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TRANS-THORACIC FINE NEEDLE ASPIRATION CYTOLOGY OF PERIPHERAL LUNG LESIONS

Dr Renu Gupta Senior Specialist, Department of Pathology, Dr B.S. Ambedkar Hospital, New Delhi-110085, India

Dr Siddhant Khare Senior Resident, Department of Cancer Surgery, Safdarjung Hospital.

Dr Sonam Kumar Pruthi Senior Resident, Department of Pathology, Dr B.S. Ambedkar Hospital, New Delhi-110085, India

Dr Swapnil Agarwal Medical Officer, Department of Pathology, Dr B.S. Ambedkar Hospital, New Delhi-110085, India

Dr Pratima Khare* Consultant & Head, Department of Pathology, Dr B.S. Ambedkar Hospital, New Delhi-110085, India *Corresponding Author

ABSTRACT

Introduction: Lung Tumors have high degree of morbidity and mortality. Various diagnostic methods are employed for their precise diagnosis.
Aims and Objectives: The aim of this study was to assess the accuracy and associated complications of Transthoracic FNAC with the help of X-rays and CECT scan reports, in diagnosing peripheral lung tumors.
Materials and Methods: Transthoracic FNAC in 22 patients with peripheral lung lesions was carried out using 22 gauge eight cm long lumbar puncture needle. Smears were prepared and the results were evaluated.
Results: Definitive diagnosis of Squamous cell carcinoma and poorly differentiated non-small cell carcinoma (8 cases each) and adenocarcinoma (3 cases) was made. In 3 cases the sample was inadequate for definitive diagnosis. In 1 of the 22 cases, there was mild hemoptysis after the procedure.
Conclusions: Transthoracic FNAC is very useful in diagnosis of peripheral lesions of the lung.

Introduction

Leyden in 1883, for the first time, used needle biopsy for peripheral lesions of the lung. Menetrier diagnosed lung cancer by needle biopsy in 1886.[1] Martin and Ellis are considered to be the founders of modern needle aspiration techniques. The German doctor Mannheim was the first to publish reports suggesting the use of fine needles with a small gauge.[2] However, due to serious complications, this technique never gained popularity until 1960's when Nordenstorm [3] modified the technique using a thin 18 or 20 gauge needle, which markedly reduced the incidence of complications. Since then many studies have reaffirmed FNAC to be a valuable method in diagnosing lung lesions located in mid & peripheral lobes, based on the chest X-ray and CT findings.[4,5]

This study was designed to find out the accuracy of transthoracic FNAC of lung lesions based upon analyzing posterior-anterior (PA) view of chest X-Ray and CECT scans of chest. The hospital did not have in house CECT scan facilities, so the patients were sent to another set up for getting CECT chest done. The results and analysis of the study of transthoracic FNAC are presented in this report

Aims and Objective:

To diagnose lung tumors by Transthoracic FNAC.
To assess the accuracy of Transthoracic FNAC and the complications associated with this procedure.

Materials and methods

Our study, which includes 22 patients, was performed during years 2014 to 2016. All these patients were screened by the treating doctors for tuberculosis and other infections of lungs. Only cases with space occupied lesions in peripheral area of lungs were referred for FNAC. The hospital tied up with the referral hospital for any kind of emergency management on priority basis. An informed consent was obtained from each patient prior to undertaking aspiration.

The patient was placed prone for a posterior approach and supine for an anterior approach. The position of the lesion in the chest and the point and depth for putting in the needle were determined by recent postero-anterior and lateral chest X-rays and Contrast Enhanced Computed Tomography (CECT) scans which were available in all cases. The radiologist help was taken for precise localization of the lesion. The skin was cleaned and the lesion was approached by a 22 gauge eight cm long lumbar puncture needle with stellate. The needle was inserted perpendicularly into the lesion close through the upper border of the rib nearest to the lesion, in order to avoid damage to the neurovascular structures. Suction was applied by a disposable 20 ml syringe attached to the needle immediately after removing stellate. All the FNAC were carried out by a senior trained cyto-pathologist. 4-8 smears were prepared immediately after aspiration of material and were fixed after air drying, in methanol. After removal of the needle, patient was monitored in the FNAC room for development of pneumothorax or hemoptysis for 30 minutes. In case of inadequacy of the aspirated material, FNA was repeated once again and adequate material was aspirated for diagnosis. No third prick was given in any case.

Results:

During the period of three years, FNAC was performed on 22 patients on outpatient basis in cytology department. Age of the patients ranged from 38 years to 78 years. Maximum patients belonged to age group between 46 to 75 years (81.8%), with the peak incidence of 36.3% in 56 to 65 years of age [Table I]. The mean age of the patients was 62.9 years. There were 15 (68.2%) males and 7 (31.8%) females in the study. Chronic cough, weight loss, dyspnea and pain on the affected side of lung were the most common presenting symptoms. Localization of lesions (using CECT scan and X-Ray films) was carried out in all the cases [Table II]. Among the 22 cases, right lung involvement was seen in 15 cases (68.2%) and left in 7 cases (31.8%). In the cases of predominant right lung involvement, lesions were localized in right lower lobe in 8 patients, in right upper lobe in 6 patients and right pleural base in one case. In cases with pathology in left lung, lesions were in left lower lobe in 5 patients, anterior segment of left upper lobe in 1 case and in anteromedial basal segment of lower lobe in 1 case.

Out of these 22 patients, 19 patients (86.3%) were positive for malignancy, whereas in 3 (13.6 %) patients, no definite opinion was possible on FNAC.

The commonest malignant lesions diagnosed on cytology were squamous cell carcinoma and poorly differentiated non-small cell carcinoma, 8 cases (36.3%) each. In one case of squamous cell carcinoma, granulomas were an additional finding. There were 3 cases (13.6%) diagnosed having adenocarcinoma. In three patients, where definite opinion was not possible, FNAC findings in two cases revealed blood cells and hemosiderin laden macrophages, whereas in the third case, FNAC showed histiocytes (singly scattered and in clumps), blood cells, chronic inflammatory cells and fibroblasts. In all these three cases, no malignant cells were seen in the aspirate. These three patients were referred to higher center for establishing diagnosis and further management. Out of 22 FNAC's, one patient complained of single episode of mild hemoptysis, which subsided spontaneously. Repeat FNAC was performed only in one patient, as the first procedure proved inconclusive.

Table I: Correlation of type of Tumor with Age distribution (n = 22)

Age group (years)	Adenocarcinoma	Squamous cell carcinoma	Poorly differentiated non-small cell carcinoma	Inconclusive Diagnosis	Total (%)
35-45	0	0	0	1	1(45)
46-55	1	1	2	1	5(22.7)
56-65	2	3	3	0	8(36.3)
66-75	0	4	1	0	5(22.7)
76-85	0	0	2	1	3(13.6)
Total (%)	3(13.6)	8(36.3)	8(36.3)	3(13.6)	22(100)

Table II: Clinical, Radiological and Cytological Profiling of patients: (n=22)

S. N.	Age/ Sex	Major complaints	CECT/ X-ray findings	Site of FNAC	Diagnosis
1	55/M	Dyspnea	Rt upper lobe mass	Posterolateral aspect of Right chest wall	Poorly differentiated non-small cell carcinoma
2	78/M	Dyspnea and weight loss	Left Lower lobe mass	Left sixth Intercostal space	Blood cells, histiocytes (No diagnosis possible)
3	65/F	Dyspnea	Left Lower lobe mass	Left sixth Intercostal space	Squamous cell carcinoma
4	50/F	Dyspnea	Rt pleural based mass lesion	Sixth Intercostal space, Right lateral chest wall	Adenocarcinoma
5	61/M	Chronic productive cough	Mass involving ant. Segment of left lung.	Sixth Intercostal space, Left anterior chest wall	Poorly differentiated non-small cell carcinoma
6	55/F	Chronic cough and weight loss	Mass lesion involving mid to lower zone of Right lung	Sixth Intercostal space, Right anterior chest wall	Blood cells & hemosiderin laden macrophages (No diagnosis possible)
7	55/M	Chronic productive cough	Anterior segment of Rt upper lobe mass	Right third intercostal space	Poorly differentiated non-small cell carcinoma
8	65/M	Right side chest pain	Mass involving ant & post zone of right lung	Right third intercostal space	Poorly differentiated non-small cell carcinoma
9	65/M	Right side chest pain	Rt apical segment of lower lobe	sixth intercostal space, right chest wall	Poorly differentiated non-small cell carcinoma
10	70/F	Chronic cough & Right side chest pain	Rt lower lobe zone	sixth intercostal space, right side	Squamous cell carcinoma
11	60/M	Dyspnea	Rt upper lobe mass	Posterolateral aspect of Right chest wall	Squamous cell carcinoma
12	77/M	Dyspnea, loss of Weight with chronic cough	Rt lower lobe zone	sixth intercostal space, right side	Poorly differentiated non-small cell carcinoma
13	48/F	Weight loss with chronic cough	Rt apical segment of lower lobe	sixth intercostal space, right chest wall	Blood cells, histiocytes (No diagnosis possible)
14	57/F	Weight loss with chronic cough and Dyspnea	Rt lower lobe zone	sixth intercostal space, right side	Adenocarcinoma
15	68/M	Chronic cough & Right side chest pain	Rt lower lobe zone	sixth intercostal space, right side	Squamous cell carcinoma
16	72/M	Weight loss with chronic productive cough	lesion involving upper and middle zone of Left lung	Sixth Intercostal space, Left anterior chest wall	Squamous cell carcinoma
17	56/F	Weight loss with chronic cough	Rt upper lobe mass	Posterolateral aspect of Right chest wall	Adenocarcinoma
18	71/M	Dyspnea & Weight loss	Left Lower lobe mass	Left sixth Intercostal space	Poorly differentiated non-small cell carcinoma
19	74/M	Chronic cough	Left Lower lobe mass	Left sixth Intercostal space	Squamous cell carcinoma
20	57/M	Dyspnea	Rt lower lobe zone	sixth intercostal space, right side	Squamous cell carcinoma
21	77/M	Dyspnea & weight loss	Rt lower lobe	sixth intercostal space, right side	Poorly differentiated non-small cell carcinoma
22	48/M	Weight loss with chronic cough	Left Lower lobe mass	Left sixth Intercostal space	Squamous cell carcinoma

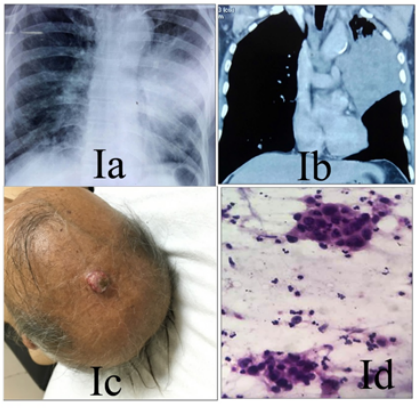

Fig I

Ia. X-ray showing Mass lesion involving middle lobe of left lung
Ib CECT showing CECT chest: Mass lesion in the left upper and middle lobe of lung (pleural based lesion)
Ic. Skull metastasis in the same patient
Id FNAC smear showing Squamous cell carcinoma (H&E 400X)

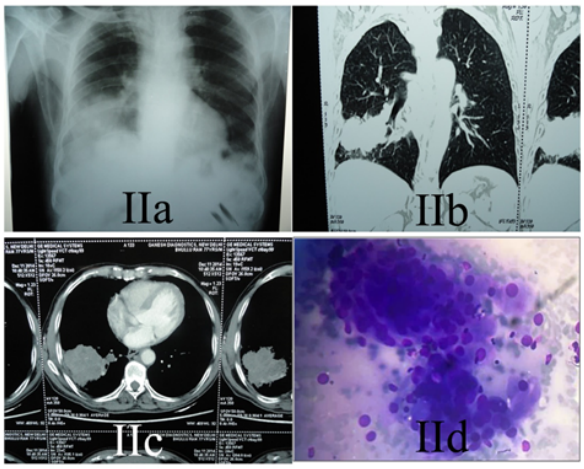

Fig II

IIa. X-ray showing Mass lesion involving middle and lower lobe of right lung
IIb CECT showing Lobulated hetrogenous soft tissue mass in right lower lobe with surrounding fibronodular opacities with paratraceal and hilar lymph nodes.
IIc CECT transverse section showing pricise location of tumor mass.
IId FNAC smear showing Poorly Differentiated non-small cell carcinoma (Giemsa Stain 400 X)

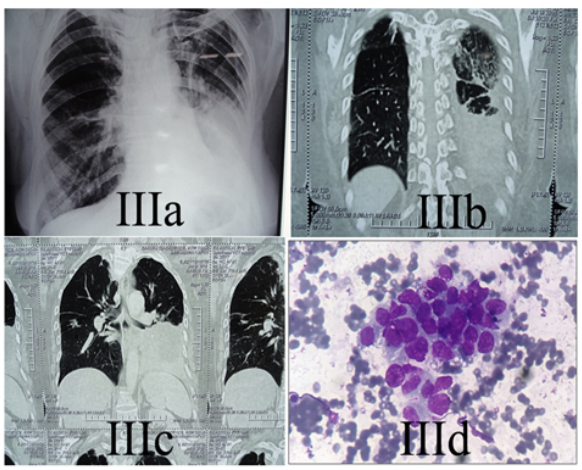

Fig III

IIIa. X-ray showing Mass lesion of Left Lung involving Middle and lower Lobe
III b. CECT: Large heterogeneous hypodense mass lesion in the left lower lobe with surrounding tiny lymph nodes and septal thickening of lung
III c CECT scan cut showing mass lesion acutely cutting over left bronchus and lymph nodes in left trachea bronchus area.
III d Photomicrograph of FNAC smear showing Adenocarcinoma (Giemsa Stain 400 X)

Discussion:

FNAC for lung lesions has shown to be a safe and effective procedure; however its role is limited in very small lesions due to technical difficulties, while in very large lesions necrosis limits conclusive cytological diagnosis [6]. Currently, at most places, the practice of CT guided FNAC is being employed. However, in many parts of the developing world, due to non-availability of in- house CT scan facilities; the transthoracic FNAC is still carried out based upon X-rays and CT scan films interpretation. Ours is a similar type of center where we carried out this study to evaluate the usefulness of FNAC, due to non- availability of in-house CT facilities.

This study spanned over a period of three years in which patients were carefully screened and investigated by an experienced physician. Cases with infective diseases and those with deeply placed lung lesions on CECT scan were excluded from the study. FNAC was carried out by an experienced senior cyto-pathologist and radiologist. In the present series of 22 cases over a period of three years, there was a male preponderance of (68.2%). Most of the patients in the series (81.8%) were middle aged or elderly, with the mean age of the patients being 62.9 years. Similar male preponderance has been observed by Nahar Begum et.al.[7], however the mean age in their series was 43.6 years, much lower than our series.

There was only one case of hemoptysis after the procedure in our series. Pneumothorax was not seen in any of the case in the series. Prasad R et.al.[8] in their series reported development of hemoptysis and pneumothorax in equal proportion of patients. However many studies have reported higher complication rate as compared to our studies [4,9]. Studies by Suri JC[5] and Malberger E[10] reported pneumothorax being the commonest complication of unguided FNAC. Byrd RP Jr[9] in their study of 64 CT guided FNAC had 2 cases of pneumothorax. They observed that if the patient does not have any post procedure pneumothorax (PTX), the chances of developing delayed pneumothorax are not there. The reasons, that none of the patients developed pneumothorax in our series, may be attributed to careful patient selection as most of the lesions, where FNAC's were performed, were peripheral and closer to the chest wall. Further we use of 22 gauze lumber puncture needle with stellate and each procedure was carried out by a senior experienced cyto-pathologist under guidance of a radiologist.

In our series, the FNA yield in 19 cases (86.4%) was good and a definitive diagnosis of type of tumor was made whereas in only 3 cases (13.6%) cases, yield was inadequate and a definitive diagnosis could not be made. In two of these cases, FNA showed blood cells and histiocytes whereas in one case, it showed blood cells and hemosiderin laden macrophages. These 3 cases where FNAC's were inconclusive were attributed to inadequacy of reaching to the depth of the lesion.

Kushwaha et. al. [11] in their study of 42 cases of unguided FNAC had a diagnostic yield of 83.3%, similar to our series. Complications reported in their series included asymptomatic pneumothorax and blood tingled sputum in a few cases. Suri et.al. [5] in their study on unguided transthoracic fine needle aspiration biopsy in 62 cases had a diagnostic yield of only 67.7% with much higher complications rate (pneumothorax in 4 cases and hemoptysis in 3 cases). However, specific tissue diagnosis was reached in all their cases. They recommended this procedure after careful patient selection and in lesions which were beyond the reach of fibro optic bronchoscope. They regarded unguided FNAC as a simple, quick, economical, safe and reliable procedure for the diagnosis of peripheral lung lesions. Zaman et al[12] carried out one of the largest series of transthoracic aspiration cytology in 1390 cases of suspected lung malignancy spanned over a period of 7 years. They had 1209 proven malignant neoplasm and transthoracic FNAC diagnostic accuracy in 1059 cases (88%) in their series. Mostafa et.al. [13] in a large series of 614 cases of percutaneous transthoracic fine needle aspiration cytology (PTFNAC) of lung diagnosed 417 cases (78.83%). They had only 2 cases that developed pneumothorax and 3 cases that had mild hemoptysis after the procedure. They concluded that PTFNAC is a simple, time saving, safe and inexpensive method for diagnosing peripheral lung lesions. Similar to these series of FNAC, our results also reaffirm the safely, efficacy, and reliability of transthoracic FNAC in carefully selected patients with space occupying lesions of lung.

In recent years, USG and CT guided FNACs are being done on routine basis. Nahar Begum et.al.[7] in their study of image guided transthoracic FNAC of 127 cases had adequate samples in only

119 cases (an yield of 93.7%). In 6 (6.3%) of their cases the diagnosis could not be made as the hemorrhage into the lesion obscured the main lesion. The results in our series of transthoracic were marginally inferior compared to their series of guided FNAC. Dash et. al.[14] compared the accuracy and safety of CT guided and unguided FNAB in the diagnosis of lung lesions. In their study, 52 cases with large peripheral lung lesions (size more than 5 cm diameter) were put to unguided FNAB whereas 27 cases with central and small lesions (size less than 5cm diameter) were subjected to CT guided FNAB. The diagnostic yield in unguided cases was 71.1% whereas in CT guided cases, it was 95.2%. They concluded that there is advantage of higher sensitivity in CT guided FNAC (97.1%) compared to unguided FNAC (90.6%). However, specificity was 100% in both the methods. Diagnostic accuracy of unguided percutaneous FNAC quoted in the literature ranges from 73 to 98%. In our study, satisfactory material was procured in most of the patients and a definitive opinion was possible in 86.4% cases. Our study had comparable results to studies performed by Prasad R [7] (84.8%), Chang [15] (86.1 %) and Munshi[16] (86%). Studies performed by Suri JC[5] and Mostafa MG[10], showed diagnostic accuracy of 67.7% & 74%, which is much less compared to our study. Diagnostic accuracy increases up to 98% with the use of radiological guidance as shown in the study by Mitchell ML[17] et.al. and 96% in study by Gangopadhyay M[18]et.al.

In our study, squamous cell carcinoma (36.3%) (Fig Id) and poorly differentiated non-small cell carcinoma (36.3%) (Fig IId) were the most common malignant tumors followed by adenocarcinoma (13.6%) (Fig IIId). These results are comparable to studies performed by Prasad[8], Mostafa MG[13] ,MitchellML[17] and Jadhav S.[19] However, in contrast, study performed by Mandal et.al.[20] showed adenocarcinoma as the most common primary malignant tumor of lung (51.7%).

Limitation of the Study

The study designed was due to non-availability of in house facility of CT scan. So, the comparison of results of transthoracic FNAC with CT guided FNAC were beyond the scope of the study. The study was aimed at evaluating the usefulness of FNAC in a suburban set up, after careful selection criteria to minimize risk of complications. The worked up patients were then referred to higher center for further needful.

Conclusion:

The study showed that transthoracic FNAC, with the help of X-Ray and CT scan films, is a safe, effective, inexpensive procedure, well tolerated by the patients, with high diagnostic accuracy, when performed by experienced and skillful hands. Due to low repetition rate, low complication rate and overall efficacy, it can be used for diagnosis on outpatient basis, especially in patients with localized mid and peripheral pulmonary lesions. It can also be performed in patients who are unsuitable for invasive procedures, because of its less complication rate.

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