**Background:**

There are about 215,000 new cases of lung cancer in the United States each year. Lung cancer is the second most common cause of cancer and the leading cause of cancer death in men and women. Non–small cell lung cancer accounts for 80% of all lung cancers. Accurate staging at the time of diagnosis is crucial, because patients with resectable disease have a better prognosis. Patients usually are not surgical candidates if they have metastases to ipsilateral supraclavicular or contralateral mediastinal nodes, pulmonary metastases to another lobe or lung, or distant metastatic disease.

PET has been shown to improve staging compared to CT alone. Pieterman and colleagues reported that PET increased sensitivity for mediastinal lymph node metastases from 75% to 91%. Furthermore, 11% of patients were found to have distant metastases (1).

A meta-analysis by Gould reported the sensitivity and specificity of PET in the mediastinum to be 85% and 90% (2). Mediastinal lymph node biopsy often is not performed in patients with negative PET and negative CT, but biopsy is important to confirm positive findings.

The introduction of integrated PET/CT in 2001 improved staging accuracy compared to PET alone, CT alone, and separate PET and CT read side by side. Lardinois reported that PET/CT provided additional information in 41% of patients, with increased accuracy for T stage as well as N stage (3). De Wever reported that PET/CT detected distant metastases in 92% of patients and was more accurate than PET or CT alone (4).

**Practice Guidelines:**

American College of Chest Surgeons:

PET to evaluate for mediastinal and extra thoracic staging should be considered in patients with clinical 1A lung cancer and should be performed in patients with clinical IB–IIIB lung cancer being treated with curative intent (5).

National Comprehensive Cancer Network

PET scan can play a role in the evaluation and more accurate staging of stage I–IV disease (6).

**Case Example 1:**

Figure 1A. A 67-year-old man with newly diagnosed adenocarcinoma. Anterior maximal intensity projection (MIP) shows the primary tumor in the left upper lobe (arrow) plus multiple left mediastinal and right hilar (arrowhead) lymph node metastases.

**Case Example 2:**

Figure 1B. Fused transaxial PET/CT images show the primary tumor (arrowhead) plus left paraaortic (thin arrow) and left paratracheal (thick arrow) mediastinal lymph node metastases.
PET/CT is also recommended by NCCN as part of modern 3-dimensional conformal RT techniques (6). PET/CT is preferable to CT alone for the gross tumor volume (GTV) delineation in cases with significant atelectasis.

PET/CT can be used to evaluate response to radiation and chemotherapy performed in the neoadjuvant setting or for curative intent. Eschmann reported that 5-year survival was 60% in patients who showed >60% decrease in FDG uptake following neoadjuvant chemotherapy, but only 15% when the decrease was less than 60% (7).

Nahmias found that a 50% decrease in FDG uptake between 1 week and 3 weeks after initiation of chemotherapy was prediactive of survival >6 months (8).

Reimbursement

CMS Coverage Policy

PET and PET/CT are approved by the Centers for Medicare and Medicaid Services for diagnosis, staging and restaging of non-small cell lung cancer. Monitoring response during treatment is only covered when patients are participating in a clinical research trial or have been registered with the National Oncologic PET Registry (9).

References