Overview

- Importance of accurate nodal staging
- Accuracy of radiographic staging
- Mediastinoscopy
- EUS
- EBUS
Staging
TNM Definitions

- **T Stage**
  - Size of the Primary Tumor
  - Adjacent structures invaded into by Tumor

- **N Stage**
  - Nodal disease involvement

- **M Stage**
  - Metastatic disease involvement
<table>
<thead>
<tr>
<th>Stage</th>
<th>TNM Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>IA</td>
<td>T1N0M0</td>
</tr>
<tr>
<td>IB</td>
<td>T2N0M0</td>
</tr>
<tr>
<td>IIA</td>
<td>T1N1M0</td>
</tr>
<tr>
<td>IIB</td>
<td>T2N1M0 or T3N0M0</td>
</tr>
<tr>
<td>IIIA</td>
<td>T1-3N2M0 or T3N1M0</td>
</tr>
<tr>
<td>IIIB</td>
<td>T4N\text{any}M0 or T\text{any}N3M0</td>
</tr>
<tr>
<td>IV</td>
<td>T\text{any}N\text{any}M1</td>
</tr>
</tbody>
</table>
### Superior Mediastinal Nodes
- 1 Highest Mediastinal
- 2 Upper Paratracheal
- 3 Prevascular and Retrotracheal
- 4 Lower Paratracheal (including azygos nodes)
  - \( N_2 \) = single digit, ipsilateral
  - \( N_3 \) = single digit, contralateral or supraclavicular

### Aortic Nodes
- 5 Subaortic (AP window)
- 6 Para-aortic (Ascending aorta or phrenic)

### Inferior Mediastinal Nodes
- 7 Inferior Mediastinal Nodes
- 8 Paraesophageal (below carina)
- 9 Pulmonary Ligament

### \( N_2 \) Nodes
- 10 Hilar
- 11 Interlobar
- 12 Lobar
- 13 Segmental
- 14 Subsegmental

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![Diagram of the thoracic structures, including lymph nodes and blood vessels.](attachment:image.png)
**Stage IA**, cancer is in the lung only, less than 3cm in size.

**Stage IB**, the cancer is:
- (a) greater than 3cm in size
- (b) involve the main bronchus
- (c) invade visceral pleura
- (d) associated with obstructive pneumonitis.
Stage IIA, cancer is less than 3cm in size and involves ipsilateral hilar lymph nodes.  
Stage IIB, cancer is either the same as in stage IB and has also spread to ipsilateral hilar lymph nodes or Cancer has not spread to lymph nodes but has spread to one or more of the following: (a) the chest wall, (b) the diaphragm, (c) mediastinal pleura, (d) pericardium, (e) the main bronchus less than 2cm from the carina, and/or (f) associated obstructive pneumonitis of the entire lung.
Stage IIIA
The cancer has spread to ipsilateral mediastinal or subcarinal lymph nodes (N2).

Similar to Stage IIB, it may also spread to one or more of the following: (a) the chest wall, (b) the diaphragm, (c) mediastinal pleura, (d) pericardium, (e) the main bronchus less than 2cm from the carina, and/or (f) associated obstructive pneumonitis of the entire lung.
Stage IIIB
The cancer has spread to (a) contralateral mediastinal or hilar nodes or ipsilateral supraclavicular nodes.

The cancer may also spread to one or more of the following: (b) the heart, (c) the inferior vena cava and the aorta, (f) the trachea, and (g) the esophagus.

Cancer may also spread to the pleural fluid (T4).

Separate nodules in the same lobe is also (T4)*
Stage IV

Lung cancer has spread to other parts of the body:
- Brain
- Lymph node
- Another lobe of the lung
- Adrenal gland
- Liver
- Kidney
- Bone

Cancer
Blood
Lymph nodes
To other parts of the body
Staging

NSCLC Incidence by Stage
US Population, 2006

<table>
<thead>
<tr>
<th>Disease and Stage</th>
<th>Annual Incidence</th>
<th>1-Year Survival</th>
<th>5-Year Survival</th>
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<tr>
<td>NSCLC</td>
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<tr>
<td>I</td>
<td>24,000</td>
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<td>70%</td>
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<tr>
<td>II</td>
<td>9,000</td>
<td>80%</td>
<td>40%</td>
</tr>
<tr>
<td>IIIA</td>
<td>42,000</td>
<td>70%</td>
<td>20%</td>
</tr>
<tr>
<td>IIIB (limited)</td>
<td>11,000</td>
<td>50%</td>
<td>4%</td>
</tr>
<tr>
<td>IIIB–IV</td>
<td>57,000</td>
<td>35%</td>
<td>3%</td>
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<tr>
<td>Stage</td>
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<td>5 Year Survival</td>
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<td>-------</td>
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<td>IB</td>
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<tr>
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</tr>
<tr>
<td>IIIB</td>
<td>T4N_{any}M0 or T_{any}N3M0</td>
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</tr>
<tr>
<td>IV</td>
<td>T_{any}N_{any}M1</td>
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</tr>
</tbody>
</table>

Mountain, Chest 1997
Why is accurate nodal staging essential?

- **N1** disease
- **N2** disease
- **N3** disease
## Treatment of Lung Cancer According to Stage

<table>
<thead>
<tr>
<th>Stage</th>
<th>Primary treatment</th>
<th>Adjuvant therapy</th>
<th>Five-year survival rate (%)</th>
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</thead>
<tbody>
<tr>
<td><strong>Non-small cell carcinoma</strong></td>
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<td></td>
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</tr>
<tr>
<td>I</td>
<td>Resection</td>
<td>Chemotherapy</td>
<td>60 to 70</td>
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<tr>
<td>II</td>
<td>Resection</td>
<td>Chemotherapy with or without radiotherapy</td>
<td>40 to 50</td>
</tr>
<tr>
<td>IIIA (resectable)</td>
<td>Resection with or without preoperative chemotherapy</td>
<td>Chemotherapy with or without radiotherapy</td>
<td>15 to 30</td>
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<tr>
<td>IIIA (unresectable) or IIIB</td>
<td>(involvement of contralateral or supraclavicular lymph nodes)</td>
<td>Chemotherapy with concurrent or subsequent radiotherapy</td>
<td>None</td>
</tr>
<tr>
<td>IIB (pleural effusion) or IV</td>
<td>Chemotherapy or resection of primary brain metastasis and primary T1 tumor</td>
<td>None</td>
<td>10 to 15 (two-year survival)</td>
</tr>
<tr>
<td><strong>Small cell carcinoma</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limited disease</td>
<td>Chemotherapy with concurrent radiotherapy</td>
<td>None</td>
<td>15 to 25</td>
</tr>
<tr>
<td>Extensive disease</td>
<td>Chemotherapy</td>
<td>None</td>
<td>&lt; 5</td>
</tr>
</tbody>
</table>

Treatment – Stage IIIA

- Stage IIIA N2 disease 5 year survival is 10-15% overall
- Stage IIIA bulky mediastinal involvement (visible on CXR) have 5 year survival of 2-5%

Radiation:
- Treatment with 60 Gy can achieve long term survival benefit in 5-10% of patients

Chemotherapy and Radiation:
- Meta analysis from 11 randomized studies showed cisplatin based chemotherapy with radiation resulted in 10% reduction in the risk of death compared to radiation therapy alone.

Combined Surgical Therapy:
- Neoadjuvant chemotherapy plus surgery had median survival > 3X versus surgery alone
- Neoadjuvant chemotherapy and radiation allowed 65-75% patients to undergo surgical resection → these patients had 27% 3 year survival.
N2 Disease

- Patients benefit from neoadjuvant therapy and surgery \textit{versus} resection followed by adjuvant therapy.

- Patients are more likely to complete chemotherapy regimen pre operatively than post operatively.

- Awaiting definitive results of the NATCH (Neoadjuvant Taxol Carboplatin Hope) trial available 2009

What is the accuracy of radiographic staging?


Chest 2007;132;178-201
Information gained by CT

- Tumor size
- Tumor number
- Central tumor or Peripheral
- Lymph node enlargement (>1 cm)
- Extent
  - Discrete lymph nodes versus mediastinal infiltration
- Metastatic disease
Accuracy of CT in Staging

CT scan

- **Tumor**
  - Sensitivity = 63%
  - Specificity = 84%

- **Mediastinum**
  - Sensitivity = 51-75%
  - Specificity = 66-86%
  - Positive predictive value = 60%
  - Negative predictive value = 80%

_Dwamena et al. Radiology 1999; 213:530–536_
Accuracy of CT in Staging the Mediastinum

- CT scanning alone is not sufficient to determine nodal staging
- However, certain characteristics can guide further staging
CT Staging of the Mediastinum

- **Group A**: mediastinal infiltration
- **Group B**: discrete mediastinal lymph node enlargement
- **Group C**: central tumor or suspected N1 disease
- **Group D**: peripheral tumor, no mediastinal involvement

- Invasive biopsy
  
  - N2, N3 involvement 20-25% → Invasive biopsy
  
  - ???
Prevalence of N2 disease in clinical stage I

- **Location?**
  - Central → 9-11%
  - Peripheral → 6-19%

- **Cell Type?**
  - Adenocarcinoma → 14%
  - Squamous → 8.9%

- **Tumor Stage?**
  - T1 → 8.4%
  - T2 → 10.4%

_Suzuki K et al, JTCVS; 1999;117:593-8_
_Daly BD, et al. JTCVS; 1993;105:904-10_
CT Staging of the Mediastinum

- **Group A:** mediastinal infiltration
- **Group B:** discrete mediastinal lymph node enlargement
- **Group C:** central tumor or suspected N1 disease
- **Group D:** peripheral tumor, no mediastinal involvement

- **Invasive biopsy**
- **Invasive biopsy**
- **N2, N3 involvement 20-25% → Invasive biopsy**
- **??? → But must assume at least 10% chance of N2 disease → Invasive biopsy**
PET Scan
PET in Staging

- Detecting both size and activity of tumor
- Detecting size and activity of lymph nodes
- Provides whole-body information
  - M1 disease found in 1-8% of patients thought to be stage I by CT
  - M1 disease found in 7-18% of patients thought to be stage II by CT

Reed CE, et al. JTCVS 2003; 126:1943–1951
Accuracy of PET in Staging the Mediastinum

PET Scan

- **Tumor**
  - Sensitivity = 83-96%
  - Specificity = 73-78%

- **Mediastinum**
  - Sensitivity = 64-91%
  - Specificity = 77-93%

- **Distant Metastasis**
  - Sensitivity = 95%
  - Specificity = 83%
Recommendations of PET in Staging the Mediastinum

- Stage IA → consider
- Stage IB-IIIB → should undergo PET
- Any abnormal result in the mediastinum should prompt lymph node sampling
PET/CT combined
### Sensitivity

<table>
<thead>
<tr>
<th>Modality</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT</td>
<td>86%</td>
</tr>
<tr>
<td>PET</td>
<td>94%</td>
</tr>
<tr>
<td>PET/CT</td>
<td>97%</td>
</tr>
</tbody>
</table>

### Specificity

<table>
<thead>
<tr>
<th>Modality</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT</td>
<td>67%</td>
</tr>
<tr>
<td>PET</td>
<td>59%</td>
</tr>
<tr>
<td>PET/CT</td>
<td>44%</td>
</tr>
</tbody>
</table>
Is the combination of PET/CT good enough to obviate mediastinoscopy?

- Radiographic N2, N3 = need for tissue biopsy prior to neoadjuvant therapy
  - NO

- Radiographic N1 = 20-25% occult N2 disease
  - NO

- Radiographic N0
  - CONTROVERSIAL
What is the prevalence of undetected N2 disease after PET/CT

- PET/CT staging was node negative
- At mediastinoscopy found to have N2 disease 11.7% of the time (n=137)

Gonzalez-Stawinski et al. JTCVS 2003;126:1900-1905
What is the prevalence of undetected N2 disease after PET/CT

- After CT → 19.2% (n=2224)
- After CT + PET → 6.7% (n=906)
- After CT + mediastinoscopy → 8.3% (n=869)
- After CT + PET + mediastinoscopy → 4.5% (n=178)

What is the prevalence of undetected N2 disease after PET/CT

- PET/CT staging was node negative but at thoracotomy found to have N2 disease 5.6%

- PET/CT/mediastinoscopy staging was node negative but at thoracotomy found to have N2 disease 4.5%

Meyers JTCVS 2006;131:882-829
## Choice of lymph node sampling

<table>
<thead>
<tr>
<th>Table 1—Techniques of Invasive Mediastinal Staging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mediastinoscopy</td>
</tr>
<tr>
<td>EUS-NA</td>
</tr>
<tr>
<td>TBNA</td>
</tr>
<tr>
<td>EBUS-NA</td>
</tr>
<tr>
<td>TTNA</td>
</tr>
<tr>
<td>VATS staging</td>
</tr>
<tr>
<td>Chamberlain procedure</td>
</tr>
<tr>
<td>Extended cervical mediastinoscopy</td>
</tr>
</tbody>
</table>
### Mediastinoscopy

- **Sensitivity = 70-95%**
- **Specificity = 100%**
- **Negative Predictive value = 88-93%**
- **Positive Predictive value = 100%**
- **Complication rate = 0.6%**
- **Mortality rate = 0.08%**
- **Emergency Sternotomy = 0.12%**
Staging with Mediastinoscopy

- Define N1, N2, N3 disease
- 1, 3, 2L, 2R, 4L, 4R, 7 + enlarged nodes
- Not 5, 6, 8, 9

Superior Mediastinal Nodes
- 1 Highest Mediastinal
- 2 Upper Paratracheal
- 3 Prevascular and Retrotactive
- 4 Lower Paratracheal (including azygos nodes)
  - $N_2$: single digit, ipsilateral
  - $N_3$: single digit, contralateral or supraclavicular

Aortic Nodes
- 5 Subaortic (AP window)
- 6 Para-aortic (Ascending aorta or phrenic)

Inferior Mediastinal Nodes
- 7 Inferior Mediastinal Nodes
- 8 Paraesophageal (below carina)
- 9 Pulmonary Ligament

$N_2$ Nodes
- 10 Hilar
- 11 Interlobar
- 12 Lobar
- 13 Segmental
- 14 Subsegmental
What’s the real problem with mediastinoscopy?

Patterns of Surgical Care of Lung Cancer Patients

Alex G. Little, MD, Valerie W. Rusch, MD, James A. Bonner, MD, Laurie E. Gaspar, MD, Mark R. Green, MD, W. Richard Webb, MD, and Andrew K. Stewart, MA

ACS survey in 2001 of 729 hospitals including 40,090 patients

- Mediastinoscopy performed in 27.1% of patients going to curative resection
- Of these mediastinoscopies, only 46.6% had documented node biopsy
Perhaps they are utilizing PET/CT?
- 26.5% received PET

Perhaps they are sampling at the time of thoracotomy?
- Only 42.2% of surgical resections had mediastinal lymph nodes

59.5% Stage I, 17.5% Stage II, 17.0% Stage III, 6.0% Stage IV
Bronchoscopy
Endoscopic Ultrasound
Endobronchial Ultrasound
EUS

- Can be done with conscious sedation
- Can detect and biopsy adrenal, celiac, liver metastasis
- Can detect T4 invasion into the mediastinum
  - EUS for T staging
    - Sensitivity 88%
    - Specificity 98%
    - False Negative 1%
    - False Positive 30%
  - EUS for N staging
    - Sensitivity 84%
    - Specificity 100%
    - False Negative 19%
    - False Positive 8%

Annema JT, et al. JAMA 2005; 294:931–936, only study to investigate positive lymph with surgical incision
Table 4 — EUS-NA of the Mediastinum in Lung Cancer Patients*

<table>
<thead>
<tr>
<th>Study/Year</th>
<th>Patients, No.</th>
<th>Patient Type</th>
<th>Feasibility, %</th>
<th>Sensitivity, %</th>
<th>Specificity, %</th>
<th>FP, %</th>
<th>FN, %</th>
<th>Prevalence, %</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>Annema et al134/2005</td>
<td>193</td>
<td>cN0–3†</td>
<td>100</td>
<td>90</td>
<td>100</td>
<td>0</td>
<td>27</td>
<td>79</td>
<td>All PET+</td>
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<tr>
<td>Annema et al29/2004</td>
<td>36</td>
<td>?</td>
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<td>78</td>
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<td>Caddy et al89/2005</td>
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<td>?</td>
<td>100</td>
<td>91</td>
<td>100</td>
<td>0</td>
<td>15</td>
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<td>Fritscher-Ravens et al90/2003</td>
<td>33</td>
<td>cN0–3†</td>
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<td>88</td>
<td>100</td>
<td>0</td>
<td>11</td>
<td>48</td>
<td>Excluding bulky</td>
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<td>Larsen et al127/2005</td>
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<td>cN0–3†</td>
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<td>87</td>
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<td>Eloubeidi et al25/2005</td>
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<td>0.7</td>
<td>19</td>
<td>61</td>
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</tbody>
</table>
EUS in the Setting of a Negative CT

Saved an inappropriate thoracotomy in 9/67 = 13%

TABLE 1. ENDOSCOPIC ULTRASOUND–GUIDED FINE-NEEDLE ASPIRATION FINDINGS THAT PRECLUDED SURGERY

<table>
<thead>
<tr>
<th>EUS-FNA Finding</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive celiac lymph node</td>
<td>2</td>
</tr>
<tr>
<td>Esophageal wall invasion (T4)</td>
<td>1</td>
</tr>
<tr>
<td>Synchronous esophageal cancer</td>
<td>1</td>
</tr>
<tr>
<td>Positive contralateral mediastinal lymph node</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
</tr>
</tbody>
</table>

Failed to detect N2 disease in 17/67 = 25%

Would never be able to detect N2 disease in 5/67 = 7%

Endobronchial Ultrasound-Guided Needle Aspiration (EBUS)

- Stations 1, 2, 3, 4, 7, 10
- Not 5, 6, 8, 9
- Only EBUS-positive nodes sampled
EBUS

- Sensitivity 90%
- Specificity 100%
- False Positive 0%
- False Negative 20%

- Few complications
- Up to 25% suspected malignancy can be benign
- Minimize mediastinal scarring for future biopsy or resection
- Can be done with conscious sedation, no need for intubation

# EBUS

## Table 6—EBUS-NA of the Mediastinum in Lung Cancer Patients*

<table>
<thead>
<tr>
<th>Study/Year</th>
<th>Patients, No.</th>
<th>Patient Type</th>
<th>Technique</th>
<th>Feasibility, %</th>
<th>Sensitivity, %</th>
<th>Specificity, %</th>
<th>FP, %</th>
<th>FN, %</th>
<th>Prevalence, %</th>
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<tbody>
<tr>
<td>Herth et al⁴⁶/2006</td>
<td>502</td>
<td>cI-III</td>
<td>RT-US bronch (22 ga)</td>
<td>94</td>
<td>100</td>
<td>0</td>
<td>(89)†</td>
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<td>98</td>
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<td>Yasufuku et al¹⁰¹/2005</td>
<td>108</td>
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<td>95</td>
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<td>0</td>
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<td>RT-US bronch (22 ga)</td>
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<td>Vilmann et al¹⁰³/2005†</td>
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<td>RT-US bronch (22 ga)</td>
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<td>79</td>
<td>100</td>
<td>0</td>
<td>30</td>
<td>70</td>
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<td>Kanoh et al¹⁰⁴/2005</td>
<td>54</td>
<td>cII–III</td>
<td>Catheter probe (19 ga)</td>
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<td>86</td>
<td>100</td>
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<td>37</td>
<td>81</td>
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<td>Plat et al¹⁰⁵/2006</td>
<td>33</td>
<td>cII–III</td>
<td>Catheter (histo needle)</td>
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<tr>
<td>Herth et al⁴⁷/2006</td>
<td>100</td>
<td>cI</td>
<td>RT-US bronch 22 ga</td>
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<tr>
<td><strong>Summary</strong></td>
<td>918</td>
<td></td>
<td></td>
<td>90</td>
<td>100</td>
<td>0</td>
<td>20</td>
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<td>68</td>
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</tbody>
</table>
EBUS in Patients with Normal CT

- 100 patients
- Biopsies taken from any identifiable lymph node 2, 4, 7, 10, 11
- 199 lymph nodes
- Average size 8mm
- Measured against pathologic specimen

- Sensitivity 92.3%
- Specificity 100%
- Negative predictive value 96.3%
EBUS in Patients with Normal CT

- Upstaged to N1 disease in 3% patients
- Upstaged to N2 disease in 13% patients
- Upstaged to N3 disease in 3% patients
- Saved an inappropriate thoracotomy in 16% of patients
- Failed to identify N2 or N3 disease in 2% of patients
EUS + EBUS

Complete “Medical Mediastinoscopy” Under Conscious Sedation: A Prospective Blinded Comparison of Endoscopic and Endobronchial Ultrasound to Bronchoscopic Fine Needle Aspiration for Malignant Mediastinal Lymph Nodes
Michael B. Wallace, Jorge M. Pascual, Massimo Raimondo,

- EBUS: stations 1-4, 7
- EUS: stations 8, 9
- Conscious sedation
- 52 minutes
<table>
<thead>
<tr>
<th>Procedure</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bronch-FNA</td>
<td>45%</td>
<td>100%</td>
</tr>
<tr>
<td>EBUS-FNA</td>
<td>83%</td>
<td>100%</td>
</tr>
<tr>
<td>EUS-FNA</td>
<td>83%</td>
<td>100%</td>
</tr>
<tr>
<td>Bronch + EBUS</td>
<td>86%</td>
<td>100%</td>
</tr>
<tr>
<td>EUS + EBUS</td>
<td>97%</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Per patient accuracy**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bronchoscopy-FNA</td>
<td>36%</td>
<td>100%</td>
<td>&lt;0.002 (vs bronch)</td>
</tr>
<tr>
<td>EBUS-FNA</td>
<td>70%</td>
<td>100%</td>
<td>&lt;0.001 (vs bronch), &gt; 0.2 (vs ebus)</td>
</tr>
<tr>
<td>EUS- FNA</td>
<td>73%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Bronch + EBUS</td>
<td>82%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td><strong>EBUS + EUS</strong></td>
<td><strong>95%</strong></td>
<td><strong>100%</strong></td>
<td><strong>&lt;0.03 (vs bronch + ebus), &lt;0.025 (vs eus + bronch), =0.09 (vs eus + ebus), &gt; 0.2 (vs bronch + ebus)</strong></td>
</tr>
<tr>
<td>Bronch + EUS</td>
<td>77%</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>
EUS + EBUS = Medical Mediastinoscopy

- Vilmann P, Puri R.

- Sensitivity 100%
- Specificity 100%
<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>False Neg</th>
<th>False Pos</th>
<th>Station</th>
<th>Limitations</th>
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<tr>
<td>Med</td>
<td>78-95</td>
<td>100</td>
<td>11</td>
<td>0</td>
<td>1, 3, 2, 4, 7</td>
<td>Utilization</td>
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<tr>
<td>EUS</td>
<td>87</td>
<td>100</td>
<td>19</td>
<td>8</td>
<td>5, 6, 8, 9</td>
<td>Limited location</td>
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<tr>
<td>EBUS</td>
<td>90</td>
<td>100</td>
<td>20</td>
<td>0</td>
<td>1, 3, 2, 4, 7, 10</td>
<td>No standard protocol</td>
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<td>EUS+</td>
<td>95</td>
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<tr>
<td></td>
<td>Sensitivity</td>
<td>Specificity</td>
<td>False Neg</td>
<td>False Pos</td>
<td>Station</td>
<td>Limitations</td>
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<td>0</td>
<td>1, 3, 2, 4, 7, 10</td>
<td>No standard protocol</td>
</tr>
<tr>
<td>EUS+</td>
<td>97 95</td>
<td>100</td>
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<td>1, 2, 3, 4, 8, 9, 10</td>
<td>No data</td>
</tr>
</tbody>
</table>

* Sensitivity in the setting of radiographic stage 1 disease
Summary

- Mediastinum should be staged invasively utilizing mediastinoscopy, EUS, EBUS or EUS+EBUS.

- PET/CT alone will miss N2 disease (5-12%).

- Perhaps future lies with medical mediastinoscopy of EUS+EBUS.