

**Original contribution**

# Core needle biopsy in benign lung lesions: pathologic findings in 159 cases

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Received 29 December 2009; revised 26 April 2010; accepted 30 April 2010

**Keywords:**Core needle biopsy;  
CNB;  
Lung;  
Benign

**Summary** Although core needle biopsy has been shown to be an accurate means of diagnosing lung malignancies, there is relatively little information in the literature about its utility in diagnosing specific non-malignant conditions. We reviewed the pathologic findings in 159 core needle biopsies showing benign changes in order to determine the types of processes that can be diagnosed by this technique and the factors that influence accuracy and specificity. There were 155 patients ranging in age from 3 to 86 years (mean 58). Nodules or masses were present radiologically in most. They ranged from 0.5 to 8.0 cm (mean 1.65 cm) in size and 80% measured 2.0 cm or less. Twenty percent were spiculated, and positron emission tomography scans were positive in 48 of 56 cases tested (30% of total). Specific diagnoses were established in 122 (77%) of 159 core needle biopsies, while 24 (15%) were nonspecific and 13 (8%) were nonrepresentative. The most common specific diagnoses were necrotizing granulomatous inflammation (45), scar (28), organizing pneumonia (13), and benign neoplasms (11). A mixture of interstitial fibrosis and chronic inflammation (16) was the most common nonspecific diagnosis. A specific diagnosis was significantly more likely in biopsies with 3 or more cores or with a core length of more than 1 cm. Malignancy was diagnosed on a subsequent biopsy in only one case, and the initial biopsy in that case showed non-specific chronic inflammation and fibrosis. Our findings confirm that core needle biopsy is an accurate method of diagnosing benign lung lesions, yielding specific diagnoses in the majority.

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## 1. Introduction

Although core needle biopsy (CNB) has been shown to be an accurate means of diagnosing lung malignancies, there is relatively little information in the literature about its utility in diagnosing non-malignant conditions. While previous series of CNB of lung have included benign diagnoses [1–12], none provide details of the histological features. The purpose of this study is to determine the types of benign diagnoses that

can be appreciated on CNB with in-depth analysis of pathologic features and to assess factors that may influence diagnostic accuracy.

## 2. Materials and methods

One hundred fifty-nine CNB with benign diagnoses from 155 patients were identified from the surgical pathology files at State University of New York Upstate Medical University from 2005 to 2007. All cases were computed tomography-guided percutaneous biopsies, performed using standard

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coaxial technique with a 19-gauge guiding needle and a 20-gauge biopsy gun. Cases with a malignant or atypical diagnosis were excluded. Slides were reviewed and clinical and radiologic information was obtained from the medical records. For each biopsy, the number of cores received was recorded and the length of all cores was measured and added in order to obtain a combined core length.

In all cases, a search was performed for biopsies or resections performed subsequent to the original CNB. Subsequent pathologic material in these cases was reviewed and compared to the original CNB.

The State University of New York Upstate Medical University Institutional Review Board for Protection of Human Subjects approved the study.

### 3. Results

Patients ranged from 3 to 86 years old (mean 58, median 59.5). All but 16 (10%) were older than 40. There were 79 men and 76 women. Ninety-nine (63%) were current or former smokers.

#### 3.1. Pathologic findings

A mean of 4.2 cores was submitted per biopsy (range, 1-11), and the mean combined length of all cores per biopsy was 1.7 cm (range, 0.2-4.4 cm). Biopsies with 3 or more cores were significantly more likely to yield a specific diagnosis ( $P = .002$ ; two-tailed, unpaired  $t$  test) (Table 1) in that a specific diagnosis was found in 82.5% of cases containing greater than 3 cores compared to 54.5% when there were less than 3 cores. Similarly, a specific diagnosis was significantly more likely when the cores had a combined length of more than 1 cm ( $P = .004$ ; two-tailed, unpaired  $t$  test) (Table 2) in that specific diagnoses were found in 82.5% of cores with a combined length greater than 1.0 cm compared to 59% with length less than 1.0 cm.

The pathologic findings are summarized in Table 3. A specific diagnosis was made in 122 (77%) of 159 cases.

##### 3.1.1. Specific diagnoses

Necrotizing granulomatous inflammation was the most common specific benign diagnosis, occurring in 45 cases (28%). An organism was detected on Ziehl-Neelsen or Grocott Methenamine Silver stains in 15 (33%), including

**Table 1** Correlation of number of cores and specific diagnosis

No. of cores	No. specific diagnoses (%)	No. nonspecific diagnoses or nonrepresentative tissue (%)	Total no.
<3	18 (54.5)	15 (45.5)	33
≥3	104 (82.5)	22 (17.5)	126

$P = .002$ ; two-tailed, unpaired  $t$  test.

**Table 2** Correlation of core length and specific diagnosis

Total core length (cm)	No. of specific diagnoses (%)	No. of nonspecific diagnoses or nonrepresentative tissue (%)	Total no.
≤1	23 (59)	16 (41)	39
>1	99 (82.5)	21 (17.5)	120

$P = .004$ ; two-tailed, unpaired  $t$  test.

*Histoplasma* (10), *Coccidioides* (2), mycobacteria (2) and *Cryptococcus* (1). In the remaining 30 cases, no organism was identified. Three of these cases occurred in patients with rheumatoid arthritis, raising the possibility of a rheumatoid nodule. In one case, there were features suggestive of Wegener's granulomatosis, including foci of dirty necrosis, scattered eosinophils, and chronic inflammation in vessel walls, although diagnostic necrotizing vasculitis was not identified. The patient was subsequently diagnosed with

**Table 3** Benign diagnoses on core needle biopsies of lung

	No. of cases (total = 159)
Specific diagnoses	122 (77%)
Necrotizing granulomatous inflammation	45
No organism identified	30
Organism identified	15
<i>Histoplasma</i> (10)	
<i>Coccidioides</i> (2)	
Mycobacteria (2)	
<i>Cryptococcus</i> (2)	
Scar	28
Organizing pneumonia	13
Benign neoplasm	11
Hamartoma	8
Solitary fibrous tumor	2
Schwannoma	1
Non-necrotizing granulomatous inflammation	8
No organism identified	5
Organism identified	3
<i>Cryptococcus</i> (2)	
Fungal hyphae (1)	
Other specific diagnoses	17
Abscess	5
Nodular amyloidosis	3
Intrapulmonary lymph node	3
Mycetoma	2
Invasive fungal pneumonia	2
Aspiration pneumonia	1
Cryptococcal pneumonia	1
Nonspecific diagnoses	24 (15%)
Interstitial fibrosis and chronic inflammation	16
Necrosis	3
Acute and/or chronic inflammation	2
Intra-alveolar fibrin	2
Organizing hemorrhage	1
Nonrepresentative biopsies	13 (8%)

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