Pneumothorax

Objective: To show the definition, etiology and management of Pneumothorax

Definition
Pneumothorax is the accumulation of air within the pleural space.

Classification of pneumothorax
A. Spontaneous:
   a. Primary spontaneous pneumothorax (idiopathic)
   b. Secondary spontaneous pneumothorax (secondary to any lung disease that breaches the pleura:
      1. Airway disease:
         1) Bullous disease including COAD
         2) Asthma
         3) Cystic fibrosis
         4) Hyaline membrane disease
      2. Infection:
         1) Pneumonia
         2) Lung abscess
         3) TB
      3. Neoplasm (primary and secondary)
      4. Interstitial lung disease:
         1) Sarcoidosis
         2) Collagen vascular disease
      5. Others:
         1) Pulmonary embolism
         2) Endometriosis
         3) Marfan’s syndrome
         4) Catamenial
   B. Acquired: secondary to:
      a. Iatrogenic:
         1. Central venous line insertion
         2. Needle biopsy (transthoracic or transbronchial)
      b. Barotrauma
      c. Traumatic:
Pathophysiology
Pneumothorax occurs when air enters the pleural space as a result of disruption of one of the pleural surfaces and may cross
- Visceral pleura secondary to ruptured pulmonary bleb
- Chest wall parietal pleura secondary to trauma
- Mediastinal parietal pleura secondary to airway or esophageal injury

This leads to:
- Loss of negative intrapleural pressure
- Collapse of the lung
- Positive intrapleural pressure as small as 15-20 mmHg leads to mediastinal shift

Clinical Manifestations
- There may be no symptoms
- Chest pain is the most common presenting symptom, followed by dyspnea
- Less common symptoms include non-productive cough and orthopnea
- Subcutaneous emphysema may be seen.

On examination
- Absent or diminished breath sounds is evident on auscultation
- Hyperresonance on percussion.

Investigations
Plain CXR
-The characteristic radiographic finding is absent bronchovascular markings and a faintly visible line defining the edge of the lung.
-When the lung collapses almost completely, it is visible as an irregular density attached to the hilum.

Chest CT - Scan

Other investigations like Sputum examination, arterial blood gas analysis, bronchoscopy, etc........

Complications of pneumothorax
1) Pleural effusion in 20% and of these 3% are true hemothorax
2) Respiratory failure, rarely occur in healthy individuals but is frequently encountered in elderly with COPD
3) **Empyema especially in pneumothorax secondary to abscess in the lung, TB, or ruptured esophagus**

4) **Trapped lung (failure of re-expansion) usually caused by:**
   - **Epithelialization (fibrothorax)**
   - **Bronchopleural fistula**
   - **Endobronchial obstruction that prevents aeration of part of the lung**

5) **Tension pneumothorax**

**Treatment**

1 - **Observation**
An initial, small (5% to 20%) asymptomatic pneumothorax can be observed in the hospital and monitored by daily chest radiography. Reabsorption of the pneumothorax is facilitated by the administration of supplemental oxygen.

2 - **Thoracocentesis (i.e., needle aspiration)**
- Its role is controversial.
- Small to moderate pneumothorax in a stable patient can be aspirated to hasten re-expansion of the lung and decrease symptoms

3 - **Tube thoracostomy with or without pleurodesis**
Tube thoracostomy should be performed in patients with:
- Persistent symptoms
- Unilateral pneumothorax greater than 15% of a hemithorax
- All patients who present with simultaneous bilateral pneumothoraces or previous pneumonectomy
- Those who fail observation

**Complications of tube thoracostomy**
1- Pain, when the lung reexpands, the visceral and parietal surfaces reoppose.
2- Reexpansion pulmonary edema involving the ipsilateral lung due to rapid reexpansion.
3- Trauma of intercostal neurovascular bundle.
4- Laceration of the lung.
5- Intrapulmonary or extrathoracic placement of the chest tube.
6- Infection & even empyema.
7- Trauma of the lung, diaphragm, spleen, liver & heart.
8- Others

4 - **Thoracotomy or VATS**

**Indications for either thoracotomy or VATS in pneumothorax**
1. Massive air leak preventing re-expansion of the lung.
2. Simultaneous, spontaneous & bilateral pneumothoraces.
3. Persistent air leak (>48 hours for primary spontaneous pneumothorax, >96 hours for secondary spontaneous pneumothorax).
4. Recurrent pneumothorax.
5. Previous contralateral pneumothorax or pneumonectomy.
6. First episode with occupational hazard for pneumothorax (pilot, scuba diver, parachutist).
7. Obvious or large bullae or cysts are seen in the collapsed lung.
8. Complete (100%) pneumothorax.
9. Pneumothorax associated with tension.
10. Poor cardiopulmonary reserves.
11. Complications such as empyema or hemothorax.
12. Persons living in remote areas

**Tension pneumothorax**

It occurs when intrapleural pressure rises sharply. This is due to a valvelike mechanism that allows air to enter the pleural spaces from the lung parenchyma or airway during brief episodes of markedly elevated airway pressure, as occurs during cough. Because of collapse of the lung and shift of the mediastinum, severe respiratory distress may develop, requiring emergency needle aspiration in the second intercostals space at the mid-clavicular line, followed by tube thoracostomy drainage. Physical findings of hyperresonance, absent breath sounds, and mediastinal shift away from the involved side are diagnostic. There is also distended neck vein and hypotension.