

Diagnostic Imaging and Newer Modalities for Thoracic Diseases

PET/Computed Tomographic Imaging and Endobronchial Ultrasound for Staging and Its Implication for Lung Cancer

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KEYWORDS

- Chest radiograph • Computed tomography • PET • MRI • Endobronchial ultrasound
- Esophageal ultrasound • Navigational bronchoscopy

KEY POINTS

- Computed tomographic (CT) scanning is the test of choice to identify nodules (ie, low-dose CT scanning) and then to further delineate the abnormality (high-resolution CT scanning).
- Integrated PET/CT imaging is superior to either CT scan or PET imaging by itself in accurately characterizing lung cancers.
- Endobronchial ultrasound and esophageal ultrasound must be used in a strategically advantageous manner relying on their individual strengths to maximize their efficacy in the diagnosis and staging of lung cancer.

INTRODUCTION

Tailoring the optimal diagnostic approach for lung cancer requires that a defined goal be based on the results of any study that is planned. Modalities to detect and characterize lung cancer generally can be divided into those that are invasive versus those that are noninvasive. Aside from the standard chest radiograph (CXR), the noninvasive imaging techniques include computed tomography (CT), PET, and MRI. The invasive imaging modalities include endobronchial ultrasound (EBUS), esophageal ultrasound (EUS), and electromagnetic navigational bronchoscopy (ENB).

NONINVASIVE MODALITIES

Computed Tomographic Scans

- CT scanning is the test of choice to identify nodules (ie, low-dose CT [LDCT] scanning) and then to further delineate the abnormality (ie, high-resolution CT scanning)

The National Lung Screening Trial (NLST) was the landmark prospective randomized, controlled study that revealed a significant decrease in lung cancer-related mortality of 20% when LDCT scans were used (6.8%) compared with CXR alone (26.7%) in the 53,454 participants who were

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considered to be at “high risk.” High risk was defined in this study as those patients who were current smokers or who were former smokers with a total of 30+ pack-years, aged 55 to 74 years old, as long as they had quit within the past 15 years¹ (**Box 1**). The results of this trial as well

as others studies evaluating CXRs for lung cancer screening have led to guidelines recommending its avoidance as a lone screening test for lung cancer because it may miss detecting 4 times as many lung cancers compared with with scans.²⁻⁴ Before the NLST, the International Early Lung Cancer

Box 1

Key elements of annual lung screening guidelines endorsed by United States Preventative Services Task Force with further modifications endorsed by the other organizations (endorsing organizations in parentheses)

Inclusion Criteria

Age

55 to 80 years

55 to 79 years (AATS)

55 to 74 years (ACCP, ACS, ASCO, NLST, NCCN)

Tobacco History (ACCP, ACS, ASCO, NLST, NCCN)

Former smoker with a 30+ pack-year smoking

Former smoker quit within the past 15 years

Current smoker

Additional (NCCN, AATS)

Age 50+ years *and* tobacco history of $\geq 20+$ pack-year with at least one additional lung cancer risk factor:

- Major exposure to arsenic, beryllium, oadmium, chromium, nickel, asbestos, coal smoke, soot, silica, and diesel fumes
- Other cancers (small cell lung cancer, head cancers, neck cancers, Hodgkin lymphoma)
- Received radiation treatment to chest for other disease
- Family member with lung cancer (ie, parent, sibling, or child)
- History of COPD
- History of pulmonary fibrosis
- Second-hand smoke exposure

Exclusion Criteria

Age

Less than 55 years

Greater than 80 years

Tobacco History

Less than 30 pack-years

Quit greater than 15 years ago

Comorbidities (ASCO)

Severe comorbidities precluding potentially curative treatment and/or limit life expectancy (ASCO)

Discontinuation of Screening

Once a person has not smoked for 15 years or develops a health problem that substantially limits life expectancy or the ability or willingness to have curative lung surgery

Abbreviations: AATS, American Association for Thoracic Surgery; ACCCP, American College of Chest Physicians; ACS, American Cancer Society; ASCO, American Society for Clinical Oncology; COPD, chronic obstructive pulmonary disease; NCCN, National Comprehensive Cancer Network.

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