

# Effect of Size of the Lesion on the Rate of Pneumothorax after CT Guided Transthoracic Needle Aspiration Biopsy of Lung Masses

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## ABSTRACT

**Purpose of study:** To analyze the rate of Pneumothorax after CT guided TNAB of lung masses , and correlating it with the size of the lesion.

**Patients and method:** Seventy patients underwent CT guided FNA of the chest masses.

**Results:** Out of seventy, 18 patients i.e.; 26 % developed Pneumothorax. Lesion less than 1 cm , out of 6 patients 3 developed pneumothorax ( 50 %), lesions 1-2 cm 5 out of 11 developed pneumothorax(45%), lesions with size of 2-3 cm 5 out of 14 patients developed pneumothorax ( 35%), lesions between 3-4cm 2 out of 8 developed pneumothorax (25%), lesion sized 4-5 cm 1 out of 15 developed pneumothorax (6%), and lesion with more than 5 cm size 1 out of 16 developed pneumothorax (6%).

**Conclusion:** The study shows that the rate of Pneumothorax after CT guided TNAB of Lung Masses increases as the size of the lesion decreases.

**Key words:** Pneumothorax, CT guided TNAB, Lesion Size.

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## INTRODUCTION

Transthoracic percutaneous biopsy of the lung masses is a long known and time proven invasive procedure. To get to a diagnosis, the clinicians rely heavily on the Radiological and Pathological findings. In previous days, open biopsy of the lung mass was done to reach a diagnosis but as the medicine is evolving the newer modalities are there to image the body and guide the invasive Radiologist, open lung biopsy has become almost obsolete now. Computed Tomography (CT) assisted Fine Needle Aspiration Biopsy (FNAB) of the lung masses is now used very frequently in cases where the diagnosis depends on histopathology. CT images guides the Radiologist towards the area of interest and then the procedure is done. Percutaneous transthoracic needle aspiration biopsy (TNAB) of the lung is a well-established method for obtaining pulmonary tissue for pathologic examination<sup>1,6</sup>. Accuracy for the diagnosis of benign and malignant diseases is greater than 80% and 90%, respectively<sup>4,5,6</sup>.

Fatal complications due to systemic air embolism, hemorrhage, or pericardial tamponade have been described<sup>3,7-10</sup>, but these complications are rare. Other serious complications, such as seeding of malignant cells into the needle track<sup>11</sup>, lung torsion<sup>12</sup>, and empyema<sup>7</sup>, also are rare and should not alter indications for TNAB.

Pneumothorax is, by far, the most frequent complication of the procedure: Reported<sup>2,8,13,23</sup> rates range widely, from 5% to 61%. Most of these data pertain to fluoroscopically guided TNAB. Overall, TNAB performed with computed tomographic (CT) guidance may be associated with a higher frequency of pneumothorax than fluoroscopically guided TNAB, probably because CT requires more time, and the average size of the lesion is smaller. The reported rate of pneumothorax with CT-guided biopsy may also be slightly higher because CT is more sensitive for the detection of pneumothorax. The authors of several investigations<sup>1,13,24</sup> have reported a 22%–45% risk of pneumothorax for CT-guided TNAB

There are multiple factors or variables which effect the rate of Pneumothorax in CT guided FNAB of Chest masses<sup>25,26</sup>. Size of the needle, size of the lesion , depth of the lesion from the pleural surface and the number of punctures that are done through the pleura are perhaps some of the important ones which have been studied in quite detail<sup>27</sup>. Also the time for which the needle remains in the chest cavity , the dwell time and the angle of pleural puncture have been reported<sup>25,26</sup> as the factors which have some sort of influence on the development of Pneumothorax after CT guided FNAB of Chest masses.

## PURPOSE OF STUDY

To analyze the rate of Pneumothorax after CT guided TNAB of lung masses and correlating it with the size of the lesion

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**PATIENTS AND METHODS**

Study Design. This was a Descriptive study.

Sample Population

Patients having a chest mass who required a biopsy to reach the definitive diagnosis. These patients were referred from Chest Medicine , Chest Surgery and Medical departments. Convenient sampling was done.

Sample Size.

Seventy patients

Place of study

Department of Radiology Mayo Hospital , Lahore.

Duration of Study.

This study was conducted over a period of 10 months from June 2002 to April 2003 , in which 70 cases will be evaluated.

Inclusion criterion

1. Patients between 15- 75 years age group.
2. The patients had a control X ray Chest and CT chest with them before the FNA.
3. All patients had PT/ APTT done for bleeding and clotting control .

Exclusion criterion

1. Because of the complications that may arise from the procedure, only indoor patients were included in the study.
2. Already diagnosed cases were not considered .
3. Patients who were not having proper advice form from the respective consultant also were not considered.

Methodology

The Fine Needle Aspirations (FNA) were carried out under the guidance of CT scan machine of Toshiba Spiral CT Xvision/Ex. The FNA was conducted via 18G, 20G or 22G. Size of the lesion, distance of the lesion from the pleura and the number of punctures through the pleura recorded and documented in the form of a proper proforma. Immediate post procedure CT slices of chest and 6 hours delayed Chest X rays were taken to analyze Pneumothorax.

Data Analysis.

In this descriptive study the data, i.e.; the effect of Size of needle, Size of lesion, Distance of lesion from the pleura and the number of punctures through the pleura on the rate of Pneumothorax after CT guided FNA of Chest masses, were evaluated using Proportions , Frequencies (%).

**RESULTS**

Total numbers of patients included in the study were 70. Eighteen out of these 70 patients developed pneumothorax after the procedure.

Lesion less than 1cm, out of 6 patients 3 developed pneumothorax (50%), lesions 1-2cm 5 out of 11 developed pneumothorax(45%), lesions with size of 2-3cm 5 out of 14 patients developed pneumothorax (35%), lesions between 3-4cm 2 out of 8 developed pneumothorax (25%), lesion sized 4-5cm 1 out of 15 developed pneumothorax (6%), and lesion with more than 5cm size 1 out of 16 developed pneumothorax (6%).

Size of Lesion	=n	Pneumothorax	Frequency
<1cm	6	3	50%
1-2cm	11	5	45.4%
2-3cm	14	5	35%
3-4cm	8	2	25%
4-5cm	15	1	6%
>5cm	16	1	6%
	70	18	



Fig 1. Marking of the lesion and localization before biopsy

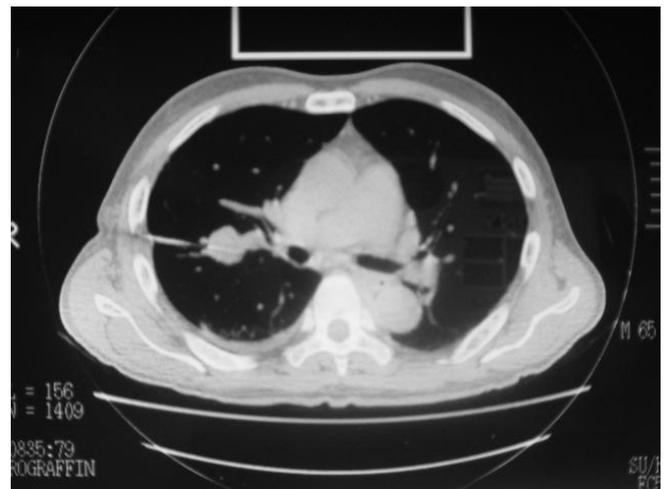


Fig 2. Needle insertion into the lesion close to hila, no pneumothorax

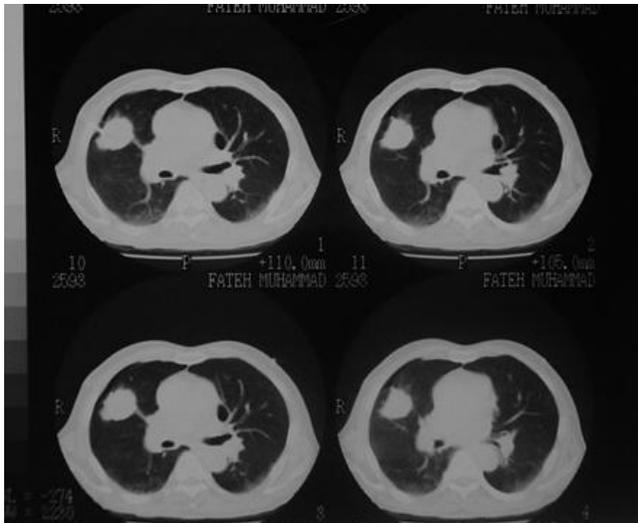


Fig. 3. Pneumothorax during the procedure of TNAB

## DISCUSSION

The rate of pneumothorax has been studied very extensively using multiple variables, the size of the lesion being one. Also the needle size, depth of the lesion, number of punctures required to obtain adequate samples, the dwell time and the angle of the needle in relation to the pleura have been studied<sup>16,17,18</sup>.

The strong correlation between pneumothorax rate and lesion size is difficult to explain, although this correlation has previously been reported<sup>15,24</sup>. It could be argued that larger lesions are more likely to contact the pleural surface and, hence, not require needle passage through aerated lung. However, the correlation of increasing frequency of pneumothorax with decreasing lesion size persists, even if lesions with pleural contact are eliminated from consideration. Another possible explanation for this finding is that the up-and-down movement of the needle tip during aspiration biopsy results in more tearing of adjacent lung parenchyma when the lesion is relatively small.

All the cases we took were not attached to the pleura and the lesions were of the lungs so the pleura had to be punctured.

## CONCLUSION

The study shows that the rate of Pneumothorax after CT guided TNAB of Lung Masses increases as the size of the lesion decreases.

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