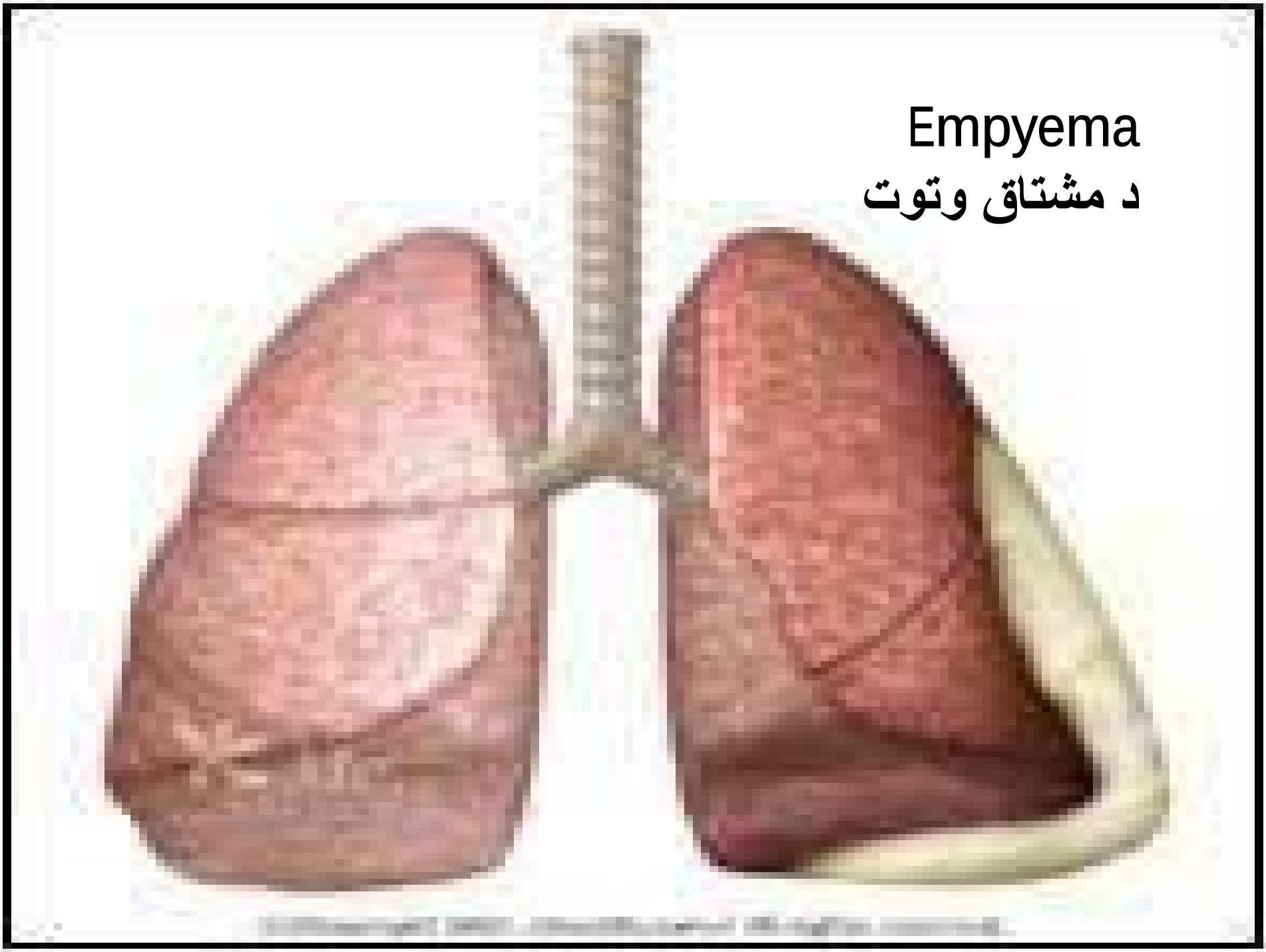
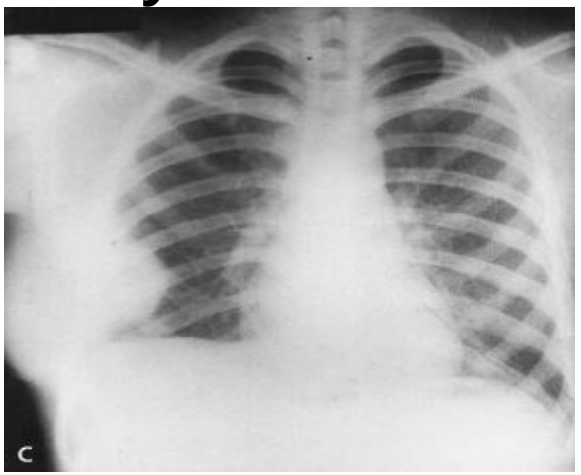
Empyema

د مشتاق وتوت



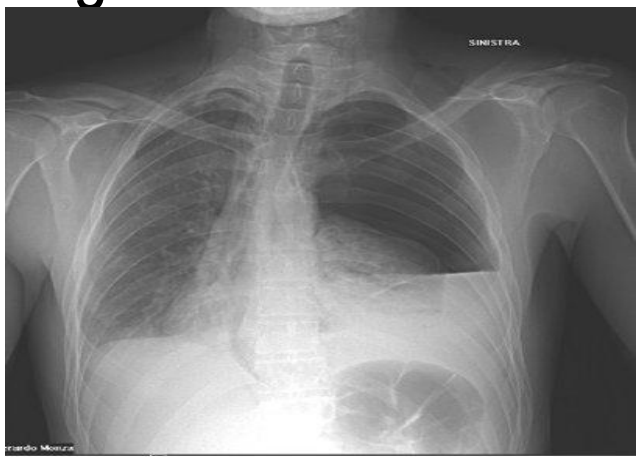
definition

- () This is a collection of pus in the pleural space.
- () *Microscopically*, neutrophil leucocytes are present in large numbers.
- () The causative organism may or may not be isolated from the pus.
- () An empyema may involve the whole pleural space or only part of it ('loculated' or 'encysted' empyema) and is usually unilateral.

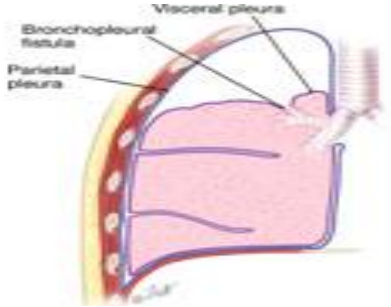


Aetiology

- Empyema is always secondary to infection in a neighbouring structure, usually the lung, most commonly due to the bacterial pneumonias and tuberculosis.
- Over 40% of patients with community-acquired pneumonia develop an associated pleural effusion ('para-pneumonic' effusion) and about 15% of these become secondarily infected.
- infection of a haemothorax following trauma or surgery, oesophageal rupture and rupture of a subphrenic abscess through the diaphragm.



Pathology



- The pus in the pleural space is often under

considerable pressure, and if the condition is not adequately treated, pus may rupture into a bronchus causing a bronchopleural fistula and pyopneumothorax, or track through the chest wall with the formation of a subcutaneous abscess or sinus, so-called empyema necessitans.

- An empyema will only heal if infection is eradicated and the empyema space is obliterated, allowing apposition of the visceral and parietal pleural layers.
- Successful re-expansion and resolution will not occur if:

1- the visceral pleura becomes grossly thickened and rigid due to delayed treatment or inadequate drainage of the infected pleural fluid

2- a bronchopleural fistula

3- there is underlying disease in the lung, such as bronchiectasis, bronchial carcinoma or pulmonary TB preventing re-expansion.

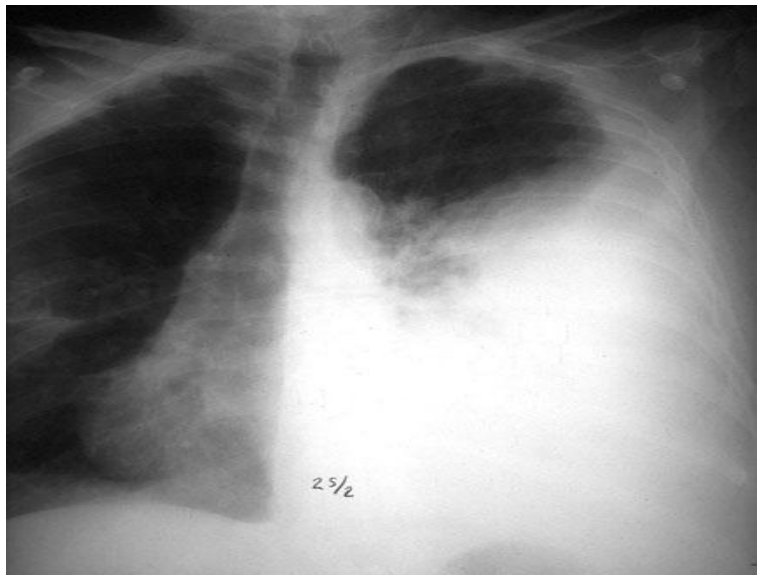
Clinical features

Systemic features

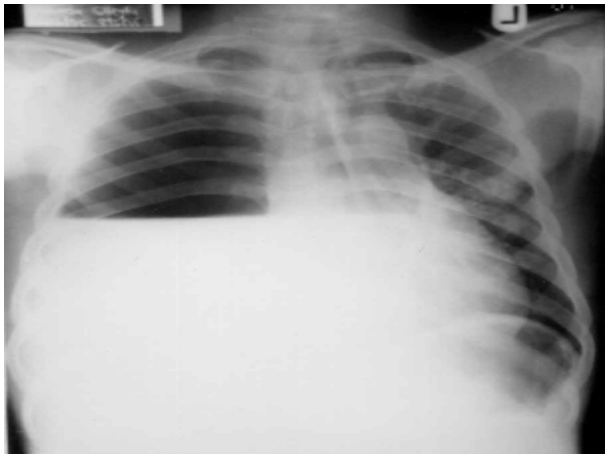
- Pyrexia, usually high and remittent
- Rigors, sweating, malaise and weight loss
- Polymorphonuclear leucocytosis, high CRP

Local features

- Pleural pain; breathlessness; cough and sputum usually because of underlying lung disease; copious purulent sputum if empyema ruptures into a bronchus (bronchopleural fistula)
- Clinical signs of pleural effusion



Investigations



()Radiological examination :

- CXR: The appearances may be indistinguishable from those of pleural effusion, When air is present in addition to pus (pyopneumothorax), a horizontal 'fluid level' marks the air/liquid interface.
- Ultrasound shows the position of the fluid, the extent of pleural thickening and whether fluid is in a single collection or multiloculated by fibrin and debris. Sometimes, pleural adhesions confine the empyema to form a 'D'-shaped shadow against the inside of the chest wall.
- CT gives information on the pleura, the underlying lung parenchyma and patency of the major bronchi.

()Aspiration of fluid :

- Ultrasound or CT is used to identify the optimal site to undertake aspiration, which is best performed using a wide-bore needle. If the fluid is thick and turbid pus, empyema is confirmed. Other features suggesting empyema are a fluid glucose < 3.3 mmol/L (60 mg/dL), LDH > 1000 U/L or a fluid pH < 7.0 (H^+ >100 nmol/L). The distinction between tuberculous and non-tuberculous disease can be difficult and often requires pleural biopsy, histology and culture.

Management

() Treatment of non-tuberculous empyema

- When the patient is acutely ill and the pus is sufficiently thin, a wide-bore intercostal tube should be inserted into the most dependent part of the empyema space (using ultrasound or CT guidance in difficult cases) and connected to an underwater-seal drain system.
- An antibiotic directed against the organism causing the empyema should be given for 2-4 weeks. Empirical antibiotic treatment (e.g. intravenous co-amoxiclav or cefuroxime with metronidazole) should be used if the organism is unknown.
- If, however, the intercostal tube is not providing adequate drainage-e.g. when the pus is thick or loculated, surgical intervention is required. The empyema cavity is cleared of pus and adhesions, and a wide-bore tube inserted to allow optimal drainage. Surgical 'decortication' of the lung may also be required if gross thickening of the visceral pleura is preventing re-expansion of the lung.

()Treatment of tuberculous empyema

- Antituberculosis chemotherapy must be started immediately and the pus in the pleural space aspirated through a wide-bore needle until it ceases to reaccumulate.
- Intercostal tube drainage is often required.
- In many patients, no other treatment is necessary but surgery is occasionally required to ablate a residual empyema space.
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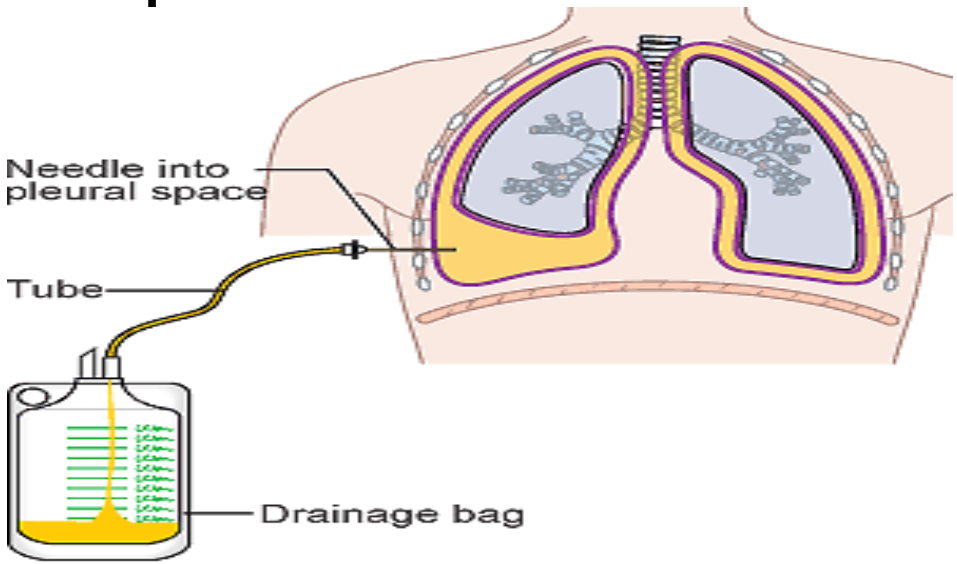
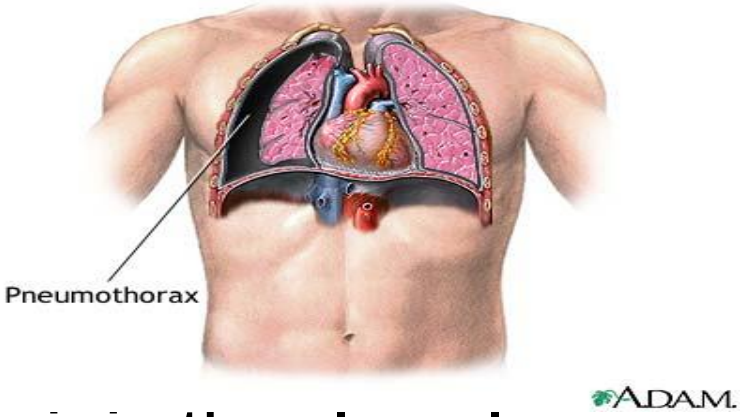


Diagram showing how a pleural effusion is drained
© CancerHelp UK

Complications

- 1- Fibrothorax, with restriction and encasement of the lung in thickened, often calcified pleura is a late complication.
- 2-Air can enter into the pleural space (pyopneumothorax)
- 3- scarring of the lungs (pulmonary fibrosis) can occur.
- 4- Pleural thickening may also occur.
- 5- bronchopleural fistula
- 6- empyema necessitatis.
- 7- Respiratory failure and septic shock are extreme complications that can result in death.

pneumothorax



- Pneumothorax is the presence of air in the pleural space, which can either occur spontaneously, or result from iatrogenic injury or trauma to the lung or chest wall .
- Primary spontaneous pneumothorax occurs in patients with no history of lung disease in whom smoking, tall stature and the presence of apical subpleural blebs are additional risk factors.
- Secondary pneumothorax affects patients with pre-existing lung disease and is associated with higher mortality rates .

lung diseases that may increase the risk for pneumothorax

1- Diseases of the airways: COPD (especially when emphysema and lung bullae are present), acute severe asthma, cystic fibrosis

2- Lung infections: pneumocystis pneumonia (PCP), tuberculosis, necrotizing pneumonia

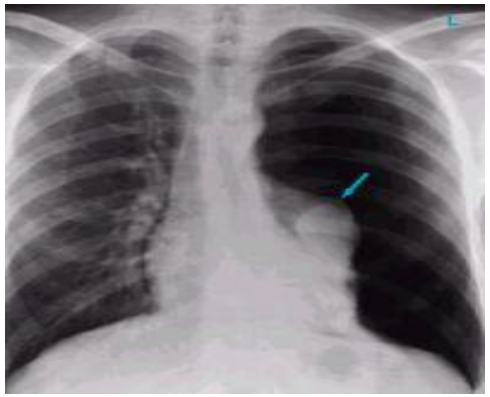
3- Interstitial lung diseases: sarcoidosis, idiopathic pulmonary fibrosis, histiocytosis X, lymphangioleiomyomatosis (LAM)

4- Connective tissue diseases: rheumatoid arthritis, ankylosing spondylitis, polymyositis and dermatomyositis, systemic sclerosis, Marfan's syndrome and Ehlers-Danlos syndrome

5- Cancer: lung cancer, sarcomas involving the lung

6- Catamenial (occurring in relation to the menstrual cycle): endometriosis in the chest

7- In children, additional causes include measles, echinococcosis, inhalation of a foreign body.



Classification of pneumothorax

1- Spontaneous

() Primary

- No evidence of overt lung disease. Air escapes from the lung into the pleural space through rupture of a small subpleural emphysematous bulla or pleural bleb, or the pulmonary end of a pleural adhesion

() Secondary

- Underlying lung disease, most commonly COPD and TB; also seen in asthma, lung abscess, pulmonary infarcts, bronchogenic carcinoma, all forms of fibrotic and cystic lung disease

2- Traumatic

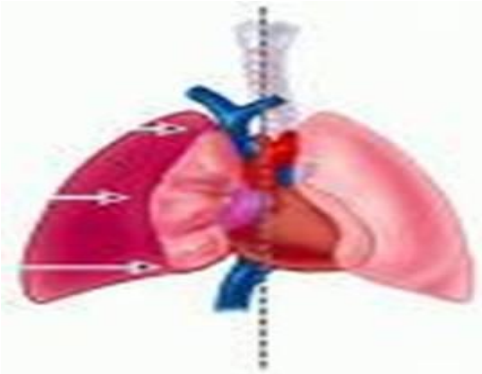
- Iatrogenic (e.g. following thoracic surgery or biopsy) or chest wall injury

Clinical features

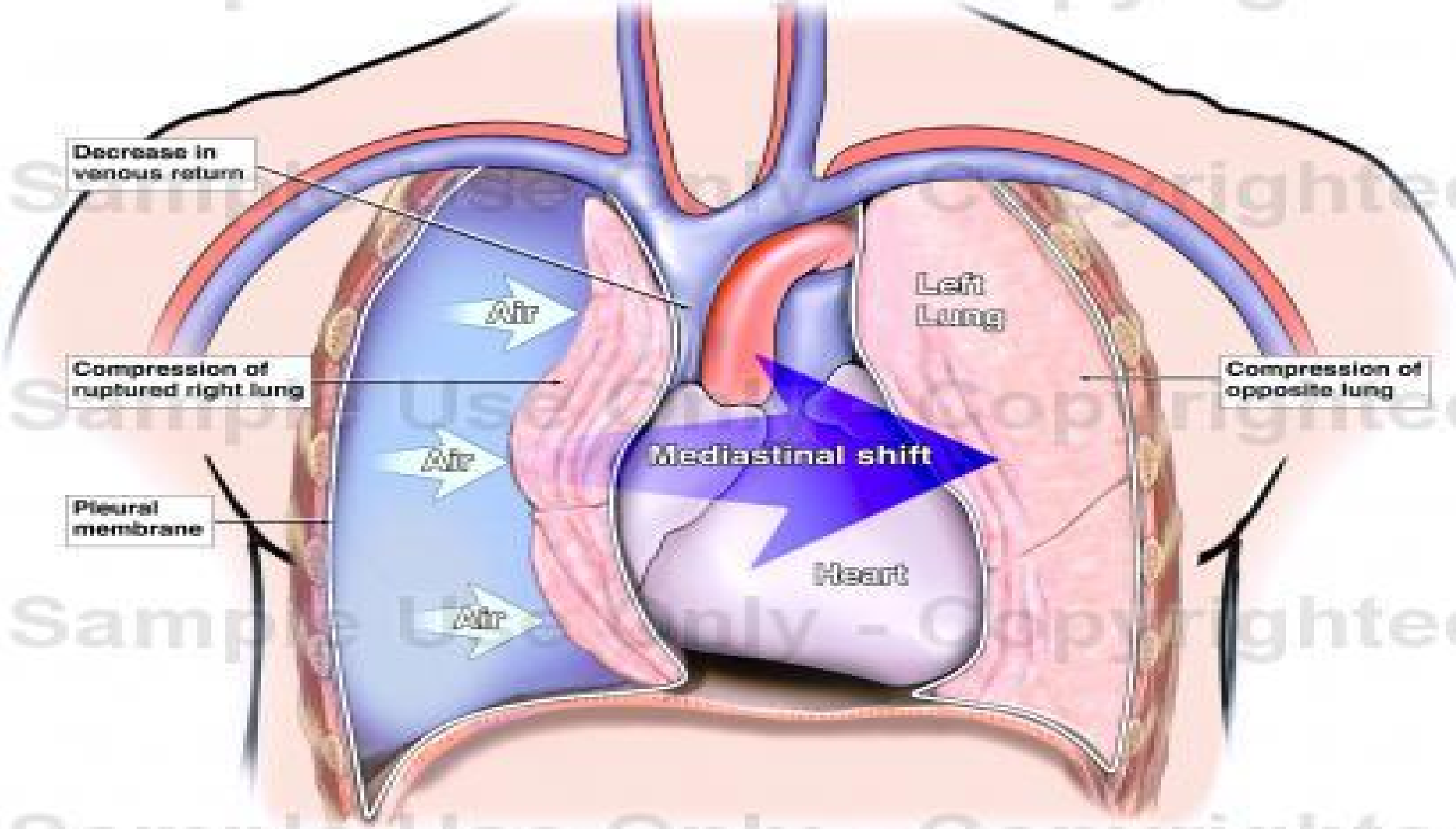
() The most common symptoms are sudden-onset unilateral pleuritic chest pain or breathlessness.

() In patients with a small pneumothorax, physical examination may be normal. A larger pneumothorax (> 15% of the hemithorax) results in decreased or absent breath sounds .

The combination of absent breath sounds and resonant percussion note is diagnostic of pneumothorax.



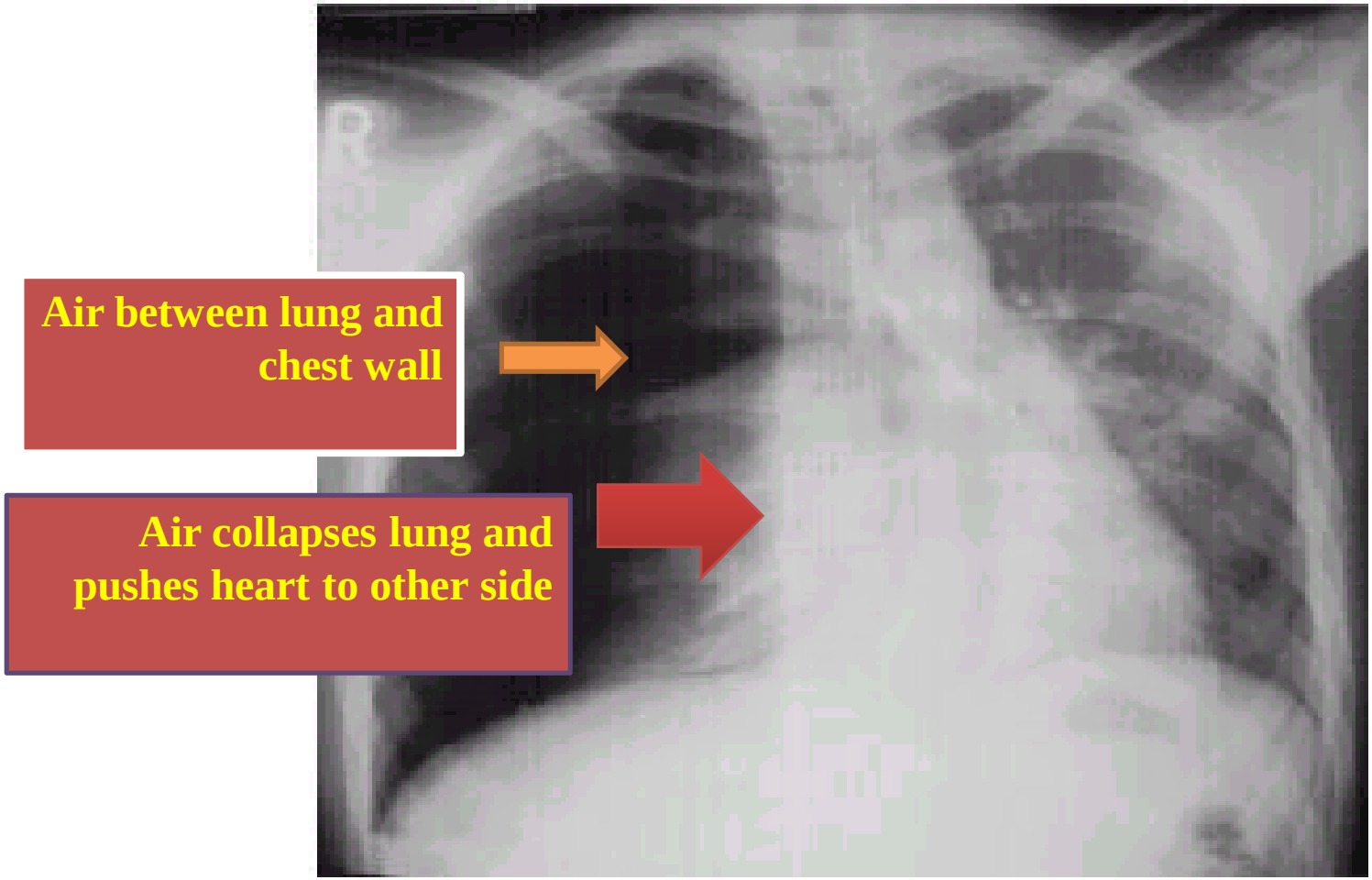
Tension Pneumothorax

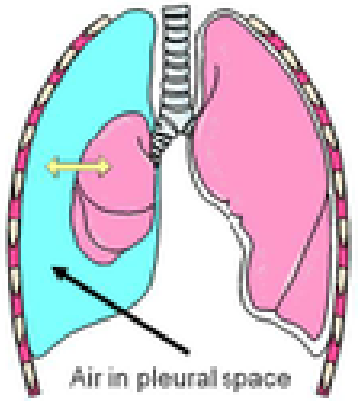


In a tension pneumothorax, air from a ruptured lung enters the pleural cavity without a means of escape. As air pressure builds up, the affected lung is compressed and all of the mediastinal tissues are displaced to the opposite side of the chest.

- Occasionally, the communication between the airway and the pleural space acts as a one-way valve, allowing air to enter the pleural space during inspiration but not to escape on expiration. Large amounts of trapped air accumulate progressively in the pleural space and the intrapleural pressure rises to well above atmospheric levels. This is a ***tension pneumothorax***. The pressure causes mediastinal displacement towards the opposite side, with compression of the opposite normal lung and impairment of systemic venous return, causing cardiovascular compromise .
- Clinically, the findings are rapidly progressive breathlessness associated with a marked tachycardia, hypotension, cyanosis and tracheal displacement away from the side of the silent hemithorax. Occasionally, tension pneumothorax may occur without mediastinal shift, if malignant disease or scarring has splinted the mediastinum.

Tension pneumothorax

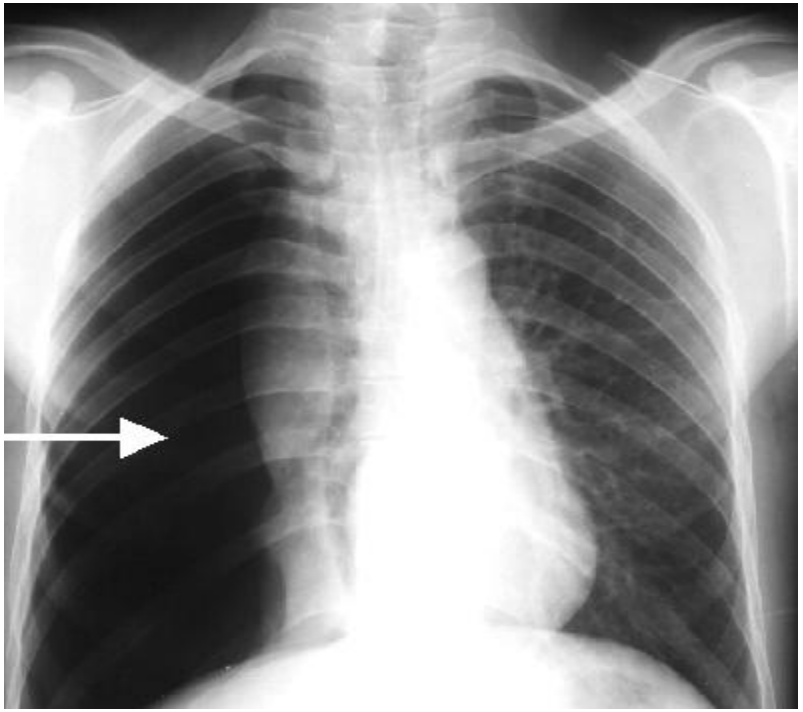




- *() Closed pneumothorax*
- Where the communication between the airway and the pleural space seals off as the lung deflates and does not re-open. In such circumstances the mean pleural pressure remains negative, spontaneous reabsorption of air and re-expansion of the lung occur over a few days or weeks, and infection is uncommon.
- *() Open pneumothorax*
- where the communication fails to seal and air continues to pass freely between the bronchial tree and pleural space , as in bronchopleural fistula, which, if large, can also facilitate the transmission of infection from the airways into the pleural space, leading to empyema. An open pneumothorax is commonly seen following rupture of an emphysematous bulla, tuberculous cavity or lung abscess into the pleural space.

Investigations

- CXR: shows the sharply defined edge of the deflated lung with complete translucency (no lung markings) between this and the chest wall X-rays also show the extent of any mediastinal displacement and reveal any pleural fluid or underlying pulmonary disease.
- CT scan: is useful in distinguishing bullae from pleural air.



Management

() Primary pneumothorax : no need treatment if:

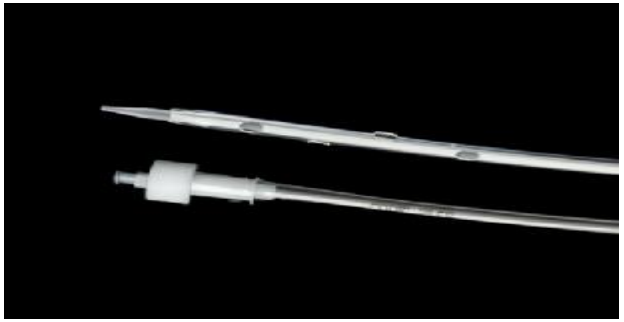
1- the lung edge is less than 2 cm from the chest wall

2- the patient is not breathless.

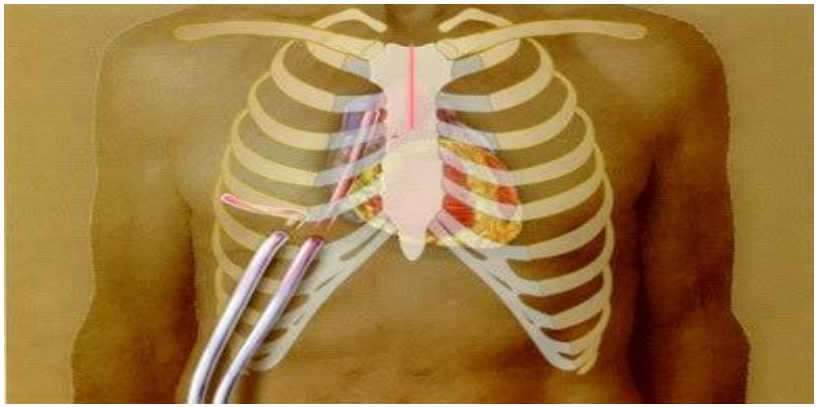
In young patients presenting with a moderate or large spontaneous primary pneumothorax, percutaneous needle aspiration of air is a simple and well-tolerated alternative to intercostal tube drainage, with a 60-80% chance of avoiding the need for a chest drain.

() Secondary pneumothorax: In these patients, the success rate of aspiration is much lower, and intercostal tube drainage and inpatient observation are usually required, particularly in those over 50 years old and those with respiratory compromise.

CHEST TUBE



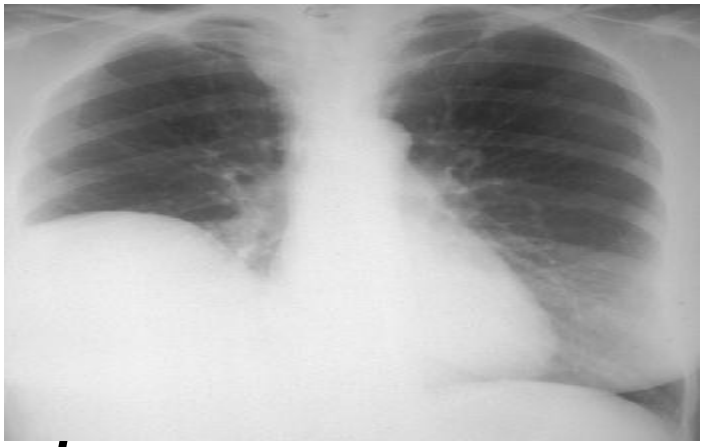
- intercostal drains are inserted in the 4th, 5th or 6th intercostal space in the mid-axillary line, connected to an underwater seal or one-way Heimlich valve, and secured firmly to the chest wall.
- Clamping of an intercostal drain is potentially dangerous and rarely indicated.
- The drain should be removed 24 hours after the lung has fully reinflated and bubbling stopped.
- Continued bubbling after 5-7 days is an indication for surgery.
- If bubbling in the drainage bottle stops before full reinflation, the tube is either blocked, kinked or displaced.
- Supplemental oxygen may speed resolution as it accelerates the rate at which nitrogen is reabsorbed by the pleura.



- Patients with a closed pneumothorax should be advised not to fly as the trapped gas expands at altitude.
- guidelines suggest that a wait of 1-2 weeks, with confirmation of full inflation prior to flight, is prudent.
- Patients should also be advised to stop smoking and informed about the risks of a recurrent pneumothorax.

Recurrent spontaneous pneumothorax

- After primary spontaneous pneumothorax, recurrence occurs within a year of either aspiration or tube drainage in approximately 25% of patients, and should prompt definitive treatment.
- Surgical pleurodesis is recommended in all patients following a second pneumothorax and should be considered following the first episode of secondary pneumothorax if low respiratory reserve makes recurrence hazardous.
- Pleurodesis can be achieved by pleural abrasion or parietal pleurectomy at thoracotomy or thoracoscopy.



Causes of elevation of a hemidiaphragm

- Phrenic nerve paralysis
- Eventration of the diaphragm
- Decrease in volume of one lung (e.g. lobectomy, unilateral pulmonary fibrosis)
- Severe pleuritic pain
- Pulmonary infarction
- Subphrenic abscess
- Large volume of gas in the stomach or colon
- Large tumours or cysts of the liver