



# Relevance of Computed Tomography Guided Lung Biopsy in Evaluating Lung Lesions with Histopathology Correlation

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## KEYWORDS

Biopsy, Computed Tomography Histopathology Benign, Malignant. hemoptysis

## ABSTRACT:

**Introduction:** A lung biopsy offers key diagnostic details that is required to provide the best possible patient care, making it an invaluable tool in the thorough assessment of pulmonary abnormalities. Lung biopsy improves patient outcomes and quality of life by enabling precise diagnosis, prognosis, and customized therapy plans by giving histological characterization of lesions.

**Objectives:** To evaluate the significance of CT guided lung biopsy for lung lesions and correlate with histopathology in a patient with a previous medical history of clinical indication of Lung lesion or a physical examination of lung lesion.

**Methods:** A retrospective study was performed among 46 patients which included the data of patients with clinical/laboratory/ultrasonography diagnosis of Lung lesion who were further referred for CT guided Lung biopsy for correlation. A detailed data of 46 patients were collected including age, Gender, Clinical history and histopathological findings were entered in a specifically designed format taken into consideration.

**Results:** The majority of patients (48%) were asymptomatic while 30% experienced chest pain as a primary symptom and 22% had a history of haemoptysis. CT guided lung biopsy demonstrated a diagnostic yield of 100%, overall, with n=33, 71.8% yield for malignant lesions and n=7, 15.2% yield for benign lesions and n=6, 13%, for other atypical findings. Out of the 33 malignant lesions most of them were diagnosed with Adenocarcinoma (n=11, 33%), followed by Squamous cell carcinoma (n=7, 21.2%), Metastatic Carcinoma n=5, 15%), Metastatic sarcoma (n=5, 15%) and Metastatic melanoma (n=5, 15%) respectively.

**Conclusions:** By integrating CT findings with histopathology, clinicians can effectively differentiate between benign and malignant abnormalities, guiding personalized treatment plans.

## 1. Introduction

Lung cancer is the most frequently reported cancer globally, accounting for an estimated 2.2 million new cases and 1.8 million deaths in 2020 [1]. In India, lung cancer constitutes 6.9 per cent of all new cancer cases and 9.3 per cent of all cancer-related deaths in both sexes [2]. In the era of modern medicine, diagnostic methodologies are in a constant state of refinement to meet the imperatives of precision, efficacy, and patient welfare. With the increasing prevalence of lung nodules and masses, largely attributable to the growing use of

imaging modalities like CT, the significance of precise biopsy methods in accurately determining the nature of these lesions cannot be overstated. CT-guided lung biopsy presents a precise approach for targeting suspicious lesions identified on imaging, facilitating the retrieval of tissue samples under real-time imaging guidance. The use of CT as a guidance modality is highlighted for its safety and accuracy, especially for central lesions and those involving the hila and mediastinal structures [3]. Among these advancements, computed tomography (CT)-guided lung biopsy emerges as a pivotal procedure in diagnosing and managing



pulmonary lesions and nodules offering a less invasive method of procuring tissue samples for histopathological assessment. With the escalating incidence of pulmonary nodules and masses, driven by the augmented usage of imaging technologies like CT scans, the significance of accurate biopsy techniques cannot be overstressed. CT-guided core needle biopsy with on-site cytology evaluation is an effective and safe method for the evaluation of peripheral lung lesions [4]. It offers several advantages, including precise localization of lesions, reduced risk of complications compared to surgical biopsy, and the ability to sample lesions in challenging locations or those unsuitable for surgical resection. Percutaneous needle biopsy of the lung is a safe and accurate procedure for the diagnosis of focal thoracic lesions [5]. The use of a coaxial needle provides stability and allows for multiple sampling, improving the diagnostic yield [6]. CT guided biopsy had higher sensitivity and would be preferable for diagnosing lung cancer and its various subtypes [7]. While histopathological examination of biopsy specimens remains the benchmark for definitive diagnosis, offering vital insights into the nature of pulmonary lesions (whether malignant, infectious, or benign), the correlation between CT-guided lung biopsy findings and histopathology results is of utmost importance. The PEARL technique for CT-guided percutaneous lung biopsy effectively reduced the incidence of pneumothorax and the need for chest tube insertion [8]. The correlation between CT-guided lung biopsy findings and histopathology results in a pivotal role in validating the accuracy of the biopsy procedure and informing subsequent management decisions. This correlation also serves as a cornerstone for validating biopsy accuracy and guiding subsequent management decisions.

## 2. Objectives

The main objective of this study was to evaluate the significance of CT guided lung biopsy for lung lesions and correlate with histopathology in a patient with a previous medical history of clinical indication of Lung lesion or a physical examination of lung lesion. The study is also used to analyzes the CT guided lung biopsy protocol to determine the size, location, and characteristics of the lesion.

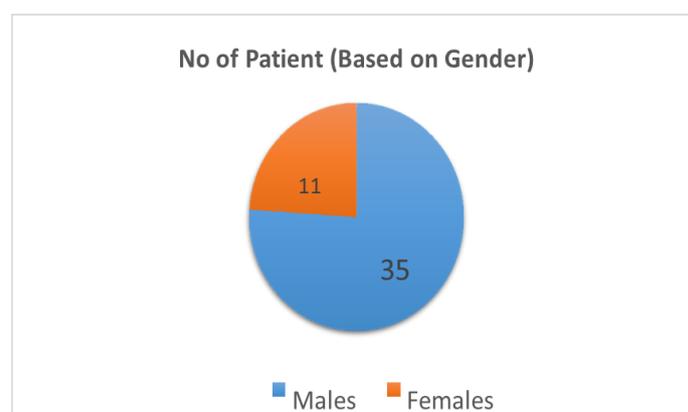
## 3. Methods

A retrospective study was performed among 46 patients at Brainware University, Kolkata, West Bengal, India. The data was collected in the time duration of November 2022 – April 2023. The study included the data of patients with clinical/laboratory/ultrasonography diagnosis of Lung lesion who were further referred for CT guided Lung biopsy for correlation. The result of the assessment was used for correlating CT guided lung biopsy with histopathology results.

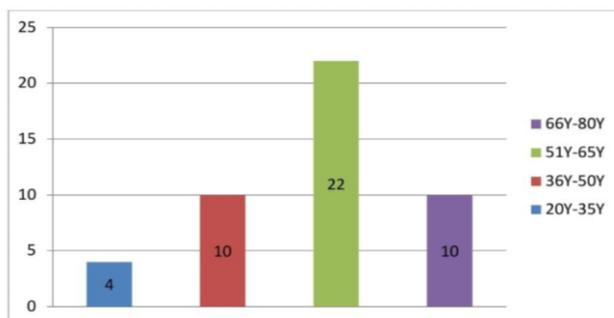
**DATA COLLECTION:** A detailed data of 46 patients were collected including age, Gender, Clinical history and histopathological findings were entered in a specifically designed format taken into consideration. Retrospectively image data of the patients who have undergone CT guided lung biopsy were assessed to identify the site, size and characteristics of the lesion. The collected data were analysed using Microsoft excel sheets. All referred patients with clinical/laboratory/ultrasonography diagnosis of lung lesion were included in this study. Those patients who were allergic to any medication like anaesthetic agents and pregnant females were excluded from this study.

## 4. Results

In our study we have retrospectively collected 46 patient histopathology report details who underwent CT guided lung biopsy. Among all patients, 35 were male and 11 of them were females with a mean age of 53.7 years (**Figure 1, Figure 2**).



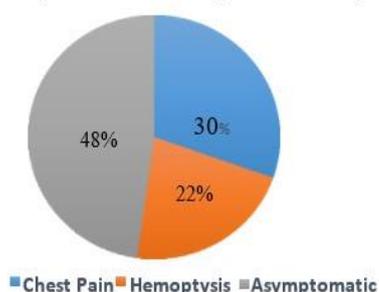
**Figure 1-** Pie Chart showing number of patients



**Figure 2-** Bar graph showing different age group of the patients.

The majority of patients (48%) were asymptomatic while 30% experienced chest pain as a primary symptom and 22% had a history of haemoptysis (**Figure 3**).

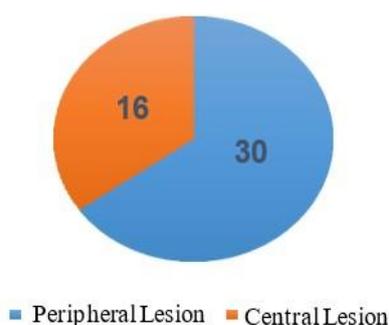
Percentage of patient showing different symptoms



**Figure. 1:** Pie chart showing the percentage of patients with different symptoms

The majority of lesions (n=30, 65.2%) were located in the periphery of the lung while (n=16, 34.8% were located in the center (**Figure 4**).

Location of lung lesion in different patients



**Figure. 4:** Pie chart showing the different locations of lesions locations of lung lesions in different patients

In our study we have retrospectively collected 46 patients histopathology report details who underwent CT guided

lung biopsy. As per the study carried out for 46 patients were diagnosed with benign lung lesion 7 of them were diagnosed with Benign lung lesion, 33 patients were diagnosed with Malignant lesions and 6 of them were diagnosed with atypical finding of lung lesion.

### 5. Discussion

This study found that CT-guided lung biopsy achieved a 100% diagnostic yield across 33 cases. Malignant lesions accounted for 71.8% (n=24), benign lesions 15.2% (n=7), and 13% (n=6) exhibited other atypical findings. Among the malignant lesions, Adenocarcinoma was most prevalent (33%, n=11), followed by Squamous cell carcinoma (21.2%, n=7), Metastatic Carcinoma (15%, n=5), Metastatic sarcoma (15%, n=5), and Metastatic melanoma (15%, n=5) (**Table 1**).

Diagnosis	Number of cases
<b>1. Benign</b>	7
<b>2. Malignant</b>	33
a) Metastatic carcinoma	5
b) Adenocarcinoma	11
c) Squamous cell carcinoma	7
d) Metastatic melanoma	5
e) Metastatic sarcoma	5
<b>3. Atypical</b>	6
<b>TOTAL</b>	<b>46</b>

**Table 1-** Table showing the types of different lung lesions after correlating with the Histopathology results.

These findings underscore the effectiveness of CT-guided lung biopsy in diagnosing various lung conditions, with a significant proportion being malignant. The predominance of Adenocarcinoma highlights its prevalence in lung pathology, followed by other metastatic and primary malignancies. This underscores the importance of accurate diagnostic techniques in guiding appropriate treatment strategies and prognosis assessment for patients with suspected lung lesions. Further research may explore refinements to biopsy techniques and their impact on diagnostic accuracy and patient outcomes in lung pathology. Elisabeth Appel et al. conducted a study involving a total of 423 biopsies performed on 409 patients (231 were female, comprising 56% of the total). Pneumothorax occurred in 83 out of the 423 biopsies (20%), leading to



the placement of a chest tube in 11 cases (3%). Perilesional bleeding was detected in 194 out of the 423 biopsies (46%), while haemoptysis was observed in 20 cases (5%) [9]. In a separate investigation carried out by Zhongyuan Yin et al., 127 patients were examined, and pathologic analysis affirmed the successful completion of all biopsies. Sensitivity, specificity, positive predictive value, and negative predictive value were each determined to be 100%. Concerning adverse events, the incidence rates of pneumothorax and haemoptysis were 33.9% and 4.7%, respectively. [10]. Y Li and Y DU carried out a retrospective investigation that included 169 patients who underwent CT-guided CNB for small pulmonary lesions. The overall diagnostic accuracy was 93.5%, with a sensitivity of 90.4% for detecting malignancy and a specificity of 100% for identifying benign lesions. Positive and negative predictive values were both determined to be 100% and 83.3%, respectively. Pneumothorax was observed in 25 patients (14.8%) subsequent to CT percutaneous CNB of the lung [11]. Iram Pasha et al. conducted a study involving 77 patients diagnosed with pleural disease who underwent CT guided pleural biopsies. Malignant pleural conditions comprised the majority, with metastatic adenocarcinoma being the most prevalent (31.2%), followed by metastatic squamous cell carcinoma and mesothelioma. Tubercular pleural involvement represented the second most frequent category (16.9%) [12]. By combining CT findings with histopathology, clinicians can differentiate between benign and malignant abnormalities, guiding personalized treatment approaches. Accurate histopathological diagnosis also assists in predicting outcomes and assessing risks, which informs patient counselling and follow-up plans. Collaboration among radiologists, interventional pulmonologists, and pathologists is critical for interpreting both imaging and histopathological data together, ensuring informed clinical decisions and improving patient outcomes in lung disorders.

CT-guided lung biopsy is essential in the diagnosis and treatment of pulmonary conditions, particularly in targeting suspicious lesions, including those that are small or deeply situated. Analysing biopsy specimens histopathological offers valuable insights into cellular composition and the presence of malignancy. By combining CT findings with histopathology, clinicians can differentiate between benign and malignant

abnormalities, guiding personalized treatment approaches. Accurate histopathological diagnosis also assists in predicting outcomes and assessing risks, which informs patient counselling and follow-up plans. Collaboration among radiologists, interventional pulmonologists, and pathologists is critical for interpreting both imaging and histopathological data together, ensuring informed clinical decisions and improving patient outcomes in lung disorders.

In Conclusion CT-guided lung biopsy is a highly valuable tool for assessing lung lesions, especially when coupled with histopathological analysis. The precise targeting of suspicious lesions, even those that are small or deeply located, improves the accuracy of tissue sampling. By integrating CT findings with histopathology, clinicians can effectively differentiate between benign and malignant abnormalities, guiding personalized treatment plans.

## 6. Ethical Consideration

Conflict of Interest: None

Source of Funding: None

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