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Introduction

- Image-guided percutaneous lung biopsy is the invasive procedure of choice for the assessment of suspicious or indeterminate lung lesions
  - Safe, inexpensive, reliable
  - High diagnostic accuracy, sensitivity, and specificity in the detection of malignancy

Introduction

Radiologists play an important role in management of pulmonary nodules

- Expected to accelerate with implementation of USPSTF and CMS guidelines for lung cancer screening with low-dose CT
- Image-guided percutaneous lung biopsy is increasingly an essential piece of the diagnostic algorithm

Sharpe et al. *JACR* 2013;10:770-3
Introduction

- Nearly any lung lesion is accessible to the skilled radiologist with special consideration of options in technique, equipment, and image guidance
  - Imaging technology
  - Patient positioning
  - Needle design
  - Biopsy technique
In the current molecular profiling era, increasing importance is placed on safely obtaining greater amounts of tissue to identify actionable mutations for personalized therapy.

- Core needle biopsy (CNB) vs fine needle aspiration (FNA)
  - CNB provides more tissue than FNA for molecular and genomic testing.
- Number of needle passes through target lesions
  - More needle passes = greater tissue retrieval.
Prior studies have described techniques to maximize lung biopsy diagnostic yield, tissue retrieval, and patient safety

- Use of CT or CT fluoroscopy for image guidance
- Use of CNB for maximal tissue retrieval
- Minimum of 3 needle passes
- Autologous blood patch for pneumothorax risk reduction

Laurent et al. *Cardiovasc Intervent Radiol* 2000;23:266-72
Cheung et al. *Lung Cancer* 2010;67:166-9
Malone et al. *AJR* 2013;200:1238-43
Introduction

- The last broad survey of radiologist practice patterns for percutaneous lung biopsy was published by Aviram et al in 2005.

- Practices have evolved in the past decade influenced by advancements in technique, technology, and molecular/genomic science.

Objectives

- To assess the current techniques and practice patterns of radiologists performing percutaneous lung biopsies
- To identify areas that may necessitate further education
Methods

- This cross-sectional study used a web-based survey sent to the Society of Thoracic Radiology (STR) membership from August-October 2015
- Responses were collected anonymously, and results were tallied
Results

- 244 STR members responded to the survey
  - 137 (58%) reported regularly performing percutaneous lung biopsies

Primary Practice Setting

- 102 (74%) academic teaching hospital
- 19 (14%) private or group practice
- 14 (10%) mixed private and academic practice
- 2 (2%) group model HMO
Results – Image Guidance

- 130 (95%) respondents most commonly utilize CT or CT fluoroscopy for image guidance

![Preferred Modality of Image Guidance]

- CT: 82 (60%)
- CT Fluoroscopy: 48 (35%)
- Fluoroscopy: 6 (4%)
- Ultrasound: 1 (1%)
• 116 (85%) respondents perform CNB alone or in conjunction with FNA for a routine lung biopsy
• 20 (15%) respondents perform FNA alone

Preferred Biopsy Technique

- CNB + FNA: 59 (43%)
- Core Needle Biopsy (CNB): 57 (42%)
- Fine Needle Aspiration (FNA): 20 (15%)
**Results – Biopsy Technique**

- **Needle gauge**
  - Fine needle aspiration
    - 22 gauge most common
  - Core needle biopsy
    - 20 gauge most common

- **Use of coaxial technique**
  - 85 (74%) respondents for FNA
  - 126 (96%) respondents for CNB
  - 19 gauge outer needle most common
Results – Biopsy Technique

- Number of needle passes
  - 66 (59%) respondents perform 3+ needle passes for FNA
  - 85 (66%) respondents perform 3+ needle passes for CNB
Among the 99 respondents who reported access to such services, on-site cytology was regularly requested by 70 (71%)

In cases of suspected lung cancer, 79 (60%) respondents estimated sending tissue for molecular analysis at least 25% of the time
Results – Patient Safety

- 53 (40%) respondents routinely use intravenous conscious sedation during biopsy
- 43 (32%) respondents routinely use intraprocedural techniques for pneumothorax risk reduction

Method of Pneumothorax Risk Reduction

- 91 (68%) None
- 27 (20%) Yes, Autologous blood patch
- 10 (7%) Yes, Hydrogel Plug
- 6 (5%) Yes, Other
Results – Patient Safety

- **115 (86%)** respondents routinely keep the patient under observation between 1 to 4 hours

- **Post-biopsy CXR**
  - **72 (54%)** respondents routinely obtain 1 CXR
  - **47 (35%)** respondents routinely obtain 2 CXRs
Among surveyed radiologists who perform percutaneous lung biopsies, most utilize CT guidance either with CNB alone or in conjunction with FNA.

Multiple prior studies support the use of CNB for:
- Diagnosis of nonepithelial malignancies and benign lesions
- Molecular/genomic profiling of NSCLC
Since 2005, significant changes in percutaneous lung biopsy practice were observed in:

- Use of CT/CT fluoroscopy for image guidance
  - 70% of surveyed radiologists in 2005, 95% in 2015
- Use of CNB, either with or without FNA
  - 27% in 2005, 85% in 2015
- Use of intravenous conscious sedation
  - 19% in 2005, 40% in 2015

Since 2005, practices are stable in:

- FNA, CNB, and coaxial needle gauge
  - 22 gauge needle most common for FNA
  - 20 gauge needle most common for CNB
  - 19 gauge outer coaxial needle most common

- Percentage of radiologists that requests on-site cytology
  - 73% of surveyed radiologists in 2005, 71% in 2015

Discussion

- Just over half of surveyed radiologists regularly sends biopsy material of lung cancer for molecular analysis
  - In this era of personalized therapy, further education of radiologists and referring physicians needed so that this is performed in most cases

- Preventive measures for pneumothorax are not yet in widespread use
Limitations

- This survey of practice patterns was sent only to the STR membership
  - Most respondents are subspecialists in academic setting
- Practice patterns amongst subspecialty and academic radiologists often differ from those of community radiologists
  - A survey with a greater proportion of community radiologists would more closely resemble overall radiologist practice
  - There is often a lag in broad adoption of best practices
Conclusions

- The majority of academic thoracic radiologists performing percutaneous lung biopsies practices in accordance with published recommendations in technique, especially with regard to obtaining sufficient tissue for molecular/genomic analysis.

- A small minority routinely performs FNA alone which may negatively impact diagnostic accuracy and provide insufficient tissue for molecular profiling.
Conclusions

- Radiologists performing biopsies of suspected lung cancer should be proactive in sending tissue for molecular analysis.

- There is room for growth in the adoption of intra-procedural preventive measures for pneumothorax risk reduction.


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