Research Paper

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Role Of Ultrasound Guided Fine Needle Aspiration Cytology in The Diagnosis of Thoracic Lesions

Medical Science

KEYWORDS : FNAC, US guidance, lung , mediastinum

Dr.M.Vasundhara	Associateprofessor of Pathology, Department of Pathology, Andhra Medical College, Maharanipet, Visakhapatnam-530043, AndhraPradesh
Dr.G.Parvathi	Associateprofessor of Pathology, Department of Pathology, Andhra Medical College, Maharanipet, Visakhapatnam-530043, AndhraPradesh
Dr. P.Nalinikumari	Professor of Pathology, Department of Pathology, Andhra Medical College, Maharanipet, Visakhapatnam-530043, AndhraPradesh
Dr.I.Vijaya Bharathi	Associateprofessor of Pathology, Department of Pathology, Andhra Medical College, Maharanipet, Visakhapatnam-530043, AndhraPradesh
Dr.A.Venkatalakshmi	Associateprofessor of Pathology, Department of Pathology, Andhra Medical College, Maharanipet, Visakhapatnam-530043, AndhraPradesh

ABSTRACT

Background: FNAC has become a major diagnostic modality in diagnosing thoracic lesions that cannot be readily biopsied. It has a great role in diagnosing lesions which are not accessible for biopsy. Ultrasound (us) guidance improves the efficiency of diagnosing deep seated lesions on FNAC.

Objectives: To evaluate the role of FNAC in thoracic lesions

To provide a rapid diagnosis

To correlate with histopathology

To compare with other studies.

Subjects and methodology: Study included patients of all age groups who presented with various chest related symptoms and who were having mass lesions on x-ray chest. A total number of 75 cases were subjected to FNAC. Age of the patients ranged from 3-70yrs. Biopsy was done in cases where the FNAC failed to give a conclusive report and also in cases where there was a controversy.

Results: Total of 75 cases was studied of which 68 were from lung lesions and 7 were from mediastinal lesions. Squamous cell carcinoma was the commonest malignancy in lung lesions. Most of the malignancies occurred in the 40-60yrs age group. All the three lymphomas were diagnosed in children of less than 10yrs.12 cases which were thought as tumors on x-ray were turned out to be inflammatory lesions. There was a good correlation between the reports of FNAC and biopsy.

Conclusion: US guided FNAC was found to be very effective in evaluating thoracic lesions. It was useful in establishing diagnosis in inoperable cases. Histopathological correlation was seen in 90% of cases and was comparable with other studies.

Introduction

Reports of role of FNAC in lung lesions are available since 1886. Advent of imaging techniques allowed the localization of even very small parenchymal lesions with high accuracy[1]. The main indication in thoracic lesions is diagnosis of malignancies though it can be used in the diagnosis of infections and some diffuse benign processes[2]. As imaging techniques cannot always differentiate benign and malignant tumors, US guided FNAC helps not only in establishing the diagnosis but also in staging of the tumors and planning the management in certain lesions[3]. Early diagnosis has a paramount importance in planning efficient treatment and outcome of the patient. FNAC is the first choice in diagnosing the lesions of mediastinum, pulmonary apex and periphery and even in the small lesions of mediastimum[4]. It is especially of great help in diagnosing lesions where thoracotomy is contraindicated like anaplastic carcinoma, metastatic tumors or infections. It provides diagnosis in inoperable cases and distinction between squamous cell carcinoma, small cell carcinoma, adenocarcinoma and undifferentiated carcinoma. Sensitivity depends upon the experience of the radiologist and size and site of the mass. It is about 90%. False positivity occurs in 0.5% cases[5].Postprocedure complications are fewer except for pneumothorax, pulmonary hemorrhage, and hemoptysis in a small percentage of cases. Severe chronic obstructive pulmonary disease, bleeding diathesis, and pulmonary arterial hypertension are the relative contraindications[6].

Material &Methods

A total of 75 patients were subjected for US guided FNAC who had mass lesion lung and mediastinum on X-RAY. The study included patients of all age groups, both male and female. The patients were thoroughly examined before doing aspiration. Procedure of FNAC was explained and written consent was taken. Site of aspiration was sterilized and local anesthetic 1% xylocaine was infused at the site of aspiration. Percutaneous needle aspiration was done using 21-23 gauge needle attached to 10ml-20ml syringe. Under ultrasound guidance needle was inserted with great accuracy to a predetermined depth in a predetermined direction and the contents were aspirated. Blood mixed material or particles were obtained .3-4 aspirations were required in some cases. Smears were prepared from the material, fixed in methyl alcohol and stained with Hematoxylin and Eosin and studied under microscope. PAP stain, PAS and other stains were done in certain cases. Basing on the material obtained lesions were categorized as satisfactory for reporting where we were able to give a definite diagnosis and inadequate when the material obtained is less or showing only blood cellular elements.

Results

A total of 75cases were studied over a period of 2yrs with age of the patients ranging from 3yrs -70yrs. Out of the 75 cases 65were males and 10 were females. Among these 5 were children of 10yrs.Out of the 75 cases aspirated 51(68%) cases were offered with a definite diagnosis. 14(19%) cases were labeled as suggestive of malignancy where the smears showed some pleomorphic cells and 10(13%) were inconclusive. Among the 51 cases that were offered with a definite diagnosis 44 were lung lesions and 7 were mediastinal lesions. Out of the 44 lung lesions 12(27%) were inflammatory and 32(73%) were malignant tumors (Table 1) .

Among the 32 malignant lung tumors 27 were primary (24 male and 3 female) and 5 were (2 males and 3 females) metastatic. Male to female ratio was 4.3:1. Metastatic tumors occurred at

a younger age in females. Out of the 27 primary lung tumors 15(55.5%) were squamous cell carcinomas, 3(11%) were small cell carcinomas, adenocarcinoma (15%) and undifferentiated carcinoma (15%) 4 each and 1 case of mesothelioma (3.5%). Age of the patients with primary lung carcinomas ranged from 21-70 yrs with maximum cases occurring between 40-60yrs. 1 case of squamous cell carcinoma and 1 case of undifferentiated carcinoma occurred between 21-30yrs.(Table 2)

A total of 29 cases, 2 inflammatory lesions and 27tumors were biopsied

Squamous cell carcinoma was the commonest tumor diagnosed and the male to female ratio was 7.5:1.Out 15 cases 9 were subjected to biopsy and there was correlation.

3 cases out of 4 of adenocarcinoma were biopsied and were correlated.

3 cases of small cell carcinoma was diagnosed all in men of 5th decade with biopsy correlation. All cases of squamous cell carcinoma and small cell carcinoma had history of smoking.

Out of the 4 cases of large cell undifferentiated 1 case which showed extension to chest wall with rib destruction was biopsied.

1 case of mesothelioma was diagnosed with biopsy correlation.

In the 5 metastatic tumors that were diagnosed in females 2cases were from gestational choriocarcinoma in the age group 20-40yrsand 1 case was from squamous cell carcinoma cervix at the age of 42 yrs. 2 sarcomas were diagnosed in males in the age group 50-60yrs.

In the 7 cases of mediastinum 3were lymphomas, 2 were sarcomas and 2 were thymomas.(Table 3)

Biopsy was done in 4 cases which were labeled as suggestive of malignancy in 3 cases and 1 case which was inconclusive. Of these one is a small cell carcinoma, one is an adenocarcinoma, one is a plasmacytoma and one is a germ cell tumor.(Table-4)

Discussion

Percutaneous FNAC became an alternative procedure for biopsy in evaluating a patient with mass lesion in the lung or mediastinum for the past 15-20yrs because of the simplicity of procedure, rapidity of diagnosis and minimal morbidity. It is helpful in diagnosing inoperable cases and cases where surgical intervention is not needed[7]. It is an accurate and reliable way in diagnosing pulmonary neoplasms where the sensitivity may range from 89-99%[8]. Most false negative results are because of sampling error that is why repeat aspiration is recommended in cases where the initial aspiration failed to yield diagnostic material. According to studies the reason for insufficient material is inexperience, inflammation and fibrosis. Adequacy of sample ranged from 80-95% as per studies[9]. In our case it was 87%.

Inflammatory conditions in our study constituted 27% (12cases) in patients ranging from 3-70yrs which is consistent with other studies[10]. All the inflammatory lesions were diagnosed in males.3 cases out of the 12 showed granulomatous inflammation. Remaining were nonspecific inflammatory lesions. All the granulomatous lesions were diagnosed in extremes of age i.e. 2 cases in one case in 70yrs age. TB cases constituted 0.2-1.5% of all FNAC cases for lung nodules in some studies. In our study it accounted for nearly 7% which is very high. The reason could be the small sample size and increased incidence. Two cases which did not respond to antibiotic therapy were biopsied and showed moderately differentiated adenocarcinoma and squamous cell carcinoma. Cytology plays an important role in diagnosing infectious diseases especially in immunocompromised patients. Bacterial infections may sometimes present as circumscribed mass lesions mimicking malignancy on x-ray[11]. Common organisms are Pneumococci, Staphylococcus aureus, H. influenza, Pseudomonas, Legionella, Nocardia, and Actinomyces etc. Granulomatous inflammation may be because of tuberculosis, sarcoidosis, fungal infections, Wegener's granulomatosis etc. Relevant clinical history and AFB staining differentiate tuberculosis from other etiological causes. In the present study all were of tuberculous etiology.

Among the 32 (73%) lung malignancies primary was 27 (84%) and metastases was 5(16%). All the patients among the primary group had history of smoking even in the females except in a female with adenocarcinoma. Maximum number of cases was recorded in the age group of 4th to 7th decade which was in correlation with other studies[12]. Male to female ratio of malignant tumors in our study is 5:1 which is consistent with other studies.[13]

Squamous cell carcinoma was the commonest malignancy (No-15 ,55.5%) mostly reported in men of 40-70yrs age. Most of the cases presented as hypo echoic to mixed echoic masses in the middle upper and lower lobes. Diagnosis has to done carefully as normal squamous cells of the skin and some atypical squamous cells that are present adjacent to a cavitary lesion or atypical cells in the background of chemotherapy, radiotherapy, infarction or diffuse alveolar damage may be misinterpreted as malignant squamous cells[2]. Some cases of squamous cell carcinoma show foreign body giant cells in response to the keratin which should not be mistaken for tuberculosis . One case which was diagnosed as squamous cell carcinoma on biopsy was found out to be adenosquamous carcinoma. The incidence of squamous cell carcinoma in our study was 55.5%and diagnostic accuracy of squamous cell carcinoma was 93% is comparable with other studies[14].(Fig-1)

Small carcinoma was diagnosed in 3 cases constituting 12% of primary lung malignancies all in the age group 40-50yrs presented with isolated apical lesions with Horner's syndrome in one case. Reserve cell hyperplasia may give a diagnostic dilemma but cohesiveness of cells with smaller size and lack of mitotic activity will help in the diagnosis[2].In the present study site and size of the tumor and age at presentation are well correlated with literature.(Fig-2)

Adenocarcinomas constituted 15 % (No-4) of the cases presented in the 4th -6th decade with hypo echoic to complex echoic masses in the basal and apical regions and one in the para tracheal region. One of the patients had superior venacava compression syndrome. Reactive bronchial cells may mimic adenocarcinoma but the presence of cells with cilia and demonstration of spectrum of changes favor reactive process rather than a malignancy. According to the literature metastasis from GIT, breast, FGT and prostate may be seen in lung and it is difficult to differentiate from primary. Mucin stains and IHC may help in differentiation[2]. In our study there was no evidence of primary anywhere. Biopsy was done in 3 cases and all correlated well (100%). Incidence of adenocarcinoma in our study is relatively less in comparison to the other studies.(Fig-3)

Large cell Undifferentiated carcinoma was diagnosed in 4 cases(15%) in 5th and 6th decade among which one case was a giant cell carcinoma diagnosed in a male 30yrs. All the cases have presented with cough, hemoptysis, breathlessness and weight loss of about 3-4 months duration. 3 cases presented as apical lobe lesion which is a common location for these lesions[15]. Among this 1 case was a giant cell variant diagnosed in a 30 yr young male.

1 Case of mesothelioma occurred in a male of 60 yrs constituting3.5% of cases, who showed diffuse homogenous opacity in the left hemi thorax with pleural effusion. He was not having any history of exposure to asbestos. Biopsy confirmed the diagnosis.

Metastatic tumors constituted 10% (No-5) of total cases of which 2 (40%) were sarcomas 2(40%)werechoriocarcinomas and 1(20%) was a squamous cell carcinoma. Out of the 2 cases of choriocarcinoma metastases one patient had history of molar pregnancy fallowed by bleeding per vagina. The other case had history of abortion 6 months back and presented with a single well defined nodular opacity in the apical region of right lung. The metastatic tumors commonly present as multiple well demarcated bilateral lesions ranging from very tiny to large cannon ball lesions[16]. 4 cases in our study had the same radiological appearance but one case presented as single large nodule which is uncommon.(Fig 4)

Mediastinal lesions were 7 in number with 3 cases (43%) of lymphoma, 2 cases (28.5%) of sarcoma and 2 cases (28.5%) of thymoma. All the 3 cases of lymphoma were diagnosed in children of less than 10yrs age in the anterior mediastinum presented as hypo echoic masses with bilateral pleural effusion of which 2 were males and 1 was a female. Biopsy showed high grade NHL in all these cases of whom 1 patient had gone into terminal leukemic phase and died within 1 month of diagnosis. In literature, malignant lymphoma has been found to be the most common mass lesion in mediastinum[17].Shobb et al study also showed more number of lymphoma cases in the mediastinum in relation to other lesions[18].

Of the 2 sarcomas diagnosed on FNAC one patient had clinical picture of Von Recklinghausen's disease so a cytological diagnosis of neurofibrosarcoma was made (Fig 5). The neural tumors most commonly occur in the posterior mediastinum[19]. Our case also was also presented as a posterior mediastinal mass. Age of the patient plays an important role in the diagnosis. Neurofibromas, Schwannomas and MPNST are common in adults where as Ganglioneuromas and Neuroblastomas occur in the children[20]. The other case which was diagnosed as a vascular tumor on FNAC was turned out to be a malignant fibrous histiocytoma with rhabdomyoblastic and vascular differentiation.This presented as an anterior mediastinal mass extending into the chest wall with rib destruction.

2 cases of Thymoma were diagnosed in females of 3rd and 4thdecades of which one patient was suffering from myasthenia gravis. X-ray showed a homogenous opacity in the anterior and superior mediastinum with mediastinal widening. Biopsy was not done in these cases. Basing on the cytological findings diagnosis of epithelial predominant thymoma was made. Thymomas represent the most common tumors of anterior mediastinum; most common in adults older than 40yrs and 30-45% develop myasthenia gravis. Morphological subtyping of thymoma has important clinical implication as epithelial predominant type carries a more aggressive course[20]. Cases like mediastinal teratoma, metastatic tumors and malignant lymphomas are to be ruled out before making a diagnosis of epithelial predominant thymoma.

Summary and conclusion

In the present study of 75 cases male to female ratio was 5:1. Granulomatous lesions occurred in the extremes of age and all in males. Common age of the malignant lesions was 40-70yrs. with male predominance. Commonest malignancy was squamous cell carcinoma and all had history of smoking. Biopsy correlated with FNA diagnosis in 90% of cases. Commonest tumor of mediastinum was lymphoma. Findings of the present study are comparable with other studies

To conclude FNAC has a great role in diagnosing mediastinal and lung lesions. It provides rapid and accurate diagnosis in malignant conditions and prevents unnecessary surgical intervention in inflammatory conditions which presented as mass lesions. FNAC under ultra sound guidance improves the efficacy and accuracy of diagnosis.

Lesion	Below 10yrs		11-20yrs		21-30yrs		31-40yrs		41-50yrs		51-60yr		61-70yrs		Total
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
Inflammatory Granulomatous Nonspecific	1	1											1		3
					2		1		1		4		1		9
Lung and Pleura Primary neoplastic-															
Squamous cell ca.					1				6	2	3		3		15
Small cell ca.									3						3
Adeno ca.									2	1	1				4
Undifferentiated ca					1						3				4
Mesothelioma													1		1
Metastatic															
Sarcomas											2				2
Chorio ca.				1				1							2
Squamous cell ca								1							1
Mediastinal tumors															
Lymphomas	2	1													3
Sarcomas					1		1								2
Thymomas						1		1							1
TOTAL	3	2		1	5	1	2	3	12	3	13		6		51

Table 1 showing age and sex distribution of lung and mediastinal lesions

Site of FNAC(Lung)	Type of lesion	FNAC	Biopsy
Inflammatory(24%)	Granulomatus Nonspecific	12 3 9	2
PrimaryMalignancies(66%)	Squamous cell carcinoma	15	9
	Adenocarcinoma	4	3
	Small cell carcinoma	3	1
	Undifferentiated carcinoma	4	1
	Mesothelioma	1	1
Metastasis(10%)	Squamous cell carcinoma	1	1
	Sarcoma	2	2
	Choriocarcinoma	2	0
Total		44	20

Table 2- Showing lesions of lung and pleura diagnosed on FNAC with correlative biopsy

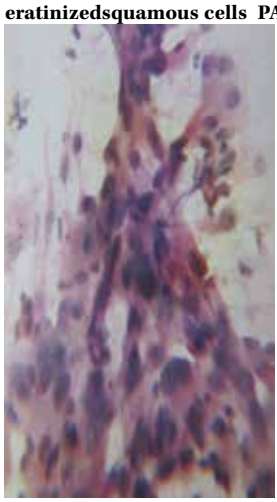
Type of malignancy	FNAC	Biopsy
Sarcomas	2	1
Lymphomas	3	3
Thymomas	2	0
Total	7	4

Table 3- Showing lesions of mediastinum diagnosed on FNAC with correlative biopsy

No of cases	FNAC	Biopsy
2	Inconclusive	1 Small cell carcinoma 1 Plasmacytoma
2	Suggestive of malignancy	1 germ cell tumor 1 Adenocarcinoma
2	Inflammatory	1 Mod.diff. Squa.cell ca. 1 Adeno ca.
1	Small cell ca.	Mixed small cell and adeno ca.
1	Squamous cell ca.	Adenosquamous ca.
1	Angiosarcoma	Malignant fibrhistiocytoma
Total- 9		

Table 4 showing discordance of FNAC and Biops

Fig 1Showing squamous cell carcinoma withpleomorphickeratinizedsquamous cells PAP 400x



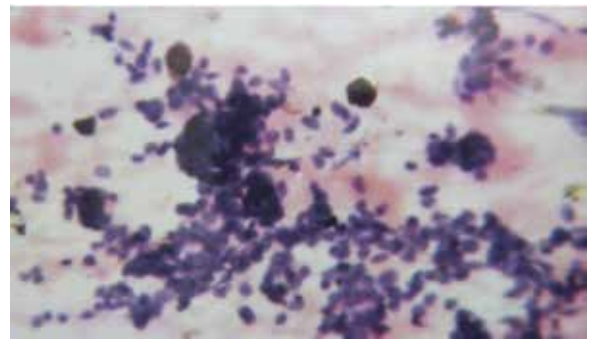


Fig 2 Showing small cell carcinoma with sheets of small cells with nuclear moulding and hyperchromasia H&E 400X

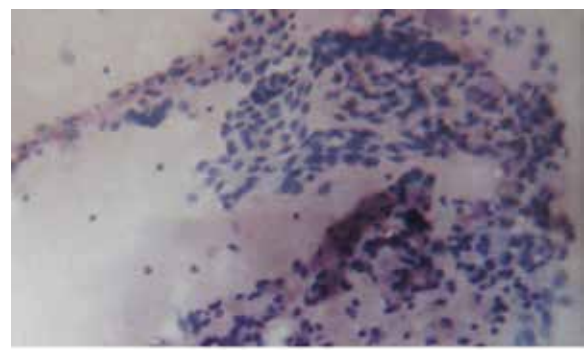


Fig3 Showing adenocarcinoma with sheets of round to oval cells with focal acinar formation H&E 400X

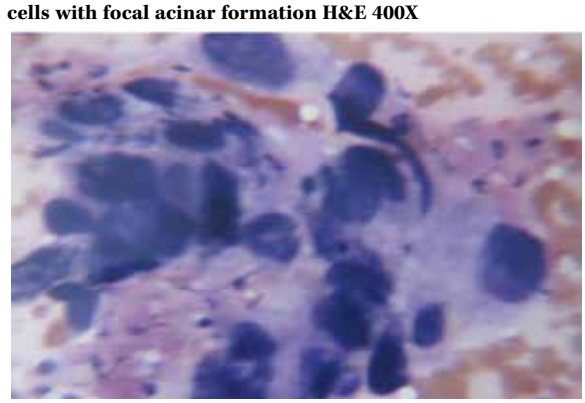


Fig 4 Showing choriocarcinoma with highly pleomorphic cells and small cells H&E 400X

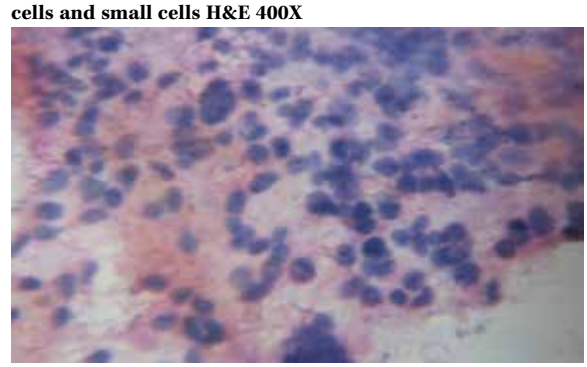


Fig 5 Showing neurofibrosarcoma with pleomorphic giant cells and focal attempted gland formation H&E 400X

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