

1098 triad includes pharyngitis, a tender/swollen neck, and noncavitating pulmonary infiltrates.

CNS Infections CNS infections associated with anaerobic bacteria are brain abscess, epidural abscess, and subdural empyema. Anaerobic meningitis is rare and is usually related to parameningeal collection or shunt infection. If optimal bacteriologic techniques are used, as many as 85% of brain abscesses yield anaerobic bacteria. Most anaerobic brain abscesses arise by direct extension from a site of otorhinolaryngeal infection such as otitis, sinusitis, or tooth infection. Hematogenous dissemination from a distant infected site, usually intraabdominal or pelvic, can occur. Common isolates are *Peptostreptococcus*, *Fusobacterium*, *Bacteroides*, *Prevotella*, *Propionibacterium*, *Eubacterium*, *Veillonella*, and *Actinomyces* species. Facultative or microaerophilic streptococci and coliforms are often part of a mixed infecting flora in brain abscesses.

Pleuropulmonary Infections Anaerobic pleuropulmonary infections result from the aspiration of oropharyngeal contents by patients with predisposing conditions such as dysphagia due to neurologic or esophageal disorders or transiently impaired consciousness due to conditions such as alcohol or drug abuse, seizures, head trauma, and cerebrovascular accidents. Clinical syndromes that are associated with anaerobic pleuropulmonary infection produced by aspiration include aspiration pneumonitis, which can be complicated by necrotizing pneumonia, lung abscess, and empyema. Many of these infections have an indolent course that may serve as a clinical clue differentiating them, for example, from pneumococcal pneumonia, which often presents with abrupt onset, shaking chills, and rapid progression.

The anaerobes most common in pleuropulmonary infections are indigenous to the oral cavity, especially the gingival crevice, and include pigmented and nonpigmented *Prevotella*, *Peptostreptococcus*, and *Bacteroides* species and *F. nucleatum*. Many of these infections are of mixed aerobic-anaerobic etiology, and the predominant aerobes isolated from community-acquired aspiration pneumonias are microaerophilic streptococci such as *Streptococcus milleri*. Studies using in-depth culture techniques in patients with community-acquired lung abscess showed aerobic and microaerophilic streptococci to be the most common pathogens (60% of patients) and anaerobes to be the second most common (26%). In a study on aspiration pneumonia from a long-term care facility, the most common isolates were gram-negative bacilli (49%), anaerobes (16%), and *S. aureus* (12%). Nosocomial aspiration pneumonia commonly involves a mixture of anaerobes and gram-negative bacilli or *S. aureus*.

ASPIRATION PNEUMONITIS Bacterial aspiration pneumonitis must be distinguished from two other clinical syndromes associated with aspiration that are not of bacterial etiology. One syndrome results from aspiration of solids, usually food. Obstruction of major airways typically results in atelectasis and moderate nonspecific inflammation. Therapy consists of removal of the foreign body. The second aspiration syndrome is more easily confused with bacterial aspiration. *Mendelson's syndrome*, a chemical pneumonitis, results from regurgitation of stomach contents and aspiration of chemical material, usually acidic gastric juices. Pulmonary inflammation—including the destruction of the alveolar lining, with transudation of fluid into the alveolar space—occurs with remarkable rapidity. Typically this syndrome develops within hours, often following anesthesia when the gag reflex is depressed. The patient becomes tachypneic, hypoxic, and febrile. The leukocyte count may rise, and the chest x-ray may evolve from normal to a complete bilateral “whiteout” within 8–24 h. Sputum production is minimal. The pulmonary signs and symptoms can resolve quickly with symptom-based therapy or can culminate in respiratory failure, with the subsequent development of bacterial superinfection over a period of days. Antibiotic therapy is not indicated unless bacterial infection supervenes.

In contrast to these syndromes, bacterial aspiration pneumonitis develops over a period of several days or weeks rather than hours. Patients who enter the hospital with this syndrome typically have been ill for several days and generally report low-grade fever, malaise, and

sputum production. In some patients, weight loss and anemia reflect a more chronic process. Usually the history reveals factors predisposing to aspiration, such as alcohol overdose or residence in a nursing home. Examination sometimes yields evidence of periodontal disease. Sputum characteristically is not malodorous unless the process has been under way for at least a week. A mixed bacterial flora with many PMNs is evident on Gram's staining of sputum. Expecterated sputum is unreliable for anaerobic cultures because of inevitable contamination by the normal oral microbiota. Reliable specimens for culture can be obtained by transtracheal or transthoracic aspiration—techniques that are rarely used at present. Culture of protected-brush specimens or bronchoalveolar lavage fluid obtained by bronchoscopy is controversial.

Chest x-rays show consolidation in dependent pulmonary segments: in the basilar segments of the lower lobes if the patient has aspirated while upright and in either the posterior segment of the upper lobe (usually on the right side) or the superior segment of the lower lobe if the patient has aspirated while supine.

NECROTIZING PNEUMONITIS This form of anaerobic pneumonitis is characterized by numerous small abscesses that spread to involve several pulmonary segments. The process can be indolent or fulminating. This syndrome is less common than either aspiration pneumonitis or lung abscess and includes features of both types of infection.

ANAEROBIC LUNG ABSCESSSES (See also Chap. 154) These abscesses result from subacute anaerobic pulmonary infection. The clinical syndrome typically involves a history of constitutional signs and symptoms (including malaise, weight loss, fever, night sweats, and foul-smelling sputum), perhaps over a period of weeks (Chap. 153). Patients who develop lung abscesses characteristically have dental infection and periodontitis, but lung abscesses in edentulous patients have been reported. Abscess cavities may be single or multiple and generally occur in dependent pulmonary segments (Fig. 201-1). Anaerobic abscesses must be distinguished from lesions associated with tuberculosis, neoplasia, and other conditions.

Septic pulmonary emboli may originate from intraabdominal or female genital tract infections and can produce anaerobic pneumonia and abscess.

EMPYEMA Empyema is a manifestation of long-standing anaerobic pulmonary infection complicated by bronchopleural fistula. The clinical presentation, which includes foul-smelling sputum, resembles that



FIGURE 201-1 Chest radiograph of right-lower-lobe lung abscess in a 60-year-old alcoholic patient. (From GL Mandell [ed]: *Atlas of Infectious Diseases*, Vol VI. Philadelphia, Current Medicine Inc, Churchill Livingstone, 1996; with permission.)