Minimally Invasive Diagnostic Techniques for Tissue Diagnosis of Lung Lesions: Radial Miniprobe, Navigational Bronchoscopy - Do We Need Percutaneous Biopsy?

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• Research Collaboration
  • Siemens
  • Novadaq Corp.
82F

- R lower lobe nodule
- Non-smoker
- Asymptomatic

**Methods of Bx?**
- Transbronchial biopsy
- CT guided biopsy
64M

- L lower lobe mass
- 40 pk yr smoker
- Asymptomatic

**Methods of Bx?**
- Transbronchial biopsy
- CT guided biopsy
78F

• Growing LUL nodule
• Severe COPD on home O2
• Current smoker

• Methods of Bx?
  • Transbronchial biopsy
  • CT guided biopsy
Which of the following is true regarding radial probe EBUS

A. The diagnostic yield of radial probe EBUS guided biopsy is not dependent on the size of the nodule

B. Radial probe EBUS is a navigational tool

C. Radial probe EBUS provides continuous real-time US guidance during biopsy of peripheral nodules

D. Combining radial probe EBUS with other technologies provides the best diagnostic yield
TBBx: Diagnostic Yield

• Malignancy:
  • peripheral lung cancer: 10 – 50%
  • < 40% if smaller than 2.5 cm

• Factors associated with increased yields:
  • size > 2 cm
  • air bronchogram to lesion

• Use of fluoroscopy increases the yield
  • C-arm
  • Biplane
  • Rotate pt

Sure et al., Am Rev Respir Dis 1983; 128: 1090
Cortese et al, Chest 2000; 117:1049
Nadich et al, 1988; 93:595
Gould et al, Chest 2007; 132:108s
Shinagawa et al, Chest 2004; 125: 1138
Improving the Yield: CT

Courtesy Dr. David Feller-Kopman
Radial probe EBUS

UM-3R (O.D. = 2.5mm)

UM-S20-20R (O.D. = 1.7mm)

Diagnosis of peripheral pulmonary lesions
EBUS-GS
EBUS-GS - Method
EBUS-GS for TBBx
84F

LUL lung nodule
Radial probe EBUS Techniques

• Use of guide sheath improves diagnostic yield over conventional approaches
  • 77% yield in 150 cases

• Not all lesions are visible by fluoroscopy
  • 54/81 lesions <20mm

• Fluoroscopy use does not necessarily improve the diagnostic yield for lesions >20mm
  • 75.6% yield using EBUS-GS without fluoroscopy for lesions >20mm
  • 29.7% yield using EBUS-GS without fluoroscopy for lesions <20mm

Chest 2004; 126: 959-65
Chest 2007; 131: 1788-93
EBUS-GS: Factors influencing yield

• Position of the probe

EBUS-GS: Factors influencing yield

- Position of the probe matters

- Concentric view (probe within) vs Eccentric view (probe adjacent) is the greatest predictor of diagnostic yield
  - Concentric View: Dx yield >80%
  - Eccentric View: Dx yield 30-50%

EBUS-GS: Factors influencing yield (size)

• Higher dx yield for lesions >20mm
  • 56.3% for lesions <20mm vs 77.7% for lesions >20mm

• May be related to being able to find and identify lesions using radial probe EBUS
  • Unable to identify 33% of nodules <20mm
    • Yield of 69% when nodule found
    • Yield of 46% overall

Eur Respir J 2011; 37: 902
Eur Respir  2009; 34: 1284
Radial probe EBUS - results

• Meta-analysis of 7 studies using radial probe EBUS for peripheral lesions
  • Pooled sensitivity for lesions < 25 mm was 71%

• One randomized prospective trial has compared radial EBUS with CT guided biopsy
  • Similar diagnostic accuracy
  • Complication rates 3% vs. 27%

Eur Respir J. 2011; 37: 902
Respir Med. 2011; 105: 1704
Navigational Bronchoscopy

• Electromagnetic Navigation Bronchoscopy
  • Super Dimension
  • Veran Medical

• Virtual Bronchoscopy
  • Lung Point
  • BF Navigation
Electromagnetic Navigation (EMN)

- inReach system, (SuperDimension, Covidien)
Real-time Location Information

Miniaturized sensor

Real-time delivery of information 166/sec

Electromagnetic Location Board

Generation of electromagnetic waves
EMN: Procedural steps

CT scan ➔ DICOM CD  
Planning ➔ File export  
Navigation ➔ Biopsy
EMN: Procedure
EMN results

• Diagnostic yield
  • SPN<30mm: 54-75%

• Limitation
  • registration error (3-8mm)
  • not real-time sampling
  • expensive

Schwartz et al., Chest 2006; 129: 988
Gildea et al, Am J Respir Crit Care Med 2006; 174: 982
Eberhardt et al, CHEST 2007; 131:1800
Eberhardt et al, AJRCCM 2007; 176: 36
Eberhardt et al, AJRCCM 2007; 176: 36
EMN + EBUS-GS

• The combination of radial probe EBUS with electromagnetic navigation had a higher dx yield than either method alone
  • 69% radial probe EBUS
  • 59% electromagnetic navigation
  • 88% combined

*Am J Respir Crit Care Med 2007; 176: 36-41*
Virtual Bronchoscopy Navigation (VBN)

- Olympus BF Navigation
Virtual Bronchoscopy Navigation (VBN)

- Olympus BF Navigation

Courtesy Dr. Fumio Asano
VBN+EBUS-GS vs EBUS-GS (V-NINJYA Study)

- Multicentre, randomized control study
  - Small peripheral nodules (≤ 3cm)
  - Dx yield higher in VBN group
    80.4% vs 67.0% (p=0.032)
  - Shorter time in VBN group
    24.0min vs 26.2min (p=0.016)

Asano et al, Thorax 2011; 66: 1072
Summary

• Radial probe EBUS can be used to confirm location of peripheral nodules

• Radial probe EBUS provides real-time feedback of location relative to peripheral nodules

• Factors such as lesion size and probe positioning significantly affect the diagnostic yield

• Combining radial probe EBUS with navigational bronchoscopy has shown an improved yield over either method alone
Which of the following is true regarding radial probe EBUS:

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- CT guided biopsy
  - Adenocarcinoma
64M

- Transbronchial biopsy
- Adenocarcinoma
78F

• Transbronchial biopsy
• Squamous cell ca
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Thank you