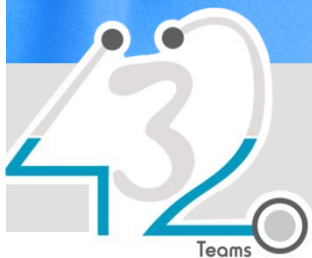


MEDICINE

432 Team

11

COPD and Bronchiectasis



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COLOR GUIDE: • Females' Notes • Males' Notes • Important • Additional

Objectives

1. Definition of COPD and Bronchiectasis.
2. Clinical and radiological diagnosis.
3. Differential diagnosis.
4. General outline of management.

The lecture's content was taken from **Davidson's Principles and Practice of Medicine page 673-679** and **Step Up to Medicine page 69-74 / + 77**

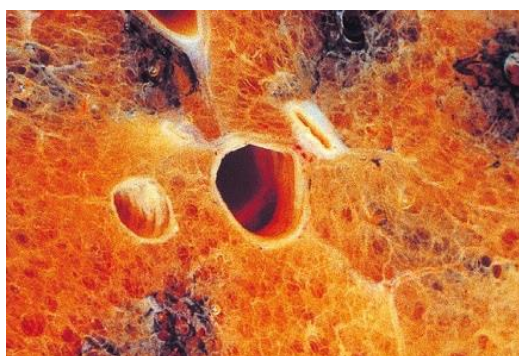
Chronic obstructive pulmonary disease (COPD)

COPD is defined as a preventable and treatable lung disease with some significant extrapulmonary effects that may contribute to the severity in individual patients.

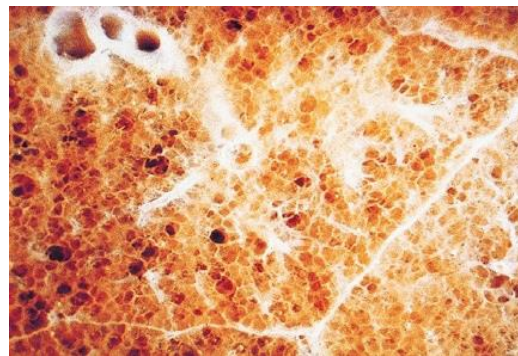
There are two classic types of COPD:

1- Chronic bronchitis: cough and sputum on most days for at least 3 consecutive months for at least 2 successive years.

2-Emphysema: abnormal permanent enlargement of the airspaces distal to the terminal bronchioles, accompanied by destruction of their walls and without obvious fibrosis.



A

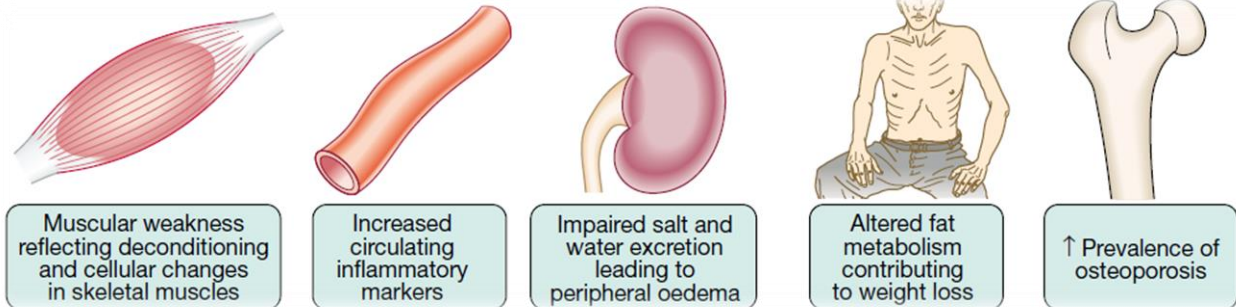


B

A: Normal lung. **B:** Emphysematous lung showing gross loss of the normal surface area available for gas exchange.

Extrapulmonary manifestations:

- 1- Impaired nutrition.
- 2- Weight loss.
- 3- Skeletal muscle dysfunction.



Aetiology of COPD:

1- Cigarette smoking:

- Represents the most significant risk factor for COPD because it increases the number of activated PMNs "**Polymorphonuclear Neutrophils**" and macrophages and increases oxidative stress in the lung by free radical production.

2- Biomass solid fuel fires:

- Wood, animal dung, crop residues and coal lead to high levels of indoor air pollution.

3- Occupation.

4- Low birth weight:

- May reduce maximally attained lung function in young adult life.

5- Lung growth:

- Childhood infections or maternal smoking may affect growth of lung during childhood, resulting in a lower maximally attained lung function in adult life.

6- Infections:

- Recurrent infection may accelerate decline in FEV1.

7- Nutrition:

- Role as independent risk factor unclear.

Clinical features:

COPD should be suspected in any patient over the age of 40 years who presents with symptoms of chronic bronchitis and/or breathlessness. Important differential diagnoses include chronic **asthma, tuberculosis, bronchiectasis and congestive heart failure**.

1. Symptoms:

- Any combination of cough, sputum production and dyspnea.
- The presentation depends on the **relative contributions of chronic bronchitis and emphysema**. Most patients have features of both.

2. Signs:

- A. **Prolonged forced expiratory time**. Timed full exhalation of vital capacity ≥ 6 seconds (evidence for obstruction with 75% sensitivity).
- B. During auscultation, **end-expiratory wheezes***¹ on forced expiration, decreased breath sounds, and/or **inspiratory crackles***².
- *¹(<http://www.easyauscultation.com/cases?coursecaseorder=8&courseid=202>)
- *²(<http://www.easyauscultation.com/cases?coursecaseorder=11&courseid=202>)
- C. Tachypnea, tachycardia.
- D. Cyanosis.
- E. Use of accessory respiratory muscles.
- F. Hyperresonance on percussion.
- G. Signs of cor pulmonale ("alteration in the structure and function of the right ventricle caused by a primary disorder of the respiratory system" MedScape)

Note: Finger clubbing is not a feature of COPD and should trigger further investigation for lung cancer, bronchiectasis or fibrosis.

Investigations:

There are no reliable radiographic signs that correlate with the severity of airflow limitation, a **chest X-ray** is essential to identify alternative diagnoses such as **cardiac failure**, other complications of smoking such as lung cancer, and the presence of bullae. A full blood count is useful to exclude **anemia** or document **polycythemia**.

The diagnosis requires objective demonstration of airflow obstruction by **spirometry** and is established when **the post-bronchodilator FEV₁*¹ is less than 80%** of the predicted value and accompanied by **FEV₁ / FVC*² < 70%**. An FEV₁ /FVC < 70% with an FEV₁ of 80% or more suggests the presence of mild disease.

The severity of COPD may be defined according to the post-bronchodilator FEV₁ as a percentage of the predicted value for the patient's age

***1 forced** expiratory volume in the 1st sec: this measures the **speed of the flow**. (Diseased people expire air slower than normal ones → low volume in 1st sec)

***2 forced** vital capacity: **the volume of gas that can be expelled** from the lungs from a position of full inspiration –the free dictionary.

Stage	Severity	FEV ₁
I	Mild	FEV ₁ /FVC < 0.70 FEV ₁ ≥ 80% predicted
II	Moderate	FEV ₁ /FVC < 0.70 50% ≤ FEV ₁ < 80% predicted
III	Severe	FEV ₁ /FVC < 0.70 30% ≤ FEV ₁ < 50% predicted
IV	Very severe	FEV ₁ /FVC < 0.70 FEV ₁ < 30% predicted or FEV ₁ < 50% predicted plus chronic respiratory failure

Complications:

1. **Acute exacerbations** – most common causes are infection, noncompliance with therapy, are cardiac disease.
2. **Secondary polycythemia (Hct > 55% in men or >47% in women)** compensatory response to chronic hypoxemia.
3. **Pulmonary HTN and cor pulmonale** - may occur in patients with severe, longstanding COPD who have chronic hypoxemia

Management:

It is usually possible to improve breathlessness, reduce the frequency and severity of exacerbations, and improve health status and the prognosis. **“Patients should be offered an annual influenza and pneumococcal vaccinations”.**

1- Smoking cessation: Disease progression is accelerated by continued smoking and can be greatly slowed by its cessation.

2- Bronchodilators: Short acting β_2 -agonists Salbutamol and Terbutaline or the anticholinergic, ipratropium bromide, may be used for patients with **mild disease**. Longer-acting bronchodilators, such as the β_2 -agonists Salmeterol and Formoterol, or the anticholinergic tiotropium bromide, are more appropriate for patients with moderate to **severe disease**. Oral bronchodilators like Theophylline could be prescribed for patients who cannot use inhaled devices efficiently.

3- Corticosteroids: Inhaled corticosteroids (ICS) reduce the frequency and severity of exacerbations; they are currently recommended in patients with severe disease (FEV1 < 50%), it is more usual to prescribe a fixed combination of an ICS and LABA **“Long Acting Beta Agonist”**.

4- Pulmonary rehabilitation: Exercise should be encouraged at all stages and patients should be reassured that breathlessness, whilst distressing, is not dangerous.

5- Oxygen therapy: **Long-term domiciliary oxygen therapy (LTOT)** has been shown to be of significant benefit in specific patients **(patients with COPD complicated by severe hypoxemia “arterial PaO₂ less than 8.0 kPa (55 mmHg)”)**

It is most conveniently provided by an oxygen concentrator and patients should be instructed to use oxygen for a minimum of 15 hours/ day; greater benefits are seen in patients who receive > 20 hours/day. The aim of therapy is to increase the PaO₂ to at least 8 kPa (60 mmHg) or SaO₂ to at least 90%.

6- Surgical intervention: Some patients with COPD may benefit from surgical intervention.

- Young patients with large bullae compressing normal lung tissue + minimal airflow limitation + no generalized emphysema = **Bullectomy**.
- Patients with predominantly upper lobe emphysema, with preserved gas transference and no evidence of pulmonary hypertension = **lung volume reduction surgery (LVRS)**.

Chest radiographs showing a patient with COPD:

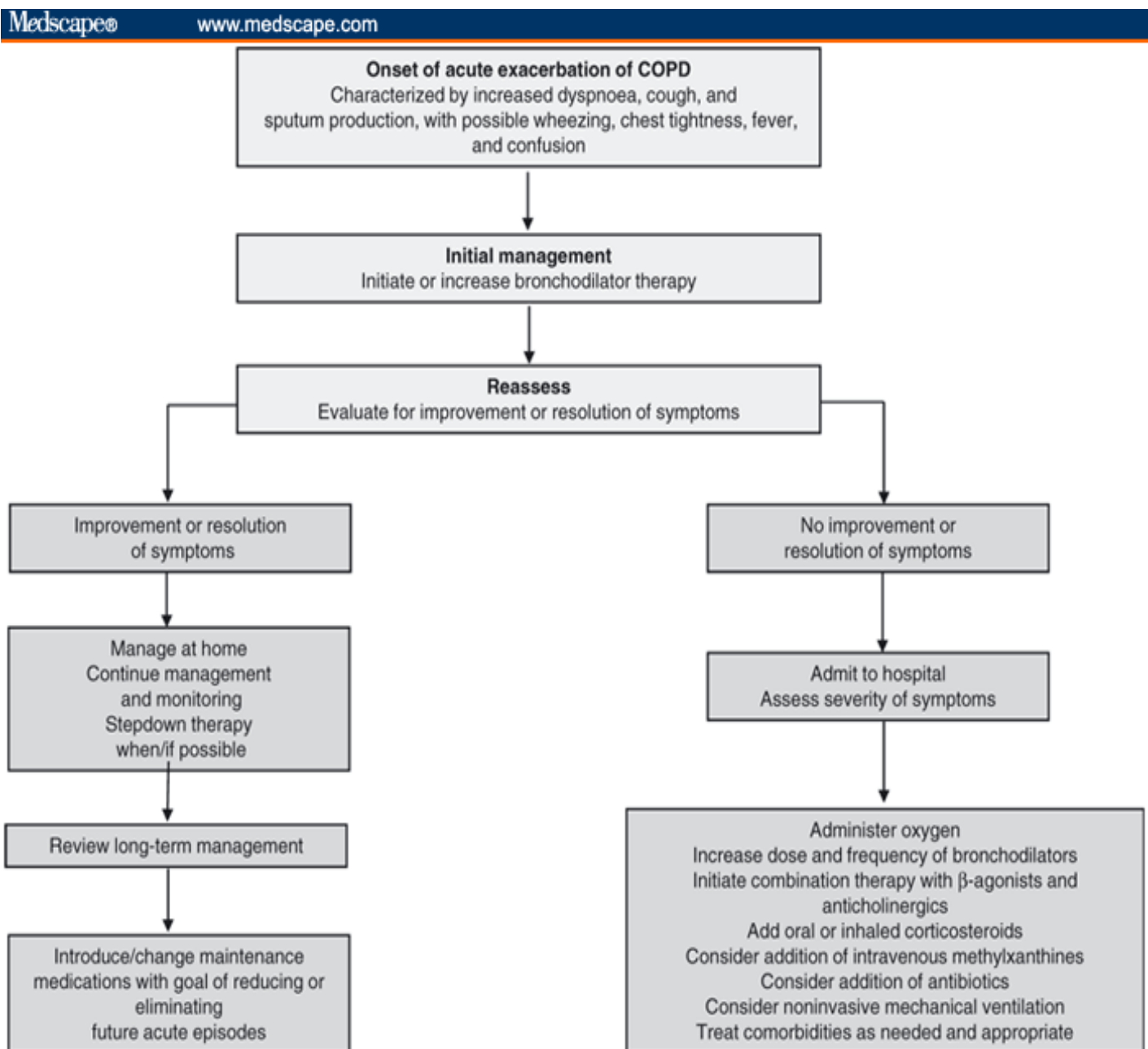


Acute exacerbations of COPD

- It is one of the complications of COPD characterized by: **increase in symptoms + deterioration in lung function and health status.**
- Triggered by bacterial (Haemophilus influenza & parainfluenzae, Streptococcus pneumonia) or viral (rhinovirus or influenza) infection or change in air quality.
- They may be accompanied by respiratory failure and/or fluid retention.

Management:

(<http://img.medscape.com/fullsize/migrated/editorial/journalcme/2008/17618/fromer.fig3.gif>)



Source: Int J Clin Pract © 2008 Blackwell Publishing Ltd.

Bronchiectasis

Bronchiectasis means abnormal dilatation of the bronchi. Chronic suppurative airway infection with sputum production, progressive scarring and lung damage are present, whatever the cause.

General characteristics:

1. Abnormal dilation and destruction of bronchial walls, onset usually in childhood.
2. Infection in a patient with airway obstruction or impaired defense or drainage mechanism precipitates the disease.
3. Less common today because modern antibiotics are used for respiratory infections.
4. Cause is identified in fewer than half of all patients.

Causes:

1- Congenital:

- Cystic fibrosis.
- Ciliary dysfunction syndromes “Primary ciliary dyskinesia, Kartagener’s syndrome”.
- Primary hypogammaglobulinaemia.

2- Acquired: children:

- Pneumonia “complicating whooping cough or measles”.
- Primary TB.
- Inhaled foreign body.

3- Acquired: adults

- Suppurative pneumonia.
- Pulmonary TB.
- Allergic bronchopulmonary aspergillosis complicating asthma.
- Bronchial tumors.

Clinical features:

1- Symptoms:

A –Cough: chronic productive cough due to accumulation of pus in dilated bronchi.

B – Pneumonia and pleurisy: due to inflammatory changes in lung and pleura surrounding dilated bronchi when spread of infection occurs: fever, malaise and increased cough and sputum volume, which may be associated with pleurisy. Recurrent pleurisy in the same site often occurs in bronchiectasis.

C -Hemoptysis: due to rupture of blood vessels near bronchial wall surfaces.

D –Dyspnea.

E -Poor general health: When disease is extensive and sputum persistently purulent, there may be associated weight loss, anorexia, lassitude, low-grade fever, and failure to thrive in children.

2- Signs:

Physical signs in the chest may be unilateral or bilateral. If the bronchiectatic airways do not contain **secretions** and there is **no associated lobar collapse**, there are no abnormal physical signs.

When there are large amounts of **sputum** in the bronchiectatic spaces, numerous coarse crackles may be heard over the affected areas. Collapse with retained secretions blocking a proximal bronchus may lead to locally diminished breath sounds.

Diagnosis

1. High-resolution CT scan is the diagnostic study of choice.
2. PFTs “**Pulmonary Function Tests**” reveal an obstructive pattern.
3. CXR “**Chest X-ray**” is abnormal in most cases, but findings are nonspecific.
4. Bronchoscopy applies in certain cases.

CT of bronchiectasis:



This scan shows extensive dilatation of the bronchi with thickened walls in both lower lobes.

Treatment:

1. **Physiotherapy.**
2. **Antibiotics** for acute exacerbations:
Mild to moderate: Amoxicillin, Macrolide, Tetracycline, Fluoroquinolone, and 2nd generation cephalosporin.
Moderate to severe: Aminoglycoside “Gentamicin, Tobramycin”, antipseudomonal synthetic penicillin, 3rd generation cephalosporin, or Fluoroquinolone. (<http://emedicine.medscape.com/article/296961-treatment#aw2aab6b6b3>)
3. **Bronchial hygiene** is very important:
 - a. Hydration.
 - b. Chest physiotherapy (postural drainage, chest percussion) to help remove the mucus.
 - c. Inhaled bronchodilators.
4. **Surgical treatment:** Excision of bronchiectatic areas is only indicated in a small proportion of cases. These are usually young patients in whom the bronchiectasis is unilateral and confined to a single lobe or segment on CT.

SUMMARY

- 1- The most risk factor of COPD is smoking.
- 2-COPD typically refers to two lung diseases -- chronic bronchitis and emphysema. A person with COPD may have one or the other, but most people with COPD have both
- 2-FEV1 is the amount of air that can be forced out of the lungs in 1 second. The lower the FEV1, the more difficulty one has breathing.
- 3- FEV1/FVC ratio less than 0.70 indicate airway obstruction.
- 4- COPD leads to chronic respiratory acidosis with metabolic alkalosis as compensation.
- 5- Smoking cessation and home oxygen therapy are only interventions shown to lower mortality.
- 6- β -Blockers are generally contraindicated in acute COPD.
- 7- In many patients with COPD, oxygen levels decrease during sleep.
- 8- The main goal in treating bronchiectasis is to prevent the complications of pneumonia and hemoptysis.

Questions

1) What hinders early diagnosis of COPD?

- a) People compensate for breathing problems.
- b) Symptoms develop slowly.
- c) Symptoms may seem to be part of natural aging
- d) All of the above.

2) Which of the following is a symptom of COPD?

- a) Severe headaches.
- b) Clogged sinuses.
- c) Excess sputum.
- d) All of the above.

3) COPD cuts the airflow in the lungs because?

- a) Bronchial tubes become inflamed and thickened
- b) Walls between air sacs are destroyed
- c) Either of the above
- d) Neither of the above

4) What will you see in a CT scan of bronchiectasis?

- You can see dots and nodules that are dilated airways that are filled with mucus plugs

432 Medicine Team Leaders

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Answers:

1st Questions: d

2nd Questions: c

3rd Questions: c