Chapter Overview

Lung cancer is the most common malignancy and the leading cause of cancer-related deaths in the United States. Thoracic imaging has an important role in the evaluation of lung cancer: it is used in the detection, diagnosis, and staging of the disease and in assessing response to therapy and monitoring for recurrence after treatment.

Screening for lung cancer—efforts to detect lung cancer before symptoms develop—has been advocated as a means for improving outcomes in patients with this disease. However, while lung cancer screening trials
have shown a reduction in the stage at diagnosis and improvement in long-term survival rates, these trials have not shown an effect of screening on disease-specific mortality. Thus screening for lung cancer remains controversial. Large randomized controlled studies are currently being established to evaluate the impact of screening on mortality in patients with lung cancer. Until these trials are completed, routine screening for lung cancer is not recommended.

Twenty to 30% of patients with lung cancer present with a solitary lung opacity on thoracic imaging. Assessment of morphologic features and growth rate can be useful in differentiating malignant from benign solitary lesions. However, often the nature of a solitary lung opacity cannot be determined with conventional anatomic imaging (radiographs and/or routine nonenhanced and contrast-enhanced computed tomography [CT] and magnetic resonance [MR] images). In such cases, the opacity can be further evaluated with dynamic contrast-enhanced CT or with positron emission tomography (PET) using a radioactive glucose analog, fluorodeoxyglucose F 18 (FDG), the metabolism of which is typically increased in malignant cells compared to benign cells. Lesions with indeterminate etiology after comprehensive radiologic assessment are observed, biopsied, or resected.

Once a diagnosis of non–small cell lung cancer (NSCLC) has been established, the disease is staged according to the International System for Staging Lung Cancer. This system describes the extent of NSCLC in terms of the primary tumor (T descriptor), lymph nodes (N descriptor), and metastases (M descriptor). The T descriptor defines the size, location, and extent of the primary tumor. Because the extent of the primary tumor determines whether the disease will be treated with surgical resection or with palliative radiation therapy or chemotherapy, CT is usually used to assess the degree of pleural, chest wall, and mediastinal invasion. MR imaging has superior soft-tissue contrast resolution and multiplanar capability and is thus particularly useful in the evaluation of superior sulcus tumors.

The presence of nodal metastases and their location are of major importance in determining the most appropriate management. However, the accuracy of CT and MR imaging in the detection of mediastinal nodal metastases (N2 and N3 disease) is not optimal. FDG-PET is a more accurate modality for assessing nodal metabolism (disease) and is particularly useful in detecting metastases in normal-sized nodes. Although the role of imaging in the evaluation of distant metastasis is not clearly defined, imaging can be used to evaluate patients at initial presentation for the presence of metastases to the adrenal glands, kidneys, liver, brain, bones, and lymph nodes.

Imaging also has an important role in the assessment of patients after surgical resection and in the determination of response to therapy after the initiation of chemotherapy or radiation therapy.