ORIGINAL RESEARCH PAPER

Pathology

A STUDY OF CLINICO – RADIOLOGICAL AND PATHOLOGICAL EVALUATION OF PERIPHERAL PULMONARY MASS LESIONS WITH SPECIAL REFERENCE TO ULTRASOUND GUIDED FNAC.

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ABSTRACT

BACKGROUND: Lung cancer is the leading cause of cancer death worldwide. Central pulmonary lesions are diagnosed with the help of bronchoscopic biopsy and brushing cytology. For peripheral pulmonary lesions fine needle (18-20 gauze) aspiration cytology (FNAC) under ultrasound (USG) guidance is easy, safe and cost effective. **MATERIAL & METHOD** : The study was undertaken to compare the diagnostic yield of USG guided FNAC with clinico radiological and histopathological findings of peripheral lung lesions in the department of Pathology in collaboration with the Pulmonary Medicine & Radiodiagnosis, SCB Medical College & Hospital, Cuttack from September 2011 to September 2012 prospectively. Forty cases of peripheral lungs lesions were studied with USG guided FNAC followed by transthoracic needle biopsy and culture. **RESULTS**: Male predominance in the age group of 41-60 years was observed with male to female ratio 2.6:1 .The ratio of malignant to benign lesions in the lungs was 3:1. Past history of tuberculosis was present in 27.5% of patients. Smoking was strongly associated with malignancy (53.3%) in males. Predominant lesions found were malignancy in 30(75%) cases, inflammatory lesions in 7 cases(17.5%) and granulomatous lesions in 2 cases(5%) . Adenocarcinoma was the commonest malignancy seen in 14 cases (46.66%) followed by squamous cell carcinoma in 10 cases (33.33%). False positive in one and   false negative in two cases was observed .Out of 10 inflammatory cases pneumonic consolidation was the commonest .The final result of our series were sensitivity 100% ,specificity 90%, accuracy of the procedure is 95% ,predictive value for non-malignant lesions is 100% and predictive value for malignant lesion is 96.77% . **CONCLUSION** : USG guided FNAC of peripheral lung lesions is safe, simple and cost effective.

INTRODUCTION:-

Lung cancer is the leading cause of cancer death both in men and women worldwide[1]. Non small cell lung cancer (NSCLC) accounts for about 80% to 85% of all lung cancers. Various diagnostic techniques have been employed to obtain tissue for the diagnosis of intrathoracic lesions. Central lesions are diagnosed with the help of fibre optic bronchoscopic biopsy and brushing. For peripheral lesions, thick needle biopsy was first undertaken by leyden in 1883.[2,3] In 1960 it was again revived using thin needle (18 to 20 gauge) with low incidence of complications [3]. Ultrasound guided FNAC is cost effective, safer and technically easier alternative to USG and CT guided truecut biopsy[3]. The present study compared the diagnostic yield of USG assisted FNAC with clinico radiological and histopathological findings of peripheral pulmonary mass lesions. The present study was done to know the prevalence of neoplastic and non neoplastic lesions in peripheral pulmonary lesions and the pathology of different types of peripheral pulmonary mass lesions and their correlation with clinical presentation and diagnosis. This study also determined the the efficacy and accuracy of USG guided FNAC in diagnosis of various pulmonary mass lesions.

MATERIAL AND METHODS: -

This prospective, hospital based study   was carried out in the department of Pathology in collaboration with the department of Pulmonary Medicine & Radiodiagnosis ,SCB Medical College & Hospital,Cuttack ,Odisha from September 2011 to September 2012. Institutional Ethical Committee approval   was obtained prior to the study. Patients were selected as per the inclusion & exclusion criteria of the study protocol. Written informed consent as per the ethical committee   was obtained from participants prior to the study.

Inclusion Criteria:

All cases admitted to the department of Pulmonary Medicine with a strong suspicion of peripheral pulmonary mass lesion by history, clinical examination and radiological features   with willingness for inclusion in the study.

Exclusion Criteria:-

Exclusion criteria for the present study were lesion in the chest wall and mediastinum as shown in   chest x-ray ,USG and CT scan, lesion more than 8cm deeper than percutaneous site of puncture . Patients with poor general condition, pulmonary hypertension, suspected vascular lesions, bleeding disorders, severe emphysema were also excluded.

METHODOLOGY: -

Written informed consent was obtained from the patients or their relatives   before the procedure. Bleeding   time (BT), clotting time(CT) and prothrombin time (PT) were estimated for each patients.USG was done in each case followed by FNAC by a 20-22 gauge lumbar puncture needle by the radiologist .Multiple slides were prepared and half of the slides were immediately fixed with 95% ethanol and half of them were air dried. For adequacy smear scan was done. The patients were advised for a guided transthoracic truecut biopsy after an interval of 2 weeks after a course of empirical antibiotics treatment.

The study included 40 patients of varied age group. A brief clinical history followed by meticulous physical examination, routine investigation were done along with Chest X-RAY ,USG and CT scan etc. whenever required, All patients presented with respiratory symptoms with a localized peripheral lung lesions clinically and radiologically where conventional investigations of sputum, blood, fibreoptic bronchoscopy, pleural fluid analysis became inconclusive regarding etiology. The slides were stained with   Papanicolaou (Pap),Hematoxylin and Eosin(H& E)and Leishman stain.

OBSERVATION:

In the present study FNAC was performed in 48 cases out of which

8 cases could not be followed up for subsequent studies like culture and sensitivity and transthoracic truecut biopsy and were thus excluded from the study. Twenty nine (72.5%) patients were males and eleven (27.5%) were females indicating male predominance with male to female ratio 2.6:1 Out of the forty cases thirty were malignant and ten were benign lesion . The ratio of malignant: benign lesions in the lungs was 3:1.

In malignant and nonmalignant conditions patients presented with mass lesion both clinically & radiologically in 95% cases followed by cough in 92.5% cases , constitutional symptoms in 77.5% cases, chest pain and bronchitis in 52.5%of the cases. Twenty one male (52.5%) and 9(22.5%) female patients presented with malignant lesions. Among the benign lesion 8 (20%) were male patients and 2(5%) were female.Most of the paitients (47.5%) were in the age group of 41-60 years . Smoking was associated with malignancy in 16 (53.3%) male cases and none in females. In non smokers 10 (33.33%) females had malignant lesions.Five (12.5%) cases of males and 4(10%) cases of females gave a past history of tuberculosis. FNAC revealed 30 (75%) cases as malignant, 7(17.5%) cases as inflammatory, 2 (5%) cases as granulomatous and 1 (2.5%) case as inadequate for interpretation(Table-1)

Table 1 DISTRIBUTION OF CASES IN CYTODIAGNOSIS

DIAGNOSIS	NUMBER OF CASES	PERCENTAGE OF CASES
INFLAMMATORY	7	17.5%
GRANULOMATOUS	2	5%
SUSPICIOUS OF MALIGNANCY	0	0%
MALIGNANT	30	75%
INADEQUATE FOR INTERPRETATION	1	2.5%
TOTAL	40	100%

After FNAC two (5%) cases had chest pain, 2(5%) cases had pneumothorax and 1(2.5%) had haemoptysis as complication. Transthoracic truecut biopsy revealed 9 (30%) cases as squamous cell carcinoma, most commonly in the age group of 71-80 years of which 6(20%) cases were males and 3(10%) cases were females. Small cell carcinoma was detected in 4(13%) cases of which one (3.3%) case was male and 3(10%) were females.

Adenocarcioma was the most commonly occurring malignant lesion with a total of 14(46%) cases out of which eleven (36%) cases were males and 3(10%) were females .Two (6.66)cases were detected as large cell carcinoma and one (3.33%) as undifferentiated carcinoma in males only. (Table-2)

Table 2 CYTOLOGICAL DIAGNOSIS

TYPE OF MALIGNANT LESION	SEX		NUMBER OF PATIENTS
	MALE	FEMALE	
SQUAMOUS CELL CARCINOMA	6 (20%)	3 (10%)	9 (30%)
SMALL CELL CARCINOMA	1 (3.33%)	3(10%)	4 (13%)
ADENOCARCINOMA	11 (36%)	3(10%)	14(46.66%)
LARGE CELL CARCINOMA	2(6.66%)	NIL	2 (6.66%)
UNDIFFERENTIATED CARCINOMA	1(3.33%)	NIL	1 (3.33%)
TOTAL	21 (70%)	9 (30%)	30

Histopathological correlation revealed 10(33.3%) as squamous cell carcinoma,14(46.6%) as adenocarcinoma, 3(10%) as small cell carcinoma and 3(10%) as large cell carcinoma (Table-3).

Table 3 HISTOPATHOLOGICAL DIAGNOSIS

| DIAGNOSIS	NUMBER OF CASES	PERCENTAGE
SQUAMOUS CELL CARCINOMA	10	33.33%
ADENOCARCINOMA	14	46.66%
SMALL CELL CARCINOMA	3	10%
LARGE CELL CARCINOMA	3	10%
TOTAL	30	100%

Final diagnosis of non-malignant lesions who presented with peripheral mass lesions revealed 8 cases as inflammatory, smears were found to show *Streptococcus pneumoniae* in 3(30%) cases, *Klebsiella pneumoniae* in 3(30%) cases, Staphylococcus aureus in 2 (20%) cases. Two (20%) cases diagnosed as granulomatous lesions on cytology were finally diagnosed as tubercular *(Mycobacterium tuberculosis)* and fungal *(Aspergillas fumigatus)* by culture. Out of 30 cases of malignant lesions these was a good correlation showing consistency between FNAC and histopathological diagnosis .

Twenty seven (27) cases in cytological diagnosis were consistent with histopathology and 3 cases were inconsistent. Squamous cell carcinoma was detected in 9 cases by cytology but 10 cases by histopathology, cytological accuracy is 90%. These were 100% consistency of cytology and histopathology to detect adenocarcinoma as all the patients were diagnosed as adenocarcinoma by both cytology and histopathology. One cases in this group was a cases of broncho-alveolar-carcinoma (BAC).Two cases of large cell carcinoma which were diagnosed by cytology but on histopathology three cases were detected to be large cell carcinoma, out of which 2 cases were large cell neuroendocrine carcinoma, the cytological accuracy is 66.6%. Four cases that were detected as small cell carcinoma of lung by cytology were confirmed by histopathology in 3 cases. One case was finally diagnosed as large cell neuroendocrine carcinoma by histopathology, the cytological accuracy is 75%. One case of undifferentiated carcinoma diagnosed cytologically was found to be squamous cell carcinoma (poorly differentiated) histopathologically. Out of 30 cases, concordance was seen in 28 cases, the cytological accuracy 93.33% with 1(3.3%) false positive and 2 (6.66%) false negative cases. In the non-malignant lesions the cytological accuracy is 100%. Taking both the lesions into account the cytological accuracy is 95% with false positive as 2.5% and false negative as 5%.(Table -4)
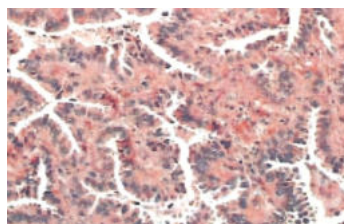
Table 4 ACCURACY OF FNAC

| TYPE OF TUMOUR	TOTAL NUMBER OF CASES	CONCORDANT	CYTOLOGIC ACCURACY	FALSE +VE	FALSE -VE
SQUAMOUS CELL CARCINOMA	10	9	90%	-	1
ADENOCARCINOMA	14	14	100%	-	-
SMALL CELL CARCINOMA	3	3	75%	1	-
LARGE CELL CARCINOMA	3	2	66.66%	-	1
TOTAL	30	28	93.33%	1(3.33%)	2(6.66%)

SQUAMOUS CELL CARCINOMA OF LUNG
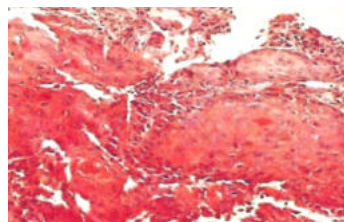
Image 1 CYTOLOGY H & E 40X & HISTOPATHOLOGY H &E 10X

Image 2 SQUAMOUS CELL CARCINOMA HISTOLOGY H &E

10X] ADENOCARCINOMA OF LUNGS
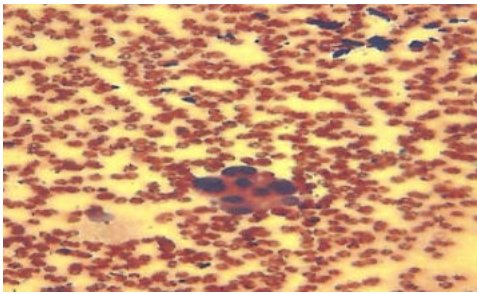
Image 3   ADENICARCINOMA OF LUNGS SHOWING ACINI H &E 10X
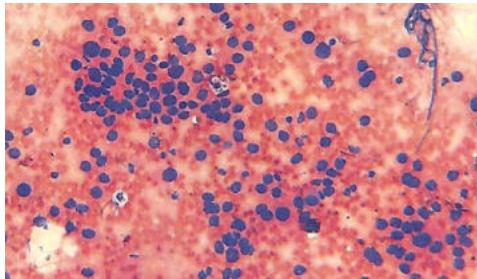
[Image 4 ADENICARCINOMA OF LUNGS SHOWING SHOWING TUMOUR CELL H &E 10X]

DISCUSSION-

Riaz Hussain shah et al in March 2010 [4] found a diagnostic accuracy of 91.66% in USG guided FNAC which was comparable to 74-97% in most literatures available. In our study forty (40) cases of peripheral pulmonary mass lesions were investigated .Thirty(75%) cases were malignant and 10(25%) cases were nonmalignant. Twenty one (52.5%) were males and 9(22.5%) were females in malignant group, the total ratio being M:F::2.6:1 This is comparable with other series by Alberg AJ et al [5] . The present study showed the ratio of smokers to non smokers with mass lesion was 3.2:1.The ratio of smoker to non smoker who presented with malignancy in males is 2.6:1.In our study the association of smoking with presentation of mass lesion and malignancy is found to be strong. In the present study the association of smoking with squamous cell carcinoma was 50%, with adenocarcinoma it was 50%, with small cell carcinoma it was 33.33% and with large cell carcinoma it was 66.66%. This is comparable to study by Manas Madan et al [6]. In our study total 10 patients gave past history of tuberculosis, 8 of whom (4 males and 4 females) showed malignant lesion, the association was 26.6%. Manas Madan et al [6] found similar results. From this study most of the patients with mass lesions were in age group between 41-60 years. This is also supported by Alberg AJ et al.[5] The predominant lesions found in this study (Table 1) was malignancy in 30 case (75%) followed by inflammatory lesions in 7 cases (17.5%), granulomatous lesion in 2(5%) cases. Our study showed the complication rate of FNAC as 12.5% which was similar to other study by Hayes MMM et al [7]. Our study showed the adenocarcinoma was the most common malignancy (46%), more common in males (36%) then females (10%).This incidence is also supported by Reddy KS and Gupta PC et al [8] which showed incidence of adenocarcinoma as 45.06% similar to our study. Squamous cell carcinoma was detected in 9 cases (30%) by cytology and 10 by definite histopathological studies. Bhattacharya et al [9] found squamous cell carcinoma in 35.34% cases and there was strong association with smoking similar to our study.

Small cell carcinoma was detected in 4 cases (13%) which is similar to study by Riaz Hussain et al [4]. Large cell carcinoma was seen in two cases in the present study detected by cytology and 3 cases by histopathology, this accounts for 10% of all malignant lesion. Mukharjee et al [10] showed a similar incidence (9.52%) of large cell carcinoma. Undifferentiated carcinoma was detected in

one cases (3.33%) diagnosed by cytology. On histology it came out to be a squamous cell carcinoma (moderately differentiated type) .Madan Manas et al [6] found an incidence of 7.5% similar to our study. The incidence of non malignant lesions who presented with peripheral pulmonary mass revealed pneumonic consol idation and granulomatous lesions. The organisms are S. pneumoniae, S aureus, M. tuberculosis and A.fumigatus respectively. Similar results were also seen in the study by Reddy KS and Gupta PC et al [8]. In our study there were 27 cases of malignancy with cytological diagnosis consistent with histopathology and 3 cases were inconsistent. There was 90 % accuracy for diagnosis of squamous cell carcinoma, 100% for adenocarcinoma,75% for small cell carcinoma and 66.66% for large cell carcinoma .Our diagnostic accuracy was 93.33% for malignant lesions and in the whole study the diagnostic accuracy was 95 % with one false positive and two false negative cases. We calculated the sensitivity of the procedure to be 100%, specificity of the procedure to be 90.90%, predictive value for non malignant lesion to be 100%, predictive value for malignant lesion to be 96.77%, final accuracy calculated for the whole test in diagnosis of malignant and non malignant lesion was 95% This study was well correlated closely with Bhattacharya Sujit et al [9] in 2001.

CONCLUSION:-

USG guided FNAC of peripheral pulmonary lesion of the lungs is a safe, cost effective and fairly accurate diagnostic procedure with early evaluation and diagnosis of pulmonary lesion .

 CONFLICT OF INTEREST: NIL

REFERENCES:
1.   Text book of Human Histology (Inderbir Singh) 4th Edition Page no;212 – 215.
2.   Weiss RL,Snow GW, Schuman GB, Hammmond ME.Diagnosis of Cytomegalovirus Pneumonitis on bronchoalveolar lavage fluid ;comparison of cytology,immunofluorescence,and i situ hybridization with viral isolation.Diagn Cytopathol 1991;7:243 -247.
3.   Sterrett GF,FrostF,Whitaker D.Tumours of lung and mediastinum.In:Gray w,ed. Diagnostic cytopathology.Edinburgh :Churchill Livingstone ,1995:69 -128 .
4.   Riaz Hussain Shah et al ultrasound guided transthoracic biopsy in peripheral lung and mediastinal masses with trucut needle,journal of medical channel,January to March 2010 volume 16;136 -139 .
5.   ALberg AJ,Samet JM.Epidemiology of lung cancer.Chest 2003;123:21S -49S.
6.   Madan M and Bannur H: Evaluation of FNAC in lung Diseases Turk Patoloji Dergisi /Turkish Journal of Pathology /Vol.26,No.1,2010;Sayfa /Page 1-6 .
7.   Hayes MMM,Zhang DY,Brown W .Transthoracic fine needle aspiration biopsy cytology of pulmonary neoplasams.Diagn Cytopathol 1994;10:315 -19.
8.   Reddy KS and Gupta PC.report on tobacco control in India.New el;hi Ministry of Health and Family Welfare,Govt of India,2004 .
9.   Bhattacharya sujit et al Clinico –pathological profile of lung cancer in a tertiary medical centre in India: Analysis of 266 cases;Journal of Dentistry and Oral Hygiene Vol.3(3),pp.30 -33,March 2011.
10. Mukharjee et al CT guided FNAC of pulmonary nodules,Journal of cytology January vol 27 issue 1.