

Interpretation of abnormal Chest radiograph

Let us review what we learned:

1- Film labeling

2-Technical aspect of the film.

3-The diaphragm :

- * Should be clearly visible, except where the heart and mediastinum are in contact .

- * Good inspiration ---→level regarding the ribs.

- * The Rt hemidiaphragm usually being up to 2.5 cm higher than the Lt

4- check the size and shape of the heart -later

5- check the position of the heart and mediastinum .

- * trachea: midway or slightly to Rt of mid point between the medial end of clavicles- be aware of rotation.

- * Heart : very variable ,usually one-third lies to Rt of the midline.

6-look at the mediastinum :

- * Outline should clear except in contact with diaphragm

- * In young children – normal thymus should not be mistaken for disease

7- examine the hilar shadow :

- * The hilar shadows represent the pulmonary arteries and veins

- * The Lt hilum is usually higher in position than Rt

8- examine the lungs

- * The only structures that can be identified within normal lungs are blood vessels, the interlobar fissures, and the walls of certain larger bronchi seen end-on .

Positions of fissures ?

- * Looks for abnormal pulmonary opacities (white) or translucency (black)

- * Do not mistake : pectoralis muscles, breasts, nipples ,plaits of hair , skin lumps

- * A good way of finding a subtle shadow is to compare one lung with other zone by zone.

- * Lateral film ?

9- Check the integrity of the ribs, clavicles, scapula, and spine and examine the soft tissues

- * In female check the presence of breast (mastectomy)
- * Reduction in the soft tissue bulk leads to increase transradiancy (blackness) of that side of the chest.

10- check the costophrenic angles and under the diaphragm

Interpretation of abnormal Chest radiograph

Where is the abnormality ? -Location ---- Define

How extensive is it ?----- Description

What is it ?----- Diagnosis (ddx)

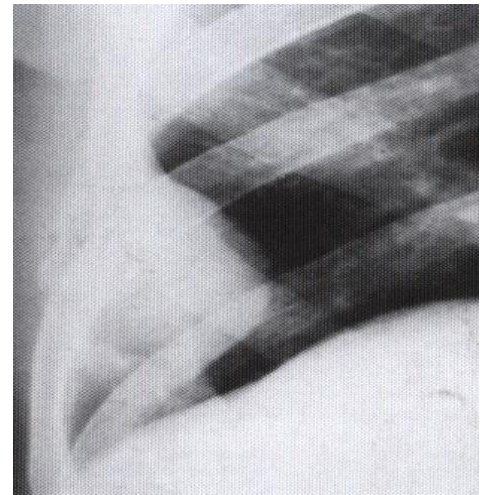
3 Ds

1. Define (Location)!!!

e.g.

If the shadow is surrounded on all sides (PA & lateral films) by aerated lung it must arise within the lung .

If the shadow has a broad base with smooth convex borders projecting into the lung and a well defined outlines its likely to be pleural, extrapleural or mediastinal in origin.



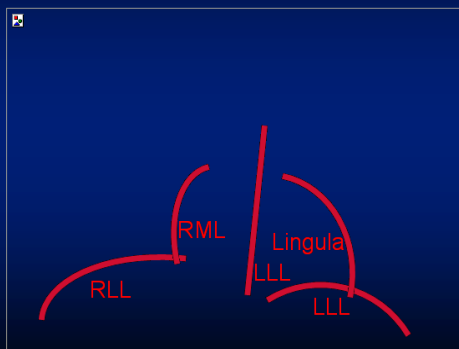
The silhouette sign ?

An intrathoracic lesion touching a border of the heart, aorta or diaphragm obliterates that border on the chest radiograph.

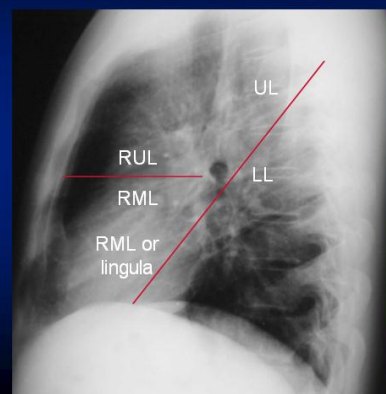
Benefit !! :

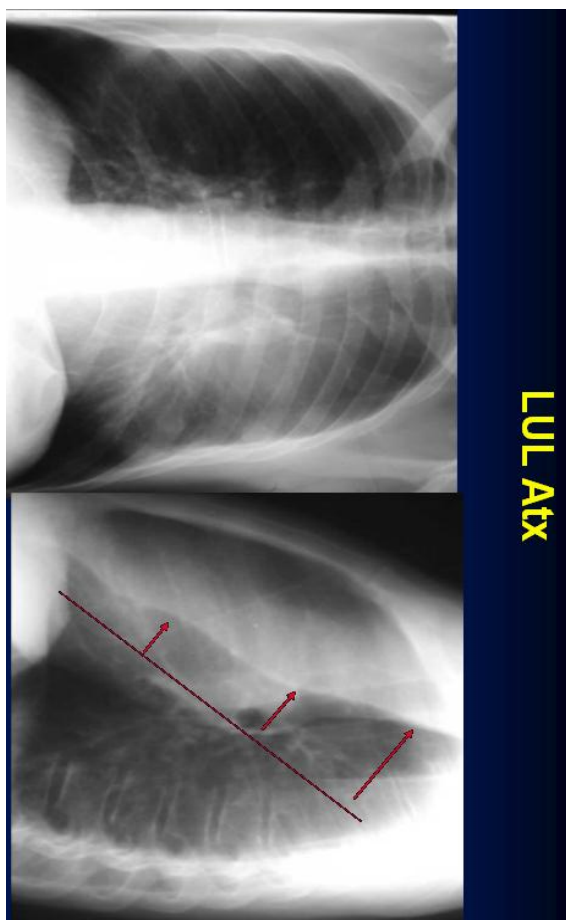
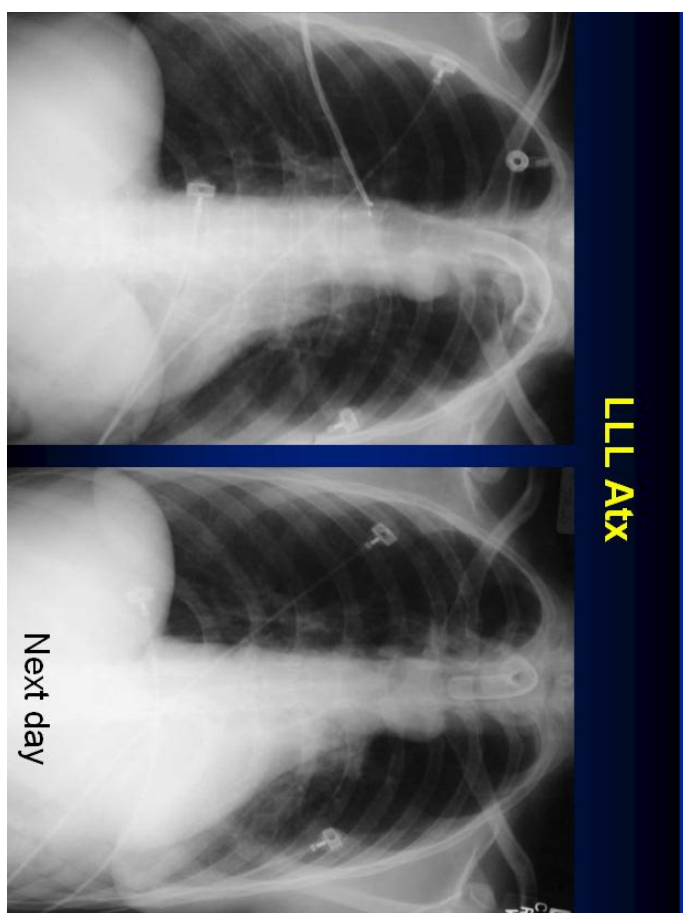
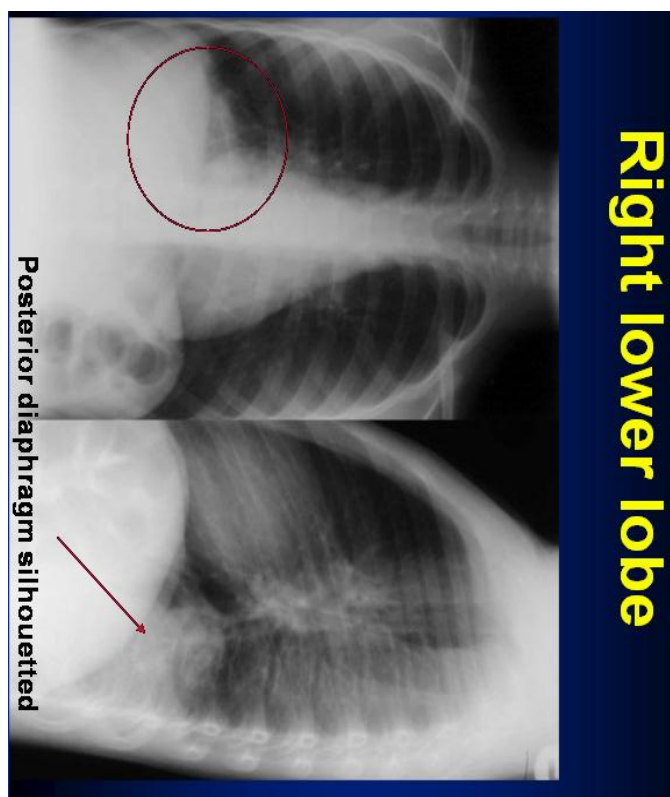
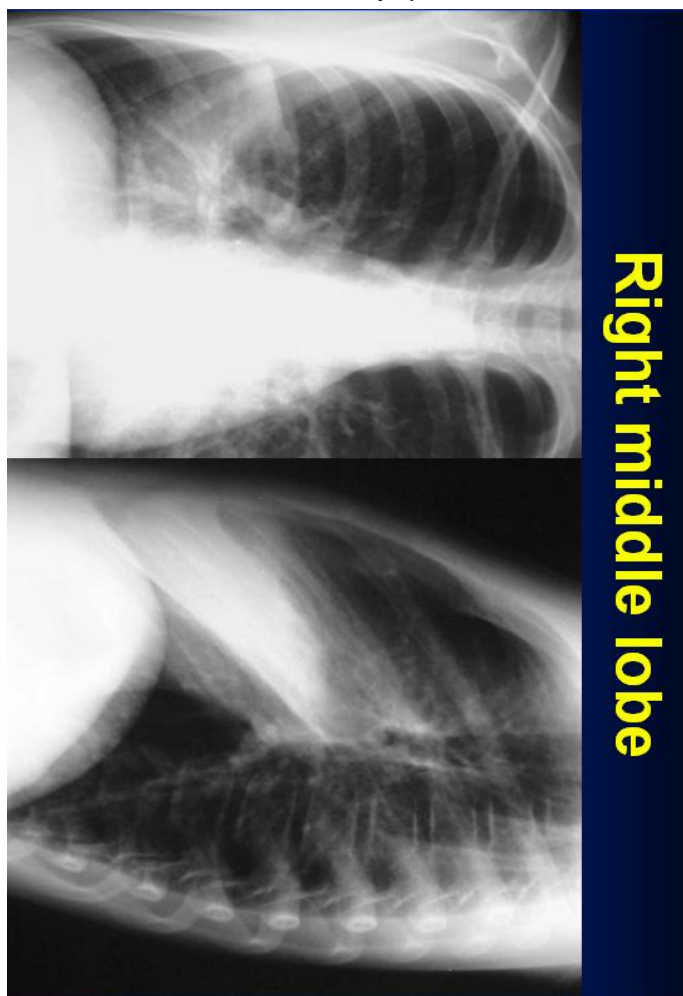
Localization e.g. loss of heart border means the that the shadow lies in the anterior half of the chest.

Localizing disease from the silhouette sign



Localizing disease from the silhouette sign





2.Description!!! + 3.Differential diagnosis for each Abnormal Lung patterns :

1. Alveolar/ acinar shadow .
2. Spherical shadows (lung masses, lung nodules).
3. Interstitial shadow.
4. Changing transradiancy pattern.
5. Vascular pattern.
6. Bronchial pattern .

1. Alveolar/ acinar pattern :

A- Air – space filling (infiltrate).

Replacement of the air in the alveoli by:

1. Fluid :

- ❖ Transudate----- (pulmonary edema)
- ❖ Exudates (consolidation)
 - ☐ infection (pneumonia)
 - ☐ infarction.
 - ☐ contusion.
 - ☐ hemorrhage
 - ☐ Immunological disorders e.g. collagen vascular disease and extrensic allergic alveolitis

Note : there is no way of telling from the chest radiograph which of these possibilities is the cause.

2. Other materials e.g. tumour cells

B- Collapse (atelectasis)

Signs of air - space filling ?

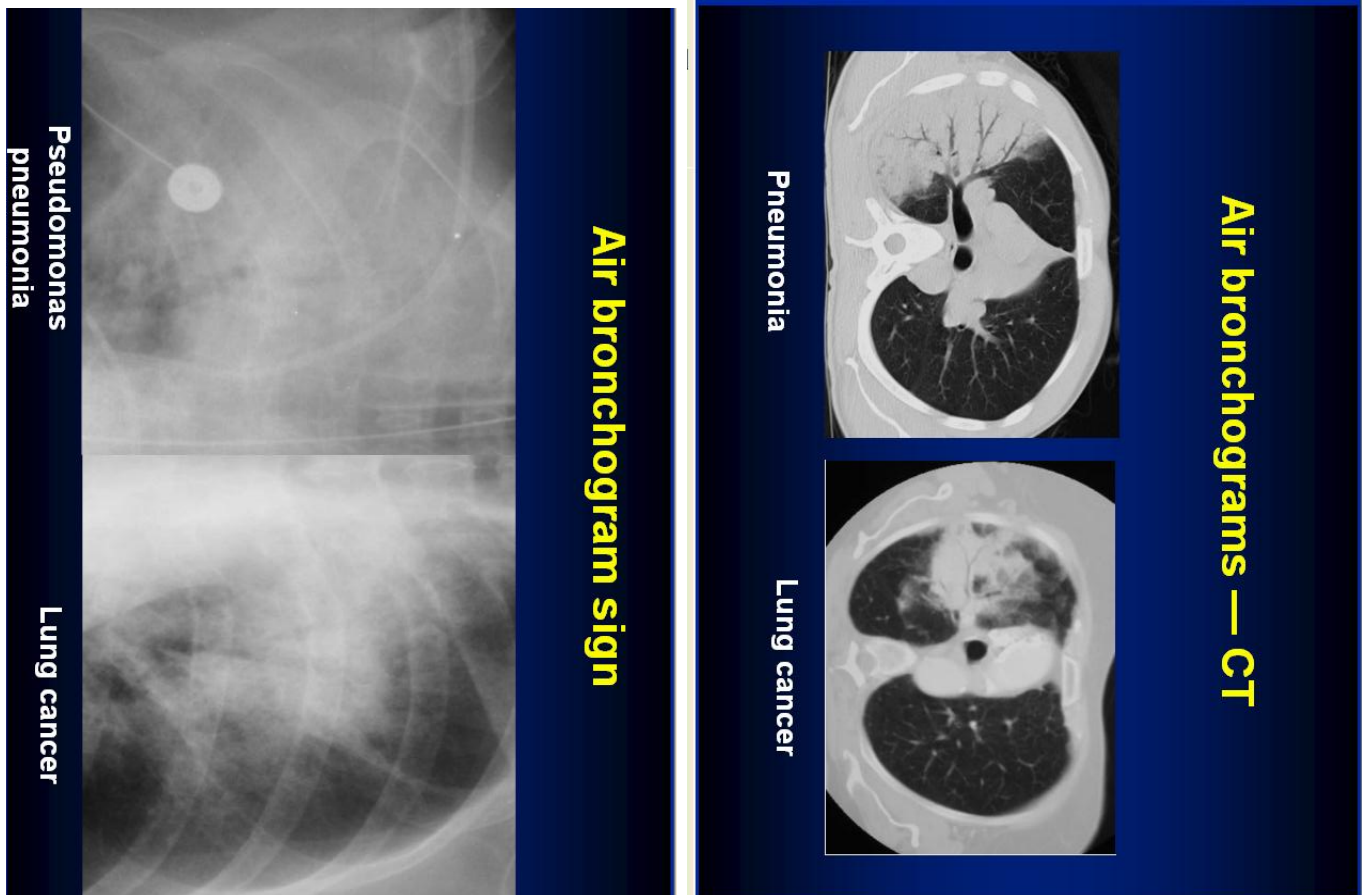
1. A shadow with ill-defined borders except where the opacity is in contact with a fissure.
2. An air-bronchogram ?

What is this ???

Normally its not possible to identify air in the bronchi within normally aerated lung(because the walls of the bronchi are too thin and air filled bronchi are surrounded by air in the alveoli.

But if the alveoli are filled with fluid, air in the bronchi contrasts with fluid in the alveoli producing radiolucent streaks. Called air bronchogram . this sign is seen to great advantages on CT (CT air bronchogram).

3. The Silhouette sign



Consolidation :

- Ground glass ----- hazy area of increased attenuation not obscuring bronchovascular markings (ddx interstitial lung disease).
- Patchy ----- area of marked increase in attenuation with obliteration of underlying anatomical features, not restricted to a lobe.
- Lobar ----- same as patchy consolidation, but restrict to a lobe.

2.Spherical shadow (nodule, mass)

Solitary lung nodule :

The common causes of a solitary pulmonary nodule:

- malignant tumour (40 % of solitary pulmonary nodule are malignant)
 - primary (lung ca)
 - secondary metastasis

- Benign tumor ---- hamartoma
- Infection ---- round pneumonia.
 - abscess
 - Hydatid
- granuloma ----.e.g. TB
- Pleural --- loculated effusion
 - pleural tumor

What is to look within a mass ?

1. Location.
2. Size. (masses larger than 4 cm are predominantly primary malignancy, metastasis ,lung abscess or pleural fibroma)or rarely spherical pneumonia
3. Shape & outline.(carcinomas are often irregular, speculated "infiltrating" or notched margins)
4. Presence of calcification.(calcification favoring benign lesion such as hamartoma or TB granuloma, although others rarely do)
5. Presence of cavitation.
6. Associated abnormalities such as (bone destruction, effusion, collapse, lymphadenopathy).
7. Other lesions.

Adjuvant signs ?

1. Comparison with previous films—doubling time !!(usually malignant lesion have a doubling time of 1-6 months) while failure to grow over a period of 18 months or more is a strong pointer to either benign tumor or an inactive granuloma
2. Age of the patient.
3. Symptoms.

The role of CT in patient with solitary pulmonary nodule :

1. Demonstrate calcification not clearly seen on plain radiograph
2. Estimate the rate of growth of a very small asymptomatic nodule
- 3- stage the extent of disease in those cases where the nodule is likely to be a primary carcinoma
- 4- establish whether or not the nodule is solitary or multiple

Hamartoma

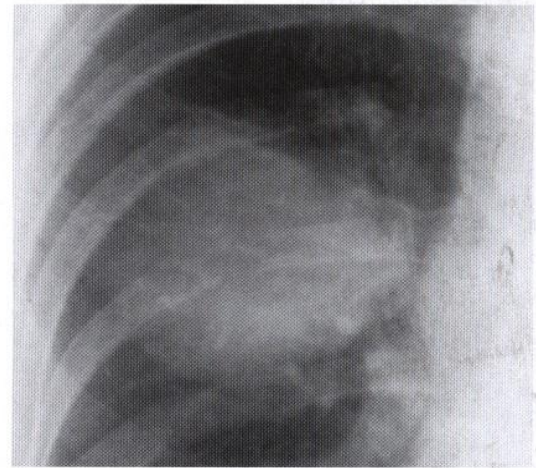
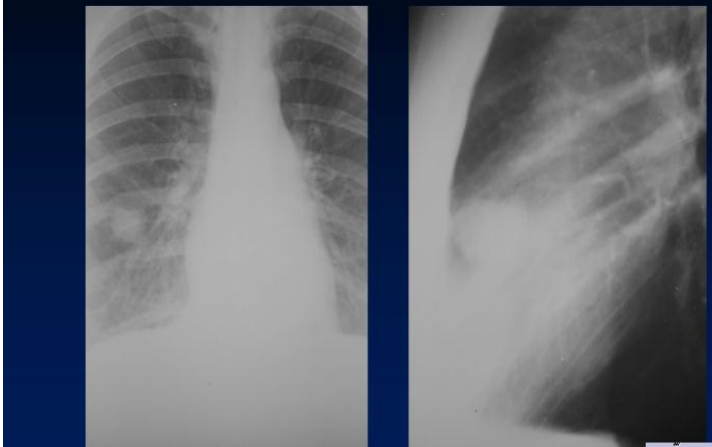


Fig. 1.39 Posteriorly positioned bronchial carcinoma with destruction of the adjacent rib.

Multiple pulmonary nodules :

The common causes of multiple pulmonary nodules:

- ❖ Tumor
 - Benign - hamartoma
 - Malignant - metastases (most), lymphoma
- ❖ Infection
 - granuloma e.g. TB (most)
 - round pneumonia
 - abscess
 - hydatid

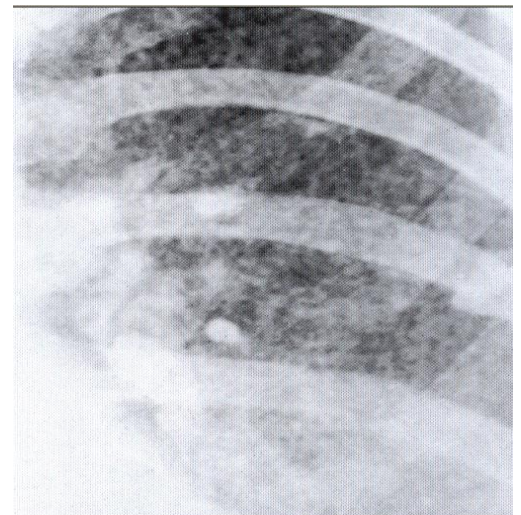
Note metastases are frequently of variable sizes

Miliary nodules : (miliary shadow)

Multiple small micro nodules (2-4 mm)

The usual causes include:

- 1.miliary TB
- 2.miliary metastases



ig. 1.31 Miliary tuberculosis. Widespread fine nodular shadowin

Metastases from Head and Neck Tumor

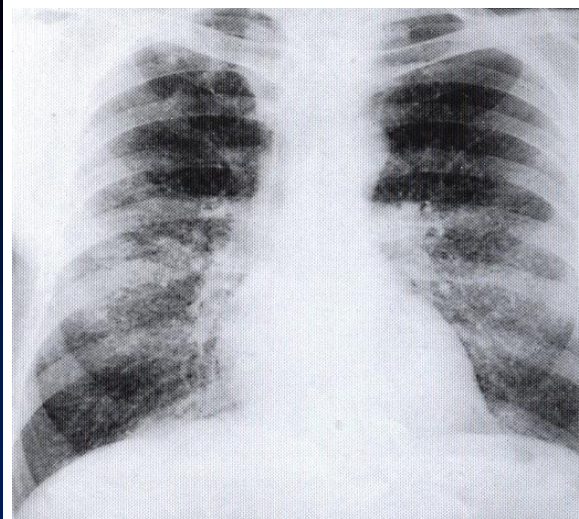


Fig. 1.32 Siderosis. Extensive dense miliary shadowing in an iron-founder worker.

Cavitating lesions & cysts :

A cavity is a gas-filled space surrounded by a complete wall which is 3 mm or greater in thickness.

Thinner walls cavities are called cysts or ring shadows.

Common Cavitating process :

1. Lung abscess.
2. TB.
3. staphylococcal infections.
4. Primary carcinoma (in the tumour mass it self or the distal lung).

Particular features of importance ?

1. the site. (TB cavities are usually upper zone, in the posterior segments of the upper lobes or apical segments of the lower lobe)
2. the wall of the cavity. (thick & thin)
3. the presence of fluid level.(common in primary tumor ,uncommon in Cavitating metastases &TB)
4. Contents.(e.g fungal ball, blood clot)
5. the state of surrounding lung.

Thick wall cavity ?

- ☐ acute abscess
- ☐ most neoplasm
- ☐ most metastases

Thin wall lesion or ring shadow?

- ☐ bullas
- ☐ Pneumatocoles (staphylococcal infection in children)
- ☐ Hydatid cyst
- ☐ Chronic inactive TB
- ☐ traumatic lung cyst
- ☐ tumour

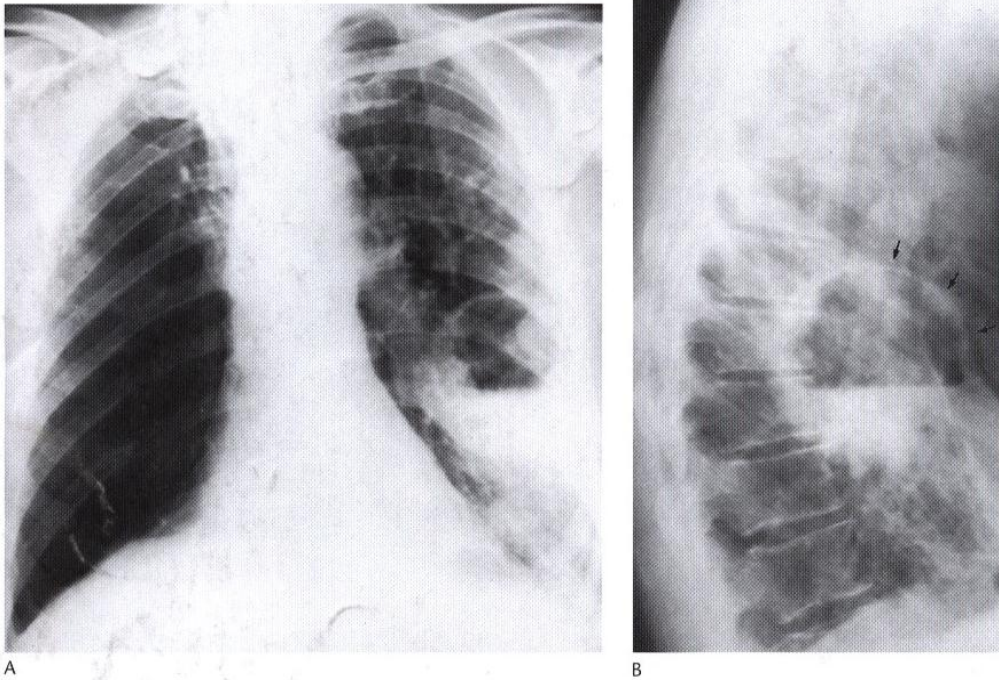
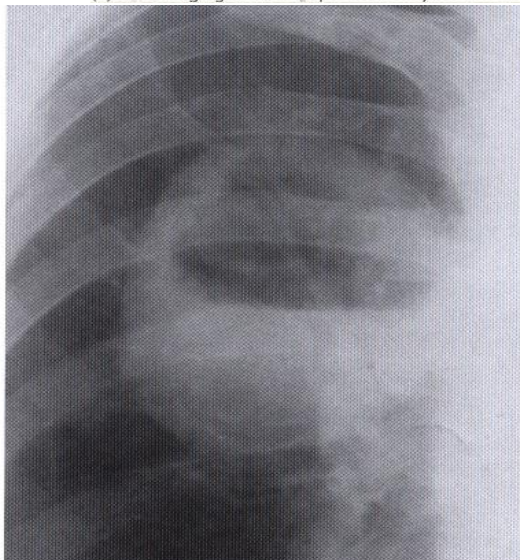


Fig. 1.34 (A) A large lung abscess with a fluid level distal to a hilar carcinoma. There is an old right upper lobe collapse with (B) Note bulging of the oblique fissure adjacent to the abscess (arrows).



Large irregular thick wall Cavitating neoplasm:



Fig. 1.44 Large irregular thick-walled cavitating neoplasm with air-fluid level.

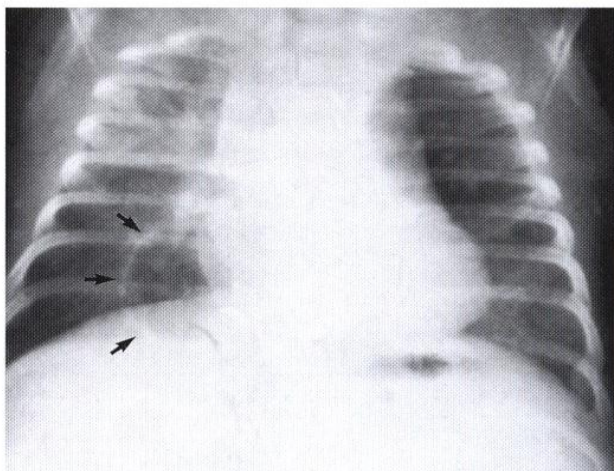


Fig. 1.36 Pneumatocele. Child with a staphylococcal pneumonia. Consolidation in the right upper lobe and a pneumatocele adjacent to the right heart border (arrows).

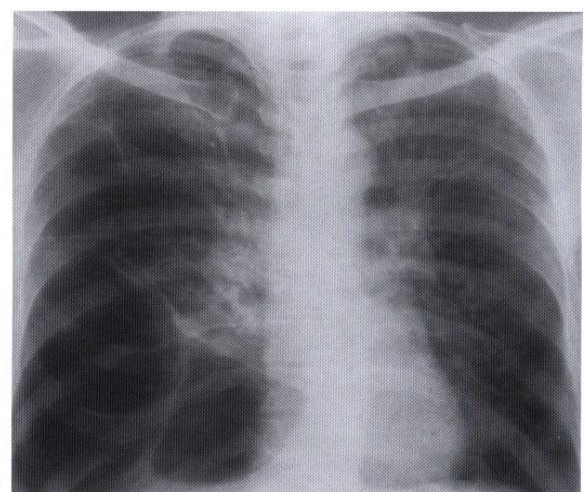


Fig. 1.45 Bullous emphysema with curvilinear shadows in the right lung and an associated paucity of vascular markings.

3.Interstitial pattern : (diffuse lung diseases)

- o miliary shadowing
- o ground glass appearance.
- o nodular (less than 1 cm)
- o reticular.
- o reticulonodular .
- o honeycomb shadowing - 5-10 mm sizes thin wall cysts--- end stage of pulmonary fibrosis.

Causes of diffuse bilateral reticulonodular shadowing ?

- 1.infection (interstitial pneumonitis) (virus , mycoplasma, fungi).
2. pneumoconiosis (silicosis , asbestosis).
3. collagen disease.
4. cardiac (pulmonary edema -- could be acinar or reticulonodular)
5. miscellaneous (fibrosing alveolitis,lymphangitis carcinomatosis).

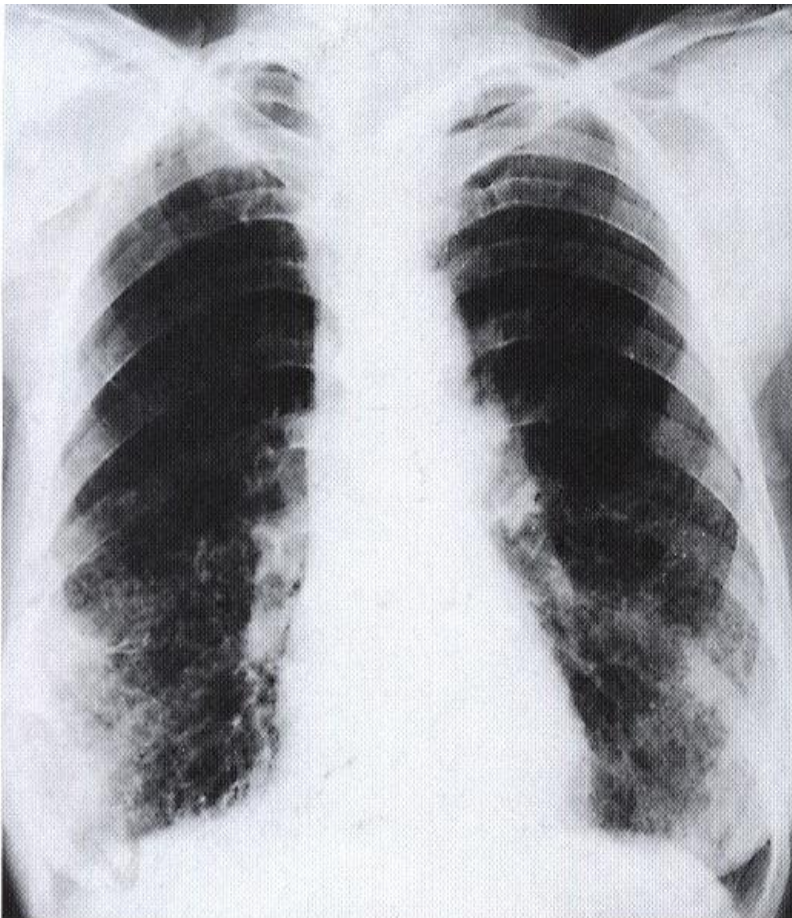


Fig. 1.30 Fibrosing alveolitis. Diffuse interstitial shadowing in the lower zones.

4.changing transradiancy pattern :

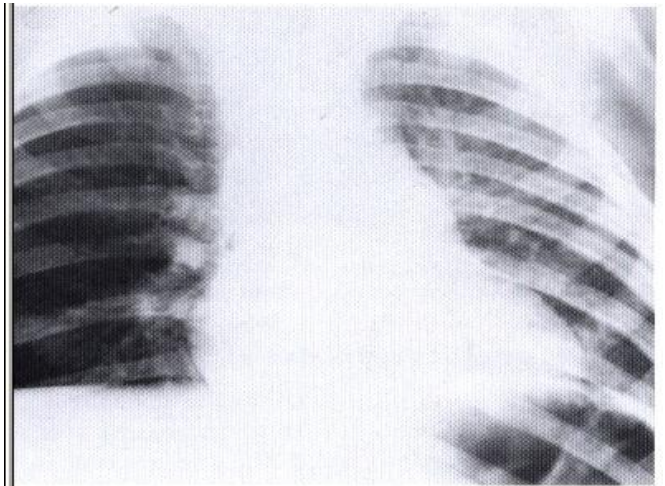
Increase transradiancy

- a- both lungs - asthma
 - emphysema
- b. unilateral - soft tissue (mastectomy)
 - emphysema * compensatory (lobar collapse, lobectomy.)
 - * obstructive (FB, tumour)

Decrease transradiancy:

causes of opaque hemithorax

1. pleural (large effusion).
2. congenital (pulmonary agenesis)
3. pulmonary (collapse/consolidation).
4. surgical (pneumonectomy)



Obstructive emphysema—Rt lung —inhaled FB

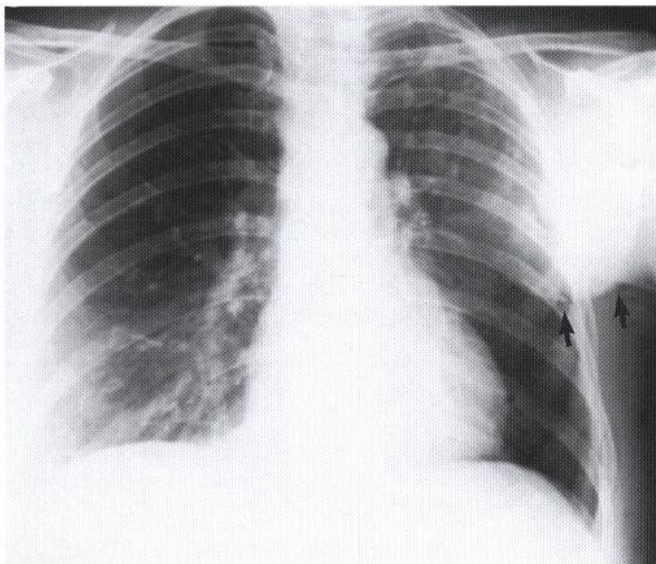


Fig. 1.114 Left mastectomy. Note the abnormal left axillary fold passing cranially (arrows). The left lung is hypertransradiant at its base. Note

The right hemithorax is opaque

There is a shift of the heart and trachea away from the side of opacification



Large Right Pleural Effusion

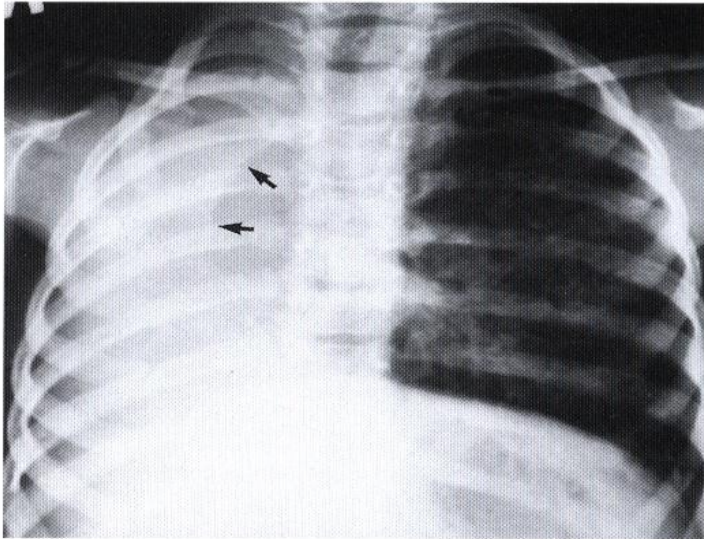


Fig. 1.53 Pulmonary agenesis. The right lung is absent. The heart and mediastinum are displaced to the right. Note herniation of the left lung across the midline (arrows). The rib spaces are narrowed on the right.

The left hemithorax is opaque

There is no shift of the heart or trachea

The opacified hemithorax contains air bronchograms

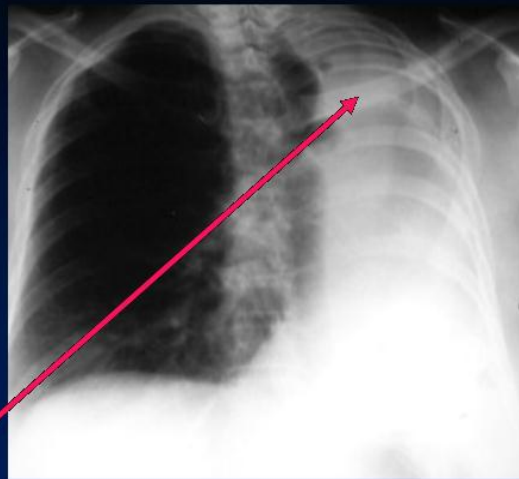


Pneumonia of the LUL

The left hemithorax is opaque

There is a shift of the heart and trachea toward that side indicating volume loss

The left 5th rib has been resected



Pneumonectomy on the left

Important Points

- In atelectasis, there is a shift toward the side of the opacification
- In pleural effusion, there is a shift away from the side of the opacification
- In pneumonia, there is no shift
- In pneumonectomy, the 5th rib is usually absent

Thank You,,,