Diagnostic challenge of small nodules
Possibilities and limitations of transthoracic procedures

S. Diederich
Department of Diagnostic and Interventional Radiology
Marien-Hospital Düsseldorf
Diagnostic challenge of small nodules
Possibilities and limitations of transthoracic procedures

No disclosures
Percutaneous (CT-guided) biopsy of small incidental pulmonary nodule

• when ?

• how ?

• accuracy ?

• complications ?
Should I perform a biopsy of this lesion?

Incidental solitary pulmonary nodule

baseline

6 weeks
Should I perform a biopsy of this lesion?

Incidental solitary pulmonary nodule
Percutaneous (CT-guided) biopsy of small incidental pulmonary nodule

- Guidelines: no biopsy in nodules < 8 mm
  (average diameter: maximum + short axis : 2)

- → follow-up with low-dose CT

- → if growth: volume doubling time (VDT)

- if VDT suspicious of malignancy (30 - 400 days)
  → resect if no contraindications

- if nodule ≥ 8 mm suspicious of malignancy
  → resect if no contraindications
Percutaneous (CT-guided) biopsy of small incidental pulmonary nodule

Biopsy of small incidental nodule if:
• nodule $\geq 8$ mm and
• nodule most likely benign or
• if likely malignant
  – patient no candidate for resection and
  – other options available if nodule malignant
    • radiation therapy
    • thermal ablation
    • medical therapy
Percutaneous lung biopsy

contraindications

absolute: none
relative:
  • decreased LFT ($O_2 < 60$ mmHg)
  • (functional) single lung
  • pulm. art. hypertension
  • coagulation disorders
  • COPD, esp. bullous emphysema
Feasibility of biopsy

large > small

apical > basal

with good cooperation
(reproducible breathhold)
biopsy of nodules > 8 mm
Selection of needle path

- not through areas of emphysema!
Selection of needle path

- not through areas of emphysema!
- not through fissures!

→ VATS
VATS: Inflammatory pseudotumor

- not through areas of emphysema!
- not through fissures!
- not if too close to large vessels!
Selection of needle

Automatic core biopsy

**pro**
- cytopathologist presence not required
- true positive benign diagnoses possible

**contra**
- potentially higher complication rate in central lesions (haemorrhage)

Percutaneous lung biopsy

Technique

• aseptic procedure
• local anaesthesia (no GA required)
• CT-guidance (if possible CT-fluoroscopy)
• control CT-scans for complications
• bed rest 4 hours, pulse & blood pressure x 2 / hour
• after 2-4 hours: CXR a.p./p.a.
• In-/ outpaient
Complications of lung biopsy

No statistically proven difference between:

• Direct puncture / coaxial technique
• Single / multiple pleural punctures
• Depth of lesion
• Needle diameter
complications: pneumothorax

• at CT: approx. 50%
complications: pneumothorax

• at CT: approx. 50%

• therapy required: 5-15%?
  
  • every symptomatic pneumothorax

  • > 30% of hemithorax, > 1 cm width

Yankelevitz (1996) Radiology
complications: pneumothorax

• at CT: approx. 50%

• therapy required: 5-15%?
  • every symptomatic pneumothorax
  • > 30% of hemithorax, > 1 cm width

• therapy by radiologist!
  • aspiration (16 - 18 G needle): immediately vs. after 4 h
  • catheter drainage (5 F-catheter !)
  • optional oxygen

Yankelevitz (1996) Radiology
complications: pneumothorax

- success rate: 80%
- 20% → chest drain (5F)
Post biopsy pneumothorax

aspiration
recurrence at 4 h
➔ catheter
complications: haemorrhage

- very common at CT (core bx)
- haemoptysis 2-4%
- therapy required < 1% ?
complications: air embolism

occurs when needle in pulmonary vein branch

• coaxial >>> direct puncture ?
• central >>> peripheral ?
• < 0,1%, however, potentially lethal
  • myocardial infarction
  • stroke
70 y/o female, endometrial ca
pT1, pN1, G1

- 18 G direct puncture (no coaxial technique)
- immediate coma, bradycardia, hypotension
Coronary air embolism
# CT-guided lung biopsy

## Accuracy

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>84 - 98%</td>
</tr>
<tr>
<td>Specificity</td>
<td>88 - 98%</td>
</tr>
</tbody>
</table>

## Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumothorax</td>
<td>- 50%</td>
</tr>
<tr>
<td>Pneumothorax requiring therapy</td>
<td>-15%</td>
</tr>
<tr>
<td>Haemorrhage</td>
<td>- 70%</td>
</tr>
<tr>
<td>Haemoptysis</td>
<td>2 - 4%</td>
</tr>
<tr>
<td>Air embolism</td>
<td>&lt; 0.1%</td>
</tr>
</tbody>
</table>
female smoker, history of ca uterus
new solitary pulmonary nodule

18 G core biopsy → immunohistology, molecular pathology

Metastasis from endometrial cancer, not primary lung cancer
Percutaneous wire localization

**Indication:**
- localization of a peripheral nodule for video-assisted thoracoscopic resection
- nodule only “palpable“ at VATS if distance to pleura < nodule diameter

**Technique:**
- CT-guided placement of wire with hook / spiral close to the nodule (centrally of nodule)
Percutaneous wire localization

Kohi MP et al. (2013) J Thorac Dis
Take-home message I

Biopsy in nodules < 8 mm
  - rarely indicated
  - rarely feasible

Biopsy in nodules ≥ 8 mm
  - size
  - location (lung apex/base, lung centre/periphery)
  - patient cooperation
Take-home message II

Percutaneous lung biopsy

• high accuracy

• low complication rate

• potentially fatal complications (air embolism)

Percutaneous wire localization

• pre VATS resection, if nodule not palpable
5th European Lung Cancer Conference, Geneva 16-04-2015

Thank you for your attention!

S. Diederich
Department of Diagnostic and Interventional Radiology
Marien-Hospital Düsseldorf