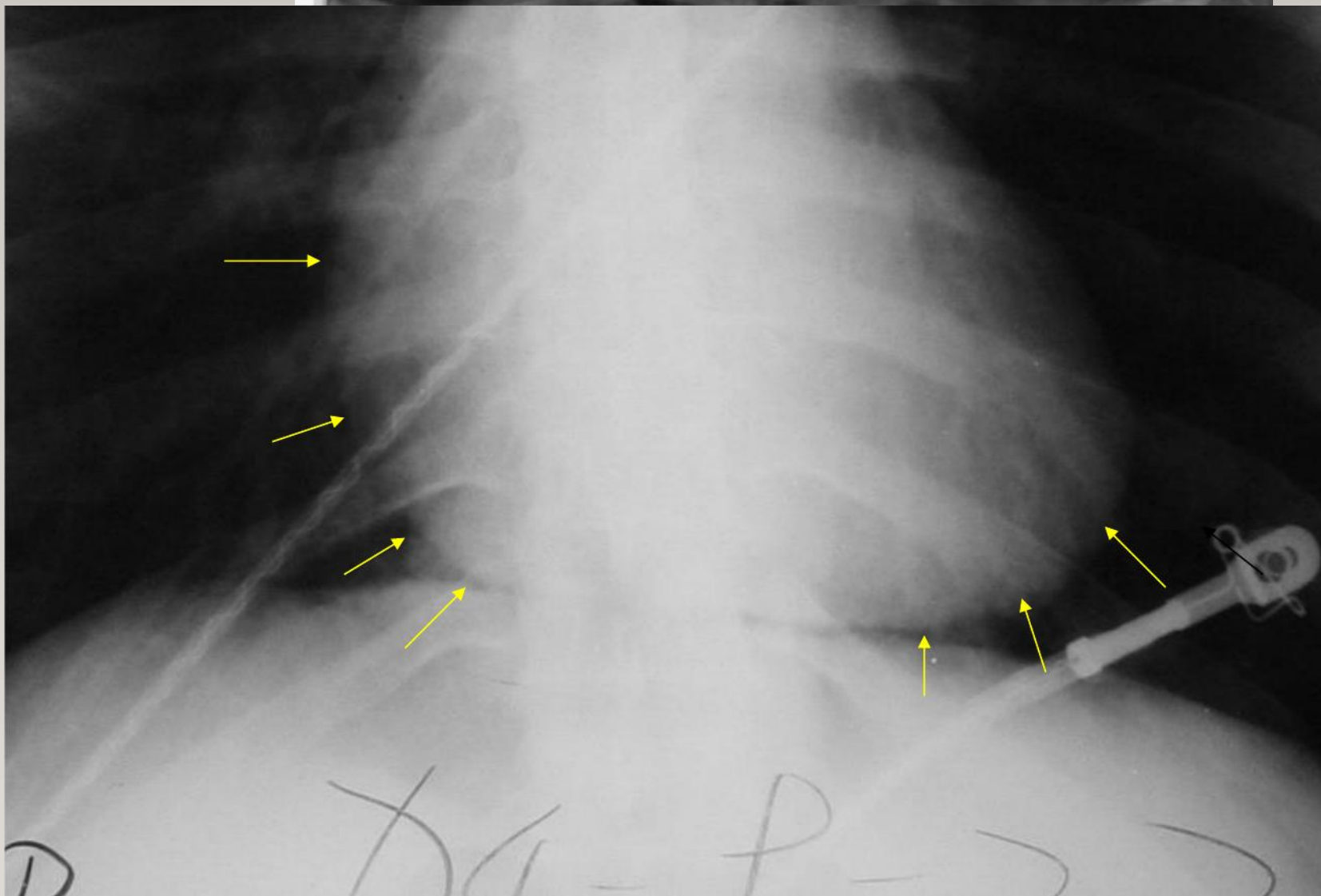
Fig.5 paravertebral masses biopsy



PNEUMOMEDIASTINUM

- **Continuous diaphragm sign**

- 正常時，心臟緊貼著 diaphragm，左右兩側 hemidiaphragm 看似分離。
- 當發生 pneumomediastinum 時，心臟底下的 mediastinal space 及兩側 diaphragm 的 extrapleural space 都可能充氣，因而可見 mediastinal gas 把兩側 hemidiaphragm 的 superior surface 顯示出來。
- mediastinal gas 與 diaphragm 面的 extrapleural gas 因而連成一條線，稱為 continuous diaphragm sign。



* References 江自得主任 -- "實用胸腔 X 光診斷學"

TAKE HOME MESSAGES

- CXR is helpful in examining chest wall, pleura, and diaphragm
- Are there many lung lesions? (ATMLL)
- Abdomen and Diaphragm:
 - Subphrenic air, Hernia, Chilaiditi sign
- Thoracic cage and Chest wall:
 - Symmetry: Hyperlucent or Hyperopaque Hemithorax
 - Start from the outside and work inward
- Pleura:
 - Air, Effusion, Pseudo-tumor, Deep sulcus sign, Mass, Chylothorax
- Mediastinal diseases:
 - Anterior: 3T,1L
 - Middle: Sarcoidosis, aortic dissection, aneurysm, esophageal cancer
 - Posterior: Neurogenic tumor, extramedullary hematopoiesis

Thank you for attention~