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Lung SOL- Cytology and histological correlation in a tertiary care centre

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Abstract: *Computed Tomography (CT) guided Fine needle aspiration cytology (FNAC) is nowadays considered to be a rapid, safe and accurate diagnostic modality in diagnosis of lung cancer with minimal complication. The purpose of the present study is to find out the correlation between cytology and histopathology and to assess the accuracy of FNAC in evaluation of lung masses. 120 patients were studied for a period of 1 year from January 2013 to December 2013. The cytological features were correlated with histological findings after performing bronchoscopic biopsy or percutaneous core biopsy. Out of the 120 cases in which cytological evaluation was done, biopsy was possible in 103 cases. Of these, 95 cases were adequate for histopathological evaluation and were included in the study. The peak age incidence was found to be 61 to 70 years. Prevalence was more in males (80.84%) compared to females. On cytology, 107 (89.17%) cases were malignant neoplasms and non-neoplastic (inflammatory) lesions were found in 13(10.03%) cases. Most common type of malignancy was squamous cell carcinoma (60.74%) followed by adenocarcinoma (21.49%). Excellent concordance rate of cytology and histology was observed statistically. Diagnostic accuracy of CT guided FNAC was found to be 95%. This study concludes that CT guided FNAC is a safe procedure with high degree of concordance with histological diagnosis and can be used independently in choosing treatment opinion.*
Key Words: *CT guided FNAC, lung SOL, lung cancer*

I. Introduction

Computed Tomography (CT) guided Fine needle aspiration cytology (FNAC) of lung tumor is safe and first line diagnostic tool in today's practice and it is a well established method in the cytological evaluation of lung SOL. The role of FNAC has moved from diagnosis of malignancy in inoperable patients and confirmation of metastasis to its present use as a first line diagnostic procedure on which management decisions are based. There has been a shift away from non invasive methods such as sputum cytology towards FNAC.[1,2]One of the major advantages of FNAC is detection of tumor type like small cell carcinoma and lymphoma which can be treated by chemotherapy rather than surgery. Nowadays, CT guidance is widely practiced because it provides a safe, rapid and accurate diagnosis.[3] Moreover, it plays an extremely vital role in small thoracic mass lesion(<1 cm) and deep mediastinal lymph nodes where it makes accurate needle placement possible avoiding any surrounding blood vessel or cardiac structure.[4] CT guided FNAC is an accurate & sensitive way of diagnosing lung cancer.[5]It also help in staging of malignancy. Our present study has been aimed to find any correlation between cytological & histopathological finding and assessment of accuracy of FNAC in evaluation of lung masses.

II. Material And Methods:

The study was carried out in the departments of Pathology, Chest medicine and CT scan unit Calcutta National Medical College & Hospital during the 1 year period of Jan 2013 to Dec 2013. 120 patients having lung SOL on chest X-ray and CT scan were selected for the procedure.

Proper consent was taken from all the patients. Required permission for the research methodology was obtained from the ethical committee of the institute where study was conducted.

Patients with severe respiratory distress, massive pleural effusion, hydropneumothorax, unconscious and uncooperative patients were excluded from the study.

All cases were extensively evaluated radiologically to exclude any primary malignancy other than lung.

CT scan was done before FNAC to localize the lesion, measure its density and for planning the approach. The radiologist identified the lesion in exact section by CT scan and determined the site of entry, route of the needle and the distance between the skin and lesion on the CT scan monitor. After proper asepsis a 20G, 88 mm long spinal needle was introduced into the lesion by percutaneous and transthorasic approach. Following correct placement of the needle aspirate was obtained and smears were prepared immediately. Air dried smears were stained by Leishman Giemsa stain and Zeil Neelsen (ZN) stain for acid fast bacilli whereas alcohol fixed smear were stained with Papanicoloau stain for rapid cytological evaluation. Special stains like Periodic Acid Schiff (PAS) and Gomori's methenamine silver (GMS) was done in selected cases to demonstrate fungal structures.

A follow up CT was done on every patient immediately after the procedure to rule out pneumothorax. All the patients with post-procedural complications were observed carefully, no active treatment was required for any of the patient.

In peripherally located lesions, CT guided percutaneous core biopsy was performed under local anaesthesia and aseptic precautions before the FNAC was done.

In case of centrally located lesions bronchoscopy was performed in the Chest medicine department. Bronchial brush smears, BAL fluid and bronchoscopic biopsy specimens were received in the department of Pathology.

Subsequently the bronchoscopic or percutaneous core biopsy specimens were histopathologically evaluated on routinely processed sections stained with haematoxylin and eosin stains. Immunohistochemistry was done in few selected cases.

Data collected was analyses by SPSS (Statistical package for social scientist) version 18. Kappa statistics was used to measure the extent to which agreement between the two tests exceeded that expected by chance.

III. Result And Analysis

A total of 120 cases were included for cytological examination of which 103 cases underwent biopsy. Biopsy was not done in inflammatory lesions and was not possible in remaining patients due to poor general condition, lack of consent or discontinuity of treatment by the patients. Of the 103 cases in which biopsy was done, in 8 cases the tissue obtained by bronchoscopy or percutaneous core biopsy were inadequate for evaluation. These cases were excluded from the study and 95 biopsies were taken.

Out of 120 cytology cases, majority of cases seen in fifth & sixth decade **(Table 1)** The cases which presented below 40 years of age were mostly inflammation or lymphoma. 97 cases (80.84%) were male & 23(19.16%) were female. **(Table 2)**

Cytological exam showed that 13 cases (10.83%) were non-neoplastic and 107 cases (89.17%) were neoplastic. **(Table 3)**

In this study all the neoplastic cases were found to be malignant. On cytological examination, maximum number of cases belonged to squamous cell carcinoma (60.74%) (Figures 3a,3b) followed by adenocarcinoma (21.49%) (Figure 3c), non-small cell carcinoma (6.47%), small cell carcinoma(4.67%) (Figure 3d), large cell carcinoma (2.8%) (Figure 4c,4d), lymphoma (1.86%) (Figure 4a). One case was proved to be of metastatic deposit from renal cell carcinoma (0.93%) (Figure 4b). **(Table 4)** Of the non-neoplastic lesions, 46.2% were diagnosed as granulomatous inflammation, 30.7% fungal lesion (Figure 6a,6b) and 23.1% nonspecific inflammation.

Histopathological correlation was possible in 95 cases. Histological examination was particularly helpful where cytology was unable to exactly categorize the non small cell carcinomas (8 cases). These cases were reported as non small cell carcinoma suggestive of either squamous cell carcinoma (5 cases) or adenocarcinoma (3 cases). On biopsy examination, 4 cases were confirmed to be squamous cell carcinoma (Figure 5a) and 2 cases confirmed adenocarcinoma (Figure 5b).. 1 case, reported on cytology as suggestive of squamous cell carcinoma was histologically diagnosed as adenosquamous carcinoma (Figure 5d). 1 case suggested cytologically to be adenocarcinoma was diagnosed as neuroendocrine carcinoma (Figure 5c) on histology. **(Table 5)**

In most cases there was concordance between cytology and histopathology reports and this agreement was found over and above that expected by chance. **(Table 5)** Correlation was established between CT guided FNAC and histology findings by calculating weighted kappa value. The weighted kappa value was 0.91 and 95 % confidence interval. [K=0.91(95% CI 0.80-0.97)]

IV. Discussion

In the present study all the patients were adults with peak incidence of 60-70 years and are somewhat older than that documented in recent studies by Saha et al (2009) in 57 cases, Shah et al (2007) in 100 cases[3,5] but similar to that conducted by Basnet et al (2008)[6] in 100 patients. All the patients were above 20 yrs of age. Inflammatory lesions and lymphoma, were mainly found in the age group of 20-30 years. Male patients (80.84%) showed significant preponderance in our study compared to females (19.16%). Saha et al (78.9%)[3], Shah et al (88%)[5], Bandyopadhyay et al (80.6%) [7]etc found similar incidence while studies by Singh et al,[8] Wallace et al[4] and KB Tan et al[9] showed a significant lower incidence of male patients i.e. 52%, 55.7% and 71.1% respectively. The male preponderance is due to greater incidence of pulmonary disease in males because of smoking habits and occupational hazards. In this study lung SOLs were located more on the right side (56.67%) than left. Similar results observed by Saha et al[3] and Basnet et al[6].

Out of 120 cytological cases 107 (89.17%) were malignant and 13 cases was inflammatory (10.83%). The results were comparable with that of Saha et al (96.5%)[3] and Singh et al(81.8%)[8]. Of all the cases of primary malignancy, squamous cell carcinoma was found to be most common (60.74%) followed by adenocarcinoma (21.49%), non-small cell carcinoma (6.47%), small cell carcinoma (4.67%) and large cell carcinoma (2.8%) .This findings were comparable with results reported by Saha et al[3] Bandyopadhya et al[7], Basnet et al[6] where squamous cell carcinoma was the most prevalent (42.6%, 28.9%, 27% respectively).On the contrary ,Tan et al[9] and Madan et al [10] found higher incidence of adenocarcinoma in their study.

In this study non-small cell carcinoma was more prevalent (6.47%) over large cell carcinoma clearly in contrast with Saha et al[3] where both were equally prevalent (3.7% each). Only one case of metastatic adenocarcinoma and two cases of lymphoma (Non Hodgkin lymphoma) were found. Of the 13 non-neoplastic lesions, 6 cases (46.2%) were diagnosed as granulomatous inflammation, 4 cases (30.7%) fungal lesion and 4 cases (23.1%) nonspecific inflammation.

The present study showed high degree of concordance rates of cytological diagnosis with that of histological diagnosis**.** FNAC is found to be highly accurate (95%) in diagnosis as compared to previous studies.[10,11] Hence CT guided FNAC alone can be accurate in differentiating histological variants of lung tumor and choosing treatment option.

V. Conclusion

CT guided FNAC is a rapid, safe diagnostic modalitiy in lung SOL. It has got high concordance rate with histological diagnosis and can be used for choosing treatment option. In case of non small cell carcinoma, histopathological examination and immunohistochemistry has got an important role in exact categorization and can predict prognosis.

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TABLES

Table 1- Age distribution of study population (n=120)

Age (Years)	Total No. of Cases	Percentage
<10	NIL	
1O-19	NIL	
20-29	3	2.5%
30 -39	8	6.67%
40-49	25	20.84%
50-59	30	25%
60-69	40	33.3%
70-79	11	9.17%
>80	3	2.5%

Table 2 : Distribution of pulmonary masses according to sex and anatomical location (n=120)

Parameters	Total no	Percentage
SEX		
MALE	97	80.84%
FEMALE	23	19.16%
SIDE OF LESION		
RIGHT	68	56.67%
LEFT	47	39.16%
MEDIASTINAL	5	4.16%

Table 3: Distribution of pulmonary lesions according to cytological diagnosis (n=120)

Cytological diagnosis	Total no of cases	Percentage
Non-neoplastic	13	10.83%
Neoplastic	107	89.17%

Table 4: Distribution of malignant tumors according to cytological diagnosis (n=107)

Type of tumor	No of cases	Percentage
Squamous cell carcinoma	65	60.74%
Adenocarcinoma	23	21.49%
Small cell carcinoma	5	4.67%
Large cell carcinoma	3	2.8%
Non-small cell carcinoma	8	6.47%
Lymphoma	2	1.86%
Metastasis	1	0.93%

Table 5: Correlation between cytology & histology (n=95)

Cytological diagnosis	No of Cases	Histological concordance	Histological discordance
Squamous cell carcinoma	58	56	2
Adenocarcinoma	21	21	0
Small cell carcinoma	5	5	0
Large cell undifferentiated carcinoma	3	2	1
Non small cell carcinoma a. Suggestive of squamous cell carcinoma b. Suggestive of adenocarcinoma	8 a. 5 b. 3	6 a. 4 b. 2	2 a. 1 b. 1

FIGURES

Figure 1

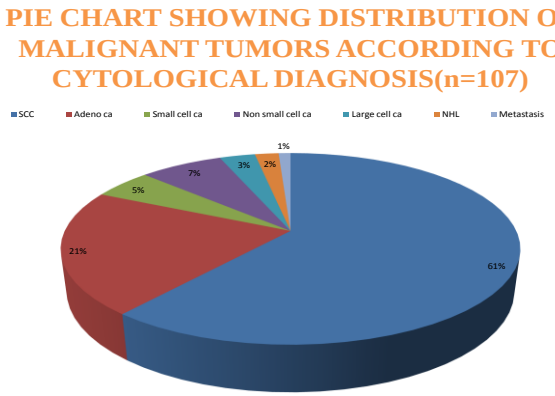


Figure 2

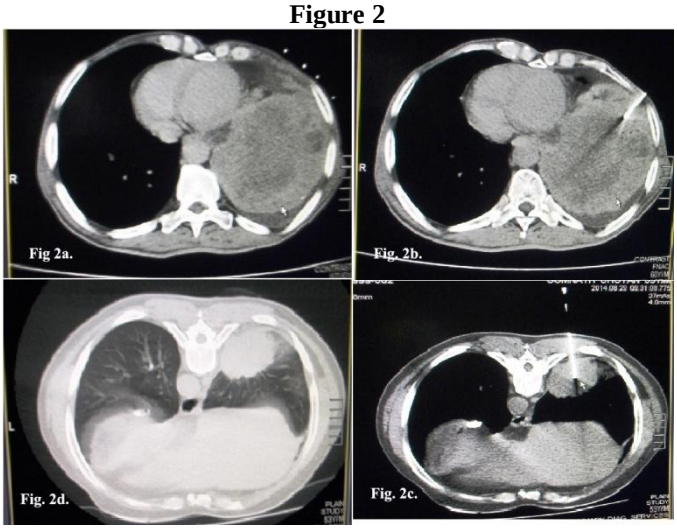


Figure 3

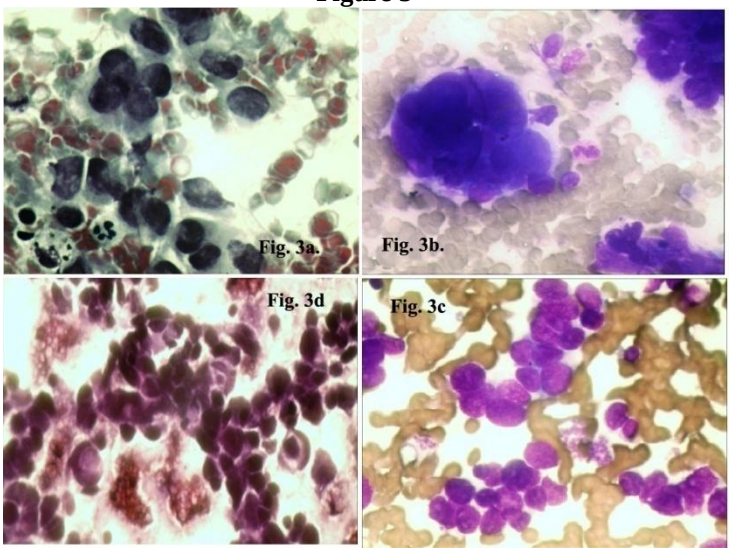


Figure 4

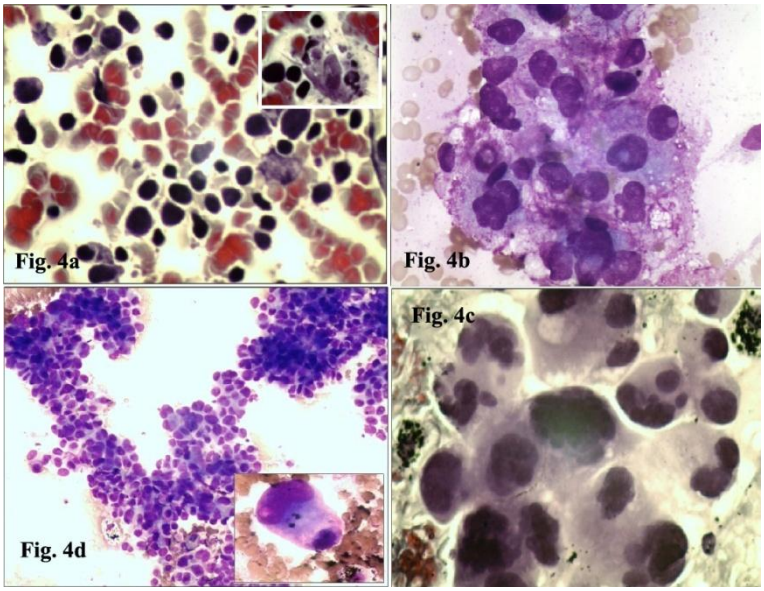


Figure 5

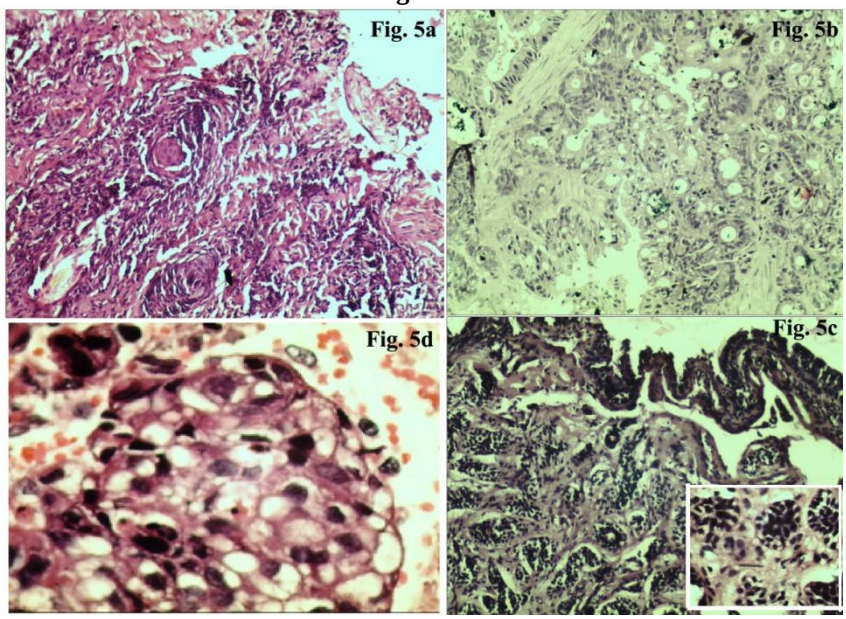
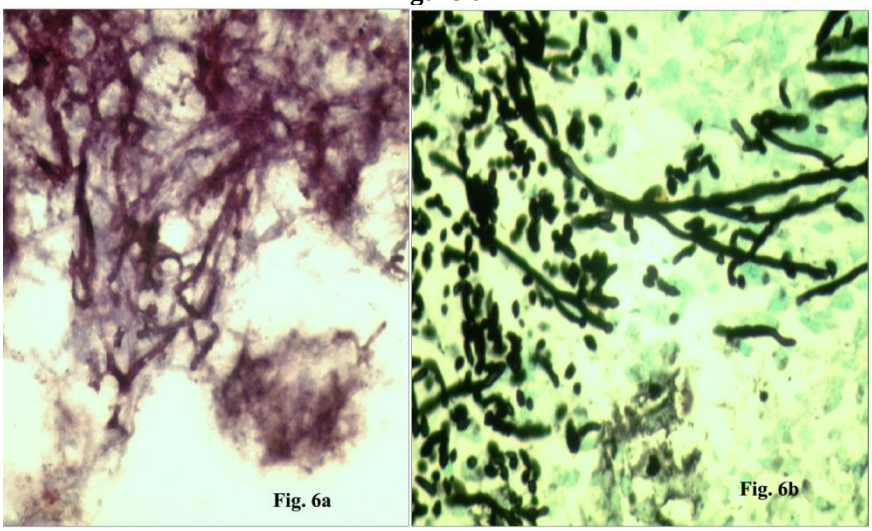


Figure 6



LEGENDS TO FIGURES

Figure 1

Pie chart showing distribution of malignant tumors according to cytological diagnosis (n=107)

Figure 2

CT scan- **2a.** Determining exact location of the lesion and distance from skin for planning the approach. **2b,2c**. After insertion of needle confirming correct placement of needle **2d**. Follow up CT immediately after procedure ruling out complication.

Figure 3

Photomicrograph showing FNAC features of- **3a**.Squamous cell carcinoma, (PAP stain, 40X). **3b.** Squamous cell carcinoma, (Leishman-Giemsa stain, 40X). **3c**. Adenocarcinoma (Leishman-Giemsa stain, 40X). **3d**. Small cell carcinoma (PAP stain, 40x).

Figure 4

Photomicrograph showing FNAC features of- **4a.** NHL showing atypical lymphoid cells, inset shows lymphophagocytosis, (MGG stain, 40X). **4b.** Metastatic renal cell carcinoma (Leishmam-Giemsa, 40X) **4c.** Large cell anaplastic carcinoma (Pap stain, 100x) **4d.** Large cell anaplastic carcinoma (MGG stain, 40X); Inset showing large bizzare cell in mitosis.

Figure 5

Photomicrograph showing histopathology of- **5a.** Squamous cell carcinoma (H&E stain, 10X) ; **5b.** Adenocarcinoma (H&E stain, 10X) ; **5c**. Neuroendocrine carcinoma-bronchoscopic biopsy (H&E stain, 10X) **5d.** Adenosquamous carcinoma (H&E stain, 40X)

Figure 6

Photomicrograph showing **5a.** Fungal hyphae (PAS stain) **5b.** Fungal bodies (GMS stain)