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Spectrum of Intrathoracic Lesions by Guided Fine Needle Aspiration Cytology (FNAC)

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SUMMARY

This study was done to evaluate the spectrum of various intrathoracic lesions by radiologically guided fine needle aspiration cytology FNAC was performed on 62 patients (48 males and 14 females) at Shaikh Zayed Hospital, Lahore under ultrasound and CT scan guidance. The cytologic diagnoses were classified as primary lung lesions and mediastinal lesions. Four major groups were made; Non Diagnostic, Benign or negative for malignancy, inflammatory lesions and malignant lesions. Diagnostic yield was 95.1%. Thirty cases (48.4%) were malignant, 19 cases (30.7%) belonged to inflammatory group, 10 cases (16.7%) were diagnosed as benign or negative for malignant cells, and 3 cases (4.9%) were non-diagnostic due to inadequate aspirate inspite of repeated aspirations. Malignant lung lesions comprised of 9 cases (31.1%) small cell carcinoma, 2 cases (6.9%) broadly categorized as non-small cell carcinoma, 7 cases (24.1%) of squamous cell carcinoma, 5 cases (17.2) of metastatic adenocarcinoma, 4 cases (13.8) of undifferentiated carcinoma and a single case each of mesothelioma and of malignant round cell tumor (3.4%). Out of mediastinal lesions there was only one case of malignancy that was malignant round cell tumour of child hood. Nineteen out of total 62 cases were of inflammatory group. Out of which 10 cases (52.6%) had chronic granulomatous inflammation, and nine cases (47.4%) were of abscesses. Tuberculosis was found in 6 cases and the remaining 4 cases were suggestive of tuberculosis. Majority of lung lesions were encountered in 6th decade of life. As the method is simple, rapid, and cost effective, it can be easily practiced in any centre, where specialized radiologists and pathologists are available. It reduces the patient's stay in hospital and thus the cost of treatment is markedly reduced.

INTRODUCTION

The therapeutic and prognostic evaluation of intrathoracic lesions largely depend upon a precise morphologic diagnosis[1]. Transthoracic fine needle aspiration cytology is a useful tool for evaluating both neoplastic and inflammatory lesions[2].

Various diagnostic techniques have been employed to obtain tissue for diagnosis of various intrathoracic lesions since 1960, when Nordenstrom revealed aspiration technique using a needle with low incidence of complications[3]. For peripheral lesions of lung, thick needle biopsy was first undertaken by Lyden (1883) when he aspirated organisms causing pneumonia and Mentrier (1886) was the first to diagnose a lung cancer by needle biopsy[4] Lung cancer is the leading cause of death in men and women worldwide and continues to rise in frequency[5].

Cytopathology is a good tool for the diagnosis of pulmonary carcinomas[6] and then its subclassification into small cell carcinoma and non small cell carcinoma[7]. Lung carcinomas are generally classified as small cell carcinoma and non small cell carcinomas. Small cell carcinomas account for 20-25% of all lung cancers[8]. These are usually inoperable because most patients present at an advanced stage. When a diagnosis of small cell carcinoma is reached a surgical diagnostic approach is no longer considered and chemotherapy is the treatment of choice. However prognosis of small cell carcinoma is poor. Non small cell carcinomas are localized at the time of diagnosis and are often

surgically resectable[9]. The prognosis of Non small cell carcinoma is variable.

The most critical factor in the success of guided needle aspiration biopsy is the presence of a pathologist during the procedure. This will, shorten the procedure as the number of aspirates is often reduced to one or two.

Mediastinal masses represent a diagnostic challenge because of their proximity to numerous structures, difficulty in tissue sampling and myriad potential pathologic etiologies. In the presence of mediastinal mass fine needle aspiration biopsy is an alternative to other time consuming and expensive diagnostic procedures[10].

Guided FNAC is of definite help in diagnosing intrathoracic lesion whether malignant or inflammatory in nature. It also avoids unnecessary thoracotomy for diagnostic purposes[11]. When a lung or mediastinal mass abuts the chest wall or diaphragm, it becomes an acoustic window and can be visualized and biopsied with ultrasound. Aerated lung surrounding a soft tissue nodule causes strong reverberating echoes that makes the nodule stand out in strong relief. Sonography offers a number of advantages over computed tomography in guiding the biopsy of pleural based nodules.

1- The needle position can be continuously monitored with ultrasound but not with computed tomography.

2- Localization of lesions by computed tomography is markedly influenced by small variation in respiration, making it easy to miss the lesion and puncture aerated lung.

3- Sonography involves no radiation exposure to either the patient or the radiologist.

4- Identification of peripheral lesions and the route of access is rapid and easy to perform.

MATERIALS AND METHODS

This study was conducted at Histopathology Department (SZPGMI) in collaboration with Radiology department. The objective of this study was to evaluate the spectrum of various intrathoracic lesions by radiologically guided fine needle aspiration cytology.

During this period 62 cases were retrieved and analyzed. Diagnosis was correlated with clinical, radiological and pathological information. The study was carried out on those patients who were either indoor patients or came to outpatient department. The FNAC was done in radiology department by an expert radiologist under ultrasound or CT scan guidance. An informed consent was taken and fine needle aspiration was done after noticing the bleeding and clotting time plus platelet counts for each patient. Patients with disturbed bleeding and clotting profile were sent back and called again after these both bleeding and clotting time were in normal range. with fresh frozen plasma transfusion. The point and depth of needle was decided by ultrasound and CT examination of the mass. After locating the point of insertion, the area was cleaned and 5-10ml of 2% xylocaine was infiltrated into the skin, subcutaneous tissue ,muscle plane upto parietal pleura in cases of lung lesions. Needle aspiration was done in sitting and lying position depending upon the site of lesion with 21-23 gauge needle. The needle was inserted perpendicularly into the lesion close to the upper border of the rib to avoid damage to neurovascular bundle. Following the insertion of the needle point into the lesion, a disposable 10 ml syringe was attached to it. After retraction of the piston the needle was moved to and fro and in various directions within the lesion. Then the piston was released and needle was withdrawn[12].

The aspirated material was put on slides Smears were made by a person from histopathology department. Air dried smears were used for GIEMSA staining. For PAP and H & E stains, wet smears were fixed immediately in 95% alcohol. If pussy material was obtained it was also sent for culture and sensitivity in addition to cytology smear preparations. If the material was adequate the remaining material in the syringe after preparation of slides was saved for preparation of clot and for processing as paraffin block for histological examination[13]. In the event of inadequacy of aspirate the aspiration procedure was repeated. After the procedure the patient was reexamined and kept under observation for some time. The aspirate was cytologically examined, plus ZN staining was done to look for AFB. Special stains & mucin staining

was done to diagnose mucin secreting adenocarcinoma No major complications were observed in our series.

RESULTS

FNAC was preformed under ultrasound and CT guidance in 62 cases. Out of these 48 were males and 14 were females. These 62 cases included 8 cases of mediastinal masses and 54 cases of lung lesions. Broadly categorized, out of these 62 lesions, 30 cases were diagnosed as malignant, 19 were included in inflammatory group, 10 cases were negative for malignancy and only 3 cases were non-diagnostic (Table 1). Out of 8 mediastinal masses only one case was diagnosed as malignant (Table 2) and out of 54 lung lesions 29 cases were malignant (Table 3).

Table 1: Total Mediastinal and lung lesions (n=62)

Mediastinal lesions	Number	Percent
Non-diagnostic	3	4.9
Inflammatory	19	30.6
Benign	10	16.1
Malignant	30	48.4

Table 2: Mediastinal lesions (n=8)

Mediastinal lesions	Number	Percent
Nondiagnostic	2	25.0
Inflammatory	2	25.0
Negative for malignant	3	38.0
Malignant	1	12.0

Table 3: Lung Lesions (n=54)

Lung lesions	Number	Percent
Non Diagnostic	1	1.8 %
Inflammatory	17	31.5 %
Negative for malignant	7	13.0%
Malignant	29	53.7%

The spectrum of 29 malignant lung lesions was classified, 9 cases of small cell carcinoma, 7 cases of squamous cell carcinoma, 2 cases of non small cell carcinoma, 5 cases of metastatic adenocarcinoma (Figs. 1-2), 4 cases of undifferentiated carcinoma, one case of mesothelioma and one malignant round cell tumor (Table 4; Figs. 3-4).

Table 4: Malignant lung lesions (n=29)

Type of tumour	Number	% age
Small cell carcinoma	9	31.1 %
Non small cell carcinoma	2	6.9%
Squamous cell carcinoma	7	24.1%
Undifferentiated carcinoma	4	13.8%
Metastatic adenocarcinoma	5	17.2%
Mesothelioma	1	3.5%
Malignant round cell tumour	1	3.5%

The only one malignant case found in mediastinal lesions was of malignant round cell tumour of childhood in a four year old child.

Out of the 19 inflammatory lesions in both mediastinal and lung lesions, 10 cases were diagnosed as chronic granulomatous inflammation and 9 cases of acute inflammatory abscesses (Table 5). Tuberculosis was confirmed in 6 cases by identification of acid fast bacilli and tuberculosis was suggested in the remaining 4 patients.

Table 5: Total inflammatory group (n=19)

Lung lesions	Number	Percent
Chronic granulomatous	10	52.7
Acute Inflammatory	9	47.4

DISCUSSION

Guided fine needle aspiration cytology of intrathoracic lesions is increasingly being applied in the diagnosis of different lesions. Large core histologic biopsy implies a risk for the patient (Menghini1970) cited by Tudway[14] while fine needle diameters between 0.6-0.8mm have hardly any risk[15]. Such aspirations should be carried out under direct visualization of lesion in order to reduce sampling error[16]. Guided fine needle aspiration cytology is better in sense that it increases the diagnostic yield.

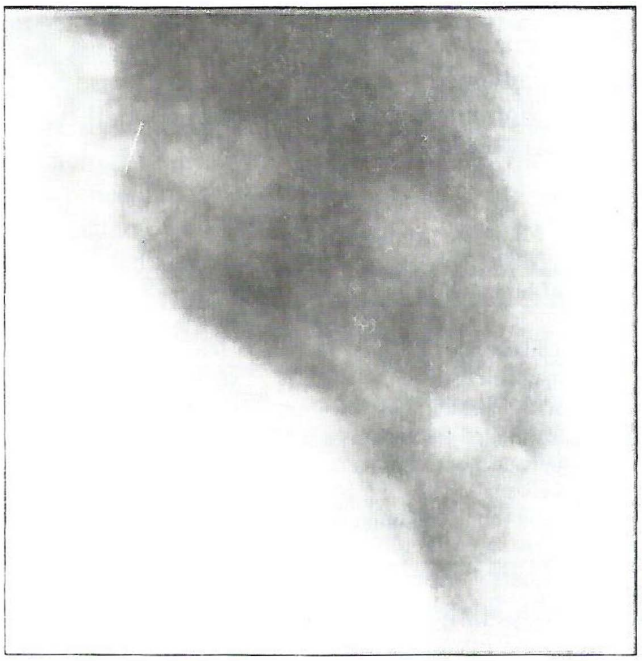

Fig. 1. Multiple left lung opacities-Metastasis

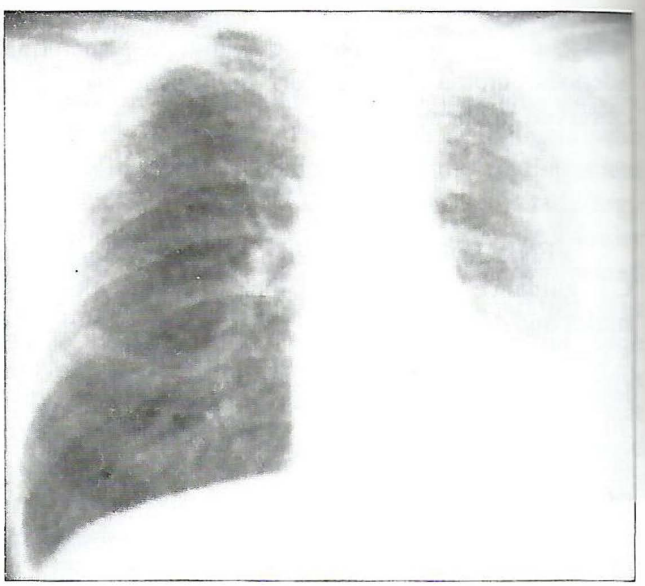

Fig. 3. Diffuse Lt sided pleural thickening and effusion – Mesothelioma

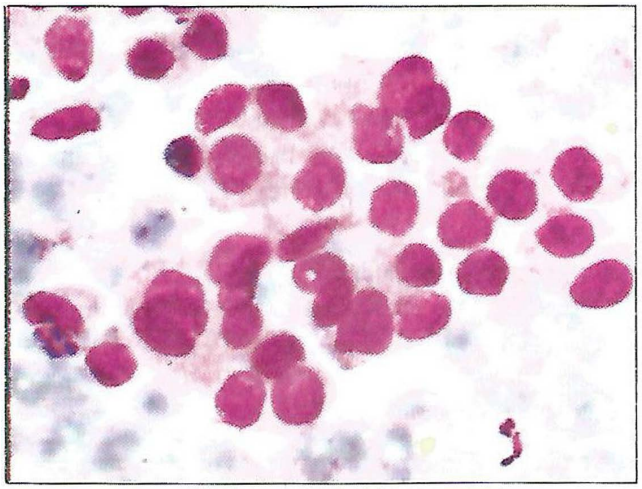

Fig. 2. FNAC-Metastatic adenocarcinoma (Giemsa x40).

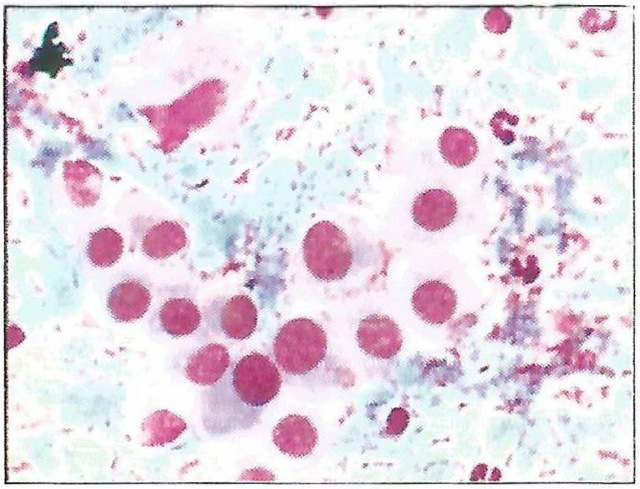

Fig. 4. FNAC-Mesothelioma (Giemsa x40).

In our study of 62 cases the diagnostic yield was 95.1% while in one study carried out in India in 1993[4], unguided FNAC was done in 59 cases and diagnostic yield was 84.40%. They did aspirations several times to get a representative aspirate which was quite distressful for the patient. In another study the diagnostic yield of guided fine needle aspiration was 93.4%. This shows that when fine needle aspiration is performed under guidance the diagnostic yield increases.

Infections and other benign processes may be proven on fine needle aspiration cytology but the main indication remains the diagnosis of intrathoracic lesions suspected of being malignant, particularly when less invasive techniques prove negative. The emphasis has shifted from the diagnosis of malignancy in inoperable patients and confirmation of metastasis to use as a first line investigation on which crucial management decisions are based[17]. In our study the lesions were

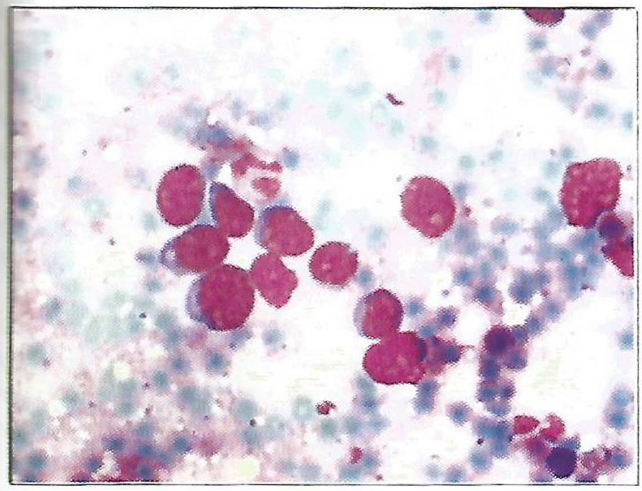

Fig. 5. Malignant round cell tumour of childhood (Giemsa x 40)

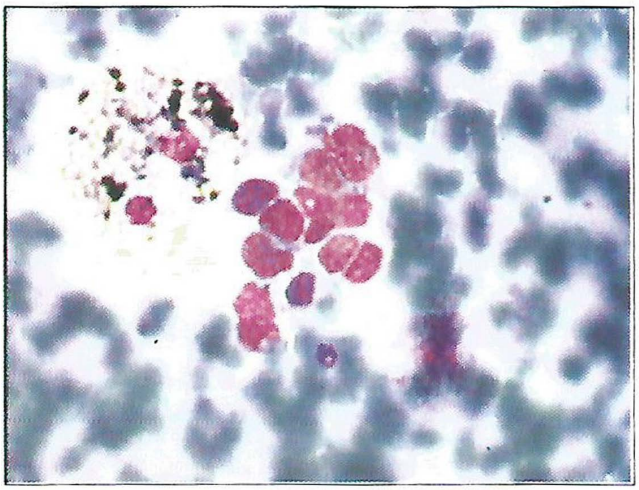

Fig. 6.Small cell carcinoma showing nuclear molding with pigment laden macrophage (H&E x40).

either from lung or mediastinum. Out of 54 lung lesions the rate of malignancy was 53.70% (29 cases) and in mediastinal lesions, only one case belonged to malignant group. 44.50% (24 cases) were inflammatory and benign and 1.8% (1 case) were non diagnostic. In one study, which was carried out in Singapore in 2002 on lung lesions, diagnostic yield of malignancy was 65.8% which is greater than ours. 25.4% were of inflammatory, 7% were inadequate. In our study, the ratio of inflammatory group is more and the rate of malignant lesions is less although the risk factor was same i.e. smoking. Only 1 case was non-diagnostic

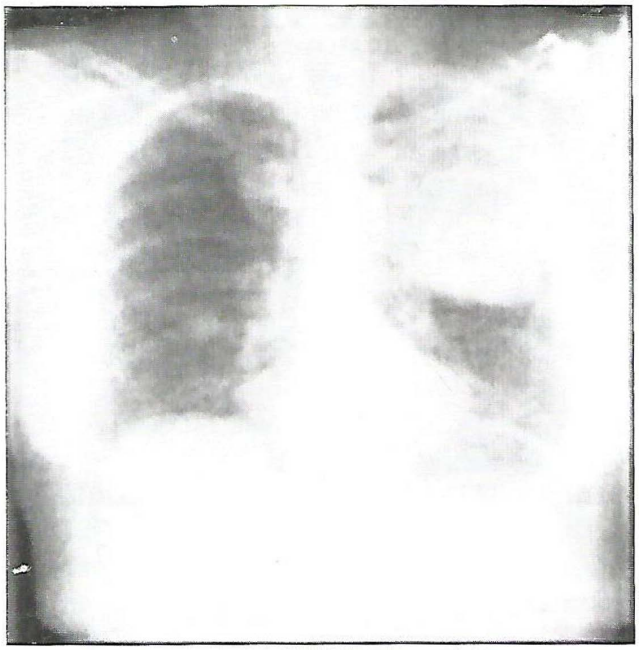

Fig. 7. Opacity in left mid lung- Small cell carcinoma

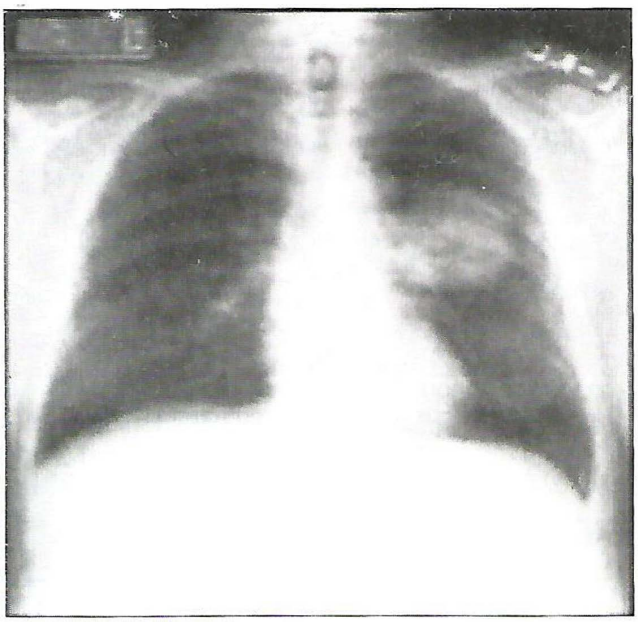

Fig. 8. Opacity left hilum-non small cell carcinoma

due to inadequate aspirate in spite of repeated aspirations.

In our study out of mediastinal lesions, there was only one case of malignant round cell tumor of childhood (Fig. 5). Among malignant lung lesions, the non small cell carcinoma and small cell

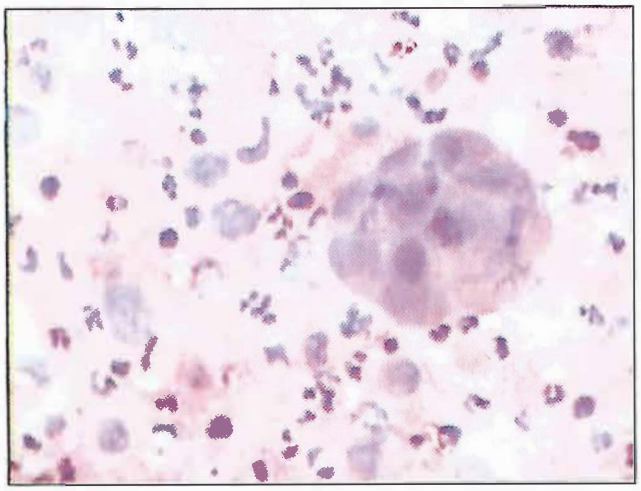

Fig. 9.FNAC -Squamous cell carcinoma

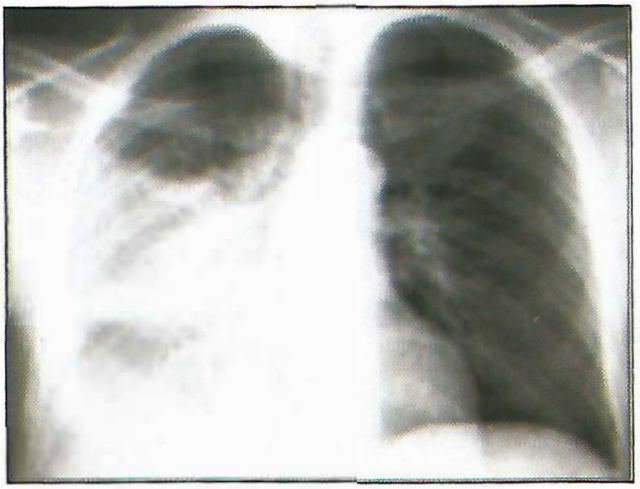

Fig. 11. Right upper and mid lobe opacification with effusion-TB

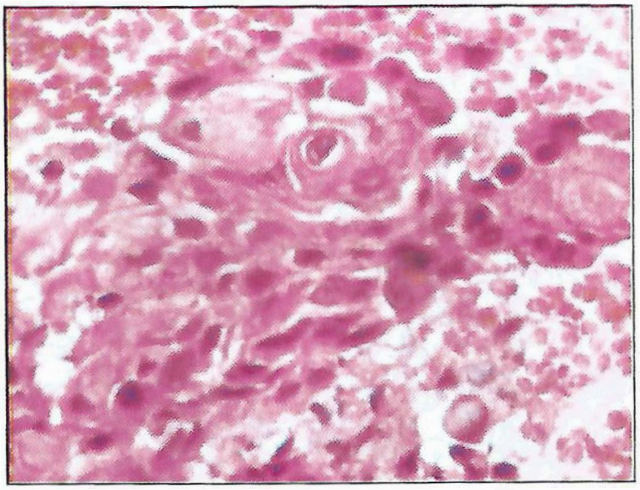

Fig. 10. Squamous cell carcinoma (clot histology) x40.

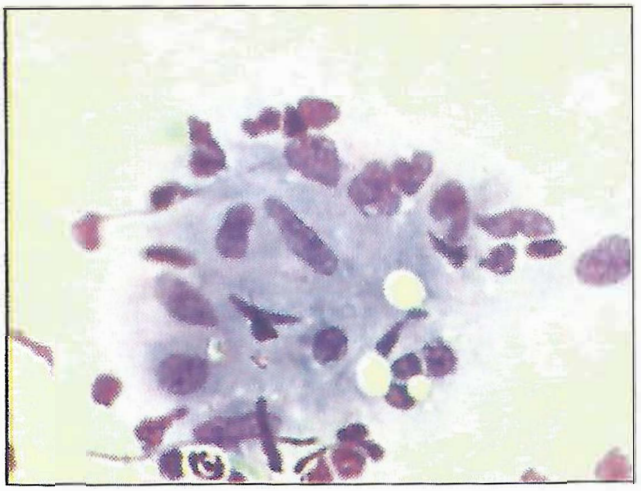

Fig. 12. Granuloma formation (x40 Giemsa)

Table 6: According to Age (lung lesions) (n=46)

Age (Years)	Malignant		Inflammatory	
	No.	%	No.	%
0-30	1	2.17	6	13.05
30-60	13	28.26	10	21.75
60-80	15	32.60	1	2.20

carcinoma had equal rate of occurrence. Among non small cell carcinoma group, squamous cell carcinoma was the biggest entity (Figs. 6-10). Similarly in another study carried out in Bangladesh[18], the rate of squamous cell carcinoma was the greatest. The age group was also common in both studies as most of the malignant cases were found in 6th decade of life (Table 6). In cases of undifferentiated carcinomas immunostains were recommended for classification of tumour.

In our study the inflammatory group contained 10 cases of chronic granulomatous inflammation, out of which acid fast bacilli were confirmed in 6 cases and in the remaining 4 cases the suspicion of tuberculosis was raised considering the presence of granulomas in the aspirate (Figs. 11-12).

So FNAC is an accurate and safe method for evaluation of lung lesions and it enables sub classification of carcinoma in many of the cases. It

is also useful for diagnosis of tuberculous and non turberculous inflammatory pulmonary lesions. It is also helpful for the diagnosis of neoplasms metastatic to lung. In our study there was only one case of malignancy in mediastinum. This was from a child of 4 years of age and was diagnosed as neuroblastoma, a mediastinal lesion not uncommon in this age group.

Clinicoradiological parameters have certain limitations in diagnosing benign versus malignant lesions, in conjunction with guided FNA they are very accurate and safe in diagnosing deep seated mass lesion in thorax[19].

CONCLUSION

This study shows that fine needle aspiration cytology is a valuable technique which can be employed easily without major complications. Thus guided fine needle aspiration cytology of intrathoracic lesions can be used with confidence for selection of various treatment modalities and avoidance of unnecessary surgery. A close cooperation between an experienced radiologist to locate and aspirate the lesion and a good experienced pathologist for accurate interpretation of the aspirated material, along with all the relevant clinical information is essential for best results and better patient management.

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