***Pleural effusion :***

The Normal Pleura

* The lung is covered with visceral pleura
* The adjacent surfaces of the mediastinum, chest wall, and diaphragm are lined by parietal pleura.
* These layers are in continuity both at the hilum and below, where they form the pulmonary ligament.
* The visceral and parietal pleura are separated by a potential space that normally contains only a few ml of fluid, though up to 15 ml may occasionally be present in normal individuals .
* Radiologically the normal pleura is a hairline of soft tissue density which is only seen when it is parallel to the X-ray beam and flanked by air.

**Normal physiology**

* Less than 15 ml of fluid is normally present in the pleural space.
* Pleural fluid is generated as interstitial fluid in the parietal pleura, leaking through non-tight mesothelial junctions into the pleural space, whence it is removed by bulk flow through the lymphatics via parietal pleura.

**Pleural pathology**

* Excess pleural fluid accumulates when inflow and outflow from the pleural space are mismatched.
* This occurs when:

 1. capillary hydrostatic pressure is increased;

 2. blood oncotic pressure is low;(hypoalbunemia)

 3. capillary permeability is increased;

 4. lymphatic drainage is obstructed.

5.reduction of pleural space pressure.

6. trans-diaphragmatic passage of ascitic fluid.

 **types of fluids**

Transudate

Exudate (thin or thick),

 Blood and chyle.

Trasudate :

Bilateral pleural effusions tend to be transudates because they develop secondary to generalized changes that affect both pleural cavities equally — a rise in capillary pressure or a fall in oncotic pressure of the blood,(CHR , Hypoalbuminemia, Cirrhosis ,and Nephrotic syndrome..)

Exudate :

 Some bilateral effusions are exudates, however, and this is seen with metastatic disease, lymphoma, or inflammatory diseases of the pleura

* Hemothorax:

 Fluid hematocrit > 50% blood hematocrit

* Empyema , exudative fluid with pus
* Chylothorax :cholestyrol and or triglyceride increment ..

**Side specificity :**

Right-sided effusions : are typically associated with ascites, heart failure and liver abscess& ovary.

Left effusions: with pancreatitis, pericarditis, oesophageal rupture and aortic dissection.

***The radiological signs of a pleural effusion:***

* subpulmonic effusions.
* blunted lateral costophrenic angles .
* meniscus sign.
* Lamellar Effusion.
* Loculated (encysted ,encapsulated )..
* Fissural (Interlobar) Loculation.
* Air – fluid level ..
* Opacified hemithorax .

**subpulmonic effusions:**

* it is unusual for it to remain localized in this site once its volume exceeds 200–300 ml.
* On a PA radiograph the signs are of a 'high hemidiaphragm'
* with an unusual contour that peaks more laterally than usual, has a straight medial segment and falls away rapidly to the costophrenic angle laterally.
* left-sided subpulmonary effusions, there is increased separation between the stomach gas and the apparent hemidiaphragm.

**Blunting of the CP angle :**

Normally there is less than 15 ml pleural fluid ..

50 – 100 ml accumulation is able to blunte the posterior costophrenic angle seen by lateral x-ray.

300-500 ml accumulation causing blunting the CP angle seen by frontal film..

Meniscus sign :

The upper margin of the opacity is concave to the lung and is higher laterally than medially.

Lamellar Effusion :

A lamellar effusion is caused by fluid between the lung and visceral pleura and it is a common finding in heart failure. It gives a vertical band shadow of soft tissue density between the lung and the chest wall above the costophrenic angle, usually occur with CHF ..

Loculated (Encysted, Encapsulated) Pleural Fluid:

Fluid can loculate between visceral pleural layers in fissures or between visceral and parietal layers.

The shape & position is unusual in thorax …

Hydropneumothorax :

* air-fluid level occurrence ,when
* air (pneumothorax ) present & pleural effusion..(hydropneumothorax) ..
* etiology due to trauma ,surgery& bronchopleural fistula..

Hemithorax opacification :

* The whole hemithorax opacity caused by pleural effusion resembling pulmonary mass lesion ..
* Cardiac and tracheal displacement away from the lesional site ,against atelectasis causing pulling toward the Opacified site ..