

Arterial blood gas testing is often helpful in assessing respiratory disease. Hypoxemia, while usually apparent with pulse oximetry, can be further evaluated with the measurement of arterial PO_2 and the calculation of an alveolar gas and arterial blood oxygen tension difference ($[A-a]DO_2$). Patients with diseases that cause ventilation-perfusion mismatch or shunt physiology have an increased $(A-a)DO_2$ at rest. Arterial blood gas testing also allows the measurement of arterial PCO_2 . Hypercarbia can accompany severe airway obstruction (e.g., COPD) or progressive restrictive physiology, as in patients with neuromuscular weakness.

Chest Imaging (See Chap. 308e) Most patients with disease of the respiratory system undergo imaging of the chest as part of the initial evaluation. Clinicians should generally begin with a plain chest radiograph, preferably posterior-anterior and lateral films. Several findings, including opacities of the parenchyma, blunting of the costophrenic angles, mass lesions, and volume loss, can be very helpful in determining an etiology. However, many diseases of the respiratory system, particularly those of the airways and pulmonary vasculature, are associated with a normal chest radiograph.

CT of the chest is often performed subsequently and allows better delineation of parenchymal processes, pleural disease, masses or nodules, and large airways. If the test includes administration of contrast, the pulmonary vasculature can be assessed with particular utility for determination of pulmonary emboli. Intravenous contrast also allows lymph nodes to be delineated in greater detail.

FURTHER STUDIES

Depending on the clinician's suspicion, a variety of other studies may be done. Concern about large-airway lesions may warrant bronchoscopy. This procedure may also be used to sample the alveolar space with bronchoalveolar lavage or to obtain nonsurgical lung biopsies. Blood testing may include assessment for hypercoagulable states in the setting of pulmonary vascular disease, serologic testing for infectious or rheumatologic disease, or assessment of inflammatory markers or leukocyte counts (e.g., eosinophils). Sputum evaluation for malignant cells or microorganisms may be appropriate. An echocardiogram to assess right- and left-sided heart function is often obtained. Finally, at times, a surgical lung biopsy is needed to diagnose certain diseases of the respiratory system. All of these studies will be guided by the preceding history, physical examination, pulmonary function testing, and chest imaging.