PET/CT Imaging of Lung Cancer

Chitra Viswanathan, M.D.

Objectives

- Role of PET/CT in diagnosis and staging of lung cancer
- ASCO recommendations for imaging of patients with advanced lung cancer
- Promising applications for PET/CT: prognosis and treatment response

NSCLC: PET/CT

TNM Staging

- Primary (T) Status
- Nodal (N) Status
- Metastasis (M) Status

Potential Pitfall – T Staging

PET negative lesions

Nodule size (<7mm)
Nodule attenuation (Subsolid)

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NSCLC: PET/CT

TNM Staging

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NSCLC Staging

Nodal (N) Disease

<table>
<thead>
<tr>
<th>PET</th>
<th>CT</th>
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<tr>
<td>Sensitivity</td>
<td>85%</td>
</tr>
<tr>
<td>Specificity</td>
<td>90%</td>
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Gould, Ann Int Med 2003;139:879-892

Can PET/CT replace invasive sampling?

PET/CT: high false positive rate
Strength: NPV 95%
May be used to direct invasive staging

Lee, BE J. Thoracic and Cardiovasc Surg 2007;133: 746-752

NSCLC Nodal Staging

ASCO Recommendations

Mediastinal LN Biopsy for:
- LN > 1 cm on CT or
- LN Positive on PET
Negative PET does not preclude biopsy

Pfister, J Clin Oncol 2004 22 (2), 330-353

NSCLC: PET/CT

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Revised Staging IASLC

M1a malignant pleural or pericardial effusion
pleural nodule
nodule in contralateral lung

M1b distant metastasis

J Thoracic Oncology 2007, 2: 593-602

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**NSCLC - M Staging**

Can PET/CT replace bone scan?

- Retrospective review n= 257 pts
- PET replaces bone scan
- Bone Scan for symptomatic regions NOT covered on PET
- Positive PET: need biopsy or plain film/CT

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<th></th>
<th>Sens.</th>
<th>Spec.</th>
<th>Accuracy</th>
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<tbody>
<tr>
<td>Bone Scan</td>
<td>75%</td>
<td>95%</td>
<td>85%</td>
</tr>
<tr>
<td>PET</td>
<td>91%</td>
<td>96%</td>
<td>94%</td>
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Cheran SK, Lung Cancer 2004 (24) 317-325

**Adrenal M1**

- SUV cut off of 3.1
- Sensitivity 98% Specificity 92%
- Adrenal/liver activity ratio >1.5

Pfister, J Clin Oncol 2004 22 (2), 330-353
**NSCLC – M Staging**

**ASCO Recommendations for potentially resectable patients**

- Adrenal: Positive PET Requires Bx
- Liver: Positive PET Requires Bx if isolated

_Pfister, J Clin Oncol 2004 22 (2), 330-335_

**NSCLC – M Staging**

**ASCO Recommendations**

Brain CT/MR for pts with signs/symptoms CNS disease and asymptomatic Stage III pts considered for aggressive local therapy (surgery or XRT)

**NSCLC: PET**

**PET in Lung Cancer Staging: PLUS Trial**

- 188 pts with potentially resectable NSCLC
- Randomized to CW (96) or CW + PET (92)
- Addition of PET to CW prevented futile surgery in 1 of 5 patients


**NSCLC: PET**

**PET in Stage I-II Management**

- 183 patients with stage I-II NSCLC
- Randomly assigned CW (92) or CW + PET (91)
- PET improves appropriate stage specific management

_Viney, RC et al. Randomized controlled trial of the role of PET in the management of stage I and II NSCLC. J Clin Oncol 2004;22:2357-2362_

**NSCLC: PET**

**PET in Stage I-II Management**

- PET upstaged 15 patients (16%)
  - Stage IIIa (n=11)
  - Stage IIIb (n=2)
  - Distant metastases (n=2)

_Viney, RC et al. Randomized controlled trial of the role of PET in the management of stage I and II NSCLC. J Clin Oncol 2004;22:2357-2362_

**PET/CT Applications**

- SUV and Prognosis
- Treatment Response
- Tumor Recurrence
PET/CT Imaging of Lung Cancer Summary

- In staging of lung cancer, PET/CT improves detection of nodal and extrathoracic metastases
- ASCO recommendations are useful in clinical practice to evaluate patients with advanced disease

Local Recurrence after XRT
Sensitivity 98-100% Specificity 62-92%

SUV and Prognosis

Treatment Response
30% Decline in SUV