- A 67 year old man with history of smoking for 20 pack years presents to hospital repeatedly with cough, shortness of breath and wheezing. This time he presents again with the same symptoms. His respiratory rate is 32/minute and pulse 106/minute. He looks cachectic. You note an increased anteroposterior diameter, distant heart sounds, and expiratory wheezing.

- What is the diagnosis?

- How will you manage the patient?

CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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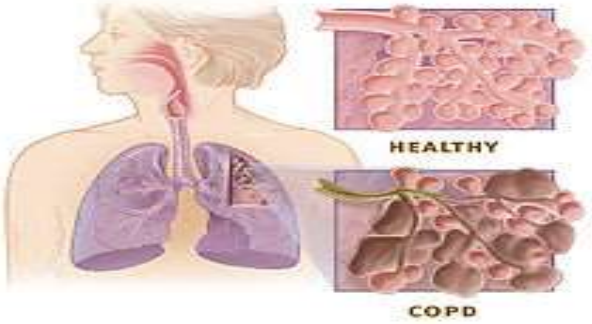
Learning Objectives

- Introduction.
- Causes.
- Risk factors.
- Pathophysiology.
- Clinical features.
- Diagnosis.
- Complications.
- Management.

Chronic obstructive pulmonary disease

- COPD is also known as chronic obstructive lung disease (COLD), chronic obstructive airway disease (COAD), chronic airflow limitation (CAL) and chronic obstructive respiratory disease (CORD).
- Chronic obstructive pulmonary disease (COPD) refers to chronic bronchitis and emphysema, a pair of two commonly co-existing diseases of the lungs in which the airways become narrowed. This leads to a limitation of the flow of air to and from the lungs causing shortness of breath.



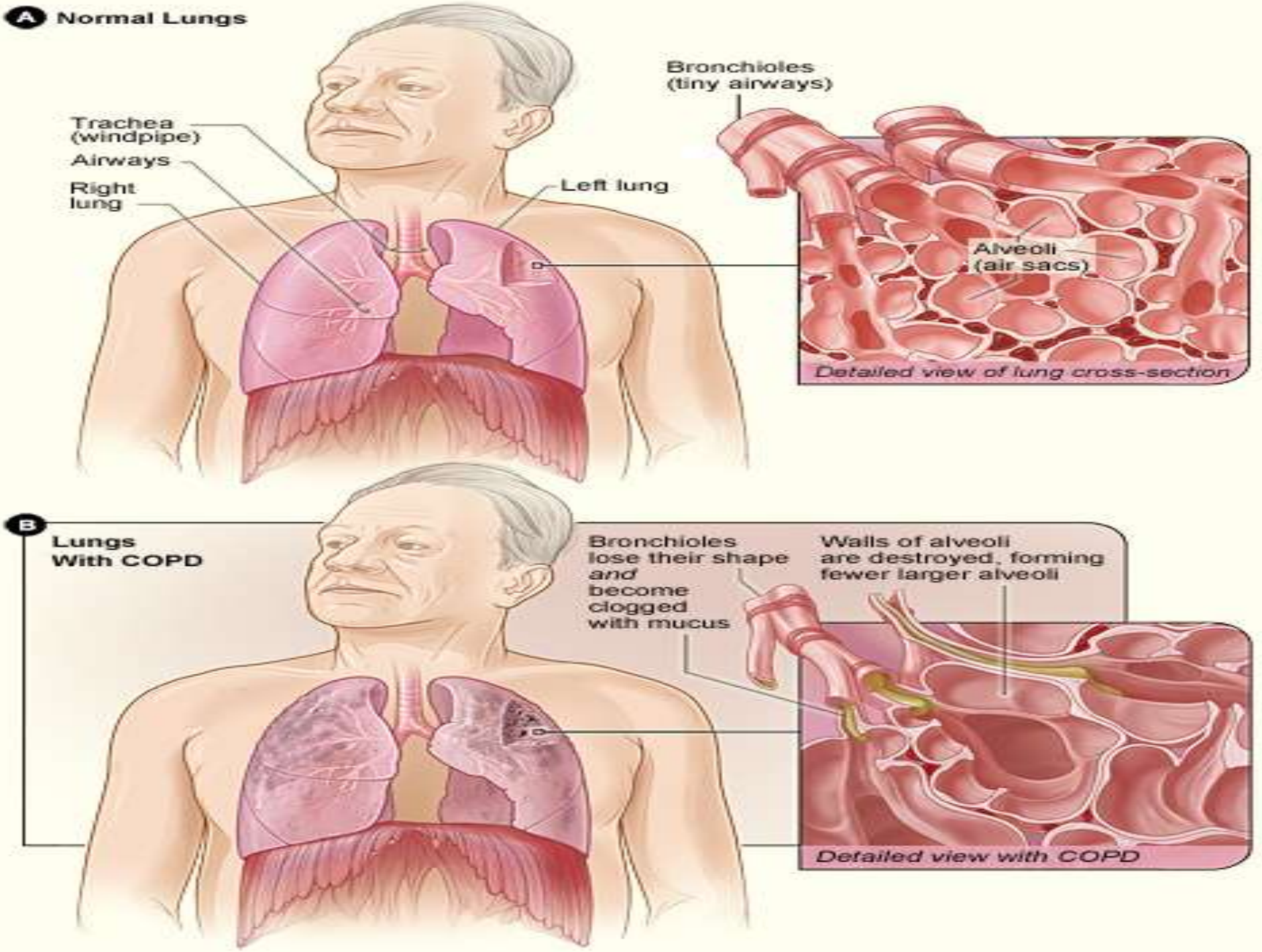
- **In COPD, less air flows in and out of the airways because of one or more of the following:**

❖ **The airways and air sacs lose their elastic quality.**

❖ **The walls between many of the air sacs are destroyed.**

❖ **The walls of the airways become thick and inflamed.**

❖ **The airways make more mucus than usual, which tends to clog them.**


A Normal Lungs
Trachea (windpipe)
Airways
Right lung
Left lung
Bronchioles (tiny airways)
Alveoli (air sacs)
Detailed view of lung cross-section
B
Lungs With COPD
Bronchioles lose their shape and become clogged with mucus
Walls of alveoli are destroyed, forming fewer larger alveoli
Detailed view with COPD

Incidence

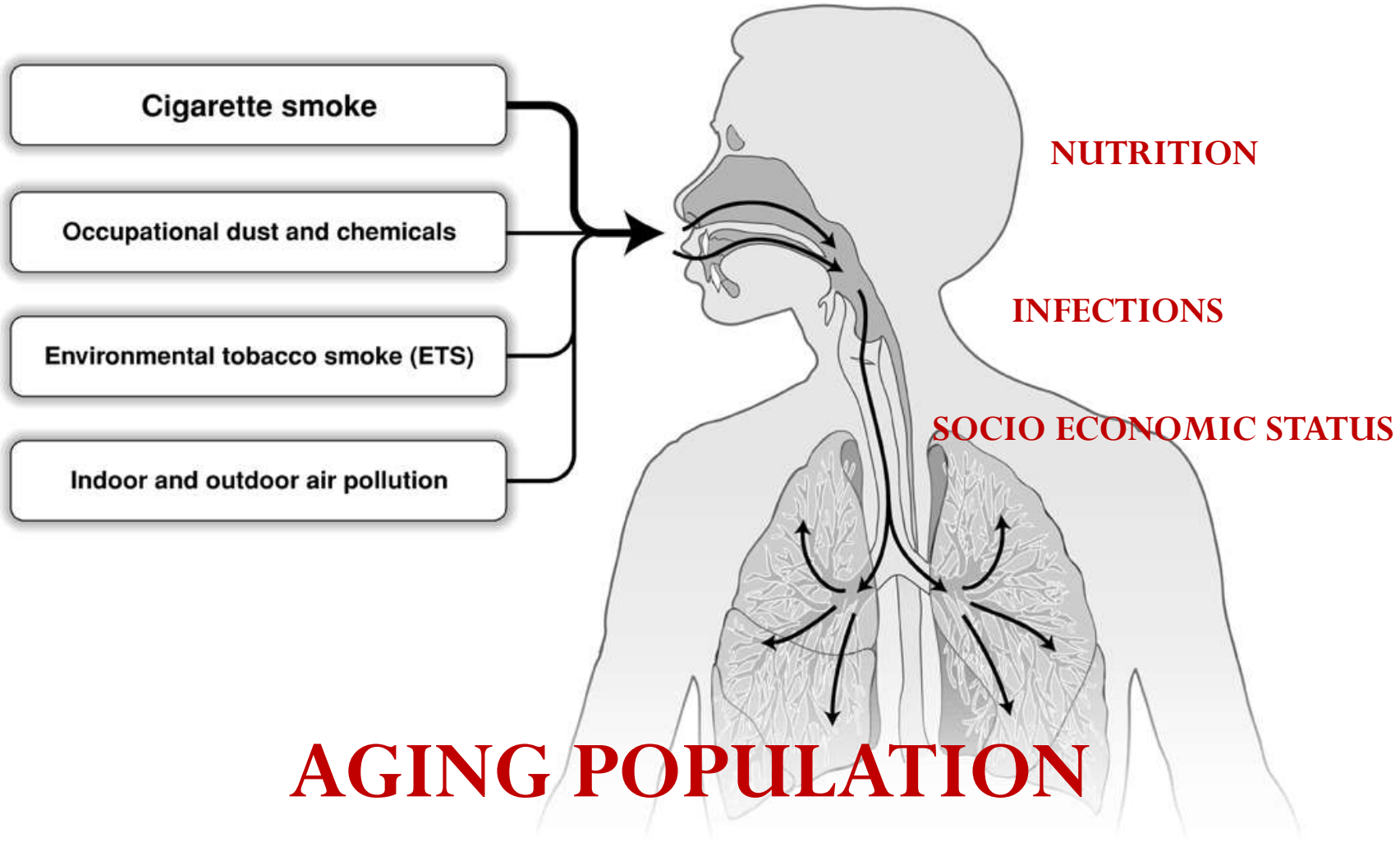
- **It is the 4th leading cause of mortality and 12th leading cause of disability in the united states.**
- **In 2020 COPD is the 3rd leading cause of death.**

Causes

- 1)Smoking.
- 2) Occupational exposures- exposure to workplace dusts found in coal mining, gold mining, and the cotton textile industry and chemicals such as cadmium, isocyanates, and fumes from welding have been implicated in the development of airflow obstruction.
- 3) Air pollution.
- 4) Sudden airway constriction in response to inhaled irritants.
- 5) Bronchial hyper-responsiveness, is a characteristic of asthma.

- *6*) **Genetics-Alpha 1-antitrypsin deficiency** is a genetic condition that is responsible for about 2% of cases of COPD. In this condition, the body does not make enough of a protein, alpha 1-antitrypsin. Alpha 1-antitrypsin protects the lungs from damage caused by protease enzymes, such as elastase and trypsin, that can be released as a result of an inflammatory response to tobacco smoke.

RISK FACTORS FOR COPD



Pathophysiology

- **Abnormal inflammatory response of the lungs due to toxic gases.**
- **Response occurs in the airways ,parenchyma & pulmonary vasculature.**
- **Narrowing of the airway takes place**
- **Destruction of parenchyma leads to emphysema.**

- **Destruction of lung parenchyma leads to an imbalance of proteinases/antiproteinases.**

(this proteinases inhibitors prevents the destructive process)

- **Pulmonary vascularchanges**

✓ **Thickening of vessels**

✓ **Collagen deposit**

✓ **Destruction of capillary beds.**

- **Mucus hypersecretion(cilia dysfunction,airflow limitation,corpulmonale(RVF))**

- **Chronic cough and sputum production**

Chronic bronchitis

- Chronic bronchitis is a chronic inflammation of the bronchi (medium-size airways) in the lungs.
- It is generally considered one of the two forms of chronic obstructive pulmonary disease (COPD), the other being emphysema.
- It is defined clinically as a persistent cough that produces sputum and mucus, for at least three months per year in two consecutive years.

- Irritants irrritate the airway

- Excess mucus production

- Inflammation

- Cause the mucus secreting glands and goblet cells to increase in number.

- Ciliary function is reduced.

- More mucus production

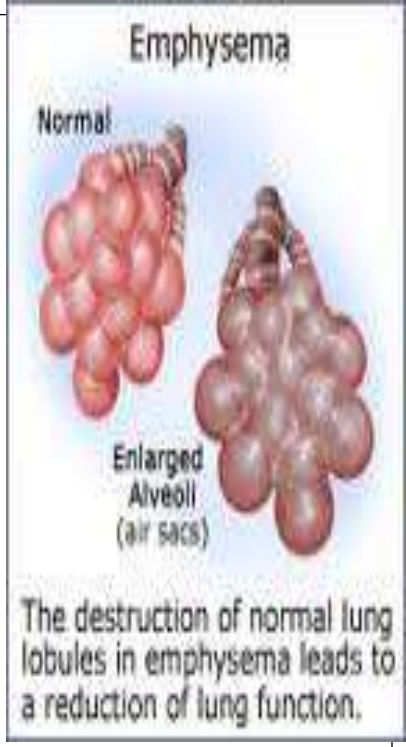
Bronchial walls become thickened and lumen narrows and mucus plug the airway

Alveoli adjacent to the bronchioles may become damaged and fibrosed.

Alter function of alveolar macrophages.

infection

Emphysema



Emphysema is defined as enlargement of the spaces distal to the terminal bronchioles, with destruction of their walls of the alveoli.

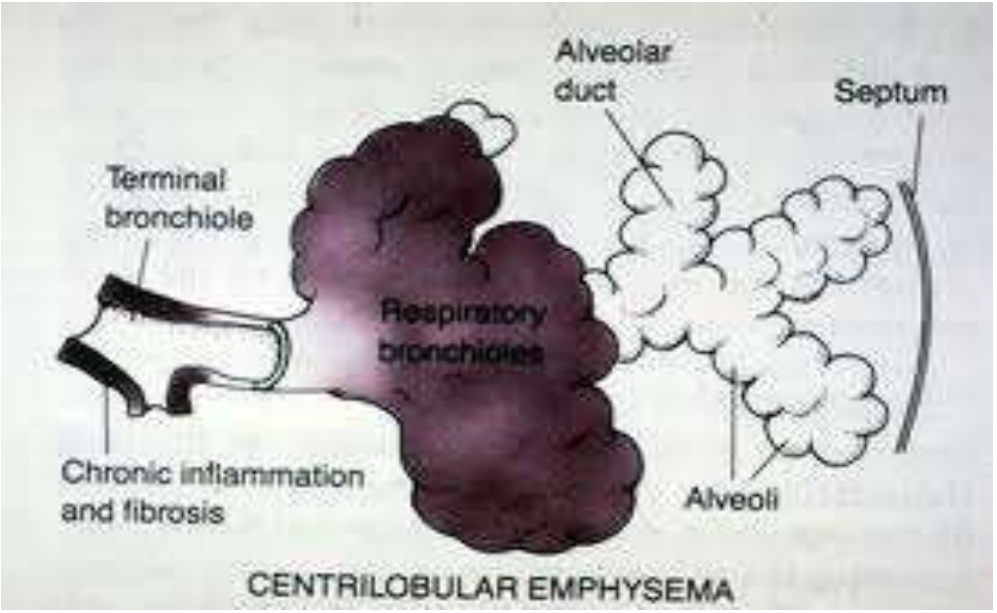
- **As the alveoli are destroyed the alveolar surface area in contact with the capillaries decreases.**
- **Causing dead spaces (no gas exchange takes place).**

- **Leads to hypoxia.**
- **In later stages:**
- **CO_2 elimination is disturbed and increase in CO_2 tension in arterial blood causing**

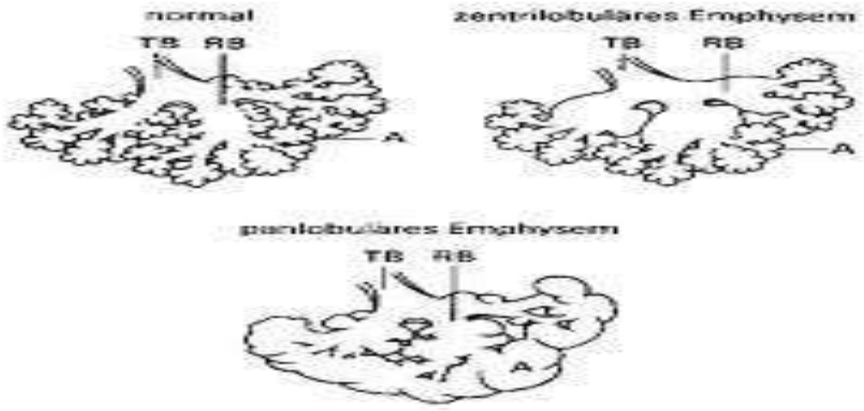
- **Respiratory acidosis**

Classification

- **Centrilobular-The respiratory bronchiole (proximal and central part of the acinus) is expanded.The distal acinus or alveoli are unchanged. Occurs more commonly in the upper lobes.**



- **Panlobular -The entire respiratory acinus, from respiratory bronchiole to alveoli, is expanded. Occurs more commonly in the lower lobes, especially basal segments, and anterior margins of the lungs.**



CLINICAL FEATURES

- Symptoms include cough, sputum, dyspnoea, and wheeze.
- Signs: Pink puffers & blue bloaters (2 ends of a spectrum).

  Patients who have chronic cough and sputum production with a history of exposure to risk factors should be tested for airflow limitation, even if they do not have dyspnea.

SYMPTOMS TYPICAL OF COPD

- History of heavy smoking for many years.
- Cough and sputum production for many years.
- Cough often present only on waking at first; later cough occurs throughout the day.
- Sputum usually mucoid – becomes purulent with exacerbation of disease, but not excessive.
- Cough and sputum often worse in winter due to infection.
- Insidious onset of breathlessness on exertion with wheezing or tightness of chest.

SYMPTOMS TYPICAL OF COPD (CONTD.)

- Some develop increasingly severe exacerbations of disease leading to chronic respiratory failure and heart failure – the "blue bloater' type of COPD.
- Others have little or no sputum or hypoxia at rest, but breathlessness and wheezing is severe and emphysema is prominent – the pink puffer' type of COPD. These patients are commonly underweight.
- Most patients with COPD present with a mixed pattern rather than the 'blue bloater' or 'pink puffer' extremes.

SYMPTOMS NOT TYPICAL OF COPD

- **Haemoptysis – can occur due to COPD alone, but its appearance is such a patient suggests the possibility of malignancy, which must be carefully sought.**
- **Seasonal exacerbations in spring or summer are more likely in asthma.**
- **Excellent response to bronchodilators or steroids with definite symptom-free intervals is suggestive of asthma, not COPD.**

SYMPTOMS NOT TYPICAL OF COPD (CONTD).

- **Continuous expectoration of purulent sputum is more typical of bronchiectasis than COPD.**
- **Breathlessness without productive cough or wheezing is more typical of cardiac disease or of other lung diseases such as interstitial pulmonary fibrosis.**

Difference between COPD and Asthma

- In COPD there is permanent damage to the airways. The narrowed airways are fixed, and so symptoms are chronic (persistent). Treatment to open up the airways, is therefore limited.

- In asthma there is inflammation in the airways which makes the muscles in the airways constrict. This causes the airways to narrow. The symptoms tend to come and go, and vary in severity from time to time. Treatment to reduce inflammation and to open up the airways usually works well.

- COPD is more likely than asthma to cause a chronic (ongoing) cough with sputum.

Difference between COPD and asthma (cont…)

- **Night time waking with breathlessness or wheeze is common in asthma and uncommon in COPD.**

- **COPD is rare before the age of 35 whilst asthma is common in under-35.**

PHYSICAL EXAMINATION

- Large, barrel-shaped chest.
- Prominent accessory respiratory muscles in neck.
- Low, flat diaphragm causing costal margin retractions on inspiration.
- Diminished breath sounds, distant heart sounds.
- Prolonged expiration with generalized wheezing predominantly on expiration.

PHYSICAL EXAMINATION (CONTD).

- Depressed liver, which is not enlarged.
- The 'blue bloater' type of COPD patient may also have:

  Cyanosis at rest or mild exertion.

  Oedema of ankles

  Crackles at lung bases.

  Loud second heart sound in pulmonary area (difficult to hear in COPD).
- The 'pink puffer' type of COPD patient may also have:-.

  expiratory pursed-lip breathing, thin body build and tendency to lean forward over a support to assist breathing.

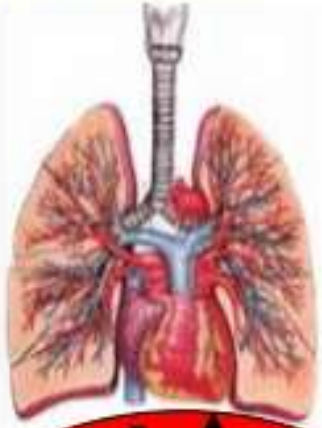
Systemic Effects of COPD

Angina

Acute coronary syndromes

Lung Infections

Lung Cancer

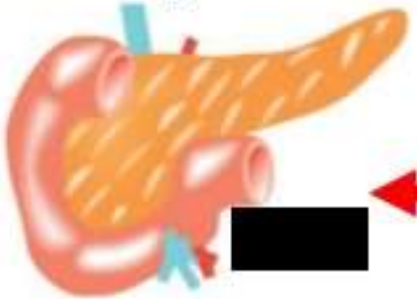


Weight loss

Muscle weakness

Diabetes

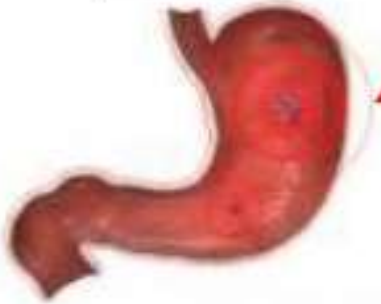
Metabolic syndrome



Osteoporosis

Systemic Inflammation Oxidatitive Stress

Peptic ulceration



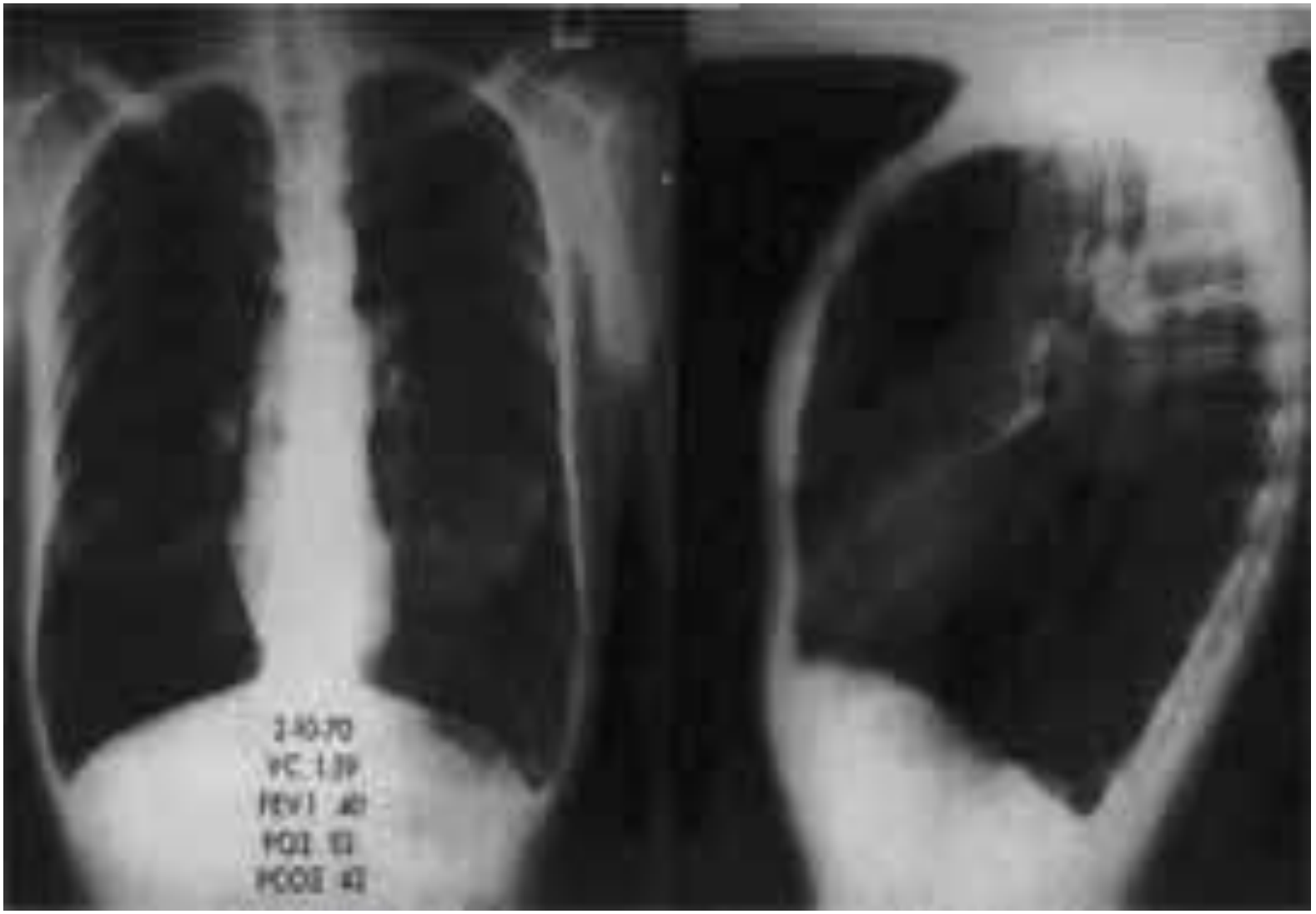
Depression

Depression

Fabbri, ERJ, 2008

Diagnosis

a) **History.**
b) **PFT.**
c) **Spirometry-to find out airflow obstruction.**
d) **ABG analysis.**
e) **HRCT/CT scan of the lung.**
f) **Screening of alpha antitrypsin deficiency.**
g) **X-ray radiography.**
h) **sputum sample showing neutrophil granulocytes** (inflammatory white blood cells) and Check for pathogenic microorganisms such as **Streptococcus spp.**



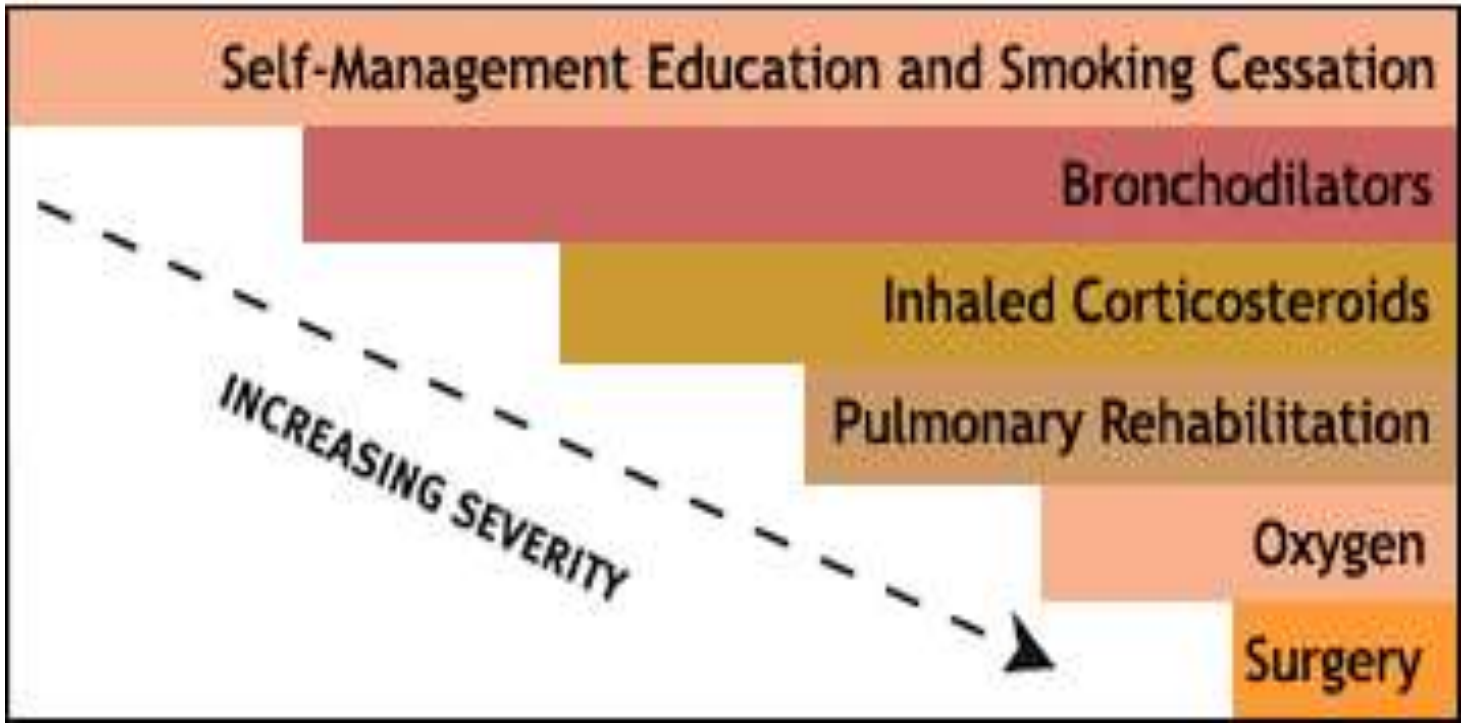
Complications

- Respiratory insufficiency
- Respiratory failure
- Pneumonia
- Pneumothorax
- Pulmonary artery hypertension.

Objectives of COPD Management

- Prevent disease progression.
- Relieve symptoms.
- Improve exercise tolerance.
- Improve health status.
- Prevent and treat exacerbations.
- Prevent and treat complications.
- Reduce mortality.
- Minimize side effects from treatment.

TREATMENT OPTIONS FOR COPD



Manage Exacerbations

Common Causes of Acute Exacerbations of COPD

Primary

- **Tracheobronchial infection**
- **Air pollution**

Secondary

- **Pneumonia**
- **Pulmonary embolism**
- **Pneumothorax**
- **Rib fractures/chest trauma**
- **Inappropriate use of sedatives, narcotics, beta-blocking agents**
- **Right and/or left heart failure or arrhythmias**

Management of Acute COPD

Controlled oxygen therapy

Start at 24-28%; vary according to ABG

Aim for a PaO2 >8.0 kPa with a rise in PaCo2 <1.5kPa

↓

Nebulized bronchodilators

Salbutamol 5mg/4h and Ipratropium 500 µg/6h

↓

Steroids

I/V hydrocortisone 200 mg and Oral Prednisolon 30-40 mg

↓

Management of Acute COPD (Contd.)

↓

Antibiotics

Use of evidence of infection: e.g. amoxicillin 500 mg/6h P.O.

↓

Physiotherapy to aid sputum expectoration

↓

If no response: Repeat nebulizers and consider I/V aminophylline

↓

Management of Acute COPD (Contd.)

↓

If no response:

1. **Consider nasal intermittent positive pressure ventilation if respiratory rate >30 or pH <7.35. I is delivered by nasal mask and a flow generator**

↓

2. **Consider intubation2 & ventilation if pH<7.26 and PaCO2 is rising**

↓

3. **Consider respiratory stimulant drug e.g. doxapram 1-2 mg/min IV. SE: agitation, confusion, tachycardia, nausea**

Only for patients who are not suitable for mechanical ventilation

A short – term measure only

Management of complications

- Acute exacerbations.
- Chronic respiratory failure
- Acute respiratory failure
- COR pulmonale

PULMONARY REHABILITATION

1. **Education about the disease process.**
2. **Breathing retraining.**
3. **Exercise training.**
4. **Proper use of mediations and oxygen.**
5. **Nutritional support.**
6. **Psychological support.**

Future trends

- New technologies i.e. (NIPPV)
- Early detection.
- New therapies:
  1. α_1– antitrypsin replacement therapy.
  2. New anticholonergics. i.e. Tiotropium bromide .
  3. Enzyme/mediator inhibitors i.e. Specific neutrophil elastase inhibitors.
  4. Anti-inflammatory treatment i.e. phosphodiesterase (PDE) type 4 inhibitors.

SELF MANAGEMENT OF COPD

- TAKEYOUR MEDICATIONS REGULARLY.

- EXERCISE REGULARLY EVERYDAY OR ELSE ATLEAST 4 OUT OF 7 DAYS.

REMEMBER TAKE YOUR VACCINATION REGULARLY

STAY AWAY FROM INFECTIONS BY MAINTAINING GOOD HYGIENE

QUIT SMOKING

EAT A REGULAR BALANCED DIET

DRINK PLENTY OF PLAIN FRESH WATER ATLEAST 1.5L/DAY

DRINK CAFFEINATED DRINKS AND ALCOHOL IN MODERATION

GET PLENTY OF SLEEP

Questions

- What is emphysema?

- What is Chronic Bronchitis?

- What are the examination findings in patients with COPD?

- How will you manage a patient with COPD?

THANK YOU!