

Yield of Percutaneous Transthoracic Ultrasound guided biopsies by Pulmonologist

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ABSTRACT

Background: Lung parenchyma lesions present a range of potential differential diagnoses, necessitating a comprehensive evaluation for appropriate treatment. However, when it comes to definitive confirmation, tissue histopathology or culture remains the gold standard.

Objective: This study was conducted with the objective of assessing the safety of ultrasound-guided Tru-cut biopsy when performed by pulmonologists.

Methodology: Patients with underlying peripheral lung lesion underwent CT chest with iv contrast then they underwent tru cut biopsy by using 18G Dr. J needle under ultrasound guidance using convex probe 2-5 MHz. Histopathology reports were collected and then retrospective analysis of data was done.

Results: Out of 50 patients 36 (72%) were male and 14 (28%) were female ranging from 16 years to 73 years. Squamous Cell Carcinoma was found in 17 cases (34%), most common tumour in our study and most common site of lung tumor was right lower lobe (22%).

Conclusion: Pulmonologists can efficiently perform tru cut lung biopsies under ultrasound guidance with minimal to no complications.

Keywords: Malignancy; Tru cut biopsy; USG guided; Lung Biopsy

Introduction

The recognition of the significant potential of transthoracic ultrasound (US) in enhancing both patient safety and diagnostic precision in the field of respiratory medicine has been a long-evolving journey, spanning over fifty years. The utilization of transthoracic US has steadily grown, revolutionizing the way we approach chest diseases and procedures.^{1,2} Over time, ultrasound has become the gold standard for guiding various transthoracic interventions, offering the promise of improved success rates and reduced risks compared to blind procedures. This transformative capability stems from its capacity to pinpoint precise and secure insertion sites. Remarkably, even in the absence of pleural effusions, studies have demonstrated the safety and effectiveness of ultrasound-guided biopsies.^{3,4}

Respiratory medicine often involves a collaborative effort among multiple medical specialists, including pulmonologists, interventional radiologists, and surgeons. When several experts are part of the clinical picture, the establishment of an efficient multidisciplinary consultation system becomes imperative. Ultrasound plays a vital role in the toolkit of pulmonologists, enabling them to perform guided aspirations or biopsies with precision. Using ultrasound, lesions can be biopsied while directly visualizing them, along with the surrounding structures. Biopsies can be conducted using either a freehand technique or specialized biopsy attachment devices mounted on the ultrasound transducer. Local anesthesia is administered to the overlying skin and parietal pleura before performing biopsies and aspirations. Fine Needle Aspirates (FNA) are employed for cytological analysis, while tissue-core biopsy (TCB) needles are utilized to obtain histological samples. It has been observed that TCB is superior in diagnosing benign lesions and non-carcinomatous tumors.⁵

One advantage of percutaneous transthoracic ultrasound-guided biopsy is its ability to obtain tissue samples from lesions located deep within the lung or in areas that are difficult to access with other biopsy techniques. Additionally, this technique is associated with lower complication rates compared to other invasive biopsy techniques.^{6,7} Despite its high diagnostic yield and safety profile, percutaneous transthoracic ultrasound-guided biopsy is not without risks, including bleeding, pneumothorax, and infection. These risks can be minimized through proper patient selection, operator experience, and careful technique.^{8,9}

Different research studies showed that percutaneous transthoracic ultrasound-guided biopsy, when performed by a pulmonologist, has been established as a safe and effective technique for procuring tissue samples from the lung and other thoracic structures. This approach boasts

a high diagnostic yield while maintaining low complication rates. It serves as a valuable tool in both the diagnosis and management of lung cancer and various other thoracic conditions.¹⁰

Despite the clear advantages of percutaneous transthoracic ultrasound-guided biopsy, it's important to note that data in our country, especially in South Punjab, is relatively scarce. While a few studies exist, they are limited in number, and no significant research has been conducted in the South Punjab region. This knowledge gap prompted our decision to undertake this study in our department, where we encountered a diverse array of cases stemming from various regions in Pakistan. The primary objective of our study was to investigate the safety and efficacy of USG-guided Tru-Cut biopsies when performed by pulmonologists.

Objective

This study was conducted with the objective of assessing the safety of ultrasound-guided Tru-cut biopsy when performed by pulmonologists.

Methodology

It was a retrospective cross sectional study of 50 patients enrolled between Dec 2021 to Feb 2023 by using consecutive non probability sampling method. Total duration of study was 15 months. Study was conducted in inpatient of Pulmonology department Nishtar Medical University Multan. Data analysis was done by using SPSS 23 version.

For study purposes, all selected cases underwent a chest CT scan with intravenous contrast before undergoing a transthoracic biopsy guided by ultrasound (USG). This was done to precisely determine the mass's location. The lung biopsies were performed using an 18-gauge Dr. J Tru-Cut Biopsy (TCB) needle. A standard Toshiba Nemio XG ultrasound machine was used, equipped with a 2-5 MHz convex probe.

Before the biopsy, specific criteria were established, including platelet count being greater than 10,000, and normal results for prothrombin time (PT) and activated partial thromboplastin time (aPTT).

Results

Out of 50 patients 36 (72%) were male and 14 (28%) were female ranging from 16 years to 73 years. Squamous Cell Carcinoma was found in 17 cases (34%), most common tumour in our study. Others were Non seminomatous germ cell tumour 1 (2%), T cell Acute Lymphoblastic lymphoma 3 (6%), T cell Acute Lymphoblastic leukaemia 1 (2%), Metastatic adenocarcinoma 3 (6%), High grade B cell Lymphoma 1 (2%), Adenocarcinoma 9 (18%), Necrotizing granuloma 2 (4%), Large Cell Carcinoma 1

(2%), Neuroendocrine Tumour 1 (2%), Ewing Sarcoma 2 (4%), Mesothelioma 1 (2%), Spindle cell neoplasm 2 (4%), Unclassified malignant neoplasm 1 (2%), Solitary Fibrous Tumour 1 (2%) and inconclusive study in 4 (8%) cases.

Out of 50 cases we found out different locations of lung mass in following order, Right lower lobe 11(22%), Right upper lobe 10(20%), Left upper lobe 9(18%), Anterior mediastinum 6(12%), Left lower lobe 5(10%), Right hilum 3(6%), effusion 2 (4%), Left hilum, posterior mediastinum,

Table 1. Distribution of tumors by their percentages.

Tumor	Percentage
Squamous Cell Carcinoma	34
T cell Acute Lymphoblastic lymphoma	6
Non seminomatous germ cell tumour	2
T cell Acute Lymphoblastic leukaemia	2
Metastatic adenocarcinoma	6
High grade B cell Lymphoma	2
Adenocarcinoma	18
Necrotizing granuloma	4
Large Cell Carcinoma	2
Neuroendocrine Tumour	2
Ewing Sarcoma	4
Mesothelioma	2
Spindle cell neoplasm	4
Unclassified malignant neoplasm	2
Solitary Fibrous Tumour	2
Inconclusive	8

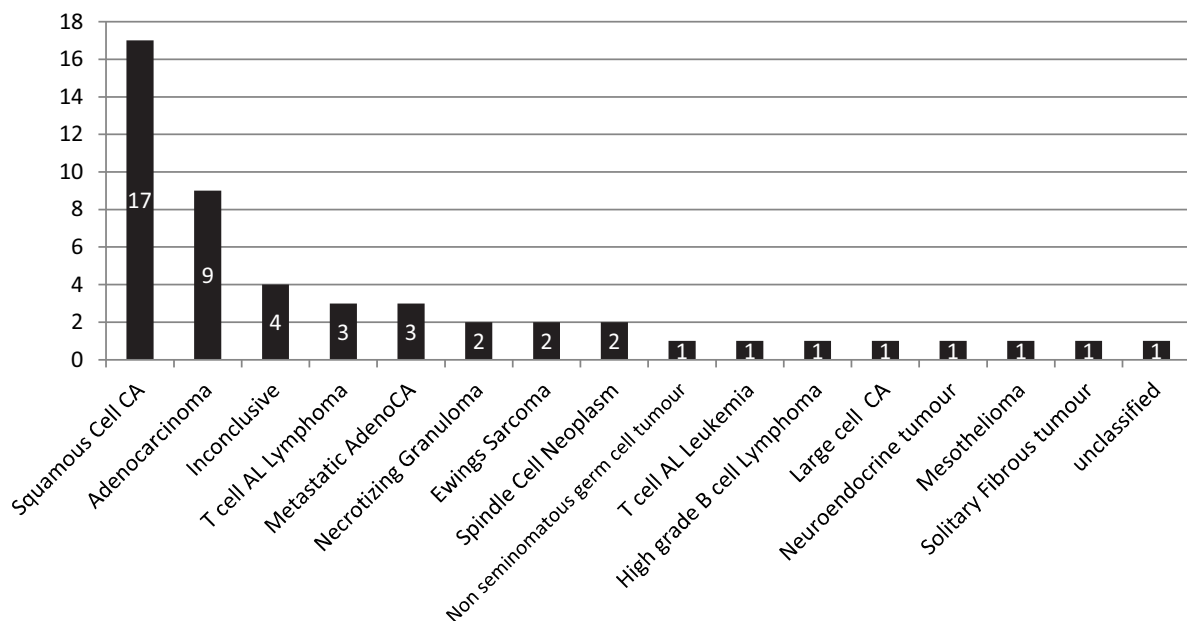


Figure 1. Distribution of different tumours by number of cases.

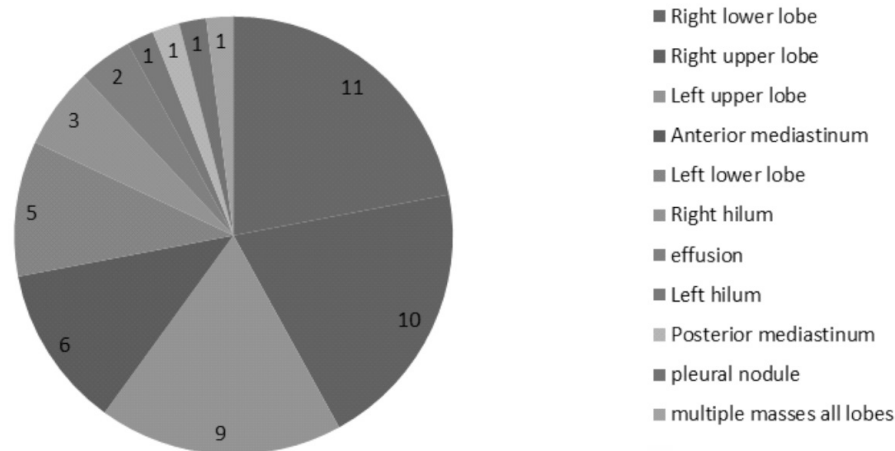


Figure 2. Distribution of tumours by site of lung involvement

pleural nodule and multiple metastatic lung nodules in all lobes involved in 2% cases each.

No major complication was seen in any case, only mild bleeding from biopsy site in 2 cases only.

Discussion

We conducted the present in our department, a study spanning 15 months was conducted, during which 50 cases underwent Tru-Cut biopsies for pulmonary lesions guided by ultrasound (USG). This procedure was carried out to precisely locate and sample the masses in the lungs. The success rate of these biopsies was an impressive 92%.

The most common tumors identified in our study were squamous cell carcinoma (34%), adenocarcinoma (18%), metastatic adenocarcinoma, and T-cell lymphoma (6% each). Additionally, we noted the distribution of these tumors in various parts of the lungs. The right lower lobe was the most common site of involvement (22%), followed by the right upper lobe (20%), and the left upper lobe (18%).

Several studies conducted previously provide valuable insights into the diagnostic yield of similar procedures. One such study described a diagnostic yield of 74.2% in a series of 31 patients, with no reported complications.¹¹ Another study conducted in Hyderabad at the Department of Pulmonology, Liaquat University of Medical and Health Sciences Hospital, reported a diagnostic yield of 88.3%.¹² A similar investigation carried out at Services Institute of Medical Sciences Lahore yielded an impressive diagnostic rate of 98%. These studies collectively demonstrate that the diagnostic yield of USG-guided Tru-Cut biopsies ranges from 74.2% to 98%.¹³

Our study's success rate of 92% is in line with these previously reported diagnostic yields. In particular, our findings align closely with the results from Services Institute of Medical Sciences Lahore, where the diagnostic yield was also very high. Thus, our study is on par with these significant findings, underscoring the reliability and effectiveness of the Tru-Cut biopsy method guided by ultrasound.

Ultrasound-guided transthoracic biopsy of pulmonary lesions offers several advantages. It is cost-effective, portable, and readily accessible. This method not only avoids exposing patients to high levels of radiation, a concern with CT scan-guided procedures, but is also straightforward to carry out. Numerous studies have demonstrated that Tru-Cut biopsies, when performed by radiologists, yield diagnostic results comparable to those obtained through CT scan guidance.¹⁴⁻¹⁶

A notable advantage of our study is the absence of complications during the Tru-Cut biopsies. We selected cases where the mass was attached to the chest wall, minimizing the chances of pneumothorax. The absence of such complications highlights the safety and reliability of this procedure.

The diagnostic yield of Tru-Cut biopsies is a critical factor in assessing the effectiveness of the procedure. A high diagnostic yield ensures that patients receive accurate and timely diagnoses, which is paramount for appropriate treatment and patient care. Our study's diagnostic yield of 92% underscores the method's reliability in accurately identifying lung lesions.

The success of our study and the proven diagnostic yields of similar procedures in other research offer significant benefits to patients. It means that patients can receive precise diagnoses without the need for more invasive or

high-radiation procedures, leading to improved patient outcomes and quality of care.

Despite the encouraging results of our study, there are some limitations that should be acknowledged. The study's sample size, while reasonable, could be expanded for further validation of the findings. Additionally, it would be beneficial to investigate the diagnostic yield in a broader range of patient populations to ensure the method's applicability in diverse clinical scenarios.

Conclusion

In conclusion, our study demonstrates the high diagnostic yield and safety of Tru-Cut biopsies guided by ultrasound for pulmonary lesions. The success rate of 92% aligns well with previous studies that have reported yields ranging from 74.2% to 98%. This method offers several advantages, including cost-effectiveness, portability and avoidance of excessive radiation exposure. These findings highlight the importance of ultrasound-guided transthoracic biopsy as an effective and safe diagnostic tool in the management of pulmonary lesions. Further research and clinical experience will continue to refine and enhance the application of this method in patient care.

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