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## Yield Of Ultrasound Guided Tru-Cut Biopsy Of Peripheral Thoracic Masses By Pulmonologists

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### Article Details

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### ABSTRACT

**Background:** Biopsy of peripheral thoracic masses can be performed percutaneously. This usually requires computed tomography guidance and is performed by radiologists. Ultrasound can visualize peripheral masses and it can be used as guidance modality for percutaneous biopsy with real time visualization.

**Objective:** To determine yield and safety of percutaneous Tru-Cut biopsy of peripherally located thoracic masses performed under ultrasound guidance by pulmonologists.

**Materials and methods:** During study period n=42 consecutive patients with thoracic masses abutting the chest wall were enrolled. 20 (47.62%) were male and 22 (52.38%) were female with mean age of 40.45 years. 28 (66.67%) patients had mass originating from lungs, 12 (28.57%) had from anterior mediastinum and 2 (4.76%) had pleural based mass. Average size of mass was more than 4 cm. 16 gauge semiautomatic Tru-Cut biopsy needle was used for all patients.

**Results:** Histological diagnosis was obtained in 38 (90.47%) patients. Inconclusive report was seen in 4 (9.52%) patients. Complication occurred only in 1 (2.38%) patient and that was pneumothorax, requiring chest tube placement.

**Conclusion:** Percutaneous Tru-Cut biopsy performed under ultrasound guidance by pulmonologists is a safe procedure and carries good yield and safety.

## **INTRODUCTION:**

Accurate and timely diagnosis of thoracic masses is a cornerstone in the management of patients with suspected malignancies or other thoracic pathologies.<sup>1</sup> Peripheral thoracic lesions, particularly those abutting the pleura or located near the chest wall, often pose diagnostic challenges due to their location, size, and the risk of complications during tissue sampling.<sup>2</sup> Establishing a definitive histopathological diagnosis is critical not only for guiding therapy but also for prognostication, as treatment strategies vary significantly between different tumor types and benign versus malignant processes.

Conventionally, computed tomography (CT)-guided biopsies have been considered the standard for sampling peripheral thoracic lesions, offering precise localization and high diagnostic yield.<sup>3</sup> However, CT-guided procedures are resource-intensive, require patient transport to radiology suites, expose patients to ionizing radiation, and may not be immediately accessible in all clinical settings. Moreover, these procedures may be associated with procedure-related complications, such as pneumothorax, hemothorax, or injury to surrounding structures.

In recent years, ultrasound-guided Tru-Cut biopsy has emerged as an increasingly utilized alternative for sampling peripheral thoracic masses. This technique allows real-time visualization of the lesion, surrounding structures, and the biopsy needle, enabling precise targeting while minimizing complications. Ultrasound guidance is portable, radiation-free, and can be performed at the bedside, making it particularly suitable for patients with limited mobility or those in critical care settings.<sup>4</sup> Additionally, it facilitates repeated sampling in cases where initial biopsy is inconclusive.

While several studies have reported on the safety and efficacy of ultrasound-guided thoracic biopsies, most data are derived from radiologists performing the procedures. There is limited literature evaluating the diagnostic yield, adequacy of tissue samples, and complication rates when the procedure is performed by pulmonologists, who often manage patients with thoracic masses in outpatient and inpatient settings. Assessing the performance of pulmonologists in conducting ultrasound-guided Tru-Cut biopsies is essential to define its role in routine clinical practice, particularly in centers where interventional pulmonology services are available.

Peripheral lung lesions are difficult to diagnose by sputum cytology or bronchoscopy.<sup>5</sup> Percutaneous biopsy of lung is usually used as a diagnostic tool for lesions situated close to the chest wall.<sup>6</sup> Computed Tomography (CT) is the preferred and most common used guidance modality for percutaneous procedures performed by radiologists.<sup>7</sup> But CT is usually not available everywhere and it does not allow real time visualization of needle and the lesion.<sup>8</sup> A lesion close to chest wall serves as acoustic window and allows penetration of ultrasound<sup>1</sup> making visualization of lesion possible.

In our study we have tried to assess the yield and safety of percutaneous biopsy of thoracic lesions performed under ultrasound guidance by a pulmonary physician or pulmonologist.

## **Methods and Material:**

This prospective observational study was carried out at Fatima Jinnah General and Chest Hospital between July 2014 and November 2017. 42 consecutive patients were selected for biopsy who had peripheral thoracic lesions based on chest X-ray or CT chest. Patients with pleural effusion and central lung mass were not included. For all the patients a 16 French semi-automatic Tru-Cut biopsy needle was used. Informed consent was obtained from all patients. Patients were positioned either seated, supine, prone or in decubitus position depending upon the location of lesion. Position, size and depth of lesion was determined using linear probe of ultrasound machine. Skin was sterilized with iodopovidone solution and anaesthetized with 2% lidocaine solution. Ultrasound probe was also sterilized with iodopovidone and placed in a sterilized sleeve. A small incision, just to introduce the biopsy needle was given. Tru-Cut needle was then introduced through the incision and was advanced into the lesion under real time ultrasound guidance. On average total of 5 passes were made in each patient. Average time of procedure was 25 minutes. After procedure patients were admitted in ward for observation and chest X-ray was done soon after procedure for complications.

## Results:

Total of 42 consecutive patients were included in our study, 20 (47.62%) were male and 22 (52.38%) were female, aged 09 to 75 years with mean age of  $40.09 \pm 6.28$  years. 28 (66.67%) patients had lesion originating from lungs, 12 (28.57%) had from anterior mediastinum and 02 (4.76%) had pleural based lesion. Average size of lesion was 4 cm. Histological diagnosis was obtained in 38 (90.47%) of patients. Non diagnostic report was seen in 04 (9.52%) biopsies, of these 03 were lesions originating from lung and 01 from mediastinum. In those with histologic diagnosis 03 were reported to be malignant without any further detail and 01 was reported as possible lymphoproliferative disorder. Percentage of different histopathological diagnoses are given below in the tables. Ewing sarcoma was the most common diagnosis. Pneumothorax occurred in 1 (2.38%) of the patients which required tube thoracostomy. No any other complication was observed in any of other patients.

**Table 1:** Demographic, Clinical Characteristics, Origin and Size of Thoracic Lesions of Diabetic Patients (n = 42)

<b>Variables</b>	
<b>Age (Years)</b>	40.09±6.28
<b>Gender</b>	
Male	20(47.6%)
Female	22(52.4%)
<b>Origin of Lesion</b>	
Lung	28(66.67%)
Anterior Mediastinum	12(28.57%)
Pleura	2(4.76%)
<b>Average Lesion Size</b>	4 cm
<b>Diagnostic Yield of Ultrasound-Guided Tru-Cut Biopsy (n = 42)</b>	
<b>Outcome</b>	
Histological diagnosis obtained	38(90.47%)
Non-diagnostic biopsy	4(9.52%)
<b>Distribution of Non-Diagnostic Biopsies</b>	
Lung	3(75%)
Mediastinum	1(25%)
<b>Procedure-Related Complications</b>	
Pneumothorax (requiring tube thoracostomy)	1(2.38%)
Other complications	0(0.0%)

**Table 2: MEDIASTINAL LESIONS**

<b>Histopathology</b>	<b>No of Reports</b>
Thymoma	04
Non-Hodgkin's Lymphoma	04

Hodgkin's Lymphoma	02
Germ Cell Tumor	01
Inconclusive	01
Total	12

**Table 3: LUNG AND PLEURAL LESIONS**

Histopathology	No of Reports
Small Cell Carcinoma	02
Squamous Cell Carcinoma	02
Adenocarcinoma	04
Ewing Sarcoma	08
Spindle Cell Sarcoma	03
Neoplastic without Detail	03
Possible Lymphoproliferative	01
Fibrous Tumor	02
Metastatic Adenocarcinoma	01
Chronic granulomatous inflammation with fungal infection	01
Inconclusive	03
Total	30

**Discussion:**

In our study histologic diagnosis could be made in 90.47% of our biopsies. The result is not different from other studies when performed under CT guidance.<sup>9, 10</sup> Our results are also consistent with others when ultrasound was used as guiding modality and biopsy was performed by the pulmonologists.<sup>11, 12</sup>

Both fine needle aspiration and core biopsy are done through transcutaneous approach. Fine needle aspiration provides cytological specimen. In our study we have used Tru-Cut biopsy needle, it provides not only cytological but also histopathological specimen.

Only one of our patient developed pneumothorax during biopsy and that was drained with chest tube. Ultrasound guided biopsies are safe and pneumothorax is seen in 1-3%, of these lesser than 1% will require chest tube. With CT guidance pneumothorax may occur in 24-45% of patients because it involves aerated lung.<sup>13</sup> If lesion is abutting pleura then CT and ultrasound carry equal risk of pneumothorax.<sup>14</sup>

Ultrasound is being used in pulmonary medicine for diagnosis of pleural effusion and for thoracentesis. Its use for biopsy of peripheral lung lesions was studied by Chandrasaekhar in 1976.<sup>15</sup> Since then several studies have validated this use of ultrasound.<sup>16, 17</sup> In a small number of patients Seth et al.<sup>18</sup> found ultrasound more successful than CT as guidance modality of transcutaneous lung biopsy because CT involves aerated lung around lesions. Jarmakani et al.<sup>19</sup> compared ultrasound and CT in a retrospective study and concluded that ultrasound is superior because it provides real time visualization of the procedure. Ultrasound and CT were found to be equal by Scofienza et al.<sup>19</sup> But ultrasound has other benefits like it does not expose patients to radiation, can be moved to bed side, has low cost and low procedure time and is more readily available than CT.<sup>11, 16, 19</sup> Moreover, it is more sensitive than CT in detecting pleural septations.<sup>20</sup>

Our study has few limitations. First it has a small number of patients. Second it is a single center study and third we could not follow the result of our Tru-Cut biopsy by some other means like excisional biopsy.

## Conclusion:

We conclude that ultrasound guided biopsy of peripherally located thoracic lesions performed by pulmonologists is safe procedure and has a high yield for histopathologic diagnosis. It can be used where CT guided facility is not available. It is more economical and can be moved to bedside.

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