

**Figure 15-5** Schematic representation of overlap between chronic obstructive lung diseases.

smoking. In addition, small-airway disease, a variant of chronic bronchiolitis, is now known to contribute to obstruction both in emphysema and chronic bronchitis. While asthma is distinguished from chronic bronchitis and emphysema by the presence of reversible bronchospasm, some patients with otherwise typical asthma also develop an irreversible component (Fig. 15-5). Conversely, some patients with otherwise typical COPD have a reversible component. It is clinically common to label such patients as having COPD/asthma.

COPD is a major public health problem. It is the fourth leading cause of morbidity and mortality in the United States and is projected to rank fifth by 2020 as a worldwide burden of disease. There is a clear-cut association between heavy cigarette smoking and emphysema, and women and African Americans are more susceptible than other groups. About 35-50% of heavy smokers develop COPD; conversely 80% of COPD is due to smoking. Other risk factors include environmental and occupational pollutants, airway hyperresponsiveness and genetic polymorphisms.

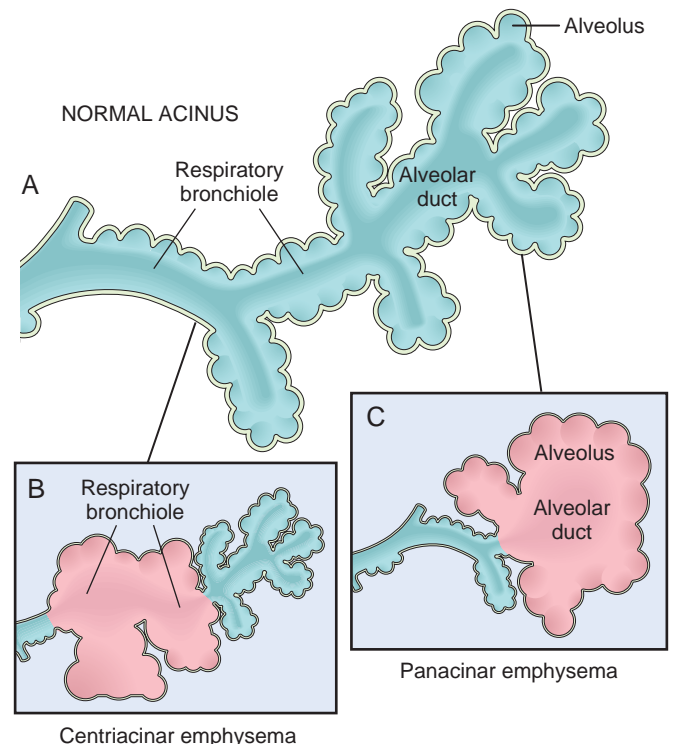
Recognizing that there is overlap between various forms of COPD, it is still useful to discuss each individually in order to highlight the pathophysiologic basis of different causes of airflow obstruction.

## Emphysema

**Emphysema is characterized by irreversible enlargement of the airspaces distal to the terminal bronchiole, accompanied by destruction of their walls without obvious fibrosis.** Small airway fibrosis (distinct from chronic bronchitis) has recently been shown to be present in patients with emphysema; it is a significant contributor to airflow obstruction. Emphysema is classified according to its anatomic distribution within the lobule. Recall that the lobule is a cluster of acini, the terminal respiratory units. Based on the segments of the respiratory units that are involved, emphysema is classified into four major types: (1) *centriacinar*, (2) *panacinar*, (3) *paraseptal*, and (4) *irregular*. Of these, only the first two cause clinically significant airflow obstruction (Fig. 15-6). Centriacinar emphysema is the

most common form, constituting more than 95% of clinically significant cases.

- **Centriacinar (centrilobular) emphysema.** In this type of emphysema the central or proximal parts of the acini, formed by respiratory bronchioles, are affected, whereas distal alveoli are spared (Figs. 15-6B and 15-7A). Thus, both emphysematous and normal airspaces exist within the same acinus and lobule. The lesions are more common and usually more severe in the upper lobes, particularly in the apical segments. Inflammation around bronchi and bronchioles is common. In severe centriacinar emphysema, the distal acinus may also be involved, making differentiation from panacinar emphysema difficult. Centriacinar emphysema occurs predominantly in heavy smokers, often in association with chronic bronchitis (COPD).
- **Panacinar (panlobular) emphysema.** In this type, the acini are uniformly enlarged from the level of the respiratory bronchiole to the terminal blind alveoli (Figs. 15-6C and 15-7B). The prefix “pan” refers to the entire acinus, not the entire lung. In contrast to centriacinar emphysema, panacinar emphysema tends to occur more commonly in the lower zones and in the anterior margins of the lung, and it is usually most severe at the bases. This type of emphysema is associated with  $\alpha_1$ -antitrypsin deficiency (Chapter 17).
- **Distal acinar (paraseptal) emphysema.** In this type, the proximal portion of the acinus is normal, and the distal part is predominantly involved. The emphysema is more striking adjacent to the pleura, along the lobular



**Figure 15-6** Clinically significant patterns of emphysema. **A**, Structure of the normal acinus. **B**, Centriacinar emphysema with dilation that initially affects the respiratory bronchioles. **C**, Panacinar emphysema with initial distention of the alveolus and alveolar duct.