ORIGINAL RESEARCH ARTICLE

Ultrasonogram – Guided Fine Needle Aspiration Cytology In Peripheral Lung Lesions

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A B S T R A C T

Introduction: For diagnosing various peripheral intrathoracic lesions USG guided FNAC is a safe radiation free, technically simple and cost effective method. CT guided FNAC is another commonly used method where lesion is difficult to access through ultrasound, but it is not radiation free and comparatively expensive also. Study aimed to evaluated the role of ultrasound guided percutaneous Fine Needle Aspiration Cytology in diagnosing and characterization of various peripheral pulmonary lesions

Material and methods: An institution based study was conducted on 32 patients in 3 months duration with peripheral lung lesions not invading chest wall. All patients who were sent to the radiology department for USG guided FNAC taken for the study. Informed consent was taken. FNAC under USG guidance done in patients who are clinically suspected to have a neoplasm as evidenced by pulmonary opacities or nodules adjacent to the chest wall or pleural diseases. All medical records preserved including history CXR, USG, CT scan, bronchoscopic findings and histopathological diagnosis. Follow up maintained.

Results: The majority of patients (n=21, 65.6%) were in the age group of 40 to 60 years. Of the 32 cases, 20(62.5%) were males and 12 (37.5%) were females. The male to female ratio was 1.6:1. Most common presenting complaints are cough 19(59.4%) and chest pain 18(56.2%). Most common lesions are observed in Right upper thorax 11 (34.3%) and followed with Right lower thorax 6 (18.7%). Of the 32 patients, 26 (81%) patients have diagnostically positive for cytology were 22 (68.7%) were diagnosed by FNAC as having malignancy and 4 (12.5%) were non-malignant lesions. Squamous cell carcinoma 11(50%) is most commonly seen malignancy and TB granuloma 3(13.5%) is in benign. One complication of pnemothorax 3.1%.

Conclusion: Ultrasonographically guided fine needle aspiration cytology is safe, less expensive, less time consuming, less invasive diagnostic tool with high degree of accuracy and no radiation toxicity to peripheral lung lesions.

Keywords: Ultrasound Guided Fine Needle Aspiration, Cytology, Lung, Mass Lesion.

INTRODUCTION

The etiologic diagnosis of small peripheral pulmonary nodules is difficult. Chest ultrasound has proved useful in the evaluation of peripheral lung lesions, pleural-based opacities, peridiaphragmatic and mediastinal lesions. The application of ultrasound in guiding FNAC / biopsy of peripheral lung lesions has been reported to have good sensitivity and specificity.[3]

Fine Needle Aspiration Cytology (FNAC) is a well-established method of diagnosing both neoplastic and inflammatory conditions of the lung, has resulted in a decrease in the need of other procedures that are more invasive. Recognition of the high accuracy rate of FNAC along with the simpler methods to treat its complications like pneumothorax has increased its popularity among clinicians, radiologists and pathologists.[1] Transthoracic Fine Needle Aspiration Cytology is regarded as the most effective of the cytological methods for diagnosing lung cancer, in particular peripherally-located lesions including lung nodules of infective etiology. Trans-bronchial lung biopsy or brushings via Fibre Optic Bronchoscope and Per–cutaneous transthoracic aspiration under fluoroscopic guidance are the other alternatives. Diagnostic methods which are time consuming and not available in all centers. In such cases Ultrasound guided Fine Needle Aspiration Cytology of peripheral pulmonary lesions using fine needle is the choice for establishing the diagnosis which is simple and safe. Aspiration cytology of small and large peripheral lesions of lung and pleura may provide an early diagnosis, thus enabling effective intervention and increasing the potential of surgical care. Cytopathological evaluation has contributed a lot to the diagnosis even in the presence of minimal sample tissue. Ultrasonography provide documentation of the needle in the mass lesion. [2,3] Ultra-sonography which is readily available in most centers is easy to perform and free from radiation, helps in the evaluation of pulmonary lesions and also the needle can be guided under vision and aspirates can be obtained

from different sites of the lesion

MATERIAL AND METHODS

This prospective study done on 32 patients in 3 months period from July 2017 to October 2017 with peripheral lung lesions (lung/pleura) referred to the Department of Radiodiagnosis, Government General and Chest Hospital, OMC, Hyderabad for fine needle aspiration under USG guidance. Informed consent was taken. FNAC under USG guidance done in patients who are clinically suspected to have a neoplasm as evidenced by pulmonary opacities or nodules adjacent to the chest wall or pleural diseases. All medical records preserved including history CXR,USG,CT scan, bronchoscopic findings and histopathological diagnosis. Follow up maintained.

Inclusion Criteria

Symptomatic patients with suspected peripheral lung lesions.
Non resolving pneumonia.
Asymptomatic patients with incidentally detected lung lesions
Previous history of malignancy or immune deficiency in a patient who presents with one or more lung lesions,

Exclusion Criteria

Patients with Very poor general condition
Highly vascular lesions on ultrasound
Bleeding diathesis,
Poor pulmonary function,
Suspected hydatid disease,
Patients needing assisted ventilation,
Severe pulmonary hypertension,
COPD with bullae documented by radiograph.

Patients were scheduled for biopsy in the morning, so that follow-up care will be provided. FNAC procedure was explained to the patients. Then a informed written consent was obtained from the patient. Patient's coagulation profile was checked. The patient pulse, blood pressure and respiratory rate were recorded. Clinical diagnosis, chest radiograph diagnosis, ultrasonographic findings, CT scan findings, FNAC diagnosis, complications, final diagnosis and followup was maintained in a proforma prepared for this purpose. Fine needle aspirations were performed after reasonable radiographic localisation of the lesion initially by means of postero-anterior and lateral radiographs of the chest, followed by ultrasonographic guidance. All aspirations were performed after obtaining informed consent without any premedication with local anaesthesia, irrespective of size or extension of the lesion or of the age of the patient.

Longitudinal and transverse scans were obtained with the patient in supine or in sitting posture to get good intercostals window and the exact site and depth of the lesion from the skin. The exact skin site was marked and the skin was prepared with aseptic precautions. In this study a disposable single pass 22 G needle attached to a 20cc syringe was used. Ultrasonographic examination was done using the real time sonographic unit (Siemens Sonoline G 20) with curvilinear transducer/ linear of 5.5/7.5 MHz. The patient was asked to hold breath and the needle inserted in to the lesion. After these preliminary evaluations, skin was cleaned to ensure strict aseptic precaution for FNAC. Distances from the skin to anterior and posterior surfaces of the mass or lesion were measured through the overlying rib interspace. Under strict aseptic precautions, a disposable 22 or 23 gauge needle was inserted into the lesion during suspended respiration under real-time visualisation. After the needle tip was confirmed to be in the desired lesion, aspiration was performed during continuous observation of the position of the needle tip to ensure that needle excursions were limited to the lesion. The needle tip was seen as a white spot or small linear echogenicity. In large lesions, the periphery of the mass or areas deemed less necrotic on the basis of their ultrasound appearance were specifically targeted. The aspirated material was expelled onto a glass slide, smeared and fixed in 95% ethyl alcohol. The smear was stained by Papanicolaou's or May-Grunwald-Giemsa stain and examined in cytology department. At the completion of the procedure, all patients underwent expiratory chest radiography to detect a pneumothorax and all outpatients were monitored for 1-2 hours in the recovery area. Positional restrictions were observed in all patients to decrease the risk of post-procedural pneumothorax. The patient was asked to inform the treating physician in case he or she had severe chest pain, haemoptysis or breathlessness. In few cases where the first FNAC report was unsatisfactory, a repeat FNAC was done.

STATISTICAL ANALYSIS

The data obtained was tabulated and appropriate statistical methods were applied and the results were compared with other studies. Statically analysis done with SPSS software by which number and percentages are done.

RESULTS

Study done on 32 patients in 3 months period with peripheral lung lesions for fine needle aspiration under USG guidance. The patients selected were clinically suspected to have a neoplasm as evidenced by pulmonary opacities or nodules adjacent to the chest wall or pleural diseases. The majority of patients (n=21, 65.6%) were in the age group of 41 to 60 years. Of the 32 cases, 20(62.5%) were males and 12 (37.5%) were females. The male to female ratio was 1.6:1. The mean age of patients in this study was 48. The youngest patient was aged 30 years and oldest was aged 75 years. Most common

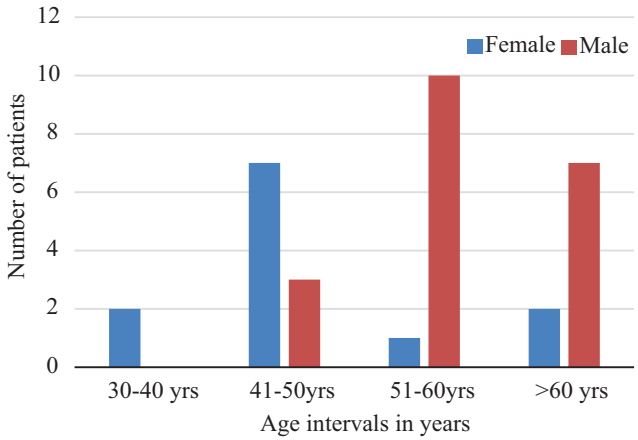


Figure-1: Demographic details

Presenting complaints	Number of subjects	Percentage
Cough	19	59.4
Fever	16	50
Chest pain	18	56.2
Shortness of breath	12	37.5
Hemoptysis	9	28.1
Loss of appetite	4	12.5
Others	2	6.2
Total	**32**	100

Table-1: Presenting complaints in study

Site of lesion in lung	Number of subjects	Percentage
Right upper lobe	11	34.3
Right lower lobe	6	18.7
Left upper lobe	4	12.5
Left lower lobe	5	15.6
Right or left Middle lobe	3	9.3
Multiple opacities	3	9.3
Total	32	100

Table-2: Distribution of Site of lesions in study

Result of Positive Cytological. Examination	Number of subjects	Percentage
Malignancy [n=22 (68.7%)]		
Squamous cell carcinoma	11	50
Adenocarcinoma	4	18
Poorly differntiated Carcinoma	2	9
Small cell carcinoma	1	4.5
Small round cell tumour	1	4.5
mesothelioma	1	4.5
others	1	4.5
Benign [n=4 (12.5%)]		
TB granuloma	3	13.5
Inflammatory/Infections	1	4.5

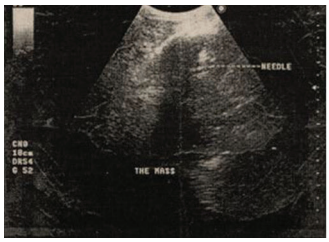
Table-3: FNAC Results of Positive Cases in study

H.P	FNAC (n=4)		
	Malignant	Unsatisfactory	Total
Malignant	2	0	2
Benign	-	1	1
Unsatisfactory	0	1	1
Total	2	2	4

Table-4: Histopathological Correlation

Author	Number of Patients	% of Patients with results	Complications
Chandrasekhar et al[7]	400	75	Nil
Sinner[8]	2726	90	Pnuemothorax 27.2%, Hemoptysis-2.5%
Afschrift M[9]	20	87	Pnuemothorax 8%
Izumi[10]	16	16	Nil
Dorothycinti[11]	12	12	Pnuemothorax 10%
Pan chyr Yang[12]	25	84	Pnuemothorax 8%
Jonpeilkezoe [13]	124	90	Pnuemothorax 4%
Ajay[15]	57	80	Pnuemothorax 4%
Chen[16]	40	87	Pnuemothorax 3.7%
Knudsen [4]	268	93	Pnuemothorax 3.7%
Modini Venkata Rao[17]	81	94	Pnuemothorax 3.7%
Present	32	81	Pnuemothorax 3.1%

Table-5: Comparison of Present Study with Previous Studies



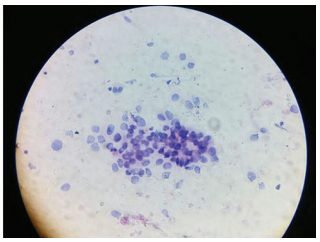


Figure-2: Ultasound Guided Fine Needle Aspiration. **Figure-3:** Histological evaluation

presenting complaints are cough 19(59.4%) and chest pain 18(56.2%). Most common lesions are observed in Right upper lobe11 (34.3%) and followed with Right lower lobe 6 (18.7%). Out of the results of FNAC in 32 cases, positive cases were 26 (81%) which are further subdivided into various groups as indicated in Histologically. Squamous cell carcinoma 11 (50%) is most commonly seen malignancy and TB granuloma 3 (13.5%) is in benign.

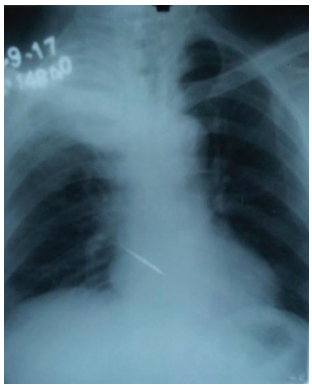


Figure-4: X ray with right upper lobe haziness

All the 2 malignant lesions were correctly diagnosed by FNAC. Out of the 2 unsatisfactory cases, one was a case of tuberculosis. One case was not diagnosed by both FNAC and histopathology

Only one patient (3.1%) of adenocarcinoma with malignant effusion developed minimal pneumothorax after the procedure. Rest of the patients underwent the procedure without any complications.

DISCUSSION

This study of Ultrasound Guided Fine Needle Aspiration Cytology has demonstrated that the technique is useful in diagnosing a variety of lesions, including malignant and nonmalignant diseases. The present study was designed to evaluate the safety of Ultrasound guided Fine Needle Aspiration Cytology and its efficacy to establish the diagnosis. Of the 32 patients studied, 20(62.5%) were males and 12 (37.5%) were females, showing the male preponderance with male to female ratio of 1.6:1(Figure-1) similar to the study of Knudsen et al.[4] This is comparable to a study by Von Sonnenberg[2] whoin his study of 150 cases had 101 males and 44 females. Nachiappan et al[5] in his study of 100 patients also showed the male preponderance with 74 males. Senthilvelmurugan V et al[6] study 69 patients were studied, 68.1% were males and 31.8% were females, showing the male preponderance with male to female ratio of 2.6:1.

Most common presenting complaints are cough 19 (59.4%) and chest pain 18 (56.2%) (Table-1). In the present study. Similar results were reported in Afschrift M et. al study and in study done by Robert D. Tarver.[9, 18]

Right upper lobe 11 (34.3%) and followed with Right lower lobe 6 (18.7%) are effected (Table-2) which is in agreement with study of VanSonnenberg[2] that more than half of the parenchymal lesions involved the upper lobe.

Of the 26 patients, 22 (68.7%) were diagnosed by FNAC as having malignancy and 4 (12.5%) were non-malignant lesions (Table-3). Squamous cell carcinoma 11(50%) is most commonly seen malignancy and TB granuloma 3(13.5%) is in benign Senthilvelmurugan V et al[6] study poorly differentiated carcinoma accounted for 31.2% cases, squamous cell carcinoma 25% cases and adenocarcinoma 16.3% of the casesIn the series of 116 cases studied by Khouri et al, [20] 10.3% cases were diagnosed as lymphomas. Yu C et al[3] found that correct histologic diagnosis with ultrasound-guided aspiration biopsy (UGAB) alone is higher in lung cancer (67%) and metastatic cancer (78%). Of the lesions diagnosed as benign, tuberculosis accounted for 64.2% cases, nonspecific inflammation for 28.5% cases. In cases diagnosed as pulmonary tuberculosis, the FNAC results correlated with the subsequent clinical course and improvement on antitubercular drugs. Ikezoe J et al[21] found that 39.9% of the cases were benign lesions in their study of USG guided needle biopsy for diagnosis of thoracic lesions. Rio F et al[22] in their study had 60.7% lesions greater than 2 cm for CT guided FNAC in bronchoscopic negative cases. Besides the limitation related to size, the efficacy of fibreoptic bronchoscopy depends on the nature of the lesion and its relation to bronchial tree.

In Fine Needle Aspiration Cytology diagnosed malignancies, cytopathological types encountered were Squamous cell carcinoma 11(50%) is most commonly seen malignancy. This was in concordance with previous studies, as Squamous cell carcinoma was the commonest malignancy in Indian sub-continent. The cytological diagnosis could be correlated with histopathological diagnosis in 4 (12.5%) cases. (Table-4) The histopathological correlation was done on the basis of bronchoscopic biopsy, surgery, and pleural biopsy in these 4 cases. In which one was unsatisfactory and other was begnin. Nachiappan et al[5] had 22% correlation of cytology with histopathology and about 80% accuracy was found for malignant lesions. Arakawa et al[23] had 33% correlation with histopathology. Of the 6 cases correlated histopathologically. Two cases with unsatisfactory FNAC reports were also included wherein one case was diagnosed to be tuberculosis and the other remained inconclusive.

Of 32 cases 26 (81%)were accuracy with FNAC diagnosis. This result compares well with the experience of Simpson et al[15] who obtained an accuracy of 80.9% and Nachiappan et al[3] who also achieved an accuracy of 80% for malignant lesions. In 62 cases, the FNAC diagnosis could not be correlated with histopathological diagnosis. However, the clinical behaviour of the patients and followup helped in the confirmation of diagnosis. In various studies reported in India, the corresponding figures range from 2.1% to 20%.

Complications were observed in 3.1% of patient, similar to reports of other studies. (Table-5) In fact Chandrasekhar et.al[7] observed no complications. Mortality due to Fine Needle Aspiration Biopsy reported in the literature was because of intrapulmonary hemorrhage, air embolism, and untreated pneumothorax. In my study, these complications were not seen. Complications and yield of various studies were compared to the present study. No mortality occured in present study.

CONCLUSION

Peripheral pulmonary nodules are frequently encountered in chest diseases, and accurate etiologic diagnosis of these lesions is important for the subsequent management. Although X Ray may be helpful for differential diagnosis, they are not conclusive. Sputum cytology is of little use for these small peripheral pulmonary nodules due to its low yield. Ultrasound can provide real-time image guidance in which the nodule is most accessible and evident this contribute high diagnostic yield of the procedure. low cost and lack of radiation hazards of ultrasound also make the repeat examination convenient. Skill and experience are the most important parameters for achieving satisfactory results in the demonstration of benign and malignant lesions. Such procedure can be adopted safely by the physicians and the coordination of pulmonologist, radiologist and pathologist is highly essential for better yield.

So ultrasound guided FNAC of peripheral pulmonary lesion is, simple, safe, quick, acceptable, easily accessible, accurate and cost-effective procedure without radiation.

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