### Pneumothorax

#### Definition of a pneumothorax
- Air in the pleural space leading to lung deflation. Pneumothoraces can be divided into:
  - **Primary**: otherwise “normal” lung
  - **Secondary**: underlying lung disease e.g. COPD
  - **Tension**: mediastinal shift and respiratory compromise

#### Epidemiology of pneumothoraces
- Approximately 10 per 100,000
- Male>Female (6:1)
- > 40 years often associated with COPD
- Smoking increases the risk of pneumothorax

#### Causes of pneumothoraces
- **Spontaneous/ Primary**
  - Thought to be due to congenital weakness of a pleural bleb
- **Secondary**
  - COPD, Asthma, Lung cancer, Pulmonary Fibrosis, TB, Sarcoid, CF, PCP
  - Marfans, Ehlers Danlos, Psuedoxanthoma elasticum
- **Iatrogenic**
  - Pleural aspiration or biopsy
  - CVP or pacemaker insertion
  - CPR
- **Chest trauma**
  - Penetrating chest injury
    - Tension pneumothorax is more likely in this group
- **Intubation and ventilation**
  - Especially with high pressures used

#### Presentation of a pneumothorax
- Pleuritic chest pain and shortness of breath
  - (but note may be asymptomatic)
- **Signs**:
  - Tachycardia and tachypnoea
  - Cyanosis
  - Tracheal deviation
  - Hyper-resonance to percussion
  - Increased breath sounds
  - In tension pneumothorax:
    - Raised JVP, pulsus paradoxus, marked tracheal deviation, Tachycardia >135, hypotension, distended neck veins

#### Differential diagnosis of a pneumothorax
- Pleural effusion
- PE
- Pneumonia
- Pericarditis

**Investigation of a pneumothorax**
- **ABG**
  - Hypoxia, severity dependent on size of pneumothorax and respiratory reserve
- **CXR**
  - Will show characteristic rim around outside of lung
  - Size can be estimated by depth of rim at hilum
    - 2cm is approximately equal to 50% lung volume lost
  - In supine films, look for deep costophrenic sulci, darkened lung field and prominent heart border.
- **USS Chest**
  - Can be helpful to look for iatrogenic pneumothorax following US guided drain insertion/pleural biopsy
- **CT**
  - Can detect occult pneumothoraces
  - Can be useful to differentiate bullae from pneumothorax
  - To look for causes of persistent leak in patients with non-resolving pneumothorax

**Staging of pneumothorax**
- **Small vs Large**
  - > 2cm rim between lung margin and chest wall at the level of the hilum

**Management of a pneumothorax**
- Observation in small primary pneumothorax without significant shortness of breath.
- Patients with primary or secondary pneumothorax and significant breathlessness should undergo active intervention
  - Supportive oxygen therapy
  - Needle aspiration or chest drain (see BTS algorithm below)
  - Suction
    - High volume low pressure suction systems
    - Risk of re-expansion pulmonary oedema

**Further management of a pneumothorax**
- **Surgical**
  - Those with persistent air leak at 48 hours should be discussed with thoracic surgeons.
  - Surgical management options include:
    - Open thoracotomy and pleurectomy (give lowest recurrence rates)
    - VATs with pleurectomy and pleural abrasion (better tolerated)
    - Surgical chemical pleurodesis
- **Medical pleurodesis**
  - Considered for patients refusing/not fit enough for surgery
- **Ambulatory management with Heimlich valve**
- **Smoking cessation**
Treatment of tension pneumothorax (a medical emergency):
- High-flow oxygen
- Emergency needle decompression
  - Large cannula, second intercostal space (just above third rib), mid-clavicular line
  - Converts tension to a simple pneumothorax
- Followed by chest drain insertion for definitive management

Complications of pneumothoraces
- Respiratory failure
- Conversion to tension pneumothorax
- Bronchopleural fistula
- Recurrence

Prognosis in pneumothorax
- Good if treated but recurrence is common: up to 30% overall.
- Mortality low, but increased in secondary versus primary pneumothorax

Common questions concerning pneumothorax:
- When can patients fly after a pneumothorax?
  - Only following complete resolution of a pneumothorax
- What about diving post pneumothorax?
  - Should be permanently avoided unless the patient has undergone bilateral surgical
pleurectomy and has normal lung function and CT chest scan postoperatively.

- What is catamenial pneumothorax?
  - Pneumothorax in women at the time of menstruation, often due to endometriosis
  - 90% in right lung
  - Treatment involves surgical and hormone therapy