

Obstructive Lung diseases 1

(airway)

Diffuse pulmonary disease in which expiratory obstruction may result from anatomic airway narrowing, classically observed in asthma, or from loss of elastic recoil, characteristic of emphysema.

OBSTRUCTIVE

vs

RESTRICTIVE

characterized by an increase in resistance to air flow caused by partial or complete obstruction at any level. -

characterized by reduced expansion of lung parenchyma and decreased total lung capacity.

The major diffuse obstructive disorders are :

- Emphysema.
- chronic bronchitis.
- Bronchiectasis.
- asthma.

} COPD

PULMONARY FUNCTION TESTS (PFT)



are noninvasive tests that show how well the lungs are working.

Spirometry. A spirometer is a device with a mouthpiece hooked up to a small electronic machine.

The tests measure lung volume, capacity, rates of flow, and gas exchange.

Forced vital capacity (FVC). This is the amount of air exhaled forcefully and quickly after inhaling as much as you can.

Forced expiratory volume (FEV). This is the amount of air expired during the first, second, and third seconds of the FVC test.

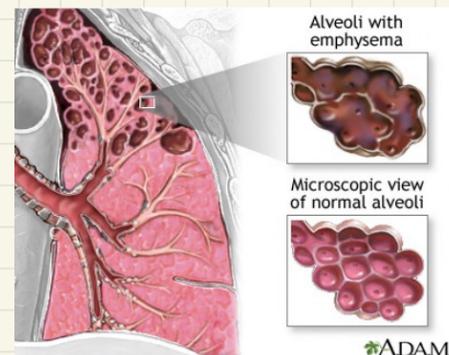
Table 13.1 Disorders Associated With Airflow Obstruction: The Spectrum of Chronic Obstructive Pulmonary Disease

Clinical Entity	Anatomic Site	Major Pathologic Changes	Etiology	Signs/Symptoms
Chronic bronchitis	Bronchus	Mucous gland hypertrophy and hyperplasia, hypersecretion	Tobacco smoke, air pollutants	Cough, sputum production
Bronchiectasis	Bronchus	Airway dilation and scarring	Persistent or severe infections	Cough, purulent sputum, fever
Asthma	Bronchus	Smooth muscle hypertrophy and hyperplasia, excessive mucus, inflammation	Immunologic or undefined causes	Episodic wheezing, cough, dyspnea
Emphysema	Acinus (alveoli)	Air space enlargement, wall destruction	Tobacco smoke	Dyspnea
Small airway disease, bronchiolitis*	Bronchiole	Inflammatory scarring, partial obliteration of bronchioles	Tobacco smoke, air pollutants	Cough, dyspnea

*Can be present in all forms of obstructive lung disease or by itself.

EMPHYSEMA

characterized by permanent enlargement of the air spaces distal to the terminal bronchioles, accompanied by destruction of their walls without significant fibrosis



parameter	Obstructive disease	Restrictive disease
FVC	normal or slightly decreased	decreased
FEV1	decreased	decreased or normal
ratio of FEV to FVC	decreased	normal

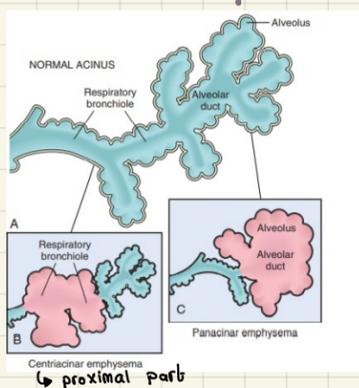
There are four major types of emphysema:

1. centriacinar

The distinctive feature is that the central or proximal parts of the acini, formed by respiratory bronchioles, are affected, while distal alveoli are spared.

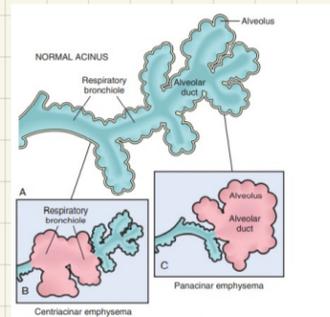
The lesions are more common and severe in the upper lobes, particularly in the apical segments.

This type of emphysema is most common in cigarette smokers, often in association with chronic bronchitis.



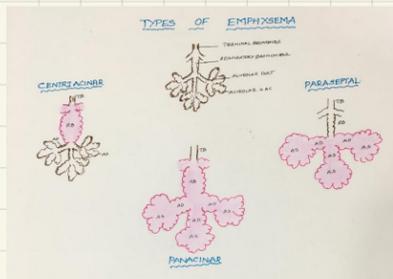
2. Panacinar (panlobular) emphysema:

- The acini are uniformly enlarged, from the level of the respiratory bronchiole to the terminal blind alveoli.
- panacinar emphysema occurs more commonly in the lower lung zones and is associated with alpha-1-anti-trypsin deficiency.



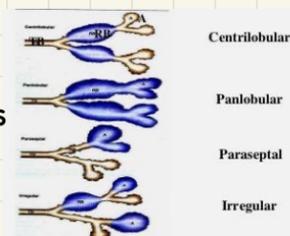
3. Distal acinar (paraseptal) emphysema:

- The proximal portion of the acinus is normal but the distal part is primarily involved.
- The emphysema is more striking adjacent to the pleura, along the lobular connective tissue septa, and at the margins of the lobules.
- It occurs adjacent to areas of fibrosis, scarring, or atelectasis and is usually more severe in the upper half of the lungs



4. Irregular emphysema:

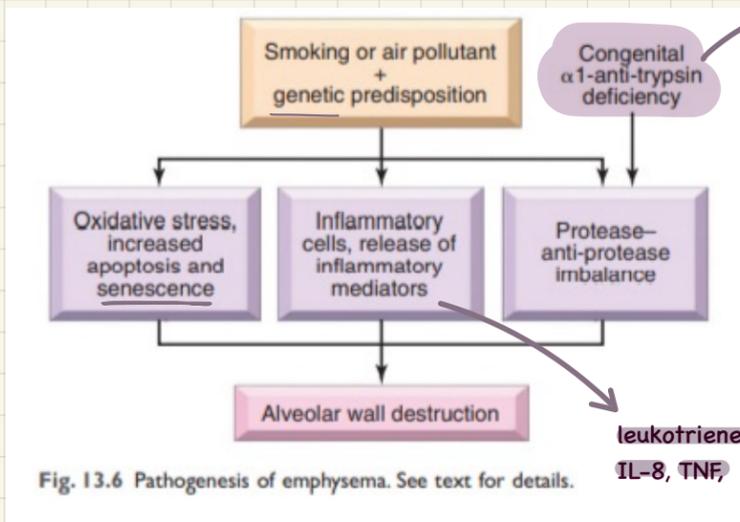
- The acinus is irregularly involved, is almost invariably associated with scarring, such as that resulting from healed inflammatory diseases.
- Although clinically asymptomatic, this may be the most common form of emphysema



PATHOGENESIS

bacterial and/or viral infections cause acute exacerbations.

most common bacterial cause of acute exacerbation?
 • H. influenzae
 • Moraxella catarrhalis



- α 1-anti-trypsin, normally present in serum, tissue fluids, and macrophages, is a major inhibitor of proteases (particularly elastase) secreted by neutrophils during inflammation.
- α 1-anti-trypsin is encoded by a gene in the proteinase inhibitor (Pi) locus on chromosome 14.

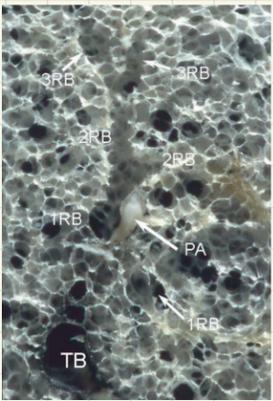
• Protease-mediated damage of extracellular matrix has a central role in the airway obstruction seen in emphysema.

• Small airways are normally held open by the elastic recoil of the lung parenchyma, and the loss of elastic tissue in the walls of alveoli that surround respiratory bronchioles reduces radial traction and thus causes the respiratory bronchioles to collapse during expiration

MORPHOLOGY

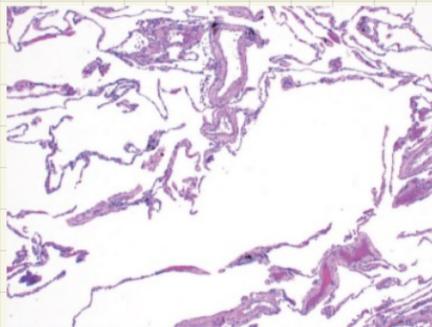
Gross:

Hyperinflation or ballooning due to entrapment of the air from airway obstruction



Histology

marked enlargement of the air spaces, with destruction of alveolar septa but without fibrosis



CLINICAL FEATURES

- Dyspnea.
- In patients with underlying chronic bronchitis or chronic asthmatic bronchitis, cough and wheezing may be the initial complaints.
- Weight loss.

- The classic presentation of emphysema with:
- 1. no "bronchitic" component is one in which the patient is barrel-chested and dyspneic, with obviously prolonged expiration, sitting forward in a hunched-over position, called "pink puffers."

↓
 $\sqrt{CO_2}$ retention due to



- 2. With pronounced chronic bronchitis and a history of recurrent infections. Dyspnea usually is less prominent, and in the absence of increased respiratory drive the patient retains carbon dioxide, becoming hypoxic and often cyanotic "blue bloaters."

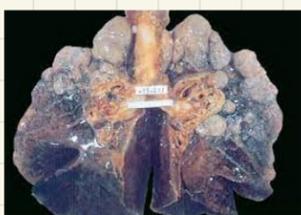


conditions related to emphysema

1. Compensatory emphysema:

- describes the dilation of residual alveoli in response to loss of lung substance elsewhere, such as occurs after surgical removal of a diseased lung or lobe.

3. Bullous emphysema refers to any form of emphysema that produces large subpleural blebs or bullae (spaces >1 cm), on occasion they may rupture, leading to pneumothorax



2. Obstructive overinflation refers to

expansion of the lung due to air trapping. A common cause is subtotal obstruction of an airway by a tumor or foreign object.

4. Mediastinal (interstitial) emphysema:

• is caused by entry of air into the interstitium of the lung, from where it may track to the mediastinum and sometimes the subcutaneous tissue.

• It may occur:

- spontaneously if a sudden increase in intraalveolar pressure (as with vomiting or violent coughing) produces alveolar rupture.
- with whooping cough.
- in patients on respirators who have partial bronchiolar obstruction or in individuals with a perforating injury (e.g., a fractured rib).



• (subcutaneous emphysema):