

Outcomes of Trucut Biopsy Technique Regarding Its Diagnostic Accuracy for Peripheral Lung Lesions Under Ultrasound Guidance

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Abstract:

Background:

Computed tomography (CT) guided lung biopsy has although been a standard in histological diagnosis of pulmonary lesions; its use is limited to the interventional radiologists only. Ultrasound (US) guided biopsy of pulmonary lesions which can be performed in-clinic by the pulmonologists only, is a becoming more popular technique. It also has the edge of real-time techniques, multi-planar imaging, and no radiation exposure to the patients.

Methods:

This is a single-center, retrospective review of all the patients presenting with pleural based lung lesions who underwent US guided biopsy for diagnosis in the Department of Radiology, Jinnah Postgraduate Medical Centre, Karachi from August 2020 to May 2021.

Results:

Ultrasound guided biopsy for lung lesions have a diagnostic yield of 88.3%, sensitivity of 95.80% and specificity of 90.00 % with an accuracy of 95.35%. Pneumothorax as an immediate complication was seen only in 1.5% cases.

Conclusion:

US-guided biopsy is a much safer diagnostic alternate to CT-guided biopsy for lung lesions with high diagnostic yield. It doesn't require special radiological interventionists, can be performed at patient bedside, and the equipment is not as expensive.

Keywords: pulmonary lesions; ultrasound guided biopsy; lung cancer; histopathology; Pakistan

Introduction:

Computed tomography (CT) guided lung biopsy has although been a standard in histological diagnosis of pulmonary lesions; its use is limited to the interventional radiologists only. Ultrasound (US) guided biopsy of pulmonary lesions, which can be performed in-clinic by the pulmonologists only, is a becoming more popular technique. It also has the edge of real-time techniques, multi-planar imaging, and no radiation exposure to the patients [1]. Ever since screening for lung cancer was introduced, pulmonary nodules were more frequently encountered; were of smaller dimensions, and some were peripherally located. Peripheral pulmonary lesions remain a diagnostic challenge. Sputum cytology and flexible bronchoscopy remain diagnostic modalities for peripheral lesions; however, their yield is low.[2] Fluoroscopy, CT scans, and US guided biopsy have remained the mainstay for extracting tissue for the diagnosis of peripheral pulmonary lesions [3].

In a study published in India in 2016, diagnostic yield of ultrasound guided biopsy was 92.1% with sensitivity of 92.2% and specificity of 91.7% [1]. US provides a complete view of lung masses for biopsy. However, this technique is still underutilized despite its high diagnostic yield, real-time guidance, and the benefits of being performed at bedside without any radiation exposure [4-10].



To our best knowledge, the only local study available, from central Pakistan, to assess the efficacy of US-guided tru-cut biopsy reveals overall diagnostic yield to be 98% with a 98% sensitivity [11]. The aim of this study is to assess the diagnostic yield, sensitivity and specificity of US-guided tru-cut biopsies in peripheral malignant lung lesions.

Patients and Methods:

This is a single-center, retrospective review of all the patients presenting with peripheral lung lesions who underwent US guided biopsy for diagnosis in the Department of Radiology at Jinnah Postgraduate Medical, Karachi from August 2020 to May 2021. Data was extracted from medical records. Patient demographics including age and gender was included. For biopsy, trucut lung biopsy needle was used. Patients were placed in comfortable position depending on the location of lesion. Lesion location was achieved by scanning the intercostal spaces, and Doppler scan was used to bypass the vessels from the biopsy path. Biopsy site was then disinfected, local anesthesia was given and real-time guidance with US was utilized to acquire trucut lung biopsy. Post-procedure US was done with suspicion of iatrogenic pneumothorax. Patients were monitored in the recovery room for an hour where chest radiography was done.

Results:

Total of 129 patients were included in this study. 106 (84.1%) were male and 20 (15.9%) were females. Their mean \pm standard deviation (SD) of age was 69.14 ± 9.06 years. The diagnostic yield of Ultrasound guided biopsy was 88.3% (114/129). The most common histological type was squamous cell carcinoma (63.72%) followed by Small Cell lung carcinoma (28.57%) as seen in table 1.

There was 1 (0.7%) false positive case; diagnosed as squamous cell carcinoma which turned out to be abscess in surgical resection. There were 5 (3.9%) false negative cases of which 3 were diagnosed were repeated ultrasound and 2 were diagnosed CT guided biopsy. There were 9 (6.9%) cases of true negative, of which 6 of them had anthracosis, 2 had abscesses and 1 had atypical cell. The specificity and sensitivity of US guided trucut biopsy in our sample is shown in Table 2. There were 2 cases (1.5%) of pneumothorax is immediate post ultrasound guide biopsy ultrasound.

Histological Diagnosis	Frequency	Percent
Adenocarcinoma	4	3.5%
Atypical cell	2	1.8%
Bronchioloalveolar mucinous type carcinoma	1	0.8%
Large cell carcinoma	1	0.8%
Small cell lung carcinoma	32	28.1%
Squamous cell Carcinoma	72	63.2%
Un-differentiated (anaplastic) carcinoma	2	1.7%

Table 1: Histological diagnoses of ultrasound guided lung biopsy (n=114)

Binary Classification Tests	Value %
Sensitivity	95.80% (90.47% to 98.62%)
Specificity	90.00 % (55.50% to 99.75%)
Positive Predictive Value	99.13% (94.67% to 99.86%)
Negative Predictive Value	64.29 % (42.69% to 81.31%)
Accuracy	95.35% (90.15% to 98.27%)

Table 2: Binary Classification Tests of US guided trucut biopsy

Discussion:

This study is one of its types as far as data from Pakistani population is concerned. It has shown a yield of around 90% with US-guided biopsy in pleural-based pulmonary lesions. This study has shown US-guided biopsy to be an accurate diagnostic modality, with a yield of 88.3%, with lesser harmful effects. US-guided technique has shown high sensitivity, specificity, accuracy and positive predictive values that help with the diagnosis of pulmonary malignancies. These results are also comparable to the results of other studies [1, 4, 8, 10, 11].

Several limitations of our study should be considered. This retrospective review could not exclude patient selection bias. There is no knowledge of number of needle punctures attempted, and time required for the procedure. This data is from a tertiary care public centre where most of the malignancies and complicated cases are referred, hence, the higher frequency of cancer diagnosis. This frequency cannot be generalized and multicentre studies are essential for this purpose.

One of the major problems with CT guided biopsy is pneumothorax [13, 14]. In our study, only 2 (1.5%) patients had incidence of pneumothorax, which is comparable to other studies found in literature [1, 4, 10, 12]. Sconfienza et al. suggested that fewer complications with US guided biopsy as compared to CT guided biopsy are attributed to real-time guidance which helps in accurate needle access and reduces the incidence of multiple punctures [12].

Along with real-time guidance, US-guided procedures do not expose the patients to radiations. However, patients utilizing CT-guided biopsy as a diagnostic modality are exposed to harmful radiation. Although, cost difference was not analysed in this study; the machinery for US is less expensive than a CT scanner, hence making US the most readily available diagnostic modality for most low resource centres [15, 16].

Conclusion:

In conclusion, US-guided biopsy is a much safer diagnostic alternate to CT-guided biopsy for lung lesions with high diagnostic yield. It doesn't require special radiological interventionists and can be performed at patient bedside by the pulmonologist only. The machinery is not as expensive and easily accessible especially in countries like Pakistan where cost is a major drawback.



Conflict of Interest: Authors have no conflicts of interest

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