

# Computed tomogram guided fine-needle aspiration cytology of lung and mediastinal masses with cytological correlation: A study of 257 cases in Western region of Nepal

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## ABSTRACT

Computed tomogram guided fine needle aspiration cytology (FNAC) is an important and useful investigation to differentiate between benign and malignant lesions of lungs. To evaluate the lung and mediastinal masses and to analyze and compare the results with cytological findings, 257 patients were retrospectively studied who underwent CT guided FNAC over a period of 2007 to 2013. The study was done in patients who presented with respiratory symptoms with a localized lung lesion which was confirmed radiologically. 252 cases of lung masses and 5 cases of mediastinal cases were included. Patients' age ranged from 24 to 84 year and the male to female ratio was 1.2:1. Radiologically, out of 257 cases, 225 cases were given as malignant, 8 cases as benign and 24 cases as inflammatory lesions. Cytologically, 212 cases were malignant, 12 cases were benign and 21 cases were inflammatory. Most common lung malignancy was adenocarcinoma (87 cases) followed by squamous cell carcinoma (56 cases). 8 cases of lung metastasis were seen. Compared to biopsy, CT guided FNAC shortens the diagnostic interval and helps in differentiating lung malignancy into different cytopathological types which aids in proper management of the malignant lesion.

**Keywords:** Computed tomogram, cytology, guided FNAC, lung mass

## INTRODUCTION:

Computed tomography (CT) guided fine needle aspiration cytology (FNAC) is a well known modality for characterization of lung masses. It has been used to differentiate lung masses into benign, malignant and inflammatory types. Furthermore its use has been extended in differentiating lung malignancy into different cytopathological types which aids in proper management of the malignant lesion. CT guided FNAC is widely recognized technique in indeterminate mass. It is a simple diagnostic method of relatively low cost, with negligible mortality and limited morbidity.<sup>1</sup> The accuracy of CT guided FNAC for discriminating benign from malignant lesion has been recorded to vary from 64% to 97%.<sup>2</sup>

Several post procedural complications have been reported for CT guided FNAC such as pulmonary hemorrhage, hemoptysis and pneumothorax. The risk for developing pneumothorax has been observed to be 22% - 45% due to high sensitivity of CT in detecting pneumothorax.<sup>3</sup> Relative contraindications to image guided FNAC are severe chronic obstructive airway disease, bleeding diathesis, contralateral pneumonectomy and pulmonary arterial hypertension.<sup>4</sup>

The purpose of our study is to evaluate the accuracy of CT and CT guided FNAC in differentiating and recording the pathological spectrum of the lung masses.

## MATERIALS AND METHOD:

This is a retrospective study conducted in Manipal Teaching Hospital (from Jan 2007 to Dec 2013) and Gandaki Medical College (Jan 2012 to Dec 2013) for a period of 7 years. The study was carried out in 257 patients who presented with intrathoracic and mediastinal mass that attended the outpatient/inpatient department of Medicine in the respective hospitals and were sent for chest CT in the department of Radiology. Relevant clinical history and investigations were obtained from the patient to narrow down the differential diagnosis and to see if patient was eligible for FNAC, such as history of bleeding disorder, thrombocytopenia, dyspnea, uncontrolled cough, chronic obstructive airway diseases, pulmonary arterial hypertension etc. CT guided FNAC was performed in patients with peripheral lung mass or mass which were only approachable by spinal needle. Patient inclusion criteria included: cooperative patient who was able to hold breath for a short while, no bleeding tendency, indeterminate lung mass, patient who was to undergo chemo- or radio-therapy and lesions not approachable by USG. Informed and written consent was taken from the patient explaining the risk and benefits of the procedure.

Axial section of the area of interest was taken after a scanogram. A feasible approach was judged and the patient positioned accordingly with radiopaque marker placed at the site of puncture. Then under all aseptic

precaution a 20-gauge spinal needle was introduced in suspended respiration into the lesion (Fig 1).

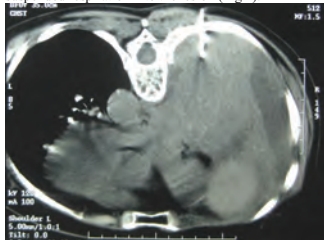


Fig. 1. Ct guided FNAC of lung mass with a needle.

Repeat scan of the area of interest was taken to check the position of the needle tip. With satisfactory position of the needle, the stylet was removed, 10 cc syringe attached, negative suction maintained and aspiration was carried out with to and fro movement. Slides were prepared from the aspirate. Both air dried and alcohol fixed (95% alcohol) smears were made for cytological evaluation. A final CT scan of the area of interest was taken to rule out any complications. The smeared slides were stained with Giemsa and Papanicolaou stains for cytological examination.

All the relevant data were collated and analysis was performed using SPSS version 17 program.

## RESULTS:

The data were collected from January 2007 to December 2013. Our study included 257 patients, out of which 252 with intrathoracic and 5 with mediastinal lesions were subjected to CT guided FNAC. Their ages ranged from 24 to 84 years with mean age of 67.32 years. The male to female ratio was

1.2:1. The distribution of cases according to radiological and cytological diagnosis is given in table 1.

**Table 1.** Distribution of cases according to radiological and cytological diagnosis.

|                                | Malignant | Benign | Inflammatory |
|--------------------------------|-----------|--------|--------------|
| Radiological diagnosis (n=257) | 225       | 8      | 24           |
| Cytological diagnosis (n=245)  | 212       | 12     | 21           |
| No of inadequate cases (n=12)  | 9         | 1      | 2            |

Comparison between radiological and cytological diagnosis is given in table 2.

**Table 2.** Comparison between radiological and cytological diagnosis.

| Radiological diagnosis | Cytological diagnosis |           |                     |       |
|------------------------|-----------------------|-----------|---------------------|-------|
|                        |                       | Malignant | Benign/Inflammatory | Total |
|                        | Malignant             | 202       | 14                  | 216   |
|                        | Benign/Inflammatory   | 10        | 19                  | 29    |
|                        | Total                 | 212       | 33                  | 245   |

Sensitivity – 95.28%, Specificity – 57.57%

Out of 212 malignant cases, adenocarcinoma (87 cases) was the commonest followed by squamous cell carcinoma (56cases). 10 cases of small cell carcinoma were seen. Out of 8 cases of metastatic tumors, 3 cases were from gastrointestinal tract and 2 cases each were from thyroid follicular carcinoma and renal cell carcinoma (Table 3).

**Table 3:** Details of cytological diagnosis

| Organ (n=257)       | Malignant                       | Inflammatory | Benign lesion | Inadequate |
|---------------------|---------------------------------|--------------|---------------|------------|
| INTRATHORACIC       |                                 |              |               |            |
| Lung (n = 252)      | TOTAL                           | 210          |               |            |
|                     | Adeno carcinoma                 | 87           |               |            |
|                     | Squamous carcinoma              | 56           |               |            |
|                     | Non-small cell carcinoma        | 49           |               |            |
|                     | Small cell carcinoma            | 10           |               |            |
|                     | Anaplastic large cell carcinoma | 1            |               |            |
|                     | Non Hodgkin Lymphoma            | 1            |               |            |
|                     | Metastasis from                 |              |               |            |
|                     | Breast adenocarcinoma           | 1            |               |            |
|                     | GIT adenocarcinoma              | 3            |               |            |
|                     | Thyroid follicular carcinoma    | 2            |               |            |
|                     | Renal cell carcinoma            | 2            |               |            |
|                     | TOTAL 2                         | 210          |               |            |
|                     | Seminoma 1                      |              |               |            |
| Mediastinum (n = 5) | NHL 1                           |              |               |            |
|                     | 212                             | 21           | 12            | 12         |
| Adequacy of sample  | 90.20%                          |              |               |            |

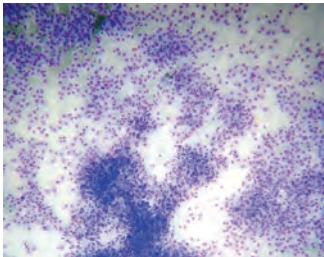
## DISCUSSION:

Fine needle aspiration cytology is a diagnostic procedure for cytological evaluation of lung mass lesions. Mentrion in 1886 used the FNAC technique for the first time to diagnose lung cancer. In spite of high diagnostic yield, the post-procedure complications are widely variable as reported in the literature.<sup>5</sup> CT-guided FNAC plays a crucial role in diagnosing lung mass lesions in which accurate needle placement is possible by avoiding injury to the surrounding structures, thus, limiting the complications of the procedure.<sup>5</sup>

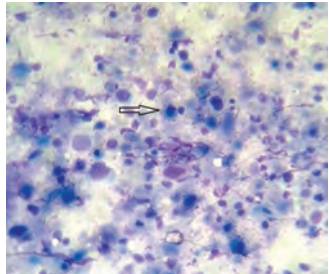
CT-guided FNAC procedure has been widely used in clinical practice to diagnose lung mass lesions with variable yield (50%-98%). The advances in imaging techniques and improved cytological techniques and expertise have improved the diagnostic yield.<sup>6,7</sup> The diagnostic accuracy of CT guided FNAC in our study was 90.20%. This is consistent with most of the studies where Emara MM et al, Jayashanker et al, Duenasa et al, and Saha A et al have reported the accuracy to be 96.9%, 90%, 93.5% and 94.7 % respectively.<sup>8-11</sup> However Sing JP et al have reported their diagnostic accuracy to be 85.3% while Ahmed S et al found malignancy in 82.10% of cases.<sup>12,13</sup>

Among the malignant cases there is variation in prevalence in the most common malignant lesions. Saha A et al and Basnet et al have reported the incidence of squamous cell carcinoma to be 58.33% and 50% respectively.<sup>11, 14</sup> The frequency of squamous cell carcinoma have been proclaimed to vary from 22- 29% by others.<sup>8, 11, 12, 15</sup>

The prevalence of adenocarcinoma of lungs have been disclosed to be variable with lower measure being 9.3%, higher of 49.4% as disclosed by Tan KB et al and 52.63% as reported by Mondal SK et al.<sup>8, 11, 16, 17</sup> In our series we have observed that adenocarcinoma



**Fig 2.** was more common as compared to squamous cell carcinoma



**Fig 3.** amounting to 41.03% and 26.41% respectively .

The metastatic tumors encountered in our study were from gastrointestinal adenocarcinoma (3 cases), breast (1 case), thyroid (2 cases) and renal cell carcinoma (2 cases) comprising of 3.77% of malignant lesion in the chest. Malignant tumors of the mediastinum (0.94% of cases) included a case each of seminoma and non-Hodgkins lymphoma (NHL). Saha A et al in their series have reported a case of metastasis from kidney and three (5.6%) cases of mediastinal mass comprising of NHL (2 cases) and Hodgkin's lymphoma (1 case).<sup>11</sup>

Non neoplastic cases comprised of 17.9% of the lesion as presented by Ahmed S et al and 2.5% of cases in the series by Madan M et al.<sup>13, 15</sup> Non neoplastic cases comprised of 13.46% of cases in our data. Non neoplastic cases were segregated as benign aspirate (5.18%) and inflammatory (9.90%) lesion. Abscess was the most common inflammatory lesion amounting to 57.14% (12cases).

The adequacy of samples in our data was 90.20% which almost correlates with those obtained by Tan et al (93%).<sup>16</sup> Emara MM et al and Prashant C et al have demonstrated that as the average number of attempts needed for final diagnosis is increased the obtained material would be sufficient for cytological diagnosis.<sup>8</sup> Only one pass was attempted in our study and the material was inadequate in 12 (4.66%) cases. However it has been suggested that an unsatisfactory aspiration must be repeated, particularly when there is strong suspicion of possible malignancy.<sup>8</sup>

Post procedure pneumothorax, perilesional hemorrhage and hemoptysis are occasionally encountered and rarely require major intervention.<sup>19</sup> Post procedural complication was very negligible in our study with few patients developing small pneumothorax (3cases) or minimal perilesional hemorrhage (2cases) accounting

to 2% of the cases which is in compliance with findings of Mondal SK who demonstrated the complication rate to be 2.4%.<sup>17</sup> In most instances the patient can be discharged after a check x-ray and few hours of observation, the hospital stay can thus be shortened for the patient which in turn also reduces the economic burden to the patient.<sup>2,3</sup>

We have observed the sensitivity and specificity to be 95.28% and 57.57% respectively for differentiating malignant and non-malignant lesions by CT. Similarly, Seemann MD et al have reported the sensitivity of 88.9% and specificity of 60.9 in differentiating malignant from non neoplastic lesion.<sup>20</sup> Basnet S B et al in their study of 100 cases reported a sensitivity and specificity of 88% and 84% respectively.<sup>14</sup> While Jayashankar E et al who conducted the study in 60 patients presented with a sensitivity of 84.5% and specificity of 76% in diagnosing malignancy with CT guided FNAC in chest and mediastinal mass and stated that a large scale of study would be more authentic to establish a statistical significance.<sup>9</sup>

CT guided FNAC is a well accepted, simple, accurate, safe and cost effective method for diagnosing a lung lesion with low morbidity rates. Combined with CT the aspiration needle can be guided safely into the lesion to improve the diagnostic yield of the cytological material. Thus improving the predictability of positive cases in malignant lesion. CT guided FNAC provides early diagnosis and subclassification of the lung masses hence directing the clinicians in proper management.

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