ORIGINAL ARTICLE

Role of FNAC in Early Detection and Diagnosis of Lung Lesions with Histo-radiological Correlation and Clinical Insights in a Tertiary Care Centre

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ABSTRACT

Background: Carcinoma of lung has now become increasingly frequent during the last 60 years; this increase is seen in males and especially in the females. Cytological evaluation from respiratory tract is the initial investigation along with radiological investigations in patients suspected to have pulmonary diseases. The various cytological samples included transbronchial needle aspiration, guided fine needle aspiration cytology (FNAC) smears and pleural fluid. Present study was undertaken to study the spectrum of lesions diagnosed by cytomorphological analysis of various cytological samples and correlation of the histopathology, cytology and radiology of lung lesions. **Materials and Methods:** Centrifuged and direct smears from received samples were stained with MGG and PAP stain. Cytohistological correlation was done when biopsy was available with radiological correlation & comparison of topographic display. **Results:** Present study was carried out during the period of December 2018 to November 2019. During this period, of total 52 cases, 36 (69.2%) were males and 16 (30.8%) were females. Their age ranged from 26 years to 73 years, most patients (53.8) belonged to the age group of 56 – 65 years. The literacy status of the patients was assessed. 2 out of 52 (3.8%) patients were illiterate, 8 out of 52 (15.4%) patients were educated above H.S. level. Adenocarcinoma was seen to be the most prevalent 29 (55.7%) followed by squamous cell carcinoma 12 (23.0%) among the cases studied. Smoking was seen to be the most common addiction i.e. 34 out of 52 cases (65.4%). Among non-smokers 66.7% presented with adenocarcinoma and 16.6% cases with squamous cell carcinoma. The topography of the neoplasms within the lungs was assessed radiologically. On chest X ray (82.6%) lung lesions were identified; (48%) of patients were found to have pleural effusion. By using CT SCAN, all masses were located definitely. **Conclusion:** A good correlation between cytology and histopathology is revealed in our study. Guided FNAC helps in early detection and diagnosis of lung lesions and facilitates appropriate management of patients.

KEY WORDS: Lung, Carcinoma, Detection, Diagnosis, Fine needle aspiration, Cytology, Histopathology, Radiology, Correlation.

Introduction

Lung cancer has now become the most frequently diagnosed carcinoma in the world. It is the most common cause of cancer related deaths worldwide.

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Carcinoma of lung has now become has now become increasingly frequent during last 60 years. This increase is seen in male and especially in the females which applies to all the major microscopic types.[1] Lung carcinoma is more common in males than females but the difference is decreasing because of a proportionally higher increase in women.[2] The current male: female ratio is 1.5:1. More than 90% of the patients are over 40 years old at the time of diagnosis.[3]

Exposure to asbestos, polycyclic aromatic hydrocarbon, arsenic, nickel & chromium compounds;

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BCME; CMME; vinyl chloride on (as seen in uranium workers & in people with high radon concentration in their houses) and other occupational agents undoubtedly account for some of the cases.[4–9]This is particularly true for asbestos, which is thought to be responsible for about 5% of all lung cancer deaths.[10,11]However, the significance of all these factors pales by comparison with the role-played by cigarette smoking, both in males and females.[12] This is true for all major histologic types of lung carcinoma.[13] The relationship of cigarette smoking with malignant, dysplastic and metaplastic alternations of the trachea-bronchial tree has also been thoroughly documented by the meticulous histologic observations of Auerbach et al.[4] and confirmed by others[14] at autopsy. The former authors found an almost linear correlation between the severity of the changes and the degree of cigarette consumption.

Most lung cancers are of considerable size when first detected, and about 60% are incurable as a result of extensive local spread and/or distant metastases. Sometimes lung carcinoma presents as a solitary circumscribed mass ('coin lesion') on the chest X ray film of an asymptomatic individual. About 35- 50% of pulmonary coin lesions in adults represent lung carcinoma.

Aims

For proper evaluation of neoplastic diseases of lung along with early detection of lung cancers, we proposed to correlate clinical features at presentation with pathological findings & comparison of topographic display. Correlation between cytological & histological findings is important in establishing the role of CT guided FNAC in early detection of lung cancer. This can be achieved by bronchoscopy or CT guided transthoracic needle biopsy of the mass and pleural fluid examination.

Materials & Methods

The study was carried out in the Department of Pathology in a tertiary care centre at Kolkata. This was an observational study, undertaken to study the cytological and histopathologic correlation of lung lesions to determine the diagnostic accuracy of FNAC. A total no. of 52 cases had been included in our study for a period of one year from December 2018 to November 2019. The subject of our study included the cytology samples and specimens received in the department of pathology during the above mentioned period. Detailed clinical data (age, site and clinical features) were obtained from the record books. Radiological correlation of the lesions was done during the same period from the Department of Radiology and evaluated. The cytological samples were processed within 2 hrs of receipt. Two smears from each sample were air dried and stained with May-Grunwald Giemsa (MGG) stain while rest of the smears were fixed in 100% methanol followed by Papanicolaou stain. The histological specimens were processed, tissue blocks prepared and sections made. The sections were stained with the standard Haematoxylin and Eosin stain. Special stains were used wherever indicated. For all cases the respective cytological smears were traced and reviewed for correlation. Data collected was analysed and classified according to the WHO classification.

Results

An observational study of cyto-histopathological correlation of lung lesions was carried out at the Department of Pathology in a tertiary care centre. Present study was carried out during the period of December 2018 to November 2019. During this period, of total 52 cases, 36 (69.2%) were males and 16 (30.8%) were females. Their age ranged from 26 years to 73 years, most patients (53.8) belonged to the age group of 56 – 65 years Figure 1.

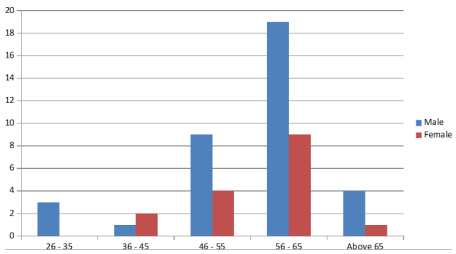

Figure 1: Age sex distribution of patients with lung neoplasm

The literacy status of the patients was assessed. 2 out of 52 (3.8%) patients were illiterate, 8 out of 52 (15.4%) patients were educated above H.S. level.

Adenocarcinoma was seen to be the most prevalent 29 (55.7%) followed by squamous cell carcinoma 12 (23.0%) among the cases studied (Table 1).

Smoking was seen to be the most common addiction i.e. 34 out of 52 cases (65.4%). Among non-smokers 66.7% presented with adenocarcinoma and 16.6% cases with squamous cell carcinoma.

Table 1: Prevalence of various lung neoplasms

H.p. Types	No. of cases		Total
	M	F	
Adenocarcinoma	18	11	29 (55.7%)
Squamous cell Carcinoma	09	03	12 (23.0%)
Small cell Carcinoma	06	01	07 (13.5%)
Large cell Carcinoma	01	00	01 (1.90%)
Carcinoid	00	01	01 (1.90%)
Teratoma	01	00	01 (1.90%)
Sarcoma	01	00	01 (1.90%)
Total	36	16	52 (100%)

The commonest presentation with which the patients presented was cough (29) followed by shortness of breath (21) as illustrated on Table S1 **(Shown in Supplementary data)**. The topography of the neoplasms within the lungs was assessed radiologically. On chest X-ray (82.6%) lung lesions were identified; 25 (48%) of patients were found to have pleural effusion.

By using CT SCAN, all masses were located definitely (Table 2). 28/52 (53.8%) were found to be peripheral, 17/52 were found to be central, 7/52 (13.4%) mid zone lung lesions were found; pleural effusion was found in 27 (52%). Lymph node metastases was seen in 13 (5.8%) cases and distant metastases in 3/52 (5.8%) cases at the time of presentation.

In cases of adenocarcinoma 26/29 (89.6%) peripheral, 1/29 (3.4%), central 2/29 (6.9%), mid zone lung mass found; 20/29 (68.9%) show pleural effusion. In squamous cell carcinoma 9/12 (75%) central, 1/12 (8.3%) peripheral, 2/12 (16.6%) mid zonal lung mass found; 4/12 (33.3%) show pleural effusion. Of 7 small cell carcinoma, central mass is seen in majority (57.1%); pleural effusion found in 2 (28.6%). The large cell carcinoma presented as peripheral mass whereas the sarcoma found as the central mass and associated with pleural effusion. The intra pulmonary dermoid and carcinoid tumor both presented as central mass lesion without any effusion **(Shown in Supplementary Data).**

Of total 52 lung neoplasms, CT guided FNAC can diagnose 47 cases with proper histopathologic types. So, accuracy of FNAC is 47/52 (90%) as shown on Table 3. Carcinoid tumor was later confirmed immunohistochemically i.e. chromogranin positive. Sarcoma was found to be synovial sarcoma monophasic type CD99 positive later on immunohistochemically.

Table 3: Cytohistological correlation of lung lesions

Types Methods	FNAC	Histopathology
Adenocarcinoma	28	29
Squamous cell Carcinoma	11	12
Small cell Carcinoma	07	07
Large cell Carcinoma	01	01
Carcinoid tumor	-	01
Teratoma	-	01
Sarcoma	-	01
Total	47	52

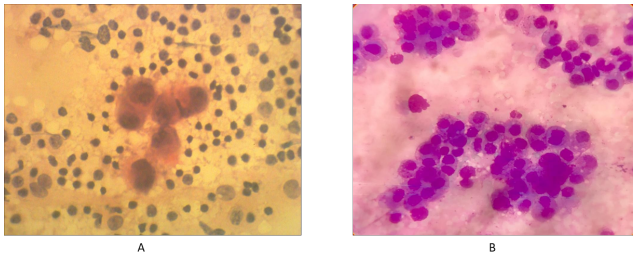

Figure 2: A. Pap stained micro-picture showing few squamoid appearing cells in clusters in pleural fluid. B. MGG stained micro picture showing pleomorphic tumor cells arranged in acinar pattern in pleural fluid

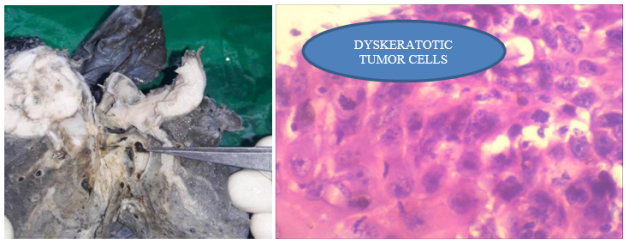

Figure 3: Gross & H & E stained microphotograph showing features of squamous cell carcinoma. Gross picture shows firm grey white mass. Microscopy shows tumor cells having hyperchromatic nuclei

Discussion

In the present study, all the 52 cases with lung neoplasm were adults. The peak age incidence (56 – 65yrs) was almost the same as found in some recent studies. The age range varied in most of the series from the third to eighth decade.

Among the cases with neoplastic lung lesion 69.2% were males. In two international studies, the percentage of male patients was found to be 55.7%.[15]

Table 2: Topography of lung neoplasms - 1

H.p. Types Chest x-ray	Peripheral lesion	Central or hilar / Parahilar	Mid zone Mass	Pleural effusion
Adenocarcinoma	18	02	02	20
Squamous cell Carcinoma	02	08	02	02
Small cell Carcinoma	02	04	01	02
Large cell Carcinoma	01	-	-	-
Carcinoid	-	01	-	-
Teratoma	-	-	01	-
Sarcoma	-	-	-	01

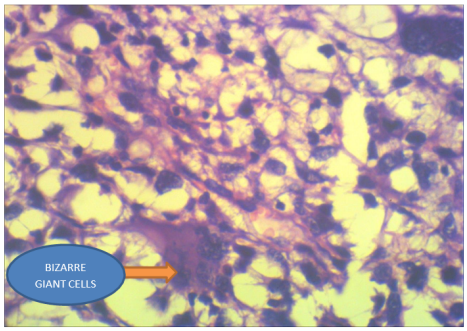

Figure 4: H & E stained microphotograph showing features of high grade sarcoma

and 71.1%.[16] However, the study by Singh et al.[17] showed a significantly lower incidence of male patients (52.0%).

In this study, literacy status and socioeconomic status of patients were evaluated. 3.8% of patients were illiterate.

Smoking is the most important contributory lung carcinogen. A meta-analysis of 41 studies showed that environmental tobacco exposure carries a relative risk of development of lung cancer of 1.48 (1.13 – 1.92) in males and 1.2 (1.12 – 1.29) in females.

In our study, smoking is the most common addiction (65.4%) followed by tobacco chewing (23%) found in patients of lung carcinoma. Among smokers, 50% presented with adenocarcinoma, 26.4% squamous cell carcinoma, 17.6% presented with small cell carcinoma. Among non-smokers 66.7% presented with adenocarcinoma, 16.6% with squamous cell carcinoma.

In our study of total 52 lung neoplasms majority 55.7% were adenocarcinoma (Figure 2 A & B) followed by 23% squamous cell carcinoma, 13.5% small cell carcinoma; very little percentage (1.9%) of large cell undifferentiated carcinoma, carcinoid, teratoma and sarcoma Figure 4 also found.

In two recently published national studies found that most common lung carcinoma to be squamous cell carcinoma Figure 3.[18,19] Study by Tan et al.[20] found similar result as ours.

In Japan, Tanaka reviewed 282 autopsy cases from 1950 to 1983, found a very high proportion of adenocarcinoma (46%).[21,22] Two other authors reviewed the charts of all lung cancer patients over the periods 1966 – 1985 and 1970 – 1989 respectively.[23,24] They observed an increasing number of adenocarcinoma over time, this subtype surpassing squamous cell carcinoma in the 1980s.

In our study, topography of lung neoplasms were evaluated by CT SCAN and most of the lung masses (53.8%) were peripheral followed by central lung mass

(32.8%). This is similar to recent study done by Saha et al where upper zone is the common site followed by the parahilar region.[18]

Adenocarcinoma presents as a peripheral mass in 61% cases and in 38.3% as a central lesion. Presentation as a central mass (72.2%) cases is more common among squamous cell carcinoma than as a peripheral lesion (27.8%). Small cell carcinoma also presents more commonly as a central lesion (83.6%) than as a peripheral lesion (16.6%). Isolated pleural effusion has been reported in 3.8% in squamous cell lung cancer, 22% in adenocarcinoma and only 4% in small cell carcinoma.[23]

In our cases of adenocarcinoma, 89.6% peripheral, 3.4% central, 6.9% midzonal lung mass found. In squamous cell carcinoma, 75% central, 8.3% peripheral, 16.6% midzonal lung mass found. In small cell carcinoma, central mass is seen in majority. Pleural effusion was found in 52% of cases. Almost similar findings are found in study done by D. Behera et al.[19] and Anupam Saha et al.[2]

In our study, of the total 52 cases CT guided FNAC conclusively diagnosed 47 cases, diagnosis accuracy being 90%. Similar accuracy found in study by Anupam Saha where 54 out of 57 cases (94.7%) diagnosed cytologically.[2]

A study by J P Singh et al.[22] revealed an overall diagnostic accuracy of the procedure to be 85.3%. Another study showed out of the 163 cytologically examined cases, in 66.25% (108 patients), diagnosis of broncho – pulmonary cancer could be given and the histological type could be established. In 11.66% of the patients, the cytological examination was negative and in 22.08% of the cases, the cytology was strongly suggestive for broncho – pulmonary cancer, but one could not determine the histological type.[23]

In our study, about 8.2% cases were highly suspicious for malignancy but exact histopathological type could not be determined.

The patient with carcinoid presented with chest pain and hemoptysis. Cytologically, possibility of a neuroendocrine tumor suspected but due to haemorrhage and scanty material, exact histologic type could not be determined. Later it was revealed by bronchoscopic biopsy and further confirmed immunohistochemically to be a case of carcinoid:chromogranin positive.

The patient with spindle cell sarcoma later revealed by immunohistochemically to be a case of synovial sarcoma representing the visceral counterpart of monophasic synovial sarcoma of soft tissue in a pulmonary location.

Zeren H et al.[24] found 25 primary pulmonary sarcoma bearing histological, immunohistochemical and ultrastructural features indistinguishable from those of monophasic synovial sarcoma of soft tissue.

In our study, the case of intra pulmonary teratoma was found in the middle lobe of lung whereas it is most commonly found in upper lobe as found in various case reports.[24,25] Our patient presented with cough and hemoptysis but the most specific symptom trichoptysis was absent which has been reported in seven cases only.

CT guided FNAC revealed benign epithelial cells, amorphous debris and inflammatory cells. Lobectomy specimen contained a cystic structure with tuft of hair and sebaceous material; on histopathological examination diagnosis of intra pulmonary mature teratoma confirmed.

Conclusion

Our study with 52 adult cases of neoplastic lung lesions reveals peak age incidence to be more than 55 years and male female ratio to be 2.25:1. Smoking is the most common addiction followed by tobacco chewing. Among non- smokers adenocarcinoma is the most common lesion found. Regarding topography of lesions, most of the adenocarcinoma presented with peripheral or multicentric lesions; squamous cell carcinoma and small cell carcinoma presented mostly with central mass lesions.

A good correlation between cytology and histopathology is revealed in our study. CT guided FNAC from lung mass conclusively diagnose majority of cases, accuracy being 90%. The results of this study suggest that transthoracic aspiration of pulmonary lesions allow their early diagnosis; this affords improved opportunities for either cure or expeditious treatment. CT guided transthoracic needle aspiration cytology is an easy procedure with good diagnostic accuracy. The discordances pointed out in this study, especially those concerning the type of pulmonary carcinoma may be due to tumoral heterogeneity and to the pluripotent differentiation of tumoral cells.

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