ORIGINAL RESEARCH PAPER

Pathology

KEY WORDS: Computed Tomography guided; fine needle aspiration cytology; pulmonary Masses

# CT GUIDED FINE NEEDLE ASPIRATION CYTOLOGY OF LUNG MASS AN INSTITUTIONAL BASED STUDY

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ABSTRACT

**Background:** CT guided fine needle aspiration cytology (FNAC) is a rapid, sensitive and economical procedure for diagnosing both inflammatory and neoplastic lesions of the lungs.

**Aims:** The purpose of this study is to evaluate the pathological spectrum of intrathoracic lesions by using CT guided FNAC in the diagnosis of pulmonary mass lesions, both benign and malignant.

**Material and Method:** We conducted an institution based retrospective study on 65 patients who presented with pulmonary mass lesions, over a period of 2 years. All patients who presented with pulmonary or mediastinal masses underwent a CT guided fine needle aspiration in the department of radiology.

**Results:** A total of 65 cases were evaluated, out of which 39(60%) were males and the rest were females. Cough was the most common symptom present in 72.5% cases followed by weight loss (67. 5%).Majority 72.5% cases were malignant and 22.5% cases were reported as cytologically benign. Adenocarcinoma was the most common tumor reported and there were no major complications.

## Introduction

Transthoracic CT guided Fine needle aspiration of suspicious lung masses is a well-established ,minimally invasive and simple diagnostic method of relatively low cost with minimal complications[1].Transthoracic FNAC is considered as the most effective cytological method for diagnosing malignant tumor of the lung particularly when the lesion is peripherally located[2,3].Fibreoptic bronchoscopy (FOB) with brushings and biopsy are considered to be most effective in diagnosing centrally placed pulmonary lesions while Fine needle biopsy (FNB) has particular value in those cases which are non-diagnostic on FOB[4]. It also has the advantage of subclassifying the tumor type, hence leading to early diagnosis and helps in implementing early and effective modality of management. Geragthy PR has reported a diagnostic accuracy of greater than 80% for benign lesions and greater than 90% for malignant disease[5].

## Material and Methods

A retrospective study was carried out in the department of pathology, JNIMS involving 65 patients who underwent CT guided FNAC for thoracic mass lesions which were suspected to be neoplastic on Chest X-Ray and CT scan. Duration of study was for 2 years from May 2013 to April 2015. The inclusion criteria were patients presenting with mass lesions in the lung clinically suspected to be pulmonary neoplasm which were found to be negative on non-invasive technique as well as lesions suspected to be of inflammatory origin.

The procedure was done on outpatient basis after ruling out any bleeding disorders and explaining the risk and benefits to the patients. Detailed personal history especially about smoking habit and history of contact of tuberculosis was obtained from every case. After taking proper aseptic precaution and placing the patient in supine, prone or lateral decubitus position depending on the location of the thoracic mass lesion, the shortest distance of the lung mass from skin surface was noted. Then a 23 gauge lumbar puncture needle was inserted during suspended respiration and computed tomography cuts were taken to visualize the tip of the needle into the mass. Once the needle location was confirmed then a 10 ml syringe attached to FNAC gun was used and aspiration done with to and fro and rotating movements within the lesion. The material aspirated were smeared on the slides and stained with May Grunwald Giemsa after dry fixation while some slides were stained with Papanicolaou stain after alcohol fixation. ZN (Ziehl Neelsen) stain were also done whenever required. Patients were kept under observation for 1 hour to rule out the development of any complications and none of the patients required any active treatment.

## RESULTS

A total number of 65 patients underwent CT guided FNAC for lung masses of which 41(63.1%) were male and 24(36.9%) were females. There was male preponderance with a male female ratio of 1.7: 1. The age ranged from 18 to 85 years with a mean age of 55.5years. Majority of the cases were present in age group of 61 to 70years. Cough was the most common presenting symptom followed by weight loss (table 1). The size of the lesion ranged from 2.0 to 6.8 cms.

**Table 1: Demographic finding of the study**

| Subject | Variable | Frequency | Percentage (%) |
|---|---|---|---|
| Gender | Male | 41 | 63.0 |
| | Female | 24 | 36.9 |
| Age | Below 40 yrs. | 4 | 6.1 |
| | 41-50yrs | 5 | 7.6 |
| | 51-60yrs | 16 | 24.6 |
| | 61-70yrs | 26 | 40 |
| | 71-80yrs | 11 | 16.9 |
| | 81-90yrs | 3 | 4.6 |
| Complaint | Cough | 29 | 72.5 |
| | Chest pain | 3 | 7.5 |
| | Wt. loss | 27 | 67.5 |
| | Fever | 11 | 27.5 |
| | Hemoptysis | 13 | 32.5 |
| Cytological diagnosis | Benign | 14 | 21.5 |
| | Malignant | 47 | 72.3 |
| | Inadequate | 4 | 6.1 |
| Sampling | Adequate | 61 | 94 |
| | Inadequate | 4 | 6 |

We had a diagnostic yield of 94% and 4 out of 65 cases were inadequate for evaluation and a descriptive report was signed out. Out of 65 cases benign lesions constituted about 21.5% and malignant lesion was detected in 72.3% and 6% cases were inadequate (table 1). In benign category chronic non specific inflammation was found in 9 cases followed by 3 cases of tuberculosis and a single case of paragonimiasis (Fig 1) and another case of lung abscess(Table2).

**Table 2: Spectrum of benign Lesions**

| Benign lesions | Number of cases(N=14) |
|---|---|
| Tuberculosis | 3 |
| Paragonimiasis | 1 |
| Abscess | 1 |
| Chronic non specific inflammation | 9 |

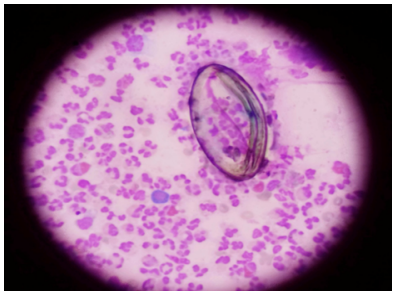

**Fig.1: Operculated egg of paragonimus in lung aspirate.**

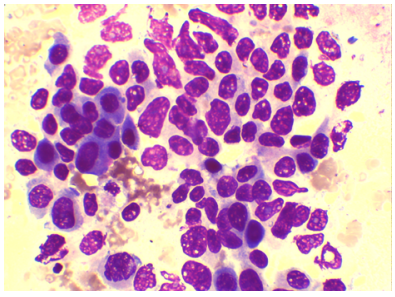

**Fig.2: Adenocarcinoma –Malignant cells in glandular pattern with cells displaying prominent nucleoli**

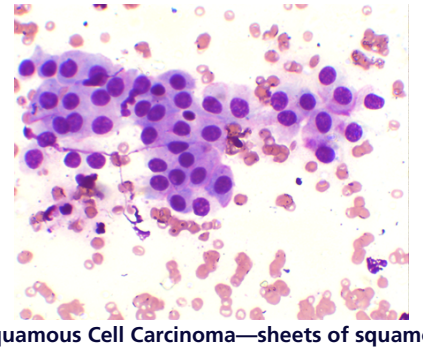

**Fig.3: Squamous Cell Carcinoma—sheets of squamous cells having abundant cytoplasm**

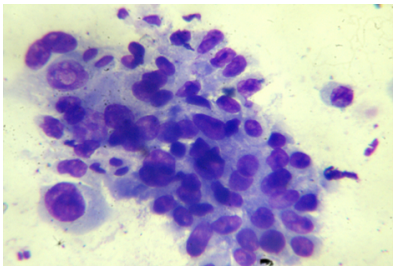

**Fig.4: Bronchioloalveolar carcinoma—papillary pattern of malignant cells showing presence of intranuclear inclusion.**

The most common malignancy diagnosed on cytology was adenocarcinoma (Fig 2) in 23 cases (48.9%)followed by squamous cell carcinoma (31.9%) (Fig 3). 3 cases were reported as bronchioloalveolar (BAC) [Fig 4] All the squamous cell carcinoma reported were centrally located while some larger tumors had involved peripheral areas of the lung. The various cytological subtype of malignant lesion is shown in table 3.

**Table 3: Cytological subtypes of malignant lesions**

| Type of malignancy | No. of cases (N=47) | Percentage (%) |
|---|---|---|
| Adenocarcinoma | 23 | 48.9 |
| Squamous cell carcinoma | 15 | 31.9 |
| Small cell carcinoma | 2 | 4.2 |
| Thymoma | 1 | 2.1 |
| Large cell undifferentiated | 1 | 2.1 |
| Bronchioloalveolar ca | 3 | 6.3 |
| Malignant mesothelioma | 2 | 4.2 |

## Discussion

CT-guided FNAC is a minimally invasive technique with high diagnostic accuracy and minimal complications. C.J.R Stewart had shown in their study a high specificity rate of 100% in diagnosing malignancy of lungs[6].In an extensive interinstitutional database study which consisted of more than 13000 lung FNA samples, from 436 institutions, the diagnostic sensitivity of FNA procedure was 89% and 99% for the pathologist's interpretation period.[7]It was detected in our study that most cases belonged to the age group 61 to 70 years which was same as shown in previous study[8].We had a male preponderance and a male to female ratio of 1.7 : 1. Our study showed a greater number of malignant lesions in comparison to the benign lesions .This was similar to the observation made by other studies[8,9]as well.

The adequacy rate of CT-guided FNAC is shown to be significantly improved when immediate assessment of the FNA sample is done on site by a cytopathologist[6].Santambrogio and coworkers have shown in a prospective study that the adequacy reaches as high as 100% with immediate cytologic assesment[10].We had 4 cases which were inadequate for interpretation. This could have been nullified if provision for rapid on site evaluation of the sample was made in the radiology department. Researchers have observed that larger size and superficial lesion increased the diagnostic accuracy. In a study by Prashant et al they have found that there was a fall in diagnostic yield when the lesions were smaller than 2cm or the depth of the lesion was more than 5 cms[11].

Tan et al have illustrated the importance of characterizing the smear as unsatisfactory or negative. In their study one of the case was reported as negative for malignancy but on review of the slide it was given a consensus opinion of unsatisfactory; this turned out to be a case of lymphoma on post lobectomy specimen[12].A non specific negative result on FNAC does not exclude malignancy. Therefore, repeat aspiration and clinical follow up or additional diagnostic procedures may be necessary for a definitive diagnosis[13].

Few cases of false positive diagnosis of malignancy have been reported and these have been attributed to reactive bronchiolar epithelial proliferation[14], squamous metaplasia[15], and reactive mesothelial proliferation[16] associated with lesions such as tuberculosis, chondroid hamartomas and granulomatous processes.

Tao et al[17] introduced the term called False "false positive". In their study from 1976 to 1982, five positive cytology reports were initially considered to be "false positive" based on the negative gross findings, benign operative biopsies, or negative histopathological findings in the surgically resected specimens. However when these cases were followed up clinically for a longer duration ,they turned out to be positive for malignancy and hence these cases were classified as False ''false positive" .They observed that four types of cancerous lesions are prone to be missed ,namely, any small cancer with a consistency similar to the parenchyma of the organ in which the tumor is located, superficially invasive carcinoma, scar cancer and radiologically occult lung cancer in presence of a coexisting radiologically demonstrable opaque lesion.

The neoplastic lesion were commonly diagnosed as compared to the benign lesions and Non-small cell lung cancer(NSCLC) constituted the predominant diagnosis. In the present study NSCLC constituted about 95.45% which are a bit higher as compared to J Kowalewski et al[18]who have reported an incidence of 70 %. And small cell carcinoma comprised of only 4.56% in comparison to 20% reported by X. Wu et al[19].

On subtyping NSCLC, adenocarcinoma was the most frequent diagnosis followed by squamous cell carcinoma. This was in concordance with various other sudies[12,18,19]. However in several other studies a higher prevalence of squamous cell carcinoma has been reported[20,21]. We had 3 cases of bronchioloalveolar carcinoma (BAC) which is a subgroup of adenocarcinoma. WHO classifies BAC as a tumor without stromal or tissue invasion[22].So

FNA cytology cannot provide a specific diagnosis as it requires complete sampling of the tumor histologically, but a BAC like growth pattern can be suggested[23].All the 3 cases showed tumor cells arranged in cell balls and clusters with occasional papillary process, having intranuclear inclusions.

Two cases were reported as small cell carcinoma. Small cell carcinoma is the most aggressive subtype of tumor so categorizing this neoplasm is of utmost importance as chemotherapy rather than surgery is the treatment modality used. The predictive value of diagnosing small cell carcinoma by FNB is over 90% and the sensitivity of tumor typing was found to be over 80%[24,25].

In the non-neoplastic lesions,3 cases (22.2%) turned out to be tuberculosis and 9 cases (55.5%)were reported as nonspecific inflammation. Surprisingly 1 case turned out to be paragonimiasis which was clinically as well as radiologically diagnosed as pulmonary Koch's. After the FNA diagnosis, the patient received praziquantel and her hemoptysis improved significantly.

Hansell DM et al[26] have illustrated that bleeding disorders, severe COPD (chronic obstructive pulmonary disease) and pulmonary arterial hypertension(PAH) along with contralateral pneumonectomy cases are some relative contraindications for CT assisted FNAC. Weisbrod GL[27]observed that an uncooperative patient unable to suspend respiration on request is an absolute contraindication. Complications reported included pain at puncture site, pneumothorax, pulmonary hemorrhage, hemoptysis and bleeding into chest wall. The rate of pneumothorax reported by various studies are quite variable and they range from 9% to 24%[6,10]. We had 3 cases which complained of pain at puncture site one case of mild perilesional hemorrhage who were managed conservatively but we did not encounter any complication of pneumothorax.

## Conclusion

CT-guided FNAC is a simple, accurate and safe diagnostic technique with low morbidity used for the evaluation of thoracic lesions. Sub classification of bronchogenic carcinoma can also be done accurately however unsatisfactory smears must be reviewed and one must refrain from giving a negative diagnosis on inadequate or unsatisfactory smears. Clinical correlation and reaspiration may be necessary.

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