Chapter– 3.1 COPD

Topic: Chronic Obstructive Pulmonary Disease (COPD)

3.1 Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a progressive respiratory condition characterized by airflow limitation and respiratory symptoms.

Etiopathogenesis: COPD is primarily caused by exposure to harmful gases and particles, most commonly cigarette smoke. Other risk factors include occupational exposure to dust and chemicals, indoor and outdoor air pollution, and genetic predisposition. Chronic inflammation and structural changes in the airways and lung tissue contribute to the development and progression of COPD.

3.2 Types

Types: COPD is commonly classified into two main types based on the predominant pathophysiological features:

1. **Chronic bronchitis:** Characterized by chronic inflammation and narrowing of the airways, excessive mucus production, and cough with sputum production.
2. **Emphysema:** Characterized by destruction of the alveolar walls, leading to loss of lung elasticity and airspace enlargement, resulting in airflow limitation and gas trapping.

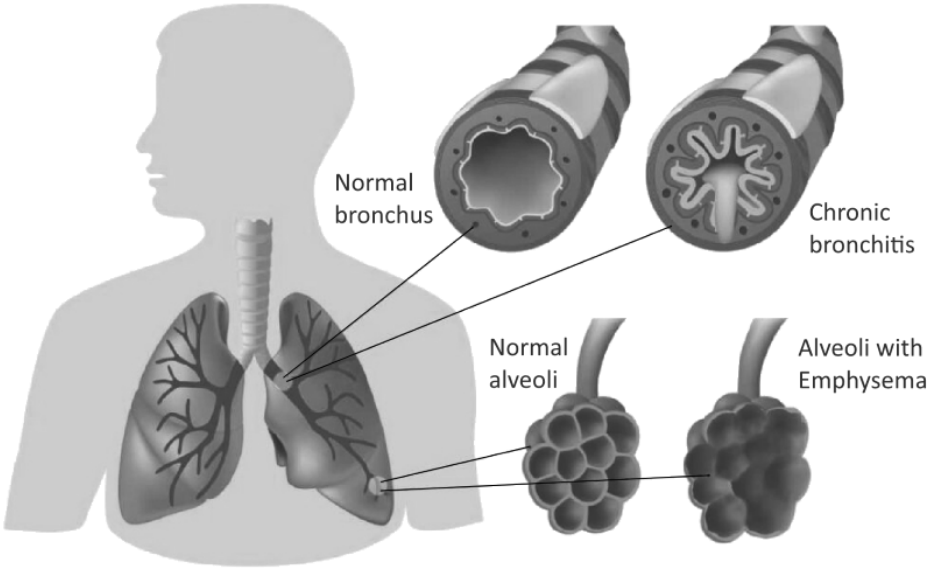

Fig 3.1 Normal vs Chronic bronchitis

3.3 Symptoms

Common symptoms of COPD include:

- Chronic cough
- Excessive sputum production
- Chest tightness
- Shortness of breath (dyspnea), especially during physical exertion
- Wheezing
- Fatigue
- Recurrent respiratory infections

3.4 Diagnostic Test

Diagnosis of COPD involves:

- Spirometry used to measures airflow limitation and assesses the severity of obstruction.
- Chest X-ray or CT scan used to detect structural abnormalities and evaluates for signs of emphysema or bronchitis.
- Arterial blood gas analysis.
- Medical history and physical examination.

3.5 Management

The management of COPD involves:

A. Pharmacological Management of COPD: Pharmacological treatment of COPD aims to relieve symptoms, reduce exacerbations, improve lung function, and enhance quality of life. Common medications used in the management of COPD include:

1. Bronchodilators:

- **Short-acting beta2-agonists (SABAs): e.g.** Albuterol (salbutamol)
- **Long-acting beta2-agonists (LABAs): e.g.** Salmeterol, Formoterol, Indacaterol
- **Short-acting anticholinergics (SABAs): e.g.** Ipratropium bromide
- **Long-acting anticholinergics (LABAs): e.g.** Tiotropium, Umeclidinium, Aclidinium

Bronchodilators relax smooth muscles in the airways, leading to bronchodilation and improved airflow. LABAs provide sustained bronchodilation over 12-24 hours and are used for maintenance therapy, while SABAs are used for quick relief of symptoms.

PHBEducation

2. Inhaled Corticosteroids (ICS): e.g. Fluticasone, Budesonide, Beclomethasone; reduces airway inflammation and mucus production, thereby decreasing exacerbations and improving lung function. They are often used in combination with LABAs or LABA/LAMA combinations in patients with frequent exacerbations or severe COPD.

3. Combination Inhalers:

- **LABA/ICS combinations: e.g.** Fluticasone/Salmeterol, Budesonide/Formoterol
- **LABA/LAMA combinations: e.g.** Indacaterol/Glycopyrronium, Formoterol/Aclidinium

  Combination inhalers provide both bronchodilation and anti-inflammatory effects in a single device, simplifying treatment regimens and improving adherence.

4. Phosphodiesterase-4 (PDE-4) Inhibitors: e.g. Roflumilast; reduce inflammation and improve lung function by inhibiting the breakdown of cyclic adenosine monophosphate (cAMP) within cells.

5. Mucolytics: e.g. N-acetylcysteine (NAC), Carbocysteine; help to reduce the viscosity of mucus, making it easier to expectorate and clearing airway secretions. They are used in patients with chronic bronchitis or excessive mucus production.

6. Oxygen Therapy: Supplemental oxygen therapy is indicated in patients with severe hypoxemia (low blood oxygen levels) to improve oxygenation and reduce the workload on the heart and lungs. It can improve exercise tolerance, reduce breathlessness, and prolong survival in hypoxemic COPD patients.

B. Non-Pharmacological Management: Non-pharmacological interventions play a crucial role in the management of COPD and may include:

- **Smoking cessation:** The most important intervention to slow disease progression and reduce symptoms.
- **Pulmonary rehabilitation:** Comprehensive program involving exercise training, education, and psychosocial support to improve functional capacity and quality of life.
- **Vaccinations:** Influenza and pneumococcal vaccinations to reduce the risk of respiratory infections.

3.6 Complications

Complications of COPD may include:

- Pneumonia, increased susceptibility to respiratory infections due to impaired lung defense mechanisms.
- Episodes of worsening symptoms (dyspnea, cough, sputum production) requiring hospitalization and increased mortality.
- Inability of the lungs to provide adequate oxygenation or remove carbon dioxide from the blood.
- Psychological disorders (Depression and anxiety) commonly associated with COPD due to the impact of symptoms on daily functioning and quality of life.