

Diagnostic Yield of Percutaneous Ultrasound Guided Biopsy of Peripheral Lung Lesions

Thesis
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Introduction: Pulmonary lesions have broad differential diagnosis including malignant, benign and inflammatory lesions. And have differential diagnosis to be parenchymal, pleural or Mediastinal. Tissue diagnosis is the gold standard for all of these lesions that is used to be obtained either by open lung biopsy, mediastinoscopy or video assisted thoracic surgery (VATS). CT guided biopsy is also a known modality for transthoracic biopsies but its cost, availability, exposure to radiation and shifting of the patient are the main drawbacks of the technique⁽¹⁾, transthoracic ultrasonography is a well-established modality in the evaluation of respiratory disorders.⁽²⁾

Interest in transthoracic ultrasound (US) procedures increased after the availability of portable settings. Transthoracic ultrasonography (US) can be performed by personnel with minimum training. Its advantages include immediate application at the point of care, low cost, and lack of radiation⁽³⁾, imaging-guided percutaneous transthoracic biopsy has become a widely accepted, effective, and safe minimally invasive technique with which tissue specimens can be obtained from a number of different intrathoracic lesions. It facilitates differentiation of primary cancer from distant metastasis or infective and inflammatory lesions, which is crucial for correct management of lung lesions.⁽⁴⁾

US guided transthoracic biopsy of pulmonary lesions is cost effective, portable and readily available modality that not only spare patient from huge radiation but also easy to perform.⁽⁵⁾

Firstly, large vessels and aerated lung parenchyma can easily be detected with ultrasound, secondly, ultrasound can be performed at the bed side and in anybody position allowing for procedures with minimal distress even in patients in poor general conditions, and lastly the integration of ultrasound into a “low-tech” procedures by pulmonologists can reduce the need for more expensive radiological or surgical biopsy.⁽⁶⁾

The aim of this study was to assess the diagnostic yield of percutaneous ultrasound guided biopsy in peripheral lung lesions.

Patients and methods: This is a prospective randomized study included 50 patients (38 males, 12 females), their ages ranged from 13 to 84 years old, all have undiagnosed peripheral lung lesions presented to chest department, Benha University hospital, during the period between November 2017 to December 2018.

All patients were subjected to the following:

- History taking and physical examination.
- Routine laboratory investigations (CBC , liver enzymes, kidney function tests, bleeding profile, ESR).
- CXR and CT chest.
- Ultrasonography was done with 2-5Hz Curvi-linear probe. Site, size, echogenicity, borders, internal echoes and vascularities of each lesion were noted.
- Lesions were biopsied by Fine core needle 16F or 18F and 4-6 biopsies were performed with different depths.
- Biopsy samples were saved in formalin jar and sent for histopathology.
- Patients were observed f post procedure for complication and post procedure CXR was done.

All data were collected, tabulated and statistically analyzed.

Results: this study showed that 48 cases have reached pathological diagnosis with US guided biopsy procedure (sensitivity = 96%), only 2 cases gave specimens not sufficient for histopathological evaluation, one of them was diagnosed with transoesophageal ultrasound guided biopsy, and the last case refused to do further investigations and didn't reach final diagnosis.

In this study, histopathological results gave the upper hand to malignancy with 34 cases (68%), being the adenocarcinoma the commonest diagnosis overall (24%) followed by squamous cell carcinoma (16%), other malignant cases varied between Hodgkin's and non-Hodgkin's lymphoma (6%, 4%) respectively, small cell carcinoma and round cell tumors (4%) each and one case of acinar malignancy and another with adenosquamous carcinoma and another one case of HCC lung metastasis (2% each), and there were 2 cases that showed undifferentiated malignant cells (4%)

The other non-malignant group in our study formed 30% of cases being pneumonia is the commonest diagnosis (16%), lung abscess (6%) , and solitary cases of inflammatory myofibroblastic tumor, pulmonary tuberculosis , sclerosing mediastinitis, and interstitial lung disease (2% each)

This study also showed that malignant lesions had lung masses in their CT chest in 97% of cases and anechoic lesions in their US imaging in 91% of cases, also malignancy was associated with higher values of ESR and lower values for TLC, hemoglobin, and creatinine and associated with higher age group and higher smoking index

In this study, the procedure had a great level of safety being serious complications happened only in 3 cases (6%); 2 cases of pneumothorax (4%) and 1 case of moderate hemoptysis (2%), there was also 4 cases of chest pain (8%) and 7 cases of self-limited mild hemoptysis (14%), and there were no significant difference in complications incidence between malignant and non-malignant groups

Discussion: this study included 50 patients; 38 males and 12 females, their ages ranged from 13 to 84 years old. *and* malignant cases have higher age group with mean = 58 compared to 44 in non-malignant group the cases have a smoking index varying from 0 to 3000 with the median in malignant cases = 350 and in non-malignant cases = 300 this agrees with Beate et al., 2013⁽⁷⁾ that concluded that there's direct intensity effect at low smoking intensities and that smoking cessation reduces the relative risk of lung malignancy in short term and long term. Malignant lesions obviously shows higher values of ESR (mean =111) compared to (mean = 78) in non-malignant lesions with (p value < 0.001) which coincide with Zhang et al., 2010⁽⁸⁾ that gave results that ESR levels were significantly higher in the lung cancer group compared to that in the chronic respiratory diseases group with (p value < 0.001). This study also shows that TLC is significantly higher in non-malignant group, this owes to that non-malignant lesions were mainly infections (12 case: 8 pneumonia, 3 lung abscess and 1 tuberculosis) so infections make 80% of non-malignant lung lesions, hemoglobin and serum creatinine shows lower values in malignant group which is mostly due to premalignant effect and higher age group. In this study, US imaging showed findings supporting consolidating lesion in 29 cases (58%) and was found in 100% of non-malignant lesions, also findings of lung masses were found in 38 cases (76%) which formed 91% of malignant lesions, this didn't coincide with Hoda et al., 2017⁽⁹⁾ that were less sensitive giving 3 cases out of 31 (9.7%) as consolidation and 11 cases out of 31(35.5%) as lung masses, while in the same study 14 cases were diagnosed as consolidation by CT chest (45%), and another 14 cases were diagnosed as lung masses by CT

chest , this was also less than our study CT chest findings as lung masses (45 cases "90%") but more than our study in diagnosis of lung consolidation (16 cases "32%"). In this study, the final result of a malignant pathology was found in 34 cases (68%), being adenocarcinoma is the commonest diagnosis with percentage of 24%, compared to Christian et al., 2015⁽¹⁰⁾ who found 99 malignant cases in 126 US guided biopsy from peripheral lung lesions malignancy in 60% of their cases. In this study, US guided biopsy was diagnostic in 48 patients out of 50 (96%) which was more than Lavinia et al., 2016⁽¹¹⁾ which performed their study on 59 patients and histopathological confirmation occurred in 54 cases with percentage of (91.52%) and more than Coskun et al., 2018⁽¹²⁾ who have 93.8% sensitivity by diagnosing 30 from 32 cases. In this study we have 2 cases complicated with pneumothorax (4%), one case of moderate hemoptysis, and other non-serious complications like chest pain and mild self-limited hemoptysis were found in 11 cases, while in Lavinia et al., 2016⁽¹¹⁾, 4 cases out of 59 was recorded as pneumothorax (6.7%), and in Christian et al., 2015⁽¹⁰⁾ who performed their study on 126 patients; only 3 patients were complicated with pneumothorax (2.4%), and two cases of hemoptysis (1.6%)

So this study shows that US-guided needle biopsy performed by interventional pulmonologist can be used to obtain a specific diagnosis of peripheral lung lesions in contact with the pleura in up to 96%. Not only malignant lesions could be identified but also US guided biopsy can establish the diagnosis of benign diseases such as infectious processes, interstitial and granulomatous lung diseases, and benign lung tumors. The safety profile of the study procedure was also excellent with low incidence of serious complications (6%), which is due to the ability of the technician to monitor biopsy taking and puncturing the lesion while visualizing the procedure in real time, and we states that good training of the procedure technicians and good selection of patients and site and depth of lesion puncturing can greatly improve the efficacy and the safety of the procedure

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