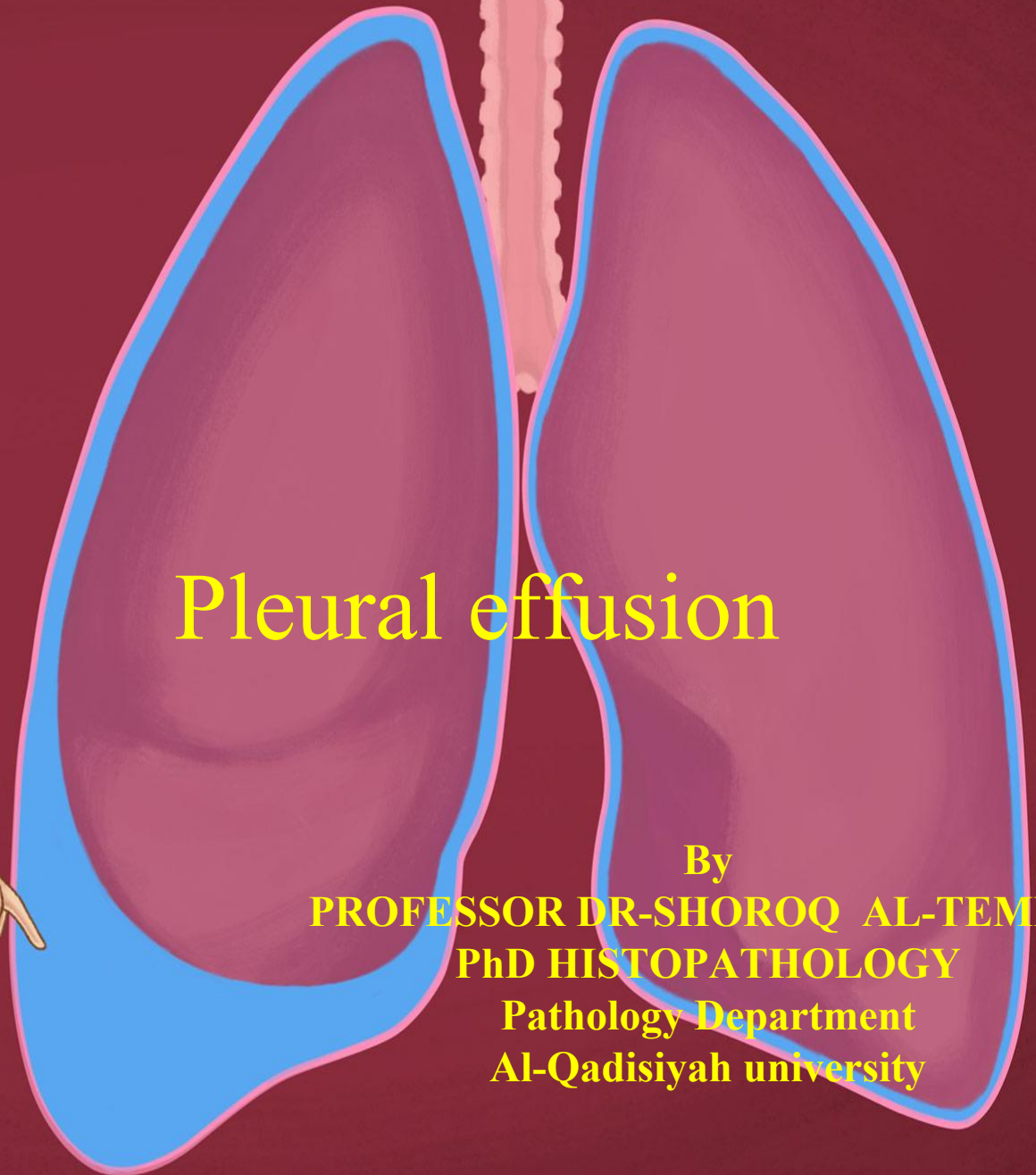




HAPPY NEW YEAR

2023



Pleural effusion

By
PROFESSOR DR-SHOROQ AL-TEMIMI
PhD HISTOPATHOLOGY
Pathology Department
Al-Qadisiyah university

Objective of lecture

- Definition of pleural effusion**
- Pathophysiology of pleural effusion**
- Types of pleural effusion**
- Clinical presentation of pleural effusion**
- Investigation of patient with pleural effusion**
- Malignant pleural effusion**

CASE

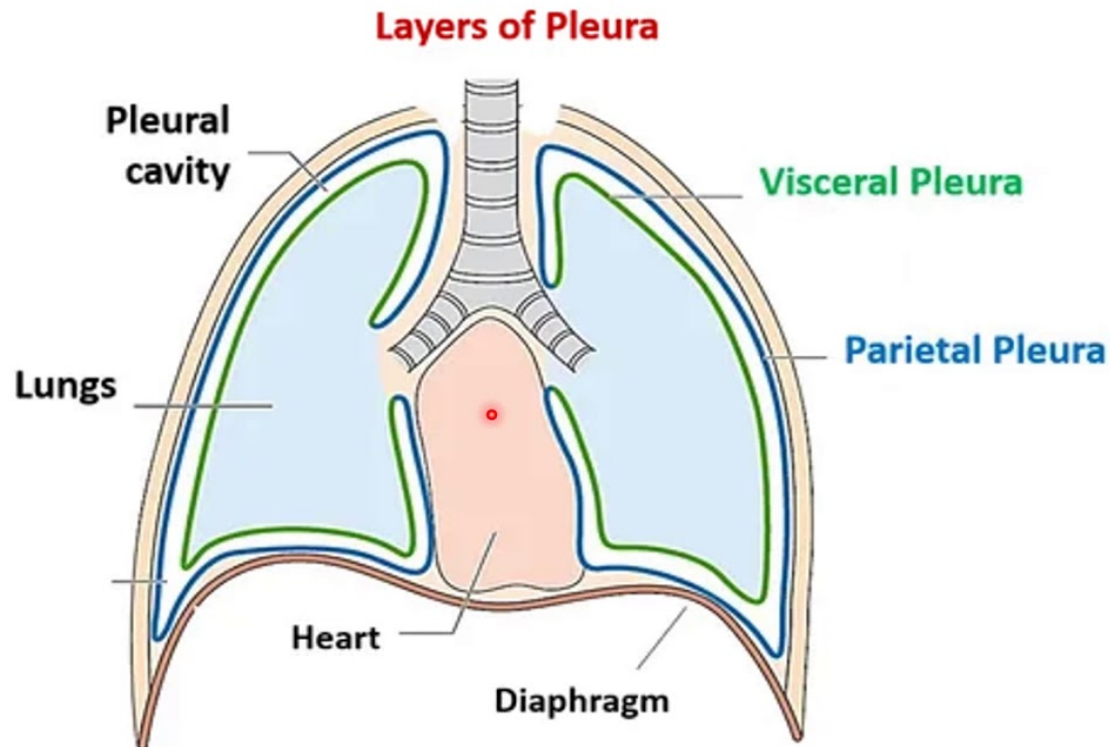
**70y old man , a known case of congestive heart failure ,
now presented with pleuritic chest pain , dyspnea ,
orthopnea .**

On CXR ,showed pleural effusion .

Normal pleura

The pleura is a vital part of the respiratory tract whose role it is to cushion the lungs and reduce any friction which may develop between the lungs, rib cage, and chest cavity.

The pleura consists of a two-layered membrane that covers each lung.



Pleural effusion

Pleural effusion is an abnormal extravascular fluid collection in the pleural space

Pleural effusion can classify in to 2 types:

1-Inflammatory types

A-Exudates

B-Empyema

2-Non inflammatory types

A-Transudates

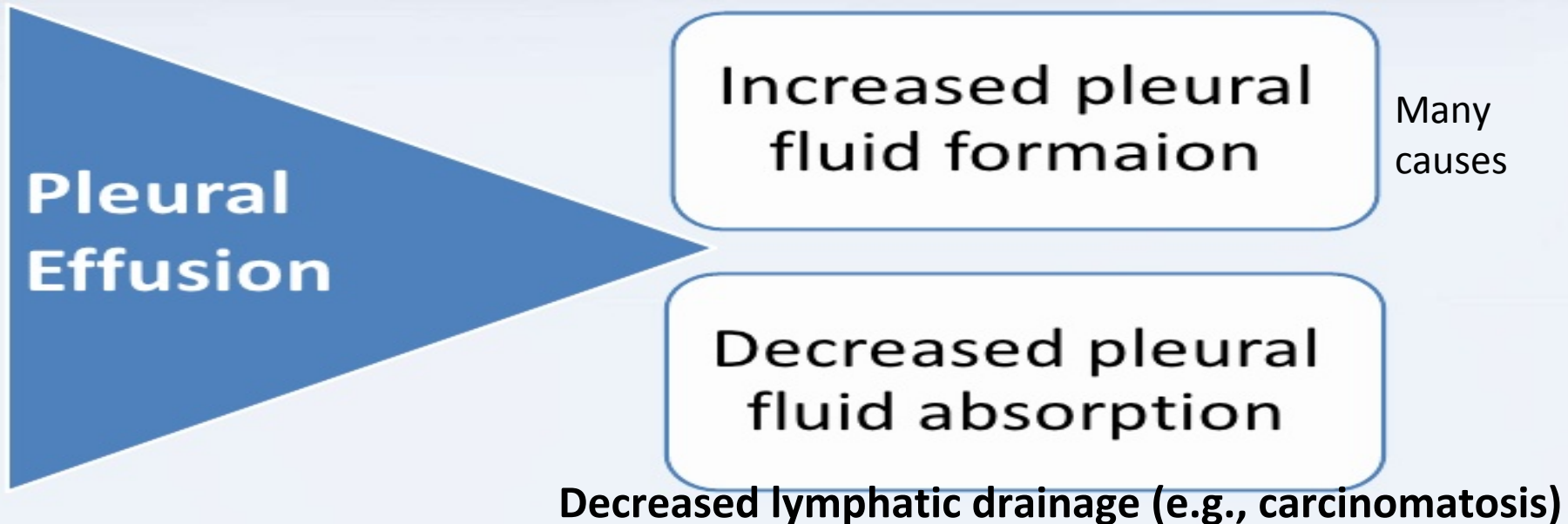
B-Hemothorax

C- Chylothorax

The pleural space usually contains a small amount of fluid (0.3ml/kg of body weight) which is absorbed and secreted in equilibrium via the lymphatic drainage system .

However disruption of this balance can lead to fluid accumulation and an association pleural effusion

Pathophysiology of pleural effusion



Exudates (pyothorax , inflammatory process) :- occur in case with inflammation because of increased vascular permeability as result of increased inter endothelial spaces and allows plasma proteins and leukocytes to enter sites of infection or tissue damage lead to edema . Organization of these exudates with dense fibrous adhesions can affect lung expansion.

Transudates(hydrothorax ,non inflammatory):- When fluid leaks out because of increased hydrostatic pressure or decreased osmotic pressure .

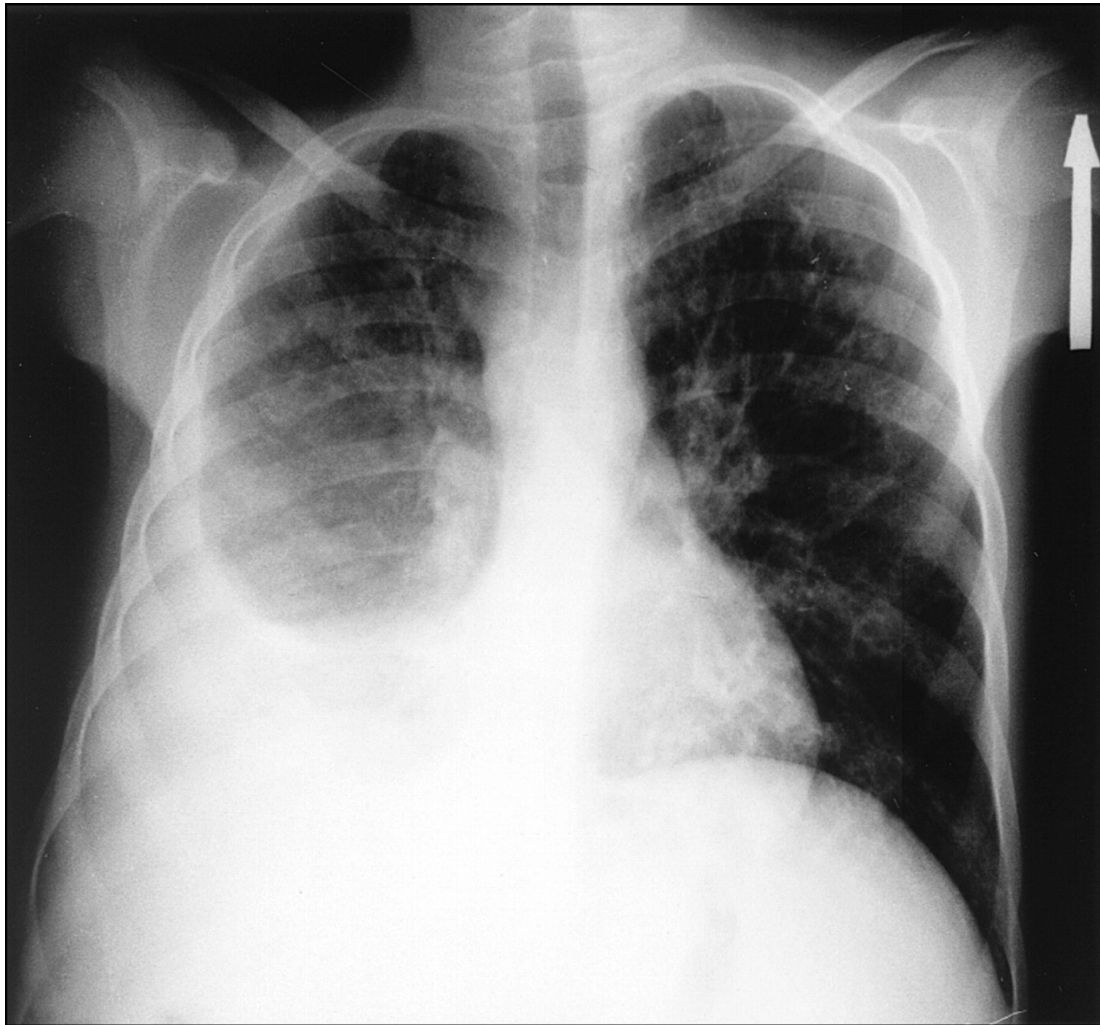


EXUDATE	TRANSUDATE
Edema of inflammed tissues due to alteration in normal permeability of small bvs	Ultrafiltrate of blood plasma that results from osmotic/hydrostatic imbalance across the vessel wall
<i>Inflammatory edema</i>	<i>Non inflammatory edema</i>
High protein(2.5-3.5g/dl) readily coagulates due to high fibrinogen	Low protein (>1g/dl)mainly albumin low fibrinogen, no tendency to coagulate
<p>Specific gravity >1.018 ph <7.3</p>	<p>Specific gravity low <1.015 ph >7.3</p>
<i>Glucose is low(<60mg/dl)</i>	<i>same as plasma</i>
LDH is high	LDH is low
Many cells, inflammatory , parenchymal cells	Few cells mainly mesothelial cells and cellular debris
<i>e.g: purulent exudate such as pus</i>	<i>Edema in congestive cardiac failure</i>

Types ?

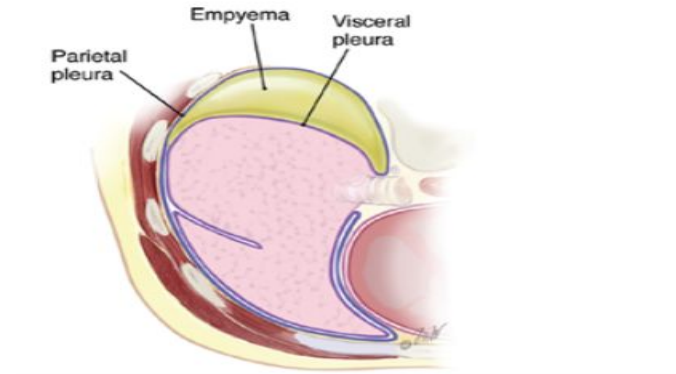
Transudate	Exudate
Congestive heart failure	Infections
Cirrhosis with ascites	bronchiectasis
Nephrotic syndrome	Lung abscess
Hypoalbuminemia	Tuberculosis
myxedema	Neoplasms
Peritoneal dialysis	Lymphoma
glomerulonephritis	
Superior vena cava obstruction	
Pulmonary embolism	PE

Note :- PE caused transudate and in late state lead to exudate .



CXR :-showing accumulation of pleural effusion in the right hemi thorax with blunting of the right costophrenic angle . Pleural effusion tend to be crescent in shape (i.e. concave towards the lung) .

Empyema (inflammatory):- is an accumulation of frank pus and fluid from infected tissue in pleural cavity . Requires the presence of bacteria on gram staining of the pleural fluid .The color is yellow ,cloudy and foul odor . Other name called para-pneumonic effusion



- **Common causes:**

- Pneumonia
- Rupture of lung abscess,
- Rupture of sub-phrenic abscess
- Tuberculosis
- Infected chest wounds
- Secondary infection during aspiration of pleural fluid

Treated by drainage of the collection and antibiotics after microbiological finding .



CXR:-Empyema's form an obtuse angle with the chest wall .The biconvex shape is also suggestive of the diagnosis.

Hemothorax (non-inflammatory) :- is an accumulation of blood that form from rupture of the aortic aneurysm or trauma .

Chylothorax (non-inflammatory) :-collection of **milky** lymph fluid , from rupture of the thoracic ducts and usually due to **neoplastic lymphatic obstruction** .
If triglyceride level is $> 100\text{mg /dl}$, consider chylous effusion.

Malignant pleural effusions

1-Malignant disease involving the pleura is the **second leading cause of exudative pleural effusions .**

2-Bloody and massive pleural effusion is the typical clinical picture .

3-Significantly high Lactate dehydrogenase (LDH) and Carcinoembryonic antigen (CEA) level in pleural effusion

4-must be malignant cells present in pleural effusion to confirm diagnosis of malignant pleural effusions in the sample

A-Pleural fluid aspiration for cytology examination ,

B-Needle biopsy , thoracoscopy or open pleural biopsy to confirmed the diagnosis .

CLINICAL FEATURES

History:

- Small pleural effusion: asymptomatic
- Large pleural effusion: pleuritic chest pain, abdominal pain, pain during inspiration or coughing
- The child may prefer to lie on the affected side (to decrease respiratory excursions)
- Cough
- Fever
- Respiratory distress, dyspnea, orthopnea, or cyanosis

Investigation for pleural effusions

1-CXR

2-US

3-CT

4- Aspiration of fluid to confirm diagnosis



LDH (lactate dehydrogenase) is an enzyme catalyzing the reaction

LDH is in almost all of the body's cells and is released into the body when cells are damaged or destroyed

The blood level of LDH is a general indicator of tissue and cellular damage

Treatment of pleural effusion

1- Treat the underlining condition

2- if fluid is large ,drainage is advised (thoracenthesisc or chest tube)

3-Surgery:- is indicated for a recurrent pleural effusion

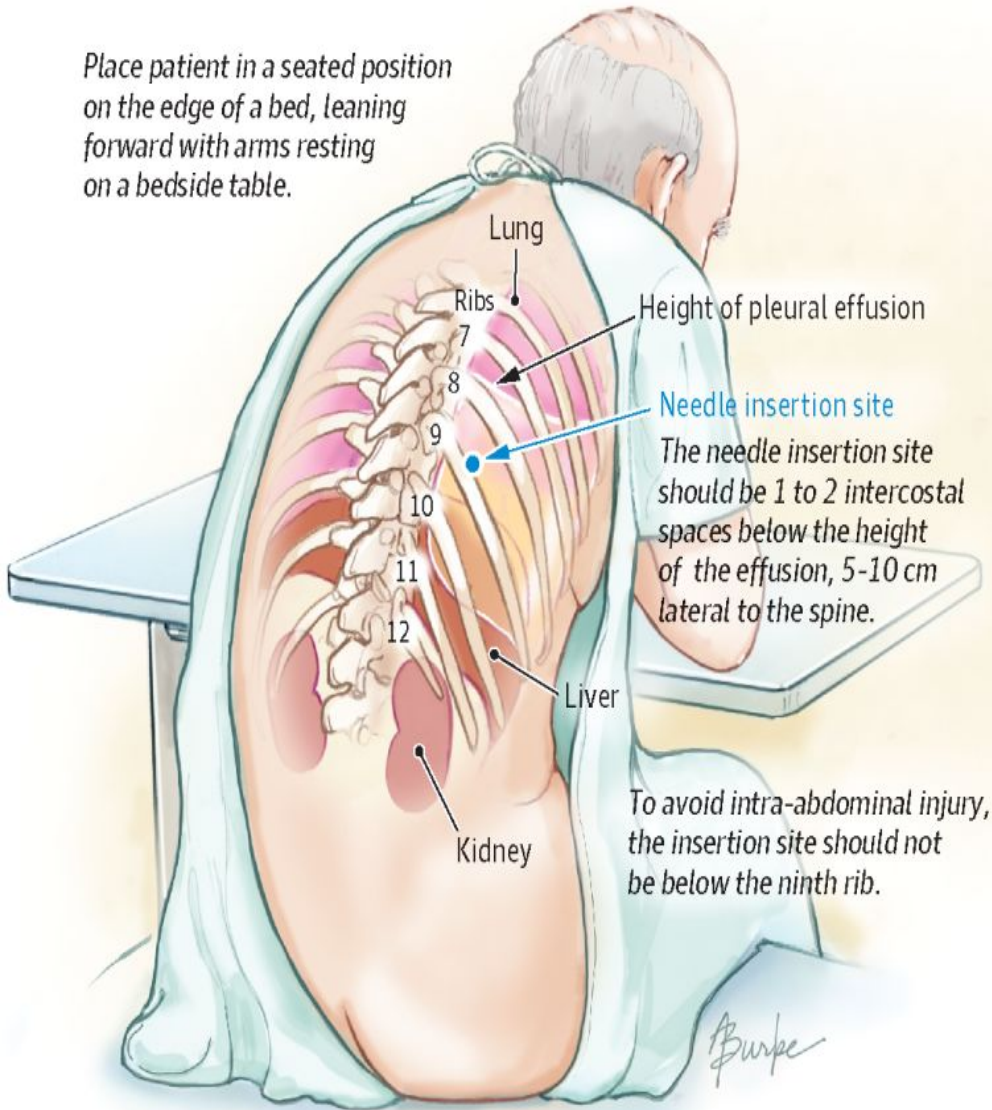
A-pleurodesis :- comprises the insertion of a powder (sclerosing agent like tetracycline)into the pleural cavity to adhere both the pleura together .

B-Pleurectomy is the removal of the parietal pleura from the chest wall leaving a raw surface to which the visceral layer sticks

The thoracentesis site should be in the mid scapular or posterior axillary line (5-10 cm lateral to spine), and one to two intercostal spaces below the highest level of the effusion

Thoracentesis

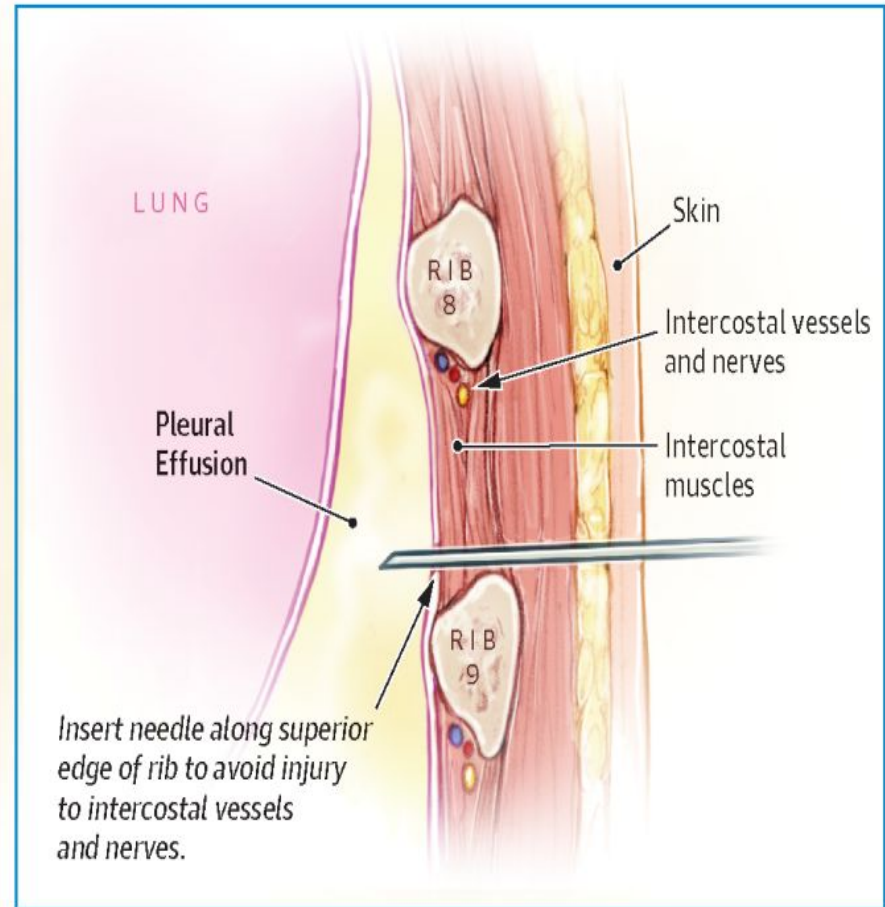
Place patient in a seated position on the edge of a bed, leaning forward with arms resting on a bedside table.



The needle insertion site should be 1 to 2 intercostal spaces below the height of the effusion, 5-10 cm lateral to the spine.

To avoid intra-abdominal injury, the insertion site should not be below the ninth rib.

Sagittal cross section in plane of needle insertion site





u/s guide for thoracentesis

Pneumothorax

Pneumothorax refers to air or gas in the pleural cavity, usually with associated ipsilateral lung deflation; it can be

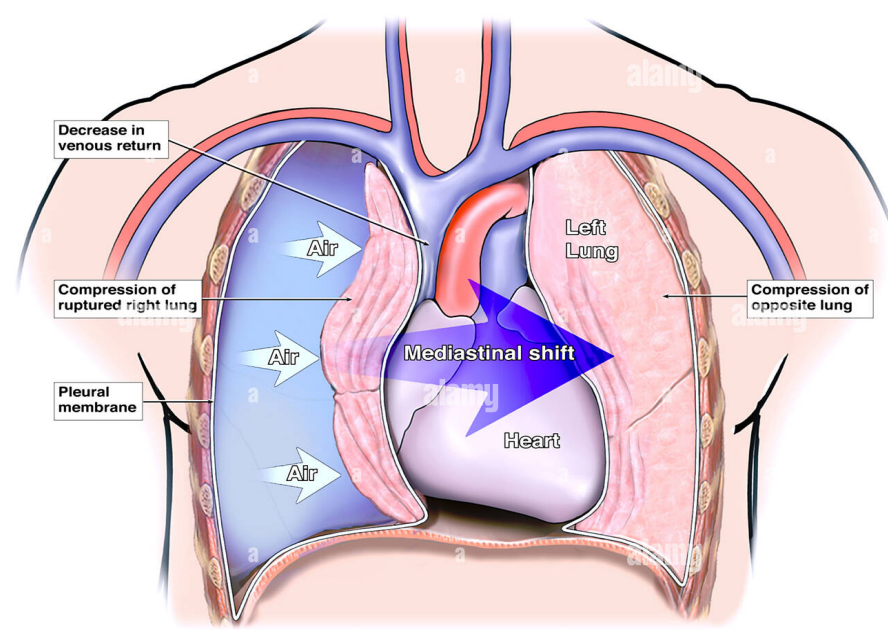
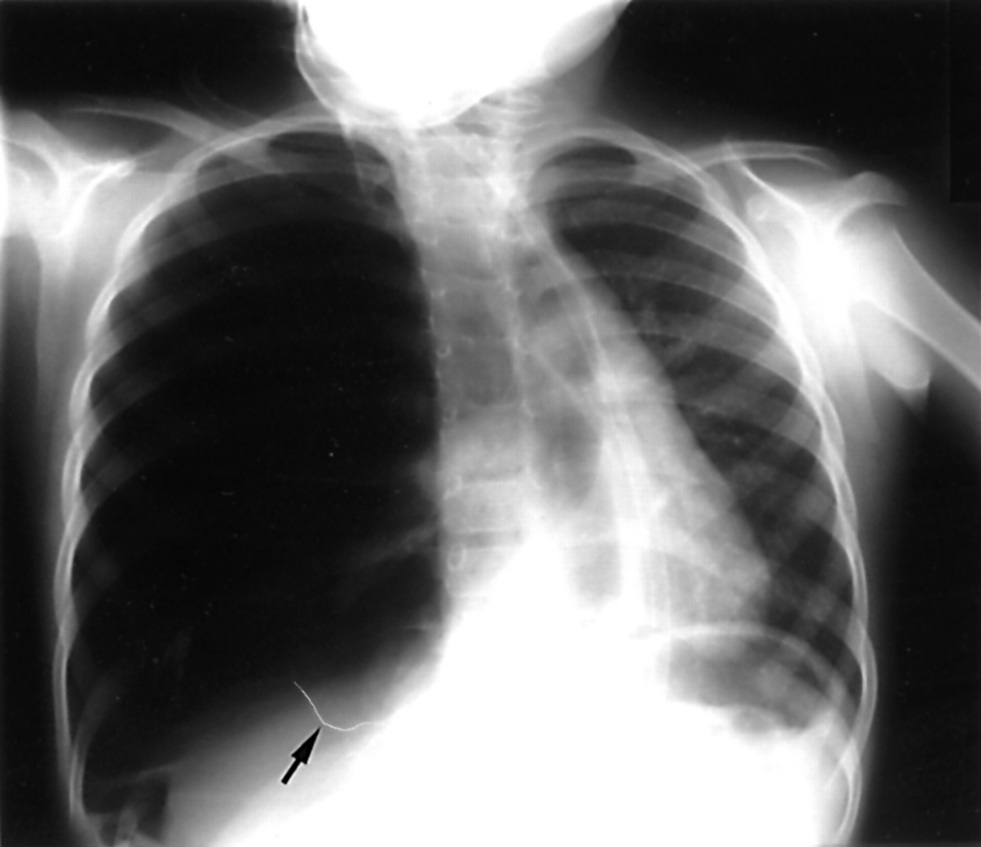
1-traumatic (e.g., after rib fractures that puncture the lung)

2-or spontaneous, occurring after peripheral apical bleb rupture.

-Tension pneumothorax occurs when a defect between airways and pleura acts as a one-way valve, admitting air during inspiration but failing to release it during expiration under positive pressure. The progressively increasing pleural pressure compresses the contralateral lung and mediastinal structures and represents a serious, potentially fatal complication.

This is **life threatening and requires immediate treatment to release the pressure .**

Treatment can life –saving



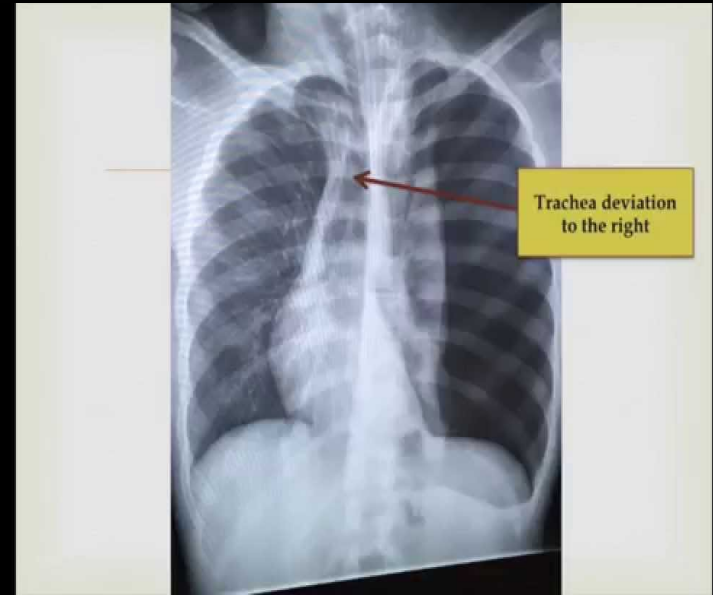
In a tension pneumothorax, air from a ruptured lung enters the pleural cavity without a means of escape. As air pressure builds up, the affected lung is compressed and all of the mediastinal tissues are displaced to the opposite side of the chest.

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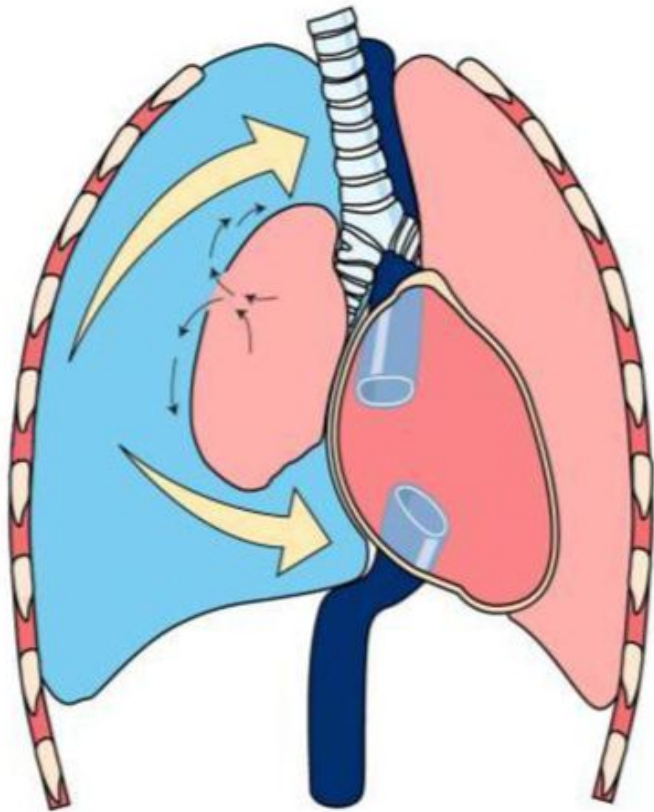
Tension pneumothorax

The progressively increasing pleural pressure compresses the contralateral lung and mediastinal structures (trachea ,heart) .



- Tension pneumothorax, cont.

Tension Pneumothorax

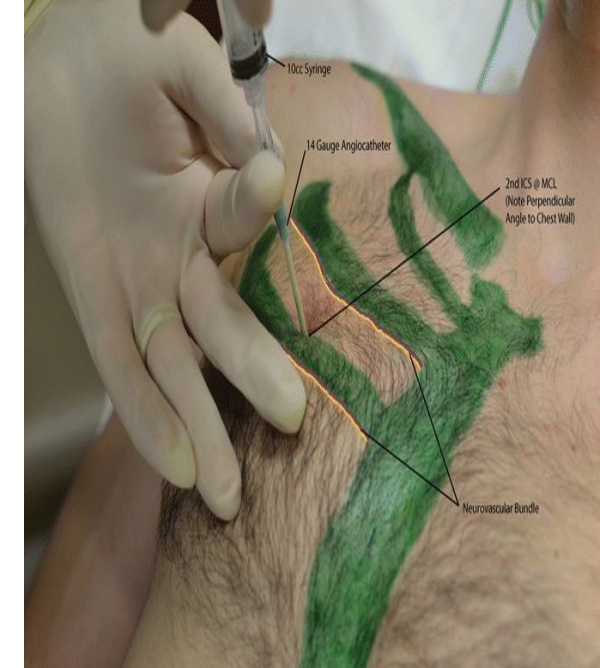
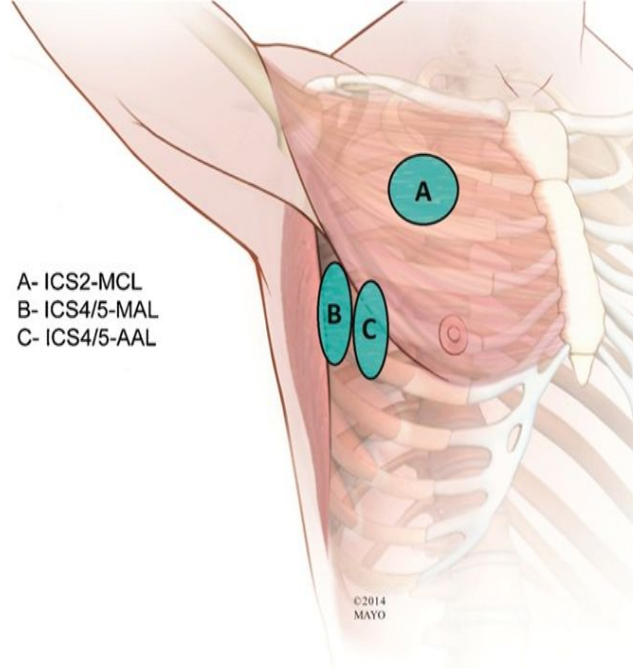
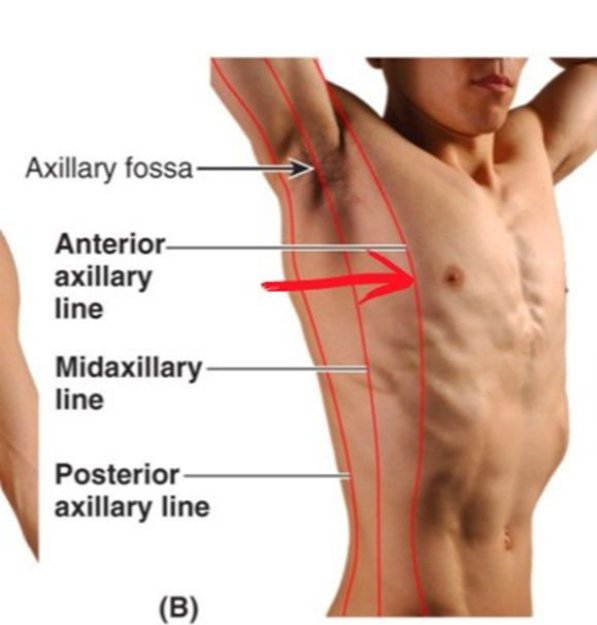


Through this valvular mechanism, air will accumulate in the pleural cavity with increased positive pressure.

➡ lung collapse on the affected side with shift of mediastinum to the other side

➡ leads kinking of the caval veins resulting in impairment of venous return and low cardiac output.

➡ Compression to the other lung leads to significant hypoxia.



Treatment :-Needle Decompression (ND).


an immediate temporizing intervention for this condition is required by direct Needle Decompression (ND).

1-the 2nd intercostal space (joint of sternal angle landmark)in the mid-clavicular line (ICS2-MCL).

- **2- the 4th/5th intercostal space just anterior to the anterior-axillary line (ICS4/5-AAL) or anterior to the mid-axillary line (ICS4/5-MAL).**
- **Followed by insertion of a chest tube**

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2023

May the faith of God
be with you this year.
May the peace of God
surround you, 
and may you be blessed
each day!

Happy New Year

