



ORIGINAL RESEARCH PAPER

Pulmonary Medicine

DIAGNOSTIC YIELD OF ULTRASOUND-GUIDED FNAC OF PERIPHERAL LUNG LESIONS WITH A SUSPICION OF MALIGNANCIES -A PROSPECTIVE OBSERVATIONAL STUDY.

KEY WORDS: malignancy, ultrasound guided, fine needle aspiration cytology, peripheral lung mass.

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ABSTRACT

Introduction: Lung cancer is the most common cancer among men with presenting diverse presentations. It can present as an incidental isolated nodule or mass to obstructive pneumonia, pleural effusions or lymphangitis carcinomatosis. Diagnosis is done by cytology or histologically obtained by bronchoscopy, pleural fluid analysis or CT-guided sampling of mass or nodules. CT has the advantage of accuracy at the cost of radiation, cost and need for technical skills. Ultrasound has recently emerged as important imaging of choice for not only pleural effusions but also for parenchymal lesions. Ultrasound has the advantage of portability, and non-radiation but needs skills in the identification and sampling of lesions. This study aimed to assess the diagnostic yield of ultrasound-guided FNAC /Biopsy of radiologically suspected peripheral lung lesions. **Materials and methods:** An institution based prospective study was conducted over a span of 2 years on 62 patients with informed consent. FNAC was performed under USG guidance for peripheral lung nodules/masses, with clinical & radiological suspicion of neoplasm in chest radiographs. All relevant medical records including history, USG, CT scan, histopathological diagnosis and bronchoscopic findings are collected and analysed. **Results:** Out of 62 cases selected for the study (n=48, 77.41%) male preponderance was seen. The commonest age group was (n=26, 41.93%) between 60 – 75 years. The commonest symptom (n=50, 80.64%) being cough and common site for lesion (n=20, 32.25%) was upper zone lesions, with an equal incidence of both right and left sides. Of the 62 patients 58 have histologically positive diagnosis of malignancy. Squamous cell carcinoma (n= 26, 41.93%) was the commonest. One patient suffered from pneumothorax with no mortality related to the procedure. **Conclusions:** USG guided FNAC is an extremely valuable, safe imaging modality in the evaluation of peripheral nodules/masses with excellent diagnostic yield.

INTRODUCTION

Tissue diagnosis being the backbone of every malignancy management, need for a simpler and higher yield technique mandates a precise method for it. Chest ultrasound has proved helpful in evaluation of peripheral lung lesions including chest wall, peridiaphragmatic and pleural based lesions.¹

Investigative modalities to get cytological /histological samples depend upon the location of the lesion in the lung - whether the lesion is endobronchial, central or peripheral lung or pleural pathologies like pleural effusions and nodules. Bronchoscopy is the prime modality of choice for endobronchial lesions whereas advances like convex EBUS allowed for a sampling of mediastinal lymph nodes or radial EBUS for sampling peripheral lesions.

These advances are associated with considerable expenses, the skill of the operator and anaesthesia. Ultrasound has become standard investigation in the ICU setup for the evaluation of not only lung and pleura but also for evaluation of conditions like a shock. It's a cheap, portable imaging modality without hazards of radiation allowing repeat examinations possible. Ultrasound can be used to sample peripheral lung or pleural lesions in suspected malignancies. Fine Needle Aspiration Cytology (FNAC) is a well-established tool for diagnosis of malignant and inflammatory lesions, that resulted in a decreased utilization of other invasive techniques. Owing to its higher accuracy and lesser complication rates, FNAC has become a preferred tool amongst clinicians, radiologists and pathologists.²

Other viable options being bronchoscopic trans-bronchial lung biopsy or brushings and fluoroscopic guided trans thoracic per-cutaneous aspiration. These methods have a downside of non-availability and are cumbersome. Cytolo-

gical evaluation can be done with minimal tissue sample obtained via aspiration cytology. Ultra-sonography is readily available in most of the centers, shorter learning curve and radiation free. It provides documentation of presence of needle inside the lesion in real time, aspirates can be obtained from multiple sites of the lesion.^{1,3} This study was put through to investigate the diagnostic utility and safety of ultrasound-guided Fine Needle Aspiration Cytology of peripheral lung nodules/masses.

MATERIALS AND METHODS

An institution based prospective study was conducted over a span of 2 years on 62 patients at Osmania Medical College, with informed consent. FNAC was performed under ultrasound-guidance for peripheral lung masses, with clinical & radiological suspicion of neoplasm as evidenced by opacities in lung. All relevant medical records including history, USG, CT scan, histopathological diagnosis and bronchoscopic findings are recorded and the data is analysed.

Inclusion Criteria

1. Patients with suspected malignancy presenting with peripheral lesions in the chest X-ray or CT scan.
2. Non resolving pneumonia
3. Previous history of malignancy or immune deficiency in a patient who presents with one or more lung lesions
4. Patients who are able to breath hold for at least 30 seconds

Exclusion Criteria

1. Bleeding diathesis
2. Highly vascular lesion on ultrasound
3. Poor pulmonary function
4. COPD with bullous lung disease
5. Suspected hydatid cyst
6. Patients requiring assisted ventilation

- 7. Patient not willing to give consent
- 8. Uncooperative patient.

After well informed consent and proper patient education regarding the ultrasonographic guided FNAC patients were taken up for the procedure. All vitals including pulse, blood pressure, respiratory rate was taken. Patient was taken up after a satisfactory Coagulation profile. Clinical diagnosis, chest radiograph diagnosis, ultrasonographic findings, CT scan findings, FNAC diagnosis, complications, final diagnosis and follow up was maintained in a proforma prepared for this purpose. The radiographic localization was done using postero-anterior and lateral chest radiographs followed by ultrasonographic localization in intercostal window, site was localized and depth of the lesion was obtained.

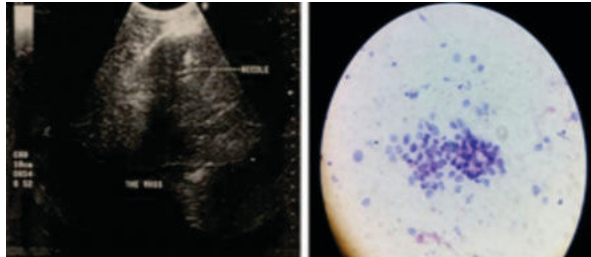


Figure 1: ultrasound guided FNAC **Figure 2: histological evaluation**

The exact site was prepared under aseptic precautions and infiltration of local anesthesia. Patient advised for a breath hold and needle is inserted into the lesion, needle tip is visualized as linear echogenicity or white spot which can be visualized in real time (Figure 1). Upon reaching the desired site, aspiration was performed under direct observation. The material aspirated was fixed onto glass slide, fixed in 95% ethyl alcohol and sent for histopathological analysis (Figure 2). All the patients were kept under observation for 2 hours and post procedure chest radiograph was taken for all to detect any iatrogenic pneumothorax.

RESULTS

The study for done over a period of 2 years in 62 patients with peripheral lung lesion for ultrasonographic guided Fine Needle Aspiration. Majority of the study population was males (n= 48, 77.41%) while (n=14, 22.59%) were females, with sex ratio of male to female being 3.42:1. The age group 60-74 years (n=26, 41.93%) predominated, with the next common age group being 45-59 (n=24, 38.70%). The most common symptom was cough (n=50, 80.64%) and constitutional symptoms (n=42, 67.74%). The most common clinical signs were clubbing (n=24, 38.70%) and pallor (n=24, 38.70%).

The lesions were commonly seen in both right upper zone (n=20, 32.25%) and left upper zone (n=20, 32.25%), followed by right lower zone (n=8, 12.90%). Of the 62 cases, 58 cases (yielded malignant cytology) were positive for malignancy. Non-small cell carcinoma variant was most common, among it squamous cell carcinoma lung (n=26, 41.93%) was commonest, followed by adenocarcinoma (n=20, 32.25%). The complication of pneumothorax developed in 2 out of 62 cases (3.22%).

Table 1: Age Distribution

| Age In Years | Frequency | Percentage |
|--------------|-----------|------------|
| <45 | 10 | 16.12 |
| 45-59 | 24 | 38.70 |
| 60-74 | 26 | 41.93 |
| >75 | 2 | 3.22 |
| Total | 62 | 100 |

Table 2: Clinical Signs

| | Number Of Subjects | Percentage |
|---------------|--------------------|------------|
| Radiculopathy | 4 | 6.45 |

| | | |
|--------------------------------|----|-------|
| Superior venacaval obstruction | 6 | 9.67 |
| Pallor | 24 | 38.7 |
| Clubbing | 24 | 38.7 |
| Lymphadenopathy | 18 | 29.03 |

Table 3: Presenting Complaints In the Study

| Presenting Complaints | Number of subjects | Percentage |
|-------------------------|--------------------|------------|
| Cough | 50 | 80.64 |
| Fever | 20 | 32.25 |
| Chest Pain | 28 | 45.61 |
| Shortness Of Breath | 40 | 64.51 |
| Hemoptysis | 16 | 25.80 |
| Constitutional Symptoms | 42 | 67.74 |
| Hoarseness Of Voice | 6 | 9.60 |
| Total | 62 | |

Table 4: Distribution Site of Lesions

| Site of lesion in lung | Number of subjects | Percentage |
|------------------------|--------------------|------------|
| Right upper lobe | 20 | 32.25 |
| Right middle zone | 4 | 6.45 |
| Right lower lobe | 8 | 12.90 |
| Left upper lobe | 20 | 32.25 |
| Lingular area | 2 | 3.22 |
| Left lower lobe | 2 | 3.22 |
| Hilar | 2 | 3.22 |
| Multiple opacities | 4 | 6.45 |
| Total | 62 | 100 |

Table 5: FNAC Results of Positive Cases in study

| Result of Positive Cytological Examination | Number of subjects | Percentage |
|--------------------------------------------|--------------------|------------|
| Malignancy [n=58,93.55%] | | |
| Squamous cell carcinoma | 26 | 41.93 |
| Adenocarcinoma | 20 | 32.25 |
| Large cell carcinoma | 4 | 6.45 |
| Anaplastic cell carcinoma | 0 | 0 |
| Small cell carcinoma | 6 | 9.8 |
| mesothelioma | 2 | 3.22 |
| Benign [n=4, 6.45%] | | |
| TB granuloma | 3 | 4.83 |
| Inflammatory/Infections | 1 | 1.61 |

DISCUSSION

Transthoracic Fine Needle Aspiration Cytology has been in use for more than a few decades, has become an indispensable tool in guiding methods and cytopathological evaluations.⁴ It is a valuable method which can be used when location of lesion or clinical condition of the patient doesn't support bronchoscopic evaluation. In comparison with thoracotomy and open lung biopsy, this is much cheaper, easier and has benefit of shorter hospital stay with low mortality rate.⁵ This procedure can be done on outpatient basis, in high risk cases (e.g.: heart diseases) and performed under local anesthesia with advantage of repeatability.⁶

The majority of cases (41.93%) were in the age group of 60-74 years as seen in table no 1. The mean age of patients with lung carcinoma has remained relatively constant over the years. The mean age in this study was 67 years which is similar to that reported by Sundaram V et al (2014).⁷ The higher mean age reported by T Kanematsu et al⁸ may be attributed to the longer life expectancy in Japan.

In the study 77.41% of the study population were males whereas 22.58% were females. The male: female ratio of patients of lung carcinoma has varied in different studies. The present study observed a male to female ratio is 3.42:1. Tan et al⁹ had a results of 2.53:1 as male to female ratio and Senthilvelmurugan V et al¹⁰ reported ratio as 2.6:1.

Cough was the commonest presenting symptom in the present study, being present in 80.64% of cases as seen in

table no 3. It was not related to any particular time or posture. The result was similar to that reported by Jindal et al¹¹ Arora et al¹² Jagdish Rawat et al¹³, Shetty et al¹⁴ and A. Vigg et al.¹⁵ This may be due to the fact that even early mucosal changes induced by the tumour can result in cough. Another explanation is that most patients are smokers and have associated chronic bronchitis.

The second most common presentation was constitutional symptoms (67.74%) (like weight loss, fatigue, fever, malaise) followed by shortness of breath (64.51%). Haemoptysis in this series was seen in 16 (25.80%) patients. Presentation was with blood-streaked sputum, but massive haemoptysis was not encountered. Haemoptysis was found in patients with squamous cell carcinoma. This could be explained by the frequent occurrence of squamous cell carcinoma in central location, its tendency to cavitate or form lung abscess. Frequency of haemoptysis found in other studies were 61% in Le Roux et al (1968)¹⁶ 24 % in P.N. Chhajed et al (1999).¹⁷

The most common examination finding in the present study was finger clubbing (38.7%) while Jindal et al¹¹ reported it in 35% of their patients as seen in table no 2. Clubbing was mostly grade II or III and was observed more frequently in adenocarcinoma. However, Leroy Hyde et al (1974)¹⁸ observed clubbing most frequently in squamous cell carcinoma.

Peripheral lymphadenopathy was seen in 29.03% of patients while Jindal et al.¹¹ and Arora et al¹² reported it in 37.9% and 26% of their patients respectively. All patients presented with significantly enlarged, hard, fixed, non-tender, supraclavicular, and cervical lymph node. Leroy Hyde et al (1974)¹⁸ found 15-20% of patients during the course of lung cancer. The incidence of superior vena cava syndrome in our study was 6 (9.67%).

The common location of masses/nodules was upper lobes, right and left being equally involved followed by right lower lobe as seen in table 4. Upper zone was involved in 73 cases (19.6%), mid zone in 113 cases (30.3%), lower zone in 74 (19.18%) and entire lungs in 52 (13.9%).¹⁹

The most common histological type obtained via ultrasound guided FNAC in the study was Non-Small Cell Carcinoma (NSCL) as (80.63%) seen in table 5. Pathak et al.,²⁰ observed NSCLC in 75-80% of malignant lesions with increasing the incidence of adenocarcinoma which is similar to this study. Among NSCL, diagnosis of Squamous Cell Carcinoma 26 cases (41.93%), followed by adenocarcinoma 20 cases (32.25%), large cell carcinoma 4 cases (6.45%) was made. Small Cell Carcinoma 6 cases accounted for 9.8% as seen in table 5. The prevalence of squamous cell carcinoma and adenocarcinoma were similar (22%) in the study by Singh et al²¹ but our results showed higher prevalence of adenocarcinoma which is similar to the findings by K B Tan et al.⁹ Where they found Adenocarcinoma 37 (49.4%), Squamous cell carcinoma 12 (16.0%), Large cell lung carcinoma 2 (2.7%), Metastatic adenocarcinoma 3 (4.0%).

In the present study, the complication was pneumothorax occurred in 2 cases (3.22%) out of 62 cases. This is comparable to Jonpeilkezo²² (4%), Ajay et al²³(4%), Knudsen²⁴ (3.7%) and Modini Venkata Rao²⁵(3.7%) rate of pneumothorax as complication.

CONCLUSION

Pulmonary opacities are a commonly detected on chest radiographs, an accurate histological diagnosis becomes the backbone for further management. Peripheral pulmonary opacities generally have a lower yield on sputum cytology. In these situations, ultrasonographic guided Fine Needle Aspiration Cytology provides real time imaging leading to higher diagnostic yield. Easy availability, cheaper and no

radiation hazard aids in convenient repeatability. To summarize ultrasound guided FNAC of peripheral lung masses is an easily assessable, accurate, safe, simple and cost-effective procedure that forms an important arsenal for pulmonologists, radiologists and pathologists.

Ultrasound-guided biopsy of the peripheral nodules/masses of the lung and pleura is a safe diagnostic modality with a very high yield. The lack of radiation, repeatability, and portability of this method makes it the diagnostic of choice in selected cases.

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