Journal of Cardiovascular

ISSN: 0975-3583,0976-2833 VOL 14, ISSUE 03, 2023

Fine needle aspiration cytology of lung mass lesions by computed tomography scan method- a tertiary care study

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Abstract

Introduction

Lung cancer is the commonest cancer worldwide accounting for 18% of all cancers in men. There are 2-2.5 million cancer cases present at any point of time in India . The present study was undertaken to establish the role of CT-guided FNAC and comprehensive evaluation of lung masses with the cytological findings and to study the incidence of various pulmonary mass lesions especially inflammatory , benign & malignant neoplasm.

Method and material

The present hospital based study was undertaken involving 60 patients from June 2009 to November 2013, who underwent CT-Guided transthoracic fine needle aspiration from pulmonary mass lesion at tertiary care centre in Jaipur between June 2009 to November 2013.

Result

A total of 49 males (81.67%) and 11 females (18.33%) who presented with lung mass lesions on plain skiagram were evaluated by CT scan and underwent CT- guided FNAC.The most common presenting symptom in patients presenting with lung mass lesions was cough (93.33%) followed by chest pain(90%). Out of 60 CT-guided FNAC's preformed, 53 cases(88.33%) revealed adequate for cytological diagnosis.

Conclusion

Percutaneous TT FNAC is a relatively simple procedure with good patient acceptance and low morbidity. It is an accurate, safe and repeatable procedure with a high diagnostic accuracy in the diagnosis of difficult lung mass lesions.

Keywords- FNAC, Lung lesion, CT guided, Neoplasm

Introduction

Lung cancer is the commonest cancer worldwide accounting for 18% of all cancers in men. There are 2-2.5 million cancer cases present at any point of time in India . Lung is the leading site of cancer in males as per the three urban cancer registries of India. Most patients present with advanced disease. The incidence of lung cancer is increasing rapidly, mainly due to progressive change in life style. The epidemiology of lung cancer is dominated by its association with smoking. The dramatic increase in cancer death rates among men and the more recent increase among women can be attributed to increase in cigarette consumption. The prevention

ISSN: 0975-3583,0976-2833 VOL 14, ISSUE 03, 2023

and early diagnosis of lung cancer thus assumes a major public health issue. Smoking is the major risk factor for lung cancer with approximately 90% to 95% of new lung cancers resulting from active smoking, tobacco exposure has been strongly associated with small cell cancer than any other type.[1]

The quest for accurate diagnosis of lung pathology has been there all through the history of medicine. The pathologist is the person who makes the final diagnosis, submission of the lesion to the pathologist involves procedures, both invasive and non-invasive, like open lung biopsy(OLB), Percutanceous transthoracic needle biopsy(TTNB) & fine needle aspiration cytology (FNAC).

LEYDEN performed the first transthoracic needle lung biopsy in 1982 to confirm pulmonary infection.[11-2]In oncology practice pathological diagnosis of the disease is of paramount importance & is always considered the standard for diagnosis.[4-3]

Percutaneous, transthoracic fine needle aspiration cytology (FNAC) is a well-established diagnostic method used in the cytological evaluation of thoracic mass lesions for the last three decades [5-4]. In thoracic lesions, early diagnosis, separation of malignant- benign lesions and early medical treatment are the main goals to decrease mortality. However, in some patients both the sputum cytology and bronchoscopic studies may be insufficient to make a diagnosis. TFNAC/B is a valuable method that can be used when sputum is unavailable, or the location of the lesion or clinical status of the patient is not suitable for bronchoscopic procedures. Compared with thoracotomy and open lung biopsy, it is a cheaper and easier method and has a fairly low mortality rate [6-5].

A well planned & executed CT guided FNAC helps to provide an accurate diagnosis & facilitates institution of definitive treatment. CT is the optimum image-guiding modality for thoracic interventions. With this background the present study was undertaken to establish the role of CT-guided FNAC and comprehensive evaluation of lung masses with the cytological findings and to study the incidence of various pulmonary mass lesions especially inflammatory , benign & malignant neoplasm.

Material and methods

The present hospital based study was undertaken involving 60 patients from June 2009 to November 2013, who underwent CT-Guided transthoracic fine needle aspiration from pulmonary mass lesion at tertiary care centre in Jaipur between June 2009 to November 2013 . Complete clinical history, examination and details of relevant investigations including radiological, fiberoptic bronchoscopic and cytological data were obtained and those with non approachable diagnosis were subjected for CT guided FNAC to know the pathological spectrum of pulmonary mass lesions.

Inclusion criteria:

1. Patients with undiagnosed pulmonary mass lesion on chest X-ray or CT scan of chest.
2. Patients with central lung mass who were unfit or refused to do FOB or with normal bronchoscopic findings or had negative repeated FOB biopsy results.

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3. Patients with undiagnosed lung consolidation, or delayed unresolved pneumonia after repeated sputum examination for acid fast bacilli.
4. Patients with undiagnosed solitary pulmonary nodule.

Exclusion criteria:

1. Patients with a bleeding disorders or abnormal coagulation profile (INR>1.5)
2. Severe thrombocytopenia (platelet count < 50,000)
3. Severe chronic obstructive pulmonary disease or bullous emphysema.
4. Pulmonary arterial hypertension.
5. Dyspnea at rest.
6. Uncontrolled cough, and the patient is not able to hold breath.

All patients were subjected to thorough history taking and careful clinical examination. Complete laboratory investigations with stress on blood picture, ESR and sputum examination for acid fast bacilli for suspected patients for tuberculosis were done. Chest X-ray both P.A and lateral view, CT chest and fiberoptic bronchoscopy were done. FOB was done for patients with central bronchial mass according to CT chest features and bronchoalveolar lavage for cytological examination or examination for acid fast bacilli for patients with undiagnosed lung consolidation, or delayed unresolved pneumonia.

For CT Guided FNAC needles which were used in this study were fine spinal needles gauge 20-22. All FNAC's were performed by using a helical CT Scanner (Philips tomoscan). Patients initially underwent imaging in the supine or prone position according to whether the lesion was nearer to the anterior or posterior chest wall and to provide a safe needle path. A Preliminary localization scan view was taken to determine the levels for transverse scans through the biopsy site. The skin was then cleared by antiseptic and infiltration anesthesia (5ml xylocain 2%) was applied to all patients .A short 20 gauge needle was introduced in the preselected angle and site. A repeated CT slice obtained at this point to verify that the site of entry and angle of approach was correct. If either was suboptimal, appropriate corrections can be made before the needle crosses the pleura.

For FNAC procedure the stylet of spinal needle was removed first and a syringe was attached to the spinal needle. Then a negative suction was maintained while the needle was moved 1cm to and fro with rotating movement. The aspirated material in the syringe were spread on glass slides 3-5 slides. The smears will be stained with Hematoxylin & Eosin(H&E) stain after wet fixation and May-Grunwald-Giemsa(MGG) stain following dry fixation and special stains wherever required.The smears were assessed & evaluated for cytomorphological features and co-related with cytological and radiological findings.

Results

CT- Guided FNA was evaluated for lung mass lesions in 60 patients with the primary objective to define the nature of abnormality and to provide a possible diagnosis in terms of malignant or benign.

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Figure 1:- cases according to demographic profile

A total of 49 males (81.67%) and 11 females (18.33%) who presented with lung mass lesions on plain skiagram were evaluated by CT scan and underwent CT- guided FNAC. The male-female ratio was 4.45:1. The age range in either sex was 18 to 85 years. The age and sex distribution of patient revealed that maximum number of males belonged to the age range 41-60 years (47%) with a second peak age incidence in 61-80 years (41%) whereas females had peak incidence in 61-80 years(63%) followed by 41-60 years (27%) . 88.33% of total cases were in age range of 41-80 yrs with the mean age being 58.34 years in our study. Only one patient was in the age group of 11 to 20 years and no patient was aged below 10 years.

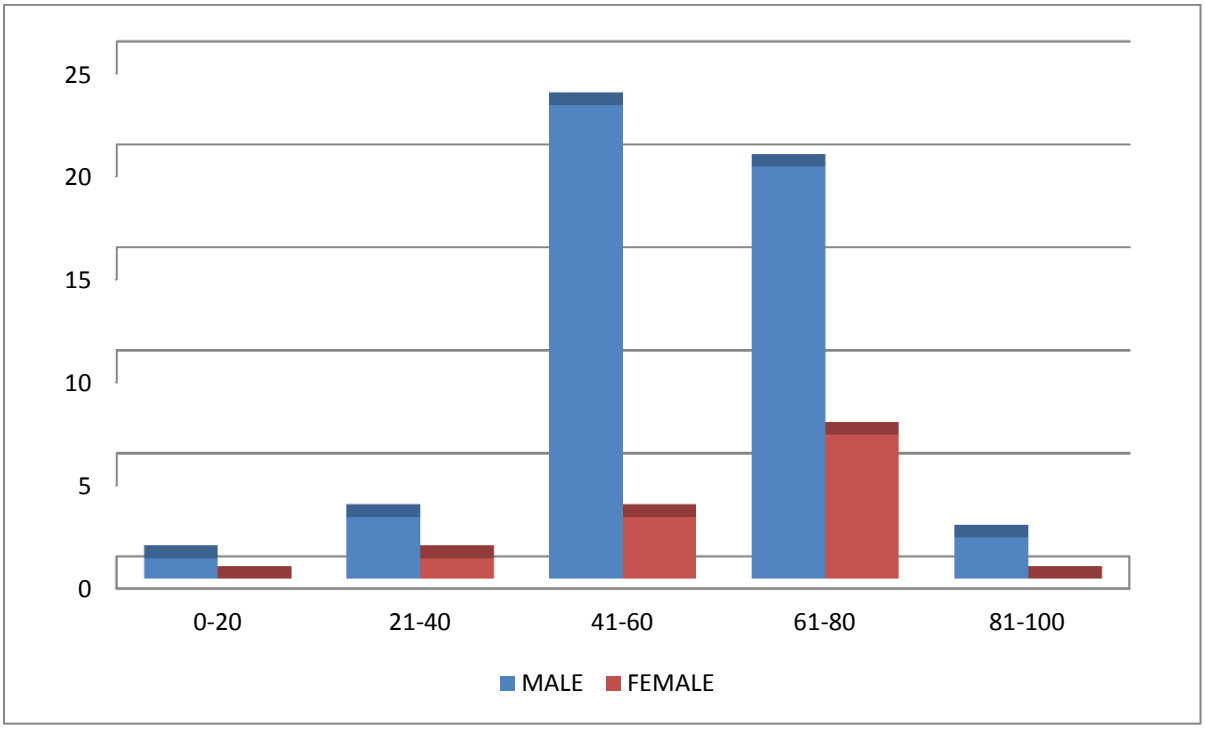

Table 1:- ***PRESENTING SYMPTOMS OF PATIENTS***

COMPLAINTS	NUMBER	%
Cough	56	93.33
Chest Pain	54	90
Hemoptysis	52	86.67
Dyspnoea	47	78.33
Weight loss	18	30
Fever	09	15

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The most common presenting symptom in patients presenting with lung mass lesions was cough (93.33%) followed by chest pain(90%), haemoptysis(86.67%) & Dyspnoea (78.33%). 18 cases (30%) presented with weight loss and 9 cases(15%) suffered from fever (Table 1).

Table 2: ***ADEQUACY OF SAMPLING***

		NUMBER	%
1.	**ADEQUATE**	**53**	**88.33**
2.	**INADEQUATE**	**07**	**11.67**
a.	**HEMORRHAGIC**	**05**	**-**
b.	**REACTIVE TISSUE**	**02**	**-**
	Total	**60**	**100**

Out of 60 CT-guided FNAC's preformed, 53 cases(88.33%) revealed adequate for cytological diagnosis. While 07 cases(11.67%) were inadequate(05 cases were haemorrhagic and 02 cases revealed only reactive cells) [table 2].

Table 3:- SPECTRUM OF DISEASE AS PER CYTO -PATHOLOGICAL FINDINGS

CYTOLOGICAL DIAGNOSIS ESTABLISHED	**NUMBER OF CASES**	**%**
MALIGNANT (49)		**81.68**
Poorly Diff. Carcinoma	13	21.67
Poorly Diff. S.C.C	06	10
Mod. Diff.S.C.C	09	15
Well Diff. S.C.C	09	15
Small Cell Carcinoma	10	16.67
Adenocarcinoma	01	1.67
Plasmacytoid Lymphoma	01	1.67
BENIGN (4)		**6.67**
Ac.Inflammotory Lesion	02	3.33
Chr.Inflammotory Lesion	01	1.67
Tuberculosis	01	1.67
Inadequate sampling (7)		**11.67**
Total	**60**	**100**

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The most common malignancy in our study was Squamous cell carcinoma accounting for 48.9%. The second most common malignancy was Poorly Differentiated Carcinoma (26.53%) followed by Small Cell Carcinoma (20.4%), Adenocarcinoma (2%) & Plasmacytoid Lymphoma (2%). Out of 04 benign cases, 02 were reported as acute inflammatory lesion, 01 case as chronic inflammatory lesion, and 01 case as tuberculosis.

Discussion

In pulmonary mass lesions, early diagnosis, separation of malignant from benign lesions and early medical treatment are the main goals to decrease morbidity and mortality. The possibility of severe complications such as respiratory or circulatory compression mandates fast and sometimes urgent diagnosis and treatment of lung masses. Anatomically critical location poses difficulties and risk for establishing tissue diagnosis[65-6]. Fine needle aspiration of intrathoracic organs is generally applied to localized lesions, All intrathoracic lesions including deep hilar lesions are now routinely and safely sampled using FNA under computerized tomography (CT) guidance its use being limited in the diagnosis of diffuse parenchymal disease. Proof of malignancy is the usual aim of such a procedure although it can be used for definitive diagnosis of some benign neoplasms and infections such as tuberculosis, including those that are inaccessible with other alternative techniques.

The M : F ratio in the present study was 4.45:1 whereas the age range varied from 18-85 years. The ratio in lung lesions as quoted by various authors ranges from 1.7:1 to 2.6:1.This difference is explained on the basis of higher incidence of predisposing factors like smoking, COPD, and alcoholism in males[60-7]. The mean age (58.36 years) was almost similar (56.4years) to the study conducted by Singh et al[7-8]. However, Wallace et al.[47-9] showed a slightly higher mean age of 61.3 years.

The results of the present study revealed that unexplained cough of more than 3 weeks was the commonest symptoms seen in 56 (93%) of patients with intrathoracic lesions followed by chest pain in 54 patients (90%), then dyspnoea in 47 patients (78%). This is in accordance to Vigg et al[68-10], who reported that unexplained cough of several weeks is the commonest symptom along with fever, weight loss, breathlessness and haemoptysis in his studied patients. Also, JayaShankar et al[61-11], found that the common clinical presentations include cough with expectoration, chest pain, hemoptysis, pleural effusion in his studied patients.

Cytological examination of FNA in our studied patients showed that 49 patients (81.66%) were malignant and 04 patients (6.67%) were benign. This is nearly similar to Mohammad[13-12], who reported in his study that cytological study showed a malignant pathology in 62% cases and a benign pathology in 38% cases.

Among the benign lesions, Granulomatous tuberculous inflammation was diagnosed in 01 case(25%) and 03 cases(75%) out of 04 patients in our study. JayaShankar et al[61-11], demonstrated that among benign lesions tuberculosis comprised 12% of their study, whereas it comprised 33% of study conducted by Singh et al[7-8].

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Similar to the findings of Fraser et al.[15-13], cases of acute inflammatory lesions showed necrotic debris, fibrin, neutrophils and macrophages. Conces et al.[70-14] supports that TFNAC is useful in diagnosis of pulmonary infections. But Covell et al.[71-15] that the above findings are not specific unless the organisms are demonstrated and advocates culture for the same. Silverman et al.[72-16] claims that one can make a confident diagnosis of a granulomatous process in aspirated material and could identify AFB in 38% cases of granulomatous lesions. Scattered epitheloid cells with adundant necrosis and AFB positivity was observed in the granulomatous lesion in the present study. The specific diagnosis in inflammatory lesions can be improved by integrating with other diagnostic methods such as Gram's stain, culture and sensitivity, special stains and ancillary techniques such as cell block and immunocytochemistry.

Among the neoplastic lesions, the malignant lesions were predominant, accounting for 82% of neoplastic lesions, which was similar to the study by Arslan et al.[10-17] while the benign lesions accounted for 7%. This supports the fact that the usefulness of TFNAC is limited to by low yield for specific benign lesions. This has been supported by the findings of Weisbrod et al.[73-18] who found it difficult to aspirate benign spindle cell lesions. Among the smokers, Squamous Cell Carcinoma was the commonest malignancy with 21cases(87.5%) followed by Poorly Differentiated Carcinoma with 11 cases(84%).These findings correlated with the previous authors. The relationship with smoking is strongest with Squamous Cell Carcinoma[60-7].

Majority of our studied patients had Bronchogenic Carcinoma as primary diagnosis (80%).Among the Bronchogenic Carcinoma, Squamous Cell Carcinoma was the commonest non-small cell lung carcinoma and was found in 24(50%) out of 48 patients followed by Poorly Differentiated Carcinoma in 13 cases(27%), Small Cell Carcinoma in 10 cases(21%) and Adenocarcinoma in 1 case(2%). The exact details of various cytomorphological subtypes are shown in the table 13.

The prevalence of Squamous Cell Carcinoma in our study was much higher as compared to 22% in the study done by Singh et al[7-8]. Basnet et al[59-19], reported in their study that Bronchogenic Carcinoma was found in 44 out of 82 cases (54%) comparable to the present study. Among the Bronchogenic Carcinoma, Squamous Cell Carcinoma was found in 22 out of 44 cases (50%), Small Cell Carcinoma in 10 cases (20%). Adenocarcinoma was seen in only one case (2%). Large cell carcinoma was not reported in the present study.

Also, JayaShankar et al[61-11], demonstrated in their study that bronchogenic carcinoma was found in 35 out of 60 cases (58%). Among the Bronchogenic Carcinoma, Squamous Cell Carcinoma 51%. Adenocarcinoma 43%, Small Cell Carcinoma and Large Cell Carcinoma in each one case.
The finding of the tumour cells arranged in the acinar pattern with abundant cytoplasm, round nuclei, solitary nucleoli and intracytoplasmic PAS positivity favours, the findings of mucin secretion in adenocarcinoma as suggested by Secoggs et al.[74-20]

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There is no definite cytological criteria for distinguish primary from Secondary Adenocarcinoma. Although there may be features indicative of a particular organ of origin. Immunostaning for TTF-1 is useful as it is the best single marker for primary Pulmonary Adenocarcinoma.The cellular smears of small cell carcinoma showed scanty cytoplasm, salt and pepper chromatin, nuclear crowding and moulding.

Conclusion

Percutaneous TT FNAC is a relatively simple procedure with good patient acceptance and low morbidity. It is an accurate, safe and repeatable procedure with a high diagnostic accuracy in the diagnosis of difficult lung mass lesions. CT scan has enabled the visualization of previously inaccessible tumors, which can now be guided by this procedure, leading to a greater yield of cytological material and a significantly greater predictability of true positive cases in malignant lesions. TT FNAC should be used earlier and more frequently to shorten the diagnostic interval and allow more prompt therapy for persistent lung lesions.

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