Possibilities and limitations of endoscopy

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Disclosure

• no conflicts of interest to declare
Endoscopy: presentation at diagnosis

1. Central tumor
2. Peripheral tumor
3. Mediastinal (hilar) lymph nodes, enlarged or PET + with/without peripheral tumor

Peripheral lesions are defined in most studies as lesions that are not visible beyond the visual segmental bronchi.
15-18 April 2015, Geneva, Switzerland
Flexible bronchoscopy using fluoroscopic guidance

<table>
<thead>
<tr>
<th>Studies (often guidance using fluoroscopy)</th>
<th>Nb patients</th>
<th>Overall</th>
<th>Sensitivity</th>
<th>Brushing</th>
<th>Lavage</th>
<th>TBNA</th>
</tr>
</thead>
<tbody>
<tr>
<td>34 studies</td>
<td>5742</td>
<td>78 %</td>
<td>57 %</td>
<td>54 %</td>
<td>43 %</td>
<td>65 %</td>
</tr>
<tr>
<td>(16 studies)</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Sensitivity of 0.45 for one sample and 0.70 for six samples

Sensitivity according to lesion size

<table>
<thead>
<tr>
<th>Studies</th>
<th>Lesion &lt; 2 cm</th>
<th>Lesion &gt; 2 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Patients</td>
<td>Pos</td>
</tr>
<tr>
<td>10 studies</td>
<td>383</td>
<td>131</td>
</tr>
</tbody>
</table>


15-18 April 2015, Geneva, Switzerland
FB using fluoroscopic guidance
Standard bronchoscopy using fluoroscopic guidance: factors affecting diagnostic yield

- Size
- Ability to perform all sampling methods
- Location (lower yield for upper lobe apical segment and lower lobe basal segment)
- Character of the border of the lesion (yield better for sharp than fuzzy border)
- Distance from the hilum

Role of distance from hilum

Reasons for decreased yield of transbronchial biopsy (TBB)
First generations: cartilages

Distally: increasing number of divisions
Role of size

**Decreased yield of TBB**

Small tumor size (1) in comparison with large tumor size (2):
- lower number of bronchi leading to the tumor
- more difficult to see with fluoroscopy
Bronchus sign predicts results of transbronchial biopsy (TBB)


15-18 April 2015, Geneva, Switzerland
New guided-bronchoscopy techniques

• Ultrathin bronchoscopy

• Virtual bronchoscopy-guided biopsy
  Asano F. Chest 2006;130:559-66.

• Radial endobronchial ultrasound-guided biopsy

• Electromagnetic navigation-guided biopsy

• Combination ultrasound+electromagnetic
New guided-bronchoscopy techniques

- Diagnostic yield better than traditional transbronchial biopsy
  - Meta-analysis of 3052 lesions from 39 studies (2002-2010)
  - Pooled diagnostic yield 70% (increase with size)
  - Low side-effect; pneumothorax rate 1.5%

### Inverse weighted diagnostic yield overall and by modality

<table>
<thead>
<tr>
<th>Technology</th>
<th>Studies, No.</th>
<th>Weighted Proportion, %</th>
<th>95% CI</th>
<th>Q statistic</th>
<th>Q P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual B</td>
<td>10</td>
<td>72.0</td>
<td>(65.7-78.4)</td>
<td>21.0</td>
<td>.01</td>
</tr>
<tr>
<td>ENB</td>
<td>11</td>
<td>67.0</td>
<td>(62.6-71.4)</td>
<td>13.3</td>
<td>.21</td>
</tr>
<tr>
<td>Guide sheath</td>
<td>10</td>
<td>73.2</td>
<td>(64.4-81.9)</td>
<td>63.8</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Ultrathin B</td>
<td>11</td>
<td>70.0</td>
<td>(65.0-75.1)</td>
<td>15.2</td>
<td>.12</td>
</tr>
<tr>
<td>Radial EBUS</td>
<td>20</td>
<td>71.1</td>
<td>(66.5-75.7)</td>
<td>84.2</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>All</td>
<td>39</td>
<td>70.0</td>
<td>(67.1-72.9)</td>
<td>119.4</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>

ENB: electromagnetic navigation B; EBUS: endobronchial ultrasound

New techniques: still an effect of size!

- 20 studies reported diagnostic yields for sizes ≤ and > 20 mm (629 vs 767 lesions)
- Weighted diagnostic yields: 60.9% (95% CI, 54.0% to 67.7%) and 82.5% (95% CI, 78.6% to 86.4%)
- Weighted difference 19.6% (95% CI, 11.7% to 27.6%, P < .001)

Radial EBUS: factors affecting diagnostic yield

- Retrospective review of 760 lesions (760 patients)
- Mean lesion diameter was $43 \pm 2$ mm. rEBUS-MP could visualize 83% and a definitive diagnosis was established in 62%
- Multivariate analysis: size $>20$ mm, distance lesion to carina $>40$ mm, malignant lesion and segment (1, 3, or 6, respectively)
- Bronchus sign was the only parameter that indirectly influenced the diagnostic yield through enhancing visualization yield

Electromagnetic navigation + EBUS

<table>
<thead>
<tr>
<th></th>
<th>EBUS</th>
<th>ENB</th>
<th>EBUS+ENB</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnostic yield</td>
<td>27/39 (69%)</td>
<td>23/39 (59%)</td>
<td>35/40 (88%)</td>
<td>0.02</td>
</tr>
<tr>
<td>Yield by lesion size</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 20 mm</td>
<td>7/9 (78%)</td>
<td>3/4 (75%)</td>
<td>9/10 (90%)</td>
<td></td>
</tr>
<tr>
<td>20-30 mm</td>
<td>16/23 (70%)</td>
<td>11/22 (50%)</td>
<td>21/24 (88%)</td>
<td></td>
</tr>
<tr>
<td>&gt; 30 mm</td>
<td>4/7 (57%)</td>
<td>9/13 (69%)</td>
<td>5/16 (83%)</td>
<td></td>
</tr>
<tr>
<td>Pneumothorax</td>
<td>2/39 (5%)</td>
<td>2/39 (5%)</td>
<td>3/40 (8%)</td>
<td>0.99</td>
</tr>
</tbody>
</table>

118 patients randomised between EBUS, ENB and EBUS+ENB

Eberhardt. Am J Respir Crit Care Med 2007;176:36
Bronchoscopic transparenchymal nodule access

First bronchoscopic technique not depending on an airway leading into the nodule
Calculation of an optimal airway wall point of entry and avascular path through lung tissue
Creation of a tunnel tract using catheters and fused fluoroscopic guidance
Feasibility study: 12 patients with 10 cases showing adequate biopsies. No adverse event.

Conclusions

• Diagnostic yield of new guided-bronchoscopy techniques is better than traditional bronchoscopy but lesion small size remains a limitation

• Combination may improve diagnostic yield to levels comparable to transthoracic needle aspiration (TTNA)

• Side-effect profile is low and lower than the side-effect profile of TTNA
Conclusions

• Use of bronchoscopy in the evaluation of the solitary pulmonary nodule (SPN) will increase in parallel with increasing data and improved techniques. Additional research is required in the field of combination of techniques and integration of bronchoscopy in the diagnostic algorithm of SPN.