

Extrapulmonary lesions on CXR

沈煥庭醫師

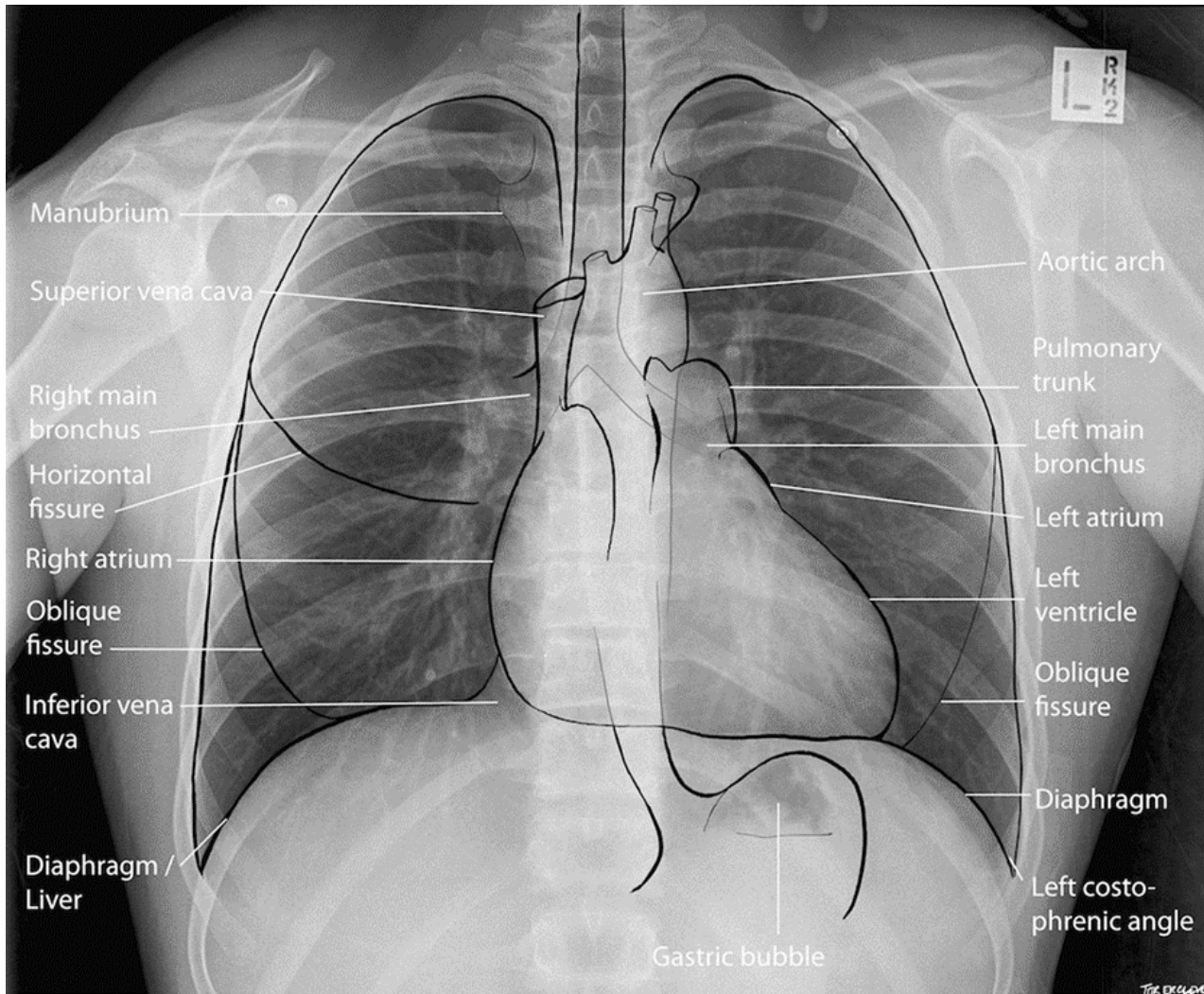
台中慈濟醫院

胸腔內科/重症醫學科

2021-8-1



Extrapulmonary lesions



- **CXR外側部位**

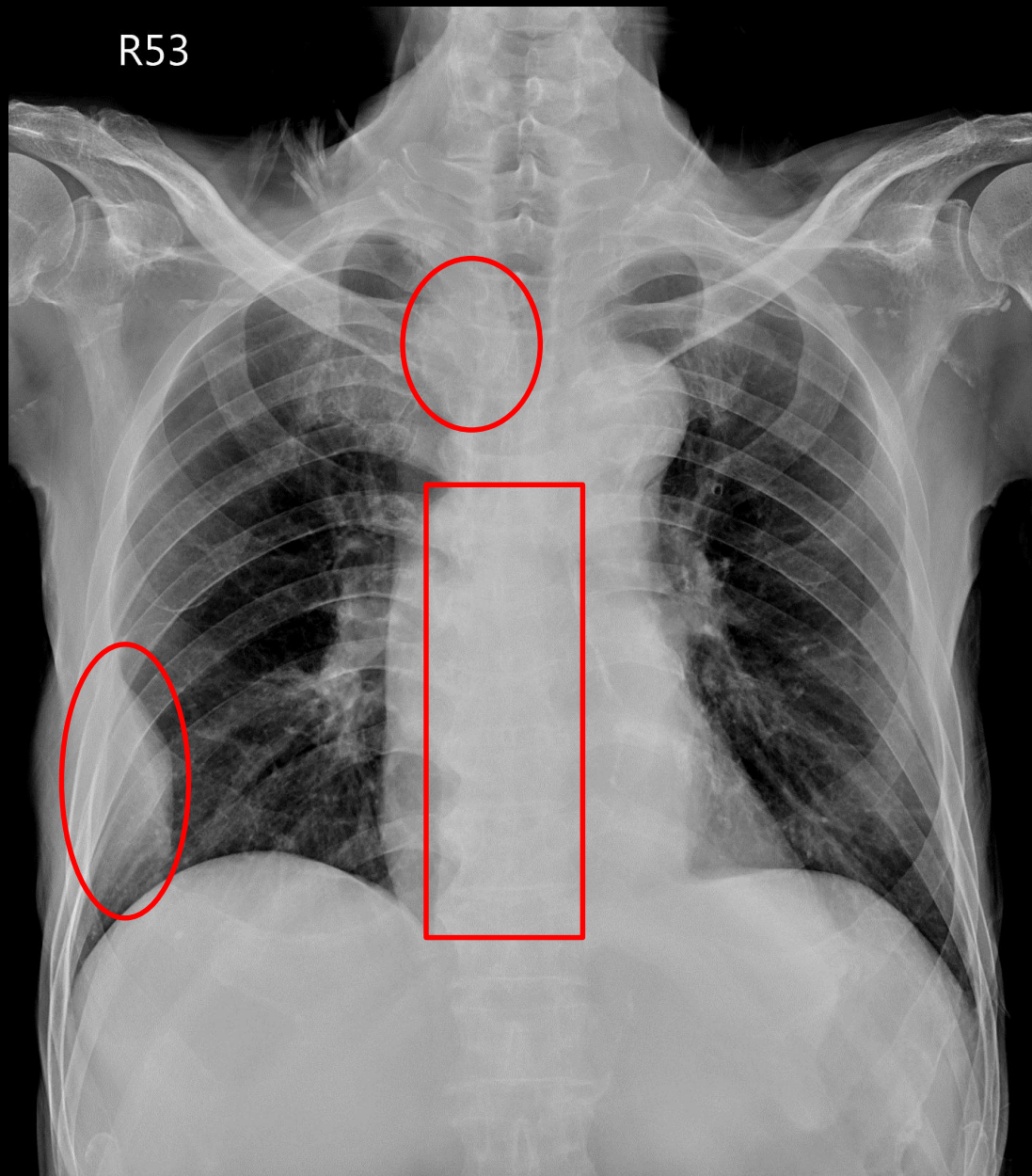
- Chest wall
- Pleura
- Diaphragm

- **CXR中央部位**

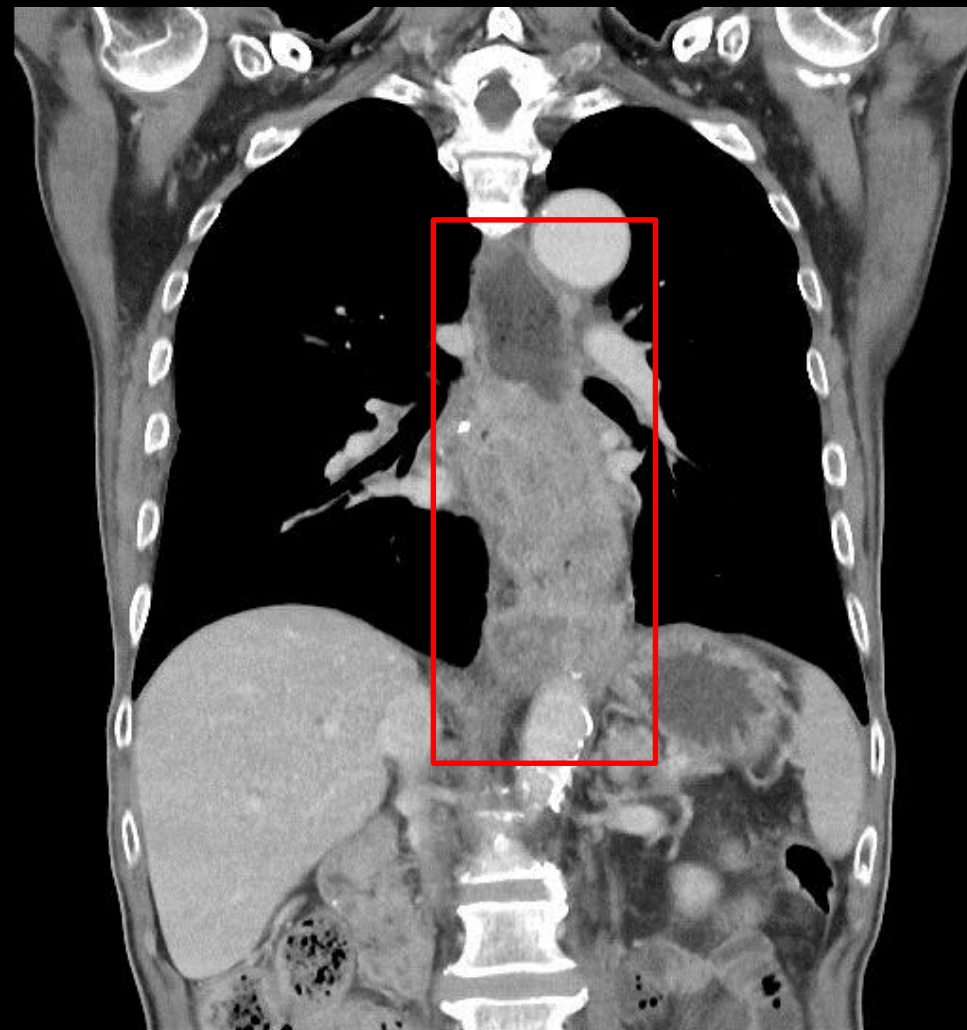
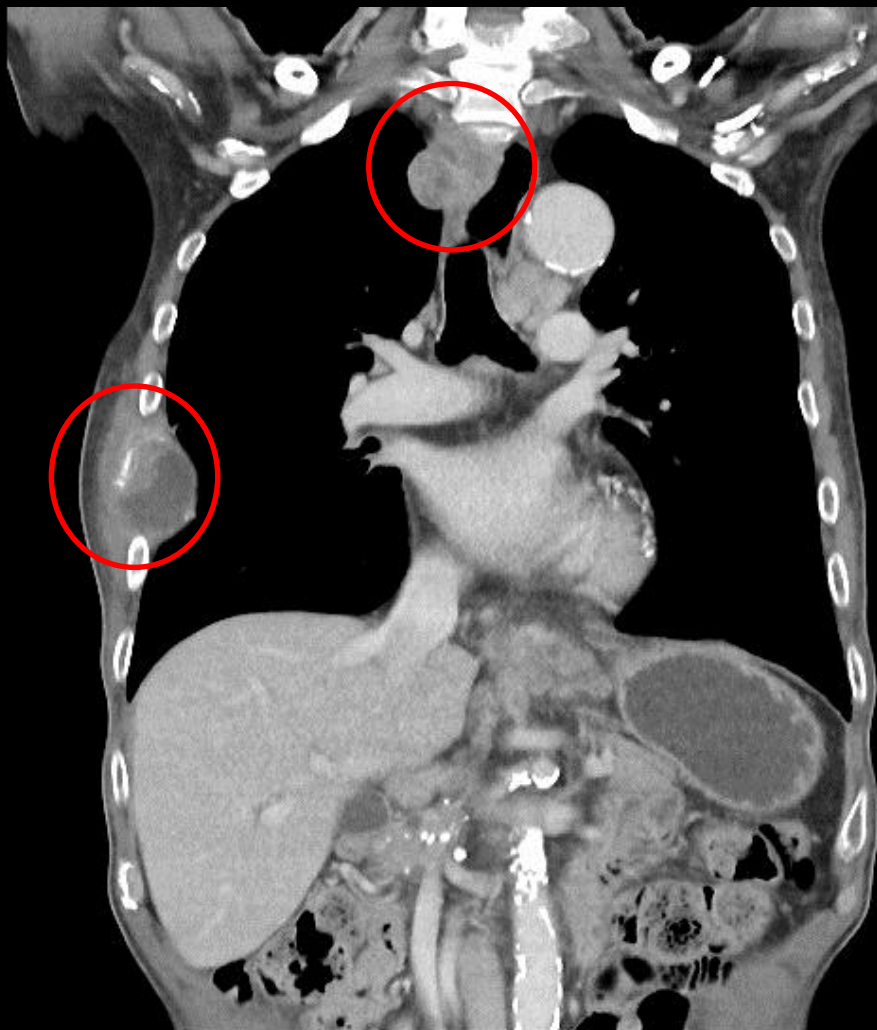
- Mediastinum
 - anterior
 - middle
 - posterior

一位患者的CXR

R53



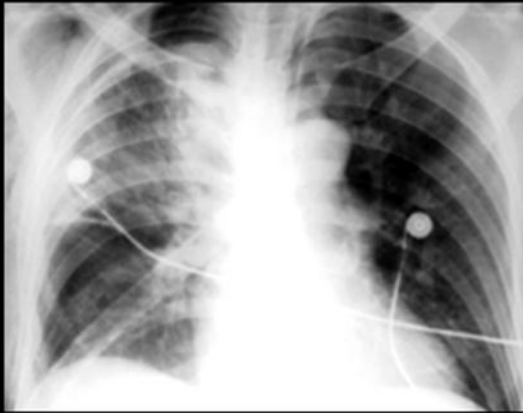
食道癌轉移至縱膈淋巴和胸壁



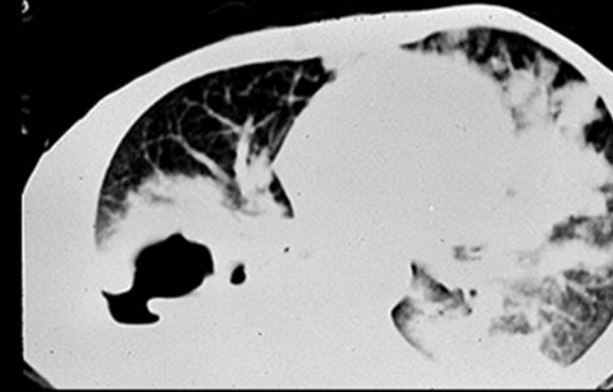
Intrapulmonary lesions 特徴



CT: Pleura intact



Lung marking



**without displacement
Of lung marking**



**Segmental or lobar
distribution**



Complete border



Air-bronchogram

Extrapulmonary lesions 特徵



Extrapleural Sign : 鈍角



Crossing Chest Wall



Note: The lung markings are still visible (PACS)



Incomplete border sign
不能排除是肺內病變



the "split pleura" sign.



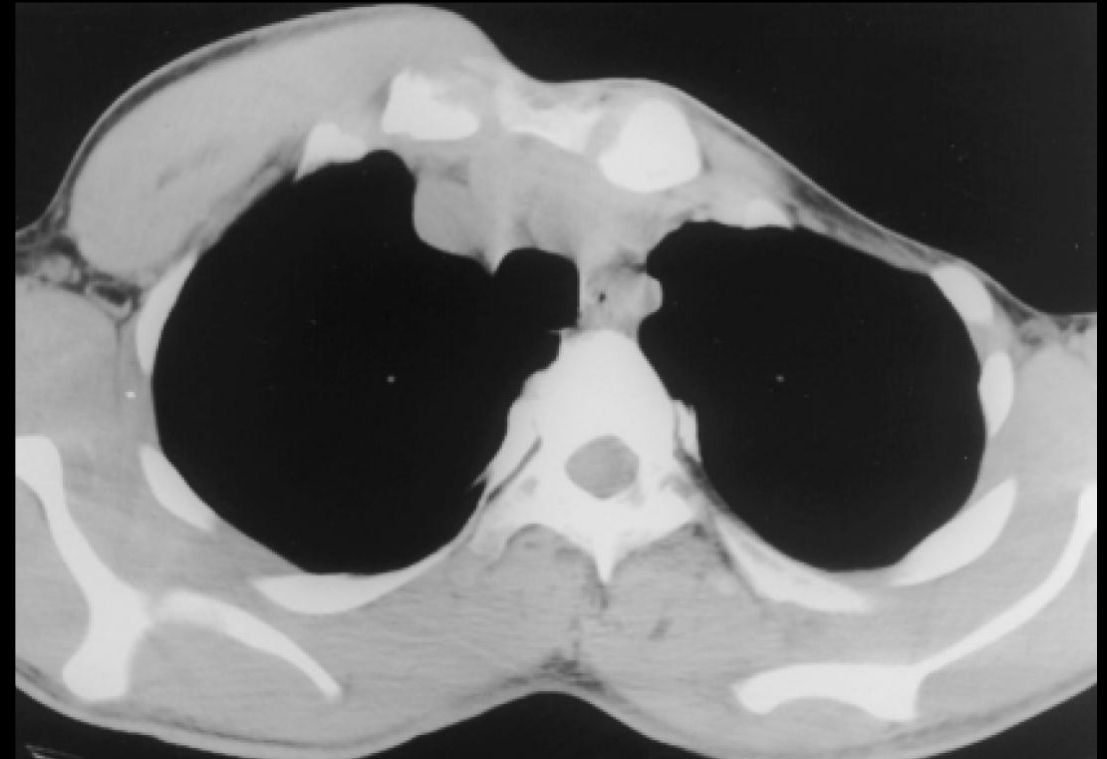
Pleural calcification

Chest wall lesions 胸壁病變

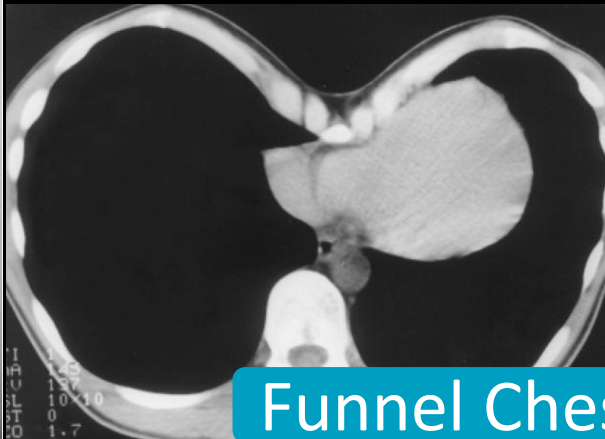
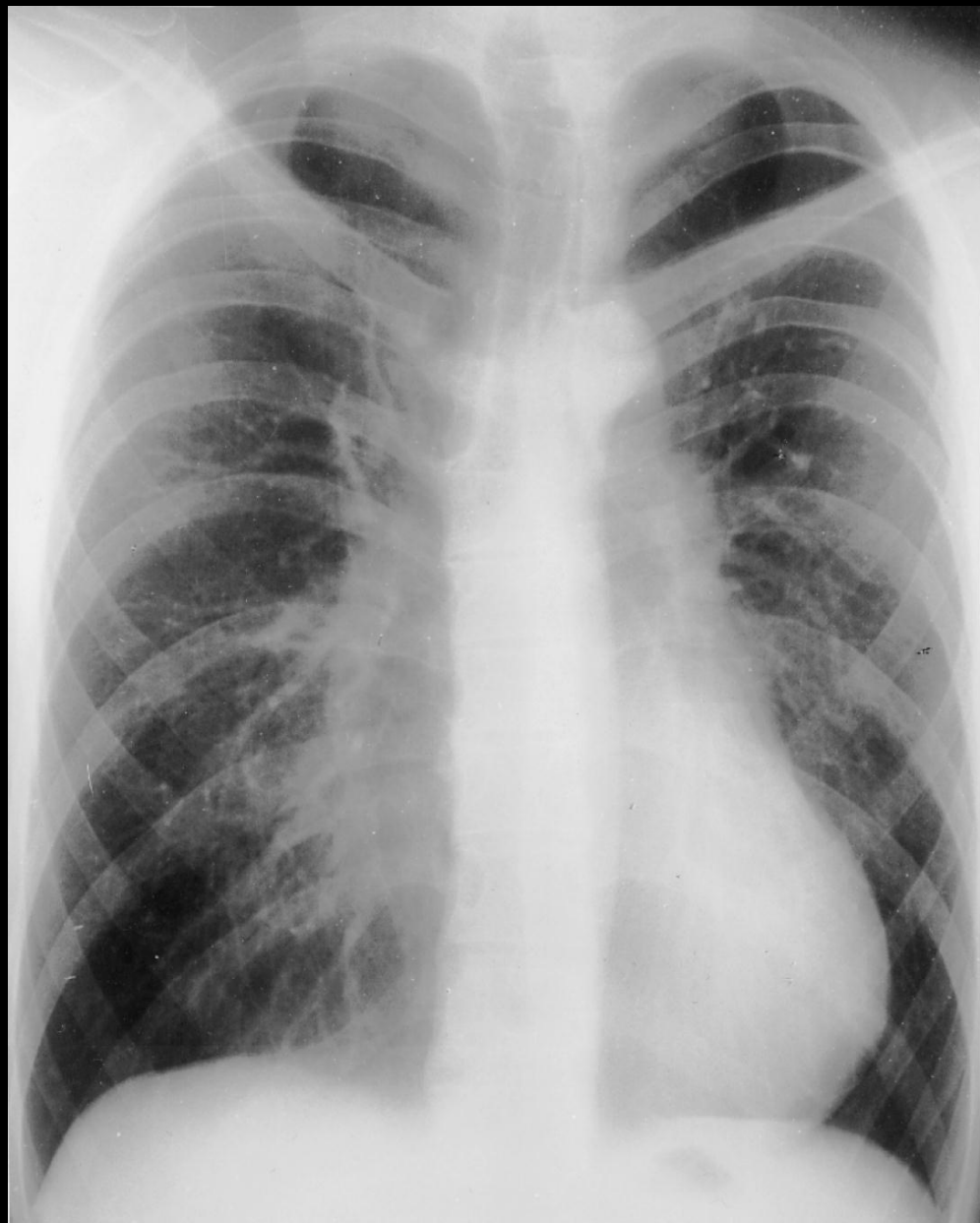
Chest wall lesions – 常見原因

- Congenital or traumatic chest wall deformities
- Infection
- Chest wall tumor
 - Benign
 - Malignant
 - Primary: myeloma 、 sarcoma
 - Metastases: lung cancer 、 breast cancer

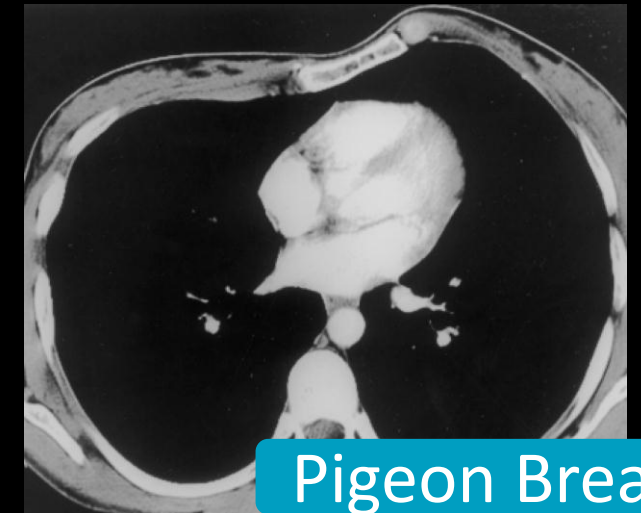
Poland syndrome



Funnel Chest vs. Pigeon Breast

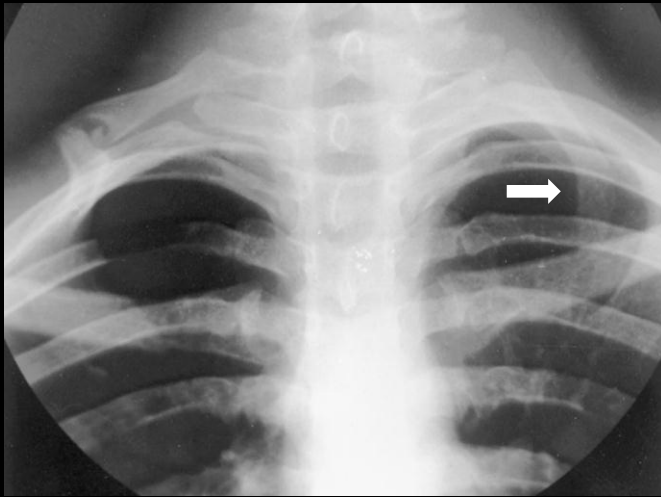


Funnel Chest

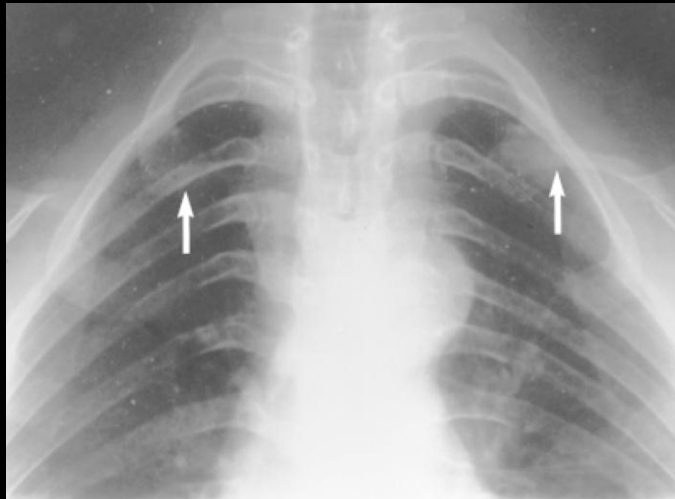


Pigeon Breast

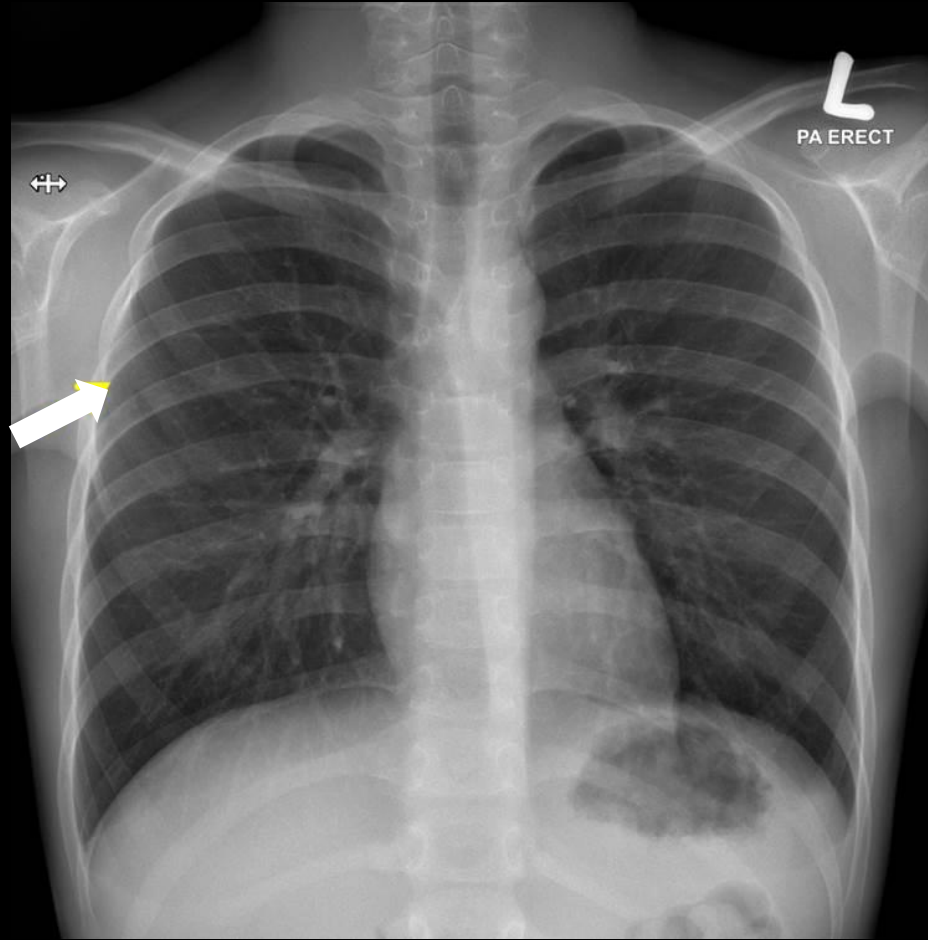
Congenital abnormality of bones



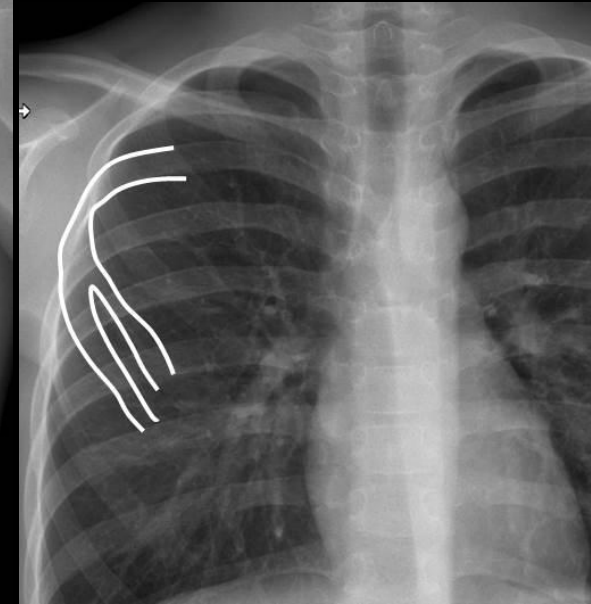
Cervical rib



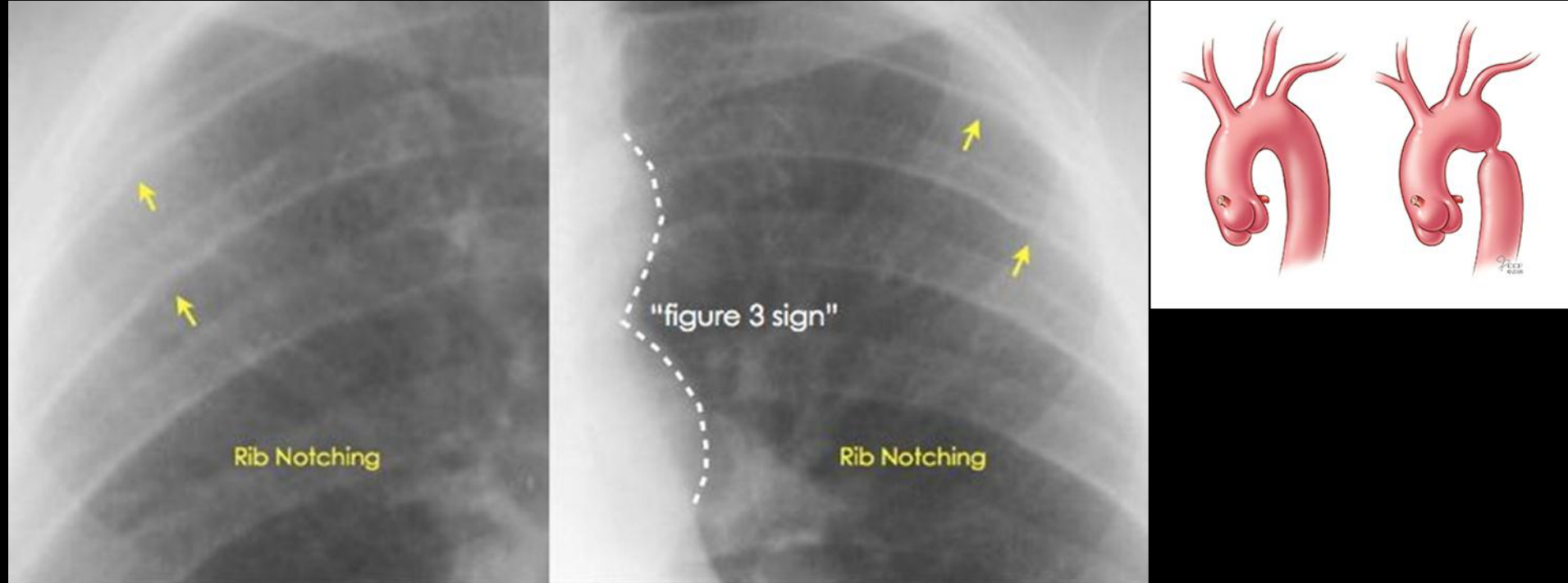
Cleidocranial dysostosis



Fork rib=Bifid rib



Coarctation (Figure 3 sign)

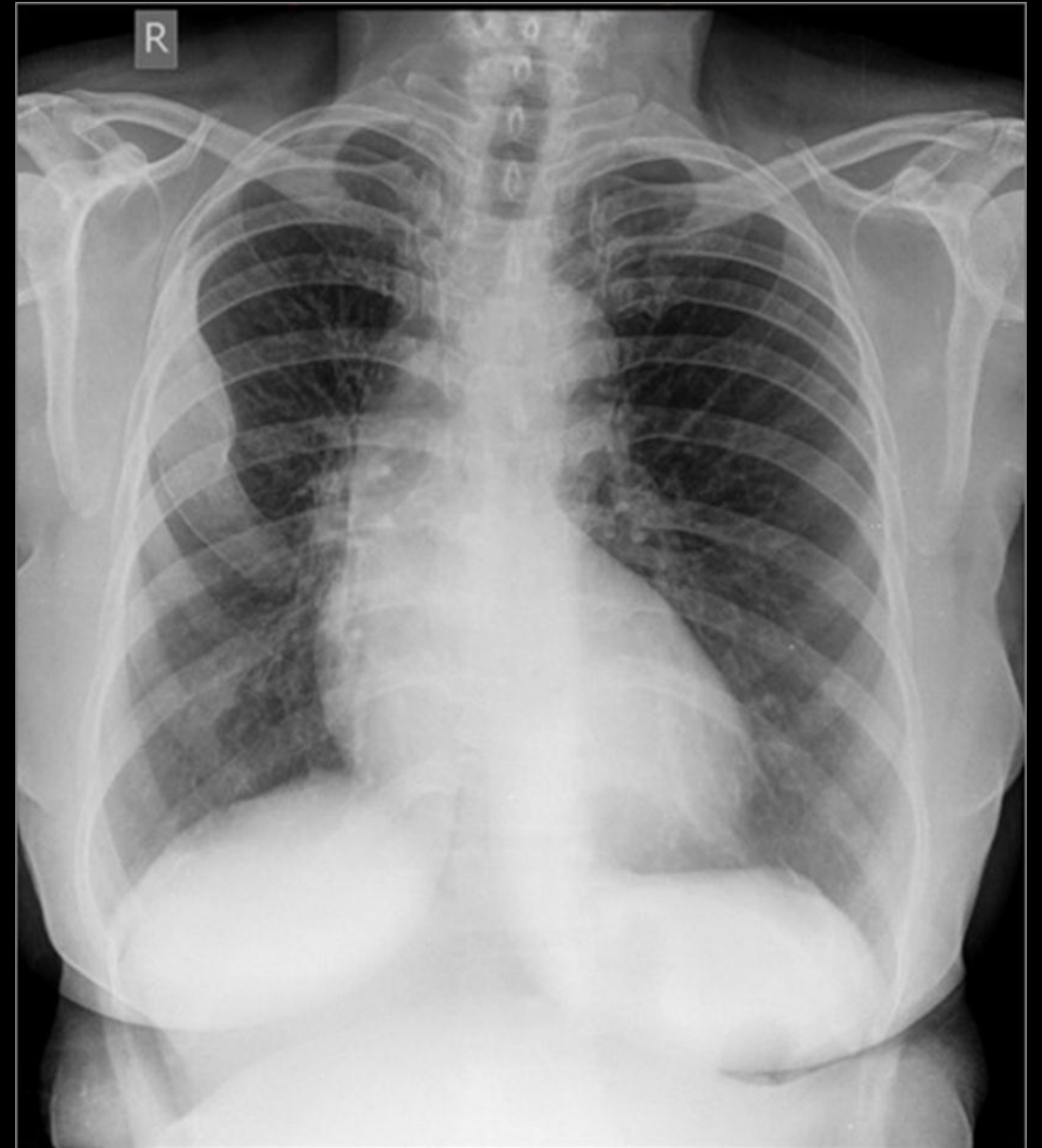


Coarctation of the Aorta

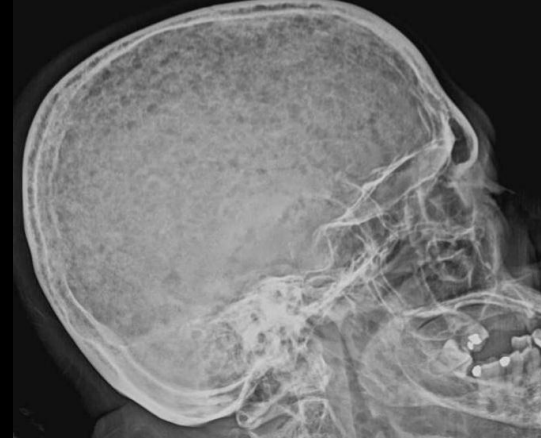
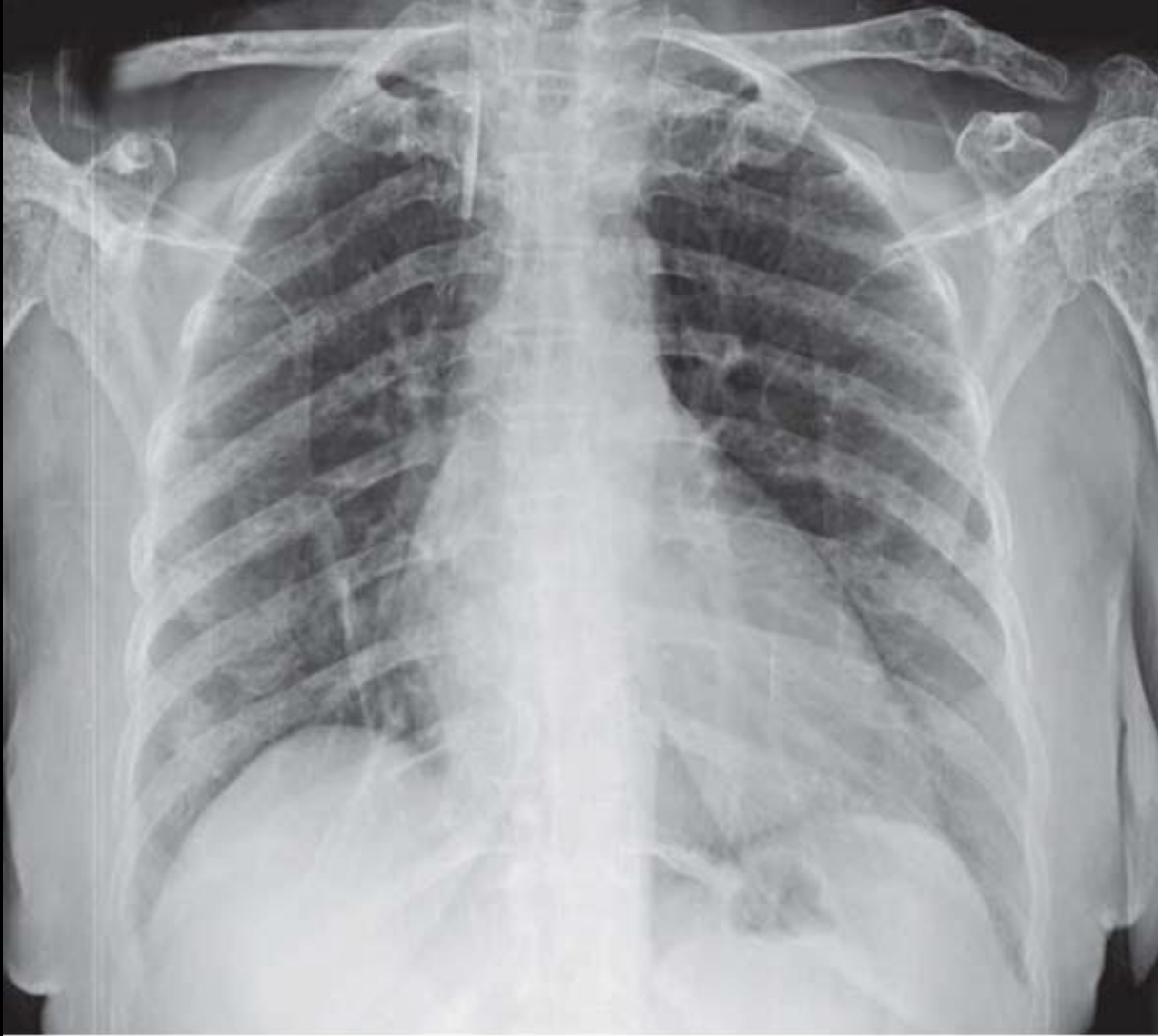
- Hypertension (upper extremity > lower extremity pulse/BP)
- CHF symptoms
- Systolic murmur
- Higher incidence of subarachnoid hemorrhage
- Associated with Turner syndrome (webbed neck and short stature)
- CXR reveals rib notching and the "figure 3 sign" (prestenotic dilation of aortic arch and left subclavian)

Fibrous dysplasia

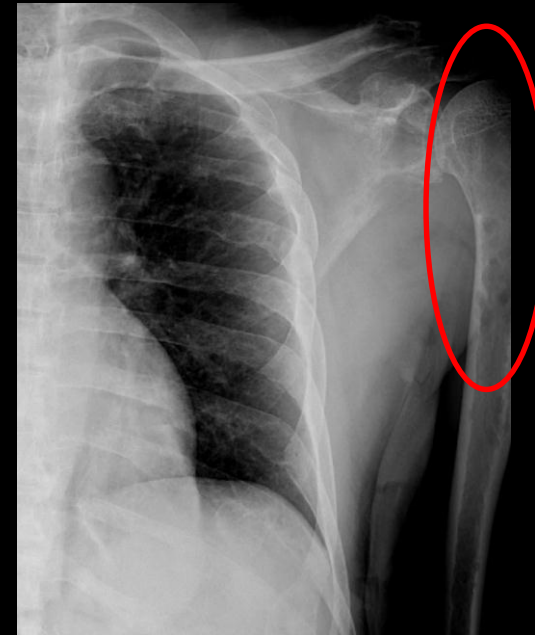
- non-neoplastic tumor-like congenital process as a localized defect in osteoblastic differentiation and maturation
- the replacement of normal bone with large fibrous stroma and islands of immature woven bone.
- usually smooth and homogeneous with endosteal scalloping and cortical thinning.
- The borders are well defined and the cortex is usually intact but thinned due to the expansive nature of the lesion.



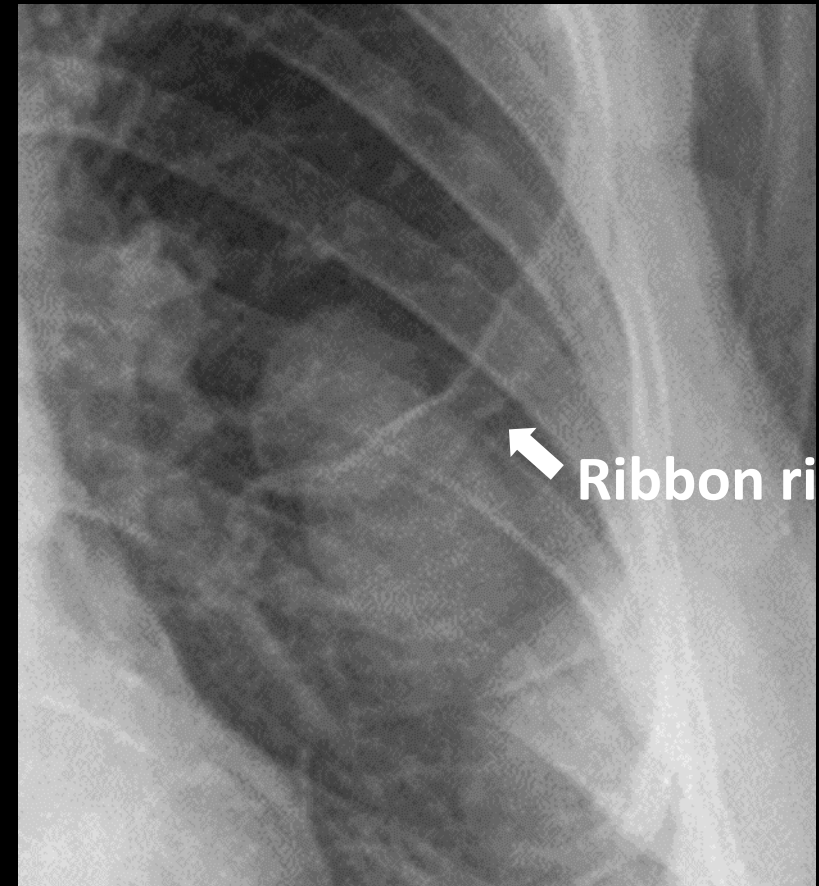
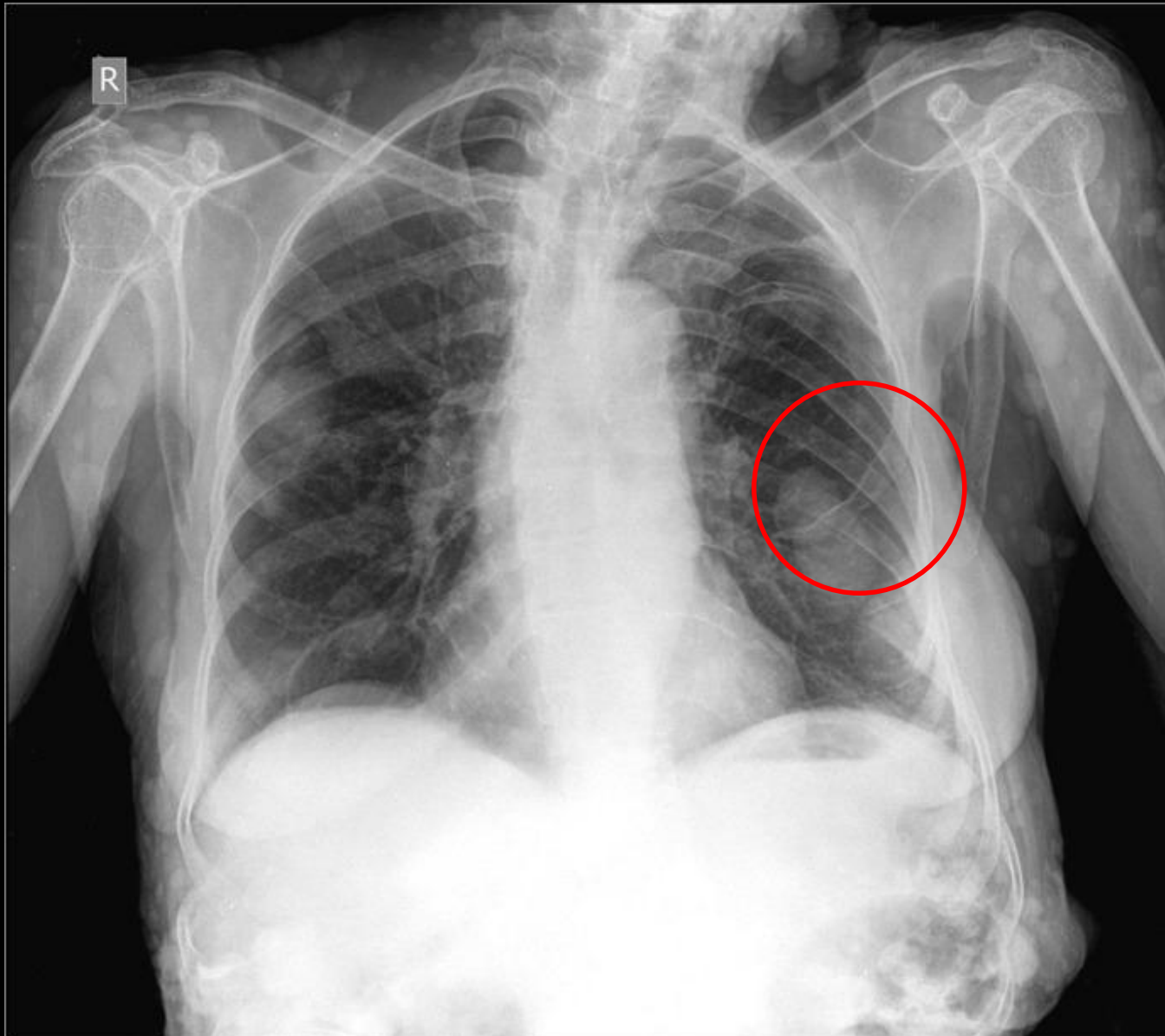
Multiple myeloma



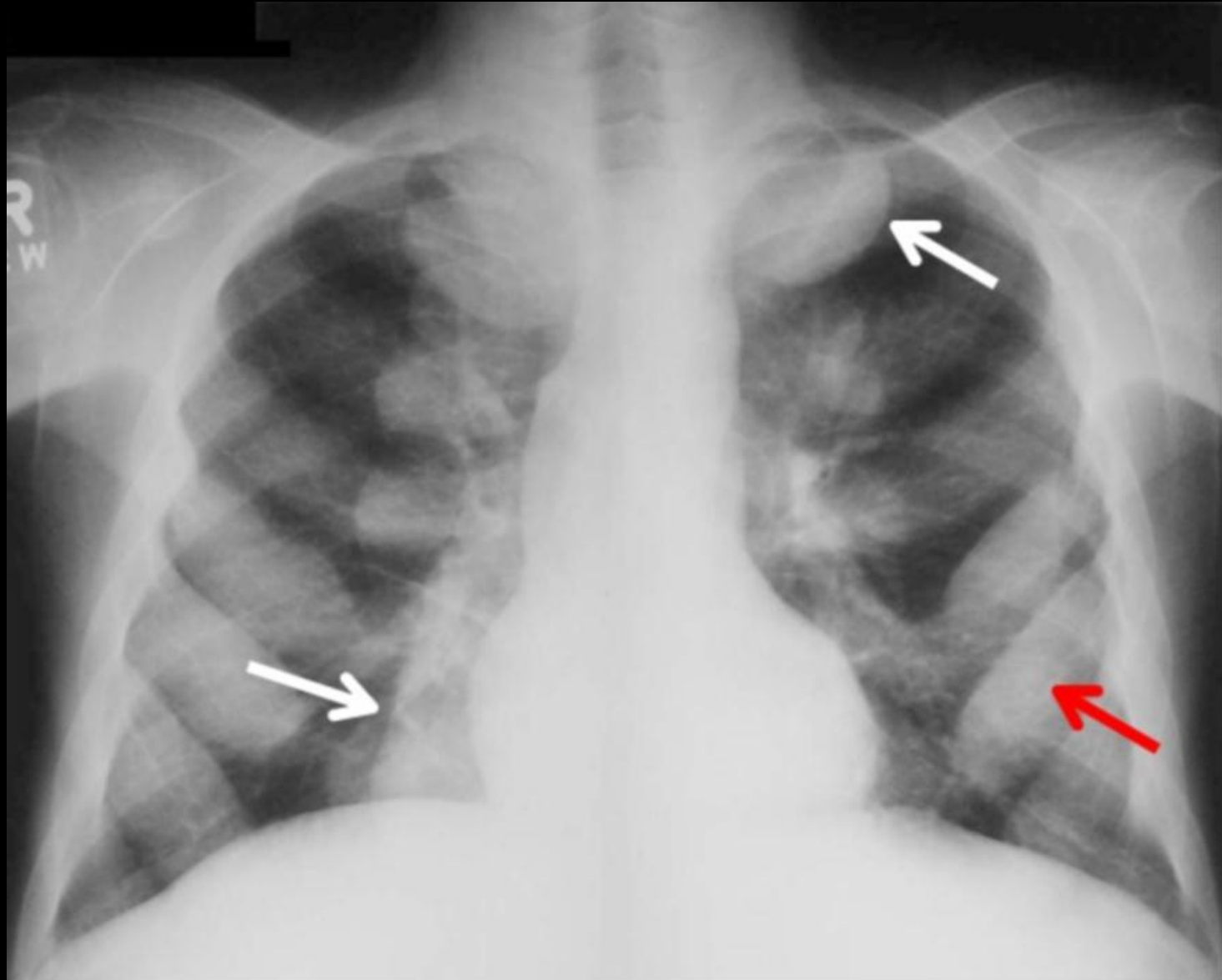
- Punched out lesions
- Pepper pot skull
- Raindrop skull
- Salt and pepper sign



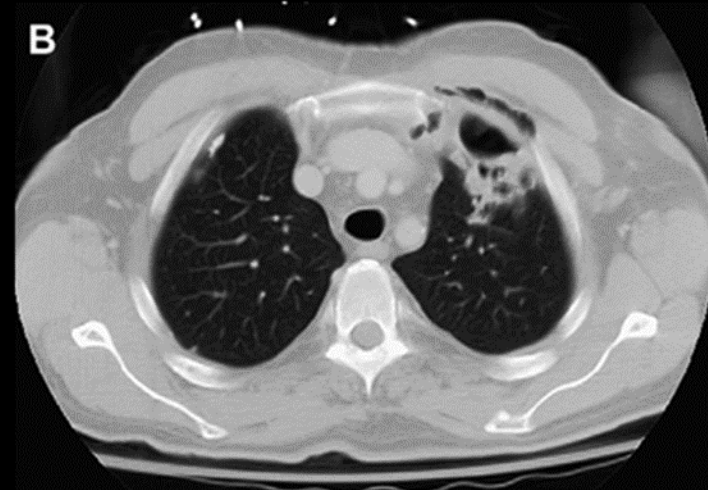
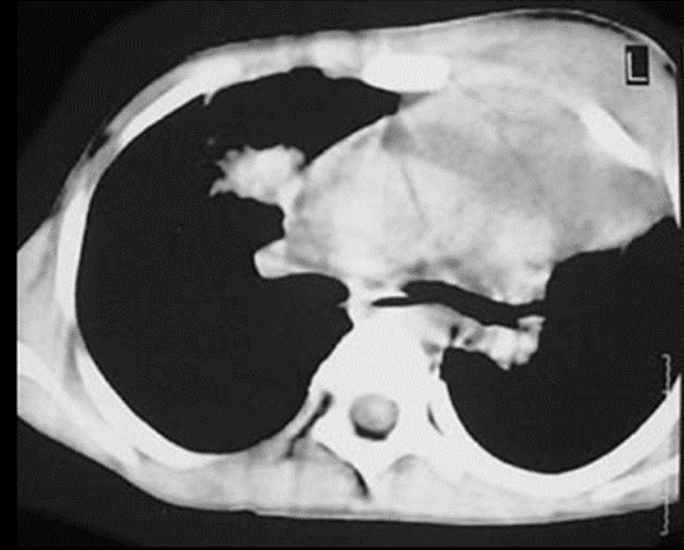
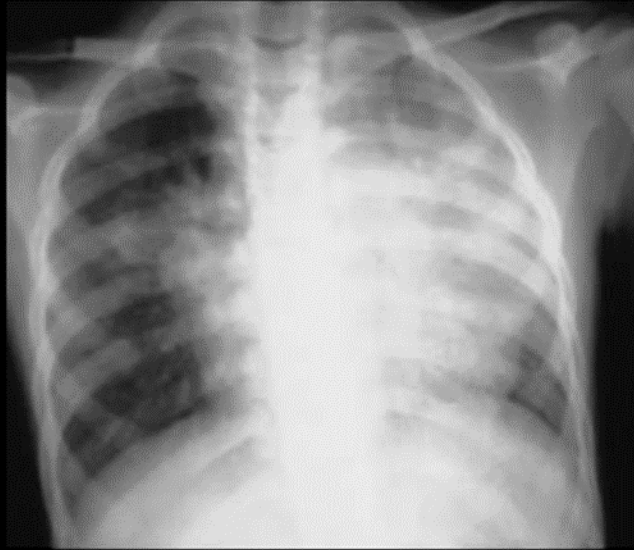
Neurofibromatosis



Thalassemia with extramedullary hematopoiesis



Invasive infection can mimic chest wall tumor



Thoracic actinomycosis

MRSA lung abscess

Invasive infection can mimic chest wall tumor

Disseminated mucormycosis



Clin Chest Med 29 (2008) 77-105

Invasive aspergillosis



Radiol Clin N Am 43 (2005) 497-512

Primary chest wall tumors: 14-yr experience in TP-VGH

Table 2. Pathologic diagnosis of 62 patients with primary chest wall tumor

Benign

Bone and cartilaginous

- Chondroma
- Chondroblastoma
- Chondromatous hamartoma
- Chondromyxoid fibroma
- Fibrous dysplasia
- Giant cell tumor
- Oseochondroma

Soft tissue

- Angiolipoma
- Cavernous lymphangioma
- Fibrolipoma
- Fibrous tumor
- Ganglioneuroma
- Hemangioma
- Leiomyoma
- Schwannoma
- Neurofibroma

Malignant

Bone and cartilaginous

- Chondrosarcoma
- Osteosarcoma

Soft tissue

- Dermatofibrosarcoma protuberance
- Epithelioid angiosarcoma
- Hemangiopericytoma
- Leiomyosarcoma
- Liposarcoma
- Malignant fibrous histiocytoma
- Neuroendocrine tumor
- Sarcomatoid carcinoma

Hematologic disease

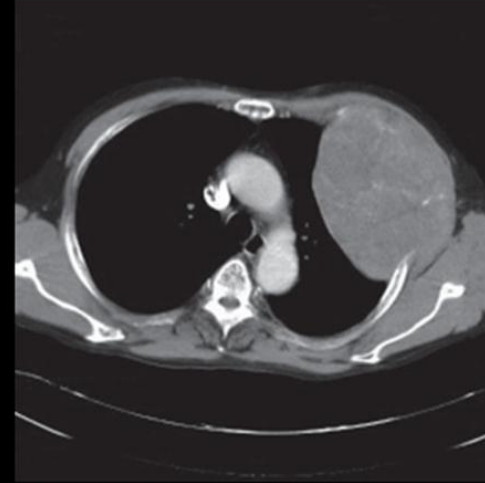
- Lymphoma
- Plasmacytoma

Malignant chest wall tumor

Rib destruction due to metastasis



Chest wall metastasis of hepatocellular carcinoma



Ewing's Sarcoma of the Chest

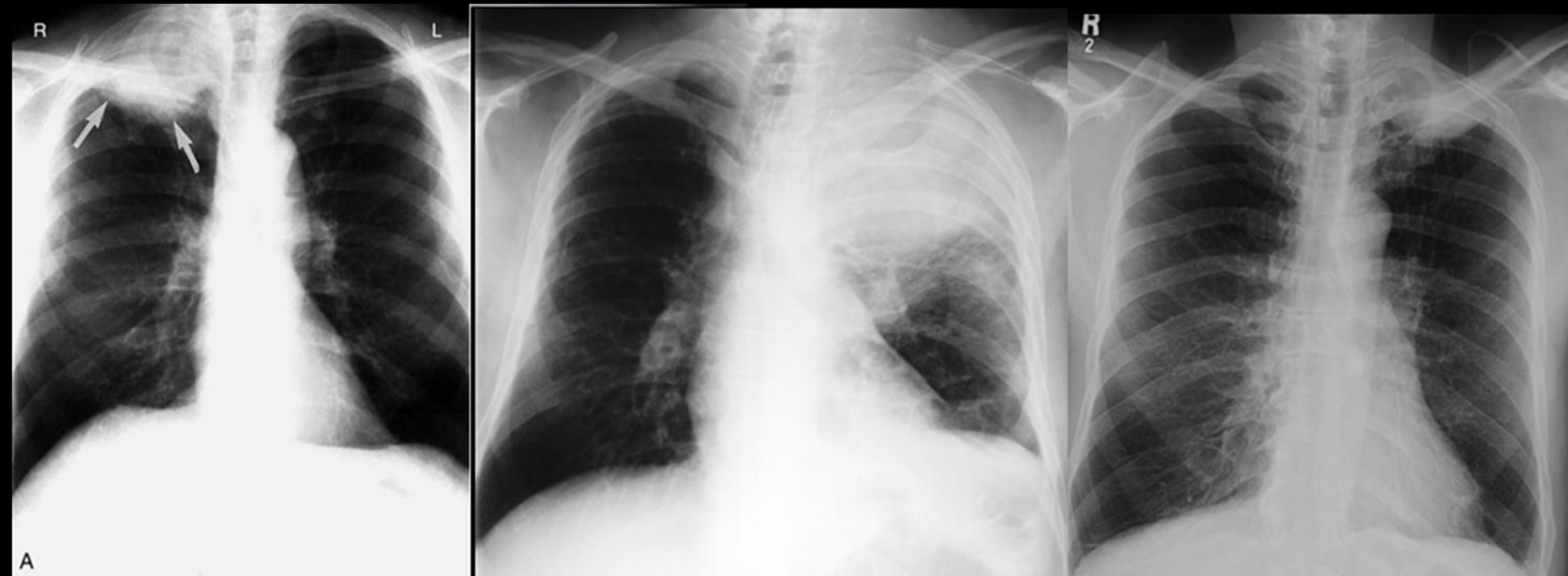


Osteochondroma

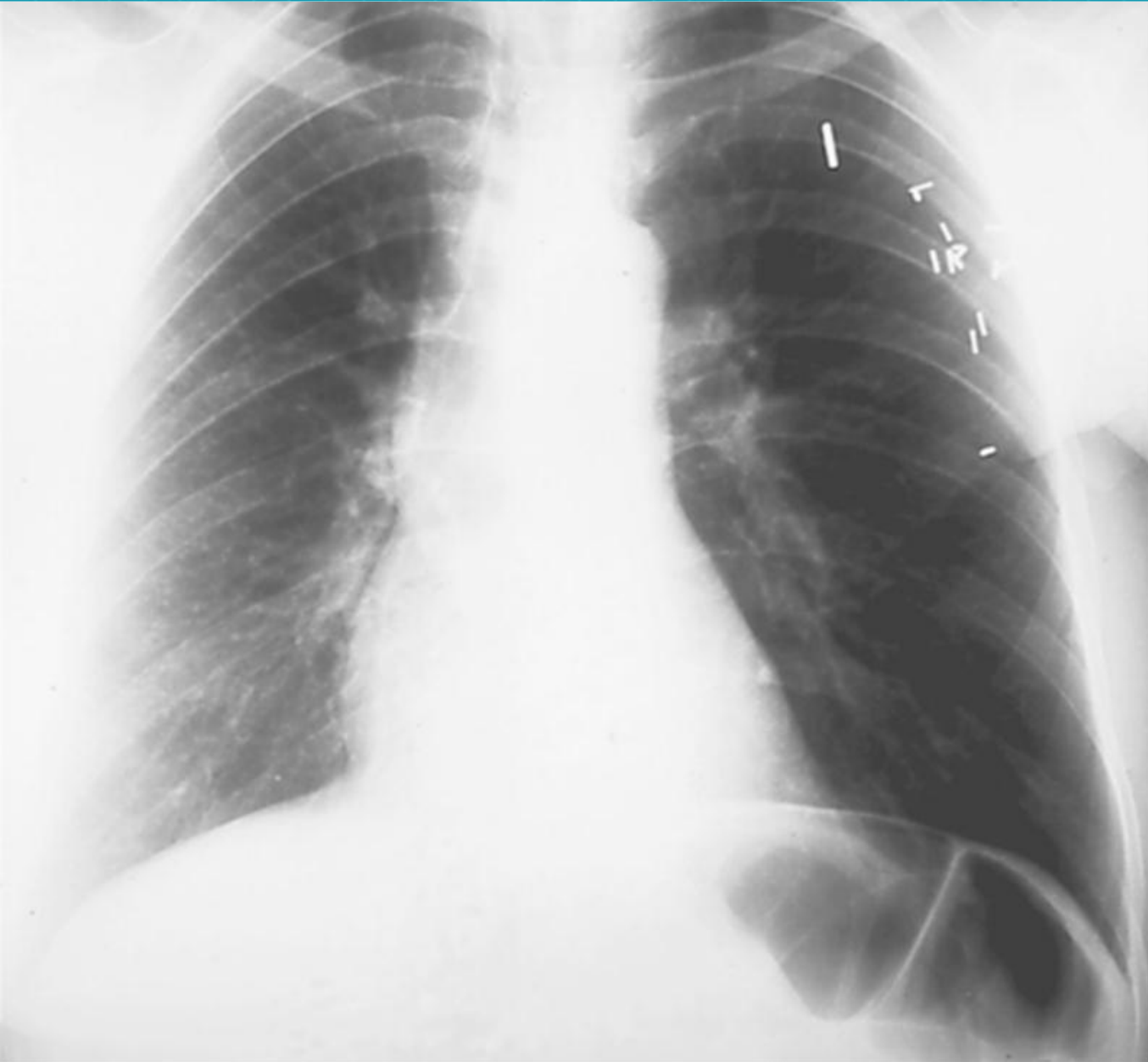


Pancoast tumor

By direct extension, Pancoast tumors typically involve the lower trunks of the brachial plexus, intercostal nerves, stellate ganglion, adjacent ribs, and vertebrae.



Mastectomy



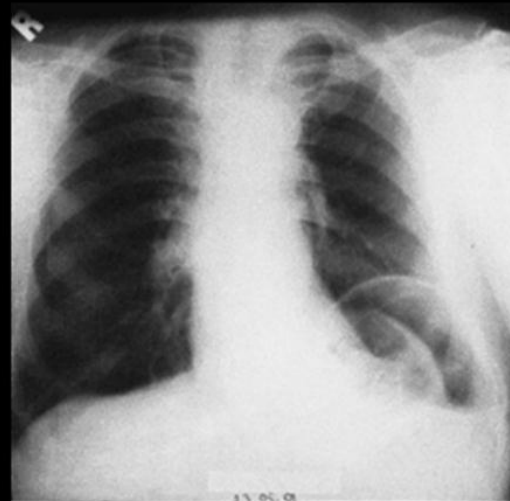
1. female, X-ray reveal **Unilateral hyperlucency** due to absence of chest wall soft tissue density.

2. May with or without **Pleural effusion**

3. May combined with Lung metastasis; **nodule or lymphangitis carcinomatosa**

Diaphragm abnormalities 橫膈病變

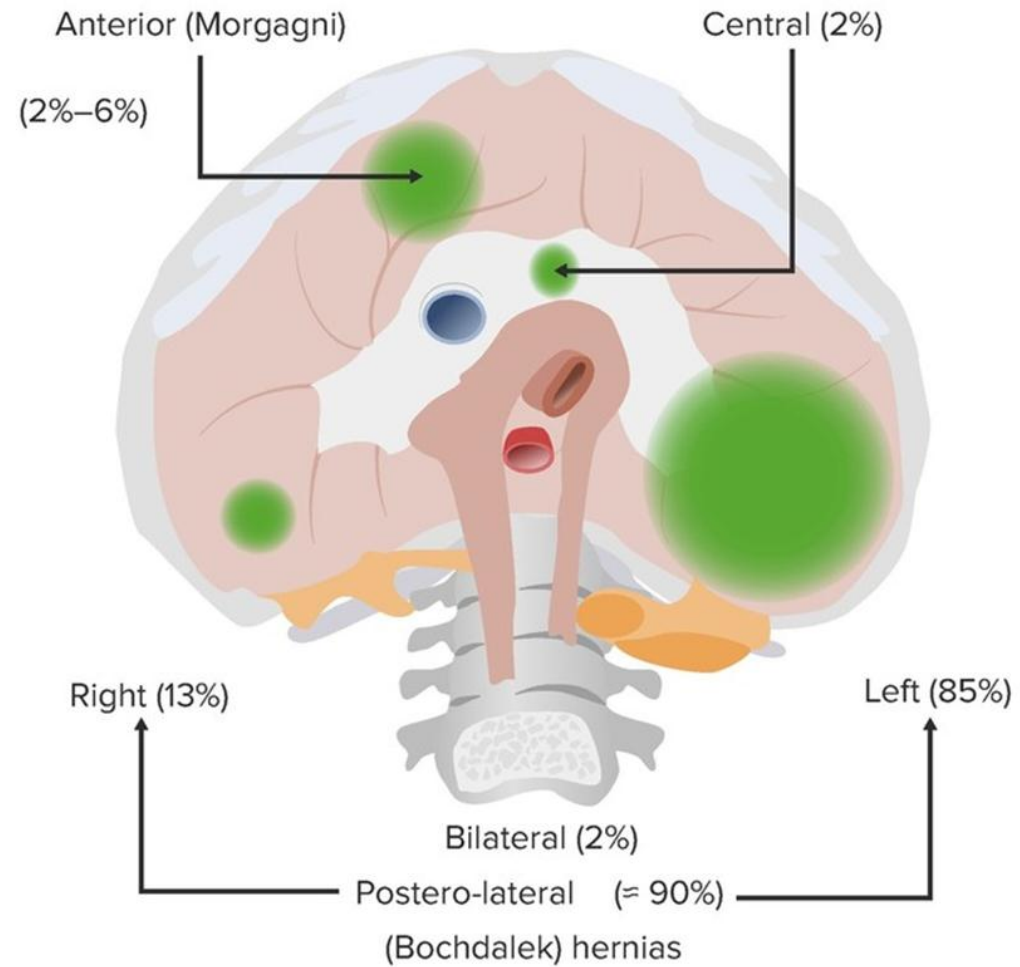
Eventration of hemidiaphragm



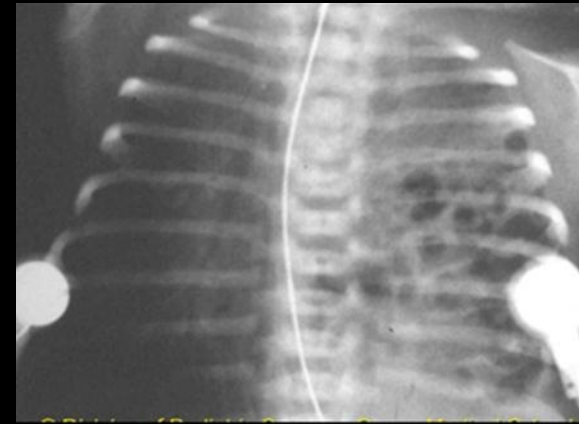
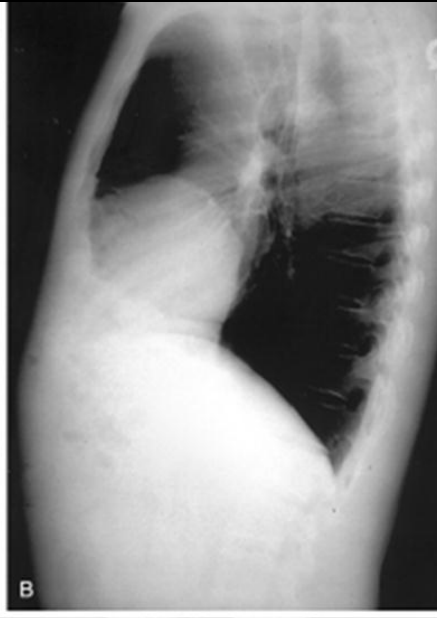
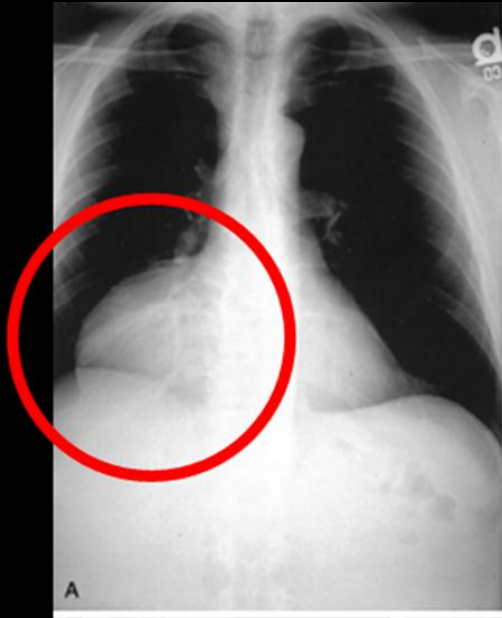
← Eventration of left hemidiaphragm

Diaphragmatic paralysis

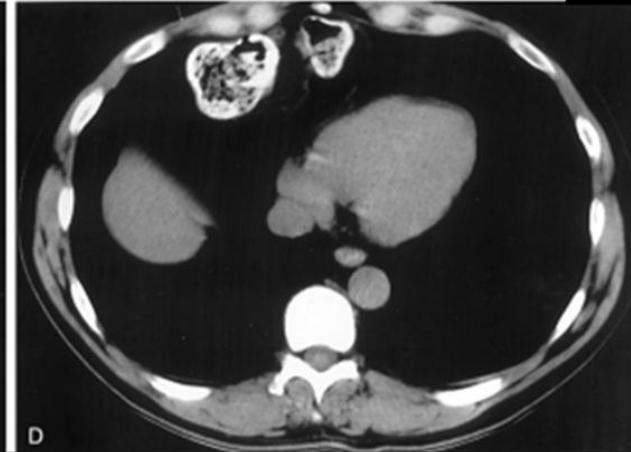
Congenital diaphragmatic hernias



Congenital diaphragmatic hernias



Left side diaphragmatic hernia (Bockdalek hernia)



Morgagni hernia



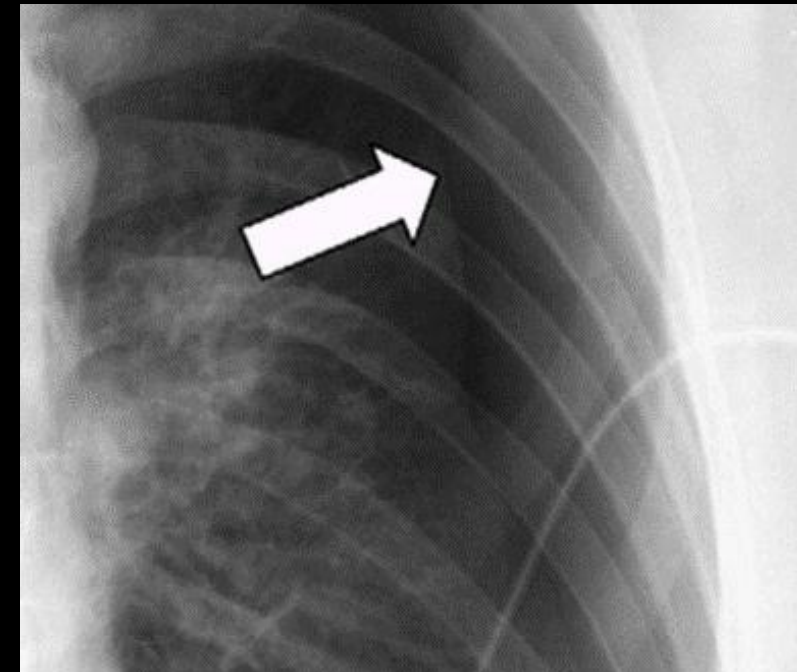
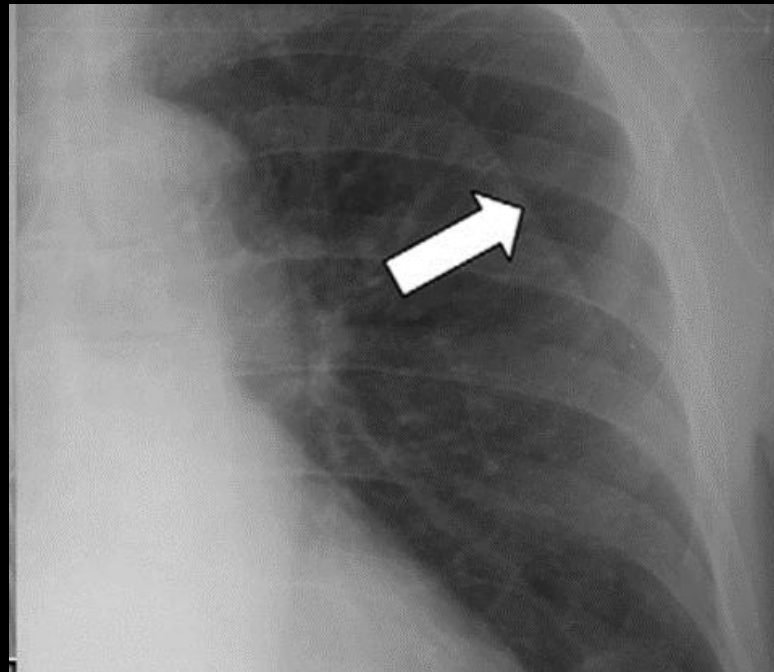
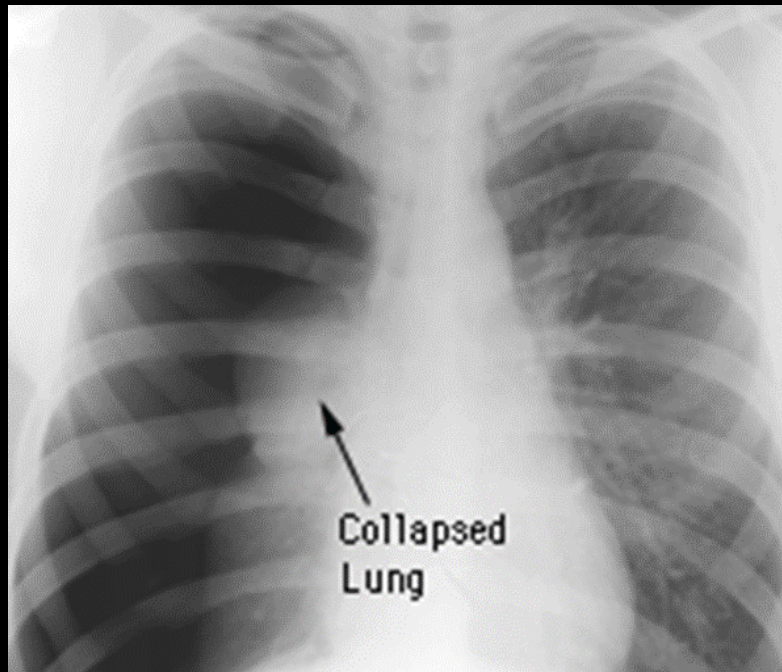
Hiatal hernia

Pleural lesions 肋膜病變

Pleural lesions – 常見原因

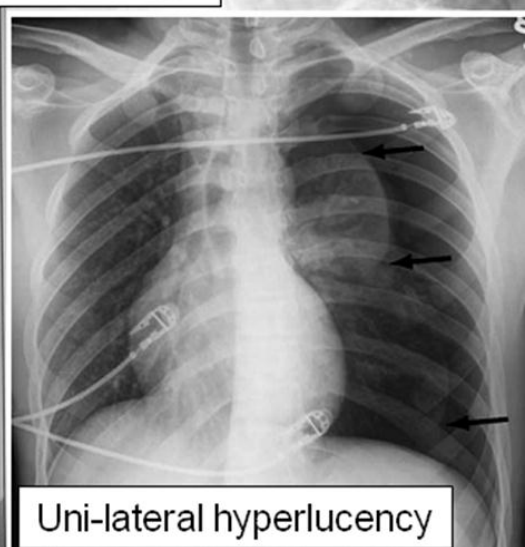
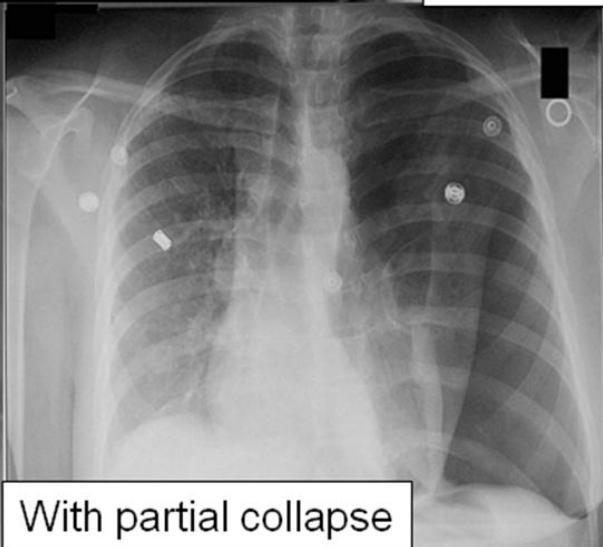
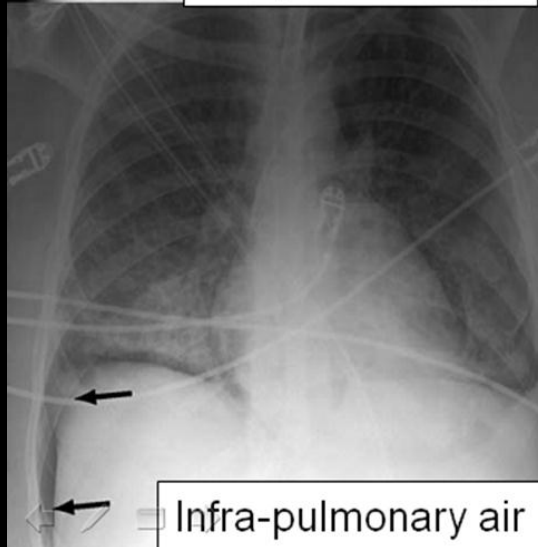
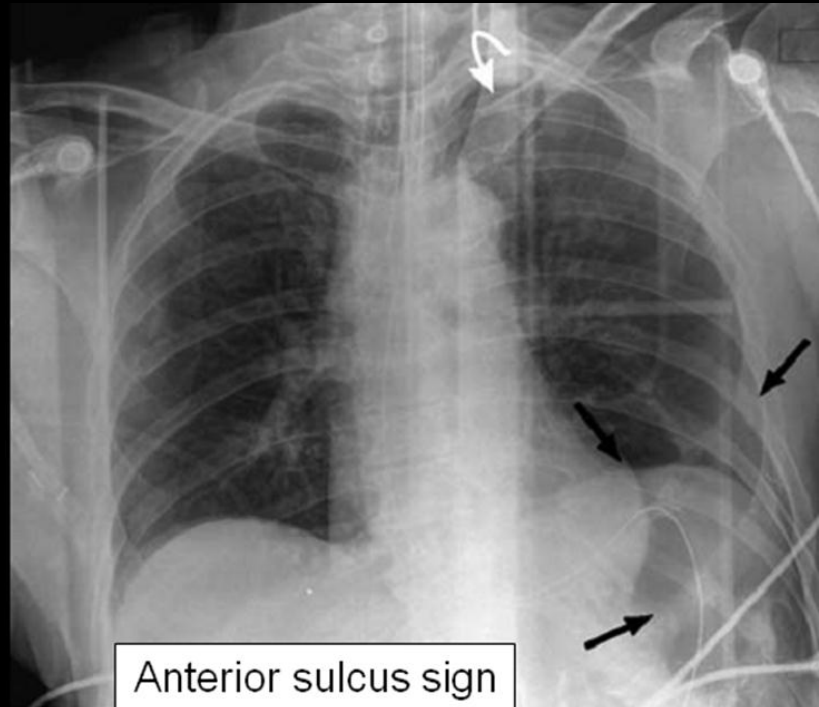
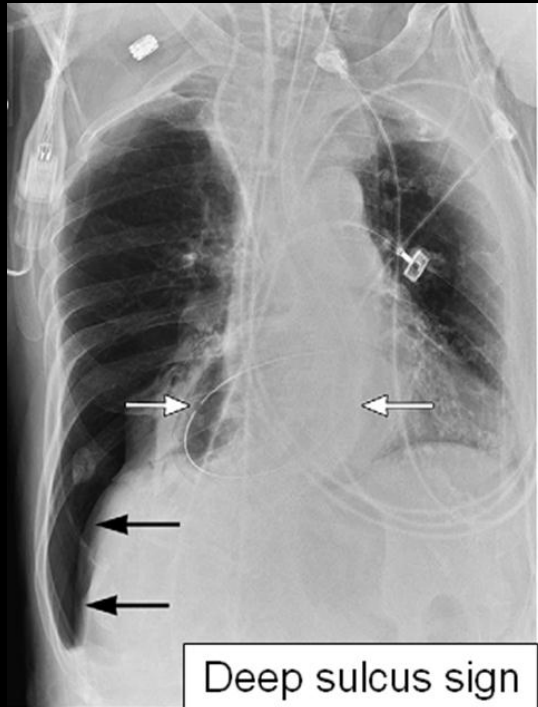
- Pneumothorax
- Pleural effusion and Empyema
- Pleural calcification: pleural plaque 、 fibrothorax
- Pleural neoplasm
 - Benign
 - Malignant
 - Primary: malignant mesothelioma
 - Metastases: lung cancer 、 breast cancer

Pneumothorax

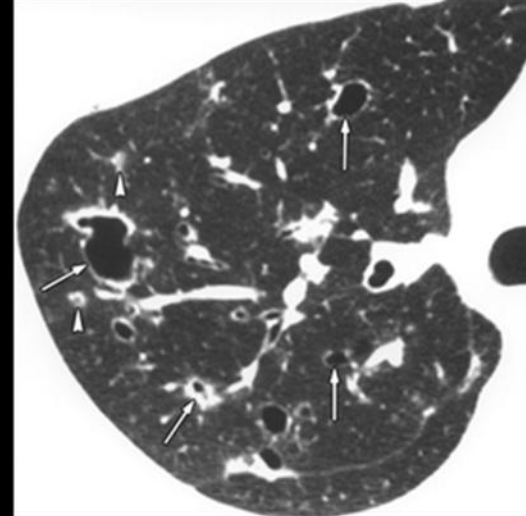


- Convex visceral pleural line
- Absence of lung markings
- Unilateral hyperlucency

Pneumothorax on A-P view

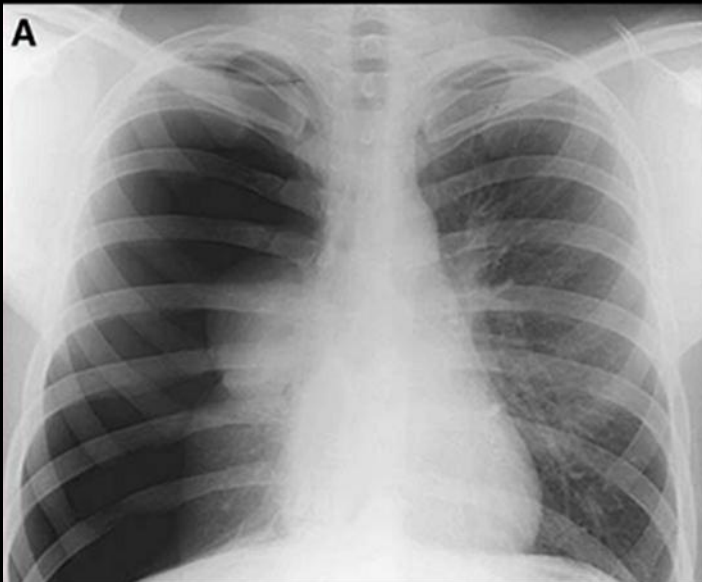


Secondary spontaneous pneumothorax



Langerhans' cell histiocytosis with pneumothorax, bizarre cyst, upper lung, smoking

- PJP
- Large bulla
- Severe emphysema
- Large cavity by abscess、TB、aspergillosis
- Lung endometriosis



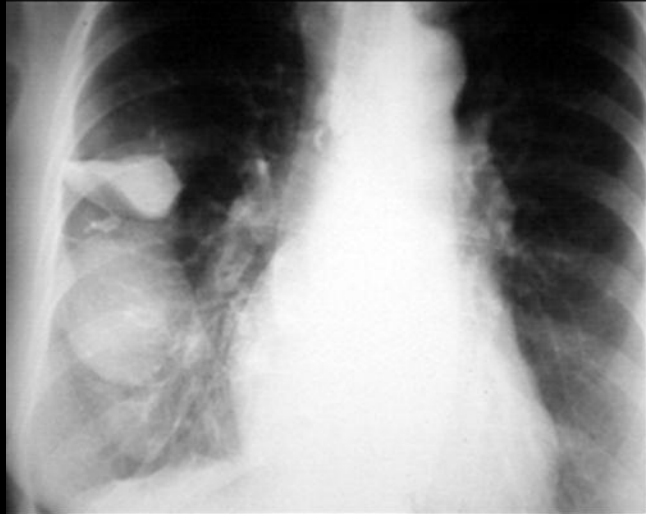
← Lymphangiomyomatosis with pneumothorax, diffuse round cyst, woman

Image pattern of pleural effusion

- Typical pleural effusion
- Interlobar pleural effusion = phantom tumor
- Subpulmonic pleural effusion
- Loculated pleural effusion



Interlobar pleural effusion = phantom tumor

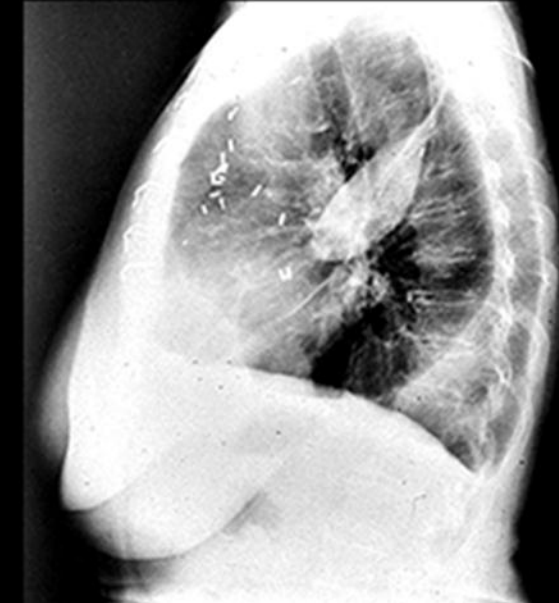


1. Homogenous, fluid density
2. Usually well-demarcated margin
3. Axis



4. Location
5. Associated X-ray finding; cardiomegaly?

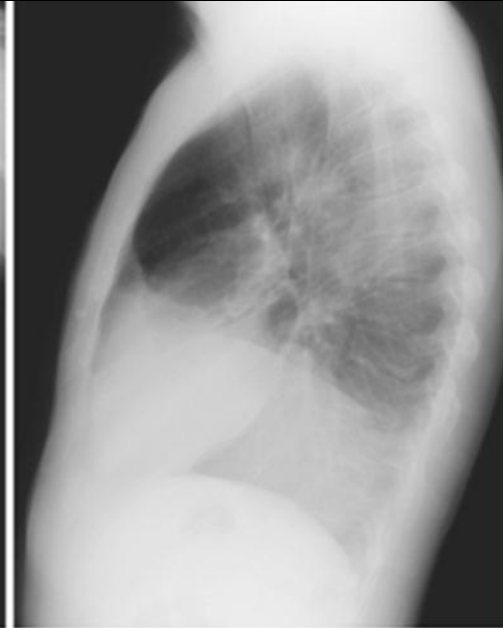
Hypoalbuminemia, CHF



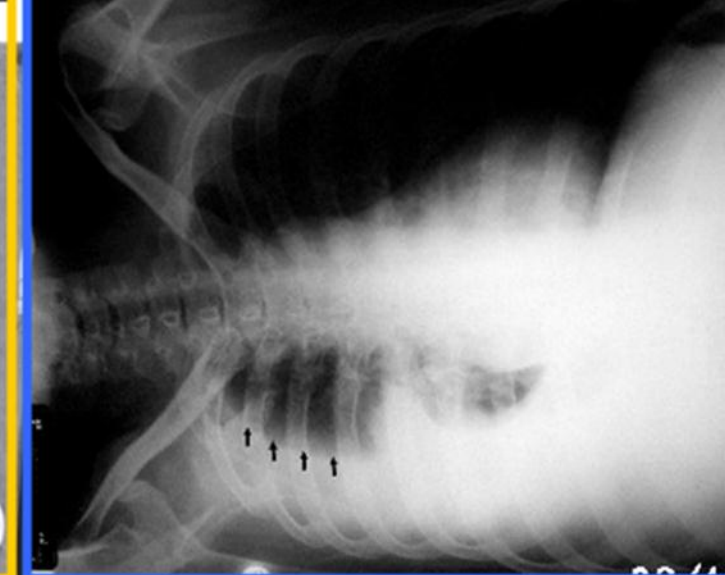
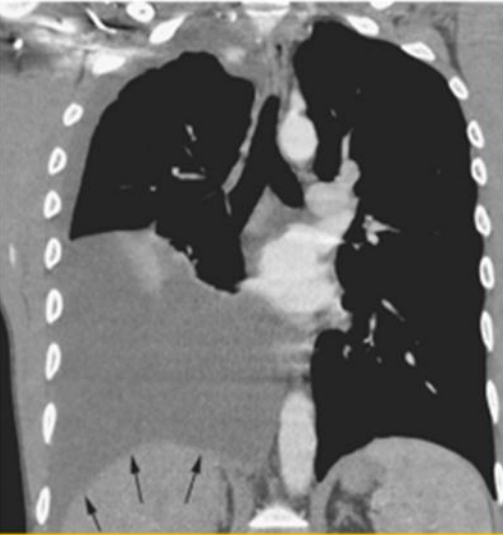
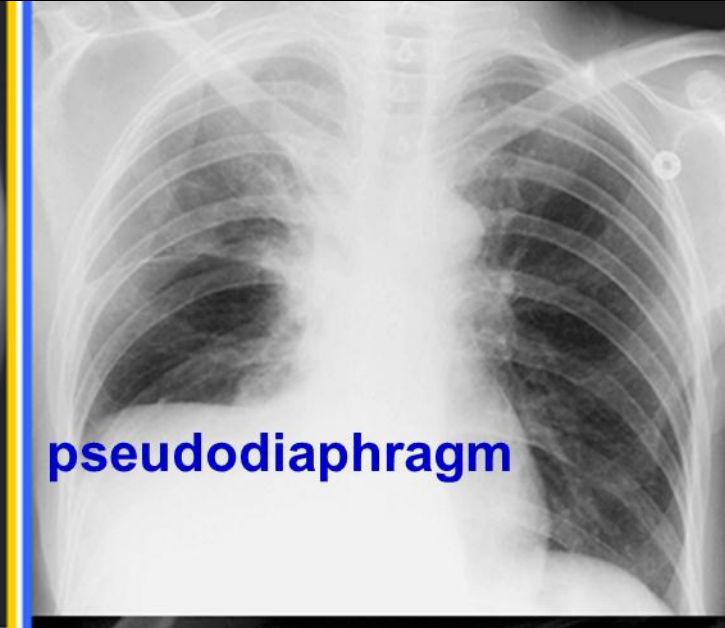
Subpulmonic effusion



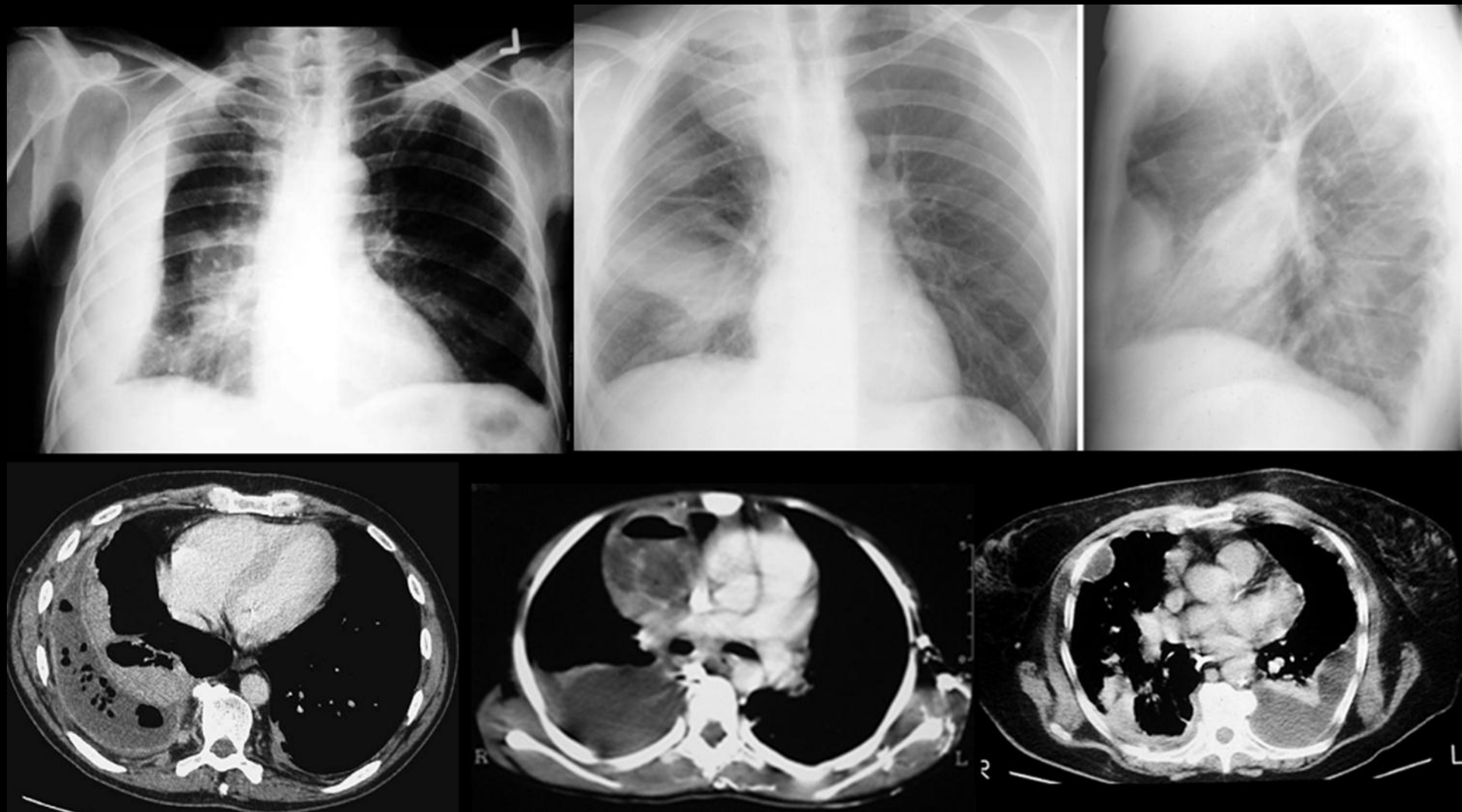
A



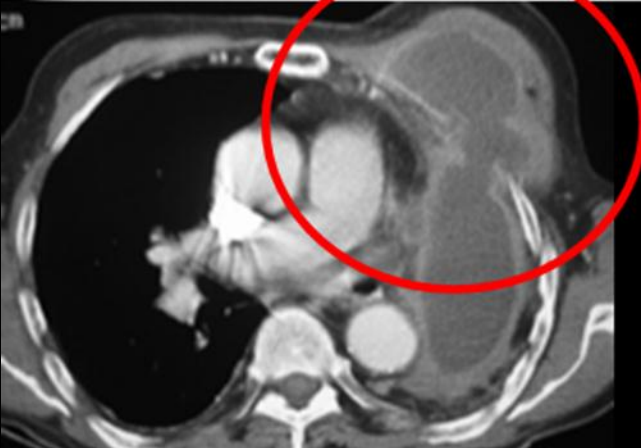
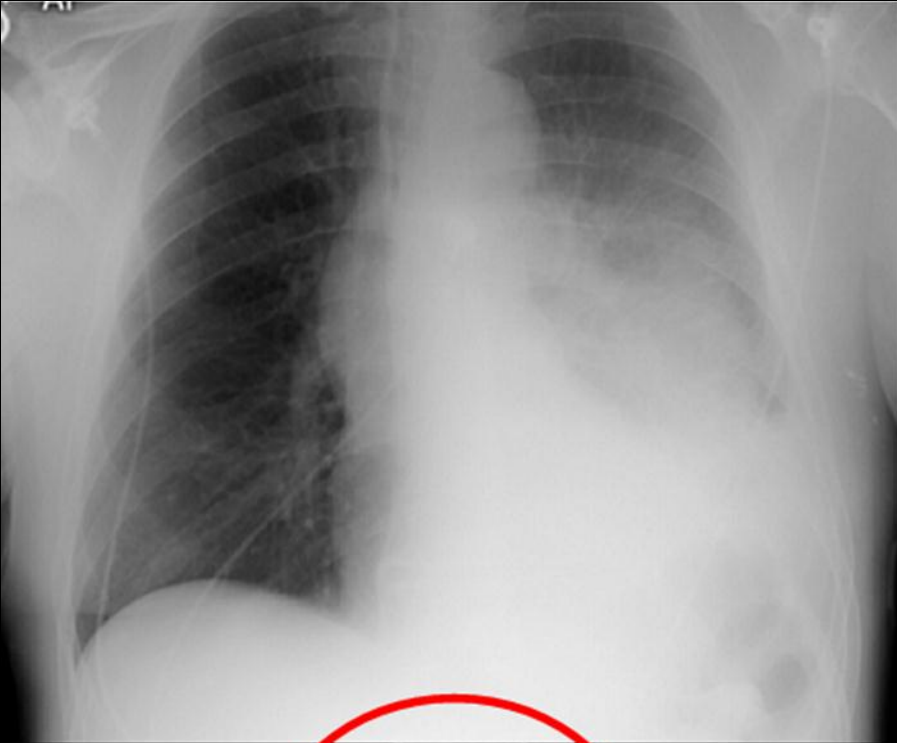
B



Loculated effusion: Parapneumonic effusion vs. Empyema



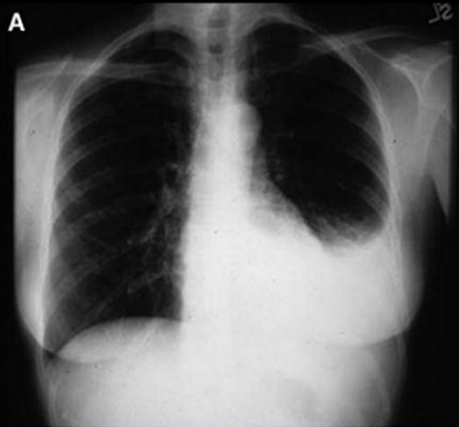
Empyema Necessitatis



anterolateral communication of empyema into subcutaneous tissue.

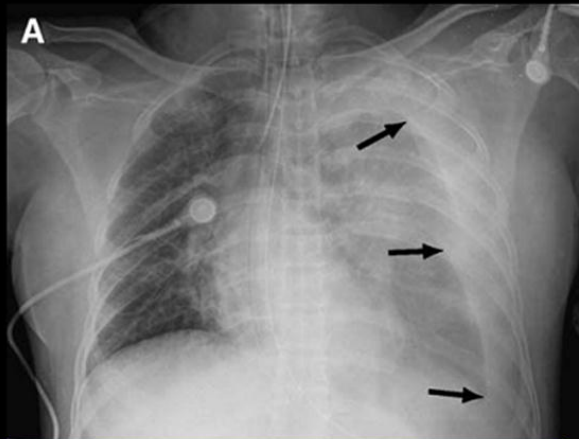
The American Journal of Medicine (2007) 120, 303-305

Chylothorax, Hemothorax, Hydropneumothorax



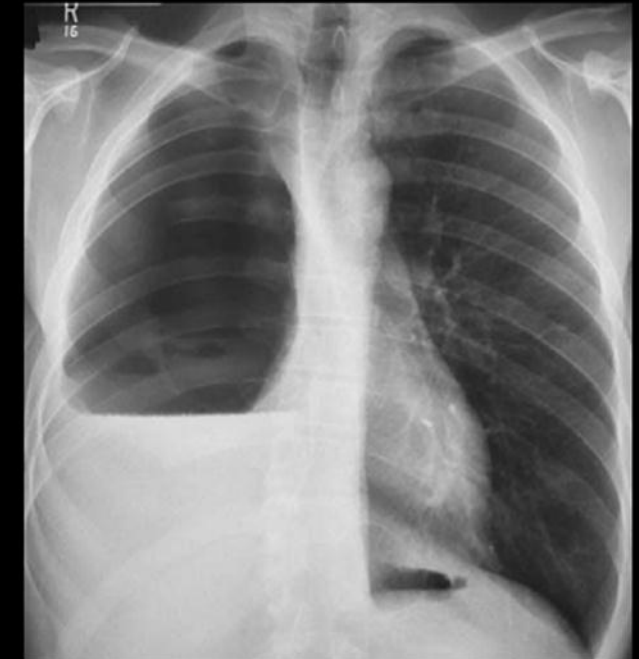
LAM and Chylothorax

LAM with chylothorax, Murray and Nadel's textbook of respiratory medicine. Fourth Edition.



Posttraumatic Hemothorax

Hemothorax, Thoracic Imaging in the ICU. Crit Care Clin 23 (2007) 539–573



Hydropneumothorax

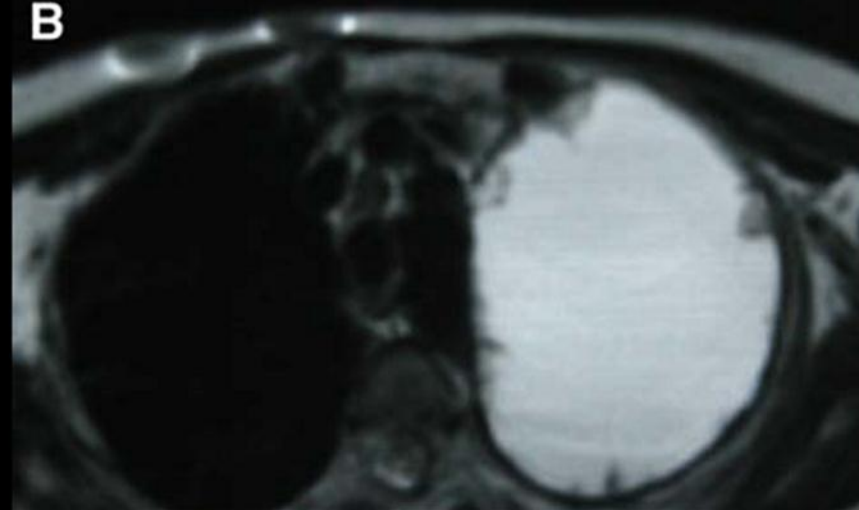
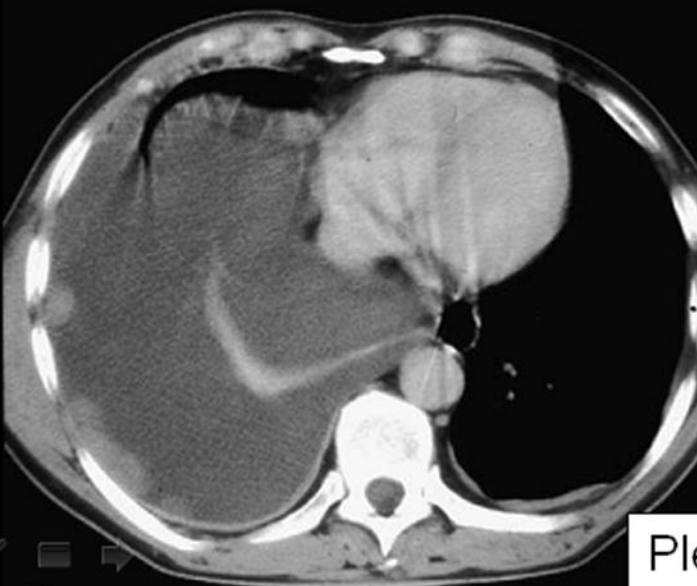
Malignant pleural effusion



Combined with:

- ◆ Lung tumor
- ◆ Lung metastasis
- ◆ Bone invasion
- ◆ Pericardial effusion
- ◆ Pleural metastases

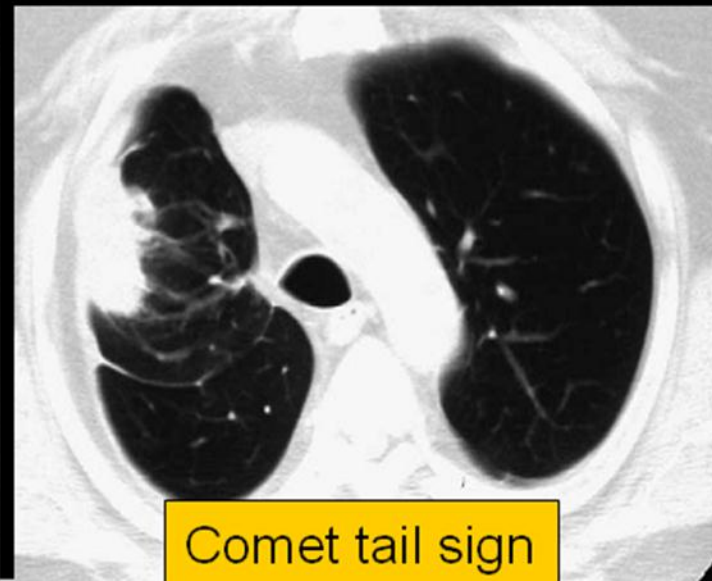
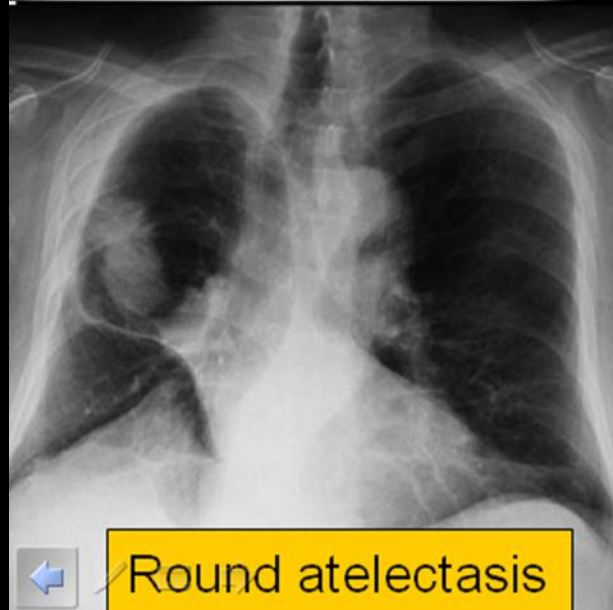
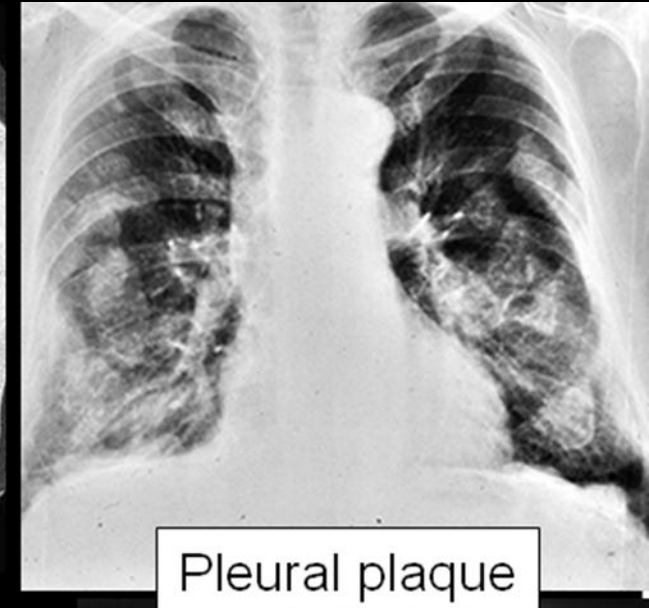
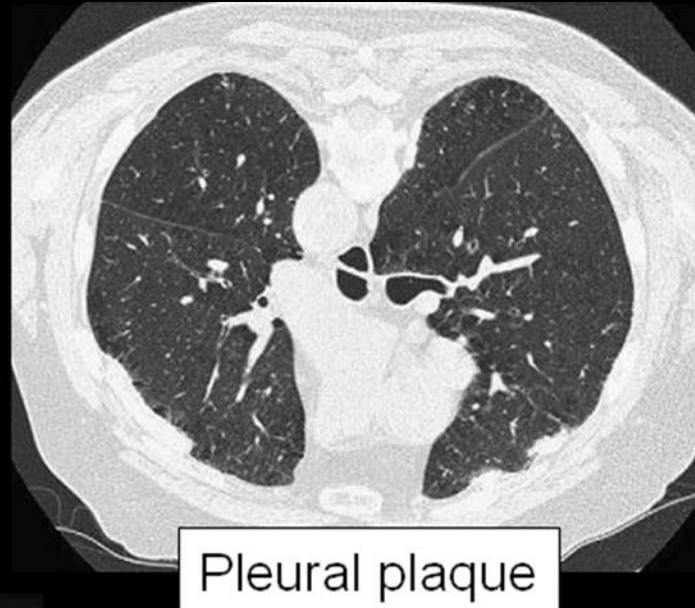
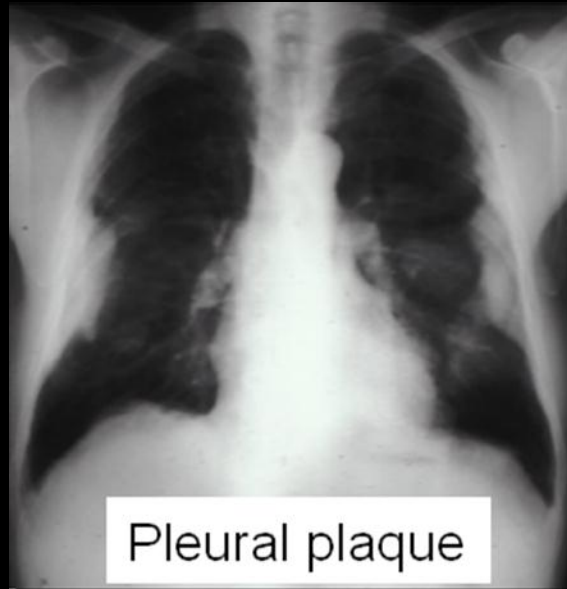
... etc)



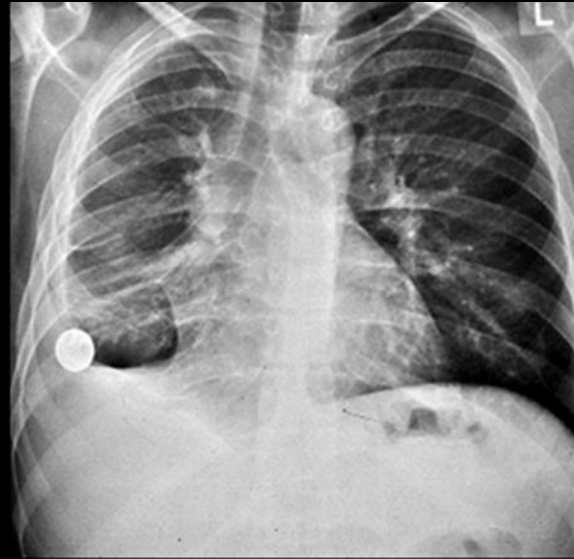
Pleural metastases with nodular pleural enhancement



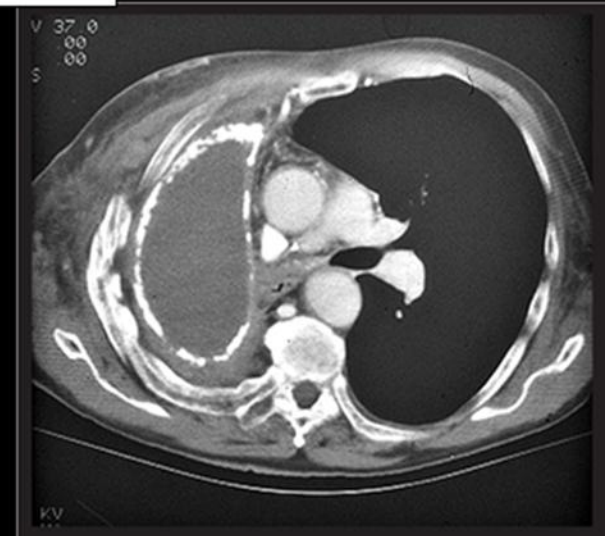
Pleural calcification: Asbestosis, TB, Empyema, Hemothorax



Pleural calcification: Asbestosis, TB, Empyema, Hemothorax



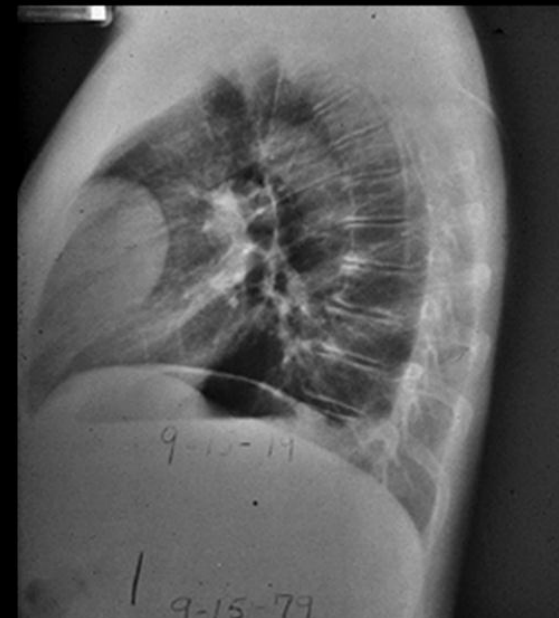
Chronic tuberculous pleurisy



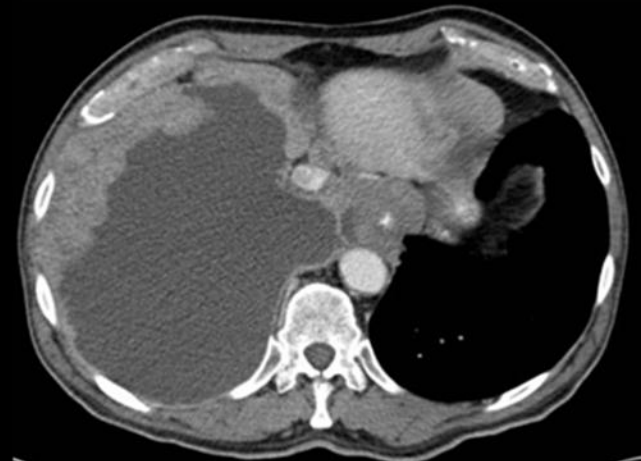
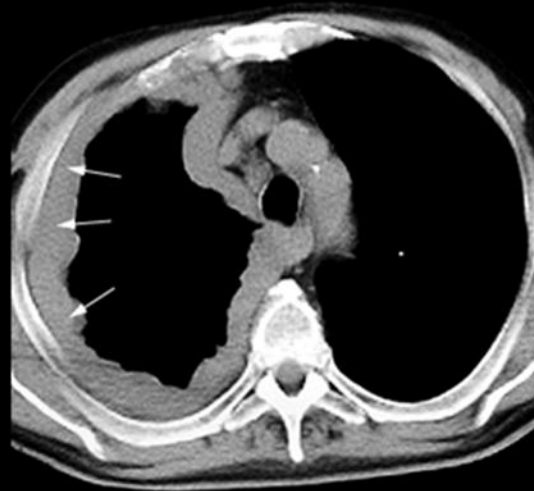
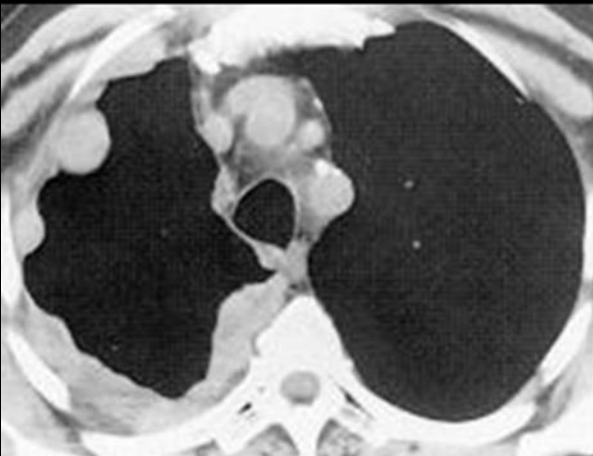
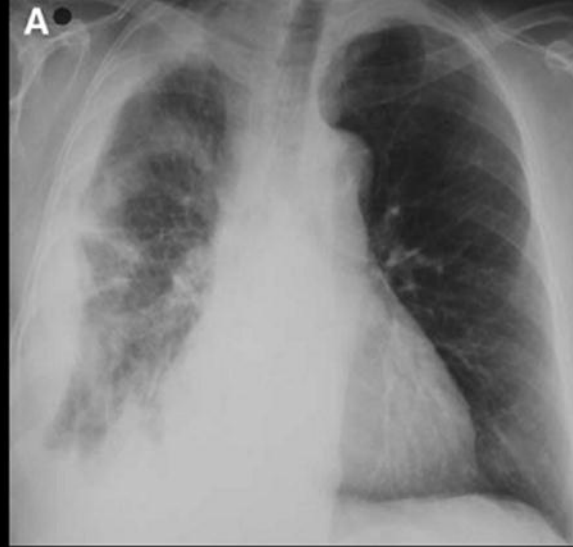
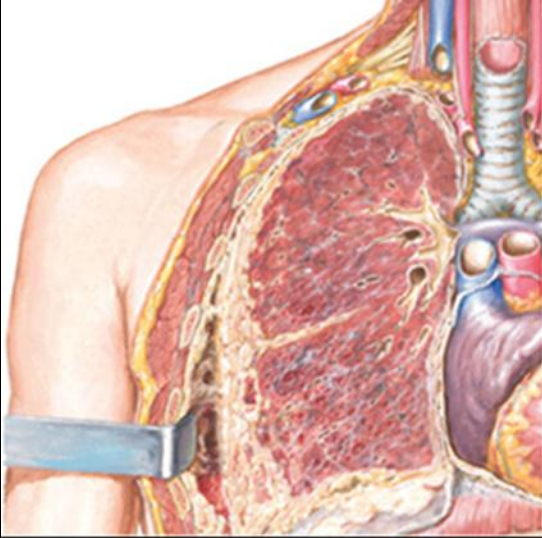
Benign pleural tumor

Fibrous tumor of the pleura:

Chest frontal radiograph shows a large mass blending with the left mediastinal contour and projecting into the left hemithorax.

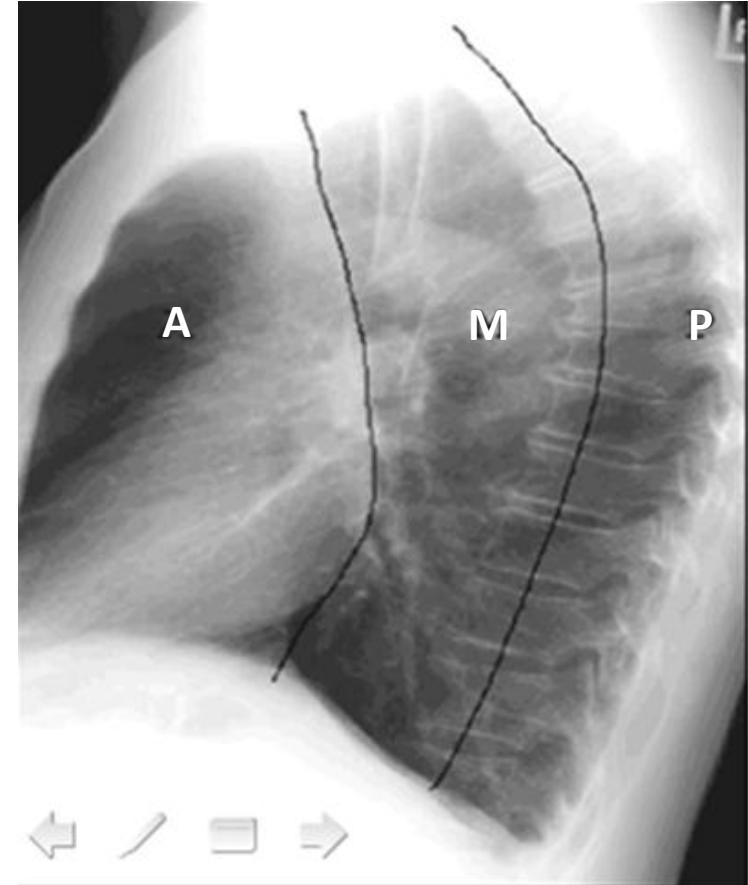
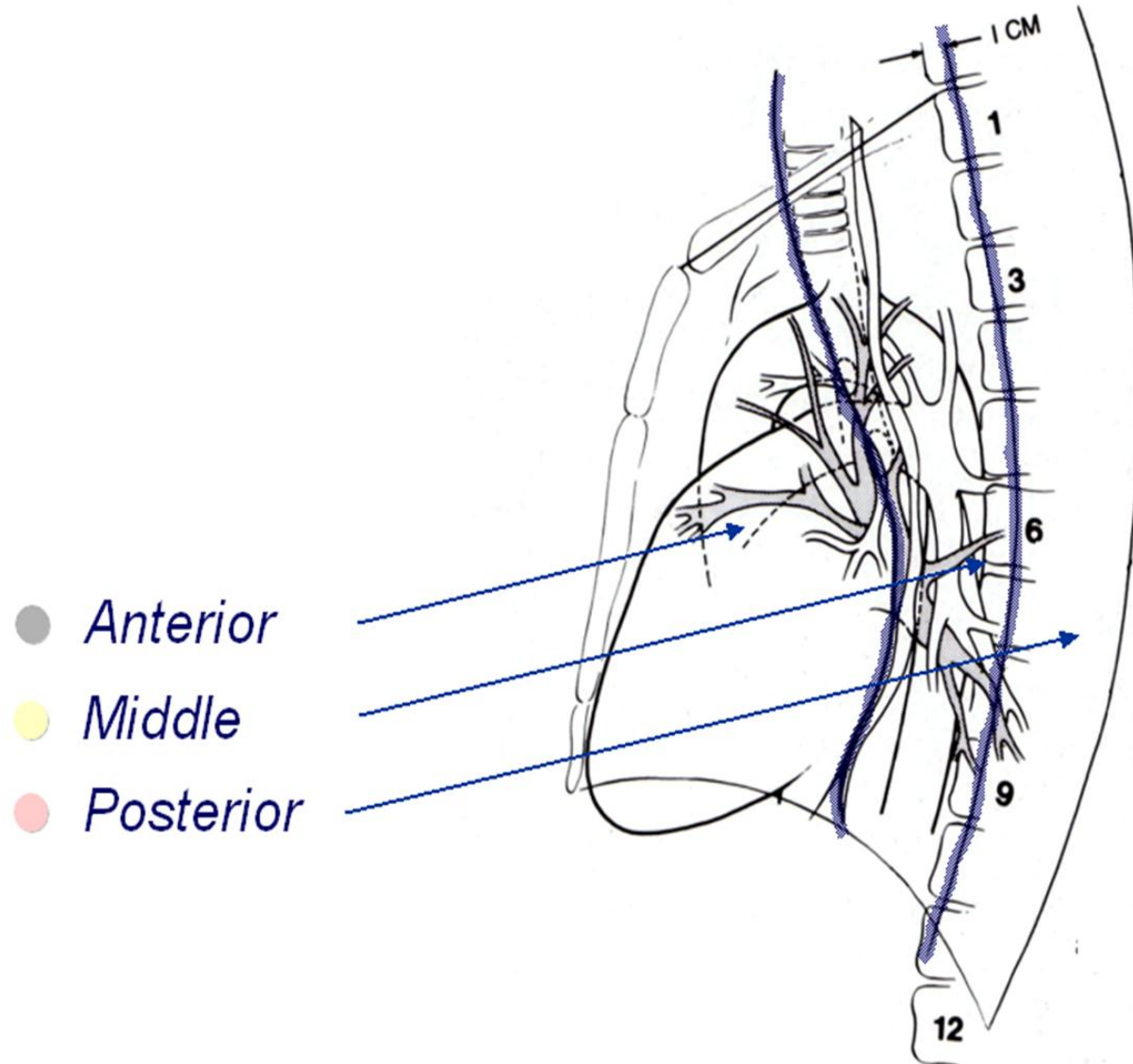


Malignant mesothelioma



Mediastinal lesions 縱膈腔病變

Felson's division of mediastinal compartments

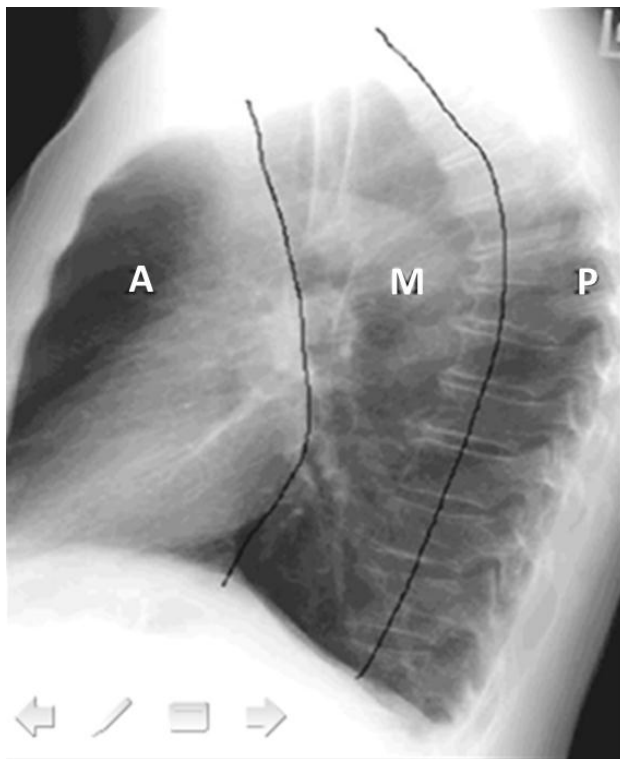


一張投影片就記住縱膈腔病灶

前縱膈腔

- Intrathoracic Goiter
- Parathyroid tumor
- Esophageal tumor
- Angiomatous tumor
- Teratoma
- Thymoma
- Pericardial cyst
- Terrible Lymphoma
- Morgagni hernia
- Lipoma

3T1L



中縱膈腔

- Lymphoma
- Lymph node hyperplasia
- Bronchogenic tumor
- Bronchogenic cyst

後縱膈腔

- Neurogenic tumor
- Aneurysm
- Enteric cyst
- Bronchogenic tumor

神經性腫瘤
囊腫、血管瘤

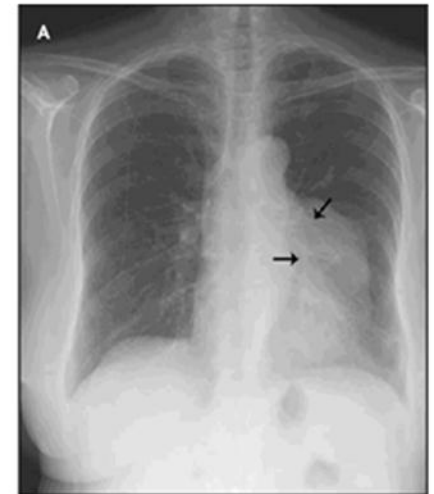
淋巴疾病
縱膈囊腫

縱膈腔常見的描述和徵候

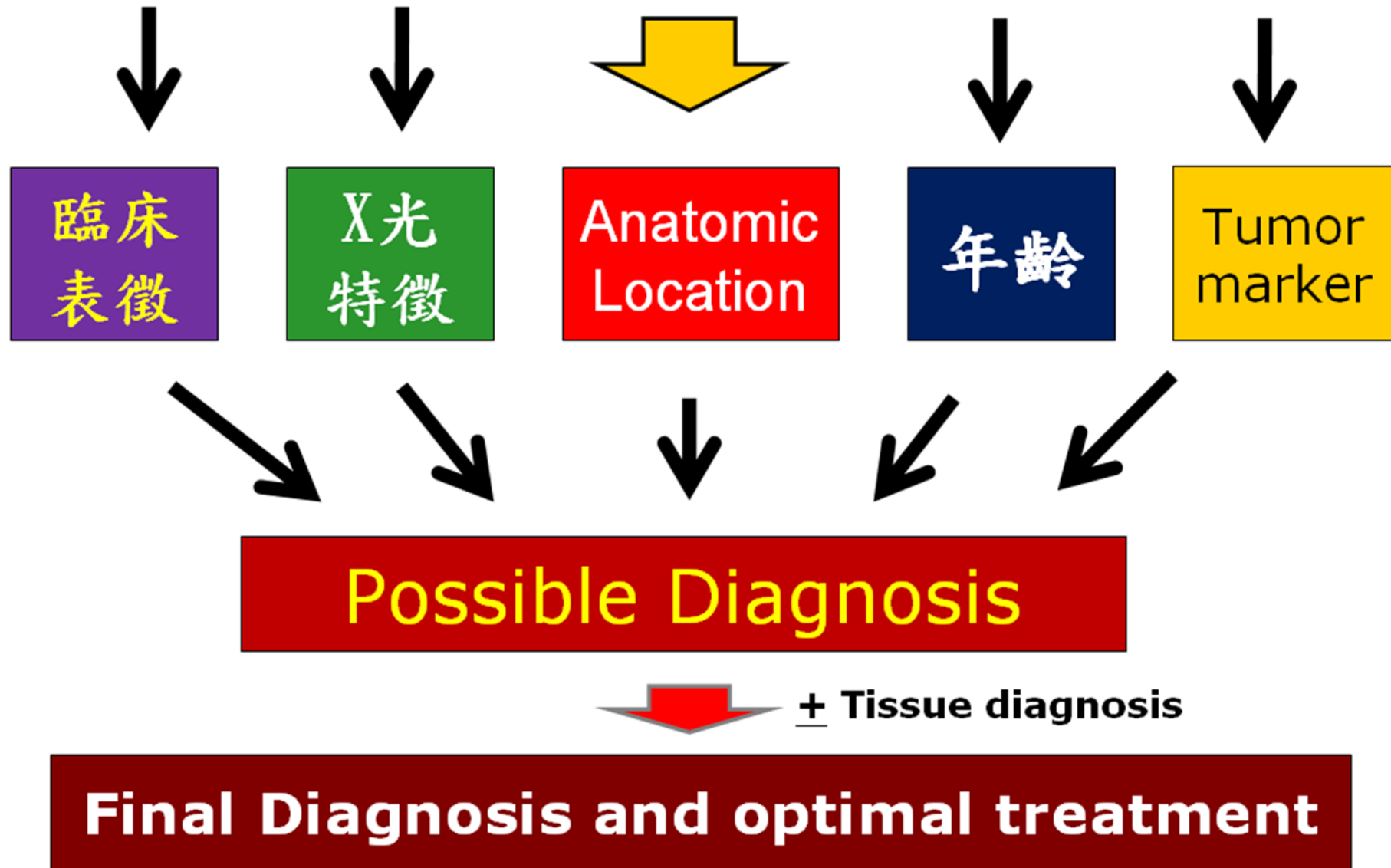
- Widening of Mediastinum
- Opacity of mediastinum
- Abnormal gas, mass, outline ... etc



- **Conventional Radiographic Signs**
 - Silhouette sign
 - The hilar overlay sign
 - The hilum convergence sign
 - The cervicothoracic sign



How to approach mediastinal lesions?



The causes of mediastinal abnormalities

- **Radiographic technique**

- Magnification (AP supine view, low-volume inspiration)
- Lordotic position

- **Vascular structure**

- Tortuous atherosclerotic dilatation of aorta
- Aneurysm
- Aortic dissection
- Coarctation of aorta
- Congenital left SVC with absent right SVC

- **Neoplasms**

- Mediastinal tumors
- Mediastinal metastases

- **Trauma**

- Hematoma (transection of aorta; venous and arterial tears; sternal fractures; vertebral fractures; post-operation ... etc)

- **Inflammation**

- Mediastinitis (perforated esophagus; tracheobronchial rupture... etc)
- Granulomatous adenopathy (MAI in AIDS; TB;... etc)
- Extension of extrathoracic infection (pharyngeal abscess; abdominal abscess; pancreatitis or pancreatic pseudocyst)

- **Lipomatosis**

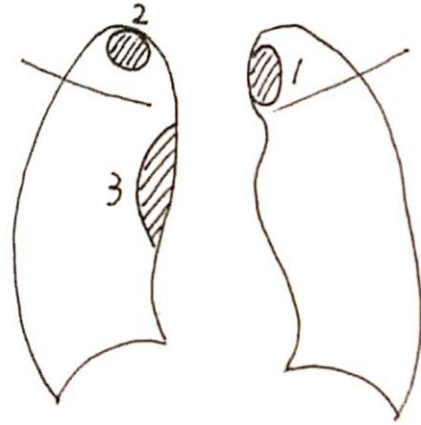
- **Others**- chylothorax, achalasia ... etc

Clinical manifestation, Comorbidity and Age with Mediastinal disorders

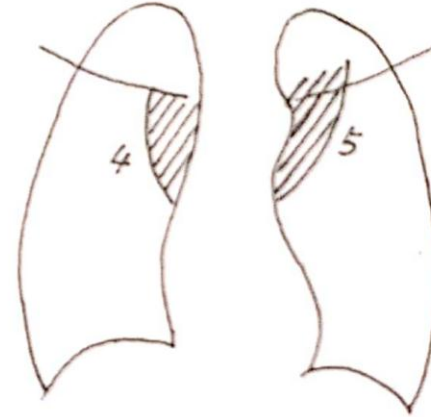
- **Symptomatic?** (Body weight loss, chest pain ..etc (more common in Malignant), fever (infection) ...etc.
- **Young age:**
 - germ cell tumor, terrible lymphoma, congenital lesion (cystic lesion ...etc), congenital diaphragmatic hernia
- **Adult or aged:**
 - Thymoma, thymic carcinoma (more than 40 age)
- **Co-morbidity:**
 - Hypertension (Aortic dissection), Trauma history (traumatic diaphragmatic hernia) ...etc

Cervicothoracic sign 頸胸徵

1和2
肺內病灶

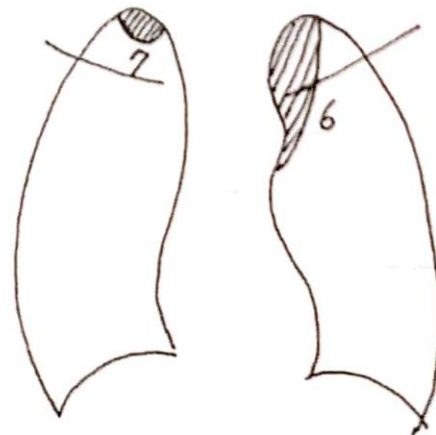


3
縱膈病灶



4
前縱膈病灶

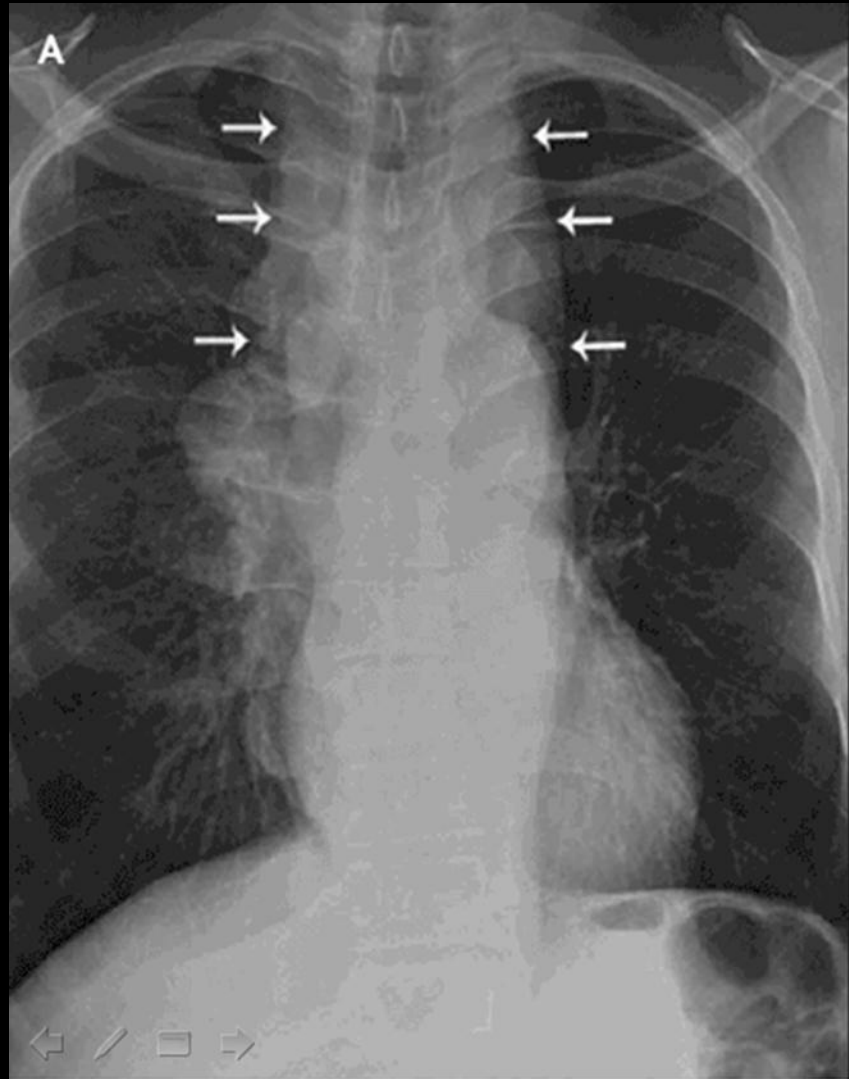
6
後縱膈病灶



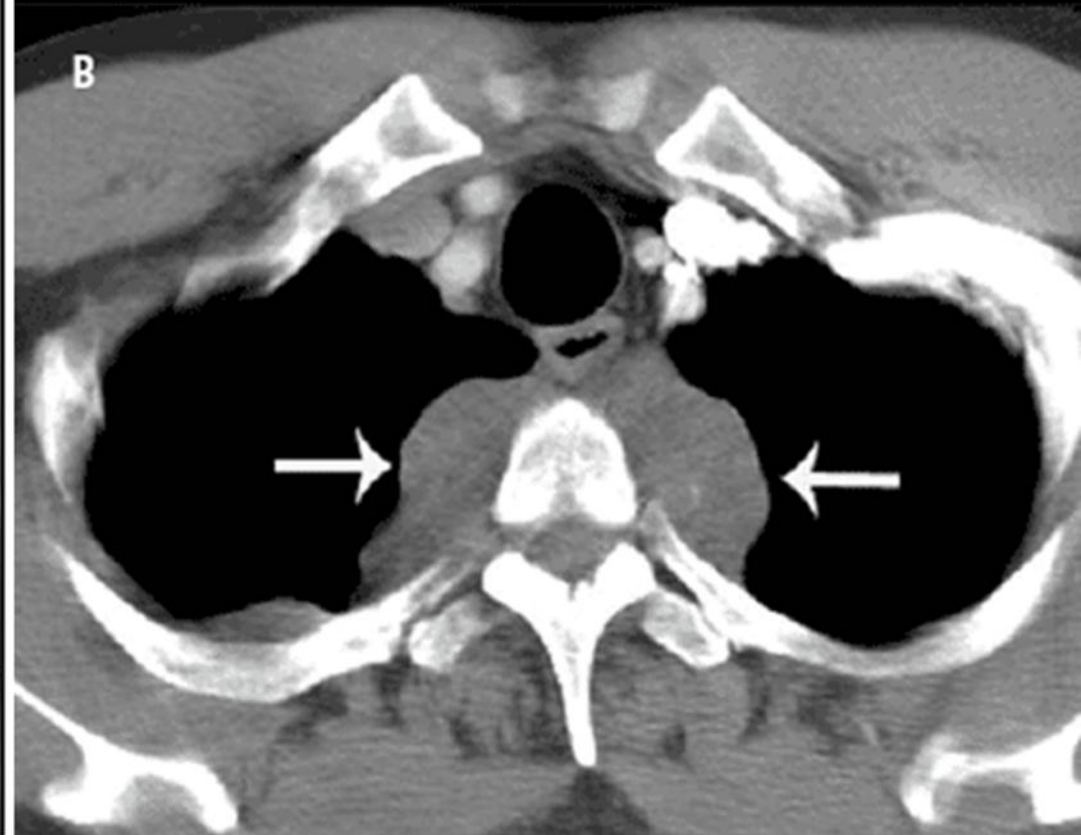
5
中縱膈病灶

7
多種可能性

Cervicothoracic sign : Neurofibroma

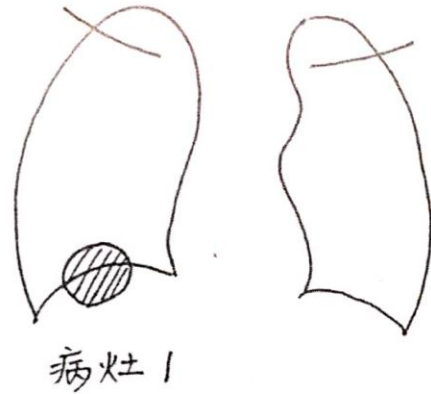


Bilateral, homogenous
No fat density, no anemia history

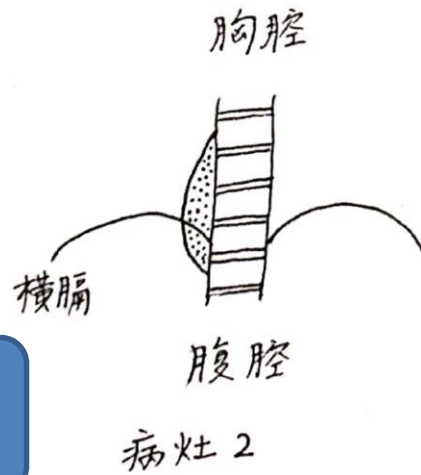
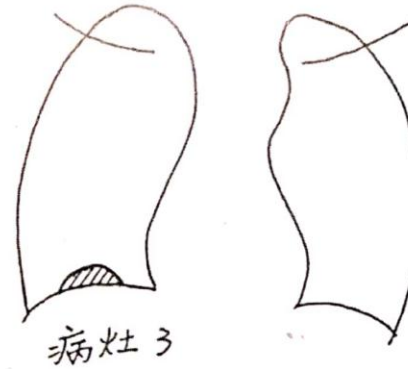


Thoracoabdominal sign 胸腹徵

肺內病灶



部份肺內
部份腹腔

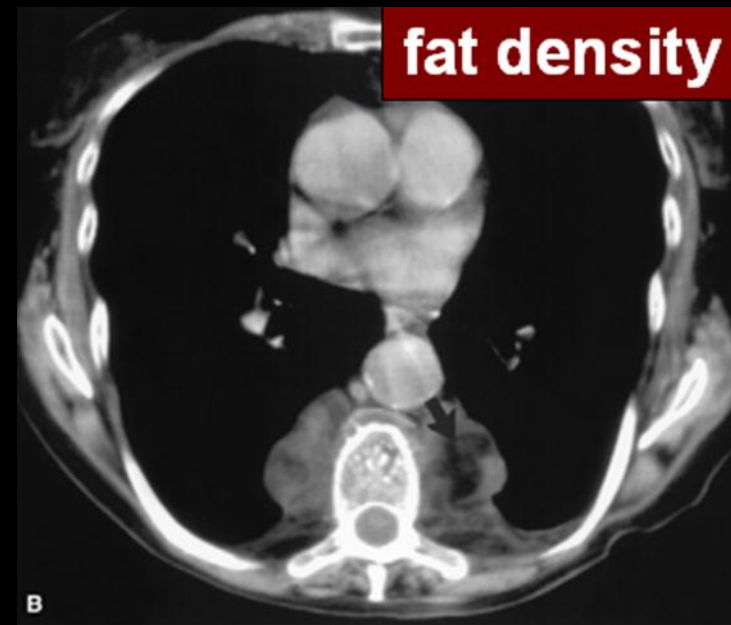
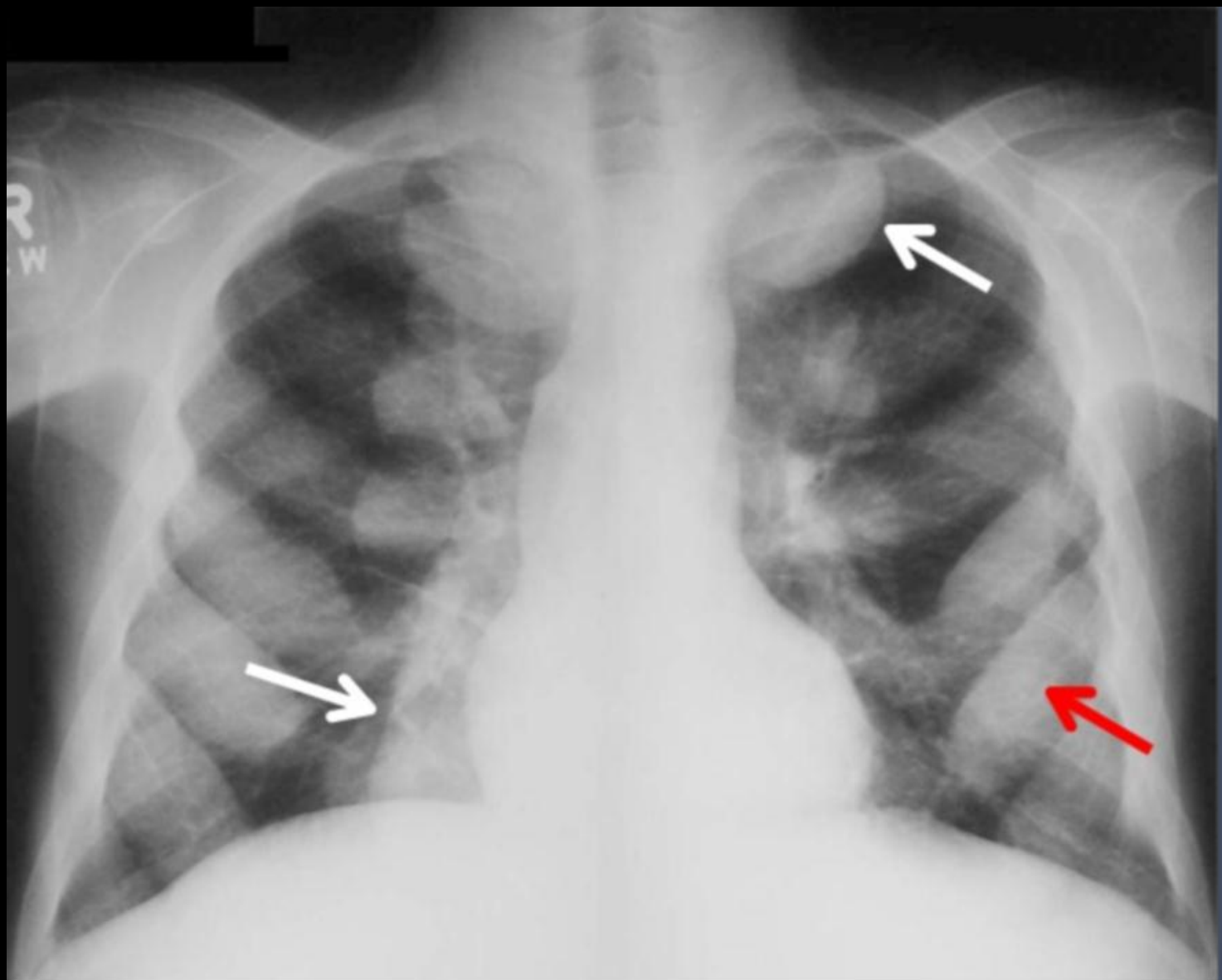


縱膈病灶

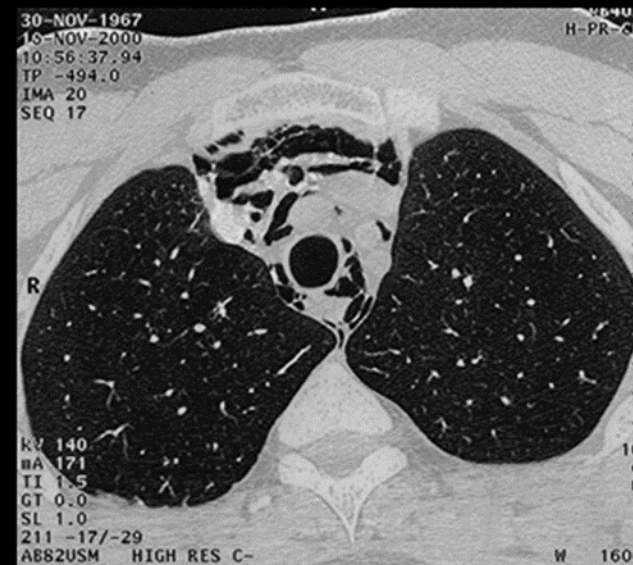
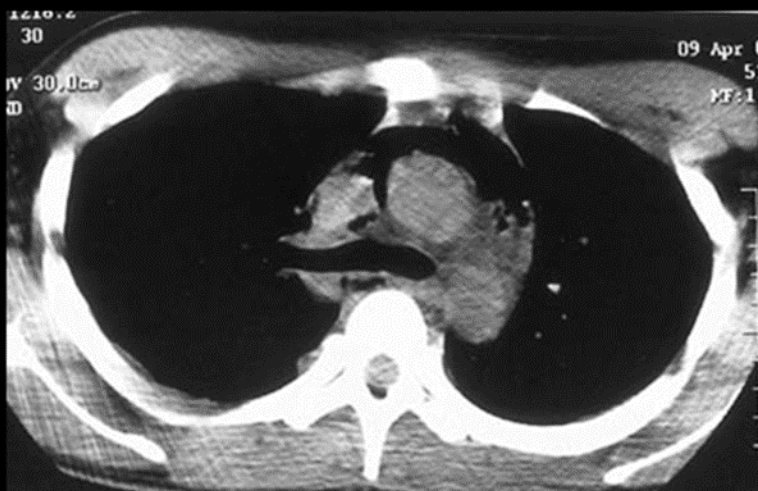
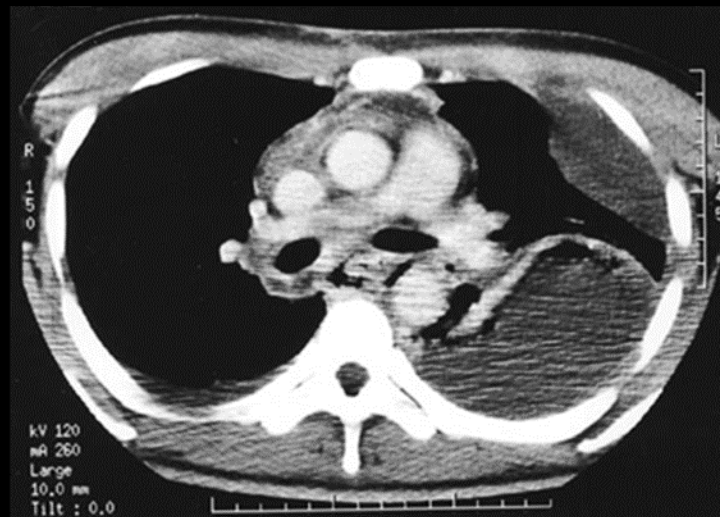
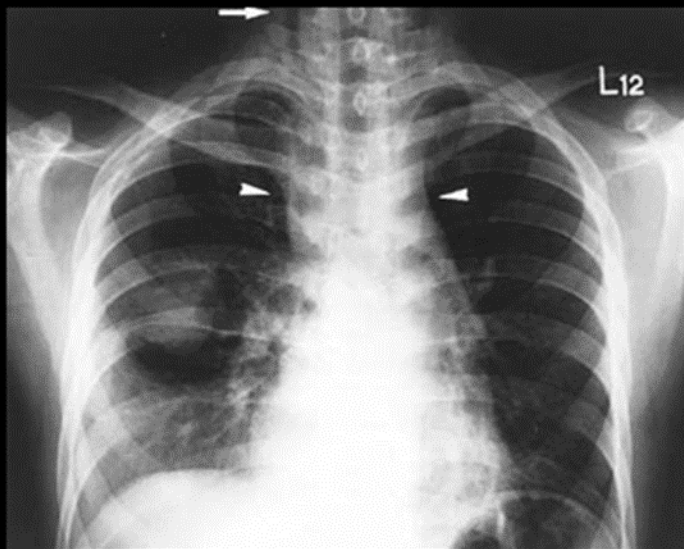


部份縱膈
部份腹腔

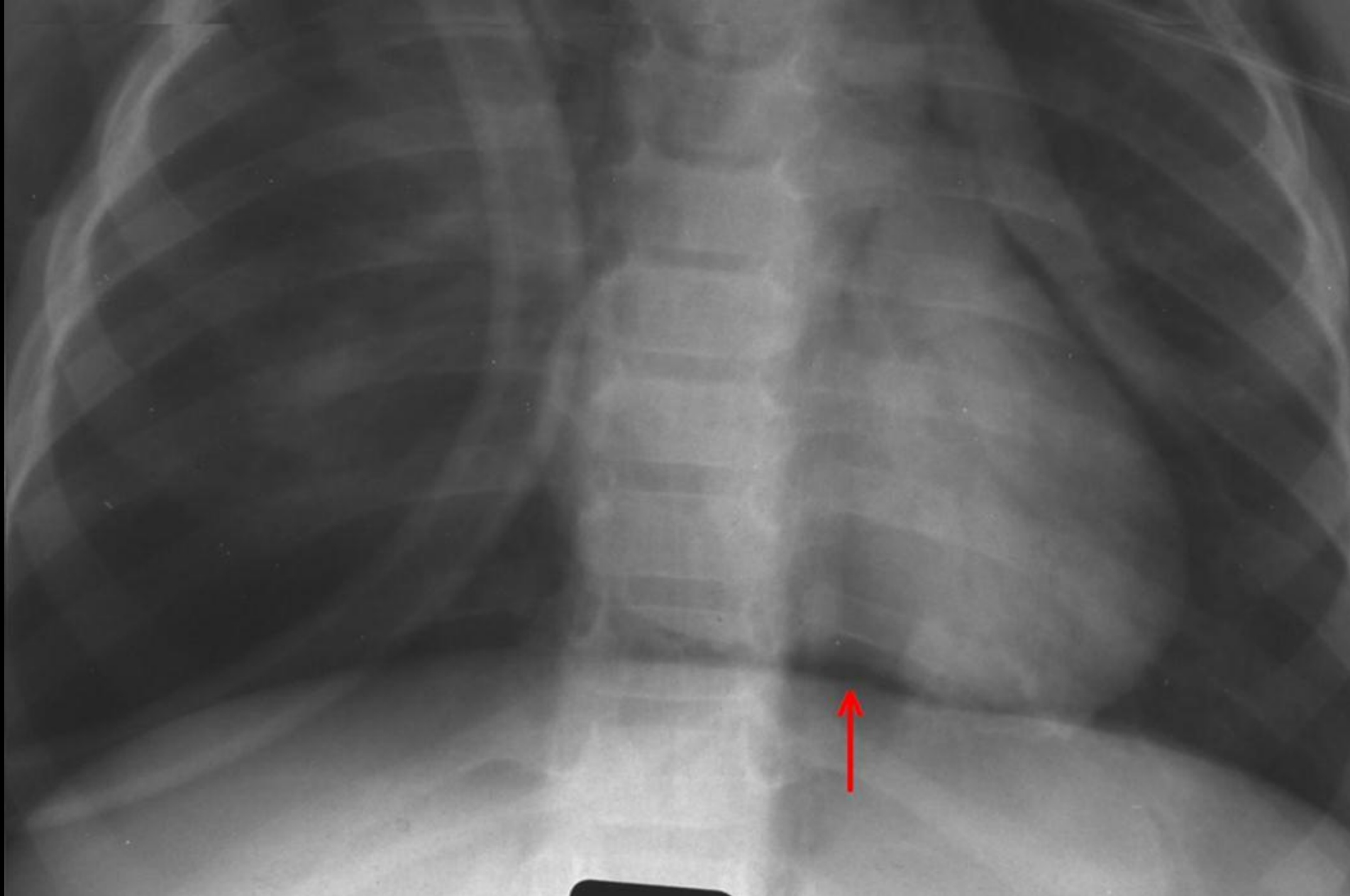
Thoracoabdominal sign: Thalassemia with EMH



Air within mediastinum: pneumomediastinum



Continuous diaphragm sign: pneumomediastinum + pneumopericardium



前縱膈腔病灶

Anterior Mediastinal Tumor(AMT)

- **T**hymic lesions

- Thymoma
- Carcinoid, carcinoma.
- Cysts
- Other

- **T**eratoid lesions

- Dermoid cyst; Teratoma (benign and malignant); Embryonal cell carcinoma; Choriocarcinoma; Seminoma)

- **T**hyroid—intrathoracic goiter
thyroid cancer

- **L**ymph nodes

- **T**errible Lymphoma; Metastases; granulomatous infections... etc

- **C**ardiovascular

- Epicardial fat pad; Aneurysm; ... etc

- **C**ysts

- Cystic hygroma (lymphangioma); Bronchogenic cysts; Extralobar sequestration

- **O**ther

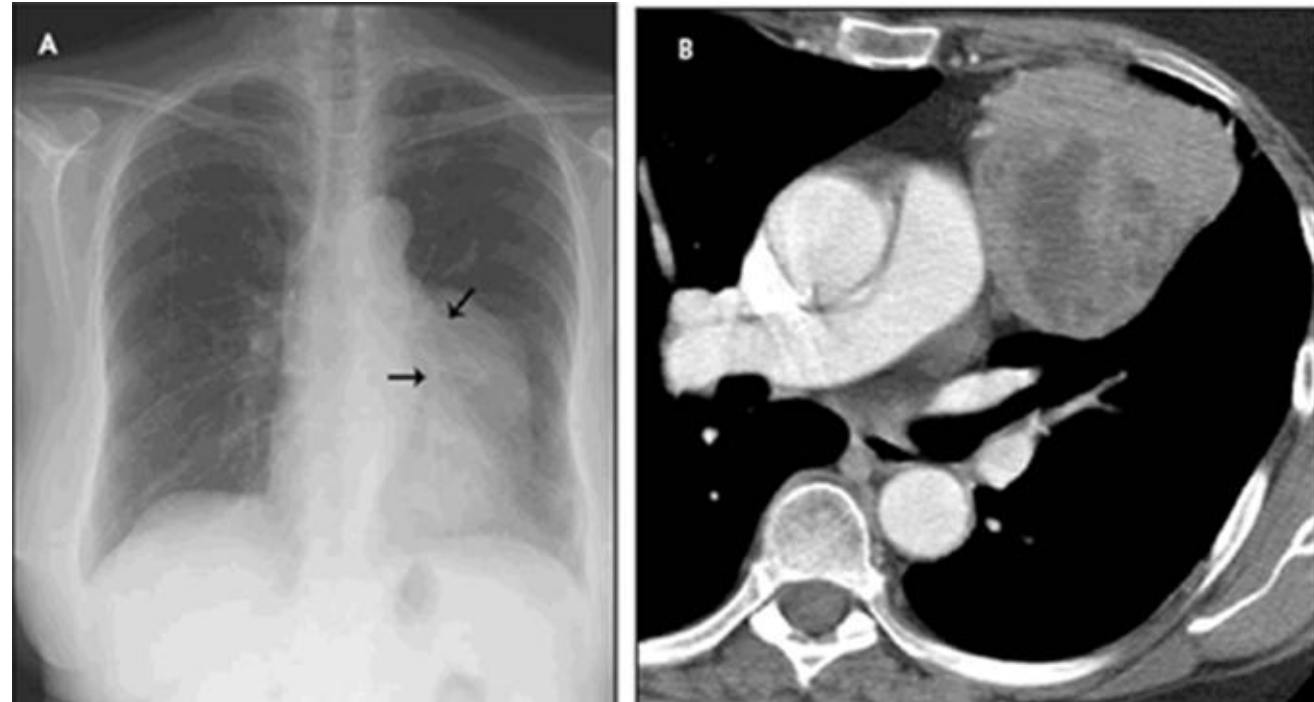
Thymoma: most common primary neoplasm in AMT

- **Imaging finding**

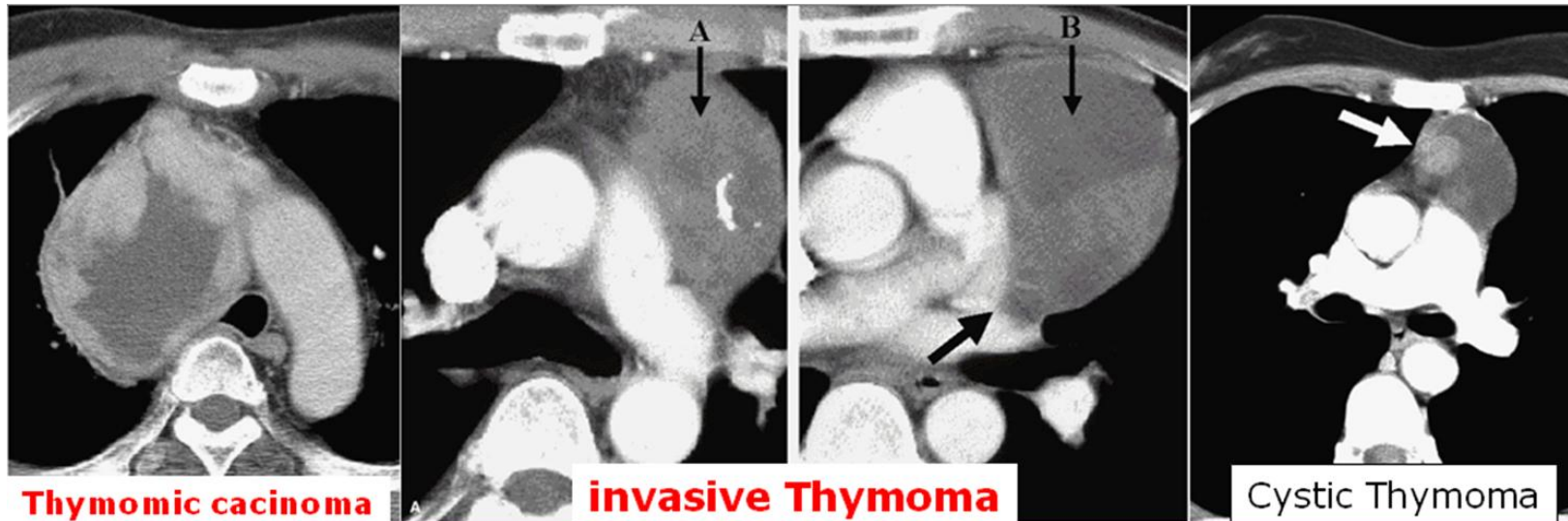
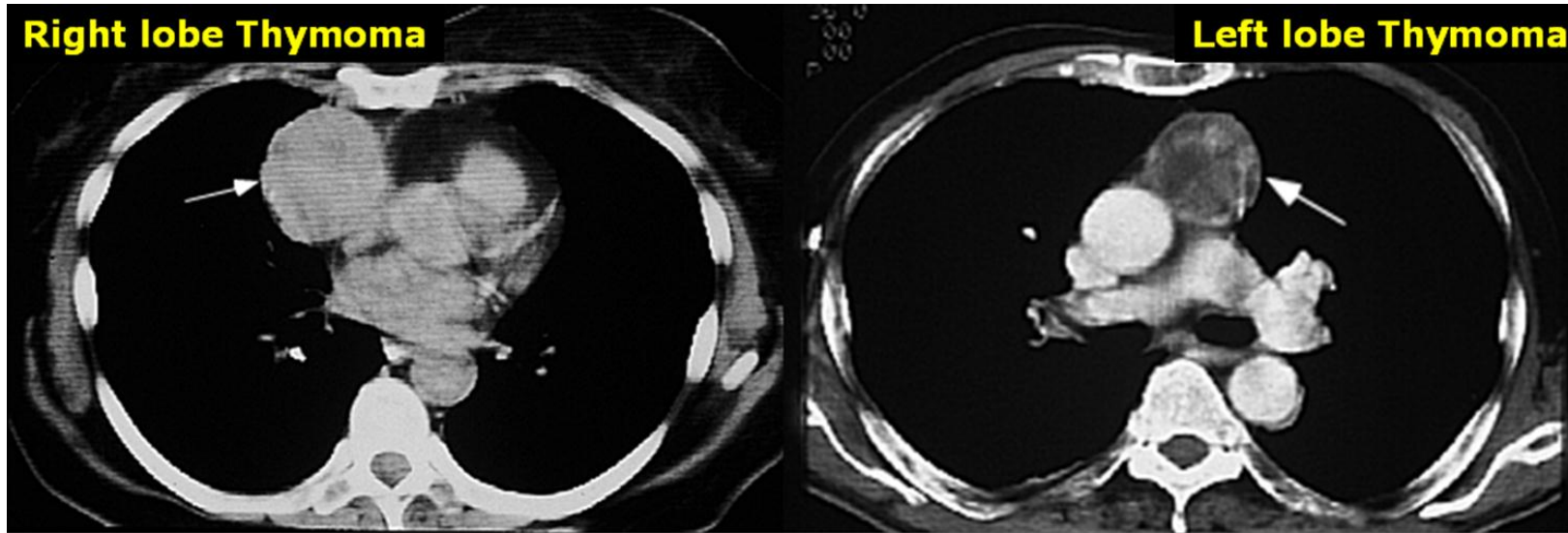
- Round or oval, smooth or lobulated mass that may calcifies and may protrude to one or both sides of the mediastinum.
- **Usually arises near the junction of the heart and great vessels** (displacing them posteriorly).

- **Comments:**

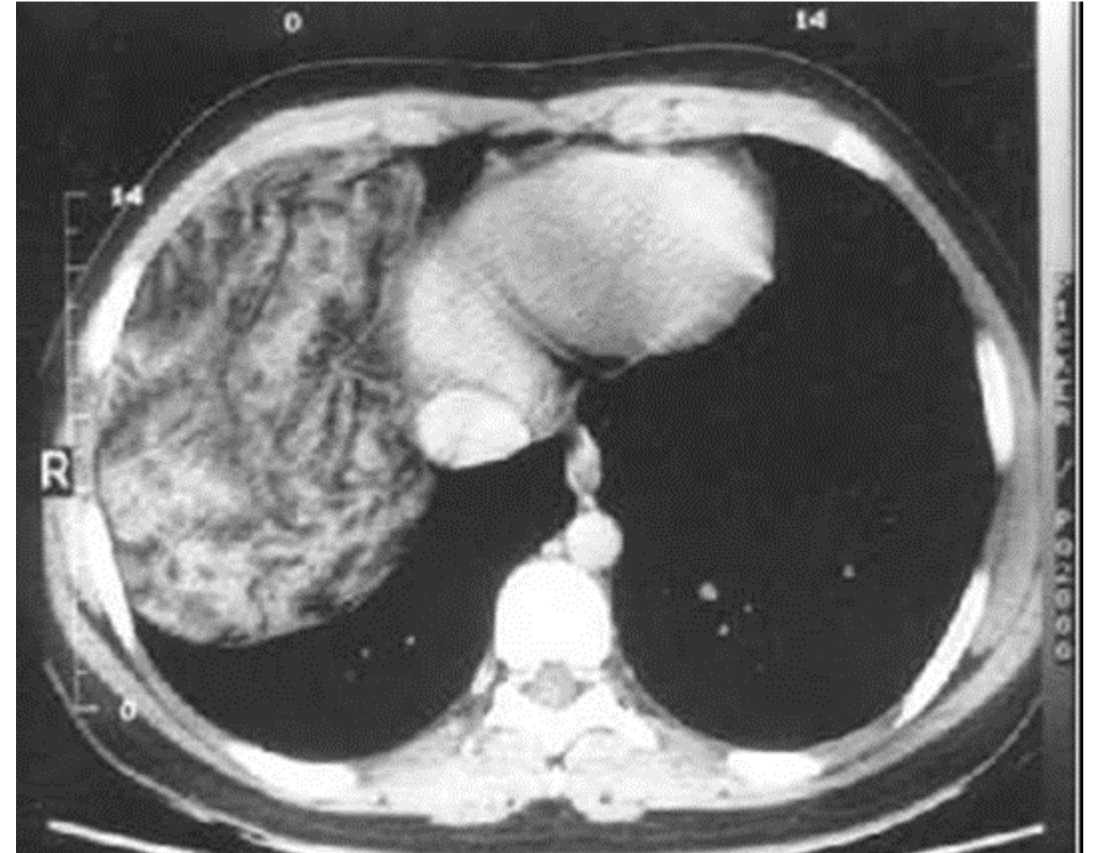
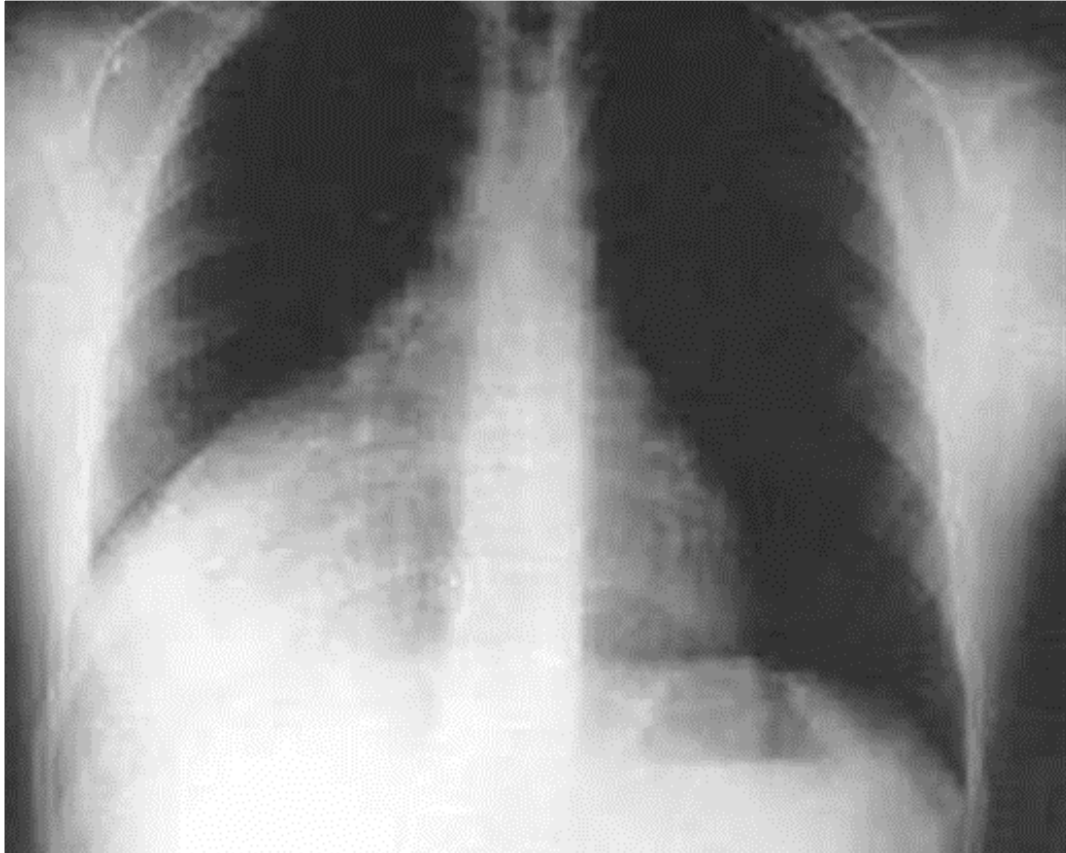
- High fat content
- 25% to 50% have myasthenia gravis (15% of MG with thymic tumors).
- M/F equally affected; **most patients > 40 years**



Non-invasive/Invasive Thymoma, Thymic carcinoma

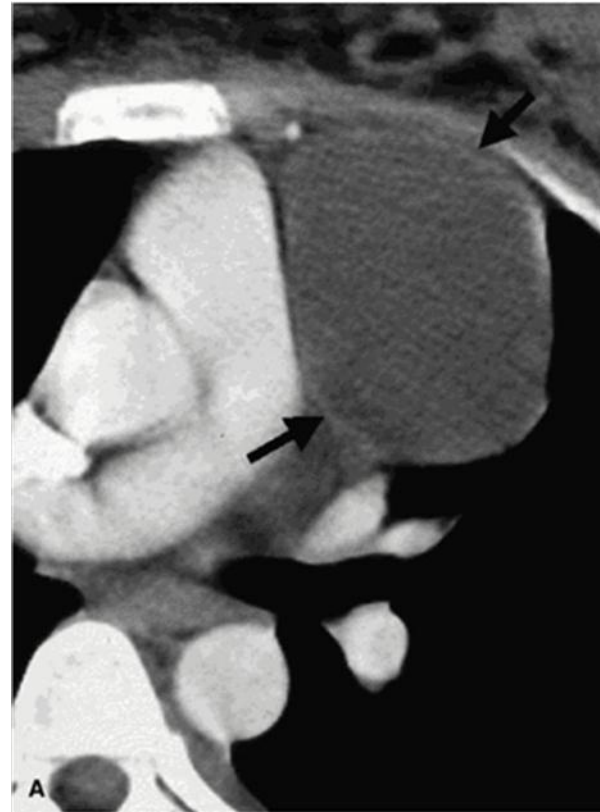
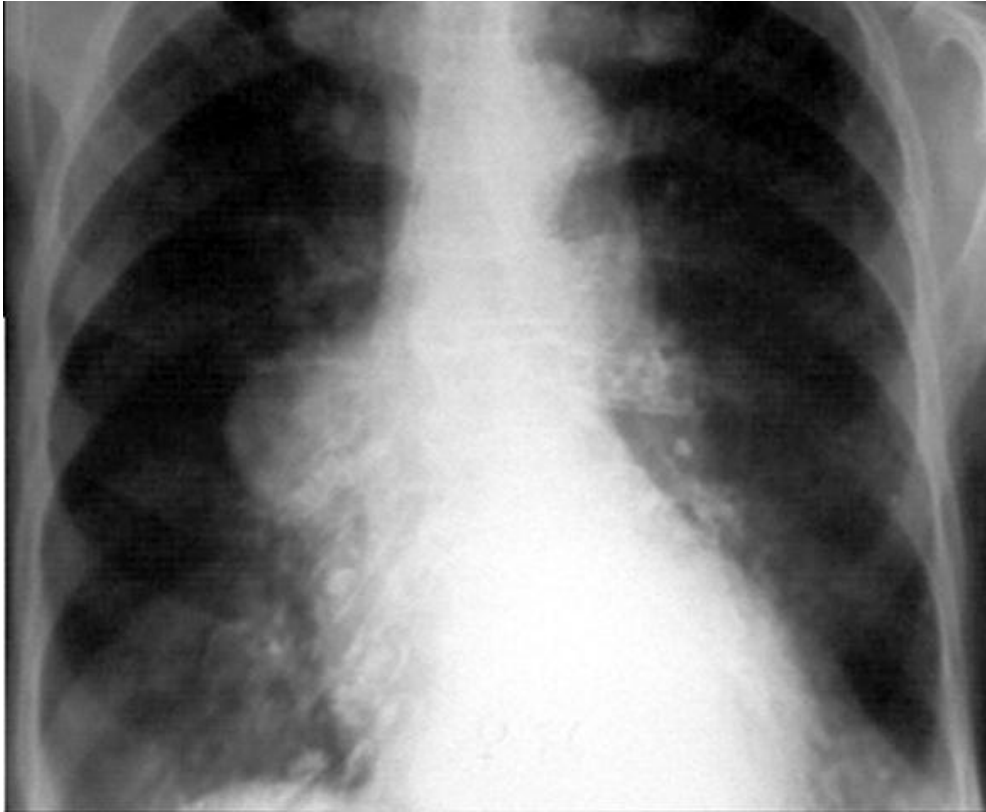


Thymolipoma



Thymolipoma is a rare, benign anterior mediastinal mass of thymic origin, containing both thymic and mature adipose tissue.

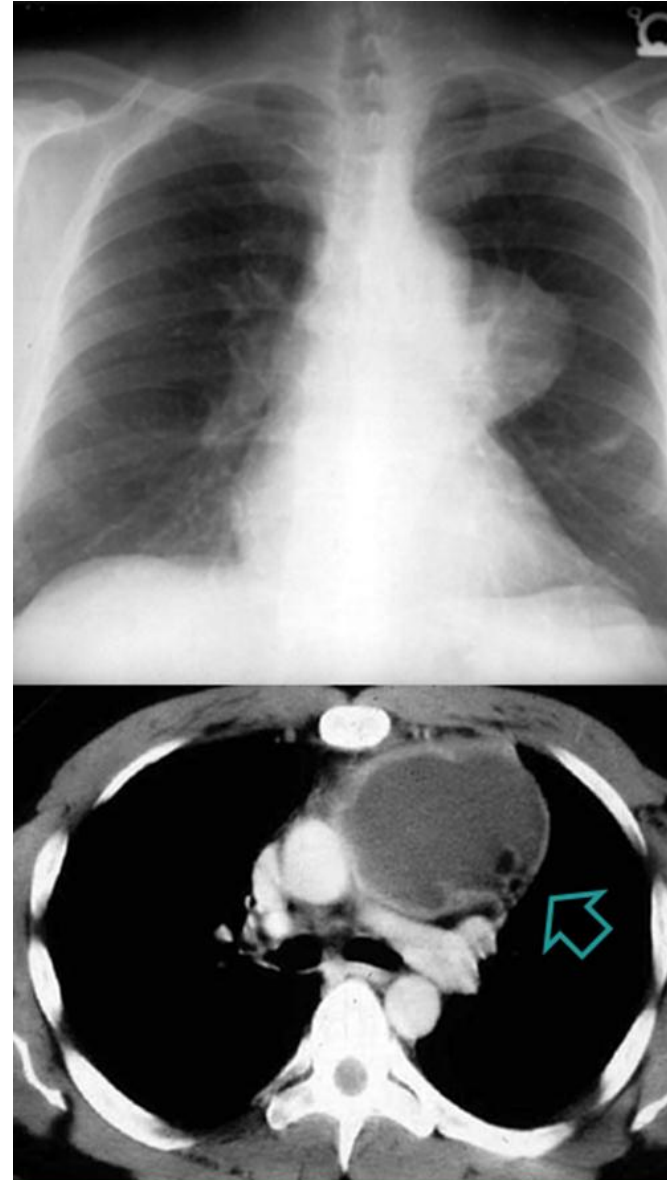
Thymic cysts



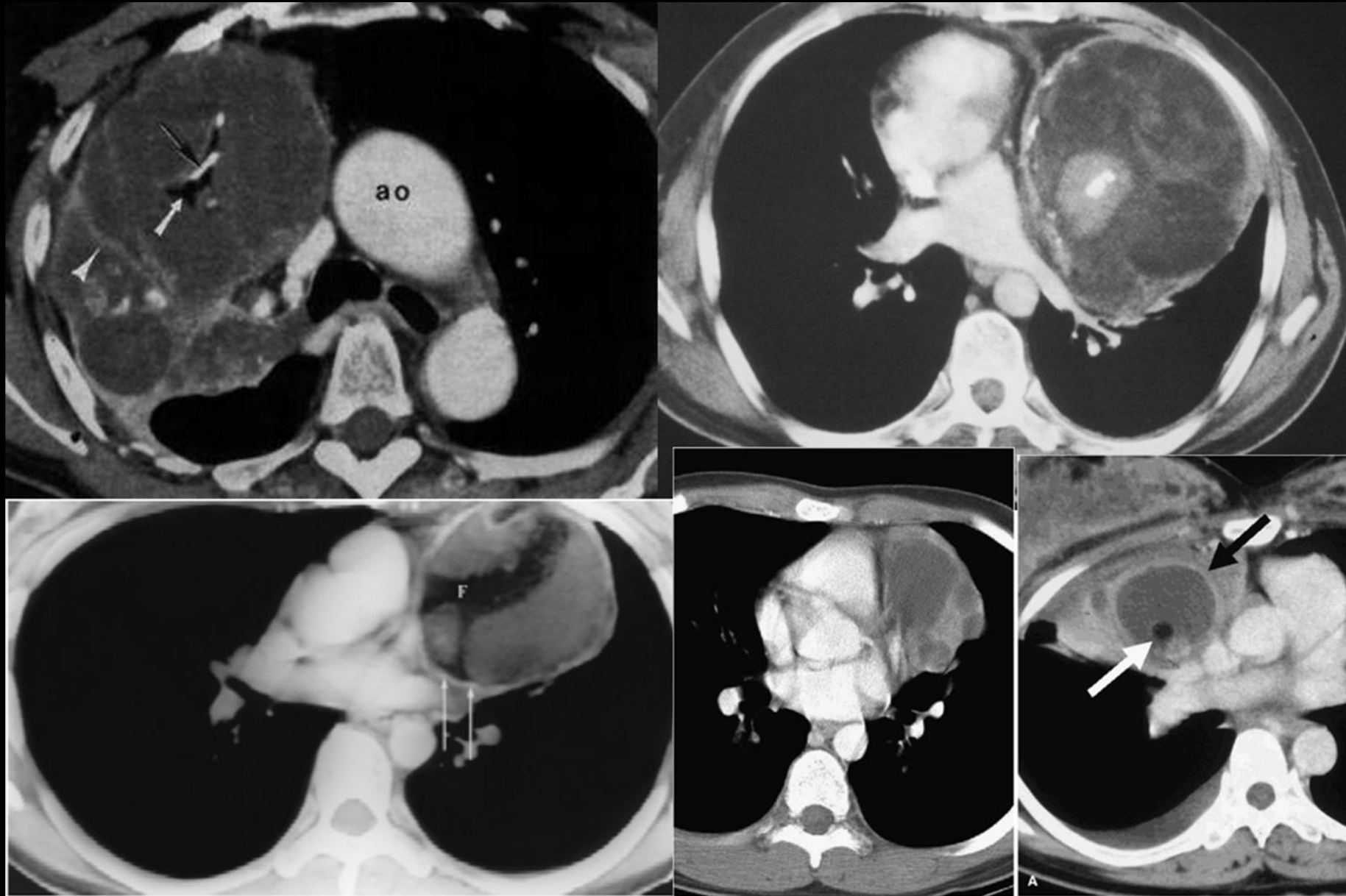
May not even be visible (especially small lesions). If visible thymic cysts often indistinguishable from other non-lobulated thymic/anterior mediastinal lesions on radiographs.

Teratoma and other germ cell tumors: 10-15% of AMT

- **Imaging finding**
 - Round or oval, smooth or lobulated mass that may protrude to one or both sides of mediastinum.
- **Comments:**
 - Calcification, bone, teeth, or fat may occur in teratomas and dermoid cysts.



Teratoma



Germ cell tumors other than Teratoma

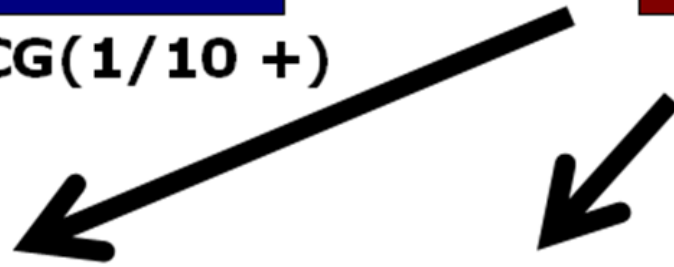
其他前縱膈生殖腺腫瘤



Mediastinal
Seminoma

The nonseminomatous
malignant germ cell tumors

AFP(-) + hCG(1/10 +)



embryonal
cell
carcinoma

AFP + HCG

endodermal
sinus tumor

AFP

Choriocarcinoma
絨毛膜癌

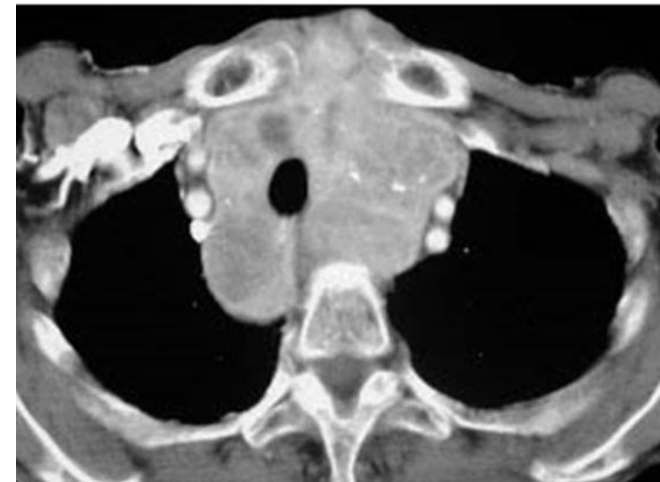
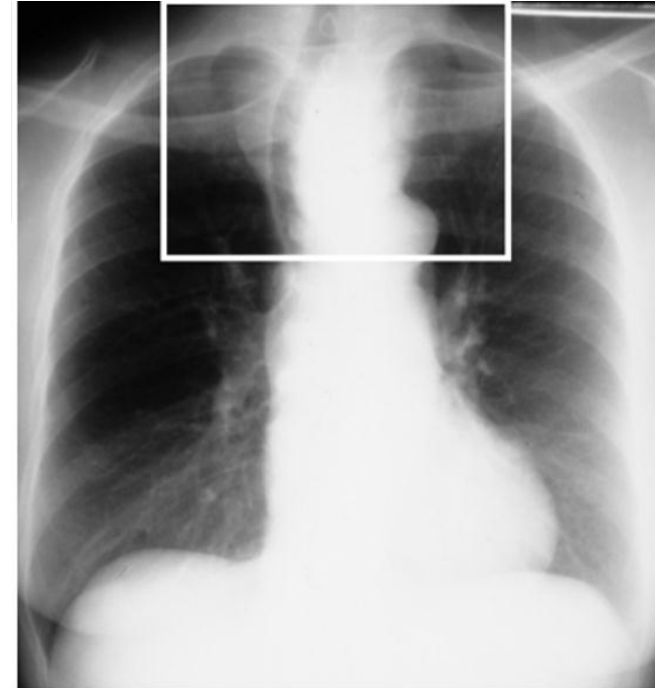
beta-HCG

mixed
germ cell
tumors

AFP + HCG

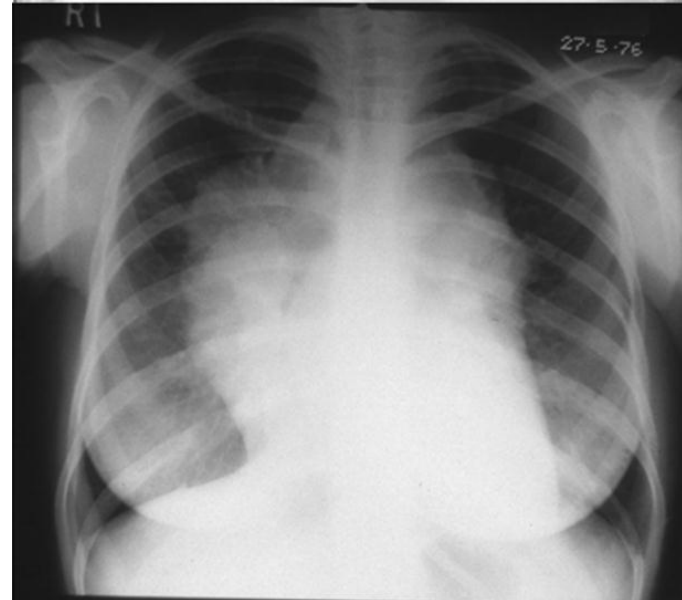
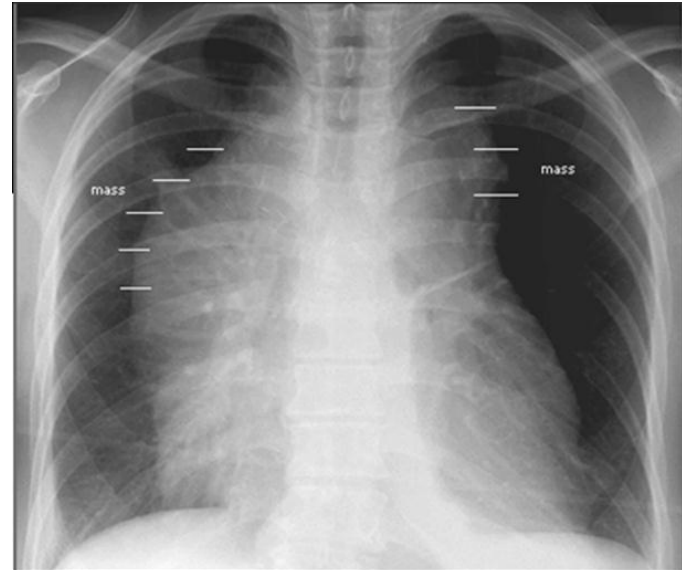
Intrathoracic(substernal) goiter

- Imaging finding
 - **Sharply defined, smooth or lobulated mass** that occurs in the superior portion of the mediastinum and may calcify
- Comments:
 - **Typically compresses the trachea or the esophagus or both.** Occasionally occurs in the posterior mediastinum



Lymphoma

- **Imaging finding**
 - Enlargement of anterior mediastinal and retrosternal lymph nodes commonly occurs.
- **Comments:**
 - The presence of anterior mediastinal nodes in lymphoma is a differential point from sarcoidosis (which also affects hilar nodes but not nodes in the anterior compartment). There is **often symmetric widening of the superior mediastinum** on frontal views.



中縱膈腔病灶

Middle mediastinal lesions

- **Lymph node** enlargement
(良性或惡性)
- **Aneurysm** of aorta or major branch
- **Bronchogenic cyst**
- Mediastinal hemorrhage/Hematoma
- **Mediastinitis**
- Pleuropericardial (mesothelial) cyst
- intrapericardial hernia
- Benign lymphoid hyperplasia (Castleman's disease)

其他：**Esophageal disease**: achalasia, esophageal cancer, mediastinitis ... must be considered.

Airway lesions

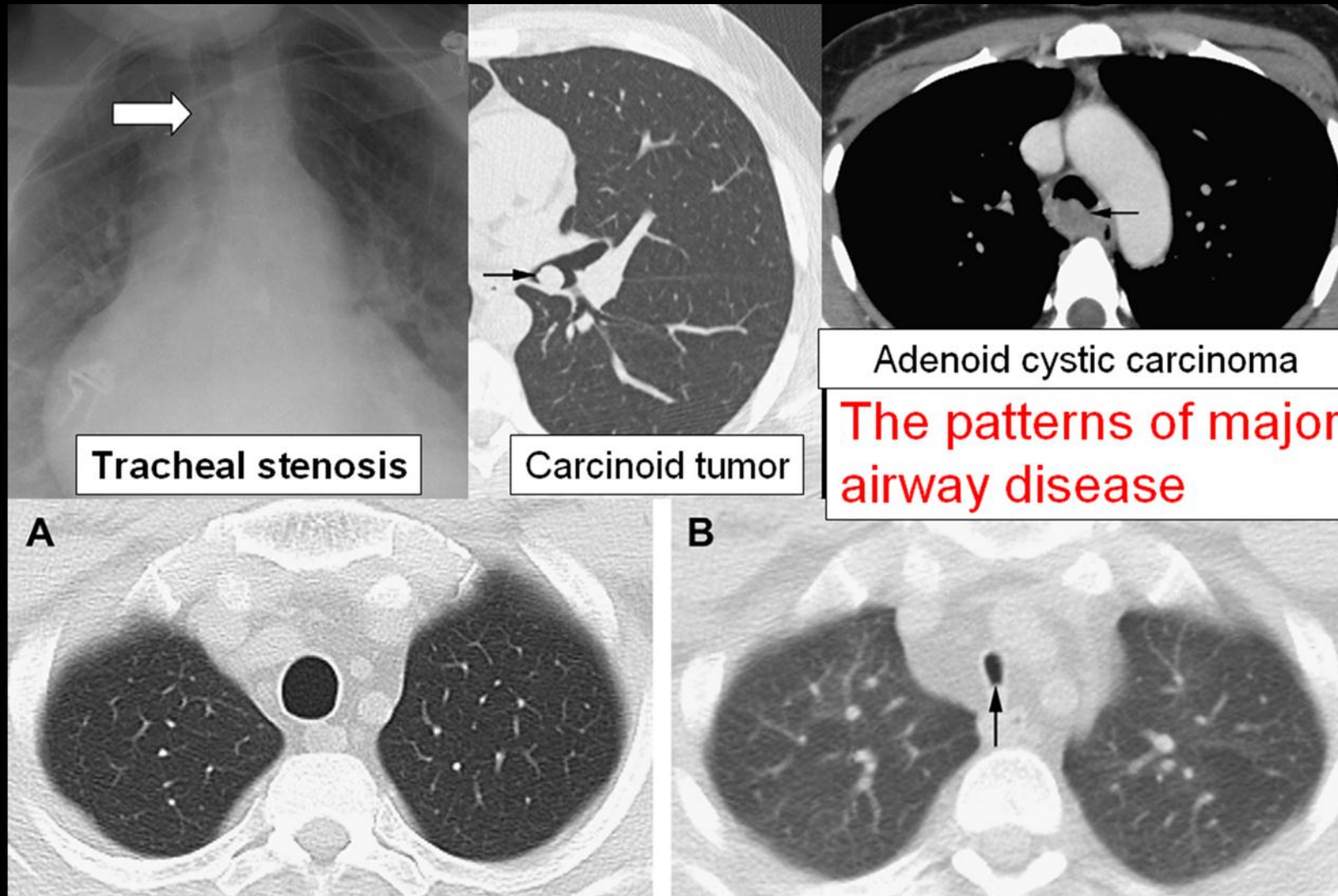
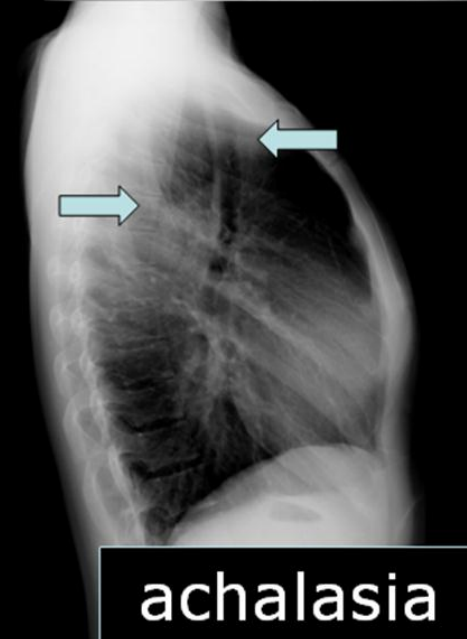
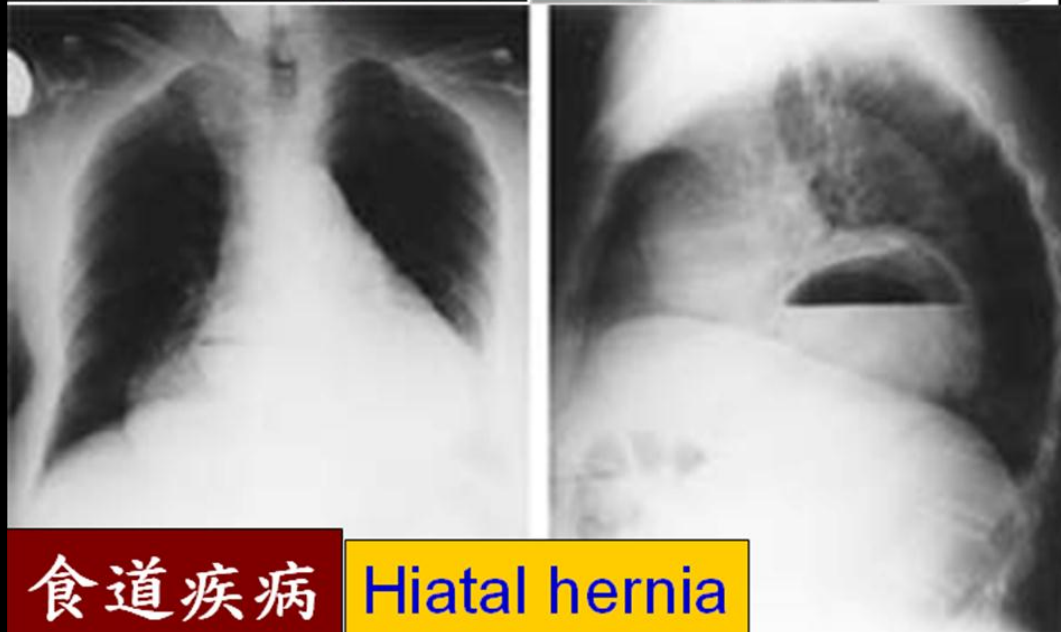
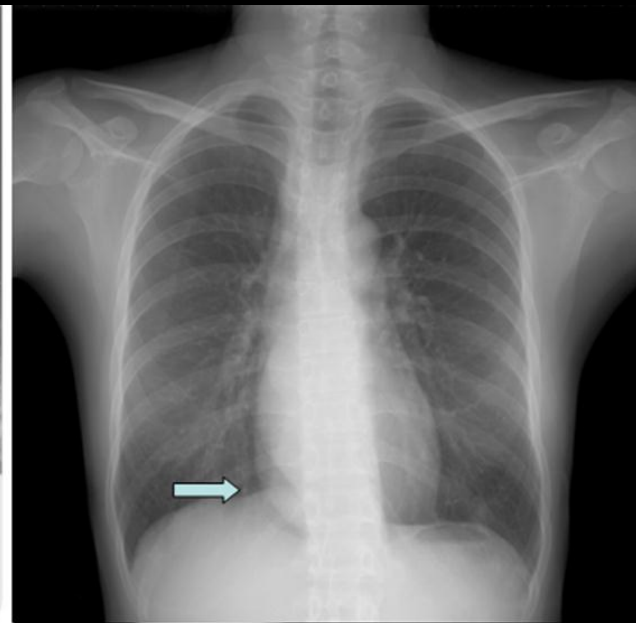
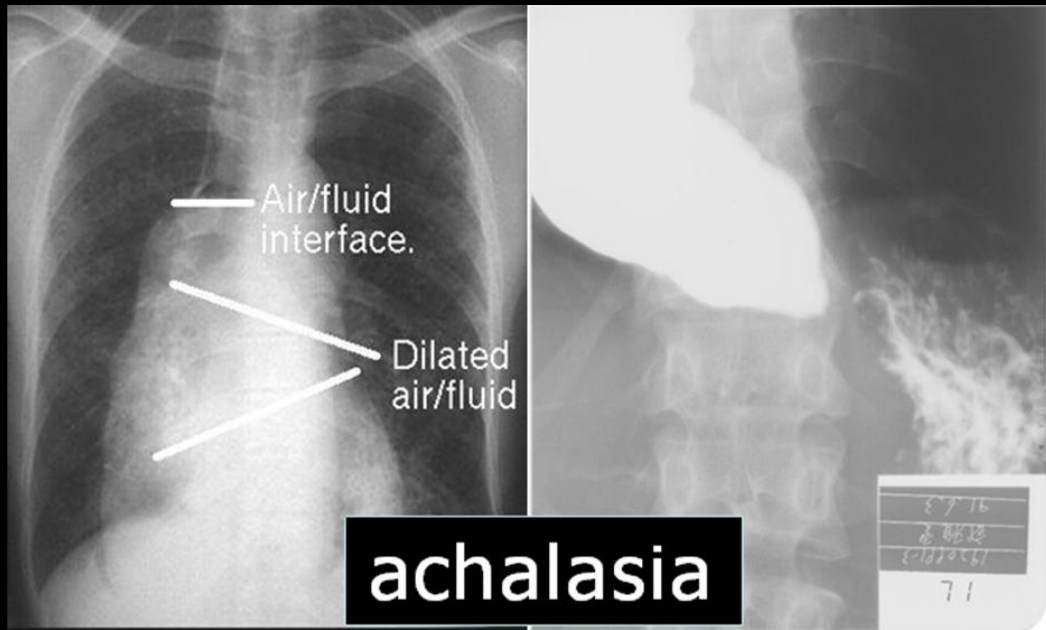


Fig. 12. **Tracheomalacia**. Dynamic expiratory image shows excessive expiratory collapse with circumferential narrowing of trachea lumen (arrow).

Esophageal disorders



Radiologic Classification of Thoracic Sarcoidosis

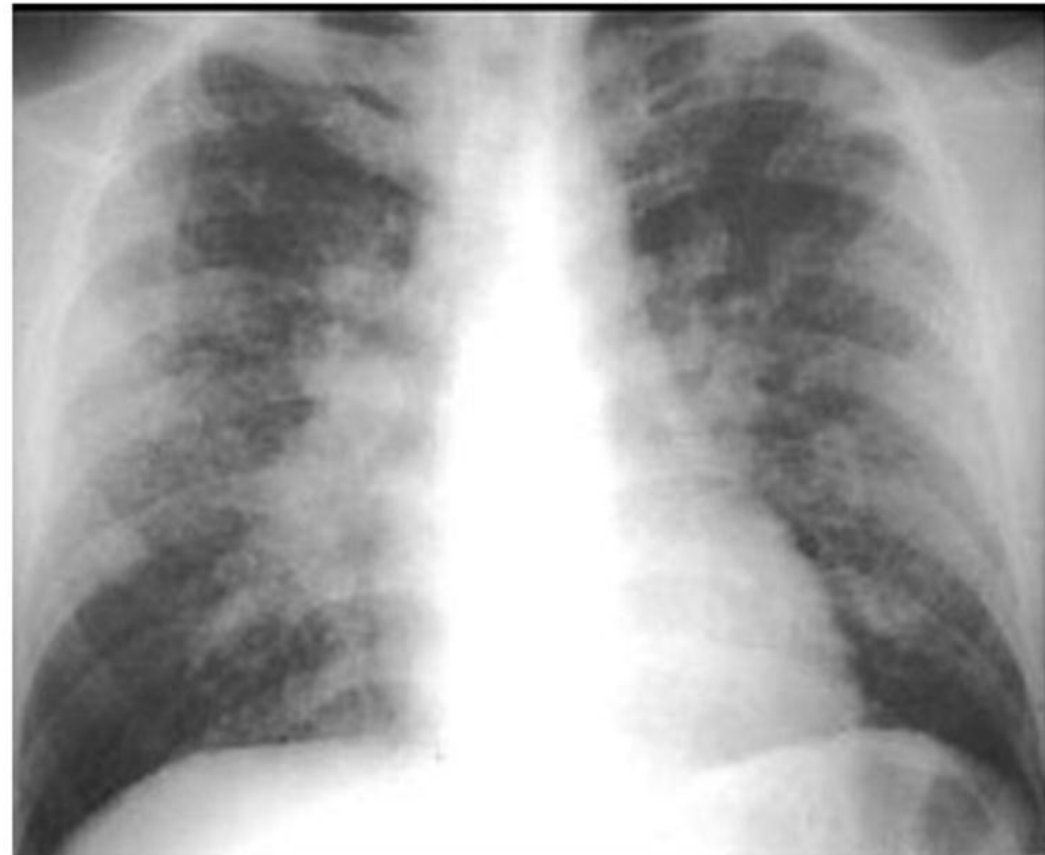
STAGE I

- Thoracic lymphadenopathy. Normal lung parenchyma. (50%)



STAGE II

- Hilar and mediastinal lymphadenopathy. Abnormal lung parenchyma. (30%)



Radiologic Classification of Thoracic Sarcoidosis

STAGE III

- Abnormal lung parenchyma.
No lymphadenopathy. (15%)

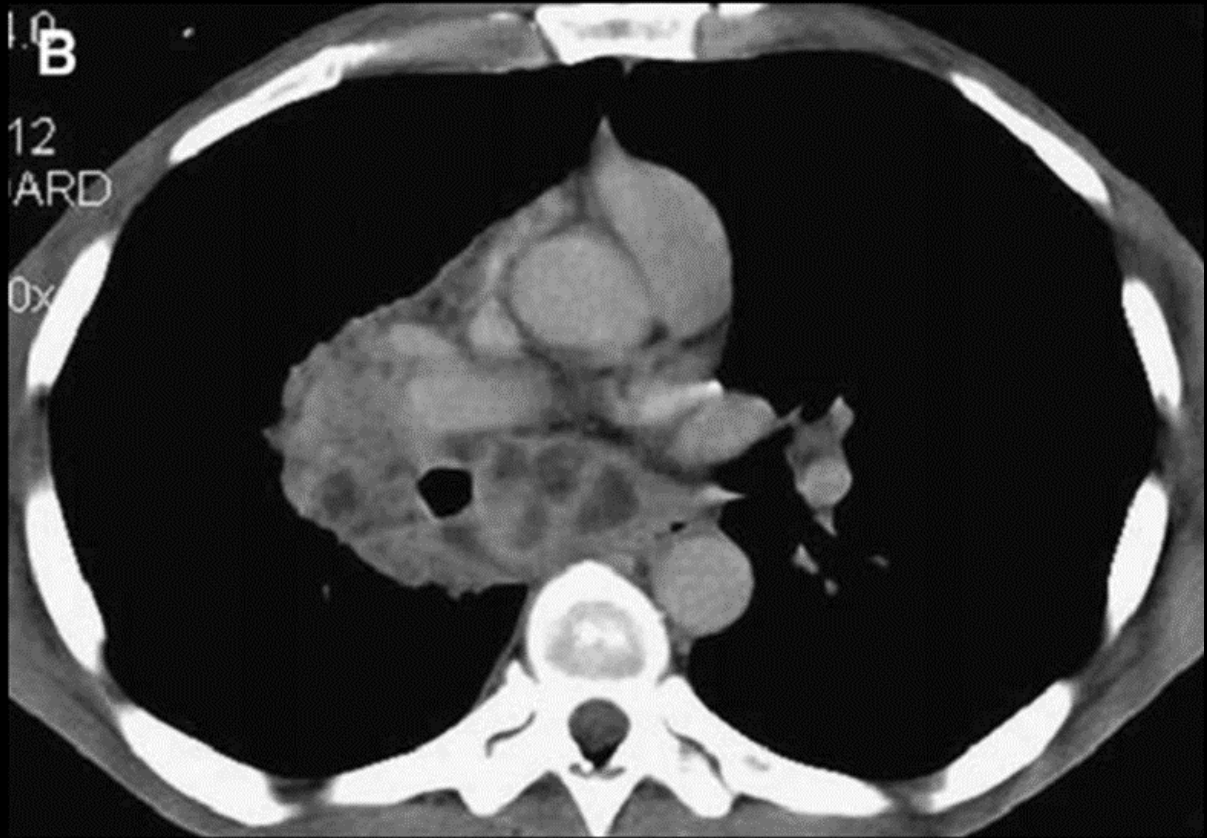
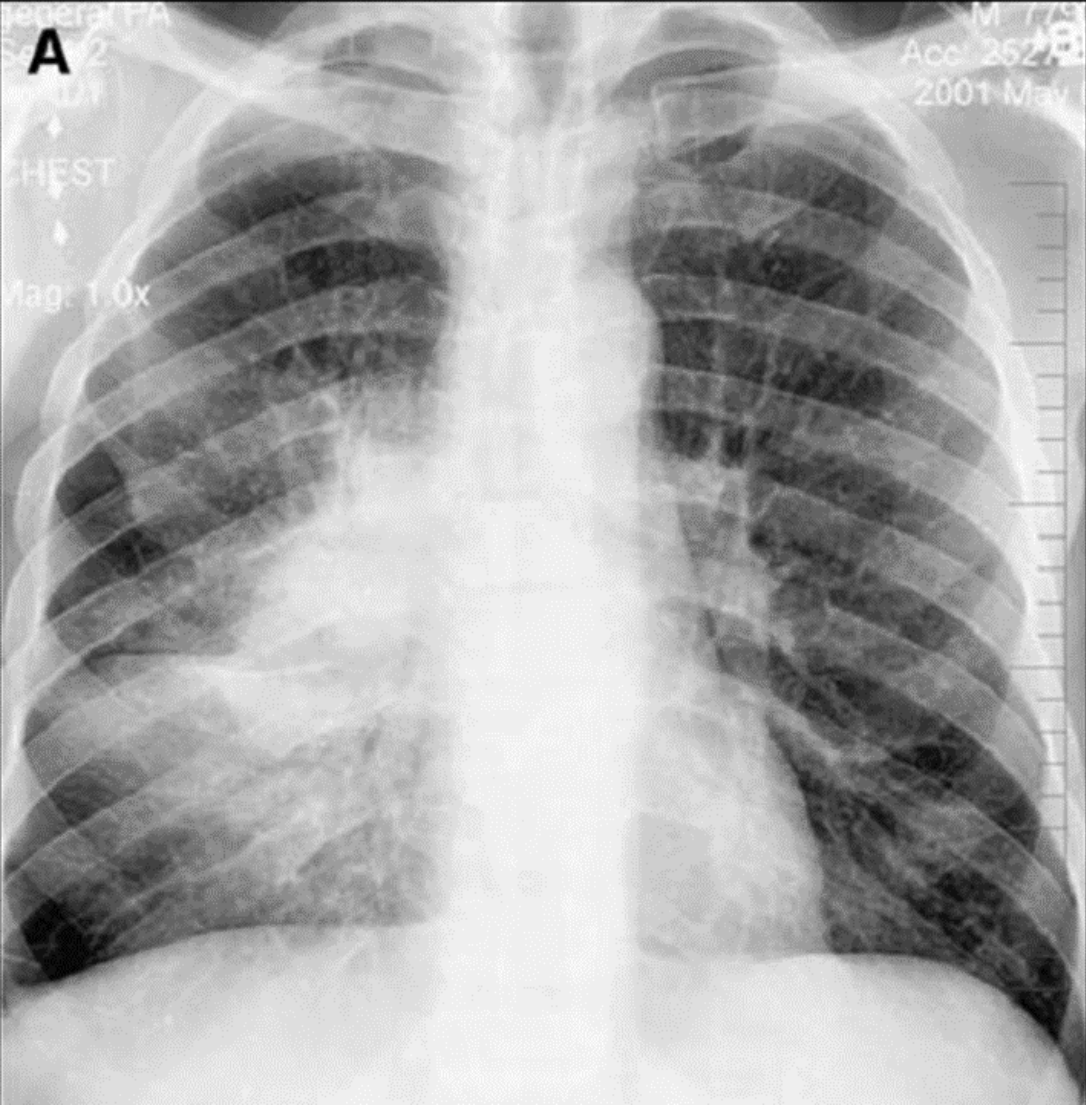


STAGE IV

- Permanent lung fibrosis.
(20%)

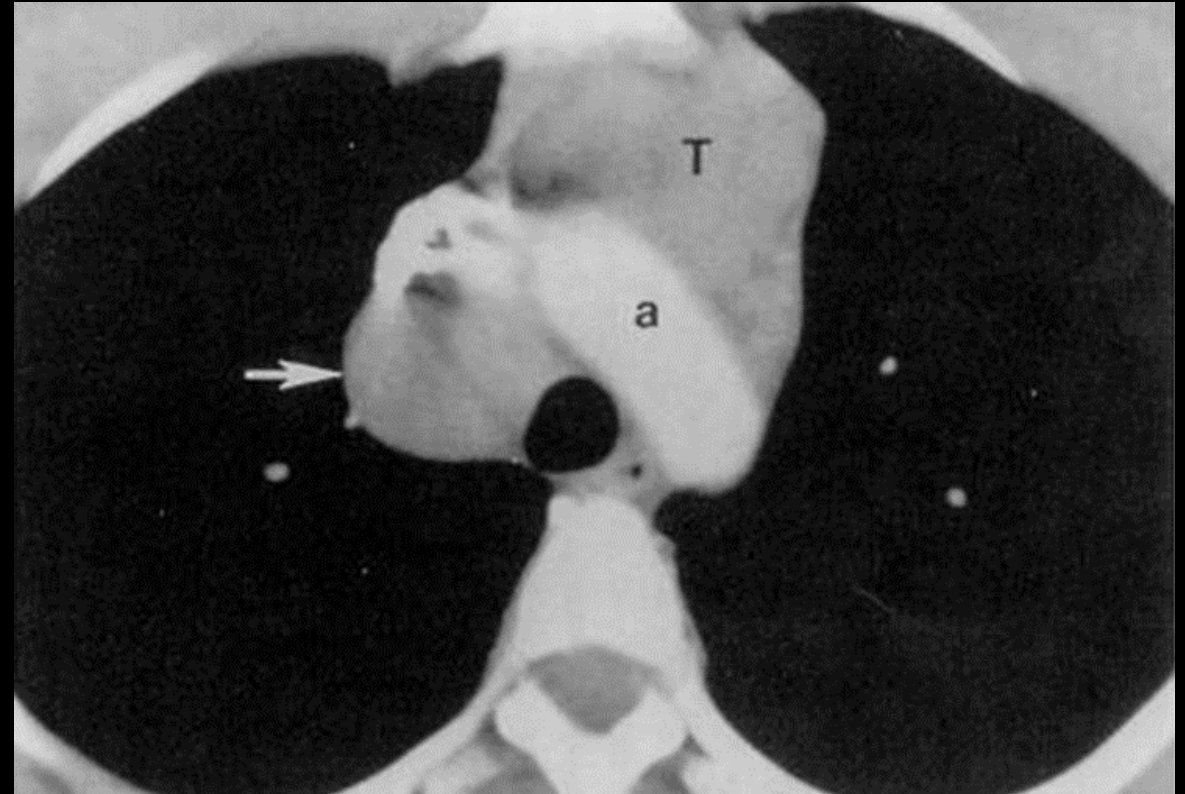
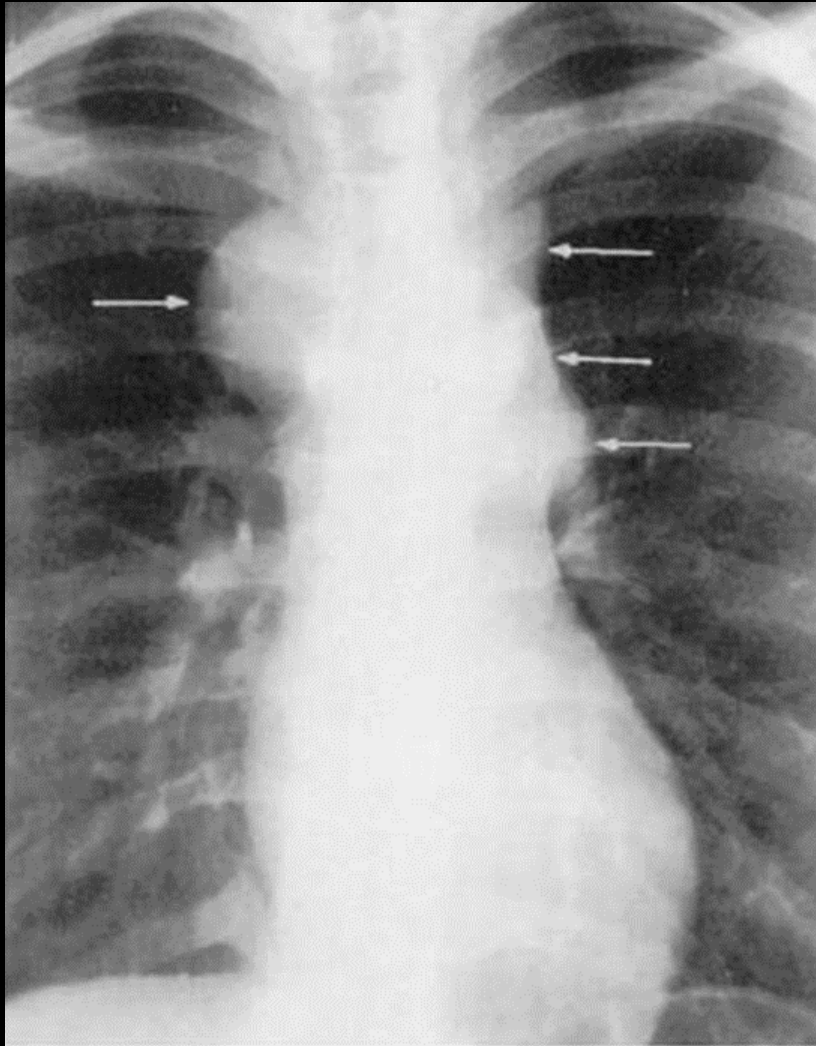


Primary TB



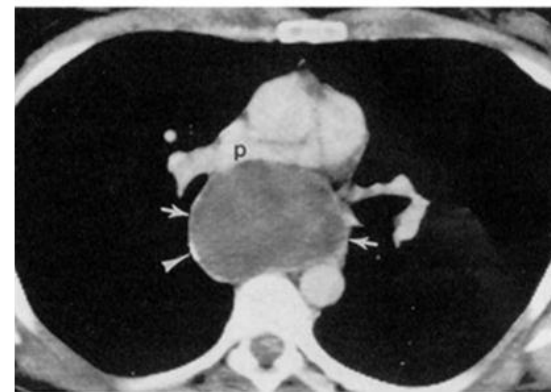
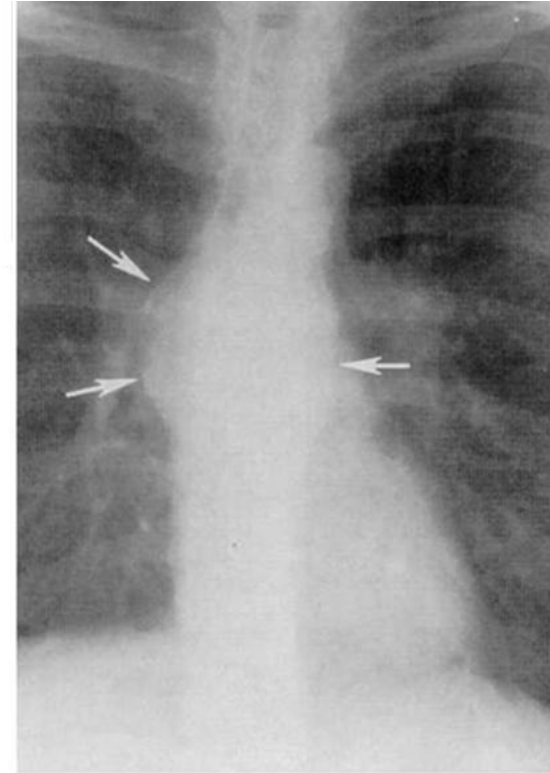
Radiol Clin N Am 44 (2006) 295-315

Lymphoma

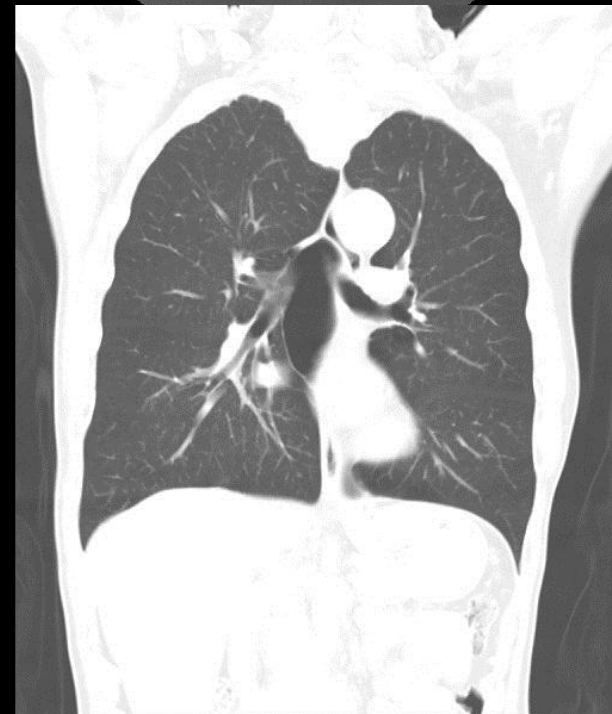
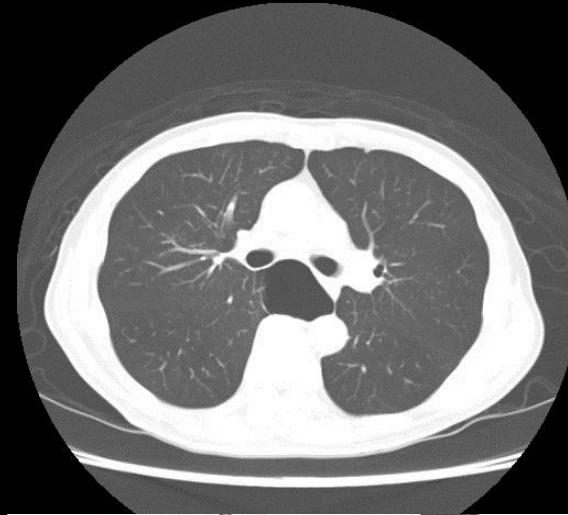


Bronchogenic cyst

- **Imaging findings:**
 - Round or oval. **Well-defined mass** that is often lobulated and tends to mold itself to surrounding structures (because of its fluid contents).
- **Comments:**
 - Most commonly located just **inferior to the carina**. Often protrudes to the right and overlaps the right hilar shadow. **Rarely communicates with the tracheobronchial tree.**



Mediastinal cyst

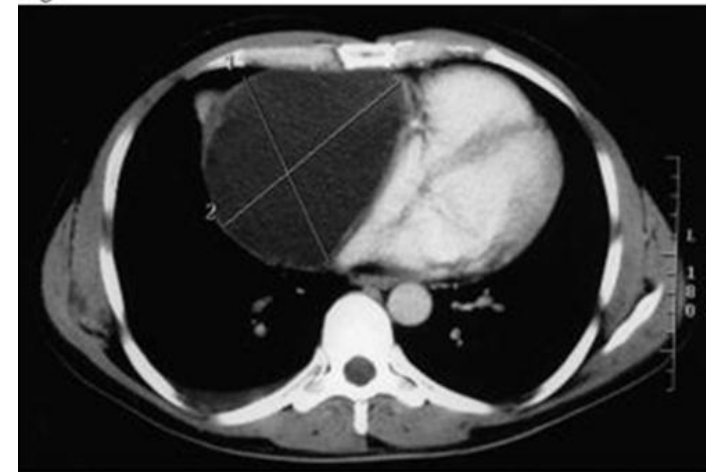


Pericardial cyst

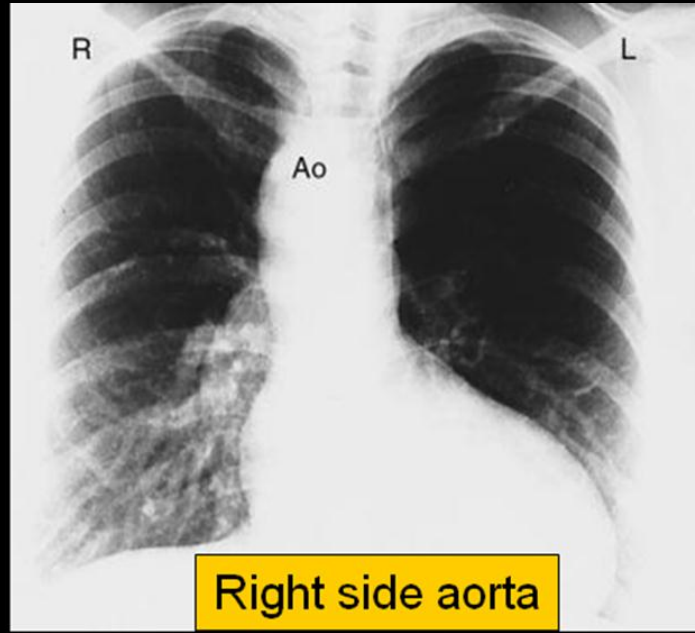
- **Imaging finding**
 - Round or lobulated, sharply demarcated lower mediastinal mass that is usually located in the right cardiophrenic angle.
- **Comments:**
 - Typically touches both the anterior chest wall and the anterior portion of the right hemidiaphragm.
Usually asymptomatic.



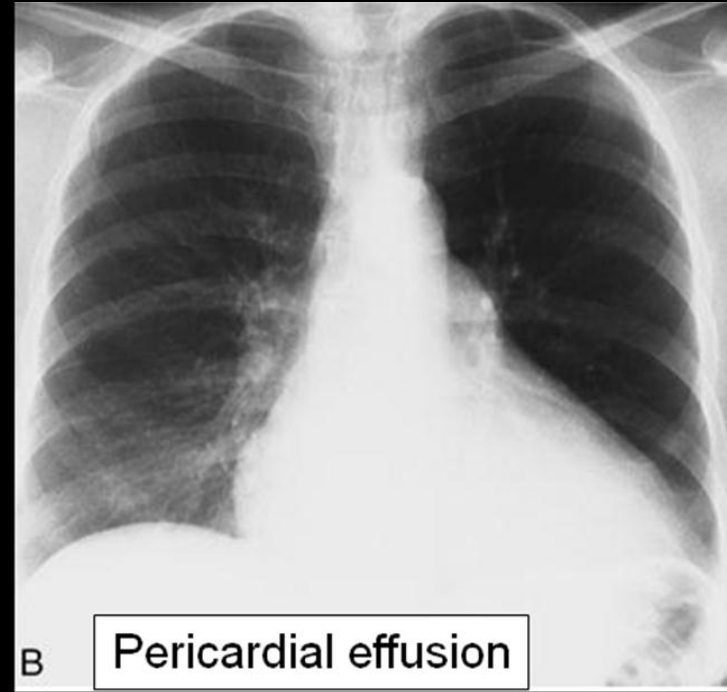
Fig. 1. X-ray of thorax showing a mass in right anterior cardiophrenic angle.



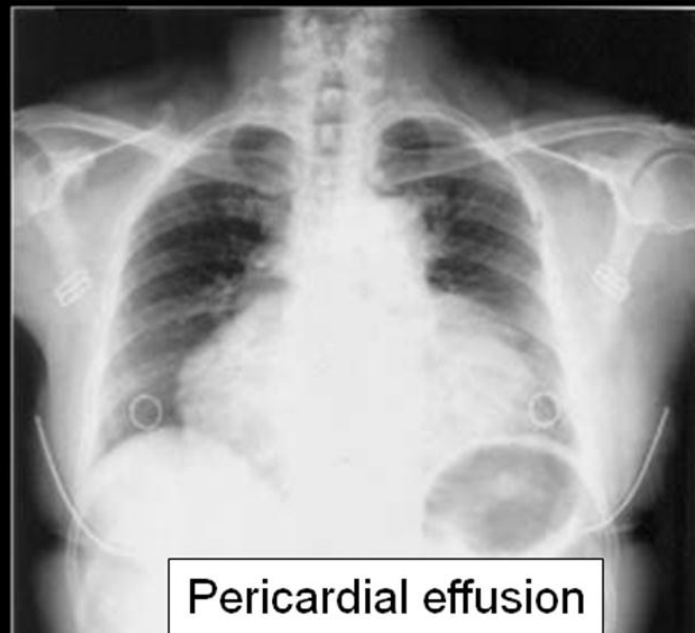
Cardiovascular disorders



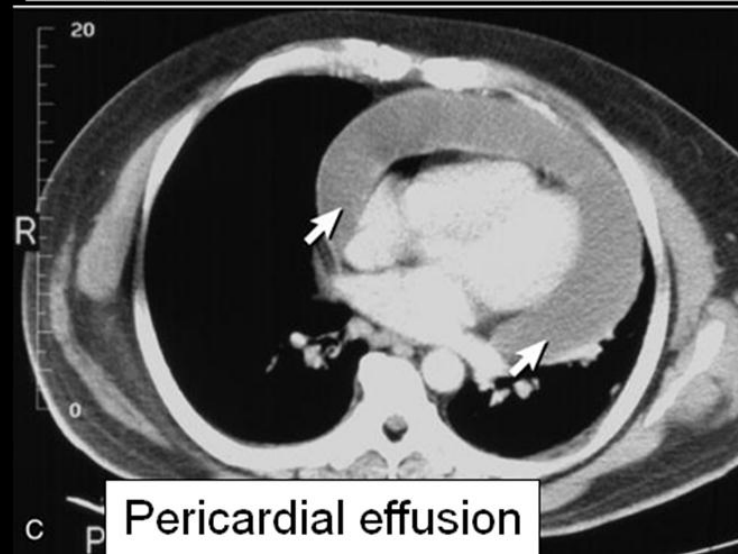
Right side aorta



Pericardial effusion

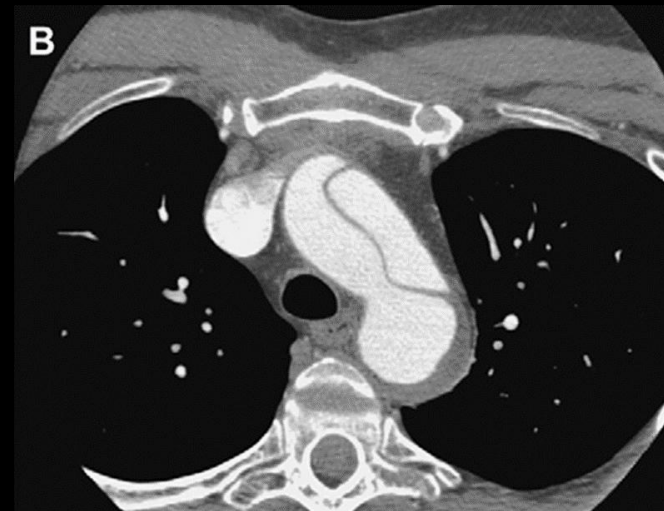
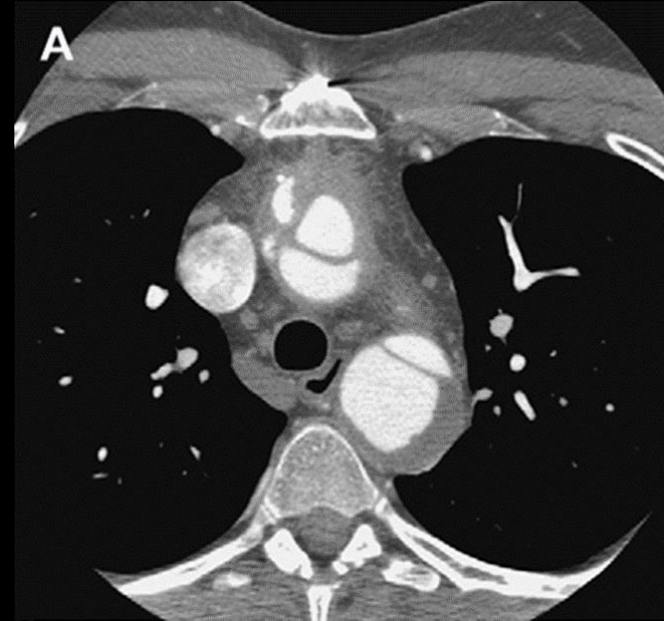
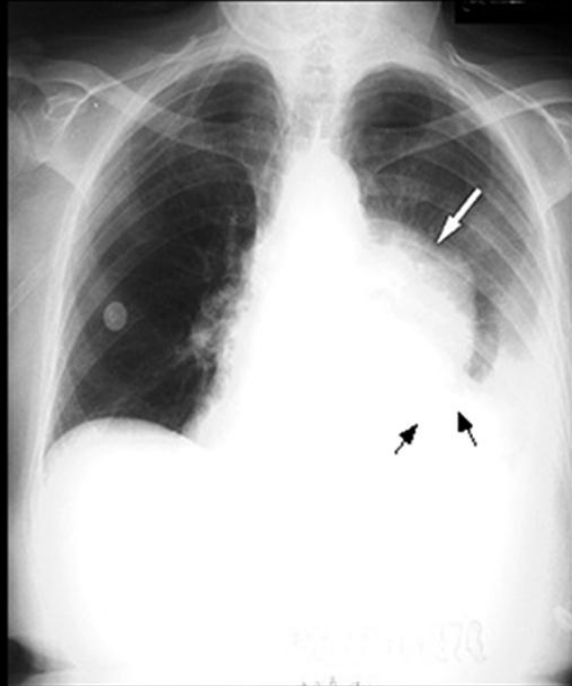


Pericardial effusion

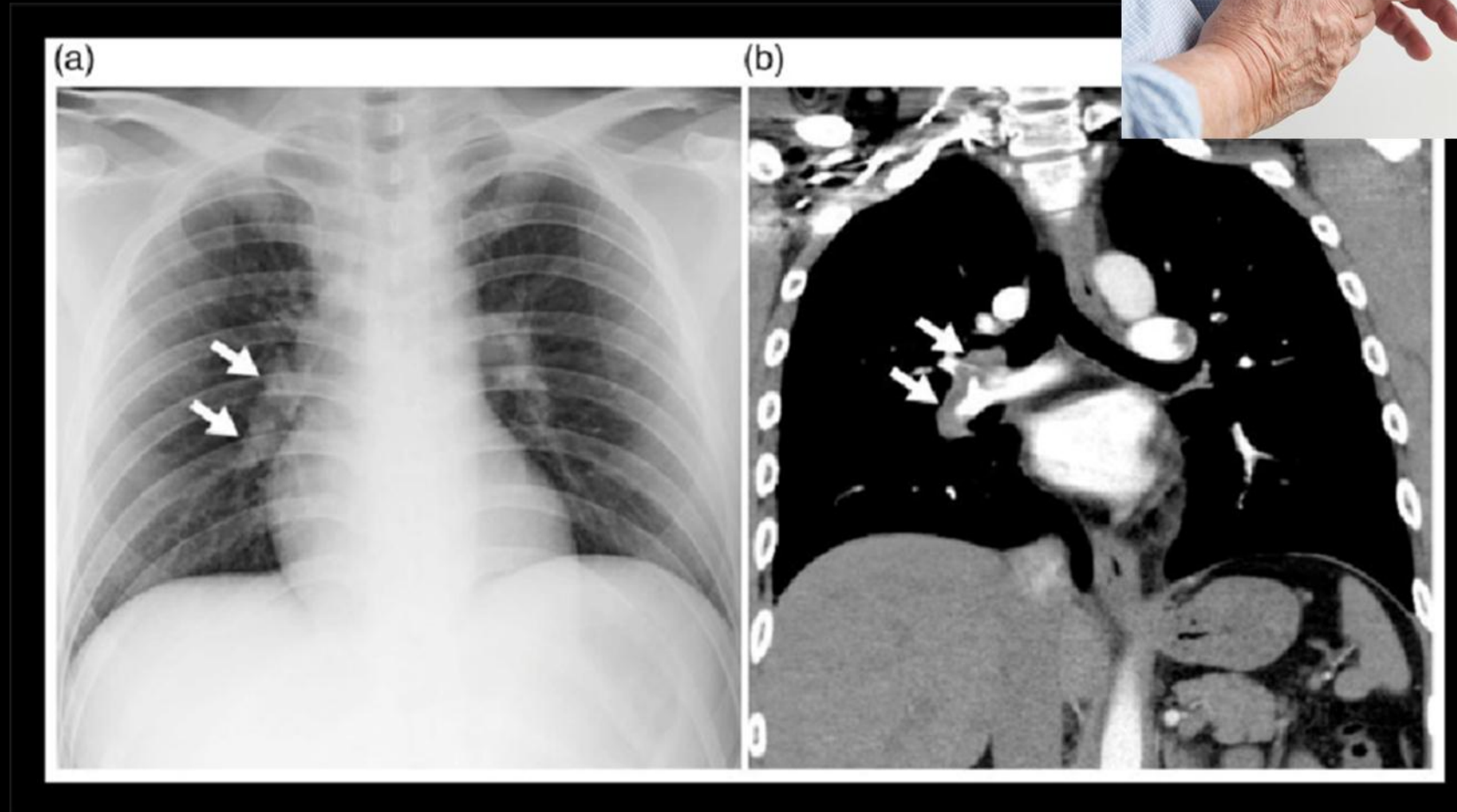


Pericardial effusion

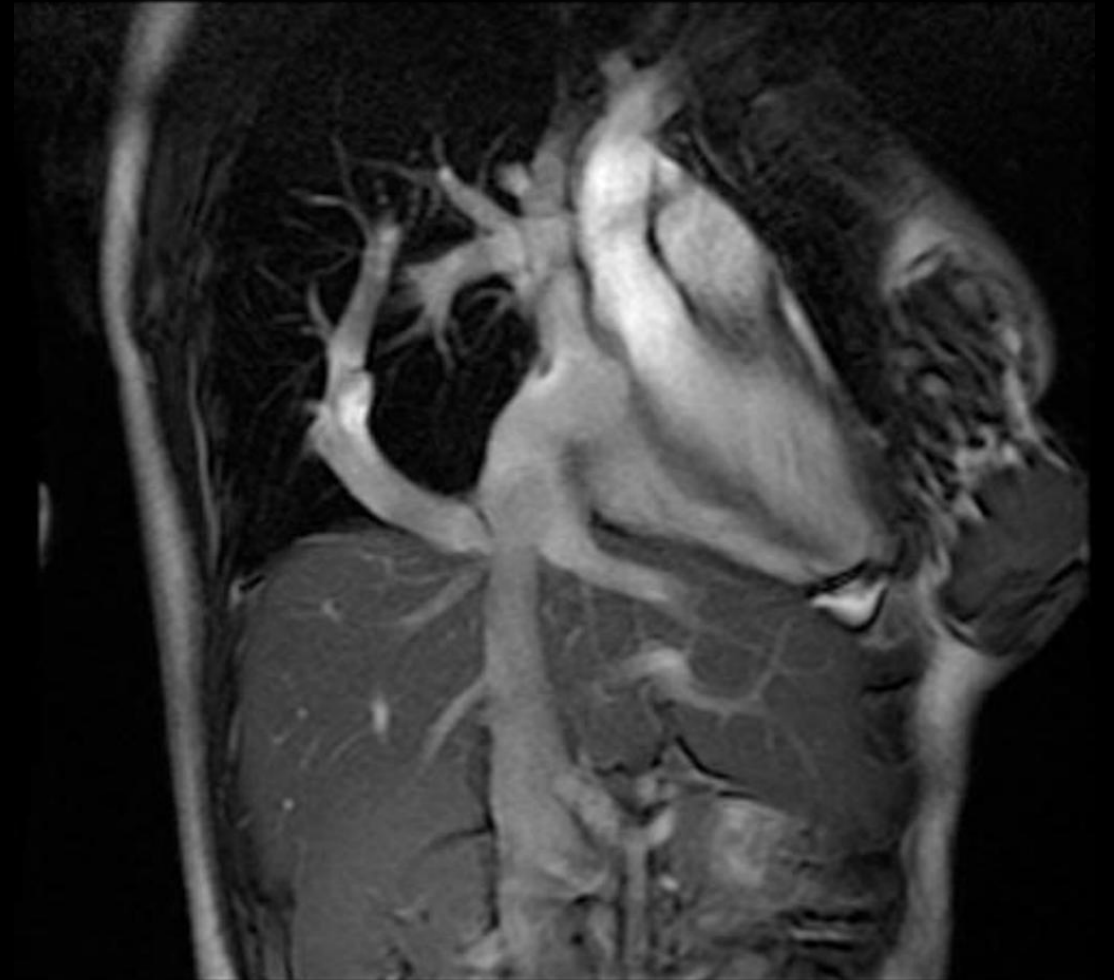
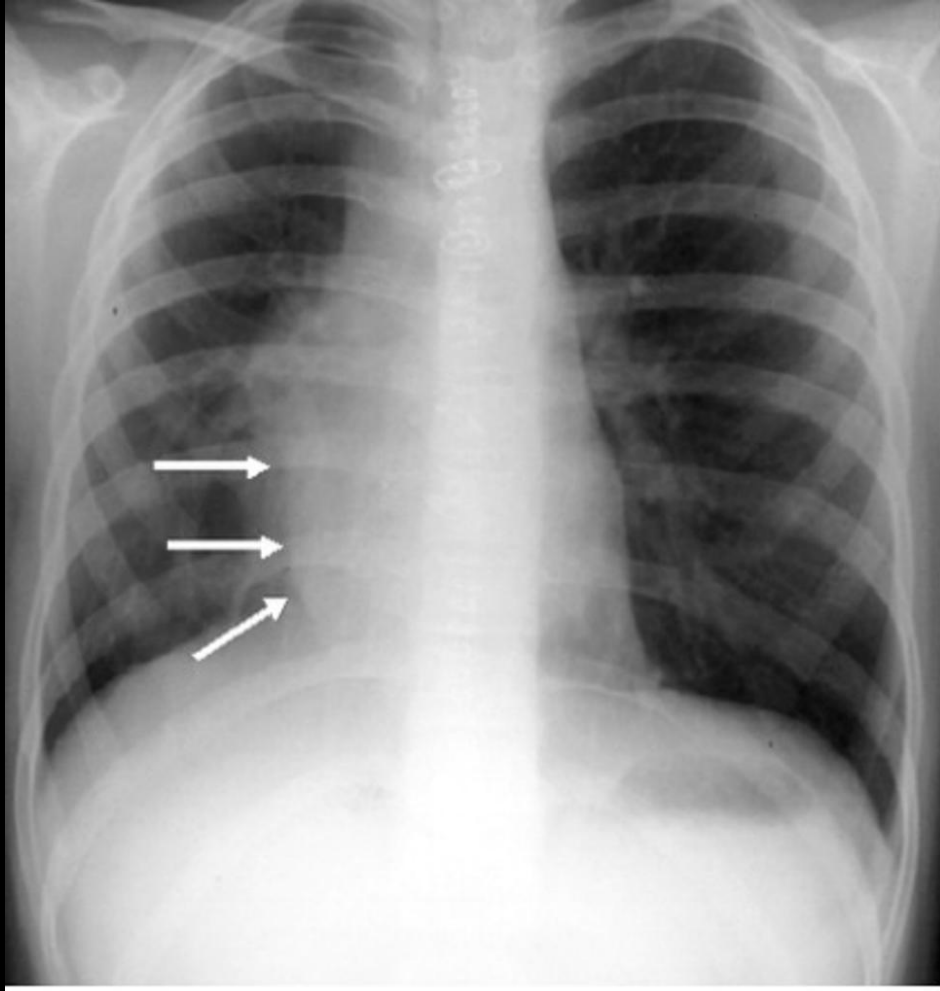
Aortic aneurysm and dissection



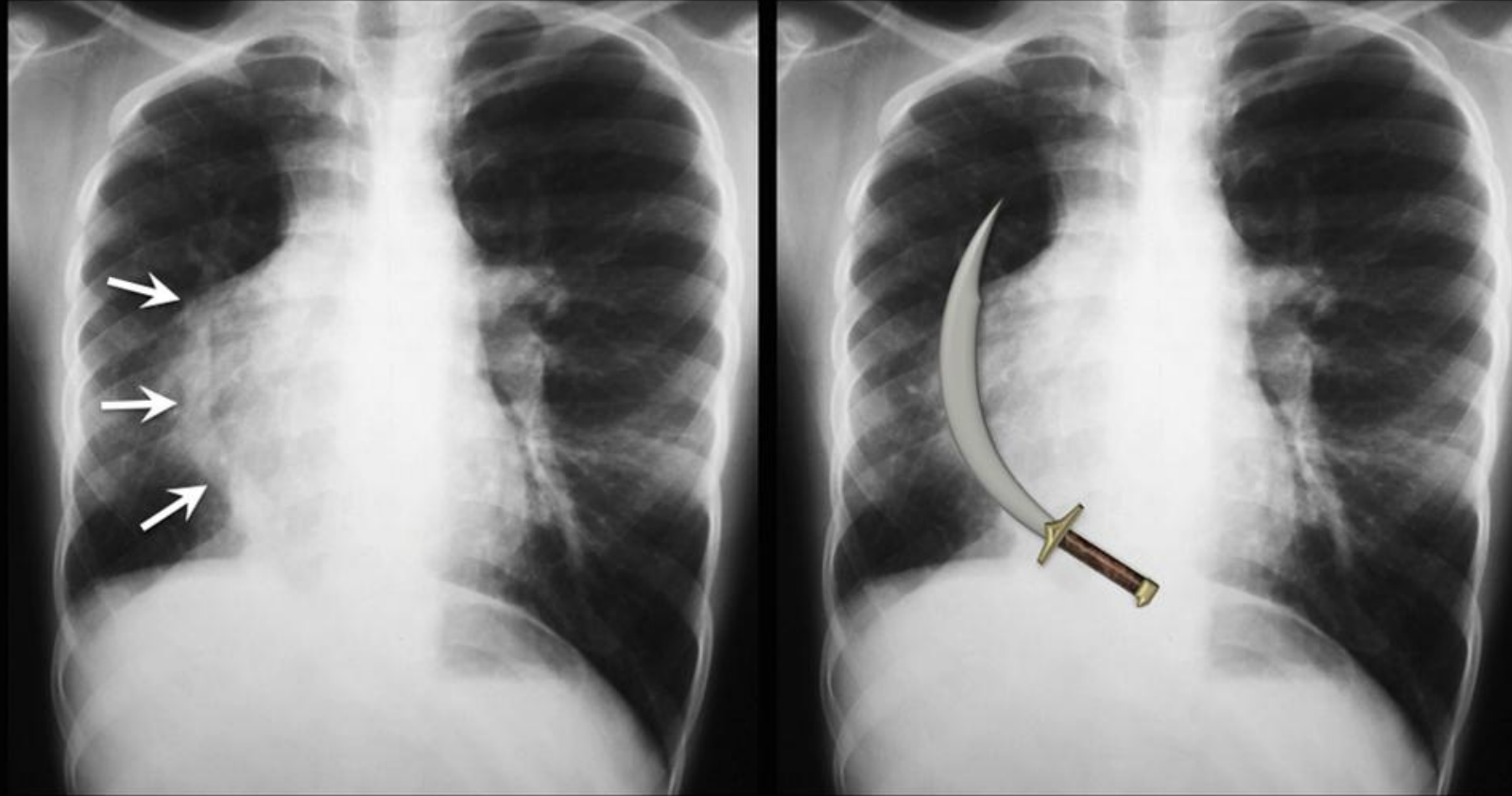
Knuckle sign in pulmonary embolism



Simitar sign

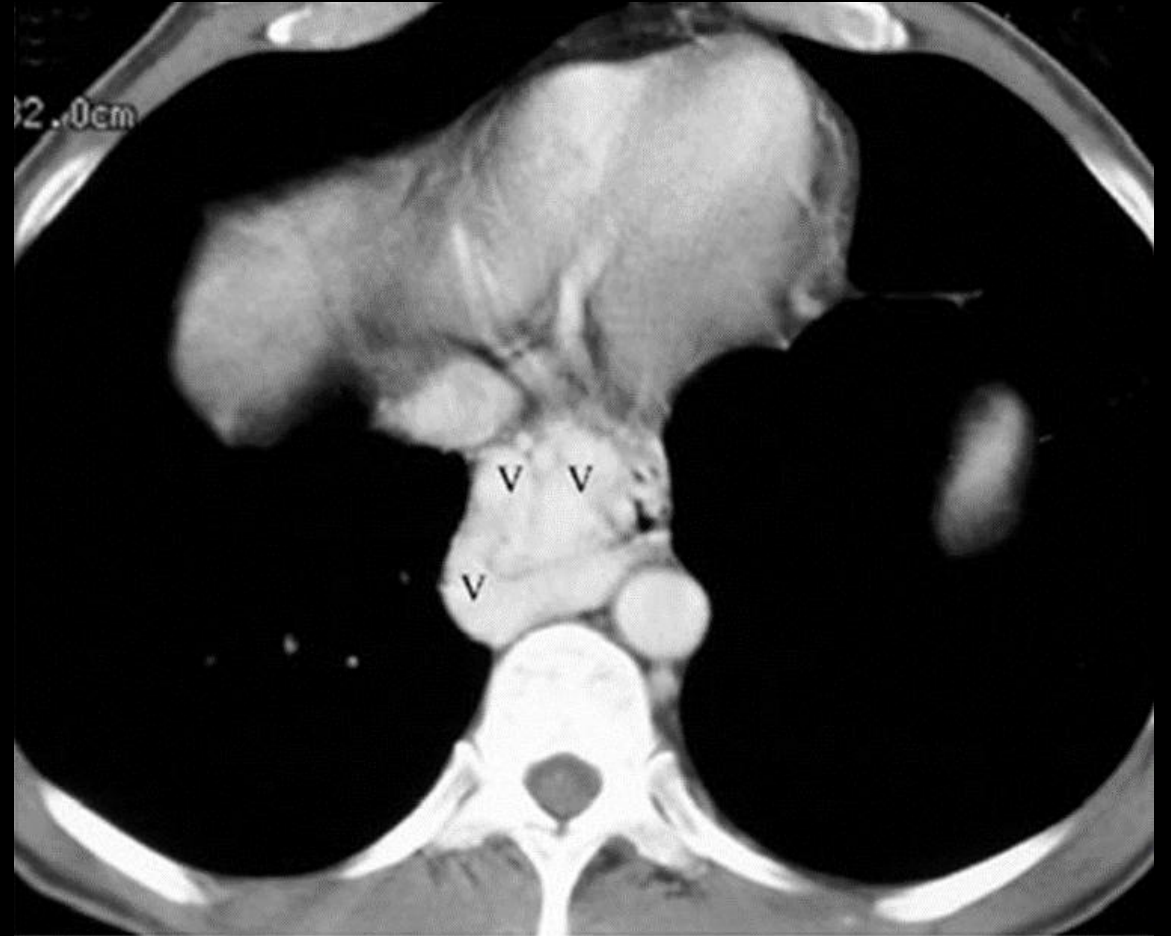
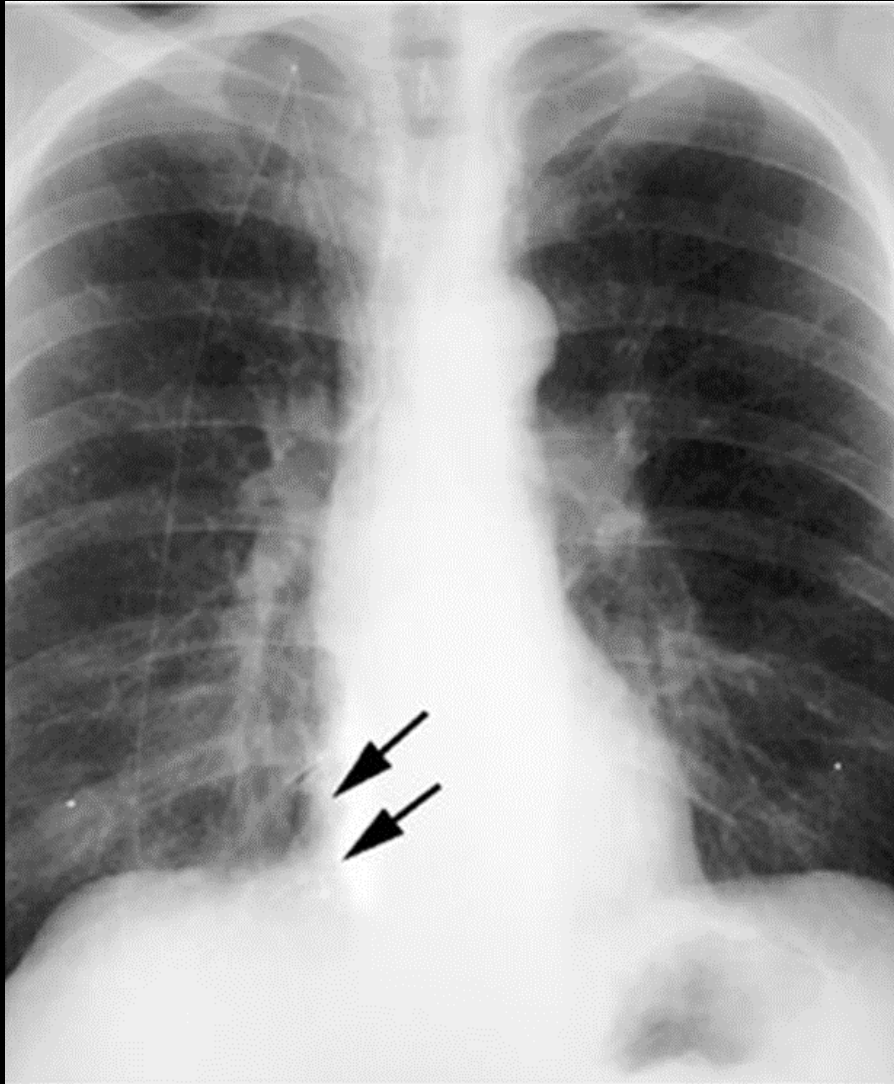


Simitar sign



Refers to the curved vascular shadow (resembling a short, curved Turkish sword called scimitar) representing an anomalous pulmonary vein draining the right lung that descends toward the diaphragm located to the right of the heart

Esophageal varices



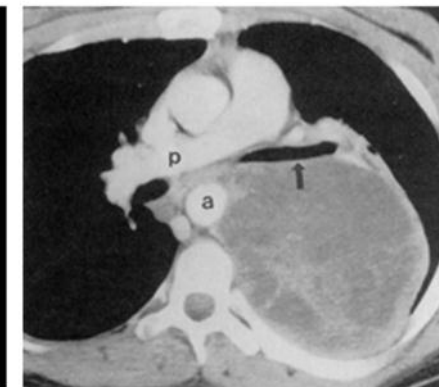
後縱膈腔病灶

Posterior mediastinal lesions

- Neurogenic neoplasm
- Spinal neoplasm
- Extramedullary hematopoiesis
- Aneurysm of descending aorta
- Bochdalek's hernia
- Hiatal hernia
- Megaesophagus
- Esophageal neoplasm
- Mediastinal hemorrhage/Hematoma
- Mediastinitis
- Thyroid tumor
- Esophageal diverticulum
- Neuroenteric cyst
- Gastroenteric cyst
- Meningocele (meningomyelocele)
- Vertebral osteomyelitis
- Azygos continuation of the inferior vena cava

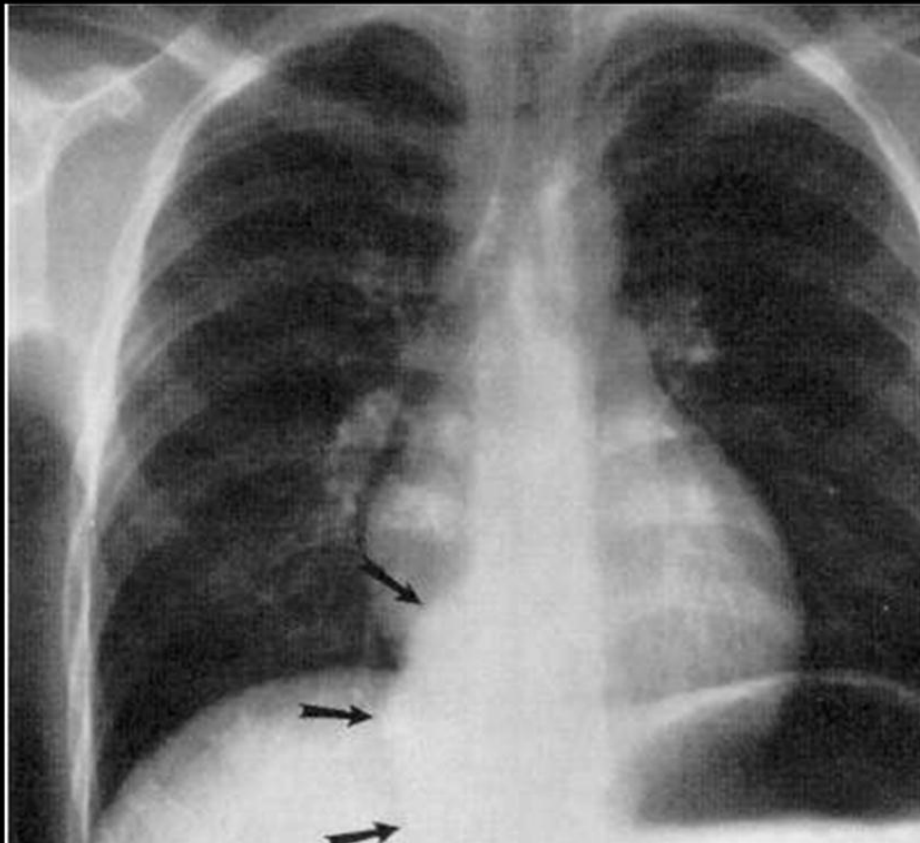
Neurogenic neoplasm

- Imaging findings:
 - Sharply, circumscribed, round or oval homogenous mass that is usually unilateral and paravertebral.
- Comments:
 - Primarily neurofibromas and neurolemmomas in adults, ganglioneuromas and neuroblastomas in children. Chemodectomas (any mediastinal compartment) and pheochromocytomas are extremely rare. There may be associated rib or vertebral erosion, calcification, and a dumbbell appearance (part of the tumor is inside and part outside the spinal cannl).

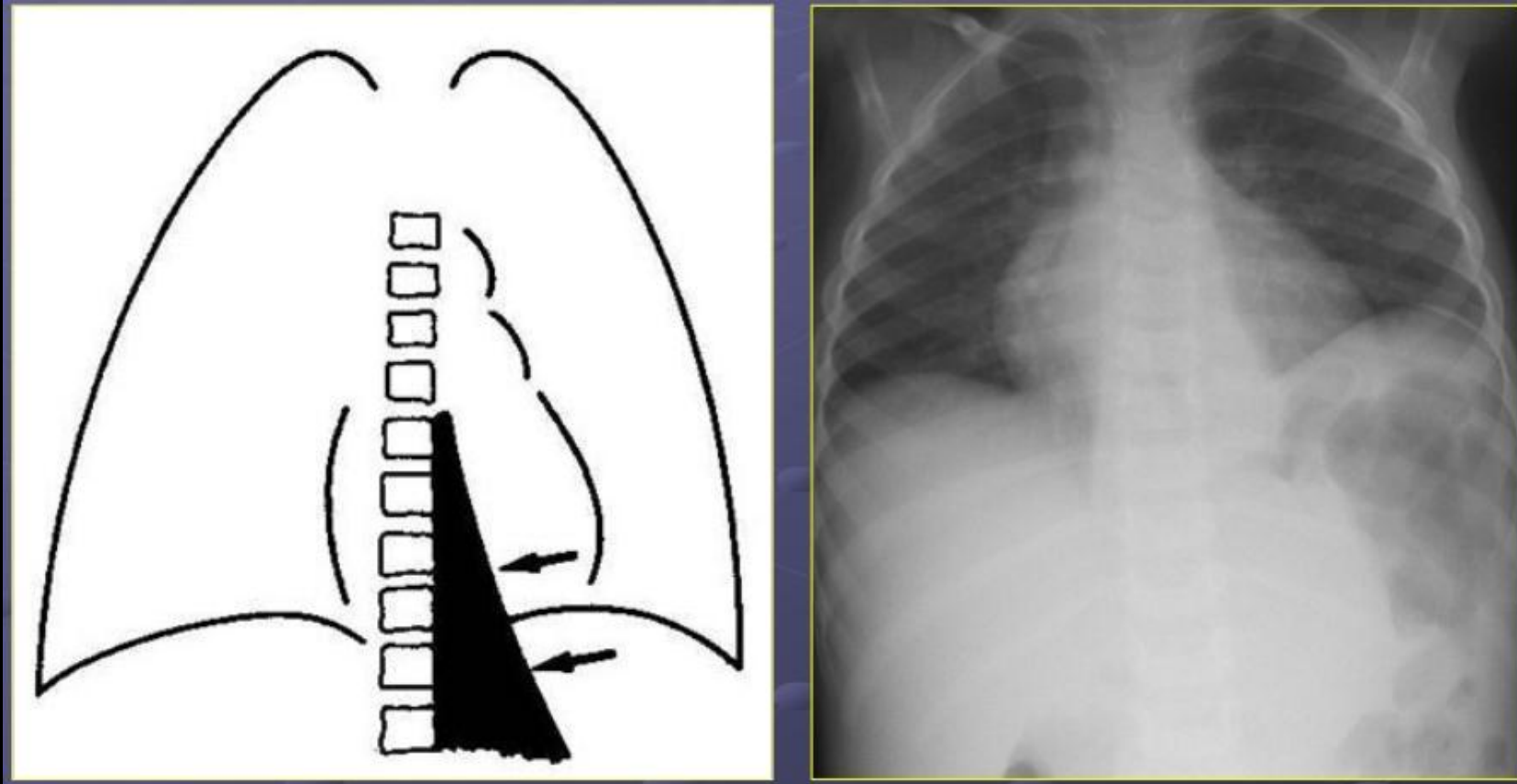


Ganglioneuroma

Figure 10. (Top) PA chest radiograph and (bottom) unenhanced T₁-weighted coronal MRI in an asymptomatic 14-year-old male subject. A well-circumscribed, oblong **posterior mediastinal ganglioneuroma** (arrows) has homogeneous low- to intermediate-signal intensity without intraspinal extension.

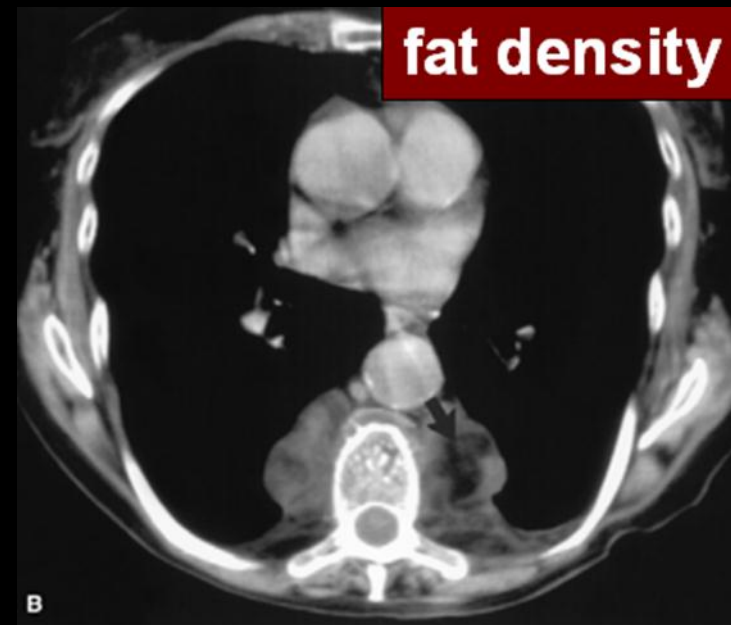
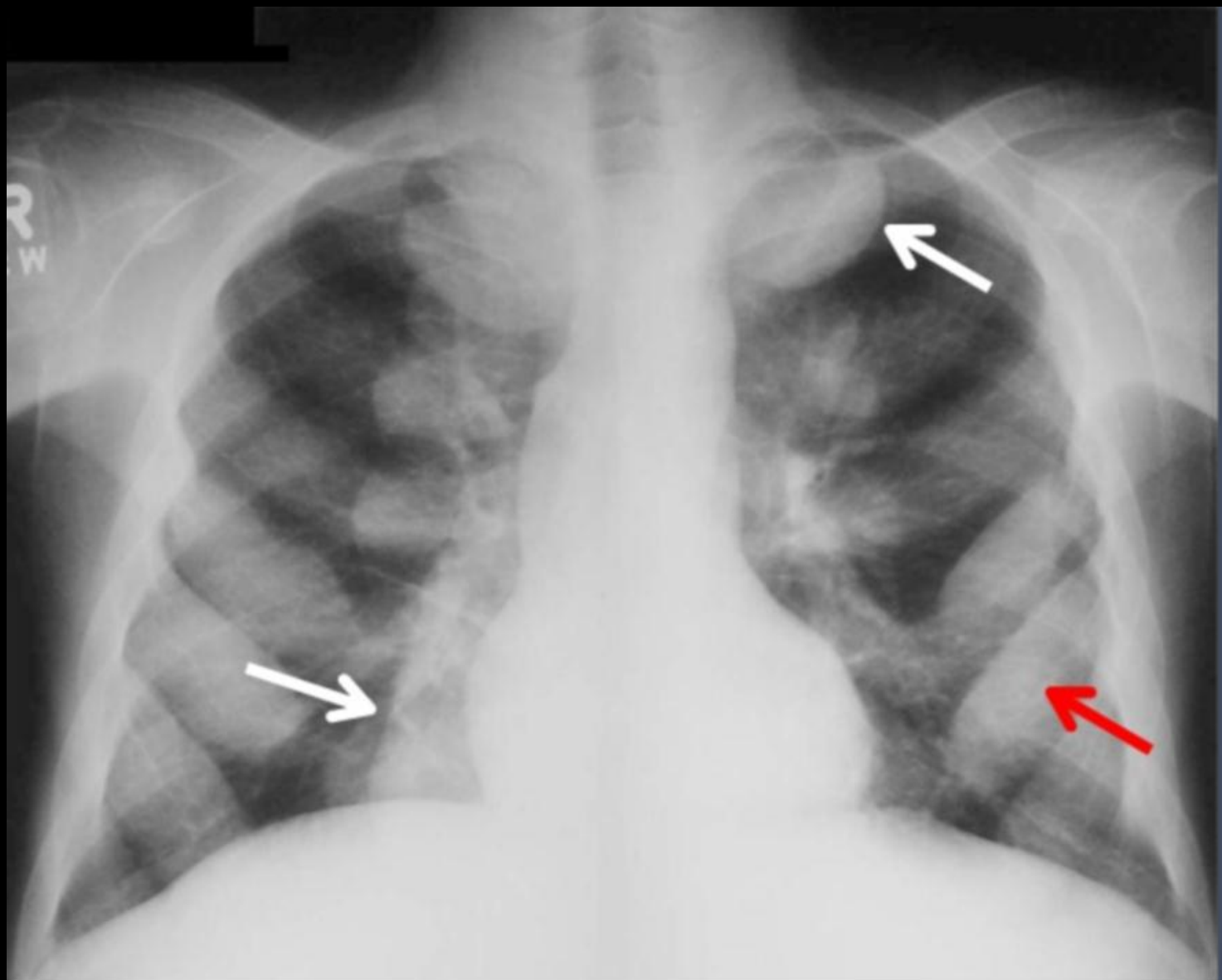


Iceberg sign



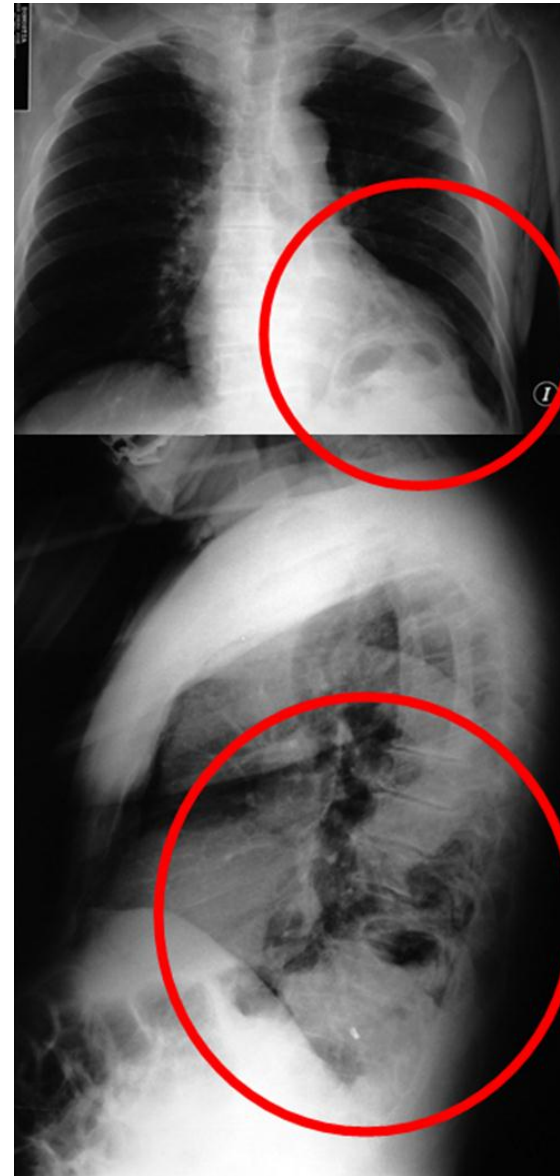
Neuroblastoma

Thoracoabdominal sign: Thalassemia with EMH



Bockdalek's hernia

- **Imaging findings:**
 - **Round or oval, retrocardiac mass** that is usually unilateral (80% to 90%) are on the left sides
- **Comments:**
 - **Air-filled bowel loops in the mass are diagnostic**
More commonly the hernia contains opaque omentum, liver, or spleen.



Thanks for Your Attention